Policies that Work:
How vehicle standards and fuel taxes can cut CO₂ emissions and boost the economy

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Who we are – the ClimateWorks Foundation

• The ClimateWorks Foundation supports public policies that prevent dangerous climate change and promote global prosperity

• ClimateWorks’ goal is to reduce global greenhouse gas emissions by 6 billion metric tons by the year 2020 (~25 percent below business-as-usual projections) and by 11 billion metric tons by 2030 (~50 percent below projections)

• These ambitious targets require the immediate and widespread adoption of smart energy and land use policies. ClimateWorks partners with an international network of affiliated organizations — the ClimateWorks Network — to promote these policies in the regions and sectors responsible for most greenhouse gas emissions
ClimateWorks’ Best Practice Networks

**POWER**
The Regulatory Assistance Project

**BUILDINGS AND APPLIANCES**
The Global Buildings Performance Network
The Collaborative Labeling and Appliance Standards Program

**TRANSPORT**
The International Council on Clean Transportation
The Institute for Transportation and Development Policies

**FORESTS & LAND USE**
The Climate and Land Use Alliance

**INDUSTRY**
The Institute for Industrial Productivity
Who we are - ICCT

The mission of the ICCT is to dramatically improve the environmental performance and efficiency of cars, trucks, buses and transportation systems in order to protect and improve public health, the environment, and quality of life.

Top Vehicle Market Sales in 2011

2011 Car and Truck Sales (in million units)

<table>
<thead>
<tr>
<th>Country</th>
<th>Sales (in million units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>18.5</td>
</tr>
<tr>
<td>EU</td>
<td>15.0</td>
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<tr>
<td>U.S.</td>
<td>13.0</td>
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<tr>
<td>Japan</td>
<td>4.2</td>
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<tr>
<td>Brazil</td>
<td>3.6</td>
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<tr>
<td>India</td>
<td>3.3</td>
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<tr>
<td>Russia</td>
<td>2.8</td>
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<tr>
<td>Canada</td>
<td>1.6</td>
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<tr>
<td>South Korea</td>
<td>1.6</td>
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<tr>
<td>Australia</td>
<td>1.0</td>
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<tr>
<td>Mexico</td>
<td>0.9</td>
</tr>
</tbody>
</table>

China EU U.S. Japan Brazil India Russia Canada South Korea Australia Mexico
Policies That Work:
A toolkit to help solve nations’ climate and energy challenges
Three kinds of policy tools
Ten policies can make the difference

1. Vehicle performance standards
2. Fuel and vehicle levies
3. Energy efficiency standards and labels
4. Clean energy supply policies
5. Utility-scale energy efficiency programs
6. Industrial energy efficiency programs
7. Effectively enforced building energy codes
8. Properly aligned economic incentives
9. Smart urban design
10. Support for R&D and innovation
Focus on Transportation

- 65 million new vehicles in 2011 (ICCT countries only)
- Road emissions are projected to grow more than 2% annually, reaching 8.4 Gt CO₂ in 2030
- US, China and EU are the top emitters – focus of PTW report

Source: EIA, ICCT
Most Effective GHG Regulations

Most effective ways to reduce GHG emission from the transport sector are:

- Vehicle performance Standards
- Vehicle and fuel fees/rebates

The report *Policies that Work* presents recommendations for performance standards and fees/rebates that are effective at aligning automakers and consumers with global GHG targets.
## Five Steps to Successful Policy Design

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Set overarching goal**                  | - Base standards and fees on GHG emissions  
- Don’t mandate particular technology solutions                                                                                                                                                    |
| **Require consistent rate of improvement**| - Steady basis over several product development cycles  
- 3%-6% per annum to encourage constant innovation                                                                                                                                                |
| **Cover all vehicles and Fuels**          | - No vehicle or fuel should be exempt – avoid consumers and manufacturers from circumventing the standards                                                                                           |
| **Long term signals**                     | - Manufacturers need stable market signals to invest in new technology                                                                                                                                |
| **Reward performance**                    | - Combine fees with rebates, “feebeats”, rewarding low emission models and penalizing high emitters  
- Avoid GHG standards based on vehicle weight – this promotes heavier models                                                                                                                          |
Vehicle Standards - history

**1960s**
- PROGRAM: First emissions regulations, covering hydrocarbons (HC) and carbon monoxide (CO) from passenger vehicles.
  - California, United States

**1970s**
- PROGRAM: Clean Air Act amendments: 75% reductions in HC and CO emissions from passenger vehicles, introduced control of nitrogen oxides (NOx) emissions.
  - United States

**1980s**
- PROGRAM: Clean Air Act: 60% reduction in HC and CO emissions, introduction of catalytic converters.
  - United States

**1990s**
- PROGRAM:
  - United States: Tier 1 levels; 60% reduction in NOx emissions.
  - Europe: Euro 3 levels; 25% reduction in NOx emissions.
  - China: Fuel economy standards.
  - Japan: Top Runner program introduced.
  - California: Low-emission vehicle (LEV) laws.

**2000s**
- PROGRAM: Tier 2 levels; 65% reduction in NOx emissions.
  - United States
  - Europe: Euro 4 levels; 50% reductions in NOx, HC, and CO.

**2010s**
  - Europe: Euro 5 levels; 25% reductions in NOx.

**TECHNOLOGY**
- 1970s: Three-way catalytic system and exhaust oxygen sensors, electronic systems to precisely control air-fuel mix, including engine control unit, electronic air sensing, fuel metering via fuel injection, and electronic spark ignition timing.
- 1980s: Catalytic converters lead to phaseout of lead in gasoline, exhaust gas recirculation.
- 1990s: Catalyst and fuel injection improvements, including multipoint fuel injection, improved air-fuel control with single oxygen (O2) sensor self-diagnosis technology.
- 2000s: Sequential multipoint fuel injection, variable spark timing, double O2 sensor, advances in three-way catalytic systems, cold start emissions.
- 2010s: Advanced direct injection, turbochargers, engine downsizing, low-rolling-resistance tires, improved aerodynamics and transmissions, lightweight materials.
Vehicle CO$_2$/FE Standards

EU Passenger new vehicle CO$_2$ Standards

- g/km CO$_2$ vs. year
- 2001 to 2020
- 2011: until 2007 = -1%/year
- from 2008: ≈ -4%/year
- 2015 – 130g
- 2020 – 95g

US Passenger new vehicle fleet average fuel economy

- mpg vs. year
- 1975 to 2025
- Historical
- CAFE Standard - Cars
- CAFE Standards - LD Trucks
- 2003 - fuel prices rose dramatically
- 2012-2016 Standards
- 2017-2025 Standards
Global Vehicle Performance Standards

Grants CO₂ per Kilometer normalized to NEDC

[1] China's target reflects gasoline vehicles only. The target may be lower after new energy vehicles are considered.

Cost and Benefit of CO$_2$ reduction technologies

- 2020 targets can be attained by improvements to internal combustion engines and moderate lightweighting

http://www.theicct.org/eu-cost-curve-development-methodology
The estimated additional manufacturing cost for attaining a CO₂ target of 95 g/km for passenger vehicles by 2020 is approximately €1000 per vehicle.

Fuel cost savings for drivers €350-450/year.
### Effective Vehicle Standards

<table>
<thead>
<tr>
<th>Category</th>
<th>Action Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set the goal</strong></td>
<td>Let the market choose the most cost effective technology</td>
</tr>
<tr>
<td><strong>Go upstream</strong></td>
<td>Target small number of market players, manufacturers, rather than consumers</td>
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<tr>
<td><strong>Use GHG as the metric</strong></td>
<td>GHG (gCO2e/km) has advantages over Fuel Economy (mpg or km/L) as the metric is fuel neutral. Can accommodate non-CO2 gases</td>
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<tr>
<td><strong>Base the standard on Vehicle footprint over vehicle weight</strong></td>
<td>Weight based standards are more lenient for heavier vehicles, Footprint&lt;sup&gt;1&lt;/sup&gt; encourages implementation of lightweighting techniques</td>
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<td><strong>Long term standard</strong></td>
<td>Rate of improvement at 3%-6% per annum to encourage constant innovation</td>
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<td><strong>Continual rather than stepwise standard</strong></td>
<td>Stepwise standards lead manufacturers to meet only the minimum requirements for each class, A continual standard requires improvements across all models</td>
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<sup>1</sup> Footprint = wheelbase x track width
## Fuel Taxes

<table>
<thead>
<tr>
<th>Year</th>
<th>U.S.</th>
<th>Japan</th>
<th>Netherlands</th>
<th>Germany</th>
<th>U.K.</th>
<th>France</th>
<th>Italy</th>
<th>Average E.U. tax rate, 2007</th>
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</table>

Source: International Energy Agency and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
Vehicle Fees Examples

**CO₂ Tax on conventional and alternative fuel vehicles (AFVS)**

![Graph showing CO₂ tax on vehicles](http://theicct.org/review-and-comparative-analysis-fiscal-policies)

**CO₂ Feebate program for conventional and alternative fuel vehicles (AFVS)**

![Graph showing CO₂ feebate program](http://theicct.org/review-and-comparative-analysis-fiscal-policies)
Vehicle fees based on CO$_2$ vs Attributes

http://theicct.org/review-and-comparative-analysis-fiscal-policies
Effective Vehicle and Fuel Fees

Set the goal
- Adjust fees to meet revenue targets

Use GHG as the metric
- GHG (gCO₂e/km) is fuel and technology neutral.
- Can accommodate non-CO₂ gases

Cover all vehicles and fuels
- Selective taxation can shift consumer demand to untaxed options and circumvent policy goals

Fœebates
- For vehicles fees, the pricing structure charges high emitters, while rewarding low emission models with rebates

Long term signals
- Transparent fees allow sufficient lead time to implement new technologies
- Increase rate annually and predictably

Linear rather than stepwise fees
- Stepwise fees lead consumers to purchase vehicles that only meet the minimum requirements for each class
- A linear standard requires improvements across all models
Combining Standards and Fees

Fuel fees:
- 10% of current fuel price
- 25% of current fuel price

Potential Reduction in CO₂ Emissions

1. Fuel fees: 10% of current fuel price
2. High Fuel fees: 25% of current fuel price
Conclusions – Vehicle Performance Standards

- Emissions performance standards increase efficiency without dictating a specific technology solution.
- Development and adoption of GHG reduction technologies implies a cost, but also promotes investment and labor while providing fuel savings to costumers.
- Fuel and vehicle fees complement performance standards and can align market forces with social benefits.
- Long-term policies are crucial to provide manufacturers and investors the reliable signals they need to boost R&D, deploy new technologies, and transform the market.
- Our conservative analysis show that we could reduce CO$_2$ emissions from the U.S., China, and the E.U. by more than 1 Gt in 2030.
- Fuel cost net savings of roughly $130 billion in 2030, or a cumulative savings of approximately $800 billion to $1.5 trillion by 2030.
THANK YOU!

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