

# SMART



Susan Zielinski, Managing Director, SMART (CARSS)

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Frontiers of Engineering

[Susanz@isr.umich.edu](mailto:Susanz@isr.umich.edu)

## *TODAY:*

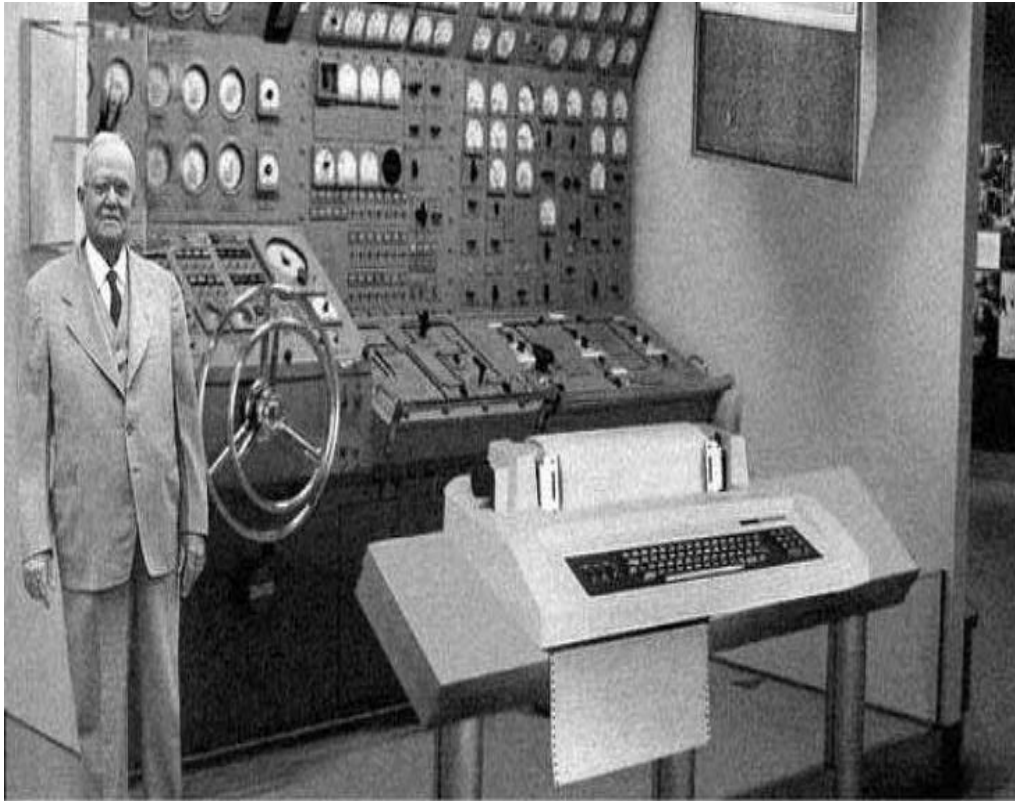
ü *Complex Systems approach to sustainable urban transportation (New Mobility)*

ü *Innovations*

ü *Integration / connectivity*

ü *Accessibility Paradigm*

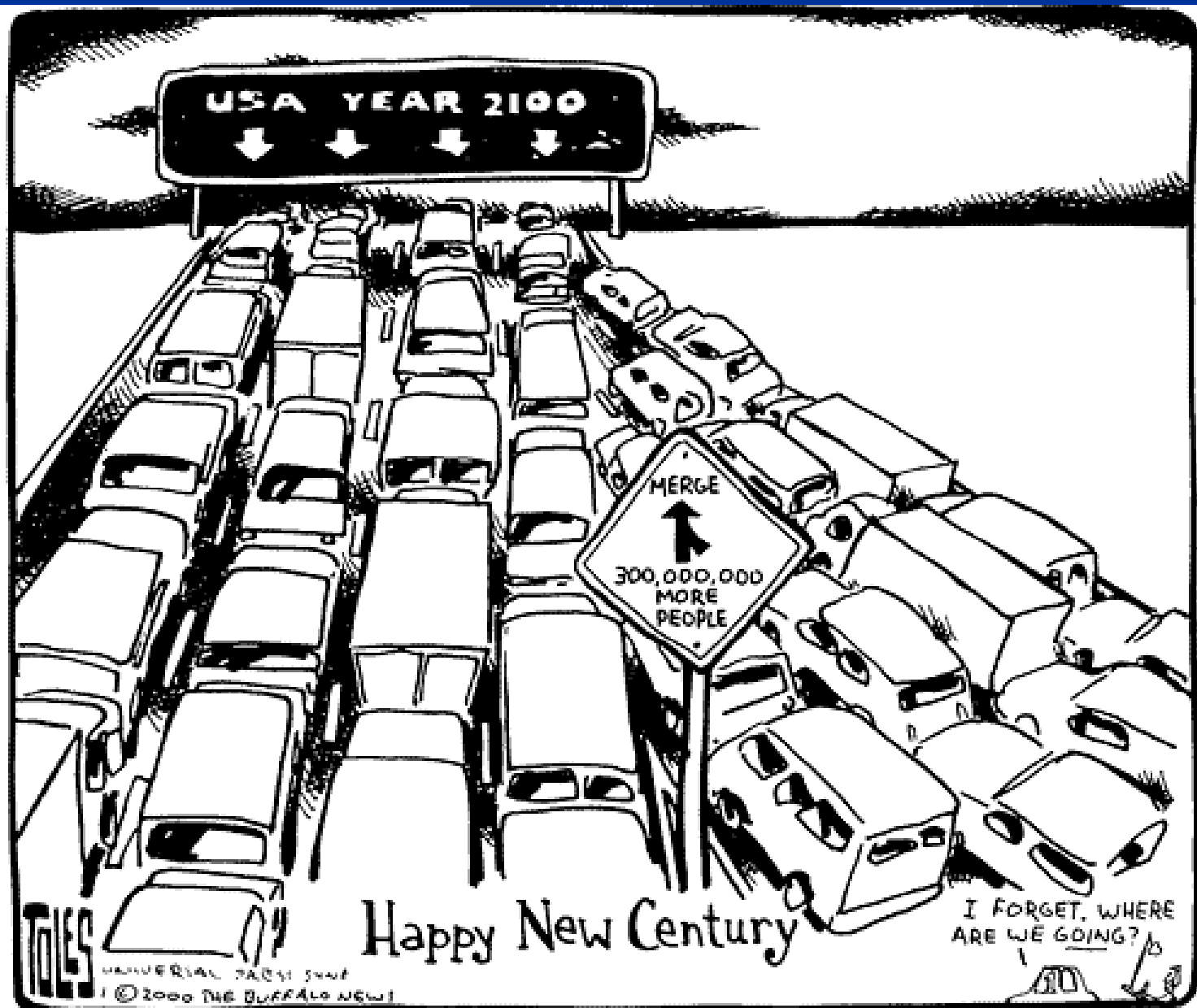
ü *New Mobility Markets*



“The Mobility Problem”



(Mini-Rorschach Test)



UNIVERSAL PAPER SIDE  
© 2000 THE BUFFALO NEWS

1/16/00 EXTRA CARTOON







Urbanization: From 1/3 - 2/3 by 2025





<http://youtube.com/watch?v=RjrEQaG5jPM>

## FEATURE

## More to Explore

- ▶ DID YOU KNOW?
- ▶ RELATED LINKS
- ▶ BIBLIOGRAPHY
- ▶ NGS RESOURCES

## On Assignment



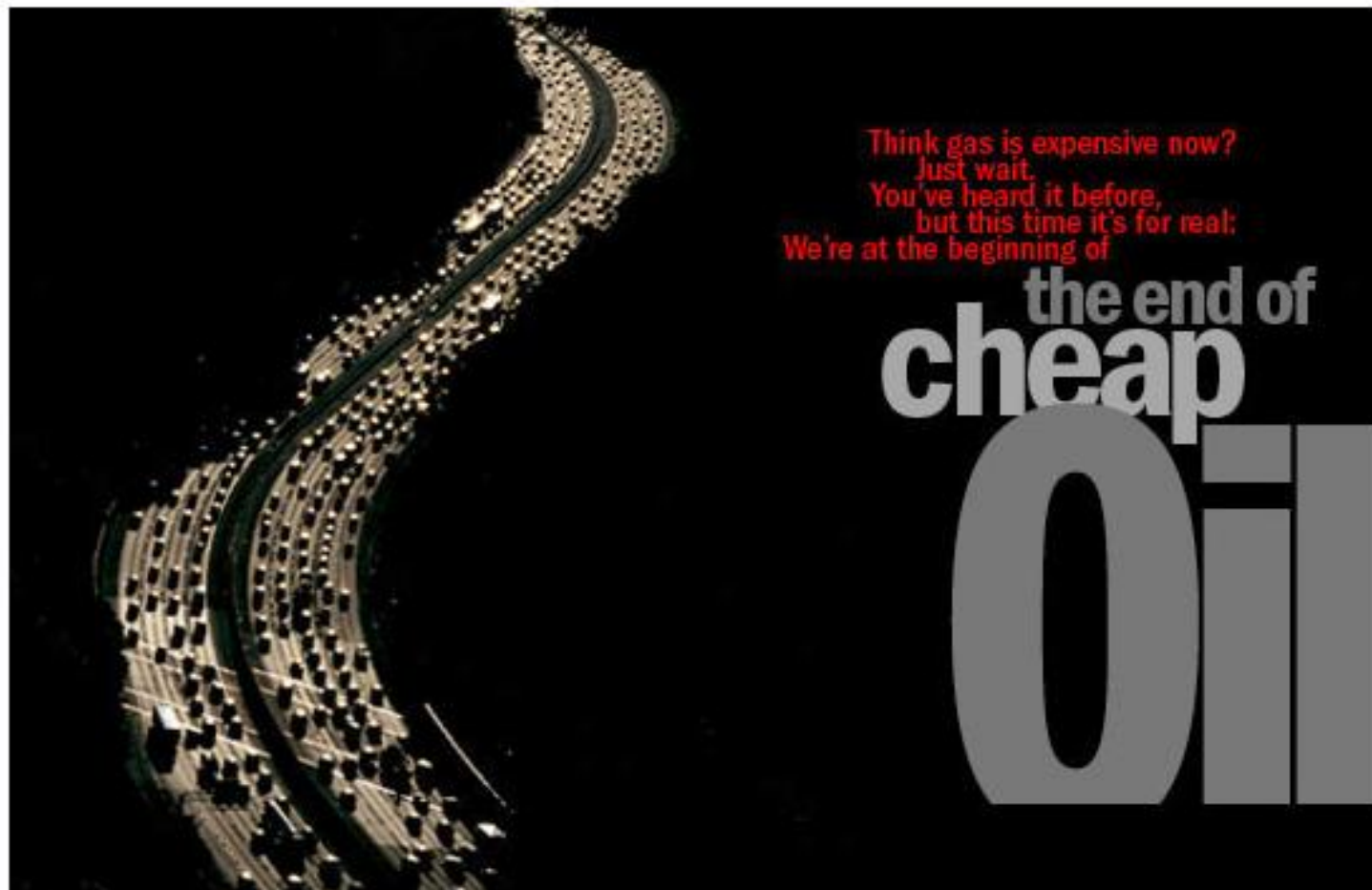
Field Notes From  
Photographer  
Sarah Leen

## End of Cheap Oil

Step into the world of writers and photographers as they tell you about the best, worst, and quirkiest places and adventures they encountered [in the field](#).

## ZOOM IN

Get the facts behind the frame in this online-only gallery. Pick an image and see the photographer's technical notes.



Think gas is expensive now?  
Just wait.  
You've heard it before,  
but this time it's for real:  
We're at the beginning of

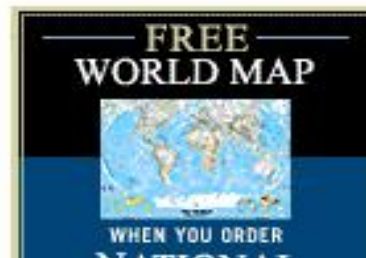
the end of  
**cheap**  
**Oil**

By Tim Appenzeller

Photographs by Sarah Leen

[e-mail >>](#) this page to a friend

**It's inevitable. But just how soon will the vital fuel become so scarce and expensive that we're forced to make hard choices about how we live?**



## Climate Change



“The Future of Transportation”



(Mini-Rorschach Test)

# *The* JEI<sup>SONS</sup>





## There is No Silver Bullet

(not even alternative fuels or pricing)

# Organ Donation Pledge

In the unfortunate event that you should die as a result of this presentation, please complete the following organ donor form and keep it in your wallet.

I, \_\_\_\_\_ (full name) wish to pledge the following organs  
\_\_\_\_\_ should I die as a result of this  
presentation.

Date \_\_\_\_\_ Signature \_\_\_\_\_.

Date \_\_\_\_\_ Signature of witness \_\_\_\_\_.





“CAPTIVE”

+

“Transportation Disadvantaged”

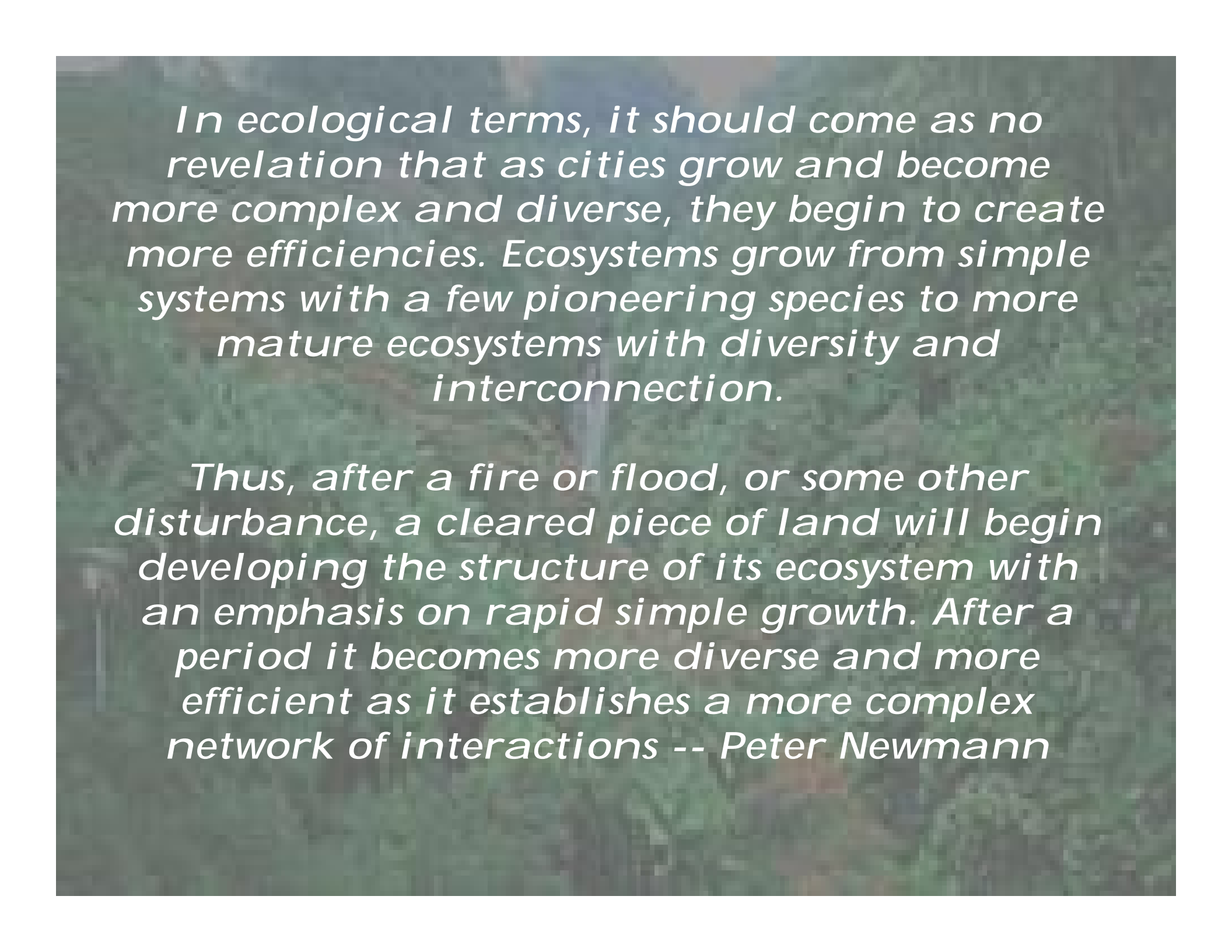
(therefore)

Transportation IS Cars

(therefore)

Improve Transportation =

???



*In ecological terms, it should come as no revelation that as cities grow and become more complex and diverse, they begin to create more efficiencies. Ecosystems grow from simple systems with a few pioneering species to more mature ecosystems with diversity and interconnection.*

*Thus, after a fire or flood, or some other disturbance, a cleared piece of land will begin developing the structure of its ecosystem with an emphasis on rapid simple growth. After a period it becomes more diverse and more efficient as it establishes a more complex network of interactions -- Peter Newmann*

## The Evolution of Transportation

### 21<sup>st</sup> Century: The Emergence of New Mobility

Information technology, communications, and New Economy drivers transform transportation once again. Innovative services, technologies, and products provide seamless access to all modes and decouple mobility from motor vehicle ownership. Major urban areas around the world evolve towards transportation systems that provide a wide range of mobility services that are integrated, smart, clean, service-based and user-focused.

### Today: Transport Meets the New Economy

New approaches emerge as congestion, high infrastructure costs, expanding cities, poor urban air quality, limited mobility for those without motor vehicles, and the possible near-term end of cheap oil all lead to growing recognition that future demand for mobility can only be met through major innovations.

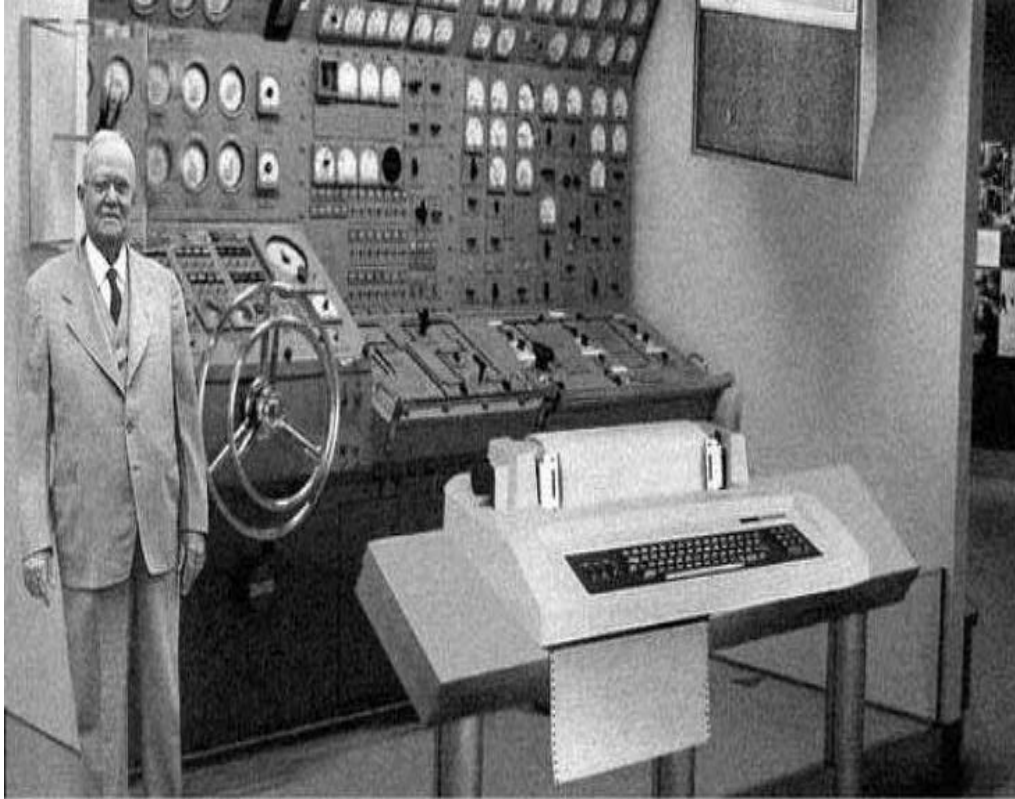
### 20<sup>th</sup> Century: Roads Take Over

The internal combustion engine, Henry Ford's production techniques and massive public investment allow roads to dominate transportation. Trucks capture most goods movement, while automobiles transform lifestyles and give rise to a new urban form. Arterials and highways fan out from downtowns, connecting sprawling suburbs to job centres and shopping malls.

### 19<sup>th</sup> Century: The Age of Rail

From an agrarian society with little need for mobility, the industrial revolution concentrated workers in factories. Cities exploded and freight distribution networks soon followed. Rail dominated—heavy rail for moving goods and people long distances, and streetcars, tramways and underground railways for getting around major towns.



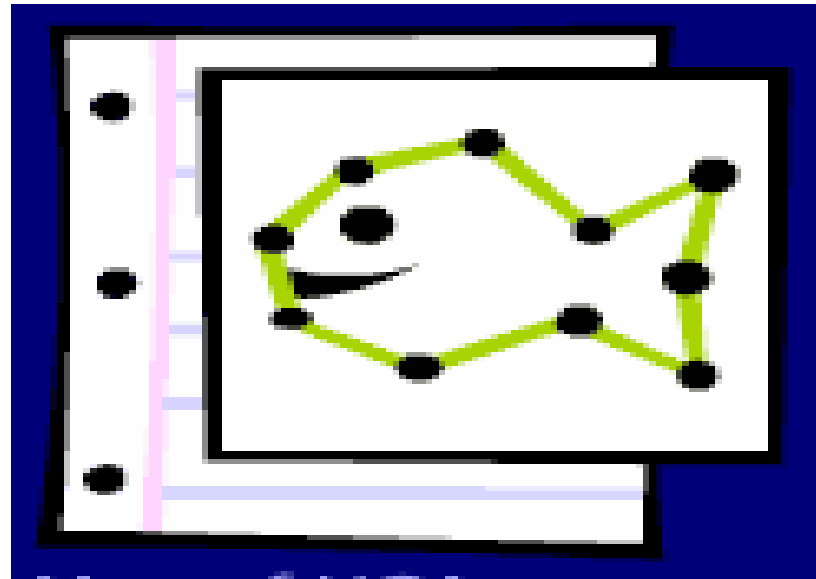






# PROFUSION OF ISOLATED INNOVATION

- New energy sources
- New services (car sharing, slugging)
- New products (seguay, BRT, mechano transit)
- New technologies (smart cards, mesh networking, wayfinding)
- New physical arrangements (hubs, mixed use)
- New financial mechanisms (congestion pricing)
- New approaches



CONNECTIVITY





QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

# Hong Kong Octopus

QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

QuickTime™ and a  
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are needed to see this picture.

*Against all odds and in no time...*

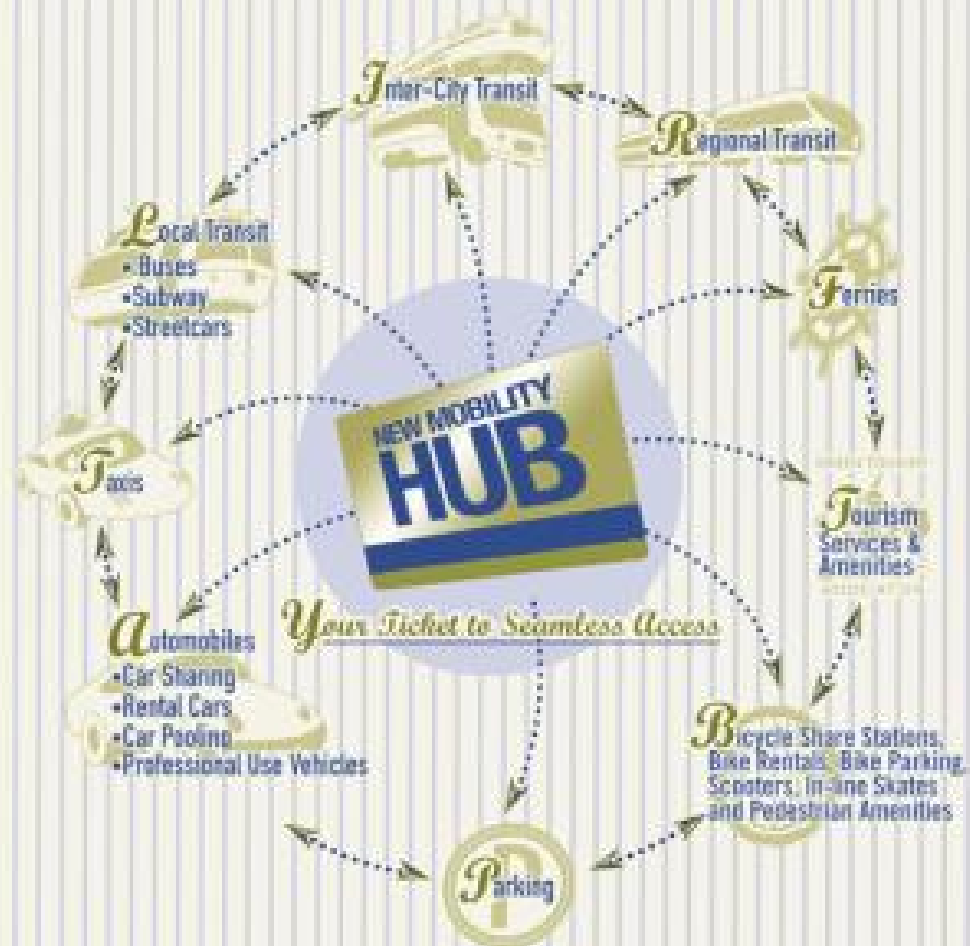
## TRANSMILLENIO BOGOTA

- BRT - alt fuels
- Bike lanes
- Public spaces
- Heritage trees
- Pico & placa
- Weekly road openings
- Car free day
- Public Private collaboration
- And more...



# NEW MOBILITY HUBS

## *The* Concept







# Qualities of New Mobility:

Like the Ideal Life's Partner...

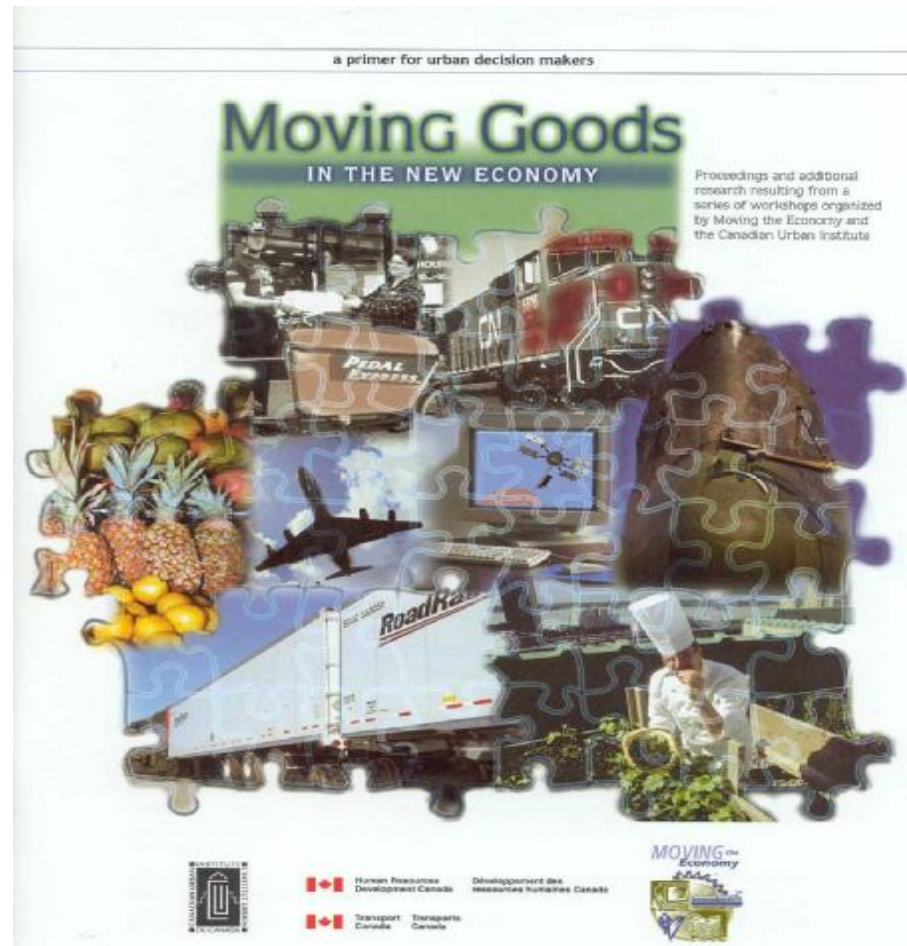
- ü Multi-talented
- ü Clean
- ü Connected and integrated
- ü Smart / technologically enhanced
- ü Sophisticated
- ü Confers status
- ü Efficient
- ü Convenient
- ü Sexy
- ü Economically beneficial
- ü Socially beneficial
- ü Environmentally beneficial
- ü Service-oriented
- ü Caters to your needs
- ü Accessible to all
- ü Other?



moving people  
moving goods  
moving less



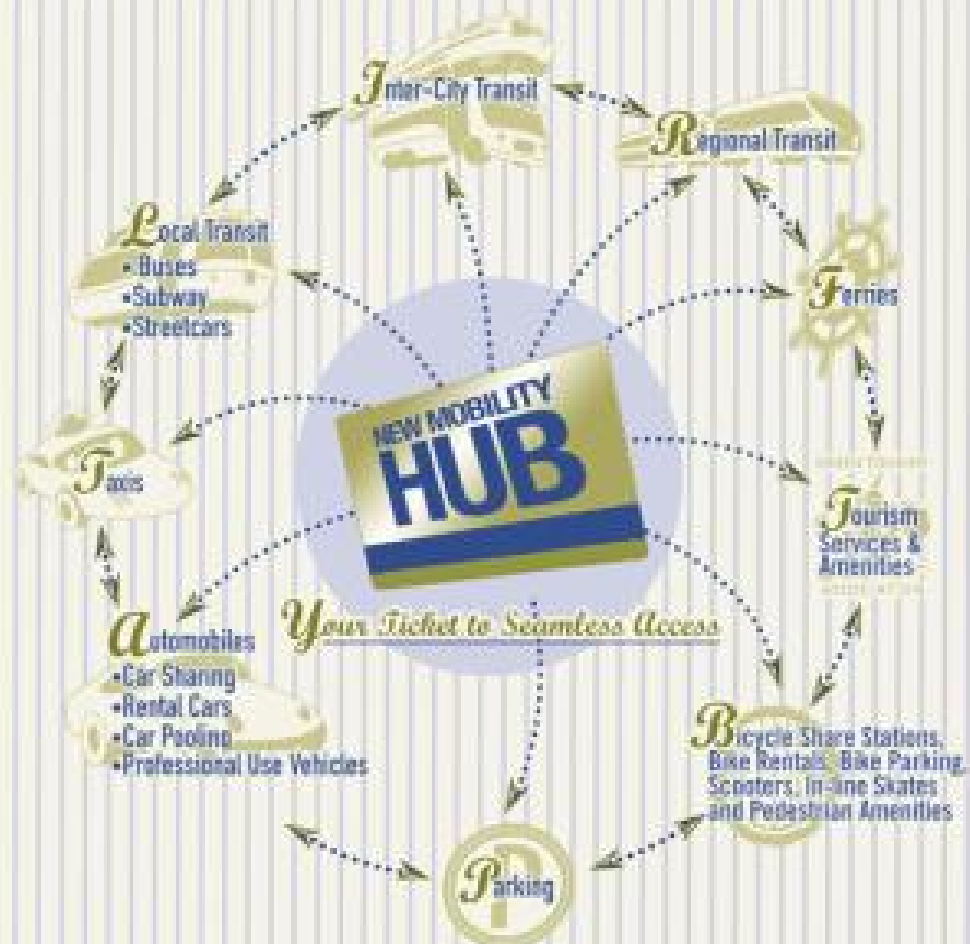
# Urban Goods Movement





# NEW MOBILITY HUBS

## *The* Concept



## *PURPOSE: Meet People's Needs*

üLive

üLove

üWork

üPlay





## **ACCESSIBILITY PARADIGM**

- Transportation is a derived demand
- How much is accomplished in a given time and budget?

### **ACCESSIBILITY IS ACHIEVED BY:**

- Proximity & design
  - Technology
- Seamless inter-modal transportation

# MOVING LESS



## Reducing un-necessary trips

- Tele-everything
- Urban design bringing things together
- Integrating technologies (traveler information, GIS etc)
  - Local urban tourism
  - Local production & distribution
    - Freight campuses
  - Fair Transport / social equity
    - And more...

## **ANALYSIS & INTERVENTION:**

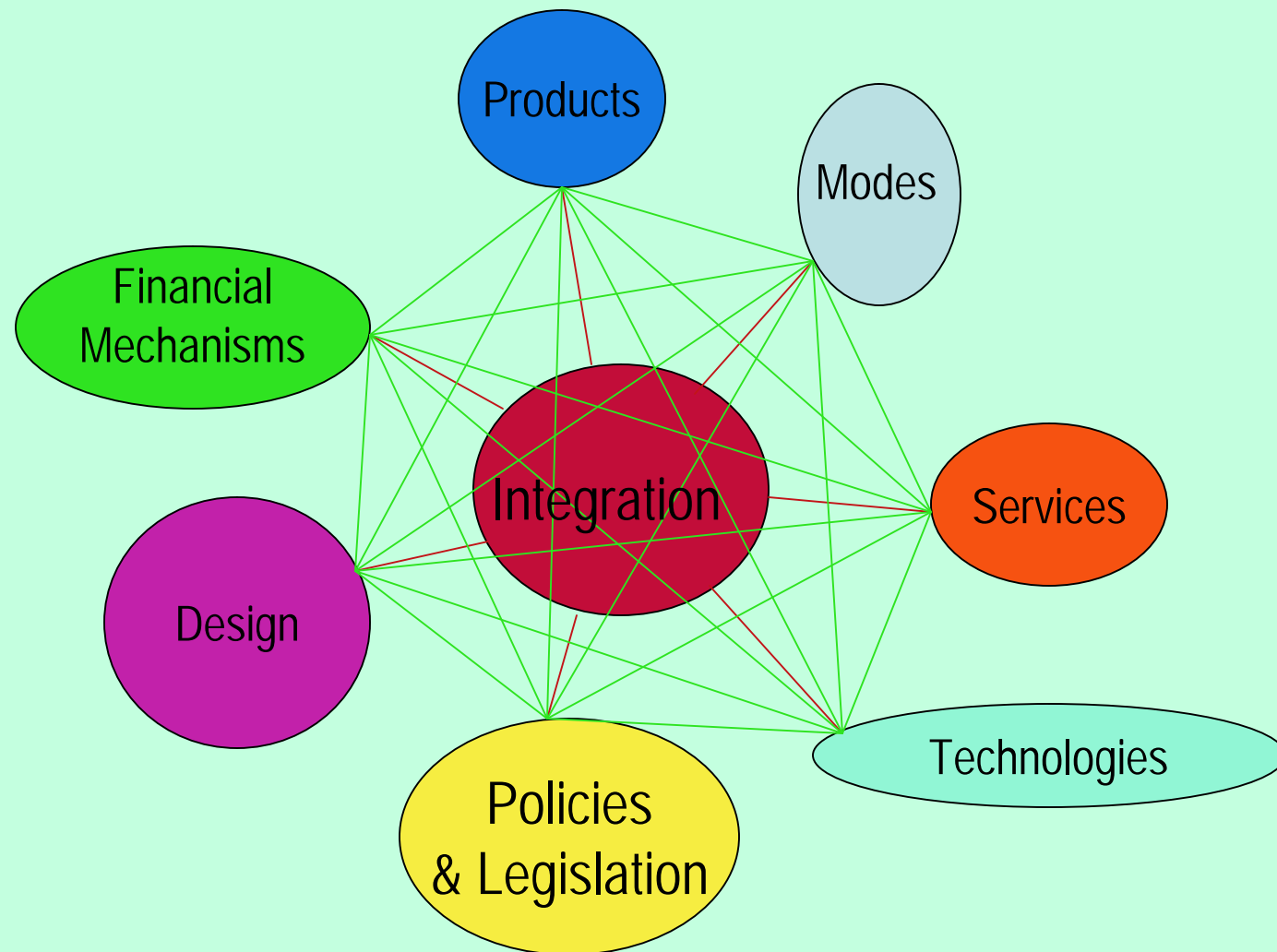
ü *Understand the variables*

ü *Understand the dynamics*

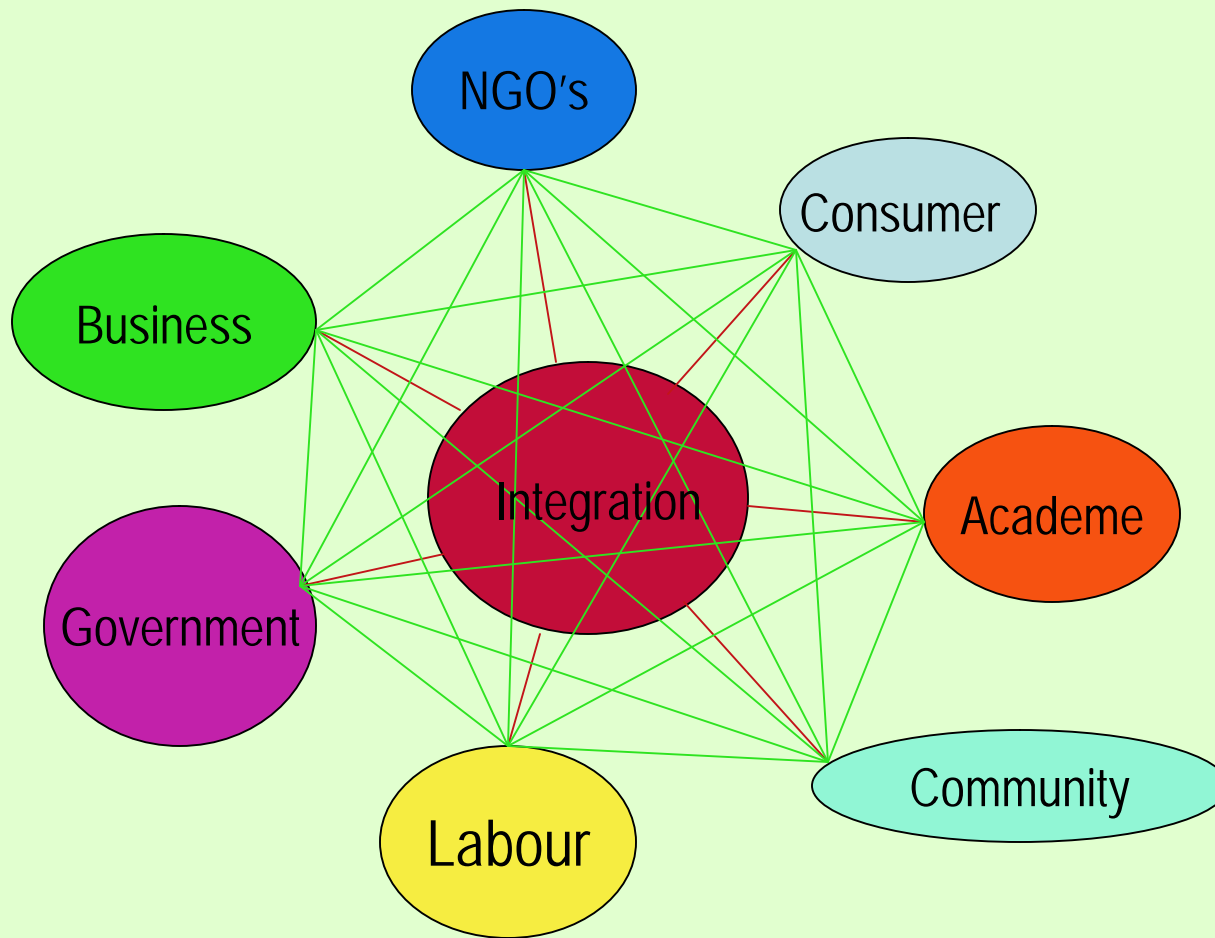
ü *Identify & connect the innovations*

ü *Apply (& commercialize)*

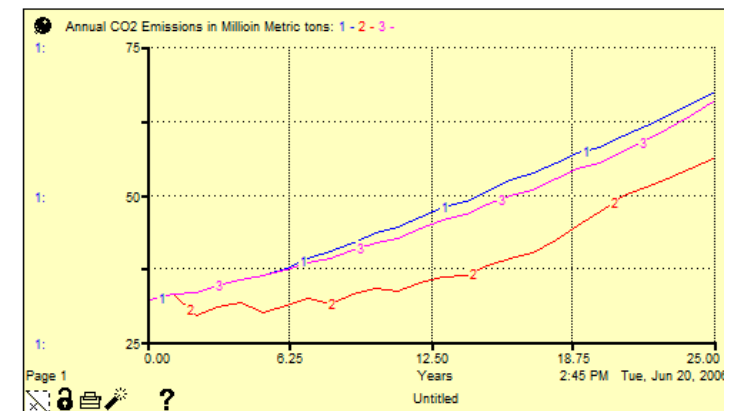
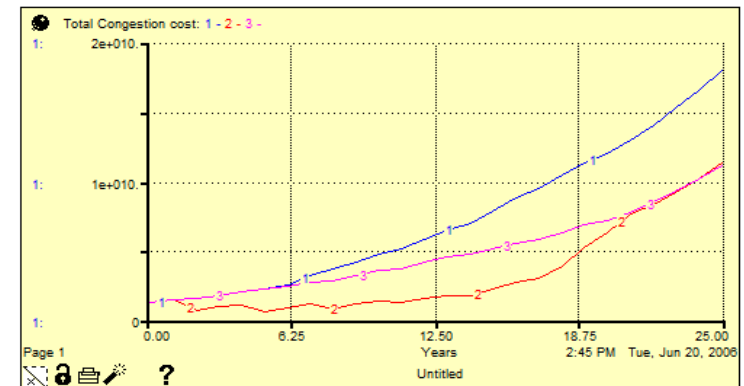
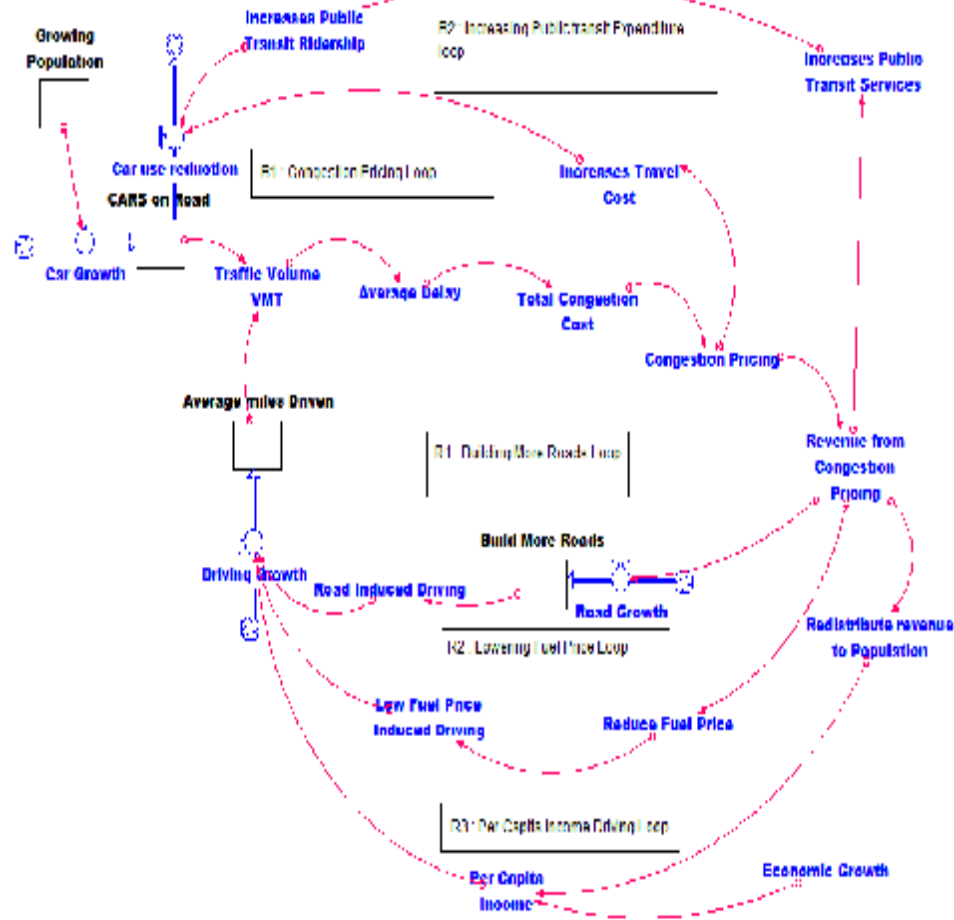
# POINTS OF INTERVENTION / IMPLEMENTATION



# THE ACTORS



# Top Down & Bottom Up Systems Analysis





Land use and transportation are intermeshed.





envision your future



MetroQuest at a Glance

A Closer Look

Showcase

News

HOME

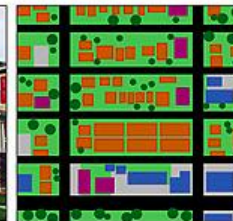
Population Location

Job Location

Deve Medium Density

How c  
housi  
devel

- ☐ Fav
- ☐ Cur
- ☐ Fav
- ☒ Con



Trans  
Trans  
Ener  
Redu  
Wate  
Popu  
Econ



1 Community Vision

Population Distribution

In this section:

Testimonials

Project Highlights

Software Screenshots

Workshop Images

Next Steps:

Show Me

Download PDF Overview

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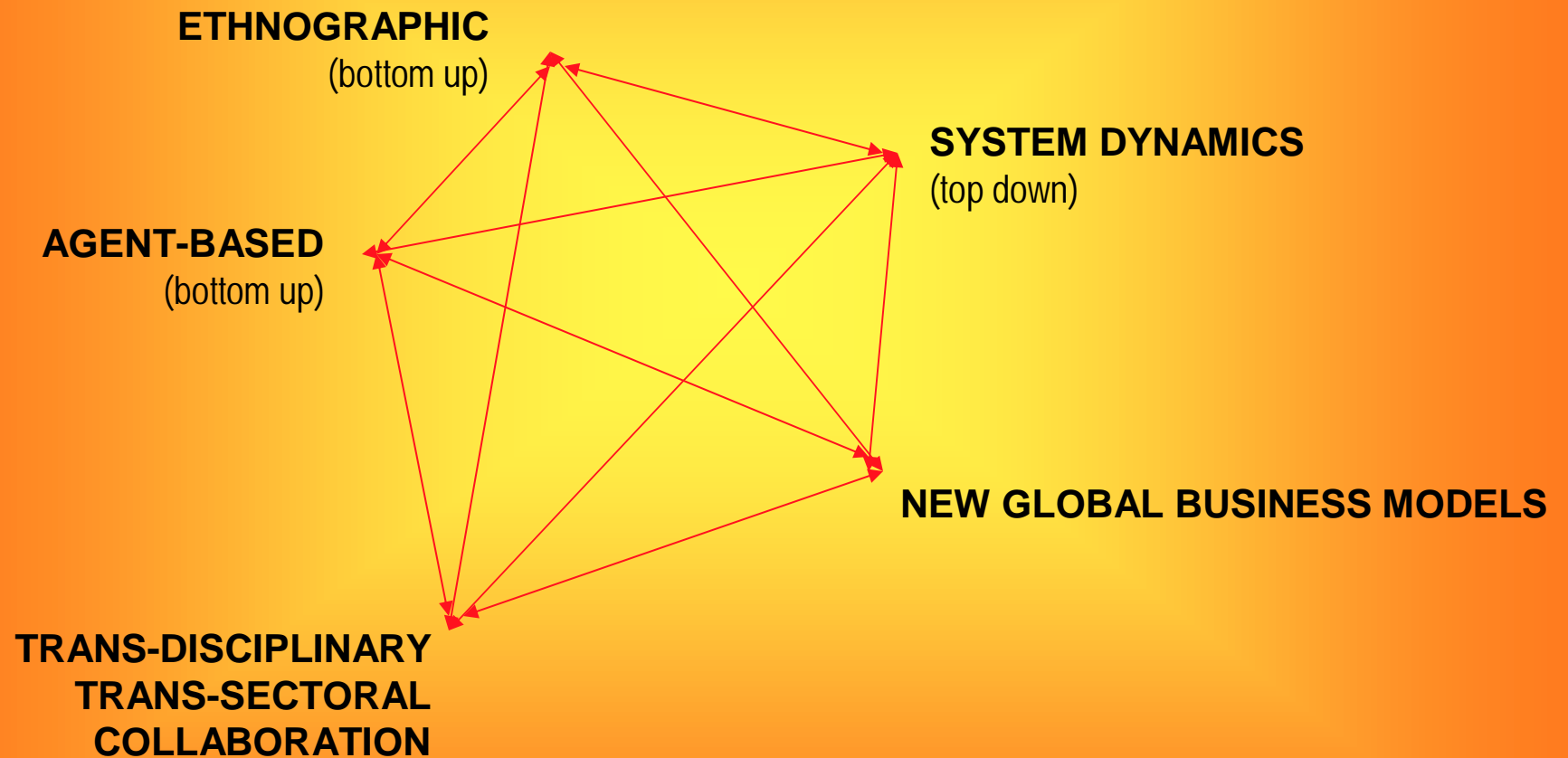
Register for Webcast

Get MetroQuest

Contextual imagery helps make sense of policy choices.

# SYSTEMS RESEARCH

SMART



The background of the slide is a green-tinted photograph of a city skyline. Overlaid on the image is a network diagram consisting of several circular nodes connected by thin lines. Some of these lines are highlighted in a brighter green. The overall aesthetic is modern and technological.

## NEW BUSINESS MODELS:

- *Urban transport is urgent & transferable*
- *New products, services, technologies are emerging*
- *New industries involved (ICT, real estate, tourism, financial, logistics etc)*
- *New markets: Top and base of pyramid*
  - *Connectivity*

# New Mobility Industry Cluster

Encompasses the industries of the future of transportation

- n Telecommunications & Wireless Technologies
- n E-business and New Media
- n Information Technology
- n Tourism and Retail
- n Transportation Operations and Services
- n Goods Movement & Supply Chain Management
- n Intelligent Transportation Systems
- n Real Estate Construction, Planning, & Operations
- n Geomatics
- n Financial Services, Banking and Investment
- n Transportation -- Equipment

“The current value of new mobility markets can be measured in the billions of dollars.”

*Building a New Mobility Industry Cluster in the the Toronto Region (MTE)*



# SMART

## ACADEMICS

- Doctoral Program
- Masters Certificate
- Mid-career fellowship

## PROJECTS

- Analysis
- Solution-building
- Detroit, India, S. Africa

## POLICY

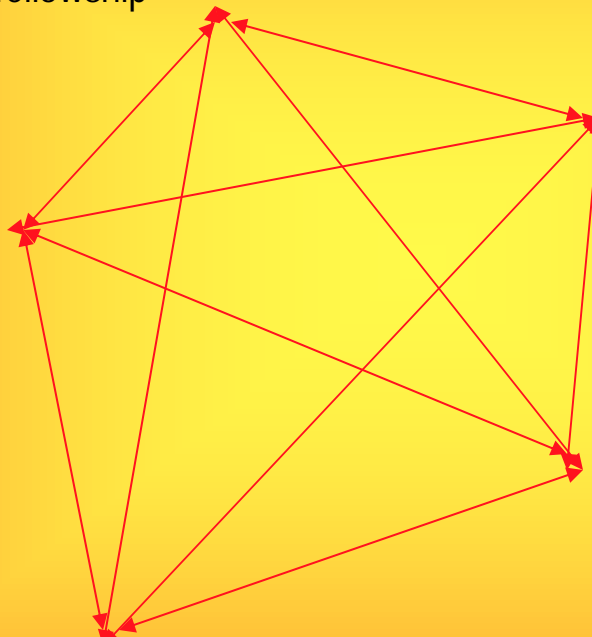
- Analysis
- Applied

## RESEARCH

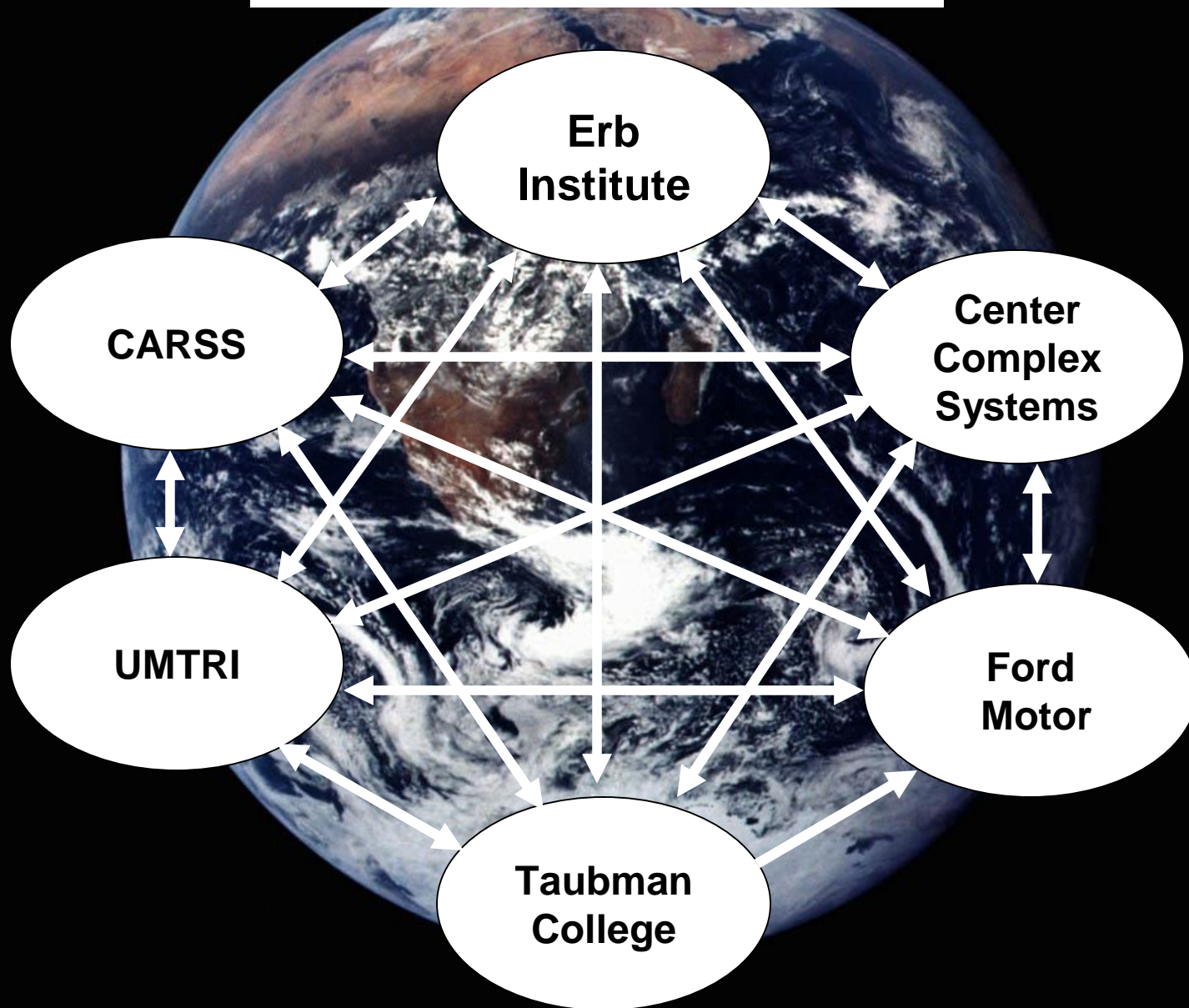
- Systems Analysis & Modeling
- Accessibility Index
- Innovation spread
- New Mobility Markets
- Aging

## LINK TANK

- Local & International
- All sectors



# **“SMART” PARTNERS**





# FRONTIERS

**CONNECTIVITY / COMPLEXITY**

**FLEXIBILITY / USABILITY**

**ACCESSIBILITY (meeting needs)**

**SUSTAINABILITY (environmental, social, economic)**

**SECURITY (robust, seamless backup systems)**

**EQUITY (base of the pyramid)**

**NEW INFRASTRUCTURE (physical, digital, cultural)**

**NEW BUSINESS MODELS - BOP, Marketing**

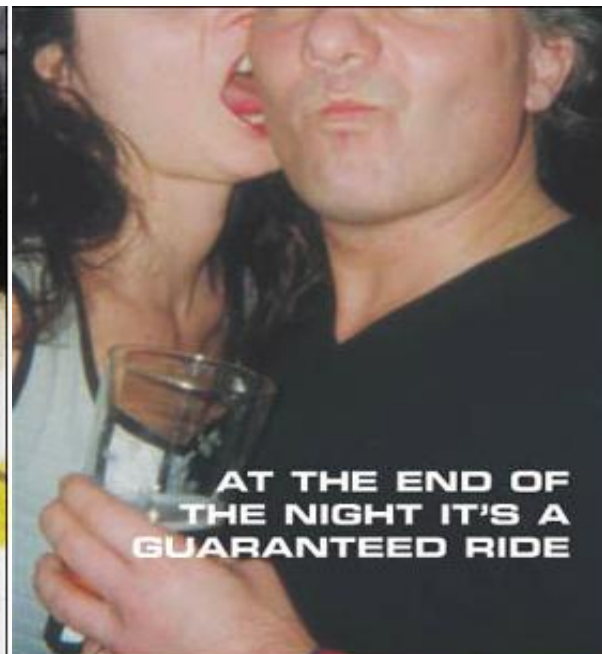


# DISCUSSION





**NiteLink from Dublin Bus**



**NiteLink from Dublin Bus**



**NiteLink from Dublin Bus**



**NiteLink from Dublin Bus**



**DUBLIN Bus Ads**



1



2



3



4



5



6



7



8



9



The background of the slide is a city skyline, likely New York City, with a green overlay. Overlaid on the green area are several thin, white lines forming a network or map-like structure, with some lines ending in small circles or arrows. The text is centered in the upper half of the slide.

# NEW MOBILITY: RETHINKING SUSTAINABLE URBAN TRANSPORTATION

- As complex and sophisticated (“whole systems”)
- As a framework for city-building (not an afterthought)
- As a vehicle to sustainability (ecological and social)
  - As a positive, sexy way forward (not a sacrifice)
    - As an investment (not a cost)
- As a collaborative, ongoing project (involving all)

*INTEGRATE\*INNOVATE\*COLLABORATE\*TRANSFORM*