



Transforming **ENERGY** through
SUSTAINABLE Mobility

Guanajuato Policy Options for Land Transportation Greenhouse Gas Reduction

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ABSTRACT

NREL consulted the Mexican state of Guanajuato to help them identify and prioritize policies that are specifically applicable to their land transportation system and help them meet their greenhouse gas (GHG) reduction goals. Three focus groups were held across Guanajuato to get the input from a wide variety of users of the transportation system. These focus groups performed a SWOT (strengths, weaknesses, opportunities and threats) analysis of Guanajuato's transportation system and logged the policy goals of participants. NREL then developed a menu of policy options that have been used successfully in relevant countries and prioritized these policies based on the weighted input from stakeholder groups. The most applicable policies were a paid parking strategy, regional transit master plan, and expanded bike and pedestrian infrastructure. Case studies of these three policies, plus a few more, were then presented to inform Guanajuato of how these policies could successfully be implemented. Finally, the GHG reductions for five of the most applicable policies were estimated to reduce emissions from Guanajuato's land transportation system nearly 40% below business-as-usual emissions by 2050.

BACKGROUND AND CONTEXT

Riccardo Bracho

BACKGROUND

NREL is providing technical assistance to subnational governments in Mexico that emphasize the following topics:

- Information related to international best practices used in the design and implementation of urban transport electrification programs
- Introduction of tools and mechanisms for analysis of urban transport electrification solutions
- Efficient deployment of charging infrastructure and integration with the electrical grid
- Development of business models, clean energy procurement and financing mechanisms for the electrified transport sector
- Increase access to clean, reliable, and affordable transport solutions to all social strata
- Policies and standards to reduce greenhouse gas emissions from last-mile freight transport

BACKGROUND

NREL is providing technical assistance to the State of Guanajuato to create a Roadmap for Decarbonization of the Transport Sector. This Roadmap will inform stakeholders about what carbon reduction goals are ambitious but realistic, and what policy and program options can best help the state meet them.

In November 2022, NREL conducted 3 focus group workshop sessions with representatives of the industry, government, civil society, academics, and experts to discuss transport related goals, barriers, opportunities and actions for the decarbonization of the sector. Input from these targeted groups has been key to understanding the state's transportation system and its potential for GHG reductions and sustainability.

Preliminary findings from these workshops are being used to inform the roadmap and develop initial scenarios.

GUANAJUATO BUSINESS-AS-USUAL GHG EMISSIONS SCENARIO

Eliseo Esparza

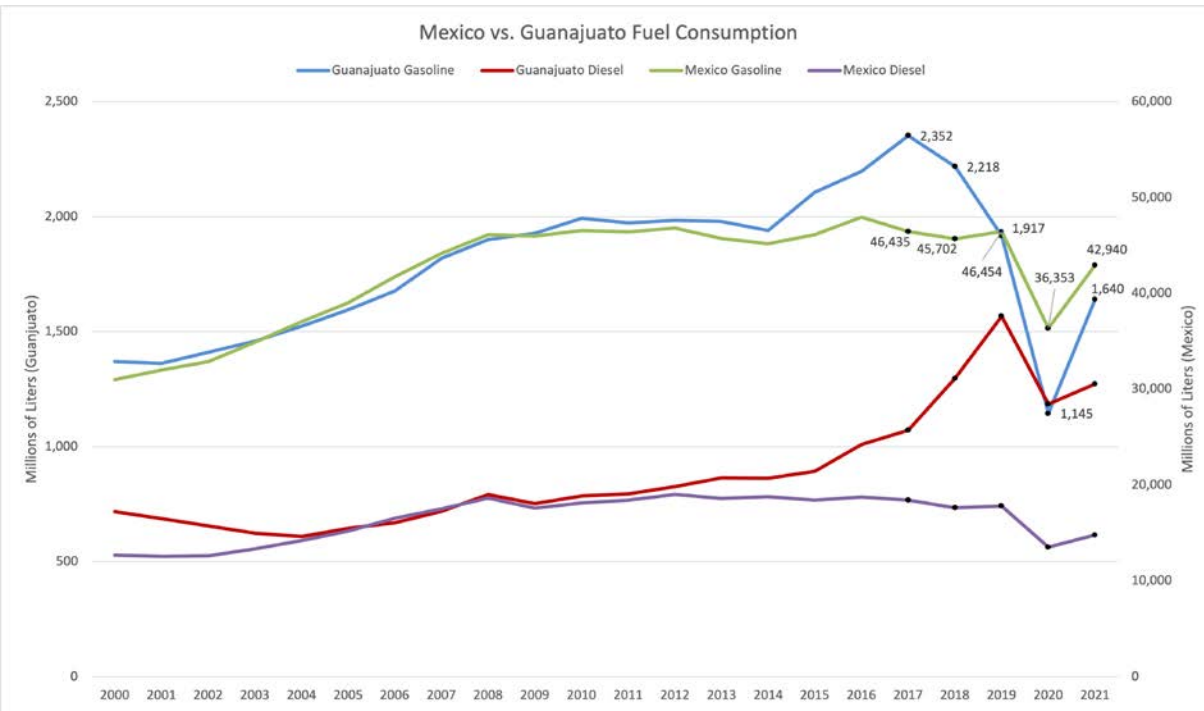
BAU Methodology

1. Collect historical fuel consumption for Guanajuato from Mexico's Secretary of Energy (SENER)
2. Validate data with the Secretary of Environment of Mexico
3. Use relationship between GDP per capita and VKT (Vehicle Kilometers Traveled)
4. Project fuel consumption through 2050

Key Assumptions:

- Fuel economy remains constant throughout projection
- “Diesel demand” is the same as consumption

Historical Fuel Consumption

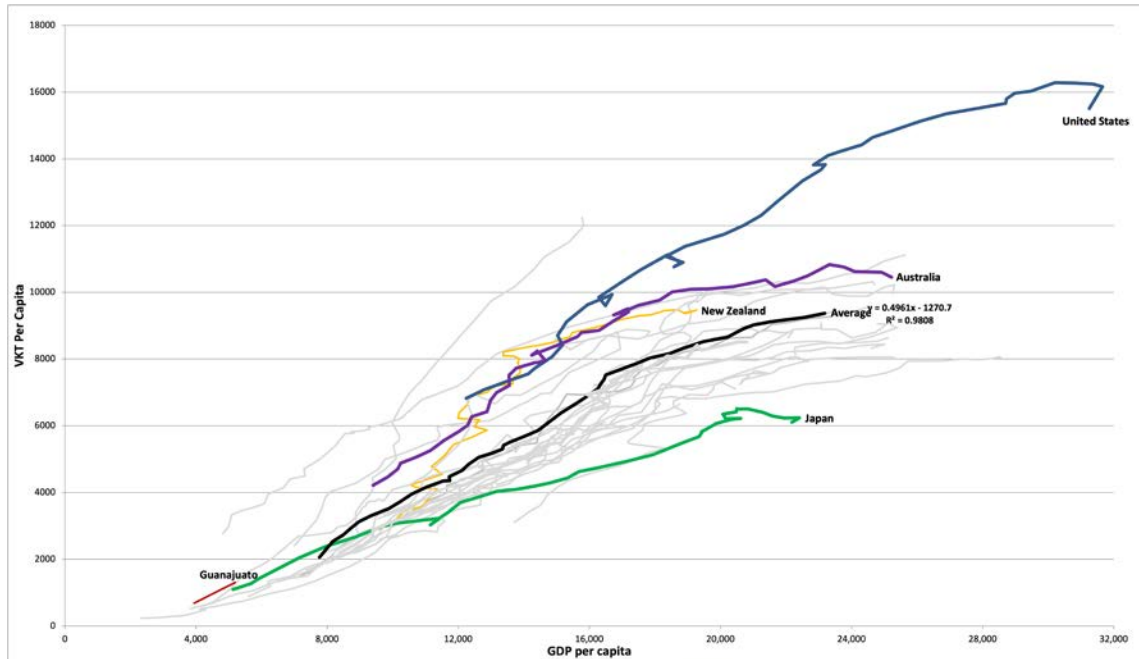


Source: [Sistema de Informacion Energetica](#)

- 43% of Mexico's total energy consumption is from transportation (ground, air, maritime, rail, and electric)
 - 89% of that is from Ground Transportation
- Guanajuato transportation sector consumed a total of 3.4 billion liters of fuel in 2019, a 25% increase from 2010

GDP vs. VKT Per Capita

Future consumption based on GDP projections

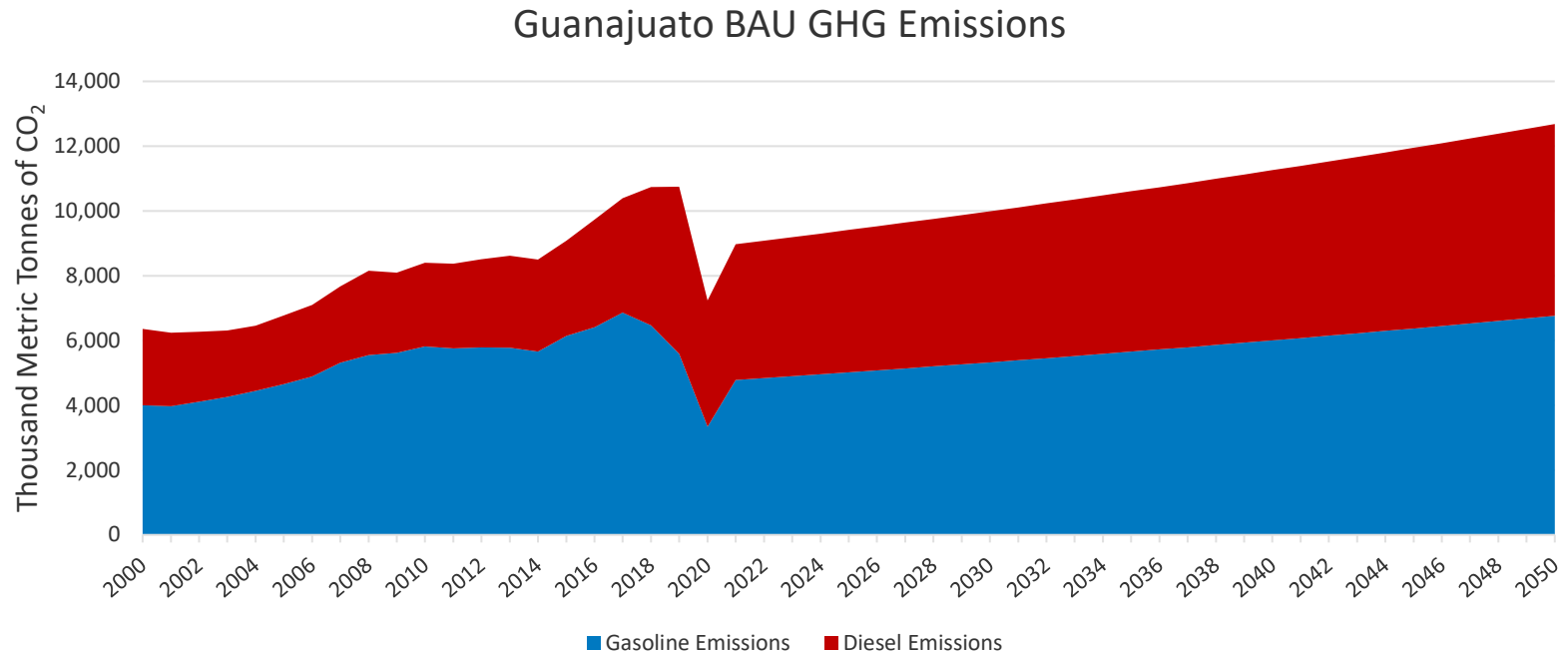


- As GDP per capita increases, so does vehicle kilometers traveled (VKT) per capita
- This is a good indicator and suggests you can predict VKT increase based on established GDP per capita projections

Source: [The Future of Driving in Developing Countries](#)

Guanajuato Transportation GHG Emissions

- Transportation GHG Emissions projected to reach 12.6 Billion kg of CO_2 by 2050



FINDINGS FROM STAKEHOLDER FOCUS GROUPS

Paty Romero Lankao

FOCUS GROUPS – CITIES

- Workshop 1: Leon
- Workshop 2: Irapuato, Celaya, Salamanca, and Silao
- Workshop 3: San Miguel de Allende and Guanajuato

Map used with permission of Tony Burton and MexConnect.com

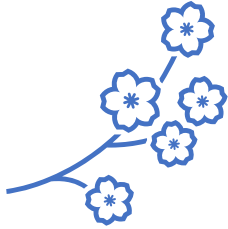
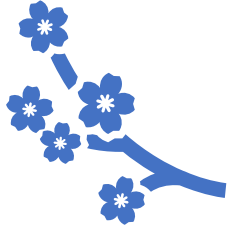



PARTICIPANTS POLICY GOALS

Goals/Priorities	Workshop 1	Workshop 2	Workshop 3	Weighted Percent of Total
GHG reduction	48%	53%	59%	26%
Traffic reduction/Time savings	44%	53%	56%	24%
Equitable mobility options	47%	40%	48%	22%
Local air quality improvement	35%	20%	33%	15%
Fostering new industry	5%	13%	15%	5%
Transportation cost savings	0%	7%	15%	4%
Energy security	4%	0%	11%	3%
Improved safety	0%	0%	7%	1%
Other	17%	0%	4%	4%

Note: Votes from each workshop sum to more than 100% because two selections were allowed.

The weighted percent of total votes sums to 100%



SWOT Analysis

Strengths

Weaknesses

Opportunities

Threats

What are the potential and the impacts of decarbonization on Guanajuato's transportation system?

Strengths

First Workshop

- **Leon's Interconnected transportation system**
 - 1 tariff, multi-mobility
- **Data and information**
- **Planning & institutional capacity**
- **Renewable energy potential**
- **Auto industry**

Second Workshop

- **Legal framework, cross cutting mobility entities & state & local planning**
- **Resources & skills along intercity transportation corridors**
- **Industrial corridor & investment in technologies**
- **Air pollution & transport programs**
- **Leon's transportation**

Third Workshop

- **Tourism Hub, Historic Cities**
 - Niche market - *sustainable* historic cities
 - Create dedicated zone for pedestrian & micro-mobility
 - Already connecting tourism sector to renewable energy
- **Existing public transportation system & biking community**
 - Strengthen Pedestrian Mobility
 - benefit locals and tourism
- **Good connectivity routes between the main cities**
- **Local awareness of mobility issues**
- **Well positioned for renewables**
- **Private Sector Investment**

Weaknesses

First Workshop

- **Benefit monitoring/evaluation**
- **Informality/inequality/affordability**
- **Inner and intercity / mobility**
- **Auto-centric policies/infrastructure/services**

Second Workshop

- **Short-term presence and lack of coordination among local authorities**
- **Concentration of investments and power asymmetry with auto-industry and Leon**
- **Lack of**
 - public and road safety
 - pedestrian infrastructure
 - reliable, affordable, & safe multimodal mobility
 - public transportation for intercity mobility
 - regulation of freight transport
- Congestion from employees transport

Third Workshop

- **Car culture**
- **Lack of**
 - Clear concept of public good
 - Public bike system to reduce congestion in center
 - Efficient public transit
 - Public transit (congestion and urban sprawl)
- **Urban planning weaknesses**
 - Lack of pedestrian and biking infrastructure
 - Unsafe biking – for women
 - Don't encourage use of public transport
- **Obsolete vehicle fleets**
 - Low compliance w. verification

Opportunities

First Workshop

- Transit electrification
- Just electrification & use of public spaces
- Fueled by clean energy
- Fleet renewal, cleaner technologies/fuels
- Decarbonization/mobility links
- Intermunicipal transport

Second Workshop

- National legal framework is already harmonized with the state and local one.
- Closing the gap with Leon's transport system/learning from its mistakes
- Convince providers & dealers to renew the fleet
- Collaborate with auto industry/build infrastructure
- Leon's e-mobility pilot
- Cycling tradition
- Achieve energy security

Third Workshop

- International Support (lessons learned)
- Private sector interest and alliances
- Turn historic cities into international models of sustainable mobility
- Small scale clean public transportation options
- Student population more apt to walk, bike
- Invest in safer, more accessible and convenient micro-mobility
- Parking management to support pedestrianization of the historic centers
- Geographic location opportunities for solar & wind

Threats

First Workshop

- **Safety (also weakness)**
 - many meanings, lightening
- **Car paradigm**
- **Geopolitics/climate**
- **Infrastructure**
 - stops, sideways
- **Gated communities**
- **(Lack of) financing**
- **Affordability**
- **Shift to motorbikes**

Second Workshop

- **Gas prices**
- **Unregulated motorbike use**
- **Lack of safety**
- **Lack of urban planning, infrastructure and services**
- **Lack of law enforcement**
- **Car paradigm – policies & status**
- **Federal energy priorities & policies**
- **Climate change and the UHI**

Third Workshop

- **Bike lane pushback**
- **Climate extremes - heatwaves**
- **Lack of climate action and planning – public financing**
- **Lack of communication between sectors**
- **Truckers & service providers “mafia”**
- **Disorganized transit system**
 - Truck and transit schedules
- **Lack of Universal Accessibility**
 - Road and Public Safety
 - Threats: drains, steps, bumps
- **Transit Investments - land price**
- **Public Policies limit green**

POLICY OPTIONS FOR LAND TRANSPORTATION GHG REDUCTION

Caley Johnson

PROCESS

1. Develop database of GHG-reduction policies in applicable countries
2. Translate findings from 3 stakeholder working group meetings to general policy strategies
3. From general policy strategies, propose policies that:
 - Target stakeholders' transportation goals
 - Capitalize on Guanajuato's strengths
 - Ameliorate Guanajuato's weaknesses
 - Seize Guanajuato's opportunities
 - Reduce threats to Guanajuato's transportation system
4. Consolidate related policies
5. Prioritize policies based on the number of times it was applied

Goals/Priorities

Goals/Priorities	Percent of Total	General Policy Strategy	Policies that target these goals
GHG reduction	26%	Target GHG emissions directly. VKT reduction policies are particularly impactful since they are zero-emissions.	Registration feebate that is calculated by lifecycle GHG emissions. Use revenues to bolster public transit for underserved communities.
Traffic reduction/Time savings	24%	VKT reduction policies. Motorcycles save space.	Paid parking in city centers. Use revenues for popular projects that improve walking/biking/microtransit infrastructure.
Equitable mobility options	22%	Avoid the need to purchase vehicle or reduce the upfront cost of vehicle purchase (used vehicles). Overlaps heavily with Transportation Cost Savings. Make inexpensive options safer for women. Expand transportation services into underserved areas.	Partner with transportation network company (TNC) to enable women riders and drivers to search for each other. Well-lit transit stops in rough neighborhoods. Well-lit EVSEs for Uber drivers.
Local air quality improvement	15%	Reduce emissions from high-polluters in the most populated areas. Target buses and motorcycles since they are often heavy polluters.	Electric motorcycles and electric buses. Cash for Clunkers program for those that turn in old motorcycles and purchase e-motorbikes.
Fostering new industry	5%	Reduce the costs of EV assembly or the manufacturing of components	Reduced import tariff of EV components. Reduced taxes for EV assemblers. Worker training programs.
Transportation cost savings	4%	Avoid the need to purchase vehicle or reduce the upfront cost of vehicle purchase (used vehicles). Overlaps heavily with Equitable options.	Standardize the testing of EV batteries for the used EV market. Policies regulating EV conversion of used vehicles.
Energy security	3%	Much the same as GHG reduction. Reduce reliance on imported petroleum, EV Components, and minerals (especially rare earths) coming from other countries.	Domestic sourcing element to feebate registration.
Improved safety	1%	Promote bus and train ridership. Make it safer for pedestrians, bikers, and micromobility	Add bollards, bike lanes, sharrows to make biking safer. Enact safe passing laws.
Other	4%	na	na

Strengths

Strength	# Work shops	General Action or Strategy	Policies that capitalize on these strengths
Transportation system with good connectivity between the main cities. Leon's system is particularly good, with 1 tariff, multi-mobility	3	Nudge people to use public transportation between cities	Paid parking. Tax breaks for employers that give free transit passes.
Renewable energy potential	2	Managed charging to help match renewable production. EV incentives, because they will be low GHG.	Require smart meters and net metering for managed charging and V2G.
Planning & institutional capacity, Legal framework, cross cutting mobility entities & state & local planning	2	It's OK to pursue more sophisticated and complex policies.	Regional transit master plan

Weaknesses

Weakness	# Work shops	General Action or Strategy	Policies that ameliorate these weaknesses
Unsafe biking and pedestrian conditions (even new infrastructure), particularly for women	3	Add biking and pedestrian infrastructure. Use funds from paid parking	Add biking infrastructure. Paid parking to fund. Requirement that X% of infrastructure expenditures must go to public transit or bike path.
Lack of decent, accessible, and safe pedestrian infrastructure for elderly, locals, and tourists	3	Add pedestrian infrastructure. Require businesses to fund it or paid parking to fund	Add pedestrian infrastructure. Rules against blocking sidewalks. Paid parking to fund. Requirement that X% of infrastructure expenditures must go to public transit or bike path.
Auto-centric public policies don't encourage use of public transport	3	Increase the cost of single-occupancy vehicles	Requirement that X% of infrastructure expenditures must go to public transit or bike paths. Paid parking. Tax breaks for employer-provided transit passes. Fuel tax. Advertising campaign for mass transit and biking.
Lack of decent public transit between cities and in historic center leads to (1) congestions for all and (2) urban sprawl for locals	3	Increase demand for public transit	Paid parking in city centers. Use proceeds to add public transit.

Opportunities

Opportunity	# work shops	General action or strategy	Policy that seizes the opportunity
Transit electrification; especially small-scale public transportation options	2	Promote electric shuttles, add charging infrastructure	Regional public transit master plan. Electric bus pilot project with route analysis. Electric on-demand shuttle pilot project. Electric Uber/Lyft
Turn historic cities into international models of sustainable mobility	1	Deploy "smart cities" tactics	Paid parking. Limit auto access. On-demand shuttles. Bike and pedestrian infrastructure.
Student population more apt to walk, bike	1	Make walking and biking more convenient around schools	Safe passing law. Education program for driving around bikers. Bike/scooter share. Bike and Pedestrian infrastructure.
Geographic location opportunities for solar & wind	1	Match EV load to renewables	Managed charging. V2G. Demand Response. TOU pricing.

Threats

Threat	# Work shops	General action or strategy	Policy that reduces the threat
Entrenched car paradigm – policies, status, and lack of action to change	3	Improve the economics for alternatives to cars	Paid parking. Policy that requires X% of infrastructure spending to be spent on alternative infrastructure. Gasoline tax.
Shift to unregulated motorbikes	2	Set quality standards for motorbikes	Set and enforce standards for conventional and electric motorbikes.
Climate change and the urban heat island	2	Reduce blacktop devoted to cars	Parking strategy that reduces spaces over time. Endorse and partner with a TNC. Set policy to consider alternatives before widening a road. Transit-oriented development.

Top Policies—combined and prioritized

- List condensed to 53 policies
- 32 were applied more than once

Priority	Policies	Times applied
1	Paid parking strategy, with a goal to reduce parking spaces over time	28
2	Regional transit master plan with transit-oriented development, transit expansion funded by parking fees, outreach to potential riders, and coordination with national plans. Supported by a working group that combines local authorities and transportation planners	18
3	Expand and improve bike and pedestrian infrastructure	14
4	Requirement that X% of state infrastructure expenditures must go to public transit or bike path	12
4	Bike and scooter share, largely electric, with rules protecting pedestrian right-of-way	12
5	Partner with a TNC to coordinate with transit, share rides, enable women to find each other, electrify, and safely charge	11
6	Tax incentives for employer-provided transit passes	10
6	EVSE master plan, developed with community organizations. It will direct public private partnerships where the govt. leases public land for free, require auto dealerships to install, includes maintenance program.	10
7	Gasoline tax	8
8	Advertising campaign for hip image in mass transit and biking; Wifi on buses	6
8	Policy that requires X% of infrastructure spending to be spent on alternative infrastructure	6
9	On-demand shuttles coordinated with mass transit	5
10	Feebate, possibly with domestic sourcing element	4
10	Electric bus pilot project with route analysis and goal of # electric buses	4

Second-Tier Policies

Priority	Policies	Times applied
11	Track city buses with Google Transit	3
11	Well-lit transit stops in disadvantaged neighborhoods	3
11	Park and Ride lots	3
11	Add pedestrian infrastructure	3
11	Auto worker re-training program for EVs	3
11	Reduced taxes for EV assemblers and component imports	3
11	Enable V2G and managed charging through smart meters and net metering	3
12	Change government fleet procurement guidelines to encourage EVs	2
12	Demand-Response programs	2
12	Develop a Household Transportation Survey	2
12	Education program for driving around bikers	2
12	Electric on-demand shuttle pilot project	2
12	Mobile emissions inspection trucks	2
12	Safe passing law	2
12	Set and enforce standards for conventional and electric motorbikes	2
12	Set policy to consider alternatives before widening a road	2
12	TOU Pricing	2
12	Cash for Clunkers, with a focus on motorcycles for e-bikes	2

Policies only applied once are listed in appendix

Preguntas / Questions

¿Qué les parecen nuestras opciones de política?

¿Hay alguna omisión significativa?

¿Qué significan estas opciones para usted y su organización?

¿Qué podría hacer su organización para llevar a cabo estas políticas?

¿Qué otros socios necesitan involucrarse?

- How do you feel about our policy options?
- Are there any significant omissions?
- What do the policy options mean for you and your organization?
- What could your organization do to further develop and implement these policies?
- What other partners need to get involved?

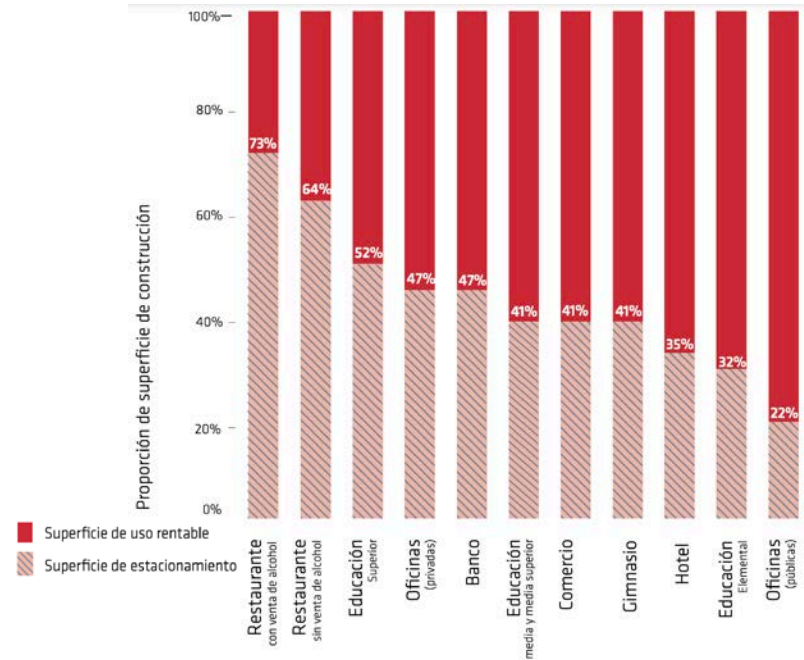
Relevant Case Studies

Eliseo Esparza

Paid Parking Strategy

- Parking storage takes up about 1/3 or more of land availability in most cities
 - The land can be used more effectively like hospitals, schools, and affordable housing
- Parking reform is gaining momentum around the world as a source to reallocate valuable space, reduce demand for driving, and unlock other co-benefits
- Co-Benefits: Improved air quality, make cities more walkable, shift to lower VKT modes of travel, fewer GHG emissions, less noise, streets that prioritize people

Proportion of usable area (red) and parking area (stripes) in Mexico City



Paid Parking Strategy: Case Study Results

Location	Inputs	Outputs
<u>Amsterdam, Netherlands</u>	\$0.90-5.00 euros/hr	20% reduction in parking-finding traffic
<u>Antwerp, Belgium</u>	\$0.50-3.50 euros/hr	50% reduction in private vehicle trips
<u>Barcelona, Spain</u>	\$1.08-2.42 euros/hr	5-10% reduction in traffic
<u>Stockholm, Sweden</u>	\$1.50-4.00 euros/hr	20% reduction in parking-finding traffic
<u>Belgrade, Serbia</u>	\$0.37-0.51 USD/hr	22 tons per block per year
<u>Singapore</u>	\$0.30-\$1.90 USD/hr	45% reduction in parking-finding traffic

Table 1. International case studies of relationship between paid parking and reductions

Paid Parking Strategy: Mexico City

Implementation	Results	Lessons Learned
<ul style="list-style-type: none">• 2012 ecoParc: Paid parking program with a current rate of \$11.60 pesos/hr.• 2017 Policy Reform:<ol style="list-style-type: none">1. Elimination of parking minimums by setting parking maximums at or below previous minimums. Fee set for any new developments in downtown Mexico City with parking beyond 50% of floor area.2. Establishment of a mobility and road safety fund paid by developers.3. New buildings are required to provide bicycle parking, with the amount varying by building size and location.	<ul style="list-style-type: none">• 2017 policy is estimated to avoid 584,000-683,000 metric tonnes of carbon dioxide equivalent annually from off-street parking construction.• More aggressive scenario: 2.6-5.6 million metric tons of CO2e reduced by 2030.• Balance between livable space and parking: built floor area dedicated to parking fell from 42% to 33%.• Housing complexes parking fell from 31% to 29%.• Office buildings parking fell from 46% to 42%.	<ul style="list-style-type: none">• Adopt low parking maximums to speed up impacts: The reduction in built floor area dedicated to parking as well as paid parking program results in the best near-term results.• Revisit and reinforce the policy over time: Expansion can include more strict control of the location, quantity, and quality of public parking lots.

Sources:

[ecoParq Paid Parking Policy](#)

[Institution for Transportation & Development Policy](#)

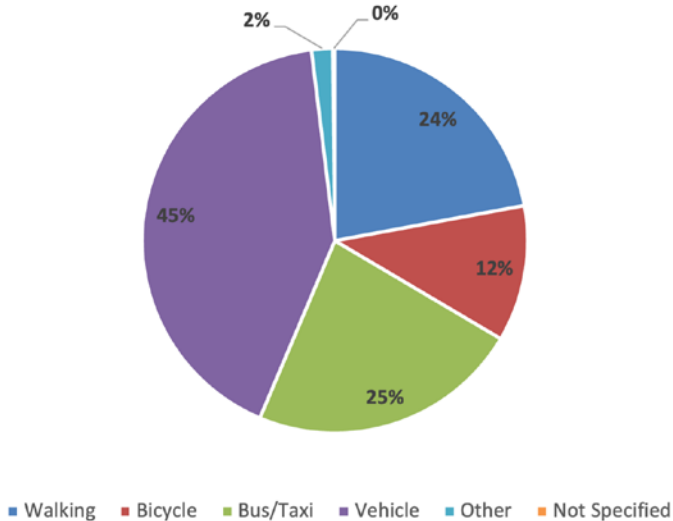
[Mexico City – Menos Cajones](#)



Regional Transit Master Plan

Employed population aged 12 years and older who commute to work and their distribution by mode

2021 Guanajuato Modal Travel to Work



Source:
[Mexico City – Menos Cajones](#)

- Regional transit master plan with transit – oriented development, transit expansion funded by parking fees, outreach to potential riders, and coordination with national plans.
- Supported by a working group that combines local authorities and transportation planners.
- Benefits include reduction in petroleum fuel consumption, reduction in air pollution, less time spent in traffic, reduced vehicle kilometers traveled, increased public health.
- Re include a cleaner, more efficient, and more resilient transportation system.



Regional Transit Master Plan: Northeast U.S.

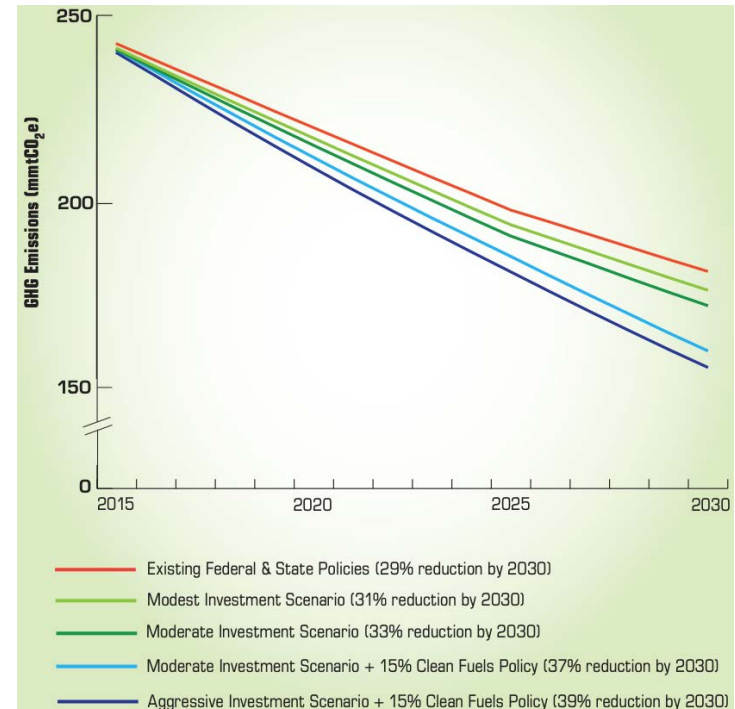
Implementation

- Investment in transit expansion including bus rapid transit, light rail, and heavy rail.
- Travel Demand Management Strategies as well as promotion to users.
- Investment in infrastructure to support rail and short-sea freight shipping and intermodal connections.
- Federal and state policies to increase standards on 2017-2025 light-duty vehicles and 2014-2018 medium- and heavy-duty vehicles.
- Clean fuels policy: fuel suppliers reduce carbon intensity by 15% over 15 years.

Results

- Projected GHG emissions for multiple scenarios from baseline to aggressive investment:
 1. Modest: Assumes \$1.5 billion in average annual funding resulted in a 31% reduction.
 2. Moderate: Assumes \$3 billion in average annual funding and results in a 33% reduction.
 3. Aggressive: Assumes \$6 billion in average annual funding and results in 39% reduction when coupled with clean fuels policy

Northeast U.S. 2030 projected GHG reductions from transit master plan



Source:

[Reducing GHG Emissions from Transportation: Opportunities in the Northeast and Mid-Atlantic](#)

Regional Transit Master Plan: Mexico City

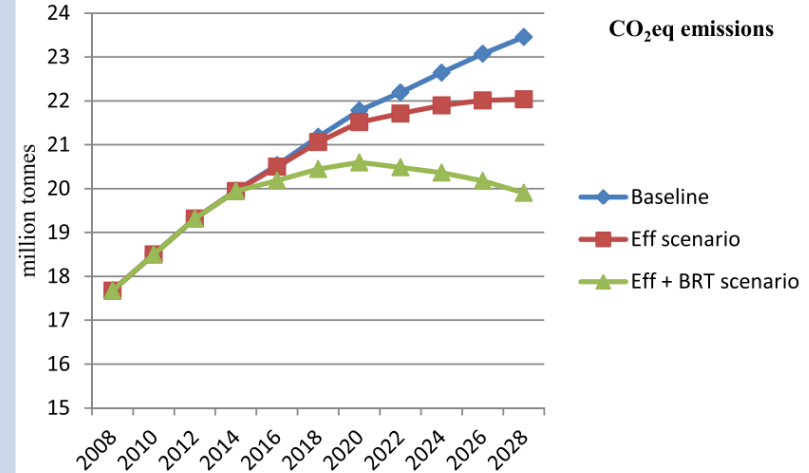
Implementation

- Approximately 49% of all trips in Mexico City have a final destination to work or school. 30% of these trips are made with passenger cars.
- Major modal shift from private passenger vehicles to a Bus Rapid Transportation System.
- Expansion of the Metrobus and Mexibus systems, along with the development of a better public system network to feed the metro.
- Improving current vehicle fleet by significantly increasing hybrid and electric vehicles as well as new technologies for vehicle emissions controls that take advantage of low Sulphur fuel content.

Results

- CO₂e reduces from 23.4 million tonnes to 19.9 (14.9% reduction in 20 years).
- NO_x emissions reduces from 122 million tonnes to 104 (14.7% reduction).
- NMVOC reduces from 162 million tonnes to 149 (8% reduction).
- CO reduces from 598 million tonnes to 584 (2% reduction)
- PM reduces from 106 million tonnes to 100 (6% reduction)

Mexico City CO₂ emissions projections



Expand and Improve Bike & Pedestrian Infrastructure

- These policies can include an increase in bike lanes, shared paths, improved sidewalks, pedestrian crossings, bike-share programs, and bike parking.
- Benefits include public health, reduced air pollution, lower emissions, traffic congestion relief, enhanced safety, and more equitable transportation options.

Mexico City Ideamos Bicycle Program



Source: Instituto de Políticas para el Transporte y el Desarrollo

Source:

[Mexico City – Menos Cajones](#)
[Institute for Transportation & Development Policy](#)



Expand and Improve Bike & Pedestrian Infrastructure: New Zealand

Implementation

- New Plymouth, New Zealand invested \$3.71 NZ million in bike and pedestrian infrastructure.
- 12.1km of off-road walkways and over 20 km of defined cycle lanes.
- Hastings, New Zealand invested \$3.57 NZ million in bike and pedestrian infrastructure.
- 29.5 km of new cycle lanes and over 108 km of on- and off-road cycleways constructed.

Results

- Carbon dioxide emissions estimated to have fallen an average of 1% over the three years.
- Overall, New Zealand found an average of 1.6% reduction in VKT over 3 years, a significant impact when projecting through 2050.
- It was found that bicycle and walking trips mainly replaced shorter car trips, and impacts could increase in a larger city area.

Year	actual VKT (millions)	counterfactual VKT in absence of intervention (millions)	estimated reduction in VKT (thousands)	tonnes carbon dioxide saved
2012	524	527	2869	677
2013	526	532	5360	1264
2014	409	416	6669	1573
Total	1460	1475	14,898	3514

Figure 7. New Zealand VKT and carbon dioxide saved

Partner with Transportation Network Company to Coordinate with Transit and Share Rides

- The introduction of TNCs initially increases VMT by reducing transit ridership ([Henao and Marshall 2018](#)) ([Schaller Consulting 2017](#))
 - This initial increase is assumed to have already been taken
- Subsidies for TNC rides to transit stations increase public transit usage
 - \$3 per ride subsidy increases the usage of transit by over 15% ([Agrawal and Zhao 2023](#))
- Via on-demand rideshare software operates in 750 communities in 40 countries, including 300 deployments in the United States
 - Virtual bus stops collect people and take them to transit centers
 - In Arlington, TX, Via (rideshare) helped reduce its customers' VMT by 36% ([Hazan et al. 2019](#))
 - Service launched in 2017 and has reached 1.6 million rides as of 2023 ([KERA News 2022](#))

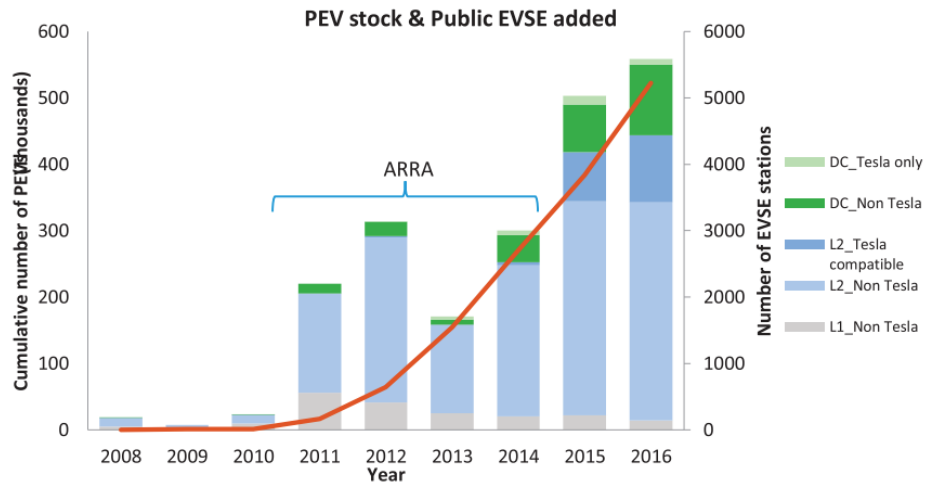
[Via](#) – Software Solution for TNC's



Source: Via

EVSE Master Plan

- Policy to increase EVSE deployment includes government investment in EVSE, financial investments and tax credits for the private sector, and adopting standards and mandates for public chargers.
- An EVSE master plan is essential for the adoption of EVs.
- As you increase 1 EVSE per 100,000 drivers (16+), the number of EVs purchased increases 3.1% and the number of BEVs (without PHEVs) increases 7.2%



Source:

[The role of demand-side incentives and charging infrastructure on plug-in electric vehicle adoption: analysis of US States](#)

GREENHOUSE GAS ESTIMATES AND ASSUMPTIONS

Eliseo Esparza

Guanajuato Wedge Analysis

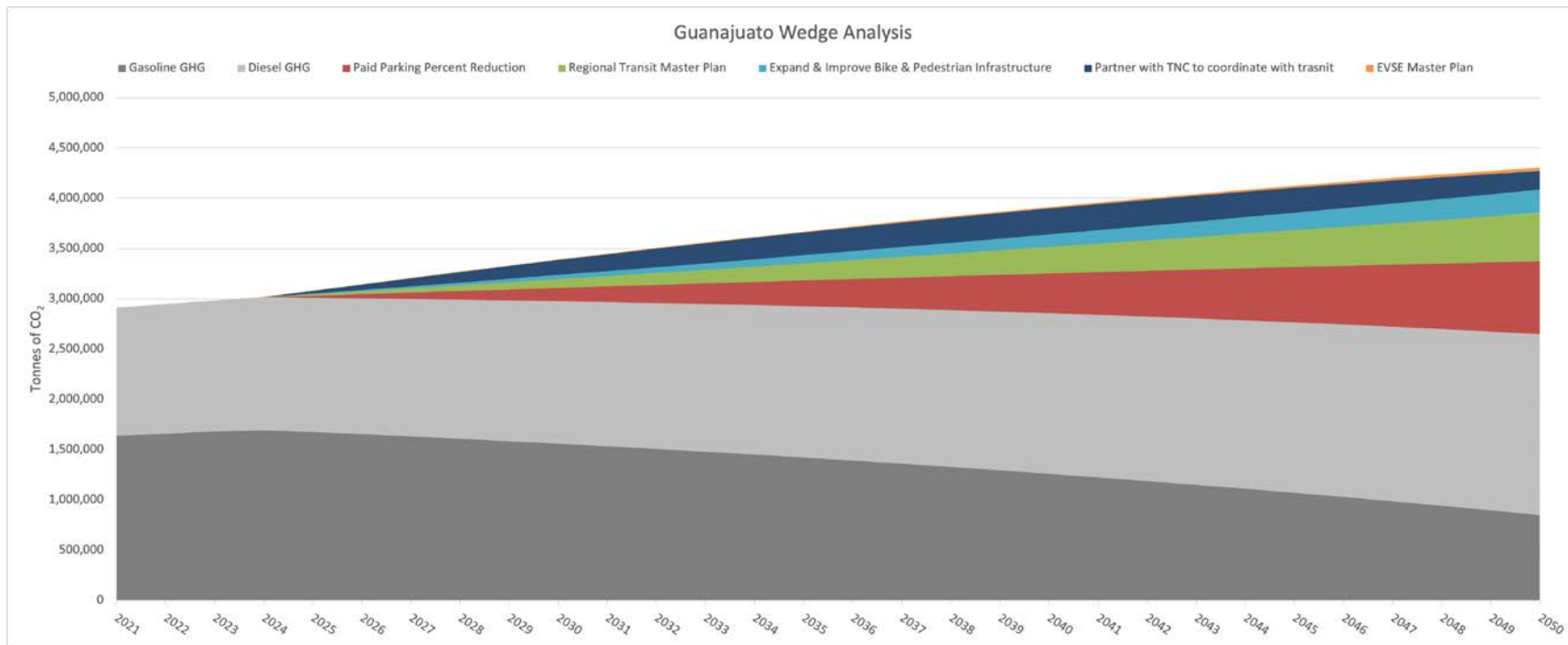


Figure 9. Guanajuato Wedge Analysis Through 2050

Guanajuato Wedge Analysis - Summary

Summary of Results

Policy	GHG Reductions from BAU in 2050	Total GHG's Saved Through 2050 (Metric Tonnes)
Paid Parking	27.0%	8,862,703
Regional Transit Master Plan	16.9%	5,539,189
Expand & Improve Bike & Pedestrian Infrastructure	8.5%	2,806,523
Partner with TNC to coordinate with transit	7.1%	5,126,618
EVSE Master Plan	1.2%	354,248
Total	39.3%	22,689,281

Table 2. Guanajuato Wedge Analysis Summary

Wedge Analysis Assumptions

Paid Parking Policy

Based on Mexico City's GHG reductions in metric tonnes and applied to a percent reduction for Guanajuato

Mexico City projected 10% reductions in 10 years. This was applied through 2050 for Guanajuato

Mexico City's reduction includes other policies such as converting parking minimums to parking maximums (suggested for Guanajuato as well)

Resulted in policy impact with an annual increase of about 1%/year until 2050

GHG emissions reductions taken into consideration only, not other emissions such as NOx which show more impacts

Regional Transit Master Plan

Based on Mexico City's projection of 15% reduction in 20 years

This amounts to 18.75% reduction when scaled to 2050 for Guanajuato

Mexico City's policy includes expansions of metrobus and Mexibus systems

Mexico City's policy includes transit vehicles to shift to EVs

GHG emissions taken into consideration only, not other emissions such as NOx which show more impacts

Table 3. Guanajuato Wedge Analysis Assumptions

Wedge Analysis Assumptions

Expand and Improve Bike and Pedestrian Infrastructure

New Zealand case study was only over three years and was thus scaled to 2050 for Guanajuato

Found that an average annual GHG reductions rate of increase was .33%/year for Plymouth and Hastings in New Zealand

Most likely require the maintenance and continual planning of expansion

Partner with TNC to Coordinate with Transit and Share Rides

Via on-demand service taken in the case study of Arlington Tx (mini-vans and devoted to shared rides)

Found that VKT lowered by 12%/year for users

Found that the number of users reached 9.9% of city population in 3 years

This is an annual growth of 3.3% of users which is used until it reached the 9.9% then lowered the rate of increase until it reached 0% growth by 2050

This was then applied to Guanajuato's population and the 12% reduction was taken for the number of possible users based on the Arlington case study

EVSE Master Plan

Based on analysis of US states: An increase of 1 charging station per 100,000 drivers increased PEV purchases by 3.1%. Per Narassimhan and Johnson 2018

Guanajuato population 16+ was used and the number of 20 EVSE installed per 100,000 drivers was used as a conservative goal

Table 4. Guanajuato Wedge Analysis Assumptions

Q&A

Appendix

Strengths

Strength	# Work shops	General Action or Strategy	Policies that capitalize on these strengths
Transportation system with good connectivity between the main cities. Leon's system is particularly good, with 1 tariff, multi-mobility	3	Nudge people to use public transportation between cities	Paid parking. Tax breaks for employers that give free transit passes.
Planning & institutional capacity, Legal framework, cross cutting mobility entities & state & local planning	2	It's OK to pursue more sophisticated and complex policies.	Regional transit master plan
Renewable energy potential	2	Managed charging to help match renewable production. EV incentives, because they will be low GHG.	Require smart meters and net metering for managed charging and V2G.
Air pollution & transport programs	1	Emissions inspections scheme that exempt EVs	Emissions inspections scheme that exempt EVs.
Good data and information tracking	1	Allows for more complex policies for VKT reduction and EV adoption	EV charge station master plan. Regional transit master plan.
Auto industry	1	Tax breaks for EV assemblers. Already have skilled workers that can be re-trained for EVs	Tax breaks for EV assemblers. Auto worker re-training program.
Resources & skills along intercity transportation corridors	1	Get suburban skilled workers into the cities in low-emissions ways	Tax breaks for employers that provide transit passes. Wifi on buses. First-mile connections with Uber.
Industrial corridor & investment in technologies	1	Could find numerous private-sector hosts for EVSE	Subsidize EVSE repair/maintenance program.
Tourism Hub with historic cities lends itself to pedestrians and micro-mobility.	1	Park and ride, walking paths, shuttle, and shared bikes	Park and ride, walking paths, shuttle, and shared bikes.
Niche market for sustainable historic cities. Tourist sector already being connected to renewable energy	1	Park and ride, walking paths, shuttle, and shared bikes	Park and ride, walking paths, shuttle, and shared bikes.
Private Sector Investment	1	Could find numerous hosts for EVSE or EV fleets. Maybe an EV incentive in rideshare?	Subsidize EVSE Repair/maintenance program.
Local awareness of mobility issues	1	Population likely to take carpool or mass transit	Carpool website.
Prepared to train next generation of green workforce (local universities)	1	Training programs for EV manufacturers and EVSE installers	Auto worker re-training program.
Existing biking community	1	Bike paths and bike share projects. Boosted by parking restrictions.	Bike paths. Bike share projects. Parking restrictions.

Weaknesses

Weakness	# Work shops	General Action or Strategy	Policies that ameliorate these weaknesses
Lack of decent public transit between cities and in historic center leads to (1) congestions for all and (2) urban sprawl for locals	3	Increase demand for public transit	Paid parking in city centers. Use proceeds to add public transit.
Unsafe biking and pedestrian conditions (even new infrastructure), particularly for women	3	Add biking and pedestrian infrastructure. Use funds from paid parking	Add biking infrastructure. Paid parking to fund. Requirement that X% of infrastructure expenditures must go to public transit or bike path.
Lack of decent, accessible, and safe pedestrian infrastructure for elderly, locals, and tourists	3	Add pedestrian infrastructure. Require businesses to fund it or paid parking to fund	Add pedestrian infrastructure. Rules against blocking sidewalks. Paid parking to fund. Requirement that X% of infrastructure expenditures must go to public transit or bike path.
Auto-centric public policies don't encourage use of public transport	3	Increase the cost of SOVs	Requirement that X% of infrastructure expenditures must go to public transit or bike paths. Paid parking. Tax breaks for employer-provided transit passes. Fuel tax. Advertising campaign for hipster mass transit and biking.
Lack clear concept of public good, and poor benefit monitoring/evaluation	2	Develop a Household Transportation Survey	Develop a Household Transportation Survey.
Lack of public bike system to reduce congestion in center	2	Add biking and pedestrian infrastructure. Use funds from paid parking	Add biking infrastructure. Paid parking to fund. Requirement that X% of infrastructure expenditures must go to public transit or bike path.
Culture focused on using individual means of transport	1	Convince residents that public transit isn't lower-class	Advertising campaign for hipster mass transit and biking.
Inefficient public transit with long transfer times and no apps to help navigate	1	Integrate public transit with Google Maps	Integrate public transit with Google Maps.
Affordability of transportation	1	Reduce lifecycle costs of transportation	Increase transit ridership to achieve economies of scale. Increase TNCs.
Large number of obsolete vehicle fleets	1	Get obsolete vehicles off the road	Cash for Clunkers.
Low percentage vehicles verify compliance with the regulations	1	Get rid of corruption in emissions inspection program	Mobile emissions inspection trucks.
Lack of regulation of freight transport	1	Regulate the emissions of freight trucks	Mobile emissions inspection trucks.
Lack of coordination among local authorities and long-term planning	1	Increase coordination between transportation planners and local authorities	Working group that combines local authorities and transportation planners.
Power asymmetry and historical concentration of investments in León (likely due to auto industry)	1	Increase the investment in non-auto forms of transportation	Requirement that X% of infrastructure expenditures must go to public transit or bike path.
Lack of reliable, affordable, and safe multimodal mobility options (wkshp 2)	1	Open the market to TNCs, bike share	Start bikeshare program. Open market to TNCs.

Opportunities

Opportunity	# work shops	General action or strategy	Policy that seizes the opportunity
Transit electrification; especially small scale public transportation options	2	Promote electric shuttles, add charging infrastructure	Regional public transit master plan. Electric bus pilot project with route analysis. Electric on-demand shuttle pilot project. Electric Uber/Lyft
Use of public spaces	1	Promote EVSE, transit stops, and infrastructure in public spaces	Lease public land for free to EVSE and battery swap stations. Policy to assess public space usage for bicycle infrastructure or transit stops.
Fleet renewal with clean technologies	1	Registration fees that encourage clean tech	Change government fleet procurement guidelines to encourage EVs. Registration fees that encourage clean tech.
Decarbonization/mobility links	1	Use electric microtransit to complete first/last mile	Shared e-bike/scooter program. Incentives for shared TNCs.
Intermunicipal transport	1	Improve the intermunicipal BRT system by increasing ridership	Employer transit passes. Advertizing campain for bus to hipsters.
Planning/Rule of law	1	Plan housing near transit stops	Zoning near transit stops automatically allows apartment complexes.
Can build upon the National legal framework that is already harmonized with the state and local ones	1	Search for national policies to promote VKT reduction or vehicle electrification, and coordinate new policies with them	Search for national policies to promote VKT reduction or vehicle electrification, and coordinate new policies with them.
Learn from Leon's land use and transportation planning mistakes, and close the gap with their transport system	1	Coordinate with urban developers	Workshop with urban developers and transportation planners that includes Leon.
Convince providers & dealers to renew the city fleet	1	Actions to make/enable the fleet manager to purchase more efficient or electric vehicles	City fleet procurement requirements that are open to EVs.
Collaborate with auto industry to build infrastructure	1	Get auto industry to build EVSE	Requirement for every dealership to install a certain number of EVSE.
Leon's emobility pilot	1	Further electric bus fleets	Requirement for portions of transit bus fleets to be electric.
Cycling tradition	1	Enable bikers to bike safely	Safe passing law. Education program for driving around bikers. Bike/scooter share. Bike and Pedestrian infrastructure.
Achieve energy security	1	Utilize EVs and renewables	Charge management program. TOU Pricing. Demand-Response programs.
International Support (lessons learned)	1	Join groups that share lessons learned	Join the Global Fuel Economy Initiative, EV Initiative, and Low Emissions Development Strategy.
Turn historic cities into international models of sustainable mobility	1	Deploy "smart cities" tactics	Paid parking. Limit auto access. On-demand shuttles. Bike and pedestrian infrastructure.
Student population more apt to walk, bike	1	Make walking and biking more convenient	Safe passing law. Education program for driving around bikers. Bike/scooter share. Bike and Pedestrian infrastructure.
Small-scale mobility options that are safer, more accessible and more convenient	1	na	Bike and scooter share.
Parking management to support pedestrianization of the historic centers	1	na	Paid parking. Park and Ride.
Private sector interest and alliances	1	na	Startup incubator. EVSE public private partnerships.
Geographic location opportunities for solar & wind	1	na	Managed charging. V2G. Demand Response. TOU pricing.

Threats

Threat	# Work shops	General action or strategy	Policy that reduces the threat
Entrenched car paradigm – policies, status, and lack of action to change	3	Improve the economics for alternatives to cars	Paid parking. Policy that requires X% of infrastructure spending to be spent on alternative infrastructure. Gasoline tax.
Shift to unregulated motorbikes	2	Set quality standards for motorbikes	Set and enforce standards for conventional and electric motorbikes.
Climate change and the Urban Heat Island	2	Reduce blacktop devoted to cars	Parking strategy that reduces lots over time. Endorse and partner with a TNC. Set policy to consider alternatives before widening a road. Transit-oriented development.
Safety (many meanings)	1	Get people out of cars and into mass transit.	Employer tax credits for transit passes. Transit-oriented development. Paid parking.
Geopolitics/climate change	1	Make the connection that conserving oil helps Ukraine	Education program showing that oil conservation reduces the sales of Russian oil.
Infrastructure, especially stops and sidewalks	1	Increase alt transportation infrastructure	Policy that X% of infrastructure funding needs to go to sidewalks and bus stops.
Gated communities	1	reduce the blockade that gated communities have on transportation infrastructure	Rule that if cars are allowed through, bikes and buses need to also.
Lack of financing	1	Reduce investment risks	Government task force to reduce investment risk. Tap into auto companies for financing as part of low-tax status.
Affordability	1	Increase inexpensive means of transportation	Tax breaks for employee bus passes. Partner with TNCs. Land to scooter battery swap stations. Bike and scooter share.
Inappropriate outreach	1	Public education program about transportation options	PR press about transportation options.
Gas prices make conventional transportation unaffordable	1	Reduce the amount of gas purchased	Education program about total cost of ownership for EVs. Financing mechanism that uses reduced fuel costs to pay for increased upfront costs.
Lack of safety from assault	1	Promote means of transportation that enable people to stay in groups	First/last mile shuttles from bus stops. Bus stop refurbishment with lights.
Lack of urban planning, infrastructure and services	1	Utilize the expertise of interested parties.	Engage with community associations. Policy that X% of infrastructure funding needs to go to alternative transportation infrastructure.
Lack of law enforcement	1	Add less-expensive specialists (including mental health experts) other than police men to free up police men to enforce more transportation-related rules.	Policy to hire mental health experts to free up police men.
Federal energy priorities & policies	1	Look to CA for examples. Federal govt probably subsidizes gasoline, so add a tax to counter	Increase gasoline tax.
Bike lane pushback (private sector & public)	1	PR to show the benefits to drivers (reduced congestion) and business owners (increased number of people entering store)	PR campaign to show the benefits to drivers (reduced congestion) and business owners (increased number of people entering store).
transit Investments affect land price by creating gentrification and real estate speculation	1	Pursue high-density development around transit stops	Policy allowing only high-density development around transit stops.
Public Policies limit green energy use	1	Make it easier to transmit green electricity to users	Policy giving priority to transmission lines connecting green electricity.
Lack of communication btwn sectors: Civil society, private industry, public sector => can impede generating collective initiatives	1	Hold events and trainings that attract a wide variety of participants that focus on interaction	Workshops that include transportation planning, land use, business opportunities, policymaking.
Truckers & service providers "mafia": Categorically and systematically oppose any transit modification	1	Have a plan to incorporate them into new transit system, similar to what TransMilenio did	Central transit system plan.
Must rely on unreliable private sector financing since municipal resources are extremely limited	1	Enact a revenue-positive policy	Gasoline tax. Paid parking strategy. Feebate.
Disorganized transit system without schedules for trucks or public transit	1	Make transit system more easily tracked	Adopt Google Transit. Use bus tracker such as Nextbus. Coordinate on-demand shuttle with larger buses.
Lack of Universal Accessibility: public safety problems for women and drains, steps, bumps for disabled people	1	Infrastructure improvement projects funded by paid parking	Paid parking. Policy that requires X% of infrastructure spending to be spent on alternative infrastructure. Alternative infrastructure improvement projects.

Paid Parking Strategy- SWOT

Goals

- Reduce traffic

Strengths

- Transportation system with good connectivity between the main cities
- Existing biking community

Weaknesses

- Lack of decent public transit to historic city centers
- Unsafe biking and pedestrian conditions, particularly for women
- Lack of decent, accessible, and safe pedestrian infrastructure for elderly, locals, and tourists
- Auto-centric public policies don't encourage use of public transport
- Lack of public bike system in city centers

Opportunities

- Turn historic cities into international models of sustainable mobility
- Parking management to support pedestrianization of the historic centers

Threats

- Entrenched car paradigm (3)
- Urban heat island effect (2)
- Safety
- Dependence on unreliable private sector financing
- Lack of universal accessibility- especially for women and disabled people

Paid Parking Strategy- General Strategies

Goals

- Reduce vehicle-kilometers travelled (VKT)

Strengths

- Nudge people to use public transportation between cities
- Improve the economics of biking

Weaknesses

- Increase demand for public transit (3)
- Fund biking and pedestrian infrastructure (4)
- Increase the cost of SOVs

Opportunities

- Deploy "smart cities" tactics
- Parking Management

Threats

- Improve the economics for alternatives to cars (3)
- Reduce blacktop devoted to cars (2)
- Get people out of cars and into mass transit
- Enact a revenue-positive policy
- Fund infrastructure improvement projects

Thank you!

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