

Health Equity In Humanitarian Crises: Climate Change & Population Health

Global Health Equity Series

Office of Global Health Equity

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Presentation Outline

- ❑ Climate Change is a Global Threat to Development and is Eroding the Modest Economic Gains Across the Developing World.
- ❑ The Global Climate Change Equity Paradox.
- ❑ Climate Change & Human Health Impacts
 - ❑ Impacts to Health from Increased Temperatures
 - ❑ Impacts to Health from Intense Storms & Floods
 - ❑ Impacts on Drinking Water Supply
 - ❑ Impacts to Health from Air Pollution
 - ❑ Impacts to Health from Vector-borne Diseases
- ❑ Addressing Equity: Health Impacts Assessments
- ❑ Addressing Equity: Improving Coping & Adaptive Capacity

Top 5 Global Risks by World Economic Forum (2020)

Top 5 Global Risks in Terms of Likelihood

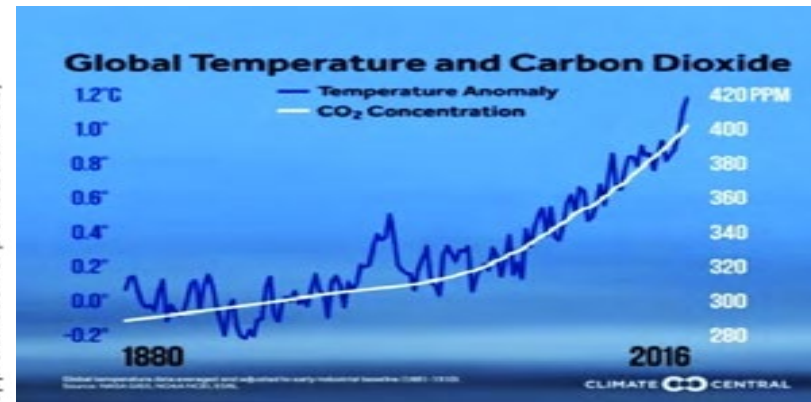
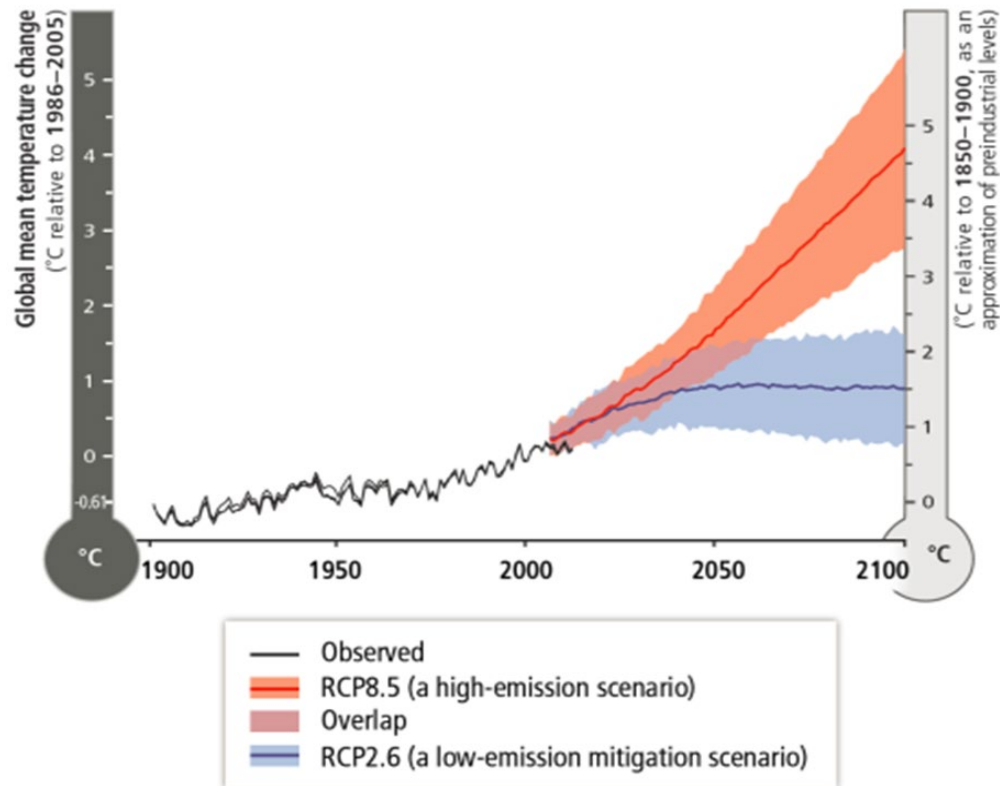
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1st	Infrastructure breakdown	Blow up in asset prices	Asset price collapse	Asset price collapse	Storms and cyclones	Income disparity	Income disparity	Income disparity	Interstate conflict	Involuntary migration	Extreme weather	Extreme weather	Extreme weather	Extreme weather
2nd	Chronic diseases	Middle East instability	China economic slowdown	China economic slowdown	Flooding	Fiscal imbalances	Fiscal imbalances	Extreme weather	Extreme weather	Extreme weather	Involuntary migration	Natural disasters	Climate action failure	Climate action failure
3rd	Oil price shock	Failed and failing states	Chronic diseases	Chronic disease	Corruption	Greenhouse gas emissions	Greenhouse gas emissions	Unemployment	Failure of national governance	Climate action failure	Natural disasters	Cyberattacks	Natural disasters	Natural disasters
4th	China hard landing	Oil price shock	Global governance gaps	Fiscal crises	Biodiversity loss	Cyberattacks	Water crises	Climate action failure	State collapse or crisis	Interstate conflict	Terrorist attacks	Data fraud or theft	Data fraud or theft	Biodiversity loss
5th	Blow up in asset prices	Chronic diseases	Deglobalization (emerging)	Global governance gaps	Climate change	Water crises	Population ageing	Cyberattacks	Unemployment	Natural catastrophes	Data fraud or theft	Climate action failure	Cyberattacks	Human-made environmental disasters

Top 5 Global Risks in Terms of Impact

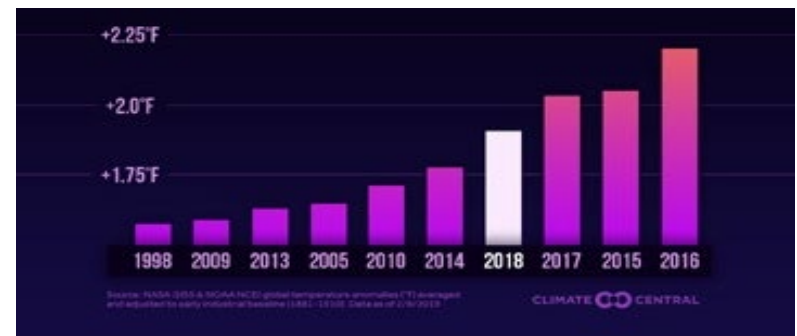
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1st	Blow up in asset prices	Blow up in asset prices	Asset price collapse	Asset price collapse	Fiscal crises	Financial failure	Financial failure	Fiscal crises	Water crises	Climate action failure	Weapons of mass destruction	Weapons of mass destruction	Weapons of mass destruction	Climate action failure
2nd	Deglobalization	Deglobalization (developed)	Deglobalization (developed)	Deglobalization (developed)	Climate change	Water crises	Water crises	Climate action failure	Infectious diseases	Weapons of mass destruction	Extreme weather	Extreme weather	Climate action failure	Weapons of mass destruction
3rd	Interstate and civil wars	China hard landing	Oil and gas price spike	Oil price spikes	Geopolitical conflict	Food crises	Fiscal imbalances	Water crises	Weapons of mass destruction	Water crises	Water crises	Natural disasters	Extreme weather	Biodiversity loss
4th	Pandemics	Oil price shock	Chronic diseases	Chronic disease	Asset price collapse	Fiscal imbalances	Weapons of mass destruction	Unemployment	Interstate conflict	Involuntary migration	Natural disasters	Climate action failure	Water crises	Extreme weather
5th	Oil price shock	Pandemics	Fiscal crises	Fiscal crises	Energy price volatility	Energy price volatility	Climate action failure	Infrastructure breakdown	Climate action failure	Energy price shock	Climate action failure	Water crises	Natural disasters	Water crises

■ Economic
 ■ Environmental
 ■ Geopolitical
 ■ Societal
 ■ Technological

Global Climate Change: The Evidence



Correlation between temperature and CO₂

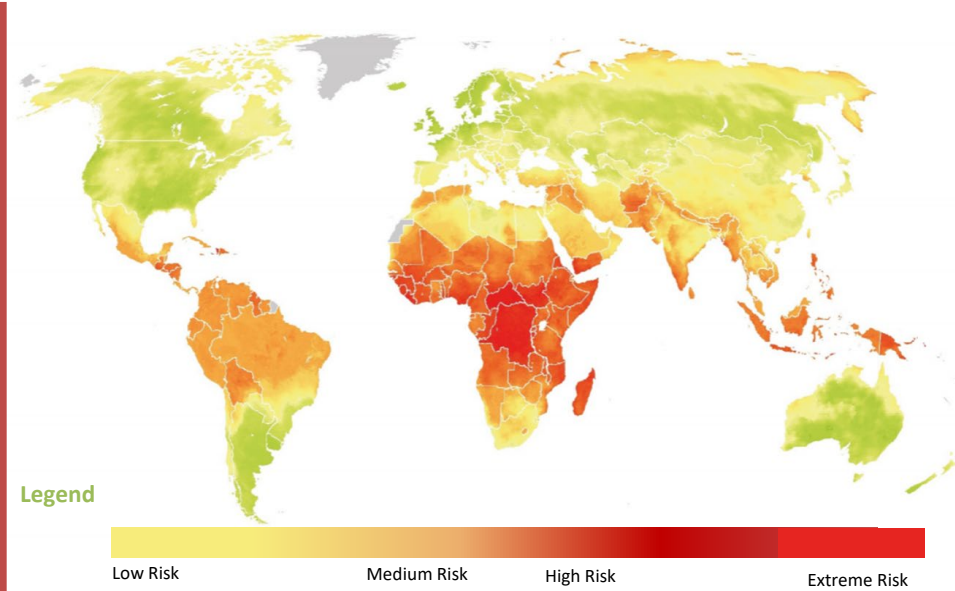


Years with the hottest months in History

The Global Climate Change Equity Paradox



Global emissions of CO2 mainly from fossil fuels (2017).



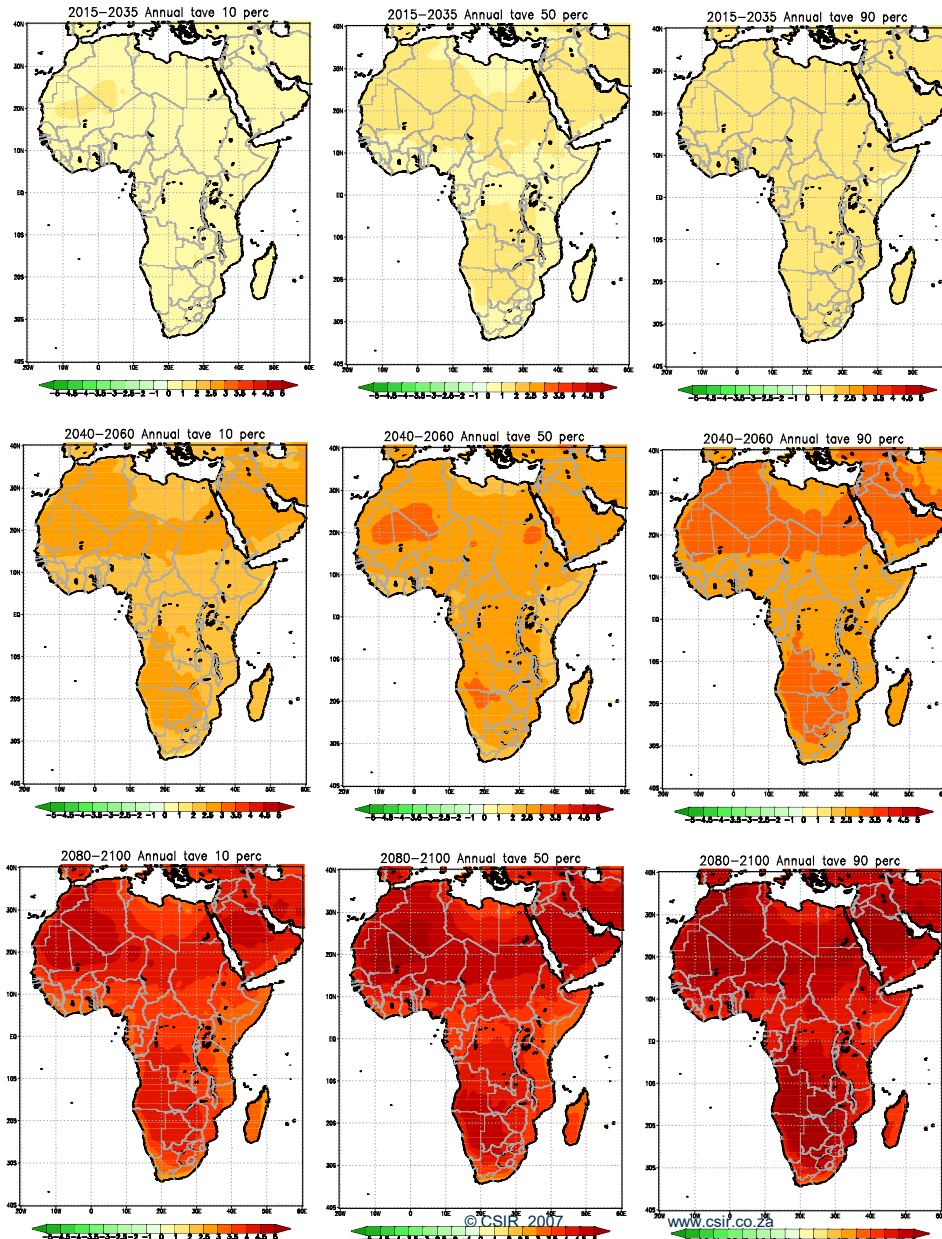
Climate change vulnerability index 2017

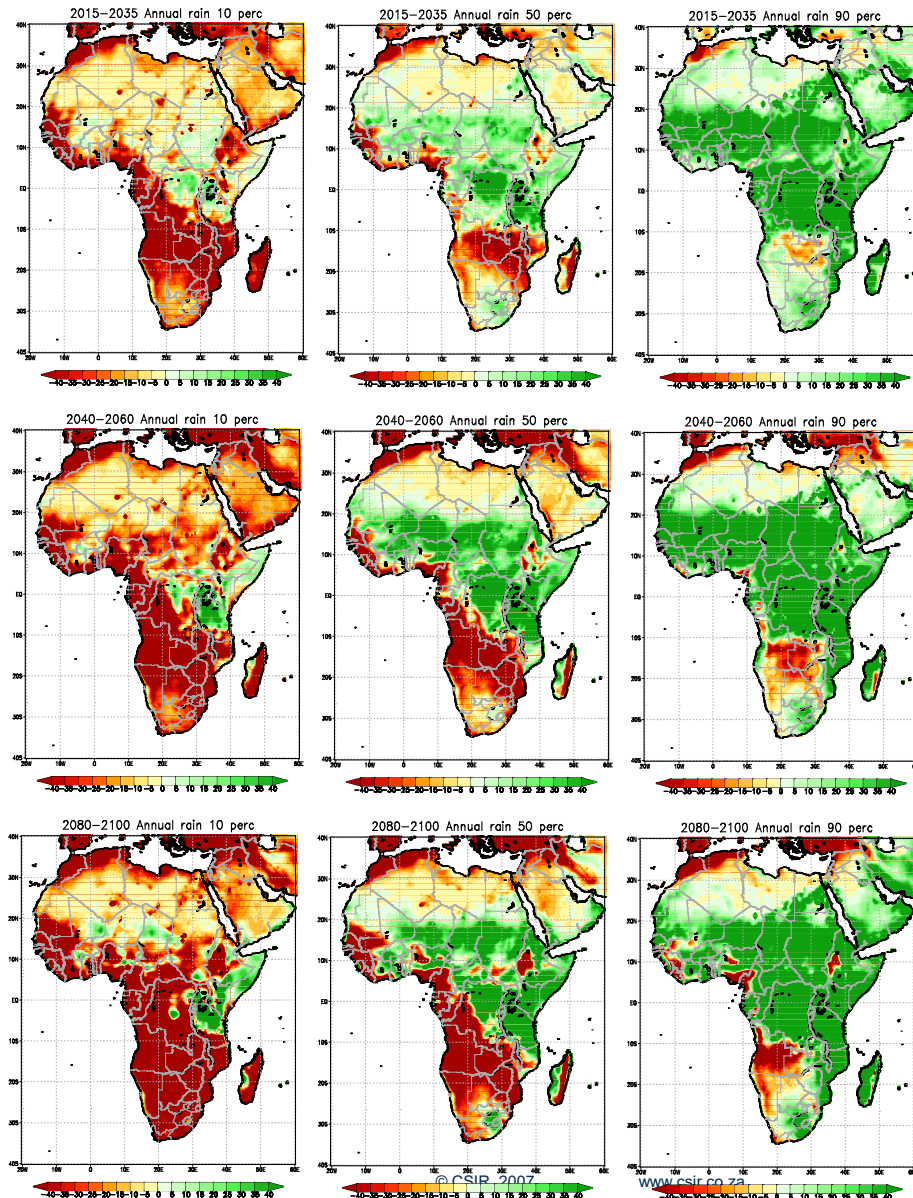
Time-slabs annual average temperature anomalies (°C) – based on six CCAM A2 SRES scenarios

Under the A2 emission scenario, temperature increases of 3 to 6 degrees C are projected for the southern African interior, for the period 2080-2100 relative to 1971-2005

Temperatures over the interior regions of South Africa are projected to rise at about twice the global rate of temperature increase

Engelbrecht, F., Adegoke, J.O., Bopape, M.M., Naidoo, M., Garland, R.M., Thatcher, M., McGregor, J.L., Katzfey, J., Werner, M., Ichoku, C., & Gatebe, C.K. (2015). Projections of rapidly rising surface temperatures over Africa under low mitigation. *Environmental Research Letters*, 10, 085004.





Time-slabs annual rainfall anomalies (mm) – based on six CCAM A2 SRES scenarios

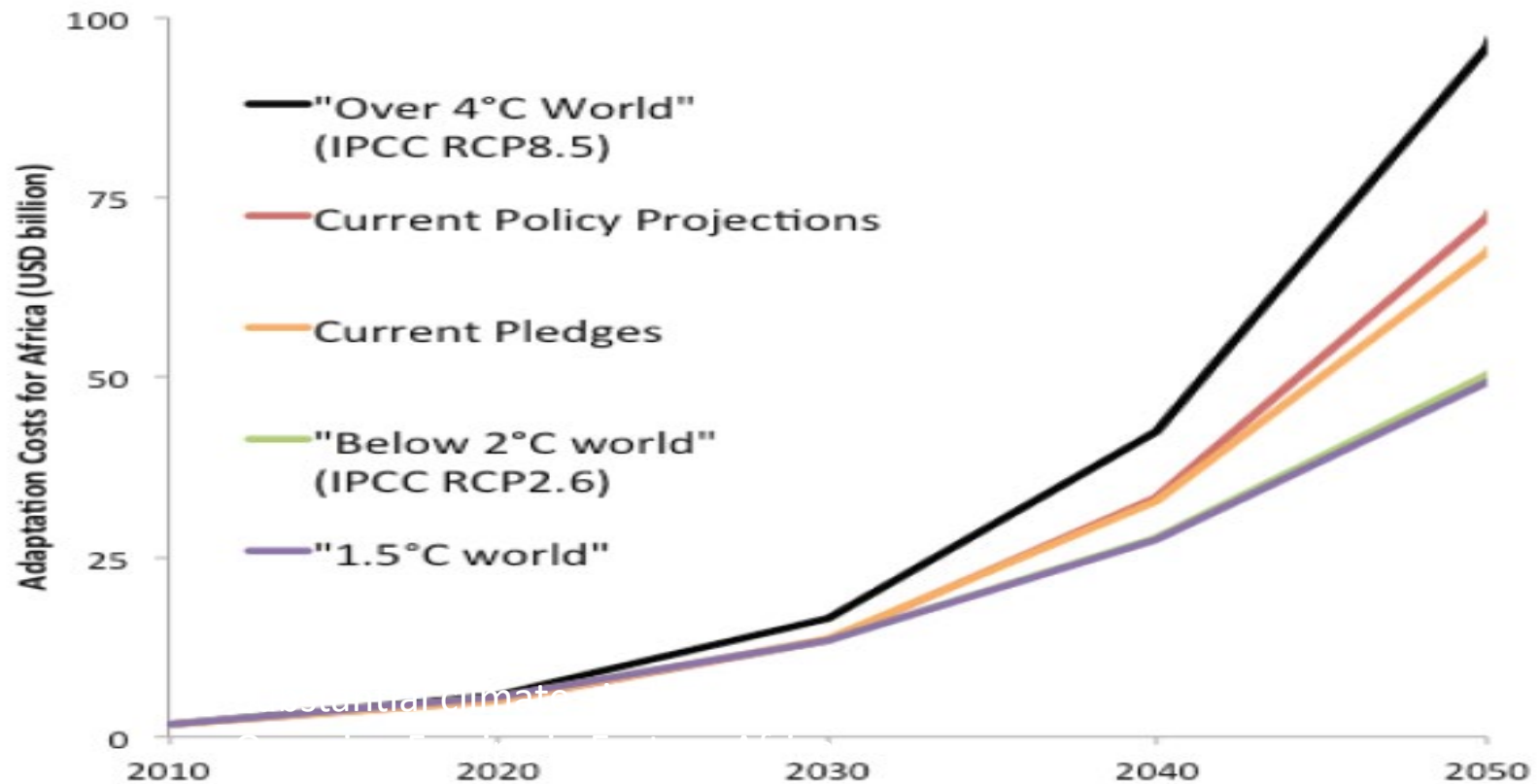
Most ensemble members project southern Africa to become generally drier under climate change

Most ensemble members project East Africa to become generally wetter under climate change

A robust signal of drying is projected for the southwestern Cape of SA.

Engelbrecht, F., Adegoke, J.O., Bopape, M.M., Naidoo, M., Garland, R.M., Thatcher, M., McGregor, J.L., Katzfey, J., Werner, M., Ichoku, C., & Gatebe, C.K. (2015). Projections of rapidly rising surface temperatures over Africa under low mitigation. *Environmental Research Letters*, 10, 085004.

Cost of Adaptation to Climate in Africa



**Sub-Saharan
Africa receives
USD 19 Bn or
just 3% of
global climate
finance**

**Approx 75% of
that is
mitigation
(private)
investment**

Destination region of climate finance, by public/private and mitigation/adaptation & dual benefit splits
(USD billion, 2017/2018 annual average)



Source: Climate Policy Initiative

The challenge is very clear

- ▶ Climate change is severely impacting our way of life
- ▶ Health Impacts are particularly Challenging
- ▶ The impacts are unevenly spread - with African countries facing some of the most extreme changes
- ▶ Our ability to adapt is unevenly spread - insurance and other financial risk sharing mechanisms in the developed world vs poverty and migration in the developing world

Volume 1

Climate Vulnerability

Understanding and Addressing Threats to Essential Resources

Volume 1: Vulnerability of Human Health to Climate



Editor-in-Chief:
Roger A. Pielke, Sr.

Volume Editors:
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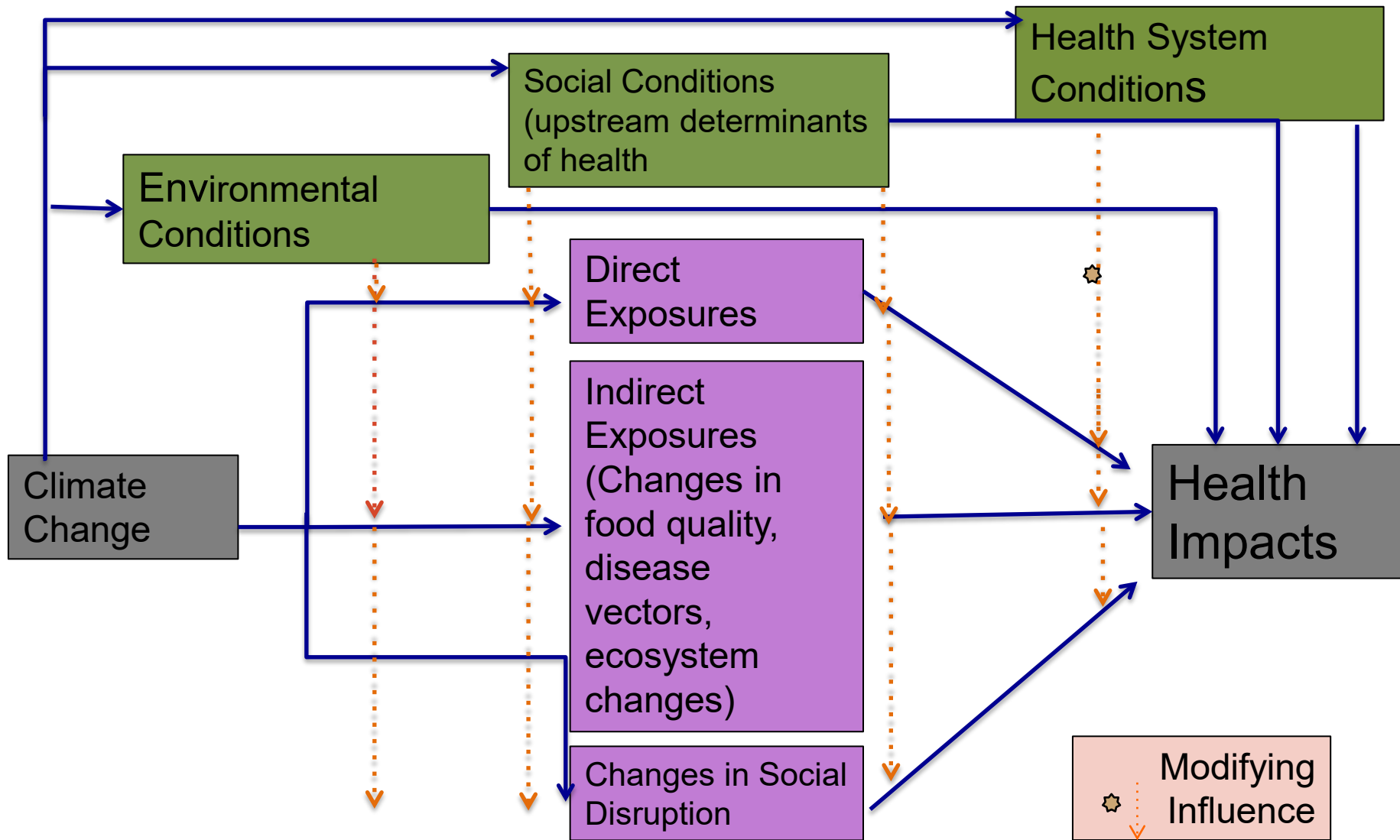
Climate Change and Health

- The WHO recognizes three kinds of climate health impacts [\[1\]](#):
 - a) Relatively direct impacts, usually caused by weather extremes
 - b) Consequences of environmental change and ecological disruption in response to climatic change
 - c) Consequences that occur when populations are demoralised and displaced by the following climate change induced factors:
 - economic dislocation,
 - environmental decline and conflict situations including traumatic, infectious, nutritional, psychological and other health consequences.

[\[1\]](#) World Health Organisation (WHO). 2003. Climate change and human health: risks and responses.

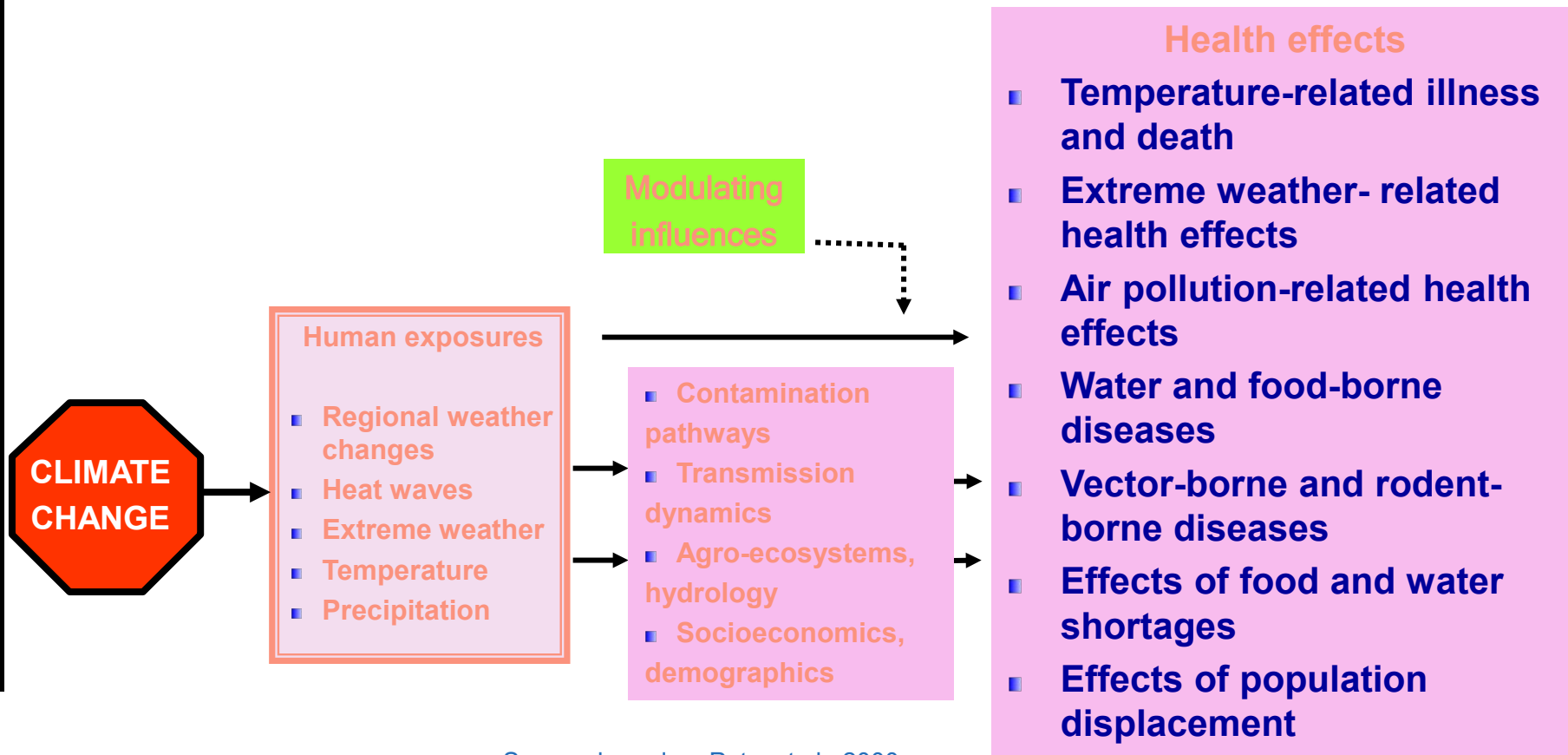


Pathways for Weather to Affect Health



Mapping Links Between Climate Change and Health

- Most expected impacts will be adverse but some will be beneficial.
- Expectations are not for **new health risks**, but rather changes in frequency or severity of familiar health risks



Source: based on Patz, et al., 2000



Temperature: Impacts to Health from Increased Temperatures

- Direct impacts to health:
 - a) **Heat cramps** – muscular pains and spasms
 - b) **Heat exhaustion** – body fluids are lost through heavy sweating
 - c) **Heat stroke** – is life threatening.
- Indirect impacts:
 - a) Range of areas that can potentially be affected with gradual and extreme temperature increases
 - b) Includes impacts on ecosystems, water, food, disease-carrying vectors, lifestyle, community resilience.





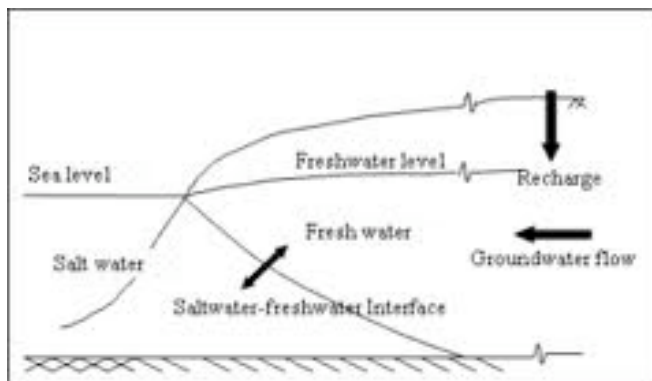
Intense Storms & Floods: Health Impacts of Floods

- Immediate deaths and injuries
- Non-specific increases in mortality
- Infectious diseases – leptospirosis, hepatitis, diarrhoeal, respiratory, and vector-borne diseases
- Exposure to toxic substances
- Mental health effects
- Indirect effects
- Increased demands on health systems.



Climatic Change: Impacts on Drinking Water Supply

- Reduction in flows to dams and groundwater aquifers
- Increased evaporation from surface water storages
- Salt water intrusion into coastal aquifers
- Acidification of susceptible inland aquifers
- Increased risk from the:
 - a) Concentration of nutrient and chemical contaminants
 - b) Formation of toxic algal bloom



Air Quality: Potential Health Impacts

- Ozone – pneumonia, COPD, asthma, allergic rhinitis and others – premature mortality
- Particulate matter (PM) – known to affect morbidity and mortality
- Toxic gases and PM from fires contribute to acute and chronic respiratory illness. Evidence from 1997 Indonesia fires – transboundary impacts
- Wind blown dust (respirable particles, trace elements) from desert regions can affect populations in remote areas. Evidence that mortality is increased in the days after a dust storm.



A fire in a tropical peat forest on Sumatra in Indonesia

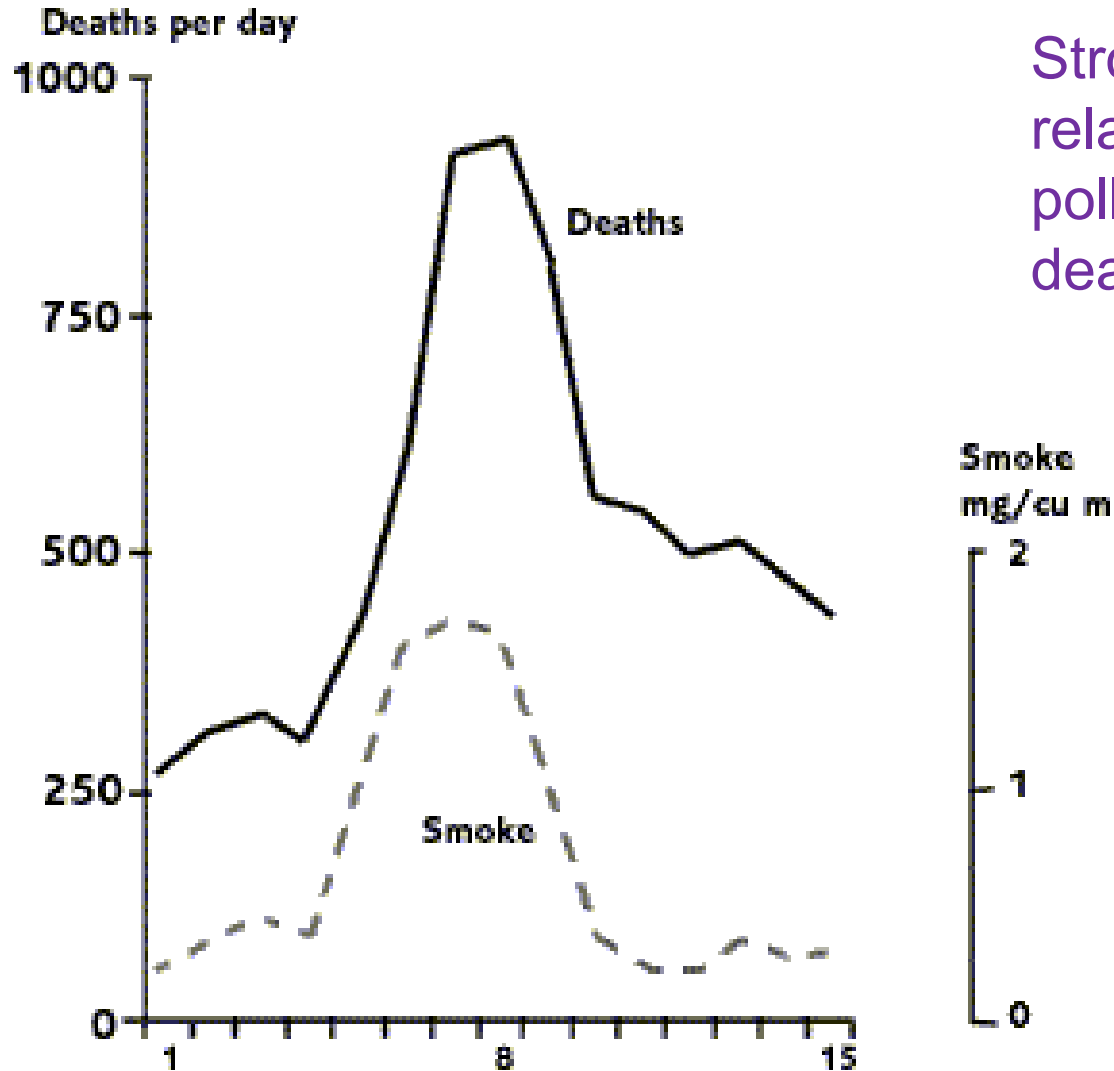
Foran Legert

Why should we be concerned about Air Pollution?

- Historical experience provides strong evidence for causal relationship between air pollution and premature death
- Modern epidemiology studies have consistently found significant associations
- Poor urban air quality is a business cost and disincentive for attracting new investments



London Killer Fog, December, 1952

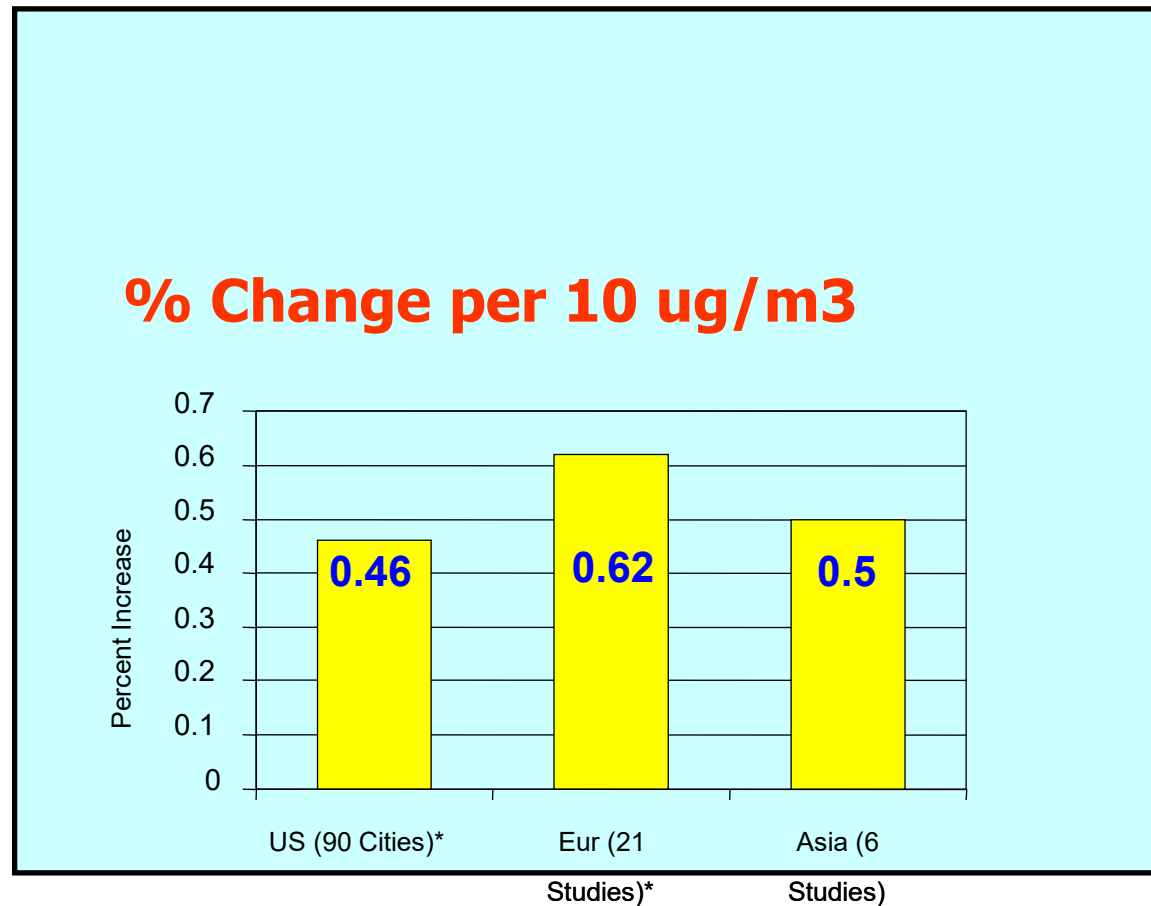


Strong evidence for causal relationship between air pollution and premature death.



Source: UK Met Office <http://www.metoffice.gov.uk/education/secondary/students/smog.html>

Acute Mortality Responses to PM in US, Europe & Asia

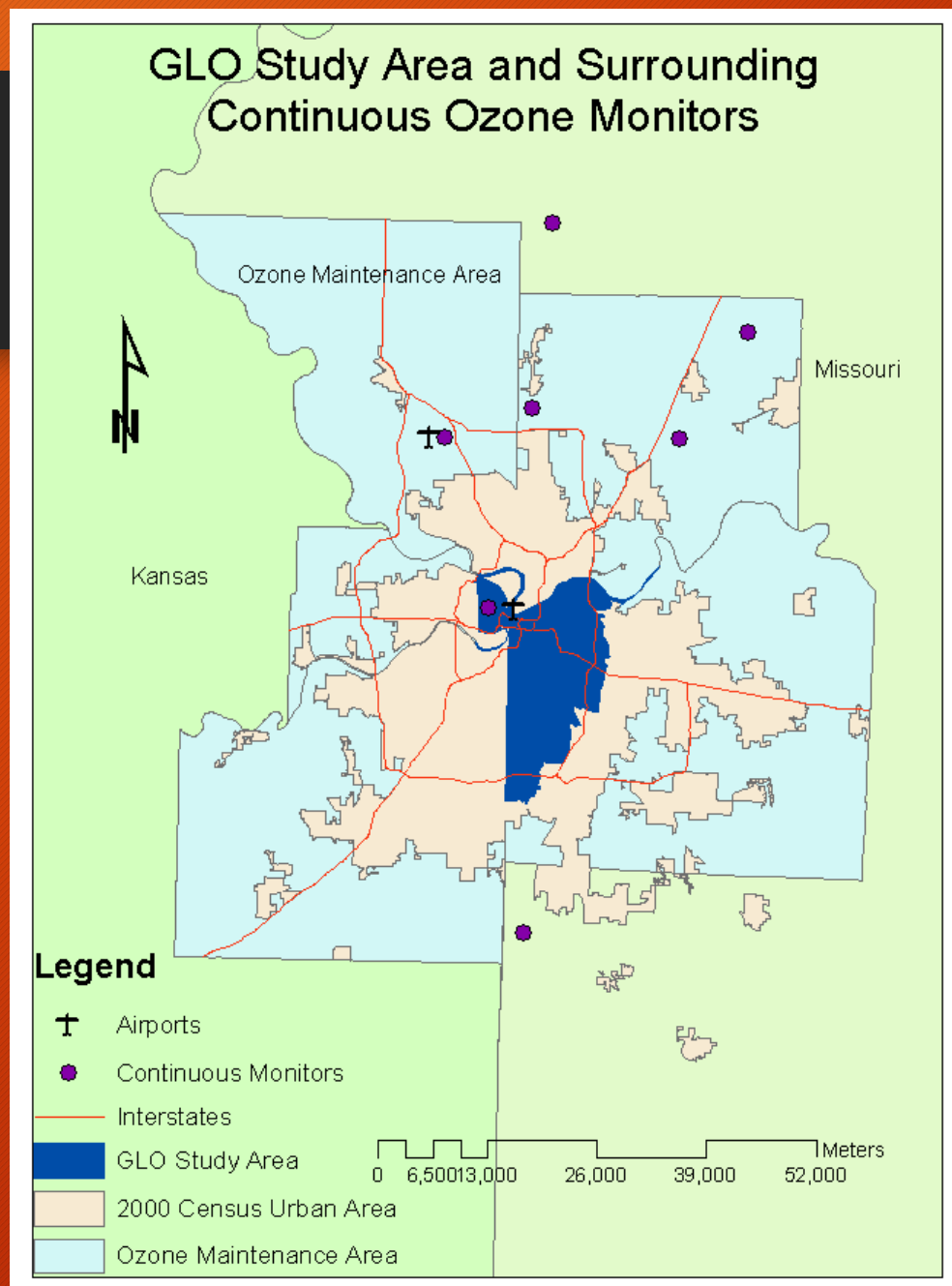


Source: Greenbaum and O'Keefe, BAQ 2003



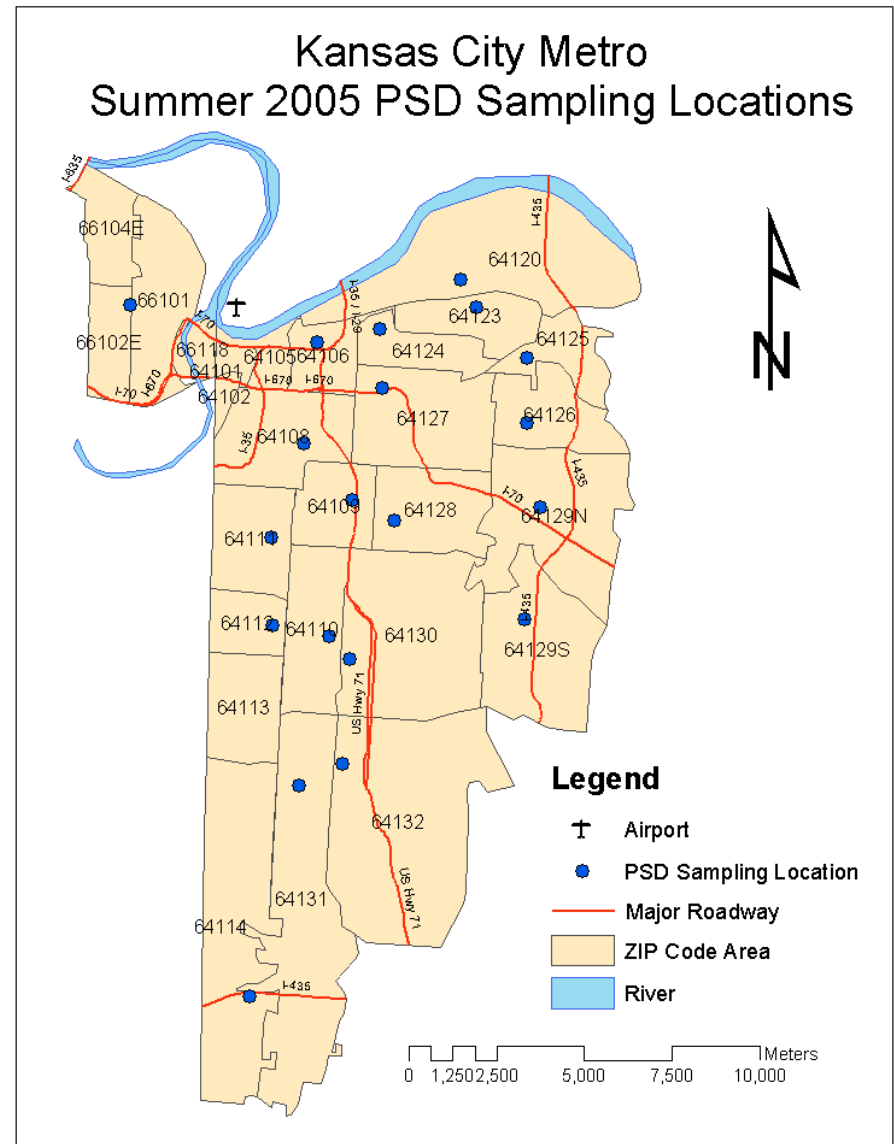
Kansas City Air Quality Measurement Network

- Seven monitors in KC Metro-area
- Only one in urban core
- Urban core of KCMO (area south of the MO river and bounded by State Line to the west, 435 to the south & West)



Measuring Ground Level Ozone in Kansas City - Pilot Study

- Deployed Passive Sampling Devices at almost every ZIP code
- One site co-located with continuous monitor
- Mostly high-density residential (urban core)
- A few suburban and one industrial for comparison



Passive Sampling Device (PSD)

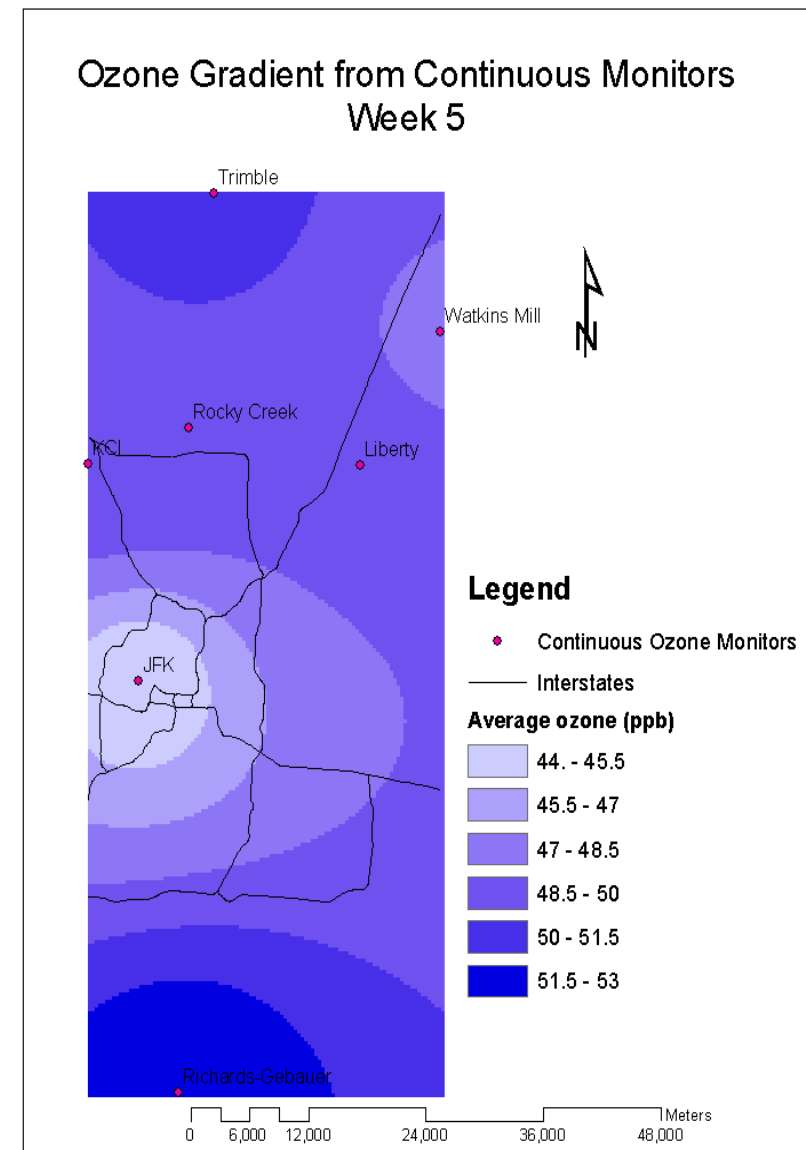
- Small cartridge containing two filter pads treated with nitrite
- Nitrite is oxidized to nitrate by ozone on equimolar basis
- Concentration of ozone can be determined by ion chromatography



What we found out in Kansas City

- Continuous monitors show ozone higher outside the city
- Consistent with ozone forming over time during transport

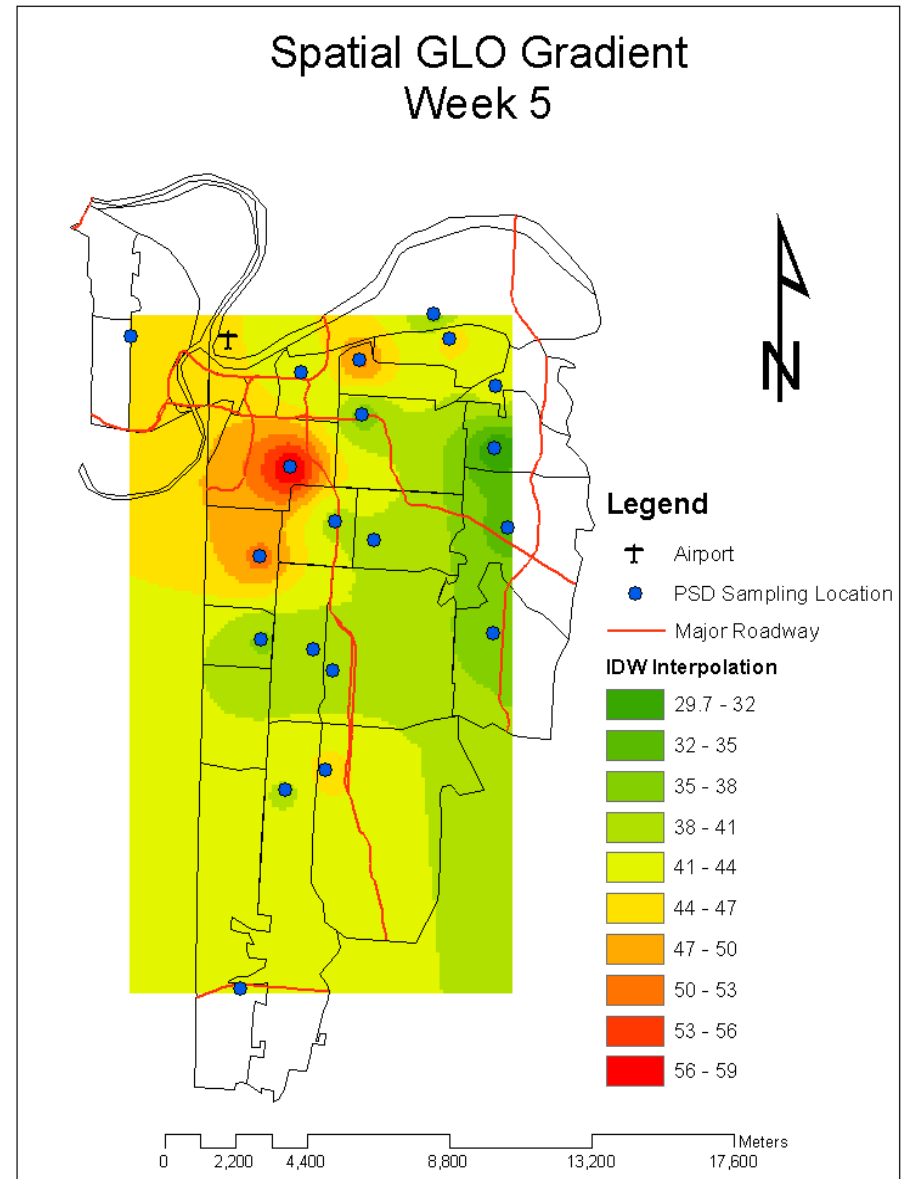
3 exceedances: RC, RG, Trimble



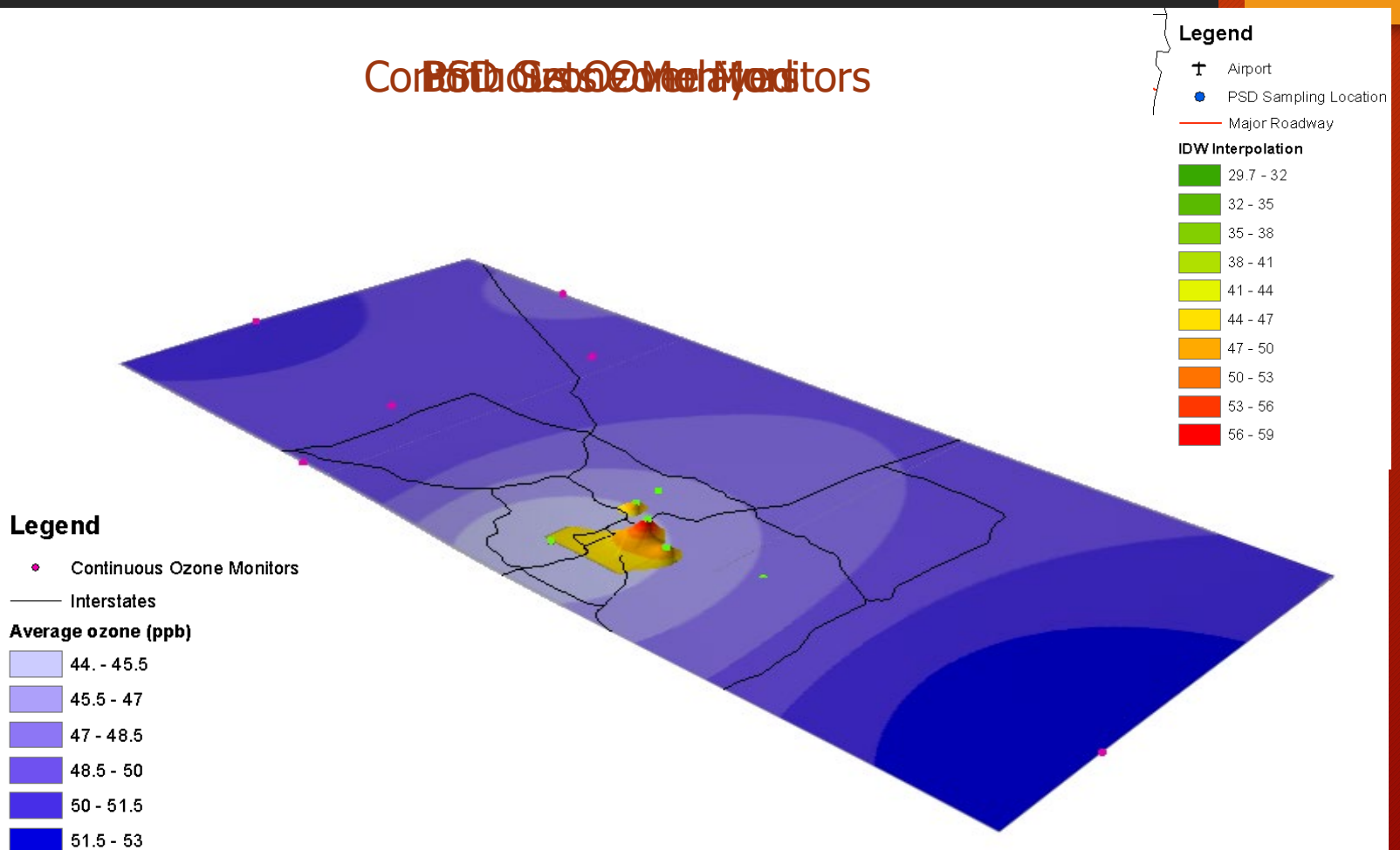
Adegoke J. et. al., 2010: The Kansas City, Missouri, ground-level ozone (GLO) project: a community-based air pollution field experiment. J Environ Health 73(1):8-13

What we found out in Kansas City

- Higher-density sampling of PSDs show a persistent high ozone peak in the central portion of the city
- Not resolved by continuous monitors due to
 - Wider network
 - Sitting requirements



What we found out in Kansas City



What we found out in Kansas City (1)

- Higher ozone concentration levels were found outside of all the interstate buffers of a quarter mile, half mile, and one mile.
- Passive sampling devices are effective and relatively cheap method of assessing air quality concentrations at detailed spatial resolutions

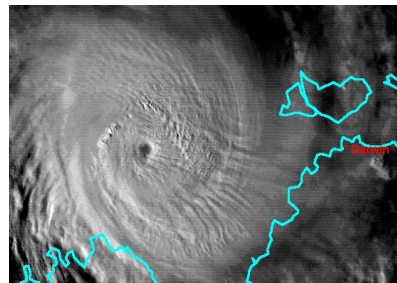
What we found out in Kansas City (2)

- The population exposure analyses revealed that sections of the study area with 25% or more minorities had an average ground level ozone concentration that was three parts per billion higher than the group of census tracts with less than 25% minorities.

Vector-Borne Diseases: Environmental Drivers

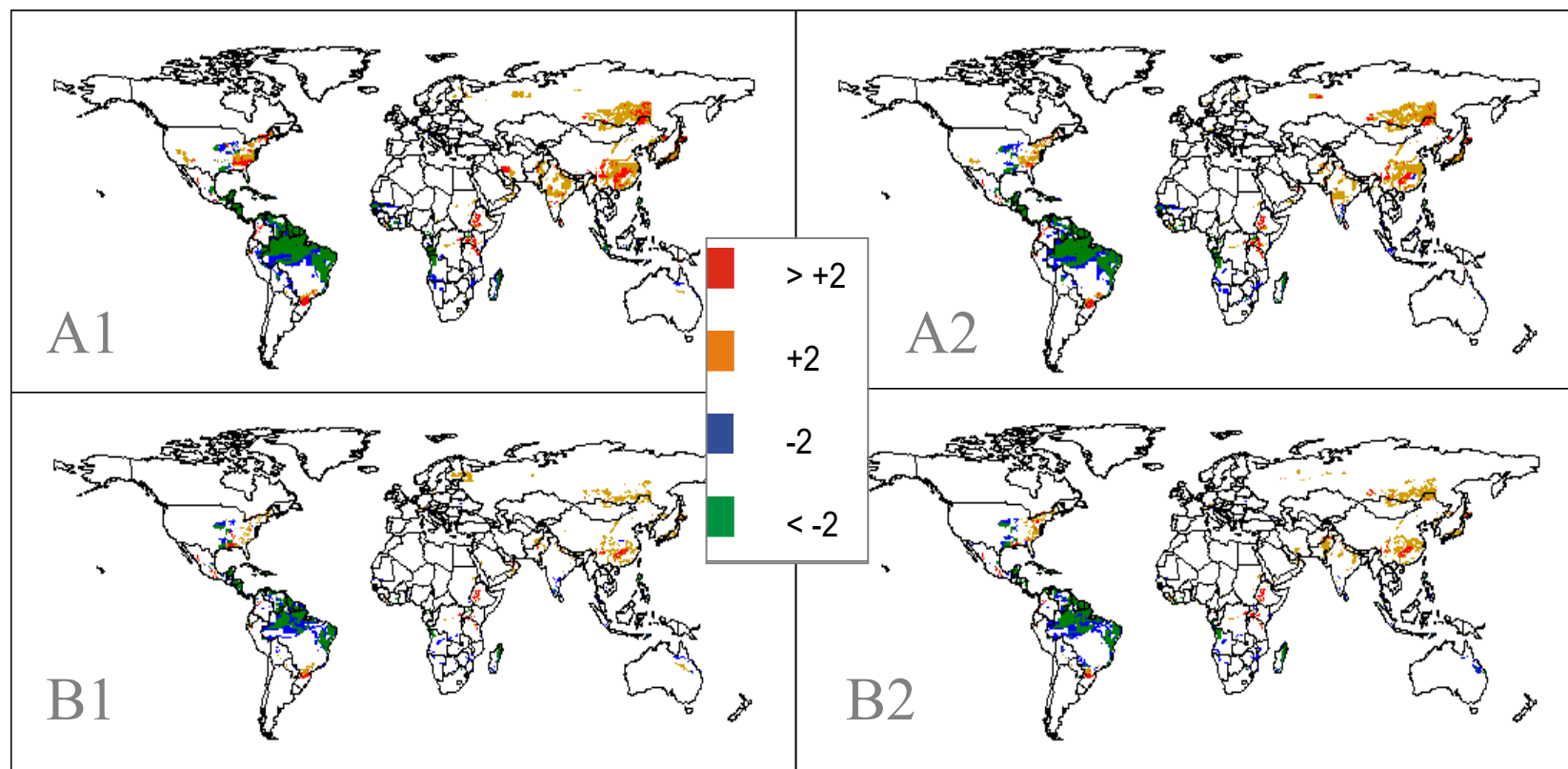
Distribution of vectors will change arising from:

- Increasing temperature
- Changing rainfall:
 - a) Increase or decrease
 - b) Seasonality
- Cyclones, flooding
- Changes in animal host/reservoir populations
- Rising sea levels
- Extreme tides
- Loss of coastal margins.



Climate Change and Malaria under Different Scenarios (2080)

- Increase: East Africa, Central Asia, Russian Federation
- Decrease: Central America, Amazon [within current vector limits.



ADDRESSING EQUITY: HEALTH IMPACT ASSESSMENT OF CLIMATE CHANGE



Questions That Should be Addressed

- What is the current population profile of the country or region?
- What diseases are important in the country or region including climate-sensitive disease?
 - a) What is the current burden of these diseases?
- What factors other than climate should be considered?
 - a) Water, sanitation, etc.
- Where are data available?
- Are health services able to satisfy current demands?



Focus on Vulnerable Populations

- Elderly
 - Children (immature immune response)
 - Socio-economically disadvantaged
 - Women, especially pregnant and breastfeeding women
 - The obese
 - Those who are not acclimatized, e.g. new arrivals
 - Those who have underlying medical conditions or immuno-compromised especially cardiovascular disease
 - Athletes and other participants in outdoor recreational activities
 - Manual labourers, outdoor workers
 - Mentally ill, disabled and homeless
 - Physically unfit – reduced vital capacity
-



Understand Local Changes Affecting Health

It is important to have a good understanding of local predicted changes in relation to:

- **Biophysical environment:**
 - a) Encompassing major impacts related to physical environment, including temperature, water quality, air quality and biodiversity
 - **Social environment:**
 - a) Encompassing the wide range of social impacts, population displacement and mental health impacts
 - **Service and infrastructure:**
 - a) The range of impacts as it relates to services, infrastructure and economics, including resource availability and access to a range of health, emergency and other services
 - **Environmental diseases:**
 - a) Impacts related to production of food, vector-borne and food-borne disease and other environmental diseases.
-



ADDRESSING EQUITY: IMPROVING COPING CAPACITY & ADAPTIVE CAPACITY





Coping Capacity

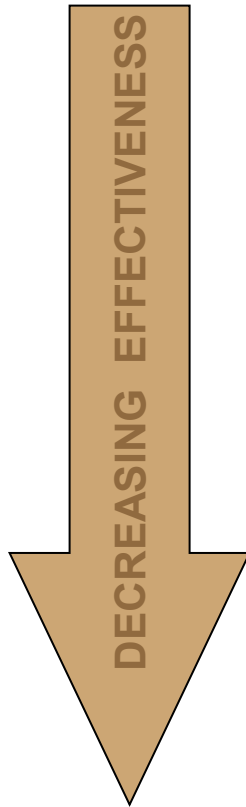
Describe what is being implemented now to minimize negative effects

Health impacts	Current controls	Limitations	Effectiveness in 2030	Gaps for 2030	Sectors involved





Stages of Adaptation



- Primary – prevent onset of health impact
- Secondary – preventative measures taken in response to early evidence of impact
- Tertiary – actions to lessen the health effects

Types of Adaptation

Adaptation responses may be of the form:

- Legislative or regulatory
- Public education or communication
- Surveillance and monitoring
- Ecosystem intervention
- Infrastructure development
- Technological/engineering
- Health intervention
- Research/ further information



“Only when countries can provide health services to all, including those in greatest jeopardy from climate change, will we achieve our goals of promoting health, keeping the world safe, and protecting the vulnerable”

**Thank
• You**



Dr Tedros Adhanom Ghebreyesus

Director-General



**World Health
Organization**