Urban Transport in Santiago de Chile’s Decontamination Plan

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Chile: Demographics and Regional Context

Metropolitan area,
7 million people
15,400 km²
6,500 urban buses (Santiago)
1,700,000 private cars

Chile,
17 million people
750,000 km²
OECD member since 2010
Motorization rate 250veh/1000inh
Chile Health impacts of air pollution

- Four thousand annual deaths related to air pollution
- 871,000 lost work days
- 3,730,000 restricted activity days
- Between $670 – $1,900 million USD a year related to health expenditures and lost productivity
In 1997, the Metropolitan Area of Santiago de Chile was declared a non-attainment Area for PM$_{10}$, CO, O$_3$ (Standard annual averages exceeded).

Authorities developed a Decontamination Plan with the aim of complying with air qualities standards.
Decontamination Plan for the Metropolitan Area of Santiago de Chile (1997)

Public policies was focused on $\text{PM}_{2.5}$

Contribution to $\text{PM}_{2.5}$ (2015)
Decontamination Plan for the Metropolitan Area of Santiago de Chile (1997)

Which public policies were implemented on urban transport?

- Fuel Quality improvements
- Improvement in emissions standards for LDV/MDV/HDV
- Emission standards for Public Transport
- Urban bus fleet renewal

Results?
Reduction in PM$_{2.5}$ concentrations between 1989 - 2016

- $\approx$ the PM$_{2.5}$ reduction has stabilized since 2010
Evolution of standards compliance: standard exceeded (%)
Main Policies carried out 1997-2016
Continuous improvement in emissions standards alongside fuel quality over last two decades

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<tbody>
<tr>
<td></td>
<td>Diesel</td>
<td>EPA 91</td>
<td>EPA 94/ EURO 3</td>
<td>TIER1/ EURO 4</td>
<td>TIER2B5/ EURO 5</td>
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<td></td>
<td>Gasoline</td>
<td></td>
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<td>TIER2B8/ EURO 4</td>
<td>TIER2 B8/ EURO 5</td>
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Sulfur in Diesel (ppm)

Fuel Quality has improved significantly over the last two decades
Santiago adopted Euro V standards for Public Transport in 2012

Tender 2018: Euro VI and BEB
Additionally Chile advanced in vehicular fuel economy

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<tbody>
<tr>
<td>Fuel economy</td>
<td>Baseline FE</td>
<td>Labelling proposal</td>
<td>Feebate proposal</td>
<td>FE mandatory Labelling</td>
<td>“Green” Tax CO$_2$ and NO$_x$</td>
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Focus on local pollutants

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<th>Year</th>
<th>2015</th>
<th>2016</th>
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<td>0.0244 g/km de NO$_x$</td>
<td>0.0172 g/km de NO$_x$</td>
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CMM Research and Development
Advantage in Latin America region: Capacity built in Homologation and Certification process

Center of Control and Certification Vehicular
New Decontamination Plan for Santiago de Chile: 2017
Santiago was declared Nonattainment Ar for PM2.5 (daily) in 2014.

The daily standard for PM$_{2.5}$ (50ug/m$^3$) was exceeded in the 98th percentile for years 2011, 2012 and 2013.

**Main policies:**

**Trucks**
- Low emission zone 2018

**Urban Bus**
- Standard Euro VI 2018/2019

**LDV**
- Standard Euro 6 by 2020
- **Permanent Restriction for catalitic vehicles (between May-August)**
- Incentives for electric and hybrid vehicles (in design*)
Decontamination Plan 2017: Driving restriction on catalytic LDV/MDV vehicles built before 2012

LDV/MDV:
Permanent Restriction for catalytic vehicles (between May-August) inside a Low Emission Zone

Which vehicles?

Restriction by plate number for vehicles registered before 2012.

Why before 2012?
The vehicles registered after 2012 comply with Euro 5 (diesel) and Euro 4 (Gasoline) standards
Chile is the first country in South America to adopt Euro VI standards for Public Transport (2018)

Emission standard base is Euro VI

Opportunity to incorporate better technologies
What are we doing in real urban emission measurements?
Capacity building on Portable Emission Measurement Systems

Theoretical workshop in PEMS, February 2018.
Participation of Environment Ministry, Transport Ministry (3CV Lab)
Support of international experts and automotive test systems makers

We hope to carry out a practical workshop on this year.
196,000 vehicles tested
19 measure points in Santiago

Focus on Emission Factor correction for Emission Inventories
And support in the design of Permanent Restriction for catalytic vehicles
Conclusions and opportunities

Chile has improved its fuel and emissions standards the last 20 years.

Without emission standard
Diesel 5000 ppm S

Euro VI/6
Diesel 15 ppm S

Opportunity for adopting TRUE initiative through a development of “smart” vehicle restriction, not by emission standard but by maker/model/

Restriction by plate number

Restriction by real emission (Ranking?)
Thanks!!
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3000 dirty buses out of the fleet

Catalytic cars/1st Tender of public transport

5000 to 3000 ppm S in diesel

3000 to 1500 ppm S (diesel)/ 2nd tender of public transport

1500 to 1000 ppm S in diesel

Pb free gasolina

1000 to 300 ppm S (diesel)

Diesel 50 ppm S

Public Transport reform (Euro III)

Euro 3/EPA Tier1 (LDV/MDV)

50 ppm S

Diesel 15 ppm/

Buses Euro III+DPF

Gasolina 15 ppm/Buses Euro V

Epa 91 (LDV/MDV)

Euro 4/EPA T2B8 (gasoline LDV/MDV)

Euro 5/EPA T2BS (diesel LDV/MDV)

Pb free gasolina 1000 to 300 ppm S (diesel)

Euro 4 (diesel LDV/MDV)

Euro 5/EPA T2BS (gasoline LDV/MDV)

Standard PM$_{2.5}$
Decontamination Plan 2017: Expected emission reduction from the transport sector

Major reductions by:
- urban bus standard
- Permanent restriction