



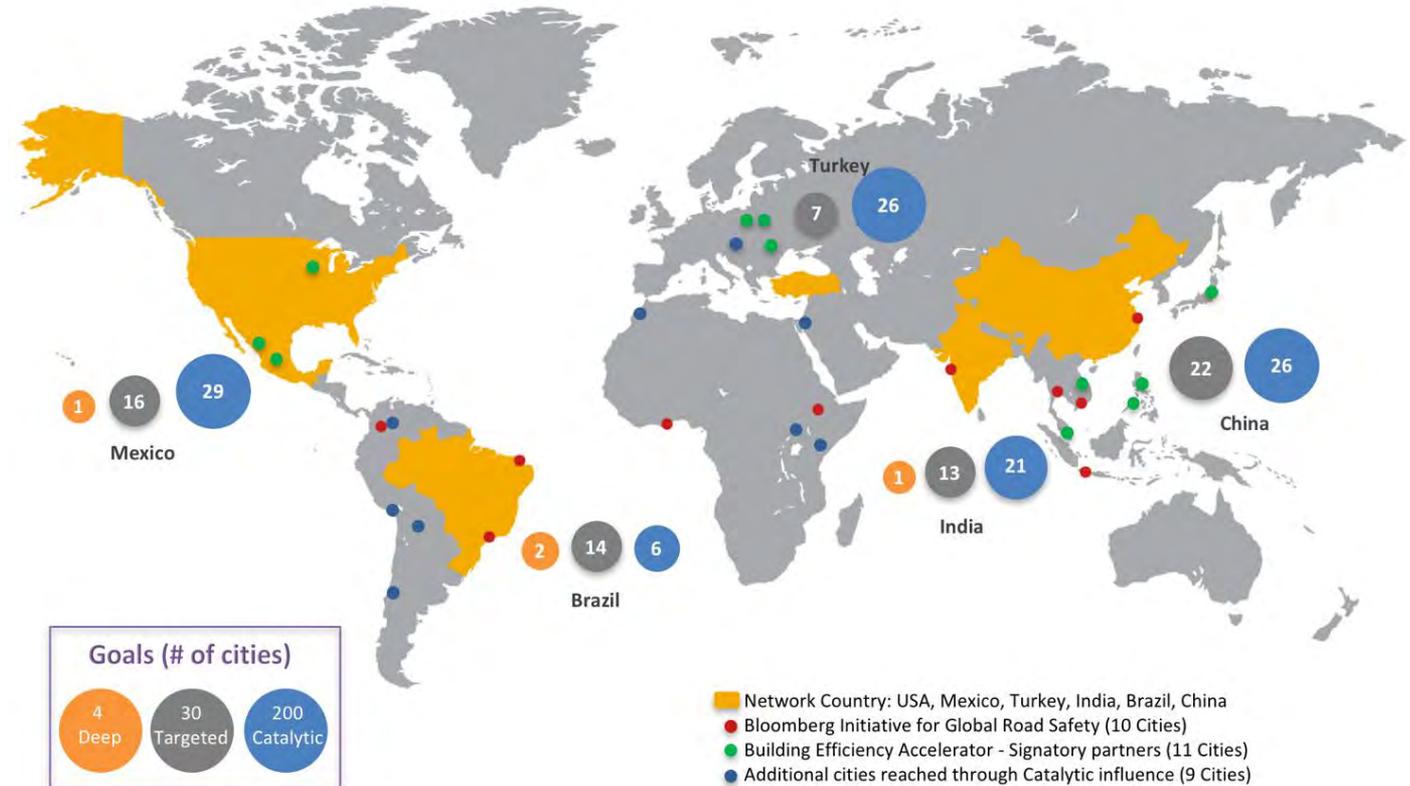
WORLD  
RESOURCES | ROSS  
INSTITUTE | CENTER

A person's hand is holding a smartphone in the foreground, displaying a ride-sharing application interface with various vehicle icons. The background is a blurred city street with cars and pedestrians, suggesting an urban environment.

# INNOVATING FOR EFFICIENT TRANSPORTATION: LESSONS FROM AROUND THE WORLD

Sebastian Castellanos, Vehicle Efficiency Lead, WRI Ross Center for Sustainable Cities

# About the World Resources Institute (WRI)



# Mobility is changing



...drivers will no longer be needed

# Mobility is changing



zipcars  
live here

zipcar.com

...we will no longer own cars

# Mobility is changing

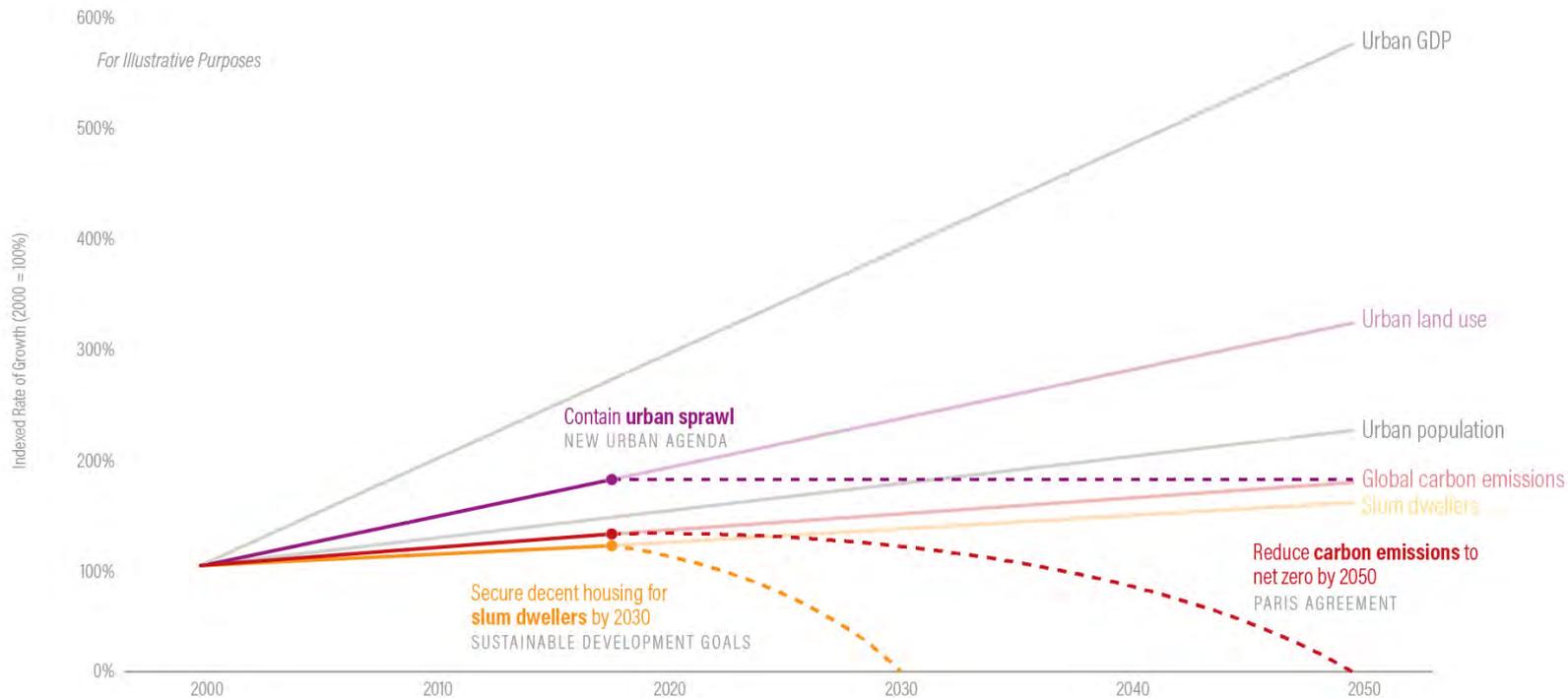


...automobiles will no longer pollute

**Or will they?**

Much depends on how we manage  
and direct these transitions.

# Cities are not on track, and we need to *bend the curve*



Notes: This graph is for illustrative purposes, showing 2050 trajectories for select indicators and what would be needed to reach various goals. **Urban GDP** is for the world's 750 largest cities. For **urban sprawl**, we project an increase is almost inevitable and possibly necessary considering population growth, but that in keeping with the New Urban Agenda, it should be managed and minimal. **Net global carbon emissions** are used as a proxy for urban emissions, which are currently difficult to measure. **Slum dwellers** are for developing regions only.



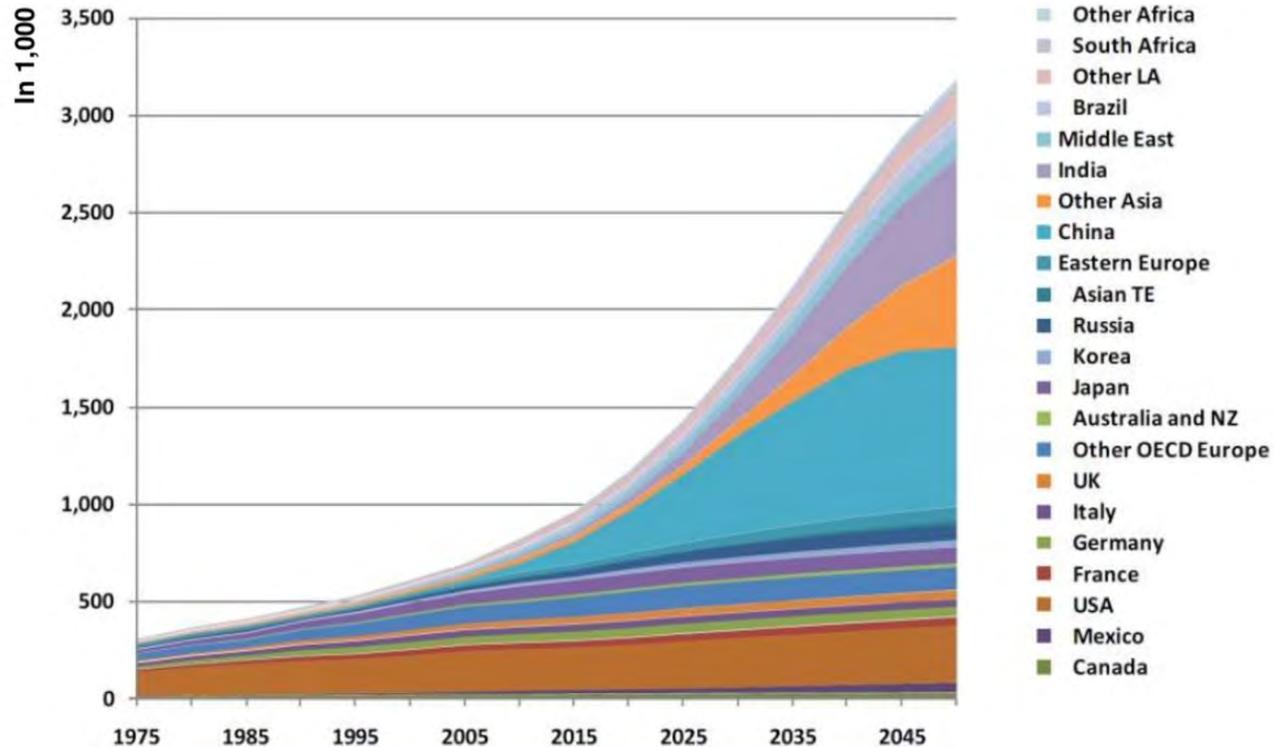
**THE CURRENT GLOBAL VEHICLE STOCK IS CLOSE TO 1.7 BILLION**

**AND COULD INCREASE TO 3.87 BILLION BY 2050**

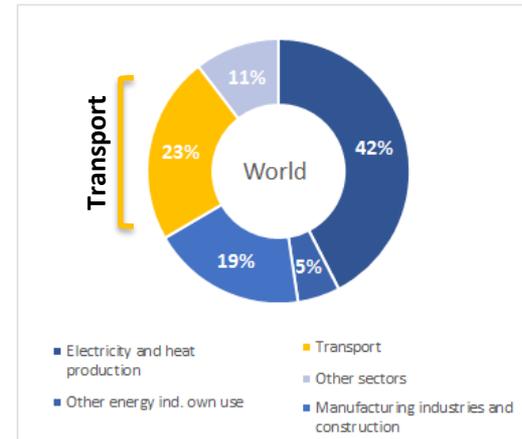
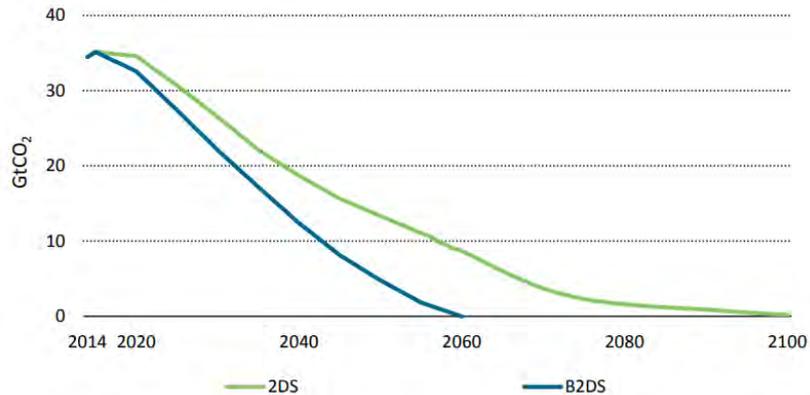
Sitty and Taft, "What will the global light-duty vehicle fleet look like through 2050?", 2016

Photo: Whitehotpix

# WITH MOST GROWTH HAPPENING IN DEVELOPING ECONOMIES



# TO HALT CLIMATE CHANGE, THE TRANSPORT SECTOR MUST BE COMPLETELY DECARBONIZED BY 2060



[Left] IEA, "Global EV Outlook", 2017.

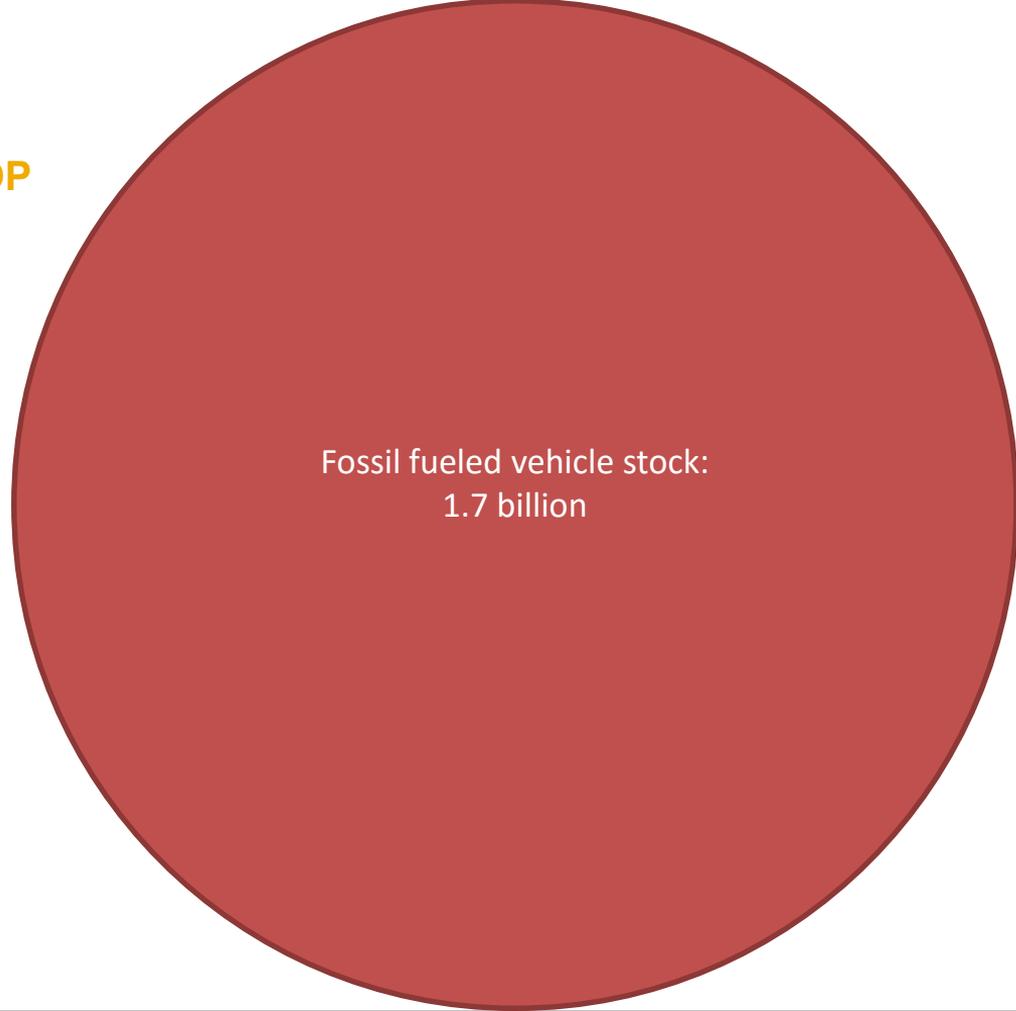
[Right] IEA, authors with data from "CO<sub>2</sub> Emissions from fuel combustion: Highlights", 2015

*VEHICLE ELECTRIFICATION*

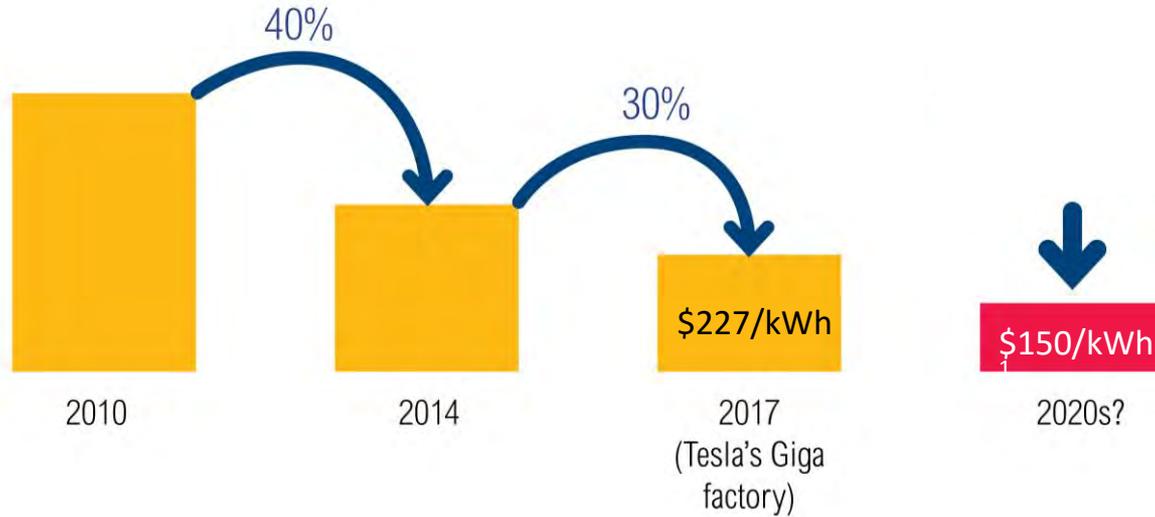
*A NEW HOPE*

**CURRENT  
PENETRATION OF  
EV'S IS BUT A DROP  
IN THE OCEAN,  
HOWEVER IT'S  
EXPECTED TO  
INCREASE IN THE  
COMING YEARS**

**Current stock:**  
2 million



# ELECTRIC VEHICLE BATTERY PRICES ARE FALLING FAST



# THE MARKET IS GEARING UP FOR THE CHALLENGE

## All Volvo cars to be electric or hybrid from 2019

Landmark move as first big manufacturer says it will stop making vehicles solely powered by internal combustion engine



**i** Sales of Volvo's hybrid XC90 have been stronger than expected. Photograph: Volvo

## *In Pivotal Moment, Tesla Unveils Its First Mass-Market Sedan*

By BILL VLASIC JULY 29, 2017



The Tesla Model 3 sedan. Tesla Motors, via Associated Press

# AND SO ARE SOME GOVERNMENTS

## Britain to ban sale of all diesel and petrol cars and vans from 2040

Plans follow French commitment to take polluting vehicles off the road owing to effect of poor air quality on people's health



Ministers believe poor air quality poses largest environmental risk to public health in UK. Photograph: Peter Macdiarmid/Getty Images

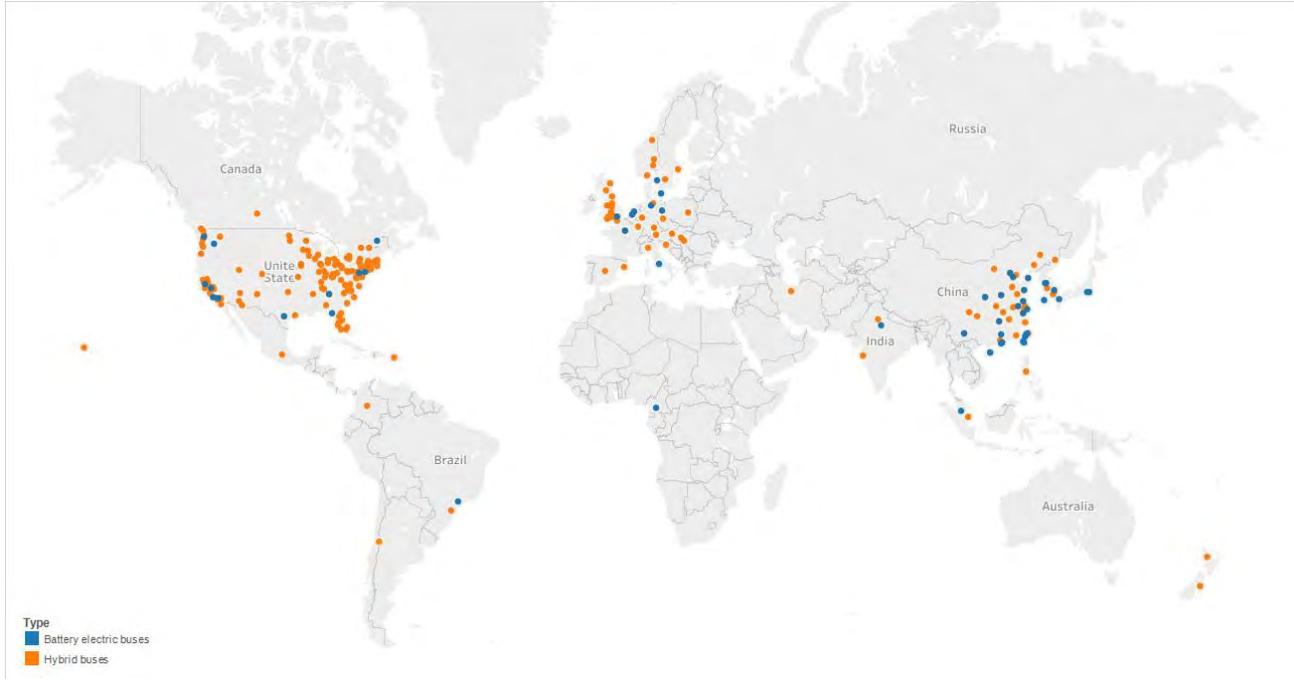
## France to ban sales of petrol and diesel cars by 2040

Move by Emmanuel Macron's government comes a day after Volvo said it would only make fully electric or hybrid cars from 2019

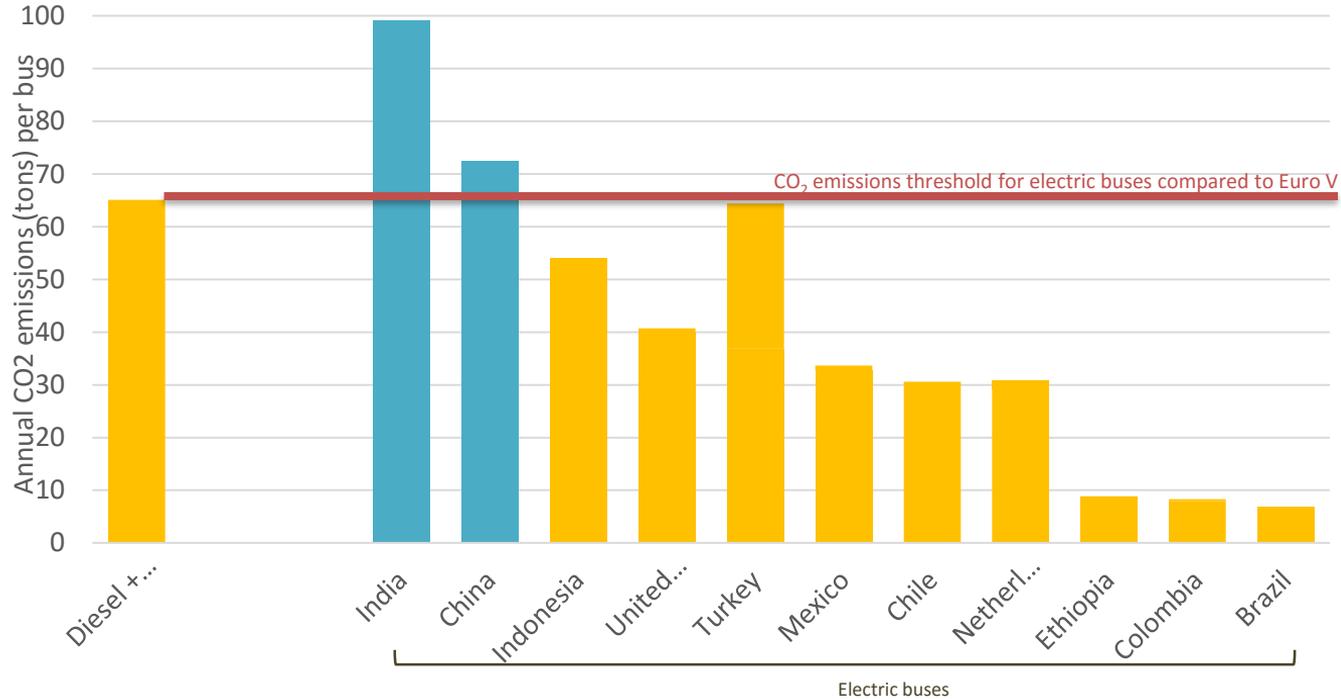


Renault's Zoe electric car will escape France's ban after 2040. Photograph: Renault

# ALREADY OVER 300 CITIES HAVE IMPLEMENTED ELECTRIC OR HYBRID BUSES AS PART OF THEIR FLEETS



# ELECTRIC VEHICLES ARE INHERENTLY MORE EFFICIENT THAN DIESEL VEHICLES, SO IT (ALMOST ALWAYS) MAKES SENSE FROM AN ENERGY AND CLIMATE PERSPECTIVE



**However, it's not just about the technology**

# IF WE ARE TO ENSURE AN ENERGY EFFICIENT MOBILITY FUTURE WE NEED TO UNDERSTAND WHERE THE BARRIERS ARE.



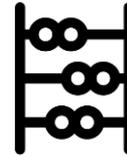
More expensive vehicles and infrastructure



Fear of change and lack of knowledge



Technology readiness (e.g. range)

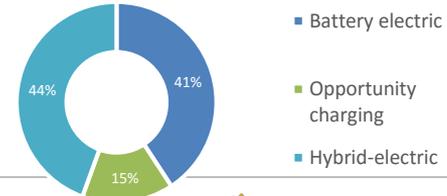


Outdated procurement models

# WE CONDUCTED RESEARCH TO UNDERSTAND WHAT 25 CITIES AROUND THE WORLD HAVE BEEN DOING TO ACHIEVE IMPLEMENTATION OF ELECTRIC BUSES



Americas		Asia/Pacific		Europe
N. America	S. America	Asia	Oceania	Europe
6	2	7	1	9



# WE IDENTIFIED SOME KEY TRENDS IN THE RESEARCH WE CONDUCTED

1 New stakeholders

2 Changes in procurement

3 Technological innovations

4 Public sector support

# NEW STAKEHOLDERS: SANTIAGO, CHILE



Utilities investing in  
transportation

# CHANGES IN PROCUREMENT MODELS: SHENZHEN, CHINA



Bus companies and third parties purchase buses and lease them to operators

# NEW OPERATION MODES: BEIJING, CHINA

Battery depots and  
swapping machines

## PUBLIC SECTOR SUPPORT: BOGOTÁ, COLOMBIA

The Clean Technology Fund provided a \$40M loan to purchase buses

City and national government gave tax incentives that reduce CapEx

# YES

EV'S HAVE HIGHER CAPEX

EV'S HAVE OPERATIONAL  
LIMITATIONS

EV'S BRING UPON A  
CULTURE SHOCK

# BUT

MANY INNOVATIONS ACROSS  
THE WORLD THAT ALLOW  
CITIES TO OVERCOME  
THESE BARRIERS  
THE MOMENT IS NOW!



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# Thank you

[WRIRossCities.org](http://WRIRossCities.org)

[TheCityFix.com](http://TheCityFix.com)

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