

Smart Cities in the Age of Pandemic

by

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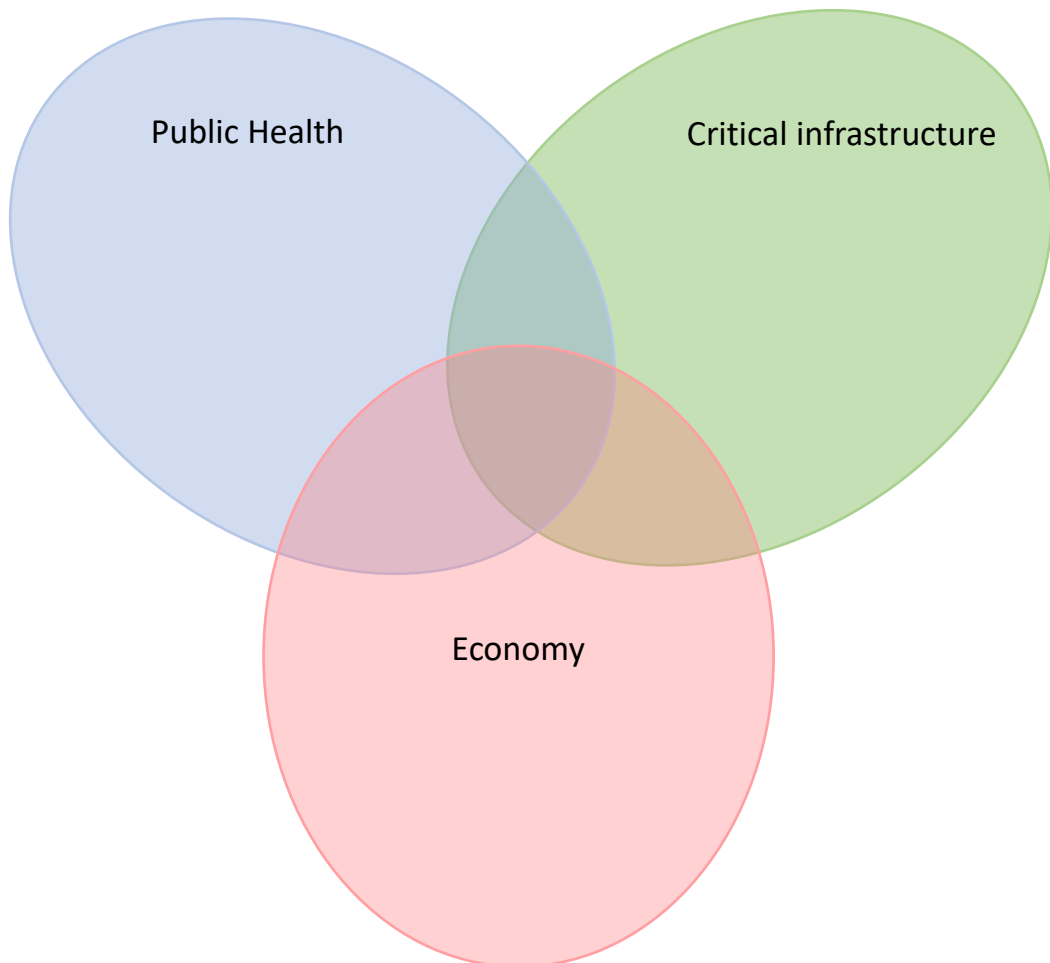
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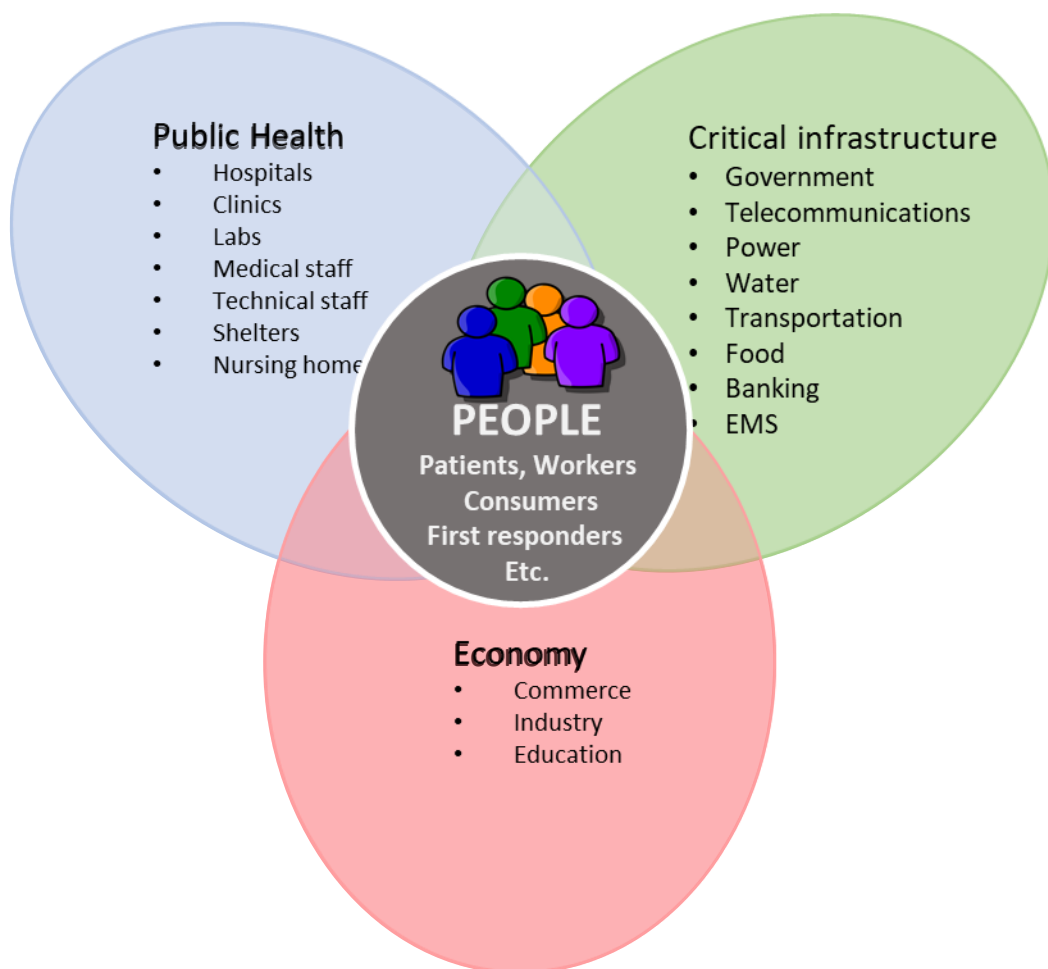
This document outlines a simple, scalable approach that cities can use to integrate smart technology into the fabric of a city to enhance efficiency and livability in normal times and increase resiliency, capability and capacity in the age of pandemic.

Three conditions to 'future-proof' cities in the age of pandemic:

1. An efficient and resilient Public Health system for a healthy population
2. An efficient and resilient critical infrastructure
3. A competitive and resilient economy

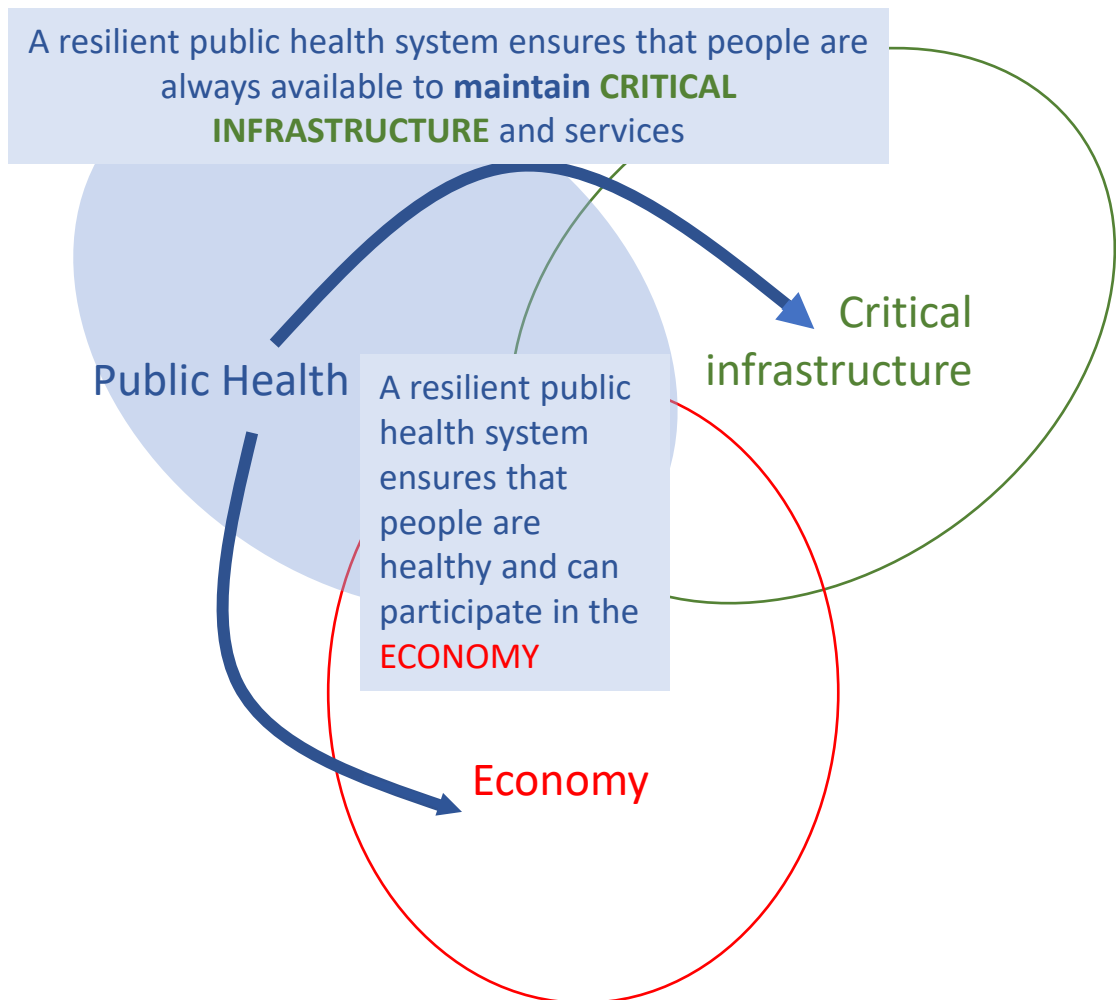


All citizens are engaged in - and impacted by all three areas in varying and multiple ways, for example: as patients, clients, consumers, medical professionals, critical infrastructure professionals, business owners, employees, first responders etc.

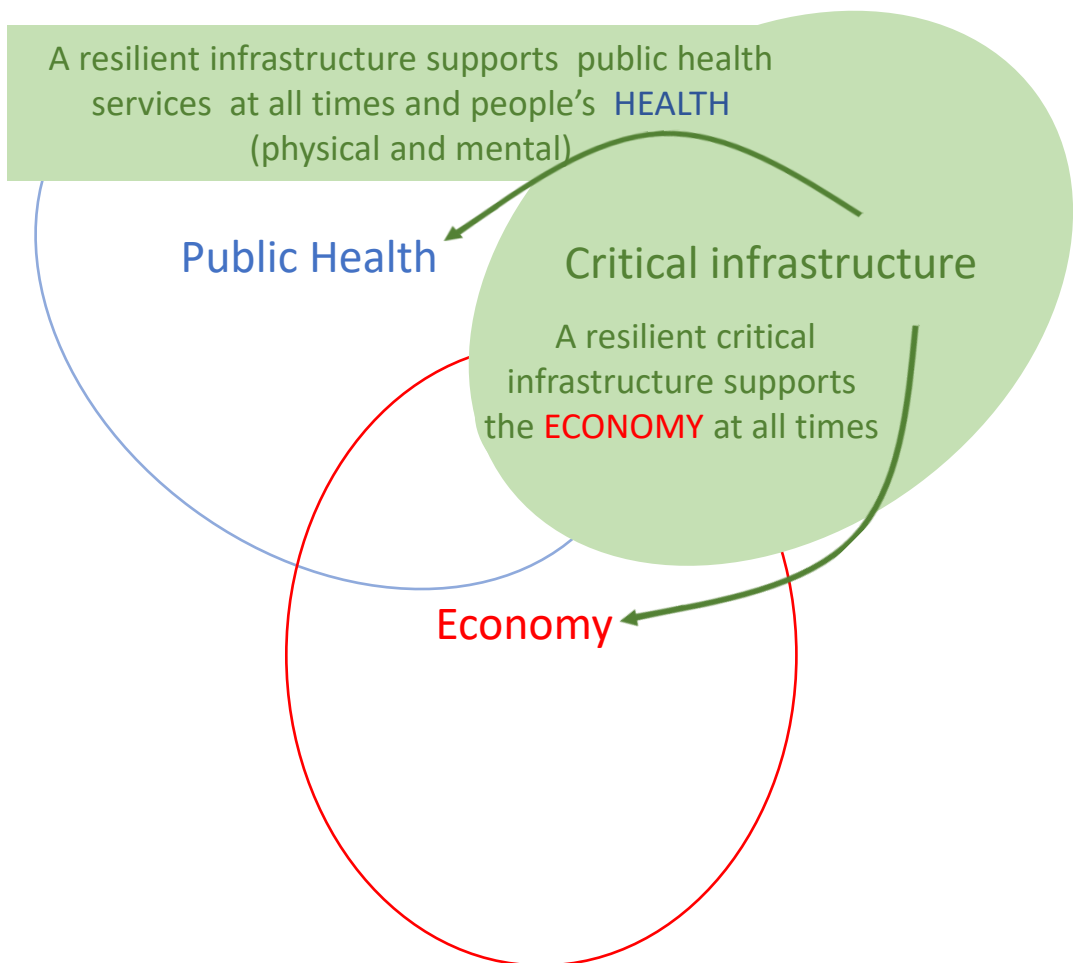


- The three areas are highly interdependent.
- Together, they constitute a resiliency ecosystem

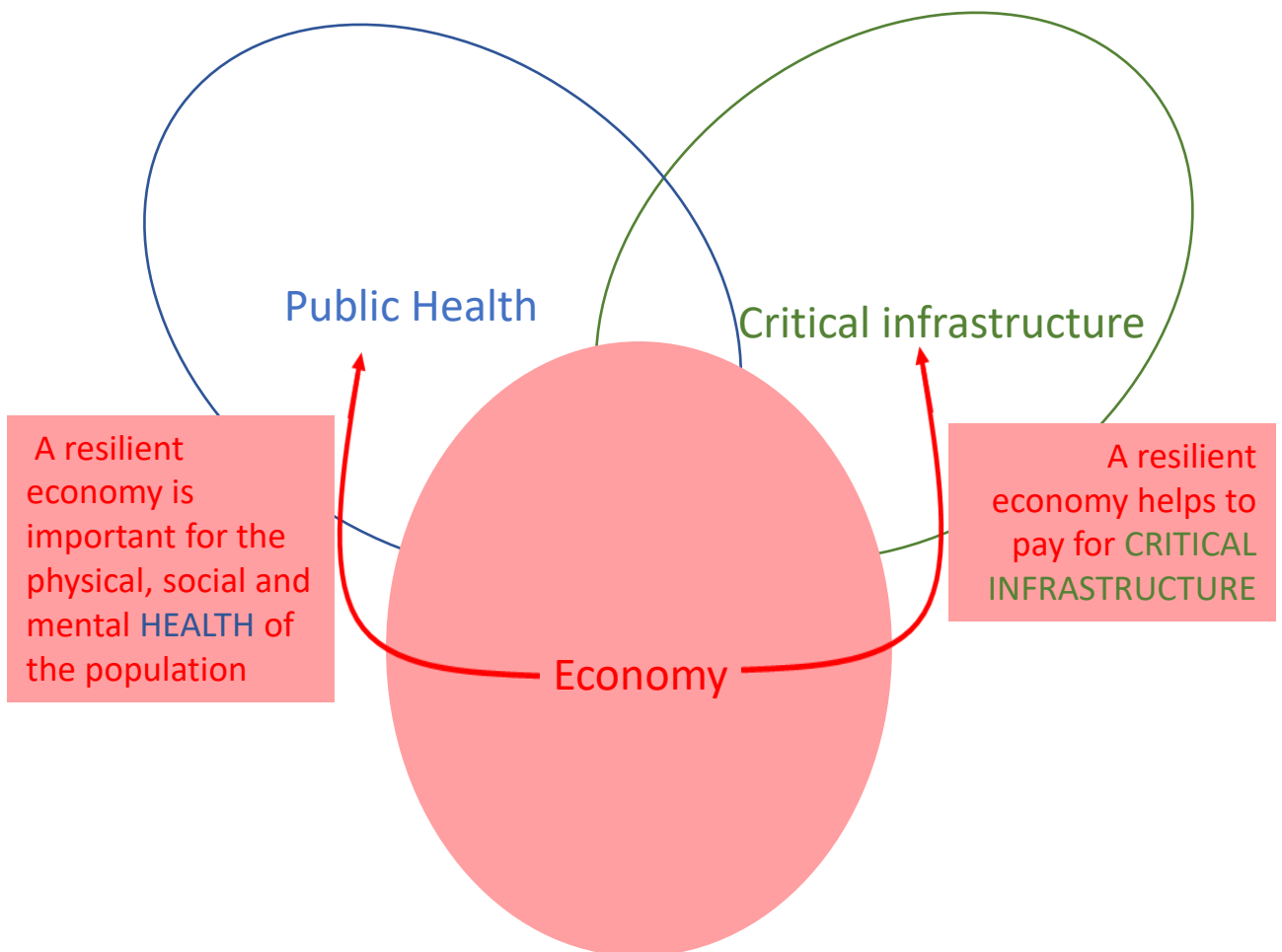
Interdependent



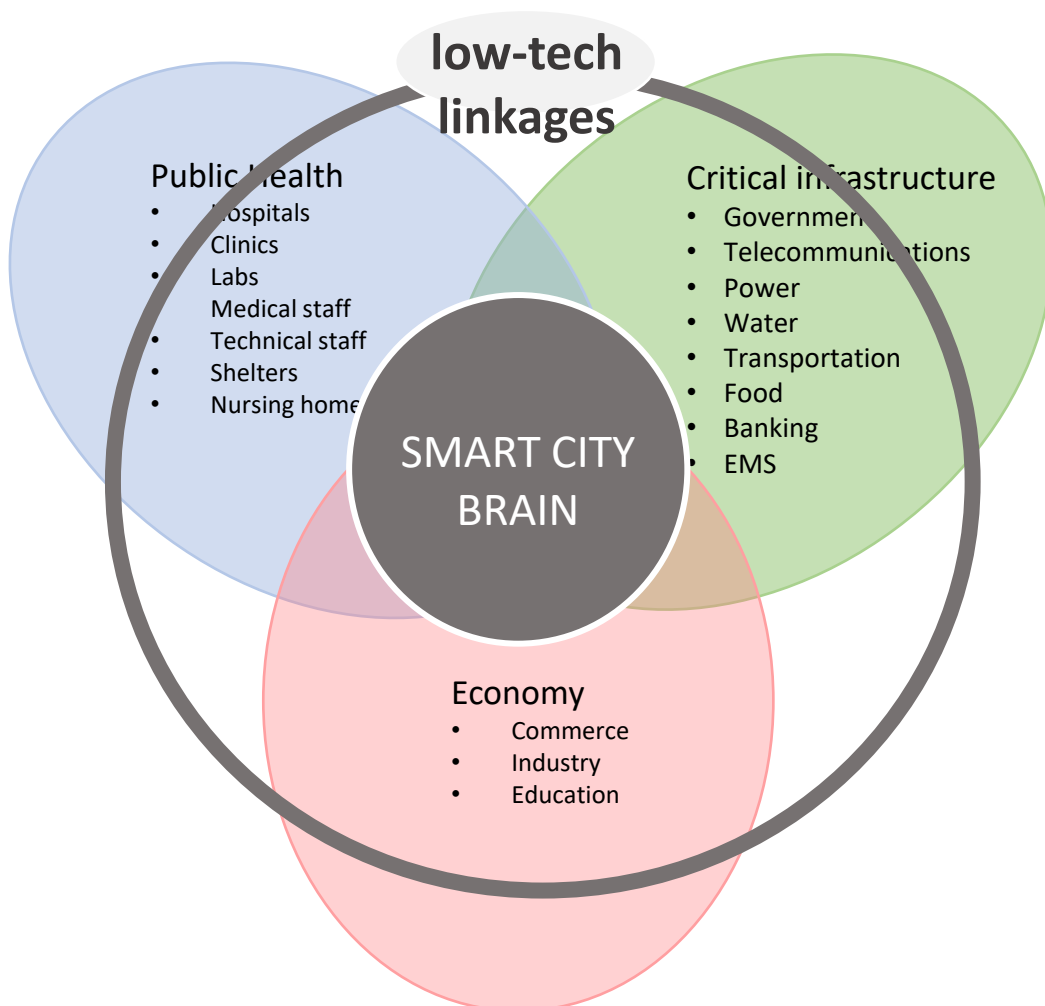
Interdependent



Interdependent

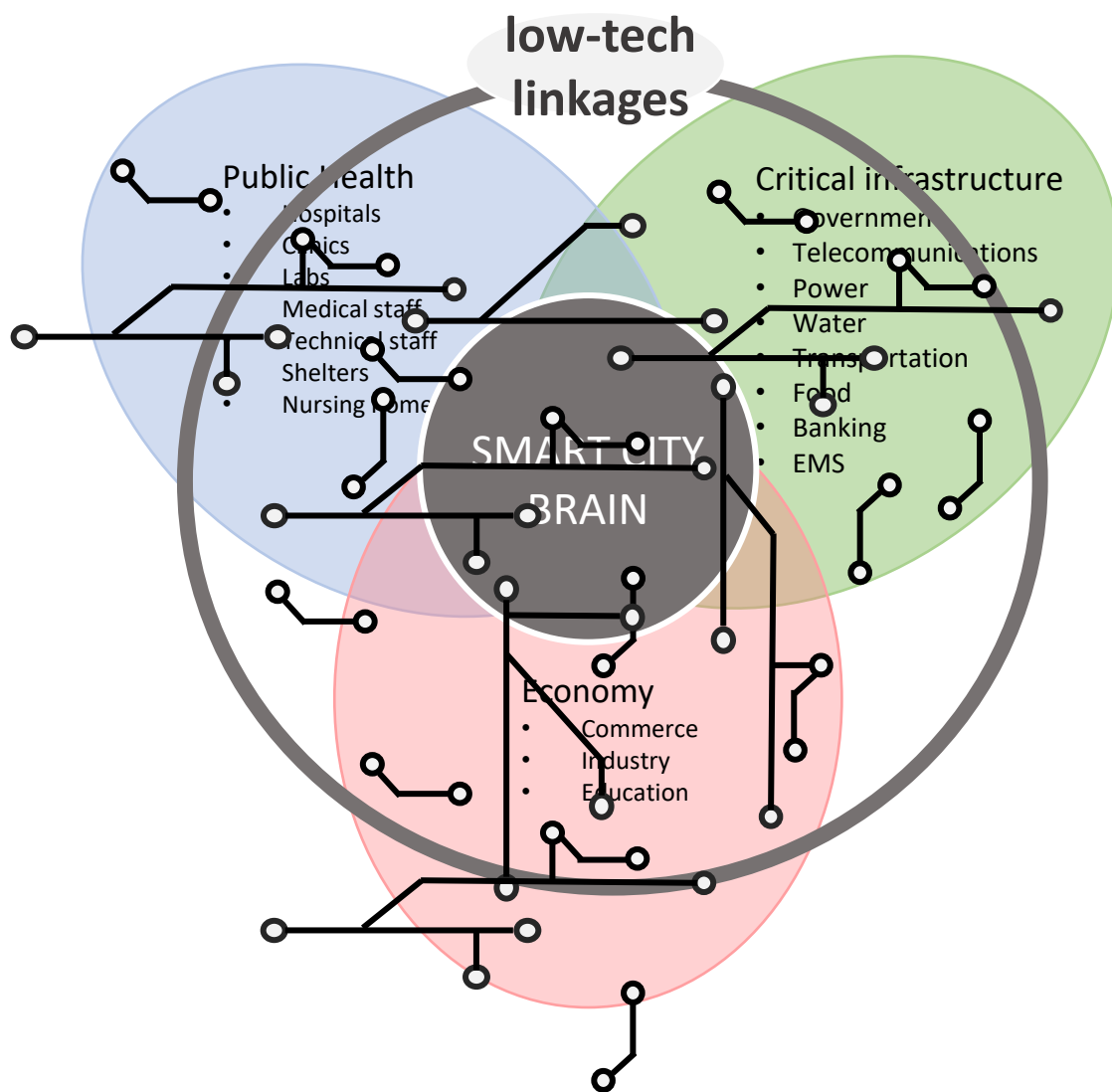


- In a pandemic, the resilience of each system constitutes an important part of an integrated emergency response and resiliency ecosystem.
- There are two types of linkages:
 - **low tech solutions**, which do not rely on smart technology, but which *can* be highly effective - to the extent that there is strong planning and leadership and a skilled and engaged workforce.
 - **smart solutions and linkages**, which can enhance the capacity and capability of the “low tech” solutions



Our mission is to overlay and integrate smart systems into the fabric of the low-tech resiliency ecosystem to increase the capacity and capability of the following:

1. An efficient and resilient Public Health system for a healthy population in normal times and in a pandemic
2. An efficient and resilient Critical Infrastructure to provide essential services in normal times and pandemic
3. A competitive and resilient Economy , which can increase safety, efficiency



VISION

A City that uses smart technology to maintain livability and efficiency **in normal times** and increase **resiliency (capability & capacity)** during a pandemic, specifically with respect a city's: i) Public health system, ii) Critical infrastructure; and iii) Local economy.

OBJECTIVE:

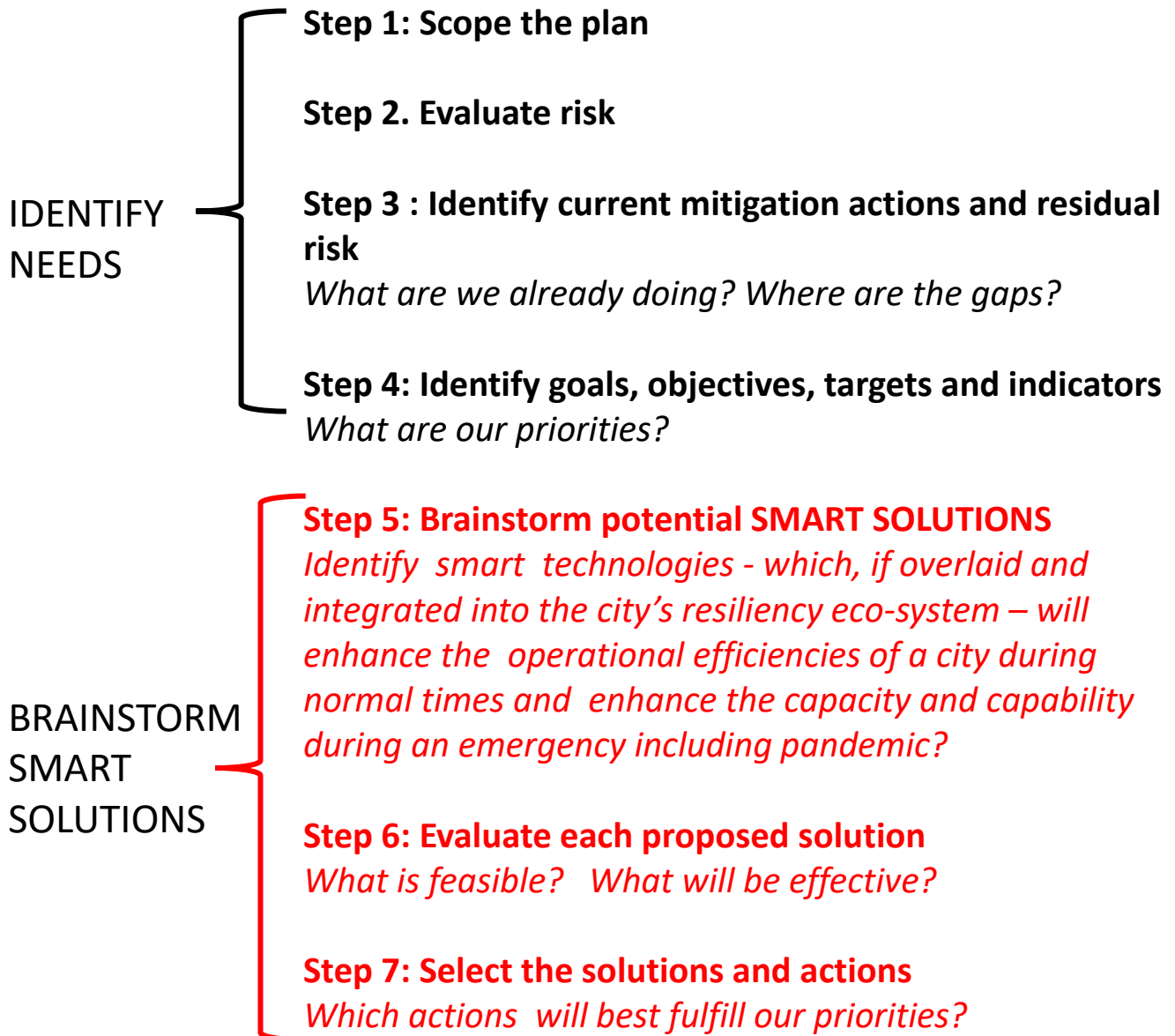
Identify **smart building/community technologies** - which, if overlaid and integrated into the city's resiliency eco-system - will support the above goal.

APPROACH:

1. View pandemic planning for a city's **public health**, **infrastructure** and **economy** through the lens of FEMA's universally recognized *7-step Safe Community Design framework*.
2. Identify the many ways that a **synchronized smart building/city technology** can increase a city's livability in normal times and increase resiliency during a pandemic



A universal and generic approach to risk management, including developing safe and resilient communities involves the following seven steps:



These 7 steps can be applied in each case to develop:

1. Public Health Pandemic Plan
2. Critical Infrastructure Pandemic Plan
3. Business Development Plan that will work in a pandemic.

STEPS 1 TO 4 – IDENTIFY NEEDS

(THESE WILL VARY FROM CITY TO CITY)

Step 1: Scope the plan

- *[Public Health Plan]* - What geographic area will our plan cover? What Public Health assets with our plan cover?
- *[Critical Infrastructure Plan]* Geographic area? Infrastructure assets? Special skills?
- *[Business Development Plan]* Geographic area? Critical commercial assets? Essential (commercial) services? Local employment hubs?

Step 2. Evaluate risk

- *[Public Health Plan]* - Brainstorm the most common health risks facing a community. E.g. vulnerable populations, geographic constraints, supply chain issues, critical infrastructure vulnerabilities, risk to public health assets due to human-caused and natural disasters etc. Map the current city health care infrastructure.
- *[Critical Infrastructure Plan]* Brainstorm the vulnerabilities and risks to the critical infrastructure: (power, water, food, banking, IT, emergency services, etc.) identify interdependency vulnerabilities, and risks to supply chains. Map the current city's critical infrastructure assets
- *[Business Development Plan]* Brainstorm essential businesses/services and employments that could be at risk in a pandemic. Brainstorm the vulnerabilities and risks including failure of power, water, food, banking, IT, emergency services etc., interdependency vulnerabilities, and risks to supply chains.

Step 3 : Identify current mitigation actions and residual risk - i.e. What are we already doing? Where are the gaps?

- *[Public Health Plan]* - Identify current mitigation measures (both smart and “low-tech”) to protect the public health system
- *[Critical infrastructure Plan]* - Identify current mitigation measures (both smart and “low-tech”) to protect the public health system
- *[Business Development Plan]* Identify current mitigation measures (both smart and “low -tech”) to protect the critical infrastructure

Step 4: Identify goals, objectives, targets & indicators – i.e. *What are our priorities?*

- *[Public Health Plan]* - Identify the Public Health priorities for a resilient system to service the population during a pandemic including goals, objectives, targets and indicators
- *[Critical infrastructure Plan]* - Identify Critical Infrastructure priorities for a resilient system necessary to survive a pandemic, including goals, objectives, targets and indicators
- *[Business Development Plan]* Identify common Business Continuity priorities for a resilient economy to be able to withstand a pandemic, including goals, objectives, targets and indicators

STEPS 5-7 BRAINSTORM AND EVALUATE SMART SOLUTIONS

Step 5: Brainstorm SMART SOLUTIONS

Brainstorm SMART solutions that will increase the capabilities, capacity and resilience of Public Health, Critical Infrastructure and Economy in normal times and in an emergency including pandemic?

EXAMPLES

- [PUBLIC HEALTH/ECONOMY] What smart solutions will help to do flex space on the fly – now and in the future? For example – adapting hotels for temporary housing, adapting office buildings to meet changing business needs in a changing world.
- [PUBLIC HEALTH / INFRASTRUCTURE] What kinds of sensors would be appropriate and where should they be? How can IT help individuals monitor their health in normal times and in times of pandemic? What smart solutions can cities use to monitor the health of the population?



AI Facial Identification



Temperature Measurement via Machine Vision Thermal Camera



Alarms for Facial Temperatures Exceeding Thresholds



No Operator Intervention Required



Powered by Thermal Technology



Integrate with Access Control Systems



Visual Annunciation – Go/Stop

- [ECONOMY/ PUBLIC HEALTH/ INFRASTRUCTURE] How can IT serve to access job opportunities in normal times for a robust economy, and in times of pandemic to ensure that essential services are being staffed? How can IT be used for e-learning?
- [PUBLIC HEALTH/INFRASTRUCTURE] What smart applications will help first responders share data and coordinate responses?
- [PUBLIC HEALTH/INFRASTRUCTURE] How can smart technology help in specific built environments that are on the move or have dense populations (e.g. cruise ships/ airports)?

Step 5: Brainstorm SMART solutions - EXAMPLES CONT'D

- [INFRASTRUCTURE/ECONOMY] How can smart technology help to ensure resilience and continuity of essential infrastructure , including
 - Energy supply/distribution/conservation: (e.g. microgrid, transactive energy; smart buildings)
 - Clean water supply
 - Sewage
 - Banking
 - Education
 - Food sourcing and distribution
 - Transportation
 - Emergency services
- [ECONOMY] What meta data can be used to monitor and regulate volume production?
- Etc. etc.

Step 6: Evaluate each proposed action

- *What is feasible? What will be most effective?*
- *Finesse the solutions for more specificity and granularity*

Step 7: Select and finesse he solutions and actions

- *Identify solutions that will best fulfill the priorities.*

Step 7 : Select the solutions and actions (CONT'D)

- Determine which solutions are **immediate and urgent**, and which ones can be done in **mid-term** “transition mode” and **long-term**
- Identify solutions that relate to: Info & data (**level 1**) ; Community engagement (**level 2**), Technology (**level 3**) ; and Innovation (**level 4**)

Level 4 -- Innovation			
Level 3 - Technology			
Level 2 – Community engagement			
Level 1 – Info & data			
	Public Health	Infrastructure	Economy
Immediate- Prevent/ Protect			
Mid term- Mitigate			
Respond			
Long term- Recover			

•**Step 7 (cont'd) : Select the solutions and actions** *Determine which solutions are immediate and urgent, and which ones can be done in mid-term “transition mode” and long-term*

- *Identify solutions that relate to: info & data (level 1) ; community engagement (level 2), technology (level 3) innovation (level 4)*

The following are some examples that have already been discussed

Level 4 -- Innovation			
Level 3 - Technology			
Level 2 – Community engagement			
Level 1 – Info & data			
	Public Health	Infrastructure	Economy
Immediate- Prevent/ Protect	Surge & Information Management		
	<ul style="list-style-type: none"> •Info to manage the expectation of the health system (level 1) •Cellphones location signals (Level 1) •“Healthy people” certification (Level 1) •Maps of antibody-test (Level 1) 		<ul style="list-style-type: none"> •In stock list of groceries- where to find X (Level 2) •Volunteer sign up (level 1)
	<ul style="list-style-type: none"> •Temperature sensing at the building entrances (level 3) •6ft sensors in public spaces (level 3) 		<ul style="list-style-type: none"> •Mobile clearance health code (Level 1)
	Incident & Bio-surveillance		
	<ul style="list-style-type: none"> •Point of contact tracing (Level 1) •Proximity tracking 	<ul style="list-style-type: none"> •Health status entry testing scanning /temperature sensing 	<ul style="list-style-type: none"> •Janitorial practices- cleaning electrostatic spraying-EPA cleaning product list
	<ul style="list-style-type: none"> •Sentiment Analysis scanning traffic for keywords (Level 1) 	<ul style="list-style-type: none"> •Virus load and antibody in sewage (Level 3) 	
	<ul style="list-style-type: none"> •Home healthcare technologies/self health (Level 2) 		

Level 4 -- Innovation

Level 3 - Technology

Level 2 – Community engagement

Level 1 – Info & data

	Public Health	Infrastructure	Economy
Mid term- Mitigate Respond	<ul style="list-style-type: none"> •Air quality testing •Water quality monitoring (Legionella) 	<ul style="list-style-type: none"> •Touchless/mobile access (Level 3) •Elevator management (Level 3) •<u>Density monitoring</u> 	<ul style="list-style-type: none"> •Cybersecurity (Level 1) •Delivery Robots (Level 3)
	<ul style="list-style-type: none"> •Info to manage the expectation of the health system (level 1) •Cellphones location signals (Level 1) •“Healthy people” certification (Level 1) •Maps of antibody-test (Level 1) 	<ul style="list-style-type: none"> •Asset management (location/performance data) (Levels 1/3) 	<ul style="list-style-type: none"> •Metadata registry on volume, means of production and logistics of what can be produced (Level 1) •Smart Building monitoring and management (level3) •Smart technology to facilitate work, education and entertainment for people self-isolating in their homes (Level 2)
		<ul style="list-style-type: none"> •Advanced Air filtration systems and monitoring (Level 3) 	<ul style="list-style-type: none"> •Robotic cleaning and janitorial services-UV (Level 3)
Long term- Recover		<ul style="list-style-type: none"> •HVAC reconfiguration DOAS instead for VAV (Level 3) 	<ul style="list-style-type: none"> •Flex space on the fly (Level 2) •Distributed workplace/educational space with density/social distancing monitoring <u>TRACTR</u> (level2)
		<ul style="list-style-type: none"> •Re-purposing buildings (offices to MURBs etc) (Level 4) 	<ul style="list-style-type: none"> •Automatic Smart Building/ Microgrids/Transactive Energy (Level 3-4)
		<ul style="list-style-type: none"> •Managing high density location (alla cruise ships) (Level 1-2) 	<ul style="list-style-type: none"> •Monitoring for job opportunities (Level 2)