Cities & transportation systems – what can cities do?
MIT 11.165/477, 11.286J

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Urban Studies & Planning
MIT DUSP

September 29, 2022
Materials for today


What can cities do?

Let me remind you that we are focusing on cities because of:

- population
- economic activity
- consumption > production (physical)

Raises questions about how we make the necessary changes in cities:

- land use and the built environment
- areas connected to cities (all of them)
- long-lived, durable, seemingly slow to change
- can we do it fast / broadly enough? WHO? HOW?
- what should we do first?
Infrastructure characteristics

BIG:
- long-lived, durable, seemingly slow to change
- expensive: assets, investment, usually debt-financed
- large volumes, continuous operations, global systems (supply chains!)
- large footprints, areas, impact
- EJ concerns: often cited near poor & minority communities. Why? (Bullard 2003 article)
## Energy density

<table>
<thead>
<tr>
<th>Concern</th>
<th>Metric</th>
<th>Critical application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>kWh / kg (energy storage)</td>
<td>Planes, cars, e-bikes</td>
</tr>
<tr>
<td></td>
<td>kWh / ton (shipping weight)</td>
<td>Ships, trucks, trains</td>
</tr>
<tr>
<td>Volume</td>
<td>kWh / liter (fuel tank)</td>
<td>Planes, cars, trucks</td>
</tr>
<tr>
<td></td>
<td>kWh / liter (freight volume)</td>
<td>Ships, trucks, trains</td>
</tr>
<tr>
<td>Land area</td>
<td>kWh / acre (biomass)</td>
<td>To produce liquid fuels, H2</td>
</tr>
<tr>
<td></td>
<td>kWh / acre (solar, wind)</td>
<td>To produce electricity</td>
</tr>
<tr>
<td>Cost</td>
<td>kWh / $</td>
<td>For pretty much everything</td>
</tr>
</tbody>
</table>
Moving Cooler strategies, 2009

AN ANALYSIS OF TRANSPORTATION STRATEGIES FOR REDUCING GREENHOUSE GAS EMISSIONS

Cambridge Systematics, Inc.

Study Author
Cambridge Systematics, Inc.

Cambridge Systematics, Inc., specializes in transportation, dedicated to ensuring that transportation investments deliver the best possible results. It is recognized as a leader in the development and implementation of innovative policy and planning solutions, objective analysis, and technology applications. Cambridge Systematics works to build the capacity of the transportation community to understand and address both sides of the climate change challenge: to develop strategies to reduce greenhouse gas emissions from transportation, and to prepare for the potential effects of climate change on transportation systems.

Moving Cooler Steering Committee

American Public Transportation Association
Rob Pedget

Environmental Defense Fund
Michael Re Jong

Federal Highway Administration
April Marchese and John Davies

Federal Transit Administration
Tina Hodge

Intelligent Transportation Society of America
Leslie Belles

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Shell Oil Company
Miriam Cohn

Urban Land Institute
Robert Denney, Rachael Lavitt, and Dean Schwanke

U.S. Environmental Protection Agency
Ken Adler

Project Facilitation
Collaborative Strategies Group, LLC

Collaborative Strategies Group, LLC, is a consulting firm specializing in facilitation, public outreach and communication, project management, and public policy development for governments, businesses, communities, and organizations that need help navigating complex problem-solving, decision-making, and relationship-building issues.
Moving Cooler strategies, 2009

Has:

- telework & less days (Zoom!)
- vehicle technology
- fuel technology
- travel activity
- vehicle system operations
- all modes: passenger, transit, freight, shipping, aviation

Does not have:

- shared vehicles (Zipcar 2000)
- ride-sharing (Uber 2009, Lyft 2012)
- autonomous vehicles (AVs)
- EVs costs greatly decrease
Moving Cooler effects, “performance outcomes”

Yes:
- GHG reduction
- implementation costs
- change in vehicle costs
- equity effects

No:
- (-) travel times?
- (+) expanded options, reduced congestion, greater accessibility
- (+) improved safety
- (+) improvements in livability, improved equity, improved local environmental quality, enhanced public health
Moving Cooler strategies

- pricing and taxes
- land use and smart growth
- non-motorized transport
- public transportation improvements
- ride-sharing, car-sharing, other commuting strategies
- regulatory strategies
- operational and intelligent transportation (ITS) strategies
- capacity expansion and bottleneck relief
- multimodal freight sector strategies
Moving Cooler deployment levels and bundles

Deployment levels:

- expanded current practice: focused mostly on major metro areas
- aggressive: sooner and more broadly geographically deployed
- maximum effort: maximum national, regional, and local focus

Strategy bundles:

1. near-term / early results
2. long-term / maximum results
3. land-use / transit / non-motorized bundle
4. system / driver efficiency bundle
5. facility bundle
6. low cost bundle
Figure ES.2 *Moving Cooler* National GHG Emissions Baseline and Baseline Sensitivity

Note: This figure displays National On-Road GHG emissions as estimated in the *Moving Cooler* baseline, compared with the study’s three sensitivity analysis baselines and with the GHG emission estimates, based on President Obama’s May 19, 2009, national fuel efficiency standard proposal of 35.5 mpg in 2016.
Maximum deployment: $110-470 \text{ M barrels per year} / 5.7 \text{ M/day} = 19-82 \text{ days per year.}$

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### Table 4.15 Summary of Moving Cooler Bundle Analysis Results: Cumulative GHG Reductions, Implementation Costs, and Change in Vehicle Costs by Strategy (at Aggressive and Maximum Deployment Levels) 2010 to 2050

<table>
<thead>
<tr>
<th></th>
<th>Aggressive Deployment</th>
<th></th>
<th></th>
<th>Maximum Deployment</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Near-Term/Early Results</td>
<td>7.1</td>
<td>$676</td>
<td>-$3,211</td>
<td>-$2,535</td>
<td>-$356</td>
<td>9.3</td>
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<tr>
<td>2. Long-Term/Maximum Results</td>
<td>7.6</td>
<td>$2,611</td>
<td>-$4,846</td>
<td>-$2,235</td>
<td>-$293</td>
<td>10.8</td>
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<tr>
<td>3. Land Use/Transit/Nonmotorized Transportation</td>
<td>3.8</td>
<td>$1,439</td>
<td>-$3,270</td>
<td>-$1,831</td>
<td>-$484</td>
<td>6.3</td>
</tr>
<tr>
<td>4. System and Driver Efficiency</td>
<td>5.0</td>
<td>$1,870</td>
<td>-$2,214</td>
<td>-$344</td>
<td>-$69</td>
<td>6.0</td>
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<tr>
<td>5. Facility Pricing</td>
<td>1.4</td>
<td>$2,371</td>
<td>-$1,121</td>
<td>$1,250</td>
<td>$891</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Note: Gt (gigatonne) = one billion metric tonnes.

**a** Implementation cost is the estimated cumulative cost to implement each bundle, including capital, maintenance, operations, and administrative costs.

**b** Vehicle cost is the estimated cumulative reduction in the cost of owning and operating vehicles from a societal perspective, which would result with reductions in VMT and fuel consumption experienced with implementation of each bundle. Vehicle costs **DO NOT** include other costs and benefits that could be experienced as a consequence of implementing each bundle, such as changes in travel time, safety, user fees, environmental quality, and public health.

**c** Included cost per tonne is simply the estimated cumulative cost of implementation, less the estimated vehicle cost savings divided by the estimated cumulative reduction in GHG emissions for each bundle.
Figure 4.2 Implementation Costs and Vehicle Cost Savings for Near-Term/Early Results Bundle at Aggressive Deployment

Vehicle Cost Savings
Implementation Costs

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Figure 4.1 GHG Reduction for Near-Term/Early Results Bundle

2010 to 2050

<table>
<thead>
<tr>
<th>Study</th>
<th>2005</th>
<th>1,700</th>
<th>1,600</th>
<th>1,500</th>
<th>1,400</th>
<th>1,300</th>
<th>1,200</th>
<th>1,100</th>
<th>1,000</th>
<th>900</th>
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<tr>
<td></td>
<td>6%</td>
<td>11%</td>
<td>11%</td>
<td>16%</td>
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<td></td>
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</tbody>
</table>

1990 and 2005 GHG Emissions—Combination of DOE AEO data and EPA GHG Inventory data.
Study Baseline—Annual 1.6% VMT growth combined with 1.9% growth in fuel economy.
Aggressive—Bundle strategies deployed at aggressive level.
Maximum—Bundle strategies deployed at maximum level.

Note: This figure displays the GHG Reduction for Near-Term/Early Reductions Bundle at Aggressive and Deployment for the 2010 to 2050 time period without economy-wide pricing. Percent reductions are on % from the study baseline.

Table 4.3 Bundle 1: Near-Term/Early Results

<table>
<thead>
<tr>
<th>GHG Reduction Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing Strategies</td>
</tr>
<tr>
<td>CBD/Activity Center On-street Parking Pricing</td>
</tr>
<tr>
<td>New Tax/Higher Tax on Free Private Parking</td>
</tr>
<tr>
<td>Residential Parking Permits</td>
</tr>
<tr>
<td>Congestion Pricing</td>
</tr>
<tr>
<td>Public Transportation Strategies</td>
</tr>
<tr>
<td>Transit Fare Measures</td>
</tr>
<tr>
<td>Increased Transit Frequency and LOS</td>
</tr>
<tr>
<td>HOV/Carpool/Vanpool/Commute Strategies</td>
</tr>
<tr>
<td>Car-Sharing</td>
</tr>
<tr>
<td>Employer-Based Commute Measures</td>
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<tr>
<td>Regulatory Strategies</td>
</tr>
<tr>
<td>Urban Parking Restrictions</td>
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<tr>
<td>Speed Limit Reductions</td>
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<tr>
<td>Systems Operations and Management Strategies</td>
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<tr>
<td>Eco-Driving</td>
</tr>
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<td>Incident Management</td>
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<td>Road Weather Management</td>
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<tr>
<td>Signal Control Management</td>
</tr>
<tr>
<td>Traveler Information</td>
</tr>
<tr>
<td>Multimodal Freight Strategies</td>
</tr>
<tr>
<td>Shipping Container Permits</td>
</tr>
<tr>
<td>LCV Permits</td>
</tr>
<tr>
<td>Truck Stop Electrification</td>
</tr>
</tbody>
</table>
Figure 4.4 Implementation Costs and Vehicle Cost Savings for Long-Term/Maximum Results Bundle at Aggressive Deployment

Vehicle Cost Savings
Implementation Costs

Note: This figure displays estimated annual implementation costs (capital, maintenance, operations, and administrative) and annual vehicle cost savings (reduction in the costs of owning and operating a vehicle from reduced VMT and delay). Vehicle cost savings DO NOT include other costs and benefits that could be experienced as a consequence of implementing each bundle, such as changes in travel time, safety, user fees, environmental quality, and public health.
Figure 4.4 Implementation Costs and Vehicle Cost Savings for Long-Term/Maximum Results Bundle at Aggressive Deployment

Note: This figure displays estimated annual implementation costs (capital, maintenance, operations, and administrative) and annual vehicle cost savings (reduction in the costs of owning and operating a vehicle from reduced VMT and delay). Vehicle cost savings DO NOT include other costs and benefits that could be experienced as a consequence of implementing each bundle, such as changes in travel time, safety, user fees, environmental quality, and public health.

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Figure 4.6 **Implementation Costs and Vehicle Cost Savings for Land Use/Transit/Nonmotorized Transportation Bundle at Aggressive Deployment**

- **Implementation Costs**
- **Vehicle Cost Savings**

2008 Dollars (in billions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Implementation Costs</th>
<th>Vehicle Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
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<tr>
<td>2020</td>
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<td>2035</td>
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<tr>
<td>2040</td>
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<td>2045</td>
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<td></td>
</tr>
<tr>
<td>2050</td>
<td></td>
<td></td>
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</tbody>
</table>

Note: This figure displays estimated annual implementation costs (capital, maintenance, operations, and administrative) and annual vehicle cost savings (reduction in the cost of owning and operating a vehicle from reduced VMT and delay). Vehicle cost savings **DO NOT** include other costs and benefits that could be experienced as a consequence of implementing each bundle, such as changes in travel time, safety, user fees, environmental quality, and public health.
Figure 4.5 GHG Reduction for Land Use/Transit/Nonmotorized Transportation Bundle
2010 to 2050

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Surface Transportation Sector GHG Emissions (mtm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>1,100</td>
</tr>
<tr>
<td>2005</td>
<td>1,700</td>
</tr>
<tr>
<td>2010</td>
<td>1,900</td>
</tr>
<tr>
<td>2020</td>
<td>2,000</td>
</tr>
<tr>
<td>2025</td>
<td>1,900</td>
</tr>
<tr>
<td>2030</td>
<td>1,800</td>
</tr>
<tr>
<td>2035</td>
<td>1,700</td>
</tr>
<tr>
<td>2040</td>
<td>1,600</td>
</tr>
<tr>
<td>2045</td>
<td>1,500</td>
</tr>
<tr>
<td>2050</td>
<td>1,400</td>
</tr>
</tbody>
</table>

GHG Reduction Strategies
- Pricing Strategies
  - CBD/Activity Center On-Street Parking Pricing
  - New Tax/Higher Tax on Free Private Parking
  - Residential Parking Permits
  - Congestion Pricing

Land Use and Smart Growth Strategies/Nonmotorized Strategies
- Combined Land Use
- Combined Pedestrian
- Combined Bicycling

Public Transportation Strategies
- Transit Fare Measures
- Increased Frequency, LOS, and Extent
- Urban Transit Expansion
- Intercity Passenger Rail Expansion
- High-Speed Passenger Rail

HOV/Carpool/Vanpool/Commuting Strategies
- HDV Lanes
- HDV Lanes (24-hour applicability)
- Car-Sharing
- Employer-Based Commute Measures

Regulatory Strategies
- Urban Nonmotorized Zones
- Urban Parking Restrictions

Systems Operations and Management Strategies
- Signal Management
- Traveler Information

Multimodal Freight Strategies
- Urban Consolidation Centers

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Quick data analysis: by maximum GHG savings

```r
# summarize net GHG reductions
# dat %>%
+  group_by(Category) %>%
+  summarise(Exp = sum(Exp.GHG.red), Agg = sum(Agg.GHG.red), Max = sum(Max)
+  arrange(desc(Max))

# A tibble: 9 x 4
   Category                              Exp     Agg      Max
   <fct>                       <dbl>   <dbl>    <dbl>
1  Pricing strategies            NA     8157    22339
2  Regulatory measures          1318   2513    2793
3  System operations and management strategies NA    1479    2219
4  HOV / carpool / vanpool / commute strategies 338    628    1471
5  Land use and smart growth strategies 160    865    1445
6  Public transportation strategies 327    531    1014
7  Multimodal freight strategies  241    336     494
8  Nonmotorized transportation strategies 133    288     403
9  Bottleneck relief and capacity expansion strategies -7    -12     -26
```
Quick data analysis: categorize by average GHG costs

```
> dat %>%
+   group_by(Category) %>%
+   summarise(Exp = sum(Exp.GHG.red)/sum(Exp.net.cost),
+              Agg = sum(Agg.GHG.red)/sum(Agg.net.cost),
+              Max = sum(Max.GHG.red)/sum(Max.net.cost)) %>%
+   arrange(desc(Max))

# A tibble: 9 x 4
#  Category                                           Exp    Agg     Max
#  <fct>                                              <dbl>  <dbl>   <dbl>
#1 Public transportation strategies                  2.11   2.06   1.65
#2 Bottleneck relief and capacity expansion strategies -0.0106 -0.00974 -0.0104
#3 Land use and smart growth strategies              -1.37  -1.32  -1.32
#4 Nonmotorized transportation strategies            -1.44  -1.50  -1.55
#5 Regulatory measures                               -2.99  -2.85  -2.61
#6 HOV / carpool / vanpool / commute strategies      18.4   -4.24  -3.02
#7 Pricing strategies                                NA    -1.90  -6.09
#8 System operations and management strategies       NA     7.52  -8.81
#9 Multimodal freight strategies                     -9.13  -24   -73.6
```
Quick data analysis: which specific strategies?

```r
data %>%
  select(Category, Strategy, Max.cost.p.mmt) %>%
  arrange(desc(Max.cost.p.mmt)) %>%
  print(n=50)
#
# A tibble: 47 x 3
#  Category                                    Strategy                              Max.cost.p.mmt
#1 System operations and management strategies Active traffic management                6.20
#2 System operations and management strategies Integrated corridor management         6.15
#3 System operations and management strategies Signal control management             3.43
#4 Public transportation strategies         Intercity passenger rail               2.76
#5 Multimodal freight strategies            Truck-only toll lanes                  2.10
#6 Regulatory measures                      Nonmotorized zones                     1.67
#7 Public transportation strategies         High-speed passenger rail              1.38
#8 Pricing strategies                       Carbon pricing (VMT impact)            1.12
#9 Public transportation strategies         Urban transit expansion                0.982
#10 Multimodal freight strategies           Marine system improvements            0.769
#11 System operations and management strategies Variable message signs                0.682
#12 HOV / carpool / vanpool / commute strategies     HOV lanes                             0.262
#13 System operations and management strategies Vehicle infrastructure integration    0.192
#14 System operations and management strategies Road weather management              0.175
```
Quick data analysis: which specific strategies?

<table>
<thead>
<tr>
<th></th>
<th>System operations and management strategies</th>
<th>Road weather management</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Bottleneck relief and capacity expansion strategies</td>
<td>Capacity expansion</td>
</tr>
<tr>
<td>15</td>
<td>Bottleneck relief and capacity expansion strategies</td>
<td>Bottleneck relief</td>
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<tr>
<td>16</td>
<td>Multimodal freight strategies</td>
<td>LCV permits</td>
</tr>
<tr>
<td>17</td>
<td>Public transportation strategies</td>
<td>Transit fare measures</td>
</tr>
<tr>
<td>18</td>
<td>Pricing strategies</td>
<td>PAYD</td>
</tr>
<tr>
<td>19</td>
<td>HOV / carpool / vanpool / commute strategies</td>
<td>Car-sharing</td>
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<tr>
<td>20</td>
<td>Pricing strategies</td>
<td>CBD / Activity Center on-street parking</td>
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<td>21</td>
<td>Pricing strategies</td>
<td>Tax / higher tax on free private parking</td>
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<td>VMT fee</td>
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<td>Residential parking permits</td>
</tr>
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<td>Urban parking restrictions</td>
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<td>25</td>
<td>Regulatory measures</td>
<td>Combined land use</td>
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<tr>
<td>26</td>
<td>Land use and smart growth strategies</td>
<td>Employer-based commute strategies</td>
</tr>
<tr>
<td>27</td>
<td>HOV / carpool / vanpool / commute strategies</td>
<td>Combined pedestrian</td>
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<tr>
<td>28</td>
<td>Nonmotorized transportation strategies</td>
<td>Cordon pricing</td>
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<tr>
<td>29</td>
<td>Nonmotorized transportation strategies</td>
<td>Combined bicycle</td>
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<td>Pricing strategies</td>
<td>Congestion pricing</td>
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<td>Intercity tolls</td>
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<td>32</td>
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<td>Speed limit reductions</td>
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<td>33</td>
<td>Regulatory measures</td>
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</table>

David Hsu (MIT)  
Transportation – what can cities do?  
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<table>
<thead>
<tr>
<th></th>
<th>Nonmotorized transportation strategies</th>
<th>Combined pedestrian</th>
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<td>Speed limit reductions</td>
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<td>Urban consolidation centers</td>
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<td>Truck APUs</td>
<td>-4.49</td>
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<td>Shipping container permits</td>
<td>-4.86</td>
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<td>Pricing strategies</td>
<td>Carbon pricing (fuel economy impact)</td>
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<td>System operations and management strategies</td>
<td>Eco-driving</td>
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<td>Truck stop electrification</td>
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<td>HOV / carpool / vanpool / commute strategies</td>
<td>HOV lanes (24-hour applicability)</td>
<td>-5.71</td>
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<td>Public transportation strategies</td>
<td>Transit frequency / LOS / Extent</td>
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<td>System operations and management strategies</td>
<td>Traveler information</td>
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<td>-267</td>
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Expanded, aggressive, and maximum effort

![Graph showing transportation efforts over time](image-url)

- **Expanded Current Practice**: 2010, 2015, 2020, 2025, 2035
- **More Aggressive**: 2010, 2015, 2020, 2025, 2035
- **Maximum Effort**: 2010, 2015, 2020, 2025, 2035

- **Large Urban with Transit**
- **Large Urban without Transit**
- **Medium Urban with Transit**
- **Medium Urban without Transit**
- **Small Urban with Transit**
- **Small Urban without Transit**
MACC for maximum strategies from Moving Cooler, 2009

Marginal abatement cost (USD mmt CO₂-eq⁻¹)

Abatement potential (mmt CO₂-eq)

Strategy type
- Bottleneck relief and capacity expansion strategies
- HOV / carpool / vanpool / commute strategies
- Land use and smart growth strategies
- Multimodal freight strategies
- Nonmotorized transportation strategies
- Pricing strategies
- Public transportation strategies
- Regulatory measures
- System operations and management strategies
Carbon emissions from transportation

Daniel Sperling from UC Davis has a nice way to think about this:

\[
\text{Mobility (vehicle-miles-traveled)} \times \frac{\text{Vehicle energy efficiency (energy use / vehicle mile)}}{\text{Carbon intensity of energy (GHG / unit of energy)}} = \text{GHG emissions}
\]
Key finding: new vehicles, fuels & a new hydrogen (H2) system all necessary!

- for low-GHG carbon-based fuels, main challenge is huge scale of fuel production
- all low-GHG fuel options (even biofuels) depend on huge-scale production of low-GHG H2
- cost of low-GHG H2 is often largest part of the cost of finished low-GHG fuel
Long-distance vehicles carry energy, so energy density is crucial. 

- weight (& volume) of fuel or battery reduces payload
- alternatives are 2-30x heavier (and bigger volume) than hydrocarbons

Scale

- today only fossil fuels are available at the huge scale needed (~1 billion tons/year)
- only a few low-carbon alternatives could reach needed scale by 2050

Existing vehicles are all designed to use hydrocarbon fuels

- either need a carbon fuel that doesn’t increase GHG, or new vehicles
- vehicle lifetimes are long (20-30 years), new vehicle development is slow

Cost of the fuel is significant part of total cost of transport

- currently fuels for this sector cost $1 Trillion/year
- expensive infrastructure adds cost

Fuel infrastructure practicalities

- room-temp liquid fuels easier to distribute & store than gases, solids
- fast refueling/recharging is important for some vehicles.
- need new fuel to be available at ~800 ports, 17,000 airports, >100,000 truck stops
## MIT CGC: Tough-to-decarbonize transport (T2DT) 2021

<table>
<thead>
<tr>
<th>Sector</th>
<th>Trucking</th>
<th>Shipping</th>
<th>Aviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions</td>
<td>1.25 Gt-CO2/yr</td>
<td>1.0 Gt-CO2/yr</td>
<td>1.0 Gt-CO2/yr</td>
</tr>
<tr>
<td>Vehicle intensity</td>
<td>1080 gCO2/km</td>
<td>400 kgCO2/km</td>
<td>125 gCO2/p-km</td>
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<tr>
<td>Engine intensity</td>
<td>500 gCO2/kWh</td>
<td>700 gCO2/kWh</td>
<td>1500-2400 gCO2/kgfh</td>
</tr>
<tr>
<td>Main fuel</td>
<td>Diesel</td>
<td>Heavy fuel oil</td>
<td>Jet A</td>
</tr>
<tr>
<td>Main engine (power)</td>
<td>ICE, 300 kW</td>
<td>ICE, 10-100 MW</td>
<td>Gas turbines, 50-100 MW</td>
</tr>
<tr>
<td>State of EV</td>
<td>Available, but high cost</td>
<td>Very challenging for shipping</td>
<td>Impossible over long distances</td>
</tr>
<tr>
<td>Fuel cell option</td>
<td>High cost</td>
<td>High cost</td>
<td>Not possible</td>
</tr>
<tr>
<td>Viable pathways</td>
<td>Many</td>
<td>Carbon-based, ammonia, H2</td>
<td>Carbon-based only</td>
</tr>
</tbody>
</table>