Purpose and Need

CE 492
Environmental Impact
Assessment

Some Basics

- Decisions are based on tradeoffs between alternatives based on their
  - Benefits (improvements in system performance, compared to no action)
  - Costs
  - Side effects (impacts)

Environmental Impact Assessment

- May apply to many types of projects – transportation, environmental, structural, plans, permits
- For "any major Federal action having a significant impact on the Environment" (NEPA law)
  - Terms defined by past practices, legal proceedings
  - You don't know if it is significant unless you assess it - EIA

Possible Actions

- Categorical exclusion – actions that are by definition (guideline), not significant
- Environmental Impact Statement – For actions that always require an EIS
- Environmental Assessment _ not sure, do an analysis to see if it is significant, if not, there is a finding of no significant impact (FONSI)

Purpose and need answers the fundamental question – Why?

- What is the problem?
- What are the goals?
- What deficiencies?
- How are they measured?

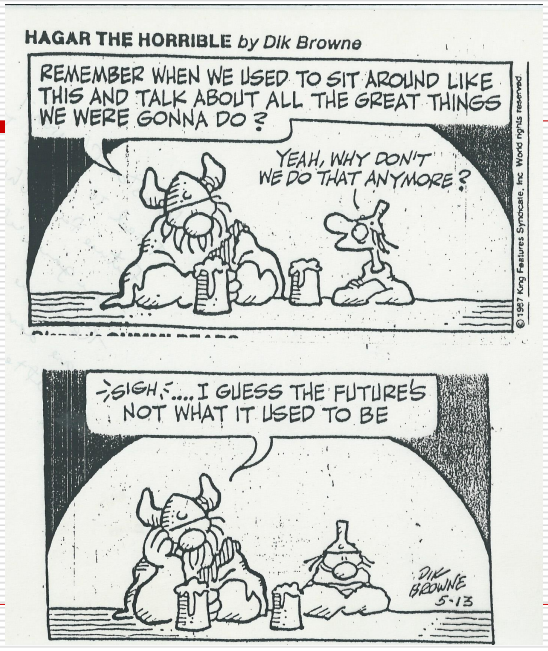
Possible Problems

- Safety – crash rates and severity
- Congestion – when and how often
- Economic Development
- Environmental deficiencies
- Community Concerns
- Structural deficiency
- Other issues
- Combinations

The Future

The Future?

- Year of birth plus 75
- Issues
  - **Population growth and change**
  - Sustainability (money, energy, work force)
  - Climate Change
  - Changing values



Global Trends

The world economy multiplied sevenfold since 1955; water use tripled; demand for sea food increased fivefold; carbon dioxide emissions increased fourfold…yet **none** of the earth's natural systems have increased their capacity to deal with these demands.

The Futures Corporation

Growth Trends…

- The World Population Data Sheet estimates the global population will rise 46 percent between 2003 and 2050, hitting 9 billion by 2050 (13B is considered sustainable)
- The U.S. population is expected to grow 45 percent - to 422 million - in that time

Did You Know…

Two-thirds of all the men and women who have ever lived past 65 in the **entire history** of the world are alive today.

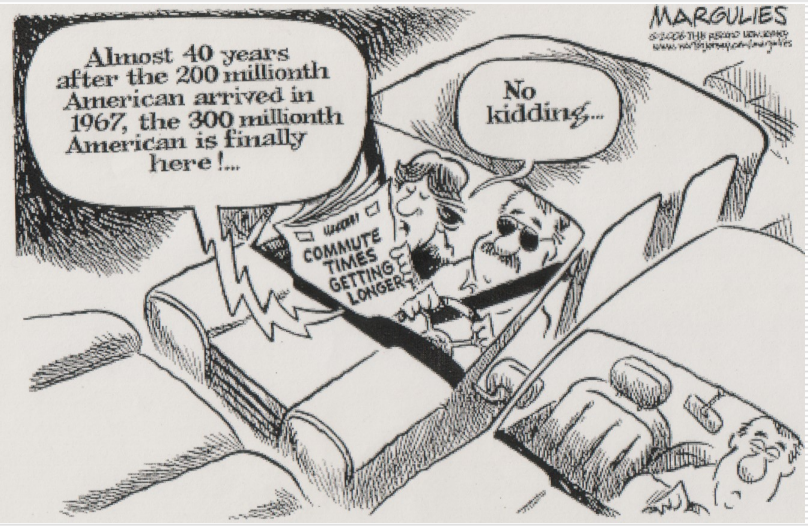
The Futures Corporation

Did You Know…

- 80% of the scientists, engineers, and doctors who ever lived are alive today and exchanging ideas in real time on the Internet.
- All the technical knowledge we work with today will represent only **1%** of the knowledge that will be available in 2050.

Did You Know…

- The U.S. population is expected to increase to 376 million by 2030.
- That's 94 million more people than there were in 2000.
- About half of the homes, office buildings, stores and factories needed by 2030 don't exist today (i.e. growth will continue).



Did You Know...

- For 50 years, families with children drove America's housing industry.
- But now, married couples with children make up less than 25 percent of American households.

Did You Know...

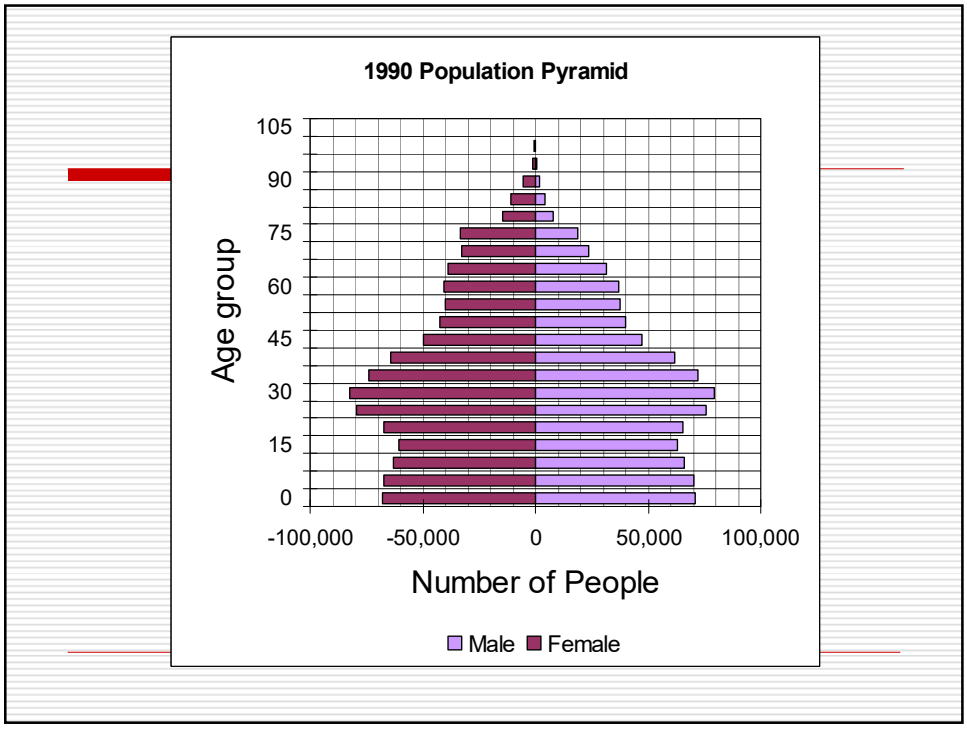
- Today's fastest growing households are:
  - Young professionals
  - Empty nesters
  - Single parents
  - Couples without children
  - Senior citizens
- They create increasing demand for:
  - the Live/Work/Walk experience
  - Apartments, condos and townhouses

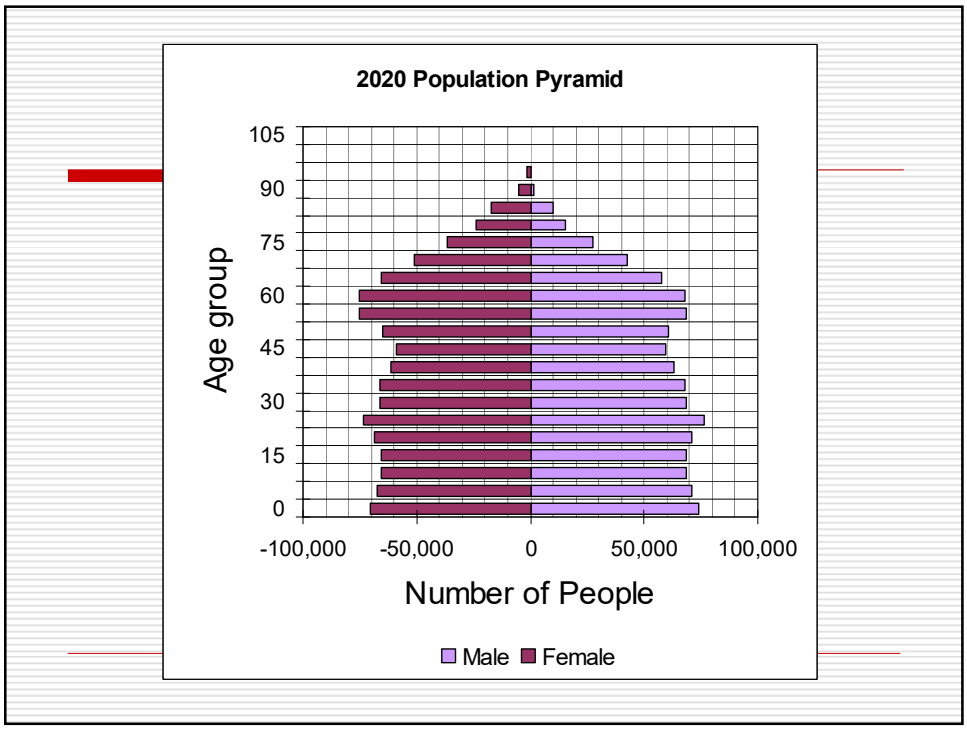
Did You Know...

- Demand for higher density homes will hit new highs by 2015 due to an influx of:
  - 78 million downsizing Baby Boomers
  - children of the Baby Boomers graduating from college
  - 9 million new immigrants

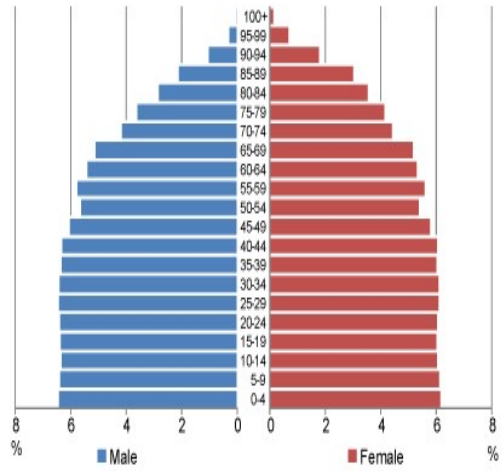
An aging population

- Increases in the portion of older cohorts, less younger
- Higher proportions of women by age
- Lower driving rates by older cohorts
- Changes in housing demand – density and location
- Need for alternatives to maintain independent living


1990 Population Pyramid
105
90
75
60
45
30
15
0
Age group
-100,000
-50,000
0
50,000
100,000
Number of People
Male
Female


2020 Population Pyramid
105
90
75
60
45
30
15
0
Age group
-100,000
-50,000
0
50,000
100,000
Number of People
Male
Female

2050


100+
95-99
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60-64
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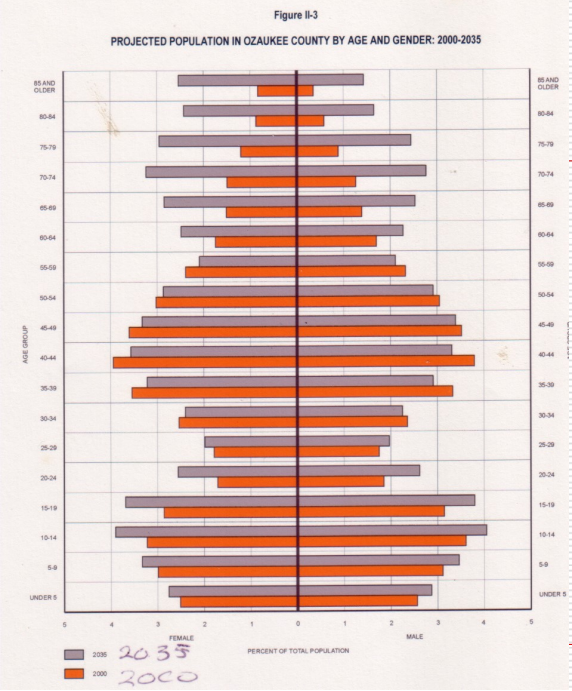
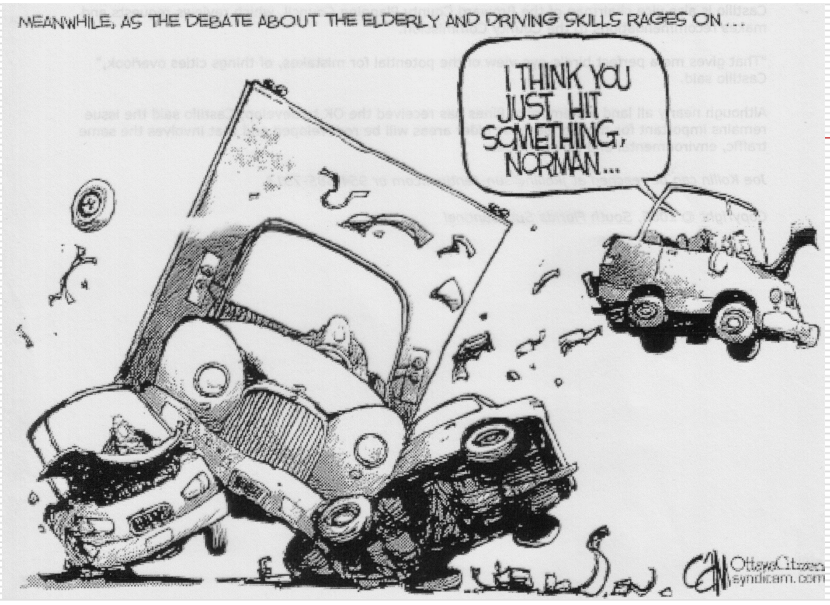


Figure II-3
PROJECTED POPULATION IN OZAUKEE COUNTY BY AGE AND GENDER: 2000-2035
85 AND OLDER
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
UNDER 5
AGE GROUP
5 4 3 2 1 0 1 2 3 4 5
FEMALE
MALE
PERCENT OF TOTAL POPULATION
2035
2000
2035
2000

Animations

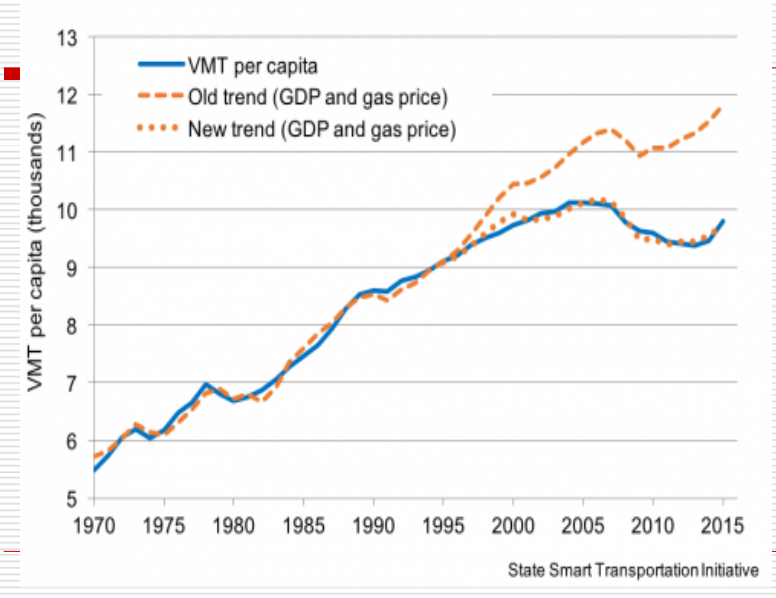
- See http://www.visualcapitalist.com/us-population-pyramid-1980-2050/



Did You Know…

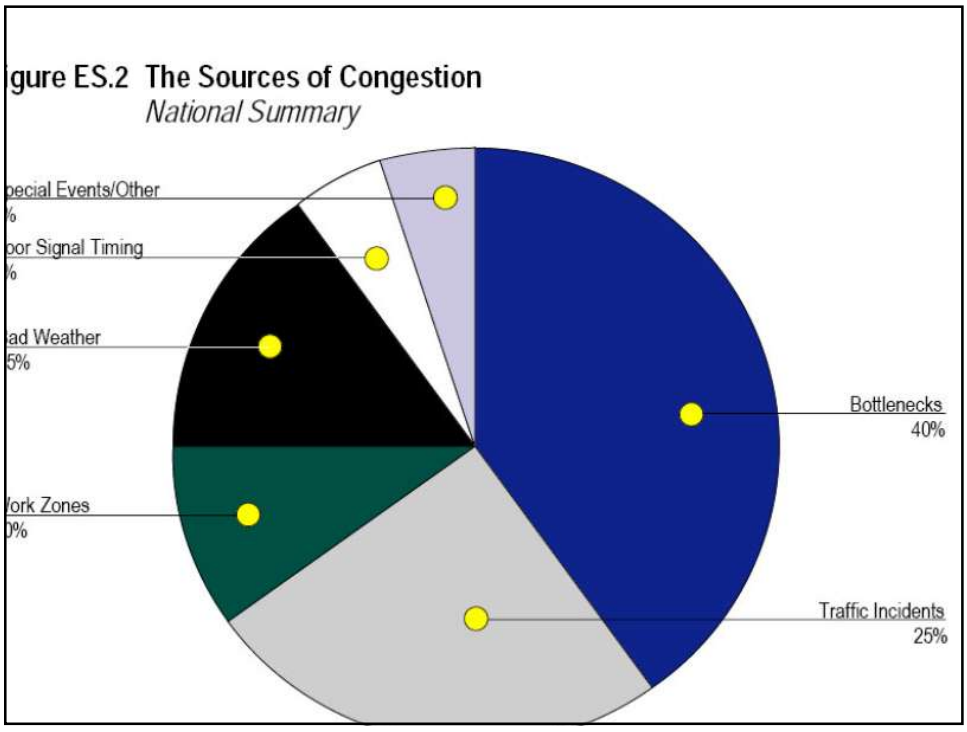
There will be significant increase in surface transportation - especially trucking - due to improvements in JIT systems and growth in E-commerce orders.

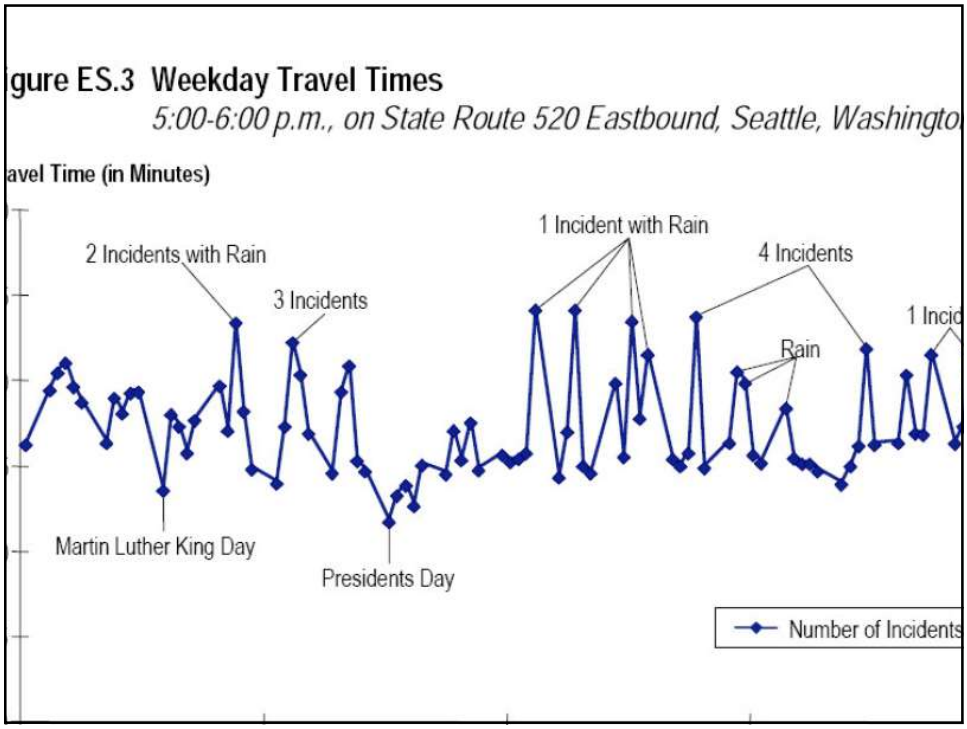
Traffic congestion will continue to grow and burden cities; growth in multimodal transportation will occur with increasing options for mass transit service.



How is the System Performing?

Traffic Congestion and Safety Drives the 'Purpose and Need' for Most Transportation Projects





Texas A&M Mobility Report 2015

National Congestion Tables

Table 1. What Congestion Means to You, 2014

Urban Area	Yearly Delay per Auto Commuter		Travel Time Index		Excess Fuel per Auto Commuter		Congestion Cost per Auto Commuter	
	Hours	Rank	Value	Rank	Gallons	Rank	Dollars	Rank
Very Large Average (15 areas)	**63**		**1.32**		**27**		**1,433**	
Washington DC-VA-MD	82	1	1.34	8	35	1	1,834	1
Los Angeles-Long Beach-Anaheim CA	80	2	1.43	1	25	11	1,711	3
San Francisco-Oakland CA	78	3	1.41	2	33	3	1,675	4
New York-Newark NY-NJ-CT	74	4	1.34	8	35	1	1,739	2
Boston MA-NH-RI	64	6	1.29	17	30	4	1,388	9
Seattle WA	63	7	1.38	3	28	8	1,491	5
Chicago IL-IN	61	8	1.31	14	29	5	1,445	7
Houston TX	61	8	1.33	10	29	5	1,490	6
Dallas-Fort Worth-Arlington TX	53	11	1.27	19	22	23	1,185	14
Atlanta GA	52	12	1.24	25	20	44	1,130	22
Detroit MI	52	12	1.24	25	25	11	1,183	15
Miami FL	52	12	1.29	17	24	15	1,169	17
Phoenix-Mesa AZ	51	17	1.27	19	25	11	1,201	13
Philadelphia PA-NJ-DE-MD	48	22	1.24	25	23	18	1,112	26
San Diego CA	42	43	1.24	25	11	92	887	61

Very Large Urban Areas—over 3 million population. Medium Urban Areas—over 500,000 and less than 1 million population.
Large Urban Areas—over 1 million and less than 3 million population. Small Urban Areas—less than 500,000 population.
Yearly Delay per Auto Commuter—Extra travel time during the year divided by the number of people who commute in private vehicles in the urban area.
Travel Time Index—The ratio of travel time in the peak period to the travel time at free-flow conditions. A value of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak period.
Excess Fuel Consumed—Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.
Congestion Cost—Value of travel time delay (estimated at $17.67 per hour of person travel and $94.04 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon for gasoline and diesel).
Note: Please do not place too much emphasis on small differences in the rankings. There may be little difference in congestion between areas ranked (for example) 6th and 12th. The actual measure values should also be examined. The best congestion comparisons are made between similar urban areas.

Texas A&M Mobility Report 2015

Table 1. What Congestion Means to You, 2014, Continued

Urban Area	Yearly Delay per Auto Commuter		Travel Time Index		Excess Fuel per Auto Commuter		Congestion Cost per Auto Commuter	
	Hours	Rank	Value	Rank	Gallons	Rank	Dollars	Rank
Large Average (31 areas)	45		1.23		21		$1,045	
San Jose CA	67	5	1.38	3	28	8	1,422	8
Riverside-San Bernardino CA	59	10	1.33	10	18	62	1,316	10
Austin TX	52	12	1.33	10	22	23	1,159	20
Portland OR-WA	52	12	1.35	7	29	5	1,273	11
Denver-Aurora CO	49	19	1.30	16	24	15	1,101	28
Oklahoma City OK	49	19	1.19	42	23	18	1,110	27
Baltimore MD	47	23	1.26	21	21	32	1,115	25
Minneapolis-St. Paul MN	47	23	1.26	21	18	62	1,035	38
Las Vegas-Henderson NV	46	27	1.26	21	21	32	984	42
Orlando FL	46	27	1.21	34	21	32	1,044	34
Nashville-Davidson TN	45	29	1.21	34	22	23	1,168	18
Virginia Beach VA	45	29	1.19	42	19	51	953	46
San Antonio TX	44	33	1.25	24	20	44	1,002	38
Charlotte NC-SC	43	35	1.23	29	17	70	963	44
Indianapolis IN	43	35	1.18	46	23	18	1,060	30
Louisville-Jefferson County KY-IN	43	35	1.20	37	22	23	1,048	32
Memphis TN-MS-AR	43	35	1.19	42	21	32	1,080	29
Providence RI-MA	43	35	1.20	37	21	32	951	47
Sacramento CA	43	35	1.23	29	19	51	958	45
St. Louis MO-IL	43	35	1.16	65	21	32	1,020	37
San Juan PR	43	35	1.31	14	24	15	1,150	21
Cincinnati OH-KY-IN	41	45	1.18	46	21	32	989	40
Columbus OH	41	45	1.18	46	20	44	933	49
Tampa-St. Petersburg FL	41	45	1.21	34	18	62	907	57
Kansas City MO-KS	39	51	1.15	76	18	62	933	49
Pittsburgh PA	39	51	1.19	42	21	32	889	59
Cleveland OH	38	55	1.15	76	22	23	887	61
Jacksonville FL	38	55	1.18	46	15	78	842	72
Milwaukee WI	38	55	1.17	54	22	23	987	41
Salt Lake City-West Valley City UT	37	66	1.18	46	22	23	1,059	31
Richmond VA	34	77	1.13	88	14	84	729	82

Large Urban Areas—over 1 million and less than 3 million population.
Yearly Delay per Auto Commuter—Extra travel time during the year divided by the number of people who commute in private vehicles in the urban area.
Travel Time Index—The ratio of travel time in the peak period to the travel time at free-flow conditions. A value of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak period.
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Note: Please do not place too much emphasis on small differences in the rankings. There may be little difference in congestion between areas ranked (for example) 6th and 12th. The actual measure values should also be examined. The best congestion comparisons are made between similar urban areas.

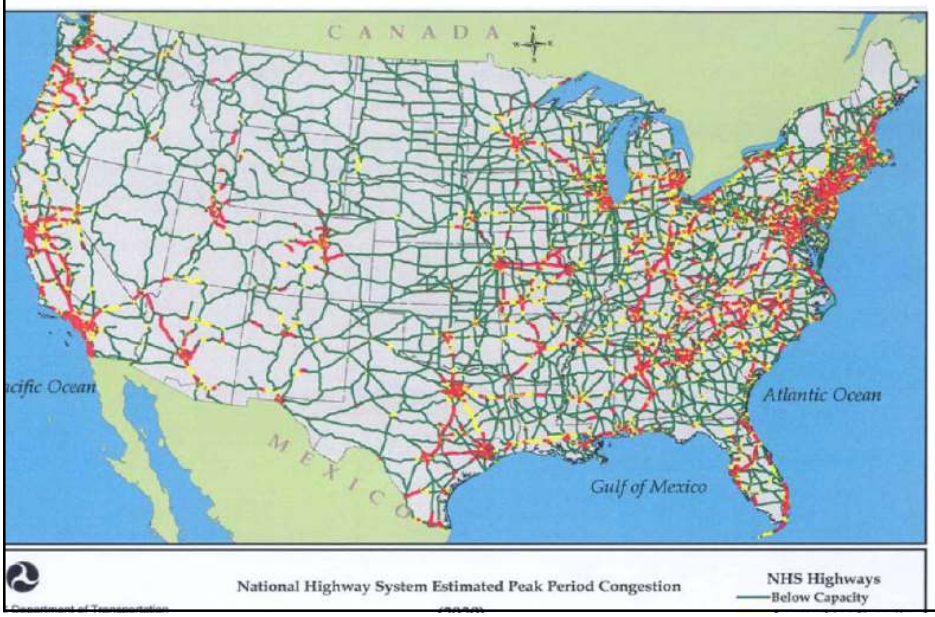
igure 3.16 Congested Highways (1998)

S Department of Transportation

National Highway System Estimated Peak Period Congestion
(1998)

NHS Highways
Below Capacity

gure 3.17 Potentially Congested Highways (2020)

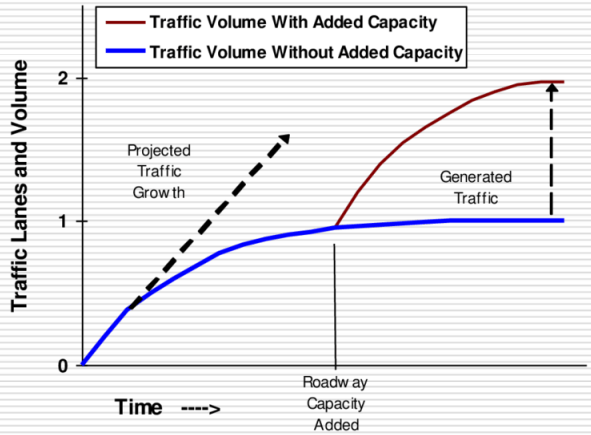


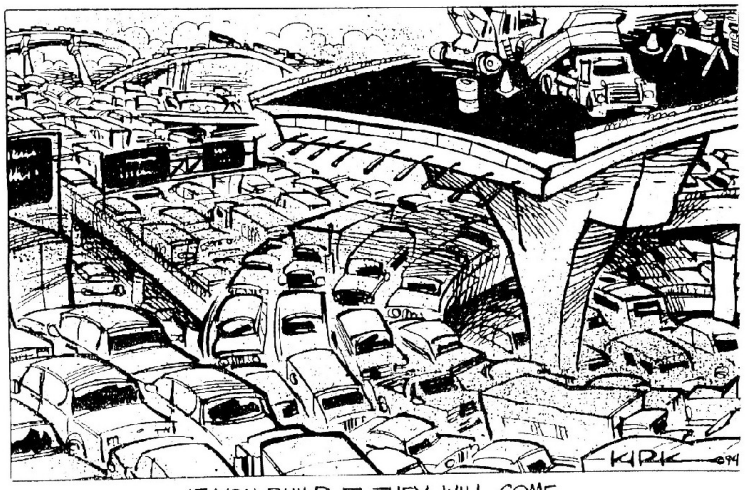
Congestion Alternatives

- Add capacity
- Improve operations
- Improved technology
- Demand management
- Modal alternatives, life style changes
- Live with it

Equilibrium

- In large urban areas, supply and demand reach an equilibrium, they are in balance.
- Additions or reductions in capacity will lead to traffic shifts to or from other routes, other modes, other times of day, induced travel, etc.
- Demand will be attracted to the new facility until there is a new equilibrium
- The result is a similar level of congestion after the investment as before





IF YOU BUILD IT, THEY WILL COME.

Guest cartoon by Kirk Anderson, Madison

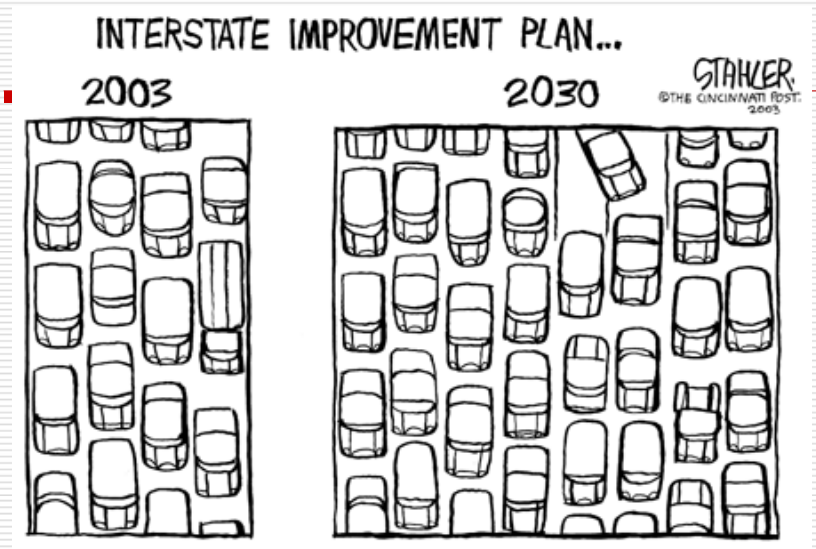
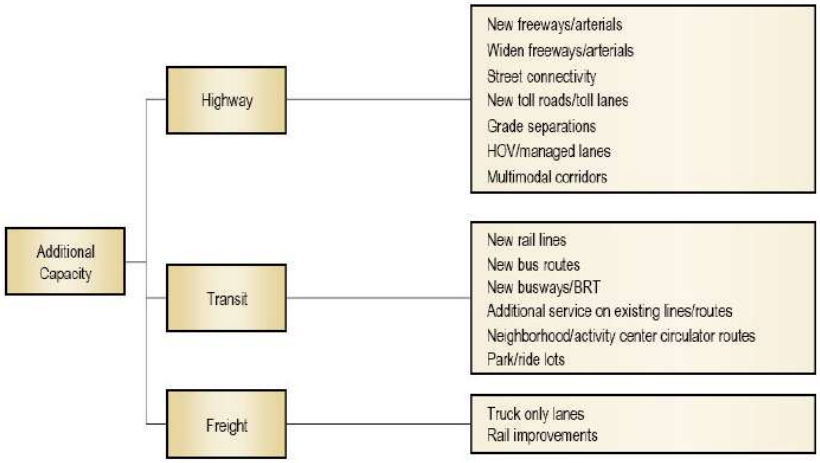
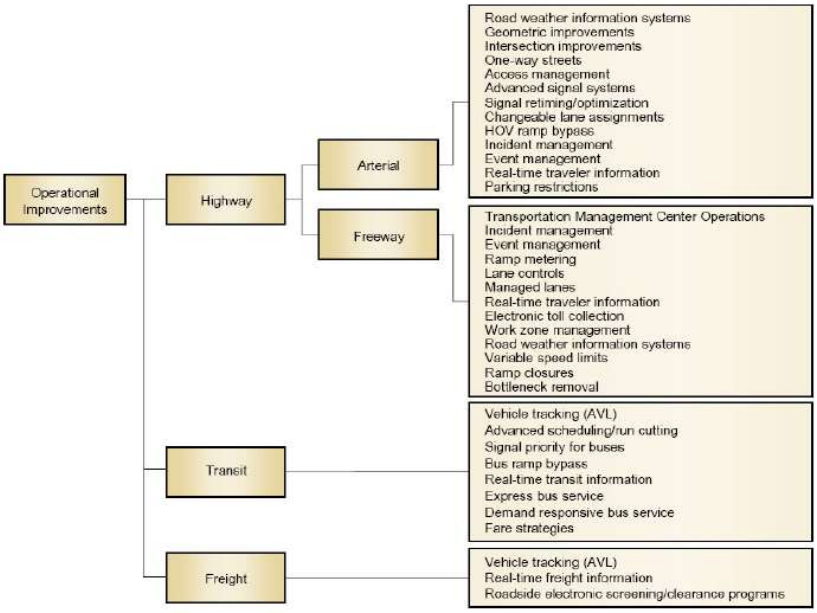
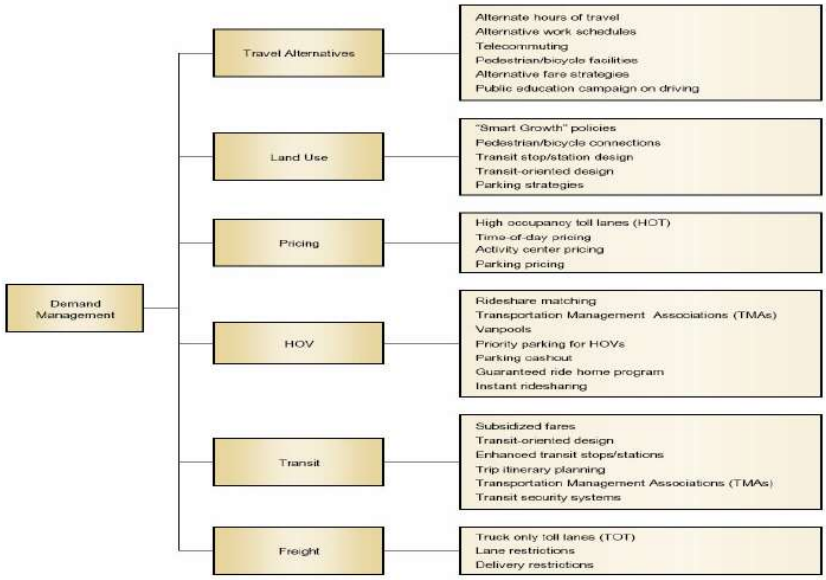


Figure 4.1 A Variety of Strategies, When Used in Combination, Can Effectively Deal with Congestion







Sustainability Briefly

- Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs. (UN World Commission on Economic Development, 1987)
- Resources renew themselves at the same rate or faster than they are used.
- Example: sustainable forest: It supplies fuel, lumber, natural communities and food at a rate less than the rate they are consumed - forever.

Collapse?

- A system that is not sustainable is a Ponzi scheme – borrow resources from the future to pay for the present
- **A system that is not sustainable will eventually collapse,**
- The only questions are
  - When and how the collapse will occur?,
  - What happens during the collapse?
  - What needs to be done to cushion the collapse?

What resources are we concerned about in transportation?

- In a sustainable system, resources need to renew themselves at the same rate or faster than they are used.
  - **Money**
  - People
  - Materials
  - Energy
  - Air, water and climate

Climate Change briefly

- As population grows and becomes more prosperous, the demand for resources (materials, people, energy, money etc.) increases
- Carbon is taken out of the ground and put into the air, CO_2 Concentration increases, changing the climate.
- 36 billion metric tons CO_2/yr global, 16 tons/person U.S. 34,000 pounds, 2000 gallons
- Risk analysis is the prudent approach – Prepare for the worst, hope for the best.
- Most things that deal with a changing climate are good things to do anyways. Most are fairly simple to accomplish (i.e. larger culverts)

Strategies

- Prevention: Reverse or stabilize growth in carbon emissions – Paris agreement, etc.
- Adaptation: Adapt systems to accommodate climate extremes and change, minimize negative affects
- Combination:

"In Stultus Et"

the ONION

WEATHER Page 8B

No pressure system to bring storms whenever they're ready

LOW 40 HIGH 54

DECEMBER 8, 2011 • VOL. 47 ISSUE 49

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INSIDE

HIGHLIGHTS

Report: Global Warming May Be Irreversible By 2006

If global warming isn't under control by 2006, scientists say it will achieve unstoppable momentum, destroying the only planet we have.

GENEVA—A new report from the U.N. Intergovernmental Panel on Climate Change warned Monday that global warming is likely to become completely irreversible if no successful effort is made to slow down the trend before 2006.

Unless greenhouse-gas emissions are drastically reduced by then, the report concludes, it will be too late to avoid inflicting a grave environmental catastrophe upon future generations of humans.

"We have absolutely no time to waste," said Dr. William Tumminelli, lead author of the report, which stresses it is utterly crucial the world cut its carbon footprint in half by the year 2000. "If we wait until 1998 or even 1995 to really start doing something about climate change, our planet's rising temperature will already have set in motion a series of devastating and irreparable long-term consequences. We need to have strict international rules in place well ahead of 2006 or, to be blunt, many of the earth's inhabitants will be doomed."

"The situation could not possibly be more urgent," Tumminelli added.

The report—the most comprehensive study of its kind ever undertaken—estimates the failure to address global warming immediately could result in sea levels rising 6 inches by the end of the 20th century, 2000-2009 being the hottest decade ever re-

see IRREVERSIBLE, page 11

In Major Gaffe, Obama Forgets To Dumb It Down

Study Finds Getting Smacked Right In The Mouth With A Goddamn Tree Branch Really Sucks

- 'But After A Minute, You're Basically Fine,' Researchers Say