

# Climate Change and Health: Opportunities for Action

## A Framework for Discussion

Linda Rudolph, MD, MPH  
CCLHO Semi-Annual Business Meeting  
April 16, 2014



Center for  
**Climate Change & Health**





**“Climate change is the biggest global health threat of the 21<sup>st</sup> century... The impacts will be felt all around the world – and not just in some distant future but in our lifetimes and those of our children.”**

## **The Lancet**



USDA, Wikimedia Commons



NOAA, Wikimedia Commons



Suat Ernani, freedigitalphoto.net

# So why aren't we doing more?

- Maybe we need a framework???

# Frameworks can help to:

- Organize our thinking
- Show key factors and variables
- Demonstrate how different things are related
- Visualize complex relationships
- Provide a shared understanding of an issue
- Identify opportunities for action
- Motivate & enable action

# We wanted a framework that explicitly

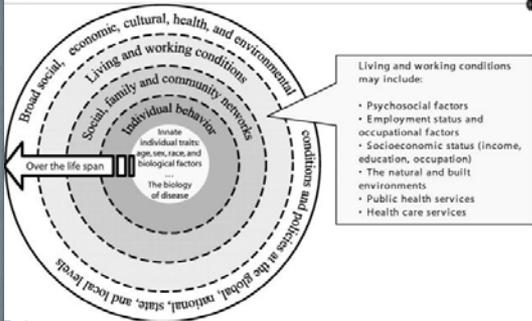
- Links to current public health thinking and practice
- Shows upstream determinants of health
- Shows causes of climate change
- Addresses health inequities and the climate gap
- Helps identify opportunities for action & intervention across spectrum, programs, expertise, interests

# How we developed a framework

- Focus groups and interviews with 135 people
  - PH engaged in climate change work
  - PH not currently engaged
  - Non-PH engaged in climate change work
- Review existing frameworks
- Review literature
  - Social determinants of health
  - Climate change and health
  - Climate action strategies
- Review and feedback

# Why aren't we doing more?

- Competing priorities
  - Climate doesn't seem as urgent as many other things
- No funding, no resources
- No mandate
- Lack capacity
  - Funding and resources
  - Knowledge and expertise
- Lack leadership
- Unclear exactly how this relates to what we do now
- Unclear what exactly we can do



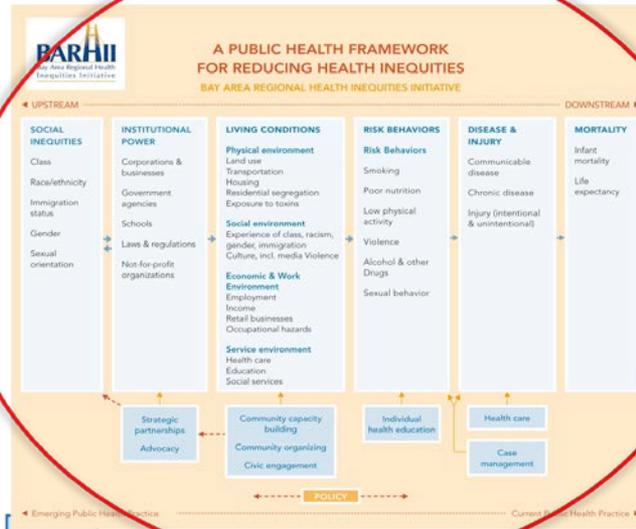
Source: Institute of Medicine, USA



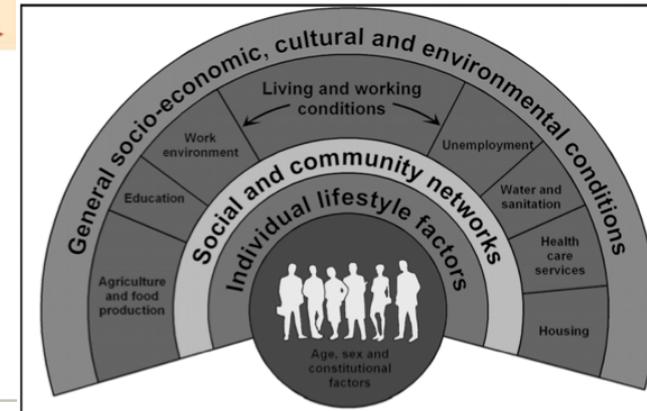
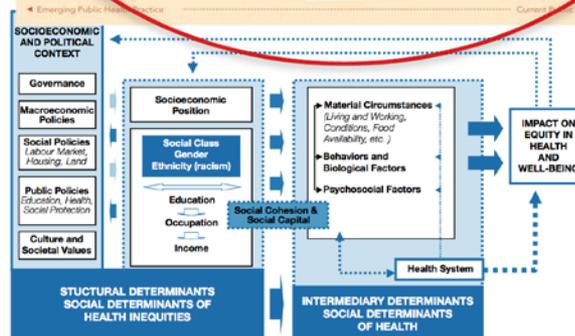
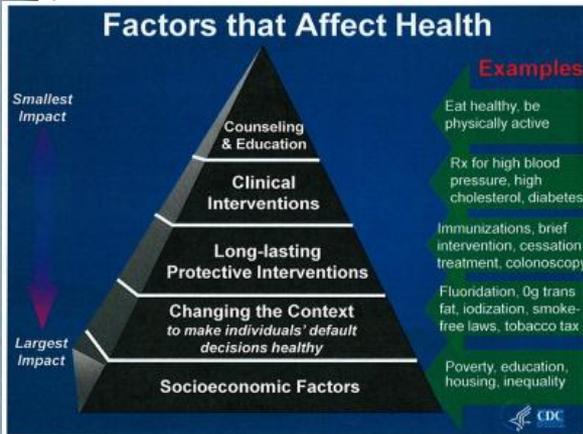
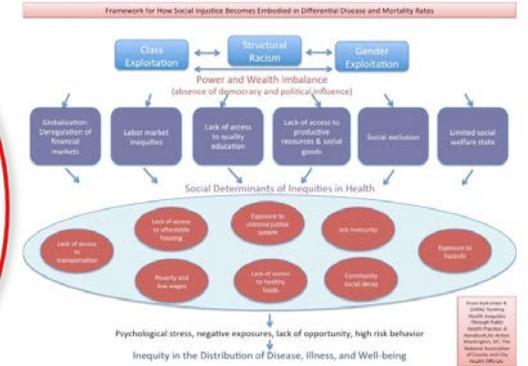
## Spectrum of Prevention



L. Cohen, Contra Costa County Health Services

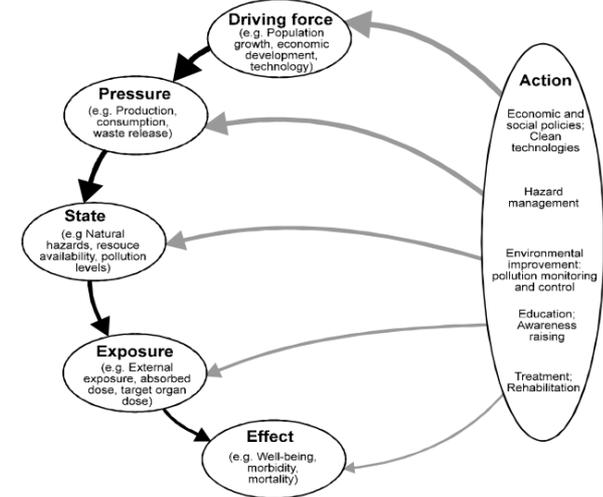
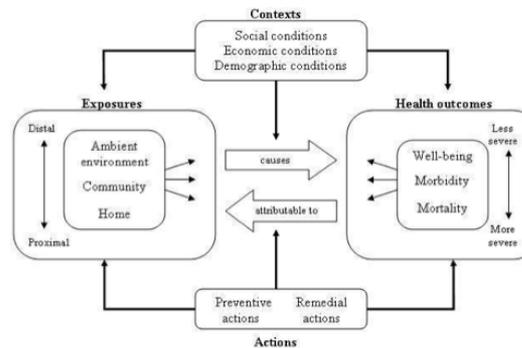
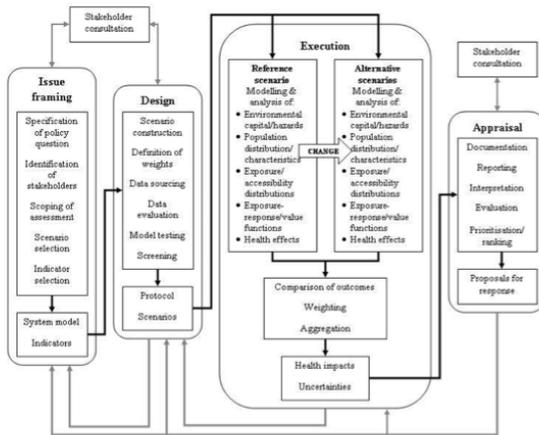
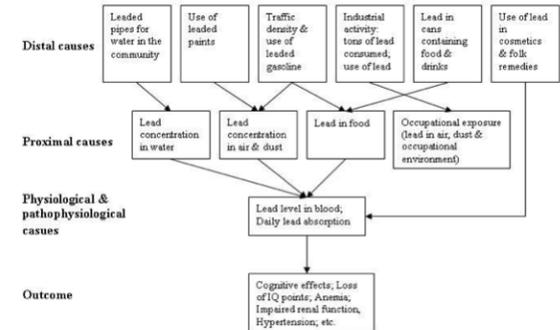
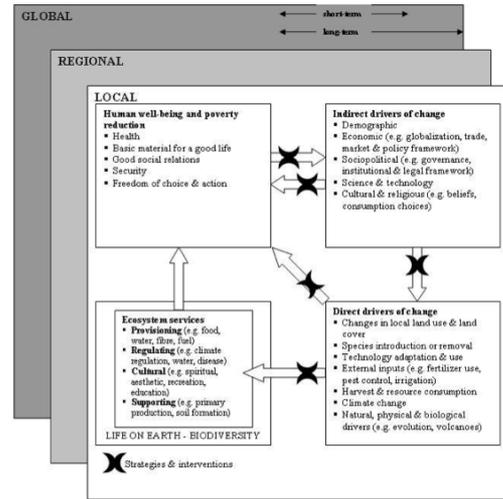
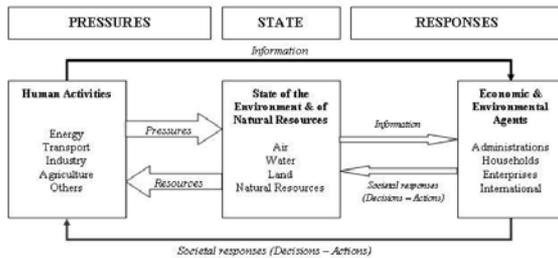


Appendix C: Hofrichter's Framework for How Social Injustice Becomes Embodied in Differential Disease and Mortality Rates<sup>20</sup>

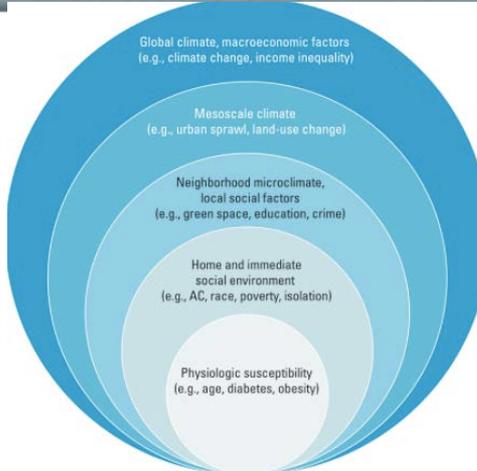


Source: Dahlgren and Whitehead, 1991

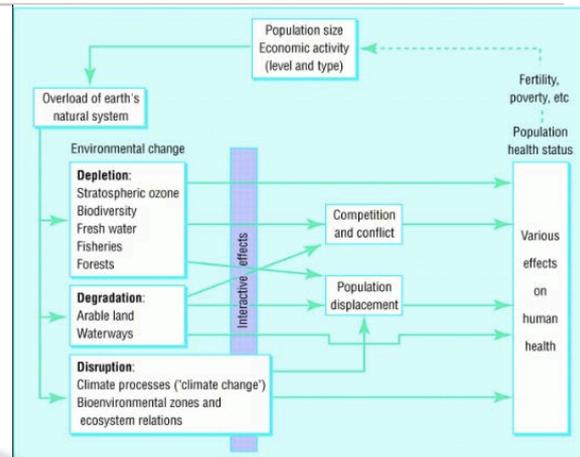
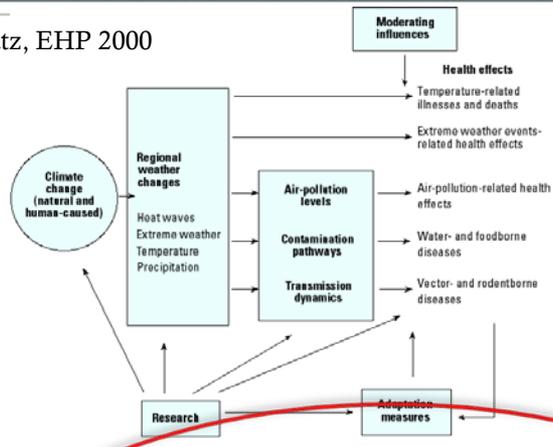
[http://www.who.int/social\\_determinants/corner/SDHDP2.pdf](http://www.who.int/social_determinants/corner/SDHDP2.pdf)



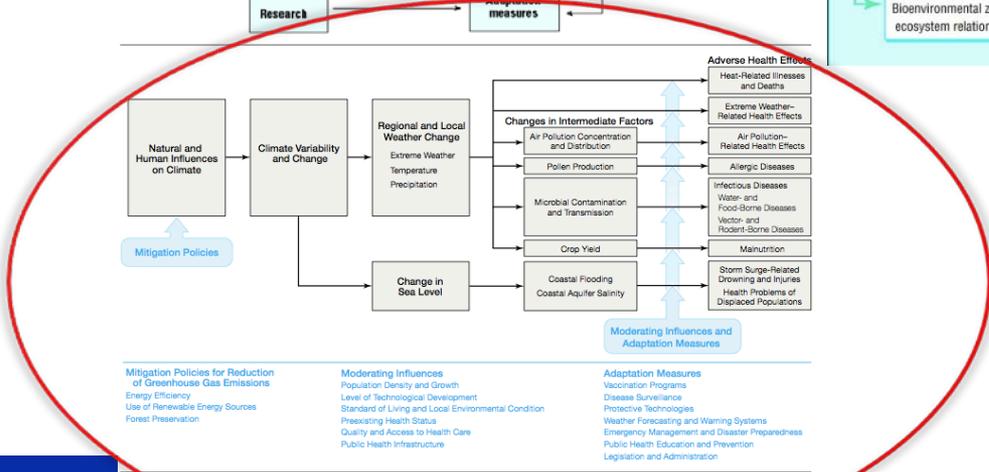
Hambling T. [www.ncbi.nlm.nih.gov/pmc/articles/PMC315333/pdf/ijerph-08-02854.pdf](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC315333/pdf/ijerph-08-02854.pdf)



Patz, EHP 2000

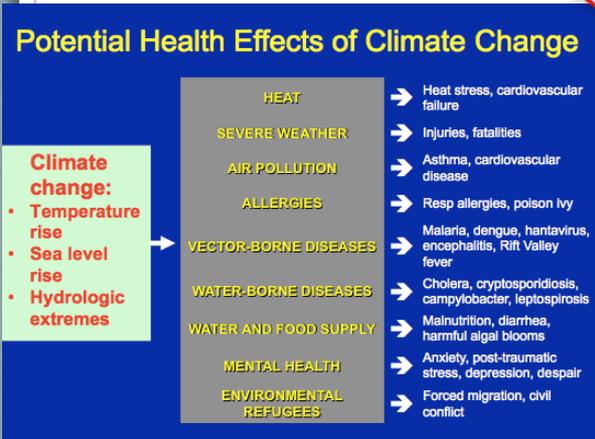


Hess, NIEHS

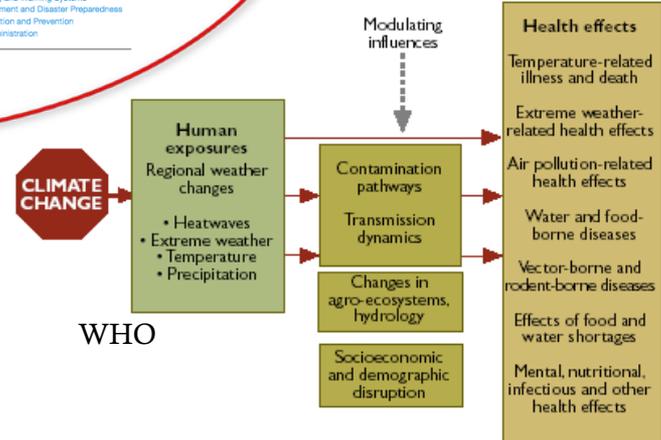


McMichael 1997

McGeehin CDC

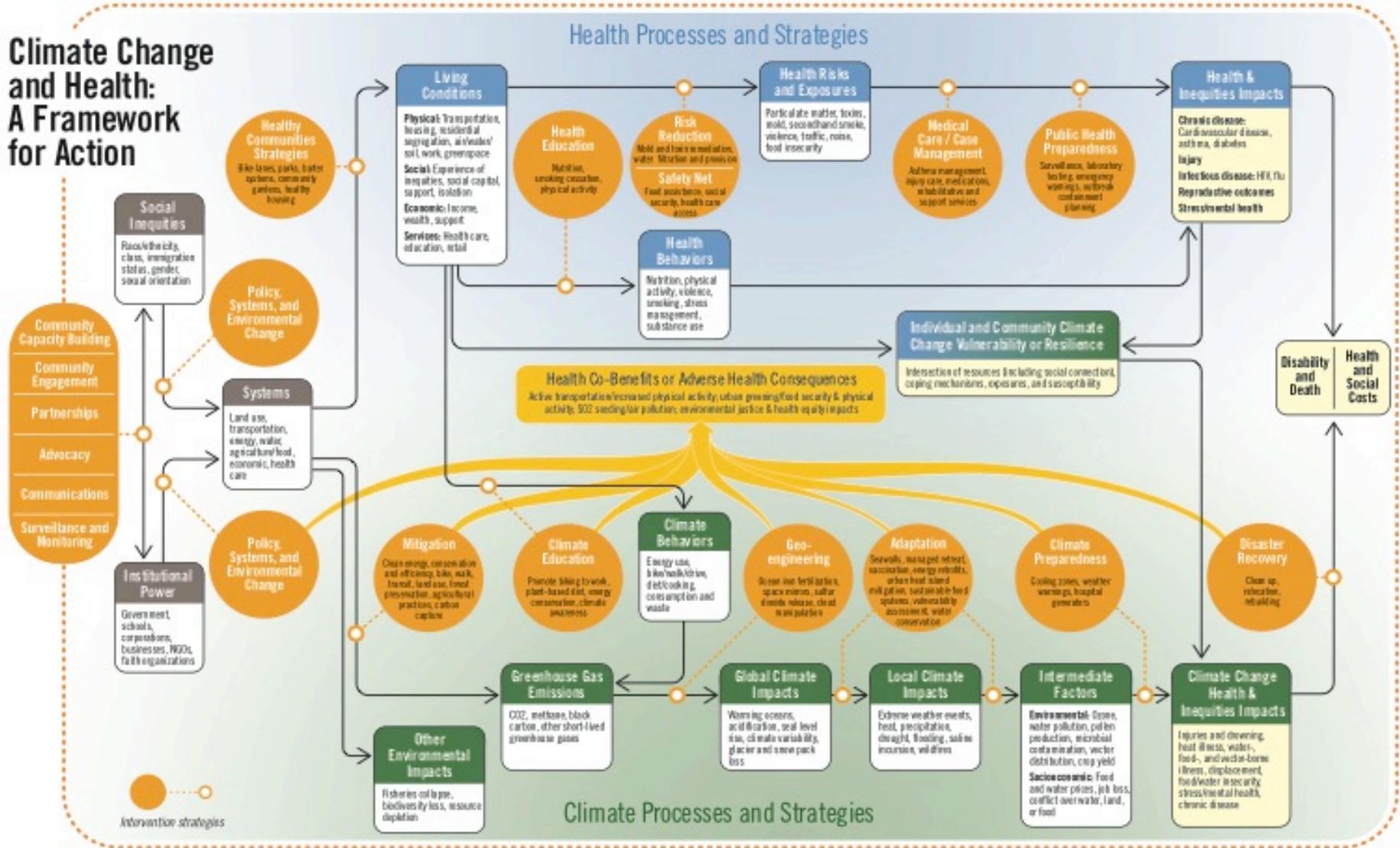


Haines & Patz 2004

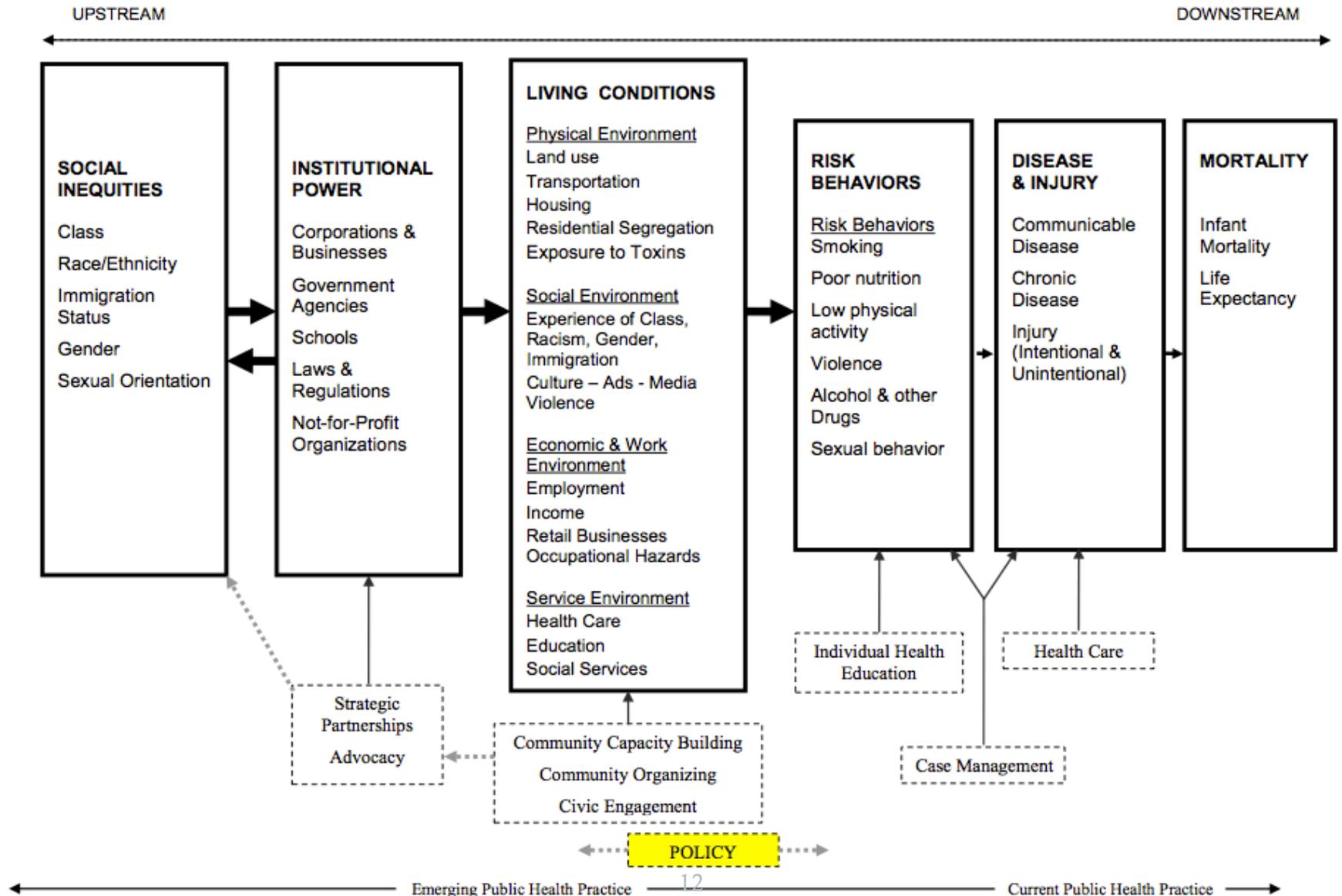


WHO

# Climate Change and Health: A Framework for Action



## A PUBLIC HEALTH FRAMEWORK FOR REDUCING HEALTH INEQUITIES BAY AREA REGIONAL HEALTH INEQUITIES INITIATIVE



## A PUBLIC HEALTH FRAMEWORK FOR REDUCING HEALTH INEQUITIES BAY AREA REGIONAL HEALTH INEQUITIES INITIATIVE

### USUAL PUBLIC HEALTH PRACTICE

#### RISK BEHAVIORS

Smoking  
Poor Nutrition  
Low Physical  
Activity  
Sexual Behavior  
Violence  
Alcohol & Other  
Drugs

#### DISEASE & INJURY

Communicable  
Disease  
Chronic Disease  
Injury (Intentional  
& Unintentional)

#### MORTALITY

Infant Mortality  
Life Expectancy



Junk Food is EVERYWHERE



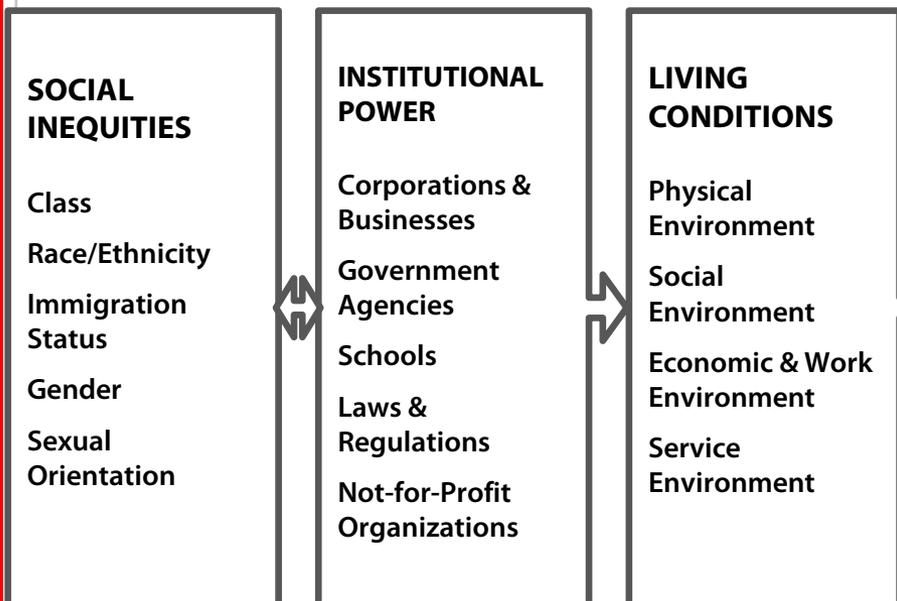


ZIP CODE 95219 Life Expectancy 73 < 88 ZIP CODE 92657 Life Expectancy

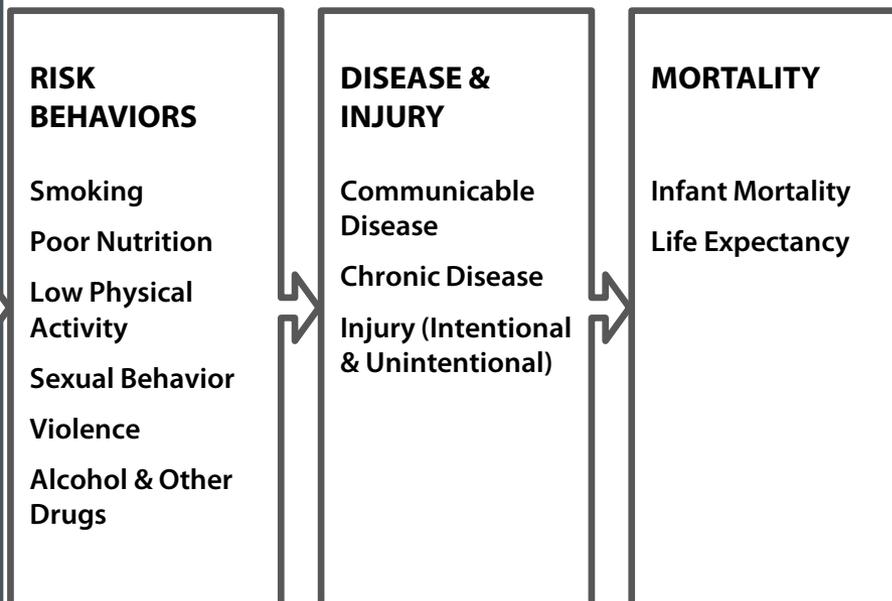
health happens here 

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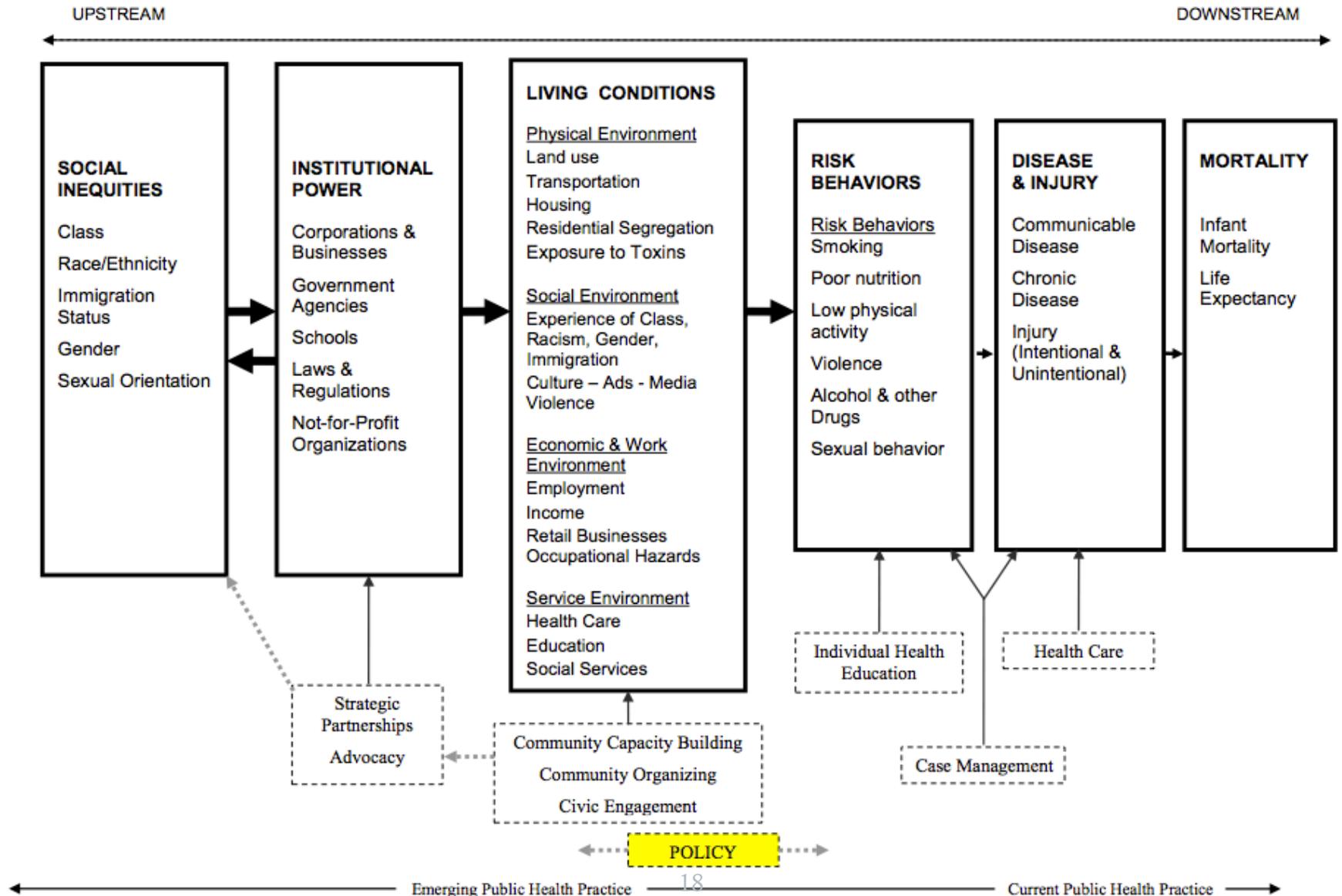
### EMERGING PUBLIC HEALTH PRACTICE



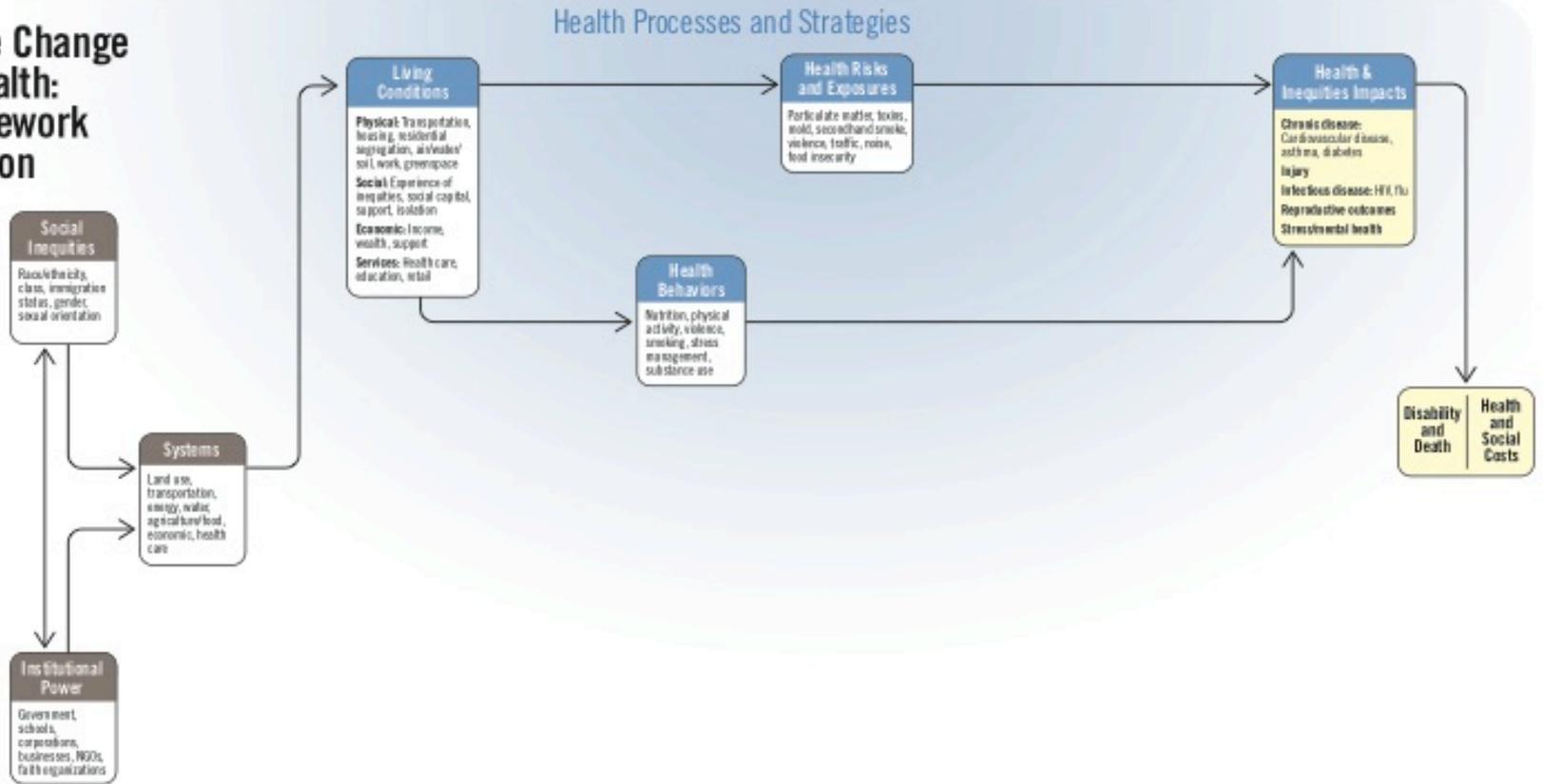
### USUAL PUBLIC HEALTH PRACTICE



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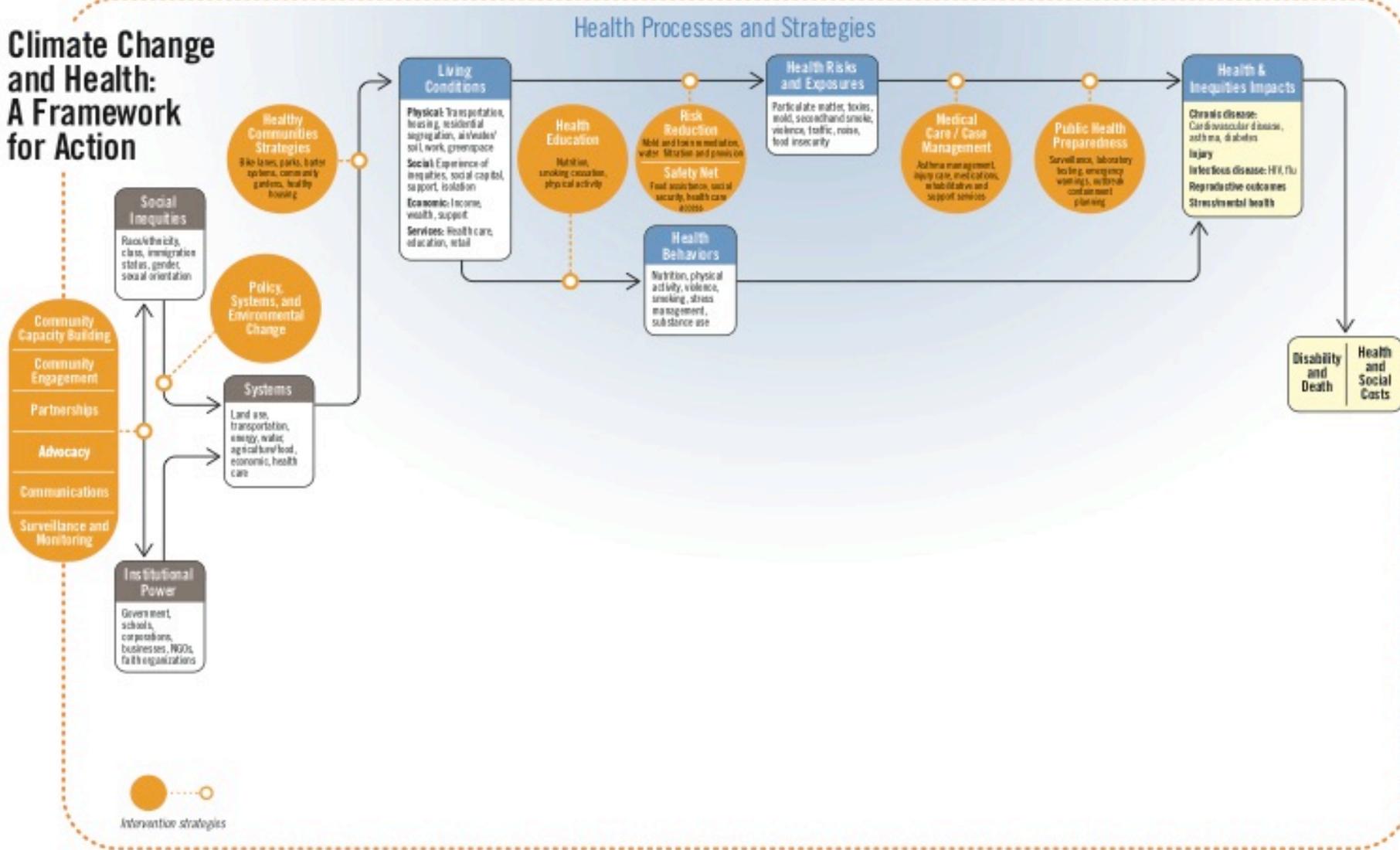
# Climate Change and Health: A Framework for Action

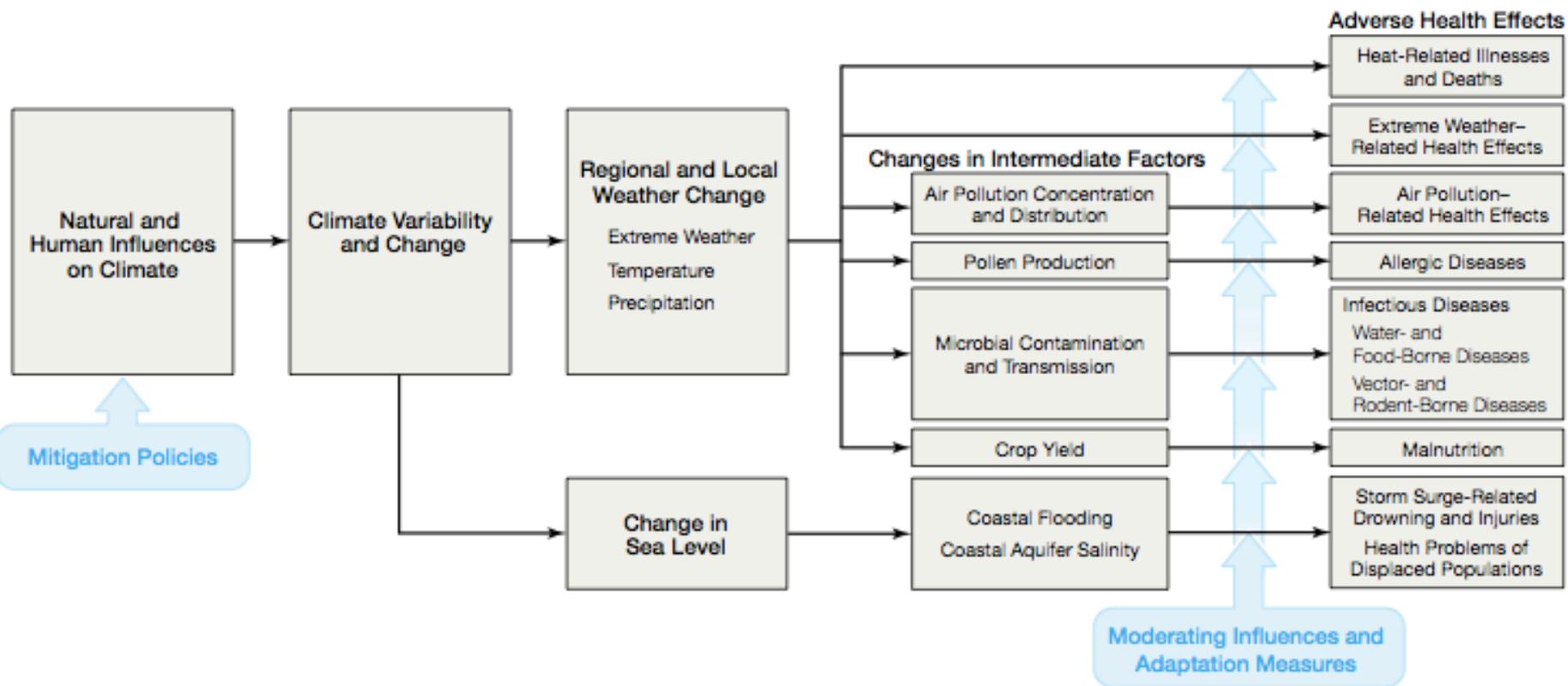


# Spectrum of Prevention



# Climate Change and Health: A Framework for Action





#### Mitigation Policies for Reduction of Greenhouse Gas Emissions

Energy Efficiency  
Use of Renewable Energy Sources  
Forest Preservation

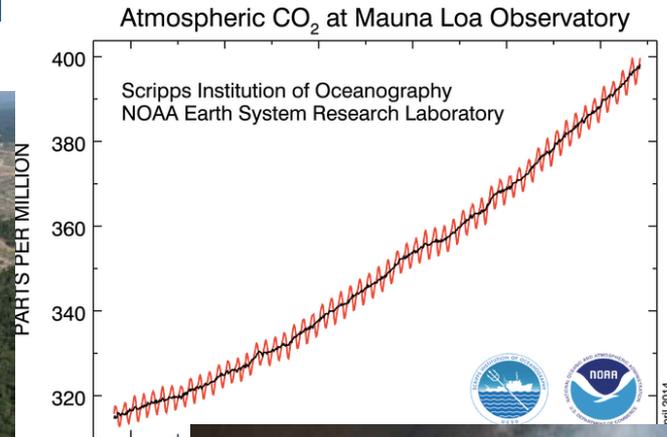
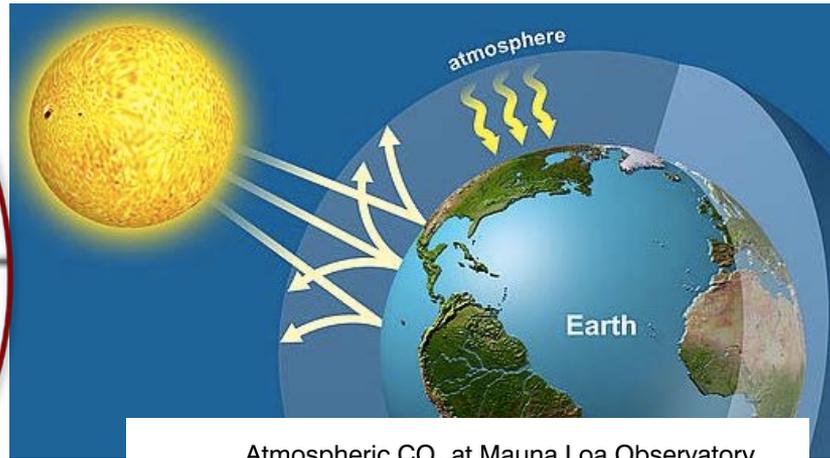
#### Moderating Influences

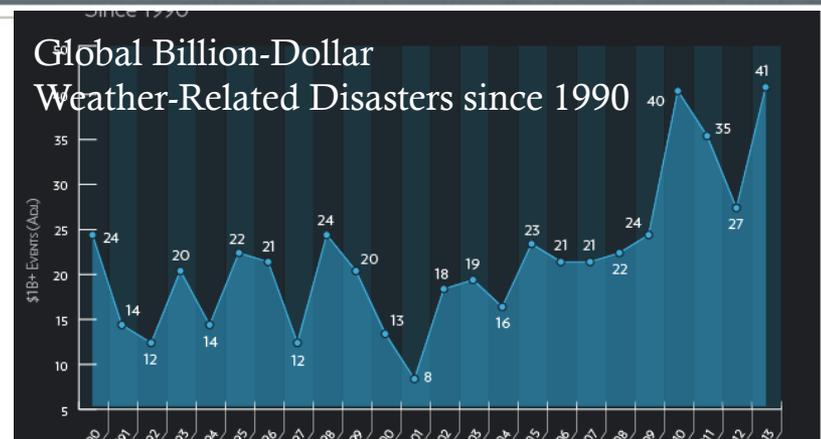
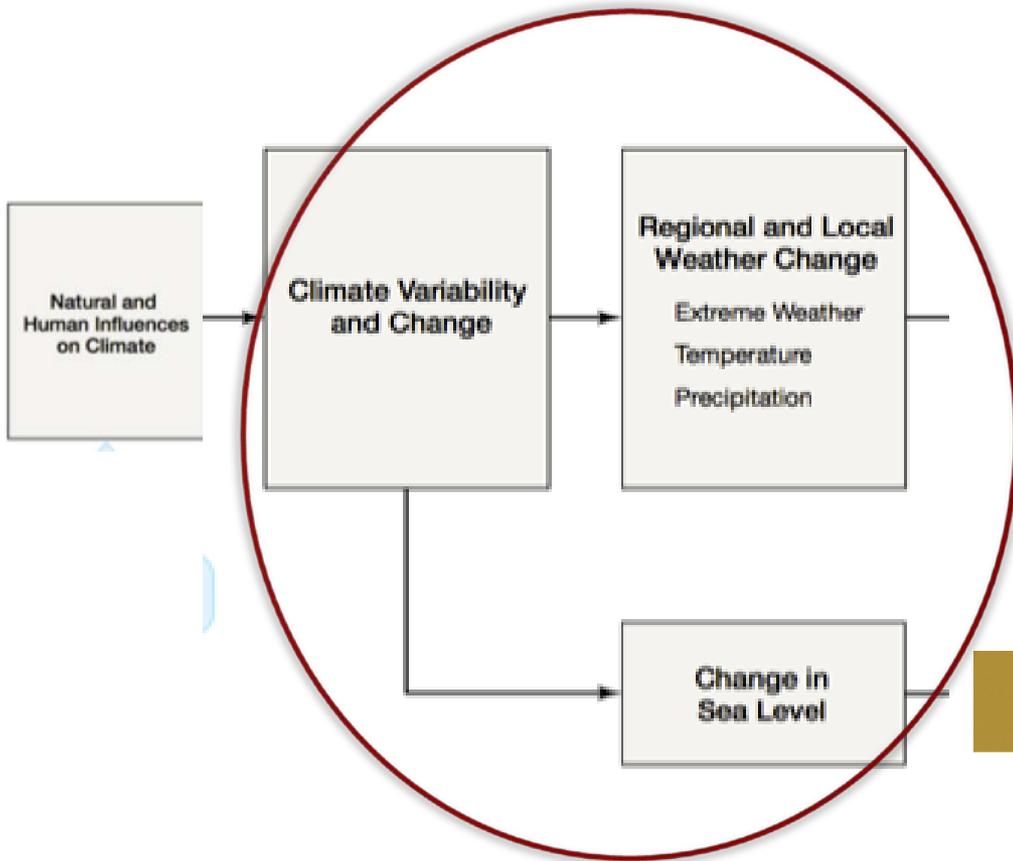
Population Density and Growth  
Level of Technological Development  
Standard of Living and Local Environmental Condition  
Preexisting Health Status  
Quality and Access to Health Care  
Public Health Infrastructure

#### Adaptation Measures

Vaccination Programs  
Disease Surveillance  
Protective Technologies  
Weather Forecasting and Warning Systems  
Emergency Management and Disaster Preparedness  
Public Health Education and Prevention  
Legislation and Administration

# Natural and Human Influences on Climate





NATIONAL ACADEMY OF SCIENCES  
 NATIONAL ACADEMY OF ENGINEERING  
 INSTITUTE OF MEDICINE  
 NATIONAL RESEARCH COUNCIL

REPORT

IN BR

## Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future

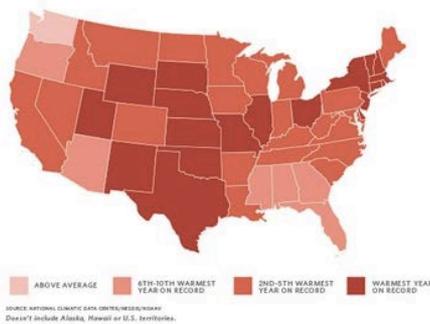
6" by 2030, 12" by 2050, 36" by 2100

# Temperature

## 2012 WAS THE SECOND MOST EXTREME YEAR ON RECORD FOR THE NATION

SOURCE: NOAA, U.S. CLIMATE EXTREME INDEX

### RECORD HEAT ACROSS THE U.S. STATE-BY-STATE TEMPERATURES IN 2012



ALSO IN 2012:

### WARMEST YEAR ON RECORD FOR THE U.S.

Doesn't include Alaska, Hawaii, or U.S. territories.

SOURCE: NOAA

356

### RECORD HIGH TEMPERATURES TIED OR BROKEN IN THE UNITED STATES.

SOURCE: NOAA, STATE OF THE CLIMATE REPORT

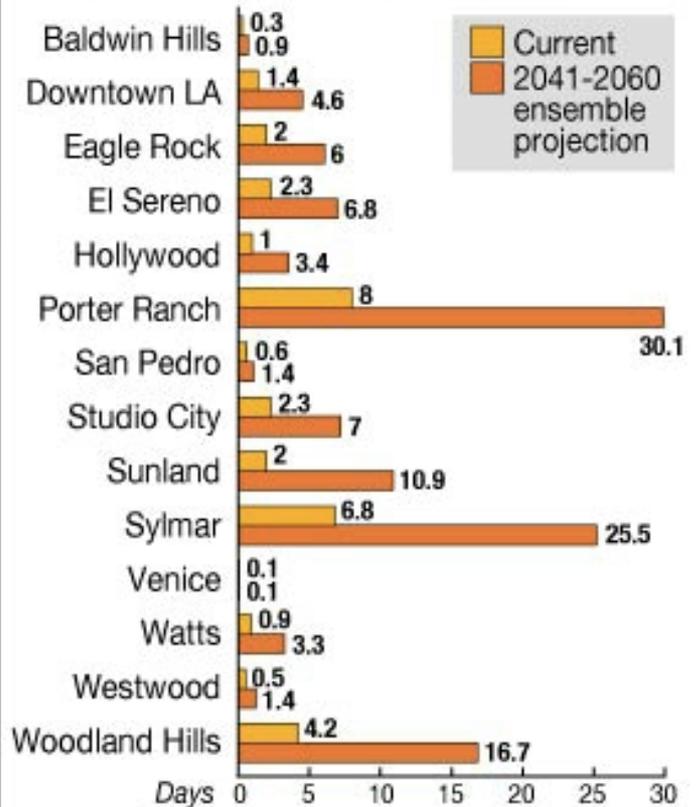


### APPROXIMATELY ONE-THIRD OF THE U.S. POPULATION EXPERIENCED 100+ TEMPERATURES FOR TEN OR MORE DAYS.

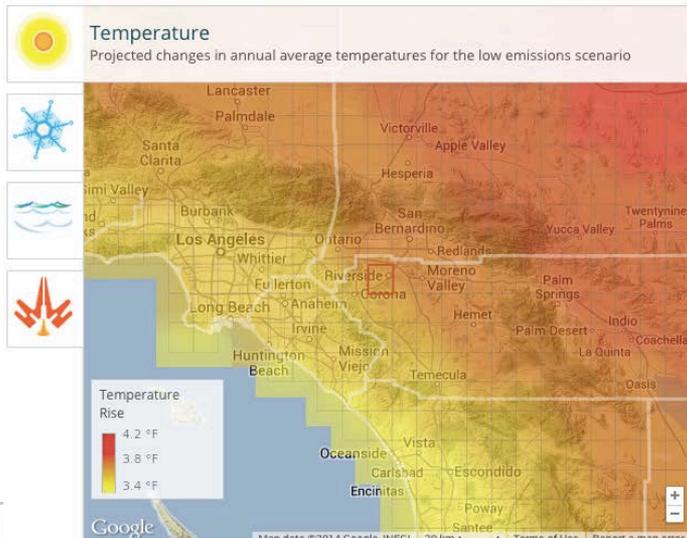
SOURCE: NOAA

## Current and projected temperature extremes for the Los Angeles area

Average annual days exceeding 95 degrees F

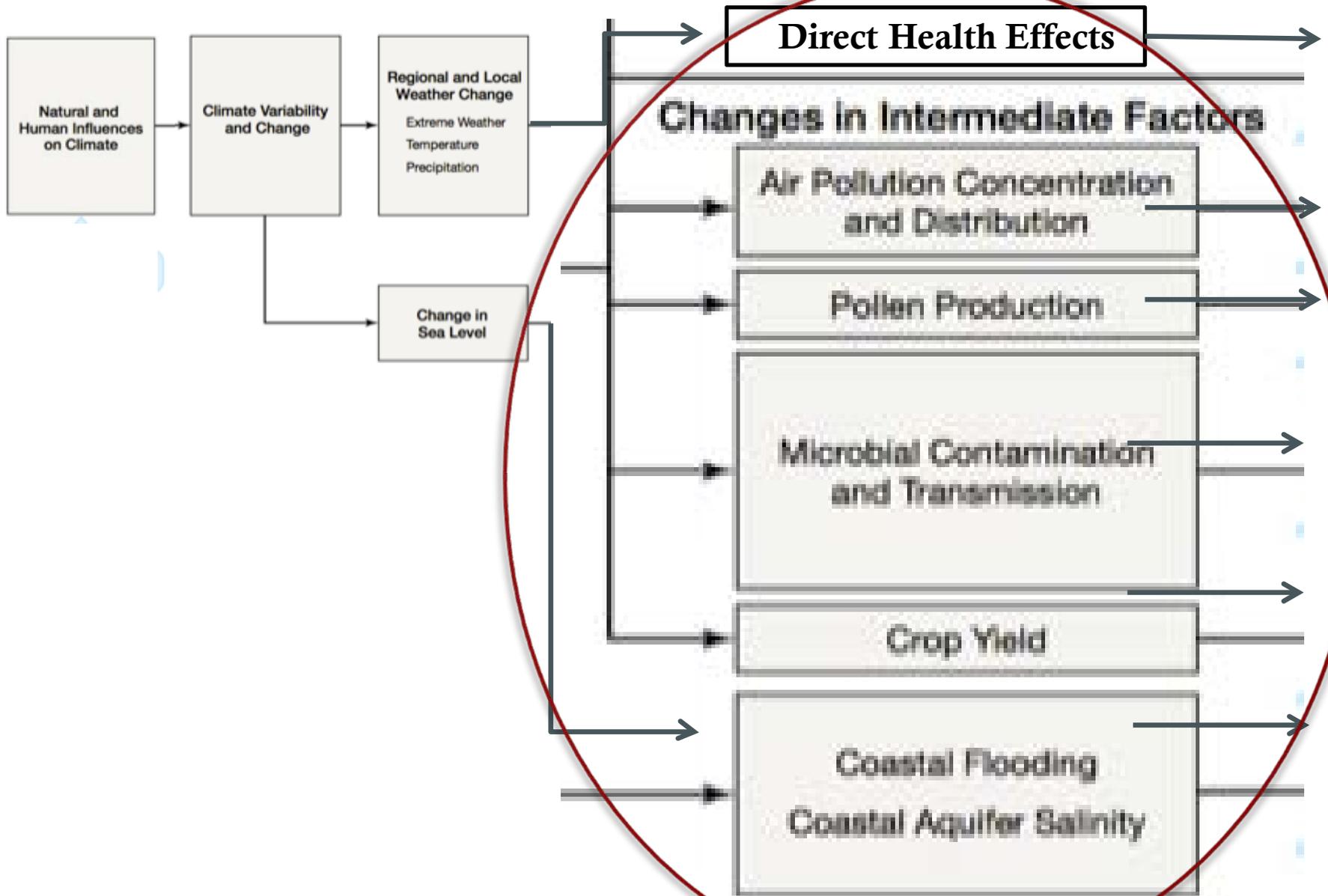


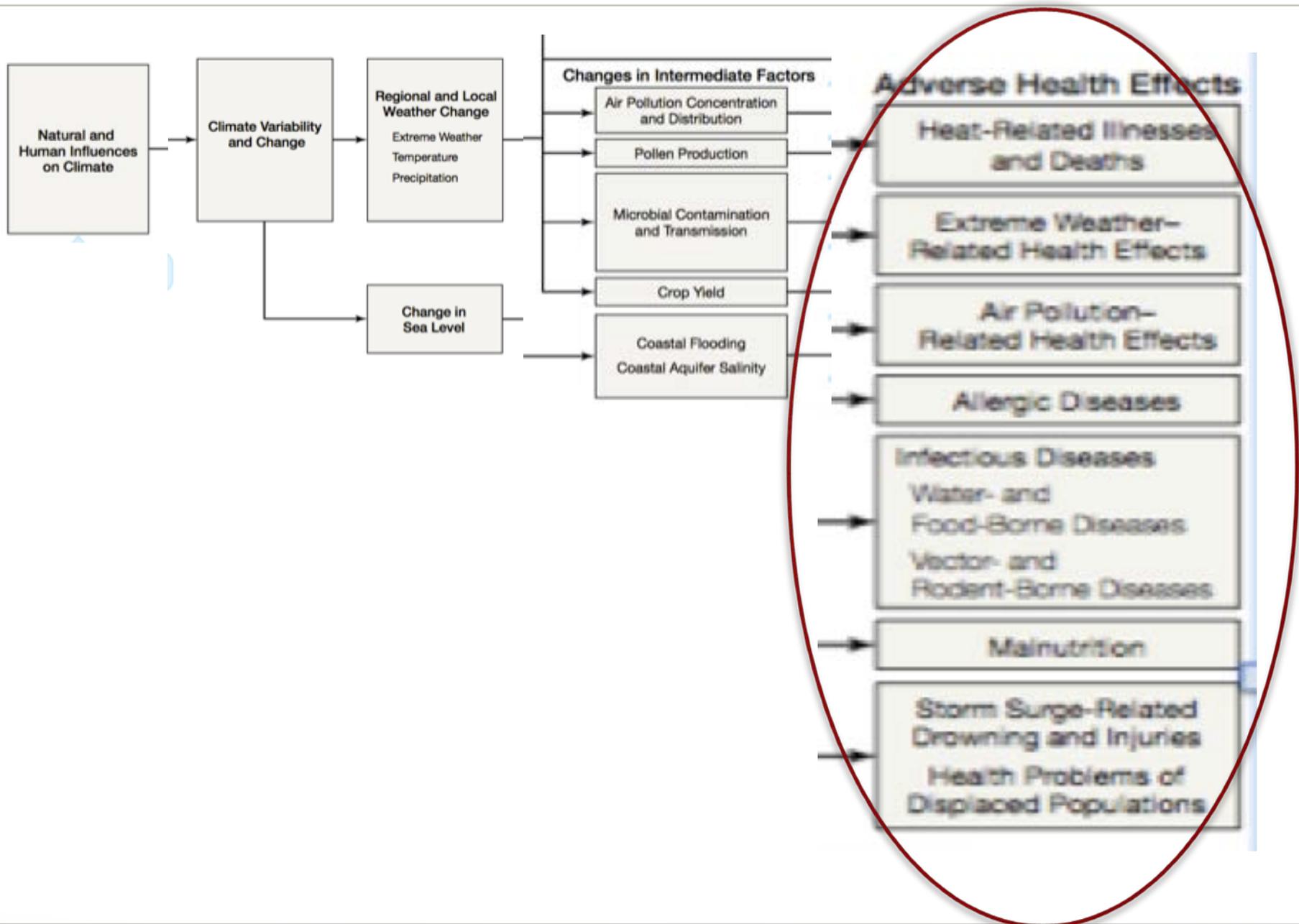
LO Public Domain White House

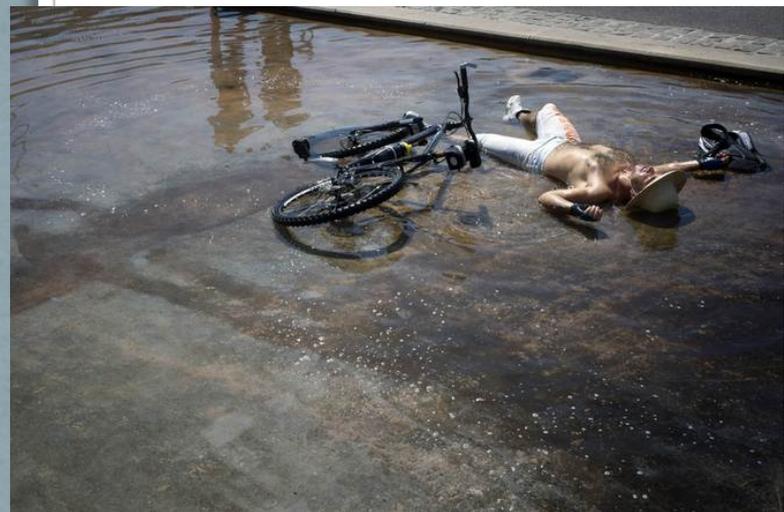


UCLA LARC 2012

L Rudolph April 2014

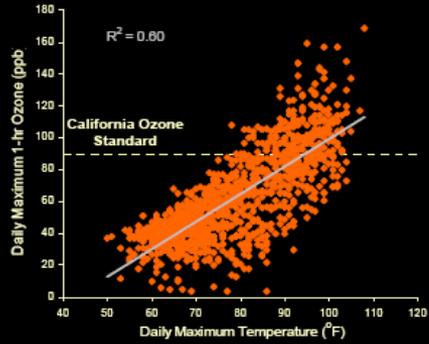




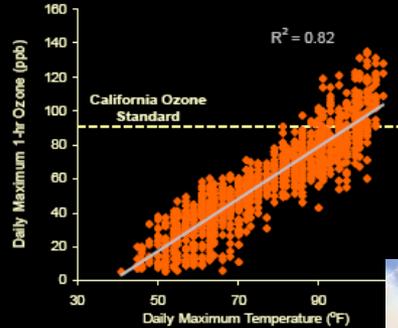


# Higher Temperatures Worsen Air Pollution

## Ozone versus Temperature



Riverside, 2003-2005



Fresno, 2003-2005



Photo: Tudor Van Hampton / ENR



# The Climate Gap



The Climate Gap

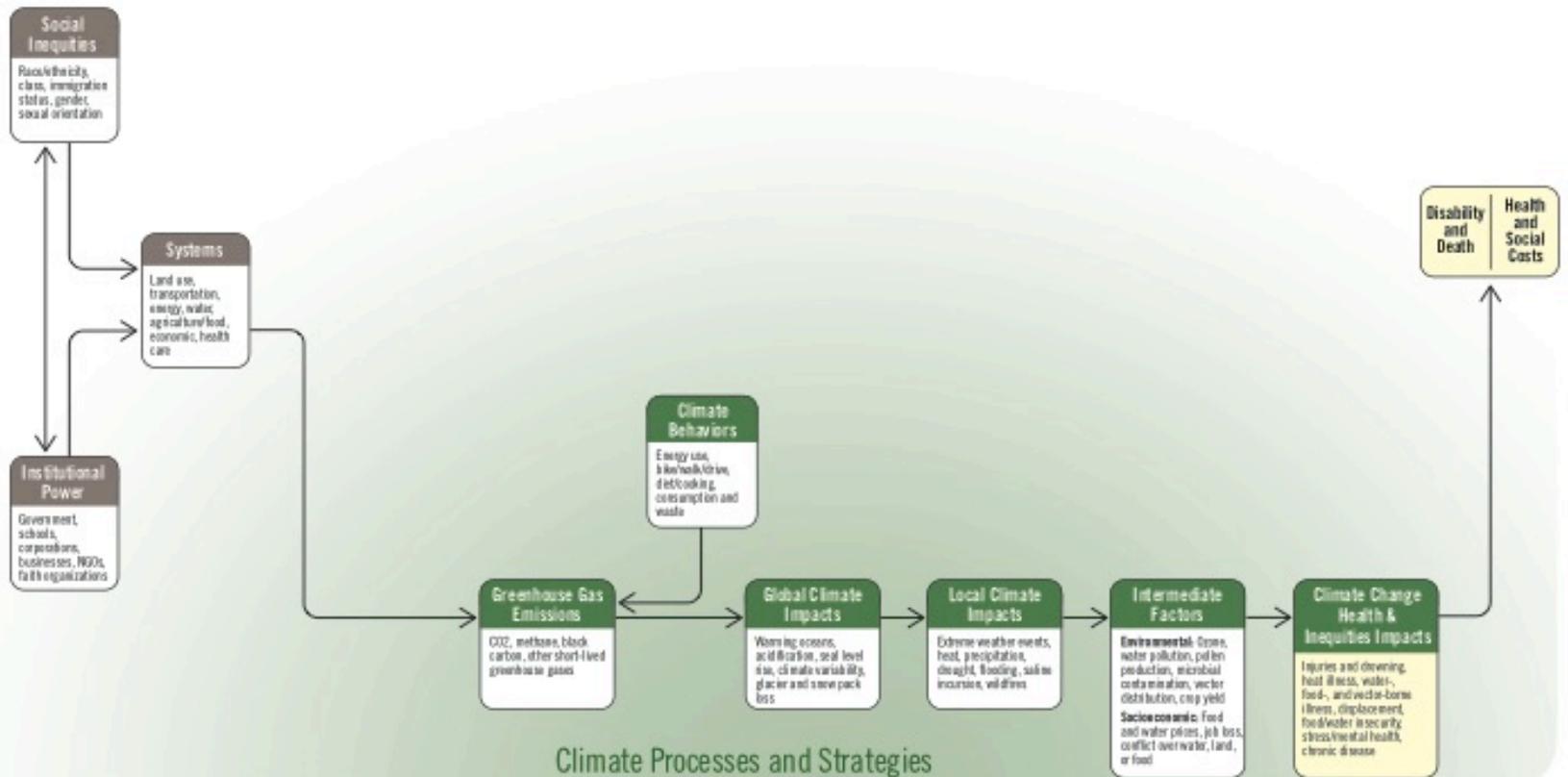


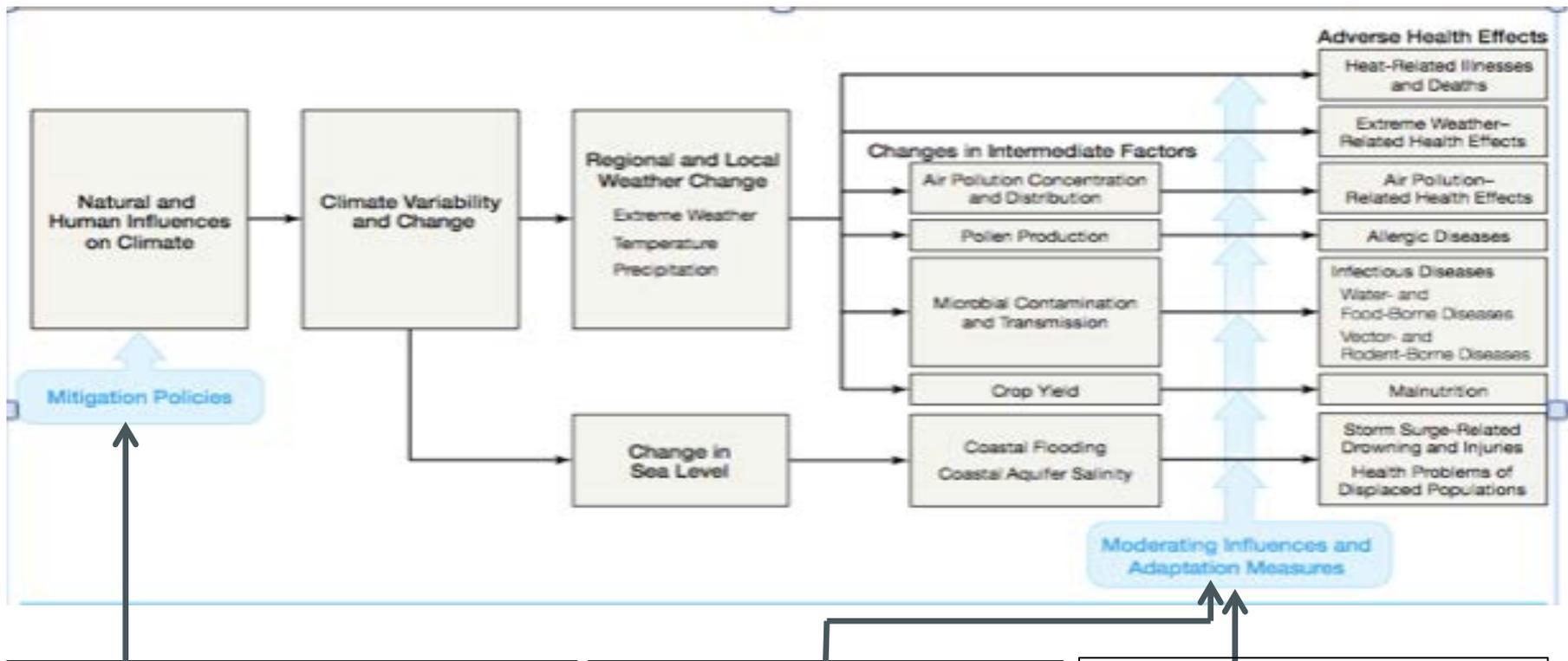
# Health-Care Costs of Climate Events

Climate-related health stressor	Premature Deaths	Hospitalizations	Total Health-care Costs \$\$ (thousands)
Ozone pollution	795	4,150	6,534,642
Heat wave	655	1,620	5,353,425
Hurricane	144	2,197	1,392,833
Infectious disease	24	204	207,447
River flooding	2	43	20,357
Wildfires	69	778	578,640
<b>Total</b>	<b>1,699</b>	<b>8,992</b>	<b>\$14,087,344</b>

Knowlton, Health Affairs, 2011

# Climate Change and Health: A Framework for Action





### Mitigation to cut GHG emissions

- Clean renewable energy
- Fuel/energy efficiency
- Reduce VMTs
- Low carbon fuels
- Forest preservation
- Reduced meat consumption

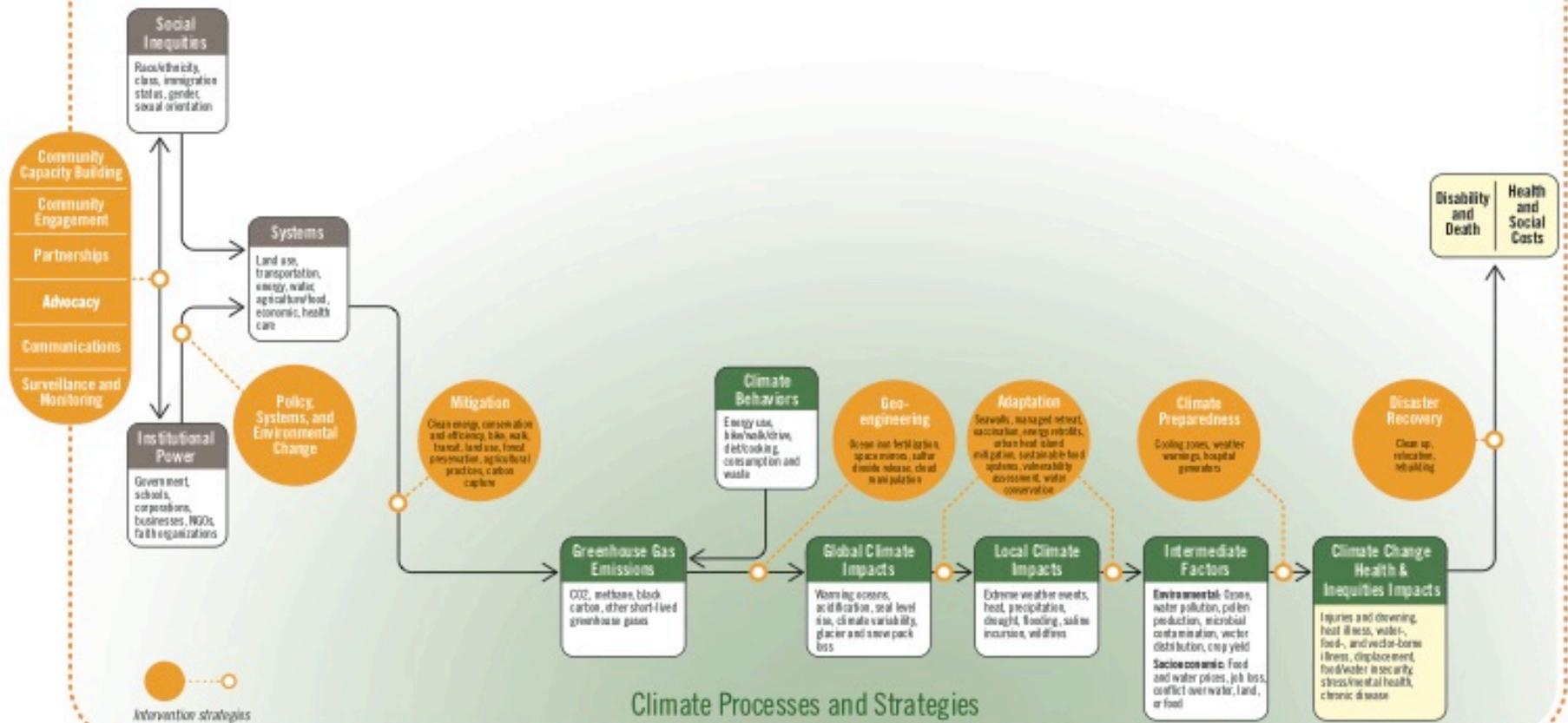
### Moderating influences

- PH infrastructure
- Health services
- Population health status
- Level of development
- Population density

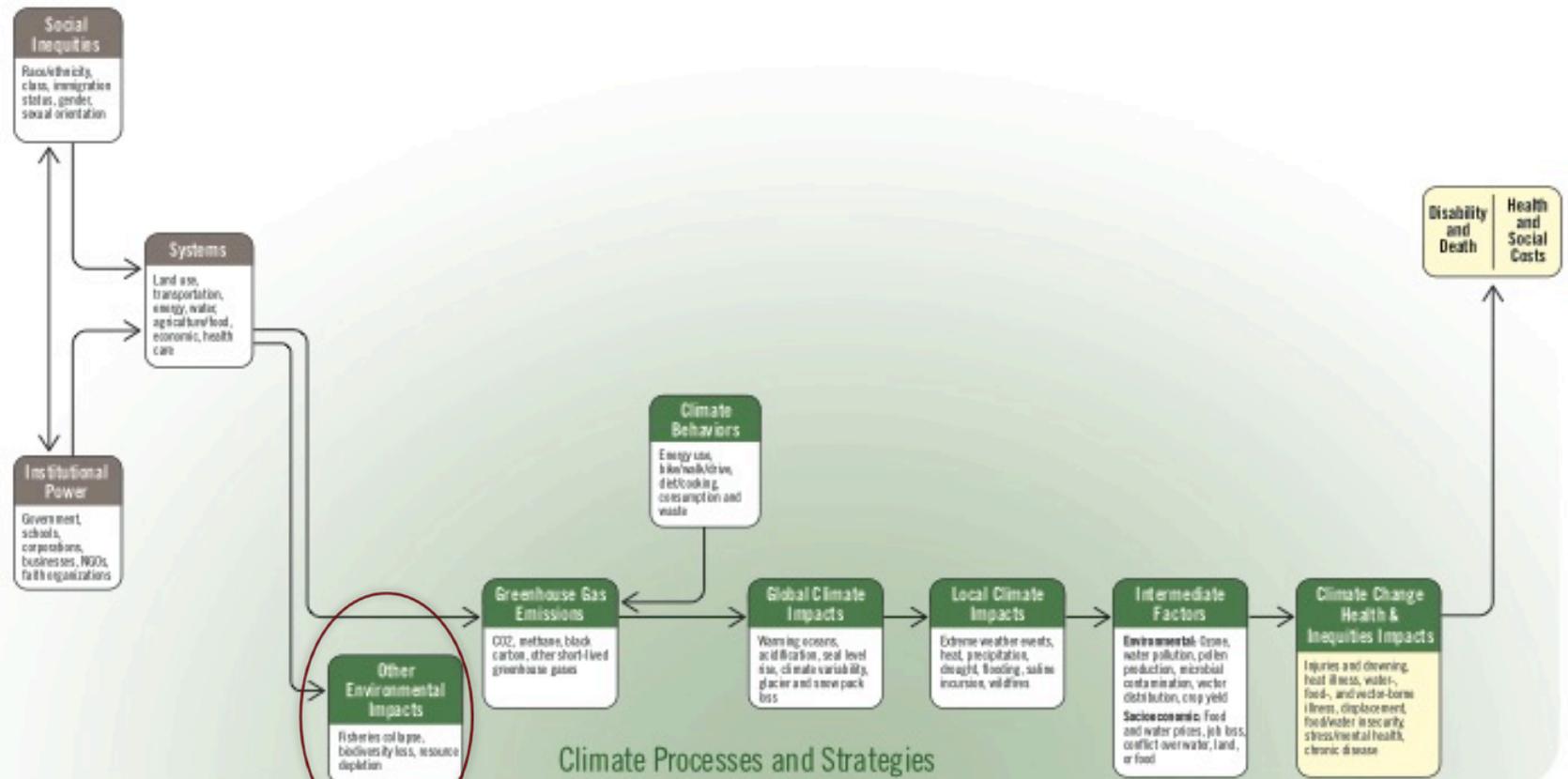
### Adaptation measures to reduce impacts of climate change

- Infrastructure
- Warnings, surveillance
- Preparedness/recovery
- Sustainable agriculture
- Urban greening

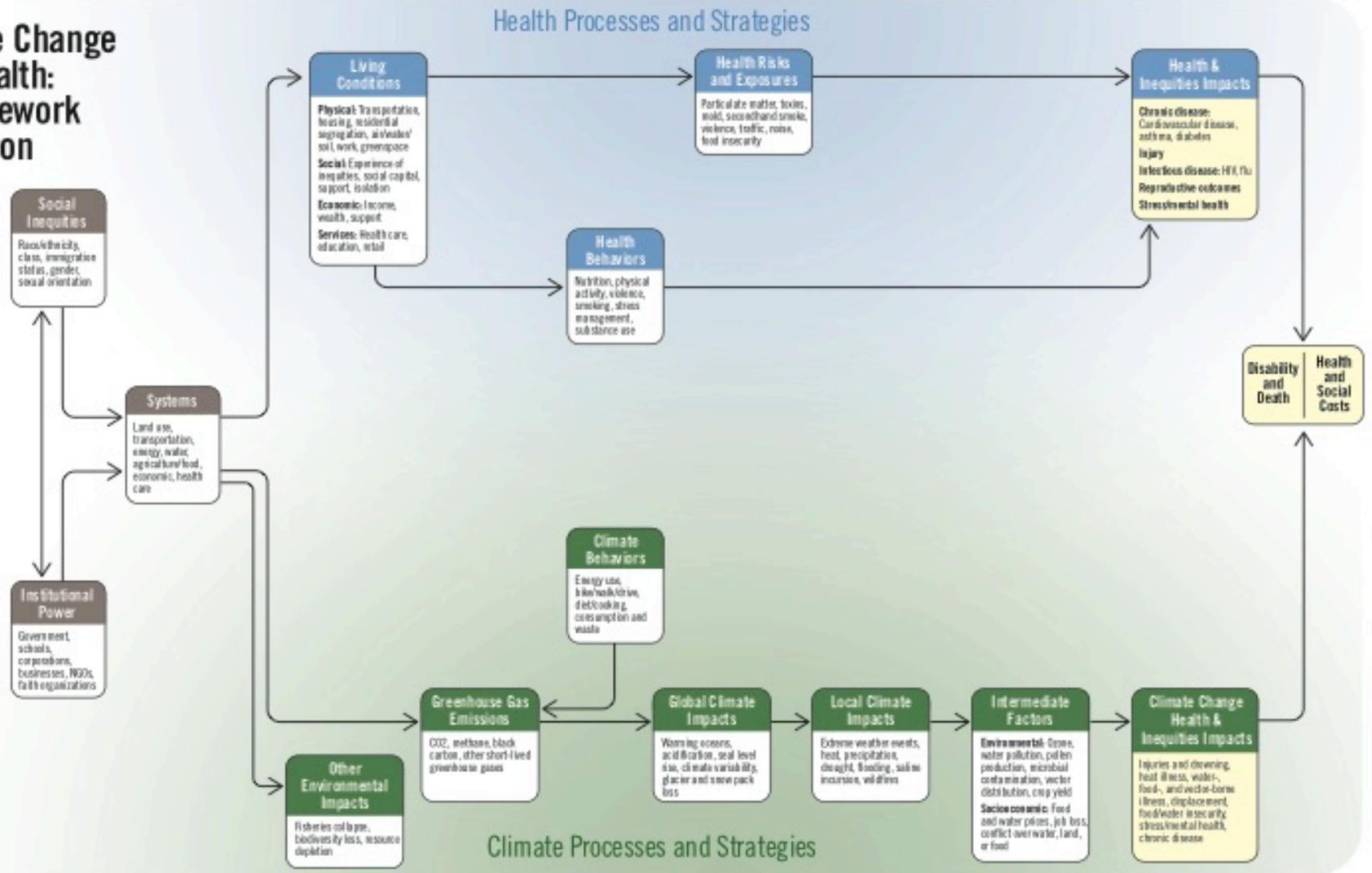
# Climate Change and Health: A Framework for Action



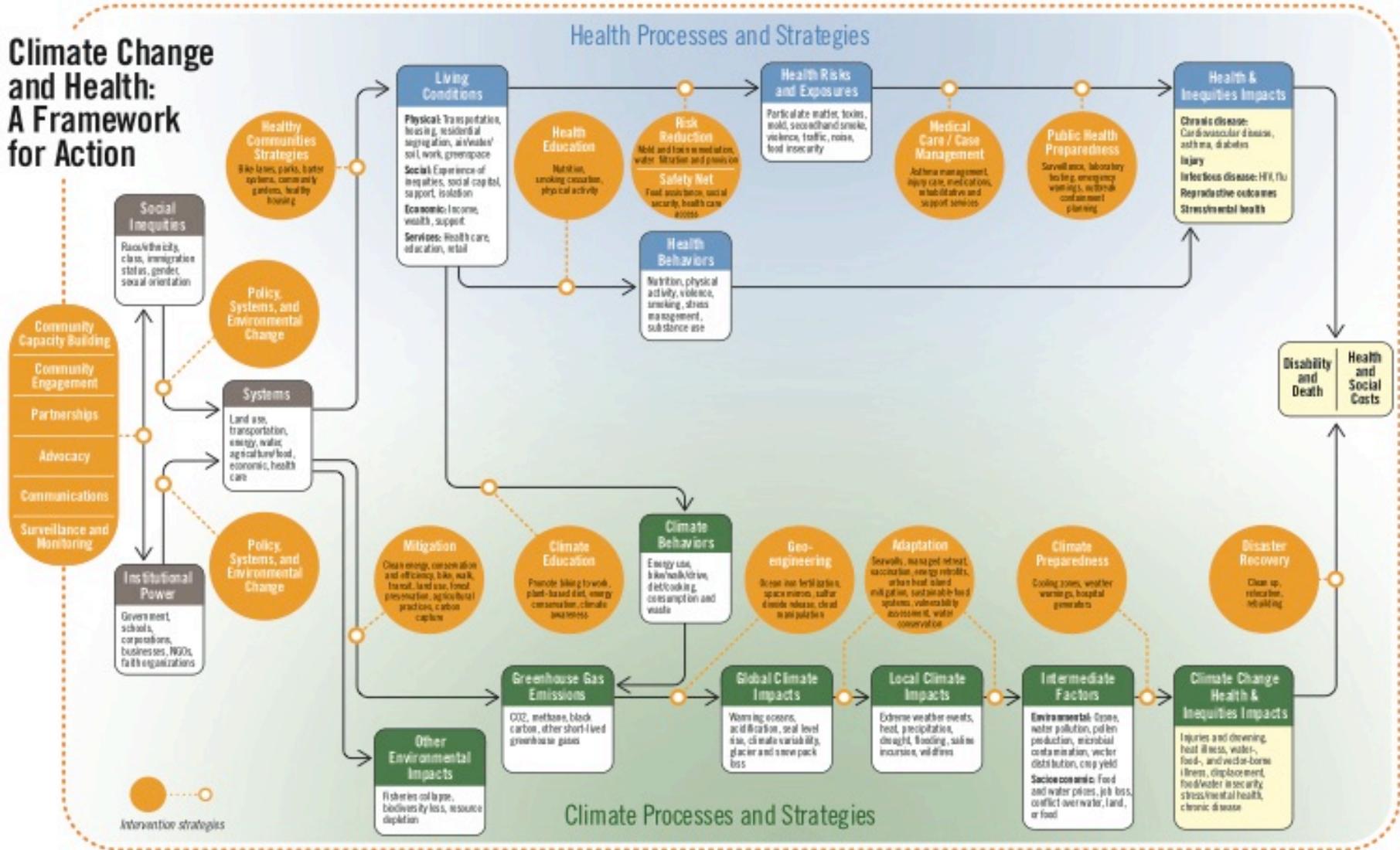
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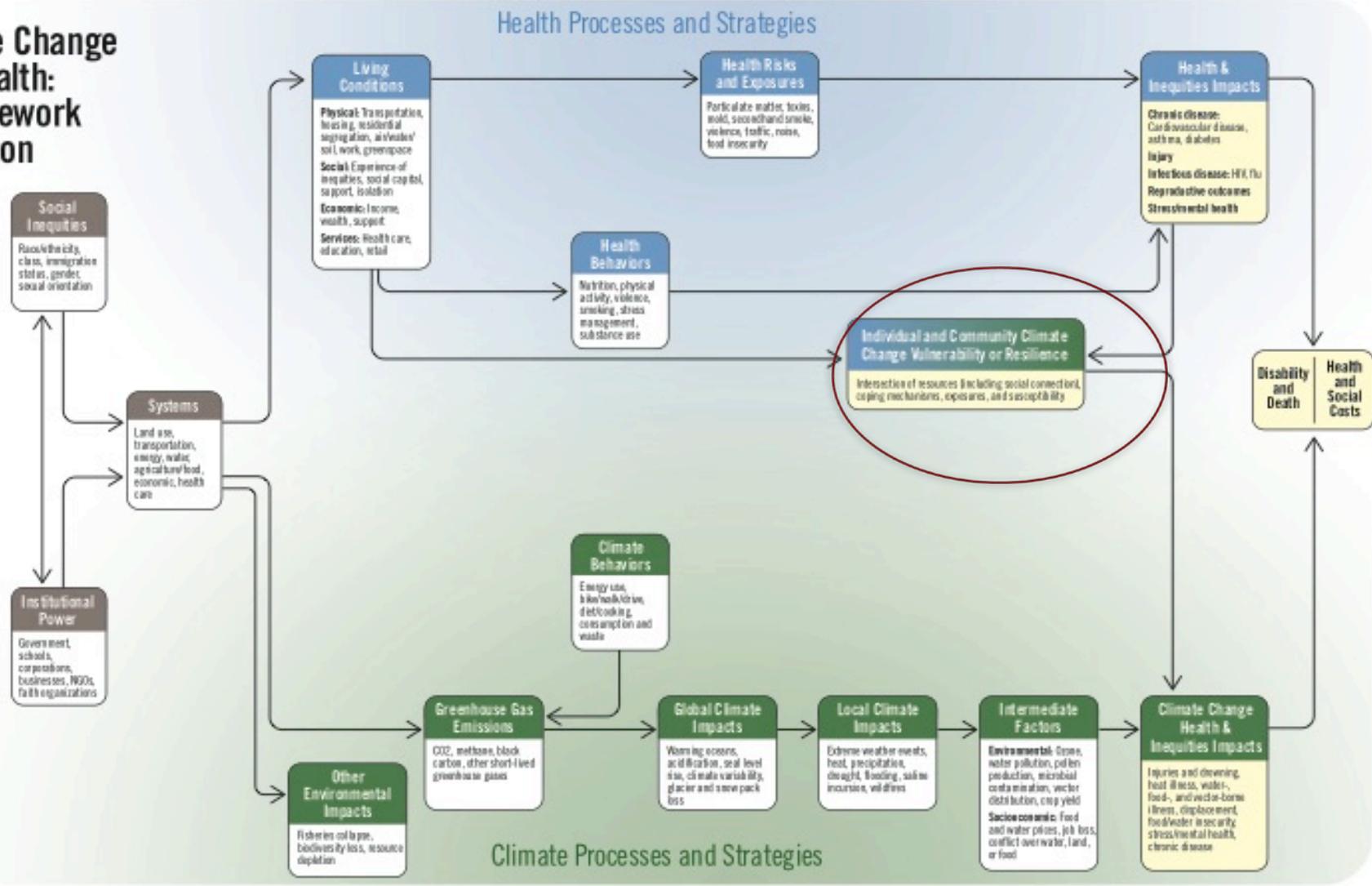
# Climate Change and Health: A Framework for Action



# Climate Change and Health: A Framework for Action



# Climate Change and Health: A Framework for Action



# Vulnerability & Resilience

- Vulnerability
  - the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change
  - human populations at higher risk, due to both environmental and individual factors
- Resilience
  - the capacity of an ecosystem to respond to a disturbance – for example a flood or drought or pest invasion - by resisting damage and recovering
  - the capacity of an individual, community, or institution to dynamically and effectively respond to shifting climate impact circumstances while continuing to function and prosper
- Characteristics of resilience or vulnerability co-exist at the same time in any community or individual.
- Together, they represent the intersection of resources, including social connection, coping mechanisms, exposures, and susceptibility that will determine the extent to which climate change impacts health and well-being.

# Individual & Community Climate Vulnerability & Resilience

- Population health status
- Public health infrastructure
- Government function
  - Health and social services
- Food systems
- Infrastructure
- Population density
- Social support

# Climate Change and Health: A Framework for Action

- Community Capacity Building
- Community Engagement
- Partnerships
- Advocacy
- Communications
- Surveillance and Monitoring

**Social Inequities**  
Race/ethnicity, class, immigration status, gender, sexual orientation

**Systems**  
Land use, transportation, energy, water, agricultural/food, economic, health care

**Institutional Power**  
Government, schools, corporations, businesses, NGOs, faith organizations

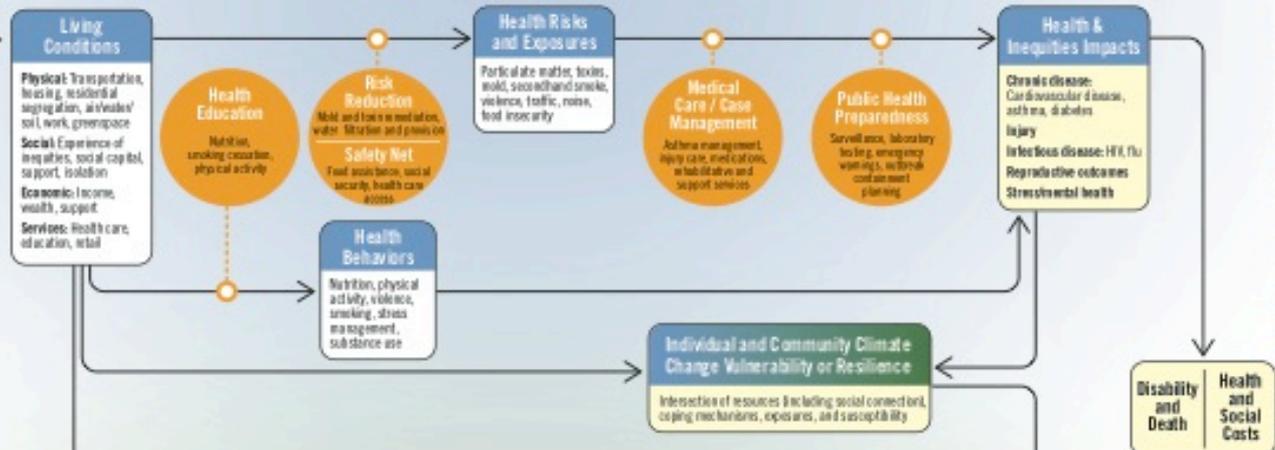
**Intervention strategies**

**Healthy Communities Strategies**  
Bike lanes, parks, better options, community gardens, heat by housing

**Policy, Systems, and Environmental Change**

**Policy, Systems, and Environmental Change**

## Health Processes and Strategies



**Disability and Health and Social Costs**

## Climate Processes and Strategies



# Climate Change and Health: A Framework for Action

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Intervention strategies

**Healthy Communities Strategies**  
Bike lanes, parks, bike repair stations, community gardens, healthy housing

**Policy, Systems, and Environmental Change**

**Policy, Systems, and Environmental Change**

## Health Processes and Strategies

**Living Conditions**  
**Physical:** Transportation, housing, residential segregation, air/water/sound/light, work, greenspace  
**Social:** Experience of inequities, social capital, support, isolation  
**Economic:** Income, wealth, support  
**Services:** Health care, education, retail

**Health Education**  
Nutrition, smoking cessation, physical activity

**Risk Reduction**  
Mold and lead remediation, water filtration and point-of-use filters

**Health Behaviors**  
Nutrition, physical activity, violence, smoking, stress management, substance use

**Health Risks and Exposures**  
Particulate matter, toxics, mold, secondhand smoke, violence, traffic, noise, food insecurity

**Medical Care / Case Management**  
Adherence management, injury care, mental care, rehabilitative and support services

**Public Health Preparedness**  
Surveillance, laboratory testing, emergency planning, outbreak control, disaster planning

**Health & Inequities Impacts**  
**Chronic disease:** Cardiovascular disease, asthma, diabetes  
**Injury**  
**Infectious disease:** HIV, flu  
**Reproductive outcomes**  
**Structural health**

**Health Co-Benefits or Adverse Health Consequences**  
Active transportation/increased physical activity, urban greening/food security & physical activity, SO<sub>2</sub> reduction/pollution, environmental justice & health equity impacts

**Individual and Community Climate Change Vulnerability or Resilience**  
Interaction of resources including social connectedness, coping mechanisms, exposures, and susceptibility

**Disability and Death** | **Health and Social Costs**

**Mitigation**  
Clean energy, conservation and efficiency, bike, walk, transit, land use, forest preservation, agricultural practices, carbon capture

**Climate Education**  
Promote biking to work, plant-based diet, energy conservation, climate awareness

**Climate Behaviors**  
Energy use, bike/walk/drive, detouring, carpooling and car share

**Geo-engineering**  
Biochar soil fertility, solar radiation management, sulfur dioxide release, cloud seeding

**Adaptation**  
Seawalls, mangrove retreat, vaccination, energy retrofit, urban heat island mitigation, heat-resistant crops, water conservation

**Climate Preparedness**  
Cooling centers, weather warnings, hospital generators

**Disaster Recovery**  
Clean up, relocation, rebuilding

**Other Environmental Impacts**  
Fisheries collapse, biodiversity loss, resource depletion

**Greenhouse Gas Emissions**  
CO<sub>2</sub>, methane, black carbon, other short-lived greenhouse gases

**Global Climate Impacts**  
Warming oceans, acidification, sea level rise, climate variability, glacier and snow pack loss

**Local Climate Impacts**  
Extreme weather events, heat, precipitation, drought, flooding, salt water incursions, wildfires

**Intermediate Factors**  
**Environmental:** Storms, water pollution, pollen production, microbial contamination, vector distribution, crop yield  
**Socioeconomic:** Food and water prices, job loss, conflict over water, land, or food

**Climate Change Health & Inequities Impacts**  
Injuries and drowning, heat illness, water-, food-, and vector-borne illness, displacement, food/water insecurity, stress/mental health, chronic disease

## Climate Processes and Strategies

# Transportation Health and Climate Co-Benefits

- Reductions
    - GHG emissions
    - Air pollution
    - Noise
    - Infrastructure costs
    - Community severance
  - Increases
    - Physical activity
    - Social capital
- Reductions
    - Respiratory disease
    - Cardiovascular disease
    - Diabetes
    - Depression
    - Osteoporosis
    - Cancer Stress
  - Avoidable increases
    - Bike/ped injuries

# Active Transportation, Health, & GHG

- Shift in active transport from <5 to 22 minutes/day (2% to 15% mode share) in Bay Area:
  - >14% reduction in GHG emissions
  - 14% reduction heart disease, stroke, diabetes
  - 6-7% reduction depression, dementia
  - 5% reduction breast and colon cancer
  - Added 9.5 months life expectancy
  - 19% increase bike/ped injuries
  - \$1.4 to \$22 billion annual Bay Area health cost savings

# Climate and Health Co-benefits of Sustainable, Local Food Systems

## • Reductions

- GHG emissions
- Pesticide use
- Synthetic fertilizer use
- Food miles
- Antibiotic use
- Water pollution
- Soil erosion
- Biodiversity loss
- Meat consumption
- Unsustainable H2O consumption

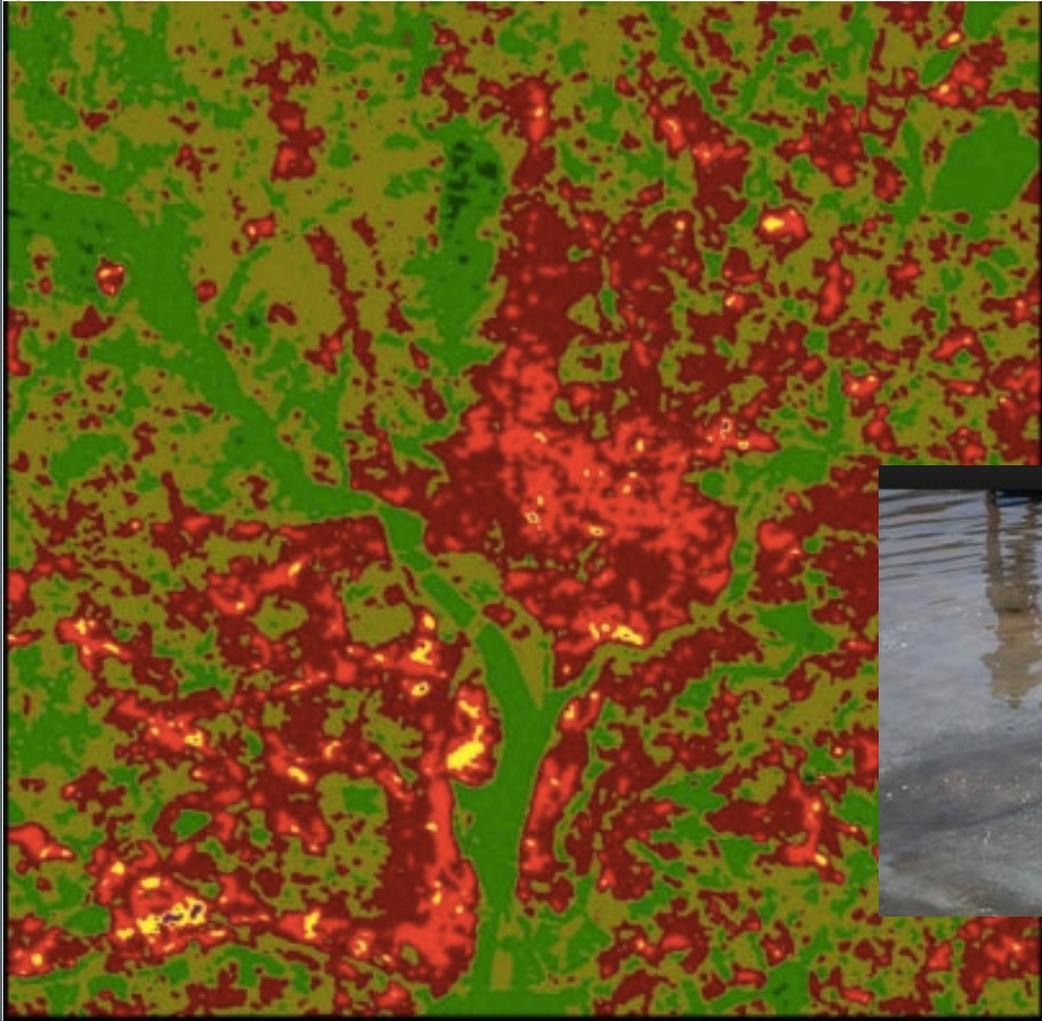
## • Increases

- Access affordable healthy food
- Rural community strength
- Agricultural land preservation

## • Reductions

- Obesity
- Cardiovascular disease
- Cancer (breast, prostate, colorectal)
- Type II Diabetes
- Antibiotic resistance
- Pesticide illness

# Urban Heat Islands



WASHINGTON, D.C.: Temperature Map  
August 8, 1990

# Heat Resilience Co-Benefits

- Urban greening
  - Places to be active
  - Healthy food access
  - Reduce storm water run-off
  - Decrease flooding risk
  - Replenish groundwater
  - Improve aesthetics
  - Reduce crime
- Reduce heat island effect
  - Reduce heat illness risk
  - Decrease energy consumption
  - Lower energy costs
  - Reduce air pollution

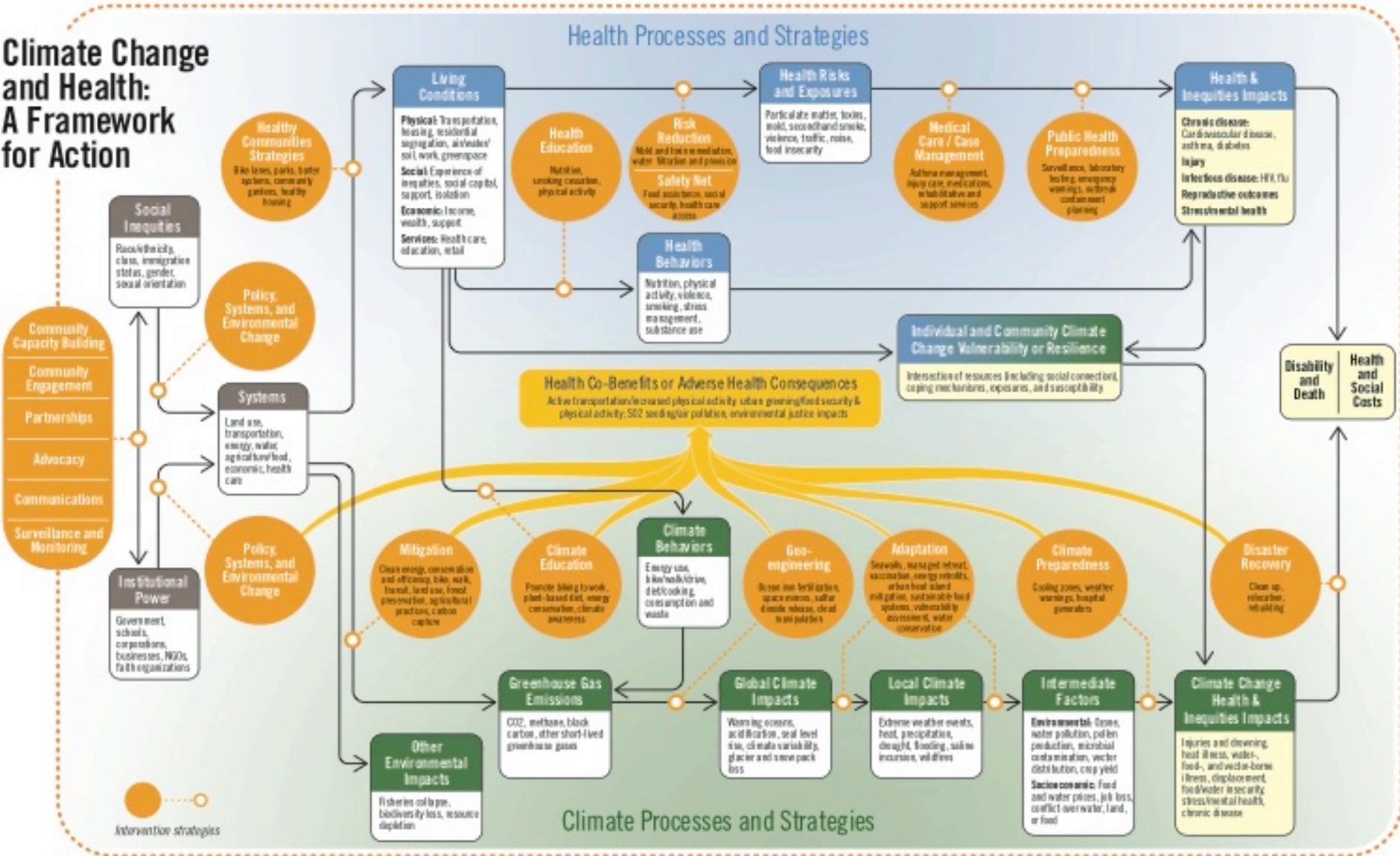


# Heat Resilient Communities

- Buildings:
  - Up-date Green Building and Building Energy Efficiency Standards
    - IAQ caveat
- Surfaces:
  - Expand the use of cool & porous pavements
  - Cool roofs
- Urban Greening:
  - Trees – green roofs – green open space – urban streams - gardens
- Extreme Heat Events:
  - Improve Heat-Health Warnings
  - Identify vulnerable populations
  - Protect the energy grid
  - Protect outdoor workers



# Climate Change and Health: A Framework for Action



# Climate Change

- There is scientific consensus and public concern
- Climate change is happening
- We are causing it
- Climate change is having health and human impacts now; the health & human impacts will continue to worsen
- We can and must do something about it
- If we do not act now, it will be too late to avert climate chaos
- There are many opportunities for public health to prevent climate disruption and promote healthy communities

# Mitigation - IPCC 5<sup>th</sup> Report

- Human-caused GHG emissions continue to increase (1970-2010); CO<sub>2</sub> emissions from fossil fuel combustion & industrial processes contributed about 78% of increase
- Without additional measures, project 3.7 to 4.8°C increase in global mean temperature in 2100 (*high confidence*)
- There are many scenarios via which temperature change can be kept to less than 2°C, with CO<sub>2</sub>eq of 450ppm; these include substantial cuts in emissions by mid-century through large-scale changes in energy systems and possibly land use
- Current actions are not consistent with keeping temperature increase to less than 2°C; delaying more robust GHG emissions reductions through 2030 will substantially increase difficulty of transition and narrow options

<http://www.ipcc.ch>

# We can do something to reduce climate change and slow impacts!

- Energy efficiency
- Renewable energy
- Green buildings
- Waste reduction, reuse, and recycling
- Land use planning
- Transportation systems
  - Reduce VMT
  - Low Carbon Fuels
- Local & sustainable agriculture
- Trees canopy
- Building efficiency

# We can do something to help communities be more climate resilient!

- Identify health impacts
- Identify at-risk populations
- Monitor preparedness and resilience
- Recommend actions to reduce health impacts, create climate-resilient communities
- Urban greening
- Water conservation
  - Preserve clean drinking water
- Energy efficiency
- Infrastructure

# Will it be easy?

- Where will the money and staff come from?
- Silos - professional and organizational
- Lack information, training, capacity
- Leadership and political will
- Climate change is big, scary, overwhelming, urgent
- Individual & collective actions must be feasible & commensurate with the climate change emergency

# Public believes climate change is happening & wants government to act now

- There is solid evidence of rising global temperature 69%
- There is scientific consensus for climate change 62%
  - Republicans 69%
  - Tea Party supporters 58%
  - African-Americans 86%
- Effects happening now 54%
- Willing to assume costs to address climate change 88%
- Believe climate change preparedness would create jobs 60%
- Federal government should act 74%
- Local government and states should act 82%



## *County of Los Angeles Department of Public Health*

### *Five-Point Plan for Reducing the Health Impacts of Climate Change*

Inform the general public on the nature of climate change, its potential health effects, and actions they can take to reduce greenhouse gas emissions

Promote local planning, land-use, transportation, water, and energy policies that reduce greenhouse gas emissions and support the design of healthy and sustainable communities (e.g. rain-gray-storm water)

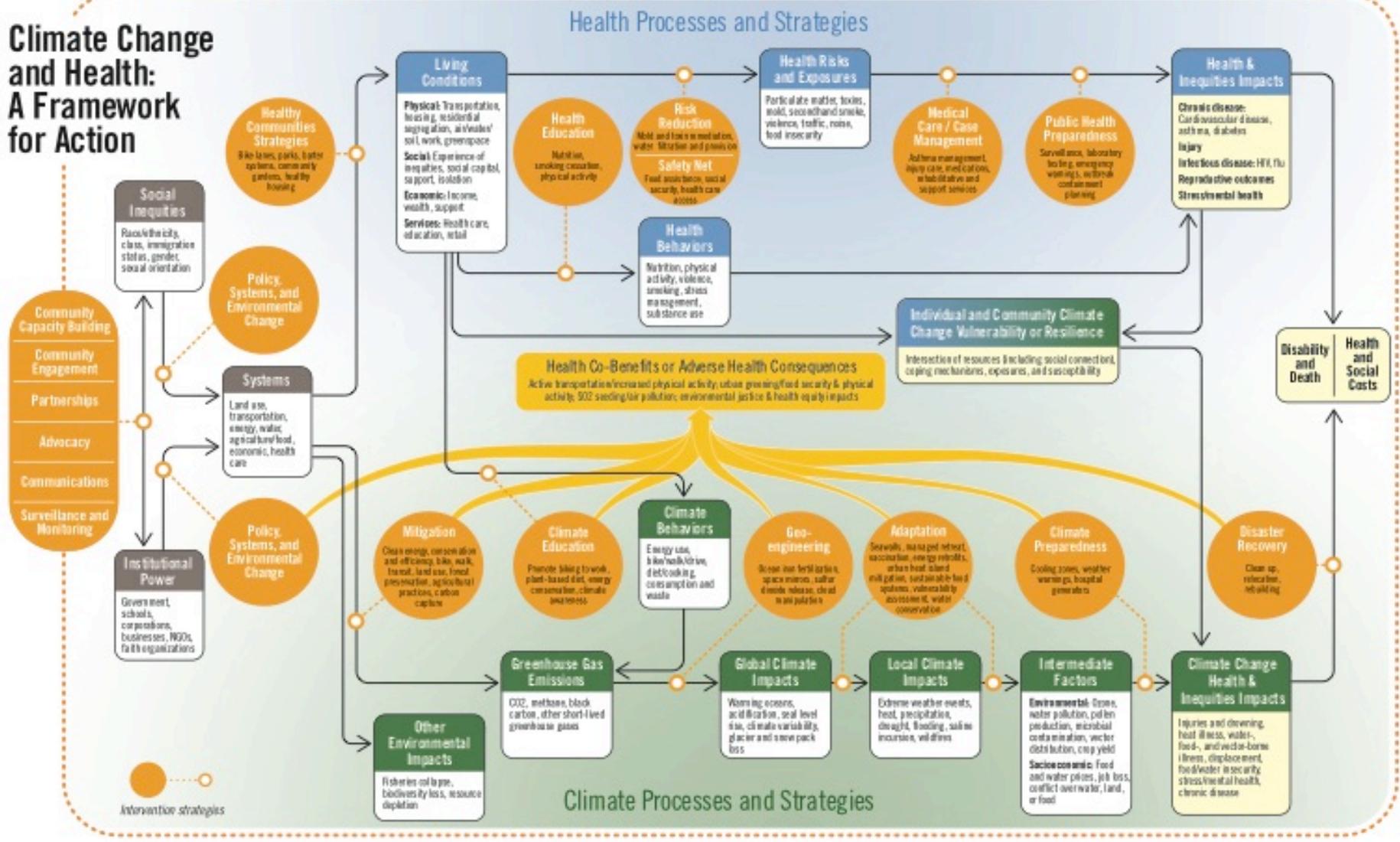
Provide guidance to local government and community partners in climate change preparedness, including the identification of potential impacts, at-risk populations, and necessary actions to reduce health impacts and create more climate-resilient communities

Build Departmental capacity for surveillance and monitoring to improve climate preparedness and response

Adopt best management practices to reduce greenhouse gas emissions associated with DPH facilities and operations (procurement, VMT, energy)

Climate change is a  
public health  
emergency.

# Climate Change and Health: A Framework for Action



Developed by the Public Health Institute's Center for Climate Change & Health. © Public Health Institute 2014

# Thank you.

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