

# C40CITIES

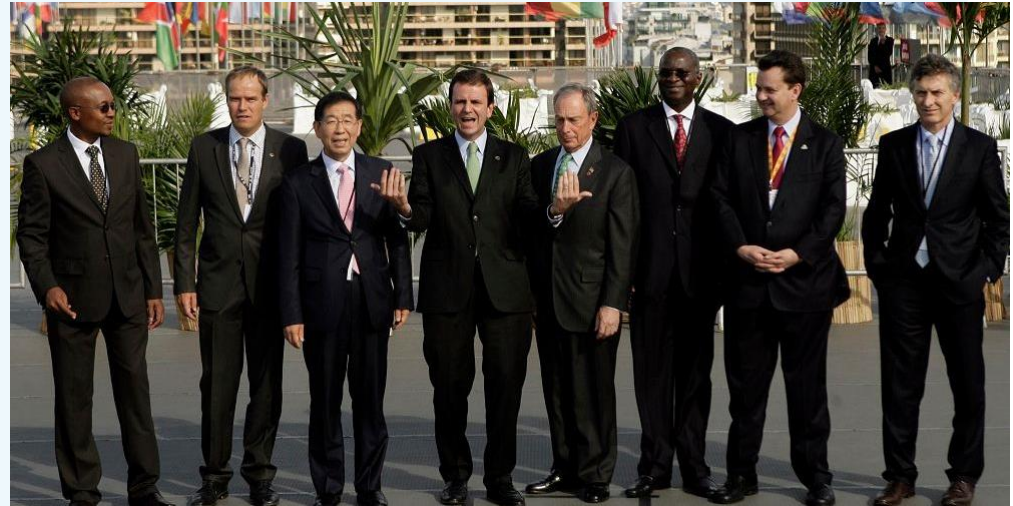
CLIMATE LEADERSHIP GROUP



# A Rede de Cidades C40

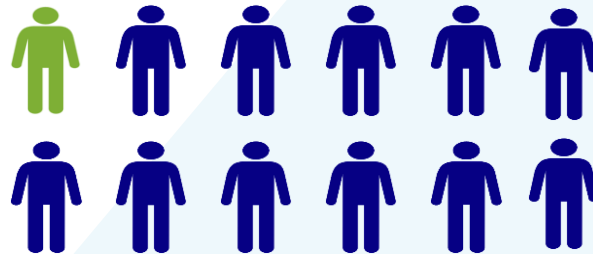


# C40 Cities Climate Leadership Group

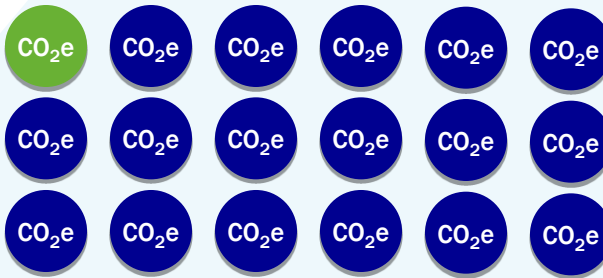


# A importancia de la C40

8%  
da população



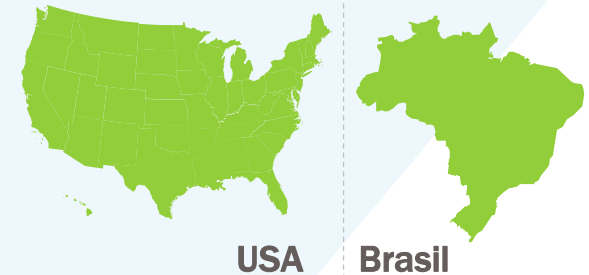
5%  
da emissão  
global GEE



21%  
do PIB global



## Equivalente



USA

Brasil

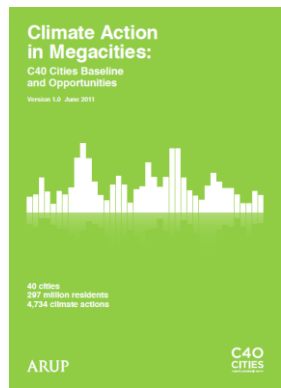


Japón



China

# Estudios Pioneros y Monitoreo De las acciones de las ciudades



## Climate Action in Megacities (2011)

- **Benchmarking das acciones de las ciudades da C40.**
- **Inventario dos poderes e capacidades disponibles en las ciudades.**
- **Evaluación de las oportunidades en las ciudades**

### Algunas informaciones.

- **75% dos Alcades de la C40 tem controle directo sobre o viario urbano, que representa cerca de 35% das emissores.**
- **Mas de 80% das ações das cidades foram feitas depois da criação da C40**



## CDP Cities (2011)

- **42 ciudades da C40 divulgaran resultados sobre riscos climáticos, emissores de GEE en plataforma consistente e comparable.**

### Algunas informaciones:

- **57% das ciudades ten metas mensuraréis de reducción de GEE; e 62% ya aprobaran planos de acciones para de las cuestiones climáticas.**
- **Mas de 90% das ciudades da C40 identificaran-se en riscos con relación a calentamiento global.**

# As ciudades controlan y deciden sobre



City streets & parking **87%**



Outdoor lighting **80%**



Transit **63%**



Residential waste **66%**



Landfills **60%**



Building Regulation **57%**




Water supply **60%**



City planning **50%**

# As ciudades lideran acciones 2011 2013

Climate Action  
in Megacities:  
C40 Cities Baseline  
and Opportunities  
Version 1.0 June 2011



**8068**  
climate actions



City streets &  
parking

**194**

**873**



Outdoor lighting

**121**

**114**



Transit

**417**

**661**



Residential  
waste

**188**

**1039**



Landfills

**1343**

**1668**



Building  
regulation

**192**

**590**



Water supply

**388**

**1038**



City planning

**1024**

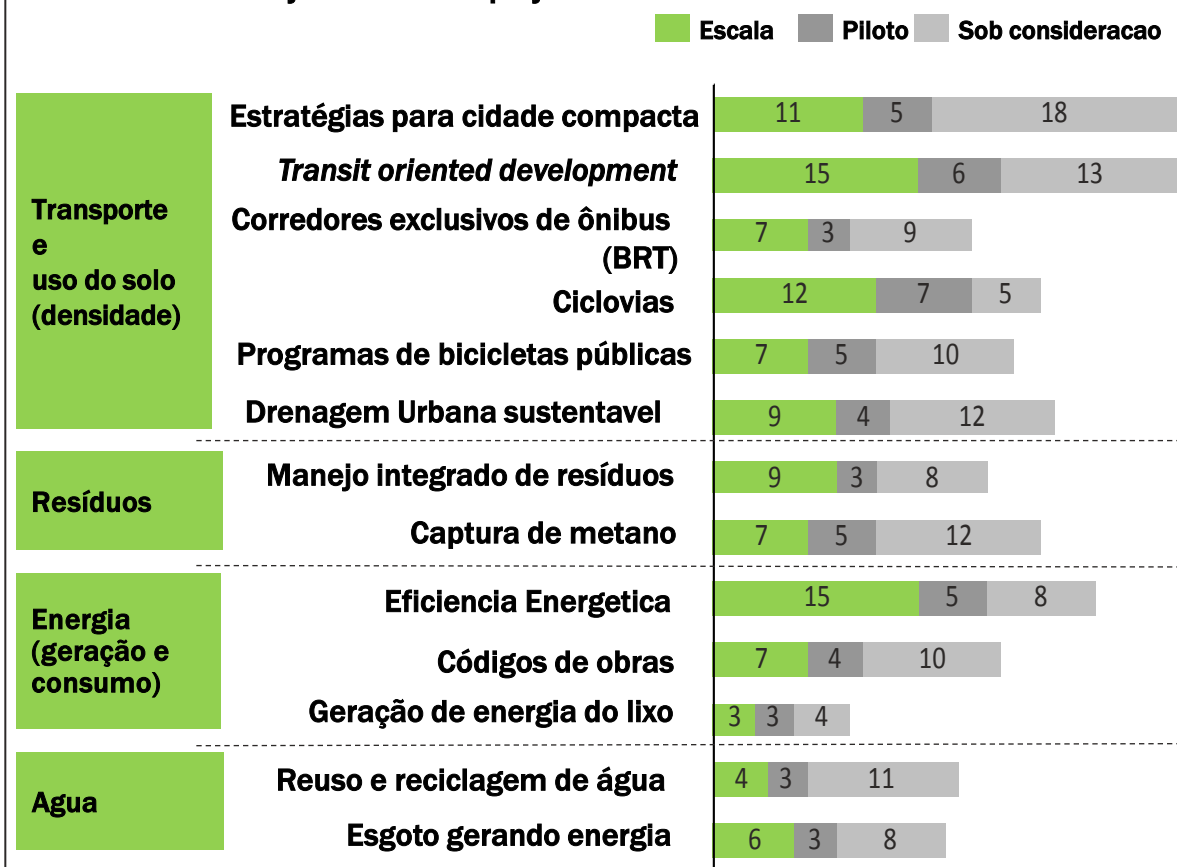
**1024**

# Ciudades ya están haciendo su parte, pero podemos mucho mas



- **4,734 acciones** estaban siendo hechas en las ciudades da C40 (2011)
- **Otras 1,465** iniciadas en 2012
- **75%** das acciones están siendo propuestas después de la creación de la C40

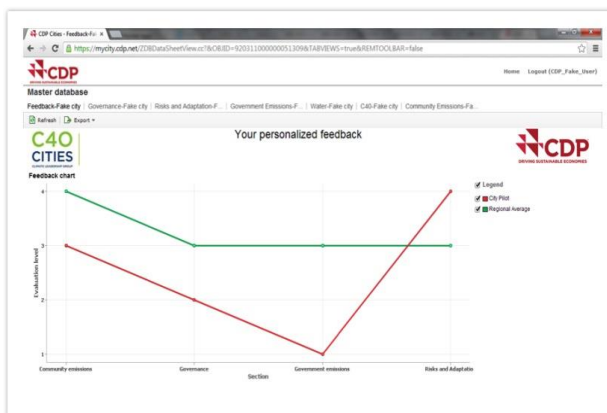
Numero de cidades já executando projetos



Globalmente, mais de 75% das emissões vem das edificações, geração de energia, transporte, resíduos e Industrias.  
Fonte: WRI, UNEP GEO.



# C40 CDP Report 2013



# Cities

296,471,000  
total population

Fig. 2 Population breakdown of responding cities

27  
cities

33  
cities

50  
cities

less than  
600k

600k-1.6m

greater than  
1.6m

Fig. 1 Map of responding cities

110 responding cities:



Cities reporting per year



# 2013 Climate Action in Megacities CAM 2.0.

**SOUTH** → **NORTH**

Following the lead of cities like Curitiba and Bogota, 35 cities (66%) now have BRT systems and 57% of these are now in the more developed northern hemisphere

**150% increase in Actions**

**In 2011: 6 cities reported cycle share schemes. In 2013: 36 cities have now followed the example of Paris and others. In 2013, 80% C40 cities have now introduced cycle lanes**

**In 2011 20 cities (50%) were introducing LED streetlighting. In 2013, more than 90% of responding cities report taking action to reduce emissions from outdoor lighting**

# Ciudades están liderando la **AGENDA**

HUFF POST **GREEN**

The New York Times

The Economist

Bloomberg: Mayors hold key to climate change progress

the guardian

Cities and climate change

Greening the concrete jungle

America's cities are confronting climate change. They are also saving money

Tackling Climate Change: New Reports Underscore Role Of Local Leaders

An Unlikely Power Duo Emerges in the Global Fight Against Climate Change

World Bank to Help Cities Control Climate Change

By ALEXEI BARRIONUEVO  
Published: June 1, 2011

Megacity mayors leading the fight for sustainable survival at the C40 summit

By Brad Johnson

grist  
A BEACON IN THE SMOG

REUTERS

TIME

BBC  
WORLD NEWS

veja



Cities From London to Portland Slash Emissions as UN Climate Envoys Bicker

indiatimes

TORONTO SUN  
torontosun.com

Mayor Paes hands letter to Joan Cloas UN-Habitat

The Jakarta Post

CHINADAILY

Mayors reach climate deal with World Bank

(AFP) – Jun 1, 2011

CNN

# Movilidad Urbana: Las ciudades están haciendo

Buses son 2/3 de las acciones reportadas por las ciudades  
**BRT y BRS (carriles exclusivos)**



Bogotá



São Paulo

# Rio de Janeiro



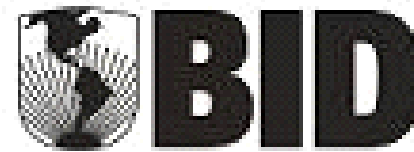
# Copenhague



# Bogotá

# Oslo

# PROGRAMA DE TESTES COM ONIBUS ELÉTRICOS E HÍBRIDOS NA AMÉRICA LATINA



**Bogotá, Rio de Janeiro, Santiago e São Paulo**



## **PROGRAMA DE TESTES:**

- **Emisión de poluentes locales (HC, CO, NOx, PM);**
- **Teste piloto con diesel de cana.**
- **Eficiencia Energética das diferentes tecnologías (motores combustión y eléctricos – batería e trolebús).**
- **Medición de ruidos e polución interna ómnibus.**
- **Viabilidades económica de las tecnologías e ciclo de vida total en cada ciudades.**

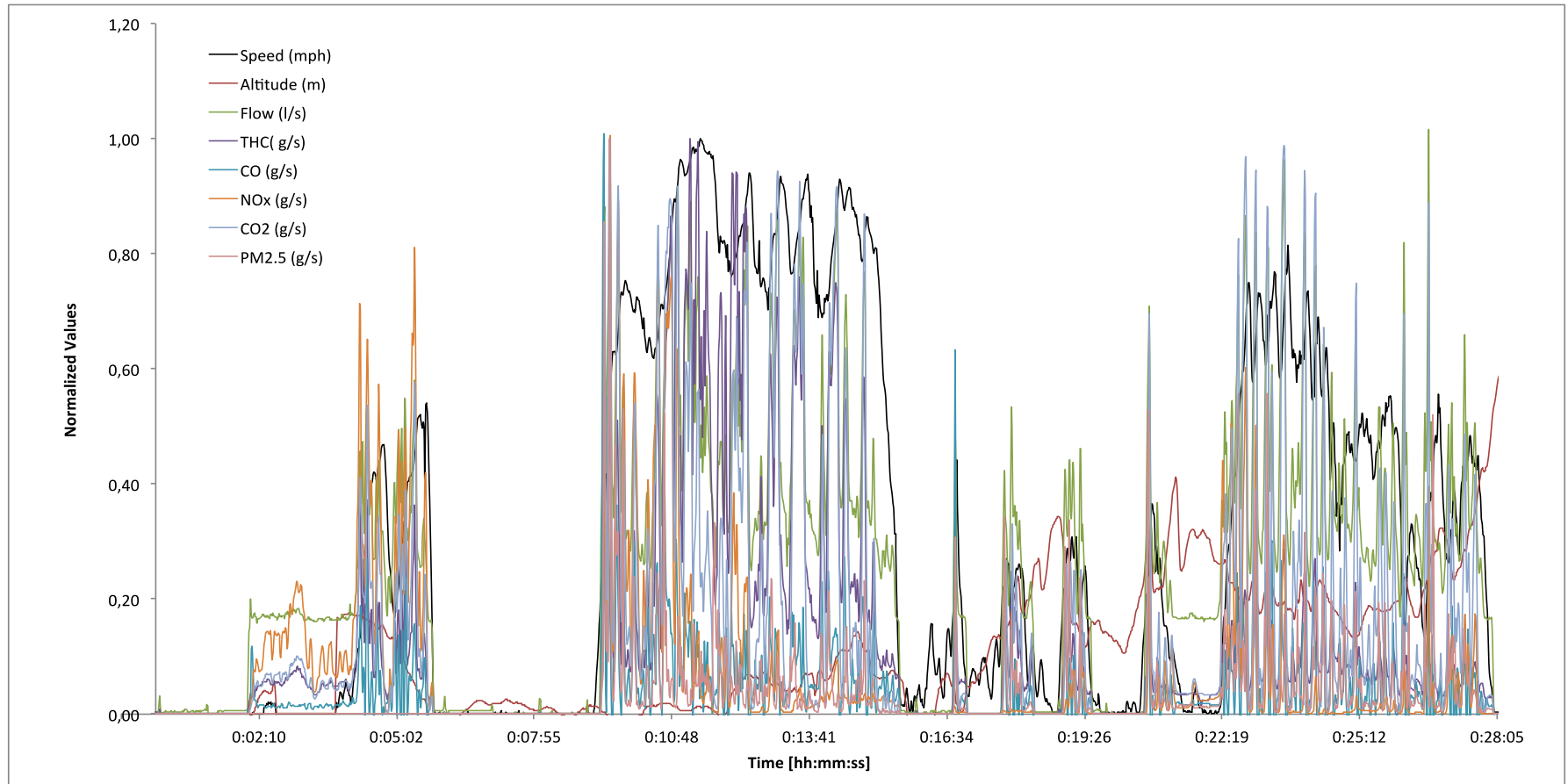


# Tecnologías testadas? Total de 16 buses (diesel, híbridos, trolebús e eléctrico con baterías)



# Como são feitos os testes?

Exemplo de medição das emissões segundo a segundo em ônibus rodando por linha comercial com carga máxima.



# Buses testados



Trolebuses y híbridos serie (Eletra)



Híbrido paralelo Volvo

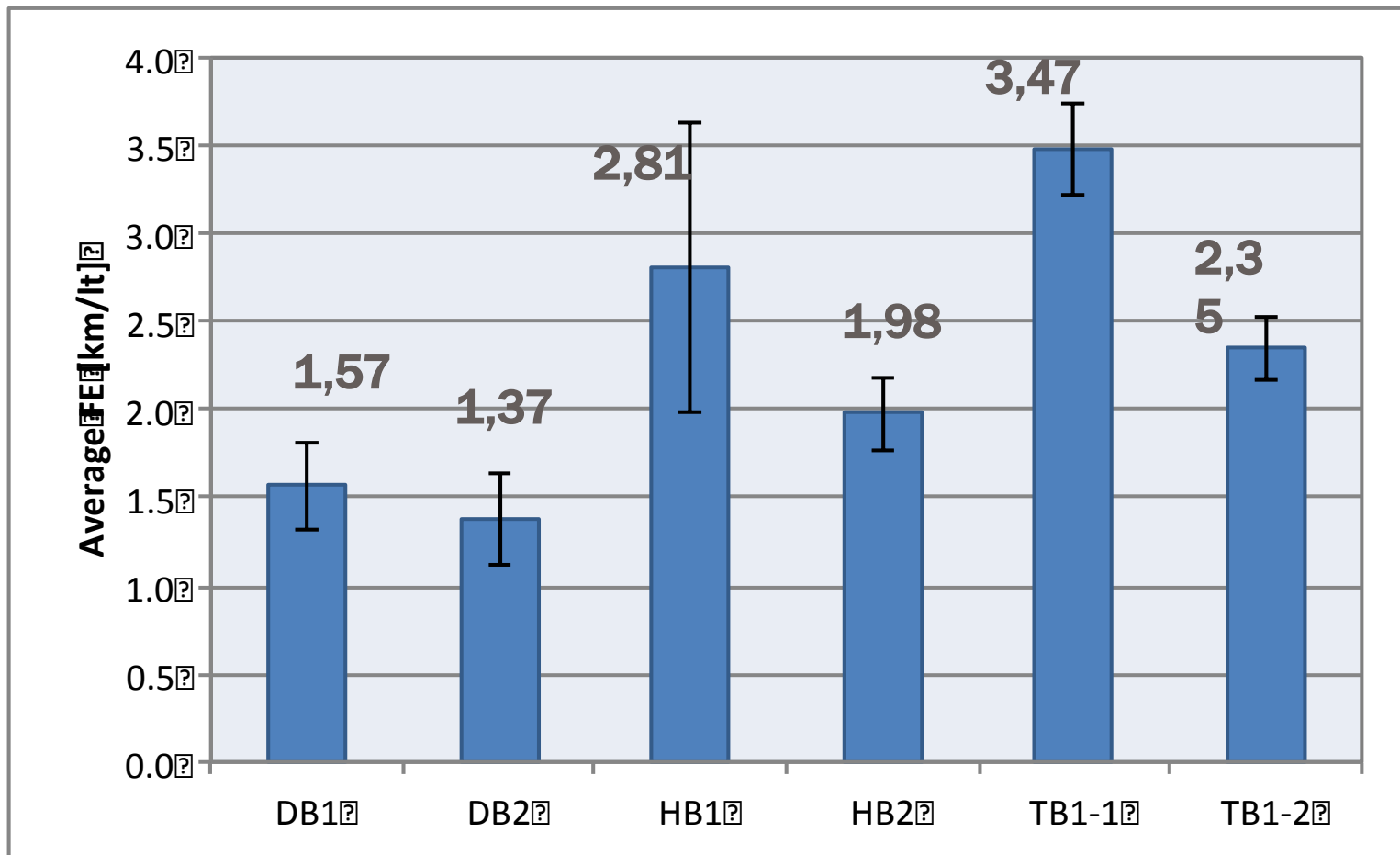


Diesel (Mercedez)

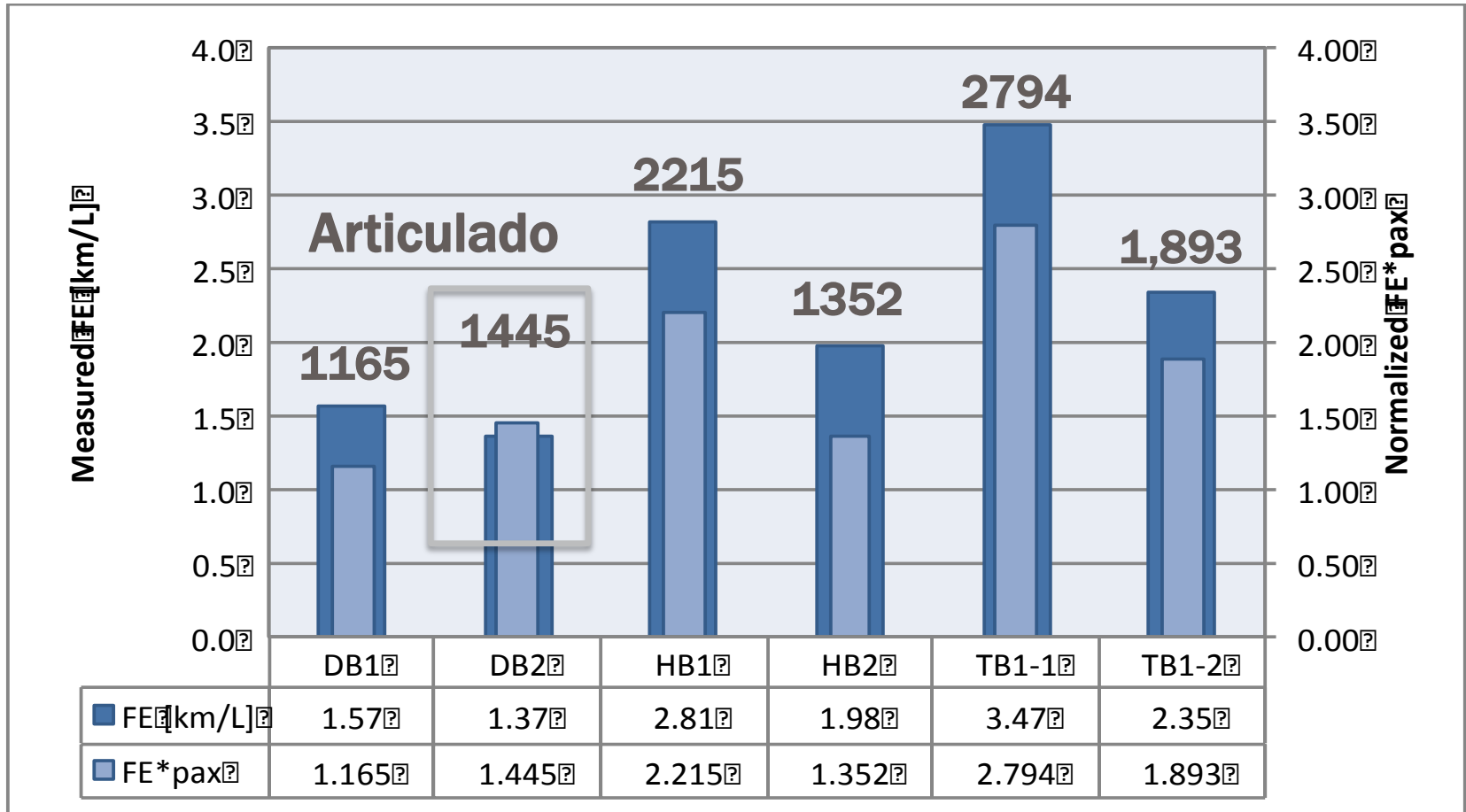


# Eficiência energética em São Paulo

1° e 2° Campanha com híbridos serie e trólebus.

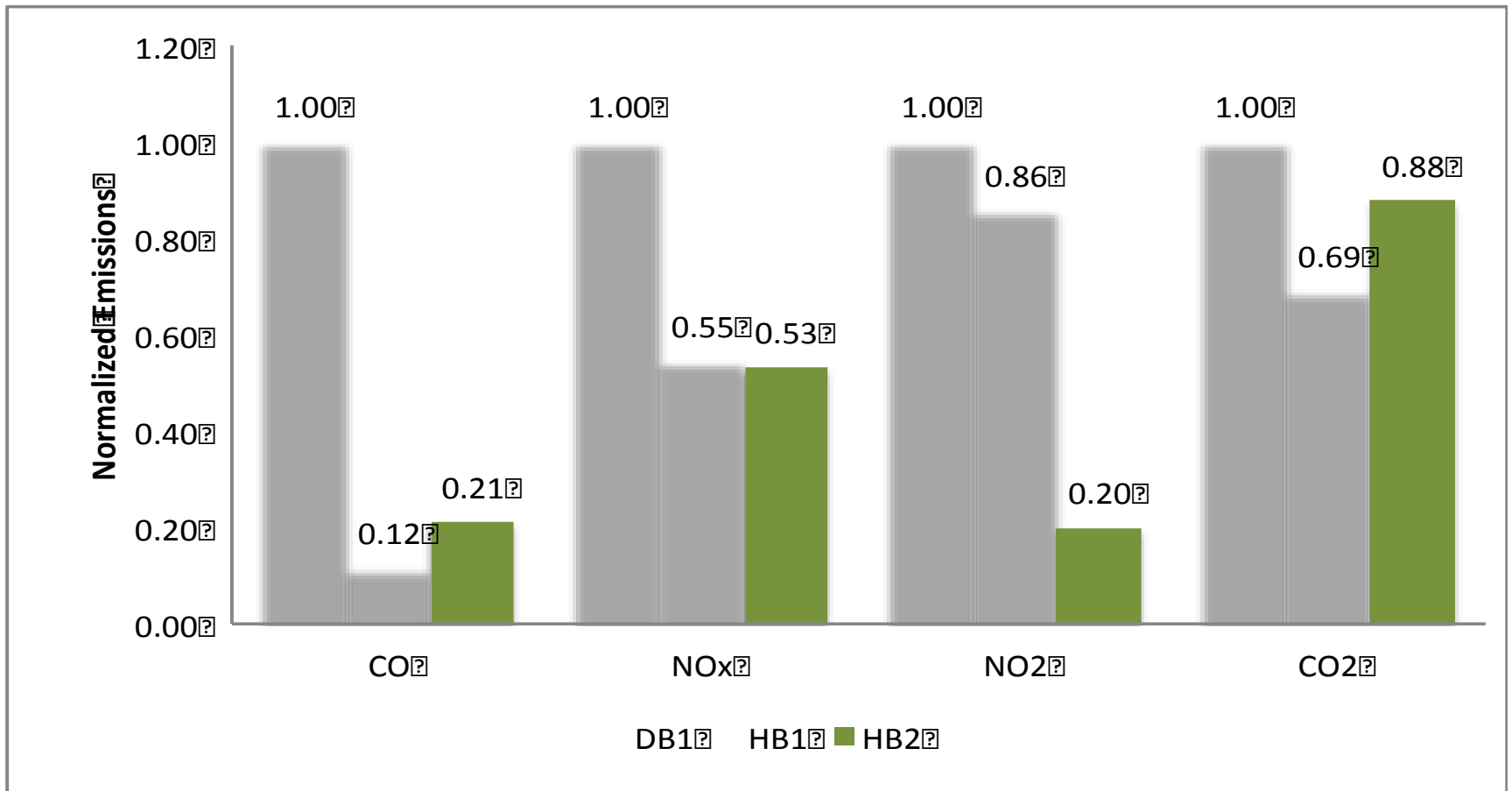


# São Paulo: Eficiência energética mensurada por la capacidad de pasajeros máxima.

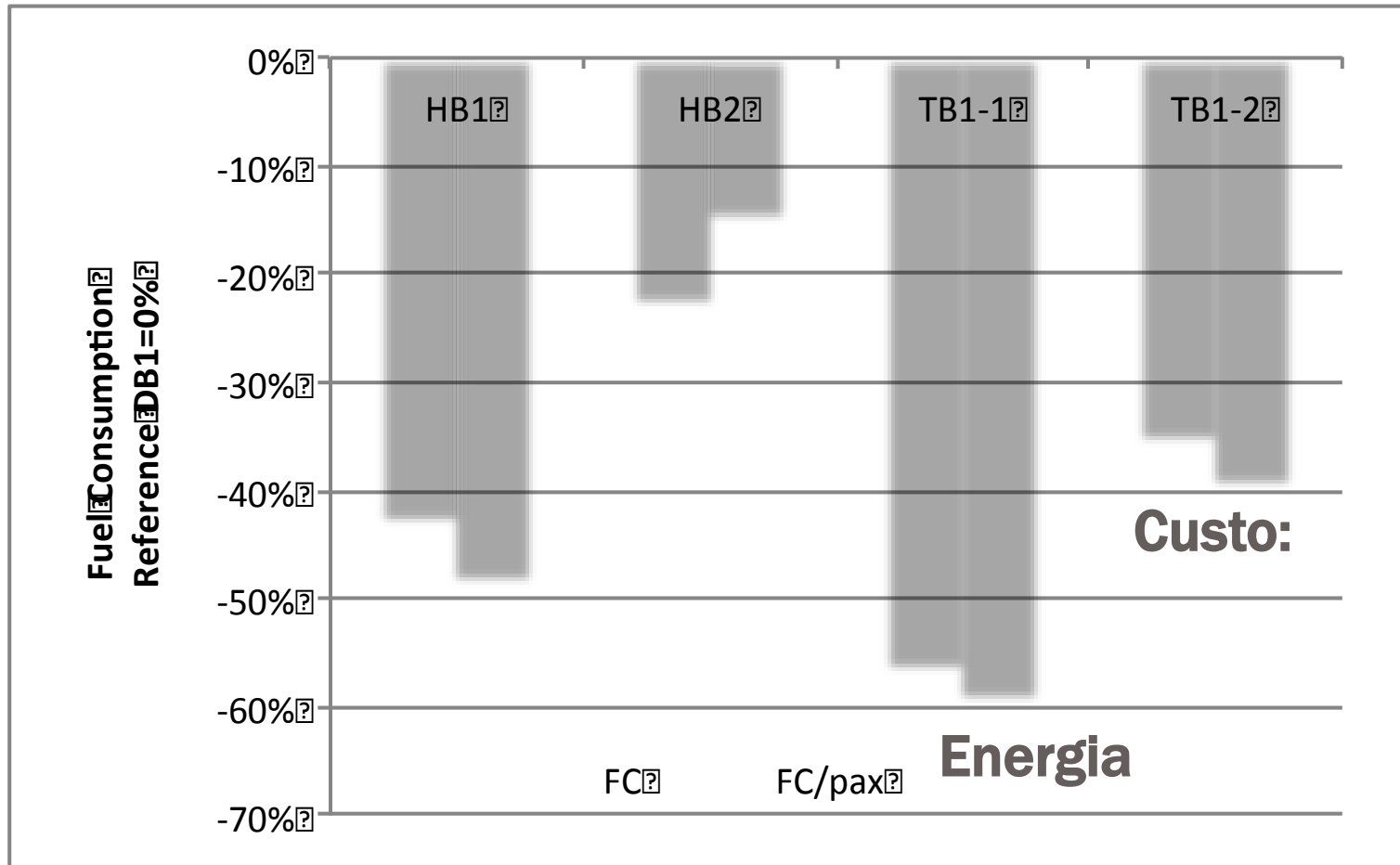


# Sao Paulo com emissões padronizadas.

## Comparação Híbridos x Diesel



# Consumo de combustível padronizado dos Híbridos e Trólebus em relação ao ônibus diesel base



# Bogotá: Tecnologías testadas?



**Diesel Transmilenio**



**Volvo**



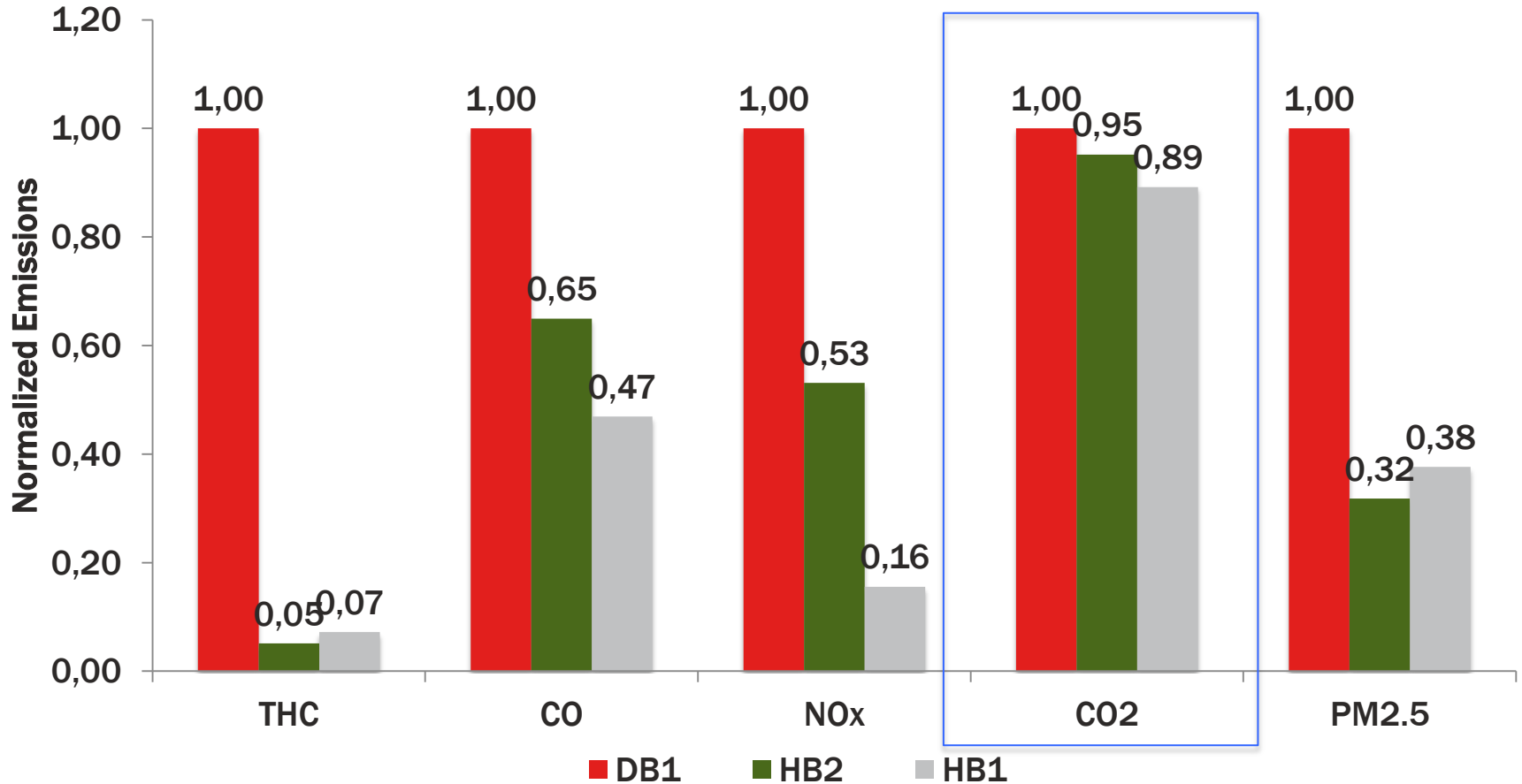
**Bus Eléctrico  
BYD**



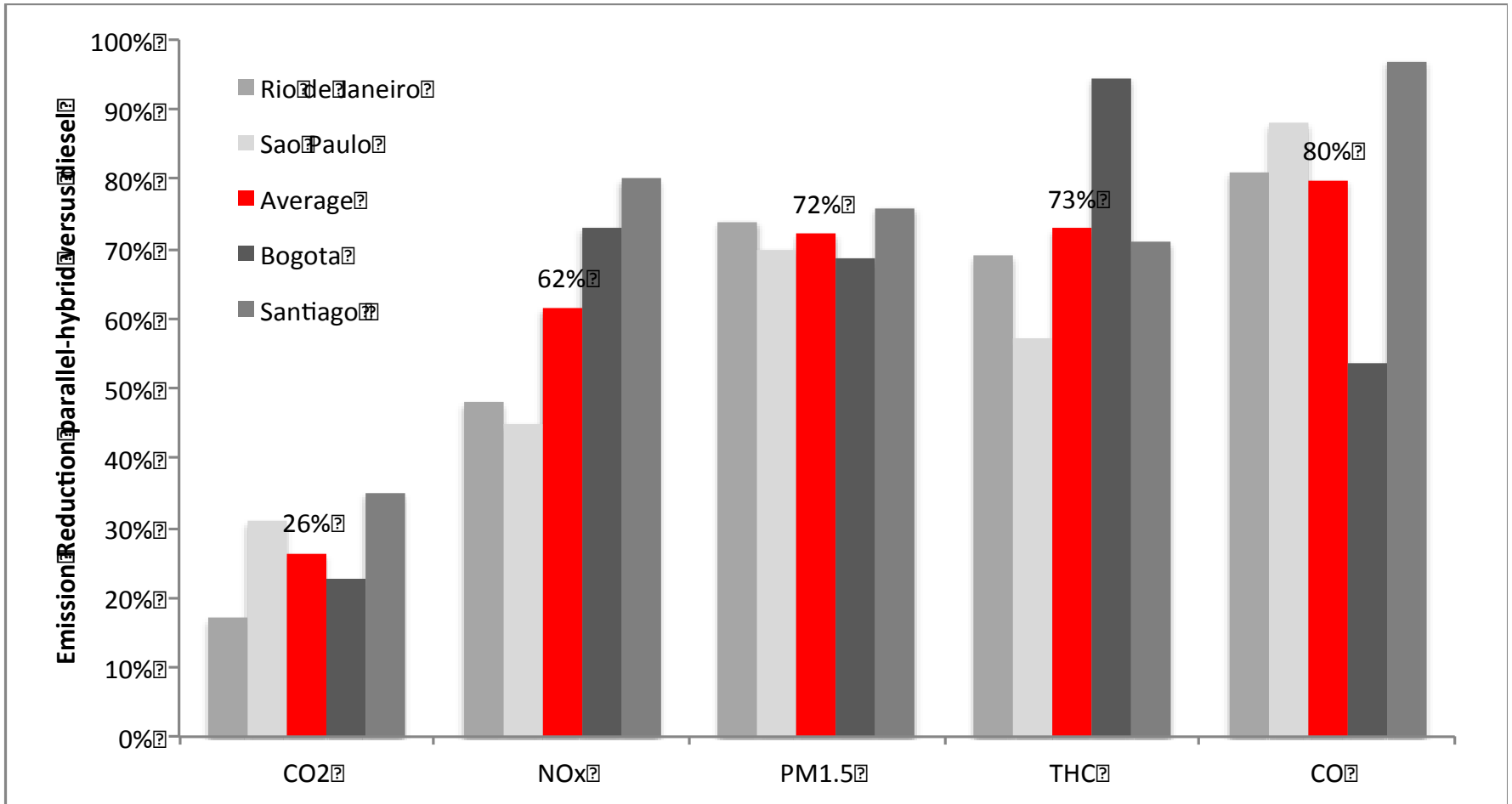
**YoungMan**



# Bogotá: emisiones normalizadas

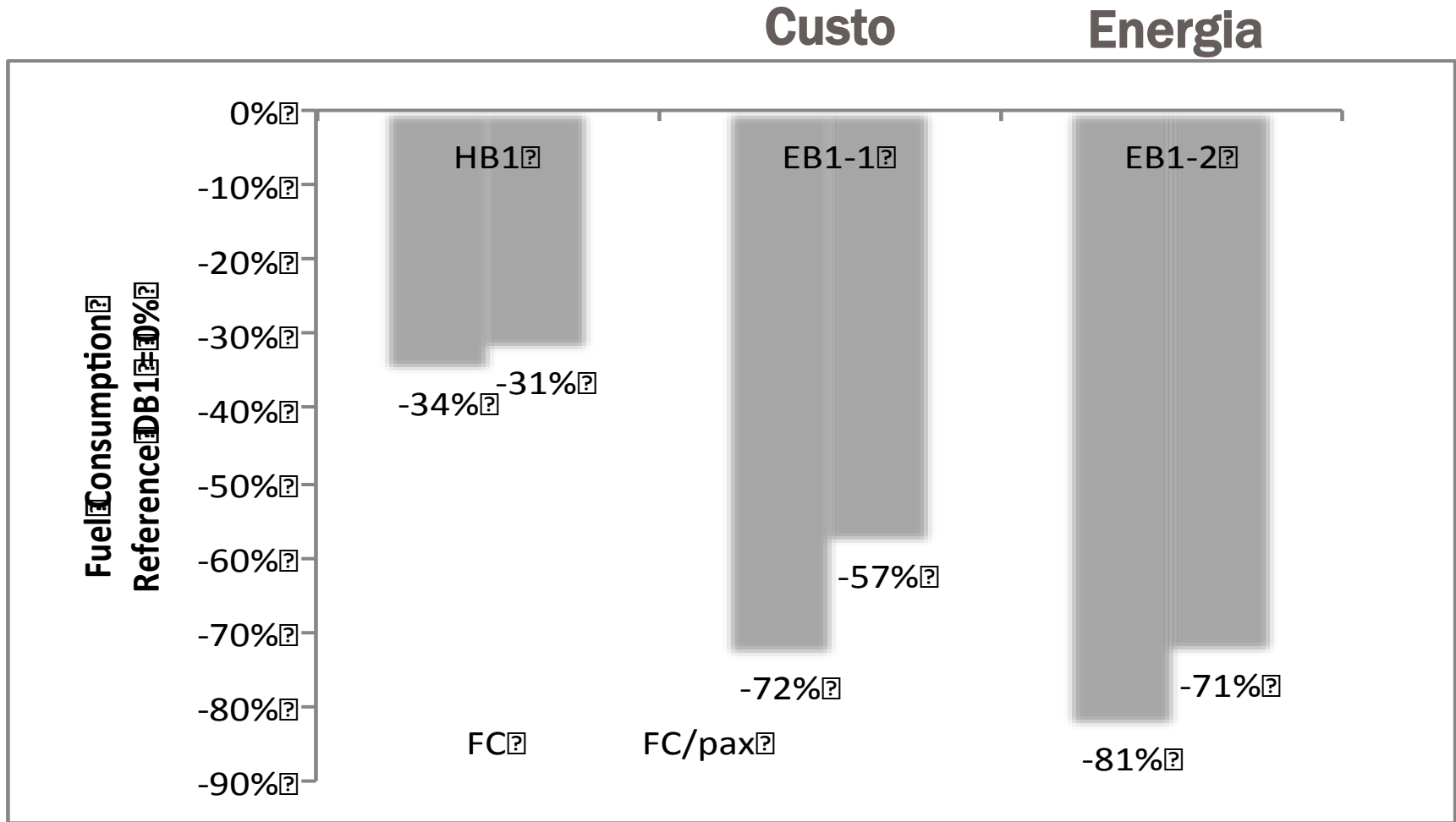


# Reducción de las emisiones de los contaminantes Rio de Janeiro, Sao Paulo, Bogotá e Santiago.



# Bogotá: Consumo

## Elétrico (Iron-Phosphate Battery)



# Bogotá: Eficiência & Consumo

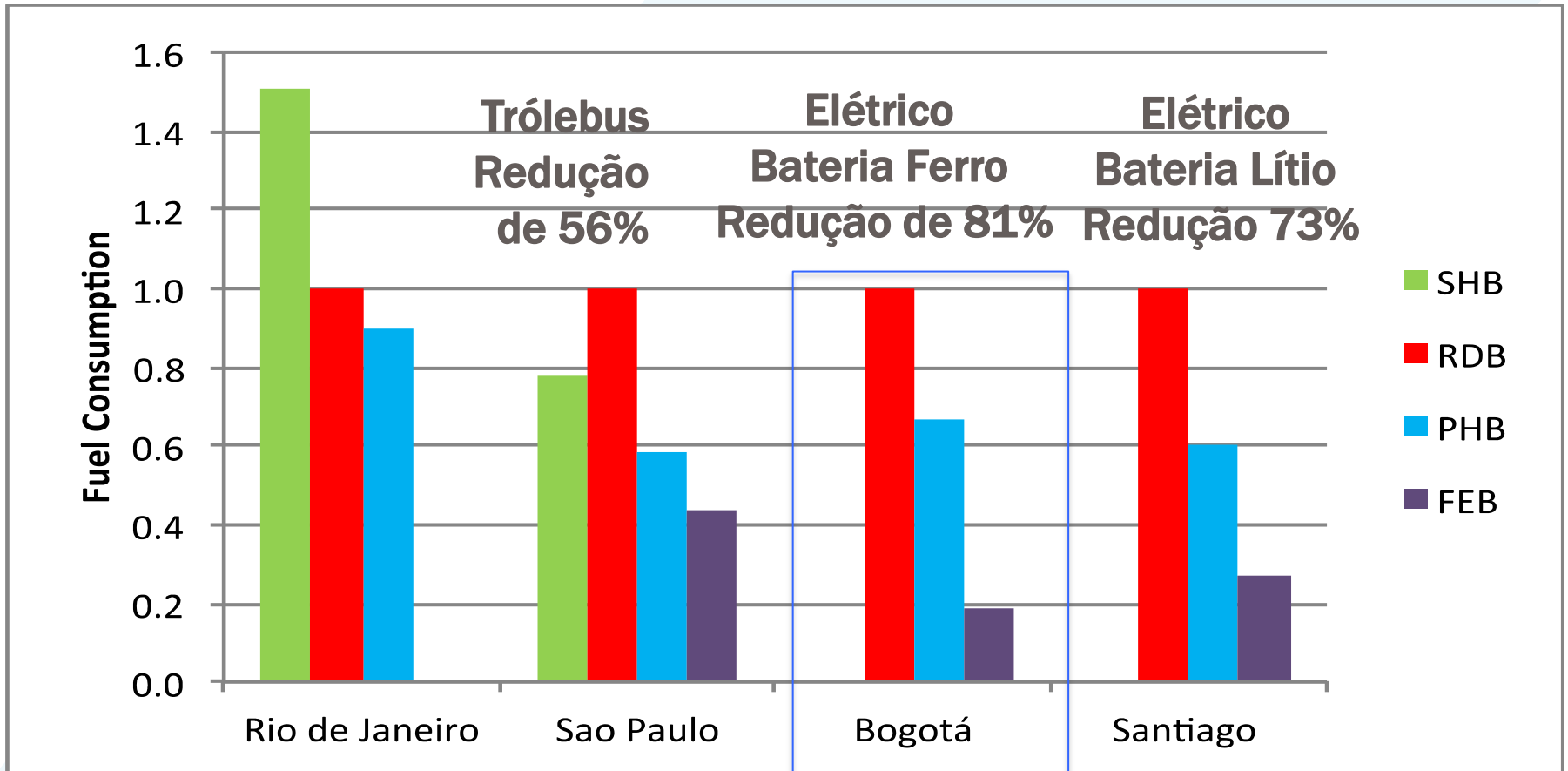
Ônibus	Eficiência (km/gl)	Eficiência %	Consumo. (gl/ 100km)	Consumo. %
Diesel	7,80	0%	13,3	0%
Híbrido	11,58	49% /die.	8,9	-34% vs eléc.
Elétrico	27,63	254% / die.	3,8	-72% vs Diesel
		139% / hb 1		- 57% vs hb 1

# Bogotá: Economizado

Ônibus	US\$ pax / 100 km	US\$ consum. / 100 km	Economizado em 100 km, %
Diesel	\$ 0,8	59	0
Híbrido 1	\$ 0,5	39	-34%
Elétrico a bateria	\$ 0,3	17	-72% / Die.
			-57% / hb.1

Gallon: \$8000

# Conclusão geral sobre consumo energético



# Nov/Dez 2012: Visita técnica

- Ciudad do México;
- Gotemburgo;
- Estocolmo;
- Londres
- Xangai;
- Shenzhen,
- Changsa;
- Hong Kong



# **HYBRID ELECTRIC BUS TEST PROGRAM IN LATIN AMERICA: Economic Analysis of the Program**

*Prepared by:*

**Dalberg**

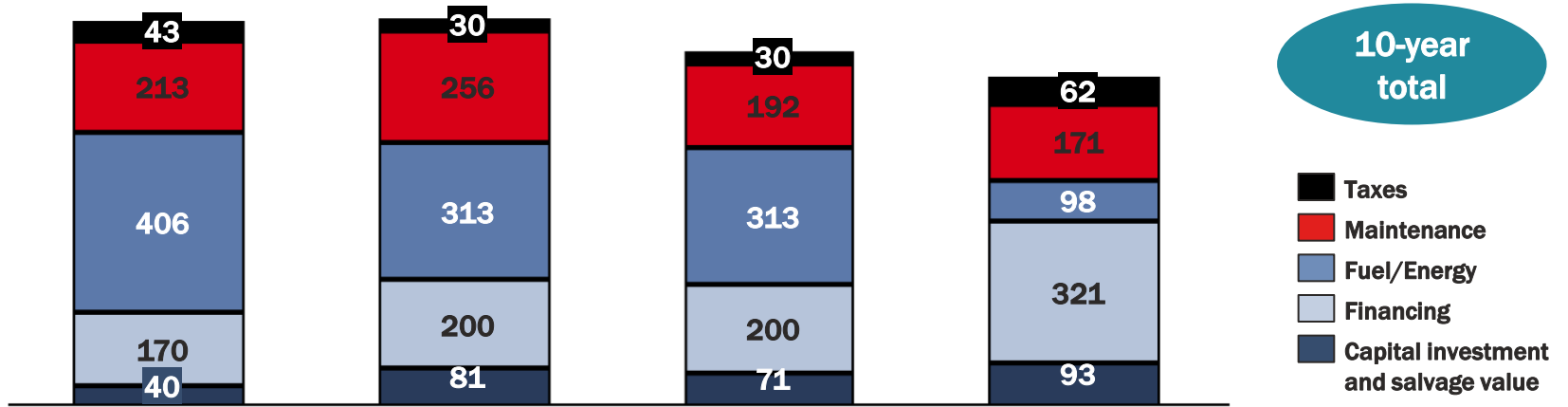
Global Development Advisors



# Lower energy and maintenance costs reduce lifecycle costs for hybrid and electric buses compared to diesel buses

**Bogota**

Lifecycle Costs ('000 USD, 10-Year Net Present Value)



- Taxes
- Maintenance
- Fuel/Energy
- Financing
- Capital Investment and salvage value

Diesel

Hybrid High Case

Hybrid Low Case

Electric

872

880

806

744

**Financing**

10% interest  
10 year term

6% interest  
10 year term

6% interest  
10 year term

6% interest  
10 year term

**Maintenance costs**

(baseline)

+20% higher than diesel

-10% lower than diesel

-20% lower than diesel

**Salvage Value**

Zero

10% of battery value

30% of battery value

30% of battery value

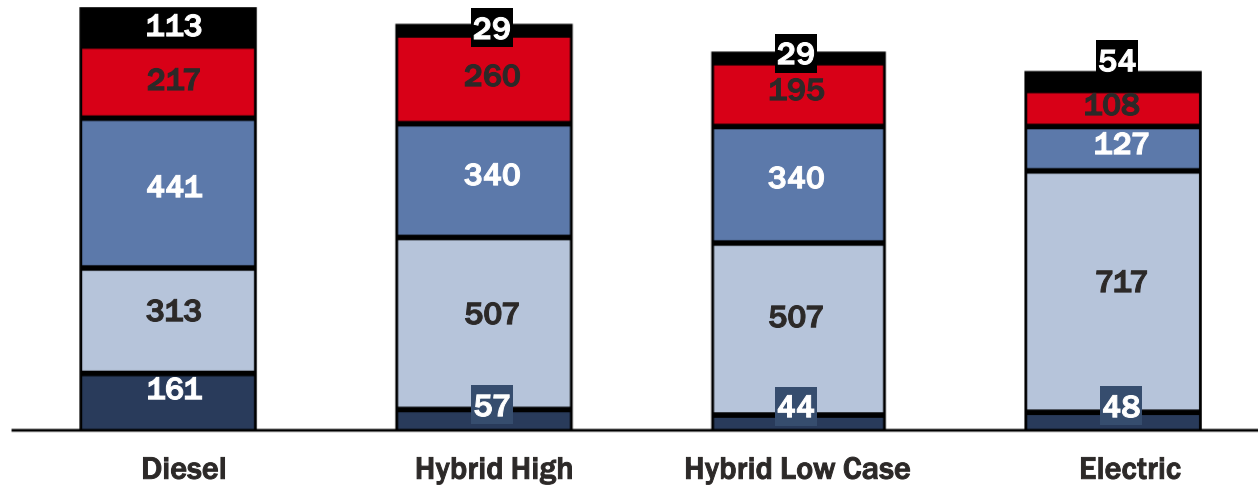
- Hybrid and electric buses have lower lifecycle costs as scale and learning effects drive down maintenance costs
- Preferential financing can speed adoption, scale, and learning

Notes: Bus costs/initial taxes are as follows: Diesel (\$180K/\$29K), Hybrid (\$290K/\$5K), Electric (\$450K/\$23K). Battery total value for hybrids are \$100K. Battery total value for electric is \$203K. Salvage value represents % of total value discounted to zero.

Capital investment includes deduction for salvage value; Taxes include initial taxes and annual taxes related to bus ownership

## Electric buses achieve savings of ~20% compared to diesel assuming partially local production and

Lifecycle Costs ('000 BRL, 10-Year Net Present Value)



10-year total

- Taxes
- Maintenance
- Fuel/Energy
- Financing
- Capital investment and salvage value

	Diesel	Hybrid High Case	Hybrid Low Case	Electric
<b>Financing</b>	10% interest 5 year term	5% interest 10 year term	5% interest 10 year term	5% interest 10 year term
<b>Maintenance costs</b>	(baseline)	+20% higher than diesel	-10% lower than diesel	-50% lower than diesel
<b>Salvage Value</b>	30% of bus value (BRL 123,280)	10% of battery value	30% of battery value	30% of battery value

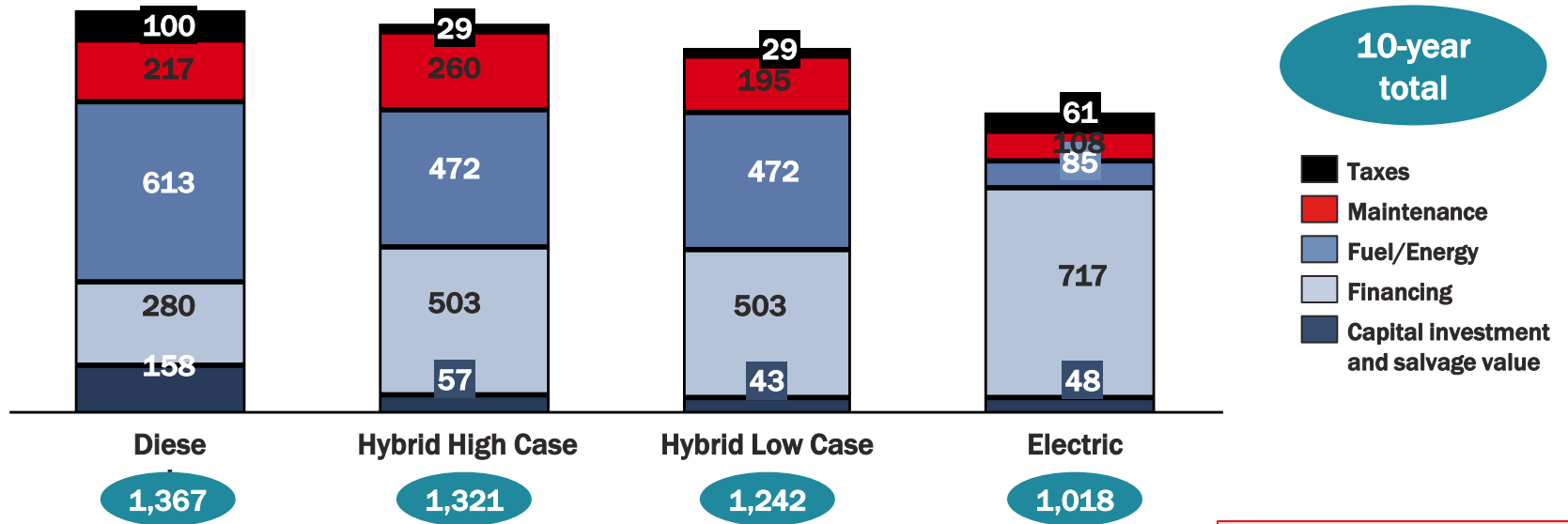
- Electric buses achieve significant savings in lifecycle costs compared to diesel
- Hybrids are less costly than diesel even accounting for higher maintenance costs

Assumes electric buses are partially produced/assembled locally, bypassing most import taxes. 10-year diesel costs includes purchase/resale of new bus after 5 years of operation. Capital investment includes deduction for salvage value; Taxes include annual taxes related to bus ownership. Bus costs/initial taxes are as follows: Diesel (BRL 329K/ BRL 140K), Hybrid (BRL 493K/BRL 151K), Electric (BRL 735K/BRL 175K). Battery total value for hybrids are BRL 163K; For electric value is BRL 340K. Salvage value represents % of total value discounted to year zero.

# Lifecycle costs of hybrid and electric buses are lower than costs for diesel buses due to preferential financing options

São Paulo

Lifecycle Costs ('000 BRL, 10-Year Net Present Value)



- Electric buses achieve ~30% lower lifecycle costs than diesel
- Even with 20% higher maintenance costs, hybrids are more attractive than diesel

<b>Financing</b>	10% interest 5 year term	5% interest 10 year term	5% interest 10 year term	5% interest 10 year term
<b>Maintenance costs</b>	(baseline)	+20% higher than diesel	-10% lower than diesel	-50% lower than diesel
<b>Salvage Value</b>	20% of bus value (BRL 98,600)	10% of battery value	30% of battery value	30% of battery value

Assumes electric buses are partially produced/assembled locally. 10-year diesel costs includes purchase/resale of new bus after 5 years of operation. Capital investment includes deduction for salvage value; Taxes include annual taxes related to bus ownership. Bus costs/initial taxes are as follows: Diesel (BRL 296K/ BRL 123K), Hybrid (BRL 493K/BRL 146K), Electric (BRL 735K/BRL 175K). Battery total value for hybrids are BRL 163K; For electric value is BRL 340K. Salvage value represents % of total value discounted to year zero.

# MUITO OBRIGADO!



@C40cities



C40 Cities

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