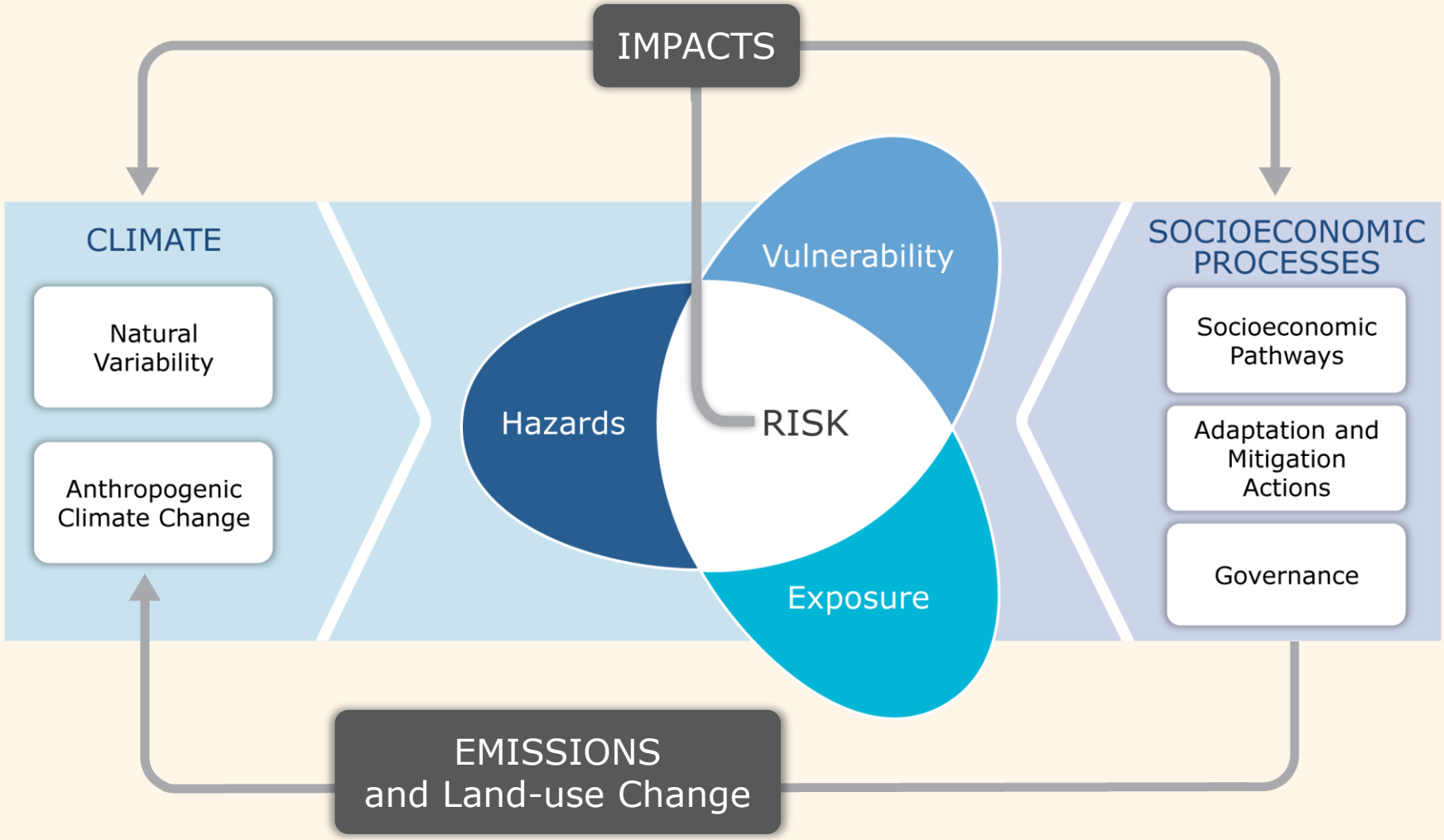
Climate Change and Human Health

Kristie L. Ebi, Ph.D., MPH
Professor, Department of Global Health and Department of Environmental and Occupational Health Sciences

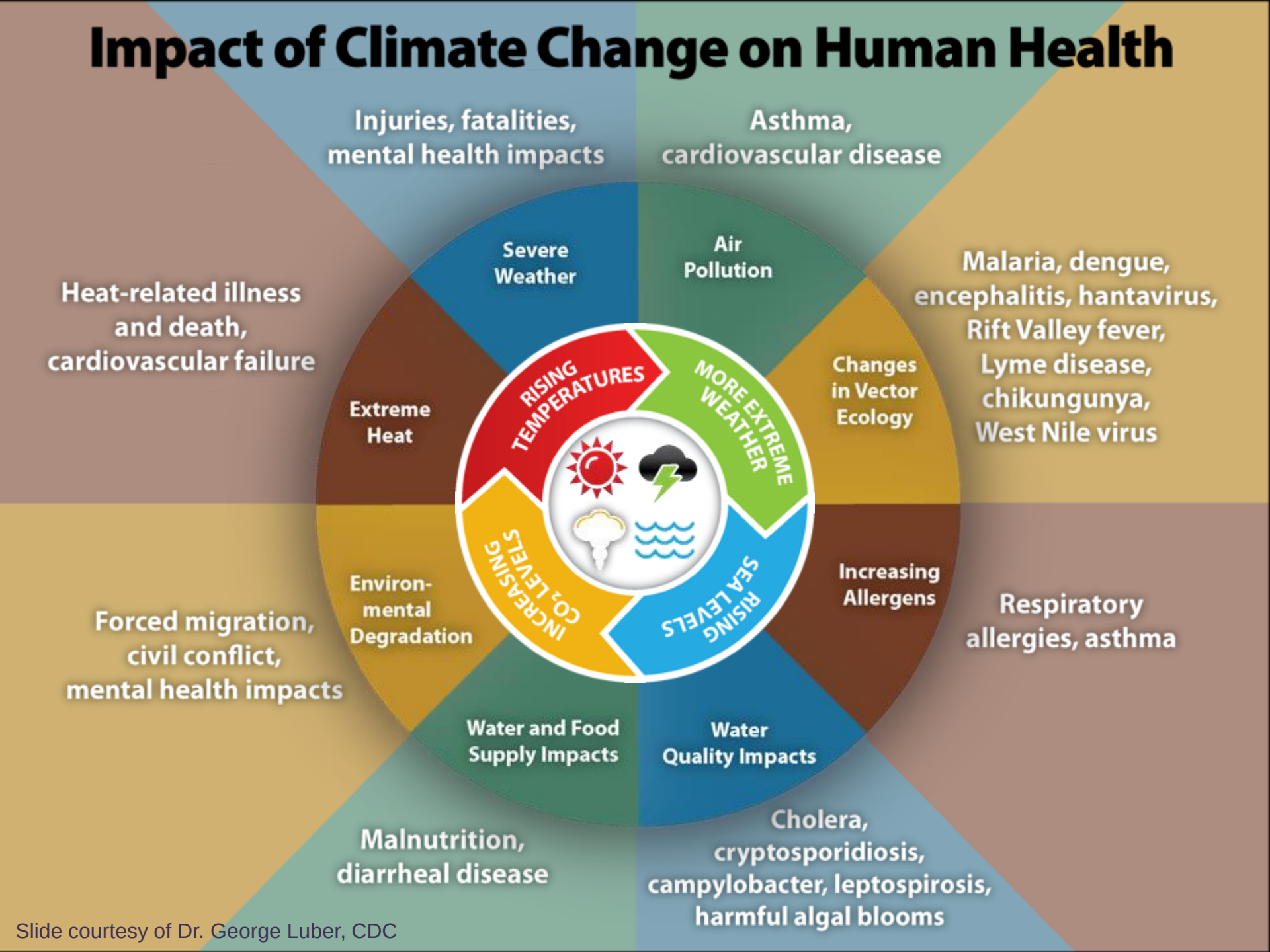
UW Medicine
SCHOOL OF MEDICINE

DEPARTMENT OF GLOBAL HEALTH
UNIVERSITY of WASHINGTON

SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON


IMPACTS
CLIMATE
Natural Variability
Anthropogenic Climate Change
Vulnerability
Hazards
RISK
Exposure
SOCIOECONOMIC PROCESSES
Socioeconomic Pathways
Adaptation and Mitigation Actions
Governance
EMISSIONS and Land-use Change

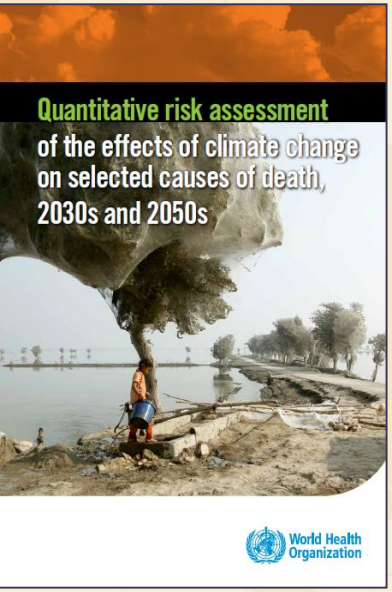
Impact of Climate Change on Human Health

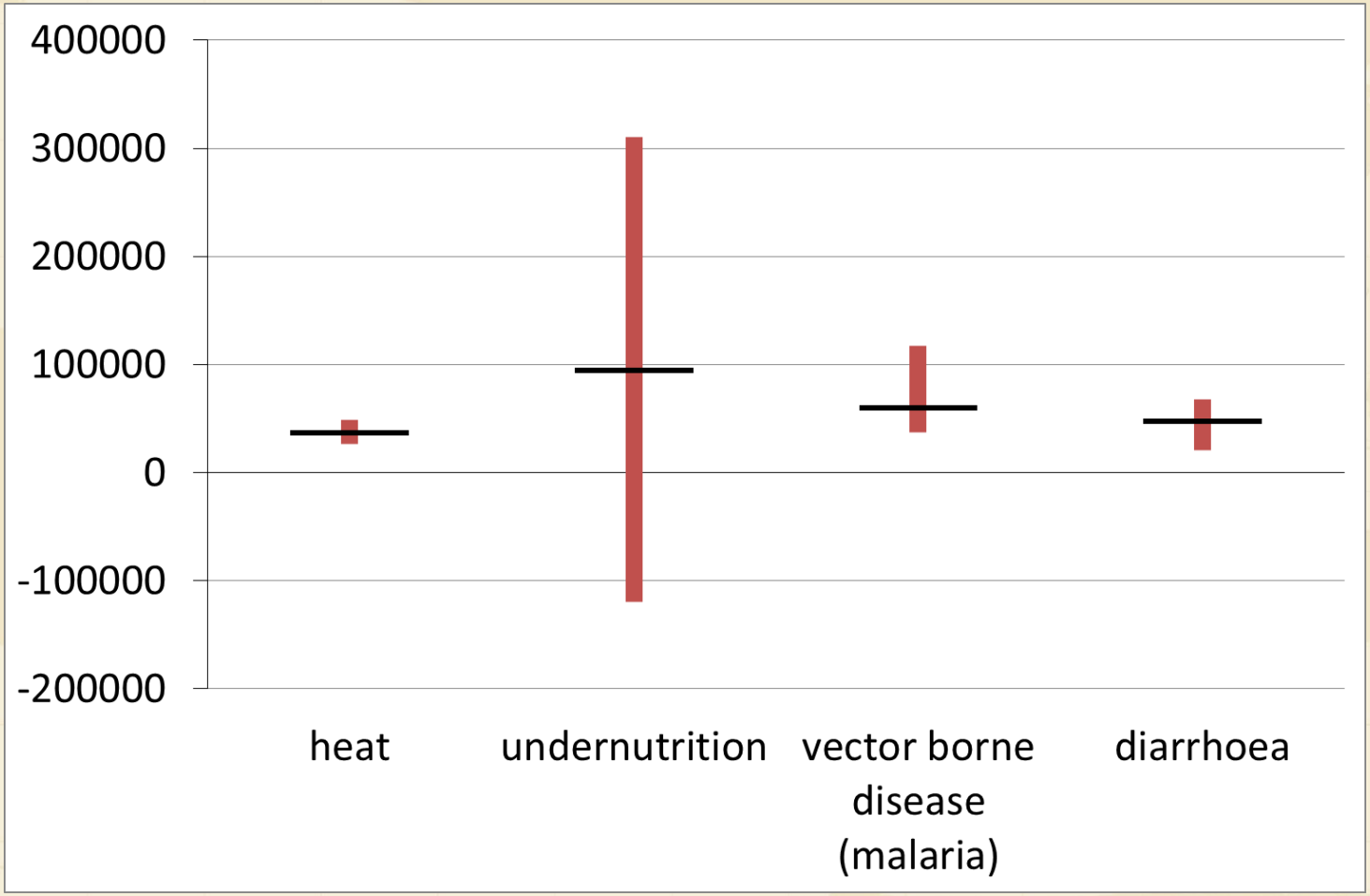


Slide courtesy of Dr. George Luber, CDC

- Reduce exposures
  - Legislative policies
  - Alterations in built environment
  - Alterations in natural environment
- Prevent onset of adverse outcomes
  - Early warning systems
  - Surveillance and monitoring
  - Vector control programs
  - Public education and outreach
- Response / treatment
  - Medical training and awareness
  - Treatment
  - Emergency response

Estimates of mortality due to climate change, 2030s: approximately 250,000 excess deaths/year





WHO 2014

Impact of tropical cyclone Heta on Niue's hospital, 2004

Howorth et al. 2004

Russia 2010
1 month heat wave and fires
Approximately 11,000 excess deaths

The 2003 heatwave in Andhra Pradesh

- Temperatures in Andhra Pradesh rose to 54°C
- At least 3,000 people died

Photo: Refugee Study Centre

Impacts of thermal extremes

Photo: CBS News 2002

The health impacts of thermal extremes are not limited to mortality. There are significant adverse social impacts with reduced worker productivity.

Photo: BBC News 2000

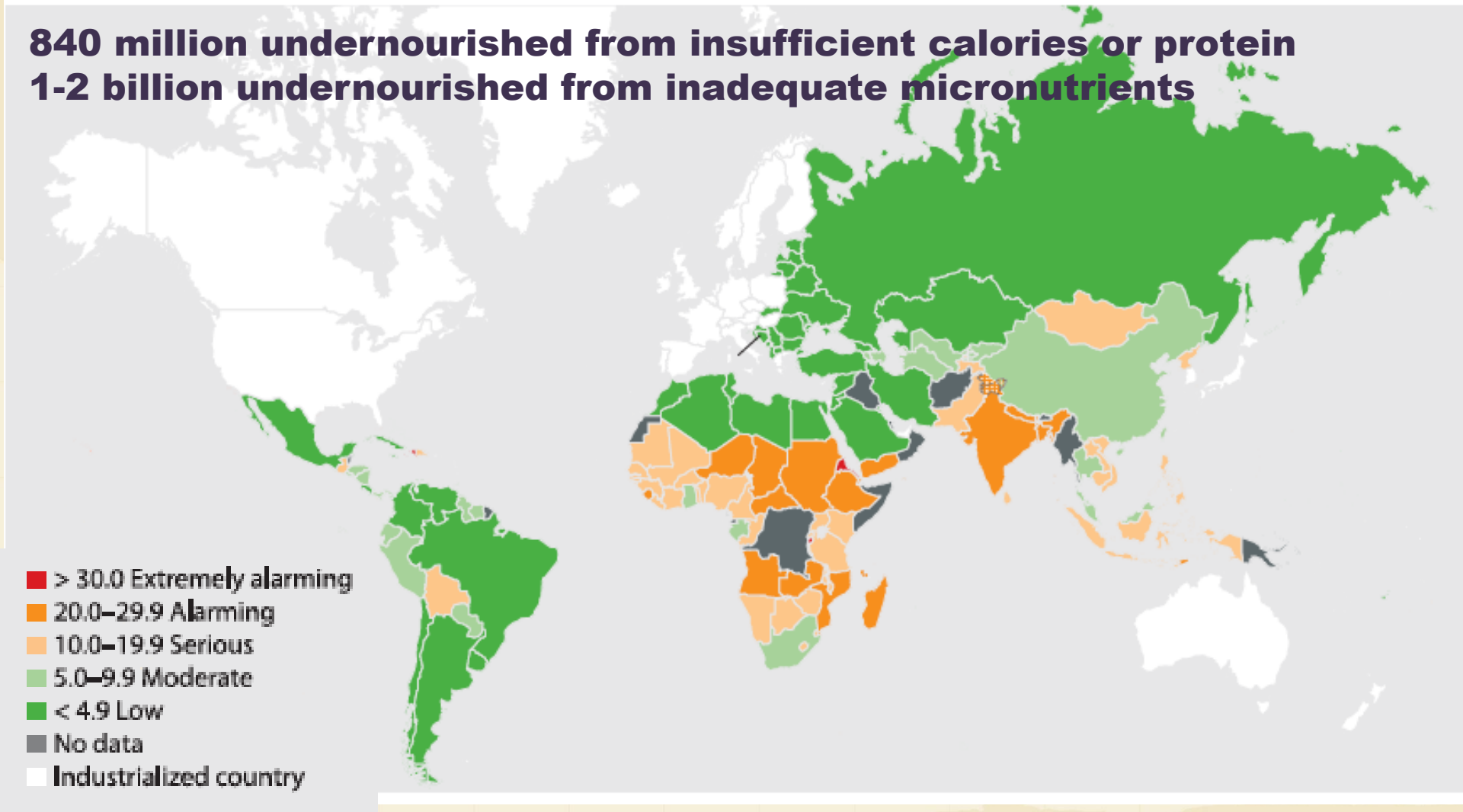
This canine friend is not amused. Photo: TT

Sweden agency hikes heat warning to 'extreme'

Published: 24 Jul 2014 09:41 GMT+02:00
Updated: 24 Jul 2014 09:41 GMT+02:00

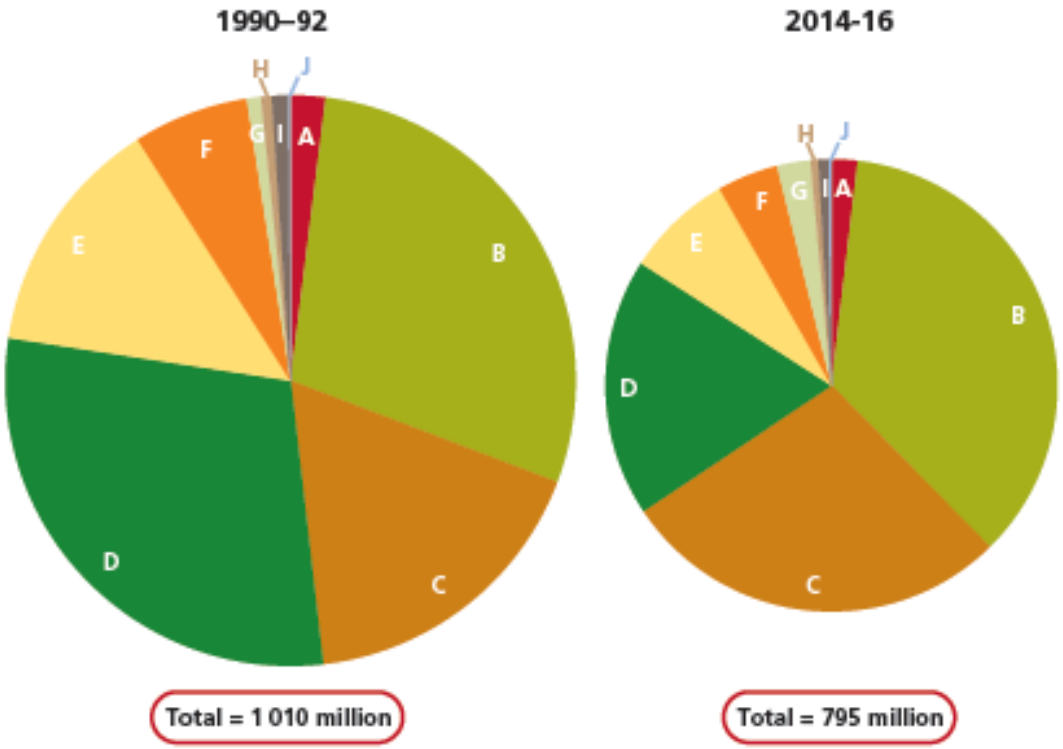
Swedish weather agency SMHI has raised its weather warning to class 2, giving notice of "extremely high temperatures" in parts of the country.

Global hunger map: 2012

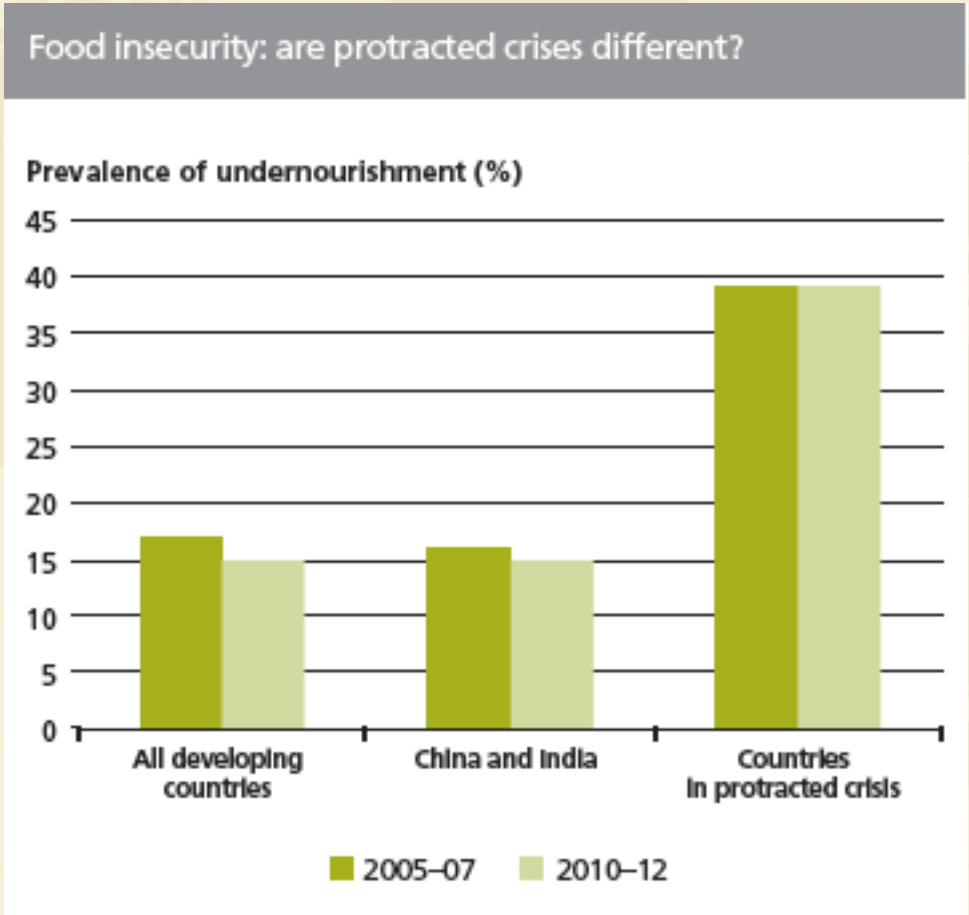


Source: IFPRI

The changing distribution of hunger in the world: numbers and shares of undernourished people by region, 1990–92 and 2014–16



	Number (millions)		Regional share (%)	
	1990–92	2014–16	1990–92	2014–16
A Developed regions	20	15	2.0	1.8
B Southern Asia	291	281	28.8	35.4
C Sub-Saharan Africa	176	220	17.4	27.7
D Eastern Asia	295	145	29.2	18.3
E South-Eastern Asia	138	61	13.6	7.6
F Latin America and the Caribbean	66	34	6.5	4.3
G Western Asia	8	19	0.8	2.4
H Northern Africa	6	4	0.6	0.5
I Caucasus and Central Asia	10	6	0.9	0.7
J Oceania	1	1	0.1	0.2
Total	1 011	795	100	100

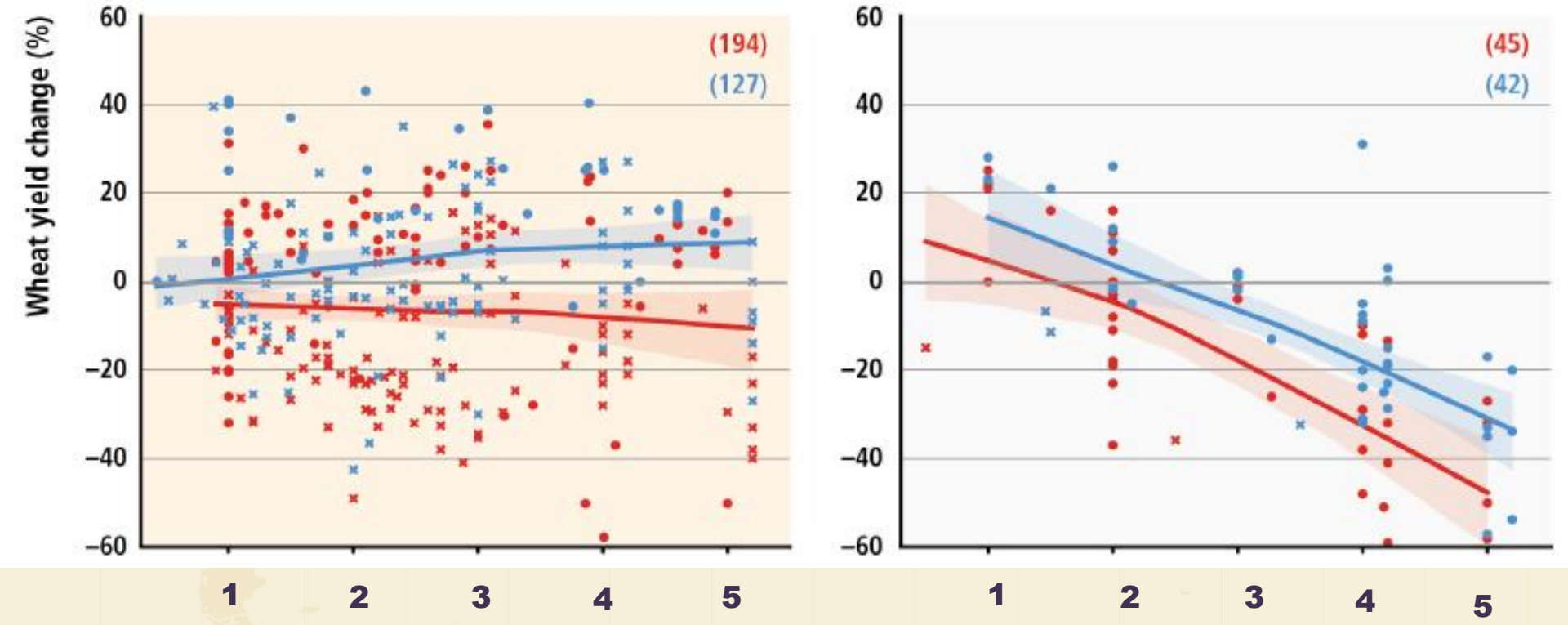


- In 2012, 366 million people in 20 countries lived in protracted crisis
  - 129 million were undernourished or 19% of the global total of food-insecure people
- Prevalence of undernourishment in these countries was 39% compared with 15% for the rest of the world

Typology of crises shifted over the past 30 years to more structural, longer-term, and protracted situations resulting from a combination of factors, especially natural disasters and conflicts, with climate change increasingly among the exacerbating factors

FAO 2015

%age simulated change in wheat yields as a function of local temperature change

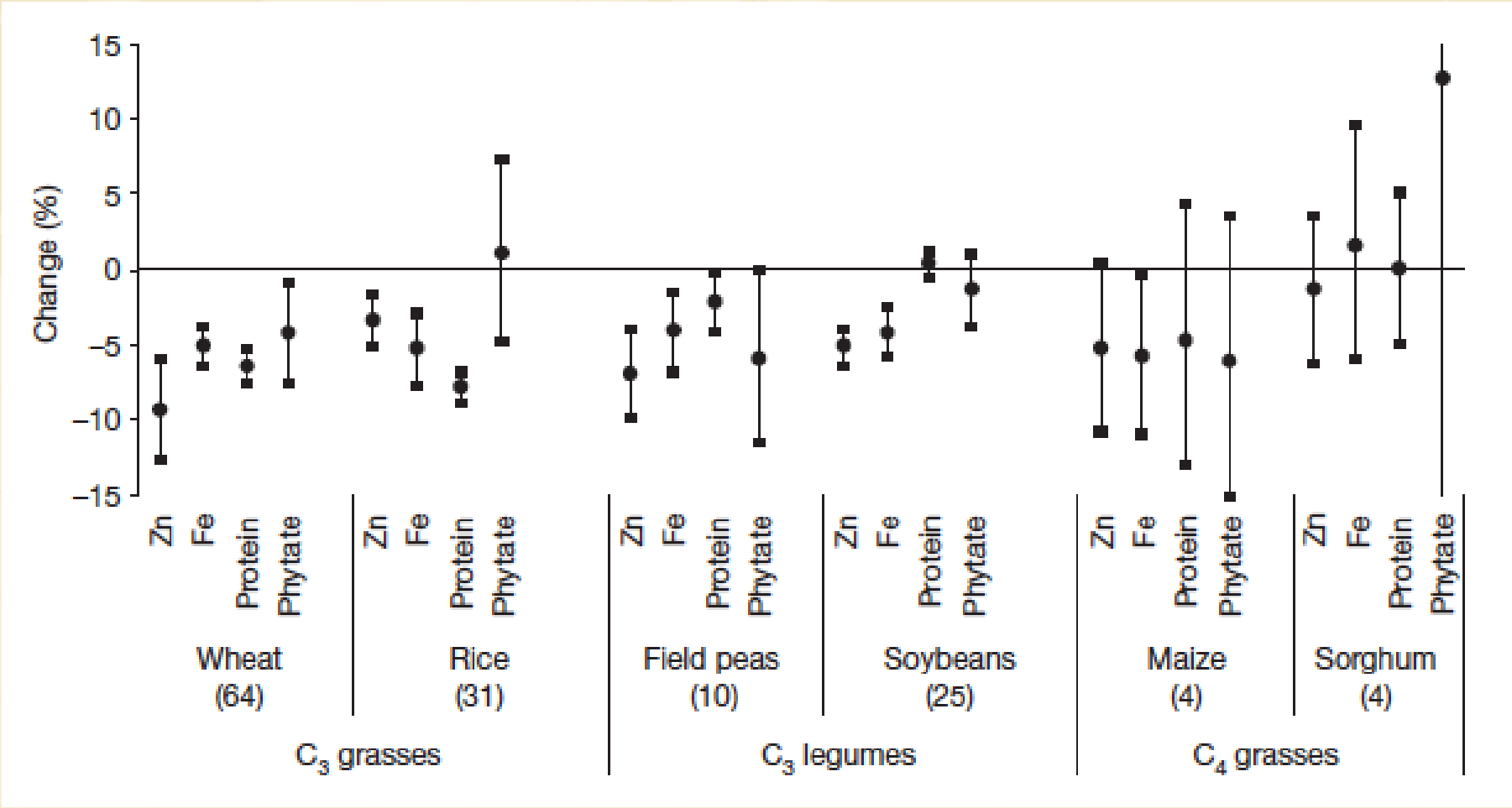


IPCC 2014

Table 11-2: Number of under-nourished children less than 5 years of age (in millions) in 2000 and 2050, using the NCAR (National Center for Atmospheric Research) climate model (and the A2 scenario from AR4). Results assume no effect of heat on farmers' productivity, and no CO_2 fertilization benefits. Adapted from Nelson *et al.* (2009).

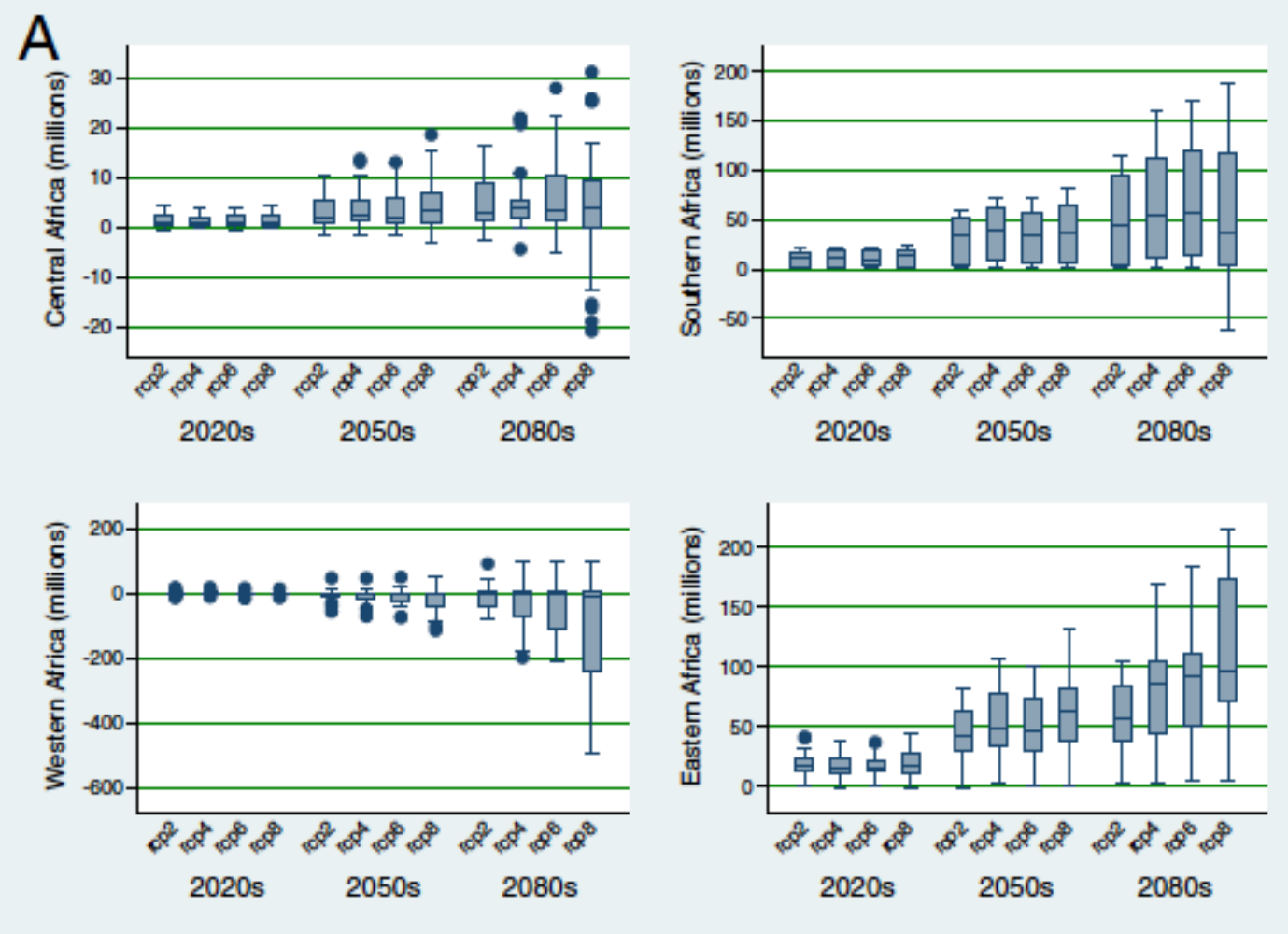
Scenario	South Asia	East Asia/ Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East/ North Africa	Sub-Saharan Africa	All Developing Countries
2000	75.6	23.8	4.1	7.7	3.5	32.7	147.9
2050							
No climate change	52.3	10.1	2.7	5.0	1.1	41.7	113.3
Climate change	59.1	14.5	3.7	6.4	2.1	52.2	138.5

% change in nutrients in elevated vs. ambient CO_2



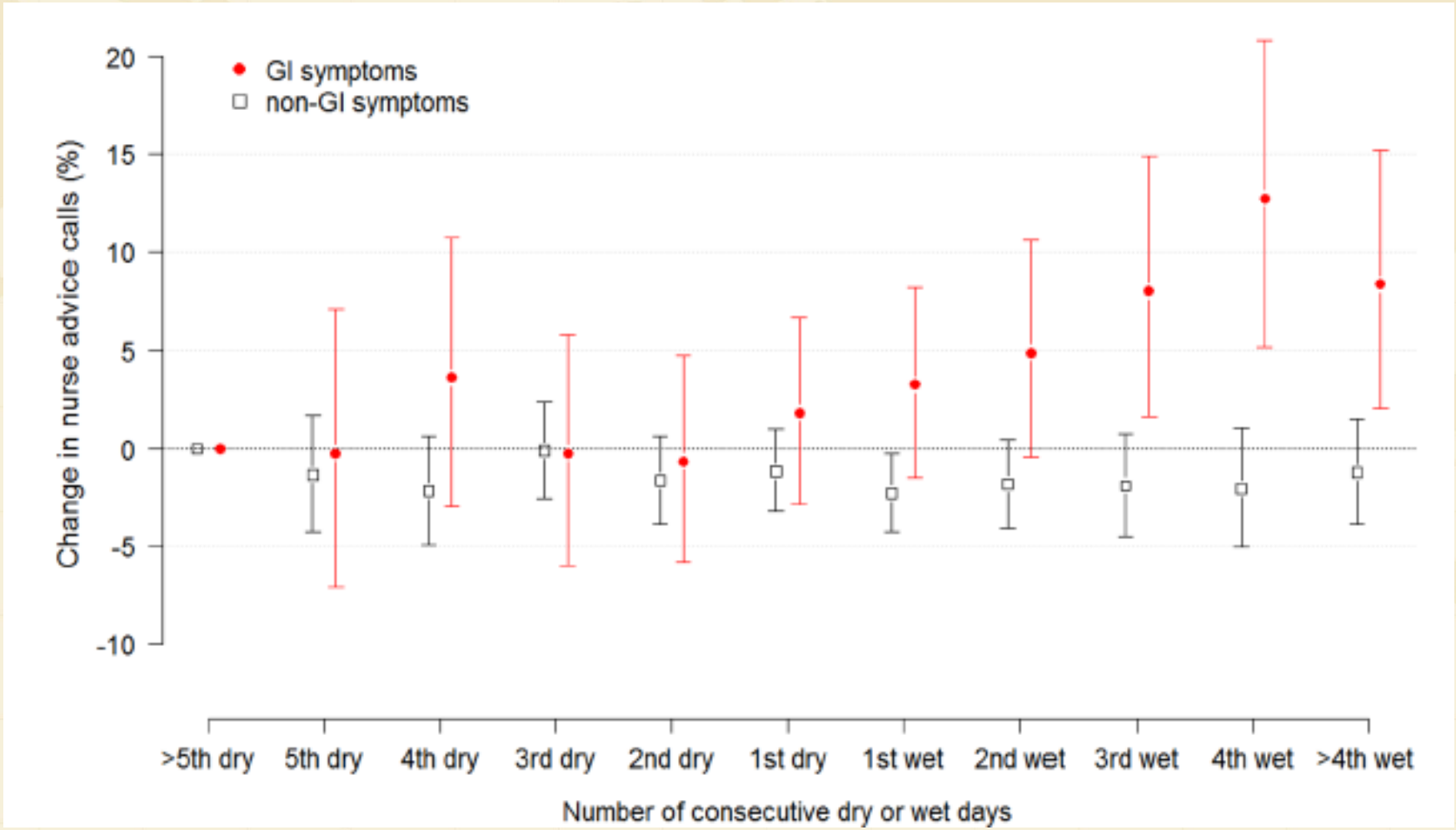
Myers et al. 2014

Projected population at risk of malaria due to climate change

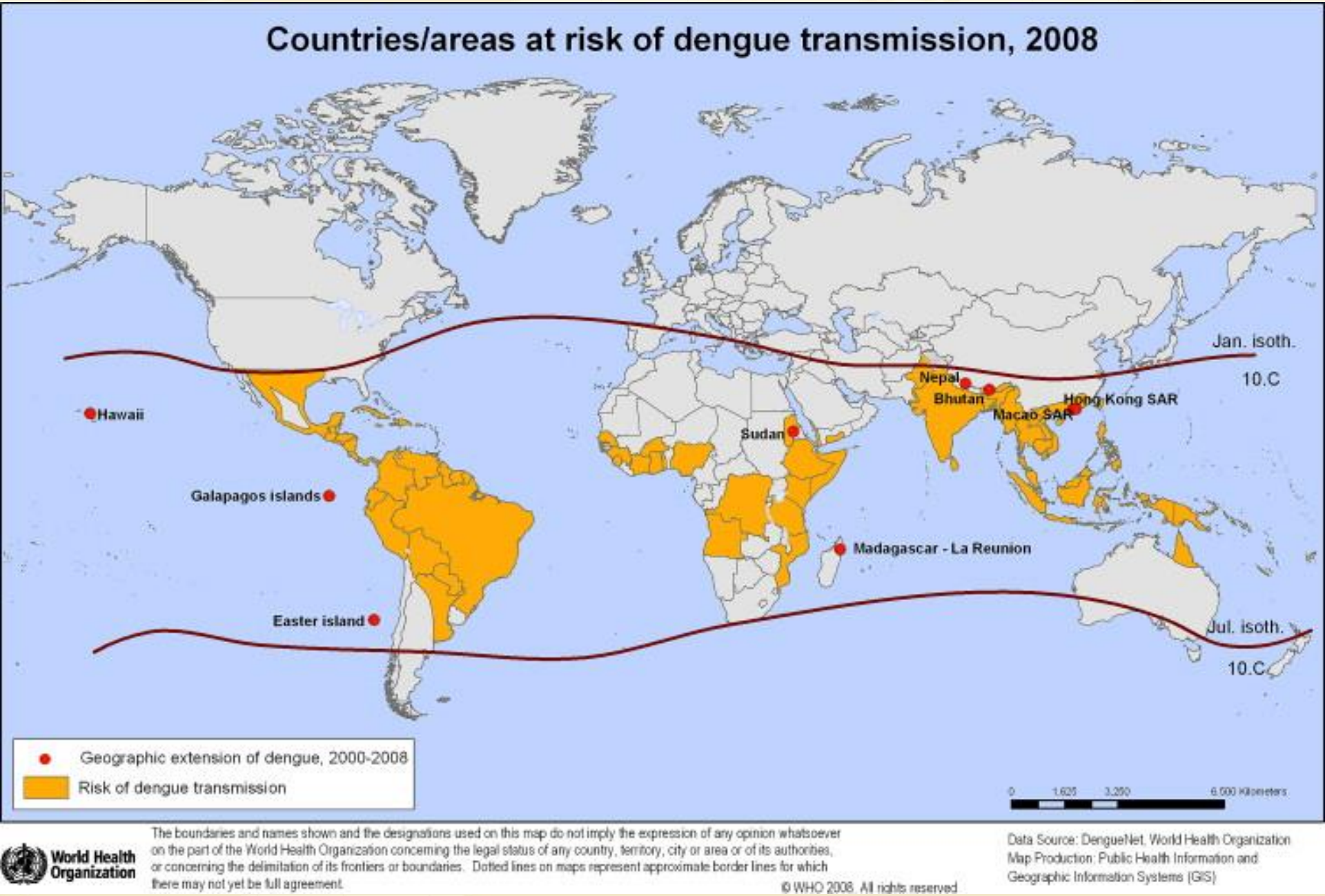


Caminade et al. 2014

Nurse advise calls during dry or wet weather, Gothenburg

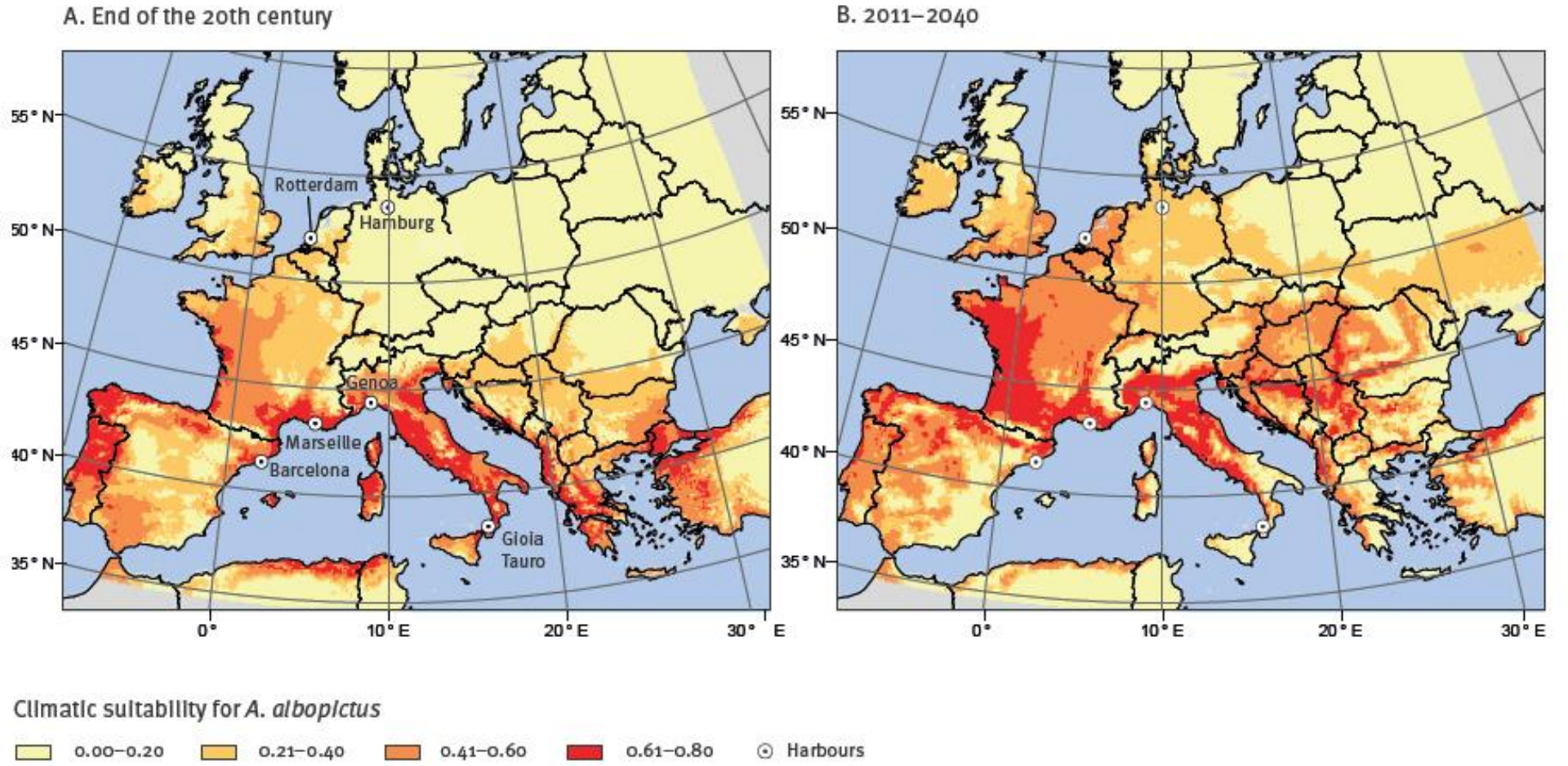


Tornevi et al. 2013



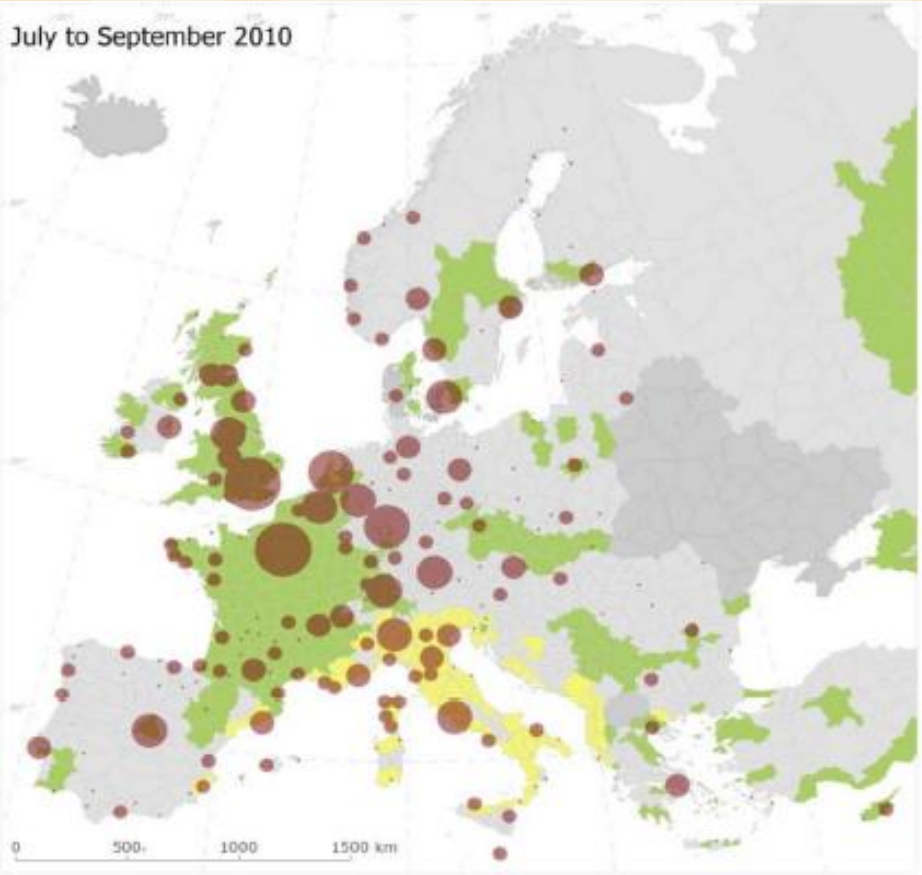
Data Source: DengueNet, World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)

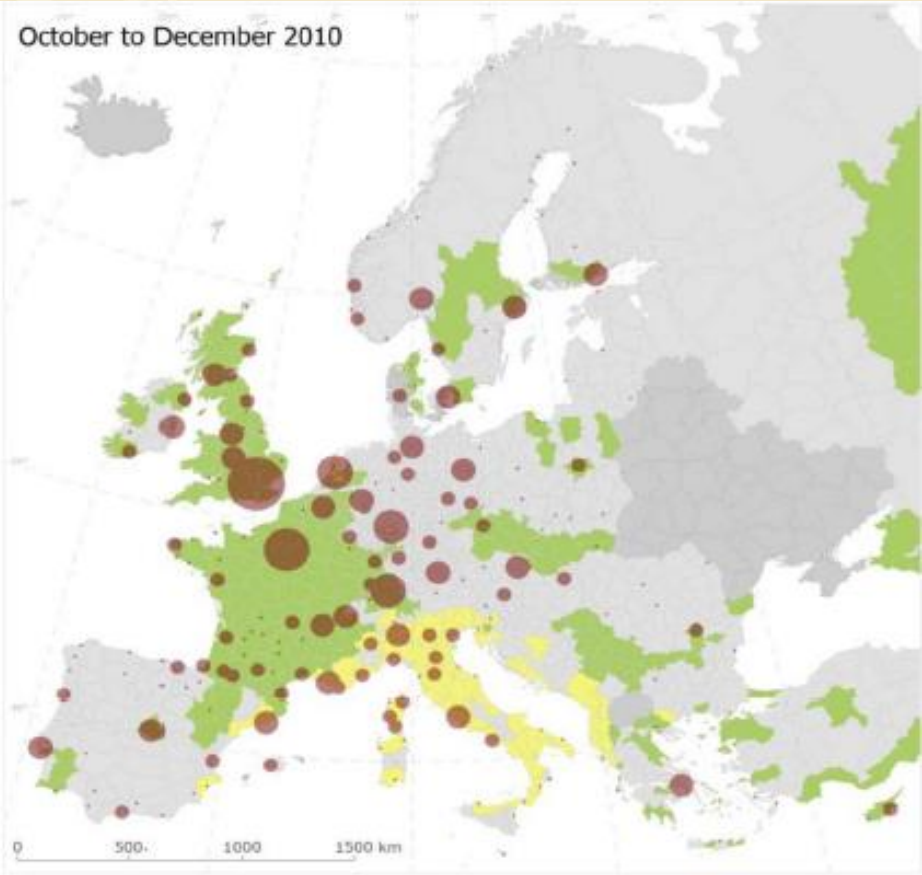
Climate suitability of Aedes albopictus in Europe, end 20th century vs 2011-2040



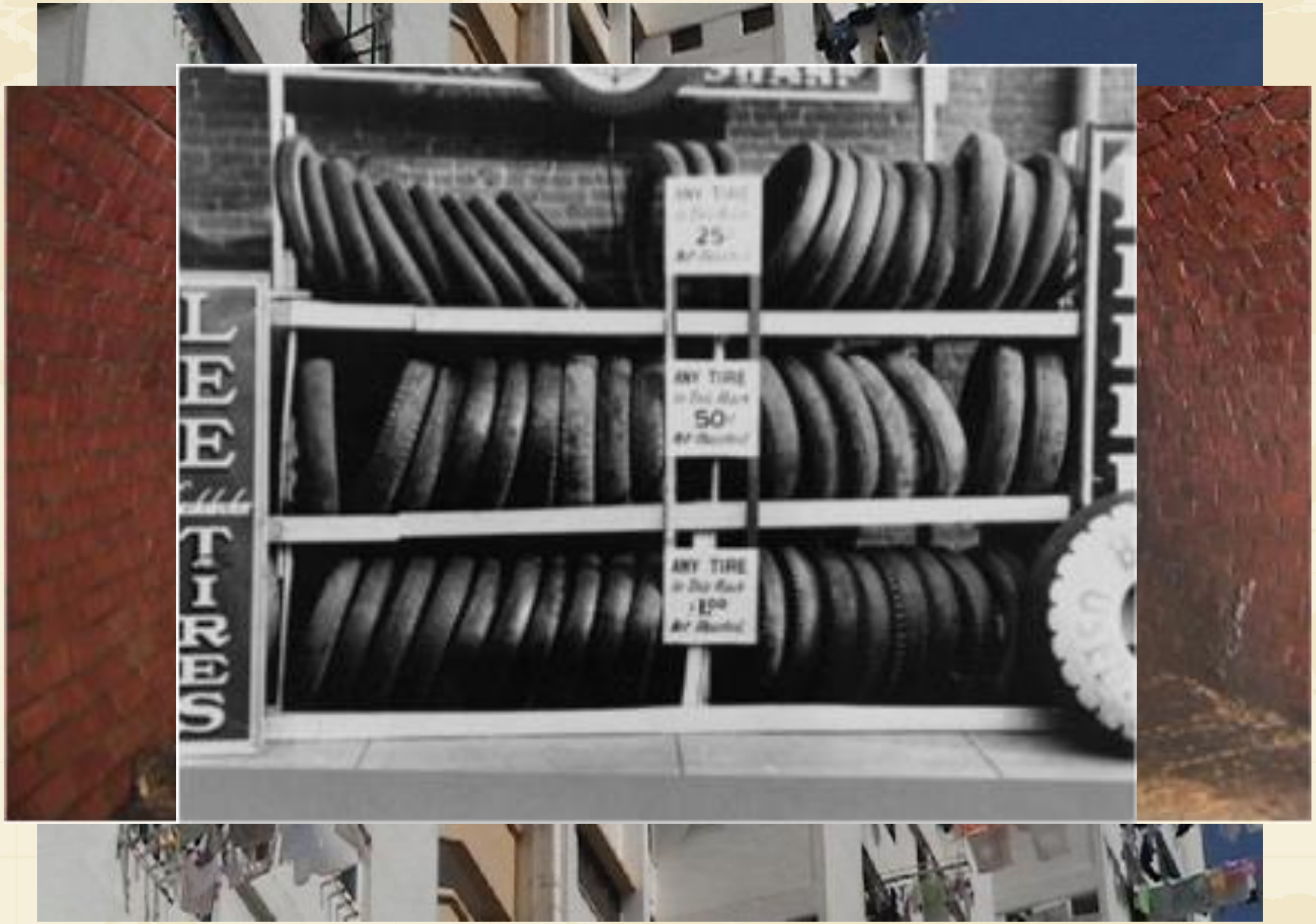
Fischer et al. 2014

Airport final destination of international travelers from dengue affected areas

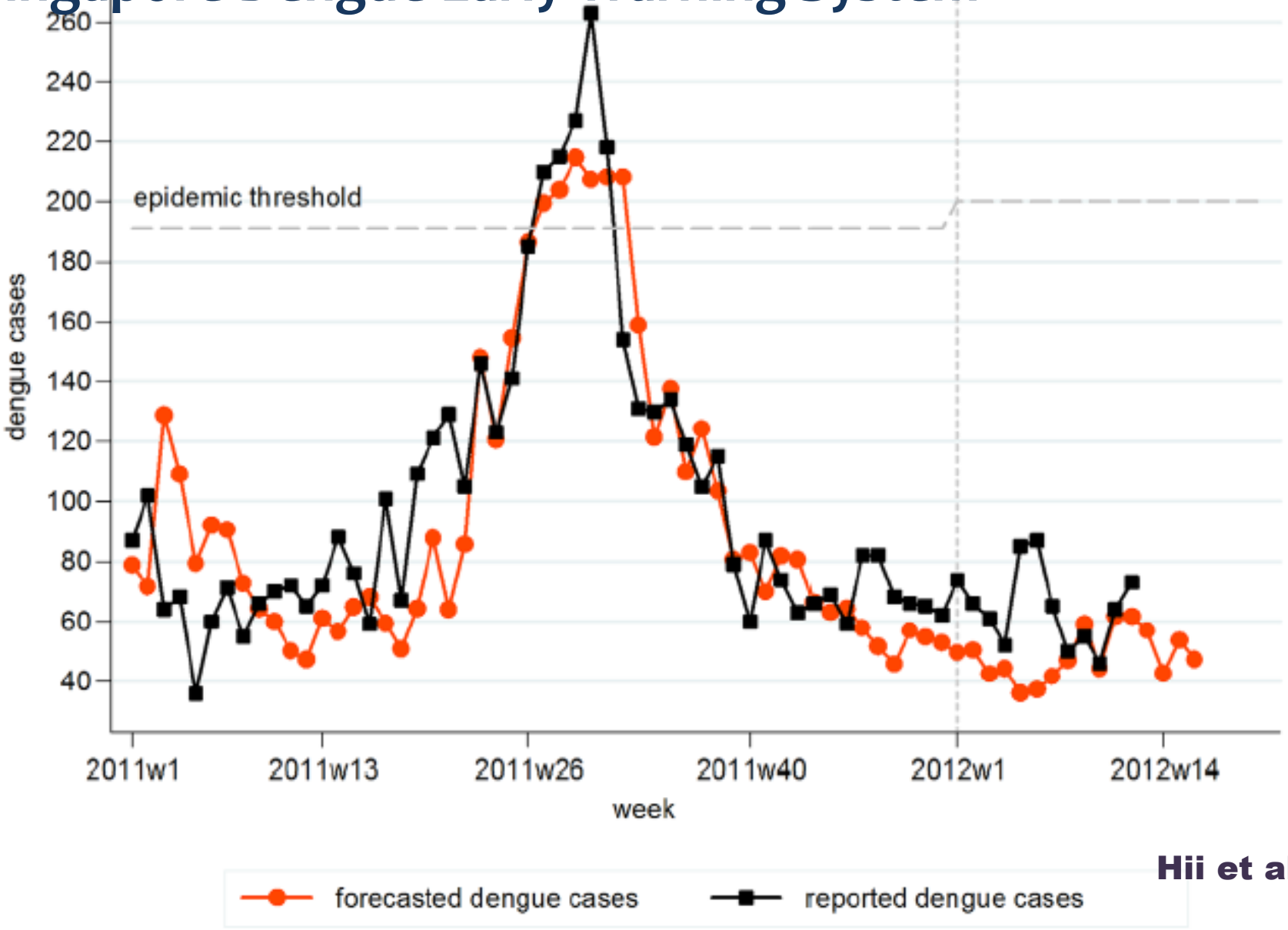




Semenza et al. 2014


LEE TIRES
ANY TIRE
25
ANY TIRE
50
ANY TIRE

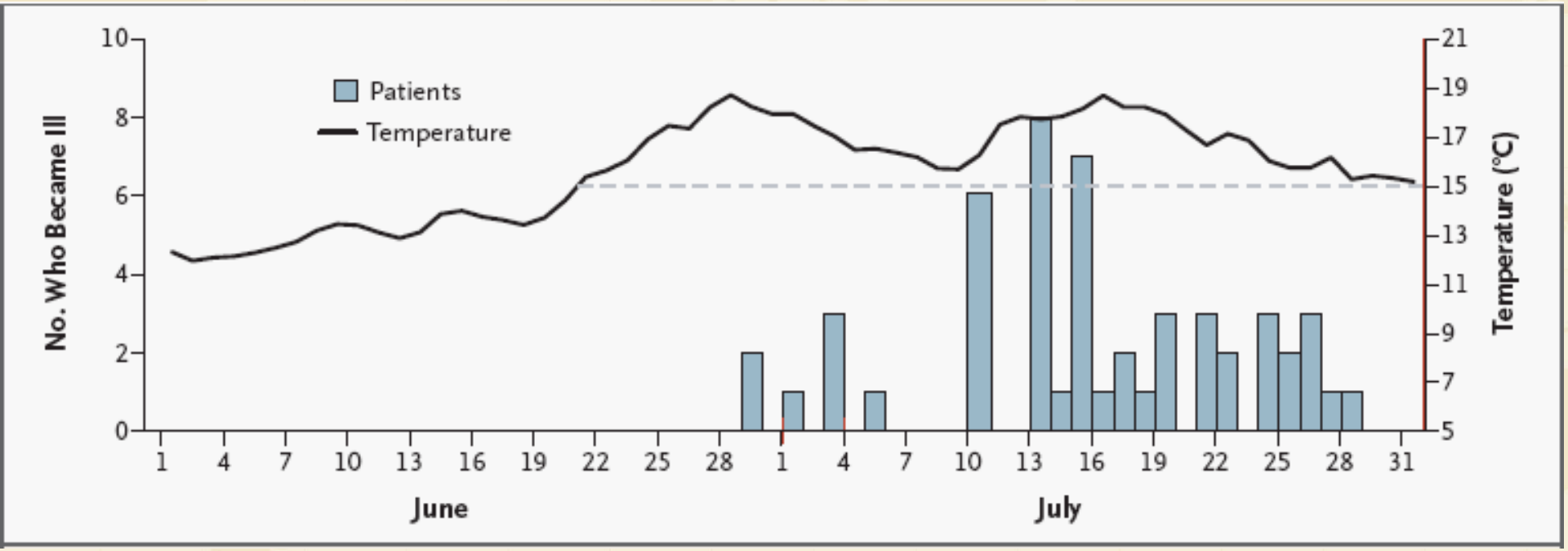
Singapore Dengue Early Warning System



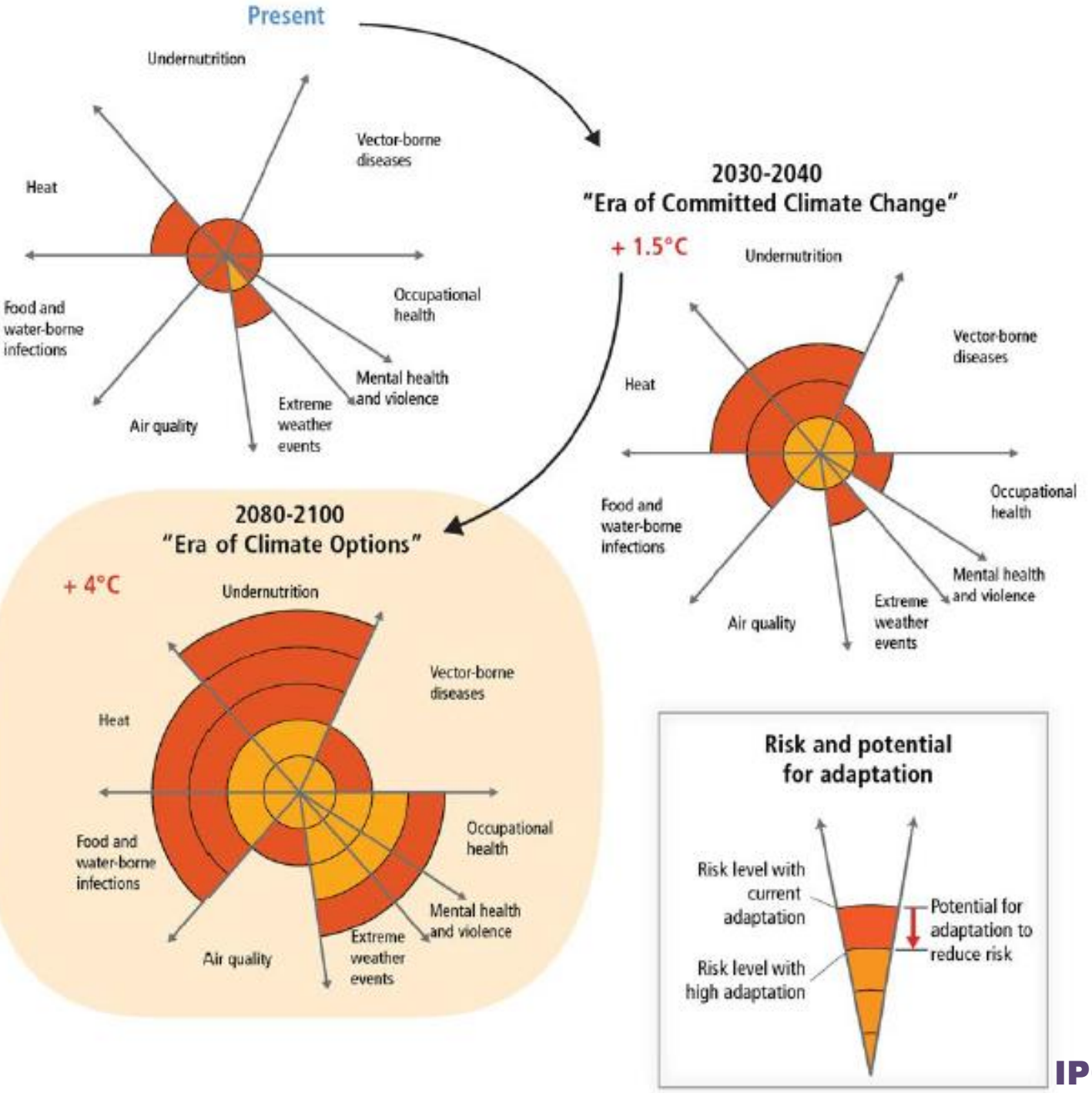
Hii et al. 2012

Figure 3. Forecasted dengue cases versus reported dengue cases in 2011–2012. Weekly forecasted dengue cases compared with reported cases during the validation period from 2011 week 1 to 2012 week 16. Epidemic threshold was 191 cases for 2011 and 200 cases for 2012.
doi:10.1371/journal.pntd.0001908.g003

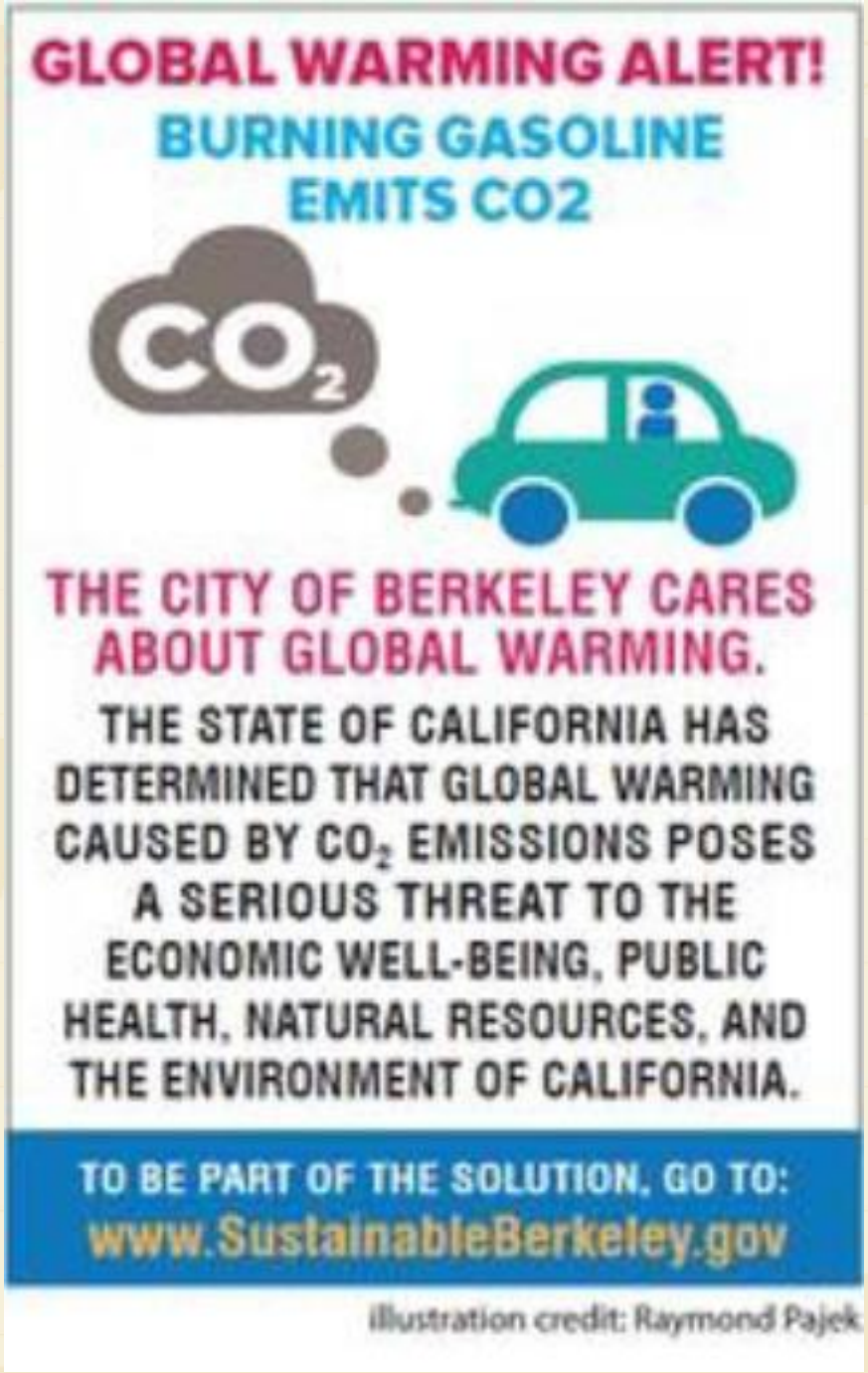
Vibrio parahaemolyticus infections by harvest date and mean daily water temperature



McLaughlin et al. 2005


Present
Undernutrition
Vector-borne diseases
Heat
Occupational health
Food and water-borne infections
Mental health and violence
Extreme weather events
Air quality
2030-2040
"Era of Committed Climate Change"
+ 1.5°C
Undernutrition
Vector-borne diseases
Heat
Occupational health
Food and water-borne infections
Mental health and violence
Extreme weather events
Air quality
2080-2100
"Era of Climate Options"
+ 4°C
Undernutrition
Vector-borne diseases
Heat
Occupational health
Food and water-borne infections
Mental health and violence
Extreme weather events
Air quality
Risk and potential for adaptation
Risk level with current adaptation
Potential for adaptation to reduce risk
Risk level with high adaptation

IPCC 2014


GLOBAL WARMING ALERT!
BURNING GASOLINE
EMITS CO2
CO_2
THE CITY OF BERKELEY CARES
ABOUT GLOBAL WARMING.
THE STATE OF CALIFORNIA HAS
DETERMINED THAT GLOBAL WARMING
CAUSED BY CO_2 EMISSIONS POSES
A SERIOUS THREAT TO THE
ECONOMIC WELL-BEING, PUBLIC
HEALTH, NATURAL RESOURCES, AND
THE ENVIRONMENT OF CALIFORNIA.
TO BE PART OF THE SOLUTION, GO TO:
www.SustainableBerkeley.gov
illustration credit: Raymond Pajek


REDUCE OUR
LIVEGREEN!
RECYCLE
CARBON FOOTPRINTS
LIVEHEALTHY!
WALK
BIKE
CAR POOL
ZERO EMISSION VEHICLE
Air Pollution
Asthma
Illegal Dumping
Leptospirosis
Severe Heat
Dehydration
Drought
Heat Stroke
Heavy Rainfall
Flooding
Chikungunya
Bacteria
PLANT TREES
GROW MORE CROPS
EDUCATE
CONSERVE
PROTECT
USE WIND + SOLAR ENERGY
KEEP OUR SURROUNDINGS CLEAN