Joint Working Group Meeting
Public Health, Sustainable Communities & Climate Adaptation

June 18, 2020
1:30 p.m. – 3:30 p.m.

Due to COVID-19, please join via web conferencing:
To join the meeting: https://scag.zoom.us/j/91993302013
Dial-In: +1-669-900-6833
**Meeting ID: 919 9330 2013**

AGENDA

1. **WELCOME, SELF INTRODUCTIONS**
   Courtney Aguirre, SCAG

2. **PANDEMIC-RESILIENT COMMUNITY PLANNING**
   Todd Litman, Victoria Transport Policy Institute

3. **CONNECT SOCAL UPDATE**
   Jason Greenspan, SCAG

4. **SUSTAINABLE COMMUNITIES PROGRAM UPDATE**
   Sarah Dominguez, SCAG

5. **CLIMATE ADAPTATION FRAMEWORK – A FOCUS ON EXTREME HEAT**
   David Von Stroh, Cambridge Systematics

Pandemic-Resilient Community Planning

Todd Litman
Victoria Transport Policy Institute
Presented
Southern California Association of Governments
Los Angeles, California
18 June 2020

Long-Term Trends

U.S. Infectious Disease Mortality Rates

Improved hygiene, vaccinations and medical treatments reduced infectious disease death rates about 90% between 1900 and 1950, which significantly reducing total mortality rates.
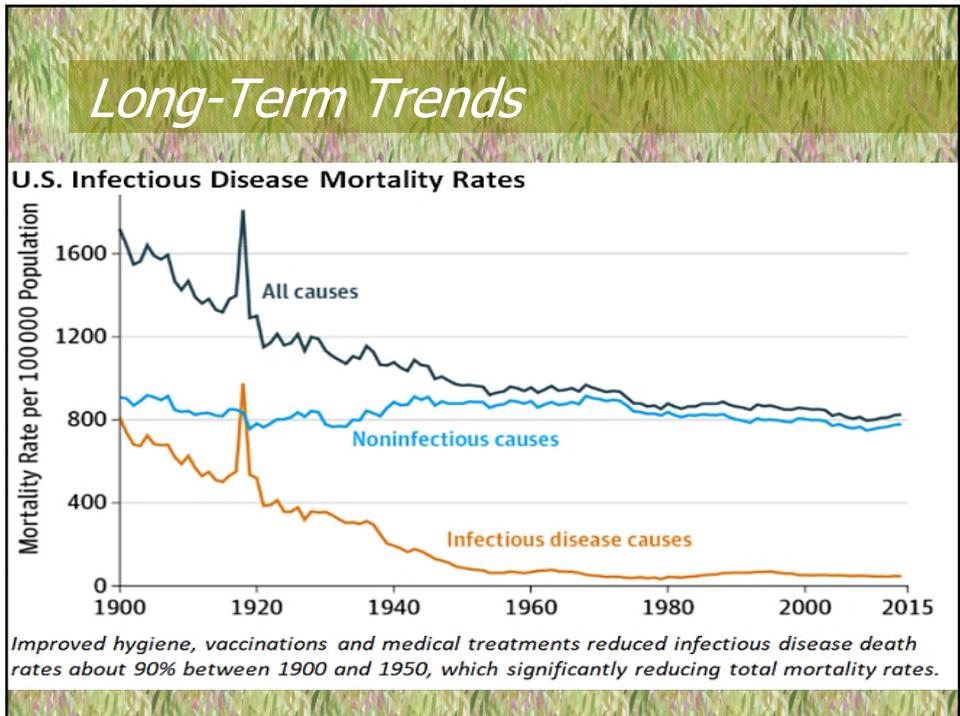
Per Capita Infection Rates
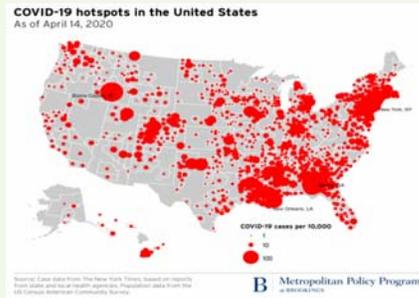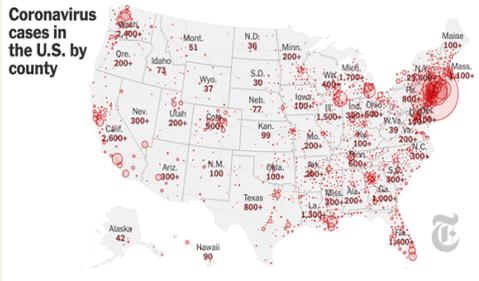
Large urban regions tend to have the most cases.

Some rural areas have high COVID-19 fatality rates.

Contagion Rates by Location

Infection rates are much higher in New York's lower-density outer suburbs than in denser, central neighborhoods.
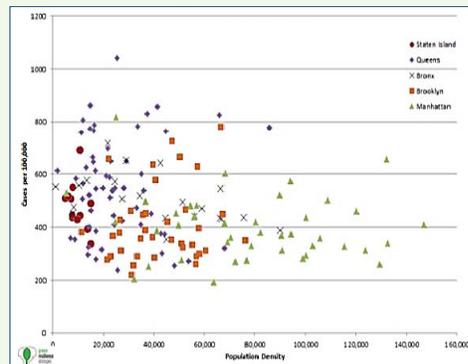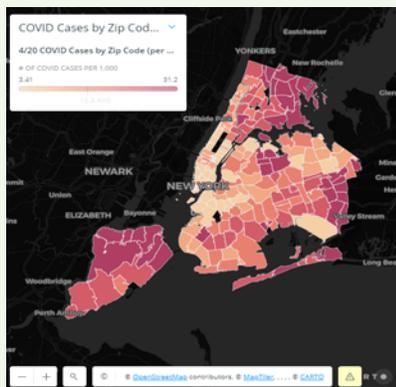
Contagion Rates by Mode

Infection rates are much higher in New York's auto-oriented areas than in transit-oriented neighborhoods.
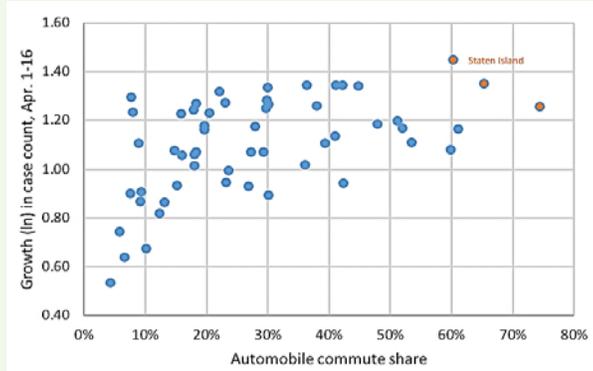
Urban Versus Rural Risks

Urban areas tend to have significantly greater average longevity due to a combination of:

- Lower traffic fatality and suicide rates.
- Lower smoking rates.
- More physical activity (walking).
- Better public health and healthcare services.
- Higher rates of education and income.
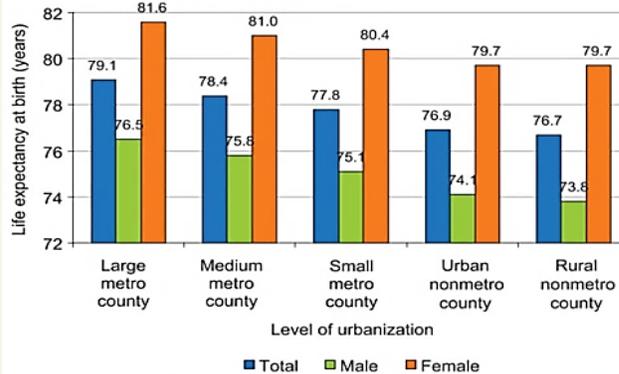
This U.S. study found that longevity increases significantly with urbanization.

Risks and Affordability By Mode

Safety and Affordability by Mode

Pandemic Safety →				
	Single-Occupant Vehicle	Telework	Bicycling	Walking
	Auto with passenger	Taxi/ Ridehailing	Transit bus	
			Subway	
	Aviation			
Increased affordability →				

*Transport modes vary in their pandemic safety and affordability.*

Isolation Problems and Solutions

| Problem	Community Solutions
Confusion and fear	Good communication, particularly for vulnerable and isolated people.
Inadequate access to essential goods	Provide shopping opportunities and delivery services.
Healthcare needs	New service models, such as on-line consultations and pharmacy deliveries.
Crowding and discomfort	Adequate housing, with private outdoor space (balconies, decks, yards)
Mental stress	Community support and mental health services. Design for "sociable distancing."
Physical inactivity	Opportunities for outdoor activity. "Open streets" with restricted vehicle traffic.
Domestic conflicts	Adequate housing. Community support. Domestic violence response.
Reduced household income	Emergency funding. Community support. Affordability.
Reduced business income	Emergency funding. Support for new business models, such as delivery services.
Homelessness	Eliminate homelessness, as described in the following section.

Housing Design Features

Townhouses with ground-floor access	Apartments with exterior access.	Apartments with balconies.

Transport Risks and Solutions

Risks	Solutions
Long-distance travel	Limit mobility and require quarantines, particularly from higher-risk areas.
Private vehicle travel	Avoid carrying passengers, clean touch surfaces, encourage hygiene.
Taxi and ridehailing	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Public transit vehicles	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Terminals	Limit crowding, clean touch surfaces, encourage hygiene, protect employees.
Walking and bicycling	Encourage distancing. Limit automobile traffic and open streets to active modes.
Automobile dependency	Create neighborhoods with convenient walking and bicycling access.

Special Risks and Solutions

	Urban	Rural Areas
Special Risks	• Crowded buildings and sidewalks • Elevators • Public transit • Homelessness and inadequate housing	• Vulnerable (old, poor, chronic illness, etc.) populations • Limited public health resources • Physical and social isolation • Poor access to medical facilities • Inadequate housing • Poverty and limited employment options
Solutions	• Targeted cleaning • Promote hygiene • Promote social distancing • Improve walking and bicycling • Eliminate homelessness and improve housing quality	• Improve public health services • Targeted outreach to isolated households • Improve access to essential services • High speed internet access and e-services • Financial assistance to poor and unemployed • Improve housing quality

Principles of Resilience

Prepared and Responsive
Communities need trustworthy leadership, effective emergency management programs, and good communication that allows public officials to communicate with residents and residents to communicate with public officials.

Robust, Secure, Redundant and Flexible
Critical infrastructure must be strong, redundant and flexible in order to withstand potential stresses and failures, and should avoid higher-risk locations.

Diversity
A diverse system is better able to respond to unexpected changes.

Affordable and Resource-efficient
If we are lucky, we will always be affluent, but we should prepare for the possibility that sometime we will be impoverished and need more affordable options, particularly housing and transport.

Resilience Planning Checklist

	Households	Communities
Pandemic Risks	• Resources to sanitize personal items, vehicles and homes, plus face masks and gloves. • A home with adequate space, home offices, natural light and ventilation, and private outdoor spaces such as a balcony, deck or yard to provide comfort for extended isolation. • Good communications resources, including telephone, internet service and computers for socializing, e-commerce and telework. • Fitness program, including in-home exercise and nearby walking and bicycling.	• Good public health programs, particularly infectious disease control and smoking reduction. • Healthcare services able to handle surges. • Shared vehicles (taxis, ridehailing and public transit) density restrictions, cleaning and sanitizing, plus employee and passenger hygiene. • Minimal homelessness or inadequate housing. • Programs to address mental illness, substance abuse, domestic violence, and vulnerable resident supports. • Expanded pedestrian facilities to prevent crowding, traffic calming and road space reallocation.
Reduces All Risks	• Household emergency plan, including emergency contact information. • Emergency supplies, including first aid equipment, flashlights, mobile phone and portable radio backup power, and food for at least two weeks. • A home in a relatively safe location (out of floodplains and wildfire interface) built to withstand local risks such as earthquakes, hurricanes, plus extreme heat and cold. • Comfortable shoes for walking and a sturdy bicycle for riding. • Housing in a compact, walkable neighborhood where essential services and activities are accessible without a car. • Ways to reduce household expenditures if income declines. • Positive relationships with neighbors.	• Effective emergency management with trustworthy leadership, reliable communications networks and critical supplies. • Robust internet and telecommunications networks, e-government, e-commerce, and delivery services. • Restrictions on development in high-risk areas such as floodplains and wildfire interface. • Zoning codes and house retrofit programs that ensure homes can withstand risks such as earthquakes and are energy efficient. • Compact, walkable and bikeable neighborhoods where most essential services and activities can be accessed without using an automobile. • Sufficient affordable housing to serve demand. • Community cohesion, so most residents have positive relationships with their neighbors. • Unemployment insurance and support for lower-income households.

Analysis Scope

Risks	Analysis Question
1. **Infectious diseases pandemics**	How do pandemics compare with other risks? What factors affect these risks, and how can they be reduced?
1. **Disaster risks**	How do disasters compare with other risks? How can communities minimize disaster deaths, injuries and damages?
1. **Health risks**	How do various health risk compare? What factors affect community health and longevity, and how can they be maximized?
1. **Economic, social and environmental risks**	How does health compare with other community goals? What trade-offs exist between these goals? What win-win strategies provide multiple benefits?

Planning Issues

Democracy and Public Engagement

Economic Development

Environmental Protection

Efficient Public Spending

Traffic safety

Physical fitness

Suicide

Public Health

Nutrition

Addiction

Infectious diseases

Social Equity and Economic Opportunity

Infectious diseases are just one of many health risks, and health is just one of many planning issues.
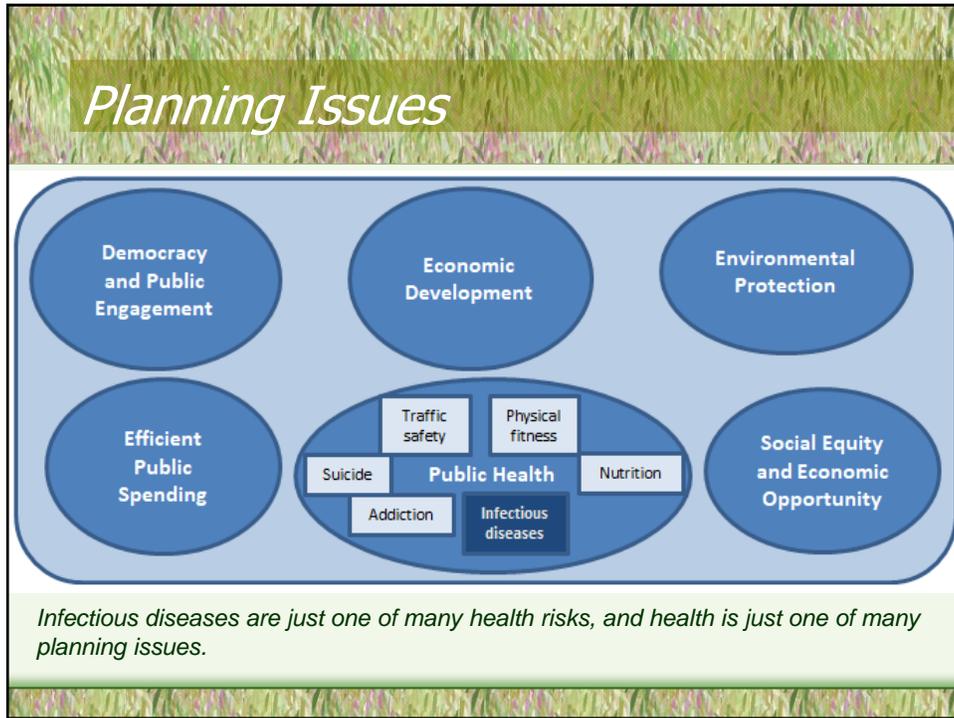
Benefit Analysis

Policy Solutions	Reduce Contagion	Public Health	Sustainability
Limit public gatherings and activities	✓		
Targeted cleaning and hygiene	✓	✓	
Improve public health and emergency services	✓	✓	
Walking and bicycling improvements	✓	✓	✓
Encourage public transport use		✓	✓
Reduce private auto travel		✓	✓
Reduce homelessness	✓	✓	✓
Affordable infill housing	✓	✓	✓
Traffic safety programs		✓	
Assist low-income households	✓	✓	✓

Comprehensive Evaluation

- An efficient and equitable transportation system must be diverse, in order to serve diverse travel demands.

- Walking, bicycling and public transit provide diverse benefits.

- Many of these benefits tend to be overlooked or undervalued in conventional planning.

Often overlooked benefits:

- Parking cost savings.
- Consumer savings and affordability (savings to lower-income households).
- Improved economic opportunity for disadvantaged groups.
- Public health and safety (due to less driving and more active travel).
- Infrastructure cost savings.
- Community cohesion (due to more walking) and reduced local crime.
- Reduced impervious surface which reduces stormwater costs and heat island effects.

Happily Poor

- What public policies help people be poor but happy?

  - Efficient public services for everybody

  - High quality affordable transport options (walking, cycling, public transport)

  - Affordable-accessible housing (affordable housing located in walkable urban neighborhoods)

A Fair Share for Everyone

"I want my infrastructure dollars spent on more roads and parking facilities, and on better alternatives that encourage my neighbors to reduce their driving, that reduce my chauffeuring burdens, and in case I am unable to drive something in the future."

""I want my infrastructure dollars spent on better walking, cycling and public transit, and policies that support transit-oriented development."

Complete Streets

A Complete Street is designed for all activities, abilities, and travel modes. Complete Streets provide safe and comfortable access for pedestrians, cyclists, transit users and motorists, and a livable environment for visitors, customers, employees and residents in the area.

Complete Streets by Design
Toronto streets redesigned for all ages and abilities

Recommended Actions

- Become familiar with the full range of multi-modal benefits and safety strategies. Assemble fact sheets designed for various audiences including transit users, local businesses, health professionals, affordability advocates, and environmentalists.

- Ensure that travellers have the resources they need to safety use public transit, for example, by providing free or discounted hand sterilizer and face masks.

- Don't focus on public transit alone, give equal consideration to active modes (walking and bicycling), since they are complementary and many people use both. For example, improving walking conditions is one of the best ways to encourage public transit travel, since most transit trips include walking links.

- Balance warnings and safety regulations with positive messages about the overall safety and health benefits of public transit travel.

- Celebrate transit operators and essential workers who use public transit as heroes and role models.

Victoria Transport Policy Institute

"Toward More Comprehensive and Multi-Modal Planning"

"Evaluating Active Transportation Benefits and Costs"

"Evaluating Public Transportation Health Benefits"

"Affordability as a Transport Planning Objective"

"Transportation Affordability: Evaluation and Improvement Strategies"

"Pandemic-Resilient Community Planning"

"If Health Matters"

and more...

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Pandemic-Resilient Community Planning

Practical Ways to Help Communities Prepare for, Respond to, and Recover from Pandemics and Other Economic, Social and Environmental Shocks

11 June 2020

By Todd Litman
Victoria Transport Policy Institute

Resilient communities can efficiently absorb economic, social and environmental shocks, including disasters such as pandemics.

Abstract

Resilience refers to a system's ability to efficiently absorb shocks. This report investigates ways that communities can increase their resilience to pandemics and other sudden economic, social or environmental risks. It compares COVID-19 with other health risks, examines various problems caused by pandemic-control interventions, and recommends specific ways that communities can better prepare for, respond to, and recover from pandemics and other shocks.

Pandemic-control travel restrictions, isolation requirements and job losses cause various domestic, social and economic problems, including physical and emotional stresses, and financial losses. Risks vary by location: urban residents have more exposure to infectious disease while rural residents are more likely to die if infected. All shared vehicle travel, including private automobiles carrying passengers, can spread disease. For most households, the safest place to live during a pandemic is an affordable home with ground-floor access in a walkable urban neighborhood where residents have low-risk and affordable mobility options. To improve resilience, communities need effective emergency response, contagion control, safe methods for delivering essential goods and services, adequate housing for all residents, physical and mental support for isolated people, and affordability. Infectious disease risks justify stronger efforts to eliminate homelessness.

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Preface – *Live Long and Prosper in an Unpredictable World*

Imagine that in 2019 a trustworthy source predicted that a pandemic would soon severely limit vehicle travel, require your household to isolate at home for months, and possibly reduce your income for extended periods of time. How would you prepare? You would probably collect emergency supplies such as hand sanitizers, facemasks and food supplies, enhance the comfort of your home with more natural light and ventilation, improve your communication links and ability to work on-line with higher speed internet services, and find ways to reduce household expenditures if needed.

Similarly, imagine that you are a city planner or mayor who received a similar prediction. How would you prepare your community? You would probably enhance your emergency management and public health programs with improved communications networks and emergency supplies, ensure that healthcare services can accommodate demand surges, implement transportation policies that can prioritize travel and provide access to essential goods and services, eliminate homelessness, and improve affordable housing and transportation options to serve residents with reduced incomes.

However, disasters are unpredictable. Major pandemics are rare and highly variable events, making them difficult to forecast. It would be a mistake to prepare for just one risk – a major pandemic – and ignore other disasters. For these reasons, this report approaches this issue broadly; it considers how lessons from the COVID-19 pandemic can be generalized to help individual households and communities prepare for diverse health, environmental and economic shocks, including but not limited to infectious disease risks. This can help people and communities live long and prosper despite life's uncertainties.

Executive Summary

This report explores a pertinent and interesting question. How can we best prepare for the "slings and arrows of outrageous fortune," or to use modern terminology, how can we plan communities that are resilient to economic, social and environmental shocks, including pandemics and other disasters?

According to popular culture, the best disaster survival plan is to isolate on a private island or rural property. For some people, preparing a secluded bunker with sufficient emergency supplies ("prepping") is a hobby or business. However, for most households this is an ineffective and unrealistic solution. Although an affluent and healthy individual with practical skills and anti-social tendencies may be happy and healthy in rural isolation, most people have responsibilities and dependencies, including work, caregiving, and personal needs that require access to services and activities, and many people find such isolation boring.

Analysis described in this report indicates that most people are best off during a disaster living in a walkable urban neighborhood with convenient access to common services and activities, and social connections that provide security and support. This is good news overall, because it indicates that policies to increase disaster resilience also tend to help achieve other community goals including affordability, economic opportunity and environmental protection.

The COVID-19 pandemic is a significant risk. If uncontrolled, it could kill hundreds of millions of people, with great social and economic costs. Fortunately, prevention seems to be relatively effective, greatly reducing mortalities. Although infectious diseases were once a dominant cause of death, improved hygiene, vaccinations, healthcare, and other public health interventions have greatly reduced their mortality rates, as illustrated at right. Pandemics now kill fewer people, and cause far fewer potential years of lost life, than many other health risks, including cardiovascular diseases, cancers and accidents.

Improved hygiene, vaccinations and medical treatments reduced infectious disease death rates about 90% between 1900 and 1950, which significantly reducing total mortality rates.
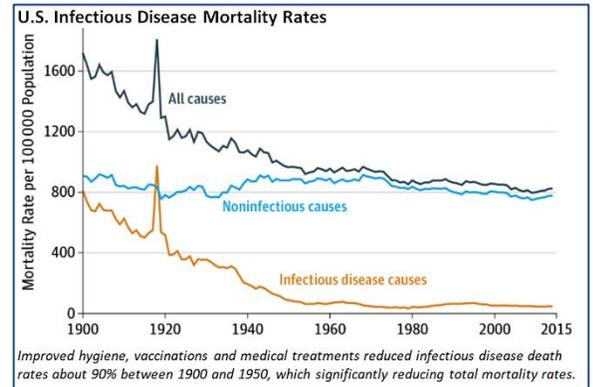
If COVID-19 follows the pattern of previous pandemics, controlling it will require many months of restricted travel and physical interaction, creating various health, social and economic problems. To improve resilience, communities need effective responses including contagion control, safe access to and delivery of essential goods and services, adequate housing, physical and mental support for isolated people, and affordability.

A key conclusion of this research is that pandemics do not justify abandoning cities. Although city residents are more exposed to infectious diseases, rural residents are more likely to die if infected, and urban living provides large health and safety benefits making cities significantly safer and healthier overall, as illustrated to the right. Many people assume that contagion risk increases with *density* (the number of people per unit of land), but that is not necessarily true; the risk is actually associated with *crowding* (the number of people within an enclosed space, such as a vehicle or house). Most infection risks are associated with specific activities – long-distance travel, worksites, stores and social gatherings – that are similar in cities, suburbs and rural areas.

This U.S. study found that longevity increases significantly with urbanization.
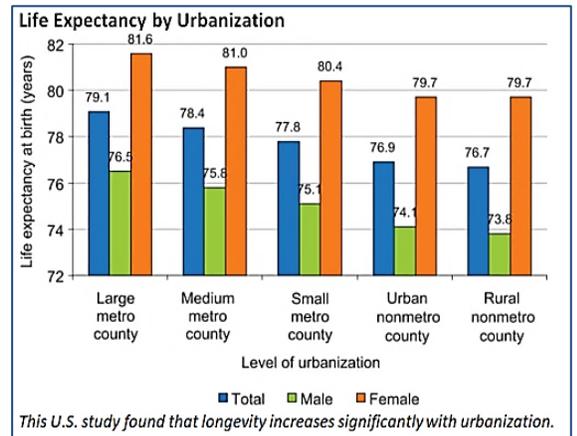
To reduce the stresses of isolation, homes need adequate space, light and ventilation. Houses with ground-floor access have the least contagion exposure. Multi-family housing with shared entranceways, indoor hallways and elevators have additional risks, but these can be reduced with appropriate design, frequent cleaning and sanitizing, appropriate hygiene, and physical distancing (Lewyn 2020). Homelessness increases contagion risks, so eliminating homelessness increases resilience. Such efforts, while costly, and therefore requiring state/provincial and federal funding, provide many long-term benefits.

Travel modes vary in their risks and affordability, as illustrated at right. All shared vehicles, including airplanes, trains, buses taxis, ridehailing, and private automobiles carrying passengers, can spread contagions. Walking and bicycling tend to have the least contagion risk, can serve people who for any reason cannot drive, provide exercise and are affordable, so improving walking and bicycling conditions tends to increase resilience. Improving walking and bicycling conditions tends to increase health and resilience.

Transport modes vary in their pandemic safety and affordability.

The table below summarizes special urban and rural pandemic risks and solutions. For equity sake, extra consideration should be given to helping physically, economically and socially disadvantaged groups.

Special Pandemic Risks and Solutions

	Urban	Rural Areas
Special Risks	• Crowded buildings and sidewalks • Elevators • Public transit • Homelessness and inadequate housing	• Vulnerable (old, poor, chronic illness, etc.) populations • Limited public health resources • Physical and social isolation • Poor access to medical facilities • Inadequate housing • Poverty and limited employment options
Solutions	• Targeted cleaning • Promote hygiene • Promote social distancing • Improve walking and bicycling • Eliminate homelessness and improve housing quality	• Improve public health services • Targeted outreach to isolated households • Improve access to essential services • High speed internet access and e-services • Financial assistance to poor and unemployed • Improve housing quality

Urban and rural areas have special pandemic risks that require special solutions.

Pandemics are just one of many risks that communities face, and generally not the most important, so it would be inefficient to implement infectious disease reduction strategies that increase other health, economic, environmental problems, for example, by reducing physical activity which increases cardiovascular disease, or increasing vehicle travel and therefore traffic casualties and pollution emissions. To increase resilience, households and communities should be prepared with emergency management programs, develop robust and flexible infrastructure, and favor affordable and resource-efficient housing and transportation options. Many of these strategies provide many economic, social and environmental benefits, in addition to reducing disaster risks.

> **Analysis Scope**
> *Planning analysis can vary in scope:*
>
> 1. Infectious disease risks only.
>
> 2. All disaster risks.
>
> 3. All health impacts.
>
> 4. All economic, social and environmental planning goals.
>
> More comprehensive analysis helps identify *win-win solutions* that achieve multiple goals, in addition to reducing infectious disease or disaster risks.

The table below provides checklists of ways that households and communities can increase their resilience to pandemics and other economic, social and environmental risks.

Resilience Planning Checklists

	For Households	For Communities
Reduces Pandemic Risks	• Resources to sanitize personal items, vehicles and homes, plus face masks and gloves. • A home with adequate space, home offices, natural light and ventilation, and private outdoor spaces such as a balcony, deck or yard to provide comfort for extended isolation. • Good communications resources, including telephone, internet service and computers for socializing, e-commerce and telework. • Fitness program, including in-home exercise and nearby walking and bicycling.	• Good public health programs, particularly infectious disease control and smoking reduction. • Healthcare services able to handle surges. • Shared vehicle density restrictions, cleaning and sanitizing, plus employee and passenger hygiene. • Minimal homelessness or inadequate housing. • Programs to address mental illness, substance abuse, domestic violence, and vulnerable resident supports. • Expanded pedestrian facilities to prevent crowding, traffic calming and road space reallocation.
Reduces All Risks	• Household emergency plan, including emergency contact information. • Emergency supplies, including first aid equipment, flashlights, mobile phone and portable radio backup power, and food for at least two weeks. • A home in a relatively safe location (out of floodplains and wildfire interface) built to withstand local risks such as earthquakes, hurricanes, plus extreme heat and cold. • Comfortable shoes for walking and a sturdy bicycle for riding. • Housing in a compact, walkable and bikeable neighborhood where essential services and activities are accessible without a car. • Ways to reduce household expenditures if income declines. • Positive relationships with neighbors.	• Emergency management with trustworthy leadership, reliable communications and critical supplies. • Robust internet and telecommunications networks, e-government, e-commerce, and delivery services. • Restrictions on development in high-risk areas such as floodplains and wildfire interface. • Zoning codes and house retrofit programs that ensure homes can withstand local risks such as earthquakes, and extreme weather, and are energy efficient. • Compact, walkable and bikeable neighborhoods where most essential services and activities can be accessed without using an automobile. • Sufficient affordable housing to serve demand. • Community cohesion, so most residents have positive relationships with their neighbors. • Unemployment insurance and support for lower-income households.

Good planning by households and communities can increase their resilience to pandemics and other risks.

Human intelligence allows us to learn from previous experiences and generalize those lessons to solve new problems. The COVID-19 pandemic is a good learning experience. The bad news: we face diverse and unpredictable risks, with no simple solutions. You can run, but you cannot hide. The good news: cooperative actions can greatly reduce deaths, and most people and communities are highly resilient. Given appropriate support, we can be healthy and happy despite economic, social and environmental shocks. This report should be of interest to policy makers, practitioners and the general public. Although focusing on North American conditions, many of the findings are applicable in other world regions.

Introduction

COVID-19 is a serious threat; if uncontrolled it could kill hundreds of millions of people around the world. Fortunately, strong public health interventions are reducing its spread and preventing it from overwhelming healthcare systems, greatly reducing deaths. Thanks public health professionals!

However, we can do better. Unnecessary delays and inadequate preparation reduced the effectiveness of these responses, and communities face many practical problems in preventing infections and addressing the pandemic's social and economic impacts. During a disaster people often ask, "Why were we not better prepared?" Every disaster is unique, so it would be a mistake to prepare for identical future pandemics; we need to identify general principles that can help communities respond effectively to diverse risks. Planners use the term "resilience" to describe a system's ability to absorb shocks, that is, sudden economic, social or environmental changes. Many communities have goals to increase their resilience (100 Resilient Cities).

This pandemic created an interrelated set of problems that include illness and deaths, healthcare system stress, travel restrictions, stay-at-home and isolation requirements, fear and confusion, mental and physical stresses, plus lost income to individuals and businesses which threaten local, national and global economic development. Although there is extensive literature on emergency management and community resilience planning, most existing publications focus on environmental threats such as hurricanes, earthquakes and wildfires; pandemics receive little consideration. Pandemics differ from most other disasters because they threaten people but not infrastructure, have long durations and huge economic impacts, as summarized below, so their mitigation is primarily concerned with protecting people and providing economic security, with little need for infrastructure protection and repair.

Exhibit 1   **Disaster Impacts**

Type	Scale	Duration	Warning	Healthcare Needs	Evacuation Needs	Economic Costs	Infrast. Damages
Earthquake	Large	Short	None	Large	Varies	Large	Large
Extreme weather[1]	Varies	Moderate	Short	Small	Moderate	Moderate	Moderate
Tsunami	Large	Short	Short	Moderate	Local	Large	Large
War/civil unrest	Varies	Short	Short	Moderate	Large	Moderate	Large
Wildfire	Large	Long	Moderate	Small	Moderate	Large	Large
Major utility failures[2]	Large	Moderate	Short	None	None	Large	Large
Chemical spill/fire	Small	Varies	Short	Large	Local	Large	Large
Pandemic	*Very Large*	*Very Long*	*Long*	*Very Large*	*None*	*Very Large*	*None*

Pandemics are one of many types of disasters that should be considered in emergency response planning.
   1. Extreme weather includes hurricanes, tornados, blizzards, ice storms, and extreme cold and heat.
   2. Major, long-term utility failures could result from technical failures, extreme weather, terrorist attacks or solar flares.

This report investigates these issues. It compares COVID-19 with other health risks; examines various impacts on people and economic activity; identifies specific problems such as homelessness and unaffordability; compares urban and rural risks; and recommends specific ways that communities can better prepare for, respond to, and recover from pandemics and other shocks. This report focuses on actions that can be implemented by individual households, community organizations, local and regional government. It highlights "win-win" strategies that increase resilience while helping to achieve other community and household goals. It should be of interest to anybody involved in emergency response or community resilience planning, or who wants guidance preparing their own household for future disasters.

Principles of Resilience

The future is unpredictable so smart planning prepares for possible unexpected changes, what economists call *shocks*, or as my grandmother recommended, we should "hope for the best but prepare for the worst." This would be easy if we faced just one possible shock, but there is a large range of possible threats that individuals and communities may face. Below are general principles for resilience planning.

Prepared and Responsive

Prepared and responsive means that communities have trustworthy leadership, effective emergency management programs, and good communication that allows public officials to communicate with residents and residents to communicate with public officials.

Robust, Secure, Redundant and Flexible

Critical infrastructure must be strong, redundant and flexible in order to withstand potential stresses and failures, and should avoid higher-risk locations. For example, earthquakes cause much less damage and casualties in areas with strong building codes, and extreme weather is less likely to cause power failures where utility lines are underground. Similarly, for security sake, homes and communities should avoid vulnerable floodplains, shorelines and forests susceptible to wildfires, risks that are increasing with climate change.

Diversity

A diverse system is better able to respond to unexpected changes. For example, people who normally travel by automobile should value having alternatives, such as good walking, bicycling and public transport in their community, for possible future situations in which they cannot or should not drive, because of a vehicle failure, medical problem or lost income, or because a disaster makes roads impassable or fuel unavailable. Drivers also benefit from non-auto modes that reduce their chauffeuring burdens. Similarly, households benefit from having diverse home heating and cooking options, food supplies, and employment opportunities.

Affordable and Resource-efficient

If we are lucky, we will always be affluent, but we should prepare for the possibility that sometime we will be impoverished and need more affordable options. Since housing and transportation are most household's two largest expenses, affordable housing and transportation are particularly important for resilience planning.

These principles can be applied to many types of planning decisions. For example, this suggests that to increase resilience, households should choose homes, and communities should design neighborhoods, that are in lower-risk locations, with efficient and redundant public infrastructure, and build multi-modal transportation systems that provide convenient access to important services and activities without requiring an automobile. These principles also suggest that communities should ensure that affordable housing and transportation options are available, so any household, including those with low incomes, physical impairments or other special needs can find suitable affordable homes in a walkable neighborhood.

These principles increase a community's resilience to many risks including pandemics and other disasters, and individual households' resilience to shocks such as lost income and physical disabilities. Although a pandemic does not damage physical infrastructure like natural disasters, it does stress household infrastructure and constrain travel activity, and its financial impacts will force many households to need more affordable housing and transport options.

Comparing COVID-19 with Other Health Risks

Infectious disease epidemics, including smallpox, typhus, plague, cholera, polio, and measles, were once common and deadly (Healthline 2016). Fortunately, better hygiene, vaccines, and improved medical treatments greatly reduced these risks, as illustrated below. Globalization increases contagion dispersion but also the speed of responses, so even highly contagious and deadly diseases can be controlled. As a result, our infectious disease risks are far smaller than our grandparents'.

Exhibit 2 **U.S. Infectious Disease Mortality Rates** (Hansen, et al. 2016)

Improved hygiene, vaccinations and medical treatments reduced infectious disease death rates about 90% between 1900 and 1950, which significantly reduced total mortality rates.

Note the 1918 Spanish flu spike, and the small increase between 1980 and 1995 due to AIDs and recent tuberculosis outbreaks.
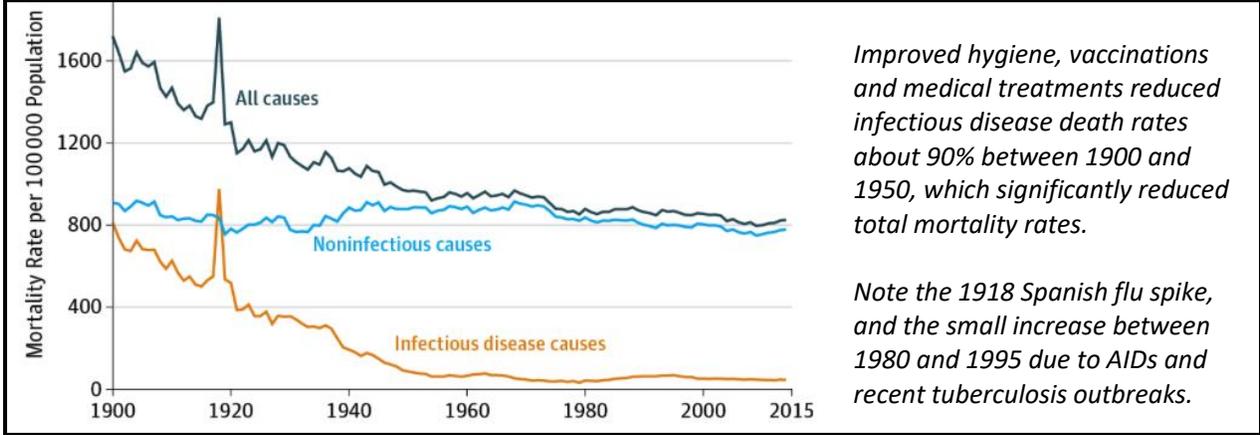
COVID-19 is dangerous due to its high transmissibility (it travels easily to uninfected people) and mortality rates (1-10% of infected people die; CEBM 2020; Varity, et al. 2020). Its long-term risks will depend on its immunity patterns (the degree infected people become immune to reinfections; Wu 2020), the ease of creating vaccines, and mutation rates (how quickly new strains develop). If it follows previous flu pandemic patterns, risks will be acute for several months, and decline as prevention and treatment methods improve, vaccines are developed, and more people become immune.

Due to successful public health interventions, pandemics are now a relatively small health risk overall. COVID-19 is predicted to kill 200,000 to 2.2 million Americans over an 18-month period (Fritze 2020; Kristof 2020), causing a 5-40% increase over the 2.8 million typical annual deaths. Assuming that major pandemics occur twice a century, they average 4,000-44,000 annual deaths, as indicated below.

Exhibit 3 **U.S. Leading Causes of Deaths** (CDC 2018)

Disease	2017 Deaths
Heart disease	647,457
Cancer	599,108
Lower respiratory disease, Influenza and pneumonia	215,873
Accidents (unintentional injuries)	169,936
Strokes	146,383
Alzheimer's disease	121,404
Diabetes	83,564
Nephritis, nephrotic syndrome and nephrosis	50,633
Intentional self-harm (suicide)	47,173
Estimated pandemics deaths	*150,000-250,000*

Assuming major pandemics occur twice a century, they represent a relatively small portion of average annual deaths.

This suggests that long-term health policies should treat pandemics as one of many health risks.

Because COVID-19 mostly kills older people, it causes smaller reductions in Potential Years of Life Lost (PYLLs), which accounts for the average age when people die, and so gives greater weight to risks to younger people. The figures below compare total death and PYLLs rates for the SDHU Region in Ontario. Risks that kill younger people, including suicides, transport injuries, perinatal conditions, poisonings and birth defects, are relatively important when measured by PYLLs, making their prevention a more important public health priority. Measured this way, diseases such as influenza and respiratory diseases rank relatively low compared with suicides, accidents and birth defects.

Exhibit 4   Comparing Major Causes of Death and PYLLs (PHSD 2018)
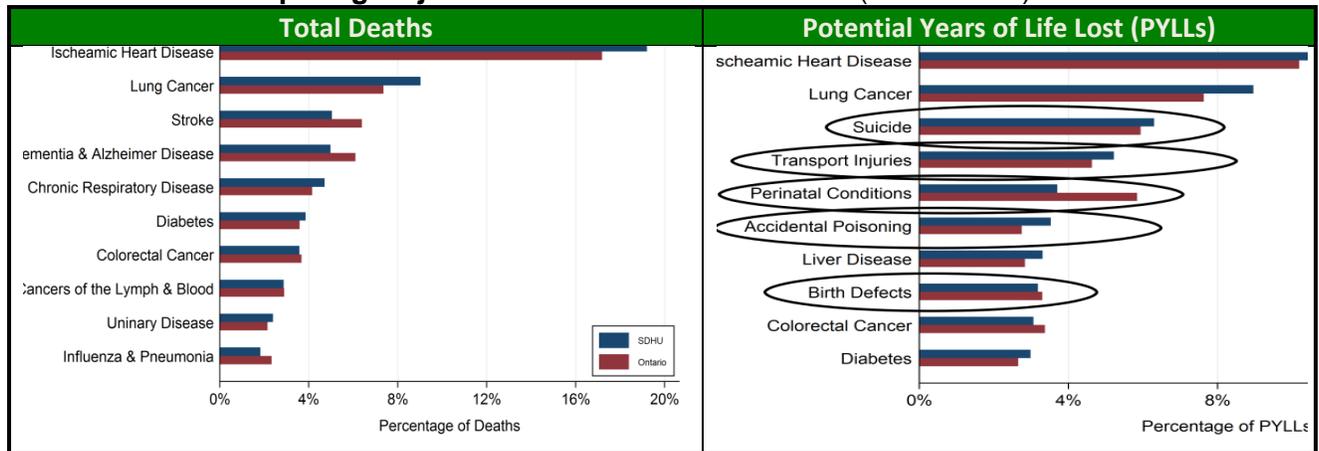
Cardiovascular diseases, cancers, dementia and respiratory diseases are major causes of death, but because they kill younger people, suicides, accidents and birth defects (circled) cause more potential years of life lost.

The table below compares COVID-19 with other major mortality risks, assuming a 30% infection rate (30% of people contract the disease in 2020) and 1% mortality rate. During the next year it would be the largest cause of death for people over 60, but even in this age group would cause a minority of all deaths, and for younger groups would cause fewer deaths than traffic crashes, drug overdoses, homicides or suicides.

Exhibit 5   Comparing Coronavirus with Other Mortality Risks (New York Times 2020)

COVID-19 could become the largest cause of death for older people, but for most people it is likely to cause fewer deaths than traffic crashes, drug overdoses, homicides or suicides.

This analysis indicates that pandemics present very large potential health risk. If uncontrolled, COVID-19 could kill up to 10% of affected community members, potentially causing up to 500 million deaths. Fortunately, public health interventions can reduce this risk by more than 99%. Although the interventions are economically costly, they are smaller than the potential damages of uncontrolled COVID-19. The table below compares best- and worst-case pandemic futures.

Exhibit 6   **Best and Worst Pandemic Futures**

Best	Worst
Infection rates are quickly controlled	Out-of-control infection rates overwhelm healthcare systems
Fewer than 200,000 U.S. deaths	More than two million U.S. deaths
Pandemic declines during spring 2020	Pandemic continues unabated
Effective vaccine is quickly developed	Rapid mutations make vaccines ineffective
Life and economy returns to normal by 2021	Life and economy are continually disrupted

With good management and luck, life and economic activity will soon return to normal.

Problems of Physical Distancing and Isolation

Pandemic control involves restrictions on travel, commercial and social activities, plus isolation and sometimes quarantine. The table below summarizes resulting problems and potential community solutions.

Exhibit 7   **Isolation Problems and Community Solutions**

Problem	Community Solutions
Confusion and fear	Good communication, particularly for vulnerable and isolated people.
Inadequate access to essential goods	Provide shopping opportunities and delivery services.
Healthcare needs	New service models, such as on-line consultations and pharmacy deliveries.
Crowding and discomfort	Adequate housing, with private outdoor space (balconies, decks, yards)
Mental stress	Community support and mental health services. Design for "sociable distancing."
Physical inactivity	Opportunities for outdoor activity. "Open streets" with restricted vehicle traffic.
Domestic conflicts	Adequate housing. Community support. Domestic violence response.
Reduced household income	Emergency funding. Community support. Affordability.
Reduced business income	Emergency funding. Support for new business models, such as delivery services.
Homelessness	Eliminate homelessness, as described in the following section.

Restrictions on travel, commercial and social interactions can create various problems.

Some of these solutions require technologies such as high-speed internet and video conferencing, plus delivery services, to help people to stay informed and entertained, access essential goods and services, work, and maintain social connections. Homes should have sufficient space and comfort features, natural light and air, and private outdoor spaces such as balconies, porches, decks and yards. Communities can be designed for "sociable distancing," for example, houses with windows oriented to the street, and front porches, plus wide sidewalks and recreational paths (Mehaffy 2020). These features are particularly important for families with children and people with disabilities.

Homelessness Risks and Solutions

People experiencing homelessness or inadequate housing, and the organizations that serve them, face special challenges from contagious diseases (Brasuell 2020). Homeless people tend to be vulnerable to infections due to a combination of daily stress, poor nutrition and chronic diseases, and living in crowded conditions that lack basic hygiene resources such as sinks, clean toilets, and opportunities to bath and clean clothes (Woodyard 2020). Homelessness services providers are also vulnerable to infectious illnesses and so may be unable to work during outbreaks.

Public health officials advise people exposed to or infected by contagious diseases to shelter in place. Such quarantines are difficult enough for people with stable homes and reliable incomes; they are virtually impossible for people who are homeless or living in inadequate housing (Fuller 2010), such as housing that is crowded, or lacks sufficient heating or cooling (DeParle 2020). If homeless people become infected, they will need to stay in hospitals, using scarce beds, adding stresses and costs to overburdened public health services. Everybody benefits by minimizing homeless residents' infection risks.

Many communities have programs to reduce homelessness, but a pandemic makes these efforts far more urgent. Homelessness service providers are reorganizing their services to reduce contagion risks, ensure physical distancing and improve hygiene (Woodyard 2020) Some communities are using RVs, tents or underutilized hotels to provide quarantine housing for homeless people who are infected but don't need hospitalization (Canales 2020). To be successful these efforts require coordinated food, healthcare and mental health services, with plans to transition occupants into stable long-term housing when the pandemic ends.

This is difficult. Homeless people have diverse abilities and needs. Although some are homeless temporarily, due to a short-term financial or domestic crisis, and simply need affordable housing, a portion is chronically homeless due to severe mental illness and substance abuse problems and so need housing with integrated medical, social and economic support. Such programs are costly but can be justified economically by their long-term health, social and economic benefits.

Homelessness problems are particularly severe in large central cities (DHUD 2018). Since homeless people tend to migrate from their home communities to those cities, called "social drift," regional, state/provincial and national governments should bear most of these costs (Lederbogen, Haddad, Meyer-Lindenberg 2013).

Resources for Addressing Homelessness Pandemic Risks

CDC (2020), *Interim Guidance for Homeless Shelters*, Center for Disease Control.

Homelessness Hub (2020), *Infectious Diseases*.

Jen Monnier (2020), "Coronavirus Poses Unique Threat to U.S. Homeless Population," *Scientific American*, 11 March.

NAEH (2020), *Coronavirus and Homelessness*, National Alliance to End Homelessness.

NCEH (2020), *What Homeless Folks Should Know about Coronavirus (COVID-19)*, National Coalition for the Homeless.

NHCHC (2020), *Coronavirus Resources*, National Health Care for the Homeless Council.

Comparing Urban and Rural Risks

Many people assume that infectious disease risks make cities dangerous (Dawid 2020; Rosenthal 2020), but this is generally untrue (Fox 2020; Smith 2020; Steuteville 2020). Although, all else being equal, infection exposure can increase with density,[1] other factors are more significant, so dense cities with good public health programs have lower infection and death rates than sprawled areas with poor programs (Li, Richmond and Roehner 2018).

High COVID-19 infection rates in large cities such as Chicago, New York and Seattle reflect their global connections – they are major travel hubs and centers of trade, tourism and migration – more than density. Some dense cities such as Hong Kong, Singapore and San Francisco, and highly urbanized countries, such as Japan, South Korea and Taiwan, minimized COVID-19 deaths (Kahn 2020; Leonard 2020; Lindeke 2020; Normile 2020), and many suburban areas, such as New Rochelle near New York, and Kirkland near Seattle, have higher infection rates than nearby central cities (Bliss and Capps 2020; Dobkin and Diaz 2020; Keil, Connolly and Ali 2020). Although COVID-19 took longer to reach rural areas in the U.S., within two months, two thirds of rural counties had at least one case, and some have high infection rates (Healy, et al. 2020).

For this analysis, it is important to distinguish between *density* (people per acre) and *crowding* (the number of people within an enclosed space, such as a vehicle or house). Contagion risks results from crowding, not density. There is no reason to believe that city worksites, stores, and healthcare facilities are more contagious than in suburban and rural areas. The table below summarizes risk factors and solutions.

Exhibit 8 **New York City COVID-19 Cases** (Open Street Map)

Infection rates are much higher in lower-density outer suburbs than in central neighborhoods.
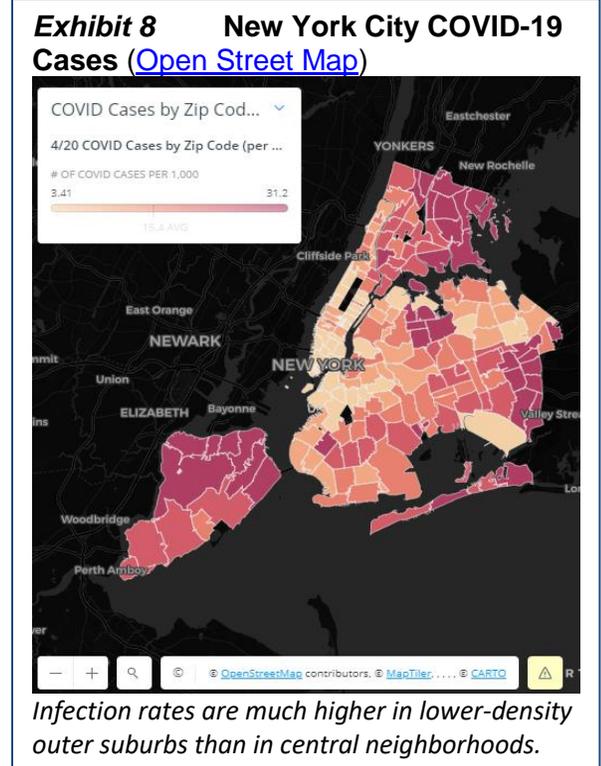
***Exhibit 9*** **Contagion Risk Factors and Solutions**

Risk Factors	Solutions – Responses
Long-distance travel	Limit mobility and require quarantines, particularly from higher-risk areas.
Crowded buildings	Limit crowding, clean touch surfaces, and encourage resident, employee and visitor hygiene.
Stores and restaurants	Limit crowding, use delivery services, clean touch surfaces, and encourage hygiene.
Shared vehicles	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Sidewalks and paths	Reduce crowding and encourage distancing. Pedestrianize streets.
Social gatherings	Forbid or discourage social gatherings, clean touch surfaces, encourage hygiene.
Nursing homes and medical facilities	Develop comprehensive infection prevention, testing and control protocols, limit access by non-essential visitors, encourage hygiene, protect staff.
Homelessness	Provide housing for homeless residents and targeted services to vulnerable groups.

Infectious diseases present specific risks which can be reduced.

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[1] Fan and Song (2009) found 28% higher infection-related mortality in central cities during 1979-2008, and Chandra, et al. (2013) found that during India's 1918–19 influenza epidemic, districts with more than 175 residents per square mile experienced 4.69% population loss compared with 3.72% losses in less dense areas.

For this analysis, it is also important to measure risk *per capita*. Large population states, such as New York, California, and Florida have more virus cases, as indicated on the left, but many lower density areas have high per capita death rates, as indicated on the right. Density is less a risk than factors such as long-distance travel (and therefore global connections), public health programs, demographics and lifestyle.

Exhibit 10   **Total Cases Versus Fatality Rates**

Total Reported Cases (NYT, 25 March 2020)	Fatality Rates (Brookings Institution)
Large urban regions tend to have the most cases.	*Some rural areas have high COVID-19 fatality rates.*
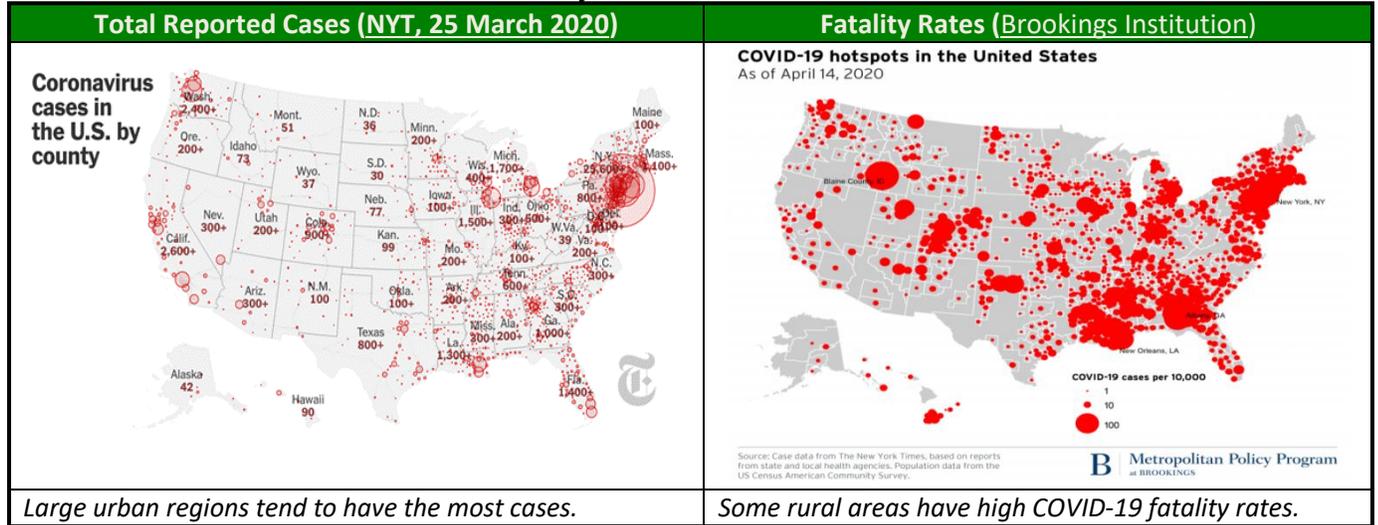
Larger and denser cities tend to have longer flu seasons, but less dense areas have greater spikes that can strain health care systems (Dalziel, et al. 2018). Rural residents tend to be more vulnerable to infectious diseases due to their demographics (they are older, poorer, and have more chronic diseases and higher smoking rates), limited public health systems, and poor healthcare access (Keating and Karklis 2020). Flu death rates are much higher in rural areas than in large cities and suburbs, as illustrated below. As pandemic expert Professor Eva Kassens-Noor explains, "Rural populations have less means to contract it [coronavirus], but rural populations have less means to treat it." (Bliss and Capps 2020).

Exhibit 11   **Flu Fatality Rates by Location** (Washington Post, 19 March 2020)

Flu death rates tend to be higher in rural areas than in large cities or suburbs.

If COVID-19 follows this pattern, any lower exposure rate in rural areas is likely to be offset by higher fatality rates.
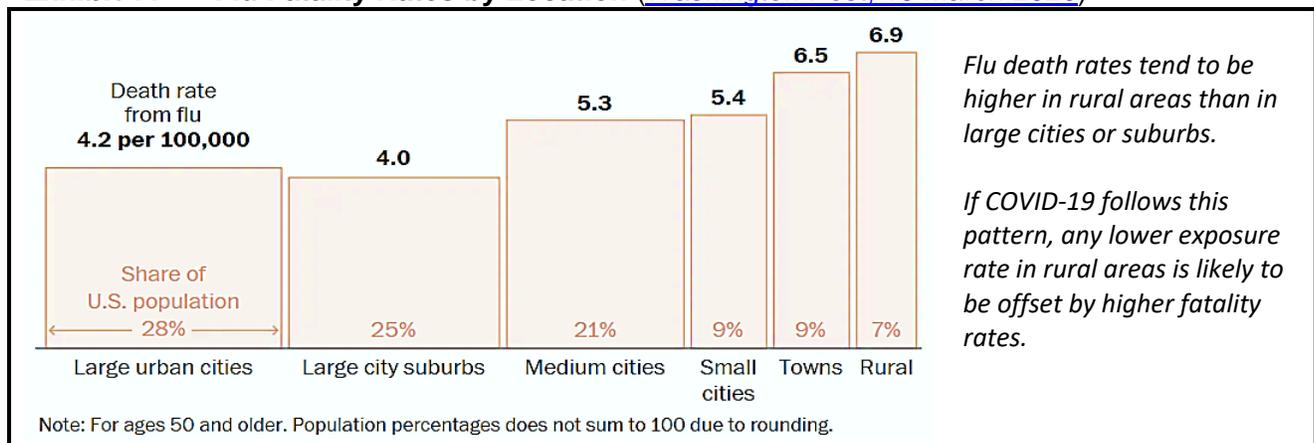
Urbanization tends to increase infectious disease risks but significantly reduces most major causes of death (cardiovascular and respiratory diseases, cancers and unintentional injuries), and so increase overall longevity ([Cosby, et al. 2019](#); [Hamidi, et al. 2018](#); [Sallis, et al. 2016](#)), as illustrated below.

Exhibit 12   **Life Expectancy by Urbanization, U.S., 2005–2009** ([Singh and Siahpush 2014](#))

This U.S. study found that longevity increases significantly with urbanization for all demographic groups. Large metro residents live 2.4 more years than rural residents, on average. Urban-rural differences are even greater for poor and minority groups.

Rural residents have shorter lifespans due to higher rates of cardiovascular, respiratory and kidney diseases, unintentional injuries lung and colorectal cancer, suicide, diabetes, Alzheimer's disease and birth defects.

Exhibit 13   **Age-Adjusted Death Rates, U.S., 1990–2009** ([Singh and Siahpush 2014b](#))

This U.S. study found that mortality rates are lowest in large metro regions and tend to increase with rurality for most demographic groups. Urban-rural disparities are particularly large for poor and most minority groups, and increased in recent decades.

Rural residents have higher rates of cardiovascular and respiratory diseases, unintentional injuries, lung cancer, suicide, diabetes, pneumonia/influenza, cirrhosis, and Alzheimer's disease.

Exhibit 14   **Preventable Mortality in Canada** ([Subedi, Greenberg and Roshanafshar 2019](#))

This Canadian study found that preventable mortality is lowest in easily accessible (i.e., urban) areas and increases with remoteness (i.e. rural).

These differences result from demographics (remote community residents tend to have lower incomes and less education), plus higher rates of cardiovascular disease, cancers, diabetes, accidents and suicides, plus less access to healthcare.

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The figure to the right, from, *Mobilizing Against COVID-19 (by Staying Put)* (Winkelman 2020), published by Green Resilience, shows a negative relationship between neighborhood density and COVID-19 infection rates in New York City.

Health and safety risks vary by location. City residents tend to have greater risks from infectious diseases, high-rise fires and street crime, but rural residents face greater risks from chronic diseases, accidents (particularly traffic crashes) suicides, and some disasters (such as wildfires), plus less healthcare access and slower emergency response.

In addition to improved health and safety, there are other reasons to favor compact development (Badger 2020). Urban living tends to reduce per capita land consumption and vehicle travel, and increases accessibility, which provide various benefits, as summarized below.

Exhibit 15   COVID-19 Versus Density in NYC (Winkelman 2020)
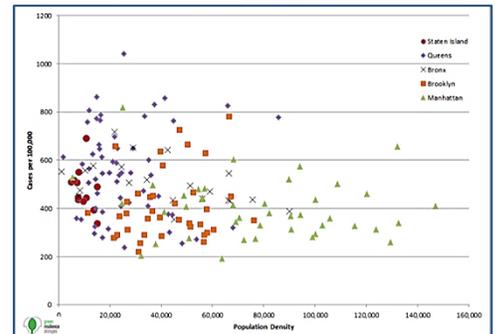
New York's denser neighborhoods had lower infection rates than in low-density suburbs.

Exhibit 16   Compact Community Benefits (Ewing and Hamidi 2015; Litman 2019)

Economic	Social	Environmental
• 10-30% transport cost savings • Less time driving and congested. • More productivity and innovation. • Public services cost savings.	• Lower traffic casualty rates. • Residents are healthier and live longer. • Greater economic opportunity for disadvantaged people.	• Requires less land for roads and parking, preserving open space. • Energy savings and emission reductions.

As a result, any additional contagion risk in cities should be balanced against the benefits of compact living. This is not to suggest that rural living is "bad" and everybody should move to cities; people should be free to live where they want. This analysis simply indicates that it would be misguided to move from a city to a rural area to reduce pandemic risks; that would reduce safety overall and endanger rural residents. Rather than abandon cities, resilient community planning would reduce risks so cities and rural areas become even safer and healthier overall (Holland 2020), as indicated in the table below.

Exhibit 17   Special Pandemic Risks and Solutions

	Urban	Rural Areas
Special Risks	• Crowded buildings and sidewalks • Elevators • Public transit • Homelessness and inadequate housing	• Vulnerable (old, poor, chronically ill, etc.) populations • Limited public health resources • Physical and social isolation • Poor access to medical facilities • Inadequate housing • Poverty and limited employment options
Solutions	• Targeted cleaning • Promote hygiene • Promote physical distancing • Improve walking and bicycling • Eliminate homelessness and improve housing quality	• Improve public health services • Targeted outreach to isolated households • Improve access to essential services • High speed internet access and e-services • Financial assistance to poor and unemployed • Improve housing quality

Urban and rural areas have special pandemic risks that require special solutions.

Transport Risks and Solutions

Both long-distance and local travel present contagion risks: long-distance travel can introduce diseases into a community and local travel can disperse it. Transport hubs and corridors, such as airports and highways, are often gateways to diseases. All shared vehicles present risks: buses, trains and airplanes can have crowded vehicles and stations, while automobiles used for taxis, ridehailing, or carrying family and friends have confined spaces and numerous touch services (handles, arm rests and seats). These risks are difficult to compare; for example, it is uncertain whether total contagion risk is lower if 1,000 non-drivers travel on 100 buses with 10 average passengers, 500 taxi/ridehail vehicles with a driver and two average passengers, or 1,000 private cars with a driver and one passenger, since each presents unique risks. The figure below compares my estimates of contagion risk and affordability of common travel modes.

Exhibit 18 **Safety and Affordability by Mode**

Transport modes vary in their pandemic safety and affordability. Of course, actual impacts will vary depending on conditions.

This suggests that to reduce risks travellers should minimize all types of shared vehicle travel. This can severely constrain the out-of-home activities of non-drivers in automobile-dependent areas. Commuters who don't drive may be unable to work, and adolescents lack independence. Even urgent rides, such as healthcare access, can be difficult and costly in sprawled areas where taxi and ridehailing services are limited and travel distances are long. Intercity vehicle travel may also be inconvenient, due to limited traveler services.

Public transport can present special risks. A paper by Jeffrey E. Harris, *The Subways Seeded the Massive Coronavirus Epidemic in New York City*, claimed that subways where the major cause of COVID-19 dispersion in New York City, based on maps showing reported cases concentrated along subway lines, and because late-March ridership declines were followed by reductions in new cases, but critics point out that infection rates are actually higher in more automobile-oriented suburban areas than in transit-oriented areas, and many other contagion-control policies were implemented in late March which can explain the decline in new infections (Furth 2020; Gordon 2020; Grabar 2020; Levy 2020; Winkelman 2020).

Exhibit 19 **New York City Infection Rates** (Harris 2020)
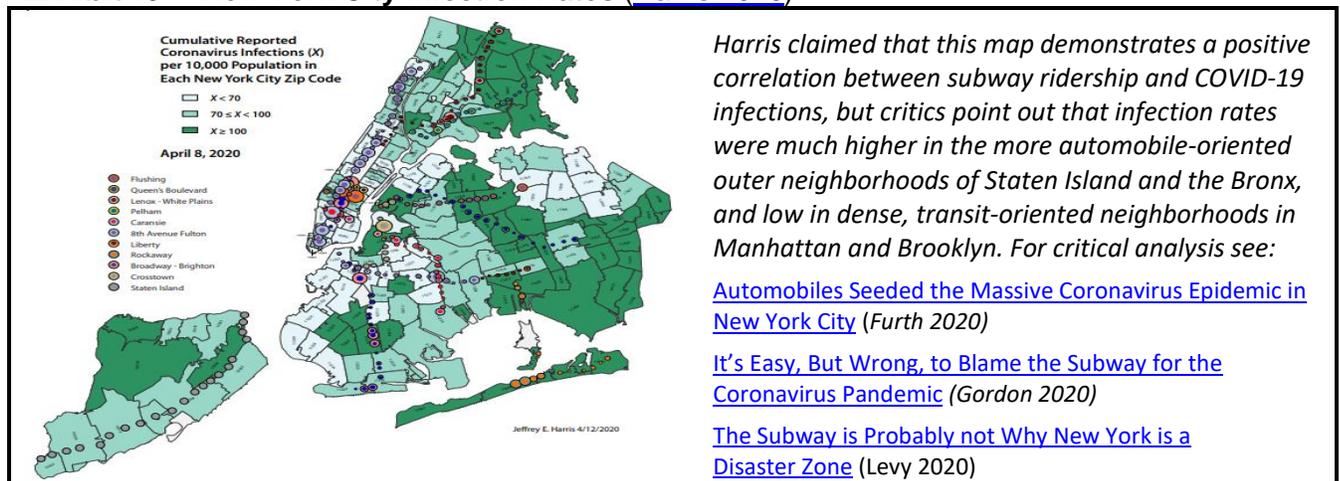
Harris claimed that this map demonstrates a positive correlation between subway ridership and COVID-19 infections, but critics point out that infection rates were much higher in the more automobile-oriented outer neighborhoods of Staten Island and the Bronx, and low in dense, transit-oriented neighborhoods in Manhattan and Brooklyn. For critical analysis see:

Automobiles Seeded the Massive Coronavirus Epidemic in New York City (*Furth 2020*)

It's Easy, But Wrong, to Blame the Subway for the Coronavirus Pandemic (*Gordon 2020*)

The Subway is Probably not Why New York is a Disaster Zone (Levy 2020)

Analysis by Salim Furth, *Automobiles Seeded the Massive Coronavirus Epidemic in New York City*, shows that neighborhood COVID-19 infection rates tend to decline with transit mode share and increase with automobile mode share, as illustrated below. He identifies various ways that motorists are likely to spread disease more than transit users: motorists tend to travel farther, visit more destinations, and reduce their vehicle trip-making less than transit users, and take fewer precautions because driving seems safer than transit travel. This explains the high infection rates in more automobile-oriented areas.

Exhibit 20 **COVID-19 Infection Rates Versus Auto Commute Mode Share** (Furth 2020)
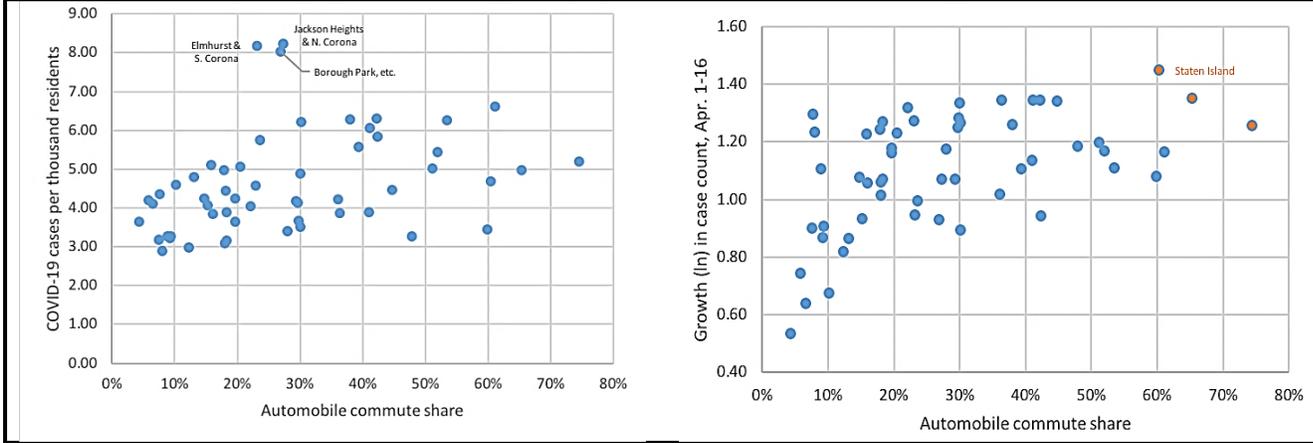
Aron Furth's study, Automobiles Seeded the Massive Coronavirus Epidemic in New York City, shows statistically strong positive correlations between automobile commute mode shares and both COVID-19 infection rates (left figure) and April 1-16 infection growth rates (right figure), plus strong negative correlations between both subway and other transit commute mode shares and infection rates.

Transit risks can be reduced by limiting crowding, appropriate cleaning and sanitizing, employee and passenger hygiene, operator protection (Fletcher, et al. 2014; Levy and Goldwyn 2020), and operational improvements that reduce delay (Transit Center 2020). Taxi, ridehailing and motorists carrying passengers can reduce risks by limiting crowding, cleaning, sanitizing and hygiene. Taxi and ridehailing companies can offer sick leave so drivers are less likely to work when they may be contagious. Delivery services reduce but do not eliminate risk since couriers handle many people's goods. Walking, bicycling and telework are generally the safest and most affordable travel modes, making walkable urban neighborhoods resilient, particularly if they are designed for minimal crowding and *sociable distancing* (Mehaffy 2020).

Exhibit 21 **Transportation Risks and Solutions**

Risks	Solutions
Long-distance travel	Limit mobility and require quarantines, particularly from higher-risk areas.
Private vehicle travel	Avoid carrying passengers, clean touch surfaces, encourage hygiene.
Taxi and ridehailing	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Public transit vehicles	Limit crowding, clean touch surfaces, encourage hygiene, protect operators.
Terminals	Limit crowding, clean touch surfaces, encourage hygiene, protect employees.
Walking and bicycling	Encourage distancing. Limit automobile traffic and open streets to active modes.
Automobile dependency	Create neighborhoods with convenient walking and bicycling access.

Travel activities impose various risks which can be reduced.

Here are some current and long-term travel impacts.

- Pandemic restrictions on travel and business activities, and stay-at-home orders, have greatly reduced vehicle traffic and public transportation (Heisler 2020), which has reduced traffic congestion, accidents and air pollution (Lunden and Thurlow 2020; Sahagun 2020).

- Telework (telecommunications and delivery services that substitute for physical travel) was already growing, but is likely to accelerate as people and businesses gain experience during the pandemic.

- Bicycling is a safe and healthy travel option. The pandemic is increasing bicycle travel, and may justify more long-term bicycling improvements.

- Reduced vehicle traffic and increased need for physical distancing can justify street space reallocation to expand sidewalks and bike lanes, and create "open streets" where non-motorized modes share road space with low-speed motor vehicle traffic (Kostelec 2020; Lydon 2020).

- Emergency, service, freight and delivery vehicles may receive additional support and priority.

- Public transit may be stigmatized and criticized, leading to ridership losses and disinvestments. Advocates should respond with evidence of benefits (Levy 2020; Litman 2018; TUMI 2020; UITP 2020).

Will this pandemic cause people to abandon cities and public transit? Probably not. Perhaps the most relevant example is experience after the September 11th terrorist attack, and various public transit terrorist attacks (Reuters 2017). At the time, many people claimed that these events would end urbanization and public transit demand. Cities and transit agencies responded with increased security and public education. Both urbanization and transit ridership soon returned to previous growth levels. Although terrorist attacks lead some people to dread (i.e., have irrational fear) cities and transit travel, they are, in fact, generally safer and healthier overall than rural living and automobile travel (Hamidi, et al 2018; Litman 2005).

During a major pandemic it may be rational to restrict public transit travel, but over the long run, total deaths and illnesses are likely to increase if exaggerated pandemic fear leads to long-term shifts from cities to automobile-dependent suburbs, or from public transit to automobile travel (Litman 2005).

Resources for Reducing Transportation Pandemic Risks

APTA (2020), The COVID-19 Pandemic Public Transportation Responds: Safeguarding Riders and Employees, American Public Transportation Association (www.apta.com)

CNT (2020), *Urban Opportunity Agenda*, Center for Neighborhood Technology (www.cnt.org).

EU (2020), *COVID-19: Guidelines on the progressive restoration of transport services and connectivity*, European Union.

ITE (2020), *COVID-19 Resources*, Institute of Transportation Engineers (www.ite.org).

Feargus O'Sullivan (2020), In Japan and France, Riding Transit Looks Surprisingly Safe, City Lab.

Polis (2020), *COVID-19: Keeping Things Moving*, Cities and Regions for Transport Innovation.

SLOCAT (2020), *COVID-19 and the Sustainable Transport Community*, Sustainable Low Carbon Transport Partnership (https://slocat.net).

Transit Center (2020), *How Transit Agencies Are Responding to the COVID-19 Public Health Threat*, (https://transitcenter.org).

TUMI (2020), *The COVID-19 Outbreak and Implications to Sustainable Urban Mobility – Some Observations*, Transformative Urban Mobility Initiative (www.transformative-mobility.org).

UITP (2020), *Management of COVID-19 Guidelines for Public Transport Operators*, Union Internationale des Transports Publics (International Association of Public Transport); at (www.uitp.org).

Affordability

For many households, the COVID-19 pandemic creates severe economic problems. Even before this pandemic, many low- and moderate-income households suffered from excessive housing, transportation and healthcare costs. This pandemic is causing large unemployment and business losses that will reduce many household's incomes. Although stimulus funds, unemployment insurance, and bill deferment policies provide some relief, many households will need additional short- and long-term solutions.

Although affordability concerns often focus on high housing costs, many households also face excessive motor vehicle cost burdens, including occasional large unexpected expenses from mechanical failures and crashes. Many moderate-income households have difficulty making vehicle loan, insurance or repair payments and will need affordable mobility options.

Below are local policies that can increase affordability:

1. Implement eviction protection, rent moratoriums and deferrals, plus subsidies for at risk households.

2. Increase allowable densities and building heights, and allow compact, missing middle housing types (secondary suites, multi-plexes, townhouses and low-rise apartments) in walkable urban neighborhoods, particularly for corner or larger lots, adjacent to parks, or on busier streets, since these locations minimize negative impact on neighbours.

3. Reduce development fees, approval requirements and inclusivity mandates for moderate-priced ($200,000-400,000 per unit) infill housing, since these are the projects we most need.

4. Reduce or eliminate parking minimums and favor unbundling (parking rented separately from housing units) so car-free households are not forced to pay for expensive parking facilities they do not need.

5. Allow higher densities and building heights in exchange for more affordable units. Minimum target densities can be applied in accessible locations, for example, at least three stories along minor arterials and four stories along major arterials.

6. Improve affordable housing design. Municipal governments can support design workshops and contests to encourage better design. The Affordable Housing Design Advisor, the Missing Middle Website, and Portland's Infill Design Project are examples of affordable housing design resources.

7. Improve active transport (walking and bicycling) and micro-mobility (electric scooters and bicycles) through improved sidewalks, crosswalks, bike lanes, complete streets policies, traffic calming and streetscaping.

8. Improve public transport services so vehicles and stations are less crowded, cleaner, better ventilated and less delayed, through better design, increased cleaning, dedicated bus lanes, all-door boarding, driver protection, and automated fare payments system, actions that improve convenience and comfort as well as reducing disease risks.

9. Implement Transportation Demand Management (TDM), which includes various policies and programs that encourage more efficient travel behavior. Local and regional governments can implement TDM strategies and require large employers to have Commute Trip Reduction programs.

10. Support development of walkable urban villages along frequent public transit corridors (also called Transit Oriented Development or TOD) to create neighborhoods where residents and workers can easily access common services and activities without a car.

Pandemic-Resilient Community Planning

This section explores ways to design communities to minimize contagion risks and maximize health and safety.

Housing with ground-floor access – a private door that connects directly to a sidewalk or driveway – minimizes contagion risks. Multi-family buildings with exterior stairs and walkways also have low risk. Buildings with shared entranceways, indoor hallways and elevators are likely to present additional risks, but these can be reduced with frequent cleaning and sanitizing, as well as resident and employee hygiene. To minimize environmental risks homes should be built to withstand local risks such as earthquakes, hurricanes, extreme heat and cold, and located outside floodplains and wildfire interface.

Exhibit 22   **Pandemic Resilient Housing**

| Townhouses with ground-floor access | Apartments with exterior access. | Apartments with balconies. |

To reduce the isolation stress, homes need sufficient space and quiet, adequate light and ventilation, plus private outdoor areas such as a balcony or deck with seating, and, particularly for children, a yard or rooftop garden (Poon 2020; Zacka 2020). Home offices are desirable, particularly if household members work or study at home. Personal privacy is important, such as a home office or quiet workspace, particularly for home workers. Windows oriented to the street, and a front porch or low balcony, allow residents to wave and talk to neighbors while maintaining safe distances (sociable distancing).

A given density can be designed to have very different degrees of contagion risk, depending on pedestrian connectivity. For example, high-rise density tends to have low pedestrian connectivity, particularly if located in an automobile-dependent area were much of the land must be devoted to vehicle parking, while mid-rise density with numerous walkways can provide very high connectivity which minimizes crowding and contagion risks, as illustrated to the right.

Mid-rise, pedestrian-oriented development tends to maximize community cohesion (the quality of interactions among neighbor) and livability. A recent article by planner

Exhibit 23   **Density and Connectivity**
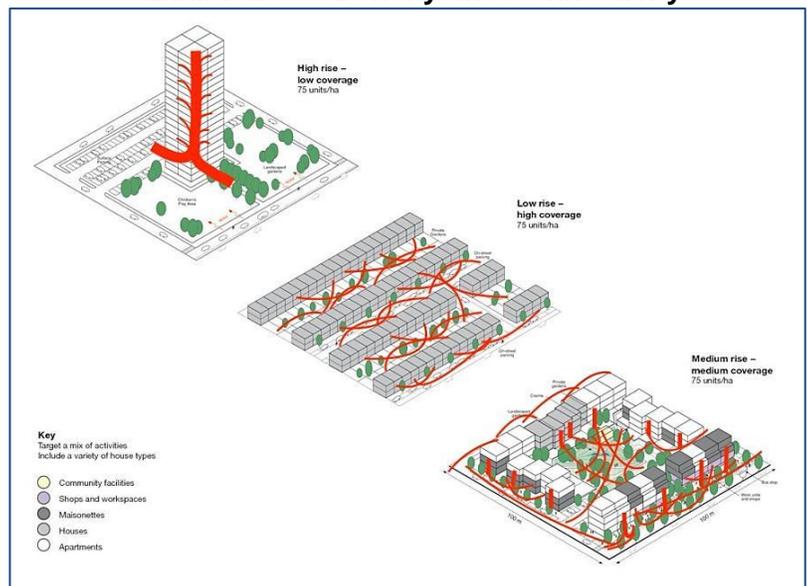
Michael Mehaffy, *Why We Need 'Sociable Distancing',* shows how moderate-density, pedestrian-oriented development maximizes residents' ability to maintain social connections among homes, shops and pedestrians, which increases safety, health and happiness.

Exhibit 24 **Urban Space as a Web of Connections** (Mehaffy 2020)

Urban space is a complex web of places where we can be, move, see and hear, and therefore connect. This provides sociable distancing, where people can safely interact with minimal contagion risks.

The National Association of City Transportation Officials (NACTO) developed the *Rapid Response: Tools for Cities* which describes ways that local governments can increase transport safety during this pandemic. These include prioritizing essential over non-essential travel, protecting front-line workers, and changing street design and management to provide more space and safety for pedestrians and bicyclists.

Exhibit 25 **Roadway Management for Pedestrian and Bicycle Safety** (NACTO 2020)

Many communities are changing streets to give pedestrians and bicyclists more space and safety.

The table below summarizes actions that households and communities can take to increase their resilience to pandemics and other economic, social and environmental shocks.

Exhibit 26   **Resilience Planning Checklists**

	Households	**Communities**
Reduces Pandemic Risks	• Resources to sanitize personal items, vehicles and homes, plus face masks and gloves. • A home with adequate space, home offices, natural light and ventilation, and private outdoor spaces such as a balcony, deck or yard to provide comfort for extended isolation. • Good communications resources, including telephone, internet service and computers for socializing, e-commerce and telework. • Fitness program, including in-home exercise and nearby walking and bicycling.	Good public health programs, particularly infectious disease control and smoking reduction. Healthcare services able to handle surges. Shared vehicles (taxis, ridehailing and public transport) density restrictions, cleaning and sanitizing, plus employee and passenger hygiene. Minimal homelessness or inadequate housing. Programs to address mental illness, substance abuse, domestic violence, and vulnerable resident supports. Expanded pedestrian facilities to prevent crowding, traffic calming and road space reallocation.
Reduces All Risks	• Household emergency plan, including emergency contact information. • Emergency supplies, including first aid equipment, flashlights, mobile phone and portable radio backup power, and food for at least two weeks. • A home in a relatively safe location (out of floodplains and wildfire interface) built to withstand local risks such as earthquakes, hurricanes, plus extreme heat and cold. • Comfortable shoes for walking and a sturdy bicycle for riding. • Housing in a compact, walkable and bikeable neighborhood where essential services and activities are accessible without a car. • Ways to reduce household expenditures if income declines. • Positive relationships with neighbors.	• Effective emergency management with trustworthy leadership, reliable communications networks and critical supplies. Robust internet and telecommunications networks, e-government, e-commerce, and delivery services. Restrictions on development in high-risk areas such as floodplains and wildfire interface. Zoning codes and house retrofit programs that ensure homes can withstand local risks such as earthquakes, and extreme weather, and are energy efficient. Compact, walkable and bikeable neighborhoods where most essential services and activities can be accessed without using an automobile. Sufficient affordable housing to serve demand. Community cohesion, so most residents have positive relationships with their neighbors. Unemployment insurance and support for lower-income households.

Good planning by households and communities can increase their resilience to pandemics and other risks.

This analysis indicates that, although affluent motorists may be healthy and happy in automobile-dependent areas, such locations impose significant costs and constraints: they require every adult to own a private vehicle, and offer poor mobility options for residents who cannot, should not, or prefer not to drive. In such areas, physical and digital access to essential services and activities is limited and expensive. For most households, the safest, healthiest and most resilient home is located in walkable urban neighborhood where commonly-used services and activities are easy to access on foot and by bicycle.

Comprehensive Solutions

Comprehensive planning recognizes that flues are just one type of infectious diseases, infectious disease reduction is just one public health objective, and improving public health is just one community planning goal. A basic principle of good planning is that individual, short-term decisions should be consistent with strategic, long-term community goals. As a result, comprehensive planning favors "win-win" solutions to pandemic problems that also help achieve other community goals.

Exhibit 27   **Community Planning Issues**
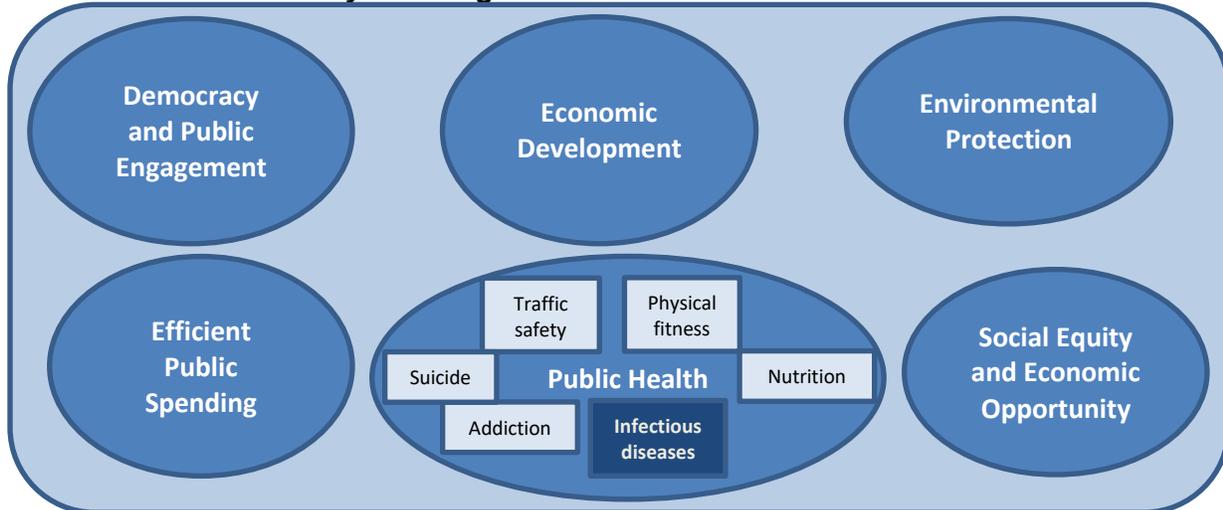
Infectious diseases – including flu pandemics – are just one of many public health risks, and reducing these risks is just one of many community planning goals. Comprehensive planning strives to find win-win solutions that help achieve multiple community goals – such as solutions to pandemic problems that also support economic development, social equity and environmental protection.

Many pandemic solutions help achieve other planning goals, as illustrated in the following matrix. For example, walking and bicycling improvements, reducing automobile travel and increasing affordable housing options helps achieve various health, social equity and environmental protection goals.

Exhibit 28   **Benefits Provided by Various Policies**

Policy Solutions	Reduce Contagion	Public Health	Sustainability
Limit public gatherings and activities	✓		
Targeted cleaning and hygiene	✓	✓	
Improve public health and emergency services	✓	✓	
Walking and bicycling improvements	✓	✓	✓
Encourage public transport use		✓	✓
Reduce private auto travel		✓	✓
Reduce homelessness	✓	✓	✓
Affordable infill housing	✓	✓	✓
Traffic safety programs		✓	
Assist low-income households	✓	✓	✓

Policy solutions vary in their scope of benefits. Smart planning favors solutions that also help achieve multiple goals, such as pandemic control policies that support other public health and sustainability objectives.

Conclusions

A basic test of human intelligence is whether we learn from previous experiences and generalize those lessons to solve new problems. There is much to learn from the COVID-19 pandemic to better prepare for future pandemics and other health, social and economic threats.

Many people assume that cities are more dangerous than rural areas during a pandemic, but most infection risks are associated with specific activities – long-distance travel, worksites, stores and social gatherings – that are similar in cities, suburbs and rural areas. Although cities tend to have higher contagion risk, other factors have more effect on mortality rates, so dense cities with good public health programs have lower infectious disease fatality rates than rural areas with poor public health programs. Overall, urban residents tend to be healthier and live longer than in rural areas, as illustrated to the right.

If COVID-19 follows the pattern of previous pandemics, controlling it will require months of travel restrictions and isolation requirements. This creates various domestic, social and economic problems for households, businesses and communities. Resilience requires robust physical and social infrastructure that allows people to protect themselves and their neighbors, including trustworthy leadership, responsive community organizations, plus neighborhood design that facilitates social connections.

To improve resilience, communities need effective emergency response programs, contagion control, adequate housing for all residents, physical and mental support for isolated people, and affordability. Homes can be designed to reduce quarantine stress, with adequate space, light and ventilation, and located in walkable neighborhoods. Ground-floor access is safest, but risks can be minimized in multi-family housing with appropriate cleaning and sanitizing, plus resident and employee hygiene. Homelessness tends to increase contagion risks, so everybody is safer if it is eliminated. Intercity travel can introduce infections into a community, and local travel can disperse it. All shared vehicles can spread germs, including taxis, ridehailing, public transit, and private automobiles that carry family and friends. This suggests that to increase safety, residents should minimize shared vehicle travel, and shared vehicle operators and passengers should ensure appropriate distancing, sanitizing and hygiene practices. Walking and bicycling are generally the safest modes, are affordable and provide exercise, so improving their conditions tends to increase resilience, particularly expanding facilities to prevent pedestrian and bicyclist crowding.

Pandemics are just one of many risks communities face, and generally not the most important, so it would be inefficient to implement contagious disease control strategies that increase other problems, for example, by reducing physical activity which increases cardiovascular disease, or increasing vehicle travel and therefore traffic casualties and pollution emissions. Many "win-win" solutions can help reduce pandemic risks and achieve other community goals, such as increasing affordability and economic opportunity, and reducing traffic problems and pollution emissions.

Exhibit 29   **Analysis Scope**

Risks	Analysis Question
1. **Infectious diseases pandemics**	How do pandemics compare with other risks? What factors affect these risks, and how can they be reduced?
2. **Disaster risks**	How do disasters compare with other risks? How can communities minimize disaster deaths, injuries and damages?
3. **Health risks**	How do various health risk compare? What factors affect community health and longevity, and how can they be maximized?
4. **Economic, social and environmental risks**	How does health compare with other community goals? What trade-offs exist between these goals? What win-win strategies provide multiple benefits?

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Connect SoCal Update

Jason Greenspan

Sustainability Department

June 18, 2020

www.scag.ca.gov

SCAG
INNOVATING FOR A BETTER TOMORROW

Connect SoCal & COVID-19

SCAG

SCAG Regional Council adopted Connect SoCal for Federal conformity purposes. Our next steps:

- "(2) Allow for more time (*120 days*) to review Connect SoCal and consider its implications in light of the short and long-term impacts of the COVID-19 pandemic on the region as requested by many stakeholders;

- (4) provide a progress report describing modifications to the SCS and associated modeling and analysis within 60 days;

- (5) work with local authorities to identify and restore locally approved entitlements as conveyed by local jurisdictions…"

THE 2020-2045 REGIONAL TRANSPORTATION PLAN/
SUSTAINABLE COMMUNITIES STRATEGY OF THE
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

CONNECT
SoCal

SCAG

AS ADOPTED
ON MAY 7, 2020

Connect SoCal & COVID-19

During the 120-day period:

- Listen to varied stakeholders

- Develop research and data to assist informed decision making

- Make limited technical refinements to Connect SoCal regarding entitlements

- Refine planned implementation programs based on community input to address a "post-pandemic recovery world"

- Identify long-term considerations for future plan amendments & the 2024 plan update

Responding to the Pandemic

Connect SoCal & COVID-19

SCAG is listening to stakeholders and community based organizations:

- What are the immediate impacts of COVID-19 on your community's transportation and housing needs?

- How can SCAG and our partners better engage your communities during the pandemic recovery period?

- What are the long term considerations regarding COVID-19 and your communities?

Opportunities for Engagement

- **Regional Planning & Technical Working Groups** (May-July)
    - Safety
    - Active Transportation
    - Natural and Working Lands
    - Public Health
    - Climate Adaptation
    - Sustainable Communities
    - Environmental Justice
    - Technical Working Group
- **Community Based Organizations** (May-July)
- **Stakeholder Briefings** (Ongoing)
- **Regional Dialogue on Connect SoCal & COVID-19** (June 24)
- **Survey** (June)

Core Vision and Key Connections

CORE VISION

COMPLETE STREETS INVESTMENT

DEMAND & SYSTEM MANAGEMENT

GOODS MOVEMENT

SUSTAINABLE DEVELOPMENT

SYSTEM PRESERVATION & RESILIENCE

TRANSIT BACKBONE

KEY CONNECTIONS

SHARED MOBILITY & MOBILITY AS A SERVICE

SMART CITIES & JOB CENTERS

ACCELERATED ELECTRIFICATION

GO ZONES

HOUSING SUPPORTIVE INFRASTRUCTURE

Sustainable Communities Program

Sarah Dominguez
Sustainability Department
June 18, 2020

www.scag.ca.gov

What is the Sustainable Communities Program (SCP)?

- Technical Assistance Program
- Implements Connect SoCal, the Regional Transportation Plan/ Sustainable Communities Strategy (RTP/ SCS)
- Over 300 projects and $30 million in funding awarded
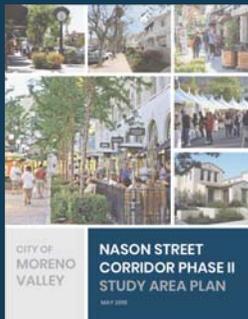
Upcoming SCP Funding Rounds

- Program Sources:
    Active Transportation Program (ATP), AB 101 and SB 1

1st Round: September 2020, Focus on active transportation

2nd Round: Fall 2020, Focus on partnerships and housing production

3rd Round: Spring 2021, *TBD*

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3rd Round Opportunity

- Help inform the 3rd round of the SCP call for proposals
- Input received during Connect SoCal development will be a starting point
- Guidelines development to be discussed at the fall SCWG meeting


10

SCAG Climate Adaptation Framework

Climate Adaptation Working Group – Meeting 5
Joint meeting with Public Health and Sustainable Communities

SCAG Sustainability Department, Cambridge Systematics, HereLA, and ESA

June 18, 2020

www.scag.ca.gov

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Project Background

SCAG

- ## SoCal Climate Adaptation Framework
  - Kicked off in February 2019
  - Funded by Caltrans Sustainable Planning Grant
  - Consultant team led by Cambridge Systematics, with ESA, Here LA, and Urban Economics
  - Focus on developing tools and resources for local jurisdictions
  - Outreach and communications strategies
  - Planning guidance and policy model language
  - Vulnerability mapping and assessment tools
  - Transportation and land use scenarios and modeling
    - Wildfire risk, sea level rise, extreme heat, and inland flooding
  - Finance and funding guidance
  - Project ideas, prioritization and tracking

Tools for Adaptation Planning
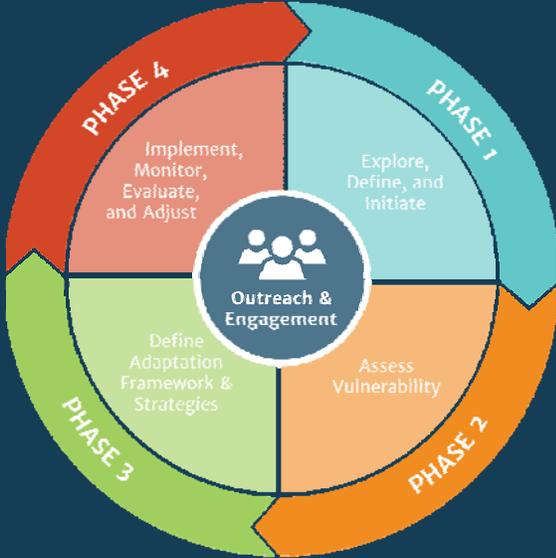
Public Engagement Tools (all phases)
- Templates
- Communication Strategies

Phase 1 Tools:
- Status of Vulnerability Assessments
- Decision Tree

Phase 2 Tools:
- Interactive Exposure Map

Phase 3 Tools:
- Adaptation strategies worksheet

Phase 4 Tools:
- Status of General Plans
- Model policies
- Project checklist
- Metrics to track progress
- Adaptation project tracking

Southern California Adaptation Planning Guide

- Aligned with phases and steps in the California Adaptation Planning Guide (Draft 2020)

- Highlights content from other key resource documents

- Incorporates examples from within the SCAG region

- Identifies tools and resources for each phase and step

26

SoCal Adaptation Planning Guide
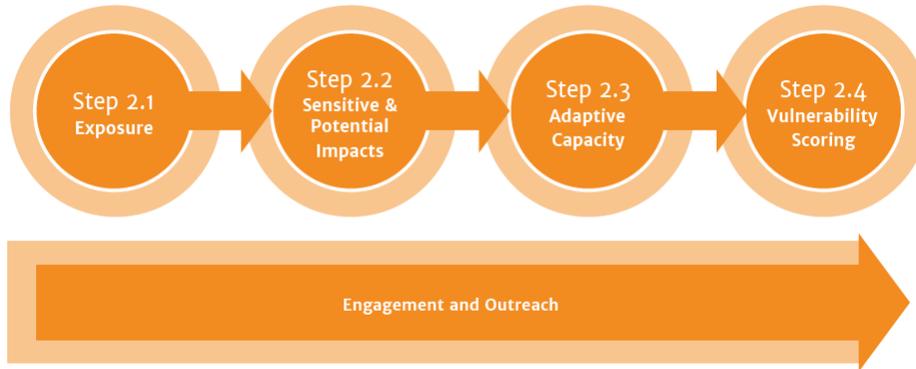
Figure 2.1 – Steps in Phase 2

SoCal Adaptation Planning Guide

Summarize Climate Change Impacts Specific to SCAG Region

- Extreme Heat
- Sea Level Rise/Coastal Flooding and Erosion
- Severe Storms/Wind
- Inland Flooding
- Drought
- Wildfire
- Air Quality and Vector Borne Diseases
- Landslides
- Pests and Ecological Hazards
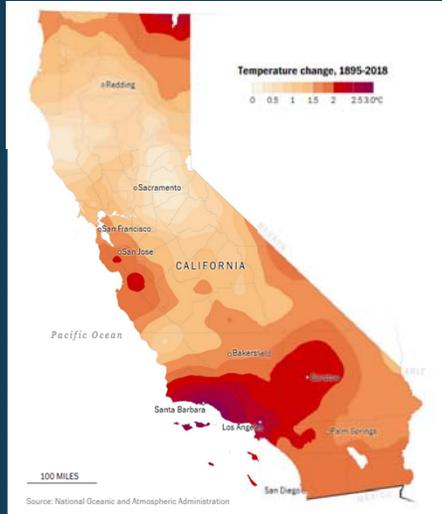
SoCal Adaptation Planning Guide

Guides and tools related to health are referenced, including:
- California Building Resilience Against Climate Effects (CalBRACE)
- California Heat Assessment Tool (CHAT)
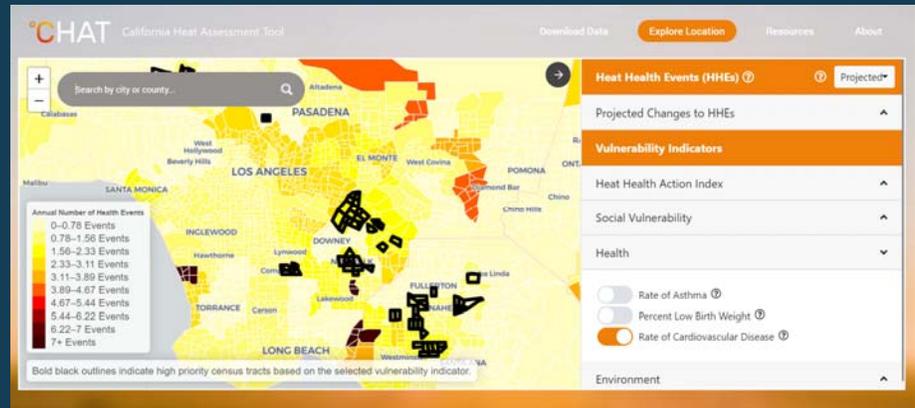
Extreme Heat Scenario Development and Modeling

- Data from CHAT tool: Annual Days of Heat Health Events
  - More complex than temperature forecast data
  - Heat Health Events defined as heat waves which cause spikes in mortality and hospital visits
  - Sensitive to ratios of elderly and vulnerable populations, hospital beds, cooling centers, tree cover, etc.
- "Business as usual" relocation scenario starts relocating demographics once 30 days per year of heat health events reached at 1% per day
  - E.g., 35 days per year = 5% relocated; 50 days = 20% relocated, 70 days = 40% relocated
- "Mitigation" scenario reduces relocation through increased tree cover, cooling centers, hospital beds, etc.

Extreme Heat 2030 – "Business as Usual" Scenario

Extreme Heat Scenario 2030
Relocation Summary (each dot = 50 people)

- Remove_POP_EH_50
- Add_POP_EH_50
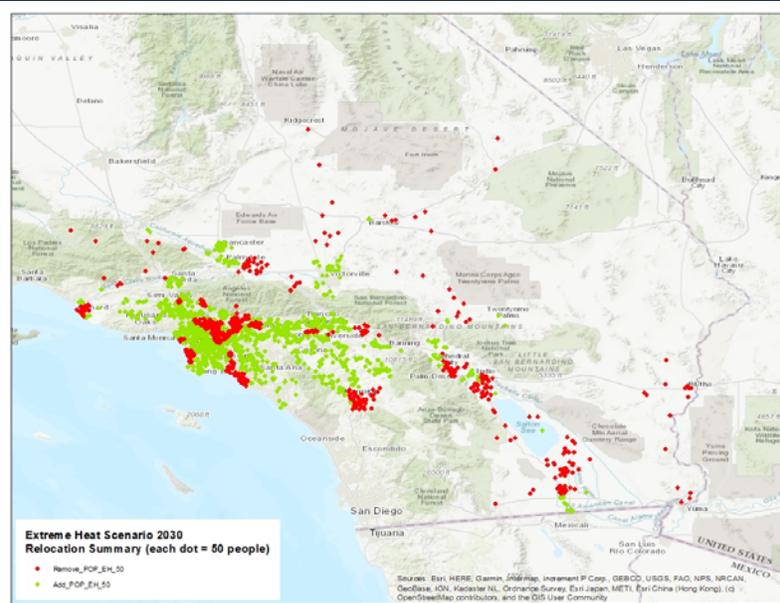
Extreme Heat Health Events 2030 "Business as Usual" Scenario

Code	County	Base				Extreme Heat				Numeric Difference				Difference			
		Trips	VMT	VHT	VHD	Trips	VMT	VHT	VHD	Trips	VMT	VHT	VHD	Trips	VMT	VHT	VHD
1	Imperial	524,487	6,755,364	120,182	3,519	464,631	6,225,064	110,087	2,874	(59,856)	(530,300)	(10,095)	(645)	-11%	-8%	-8.40%	-18.34%
2	Los Angeles	22,544,031	234,673,126	7,195,893	2,251,895	22,416,901	233,736,930	7,212,870	2,287,800	(127,130)	(936,196)	16,978	35,905	-1%	0%	0.24%	1.59%
3	Orange	8,097,287	79,600,042	2,091,159	549,667	8,074,927	79,553,716	2,099,833	559,164	(22,360)	(46,327)	8,673	9,497	0%	0%	0.41%	1.73%
4	Riverside	6,293,669	77,764,585	1,994,026	575,835	6,347,084	78,077,313	2,078,758	652,601	53,416	312,727	84,732	76,766	1%	0%	4.25%	13.33%
5	San Bernardino	5,560,880	75,639,862	1,572,418	210,823	5,676,502	76,634,464	1,616,612	234,797	115,622	994,602	44,194	23,973	2%	1%	2.81%	11.37%
6	Ventura	2,180,683	19,718,820	465,617	88,599	2,166,273	19,541,435	463,005	89,838	(14,409)	(177,385)	(2,612)	1,239	-1%	-1%	-0.56%	1.40%
	Total	45,201,037	494,151,800	13,439,295	3,680,338	45,146,319	493,768,921	13,581,166	3,827,073	(54,718)	(382,878)	141,871	146,735	-0.12%	-0.08%	1.06%	3.99%

Extreme Heat

Red = decrease
Green = Increase

Extreme Heat
Zoom-in

Red = decrease
Green = Increase

Extreme Heat
Zoom-in

Red = decrease
Green = Increase
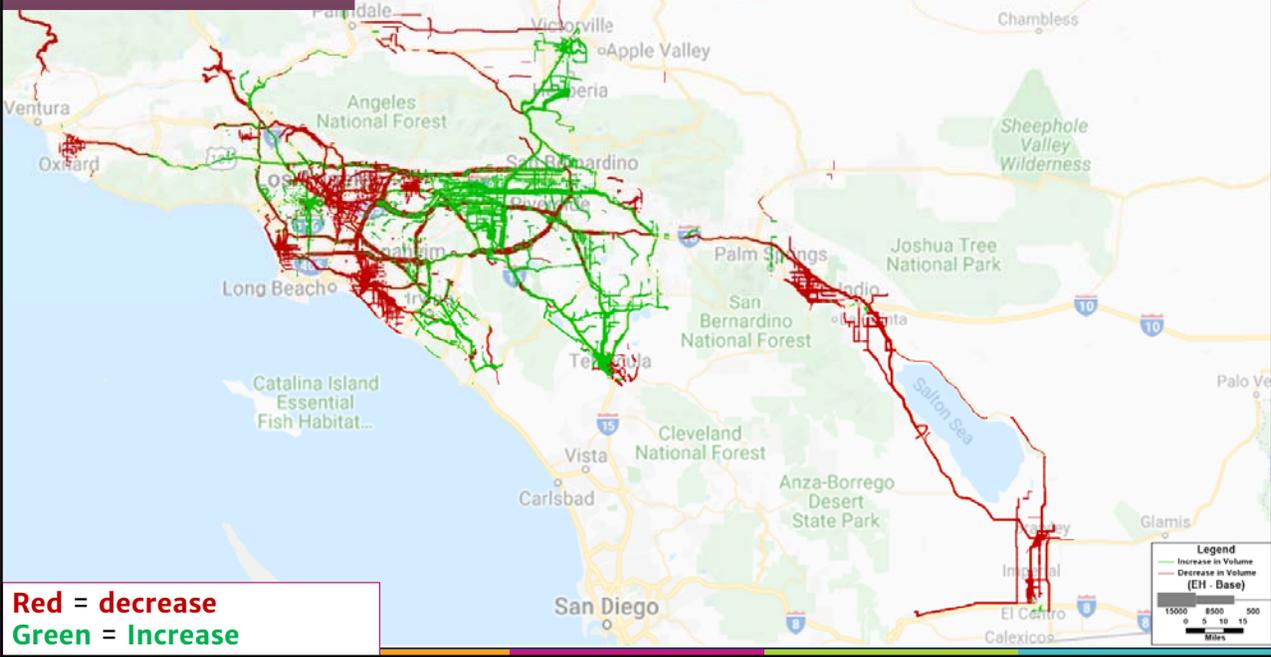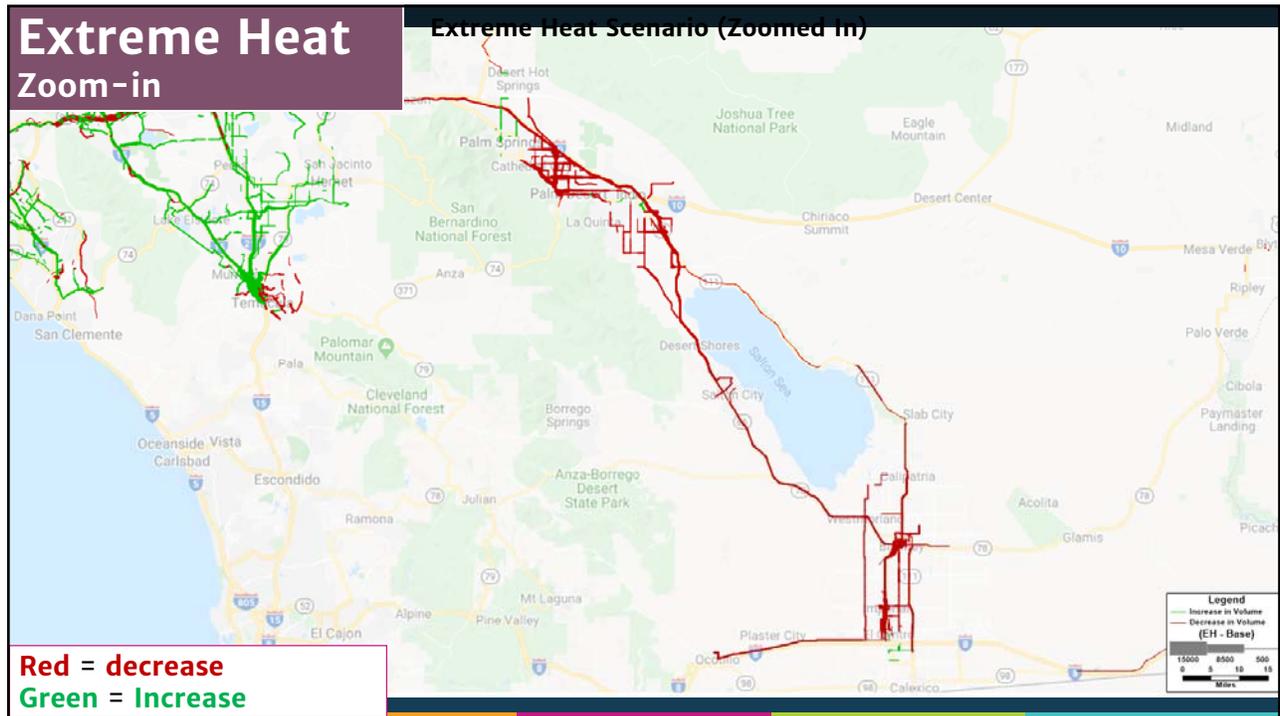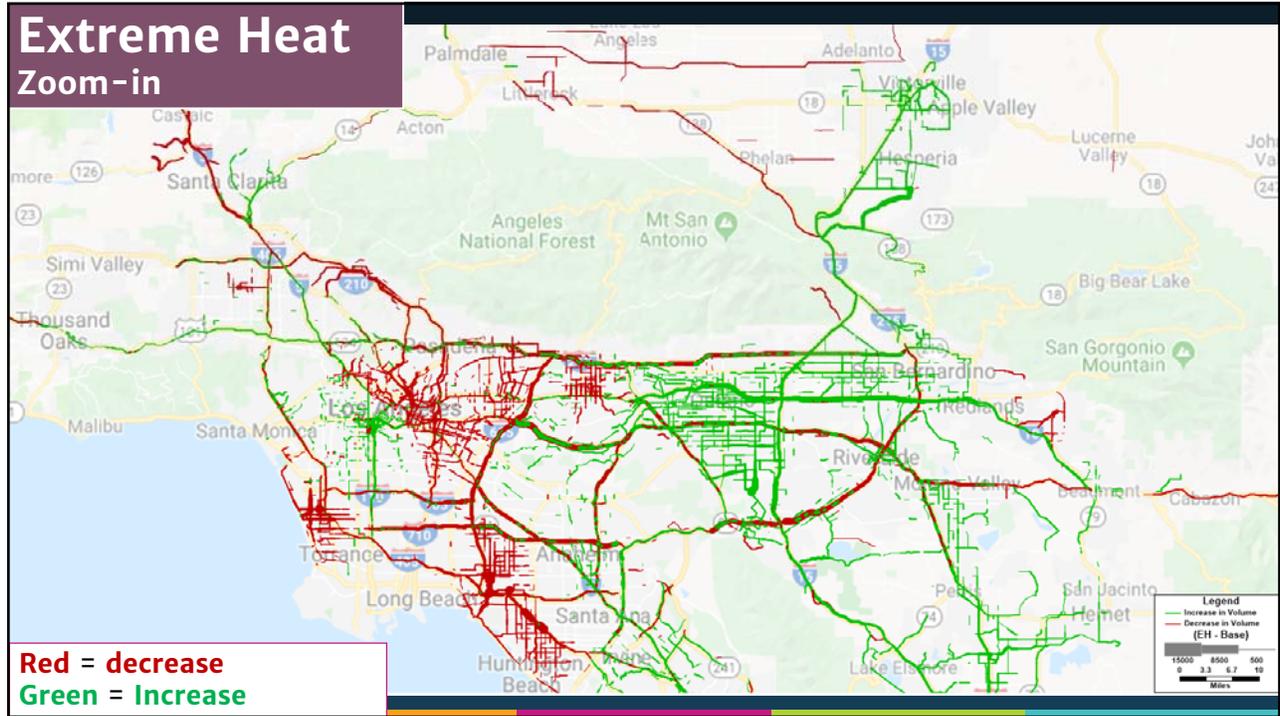
SoCal Adaptation Planning Guide

Equity considerations integrated throughout the phases and steps:

- Engagement
- Goal setting
- Vulnerability assessment
- Developing adaptation strategies
- Guides and tools

Figure 8: An Example of Community Adaptation Solutions and Transformative Actions
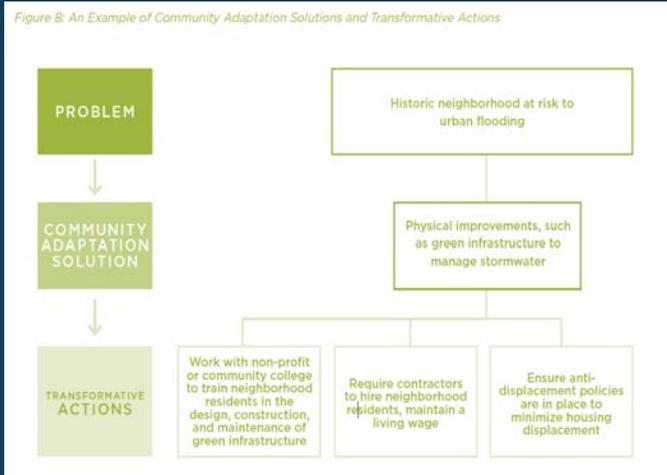
Southern California Adaptation Planning Guide

Climate event emergency resilience during pandemics:

- Mutual Aid Medford and Somerville network in Massachusetts (example)
  - Neighborhoods mapped into pods
  - Each pod has a leader
  - Virtual platform to post resources or requests during stay-at-home order
  - Approaches to reach neighbors with limited internet access
  - Resilience hubs can serve as an adaptation strategy to provide support before, during and after emergency events
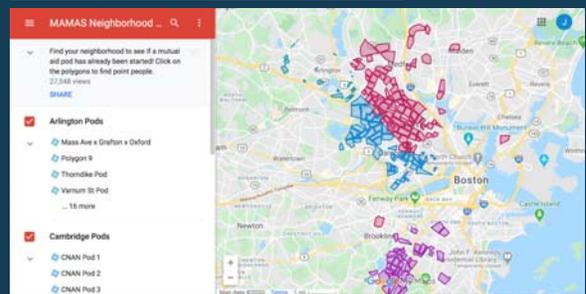
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Outreach Overview

What is the Climate Talks Box?

An immersive pop-up experience, crafted with sustainable materials, educating the public about climate change and climate adaptation strategies.

Goal

Test four different messaging strategies about climate change to understand what resonates with people who live in the SCAG region.

Messaging Strategies

1. How climate change causes personal, monetary & health-related harm
2. How trusted leaders are speaking about climate change
3. How climate change is affecting California's natural resources
4. How climate change will affect the region surrounding the pop-up

6

Messaging Strategy #1

Visual showing Panel #1

Messaging Strategy #2

Visual showing Panel #2

Messaging Strategy #3
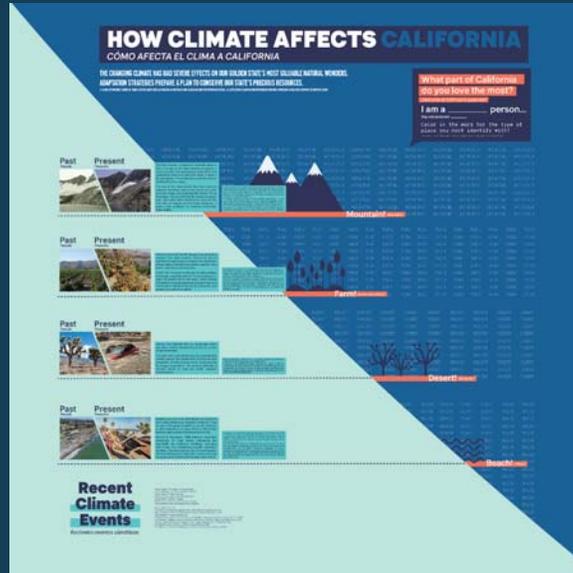
Visual showing Panel #3

Messaging Strategy #4

Visual showing Panel #4

Events

Redondo Beach Pier Summer
Concert Series, 08/24

Taste of Baldwin Park, 08/29

Climate Resolve Keep LA Cool Day @
Hansen Dam, 09/07

Open Arts & Music Festival, 09/15

Urban Hive Market Long Beach, 09/28

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Outreach Workshop Templates

WHAT IS INCLUDED IN THE WORKSHOP TEMPLATE

This workshop template includes three customizable components:

1. A presentation slide deck tailored to SCAG jurisdictions who would like to engage constituents in a conversation about climate adaptation and/or mitigation.
2. Materials for an interactive activity, in both group and individual formats.
3. Corresponding meeting announcements and invites that you can change for your event

All template components provide you with a flexible base. Add to and change them as you see fit.

HOW TO USE THIS TEMPLATE

1. Read through this Guide to help orient yourself to the materials included, messaging strategies, and best practices as you craft your communications approach.
2. Open up the presentation slide deck in either InDesign or PowerPoint and start to move things around, add your content, and customize the presentation as you see fit.
3. Modify the template invitations/notices and send them to your constituents to announce your upcoming workshop.
4. Print out the final materials or project them digitally at your workshop to start the conversation!

Communication Strategies

1) Make it personal
Use a personal "risk-based" messaging strategy that identifies the monetary costs and health impacts of climate change for your constituency.

- This strategy ranked as the most effective during SCAG's community outreach.
- Use facts that can apply to an individual's or family's life and phrase the risk so that the effects are tangible. A utility bill increasing by hundreds of dollars is an experience that is easy to grasp; it is much more difficult to grasp a change in millions of dollars to a government's budget.
- *As an example, we have included four such facts in the "How the Climate Affects You" section of the slide deck.*

2) Localize and concretize
Use a before and after visualization of a familiar and beloved resource.

- In this strategy, you can direct your audience's feelings of attachment towards a place, into collective support. Use a visual (photographs, videos, renderings) to show the before and after effects of our changing climate. This allows attendees to see the effects for themselves.
- A good subject is nearby nature that has been affected by extreme weather events.
- As an additional note, the literature shows that conservative audiences respond more favorably to changes that are framed as the "past & present," whereas liberal audiences preferred a "present & future" framing.
- *See the examples in the "How the Climate Affects California" section of the slide deck.*

3) Map the risk
Use a chronological map to show the proximity of risk and change over time.

- This strategy uses mapping visualization to help participants understand the future effects of climate change.
- It is important to keep in mind that map-reading is a special skill. Aid participant understanding by ensuring your visualizations are focused on your immediate locality, and that familiar landmarks are called out .
- Connecting the familiar (local places) to the hard-to-grasp (future climate effects) builds a kind of support grounded in personal affection.
- *See the examples in the "How Climate Changes at Home" section of the slide deck.*

**4) Bring in a trusted advisor:**
Use the words and stature of someone your community already trusts.

- This strategy requires the identification of a leader or authority figure with whom your community has a rapport and finding a values-based message that will resonate with them.
- This can occur as quotes, a video message, or an in-person appearance. The literature says this strategy can work especially well with older, and more conservative constituencies.
- However, appropriate advisor selection can align this strategy with a wide range of ideologies. Notably, this strategy was reported as slightly less impactful than the other strategies explained here.
- *See the examples in the "How the Climate Affects Us" section of the slide deck.*

Tools for Adaptation Planning
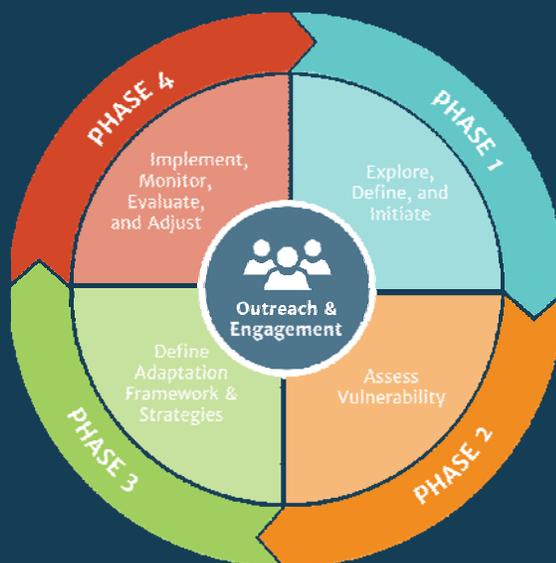
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Gap Analysis of Existing Vulnerability Assessments

SCAG

Hazards Assessed:

Drought		Sea Level Rise/Coastal Flooding
Heat		Vector Borne Illness
Inland Flooding		Wildfire
Landslide		Wind

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Gap Analysis of Existing Vulnerability Assessments

SCAG

Vulnerability Assessment Snapshots by County

Key Documents Reviewed	Drought	Heat	Inland Flooding	Landslide	Sea Level Rise/ Coastal Flood	Wildfire	Wind	Vector Borne Illness
Imperial County								
Seismic and Public Safety Element of General Plan			●			●		
Imperial County Climate Change and Health Profile Report	○	○			○	○		○
Imperial County Multi-Jurisdiction Hazard Mitigation Plan			●	○		●		
Los Angeles County								
Local All-Hazard Mitigation Plan	●		●	●		●		
Our County: Los Angeles Countywide Sustainability Plan	○	○	○		○	○		○
Los Angeles County Climate Change and Health Profile Report	○	○			○	○		○
The LA Metro Climate Action and Adaptation Plan		●	●	●	●	●		
AdaptLA						●		
Public Beach Facilities Sea-Level Rise Assessment					●			
Orange County								
Regional Water and Wastewater Hazard Mitigation Plan	●							
Local Hazard Mitigation Plan	●	●	●	●	●	●		
Orange County Climate Change and Health Profile Report	○	○			○	○		○
General Plan Safety Element			○		○	○		
Riverside County								
Local Hazard Mitigation Plan	●	●	●	●		●		
Riverside County Climate Change and Health Profile Report	○	○				○		○
General Plan Safety Element			●			●		
San Bernardino County								
Local Hazard Mitigation Plan	●	●	●			●		
San Bernardino County Climate Change and Health Profile Report	○	○				○		○
Ventura County								
Ventura County Resilient Coastal Adaptation Project Sea Level Rise Vulnerability Assessment					●			
Ventura County Climate Change and Health Profile Report	○	○			○	○		○
Ventura County Multi-Hazard Mitigation Plan	●		●	●		●		

ESA identified whether hazards and vulnerabilities were mapped, and if they were geospatially overlaid. The level of hazard mapping was assessed as follows:
○ Low = high level, specific assets not mapped   ● Medium = identified hazards and assets   ● High = assets mapped in relation to hazards

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Gap Analysis of Existing Vulnerability Assessments

Asset Categories Assessed:

Natural and Managed Resources

Land Use and Community Development

Infrastructure

Public Health, Socioeconomics and Equity

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Natural and Managed Resources

Assets Examined in County Vulnerability Assessments	County					
	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
Natural and Managed Resources						
Agriculture	■			■		■
Biodiversity and Habitat		■		■	■	■
Forest and Rangeland		■	■			■
Oceans and Coastal Resources	na	■		na	na	■
Surface Water (lakes, streams)	■					

na = not applicable

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Land Use and Community Development

Assets Examined in County Vulnerability Assessments	County					
	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
Land Use and Community Development						
Commercial	■	■	■	■	■	■
Industrial	■	■		■	■	
Residential		■	■	■	■	■
Hospitals and Emergency Services	■	■	■	■	■	■
Public Housing	■	■				
Public Assets and Institutions	■	■	■	■	■	■
Private Institutions				■	■	
Military Institutions	■	■	■		■	■
Parks and Recreation; Urban Forests	■	■				■
Historic and Cultural Assets	■	■	■			■

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Infrastructure

Assets Examined in County Vulnerability Assessments	County					
	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
Infrastructure						
Roads and Highways	■	■	■	■	■	■
Public Transit - bus and light rail		■		■	■	■
Heavy Rail						
Ports and Marinas	■	■	■	na	na	■
Airports	■	■		■	■	■
Communication		■		■	■	■
Energy	■	■		■	■	■
Stormwater Management	■	■	■	■	■	■
Flood and Erosion Management		■	■			■
Water Supply	■	■	■	■	■	■
Wastewater Treatment	■	■	■	■	■	■
Solid and Hazardous Waste Management	■	■		■		■

na = not applicable

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Public Health, Socioeconomics, & Equity

Assets Examined in County Vulnerability Assessments	County					
	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura
Public Health, Socioeconomics and Equity						
Public Health	■	■	■	■	■	■
Disadvantaged Groups		■				■
Tribal and indigenous Communities						
Food Security (covered in health profile reports)	■	■	■	■	■	■

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Tools for Adaptation Planning

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Decision Tree Tool

SCAG

AGENCY INFO				
Select the County you represent	San_Bernardino			
Select City you represent	Needles			
Total	**Population**	**Employment**	**Households**	**Housing Units**
County	2,258,662	828,692	700,095	2,587,070
City	7,828	3,264	3,151	10,959
Wildfire	**Population**	**Employment**	**Households**	**Housing Units**
County	494,946	176,782	155,171	573,404
City	1	0	0	1
Sea Level Rise	**Population**	**Employment**	**Households**	**Housing Units**
County	-	-	-	-
City	-	-	-	-
Flood	**Population**	**Employment**	**Households**	**Housing Units**
County	68,514	24,007	21,336	78,842
City	708	295	285	991
Extreme Heat	**Population**	**Employment**	**Households**	**Housing Units**
County	88,885	20,662	33,587	124,116
City	7,828	3,264	3,151	10,959

PROJECT INFO	
Questions	**Project**
Which hazard category do you want to look for projects in?	Extreme_Heat
If selected "Other", please mention hazard name	
Asset protected in said project	Vulnerable_Populations
If selected "Other", please mention protected asset name you are interested in	
Desired strategy	Improve access to air conditioning and cooling centers by vulnerable populations
If selected "Other", please mention your desired strategem	
Action item interested in	Encourage partnerships between local emergency responders and local health departments to identify and reach vulnerable populations in need of access to cooling centers or personal cooling resources
If selected "Other", please mention your desired action item	

Tools for Adaptation Planning

SCAG

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Interactive Mapping Tools

- Under development using ArcGIS Online and StoryMaps tools
- One-stop shop for exploring all risk hazard layers
- Includes demographics (pop, HHs, emp) as dot density layers
  - Able to search and query overlays in your jurisdiction by risk layer
    - Wildfire Risk, Sea Level Rise, Inland Flooding, Extreme Heat Health Events
  - Select by jurisdiction or by spatial area user-determined
  - Summarize vulnerability data to input to other tools

Tools for Adaptation Planning
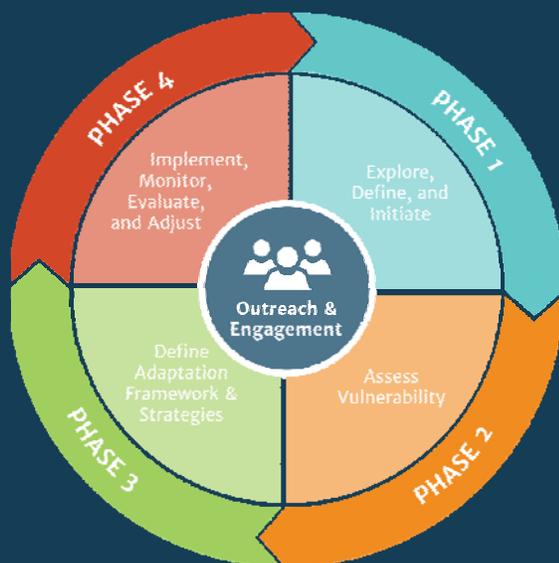
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Adaptation Actions

- Excel Spreadsheet
- Over 275 actions
- Filter by climate change hazard type (e.g., extreme heat, air quality)
- Filter by asset type (e.g., vulnerable populations, public health)
- Strategies and actions can be incorporated into Climate Adaptation Plans or as implementation programs for the General Plan

Adaptation Actions

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Status of General Plans

- Identified cities and counties that have draft or adopted policies on climate adaptation
  - 84 cities and 4 counties acknowledge climate change
- Provides SCAG with a baseline to track progress
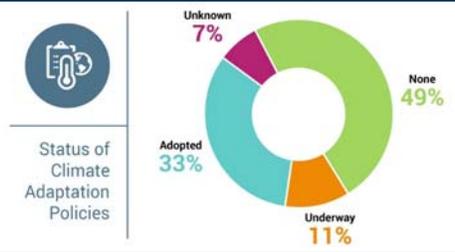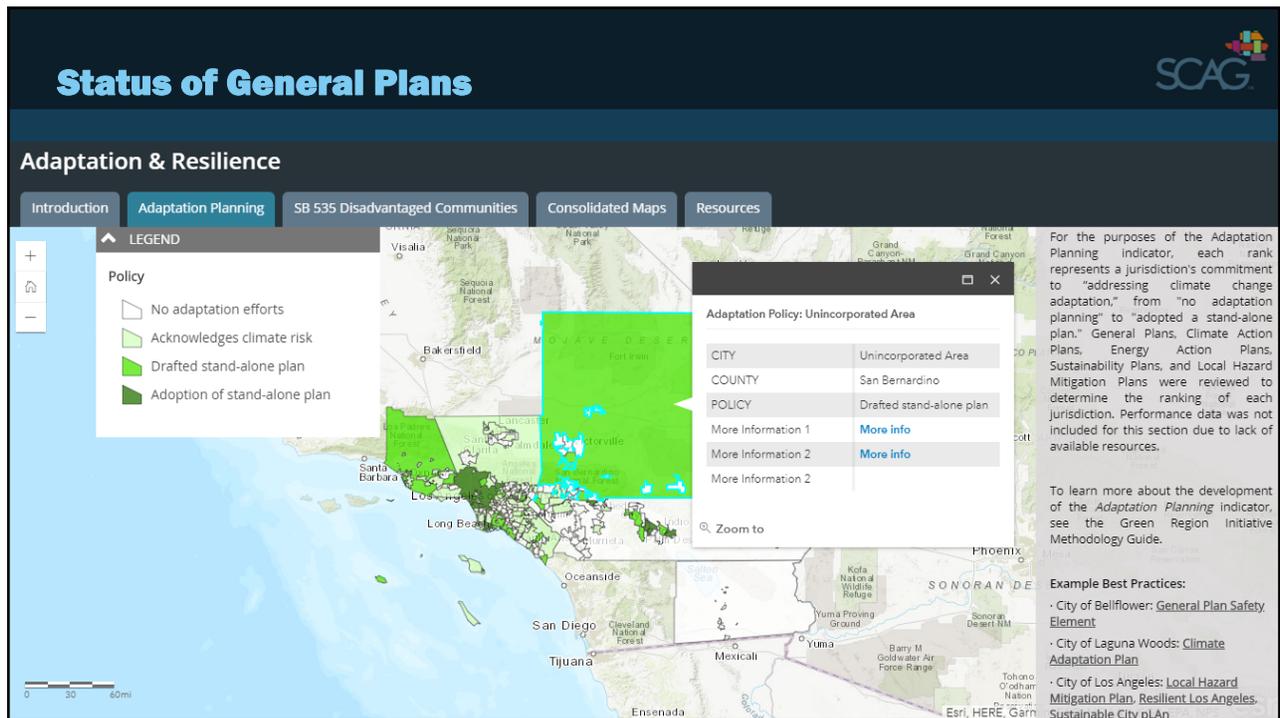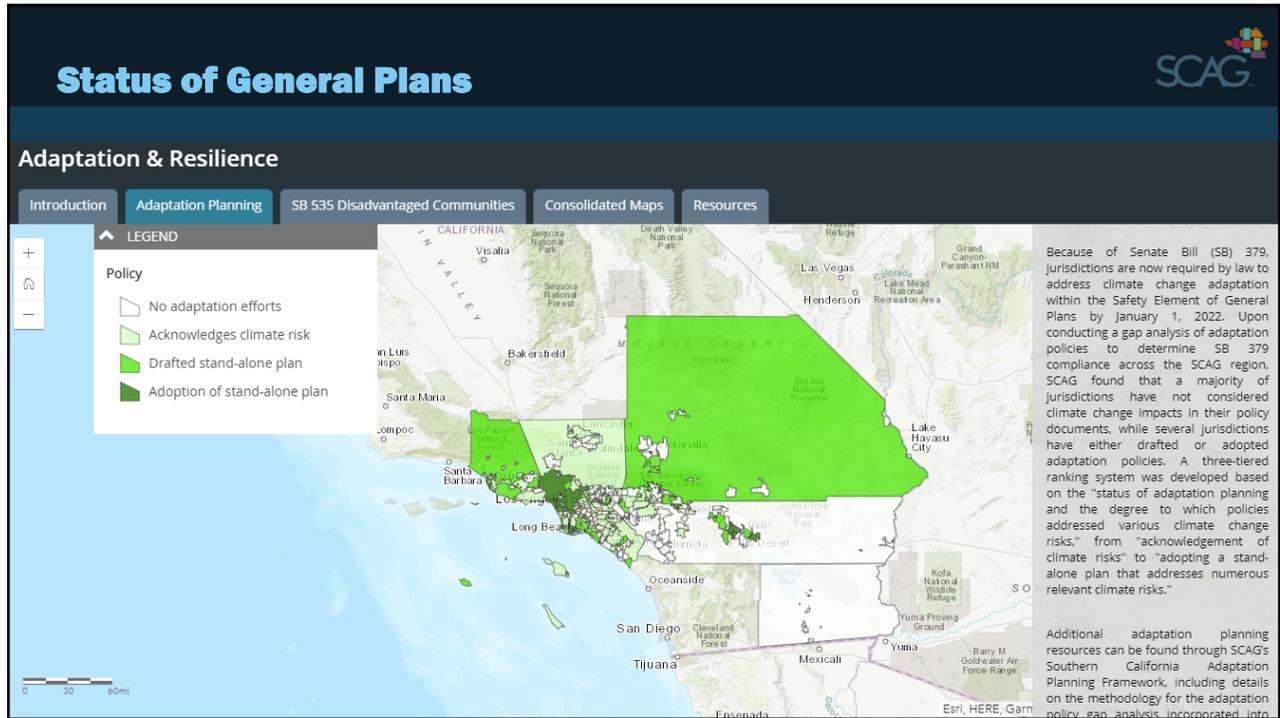
Status of General Plans

Cities and Counties that specifically address public health considerations:
- Total cities/counties with adopted or draft policies or strategies: 30
- Cities that address public health related aspects of climate change:
  - Extreme Heat: 5 cities
  - Vector borne disease: 1 city
  - Air quality: 4 cities
  - Public health collaboration: 6 cities
  - Equity and environmental justice: 4 cities

Tools for Adaptation Planning
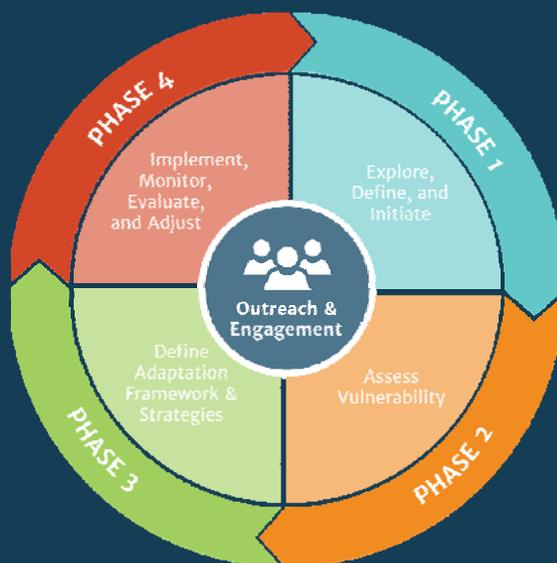
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Model Policies for Local Coastal Programs and General Plans

Model policies organized by general plan element and climate hazard type

- Elements:
  - Environmental Justice
  - Circulation
  - Land Use
  - Safety
- Hazards:
  - Multiple hazards
  - Extreme heat
  - Air quality and human health
  - And other climate-related hazards

LAND USE ELEMENT

Extreme Heat

- **Shade for Livestock.** Amend local zoning ordinances to allow ancillary shade structures for vulnerable livestock populations. (Agriculture)
- **Green or White Roofs.** Require green or white roofs, depending upon sub-regional locations and water requirements, to reduce solar gain and heat island effects. (Buildings and Facilities)
- **Landscaping to Reduce Heat.** Develop landscaping standards and guidelines to encourage or require native-cultivar drought tolerant landscaping with enough coverage to provide shade and reduce heat absorption. (Public Health, Socioeconomics, and Equity)
- **Building Design Features.** Modify the community's zoning ordinance and/or design guidelines to allow and encourage awnings, canopies, arcades and/or colonnades that can encroach into the public sidewalk area to create shade for pedestrians. (Transportation)

Tools for Adaptation Planning
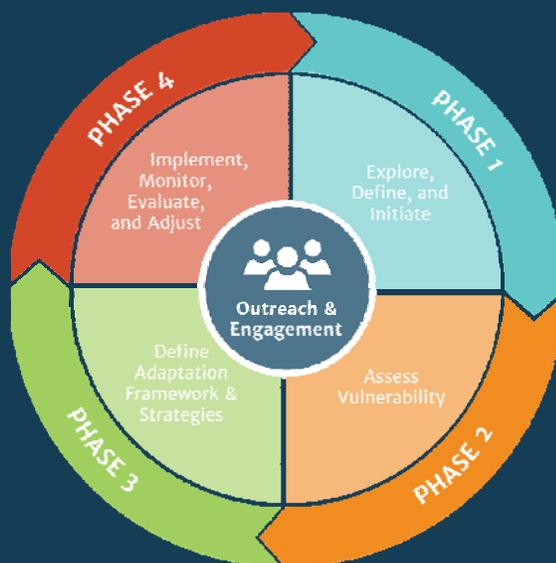
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Project Checklists

SCAG

TABLE 1
PROJECT SCREENING THRESHOLDS FOR CLIMATE HAZARDS (FOR PROJECT PROPONENT TO COMPLETE)

Template for incorporating climate change adaptation elements into local project approval process:
- Residential and commercial development
- Infrastructure projects

Two-step process:
1. Suggested screening thresholds for 6 hazards
2. Detailed checklist for each hazard

Project Checklists

SCAG

Extreme Heat Checklist

For each hazard of potential concern:
  a. Assess project's <u>vulnerability</u> based on exposure and sensitivity
  b. Assess potential <u>consequences</u> based on:
      I. Estimated level of asset damage
      II. Level of disruption of asset service or function
      III. Cost to replace and/or repair and cost of losing the service/function of the asset

Project Checklists

c. Assess project's <u>adaptive capacity</u>, based on the adaptation measures incorporated into its design
    i. Suggested measures: customize to local needs
    ii. Utilize the Strategy Matrix

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Project Tracking Tool

				AGENCY INFO		
Select the County you represent	San_Bernardino			Population	Employment	Households
Do you represent a County Agency, a City Agency or Other Agency?	City		County	2,258,662	828,692	700,095
If selected Other Agency, please select Agency Name from the list			City	7,828	3,264	3,151
If selected "Other", please mention the name of the agency you represent						
Select City you represent	Needles					

				PROJECT INFO		
Metrics	**Project 1**	**Project 2**	**Project 3**	**Project 4**	**Project 5**	**Project 6**
Climate Change Hazard combating through existing, planned or proposed projects (can mention as many as you know)	Extreme_Heat	Inland_Flood	Wildfire	Extreme_Heat	Severe_Storms_Or_Wind	
Affected Population	7,828	708	1	7,828	*Unknown*	*Unknown*
Affected Employment	3,264	295	0	3,264	*Unknown*	*Unknown*
Affected Households	3,151	285	0	3,151	*Unknown*	*Unknown*
If selected "Other", please mention hazard name						
Asset protected in said project	Public Transit	Multiple Assets	Public Health	Vulnerable Pop	Buildings and Facilities	
If selected "Other", please mention protected asset name						
Scale of project (SED protected) by this effort (in % ??)	0.05	0.35	0.9	0.2		
Protected Population	391	248	1	1,566	Unknown	Unknown
Protected Employment	163	103	0	653	Unknown	Unknown
Protected Households	158	100	0	630	Unknown	Unknown
Additional Description						
Stage of the project	Construction	Proposed	Planning	Engineering/De	No Action	
Timeline						
Cost						
Funding	Partially funded	Unfunded	Partially funded	Fully funded	Unfunded	
Contact Info for PM						

Climate Change and Adaptation Metrics

Two New Resources

1) Metrics for Local Jurisdictions

2) Metrics for Metropolitan Planning Organizations

Types of Metrics
- Climate Change Indicators *(e.g., mean monthly temperature)*
- Vulnerability Metrics
  - Exposure *(e.g., # of tribal community population in area of identified risk)*
  - Sensitivity *(e.g., % of population that is 65 years or older)*
  - Adaptive Capacity *(e.g., # of acute care hospital beds per 1,000 residents)*
- Climate Adaptation Metrics
  - Process-based metrics *(e.g., # of adaptation projects added to capital improvement plans)*
  - Outcome-based metrics *(e.g., % increase in tree canopy)*

Metrics to Track Adaptation Progress

Goal 1: Resilient Communities. All people and communities respond to changing average conditions, shocks, and stresses resulting from climate change in a manner that minimizes risks to public health, safety, and economic disruption and maximizes equity and protection of the most vulnerable.	
Address underlying health inequities for all residents, including those related to hazards such as localized air pollution, extreme heat, and flooding; access to basic health services; and access to affordable and nutritious foods.	• # of grocery stores with fresh produce per 1000 residents • % reduction in food desert area
Deepen and focus engagement with disproportionally vulnerable communities.	• % of people aware of potential risks (based on targeted surveys)

- Measure your progress towards your climate adaptation goals and objectives
- Quantifiable
- Resource: Menu of metrics to choose from

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