



Center for
Clean Air Policy

Potential NAMAs and Sectoral Programs for the Cement Sector in Mexico

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Mexico Sectoral Study Workshop

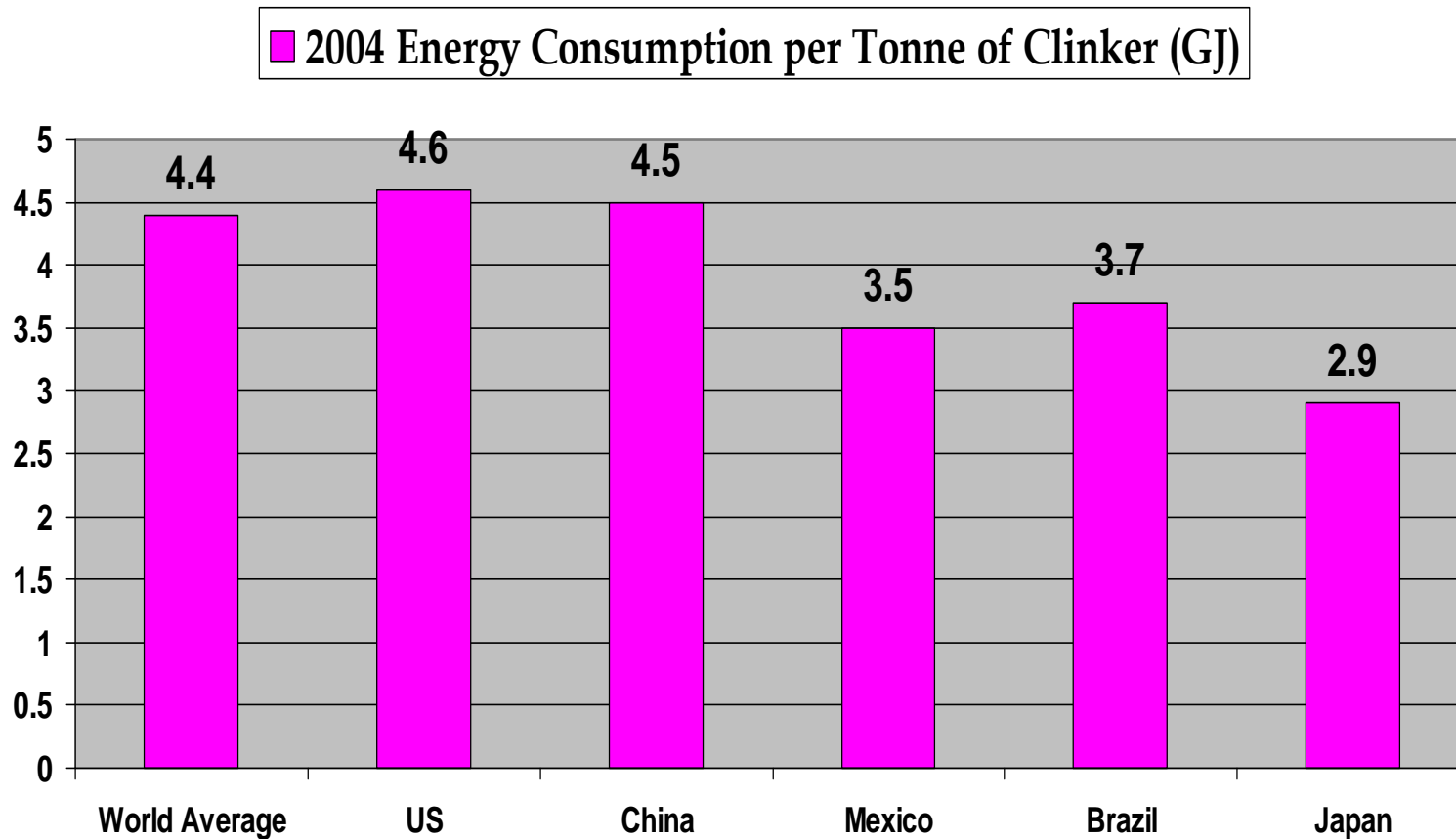
Mexico City, 3 September 2009

DISCLAIMER!

- Analysis and results presented here are those of CCAP alone. They are preliminary and meant to illustrate the proof-of-concept of sectoral approaches. None of the information or proposals have been officially endorsed by the Mexican government or by Mexican industry.

Mexico's Cement Sector — Energy Efficiency

Mexico's cement sector is one of the most energy efficient in the world



Source: IEA. 2008. Worldwide Trends in Energy Use and Efficiency

Setting Goals for Mexico's Cement Sector

- CCAP performed a preliminary analysis of Mexico's cement industry to estimate the GHG emissions reduction potential in 2020
- The analysis involved estimating the:
 - » BAU emissions through 2025, based upon expected growth in production and projected changes in production capacity, energy intensity, electricity intensity, fuel mix, industry practices
 - » Emissions reduction options and implementation costs
 - » Maximum deployment of mitigation options, both individually and as packages of options
 - » Barriers to implementation of promising mitigation options
- CCAP then proposed possible unilateral and no-lose sectoral goals for the Mexican cement sector
 - » **Emissions intensity goals to allow for growth of the industry**

Assumptions (must be checked)

- BAU:
 - » Production growth = 2.89% per year
 - » Clinker percent constant at 80.19%
 - » **No changes in plants (builds, retirements, etc.) before 2020**
 - » Energy efficiency constant at 3.515 GJ/t clinker
 - » Electricity intensity constant at 0.06165 tCO₂/ t cement
 - » **Alternative fuels (tires) 1.5% of fuel mix**
 - » **Fuel mix constant**
- Is CEMEX representative of rest of sector?
- Mitigation option deployment

Initial Analysis of Mitigation Options

	Emissions Reduction Potentials	Emissions	Redux	Redux	Emissions Intensity
No.	2020 Scenario	MtCO2	MtCO2	%	tCO2 / t cement
0	Baseline (BAU)	41.63	0.00	0.0%	0.737
1	EE = 3 GJ/t clinker	39.54	2.09	5.0%	0.700
2	Blending = 72.3%	37.87	3.76	9.0%	0.671
3	Electricity 100% offset	38.15	3.48	8.4%	0.676
4	alt fuels (tires) = 50%	40.69	0.94	2.3%	0.721
5	Electricity Intensity = 80 KWh/t cement	40.52	1.11	2.7%	0.718
6	Intermediate (2+3)	34.39	7.24	17.4%	0.609
7	Max (1+2+3)	32.44	9.19	22.1%	0.574

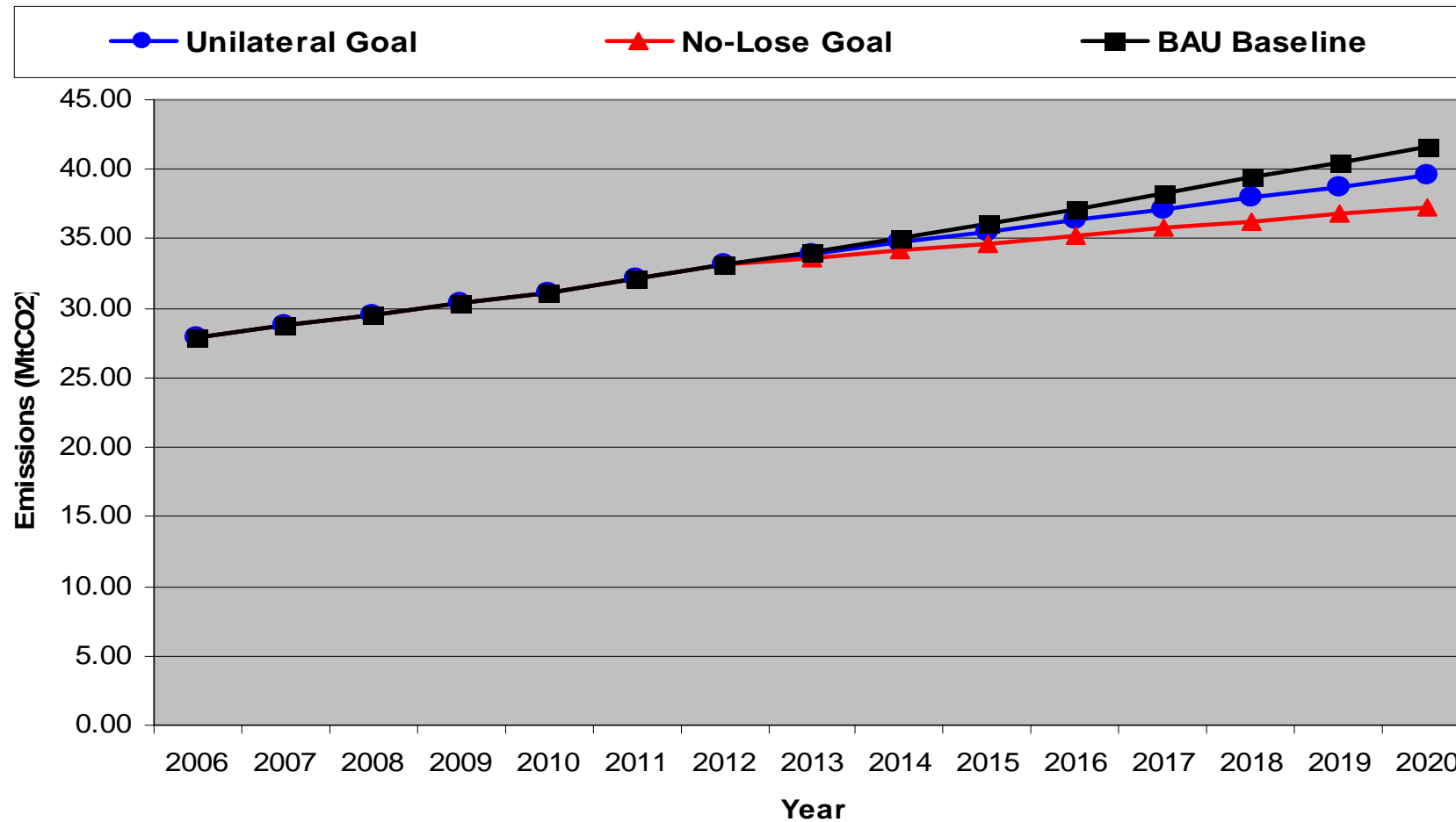
Promising Cement Sector Mitigation Options – First Conclusions

- Initially, the most promising options for cement appear to be:
 - » Cement blending (3.8 MtCO₂ in 2020)
 - Primary barrier believed to be supply of blending materials
 - Full implementation cost estimated to be about \$100 million (2012 USD) over 20 years
 - » Replacement of fossil-fuel based electricity generated by CFE with electricity produced by renewable sources (3.5 MtCO₂ in 2020) built by cement industry (expanded cement sector boundary)
 - Primary barrier believed to be electricity pricing
 - May require international loans to cover capital costs
 - » Improvements in kiln energy efficiency (2.1 MtCO₂ in 2020)
 - Primary barrier believed to be cost
 - Full implementation cost is about \$800 million (2012 USD) over 20 years, for which Mexico could request partial support

Mexico's Cement Sector — Initial Proposal for Sectoral Goals

- **Unilateral: 0.70 tCO₂/t cement in 2020** (BAU=0.737)
 - » based upon partial deployment of blending or RE option
 - » reduces emissions by 5% (2.1 MtCO₂) from BAU in 2020
- **No-lose: 0.66 tCO₂/t cement in 2020** (approximately the current EU average)
 - » based upon maximum deployment of blending or RE options
 - » reduces emissions by more than 10% (4.3 MtCO₂) from BAU in 2020
 - » international assistance may be required if energy efficiency measures must be employed, supply of blending materials is limited, or wind farm financing is difficult to obtain

Emissions Performance from Initially Proposed Goals



Valuable Feedback from CANACEM

- **Scenario 1 (EE):**
 - » Can't physically retrofit to this efficiency
 - » Specific conditions prevent some upgrades
 - » Implementation cost is very high (\$1.9 billion)
- **Scenario 2 (blending):**
 - » Inexpensive way to reduce emissions
 - » Need new NOMs for cement and market support to ensure demand
 - » Slag/fly ash supplies limited but pozzolans prevalent in some areas
 - » Cost may be underestimated and implementation scenario is unrealistic
- **Scenario 3 (RE):**
 - » Cement sector shouldn't be responsible for indirect emissions
- **Scenario 4 (alt fuels):**
 - » Very promising option (MSW and sludge have high biomass content)
 - » barriers are significant – waste handling laws, three-year terms for municipality administrations, expense involved in waste processing (e.g., \$100 million per sludge-drying plant; MSW must also be processed)
- **Scenario 5 (electricity intensity):**
 - » Mitigation scenario is infeasible

Revised Analysis of Mitigation Options

	Emissions Reduction Potentials	Emissions	Redux	Redux	Emissions Intensity
No.	2020 Scenario	MtCO2	MtCO2	%	tCO2 / t cement
0	Baseline (BAU)	41.63	0.00	0.0%	0.737
1	EE = 3 GJ/t clinker	39.54	2.09	5.0%	0.700
2	Blending = 72.3%	37.87	3.76	9.0%	0.671
3	Electricity 100% offset	38.15	3.48	8.4%	0.676
4	Alt fuels (tires) = 30%	41.05	0.58	1.4%	0.727
5	Alt fuels (MSW) = 30%	39.17	2.46	5.9%	0.694
6	Alt fuels (sludge) = 30%	36.97	4.66	11.2%	0.655
7	Electricity Intensity = 80 KWh/t cement	40.52	1.11	2.7%	0.718



Promising Cement Sector Mitigation Options – Revised Conclusions

- Thus, the most promising options for cement appear to be:
 - » Cement blending (3.8 MtCO₂ in 2020)
 - Barriers include NOMs, market (supply of blending materials?)
 - Full implementation cost could be much higher than original estimate (more than \$600 million (2012 USD) over 20 years)
 - » Use of alternative fuels (0.6 - 4.7 MtCO₂ in 2020)
 - Primary barriers are legal/regulatory + fuel processing costs
 - Full implementation cost depends upon choice of alternative fuel and relative prices of alternative fuel vs. petcoke
 - » Replacement of fossil-fuel based electricity generated by CFE with electricity produced by renewable sources (3.5 MtCO₂ in 2020) built by cement industry (expanded cement sector boundary)
 - May now depend upon how the power sector is included in mitigation efforts

Examples of Alternative Fuel Costs

- Price of petcoke:
 - » \$111.68/tonne per Mexico cement PDD
 - » \$58/tonne per ICF (also from PDD)
- Prices of alternative fuels:
 - » Mexico cement PDD
 - Tires \$76.75/tonne
 - MSW \$25.87/tonne
 - Sludge \$29.14/tonne
 - » €15.50 (about \$22)/tonne fuel per ICF

Net Costs for Use of Alternative Fuels

- Net value of costs in 2012, assuming 20 year lifetime of measure and \$4M per plant capital cost
- CANACEM: \$250M using extrapolation of existing MSW use across entire sector

		Petcoke Price	
Alt Fuel Price	Alt Fuel	ICF	CEMEX
ICF	tires	-\$179K	-\$657K
	MSW	+\$173K	-\$306K
	sludge	-\$164K	-\$642K
CEMEX	tires	+\$326K	-\$152K
	MSW	+\$266K	-\$212K
	sludge	-\$94K	-\$573K

Mexico's Cement Sector — Revised Proposed Sectoral Goals

- Based upon the feedback from CANACEM, it isn't yet clear that the initial proposal for sectoral goals should be altered.
- Further review and analysis, particularly of the costs of the blending and alternative fuels options, is required before new goals can be proposed.

Next Steps

- The analysis needs to be improved through:
 - » Better data:
 - Plant-specific data and better coverage of sector
 - Mitigation costs and potentials
 - Barriers
 - » Verification and/or revision of assumptions
 - » Feasibility checks
 - » Improvements in the methodology

Key Questions

- What are the true costs of the cement blending and alternative fuels options?
- Are the supplies of blending materials and alternative fuels limited in any way? How are they distributed geographically?
- What policy reforms would best allow cement plants to access alternative fuels?
- What forms of international assistance would be most helpful for a sectoral program in the cement sector in Mexico?

Thank you!

For more information:

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Mexico's Cement Sector — Revised Proposed Sectoral Goals

- **Unilateral: 0.67 tCO₂/t cement in 2020** (EU average is about 0.66)
 - » based upon full deployment of blending option
 - » reduces emissions by 9% (3.8 MtCO₂) from BAU in 2020
- **No-lose (with financing): 0.63 tCO₂/t cement in 2020**
 - » based upon maximum deployment of blending and alternative fuel (MSW) options
 - » reduces emissions by 15% (6.1 MtCO₂) from BAU in 2020
 - » incentives to municipalities (e.g., for avoided emissions of methane)
 - » financing assistance to waste processors
 - » assistance to cement companies if future municipal administrations break alternative fuel supply contracts

Emissions Performance from Revised Proposed Goals

