



The Effects of Climate Change on Vector-Borne Diseases

Dr. Grace Wangge, MSc, PhD

Southeast Asia Ministers of Education Organization –
Regional Centre for Food and Nutrition





Disclaimer

- The opinions (if any) expressed in this presentation and on the following slides are solely those of the presenter and not necessarily those of SEAMEO-RECFON



Climate Change

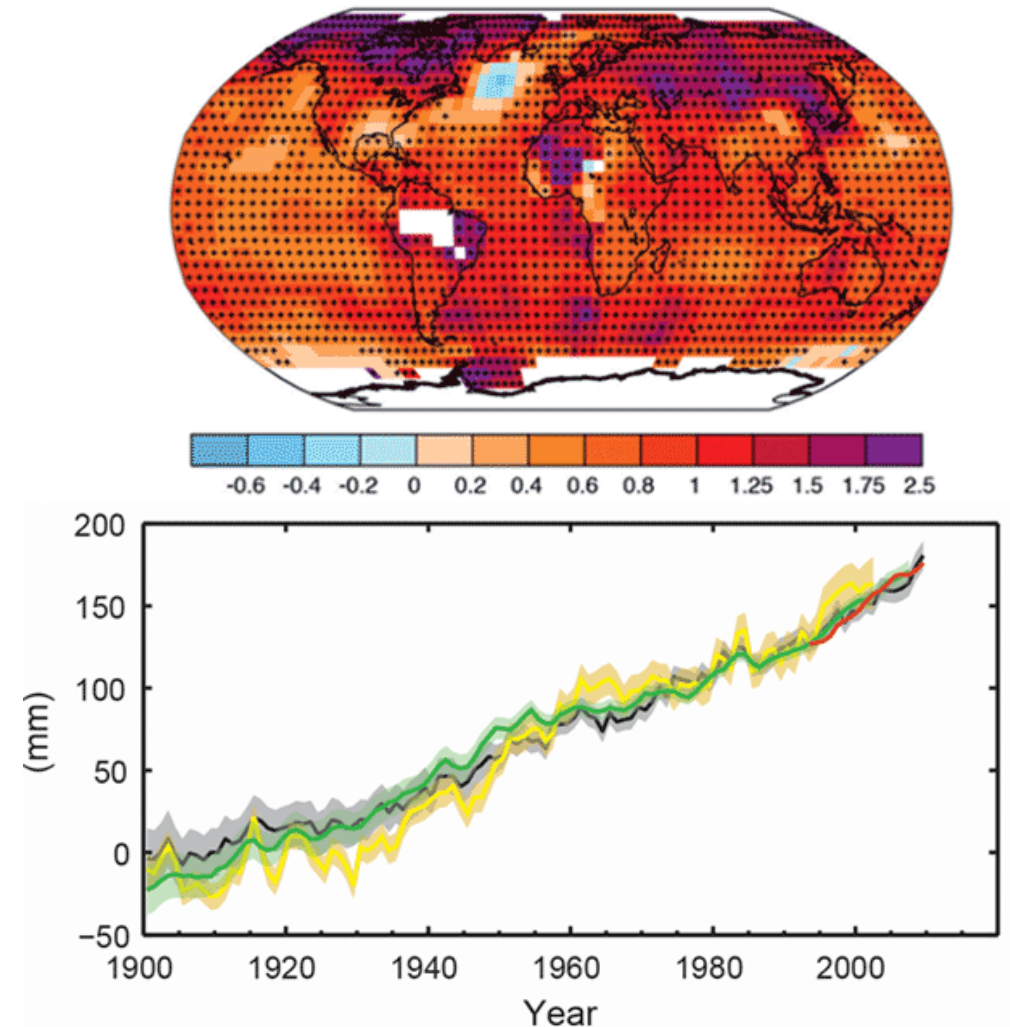
“A change in the state of the climate that can be identified by changes in the mean of its properties, such as temperature, precipitation, or wind patterns, that persists for an extended period, typically decades or longer”(IPCC, 2007)





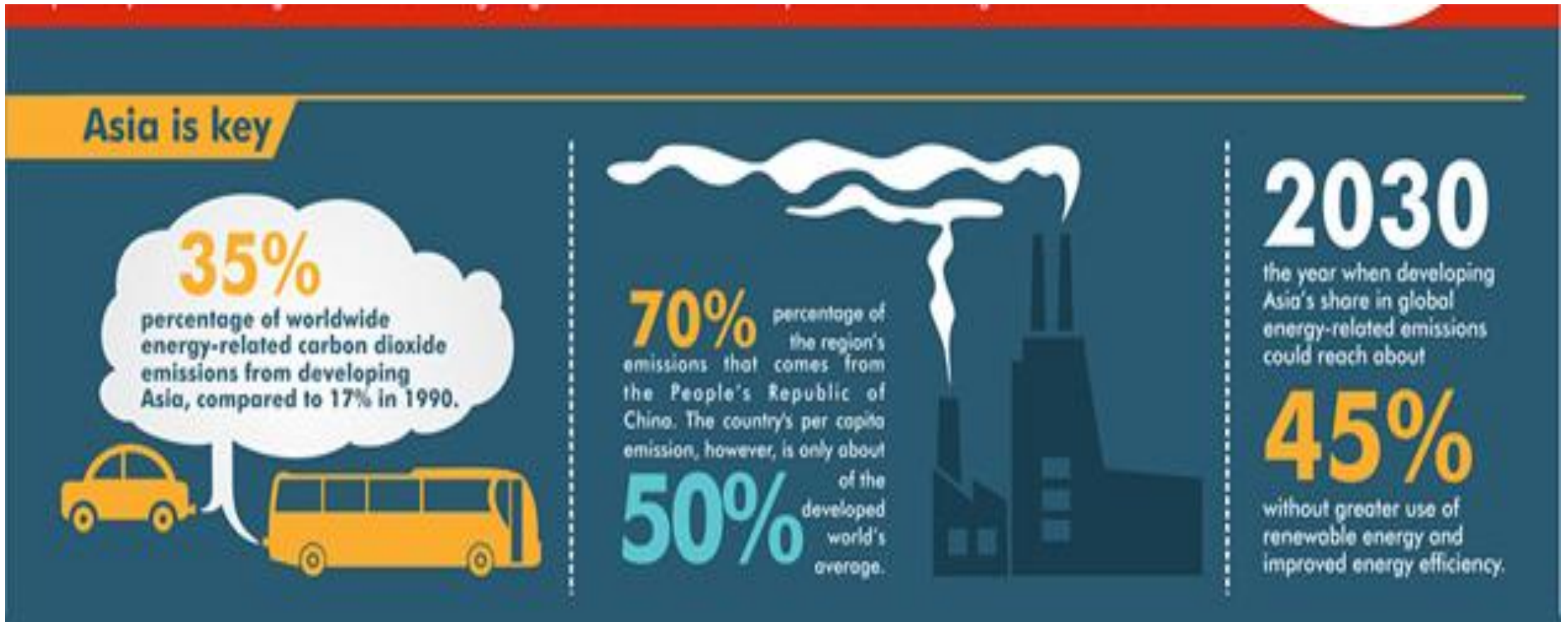
Major Evidence for Climate Change

- Increase atmospheric concentration of CO₂
- Increase global mean surface temperature
- Melting of ice and snow
- Sea level rise
- Extreme heat
- Increase in heavy precipitation





Climate change in Asia - Pacific





Climate change impacts in Asia - Pacific

Impacts to the Region

7 out of the 10

nations at greatest risk to climate change and natural disasters globally are in Asia and the Pacific, and 3 of these are small Pacific island states.



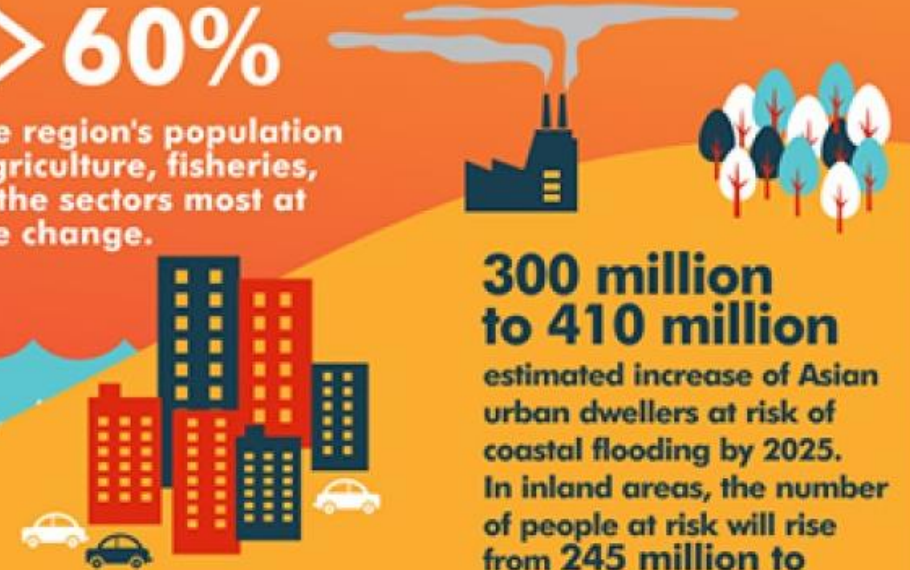
20 million

number of Bangladeshis who will be displaced by a **1-meter rise** in sea level in 2050.



More than > 60%

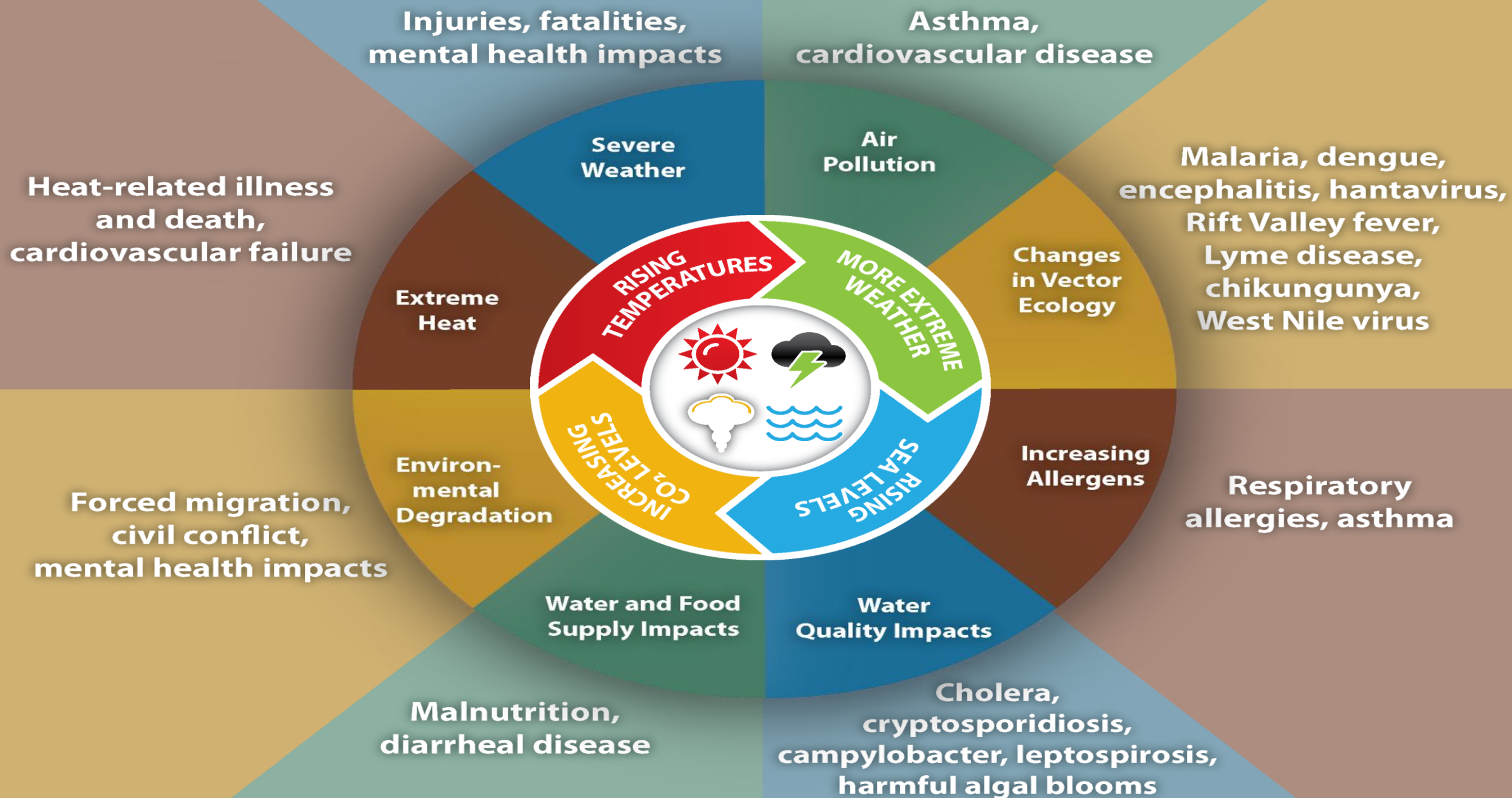
number of the region's population working in agriculture, fisheries, and forestry, the sectors most at risk to climate change.



300 million to 410 million

estimated increase of Asian urban dwellers at risk of coastal flooding by 2025. In inland areas, the number of people at risk will rise from **245 million to 341 million** by 2025.

Impact of Climate Change on Human Health





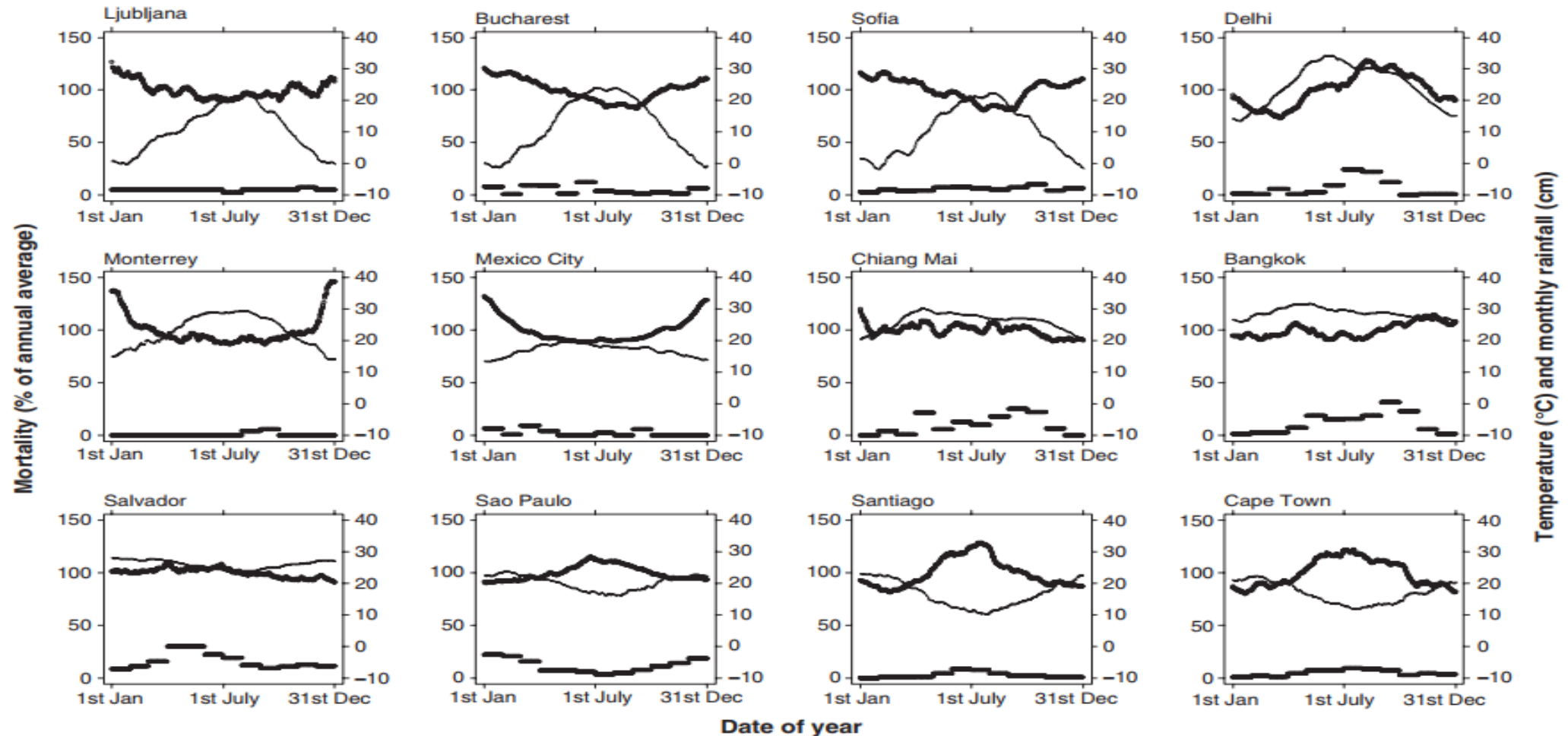
“Climate change is one of the greatest challenges of our time. Climate change will affect, in profoundly adverse ways, some of most fundamental determinants of health: food, air, water”

Dr Margaret Chan
Director-General, World Health Organization
World Health Day, 7 April 2008





CLIMATE CHANGE AND TEMPERATURE-RELATED MORTALITIES



From: International study of temperature, heat and urban mortality: the 'ISOTHURM' project

Int J Epidemiol. 2008;37(5):1121-1131. doi:10.1093/ije/dyn086

Int J Epidemiol | Published by Oxford University Press on behalf of the International Epidemiological Association © The Author 2008; all rights reserved.



CLIMATE CHANGE AND TEMPERATURE-RELATED MORTALITIES

Cities	Temperature threshold	Daily mortality risk
Hong Kong ^a	28.2°C	1.8 %
Seoul ^b	15°C	10.16-12.17 %
Delhi ^c	29.0°C	3.94%
Bangkok ^c	29.0°C	5.78%
Hanoi ^e	19.0°C	21 %

a Chan EYY, Goggins WB, Kim JJ, Griffiths SM. A study of intracity variation of temperature-related mortality and socioeconomic status among the Chinese population in Hong Kong. J Epidemiol Community Health. 2012;66:322-7.

b Son JY, Lee JT, Anderson GB, Bell ML. Vulnerability to temperature-related mortality in Seoul, Korea. Environ Res Lett. 2011 Sep 7; 6(3): 034027

c McMichael AJ, Wilkinson P, Kovat SJ, et al. International study of temperature, heat and urban mortality: the ISOTHURM project. Int J Epidemiol 2008;37:1–11

d Xuan le TT, Egondi T, Ngoan le T, Toan do TT, Huong le T. Seasonality in mortality and its relationship to temperature among the older population in Hanoi, Vietnam. Glob Health Action. 2014 Dec 8



Impacts of Climate Change on Diseases

Communicable diseases

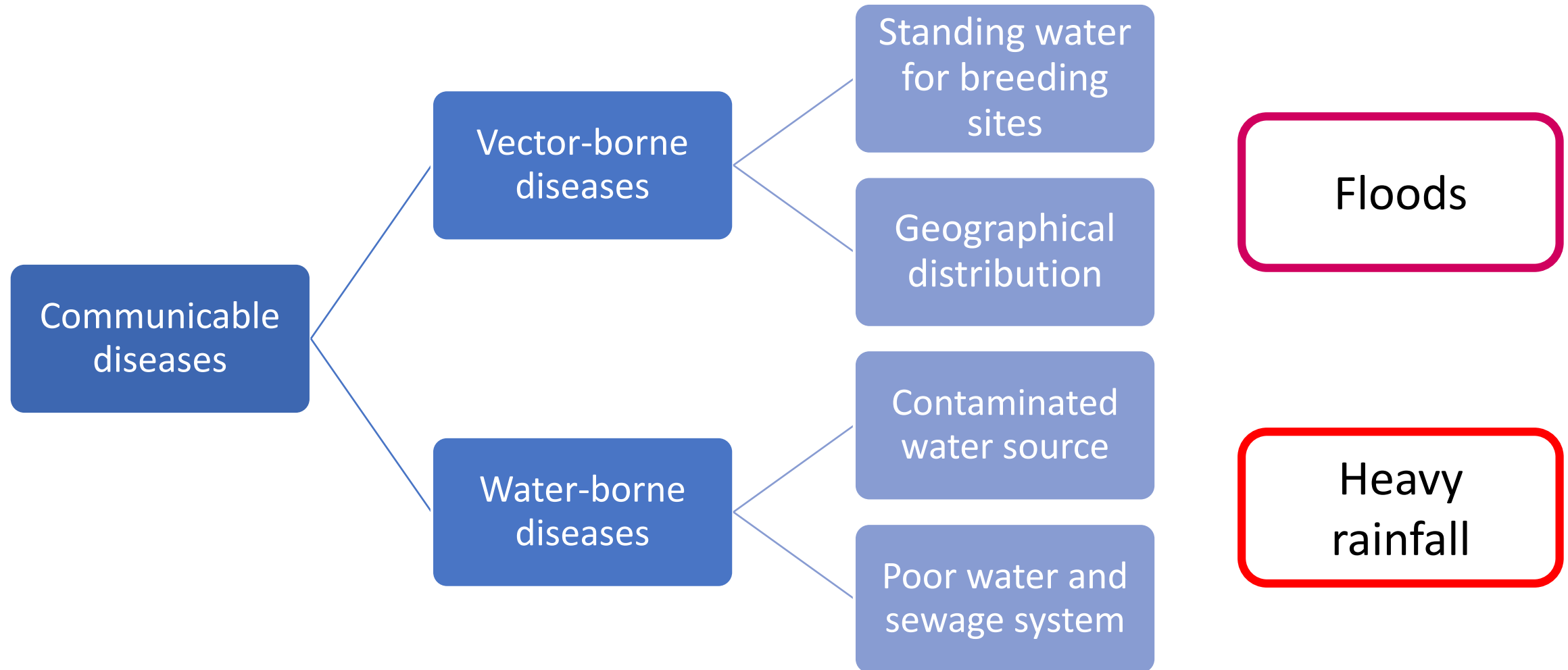
- Water-borne diseases (water contamination)
- Food-borne diseases (diarrheal, malnutrition)
- Vector-borne diseases (malaria, dengue)

Non-communicable diseases

- Respiratory & allergic diseases
- Cancer
- Cardiovascular disease (heat stress & air pollution)
- Human developmental effects (prenatal & early childhood exposure)
- Mental health and stress-related disorders (population displacement)



CLIMATE CHANGE AND COMMUNICABLE DISEASE





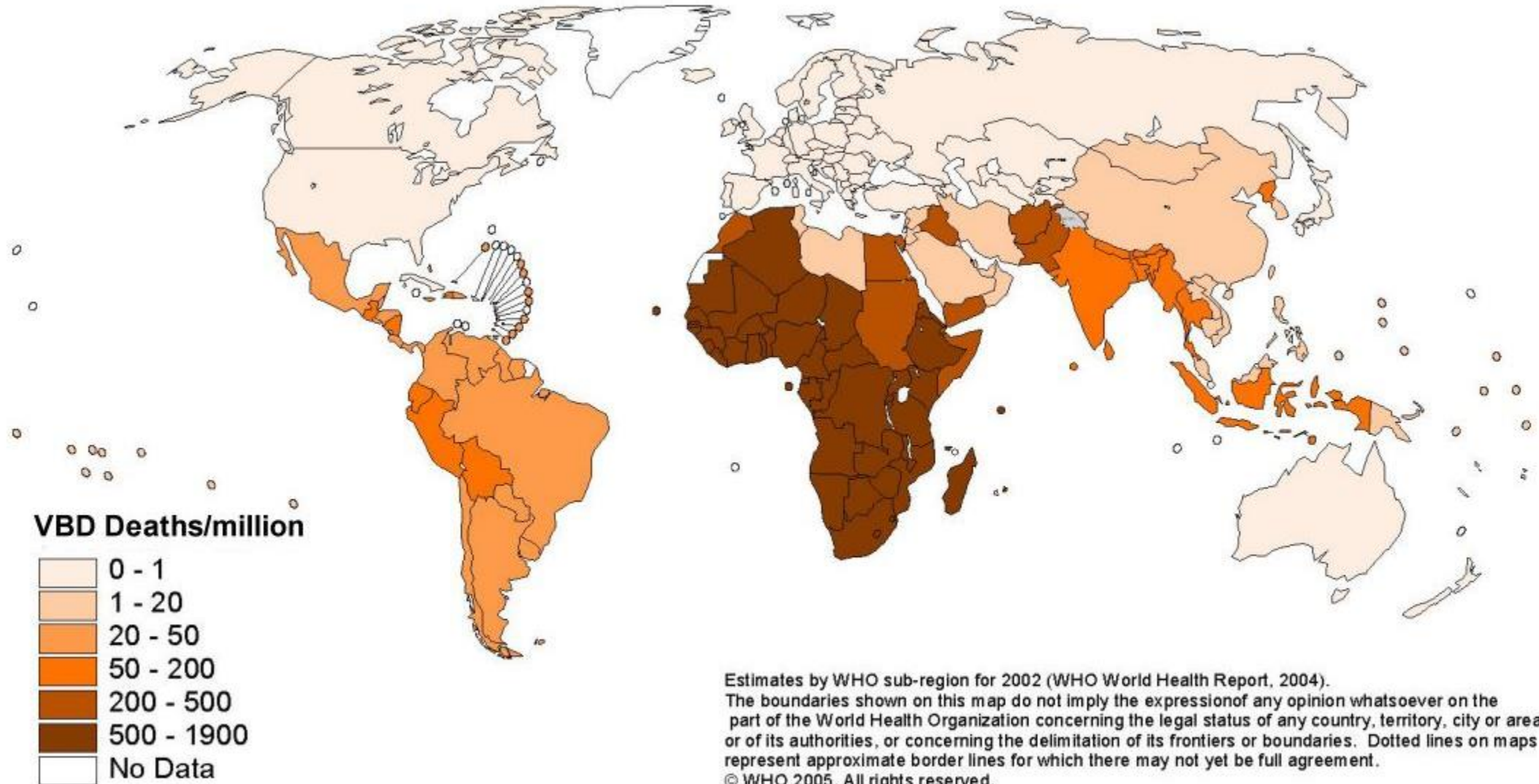
Vector-Borne Diseases

- Diseases (due to viruses, bacteria, protozoa) that are transmitted by vectors, (mosquitoes, ticks, and fleas) that can be transferred from one host (carrier) to another.





Deaths from Vector Borne Disease



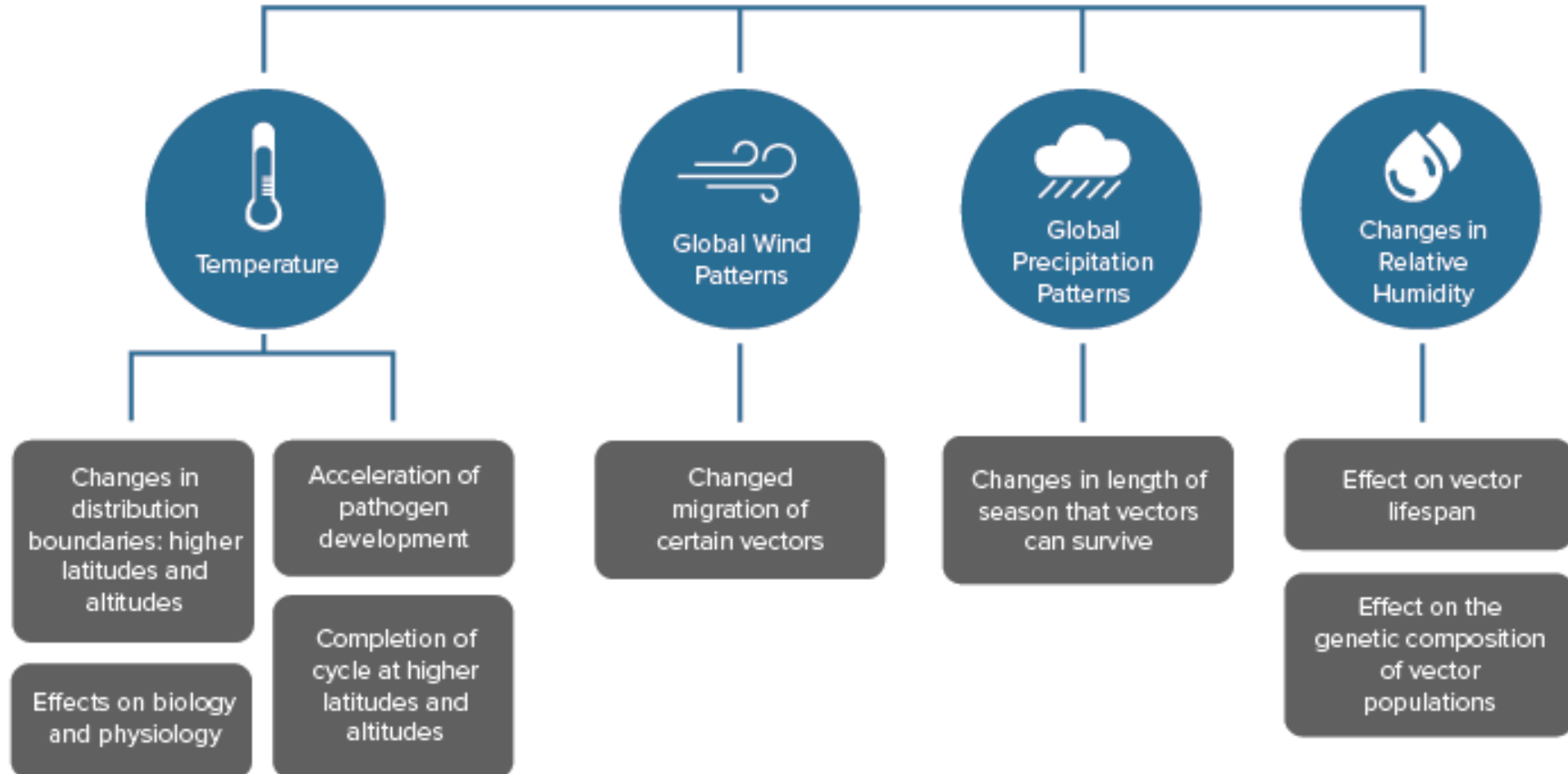


CLIMATE CHANGE AND MOSQUITO-BORNE DISEASES

- Excessive heat kills mosquitoes, but warmer temperatures (within their survival range) increase their reproduction and biting activity.
 - At 20°C *malaria falciparum* needs 26 days to incubate, but at 25°C it requires only 13 days
- The increase of temperature threshold affects the geographical range of mosquitoes
 - Vector-borne disease are currently found at highlands

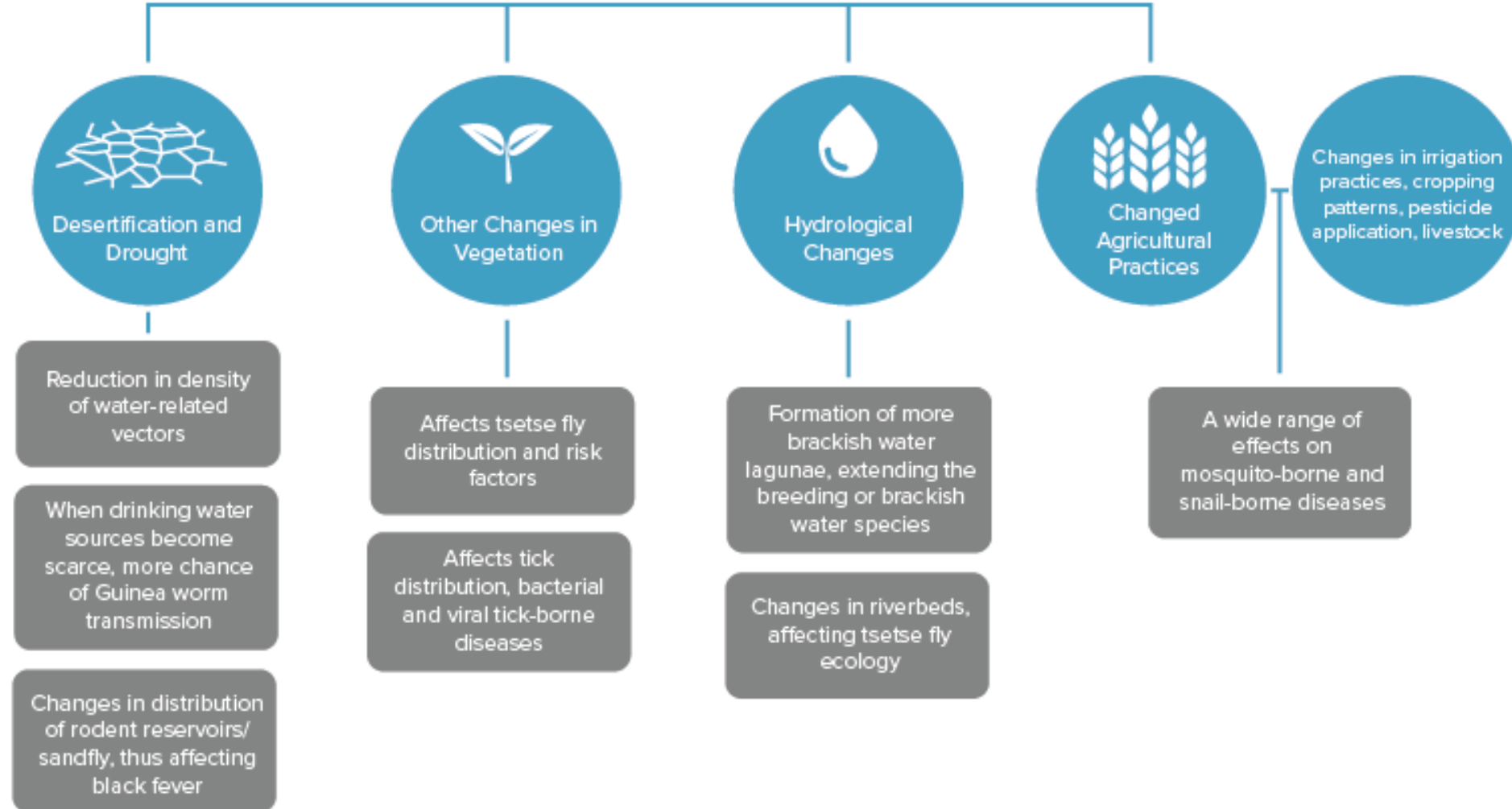


Climate variability and climate change direct impact





Climate variability and climate change indirect impact





Climate change and human migration

- Human migration aggravate the risk of Vector borne disease by :
 - Spread of vectors into new areas
 - Spread of pathogens into new areas
 - Pathogen spreads quicker in urban/dense areas without proper sanitation
 - Spread of drug resistance



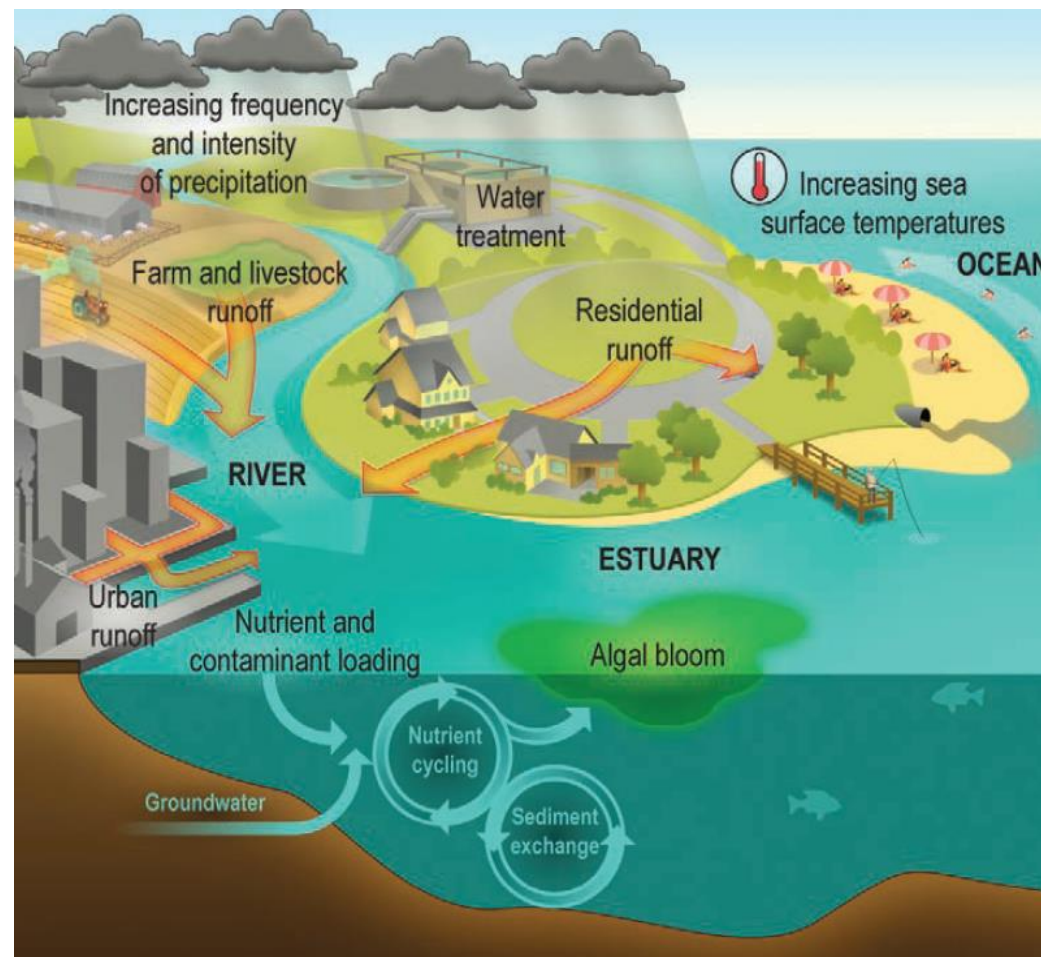
WHO responses

- A crucial element in vector-borne diseases is behavioral change.
- WHO efforts :
 1. providing technical support to countries so that they can effectively manage cases and outbreaks;
 2. supporting countries to improve their reporting systems and capture the true burden of the disease;
 3. providing training (capacity building) on clinical management, diagnosis and vector control with some of its collaborating centres throughout the world; and
 4. supporting the development and evaluation of new tools, technologies and approaches for vector borne diseases, include vector control and disease management technologies.



Water-Borne Disease

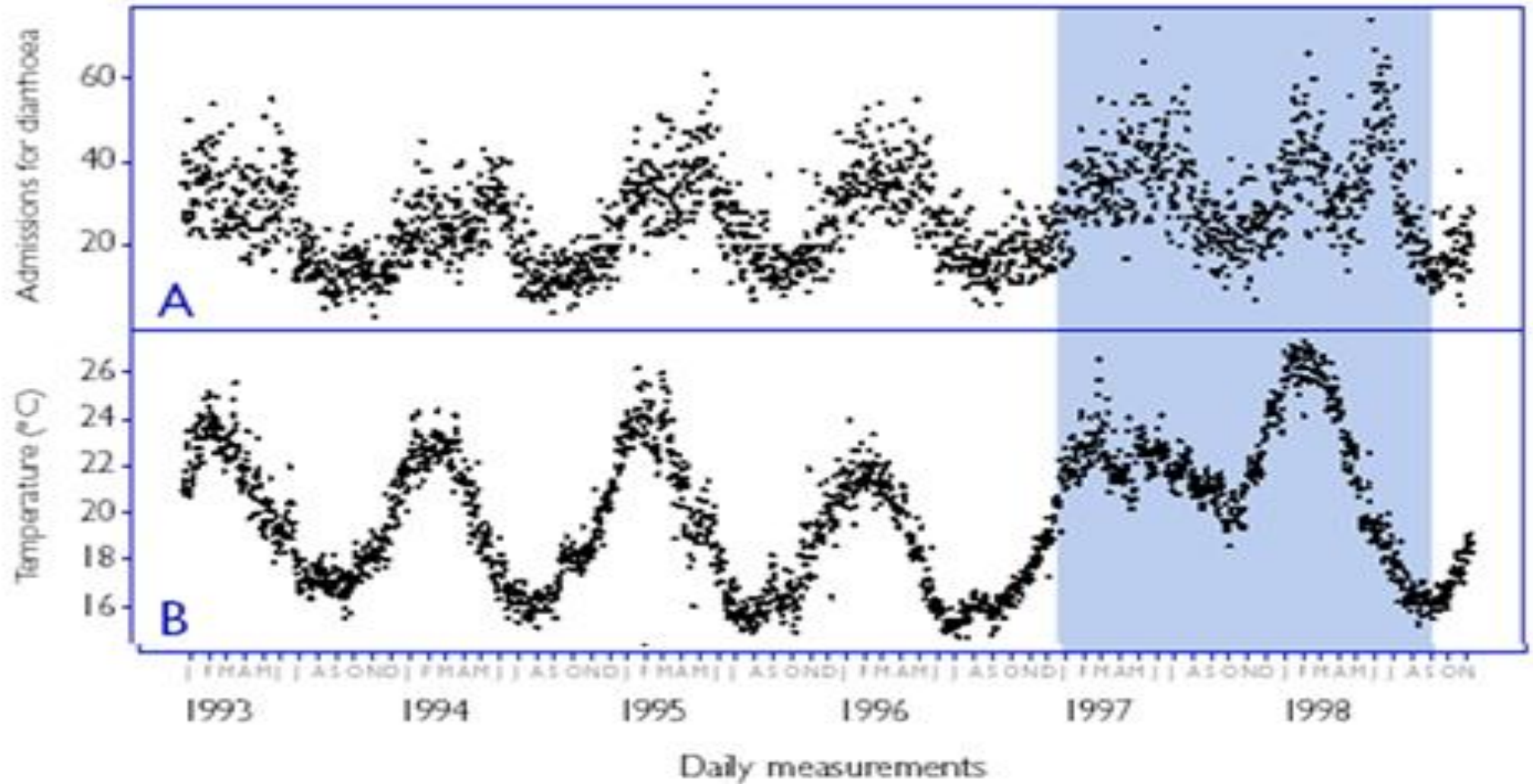
- conditions caused by pathogenic micro-organisms that are transmitted in water
- Root of cause :
 - Unsafe drinking-water
 - poor sanitation
 - Hygiene
- = WASH



USGCRP, 2016: *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. <http://dx.doi.org/10.7930/J0R49NQX>

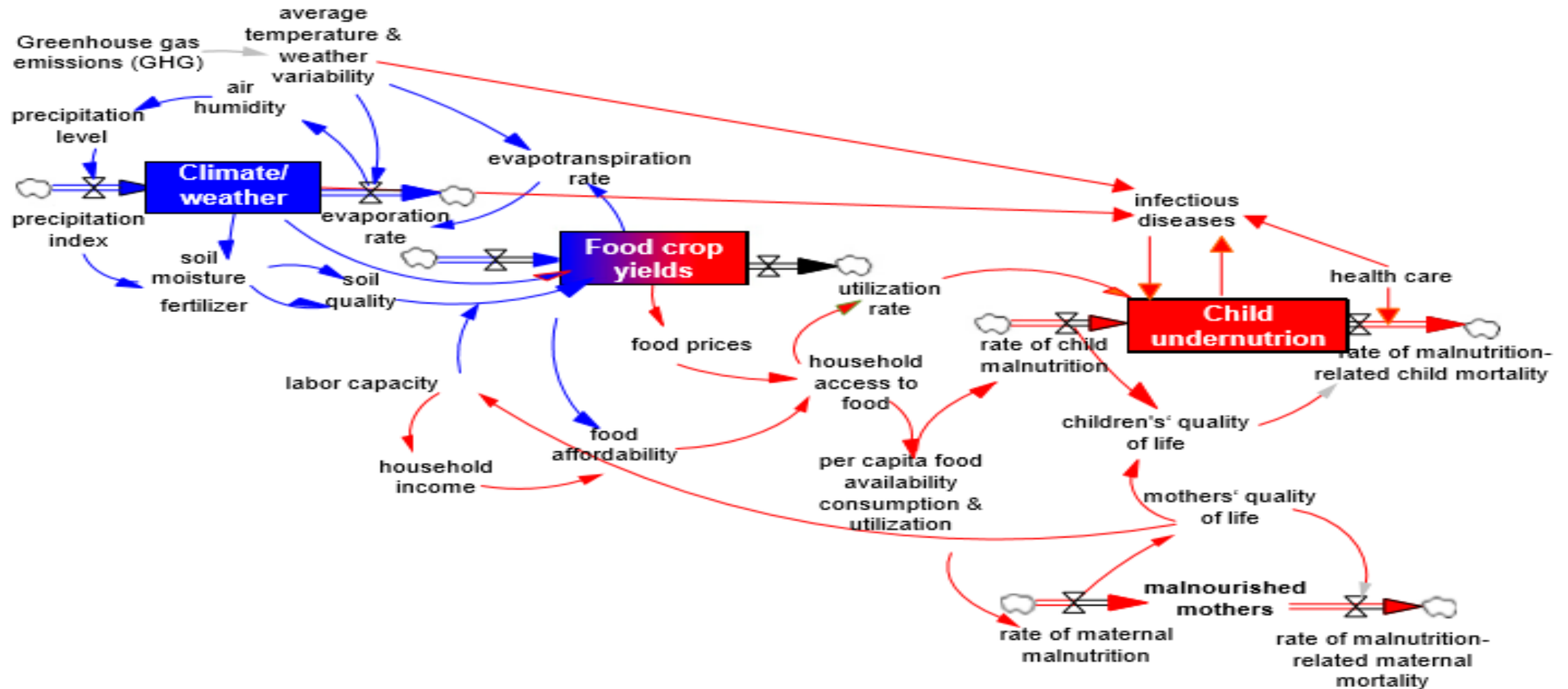


CLIMATE CHANGE AND DIARRHEAL DISEASE





Climate Change and Malnutrition





Impacts of climate change on health systems

Direct impacts	<ul style="list-style-type: none">✓ Increase demands for health services✓ Destruction of public health facilities due to climate related disasters
Indirect impacts	<ul style="list-style-type: none">✓ Reduced supply water and electricity✓ Lack of healthcare workers due to injuries or population displacement✓ Lack of medical resources and equipment



“We call on health professionals to reach beyond conventional professional boundaries to collaborate with policy makers and scientists concerned with the study, development, and implementation of policies and technologies to mitigate climate change”

Haines A, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers



Health Community & Climate Change

- Educate the health community, public and policy makers about the health effects of climate change
 - 6.5% Hong Kong university medical/public health students^a and only 4% nursing students in US^b were able to list the health issues related to climate change
 - Australia incorporated climate change into undergraduate curriculum in faculty of medicine^c

^a Chan EYY, Khoe LC, Chan C, Tam G, Lee P, Cheng CYK. Knowledge, attitude, and practice of climate change and health among university students in Hong Kong. [unpublished]

^b Portier CJ, Thigpen Tart K, Carter SR, Dilworth CH, Grambsch AE, Gohlke J, et al A Human Health Perspective On Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change. Research Triangle Park, NC: Environmental Health Perspectives/National Institute of Environmental Health Sciences 2010.

^c Green EIH, Blashki G, Berry HL, et al. Preparing Australian medical students for climate change. Aust Fam Physician 2009;38:726–9.



WASH education at elementary school East Nusa Tenggara, Indonesia



Tippy Tap



Conclusion

- Climate change and Health are interrelated
- Vector borne diseases increases as the temperature changes and water supply decreases
- Access to water and sanitation is a key factor in disease control and elimination
- Cross-sectoral collaboration is needed



Acknowledgement

- Dr. Levina Chandra, MPH – Department of Community Medicine, Faculty of Medicine, Universitas Indonesia
- Rural Health Elective Module 2015-2017 – Department of Community Medicine, Faculty of Medicine, Universitas Indonesia



Thank You

