It’s Not
Your Father’s Transportation Program
Brief History of US Roads & Streets
Our Learned Approach

- Build it fast, build it cheap
- Faster, straighter, wider = better
- Don’t worry about land use
- Just get ‘er done
Major Phases in U.S. History

- Exploration, Initial Settlement
- Expansion of Cities & Suburbs
- New Millennium

Population growth over time:
- 1600: 100 million
- 1700: 300 million
- 1800: 600 million
- 1900: 1000 million
- 2000: 2500 million

Key events:
- 1893 Frontier Closes

Future phase: ???
Climate Change
Recession
Public Health
Congestion
Sustainability
Smart Growth
Energy
Safety
Needed: Keys to the Future
3 Keys

Transportation and the Future
Energy
Petroleum Dependency
How petroleum is used in the US

- 71% transportation
- 29% other

EIA, 2008
Sources of energy for transportation in the US

95% petroleum

5% other

EIA, 2008
Our transportation systems are almost entirely dependent on oil.
Where our oil comes from

33% domestic

67% imported

2008 US Net Petroleum Trade Deficit: $300 B

EIA, 2008
Our transportation systems are almost entirely dependent on oil imported
“Peak Oil”
The Original Hubbert Curve

M. King Hubbert (1956)
US Oil Consumption (million barrels per day)

EIA, Annual Energy Outlook 2001; "Potential Oil Production from the Coastal Plain of ANWR," - EIA Reserves & Production Division
Petroleum Demand by World Region

India & China will double their demand for petroleum by 2030

The oil is not gone...

...but the cheap oil is gone.
Those were the days!
BP’s Thunder Horse Field
Production Facility Cost:
$1 billion
BP’s Thunder Horse Field

7,000 feet
Figure 5.21  Crude Oil Refiner Acquisition Costs, 1

Summary

Nominal Dollars\(^1\) per Barrel

120-
100-
80-
60-
40-
20-
0-


Imported

Domestic

Composite

Source: Energy Information Administration
Production Cost – Sources of Oil

Production Cost Per Barrel of Oil - 2007

- **Oil Shale**: $57
- **Liquefied Coal**: $35
- **Synfuel**: $26
- **Tar Sands/Heavy Oil**: $23
- **Enhanced Recovery**: $16
- **Conventional Oil**: $9

Source: Brandt & Farrell, UC Berkeley
Will energy prices control our economic growth?
Figure 3: Energy and Income, by Country, Income, and Population (2005)

Source: Energy Pathways for the California Economy, UC Berkeley, June 2009
We have used cheap energy to drive economic growth.
Volatile Gas Prices

72 Month Average Retail Price Chart

USA Average

Regular Gas Price (US $/G)

Date (Month/Day)

©2010 GasBuddy.com
Oil prices rise, economy slows down

Rate of economic growth

Oil prices drop, economy rebounds

Oil price per barrel
“playing ping pong on a train”
EIA 2011 Fuels Outlook

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>$80/barrel</td>
</tr>
<tr>
<td>Gasoline</td>
<td>$3.00/gallon</td>
</tr>
</tbody>
</table>
World’s Two Largest Companies

$328 b

PetroChina

$315 b

Exxon Mobile

Based on market capitalization on 3/23/10

Source: New York Times 3/24/10
Maybe technology will save us?
Potential Reduction in Petroleum Consumption Through Technology

Potential for reduction in petroleum consumption through technology improvements.

- NHTSA Reg.
- 20% CAFE Increase (=28.8 mpg)
- 40% CAFE Increase (=33.6 mpg)
- 60% CAFE Increase (=38.4 mpg)

- CAFE increases include light trucks
- Beyond 2025, EIA data extrapolated

Source: NREL

Graph showing projected domestic production and potential reduction in oil use with CAFE improvements.

Ref: EIA SR/O&G/2000-02, and USGS Report 98-34

Source: NREL
Electric cars have a role to play, but...

...will be expensive and...

...will create energy demand issues.
Total Motor Vehicles in Service in US in 2010: 250,000,000

Total Electric Autos in Service by End of 2012: 100,000

0.04%
Technology will not save the day
World’s Liquid Fuels Supply

Source: EIA, AEO2009
Worldwide supply of oil

42 years

1.3 trillion barrels
The oil is not gone...

...but the cheap oil is gone.
US travel behavior is already changing...

VMT – Vehicle Miles of Travel
United States

Population & VMT

- **Population (millions)**: 166 in 1955, 227 in 1980, 296 in 2005
- **VMT (trillions)**: 0.6 in 1955, 1.5 in 1980, 3.0 in 2005

- **Population Growth**: 178%
- **VMT Growth**: 500%
United States
Annual Rate of Change in VMT

June – July
3.35% 3.59% 2.39% 0.06% 0.03% 2.80% 0%
Daily Per Capita Travel

- **Family/Personal**: 43%
- **Commuting**: 16%
- **Social/Recreational**: 27%
- **Church/School**: 10%
- **Other**: 4%

Source: 2001 NHTS
Daily Miles of Travel Per Capita

**Commute Trips**
- 1977: 5.2
- 1983: 5.0
- 1990: 6.5
- 1995: 8.7
- 2001: 7.7

Change: +2.5

**Discretionary Trips**
- 1977: 20.8
- 1983: 20.1
- 1990: 28.4
- 1995: 30.0
- 2001: 32.6

Change: +11.8

(NHTS)
Figure 1b. U.S. Vehicle Miles Traveled Per Capita, Annualized and Real Gasoline Pump Prices, January 1991–September 2008

Source: Traffic Volume Trends and Energy Information Administration
Annual Sales: New Motor Vehicles

Millions

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>15.4</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>10.4</td>
<td>13.6</td>
</tr>
</tbody>
</table>

Source: Bureau of Transportation Statistics
We are entering the Post Petroleum Era, ready or not.
2

Public Health
US Health Care
% of GDP

<table>
<thead>
<tr>
<th>Year</th>
<th>% of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>5.1</td>
</tr>
<tr>
<td>1970</td>
<td>7.0</td>
</tr>
<tr>
<td>1980</td>
<td>8.8</td>
</tr>
<tr>
<td>1990</td>
<td>12.1</td>
</tr>
<tr>
<td>2001</td>
<td>14.1</td>
</tr>
<tr>
<td>2007</td>
<td>16.3</td>
</tr>
<tr>
<td>2017</td>
<td>19.5</td>
</tr>
<tr>
<td>2020</td>
<td>&gt; 20</td>
</tr>
</tbody>
</table>

2008 transportation: 9.5%
Annual Health Care Costs/Capita

- Germany: $2,983
- Australia: $2,886
- Denmark: $2,743
- France: $3,048
- Ireland: $2,455
- Japan: $2,249
- Sweden: $2,745
- Switzerland: $3,847
- United Kingdom: $2,317
- Canada: $2,998
- United States: $5,711

Source: Kaiser Family Foundation, Visual Economics, 2010
Average Life Expectancy

<table>
<thead>
<tr>
<th>Country</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>82.1</td>
</tr>
<tr>
<td>Germany</td>
<td>79.0</td>
</tr>
<tr>
<td>Switzerland</td>
<td>81.3</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>79.0</td>
</tr>
<tr>
<td>United States</td>
<td>77.0</td>
</tr>
</tbody>
</table>

*Source: Kaiser Family Foundation, Visual Economics, 2010*
Scale – United States Economy

($ Billions/Year)

- Cost of obesity: $147
- Cost of traffic air pollution: $80
- Cost of traffic accidents: $180
Scale – United States Economy

($ Billions/Year)

Transportation impact on public health: $407

Public sector transportation expenditures: $199
1985 Obesity Trends Among U.S. Adults

No Data  <10%  10%-14%
### Health Indicators – Poor or Fair Health

#### ARIZONA

<table>
<thead>
<tr>
<th>County</th>
<th>Poor or Fair Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconino</td>
<td>11%</td>
</tr>
<tr>
<td>Maricopa</td>
<td>15%</td>
</tr>
<tr>
<td>Pima</td>
<td>14%</td>
</tr>
<tr>
<td>Pinal</td>
<td>17%</td>
</tr>
</tbody>
</table>

#### NEW MEXICO

<table>
<thead>
<tr>
<th>County</th>
<th>Poor or Fair Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandoval</td>
<td>15%</td>
</tr>
<tr>
<td>San Miguel</td>
<td>24%</td>
</tr>
<tr>
<td>Santa Fe</td>
<td>13%</td>
</tr>
<tr>
<td>Torrance</td>
<td>23%</td>
</tr>
</tbody>
</table>

#### CALIFORNIA

<table>
<thead>
<tr>
<th>County</th>
<th>Poor or Fair Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calaveras</td>
<td>23%</td>
</tr>
<tr>
<td>Mendocino</td>
<td>20%</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>27%</td>
</tr>
<tr>
<td>San Luis Obispo</td>
<td>22%</td>
</tr>
</tbody>
</table>

#### COLORADO

<table>
<thead>
<tr>
<th>County</th>
<th>Poor or Fair Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams</td>
<td>18%</td>
</tr>
<tr>
<td>Fremont</td>
<td>15%</td>
</tr>
<tr>
<td>Larimer</td>
<td>10%</td>
</tr>
<tr>
<td>Mesa</td>
<td>12%</td>
</tr>
</tbody>
</table>
Transportation & Public Health

Traffic Safety + Personal Health
PUBLIC HEALTH IS A HUGE FACTOR IN OUR ECONOMY AND IS DIRECTLY AFFECTED BY OUR TRANSPORTATION CHOICES.
3

Land Use Economics
Spatial Relationships

Community

Region

Neighborhood

Home
“Location Efficiency” = Complete Neighborhoods + Regional Access
the neighborhood

• $\frac{1}{4}$ mile radius
• 160 – 200 acres

Graphic: Doug Farr, Sustainable Urbanism
the complete neighborhood

- schools
- local retail
- services
- parks
- diverse housing
- transit

Graphic: Doug Farr, Sustainable Urbanism
the complete neighborhood

- walkable
- mixed-use
- transit-served

Graphic: Doug Farr, Sustainable Urbanism
Regional Accessibility
Place Types
* from EPA/Caltrans work
Complete, Accessible

- Urban centers
- Core neighborhoods
- Walkable places
- Good public health
- Great transit
- Good access to jobs
- Low oil dependency
- High housing costs
Complete, Low Accessibility

- Stand-alone cities
- Intact rural towns
- Walkable places
- Good public health
- Limited local transit
- Limited access to jobs
- Lower housing costs
Regional Accessibility

Incomplete, Accessible

- First tier suburbs
- Connected sprawl
- Few walkable places
- Poor public health
- Fair to good transit
- Good access to jobs
- Higher housing costs
Incomplete, Low Accessibility

- Fringe & exurban sprawl
- High oil dependency
- Tight household budgets
- Mortgage foreclosures
- Few walkable places
- Poor public health
- Poor access to jobs
- Little or no transit
Location Efficiency Outcomes

- VMT per capita
- Access to daily household needs
- Walkability, active living
- Household transportation costs
- Business transportation costs
- Economic viability
- Access to jobs & opportunities
household economics

- food
- health care
- education
- consumer expenditures
- recreation
- savings

needed for:
- housing
- transportation

available for:

common perception
share of family income spent on housing & transportation

family income = $35,000 - $50,000

central city
- housing: 23%
- transportation: 16%
- Total: 39%

near jobs
- housing: 26%
- transportation: 23%
- Total: 49%

away from jobs
- housing: 25%
- transportation: 26%
- Total: 51%

Source: A Heavy Load, Center for Neighborhood Technology
share of family income spent on housing & transportation

family income = $20,000 - $35,000

- central city: 32% housing, 22% transportation, 54% total
- near jobs: 35% housing, 31% transportation, 66% total
- away from jobs: 33% housing, 37% transportation, 70% total

Source: A Heavy Load, Center for Neighborhood Technology
household economics

available for:
- food
- health care
- education
- consumer expenditures
- recreation
- savings

needed for:
- housing
- transportation

common perception
household economics

available for:
- food
- health care
- education
- consumer expenditures
- recreation
- savings

needed for:
- housing
- transportation

actual for many working families
US Population

2005: 295 M
2030: 364 M (+23%)
2050: 392 M (+33%)

Source: US Census Bureau, 12/08
US Households

<table>
<thead>
<tr>
<th>Year</th>
<th>With Children</th>
<th>Without Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>48%</td>
<td>52%</td>
</tr>
<tr>
<td>2000</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>2040</td>
<td>26%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Source: Dr. Arthur Nelson, University of Utah
US Households - % of Growth

Source: Dr. Arthur Nelson, University of Utah
US Dwelling Units

Millions

<table>
<thead>
<tr>
<th></th>
<th>2003 Supply</th>
<th>2025 Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attached</td>
<td>27</td>
<td>44</td>
</tr>
<tr>
<td>Small Lot</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>Large Lot</td>
<td>57</td>
<td>56</td>
</tr>
</tbody>
</table>

Source: Dr. Arthur Nelson, University of Utah, JAPA 72.4
US Dwelling Units

Millions

- Attached: +17
- Small Lot: +18
- Large Lot: -1

Demand to 2025

Source: Dr. Arthur Nelson, University of Utah, JAPA 72.4
US Households

<table>
<thead>
<tr>
<th></th>
<th>2007 Supply</th>
<th>2030 Market</th>
<th>Net Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Supply</td>
<td>43</td>
<td>140</td>
<td>+ 27</td>
</tr>
<tr>
<td>2030 Market</td>
<td>116</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

Source: National Association of Realtors & SGA
this is beginning to affect developers and housing starts
Growth goes urban

Denver trails only Douglas County in metro-area population gains

By Burt Hubbard The Denver Post

Forget suburbia. Denver is the new growth hot spot in the metro area.
A U.S. Census Bureau report released today shows Denver grew faster last year than all but one of its surrounding suburban counties.

"That is amazing. It doesn't surprise me (it grew), but I didn't realize it was at such a fast rate," said Denver City Councilman Michael Hancock.

Denver wasn't the only growth superstar in Colorado, according to the report. The Greeley metro area, consisting of Weld County, was the fourth fastest-growing metro area in the nation since 2000.
And five Western Slope counties, led by energy-rich Garfield County, ranked in the top 10 in population gains in Colorado in the 12 months ending in July 2008. The report showed Denver's population grew 2.7 percent in the 12 months ending July 2008, adding about 16,000 people since July 2007 and falling just short of 600,000.

Only Douglas County, at 3.5 percent, grew faster in the seven-county metro area. It's the first time this decade that Denver has grown faster than most of its suburbs.

Jeff Hornby, chief economist for the Denver Office of Economic Development, said a resurgence CENSUS = 12A

Denver's growth
Denver's population last year grew faster than all but one of its neighboring suburban counties, the first time that has happened this decade.

<table>
<thead>
<tr>
<th>City</th>
<th>Percent change 2001-02</th>
<th>Percent change 2007-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broomfield</td>
<td>2.6%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Douglas</td>
<td>3.5%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Adams</td>
<td>2.4%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>-0.5%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Denver</td>
<td>2.7%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Jefferson</td>
<td>1.9%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Boulder</td>
<td>0.7%</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau
Share of New Housing Starts by Regional Location – Denver Region

<table>
<thead>
<tr>
<th>Year</th>
<th>Suburbs and Rural</th>
<th>Central City (Denver)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-95</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>2003-08</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>2008</td>
<td>32%</td>
<td>68%</td>
</tr>
</tbody>
</table>
## Walkability and House Value*

<table>
<thead>
<tr>
<th>City</th>
<th>Walkability Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austin, TX</td>
<td>+ $24,871</td>
</tr>
<tr>
<td>Dallas, TX</td>
<td>+ $4,278</td>
</tr>
<tr>
<td>Fresno, CA</td>
<td>+ $7,427</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>+ $18,689</td>
</tr>
<tr>
<td>Sacramento, CA</td>
<td>+ $34,345</td>
</tr>
<tr>
<td>San Francisco, CA</td>
<td>+ $32,837</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>+ $19,789</td>
</tr>
<tr>
<td>Tucson, AZ</td>
<td>+ $10,841</td>
</tr>
</tbody>
</table>

* difference in house value: citywide median WalkScore compared to 75 percentile and above
Walkable, mixed-use urbanism will be the primary market for new housing

- **Walkable, mixed-use urbanism – housing stock available in 2010**: 5%
- **Walkable, mixed-use urbanism – housing demand to 2040**: 33%

Chris Leinberger, Brookings Institution
76 million seniors
78 million millennials

two largest generations, same housing market: mixed-use, transit-served, walkable neighborhoods
3 Keys

Transportation and the Future
Implications – Federal Policy
Reducing Our Vulnerability
Triple Bottom Line

- Economy
- Environment
- Equity
“Sustainability”

...meeting the needs of the present without compromising the ability of future generations to meet their needs.

U.N. World Commission, 1987
How We Spend Money
Single Purpose Spending

Transportation

Housing

Public Health

Environment

Energy
Integrated, Strategic Investment

- Housing
- Transportation
- Energy
- Environment
- Public Health

$$$

Integrated, Strategic Investment
Interagency Partnership for Livable Communities
How We Plan
Old School Transportation Planning

Population & Land Use Forecasts (negotiations) → Modeling of Future Traffic → Alternative 1 → Alternative 2 → Alternative 3
Scenario Planning

**COMMUNITY VISION**

- Land Use Scenario 1
- Land Use Scenario 2
- Land Use Scenario 3

- Transportation Scenario 1
- Transportation Scenario 2
- Transportation Scenario 3

Modeling, analysis of multiple factors, including traffic
Our Next Big National Infrastructure Program
50s – 70s: Interstate Highway System
70s – Today: Urban Rail Transit
Rail Cities in the United States (as of 1971)
Rail Cities in the United States (as of 2006)
Rail Cities in the United States (by 2021)
21st Century: Intercity Rail System
High Speed Rail
Many western city pairs fall into feasible HSR range (100 – 600 m)
wrap up
Energy
Petroleum Dependency
Public Health
Transportation & Public Health

Traffic Safety + Personal Health
3

Land Use Economics
the complete neighborhood

- walkable
- mixed-use
- transit-served
Place Types

* from EPA/Caltrans work
Implications – Federal Policy
Integrated, Strategic Investment

- Public Health
- Housing
- Transportation
- Energy
- Environment
It’s Not
Your Father’s Transportation Program
Thanking You

www.charlier.org