DEVELOPING REAL DRIVING EMISSIONS FOR BRAZILIAN REALITY

FORCETTO, A. L. S.,
USP – University of São Paulo/Brazil

Introduction

* Europe: high NOx, O_3 and particulate levels
* Laboratory tests: far from reality
  * Actual emissions: NOx: 7-40x higher / CO_2: +50%
  * Regulations gaps / Cycle beating / Defeat devices

    (*Br. News*: motorcycles w/DD for noise!)
* Real Driving Emissions + PEMS
  * Growing in the world. E.g.: China, India, …
  * Brazil: forecast: next regulation pack (202x)
  * However: differences between EU and Brazil

Typical EU profile

* Almost plain topography
* Median altitude < 350 m
* Temperature average: about 8-16°C
* 50% Passengers cars: Diesel
  * Gasoline (Petrol): add ≤ 5% Ethanol
* Main pollutants: NOx and PN
  - ➔ RDE circuit: 34% urban / 33% rural / 33% highway
  - ➔ RDE Boundaries: < 30°C / < 700 m / Δ alt < 100m

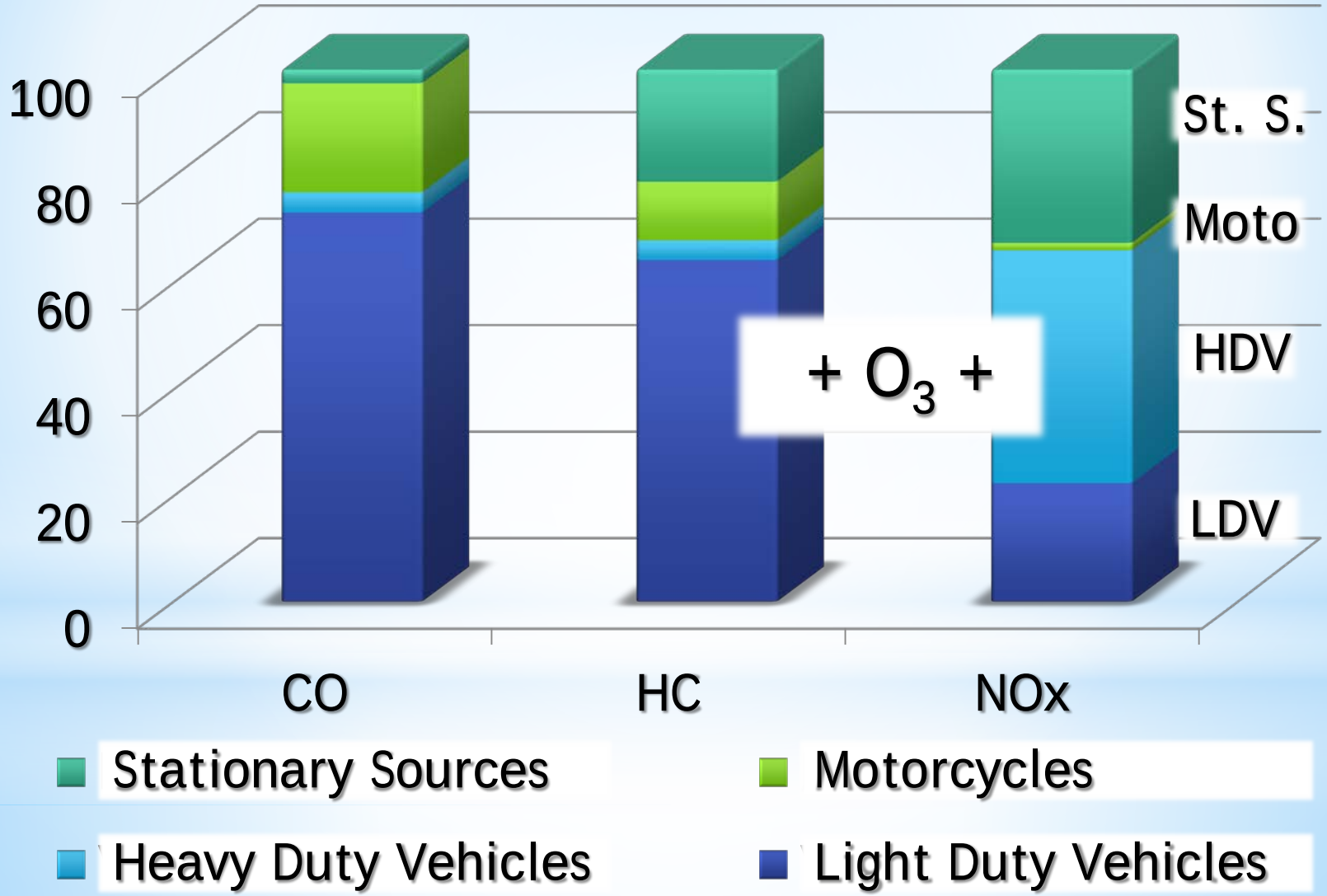
Typical Brazilian profile I

* Large metropolitan areas close to 1,000 m
* Hills and valleys (high Δ altitute)
* Traffic jams, low avg speeds, short travels
* Temperature avg: - South: 18°C
  - North: 26°C
* ...

Typical Brazilian profile II

* …
* Diesel: not allowed for cars
  * Instead: Gasoline w/25% ethanol / 100% ethanol
* Flexfuel cars & motorcycles (>15% of the fleet)
* Main pollutants: O_3 and $PM_{2.5}$
  * Precursors: CO/**VOC** (from *LDV*)
    NOx (from *HDV*)

Sao Paulo: main pollutant sources



6 Points to rethought (I)

1) **Boundary Conditions**:
   - Higher altitude;
   - Δ altitude and
   - Temperature
2) **Test circuit**:
   - Shorter
   - Only urban and rural needed
3) …

6 Points to rethought (II)

3) **Average speed**: Must be lower

4) **Pollutants**: trends:

* PN: just in laboratory tests for type-approval
* Hydrocarbons, CO_2, CO, NOx control: important

5) **Flexfuel vehicles:**

* Gasoline w/ethanol X Ethanol requirements

  ➔ Unburned fuel, aldehydes, etc.

6)...

6 Points to rethought (III)

6) **Motorcycles**:

* Also flexfuel
* Main group: 125-250 cm^3
* Requires small / lightweight PEMS
* Control of hydrocarbons, CO_2, CO and NOx
  * HC control: FID + H_2 bottle??
* …

Conclusions

* RDE+PEMS in Brazil: a long path to walk...
* Fleet, topography, fuel particularities
* Important: NOx + HC: O_3 in metropolitan areas
* RDE Br procedures: need for adjusts
* Surely it will bring environmental improvement
* *That's is not all, it is just the beginning!*

Thanks for your attention

André Forcetto – aforcetto@sp.gov.br

Universidade de São Paulo

CETESB