



MEDEC:

Low-carbon development for Mexico

Todd M. Johnson

MEDEC – **M**éxico: **E**studio sobre la **D**isminución de **E**misiones de **C**arbono

World Bank – LCR Sustainable Development Department – August 24, 2009

Global context

Run-up to Copenhagen

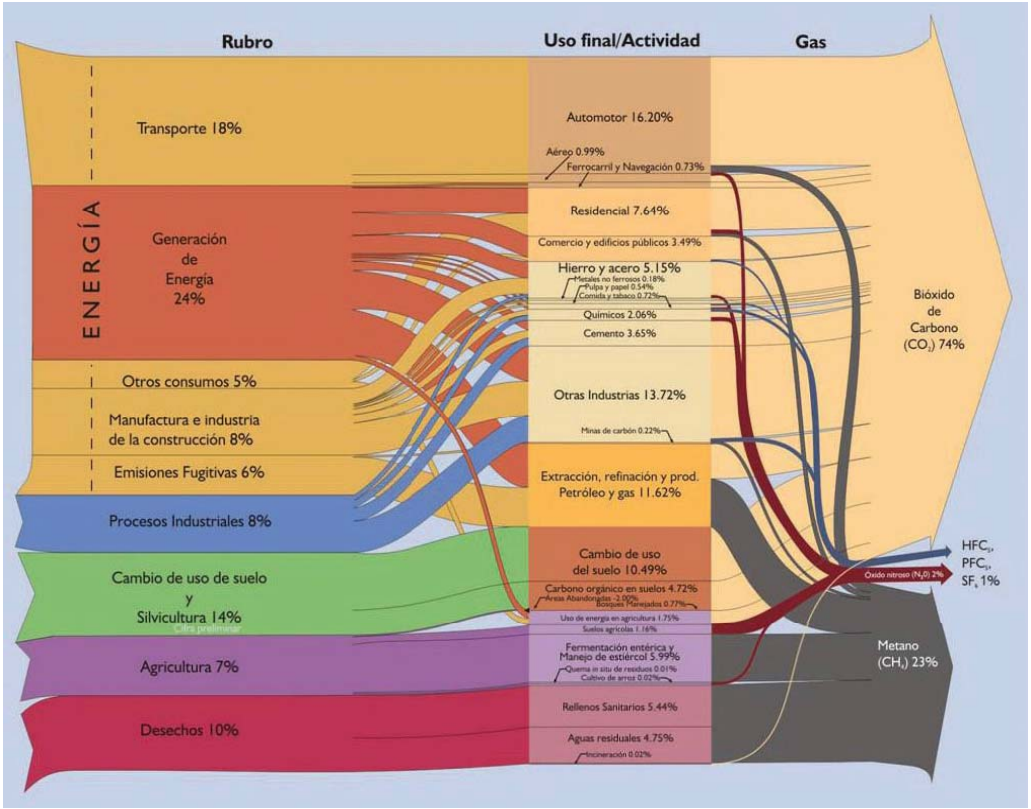
- How much will climate change mitigation cost?
- How do interventions compare across sectors?
- What can be done today to mitigate CO_2 emissions that has financial, economic, employment, and other benefits?

Mexico and other major non-Annex 1 countries

- One of five low-carbon country studies being undertaken by the WB
- Middle income developing country, proactive on climate change, mitigation potential, several studies (PECC, Instituto Mario Molina, Galindo, Quadri, McKinsey, CCAP, …)

Mexico GHG emissions

- 14th largest emitting country worldwide (1.5% of the total global emissions), largest energy emitter in LAC
- Nearly 2/3 of the CO_2 emissions from energy consumption (transport, energy generation, industry, gas flaring)
- Poznan: Mexico announced target of reducing 2002 GHG emission levels 50% by 2050



Study methodology

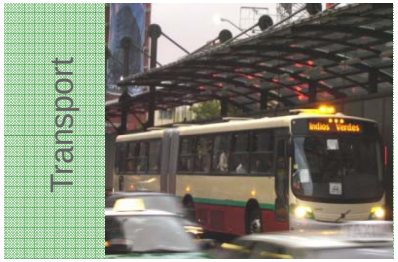
Modeling the low-carbon scenario

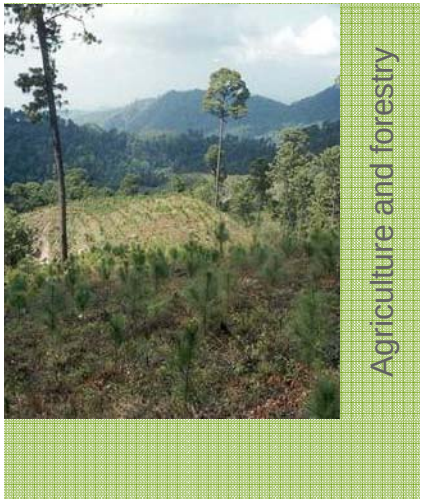
- Construction of an economic and emissions model for Mexico to the year 2030
- BAU consistent with national income and energy estimates and international energy forecasts and markets
- Bottom-up analysis of GHG reduction potential to 2030 from major sectors
- 3 criteria for selection of reduction options– limited number of interventions

Cost methodology

- Economic cost-benefit analysis of interventions across sectors using a common methodology
- Not CDM analysis, but many interventions would qualify (carbon price=0)
- Focus is on existing technologies only – thus underestimates potential
- Calculate externalities where possible
- Excludes “transactions” costs

MEDEC sectors

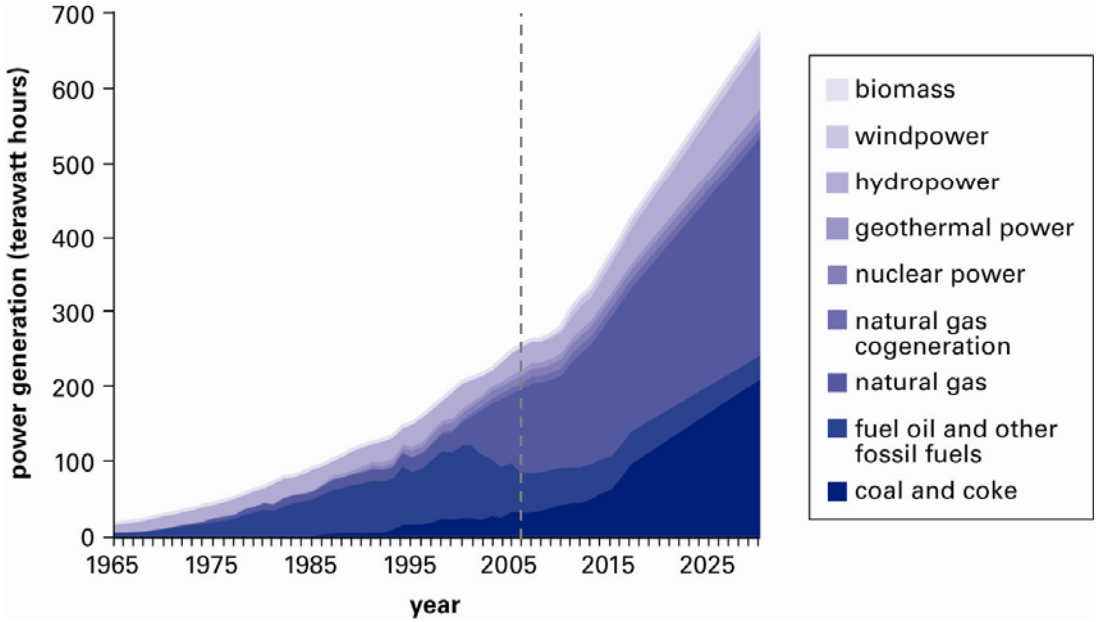




ELECTRICITY

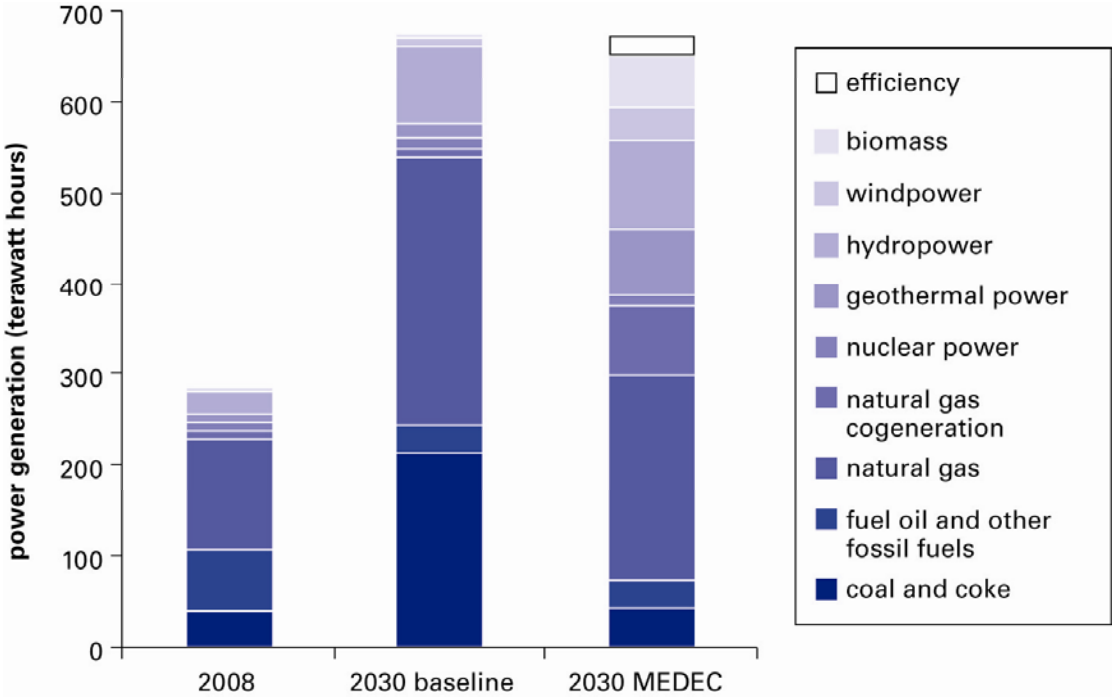
Baseline generation

- 2009 – 2016: Based on Mexico's official outlook
- 2017 – 2030: Based on national and international estimates for least cost generation technologies
- BAU emissions increase from 142 Mt CO2eq in 2008 to 322 in 2030 (+230%)



MEDEC scenario generation

- Coal and gas generating plants are replaced by low-carbon technologies
- Capacities based on national potentials

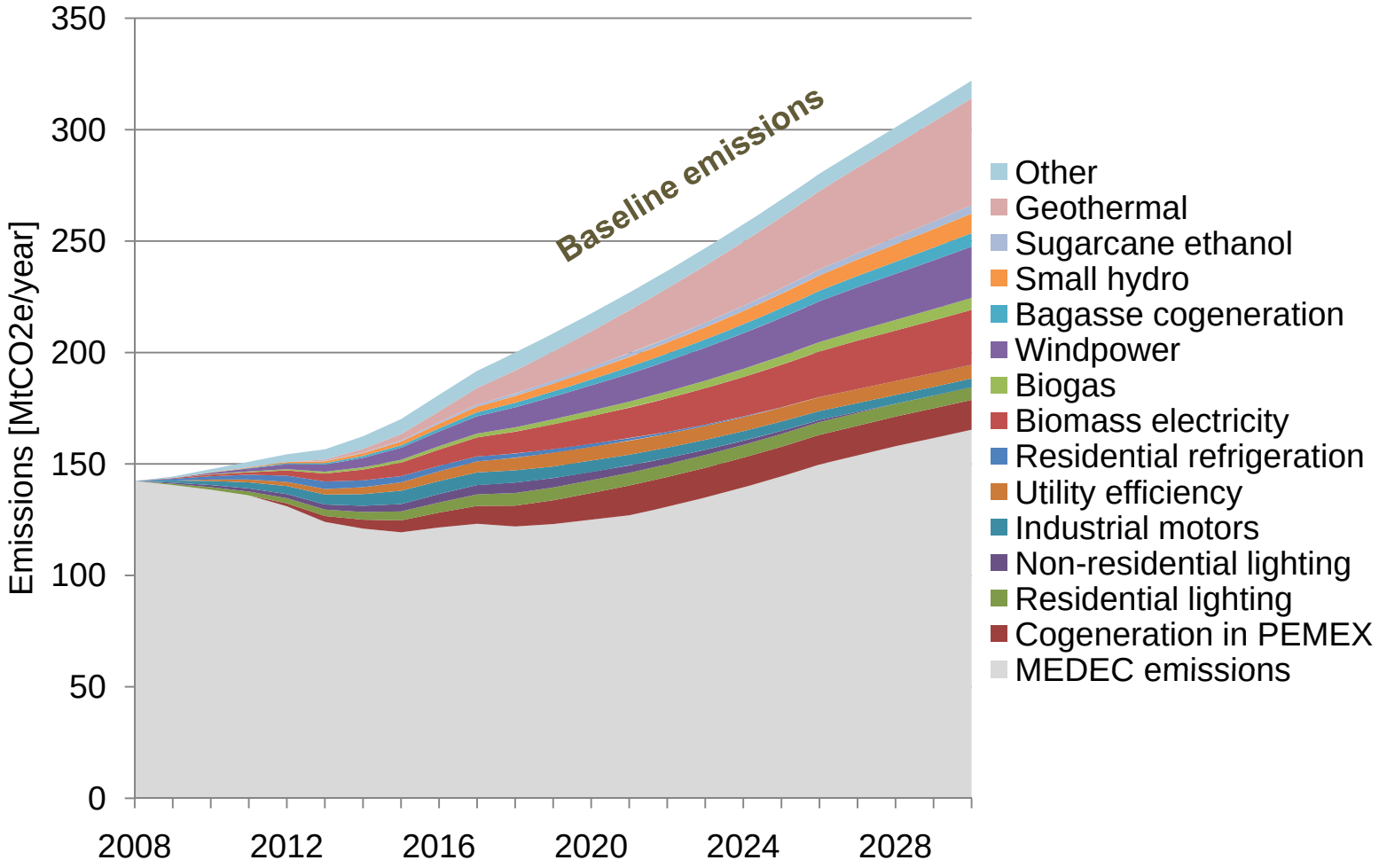


Electricity

MEDEC electricity interventions

			Maximum annual emission reduction ($MtCO_2e$/year)	Net cost or benefit of mitigation (US$/$tCO_2e$)
Utility efficiency		Utility efficiency	6.2	19.3 (benefit)
Electricity generation		Biogas	5.4	0.6 (cost)
		Windpower	23.0	2.6 (cost)
		Small hydropower	8.8	9.4 (cost)
		Geothermal power	48.0	11.7 (cost)
Electricity generation in other sectors	*Oil and gas*	Cogeneration in PEMEX	26.7	28.6 (benefit)
	Industry	Cogeneration in industry	6.5	15.0 (benefit)
	Ag and forestry	Biomass electricity	35.1	2.4 (benefit)
		20% fuelwood co-firing retrofitting	2.4	7.3 (cost)
		Bagasse (existing sugar mills)	6.0	4.9 (cost)
		Bagasse (new ethanol factories)	16.8	11.3 (cost)

Electricity emissions BAU and MEDEC



OIL AND GAS

Oil and gas

MEDEC oil and gas interventions

	Maximum annual emission reduction ($MtCO_2e$/year)	Net cost or benefit of mitigation (US$/$tCO_2e$)
Cogeneration in PEMEX	26.7	28.6 (benefit)
Gas leakage reduction	0.8	4.4 (benefit)
Refinery efficiency	2.5	16.6 (cost)

ENERGY END-USE

MEDEC energy end-use

		Maximum annual emission reduction ($MtCO_2e$/year)	Net cost or benefit of mitigation (US$/$tCO_2e$)
Electricity end-use efficiency	Residential lighting	5.7	22.6 (benefit)
	Residential refrigeration	3.3	6.7 (benefit)
	Residential air conditioning	2.6	3.7 (benefit)
	Nonresidential lighting	4.7	19.8 (benefit)
	Nonresidential air conditioning	1.7	9.6 (benefit)
	Street lighting	0.9	24.2 (benefit)
	Industrial motors	6.0	19.5 (benefit)
Cogeneration	Cogeneration in industry	6.5	15.0 (benefit)
	Bagasse cogeneration	6.0	4.9 (cost)
Renewable heat supply	Solar water heating	18.9	13.8 (benefit)
	Improved cookstoves	19.4	2.0 (benefit)

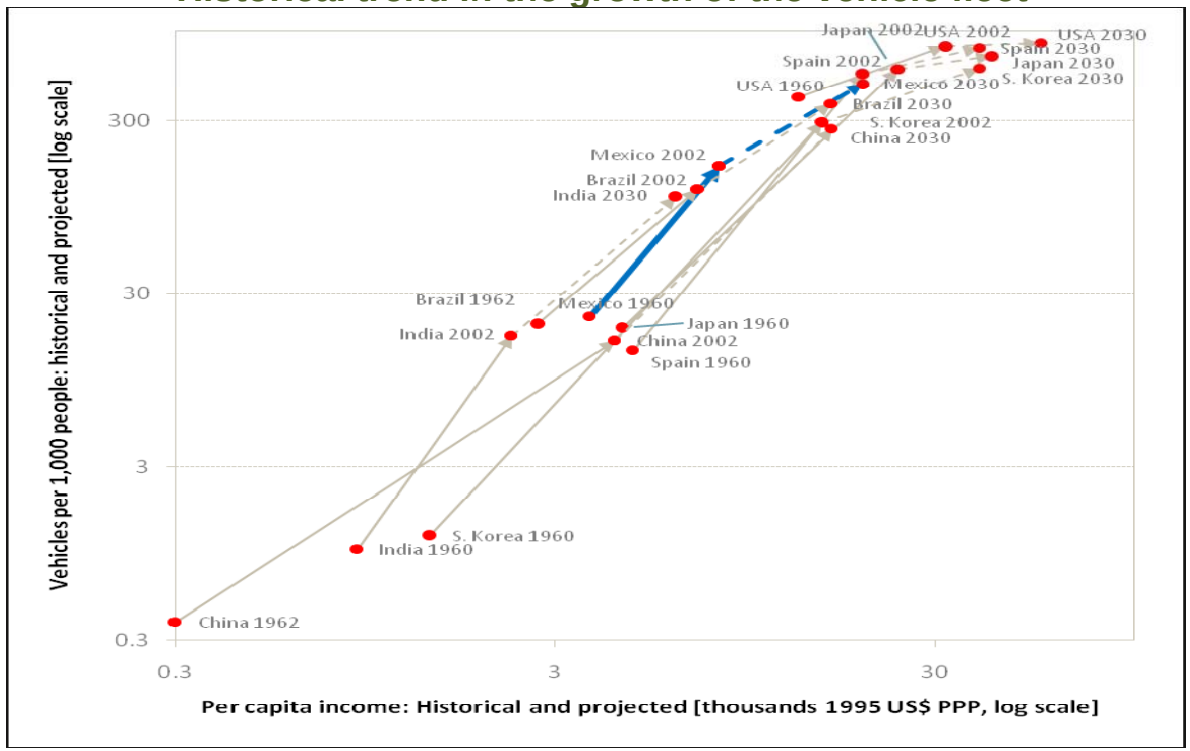
TRANSPORT

Transport

Baseline fleet growth

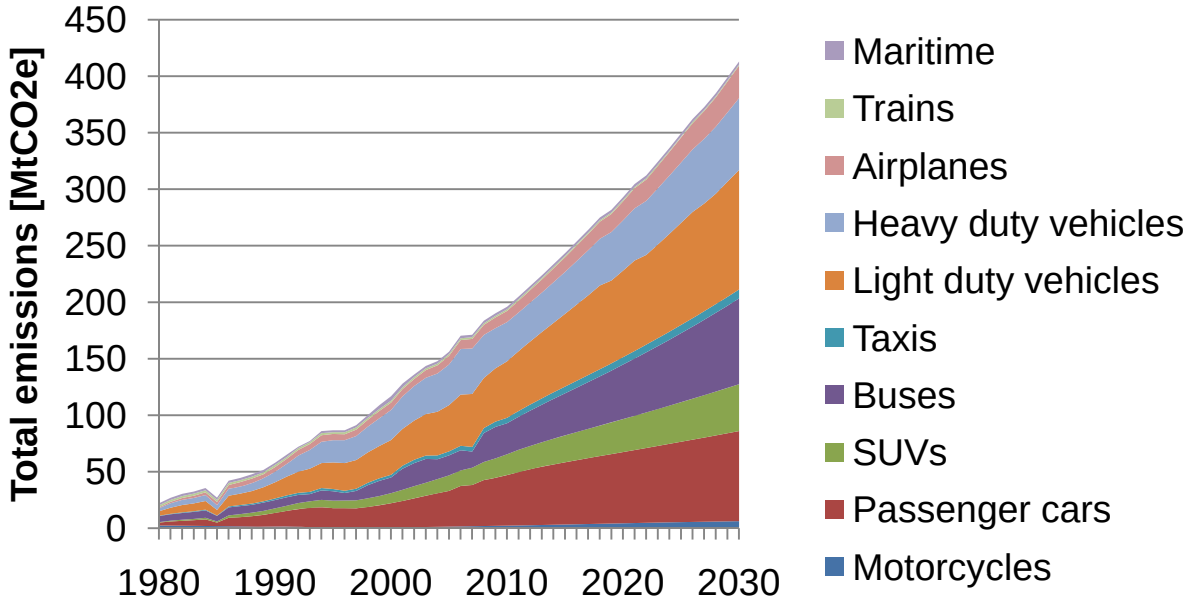
- The transport sector is the main consumer of energy, and responsible for the largest growth and absolute quantity of GHG emissions in Mexico
- Currently the sector accounts for 18% total emissions

Historical trend in the growth of the vehicle fleet



Transport baseline emissions

- Trends in Mexico's transport sector are assumed to be consistent with international trends
- The national vehicle fleet would grow from 24 million vehicles in 2008 to 70 million in 2030, with emissions increasing from 167 to 347 Mt CO2eq tmj1
- 72% of emissions would be generated by trucks and private automobiles



Slide 17

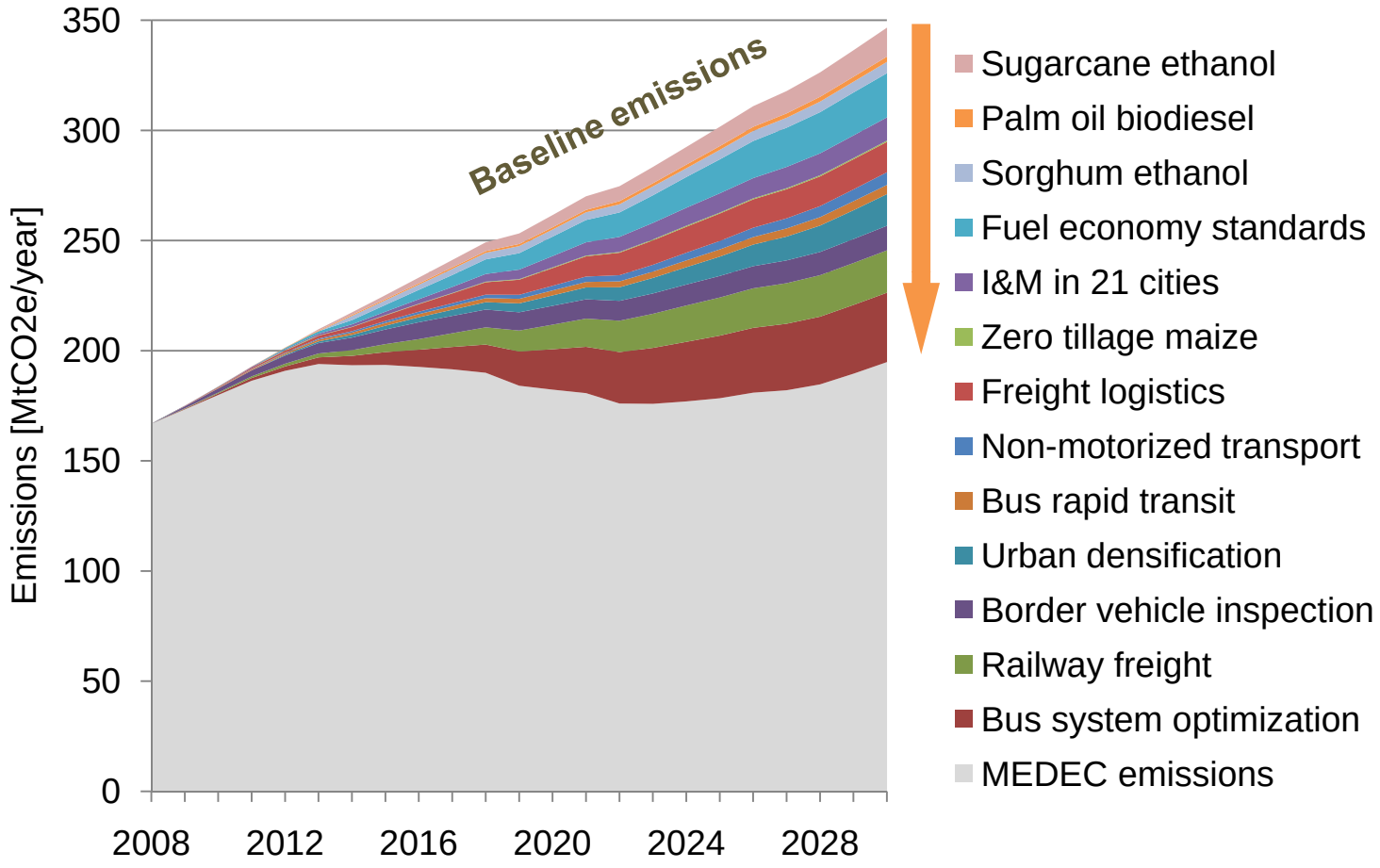
tmj1 There is a mistake in the BAU emissions graph for transport, both in this chart and in the document. BAU emissions are 347 compared to over 400 in graph.
wb63005; 8/23/2009

Transport

MEDEC transport interventions

		Maximum annual emission reduction ($MtCO_2e$/year)	Net cost or benefit of mitigation (US$/$tCO_2e$)
Modal shift and urban development	Bus system optimization	31.5	96.6 (benefit)
	Urban densification	14.3	66.4 (benefit)
	Bus rapid transit	4.2	50.5 (benefit)
	Non-motorized transport	5.8	50.2 (benefit)
Technologies	Border vehicle inspection	11.2	69.0 (benefit)
	Inspection and maintenance in 21 cities	10.6	14.5 (benefit)
	Fuel economy standards	20.1	12.3 (benefit)
Freight	Freight logistics	13.8	46.3 (benefit)
	Railway freight	19.2	88.7 (benefit)

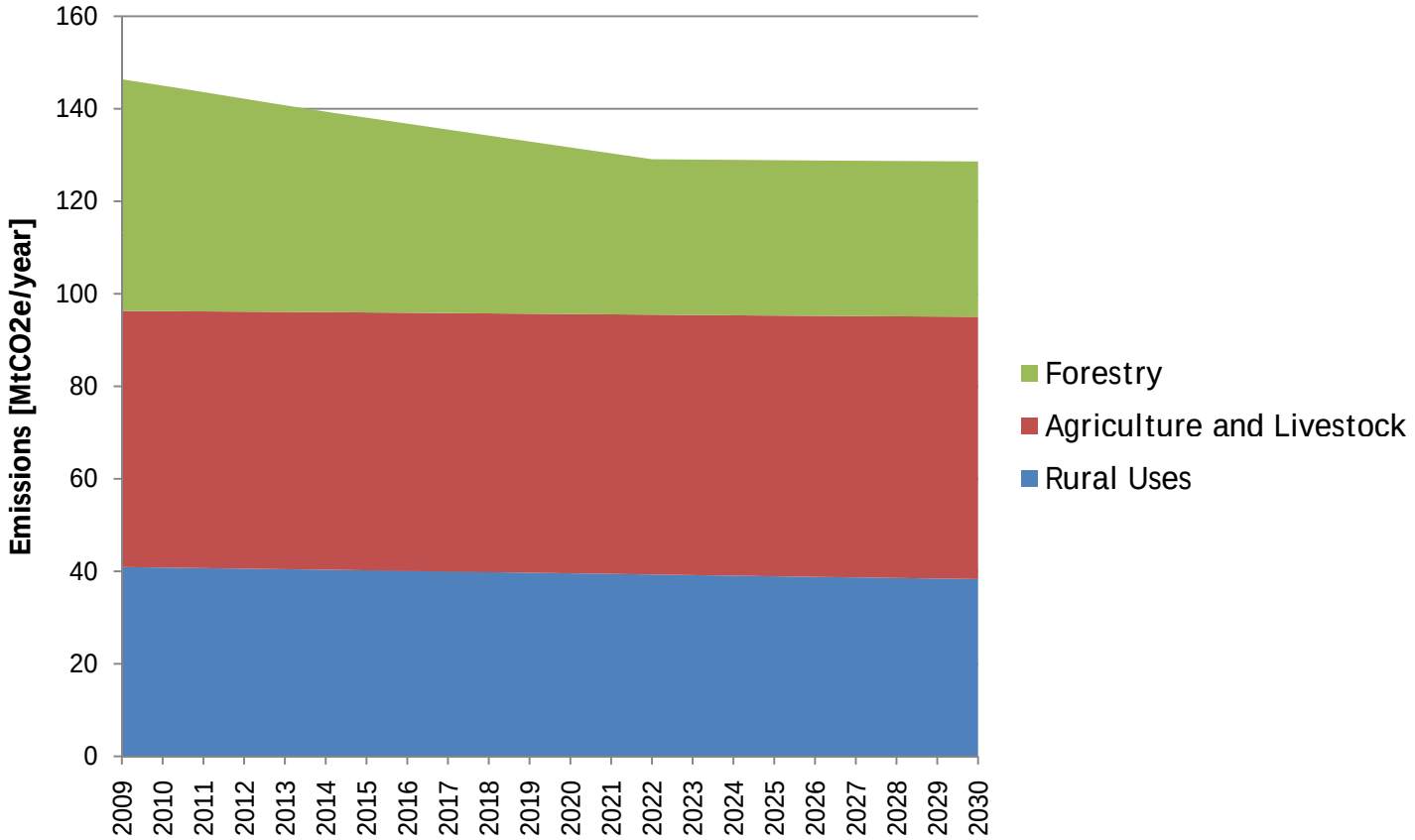
Transport emissions wedge graph



AGRICULTURE AND FORESTRY

Land-use and bioenergy

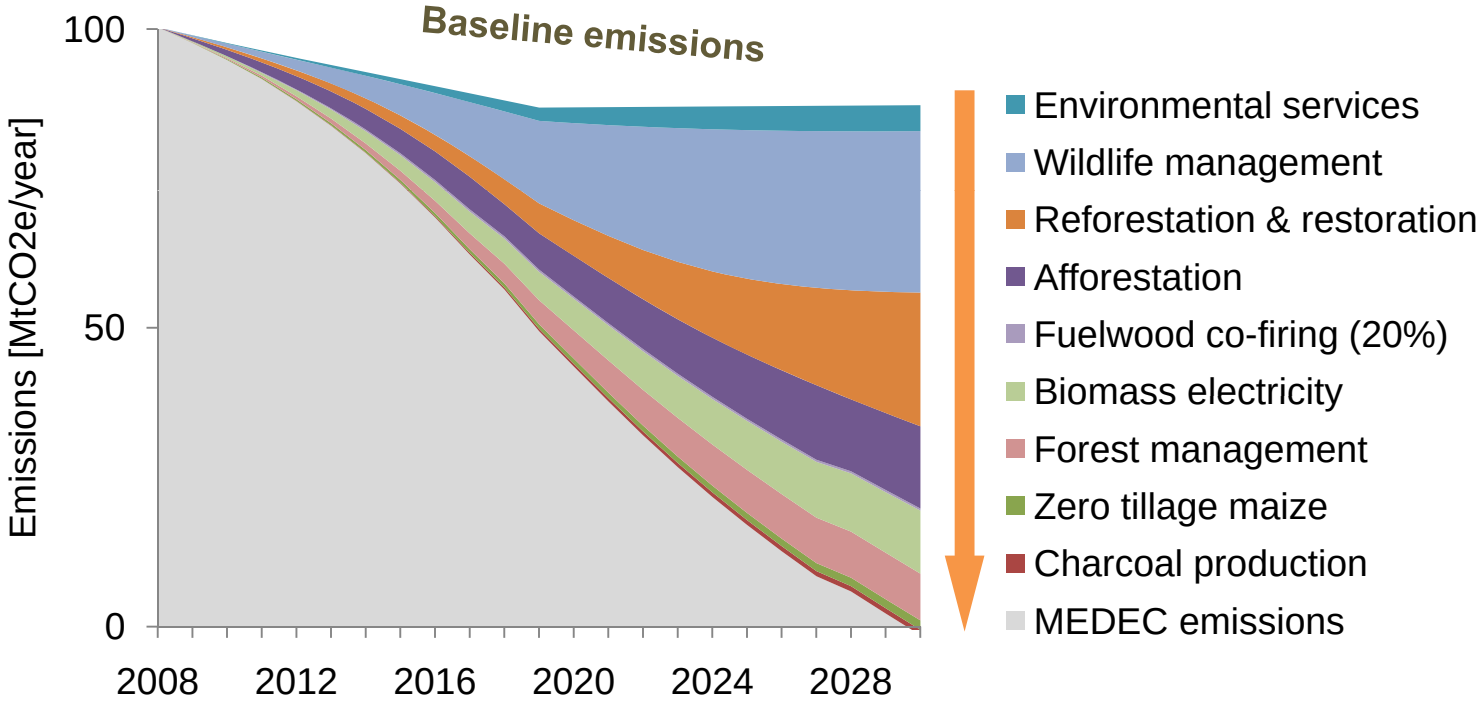
Baseline emissions



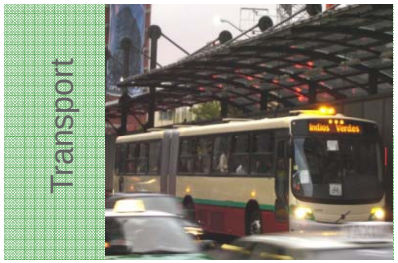
Agriculture and Forestry interventions

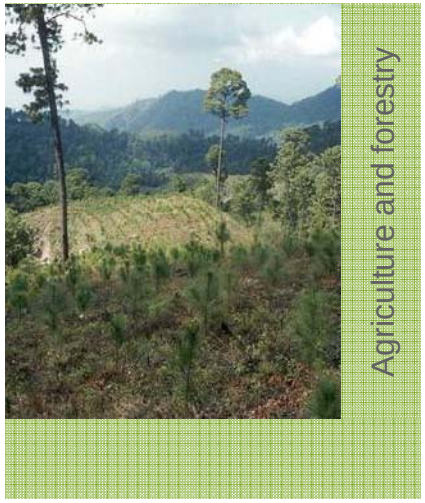
					Maximum annual mitigation reduction [$MtCO_2e/yr$]	Net cost or benefit of mitigation [$US\$/tCO_2e$]
Forestry	*REDD*	*Productive use of biomass*	*For energy purposes*	Biomass electricity	35.1	2 (benefit)
				Fuelwood co-firing	2.4	7 (cost)
				Charcoal production	22.6	20 (benefit)
			For other purposes	Forest management	7.8	13 (benefit)
		No productive use of biomass		Wildlife management	27.0	18 (cost)
				Payment for environmental services	4.4	18 (cost)
	Reforestation / afforestation			Reforestation and restoration	22.4	9 (cost)
				Afforestation	13.8	8 (cost)
Agriculture				Zero tillage maize	2.2	15 (benefit)
Liquid biofuels				Sugarcane ethanol	16.8	11 (cost)
				Sorghum ethanol	5.1	5 (cost)
				Palm oil biodiesel	2.4	6 (cost)

Land-use emissions wedge graph

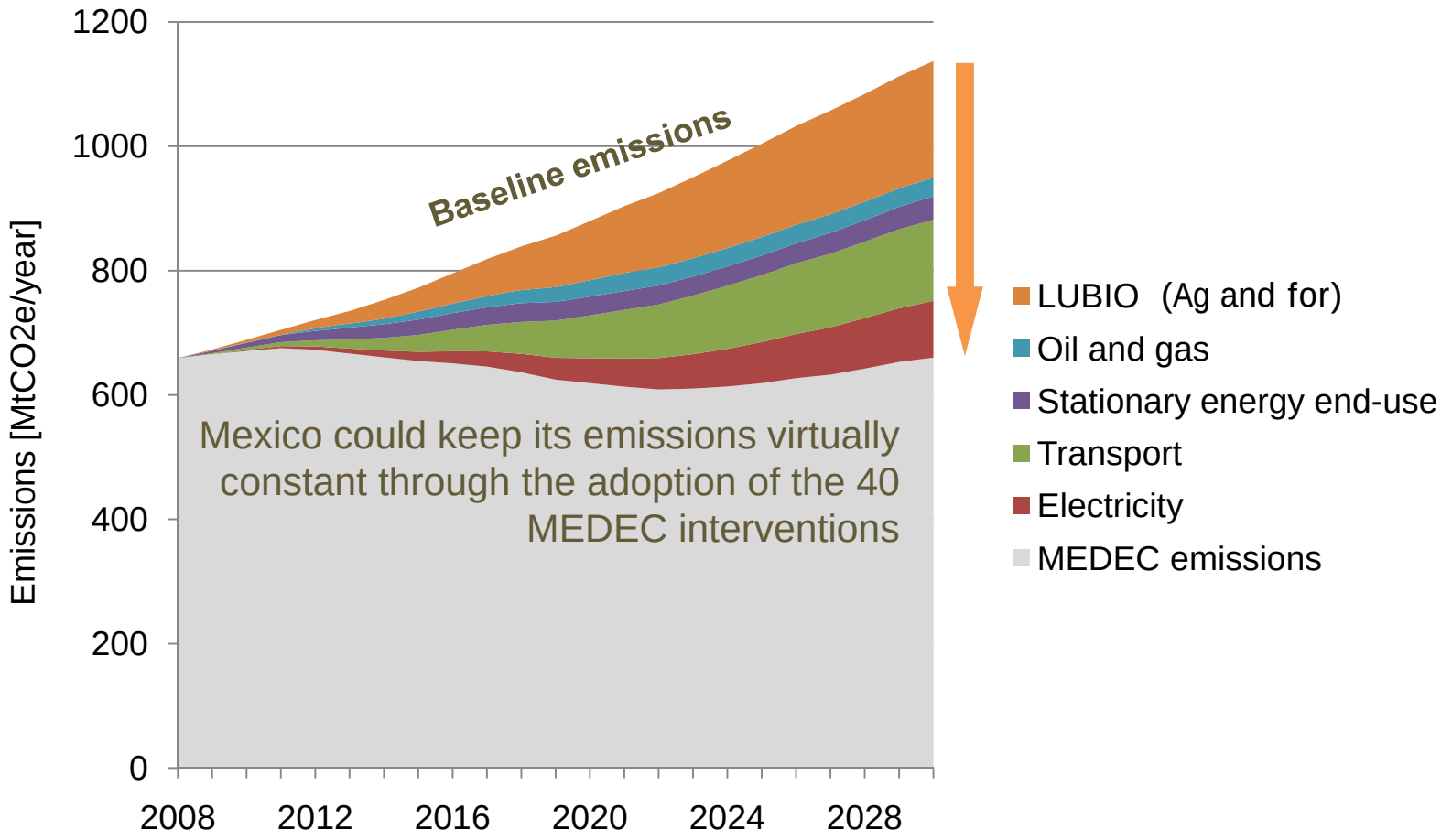


MEDEC scenario

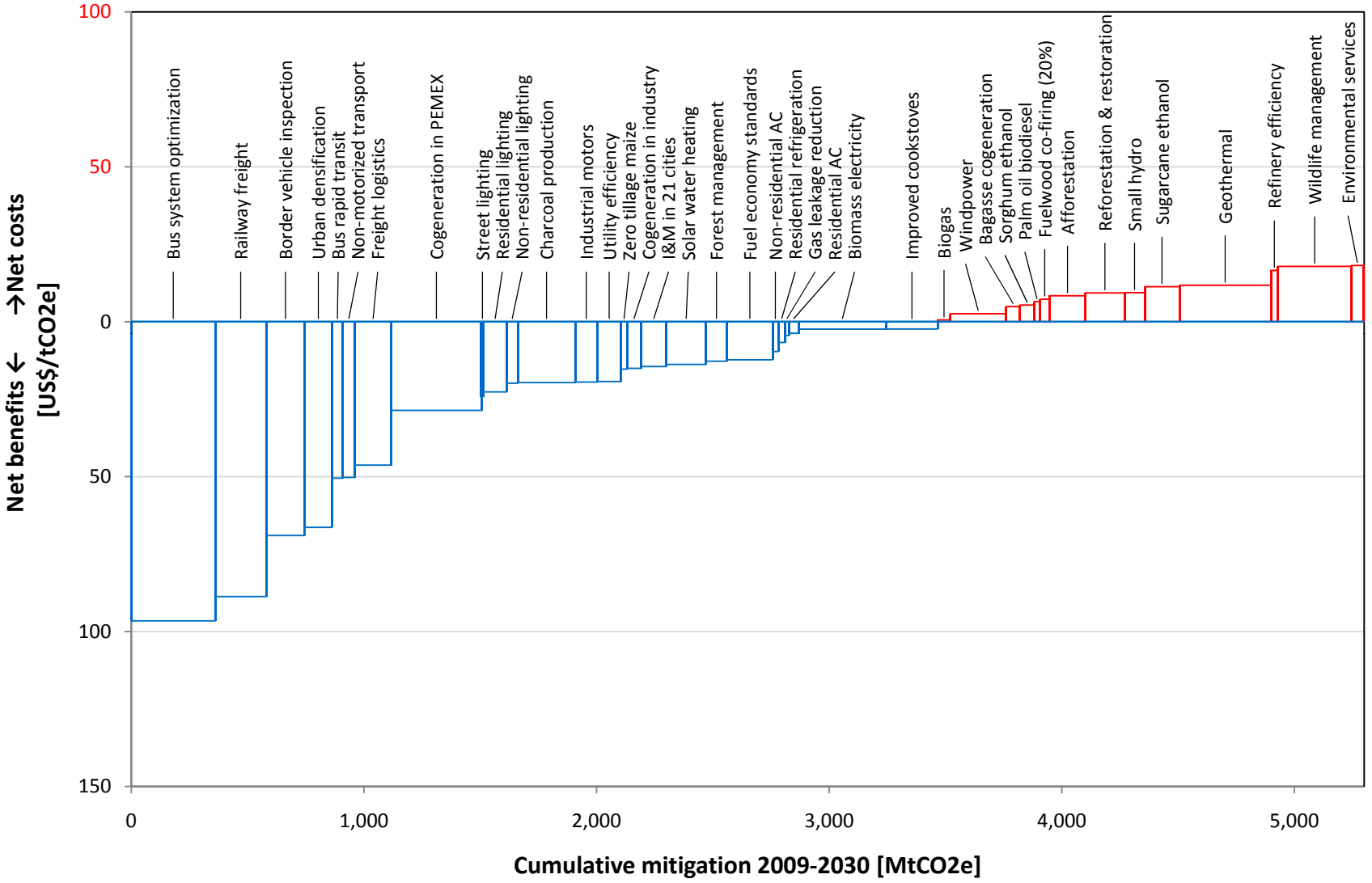




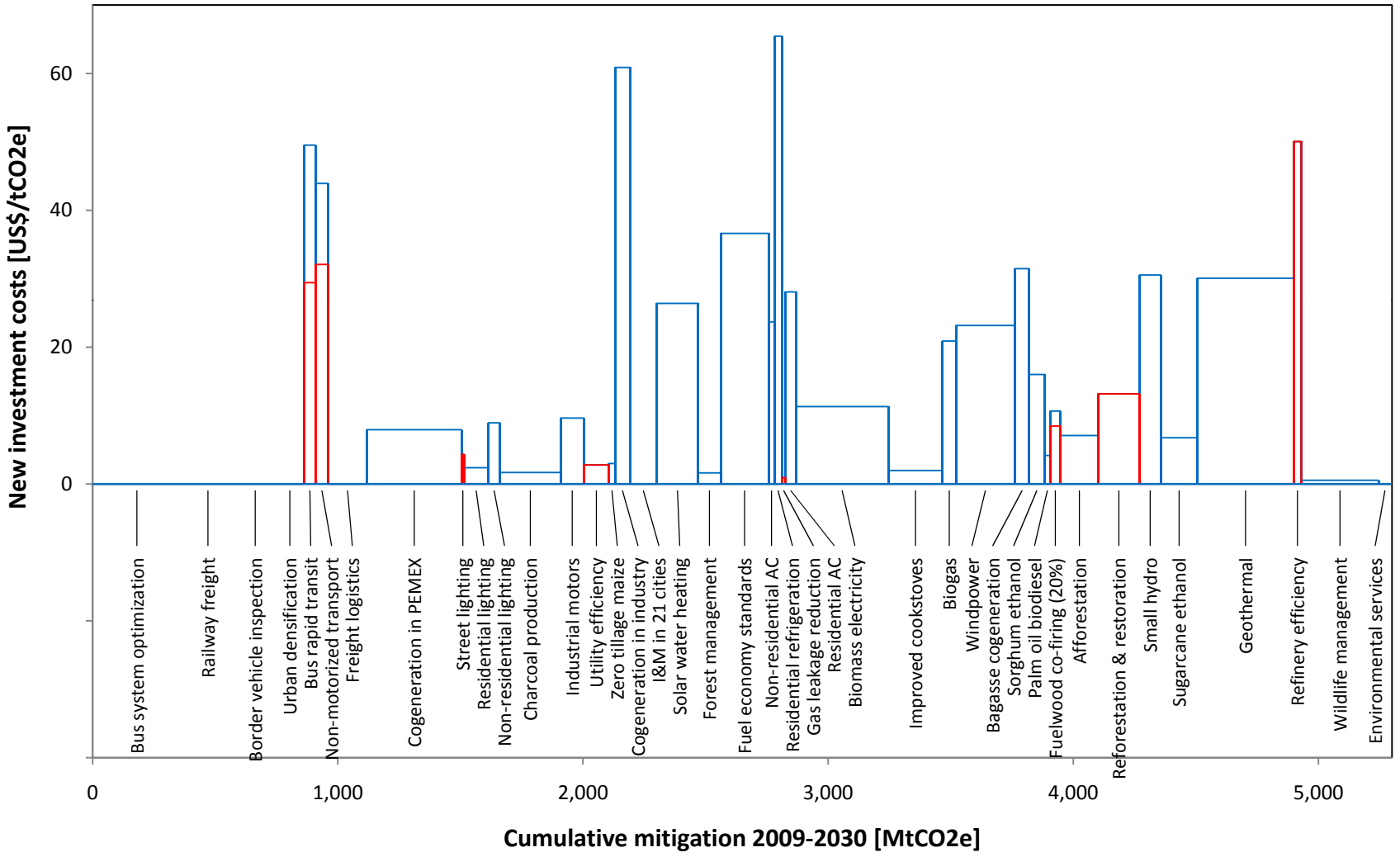
Overall wedge graph



Marginal abatement costs / benefits



Investments required



Main messages

Mexico has significant GHG reduction potential…

- Mexico could keep emissions relatively constant by undertaking a limited number of low-carbon interventions
- Primary emissions reduction potential is in transport (27%), agriculture and forestry (32%), power (17%), and energy efficiency (16%)

... at relatively low financial and economic cost…

- 65% of MEDEC interventions have positive financial and economic benefits. A carbon cost of $10/ton would capture another 17%

Main messages

...that will require changes in investment and financing, regulations, and institutions to achieve…

- Investment and Financing. Higher up-front costs (MEDEC scenario -- ~$64 billion to 2030). Financing required from public and private sectors and households
- Regulatory. Below-MC pricing of electricity (especially residential) and fossil fuels. Enforcement of environmental and efficiency standards and natural resource policies. Contracting issues
- Institutional. Governance reforms in CFE and PEMEX. Better coordination of Federal, State and Municipal government agencies, such as for public transport