

ENERGY AND URBAN SYSTEMS



Using ecological analysis methods to understand urban systems

a new paradigm

Environmental concerns have become of paramount importance.

Certain global problems may soon be *irreversible* (e.g., deforestation, extinction, soil loss, climate change).

These are *systemic problems* that cannot be understood in isolation but rather are interconnected and interdependent.

Solutions may be simple but will require a radical shift in our perceptions, our thinking, and our values.



Humans unwittingly express
and incorporate their
paradigmatic priorities – their
societal organizing principles –
in their built environment



Medieval cities dominated by churches

19th and early 20 century American cities dom



21st century cities dominated by business

A new paradigm that includes ecological principles and livability?



Urban Ecosystems

Socio-ecological-economic systems

Three issues:

- 1) understanding a city as a system
- 2) understanding specific environmental impacts of cities
- 3) understanding a city as a sense of space (human niche)

A. City as system

Inputs: air, water, food, fuels, raw materials, people

Outputs: waste heat, finished goods, ideas, wastewater, solid wastes, air pollutants

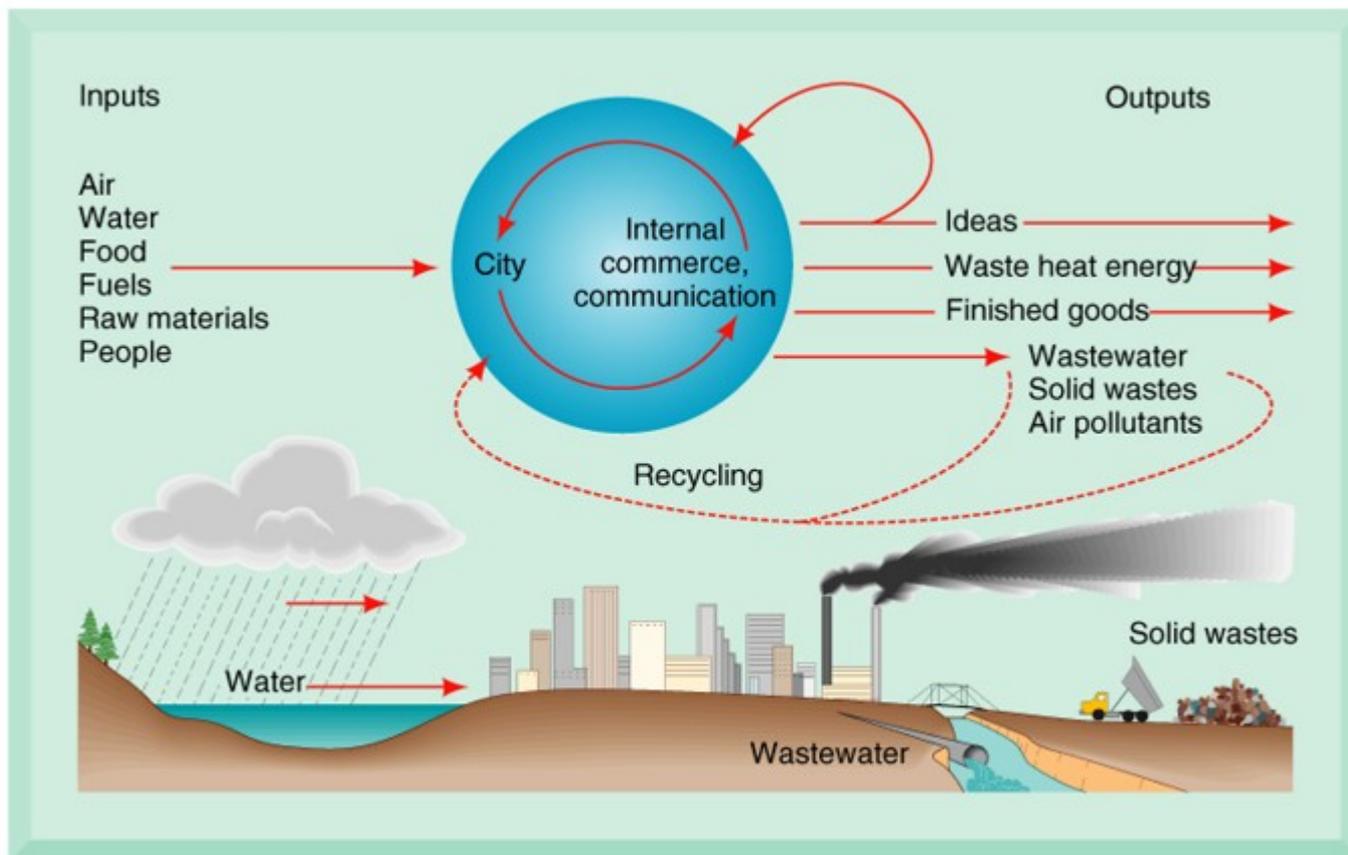


“Systems theory is, strictly speaking, not a theory of systems, but of system-environment distinctions.”

1) City as system:

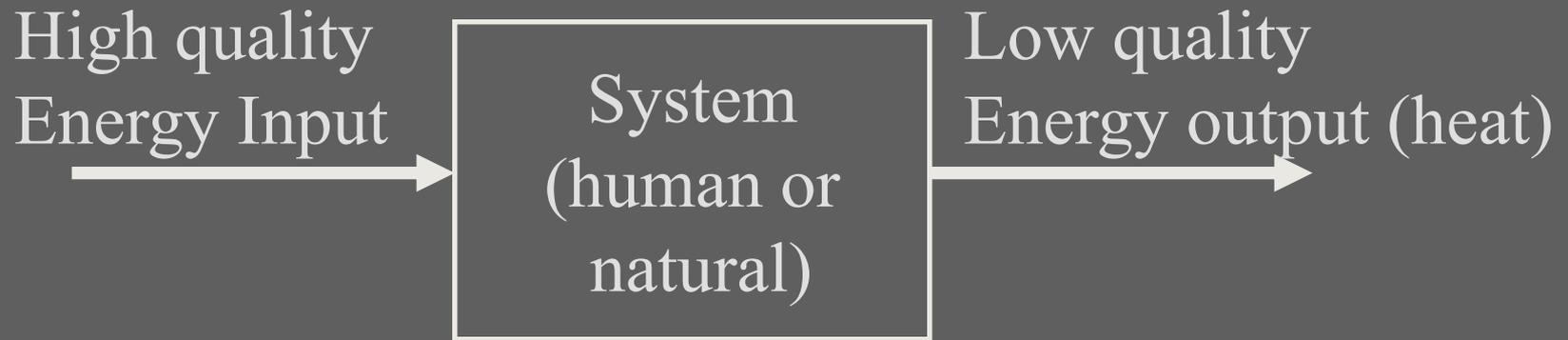
Inputs: air, water, food, fuels, raw materials, people

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Thermodynamically, Open Systems

...build and maintain order and organization by taking in high quality energy, using it, and passing degraded energy outside of the system.



B. Impacts on Environment

Loss of habitat

Impervious surface increase

Alter biogeochemical cycles

- Water - increases runoff & flooding (faster & higher peak)

- Nitrogen - air pollution (smog)

- Phosphorus - water pollution (runoff, wastewater)

- Sulfur - air pollution (acid rain)

- Carbon - GHG emissions

Microclimate changes

Transportation requirements



3) Built Environment - We define our space (landscape): Space defines us

Places of quality and character need a successful definition of space

Quality of life = quality of (public) spaces



What are the key features of cities?

Do we feel comfortable, safe?

Is it convenient?

Is it efficient?

Does it provide the homes, jobs, services and ability to access them that we need?



Due to continued disinvestment since the 1950s, most American cities* today fail to provide this sense of place or to function as places to live, work, and play. They were allowed to fail by public and private choices and instead they are mostly seen as places to visit (for work or entertainment).

*With some notable exceptions (NYC, Boston, San Francisco, Chicago, Portland, Washington DC, Baltimore?)

How did it get to be that way?

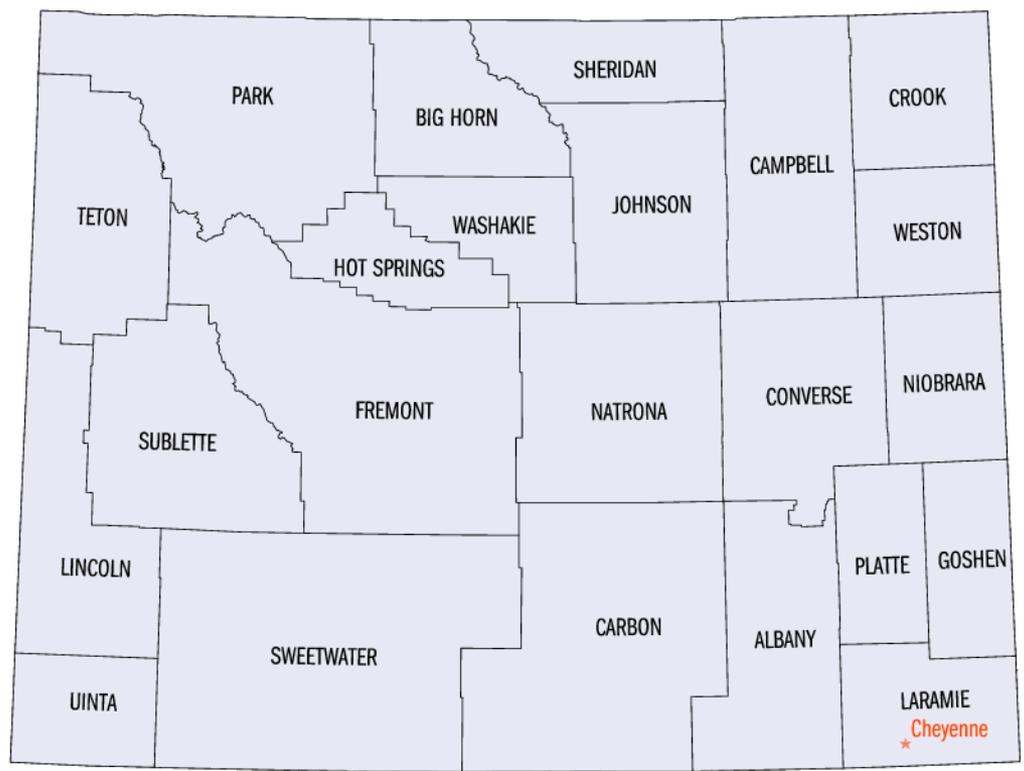
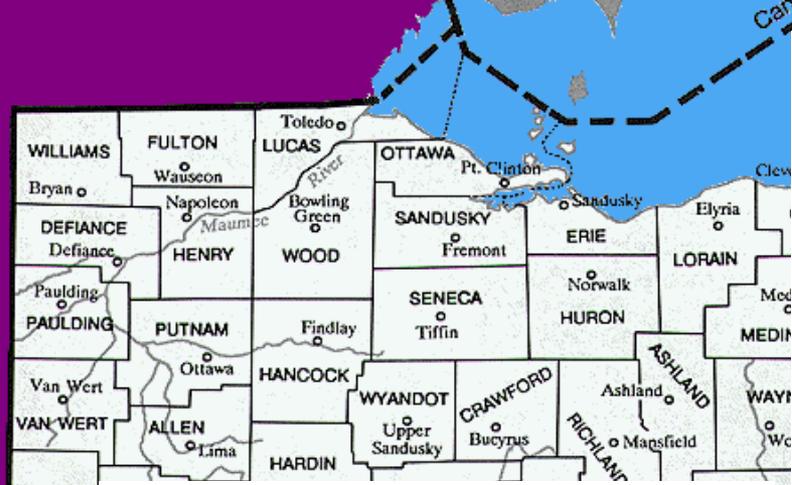
Response to what? Consequences of what?



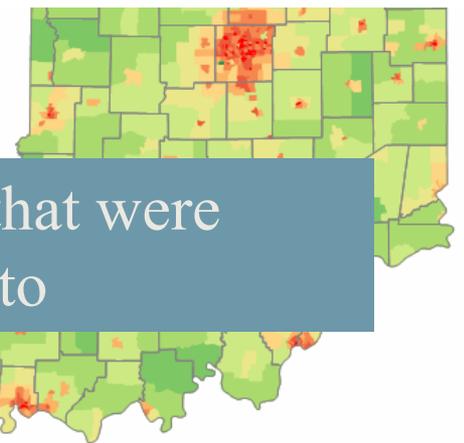
Late 1800s early 1900s - fossil fuel age brought on:

- 1) New transportation methods
- 2) New industries

“It’s a simple rule: How we get around determines how we live. But it’s a rule we still haven’t grasped. Transportation determines the form of our places.” p. xi. *How Cities Work: suburbs sprawl and the road not taken*. Alex Marshall. 2000.



Census 2000 summary file 1: population by census tract.



results

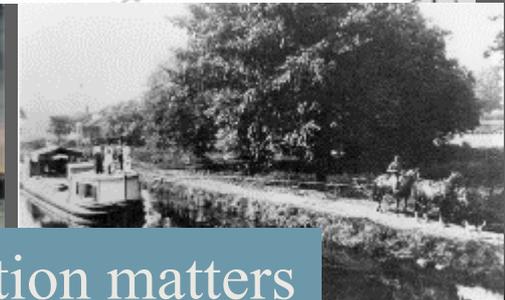
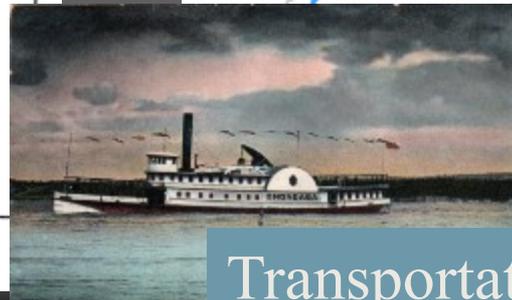
Contrast with states that were surveyed after the auto

Transportation matters

Access to water



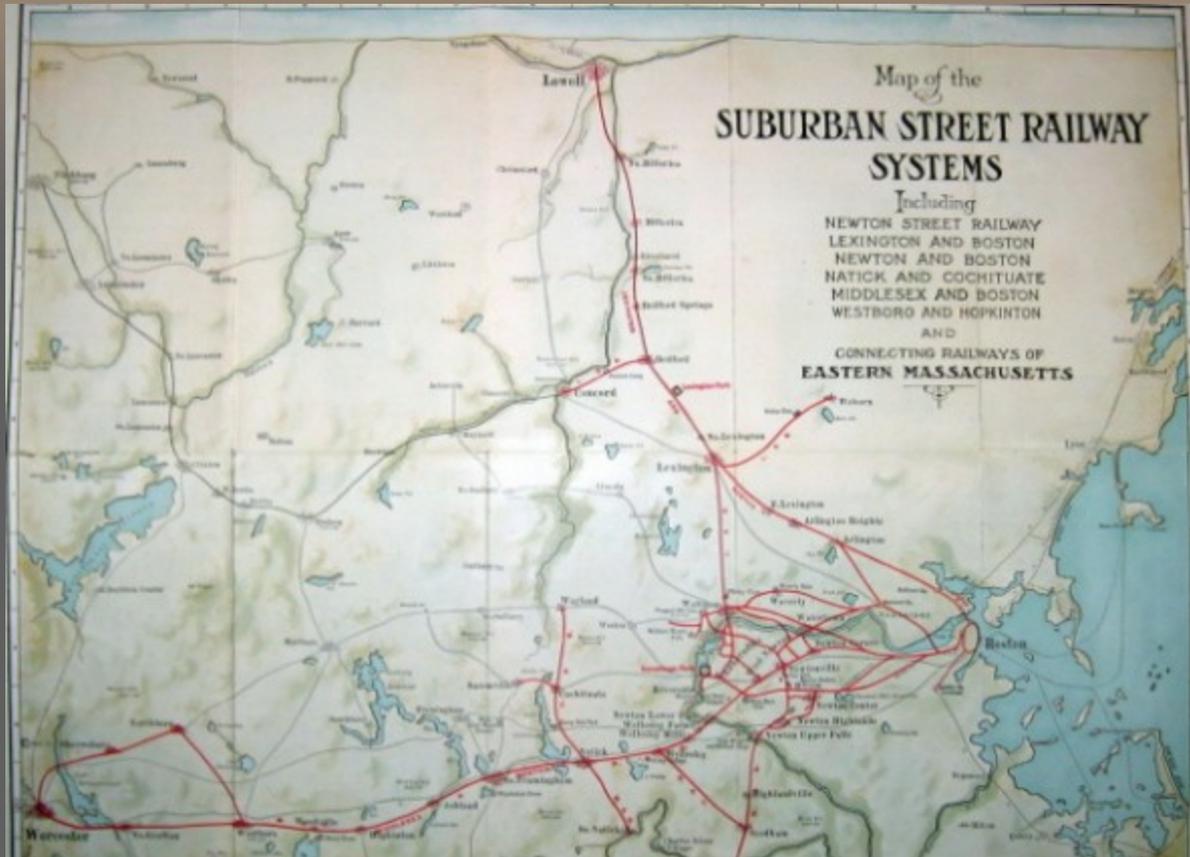
European Settlements and Indian Tribes, 1750



Transportation matters

Rise of train and streetcar extended the distances

Garden City
(Ebenezer Howard
1898): decentralize,
disperse into smaller
populations built
mainly in suburban
settings or at the
fringe of cities.



Transportation matters



From 1950 onward almost all investment went to roads which cover the landscape

Transportation matters

2) Response to industrialization was ZONING, end result is elimination of mixed-use.

Typical strip mall

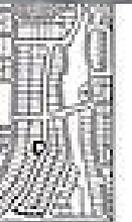


Mall of America

Mixed use



Bedroom community
Separation of uses



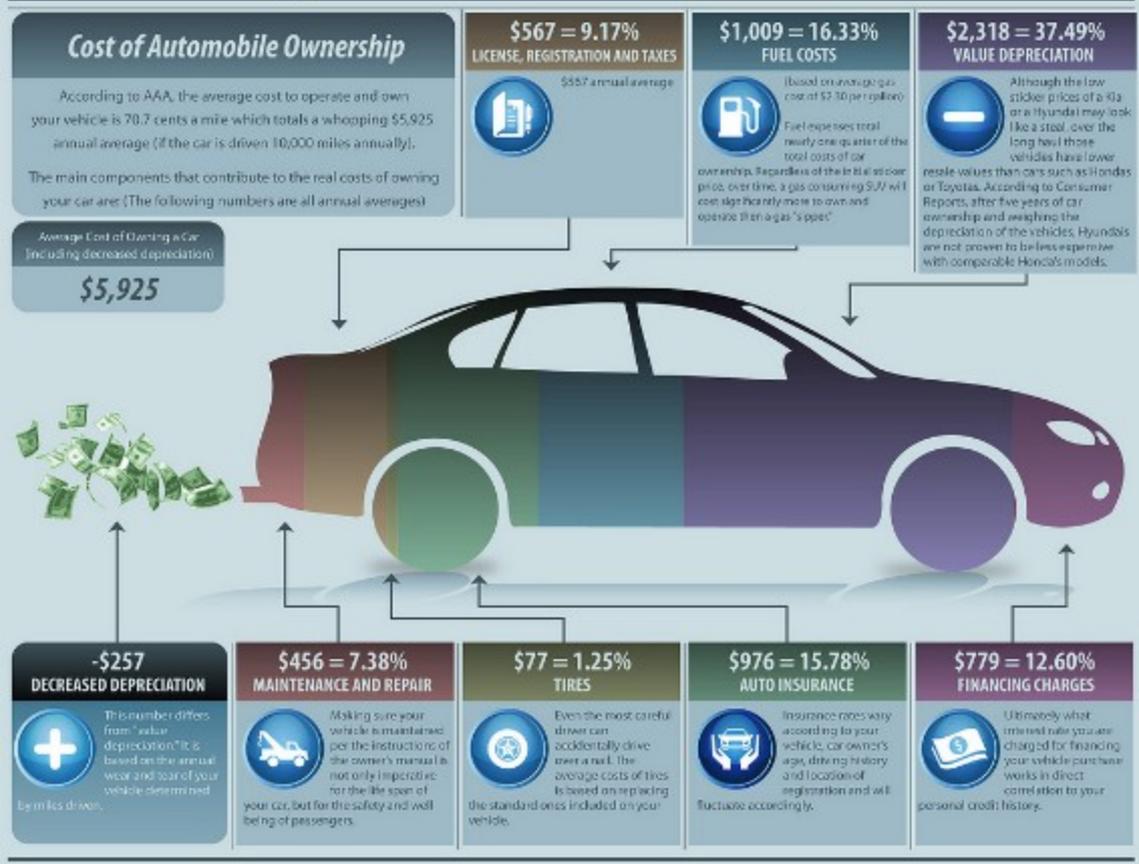
THE RESULT: SPRAWL

Sprawl is low-density development beyond the edge of service and employment, which separates where people live from where they shop, work, recreate, and educate - thus requiring cars to move between zones.

Leads to auto dependency

Auto dependent societies:

- 1) Cost – to individual, to society (cost of services)
- 2) Safety – traffic deaths and injuries
- 3) Environment – burning of fossil fuels, removing habitat, changing hydrology
- 4) Psychological cost – isolation, anti-social behavior, young and the elderly not participating, ugliness of the built environment

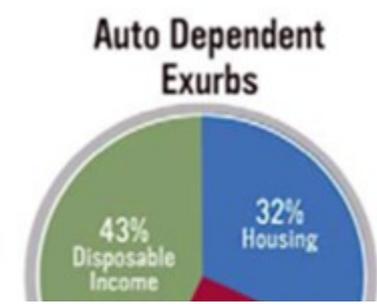
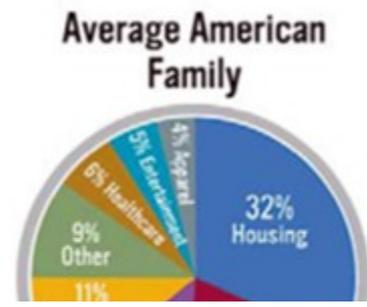


Cost to society
 Federal
 State
 County
 Local taxes

For roads and services:
 police, fire, mail, water,
 trash removal

SPRAWL costs more than
 higher density

Cost to individual



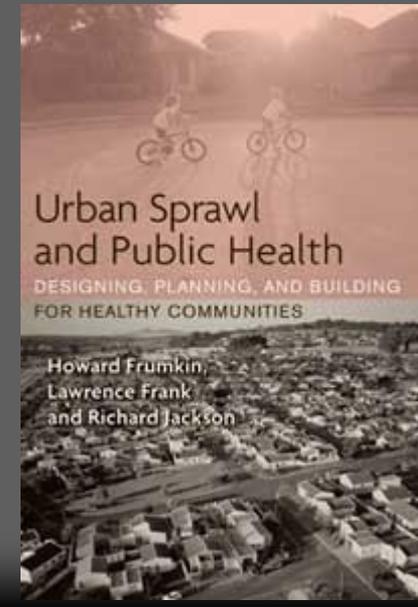
Misplaced investment in an unsustainable future

Safety

In 2010, 32,885 deaths from car crashes. Leading cause of death for U.S. teens, about 2,700 teens aged 16–19 were killed (~7 per day) and almost 282,000 were treated and released from emergency departments for injuries suffered in motor-vehicle crashes.



More than 2.3 million adult drivers and passengers were treated in emergency departments as the result of being injured in motor vehicle crashes in 2009. The economic impact is also notable: the lifetime costs of crash-related deaths and injuries among drivers and passengers were \$70 billion in 2005.



Environmental Impacts of sprawl

Traffic congestion

Longer commutes

Loss of habitat: farmland, open fields, forests & wetlands

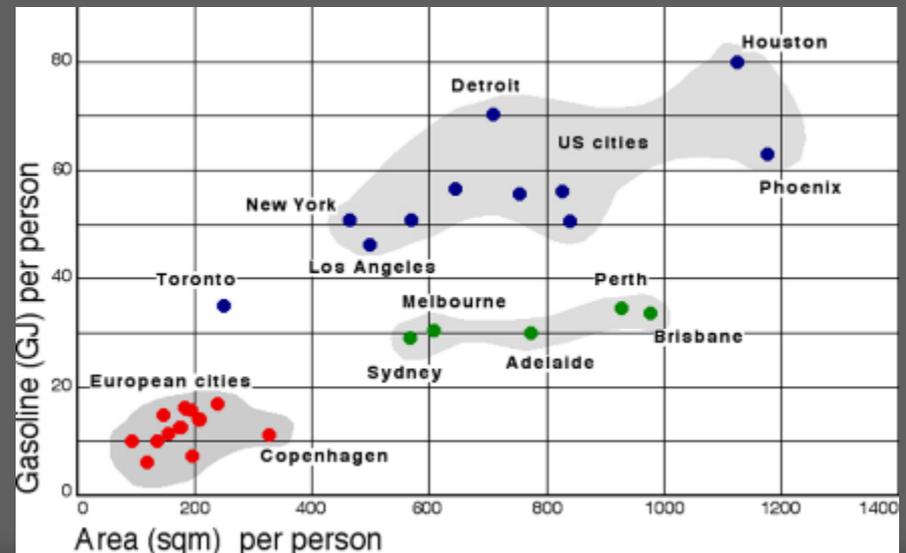
Increased use of gasoline

Increased GHG emissions

Worsening air and water pollution

Change in land use leads to changed hydrology (increased flooding)

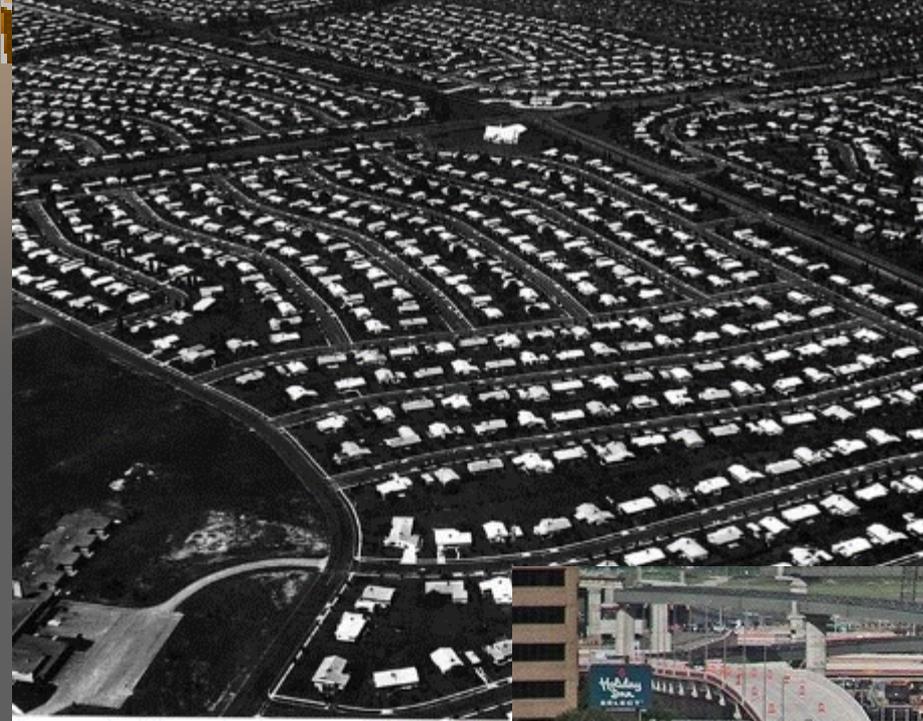
Google maps



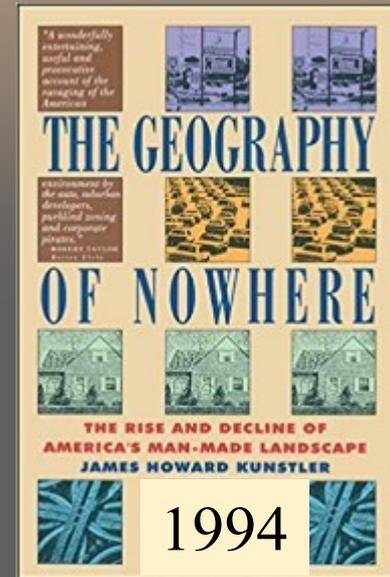
SOCIAL COSTS OF AUTOS

[I'm] afraid Americans misunderstand the crises of the suburbs...Suburban moms and dads wonder why their fifteen-year-old children seem so alienated. These kids are physically disconnected from the civic life of their towns. They have no access to the civic equipment. They have to be chauffeured absolutely everywhere - to football practice, to piano lessons, to their friends house, to the library, and of course, to the mall. All they live for is the day that they can obtain a driver's license and use their environment. Except then, of course, another slight problem arises: they need several thousand dollars to buy a used car and pay for insurance.

Kunstler, James Howard. 1998. *Home from Nowhere: Remaking Our Everyday World for the Twenty-First Century*; Kunstler, James Howard. 1993. **Geography of Nowhere: The Rise and Decline of America's Man-Made Landscape**



Geographies of nowhere



James Howard
Kunstler

Building nowhere places, that no one cares about or invests in

It's not just about the means of transportation:

...the problem with the electric car, is that it does absolutely nothing to address the disastrous social problems caused by urban sprawl.

There is every reason to believe it will only make things worse by perpetuating the delusion that we can continue to live vast distances from the places where we sleep, work, shop, and play – or that we should *want* to continue.



If We Don't Like Sprawl, Why Do We Go On Sprawling?



Certain sectors benefit greatly from the current situation:

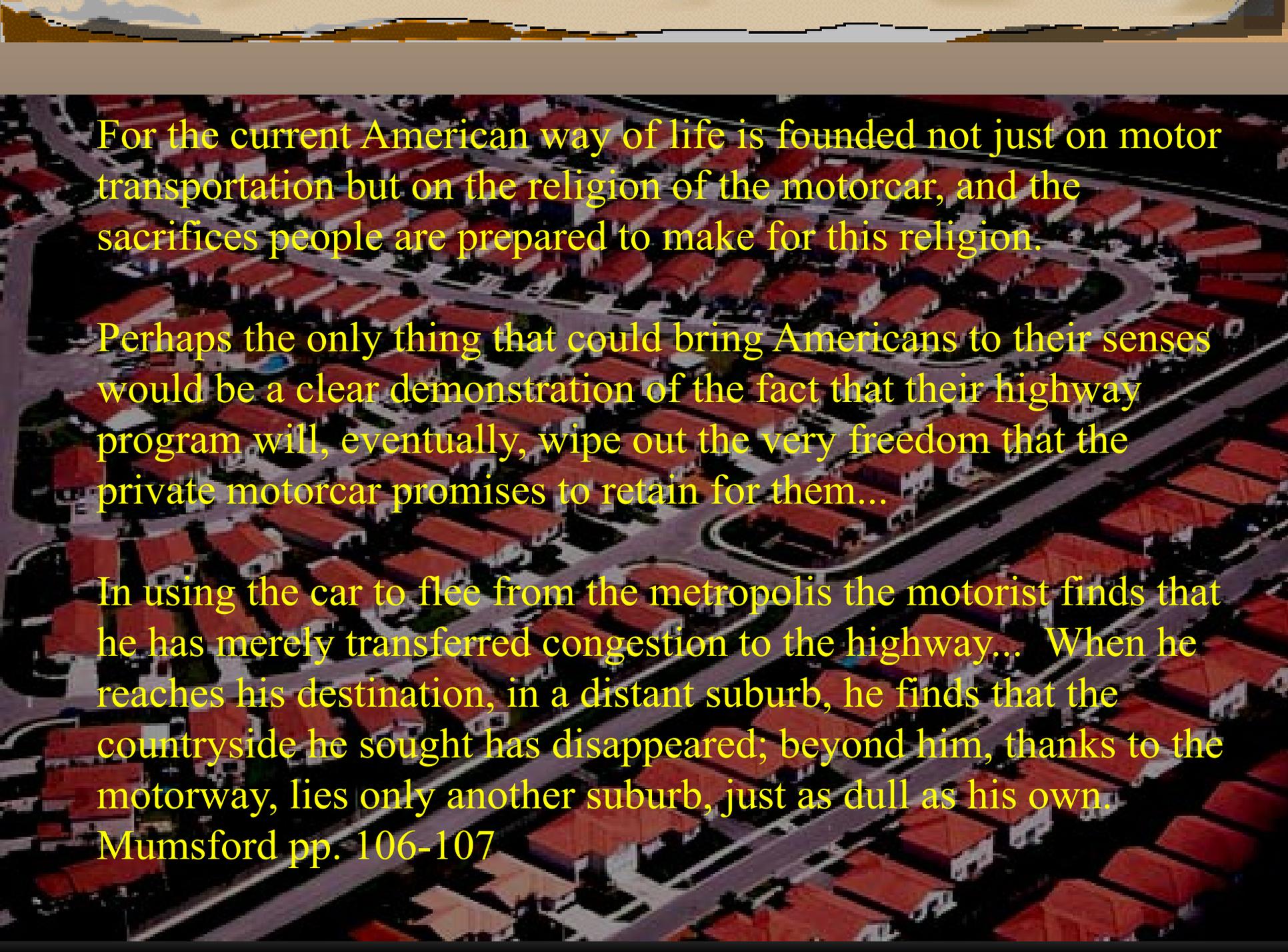
Auto industry, Oil companies, suppliers (tires, etc.)

Road construction

Housing construction, real estate, financing

Reinforced as Freedom of Choice and “American Dream”

Creating places is almost wholly a product of public, political, and taxpayer-financed decisions. Not individual choice.

An aerial photograph of a suburban residential area. The houses are arranged in a grid-like pattern with winding streets. The roofs are mostly red or brown. There are some trees and green spaces scattered throughout. A road with a median runs diagonally across the lower right portion of the image.

For the current American way of life is founded not just on motor transportation but on the religion of the motorcar, and the sacrifices people are prepared to make for this religion.

Perhaps the only thing that could bring Americans to their senses would be a clear demonstration of the fact that their highway program will, eventually, wipe out the very freedom that the private motorcar promises to retain for them...

In using the car to flee from the metropolis the motorist finds that he has merely transferred congestion to the highway... When he reaches his destination, in a distant suburb, he finds that the countryside he sought has disappeared; beyond him, thanks to the motorway, lies only another suburb, just as dull as his own.

Mumsford pp. 106-107

Response to Sprawl

Planning options

Urban growth boundaries

Smart Growth

Baltimore County: Urban Rural Demarcation Line (URDL)

Design options

Neo-traditional planning

Traditional neighborhood development (TND)

Transit Oriented Development (TOD)

New Urbanism

“New” Urbanism Principles

Take advantage of compact building design

Create housing opportunities and choices

Create walkable communities

Foster distinctive, attractive communities with strong sense of place

Preserve open space, farmland, natural beauty, and critical environmental areas

Strengthen and direct development toward existing communities

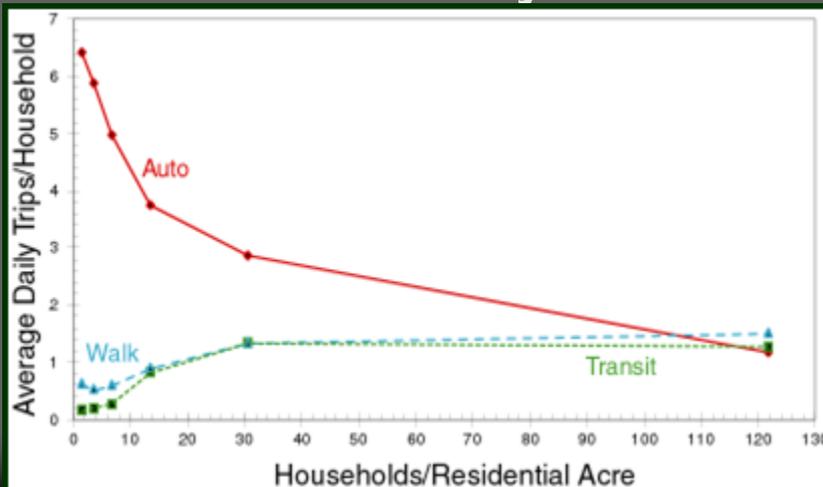
Provide a *variety* of transportation choices

Make development decisions predictable, fair, and cost-effective

Encourage community and stakeholder collaboration in development decisions.

PlaceMaking

- ⇒ “Livable communities”
- ⇒ Mixed uses, higher density, friendly to pedestrians and cyclists
- ⇒ Civic places, green spaces
- ⇒ Proximity to mass transit



Uses of sidewalks: contact

The sum of casual public contact at a local level – most of it fortuitous, most of it associated with errands, all of it metered by the person concerned and not thrust upon him by anyone – is a feeling for the public identity of people, a web of public respect and trust, and a resource in time of personal and neighborhood need. p. 73



GENERAL ELECTRIC COMPANY

Schenectady, N. Y.

SALES OFFICES IN PRINCIPAL CITIES



This Equation Can Help You Solve Your Parking Problem

**There's Plenty of Street Space for All the People--
 But Not for All the Vehicles**



“To walk or take transit is a public act which makes the street a safer. To drive is a private act which turns the street into a utility.”

The process is cyclical.

on 1 light rail train



Scale of human versus the auto



to serve automotive scale, commercial buildings that are designed to be legible from roadways assume a radically different shape. The human eye can distinguish about 3 features per second. A pedestrian steadily walking along a 100-foot (30-meter) length of department store can perceive about 68 features; a driver passing the same frontage at 30 mph (13 m/s) can perceive about 6-7 features. Auto-scale buildings tend to be smooth, shallow, simplified, with bigger letters and fewer words.

Narrow streets

HOW TO REVITALIZE URBANISM

Urbanism is a result of pressure. It is produced by confining people, places, and economic activity within a limited area.

purchased. For crowds to walk sidewalks from store to store in the traditional way, a downtown must draw people to it from multiple sources, not just from a few single-note city projects or even a football stadium. And this can only happen if downtown is an actual center of something, particularly retail. Via the Portland model, a center city can be repressurized, the energy of a region turned inward until the downtown streets begin to fill up again.



Community Transformation Examples

*All images and text
courtesy Steve Price,
Urban Advantage*















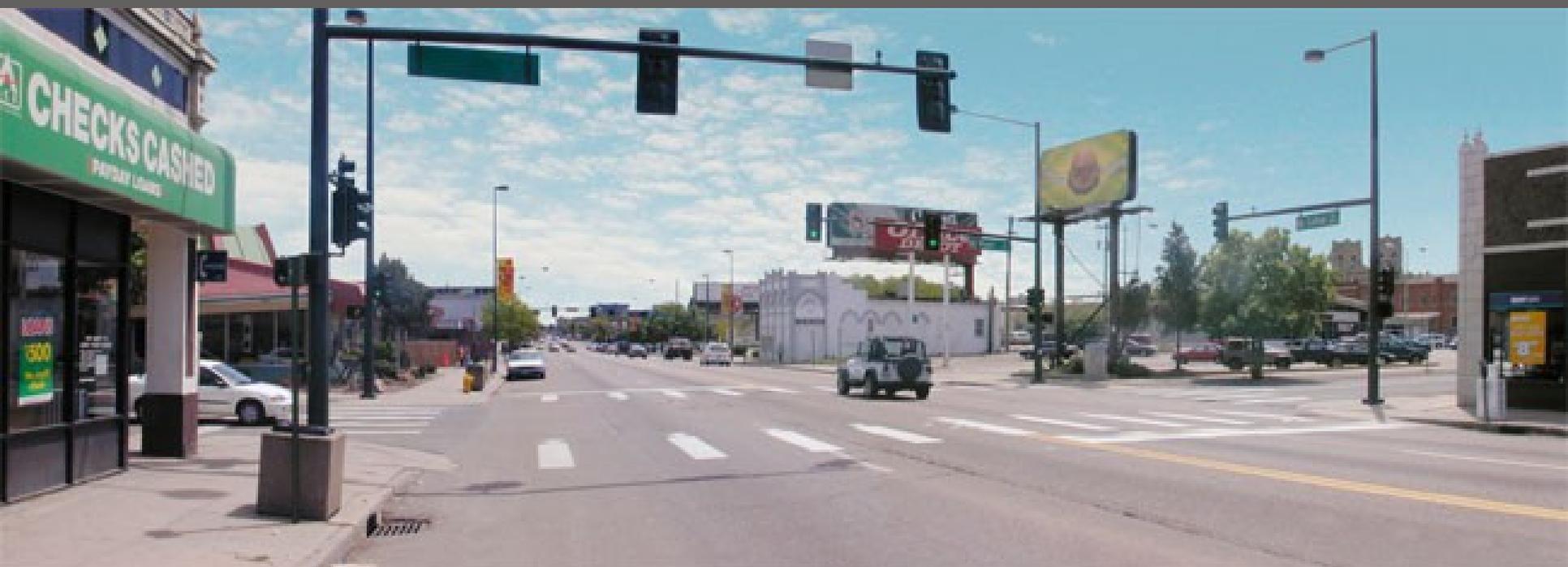


























A good transportation system minimizes unnecessary transportation; and it offers change of speed and mode to fit a diversity of human purposes. p. 57. Marshall 2000

The City Solution

Why cities are the best cure for our planet's growing pains

Cities themselves are dependent on the countryside for inputs and outputs but have a lower per capita impact than rural areas.

We are now in a renaissance for urbanity, so expect good things with continued effort

Still time to exchange this ...



For this.





New Urbanism

www.cnu.org

Smart Growth

<http://www.op.state.md.us/smartgrowth/>

<http://www.smartgrowth.org/>

Sprawl

<http://www.sierraclub.org/sprawl/>

www.carfree.com

www.kunstler.com