The New Megalopolis: The Role of Interconnection in Achieving Urban Sustainability

Kristen Brown, Ph.D.

ARPA-E Fellow

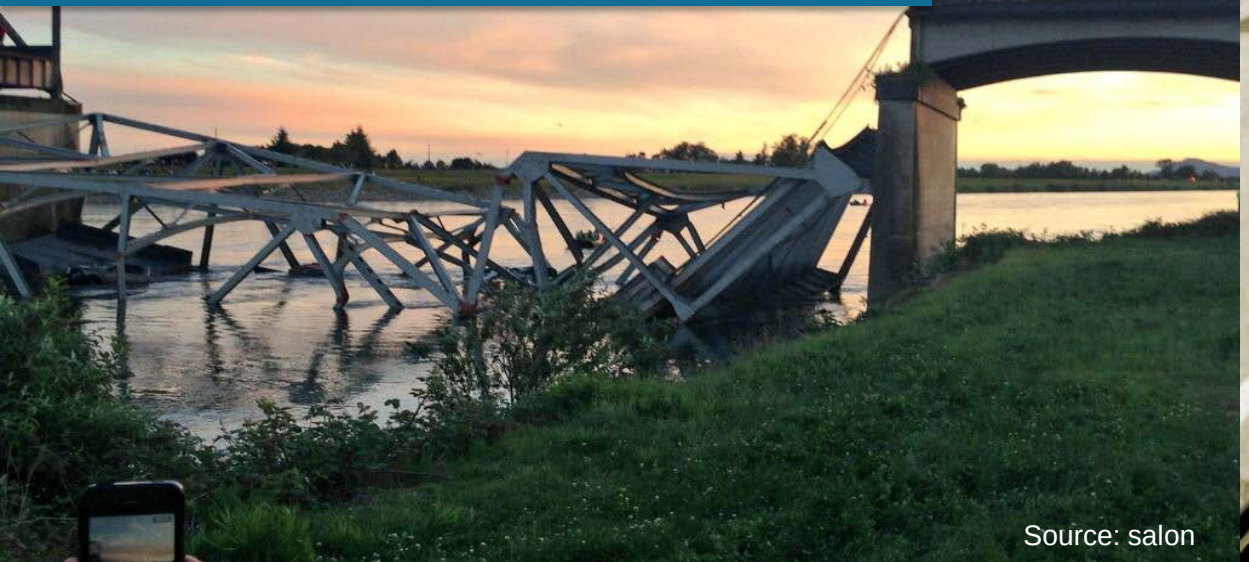
February 28, 2017

Increased Density

Changing Climates

Source: five thirty eight

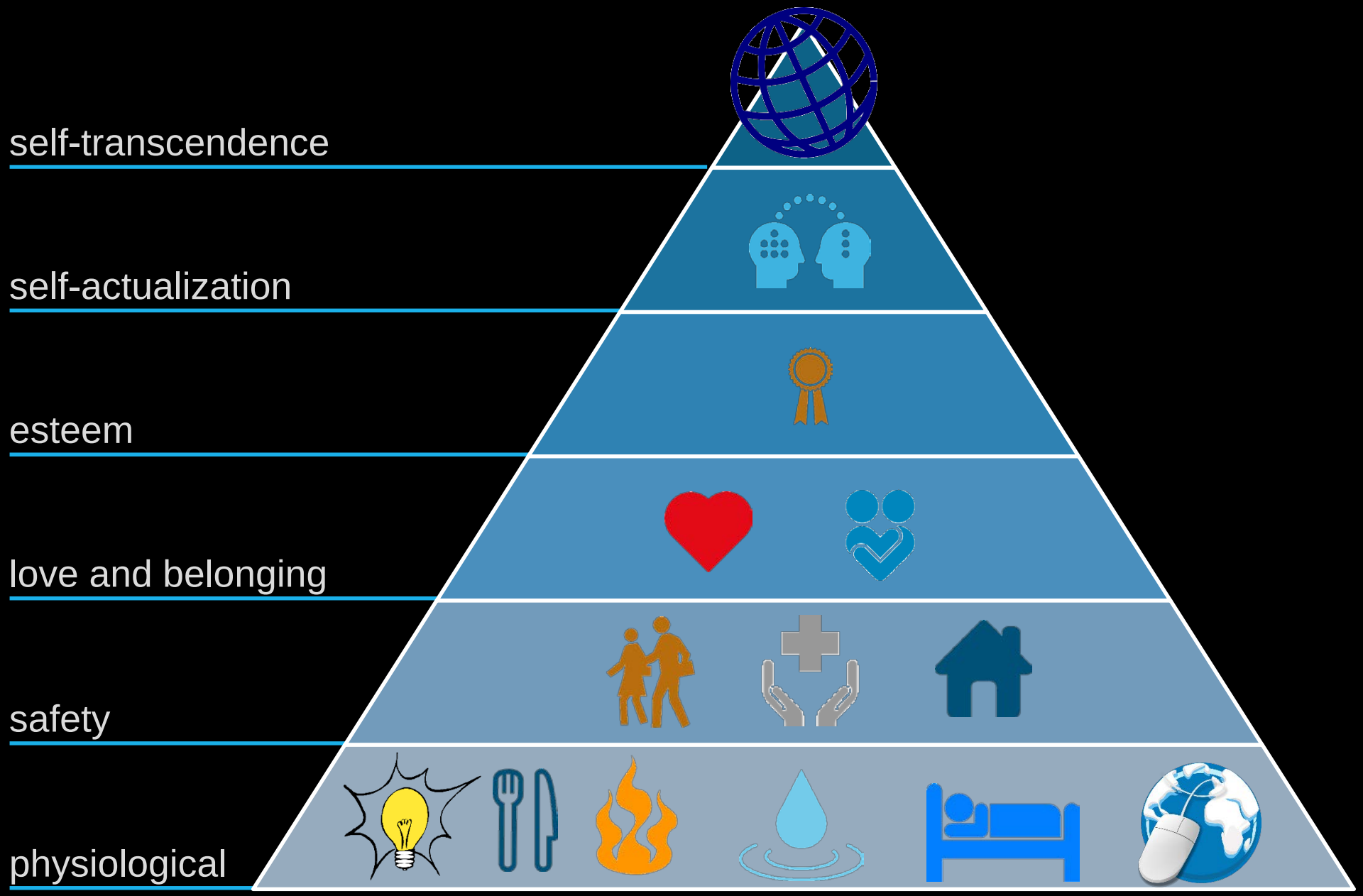
Aging Infrastructure



Source: salon

Evolving Technology

Source: Rand


self-transcendence
self-actualization
esteem
love and belonging
safety
physiological

Smart Cities market is growing

$36.8B

↓

$88.7B

global market by 2025

Smart Technology

Smart Healthcare

Smart Building

Smart Citizen

Smart Governance

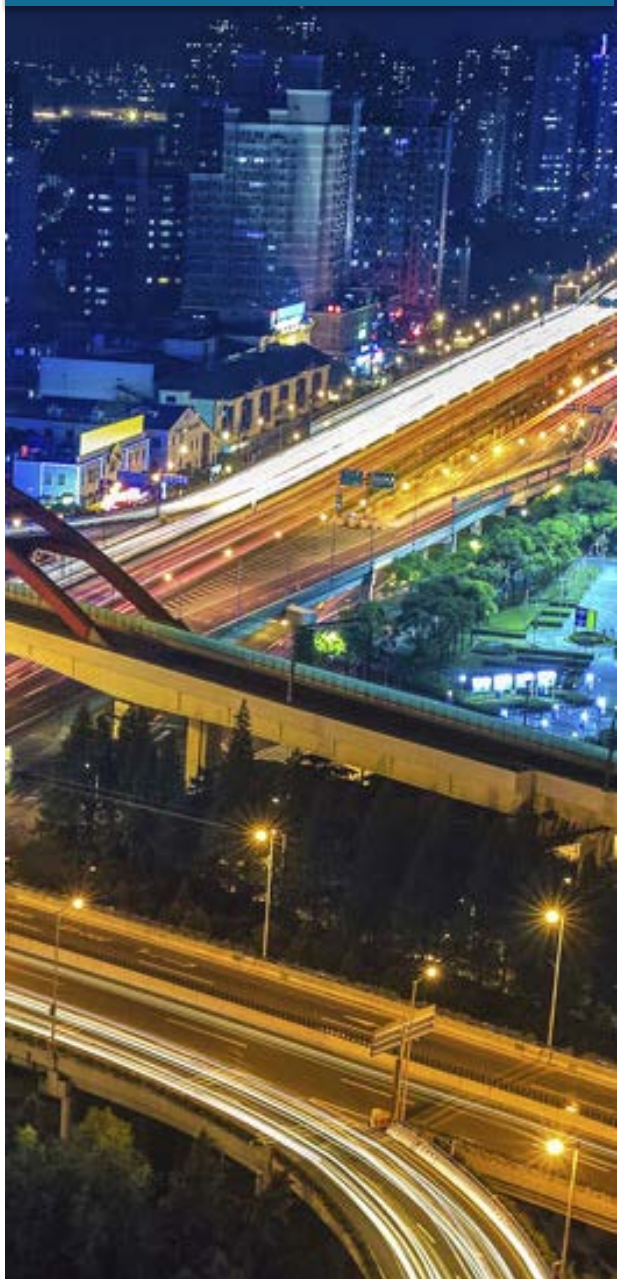
Smart Mobility

Smart Energy

AVAILABLE

AFFORDABLE

ACCESSIBLE



AVAILABLE

ACCESSIBLE

AFFORDABLE

AVAILABLE | ACCESSIBLE | AFFORDABLE

Centralized Infrastructure Planning

Transportation

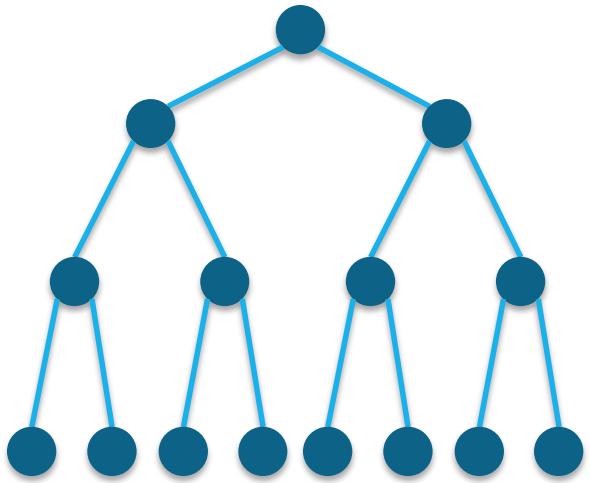
Utilities

Telecom

Buildings

⋮

Linear relationships



AVAILABLE | ACCESSIBLE | AFFORDABLE

Centralized Infrastructure Planning

Transportation

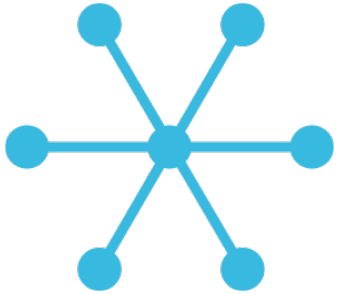
Utilities

Telecom

Buildings

Limited connectivity

Multimodal transportation



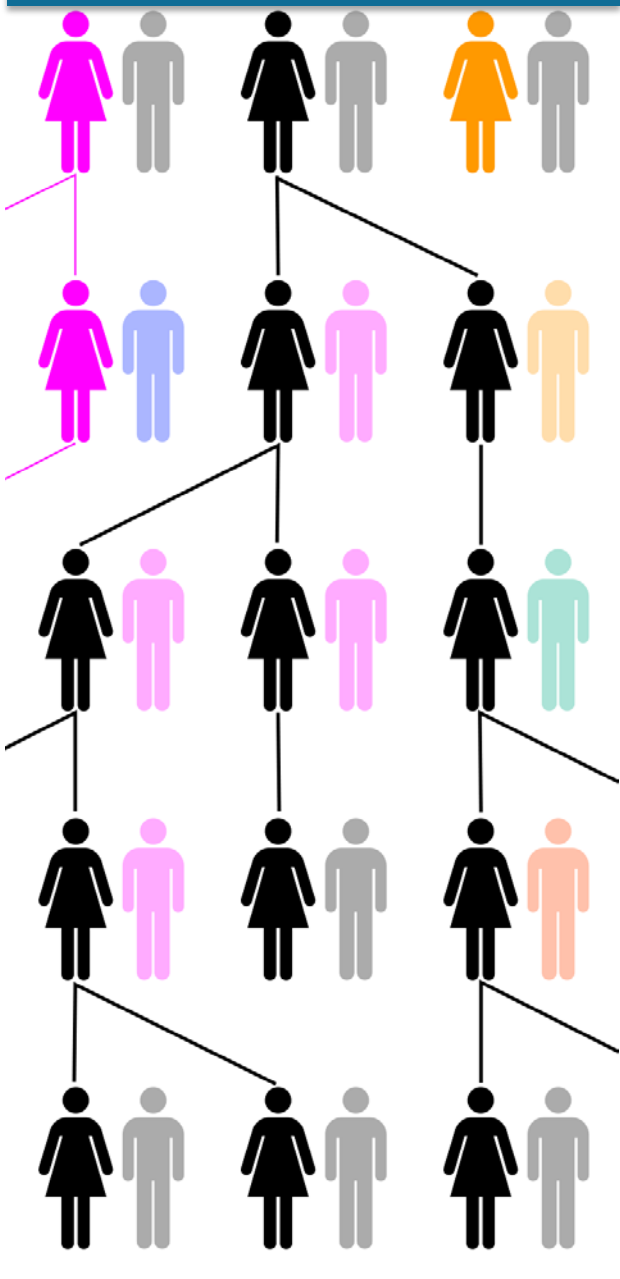
Community solar

AVAILABLE

ACCESSIBLE

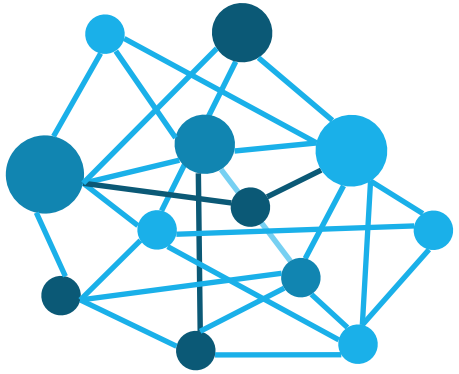
AFFORDABLE

ACCEPTABLE



Three components to increase acceptability & resilience

Diverse data streams



New optimization frameworks

Inherent physical adaptability

We need to expand our understanding and capabilities

Sensing of….

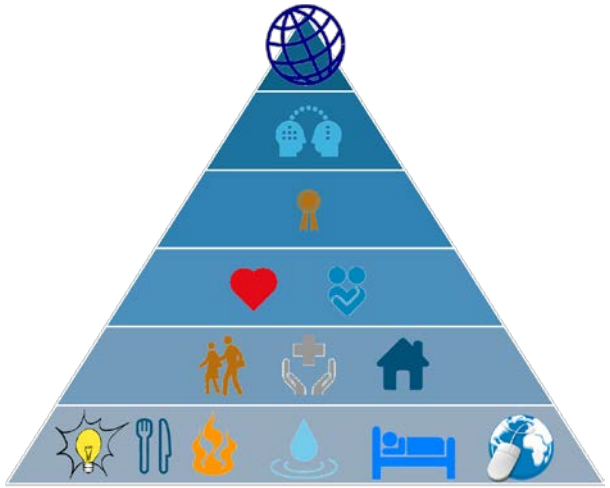
Diverse data streams

Physical Data

- Temp & humidity
- Air temp & wind flow
- Weather patterns
- Building energy usage
- Infrastructure aging
- Traffic patterns

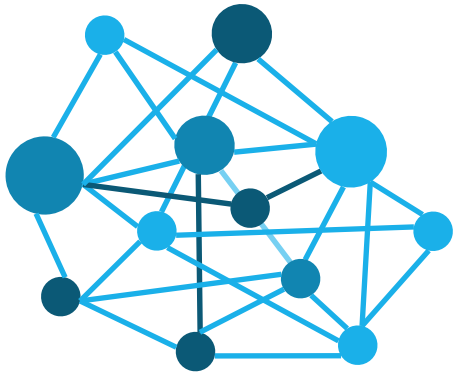
Citizen Data

- Movement patterns
- Health & activity levels
- Individual energy use
- District energy patterns
- Happiness/Fulfillment

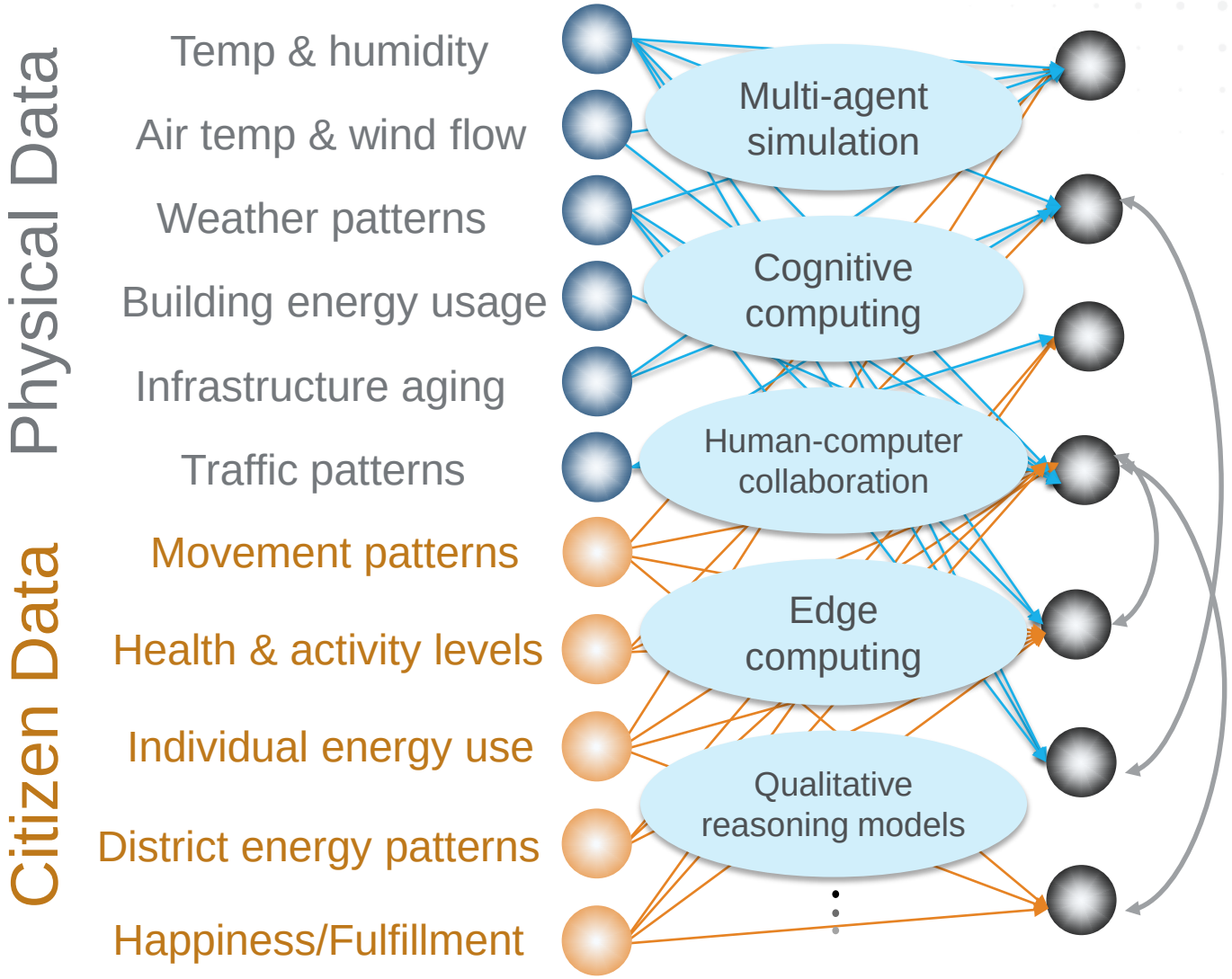


Move away from linear thinking

Design of…



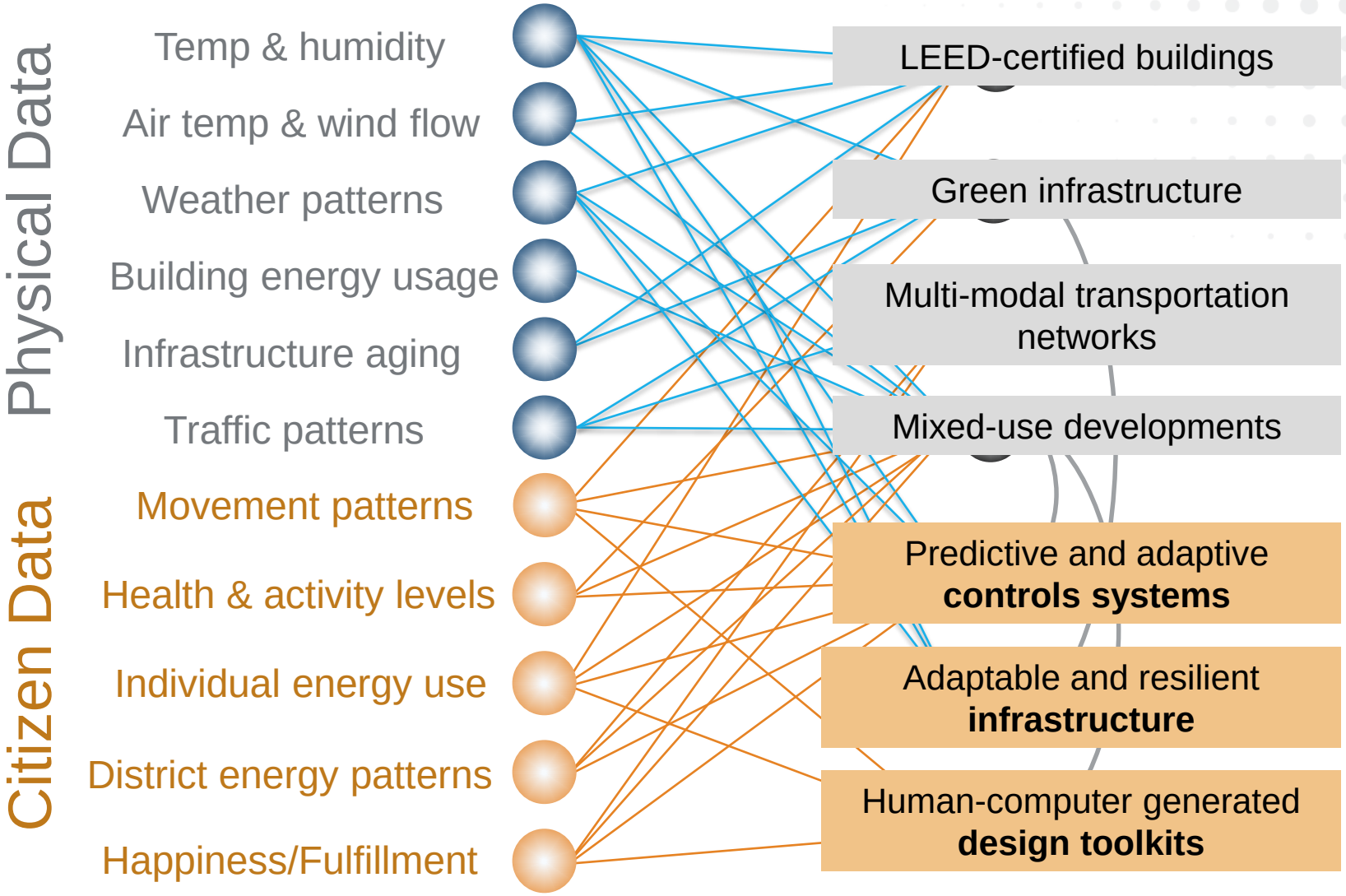
New optimization frameworks



Build complex and adaptive physical systems

Deployment of…

Inherent physical adaptability



Let’s build better cities, not smarter cities

Architects
Building Scientists/Engineers
Atmospheric Scientists
Urban Studies & Planning
Systems Engineering
Sociology & Anthropology
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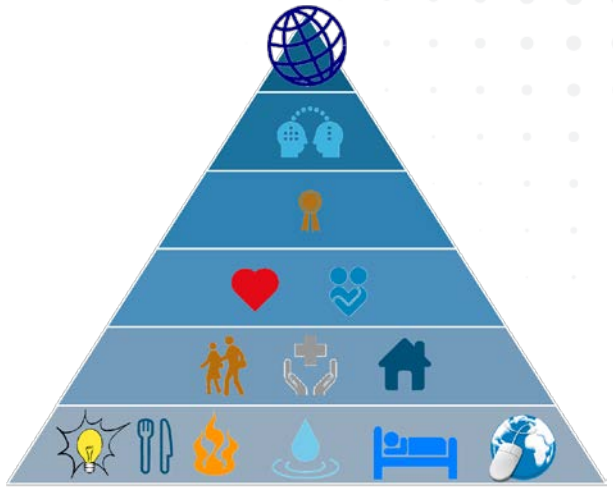

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The Energy Implications of the Changing Urban Environment

Wednesday, 9:00 – 9:50 am

Potomac 5