Eco-Driving Index (EDI): Monthly monitoring of vehicle fuel economy and emissions

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Research on environmental and safety aspects of future road transportation worldwide
What is the EDI?

A national index that estimates the average monthly amount of greenhouse gases (GHG) produced by an individual U.S. driver who has purchased a new vehicle that month.

www.ecodrivingindex.org
www.umich.edu/~umtriswt/ecodriving.html
What is the EDI?

- GHG emitted* ≈ amount of fuel used
  - The EDI estimates the amount of fuel used...
    - Distance driven
    - Vehicle fuel economy

* about 19.7 lb (8.9 kg) of CO$_2$ per gallon of gasoline
How is the EDI calculated?

- Monthly values from two sub-indexes:
  - \( EDI_d \) – distance driven per driver
  - \( EDI_f \) – fuel used per distance driven
How is the EDI calculated?

- Monthly values from two sub-indexes:
  - $\text{EDI}_d$ – distance driven per driver
    - Monthly FHWA distance estimates
      - Seasonal variations in driving
      - Varying number of days in a month
      - Continuous increase in number of drivers
      - Rebound effect
  - $\text{EDI}_f$ – fuel used per distance driven
How is the EDI calculated?

- Monthly values from two sub-indexes:
  - $\text{EDI}_d$ – distance driven per driver
  - $\text{EDI}_f$ – fuel used per distance driven
    - Inverse of sales-weighted harmonic mean fuel economy
      - EPA Fuel Economy Guide “combined” rating
      - Monthly light-duty vehicle sales by make/model
How is the EDI calculated?

- EPA method for fuel economy estimates changed with MY2008
  - Not directly comparable with pre-MY2008 values
- Monthly values are scaled relative to October 2008 – the nominal starting month of MY2008
How is the EDI calculated?

\[ \text{EDI}_d \times \text{EDI}_f = \text{EDI} \]
EDI values

EDI for November 2012:

0.96 \times 0.85 = 0.82
EDI values

Proportion relative to Oct-07

Month-Year

EDI\textsubscript{d} (distance driven)

0.93
-7%
EDI values
EDI values

EDI_d (distance driven)

EDI_f (fuel used per distance driven)

EDI (vehicle emissions)

Proportion relative to Oct-07

Month-Year

0.79 -21%
Fuel economy monitoring

- Average sales-weighted fuel economy
  - Monthly sales of new, light-duty vehicles
  - EPA “combined” city/highway ratings (window sticker value)
  - Corporate Average Fuel Economy (CAFE) ratings also monitored
On-road fuel economy: 1923-2008

Miles per gallon

Year

+3.4 mpg
Fuel economy monitoring

Average sales-weighted mpg

Month-Year

MY2008 20.8
MY2009 21.3
MY2010 22.1
MY2011 22.5
MY2012 23.5
Fuel economy monitoring

Average sales-weighted mpg

Month-Year

- MY2008 20.8
- MY2009 21.3
- MY2010 22.1
- MY2011 22.5
- MY2012 23.5

+4.4 mpg (+22%)
Fuel economy monitoring (CAFE)

- Unadjusted mpg reported to EPA
- Does not include credits or adjustments available to manufacturers
Fuel economy monitoring (CAFE)
Fuel economy monitoring (CAFE)

+5.1 mpg (+21%)
Why the recent increases?

- More demand for better fuel economy
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  - Sales-weighted fuel economy is higher than unweighted fuel economy (based on general availability)
Why the recent increases?

- More demand for better fuel economy
  - Sales-weighted fuel economy is higher than unweighted fuel economy (based on general availability)
- Greater availability of more fuel-efficient vehicles
Why the recent increases?

<table>
<thead>
<tr>
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<tr>
<td>Min (mpg)</td>
<td>10</td>
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<td>Max (mpg)</td>
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<td>➔</td>
<td>11 (1)</td>
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<td>Flex fuel (FFV)</td>
<td>12</td>
<td>→</td>
<td>30</td>
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Summary

- Average new-vehicle fuel economy at a record high
- Demand (and availability) of more fuel-efficient vehicles also at a record high
- Gains over last 5-6 model years are similar in magnitude to gains over previous 20 years
- Fuel economy improvements have resulted in a significant decrease in emissions from new vehicles
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Michelin
Nissan
Renault
Saudi Aramco
Toyota
Volkswagen
Thank you