

### **A) Understanding the benefits of High Density Development on:**

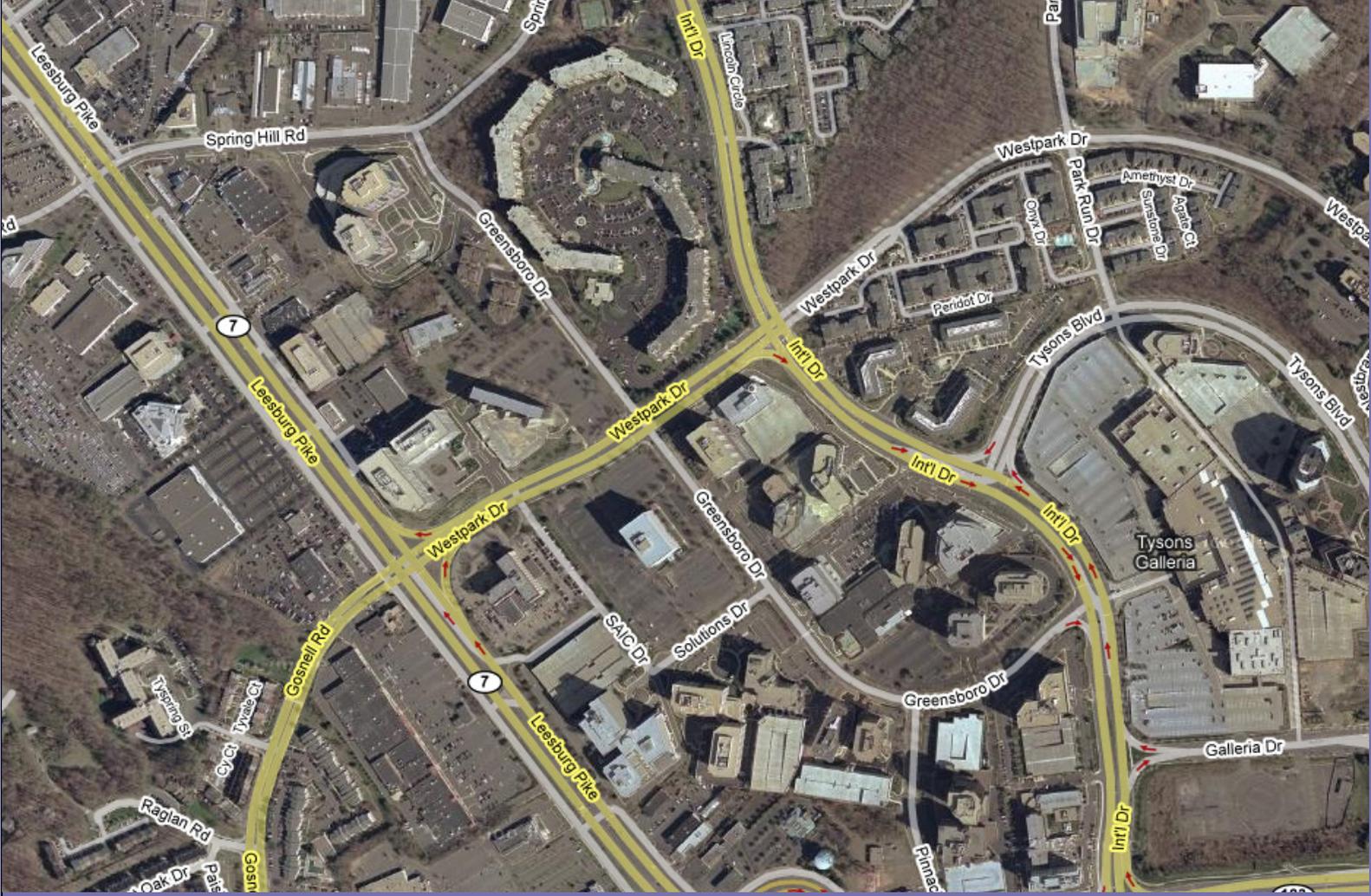
- Growth
- Health
- Pollution
- City Grid Design
- Social Capital
- Mental Health

### **B) Understanding the benefits of “Green” High Density Development on:**

- Stormwater Management
- Water Consumption
- Waste Water Treatment
- Energy Consumption / “Power” & “Gasoline”
- Recycling
- Productivity & Health

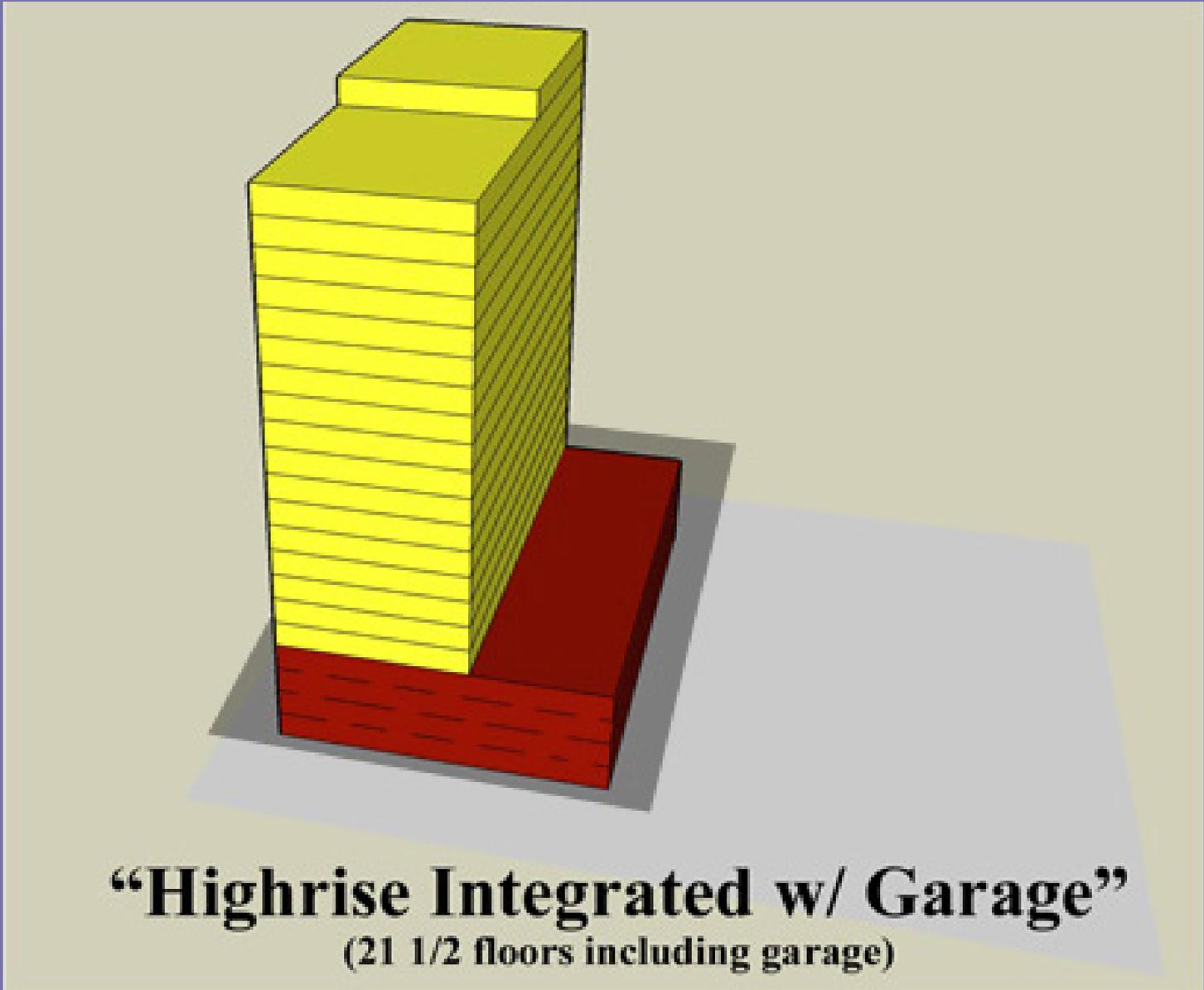
# TYSONS WEST

## Benefits of High Density



# TYSONS WEST

## Benefits of High Density



**“Highrise Integrated w/ Garage”**  
(21 1/2 floors including garage)



# TYSONS WEST

## Benefits of High Density

# City Grid



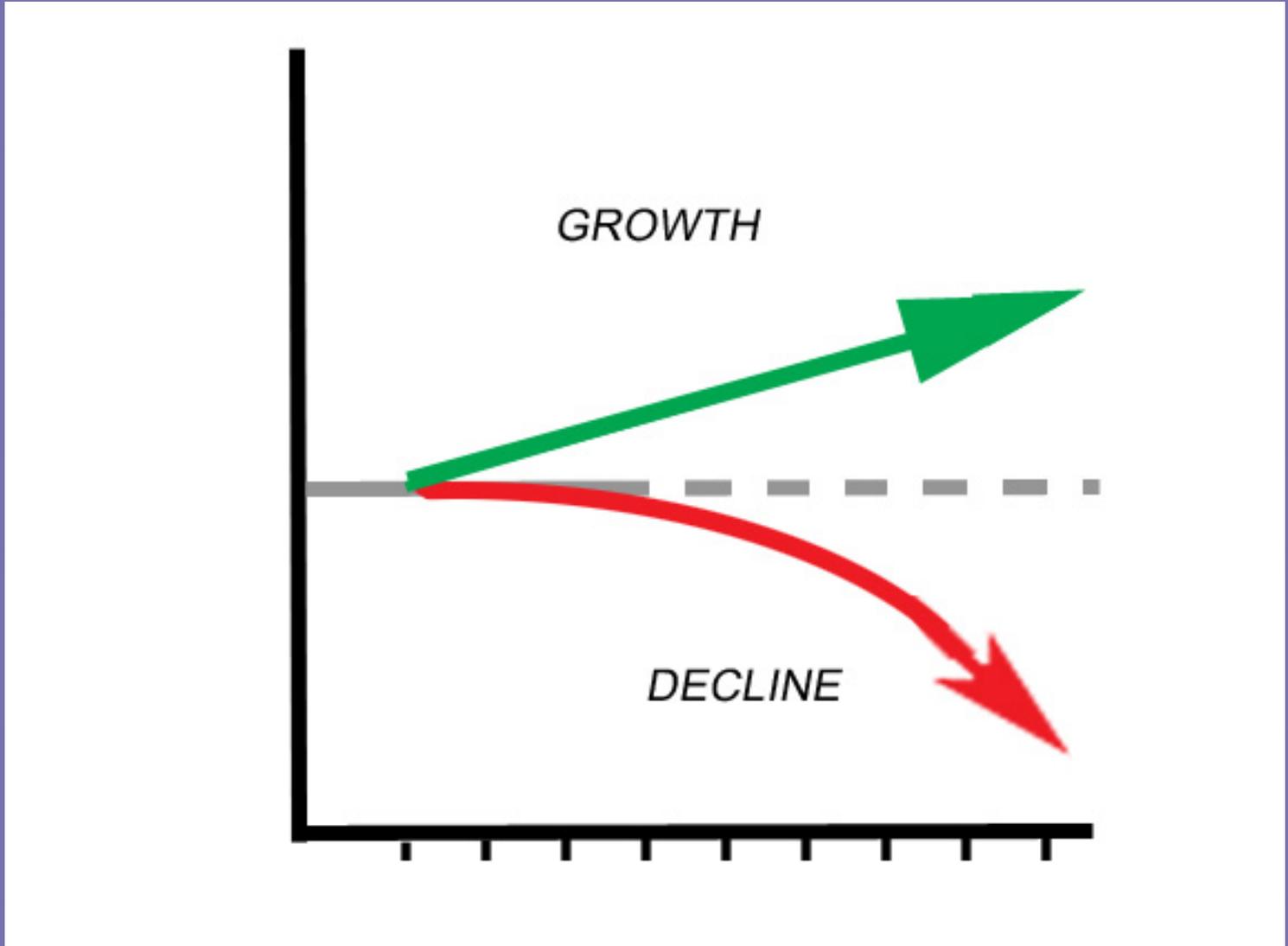
# TYSONS WEST

## Benefits of High Density



# TYSONS WEST

## Benefits of High Density



# TYSONS WEST

## Benefits of High Density



"The highway's tied up. You'll have to make an appointment."



It's not the destination, but the journey that counts.



Unless you're stuck in traffic.  
Then it's the destination.

**TYSONS WEST**

**Benefits of High Density**

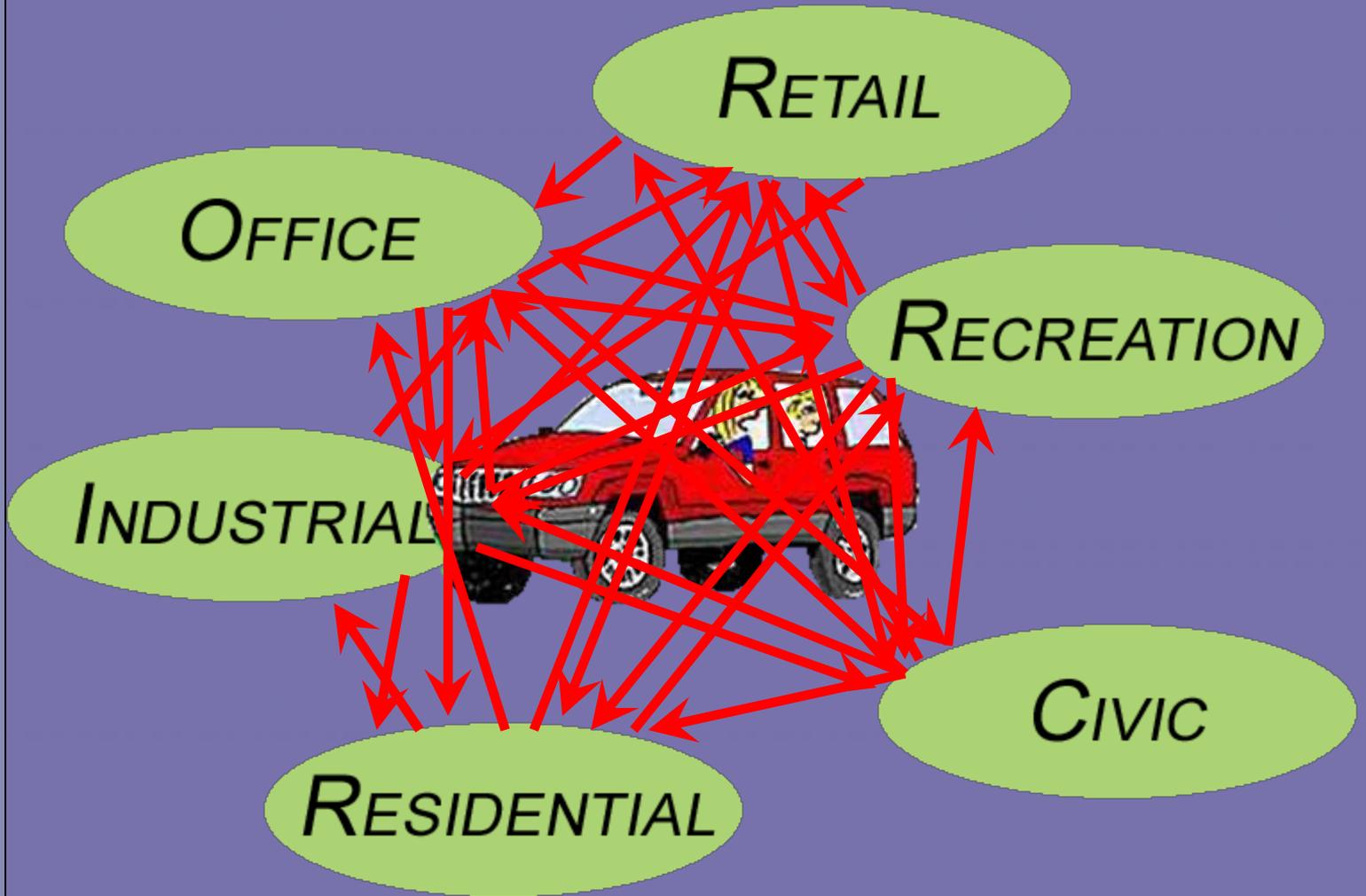
# Congestion Solution



# TYSONS WEST

Benefits of High Density

## Spot Zoning



# TYSONS WEST

## Benefits of High Density

# Amenity Rich Communities



# TYSONS WEST

## Benefits of High Density

# Walkable Streets



# TYSONS WEST

## Benefits of High Density



# TYSONS WEST

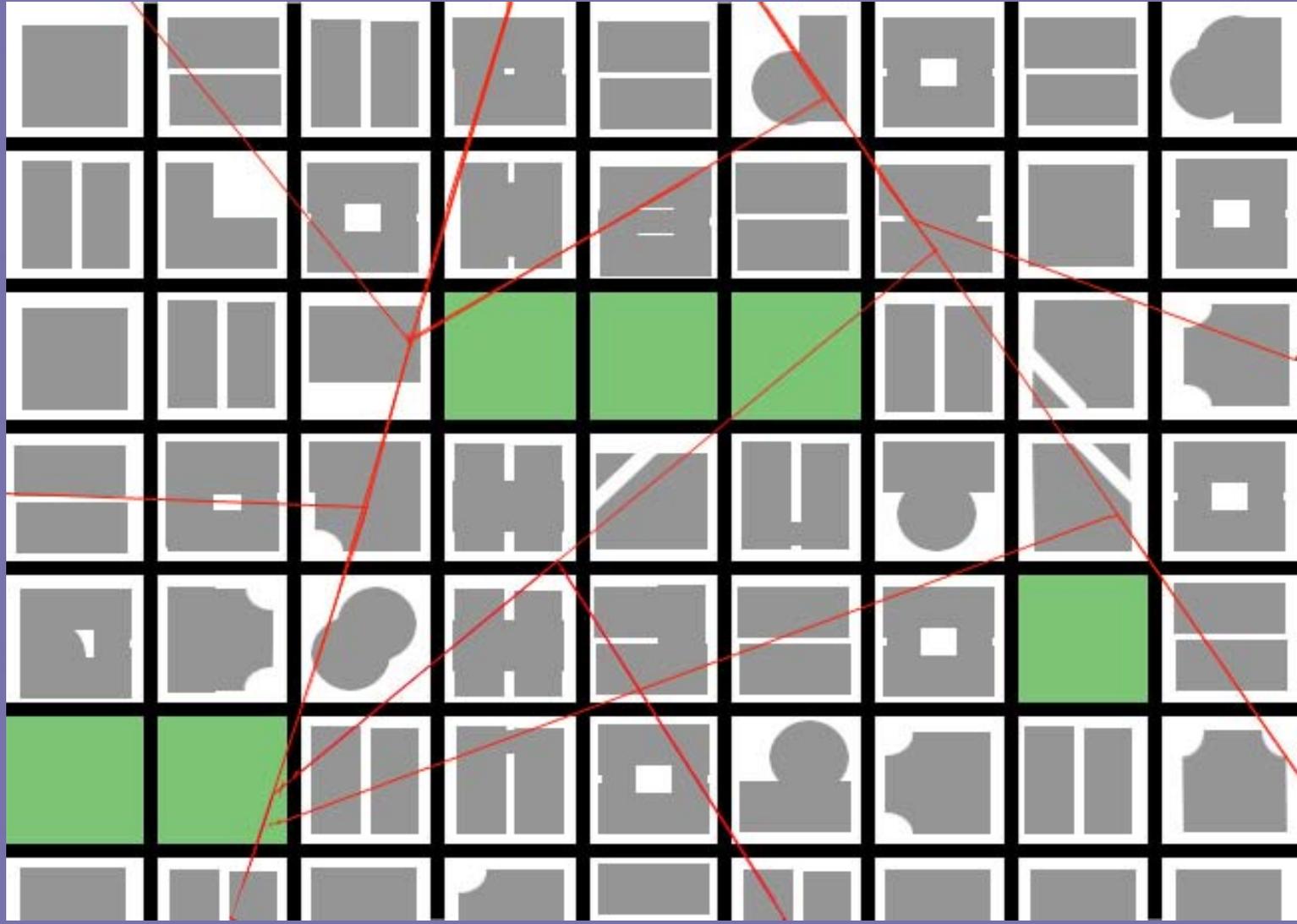
## Benefits of High Density

# City Grid

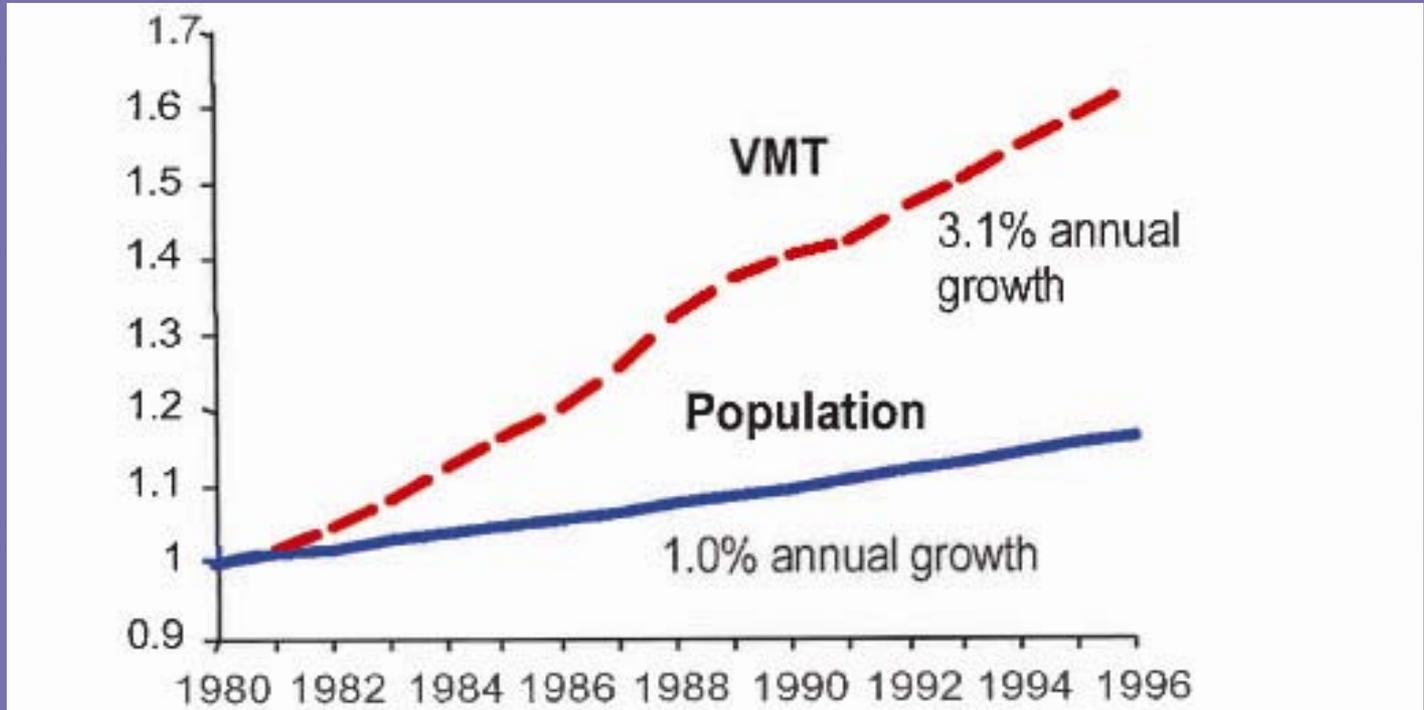


# TYSONS WEST

## Benefits of High Density



# Vehicle Miles Traveled (VMT) & Growth

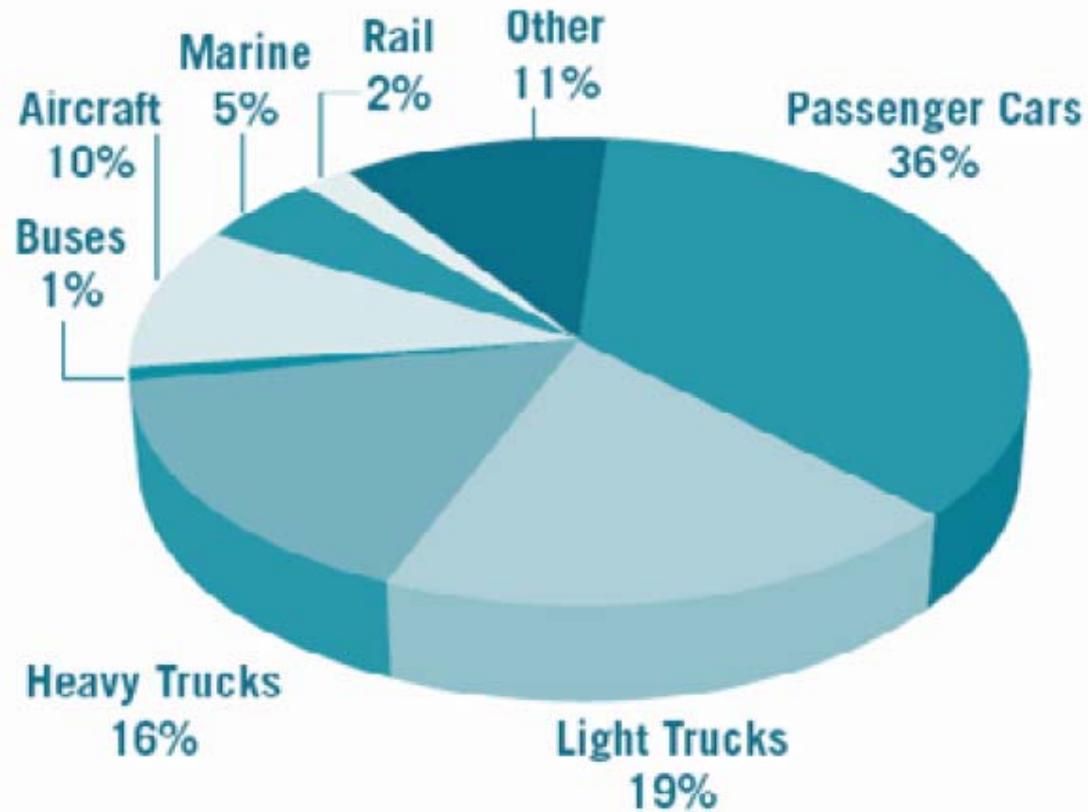


Scale: 1980 value = 1.0

Sources: U.S. Department of Transportation, Federal Highway Administration. Highway Statistics (Summary to 1995, and annual editions, 1996 and 1997), Washington, and Environmental Protection Agency, *Our Built and Natural Environment*.

### Transportation GHG Emissions

by Mode, 2000



Source: U.S. EPA, 2002, Table 1-14.

**TYSONS WEST**

**Benefits of High Density**

# **Air Pollution Causes**

**Increased Mortality**

**Respiratory Illness**

**Impaired Cardio Vascular  
Functions**

**Increased Cancer Risk**

**64,000 people die  
prematurely each year**



**TYSONS WEST**

**Benefits of High Density**



## **Air Pollution**

**The Tysons Corner  
Commuters Today  
Consume Approx.**

**132,000 Gallons,**

**and Produce**

**2,641,000 lbs of CO<sub>2</sub>**

**Daily**

# **Density Benefit**

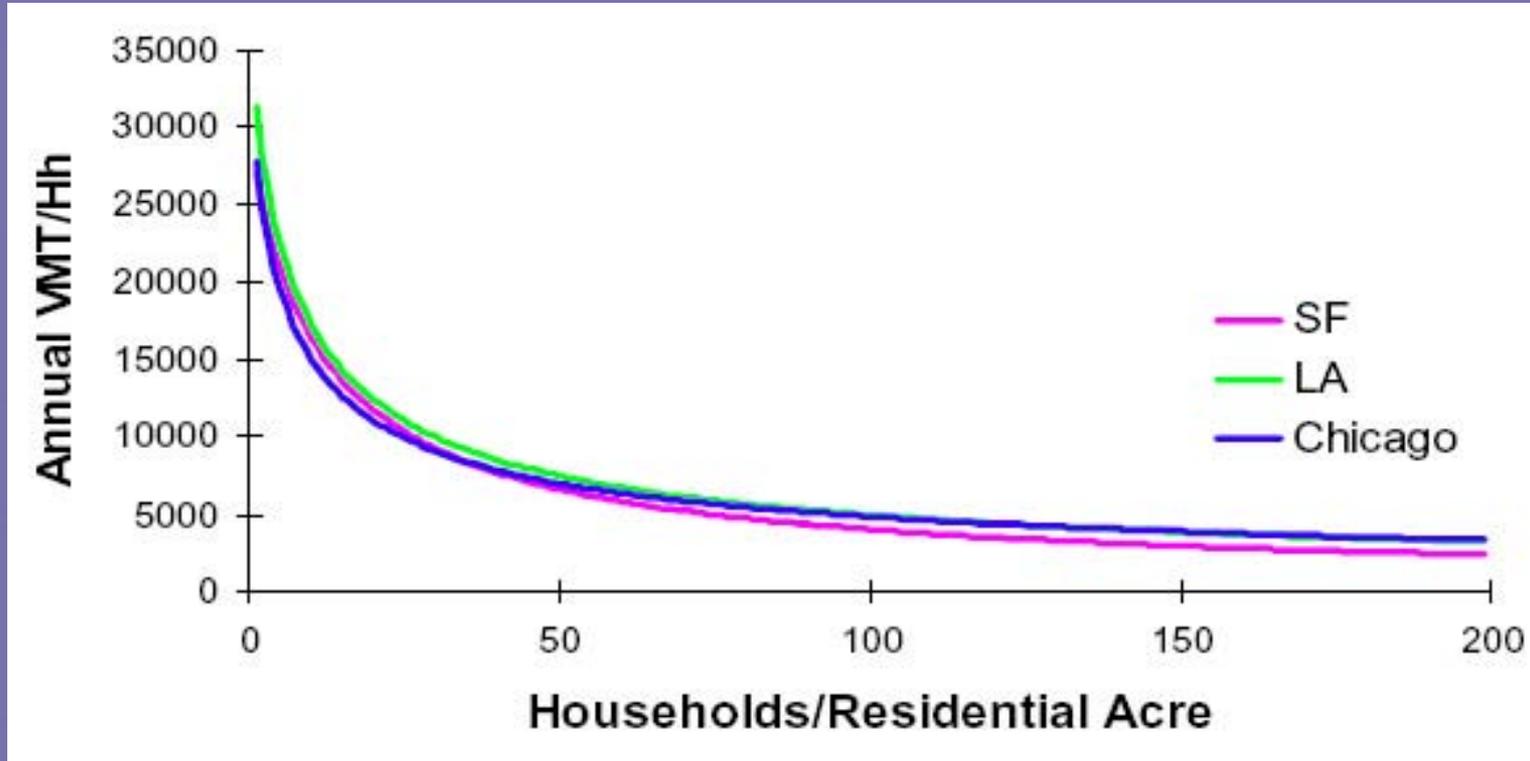
**Reduces Trips**

**Reduces Road Hours**

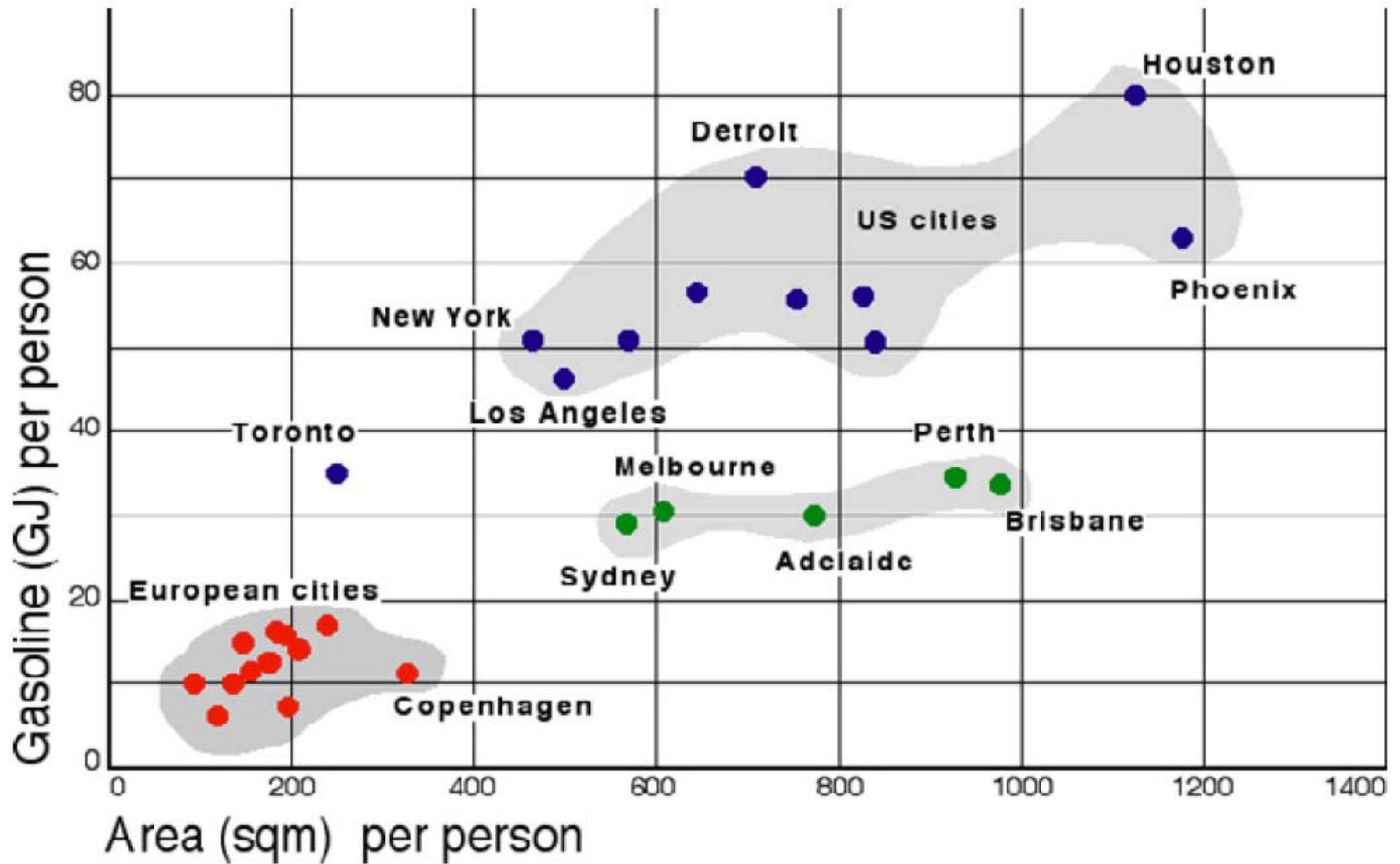
**Increases Mode Choice**

**Reduces Vehicle  
Ownership**

# Vehicle Miles Traveled (VMT) & Density



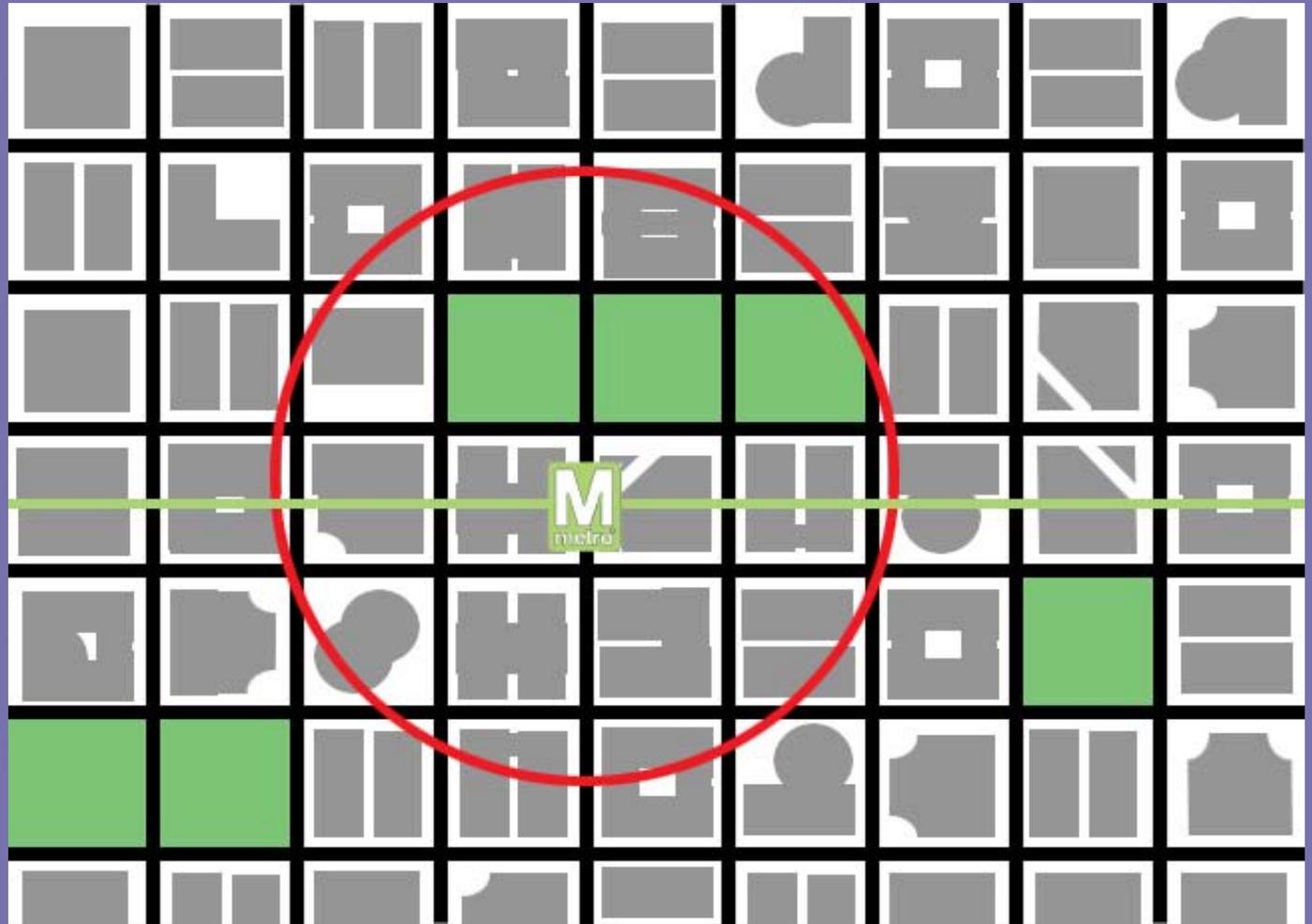
# Gasoline Use & Density



Data from Newman and Kenworthy, 1995.

# TYSONS WEST

## Benefits of High Density



**570% Reduction in 500/MT**

- 40% will walk 1,000'
- 10% will walk 1/2 mile

# TYSONS WEST

## Benefits of High Density

### Increased Residents





# Street Design



**RoundABOUTS =** 39% Reduction in crashes  
76% Reduction in Injuries  
90% Reduction in Fatalities

# **Walkable Neighborhood Criteria**

**Population & Employment  
Density**

**Land Use Mix**

**Street Connectivity**

**Connectivity of Network**

**Streetscape Design & Safety**

**Recreation Opportunity**



# Living in a Mixed-use Environment

**Each .25 increase in land use mix =  
12.2% reduction in Obesity**

**Each added Vehicle Hour =  
6% increase in Obesity**

**Each Added Kilometer Walked =  
4.8% reduction in Obesity**

**TYSONS WEST**

**Benefits of High Density**

# **Social Capital**

**Prolonged Life**

**Better Health**

**Improved Cardiovascular Health**

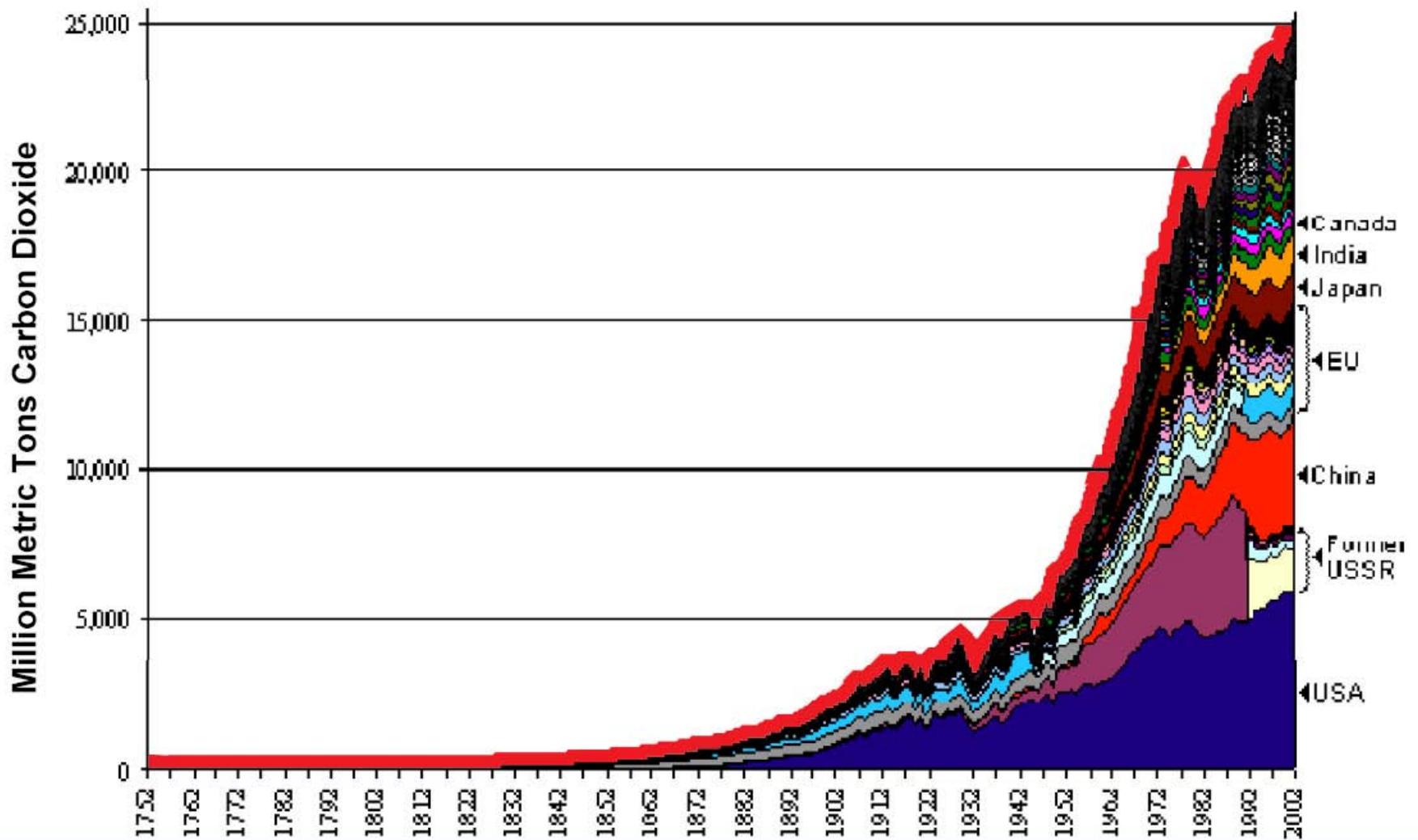
**Less Stressful Commutes**

**Less Road Rage**

**Better Mental Health**

**Greater Sense of Community**





Source WRI

BHARAT PATEL HOK | GREENBUILD 2007



**Builds Social Capital**  
**Preserve Our Country Side**  
**Helps Solve Global Warming**

# TYSONS WEST

## A Green Approach



38,000,000 SF of Potential  
68% Residential  
32% Office

Balance based on  
1.6 Jobs per  
Dwelling Unit



# Tyson's West A Green Approach

- **Community Connectivity**
  - Live, Work, Play Community
  - Pedestrian Pathways
  - More Green Space
- **Increased Density**
  - Access to Public Transportation
  - Reduce Traffic Congestion/Pollution
  - Reduce Urban Sprawl

# A Green Approach

- **Stormwater Management**
- **Domestic Water Use Reduction**
- **Wastewater Reduction**
- **Energy Efficiency**
- **Transportation Options**
- **Recycling**
- **User Health & Productivity**

# Stormwater Management



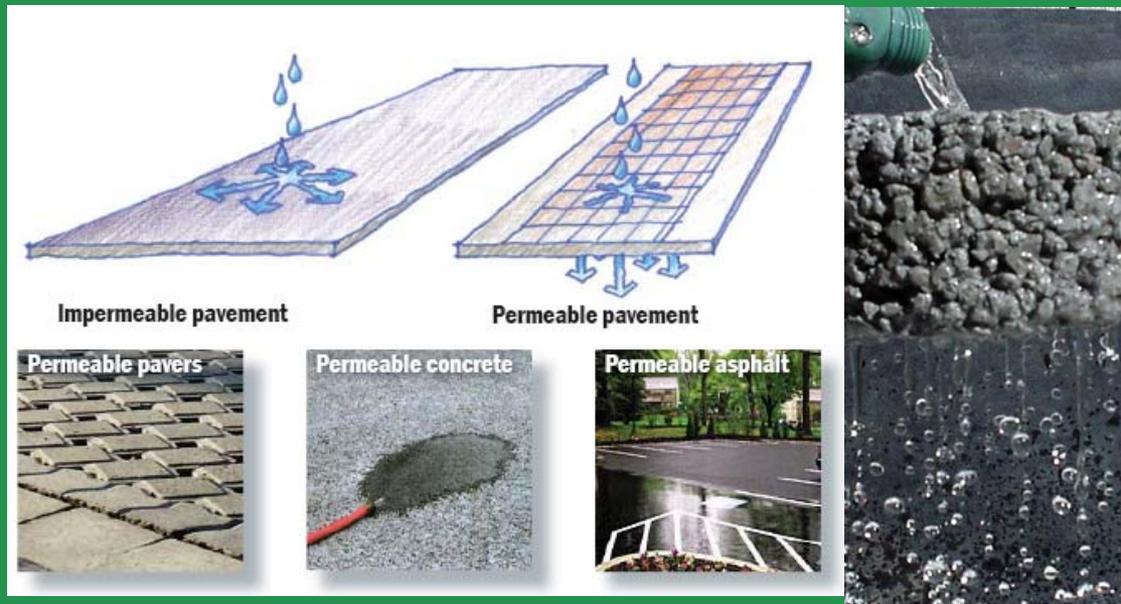
**Average rainfall in DC area  
39 inches per year**

**Annually, 600,000 gallons of rainwater are shed from the roof of each commercial building and must be contained and treated by the County storm water system .**

# Stormwater Management

## Permeable Pavement

Pervious materials allow precipitation to percolate through them.



- **Reduces the rate and quantity of stormwater runoff**
- **Reduces stress on the sewer system** • **Recharges ground water**
- **Filters silt, pollutants and debris**

**-Chicago Green Alley Handbook**



### **Stormwater Management Savings for 250,000 SF Office Building**

**25,000 SF roof area can collect 608,000 Gallons of Rain water annually thus reducing potable water requirements by this amount.**

# Water Use Reduction

Target **60%** minimum water savings

- Low flow plumbing fixtures
- Dual flush toilets, waterless urinals, automatic faucets
- Reduced or no irrigation
- **Further savings:**
- Rainwater harvesting
- Greywater reuse



# Commercial Domestic Water

**The occupants in a 250,000 SF office building consume 4,160,000 gallons of water annually.**



**An annual water cost of \$11,024 per office bldg.**

**“The Typical Office User Wastes 2 gallons of water a day by keeping the water running while washing their hands”**

USGBC

# **Commercial Domestic Water**

**Annual Savings per 250 000 SF of Office Space**

Using dual flush toilets, waterless urinals, and automatic low flow faucets can save...

**3,110,000 gallons of water annually**

**\$8,268 off water bills annually**

**That's nearly 75% less water than conventional fixtures!**

Based on FCWA Water and Sewage Rates  
Electricity Rates From Dominion Power  
Usage and Flow Rates from USGBC



# Residential Domestic Water

**The occupants of a 1000 SF residential unit  
consume 81 gallons of water daily.  
29,565 Gallons Annually**



**\$50 per unit / per year**

<b>Water</b>	<b>\$ 1.70/1000 gallons (for first 6,000 gallons) \$2.65/1000 gallons thereafter</b>
<b>Sewer</b>	<b>\$3.74/1000 gallons</b>

# **Residential Domestic Water Savings**

**Annual Water for a 1,000 SF Residential Unit**

**Using low flush toilets, low flow shower heads, and low flow faucets can save...**

**12,184 gallons of water annually**

**\$21 off water bills annually**

**That's over 40% less water than conventional fixtures!**

Based on FCWA Water and Sewage Rates  
Electricity Rates From Dominion Power  
Usage and Flow Rates from USGBC

# Wastewater Reduction

Annual Savings per 250,000 SF of Office Space

3,110,000 gallons of water saved means...

3,110,000 gallons less sewage produced

\$11,630 savings in disposal costs

Total water & sewer savings = **\$19,800**

Sewer \$3.74/1000 gallons  
Electricity Rates From Dominion Power  
Usage and Flow Rates from USGBC



# Wastewater Reduction

Annual Savings per 1000 SF of Residential Unit

12,184 gallons of water saved means...

12,184 gallons less sewage produced

\$46 savings in disposal costs

Total water & sewer savings = **\$67**

Sewer \$3.74/1000 gallons  
Electricity Rates From Dominion Power  
Usage and Flow Rates from USGBC

# Energy Efficiency

**Target 25% minimum energy savings using:**

- **Roofing w/ high Solar Reflectance**
- **Green roofing**
- **Efficient lighting**
- **Lighting controls**
- **Energy-efficient envelope**

**Further savings using:**

- **Active solar strategies**
- **Passive solar strategies**
- **Wind generation**
- **Energy co-generation**

# Electricity Consumption

**The average 250,000 SF office building uses  
6.8 million kWh/yr**



**This results in a \$544,526 annual electric bill**

**Electricity \$0.08 per kWh**

# **Energy Efficiency**

**Annual Energy for a 250,000 SF Office Building**

**At 25% energy use reduction, a green office building could save:**

**930,000 kWh of electricity annually**  
**\$74,700 in energy bills annually**

**At 50% energy use reduction, a green office building could save:**

**1,860,000 kWh of electricity annually**  
**\$149,400 in energy bills annually**

**Electricity \$0.08 per kWh**



# **Electricity Consumption**

**The average home uses**

**10,654 kWh/year**

Ten 100-watt light bulbs on  
for 1/2 an hour, is 0.5 kWh

Running a 3500-watt air conditioner  
for an hour is 3.5 kWh

**Electricity \$0.08 per kWh**



# **Energy Efficiency**

## **Annual Energy for a 1,000 SF Home**

**At 25% energy use reduction, a green home could save:**

**2,700 kWh of electricity annually  
\$213 in energy bills annually**

**At 50% energy use reduction, a green home could save:**

**5400 kWh of electricity annually  
\$416 in energy bills annually**

**Electricity \$0.08 per kWh**



# Transportation - Traffic



Residents of Tysons	18,540
Tysons Workforce	130,000

“Commuting by office workers requires 30% more energy than the building itself uses.”

Environmental Building News

**Tysons Corner Daily Traffic Counts**

**Tysons workforce commutes approx. 3.25 million miles daily!**

# Transportation - Emissions

3.5 billion cubic feet of CO<sub>2</sub> emissions created by Tysons' commuters could fill up the entire volume of all of the buildings in Tysons every 16 days.



Amount of gasoline consumed daily

131,579 gallons

Amount of CO<sub>2</sub> created daily

2,641,540 pounds

An average coal-fired power plant emits 3.5 billion cubic feet of CO<sub>2</sub> every 16 days.

# Transportation Savings

If 42% of commuters took Metro  
or walked to work  
(similar to DC & Arlington),  
we would save:

**55,000 gallons/day**

**1,110,000 lbs of CO<sub>2</sub>/day**



# A Green Approach Recycling

1. Recycle 50% minimum of construction waste
2. Use 50% minimum recycled content in infrastructure materials
2. Recycle building operations waste



**TYSONS WEST**

**A Green Approach**

# Construction Waste



**For every SF of new construction, 13 lbs of construction waste is generated.**

**Landfill fees: \$57/ton**



# **Waste Reduction**

**Annual Trash for a 12,500,000 SF  
Office Building**

**Recycling Office Paper could divert:**

**10,600 tons of paper from  
landfills annually**

**Save 180,000 trees  
and 75,000,000 gallons of water**

# User Health & Productivity

- Indoor air quality
  - Low VOC products
  - Improved ventilation
  - Improved air filtration
- Daylighting/Views

# Health & Productivity

Case studies of green buildings show huge productivity increases

Reno Nevada Post Office	+ 6%
Pennsylvania Power and Light	+ 13%
San Diego Federal Courthouse	+ 15%
Lockheed Building 157	+ 15%
West Bend Mutual Insurance Company	+ 16%

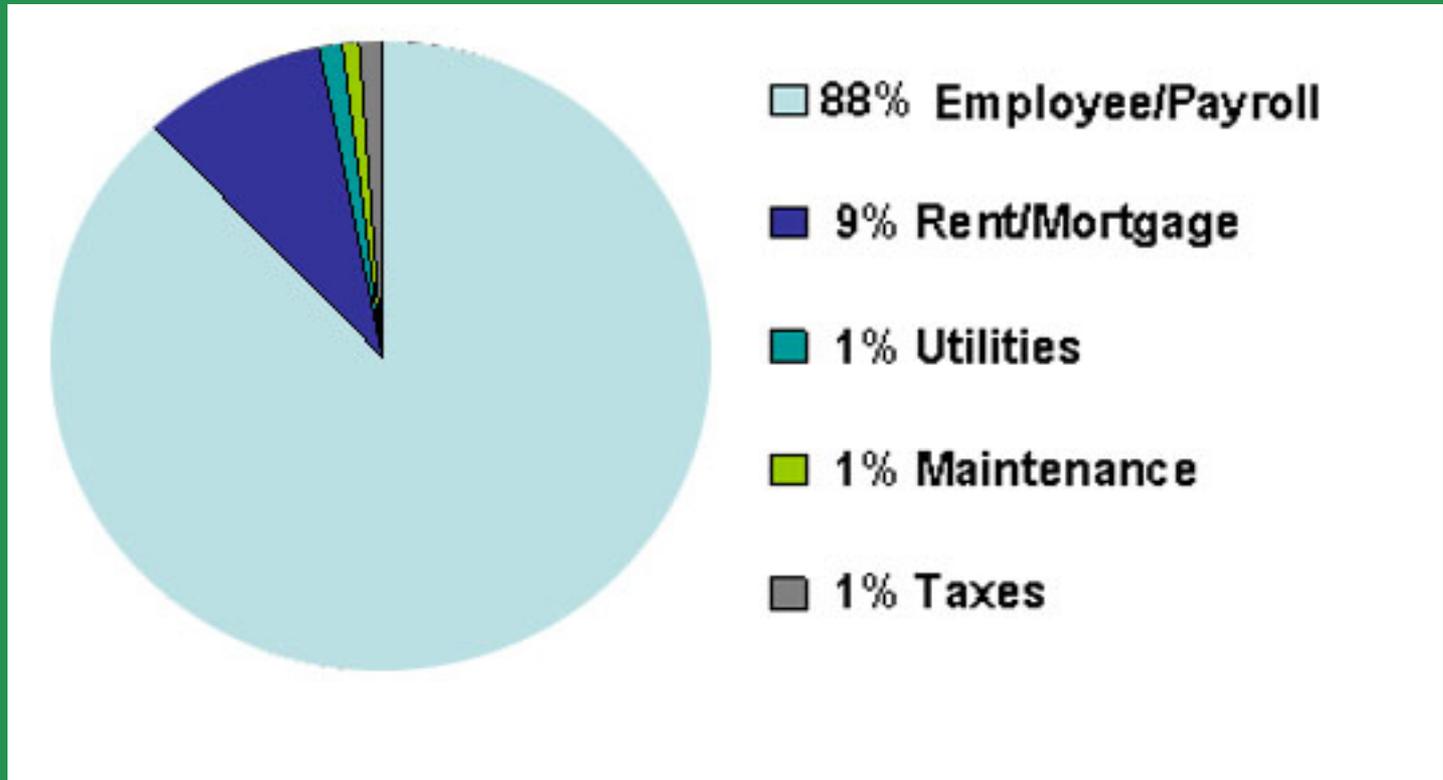
**Average = 13%**

Romm and Browning, "Greening the Building and the Bottom Line"



# User Health & Productivity

## AVERAGE ANNUAL COMMERCIAL TENANT COSTS (1)



**2% increase in worker productivity**

**represents a cost benefit of \$5.50/sf.**

**Using average Tyson's Corner rental rate (2) of \$28.50/sf**

**TYSONS WEST**

**A Green Approach**

# **Health & Productivity**

**In Tyson's Corner,  
a 13% increase in productivity  
translates to**

**\$36.14 / s.f.**

**More than rent and utilities combined!**



# Health & Productivity

According to stats from Lawrence Berkeley National Laboratory, greening Tyson's Corner's buildings could prevent annually

- 15,900** cases of cold & flu
- 7,418** allergy and asthma attacks
- 3225** cases of sick building syndrome

**TYSONS WEST**

**A Green Approach**

# **Impact Summary & Benefits**

- **Developers**
- **Local Infrastructure**
- **Tenants**
- **Residents**



# Potential Savings for Tysons West

- **Stormwater:**
  - **334 million gallons/year relief for local infrastructure**
- **Domestic Water:**
  - **470 Million gallons/year less consumption**
  - **\$950,000 savings for building owners/tenants**
- **Wastewater:**
  - **470 Million gallons/year relief for local infrastructure**
  - **\$1.7 Million savings for building owners/tenants**
- **Energy:**
  - **114 Billion kWh/year relief for local infrastructure**
  - **\$9.3 Million savings for building owners/tenants**

# Potential Savings for Tysons West

- **Transportation:**
  - **14.3 Million gallons gas saved per year**
  - **290 Billion lbs of CO2 avoided**
  - **55,000 cars off the road**
  - **\$43 Million saved**
- **Recycling:**
  - **500 Million lbs of trash diverted from landfills**
  - **\$14 Million in disposal cost savings for developers**
- **Productivity:**
  - **\$450 Million saved by employers**

# TYSONS WEST

## A Green Approach

