



# Transportation and the Clean Development Mechanism

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**Toward a Policy Agenda for Climate Change**  
**Asilomar Conference Center**  
**August 25, 2005 Pacific Grove, CA**

## Overview

- Context
- What is the CDM?
- Lessons from CCAP's Chile project
- Experience to date
- Options for improving CDM

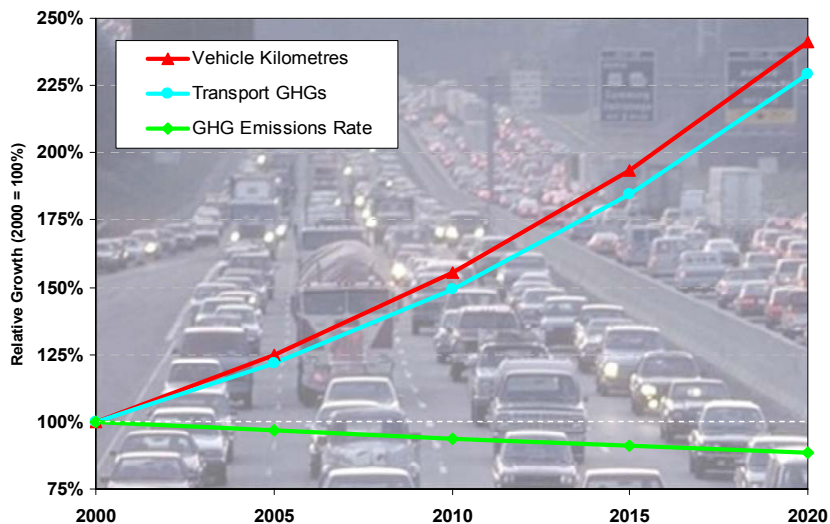
# Context

- Transportation:  $\approx$  22% of world CO<sub>2</sub> emissions
- Fastest growing source of emissions
  - » 2.1% per year globally
  - » 3.5% per year in developing countries
- Transportation CO<sub>2</sub> emissions from developing countries expected to double by 2025
- Three key factors “drive” transportation emissions
  - » Travel activity (vehicle kilometers traveled, VKT)
  - » Vehicle energy intensity
  - » Fuel carbon content



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## Efficiency Gains Swamped by VKT Growth (Pew forecast for Chile)



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# The Kyoto Protocol...

- ...to the United Nations Framework Convention on Climate Change (UNFCCC)
  - » Adopted in Dec 1997; Entered into force on Feb 2005
  - » Legally binding GHG emission targets for industrialized countries and economies in transition (Annex I) that ratified the Protocol
- No quantitative targets for emission reductions in developing countries
- **5% below existing 1990 levels by 2012**, with varying targets for individual countries
- BUT, atmospheric stabilization requires 20% below 1990 levels by 2020 and 60% below 1990 levels by 2050



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# Clean Development Mechanism (CDM)

- “Annex I” countries pay for emission-reducing sustainable development projects in developing countries and use the **certified emission reductions (CERs)** to help meet their own targets
- Goal: **sustainable development** in host developing countries and cost-effective emission reductions
- Project Criteria: “Real, measurable and long-term benefits of emission reduction or removals” that are **additional** to any that would have occurred without the project (baseline)



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# Additionality

- Can be a very ambiguous and problematic issue
- “A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.”
- Investment analysis: project is economically less attractive than other alternatives without the sale of CERs
  - » CERs don't have to cover all project costs
  - » Need CERs for investment to become viable
- Barriers analysis: proposed activity faces barriers that prevent widespread implementation of this activity



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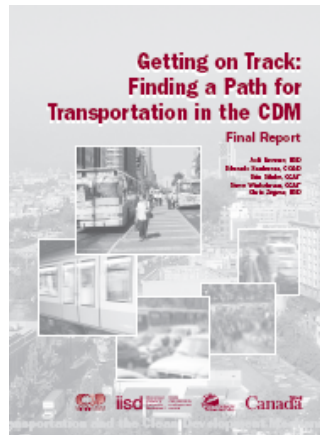
# CCAP Project on Transport & CDM in Chile (2001-4)

- Funded by CIDA
- Conducted with IISD (Canada) and CC&D (Chile)
- Premise: no transportation projects in the pipeline
- Project goal: to enhance the capacity of Chile to undertake transportation CDM projects
  - » Chile has high-quality data, advanced models and experienced professionals.
- Analysis included three case studies
  - » Bus Technology
  - » Bicycle Policies
  - » Location Efficiency
- August '04 international workshop to share results



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Final Report at [www.ccap.org](http://www.ccap.org)



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## Case Studies Findings: Buses

- **Hybrid Buses on Feeder Routes: 12 ktCO<sub>2</sub>/year**
  - » It is possible to establish an acceptable methodological framework for the CDM
  - » Marginal return may be too small to attract investment
  - » Technology/fuel switch has lower impact than reduction in number of buses or displacement of car trips
- **TranSantiago (Bus Rapid Transit) 350 ktCO<sub>2</sub>/year**
  - » Short-term savings from reducing # of buses 8,200 to 6,500
  - » Long term savings from displaced car trips
  - » Significant debate over additionality



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## Case Studies Findings: Bicycle Infrastructure

- Individual bikeways not viable as CDM projects
  - » Uncertainty in establishing baseline, monitoring
    - Need high quality data for good estimates of displaced trips
  - » Infrastructure, monitoring costs much higher than CER values
- Comprehensive network could save **25-100 ktCO<sub>2</sub>/yr**
  - » Would require policy-based and/or sectoral CDM approach
  - » CERs could fund 10-30% of infrastructure costs
  - » Monitoring costs could be reduced through use of improved regional data collection mechanisms (e.g., O-D surveys)
- Major ridership increase requires
  - » Promotional campaigns
  - » Adequate, secure parking at intermodal transfer facilities
  - » Land use policies that enable shorter trips suitable for bicycles<sup>11</sup>



## Case Studies Findings: Location Efficiency

- Regional development patterns, local design and transit service shape the sector GHG footprint
- **500 to 1,000 ktCO<sub>2</sub>/year**, strong co-benefits
- Current CER prices will not provide sufficient incentive
- Unlikely fit for project-based CDM
  - » Methodologies are data & capacity intensive
  - » Baseline uncertainty is significant
  - » Monitoring can be difficult
- Policy-based or sectoral CDM could make location efficiency efforts more feasible
  - » Requires high quality regional travel and land use data, advanced modeling capacity



# Case Study Comparisons

Figure 17 Comparison of Case Study Results<sup>190</sup>

Case Study	Project Scale	Annual CO <sub>2</sub> Savings (tonnes)	Project Time Period (years)	Cost per tonne* CO <sub>2</sub>	Annual CER Revenues (US\$10/tonne)
Bus Technology	462 buses	11,700	10	-\$80	\$117,000
Bikeway project	4.5 km (1,000 cyclists)	73	21	\$212	\$735
Bicycle network	1,200 km	27,300 to 99,600	21	\$30 to \$111	\$273,000 to \$996,000
Location Efficiency: Schools**	Greater Santiago	500,000 to 650,000	21	\$2	\$5,000,000 to \$6,500,000
Location Efficiency: Non-Residential**	(34 comunas)	850,000 to 1,200,000	21	\$27	\$8,500,000 to \$12,000,000

\* Assumes a 10 per cent social discount rate for each case study. Transaction and monitoring costs are not included. Projects with 14 or 21 year timeframes will incur additional transaction costs for preparing and submitting renewal applications and updating the baseline.

\*\* Annual savings grow over the 21 year time frame.



(Note: Transantiago BRT: 350,000 tCO<sub>2</sub>/year)

# CDM Project Cycle

- Project Design Document (PDD)
  - » Baseline & monitoring methodology are submitted for approval to the Executive Board
    - No transportation methodologies approved to date
  - » Environmental impact analysis
- Validation
- Registration
- Monitoring
- Verification and Certification



## CDM Experience to Date

- 14 projects registered to date
  - » 88% of reductions from two HFC<sub>23</sub> decomposition projects
  - » 8% from landfill methane projects
  - » These do not do much to advance local sustainability priorities
- 184 in the “pipeline”
  - » 60% of reductions from six N<sub>2</sub>O and HFC projects
  - » Range: 0.5 to 9,150 ktCO<sub>2</sub>/year
  - » Median size: 44 ktCO<sub>2</sub>/year.
- Only 3 transportation projects in the pipeline



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## Transportation Projects in the CDM "Pipeline"

- Khon Kaen, Thailand: Biofuel ethanol project
  - » **46** ktCO<sub>2</sub>/year (10 years)
- Andhra Pradesh, India: Biodiesel
  - » **26** ktCO<sub>2</sub>/year (7 years)
- Bogotá, Columbia: TransMilenio Bus Rapid Transit
  - » **295** ktCO<sub>2</sub>/year (10 years)
  - » Rejected 1<sup>st</sup> time submitted, tough case for additionality



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## Other Projects under consideration: BRT & Travel Demand Reduction

- Santiago, Chile: Transantiago (BRT & transit reorg)
  - » **350** ktCO<sub>2</sub>/year
  - » PDD completed (but considering World Bank offer)
- Mexico City: *Insurgentes* BRT
  - » **35 - 70** ktCO<sub>2</sub>/year
  - » PDD under development
- Peru
  - » Two projects in very preliminary phases
    - Lima and Callao: electric mass transit system. **900** ktCO<sub>2</sub>/year.
    - Protransporte BRT. **300** ktCO<sub>2</sub>/year



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## Other Projects under consideration: Fuel Switching

- Bangladesh: Natural Gas Conversion (17,000 vehics)
  - » **1** ktCO<sub>2</sub>/year
- Dhaka City, Bangladesh: electric vehicles (300)
  - » **1** ktCO<sub>2</sub>/year
- Brazil: 100,000 ethanol-fueled vehicles
  - » Could be significant but may require policy-based approach
- India:
  - » gasahol project: under development
  - » (Rejected: LPG retail stations)



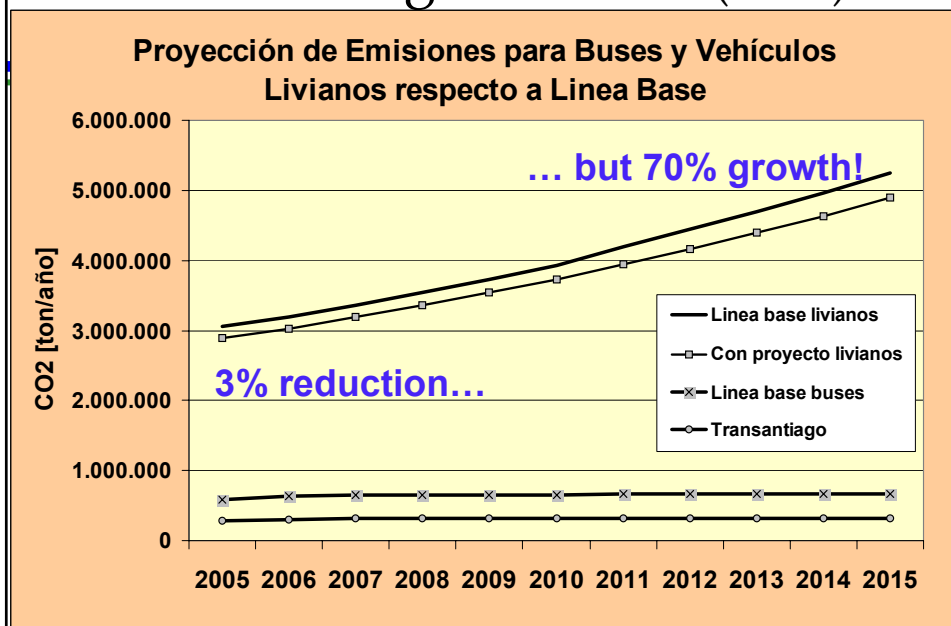
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# Initial Observations

- No approved methodologies for transportation projects
- Travel demand reduction projects are projected to save much more than fuel switching projects
- Fuel switching projects are much easier to score
- Context: how much do these projects save with respect to total sector emissions?
  - » Mexico BRT corridor: on the order of 1% of regional transport GHG. Potential for replication
  - » Transantiago: 3% reduction off BAU, but 70% overall growth
  - » Comprehensive land use and transit policies could save 20%+ in the US, potentially even more in fast growing developing country with high transit and NMT mode shares



## TranSantiago Forecast (draft)



## Lessons Learned on the CDM

- CDM influence limited by:
  - » Current CER prices ( ≈\$5 -10 per tonne CO<sub>2</sub>)
    - Demand and prices would be higher had the US ratified
  - » High transaction costs, lengthy approval process
- Projects that fit well have a small emissions impact
- Major impacts will come from policies that address many passengers, vehicles or large volumes of fuel
  - » Fuel economy regulation
  - » Renewable fuel standards
  - » BRT networks & smart growth
- Establishing “additionality” for such policy-based approaches is difficult



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## Lessons Learned on the CDM (2)

- Tension between environmental integrity and sustainability goals
  - » If the process is too onerous investors won't play
  - » If scoring is flaky, trading fails and net emissions increase
  - » If CDM is to advance local sustainability it should better accommodate travel demand reduction (multiple co-benefits)
- If we focus only on what we can quantify with confidence, we may miss the big picture of what's needed for sector-wide and long-term GHG reductions
  - » While we are busy debating additionality and perfecting conservative calculations, BAU policies pump more GHGs into the atmosphere (e.g., funding roads vs. transit, NMT)



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## Fixing the CDM?

- There are several forums for discussing how to improve and/or move beyond the CDM
- CCAP's CDM Dialogue evolved into the Future Actions Dialogue, exploring post-2012 options
- One of the major goals of the next Conference of the Parties to make the CDM work better
- The Canadian government is hosting a private workshop to discuss revisions to the CDM (CCAP facilitating)



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## Post-2012 Options

- CDM's short-term marginal cost focus makes it hard to incentivize changes important to local sustainability and long-term GHG goals
- Options for rewarding developing country action
  - » Policy and Sectoral Approaches
  - » Enhanced Financing for Sustainable Transport
  - » Fostering Local Leadership
  - » Support Metropolitan Visioning Efforts
  - » Coordinated Policies and Measures?



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## Post-2012 Options (2): Policy and Sectoral Approaches

- Would better accommodate structural changes
- Could national fuel economy standards qualify?
  - » Feng An and I estimate that even modest standards in Mexico could yield tens of millions of dollars per year in CERs
- Renewable fuel standards or policies?
  - » Could have a major impact in a country like Brazil
- Sectoral or regional targets are under discussion
  - » E.g., if a metropolitan region (or country) committed to implement policies that would reduce transport GHGs 3% below the baseline, then any reductions beyond that level could be sold as CERs
- Major data quality concerns for implementation



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## Post-2012 Options (3)

### **Enhanced Financing for Sustainable Transport**

- Development banks: loans, climate friendly portfolios
- debt relief??

### **Fostering Local Leadership**

- Politicians will only pursue long-term solutions if
  - » They have an appreciation of the GHG impacts and economic risks of current policies and trends
  - » They are aware of policy solutions with tangible short-term benefits (e.g., health, congestion relief) that will be seen during their term in office



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## Post-2012 Options (4)

### Support Regional Visioning Efforts

- Scenario analyses to quantify risks of pursuing BAU policies and benefits of more integrated transport & land use policies
- Helps identify policy solutions and build public support

### Coordinated Policies & Measures

- E.g. harmonize international vehicle standards??
  - » Major hurdle: accommodating differences in vehicle size and power across international markets



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## Closing Thoughts (1)

- Actually addressing climate change (<< 1990 levels) requires progress on all 3 fronts
  - » Technology, fuels and especially travel demand
- Current CDM likely to have very limited impact on transport emissions
- Policy and sectoral approaches will be critical for the post-2012 regime
  - » May help wealthier developing countries “play”
- The GHG problem can only be minimized as part of broader sustainability strategies



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## Closing Thoughts (2)

- Current infrastructure and land use decisions shape future travel patterns and emissions for 100 years
- High opportunity costs of BAU development
- Delaying investments in planning, transit, NMT puts even more pressure on technology
- Implementing sustainable solutions now advances multiple policy goals that voters care about
  - » Economic development, air quality, health, congestion
- Requires deliberate planning, investment and local leadership



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## Finally: I have developed an exciting transportation solution...

- Biomass fueled
- Minimal initial capital costs
- Very low lifetime emissions
- Higher efficiency than any hybrid or fuel cell vehicle
  - » More efficient in urban drive cycle
  - » Efficiency increases over time
- Renewable
- Technology has gone through many generations of evolution



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# Benny!



## Caveats:

- Methane emissions higher in early years
- Operating costs increase from 18-22 years
- Habitat has become fragmented and needs restoration so he can walk to school, bike to the park, and I don't become a suburban chauffeur!



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## For more information:

[www.ccap.org](http://www.ccap.org)

- This presentation (coming soon)
- Transportation and the CDM in Chile
  - » Executive Summary available today
- CCAP Future Actions Dialogue
- Transportation & Emissions Trading
- CCAP Transportation Emissions Guidebook
- Freight Solutions Dialogue



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