33rd Annual INCOSE international symposium

hybrid event

Honolulu, HI, USA
July 15 - 20, 2023

US-based systems thinking in Smart Cities

Smart Cities

PIONEER PARTNERS

Presented by Sarah Fustine, Pioneer Partners

PIONEER
PARTNERS

We are a highly specialized advisory firm with a mission to help build a better world in which to live, work and play.

Pioneer Partners is a specialized consulting firm that helps cities envision their future, activating their full economic development potential by modernizing infrastructure (digital and physical), processes, and policy to create a vibrant, equitable, and sustainable high quality of life for all residents, employers, visitors, and partners. We are holistic strategists with a tactical focus.

Pioneer Partners helps cities through:

Smart City Master Planning
Comprehensive Analysis with Roadmap

Technology ROI and Impact Analysis
Analyze ROI, Breakeven and Impact

Funding Advisory (Incl. grant support)
Identify funding sources and strategies

Climate Action Technology Strategy
Identify technology to support climate goals

Smart City Citizen Engagement Events
Engage & educate residents to gain support

Digital Transformation Education Workshops
Educate key stakeholders & City officials

AWARD-WINNING SMART CITY EFFORTS

Our founding team (with roots back to Think Big Partners) is the proud recipient of the Gold Edison Award for its Smart City Initiative deploying *"the most extensive coordinated suite of connective Wi-Fi technology and analytical platforms in the world"* in collaboration with the City of Kansas City, MO, Cisco and other organizations.

The Kansas City smart city project has enhanced citizens' experiences in downtown, improved the delivery of city services and helped spur over $2 billion dollars of economic development.

Sample of Experience

PIONEER PARTNERS

- Akron, OH
- Aransas County, TX
- Atlanta, GA
- Bakersfield, CA
- Baltimore, MD
- Buckeye, AZ
- Carlsbad, CA
- Cary, NC
- Cedar Park, TX
- Chula Vista, CA
- Cleveland, OH
- Dallas/Fort Worth, TX
- Denver, CO area (Pena Station)
- Des Moines Area MPO
- Ft. Lauderdale, FL
- Leavenworth, KS
- Henderson, NV
- Hoover, AL
- Hudson County, NJ
- Irving, TX
- Kansas City, MO
- Keller, TX
- Lee's Summit, MO
- Louisville, KY
- Mesa, AZ
- National Institute of Standards and Technology (NIST)
- Orange County, CA
- Raleigh/Durham, NC
- San Diego, CA
- Scottsdale, AZ
- Sioux Falls, SD
- St. Charles, MO
- St. Joseph, MO
- St. Louis, MO
- Tampa Bay, FL
- Topeka, KS
- Toronto, Ontario, Canada
- Victoria, TX
- Waterloo, IA
- Wichita, KS
- More available upon request

Today's Agenda

1 Defining a Smart City

2 Systems Thinking Approach

3 Common US City Needs

4 Case Studies

5 Q&A

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1. Defining a Smart City
2. Systems Thinking Approach
3. Common US City Needs
4. Case Studies
5. Q&A

"**A smart city** is a city that is capable of identifying its problems and mitigating root causes by generating and processing engineered quality data in a continuous and inclusive manner."
- *Smart City Definition, Metrics, and INCOSE-TUS Framework*


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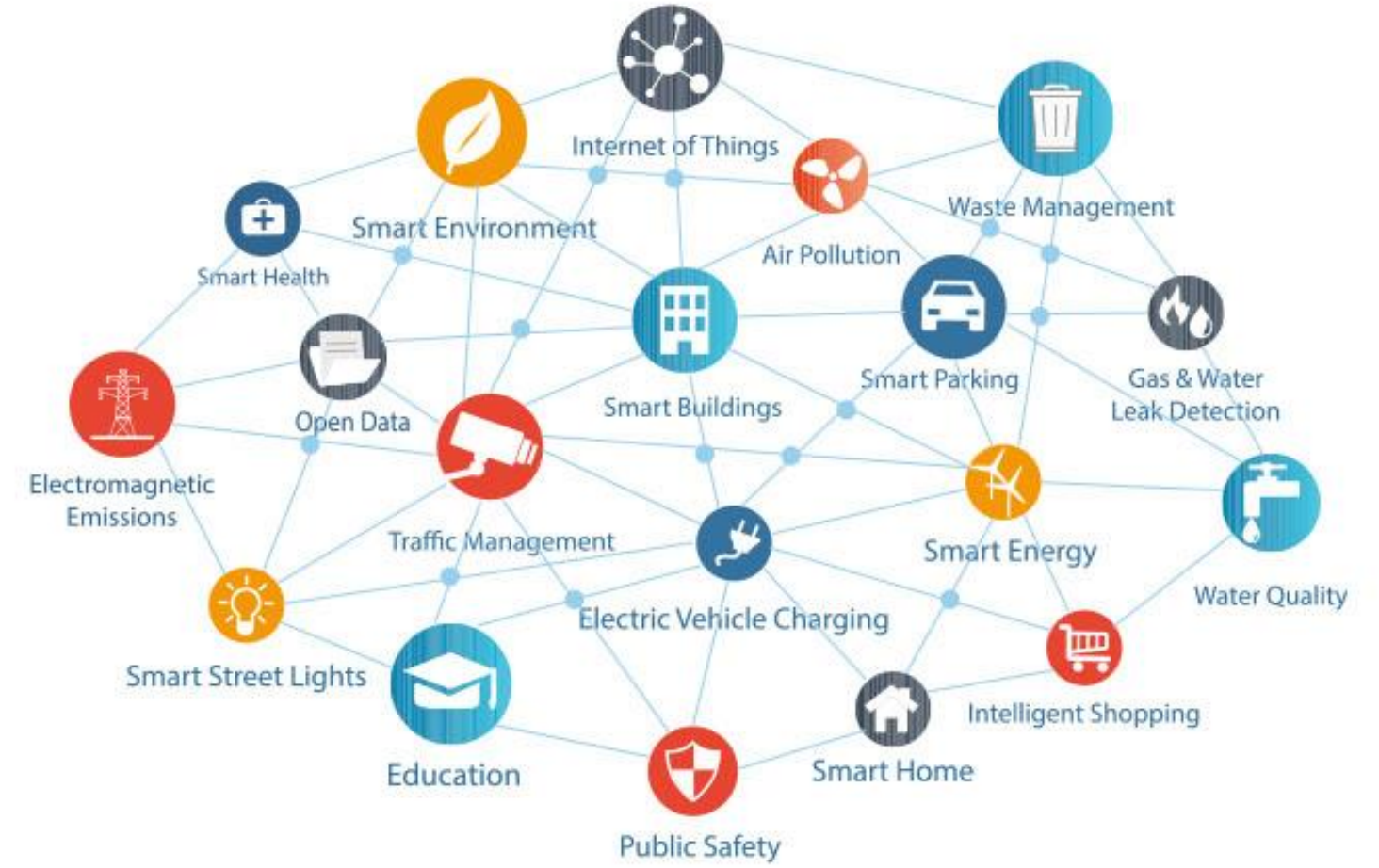

Internet of Things
Smart Environment
Waste Management
Smart Health
Air Pollution
Smart Parking
Gas & Water
Leak Detection
Smart Buildings
Open Data
Electromagnetic
Emissions
Traffic Management
Smart Energy
Water Quality
Electric Vehicle Charging
Smart Street Lights
Intelligent Shopping
Education
Smart Home
Public Safety

Smart cities use data and technology to make better decisions.

Smart applications in eight domains affect multiple aspects of the quality of life

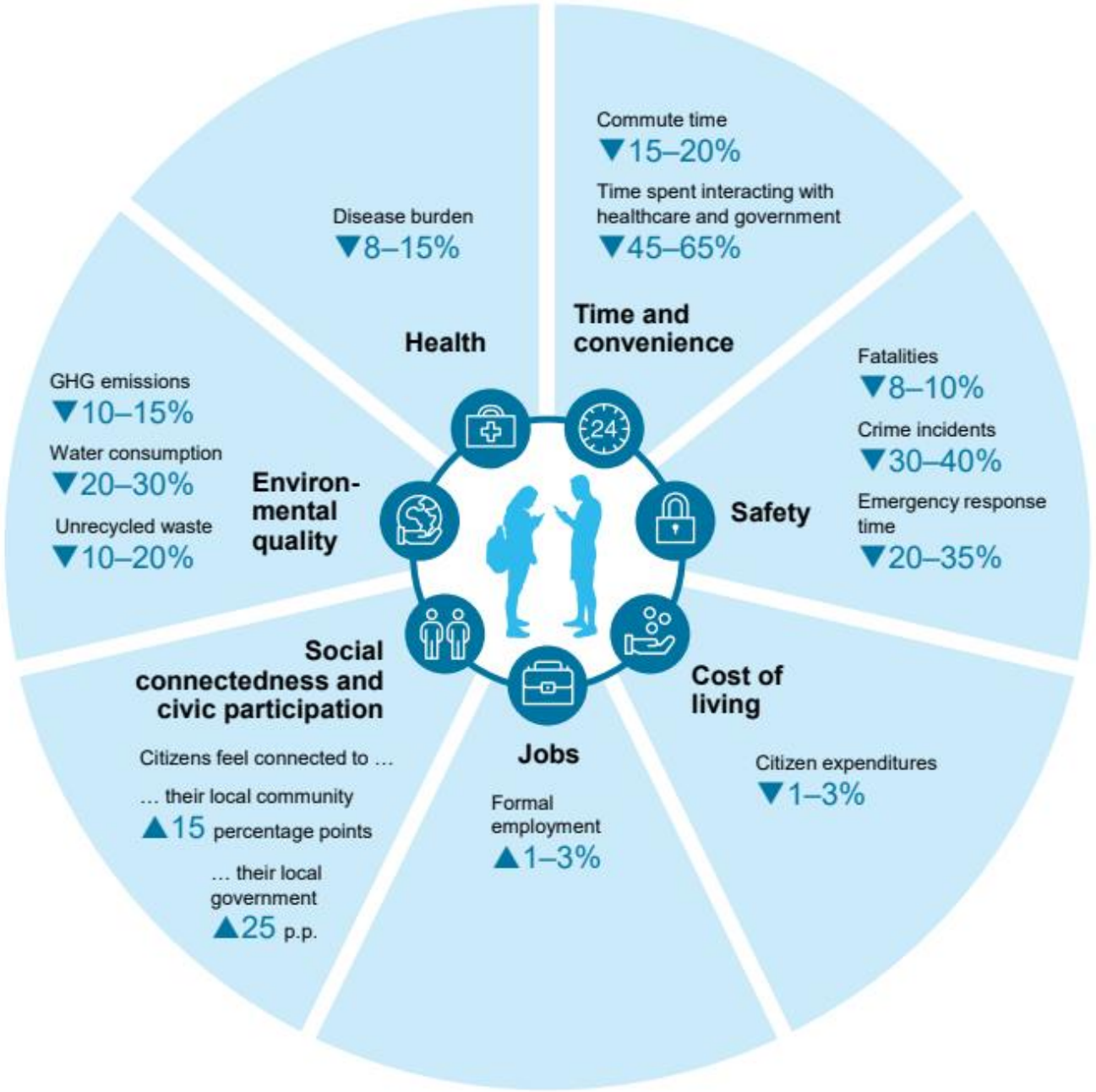
The result?

A more efficient, responsive, and sustainable city . . .

. . . that delivers better outcomes for the people who call it home

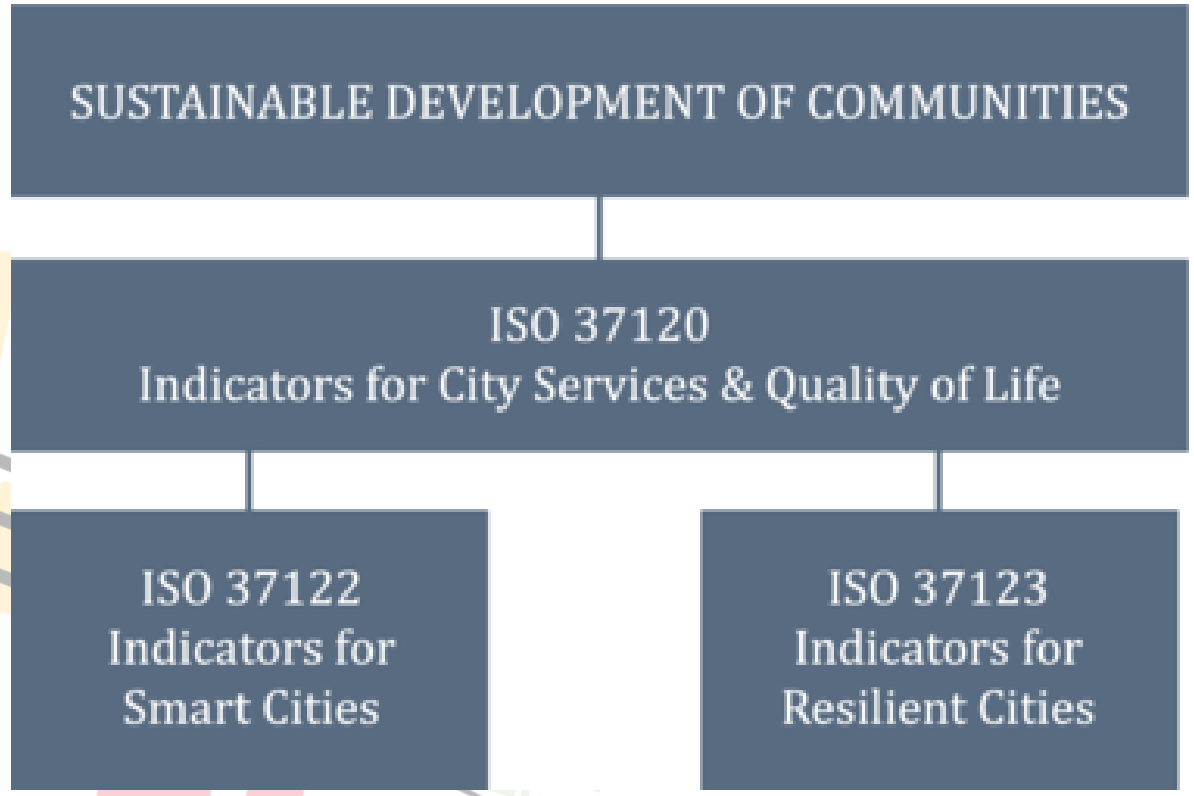
30–300	30–40%	8–15%	15–30	25–80	20–35%
lives saved each year in a city of 5 million	fewer crime incidents	lower disease burden	minutes shaved off the daily commute	liters of water saved per person per day	faster emergency response times

CITIZEN IMPACT



Global Standards

- Communities can follow and measure these ISO standards as a roadmap to objectively become a world-class smart city



Source: ISO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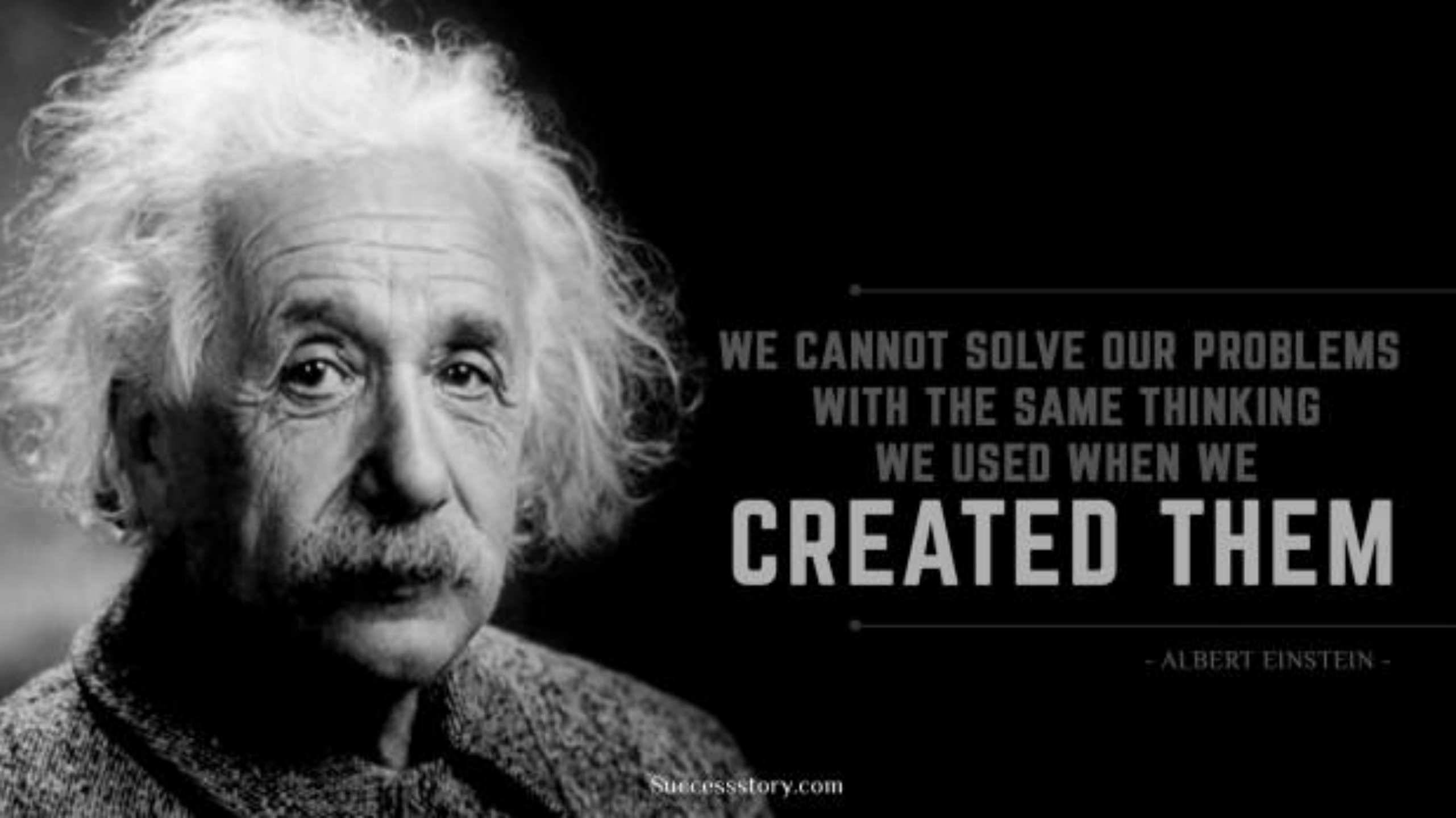
Defining a Smart City
Systems Thinking Approach
Common US City Needs
Case Studies
Q&A

A Systems Thinking Approach to Smart Cities

Pioneer Partners' Approach


WE CANNOT SOLVE OUR PROBLEMS
WITH THE SAME THINKING
WE USED WHEN WE
CREATED THEM
- ALBERT EINSTEIN -
Successstory.com

Smart cities and digital transformation are less about modern technology and **MORE ABOUT PEOPLE**. We must develop **HUMAN-CENTERED INNOVATIONS** to create more livable, vibrant and socially inclusive communities that foster economic development.

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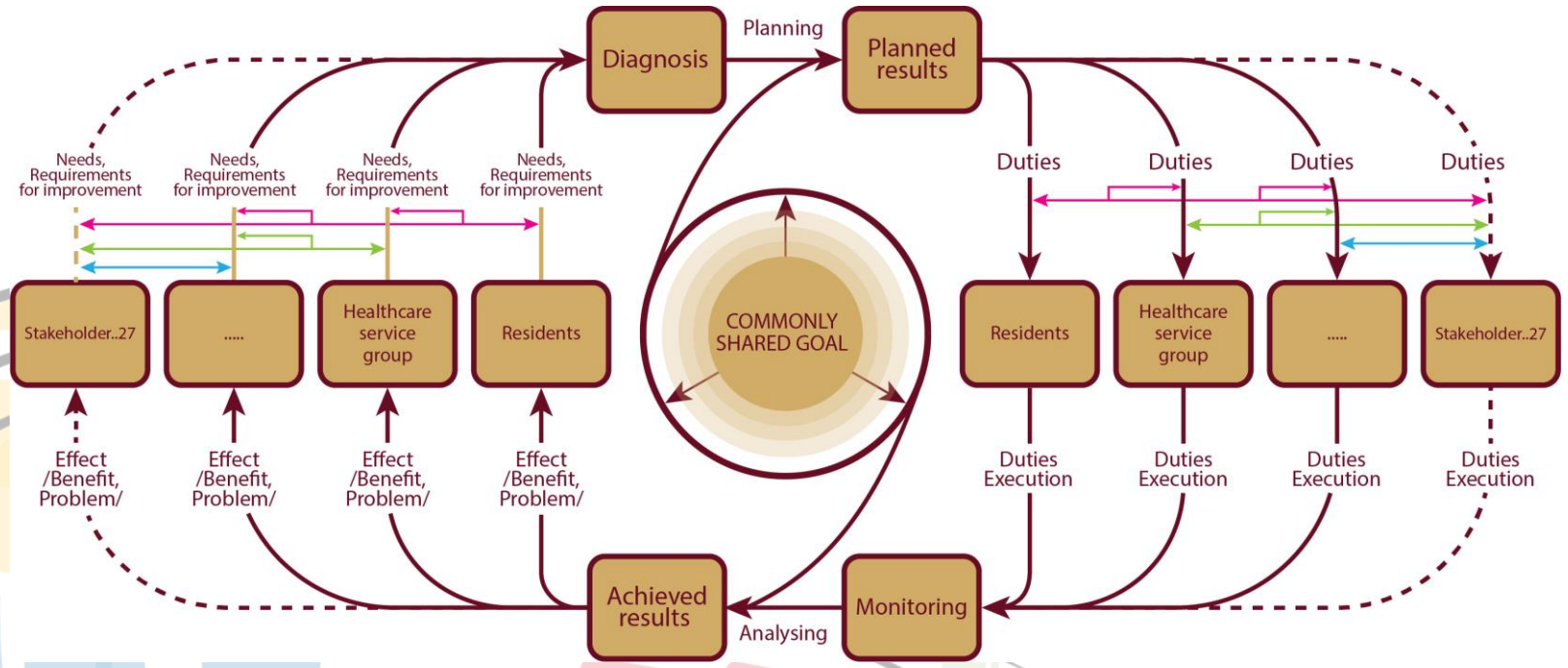
INCOSE Smart Cities Initiative

- Smart Cities Initiative Working Group publication: *Smart Cities Definition, Metrics, and TUS Framework*



Source: INCOSE

How do we do that on a community level?

- Define a Program with:
  - Design Thinking-Inspired Process
  - Multistakeholder Approach
  - Challenge-Solution Mapping

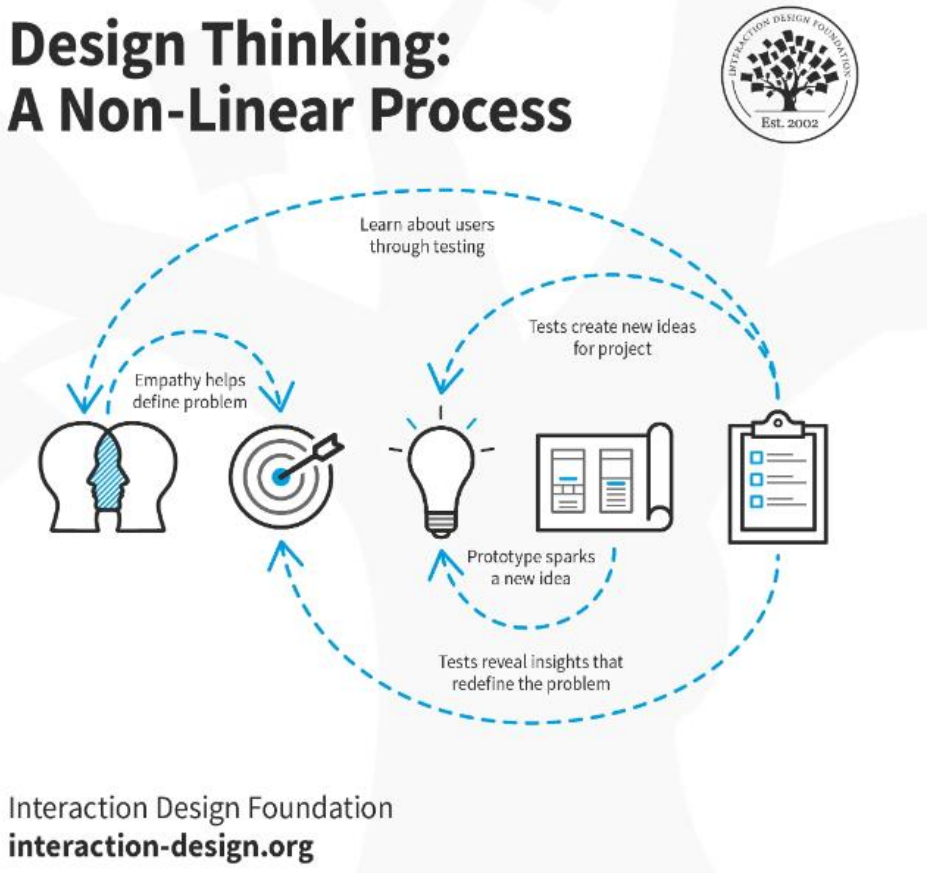
Design Thinking-Inspired **Planning** Process

- Empathize
- Define
- Ideate
- Prototype
- Test

Planning a Smart City Program

Continuous Improvement of a Smart City Program

Stakeholders stay involved perpetually.



Source: Interaction Design Foundation

Multistakeholder Approach

Mayor, Council, Department Heads, Staff, Committees

Local Large Co, Small Business, Regional Orgs, Non-Profit/NGOs

Live Public Events, Surveys, Focus Groups

Challenge-Solution Mapping

1. Establish Solution Pillars
2. List the Challenges/Needs from Stakeholder Feedback
3. Categorize Needs by City Goals
4. Develop Recommended Solutions
5. Map to Solution Pillars
6. Score the Recommendations (human-centered scoring)

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Defining a Smart City

Systems Thinking Approach

Common US City Needs

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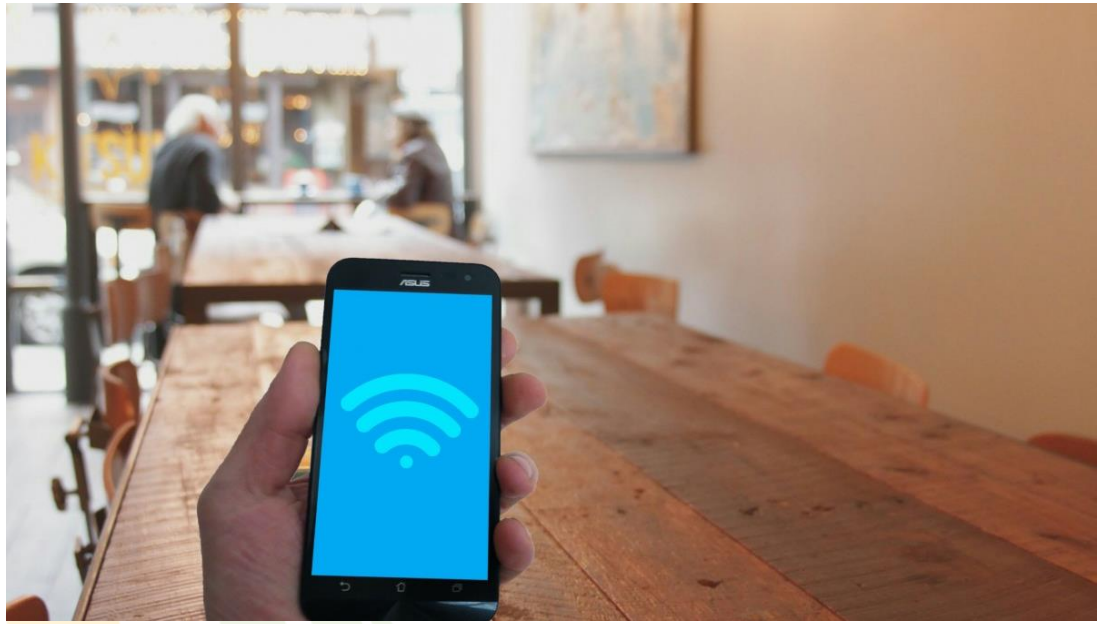
Common US City Needs



Ubiquitous Connectivity & Digital Divide

- Lack of control of inequitable private market build-out
- Ever-evolving technology demands for capacity
- Digital Divide is a three-legged stool that needs fulfilled in all areas: connectivity, devices, digital skills

Safe Streets for All

- Combatting the rising rates of vehicle-related injury or death (2021 had highest number of deaths since 1990)
- US DOT putting $5 Billion in competitive grants over five years (2022-2026)

Traffic Mitigation

- Poor multimodal mobility options
- Urban revitalization impacts
- Aging signalization infrastructure

Electric Vehicle Infrastructure

- Rapid adoption of EVs without sufficient charging infrastructure
- Private market will determine location of charging buildout without City input
- Cities need to advocate for their residents for equity infrastructure

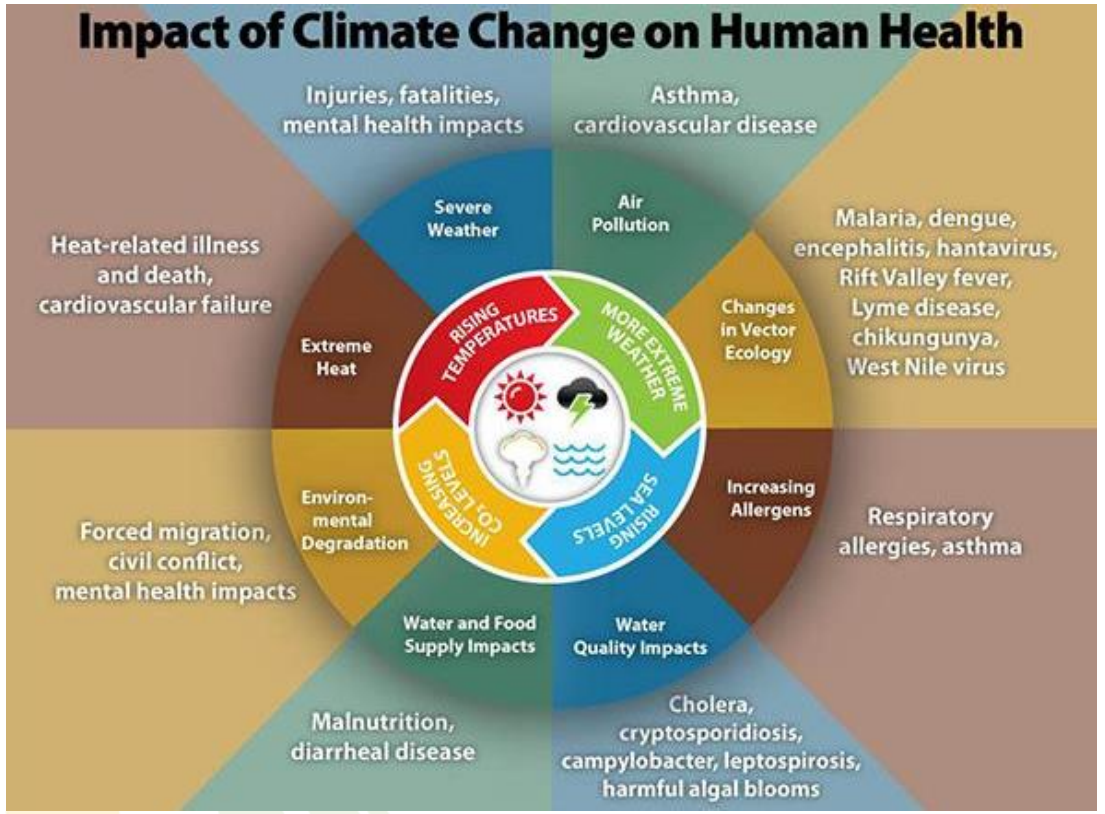


Photo Source

Impactful Climate Action

- Cities account for over 70% of CO_2 emissions
- Well-intended but often falling short of climate action goals
- Lack of ability to measure impacts before adaptation is needed

Managing Data

- Protecting city and resident-related data is cumbersome
- Proven US data privacy policies are almost non-existent – it's new territory (look to GDPR)
- Finding ways to monetize non-PII data while maintaining resident satisfaction

Photo Source

Cybersecurity Monitoring

- Cities are “doing their best” but as threats become more sophisticated, so will the cybersecurity
- Protecting critical infrastructure is of upmost importance (water treatment, electric grid, transportation systems, etc.)

Seamless Mobility Experience

- Disparate systems create disjointed experience
- Discourages use of multimodal options
- Climate change and commute times demand better mobility

Photo Source

Community Resilience

- Protection against extreme weather events
- Grid resilience (increasing demand)

Photo Source

Integrated Resident Engagement

- Residents expect digital experiences and closed-loop communications
- 311 inquiries are not met to residents' satisfaction
- Lack of transparency and accountability of city service delivery
- Lack of feedback from the core stakeholder

Photo Source

Crime Mitigation

- Inefficient systems and under-resourced data analysis departments
- Racial tensions cause continued distrust of police
- Underinvestment of basic city services in underserved neighborhoods (i.e. illegal dumping, poor street maintenance, vacant properties, etc.)

Photo Source

Digital Transformation of City Services

- Long-term underinvestment in IT systems
- Implementation of simple paper-to-digital point solutions rather than data-driven systems
- Cultural resistance to change (multi-faceted)

Defining a Smart City

Systems Thinking Approach

Common US City Needs

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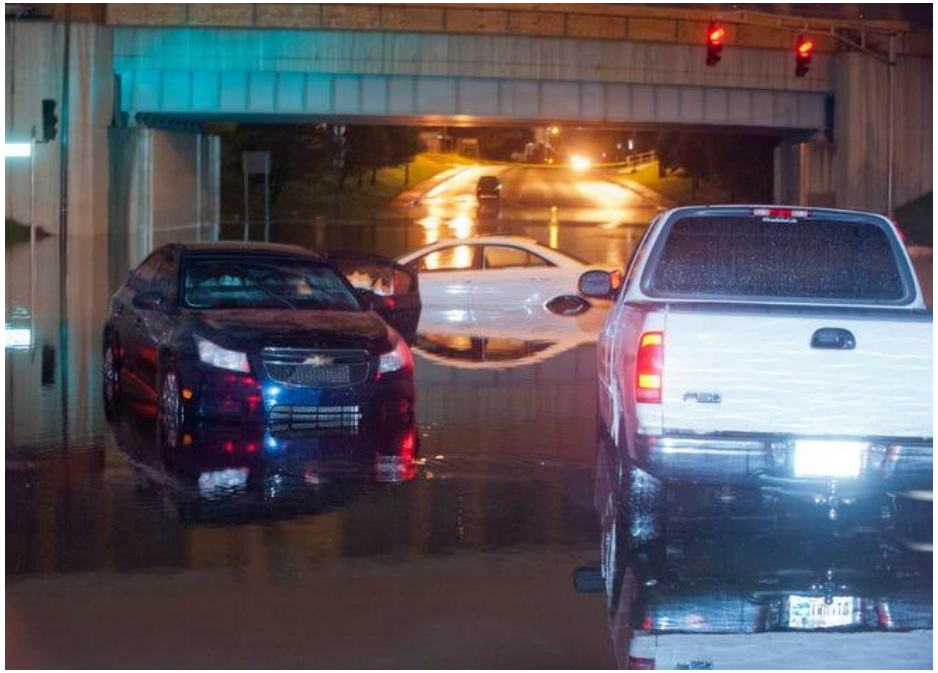
Case Studies

City of Louisville, KY

- **Problem:** Viaduct flash floods catches drivers unaware
- **Solution:** ViaSMART Proof of Concept -Integrate an intelligent, sensor-based platform that can report real-time data on flooding and congestion with existing advanced transportation, water, and communication technologies in Louisville.
- **Next Steps:** Applied and was awarded US DOT SMART grant program for ~$2M to develop POC on four intersections (Mar. 2023)

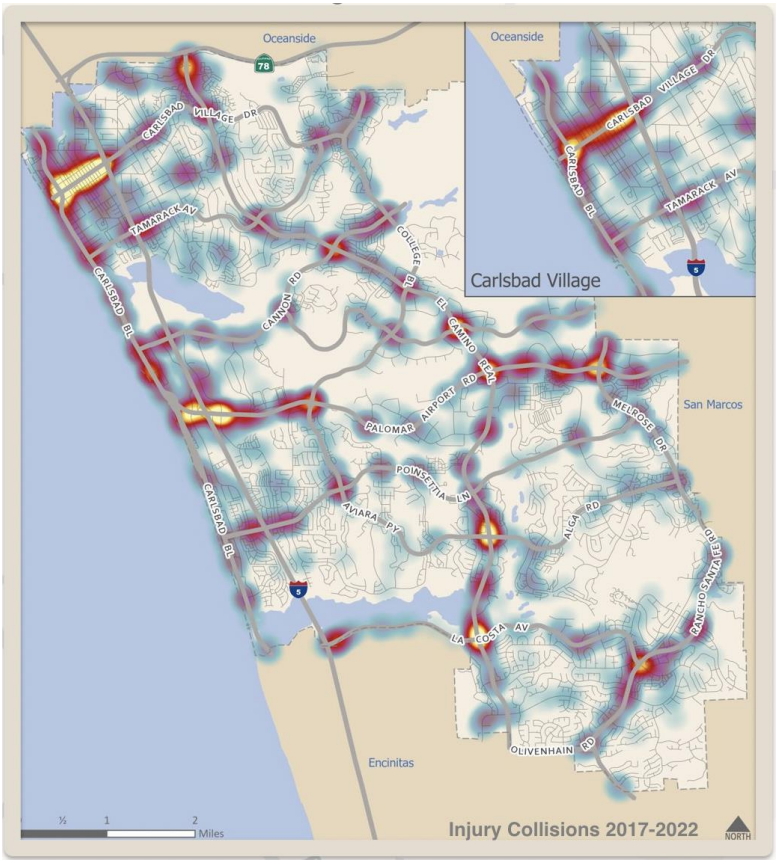


City of Mesa, AZ

- **Problem:** The pandemic highlighted several areas that lacked essential internet access for students.
- **Solution:** Expand the innovative pilot Citizen Broadband Radio Service (CBRS) connectivity program to a 10-square mile deployment.
- **Outcome:** 2,100 students' access to the internet was improved upon completion (2022).

City of Carlsbad, CA

- **Problem:** Road injury collision numbers were extremely high (bike collisions increased over 200% from 2019-2022)
- **Solution:** City Declared state of emergency in Aug. 2023 and approx. 30 days later the *Safer Streets Together Plan* was released and initiatives started (immediate actions included public campaign, high visibility paint on bike lanes, digital messaging boards, enhancement enforcement). The City used data to create heat maps to inform the plan and policies.
- **Outcome:** 19% decrease in all injury collisions; City team won What Works Cities Certification for use of data.



Cities Must Manage the Accelerating Rate of Change

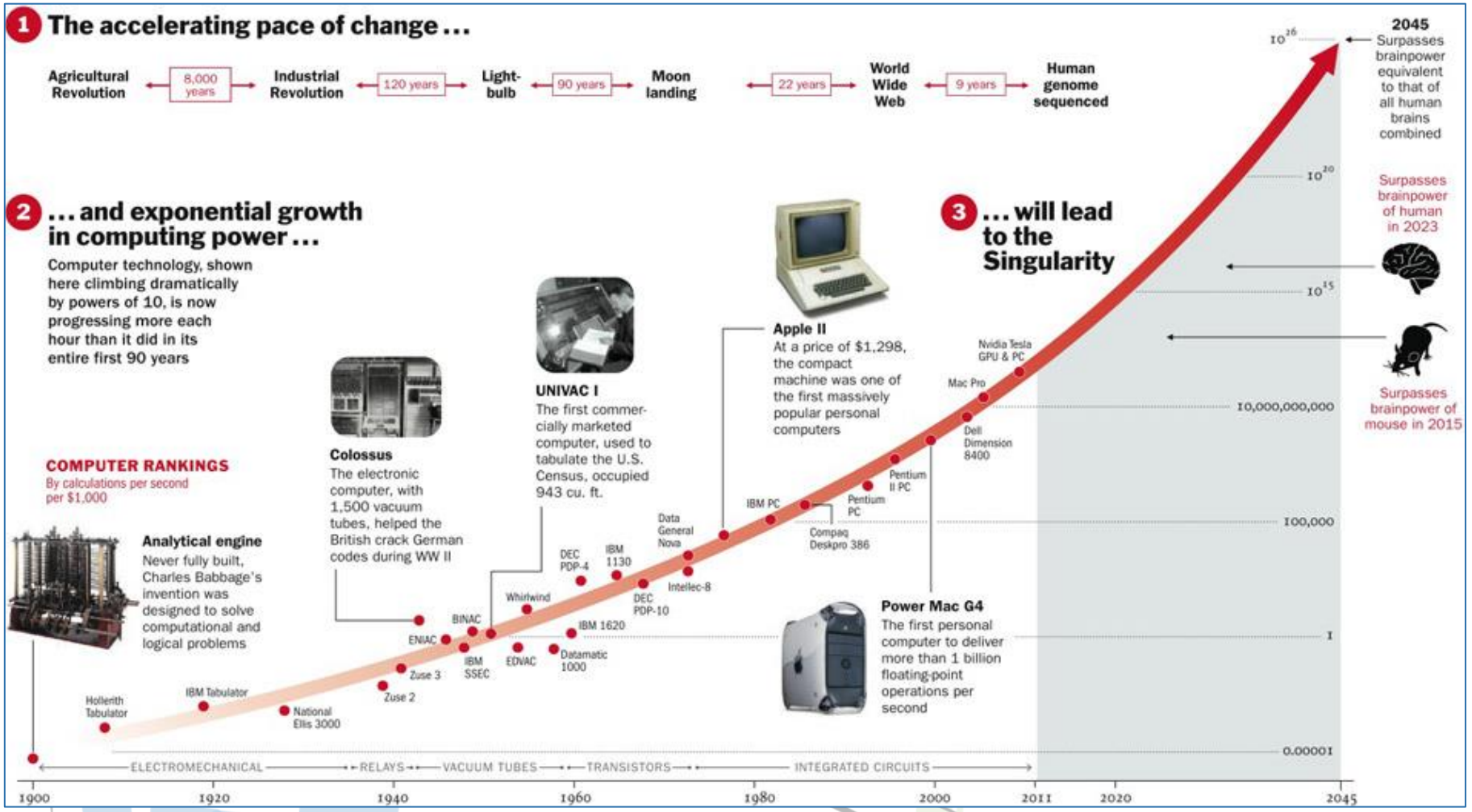


Image Source: Time Magazine 2011; Concept Source: Ray Kurzweil

Tectonic Technology Shifts

- Remote Work
- Artificial Intelligence
- Augmented/Virtual Reality
- Robotics
- Fleet Electrification
- eVTOL (Flying EVs)
- Climate Change & Community Resilience
- Social Networks Impact on Public Safety

Honeywell

ACCELERATOR FOR AMERICA

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Questions?

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www.incose.org/symp2023
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