Reducing CO2 and Energy Use Through Livable Communities: What’s Possible and Next Steps

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By Michael Replogle, Global Policy Director and Founder
Institute for Transportation and Development Policy
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Converging Forces Driving Transportation Transformation

- Rising motorization
- Growing congestion
- Climate change
- Finance challenges
- Public health & safety
- Economic competitiveness
- Growing income inequality
Global transportation CO₂ emissions predicted to grow from 4.6 gT to 11 gT by 2050

Projected Growth of Transport CO₂e Emissions

50% global reduction from 1990 levels needed by 2050
Transportation’s Contribution to U.S. GHGs

From 1990 to 2006, transportation GHG emissions increased 27%, accounting for almost half the increase in total U.S. GHG emissions.

Growth Choice: High or Low Carbon Footprint?

- What growth rate for motor vehicle travel?
- How efficient are transportation networks?
- What implications for overall long-term building and community energy efficiency?
To cut carbon emissions from traffic

• Cut emission rate/mile traveled:
  ➢ Operate roads for peak efficiency (optimal speeds, less congestion)
  ➢ Use more efficient vehicles
  ➢ Use lower carbon fuels

• While cutting distance traveled:
  ➢ Shorten trip lengths
  ➢ Use more efficient modes
  ➢ Reduce need to travel
Oregon Transportation Planning Rule
VMT goals on way to being met

Vehicle Miles Traveled per person: Portland vs. US

2040 Growth Concept

U.S. National Average

Portland, Oregon

Source: Andy Cotugno, Metro
Per Capita VMT: Washington State
Business-As-Usual vs. Goal in 2008 State Law

YEAR

VMT/capita

1990 per capita VMT level

State Goal in 2008 Law

Prior Business-As-Usual
Knowledge Gap:
McKinsey - Pathway to a Low-Carbon Economy Did Not Consider Transportation Management, Smart Growth

Global GHG abatement cost curve beyond business-as-usual – 2030

Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO₂e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.0
Filling the Gap: Moving Cooler

- Fill a gap left by McKinsey and others who analyzed future technologies and fuels but not travel behavior
- Goal of consistent analysis across strategy types
Moving Cooler Study

• Analytic Team: Cambridge Systematics

• Multiple Partners on Steering Committee:
  - U.S. Environmental Protection Agency
  - U.S. Federal Highway Administration
  - U.S. Federal Transit Administration
  - American Public Transportation Association
  - Environmental Defense
  - ITS America
  - Shell Oil
  - Natural Resources Defense Council
  - Kresge Foundation
  - Surdna Foundation
  - Rockefeller Brothers Fund
  - Rockefeller Foundation
  - Urban Land Institute
Baseline Assumptions

• Travel continues to grow
  – VMT growth of 1.4% per year
  – Transit ridership growth 2.4% / year

• Fuel prices increase
  – 1.2% per year, beginning at $3.70 / gallon in 2009

• Fuel economy improves steadily
  – Light duty vehicles at 1.91% annually
  – Heavy duty at 0.61%
Moving Cooler Baseline to 2050

National On-Road GHG Emissions (mmt)

Note: This figure displays National On-Road GHG emissions as estimated in the Moving Cooler baseline, compared with GHG emission estimates based on President Obama’s May 19, 2009, national fuel efficiency standard proposal of 35.5 mpg in 2016. Both emission forecasts assume an annual VMT growth rate of 1.4 percent. The American Clean Energy and Security Act (H.R. 2454) identifies GHG reduction targets in 2012, 2020, 2030, and 2050. The 2020 and 2050 targets applied to the on-road mobile transportation sector are shown here.
Wide Range of Strategies Examined Individually and in Strategic Bundles

- Pricing, tolls, PAYD insurance, VMT fees, carbon/fuel taxes
- Land use and smart growth
- Non-motorized transportation
- Public transportation improvements
- Regional ride-sharing, commute measures
- Regulatory measures
- Operational/ITS strategies
- Capacity/bottleneck relief
- Freight sector strategies
Evaluation of Implementation
Costs / GHG Reduction Effectiveness

- Estimates direct implementation costs and GHG effectiveness
- *Not* a full cost-benefit analysis – therefore not a complete basis for decisions
  - GHG benefits only
  - Direct agency monetary implementation costs
  - Vehicle operating costs (savings): fuel, ownership, maintenance, insurance
  - Not including co-benefits (air pollution, health, economic development, mobility, time savings) or time losses
- Allows comparison to McKinsey Report findings on fuels and technology
**Range of Annual GHG Reductions of 6 Strategy Bundles (Aggressive and Maximum Deployment)**

![Graph showing GHG emissions reduction over time](image)

**Total Surface Transportation Sector GHG Emissions (mmt)**

- **Study Baseline**
- **Aggressive Development Levels**
- **Maximum Development Levels**

1990 & 2005 GHG Emissions – Combination of DOE AEO data and EPA GHG Inventory data

Study – Annual 1.4% VMT growth combined with 1.9% growth in fuel economy

Aggressive Deployment Levels – Range of GHG emissions from bundles deployed at aggressive level

Maximum Deployment Levels – Range of GHG emissions from bundles deployed at maximum level

**Note:** This figure displays the GHG emission range across the six bundles for the aggressive and maximum deployment scenarios. The percent reductions are on an annual basis from the Study Baseline. The 1990 and 2005 baseline are included for reference.
Pricing Strategies Multiply Effectiveness of Other Measures

Total Surface Transportation Sector GHG Emissions (mmt)

- Study Baseline
- Aggressive
- Economy-Wide Pricing

1990 & 2005 GHG Emissions – Combination of DOE AEO data and EPA GHG Inventory data
Study Baseline – Annual 1.4% VMT growth combined with 1.9% growth in fuel economy
Aggressive – GHG emissions from bundle deployed at aggressive level without economy wide pricing measures
Direct Vehicle Costs and Costs of Implementing Strategy “Bundles” Without Economy-Wide Pricing

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 vehicle-miles traveled (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.
# Summary of Bundle Results

(2010 to 2050 – Aggressive Deployment without economy-wide pricing)

<table>
<thead>
<tr>
<th>Scenario Bundle</th>
<th>GHG Reduction (Gt)</th>
<th>Implement. Costs</th>
<th>Change in Vehicle Costs</th>
<th>Net Cost per Tonne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Term/Early Results</td>
<td>7.1</td>
<td>$676</td>
<td>-$3,211</td>
<td>-$356</td>
</tr>
<tr>
<td>Long Term/Maximum Results</td>
<td>7.6</td>
<td>$2,611</td>
<td>-$4,846</td>
<td>-$293</td>
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<tr>
<td>Land Use/Transit/Nonmotorized Transportation</td>
<td>3.8</td>
<td>$1,439</td>
<td>-$3,270</td>
<td>-$484</td>
</tr>
<tr>
<td>System and Driver Efficiency</td>
<td>5.0</td>
<td>$1,870</td>
<td>-$2,214</td>
<td>-$69</td>
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<tr>
<td>Facility Pricing</td>
<td>1.4</td>
<td>$2,371</td>
<td>-$1,121</td>
<td>$891</td>
</tr>
<tr>
<td>Low Cost</td>
<td>7.5</td>
<td>$599</td>
<td>-$3,499</td>
<td>-$387</td>
</tr>
</tbody>
</table>
Economy-Wide Pricing

• Mechanisms: Carbon pricing, VMT fee, and/or Pay As You Drive (PAYD) insurance

• Strong economy-wide pricing measures added to “bundles” achieve additional GHG reductions
  – Aggressive deployment: additional fee (in current dollars) starting at the equivalent of $0.60 per gallon in 2015 and increasing to $1.25 per gallon in 2050 could result in an additional 17% reduction in GHG emissions in 2050

• Two factors would drive this increased reduction
  1. Reduction in vehicle-miles traveled (VMT)
  2. More rapid technology advances
Near-Term and Long-Range Strategies

• Some strategies are effective in achieving near-term reductions, reducing the cumulative GHG challenge in later years: speed limits, congestion pricing, eco-driving, expanded transit service, pay-as-you-drive insurance

• Investments in land use and improved travel options involve longer time frames but have enduring benefits

• Relieving bottlenecks in road networks without pricing boosts short and long-term GHGs; with pricing of new capacity: smaller, but still negative long term GHG effects

• Most bundles yield large net negative cost/ton GHG reduction. Best is to combine transit, land use, smart traffic management and operations, economy-wide pricing.
Linking Moving Cooler and Growing Cooler to Building Cooler

Pedestrian and transit oriented development expands opportunity for green building
- District heating & cooling
- More shared wall construction
- Efficient infrastructure

Copenhagen, Denmark
Moving Cooler Reduces Time Wasted in Traffic

- 23% difference in Vehicle Hours of Delay (Scenario F vs. Scenario C)

Scenarios

- **Scenario C**: Expanded Urban Footprint
- **Scenario F**: Compact Urban Footprint Plus Transit Plus “Pricing”

Pricing
1. Double auto operating costs
2. Make transit free
Transit Expansion With Pricing Yields Better Performance Than Road Expansion

DRCOG 2035 Metro Vision Update
Today’s growing investment in costly rail expansions concurrent with broad transit service cuts
Can we manage, allocate, and price street space to favor a faster, affordable pathway to low-carbon transport?
Growing Investment in Bus Rapid Transit

Cheaper and quicker to put in place than new rail lines...
Critical elements for High Quality BRT

- Enclosed and Secure Stations
- Newer, Cleaner High-Capacity Buses
- Rapid Boarding
- Pre-board Payment and Free Transfer
- Pedestrian and Bicycle Access
- Dedicated Bus Lanes
World Class BRT Designed For High --

- **Efficiency**: pre-paid fares, wide doors, and high level boarding; priority at junctions, reserved right-of-way
- **Reliability**: real-time dispatching/operations management, real-time passenger information
- **Capacity**: stations sized for demand
- **Speed**: local & express services
- **Connectivity and directness**: inter-line routes on comprehensive network, collection & distribution off-network
- **Management effectiveness**: performance contracting with rewards and penalties
Bike-and-ride transit access:
much less costly than park-and-ride
But needs secure parking, safe routes to transit with complete streets…
Marketing & social action cultivates support, changes behavior
Information-driven services

Offer new approaches to boost mobility while reducing driving
Parking: Measure it, Manage it, Price it

Pasadena & London set parking charges to keep 85% occupancy
Can we dedicate road pricing & parking proceeds to transit, bike, communities: through innovative contract structures?
Can we help cities develop traffic cells that allow bikes and transit to pass through while blocking through traffic by cars?

Cars need to use ring road for entering other district, no direct routes
Can we revitalize dying city centers that drive elites to suburban, auto dependent developments?
Can we find cities willing to tear down highways or open up hidden waterways, like Seoul?
Oslo Put Main Artery Underground
(financing with congestion charge)
Can we ensure most new development is pedestrian and transit-oriented?
Can we optimize the logistics of bike sharing and car sharing through modeling?
Can a city phase into bike sharing with franchised bike rental and parking facilities?
How can private initiatives be accelerated?
Can we adapt Singapore’s success in road pricing and public transport investment to other cities?
Singapore’s quarterly review of toll rates

Tolls adjusted up or down to ensure traffic flows freely at least 85% of the time

Expressways

Increase

45 kph

Decrease

65 kph

Increase

CBD/Other Roads

Decrease

20 kph

30 kph
Can We Learn From Stockholm’s Success in Implementing Cordon Pricing?

Public opinion of cordon charge in Stockholm for - against:

**Before** start of tolling: 31% - 62%

**After** 6 months: 52% - 40%

After 9 months: 67% approval

"Stockholm ° the congestion tax"
How can we re-price car insurance?

Insurance fully priced based on miles driven can cut GHGs 8% and saves 2/3 of households money on insurance, with average savings of $270/car/year for these households.

- 2008 Brookings Institution study

Progressive’s My Rate™ PAYD Policy now in 7 States
### Choose coverage - Step 2 of 5

<table>
<thead>
<tr>
<th>Essentials</th>
<th>Cost per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/50/25 - Bodily injury liability coverage of $25,000 per person and $50,000 per accident. Property damage liability coverage of $25,000 for property liability.</td>
<td>3.05¢</td>
</tr>
<tr>
<td>50/100/25 - Bodily injury liability coverage of $50,000 per person and $100,000 per accident. Property damage liability coverage of $25,000 for property liability.</td>
<td>3.70¢</td>
</tr>
</tbody>
</table>

Policy administration fee

<table>
<thead>
<tr>
<th>Cost per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8¢</td>
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</table>

<table>
<thead>
<tr>
<th>Extras</th>
<th>Cost per Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical damage coverage for collision, theft, fire, hail or flood, with a $500 deductible.</td>
<td>4.76¢</td>
</tr>
<tr>
<td>Matching liability coverage for collision with an uninsured or underinsured motorist.</td>
<td>0.44¢</td>
</tr>
<tr>
<td>Towing reimbursement of up to $40, and vehicle reimbursement of up to $20 day (max $600).</td>
<td>0.13¢</td>
</tr>
<tr>
<td>Coverage for personal injury up to $2,500.</td>
<td>0.66¢</td>
</tr>
</tbody>
</table>

**Total Cost per Mile** 3.85¢
How many miles do you want? - Step 3 of 5

3.85¢ \( \times \) 2,000 \( \div \) Miles = $77.00

Per mile Miles Policy Cost

- Your policy will expire at the soonest occurrence of an odometer reading of 99,000 or the end of 07 May 2009.
- Adjust your total purchase cost by selecting the amount of miles you want. You can purchase as many as 6000 or as few as 1000 miles per policy.
How fast will we move towards time, distance & place based road use fees?

Pay more during peak periods
Pay for actual use
Pay varying rates on different roads

enabling a variety of new travel services
How can we learn from Germany’s success With GPS truck tolls?

- 2005: $.25/mile toll on trucks over 12 tons on 12,000 km autobahn system
- 50% toll premium for old dirty trucks
- US $5 billion/year revenue for road, rail, waterway transport investment
- Freight VMT & deadheading cut 7%

Can America renew its vision and commitment to invest for the future?
How can we advance near-term progress?

- Innovative transport finance
- Cutting operating costs
- Cutting red tape for sustainable transport
- Incentives for performance
- Support for local/state reforms
21st century leaders will put smart transport and development strategies at the heart of their efforts to foster healthy, economically successful cities.
For More Information

Michael Replogle
Global Policy Director and Founder
Institute for Transportation and Development Policy

1210 18th Street NW, 3rd Floor
Washington, DC 20036
mreplogle@itdp.org
212-629-8001

www.itdp.org