How is the climate crisis affecting China?

Students from College of Environmental Science and Engineering, Peking University

2021/11/09

Background | Extreme Rainfall in Zhengzhou

From 18:00 on July 18th to 0:00 on July 21st, 2021, a rare and sustained heavy precipitation occurred in **Zhengzhou,** Henan province. In three days, an entire **year's-worth** of rain fell on this city.

From 16:00 to 17:00 on July 20th, 2021, the rainfall in Zhengzhou reached **201.9 mm in one hour**.

Fig 1: Precipitation GIF from July 19th to 20th

More than **100 *West Lakes*** poured into Zhengzhou in one hour

Related News

BBC

China floods: Thousands evacuated as rail stations and roads submerged

1 hour ago | China

Guardian

Heavy flooding hits central China, affecting tens of millions

New York Times

ASIA PACIFIC

Floods in China Leave Many Stranded

Background | Extreme Rainfall in Zhengzhou

Here are **some photos** pictured by one of my friends when he was stuck in Zhengzhou.

A: View from Zhengzhou East High-speed Railway Station

B: Life supplies delivered to Zhengzhou

C: Volunteers played a very important role

Background | Experience in Beijing

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SANDSTORM

A photo on March 15th 2021, on PKU campus

"It's of the greatest intensity over 10 years!"

PM_{10} concentrations in most areas **exceeded 2000 μG/m3**

A sandstorm that hit Beijing in March pushed air pollution **levels off the charts**, turned the sky yellow and reduced the sun to a blue dot.

Thick dust carrying extremely high levels of hazardous particles blows in from drought-hit **Mongolia**.

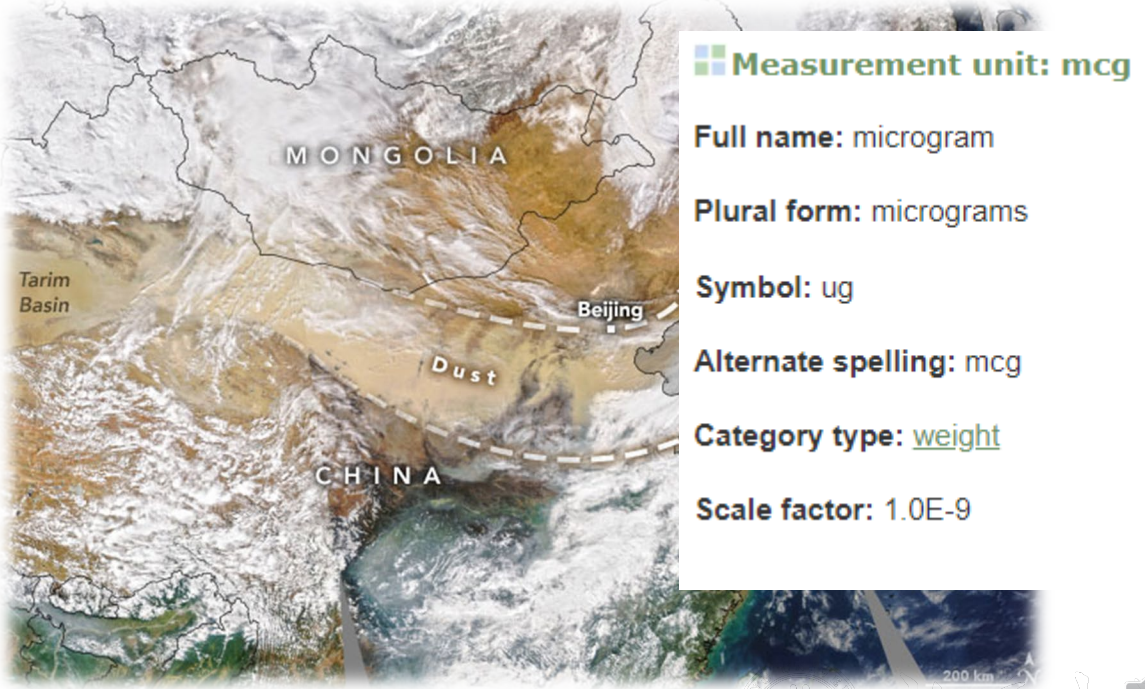

Fig 2: a natural-color image shows trajectory of dust (NASA)

Background | Experience in Beijing

PKU campus shrouded in the snow

Extreme cold

2021.1.7: -19.6 ℃, the second lowest winter temperature since 1951

2021.10.17: -0.2 ℃ ,the lowest since 1969. The first temperature below zero was 20 days earlier.

2021.11.6: first snow, which is much earlier than last year (11.21)

Extreme rainfall

Long Flood season 122 DAYS

Strong

1. 10 times over **25 mm/d**, 2 times over **50 mm/d**

2. 792mm, 90% higher than annual data, 70% higher than the data in recent 10 years

3. 400.4mm in July, the most since monitoring began (1951)

Changes in heavy precipitation in the world

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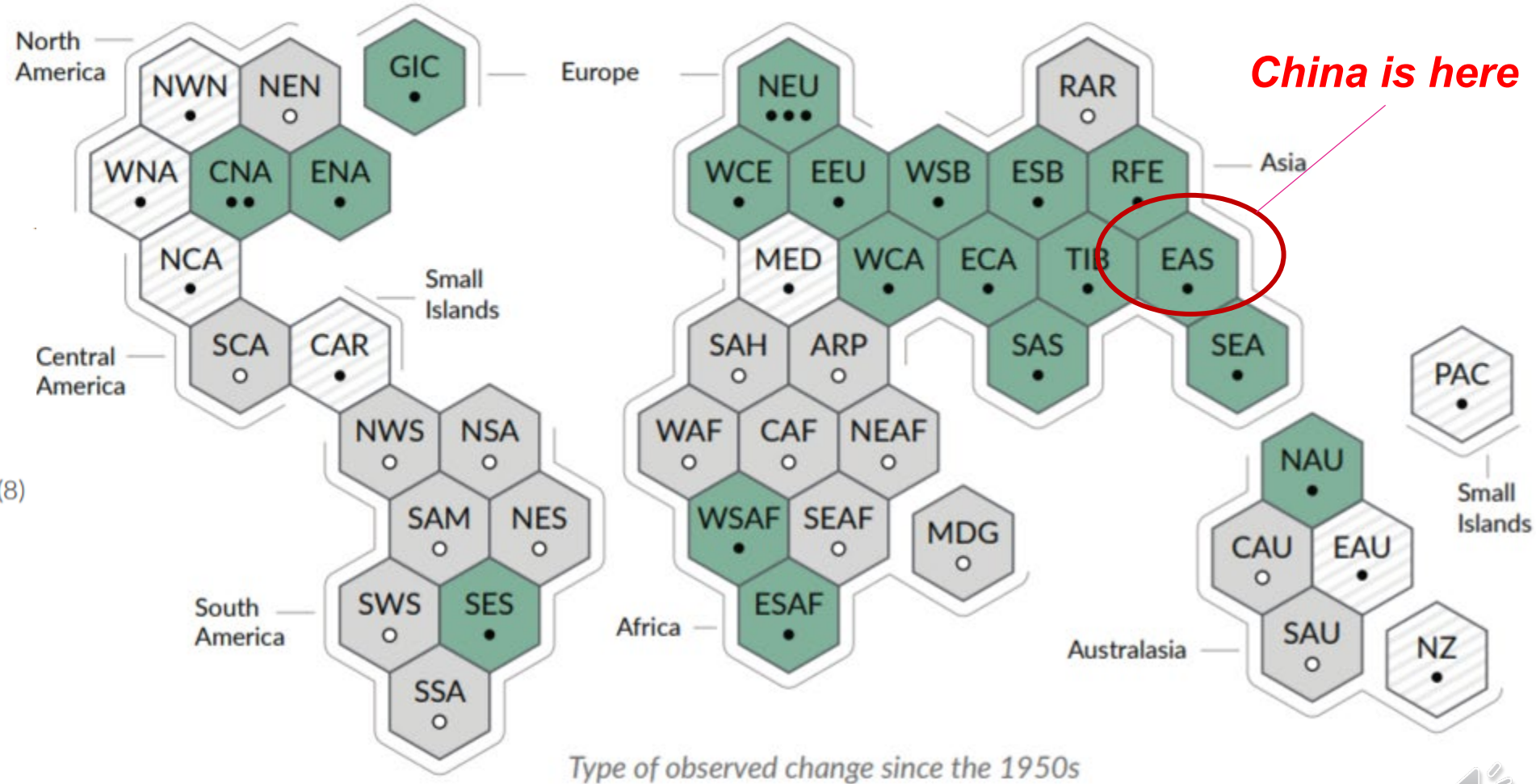
(b) Synthesis of assessment of observed change in **heavy precipitation** and confidence in human contribution to the observed changes in the world's regions



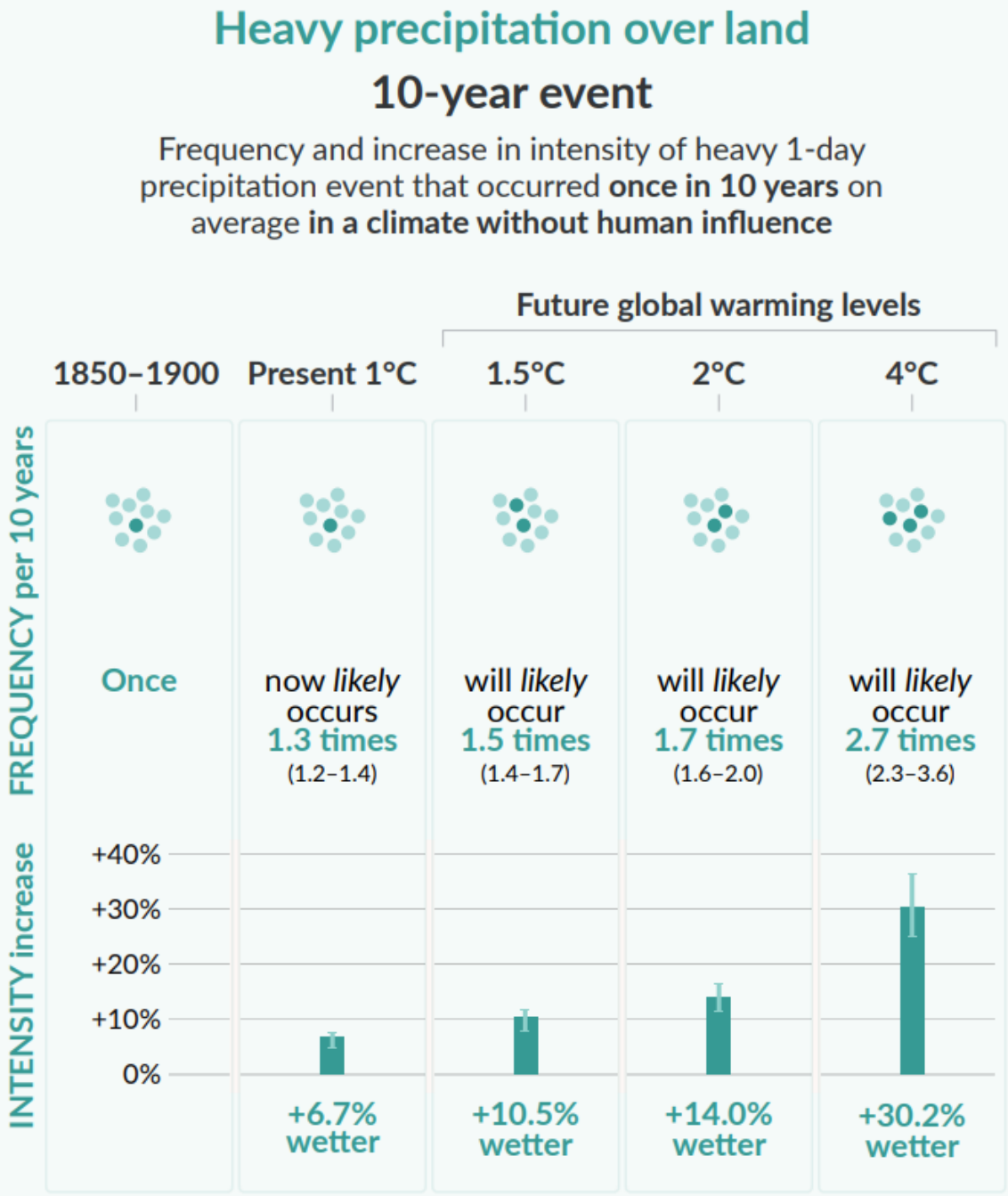
Type of observed change
in heavy precipitation

- Increase (19)
- Decrease (0)
- Low agreement in the type of change (8)
- Limited data and/or literature (18)

Confidence in human contribution
to the observed change

- ●●● High
- ●● Medium
- ● Low due to limited agreement
- ○ Low due to limited evidence

Source: The Sixth Assessment Report of the Intergovernmental Panel on Climate Change



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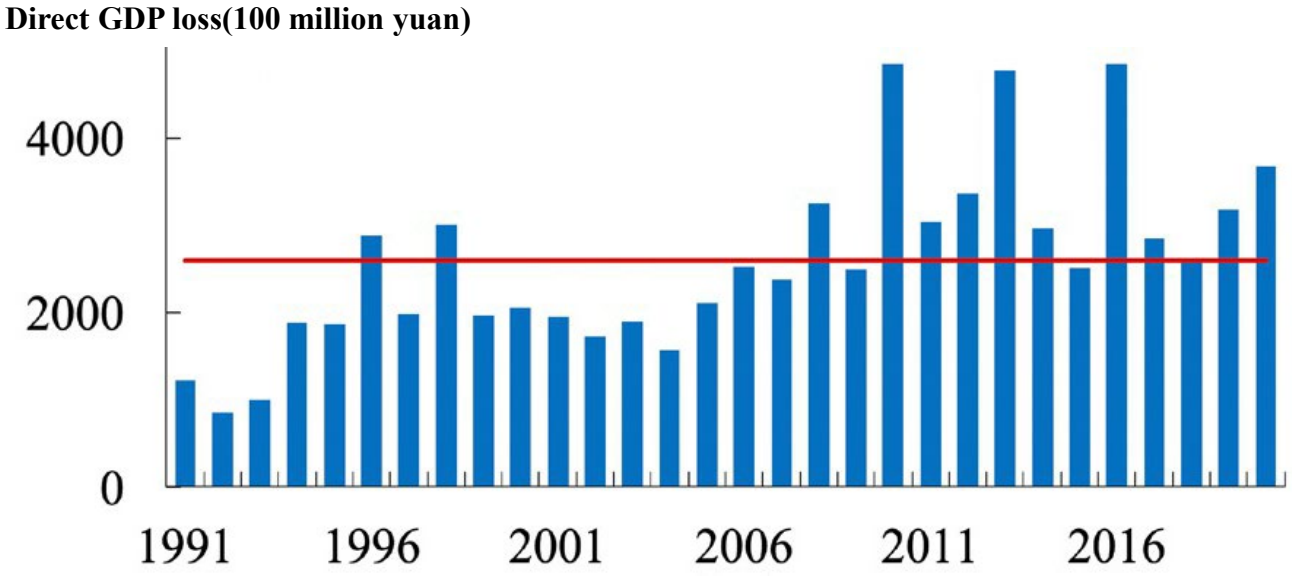
Heavy precipitation (frequency and intensity)

- Projected changes are shown at global warming levels of 1°C, 1.5°C, 2°C, and 4°C and are relative to 1850–1900,9 representing a climate without human influence. The figure depicts frequencies and increases in intensity of 10- or 50-year extreme events from the base period (1850–1900) under different global warming levels.

- Extreme precipitation events are defined as the daily precipitation amount over land that was exceeded on average once in a decade during the 1850–1900 reference period.

Source: The Sixth Assessment Report of the Intergovernmental Panel on Climate Change

Economic Issue



The **blue bar** here means the loss annually and the **red line** means the average loss over the last 30 years (Units: **One hundred million yuan**)

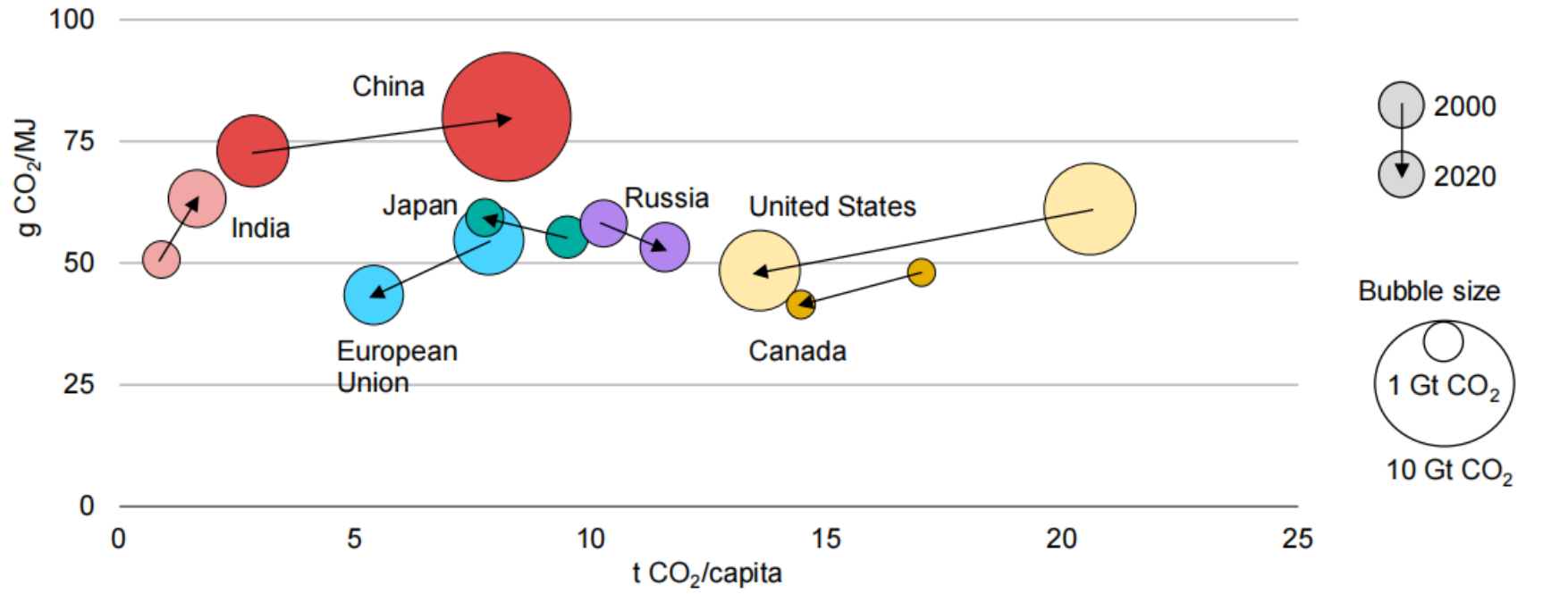
Features of extreme weather:

- Wide variety
- high frequency
- long duration
- strong seasonality
- obvious regionality

- Extreme weather
  - Bring greater economic costs
- Financial system
  - Physical risks associated with economic losses caused by climate related events
  - Transformation risks associated with revaluation of carbon intensive assets
- Agricultural sector
  - probably one of the most sensitive sectors to climate change

In 2020, the direct economic loss reached 368.1 billion yuan

Economic Issue



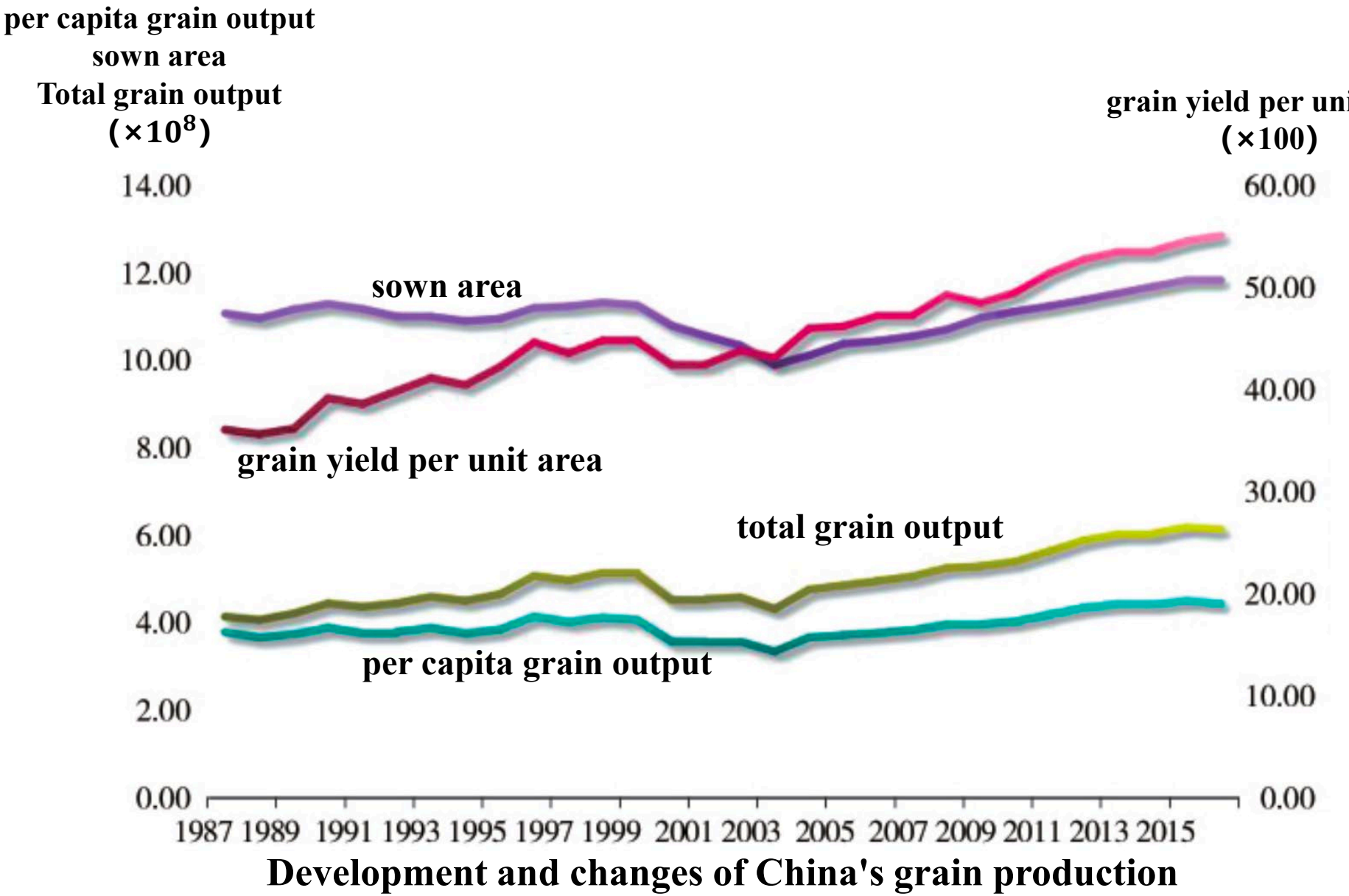
IEA, 2021.

Notes: Bubble area represents total energy-related and process-related CO_2 emissions.

CO_2 emissions intensity of primary energy demand relative to CO2 emissions per capita by country/region, 2000 and 2020

- Despite impressive growth in renewables since 2000, China remains heavily dependent on fossil fuels, with coal alone still meeting 60% of its total primary energy needs.

Agriculture Issue



Development and changes of China's grain production

China's agriculture accounts for 9% of the world's arable land, yet it provides food and clothing for 20% of the world's population!

Reference: WEN Jing, ZHANG Chao, et. al. Spatio temporal Evolution and Influencing Factors of Chinese Grain Production under Climate Change. Journal of Henan University(Natural Science). 2020: 50(6).

Agriculture Issue

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Climate Change

- plant diseases & insect pests
  - Many diseases and pests began to evolve a unique hibernation mechanism, and the survival time gradually increased
  - Many of the northern diseases and insects were brought to the south without corresponding natural enemies to contain them
- extreme weather
  - Large-scale precipitation will cause landslides and mountain floods, resulting in the breach of the reservoir dike
  - Extreme droughts can reduce crop yields
- light resources; Planting area and system……

→ Example: Since the 1990s, the climate in northeast China has changed significantly, and rice can no longer be grown in some areas, while the planting range of warm-loving plants in northwest China has expanded.

Reference: XIE Wei, WEI Wei,CUI Qi.The impacts of climate change on the yield of staple crops in China: a Meta-analysis[J]. China population,resources and environment,2019,29(1):79-85.

Agriculture Issue

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China is making great efforts in agricultural production to mitigate the impact of global climate change on food production.

Academician Yuan Longping (1930.9-2021.5)
"Father of Hybrid Rice"

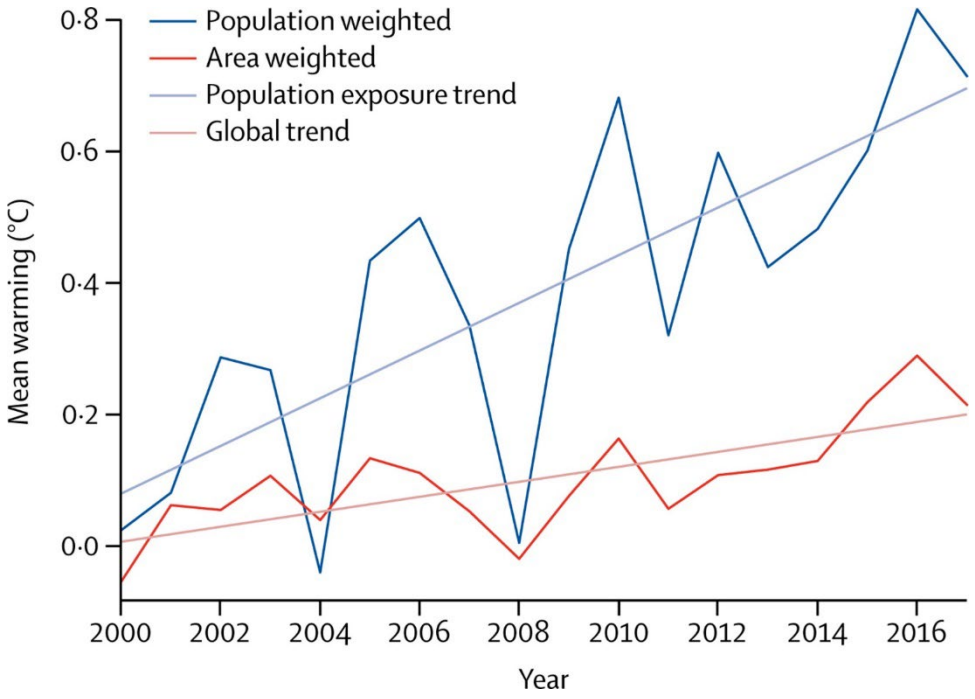
“I have two dreams:
The dream of enjoying the cool under the grain.
The dream of covering the world with hybrid rice.”

For People in China,
for People of the World.

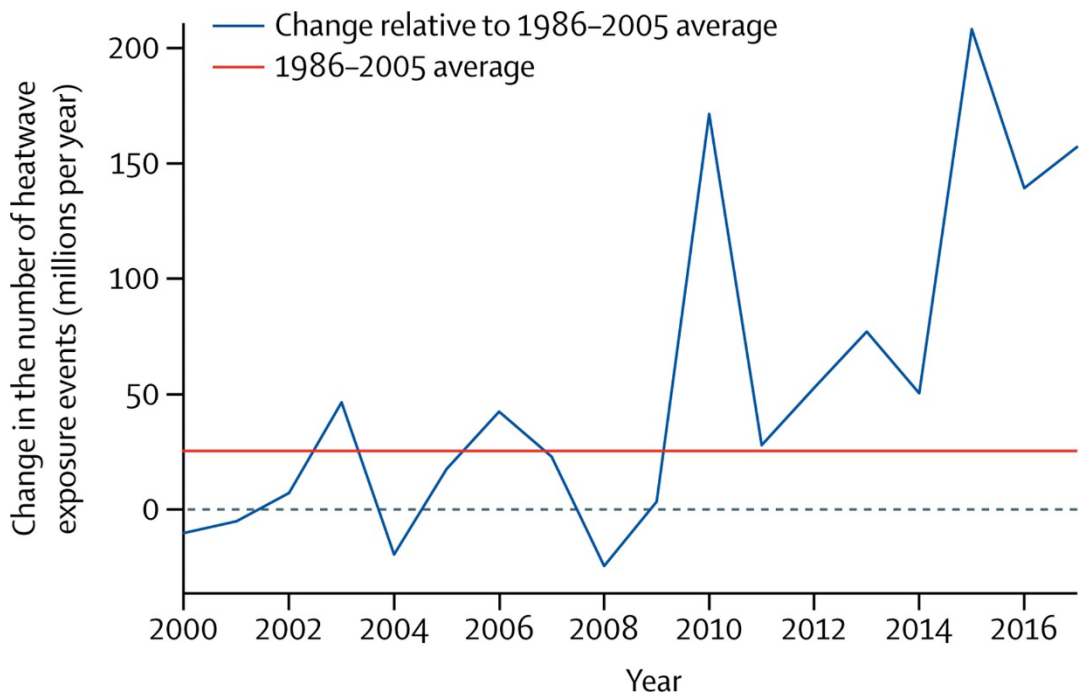
On October 26, 2021, nanfan public experimental base in Sanya city, Hainan province announced the results of double season rice yield measurement: Hainan has achieved the goal of 1500 kg per unit area of double season rice, creating the highest local double season rice yield per mu record!

Health Issue

In 49 large cities in the United States, changes in extreme hot and extreme cold temperatures are projected to result in more than 9,000 additional premature deaths per year under a higher scenario by the end of the century.



Mean summer warming relative to the 1986–2005 average



Change in the number of heatwave exposure compared with the historical average number of events (1986–2005 average)

Reference： Watts, Nick, et al The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come[J]. The Lancet, 2018.

Health Issue

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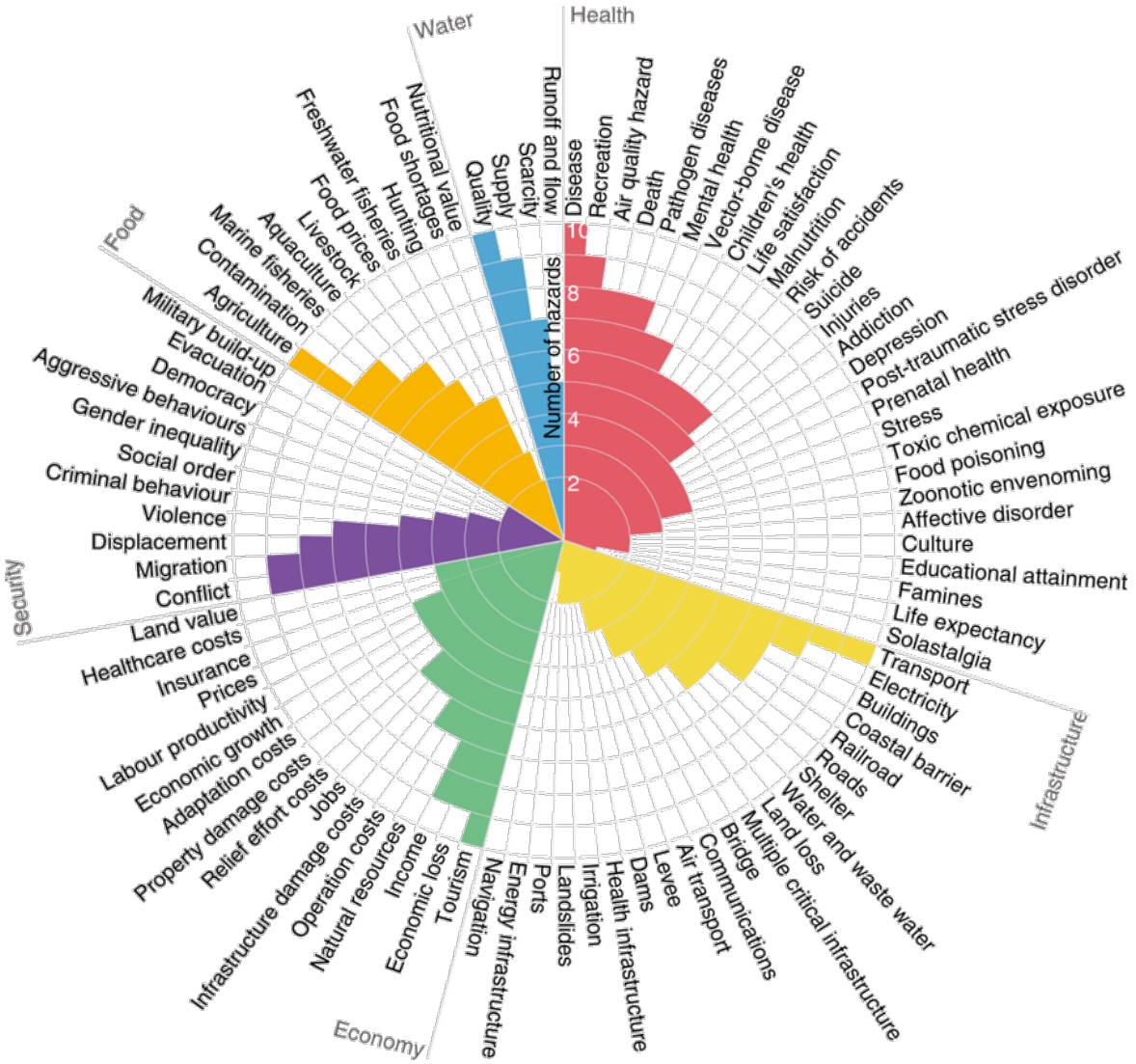
Ten Climate Hazards And six aspects of human systems



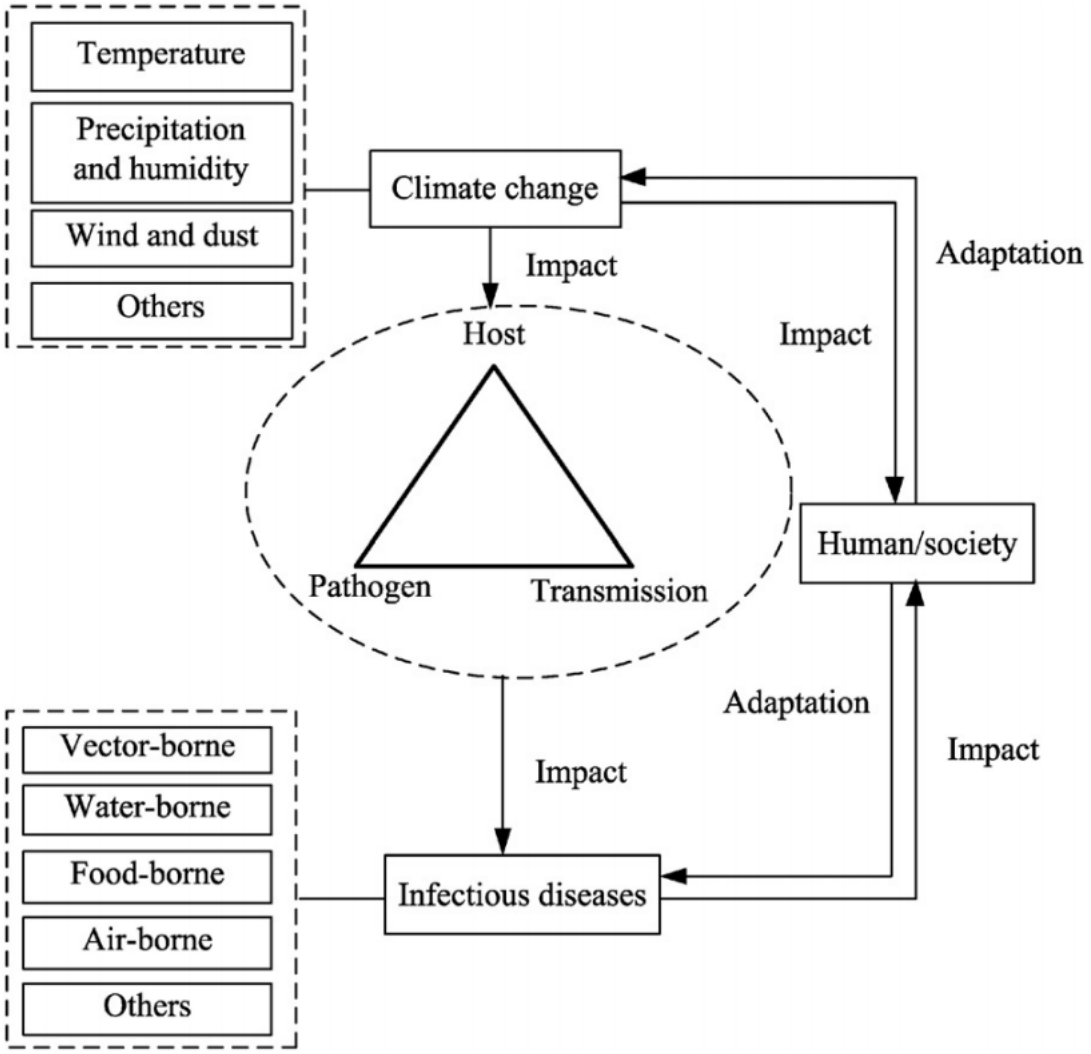
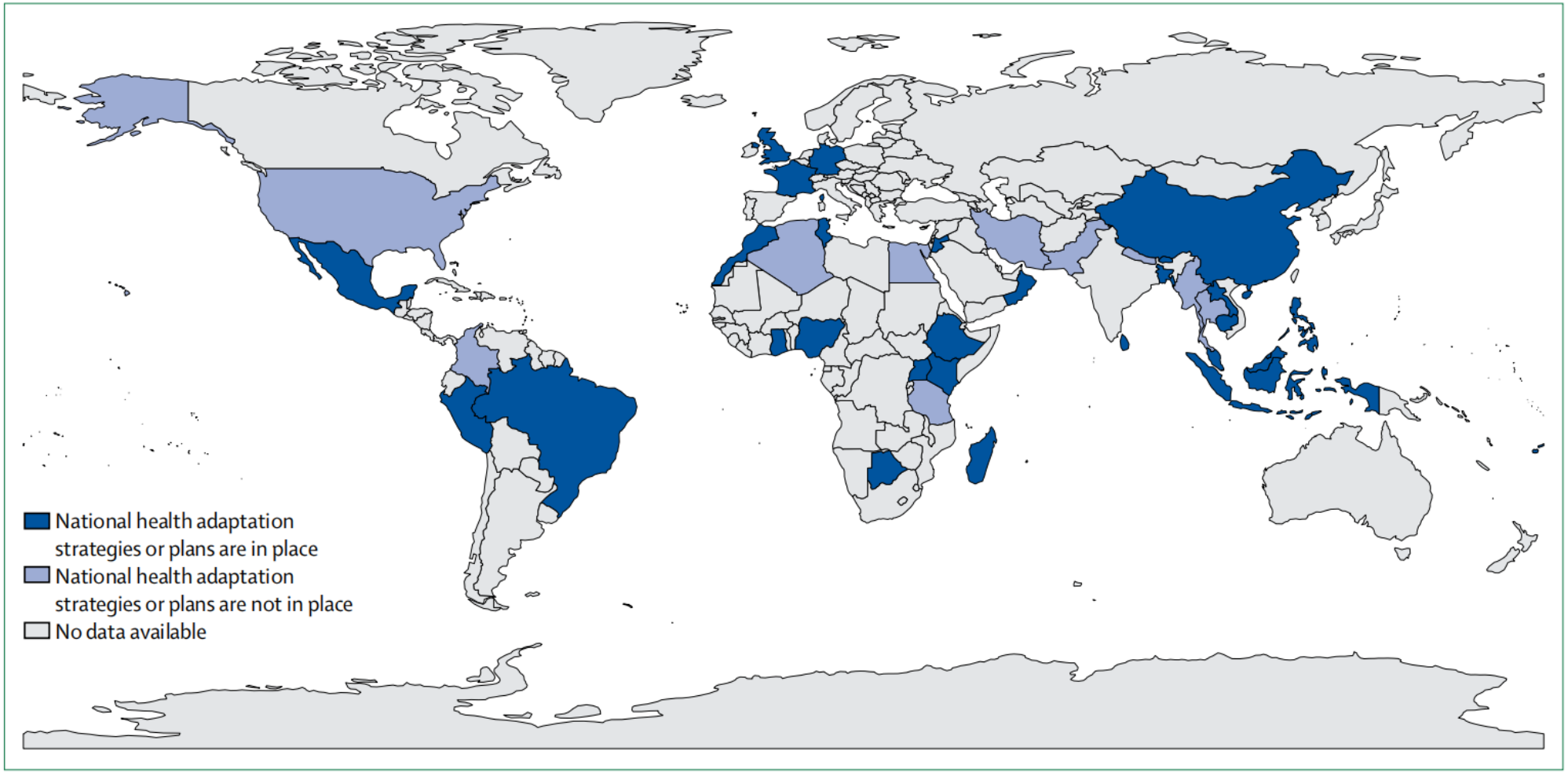


Fig. 1. Climate change, human infectious diseases, and human society.

Reference： **Impact of climate change on human infectious diseases: Empirical evidence and human adaptation**

Adaptation

·**Some countries have taken national health climate adaptation strategies or plans.**



Reference: The *Lancet* Countdown on health and climate change: from 25 years of inaction to a global transformation for public health

Adaptation

Key Message 3

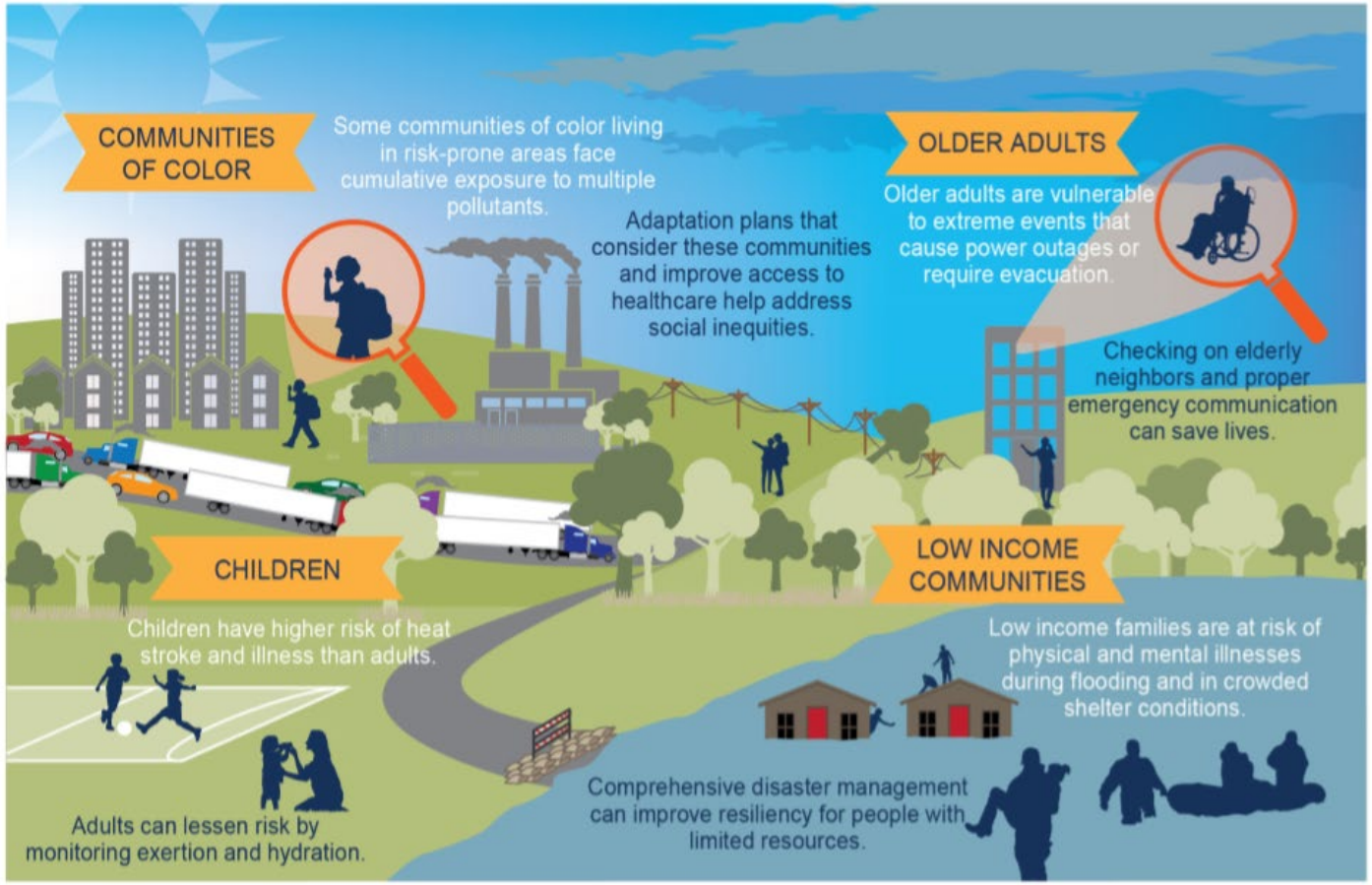
Adaptation Reduces Risks and Improves Health

Proactive adaptation policies and programs reduce the risks and impacts from climate-sensitive health outcomes and from disruptions in healthcare services. Additional benefits to health arise from explicitly accounting for climate change risks in infrastructure planning and urban design.

Local efforts including:

- Altering urban design (for example, by using cool roofs, tree shades, and green walkways)
- Improving water management (for example, via desalination plants or watershed protection)

can provide health and social justice benefits, elicit neighborhood participation, and increase resilience for specific populations, such as outdoor workers.



Reference: US Fourth National Climate Assessment

Thanks!