Science, Technology, Innovation, and Collaboration for Water-Secure Asia

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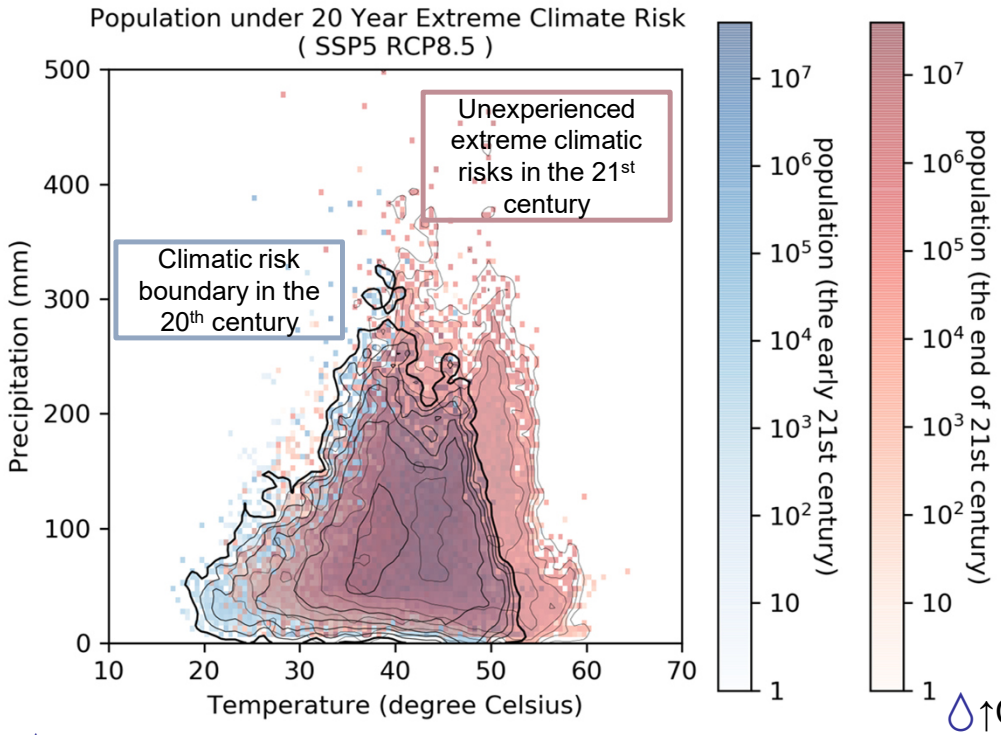
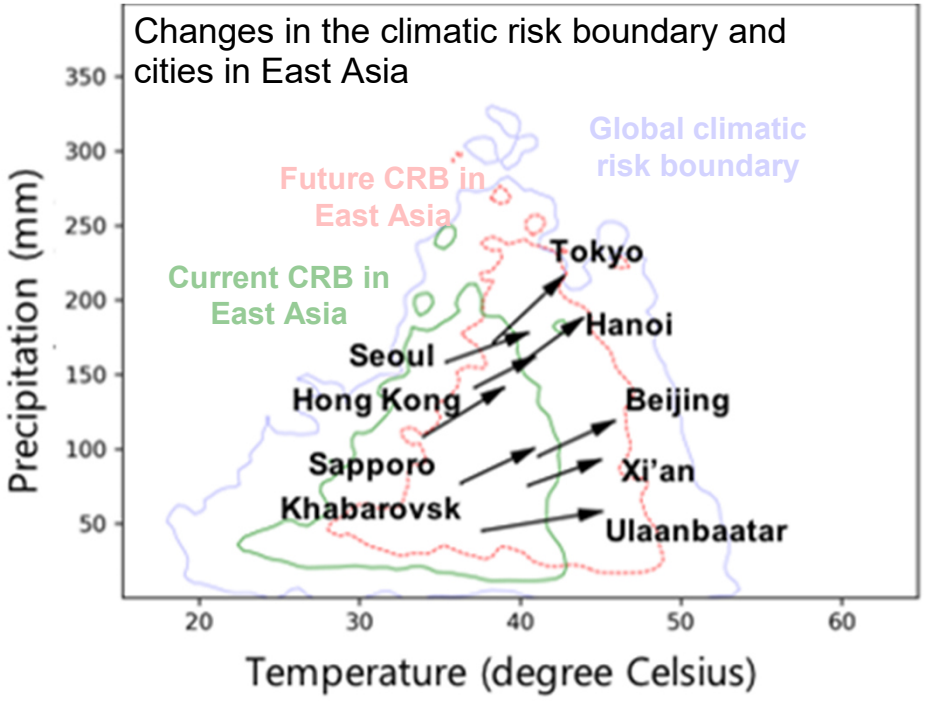
How can hydrology help achieving water security?

- Hydrology contributes for society by providing *reliable*…
  - dataset of past and current global/local hydrological cycles,
  - near-real time to seasonal predictions of weather/climate, and
  - future hydrological cycles under climate change.
- Hydrology contributes for society by giving answers to…
  - Identify effective measures to be taken in order to secure the water supply, mitigate potential flood risks, improve water quality, and protect and/or restore aquatic ecosystems.
  - Quantitative estimates how much water is (and will be) really available for water withdrawal/consumption for human beings. ← requires predicting societal aspects, as well.

(Sano and Oki, *Environ. Res. Commun.*, in press, 2022,)

Changes in the climatic risk boundary



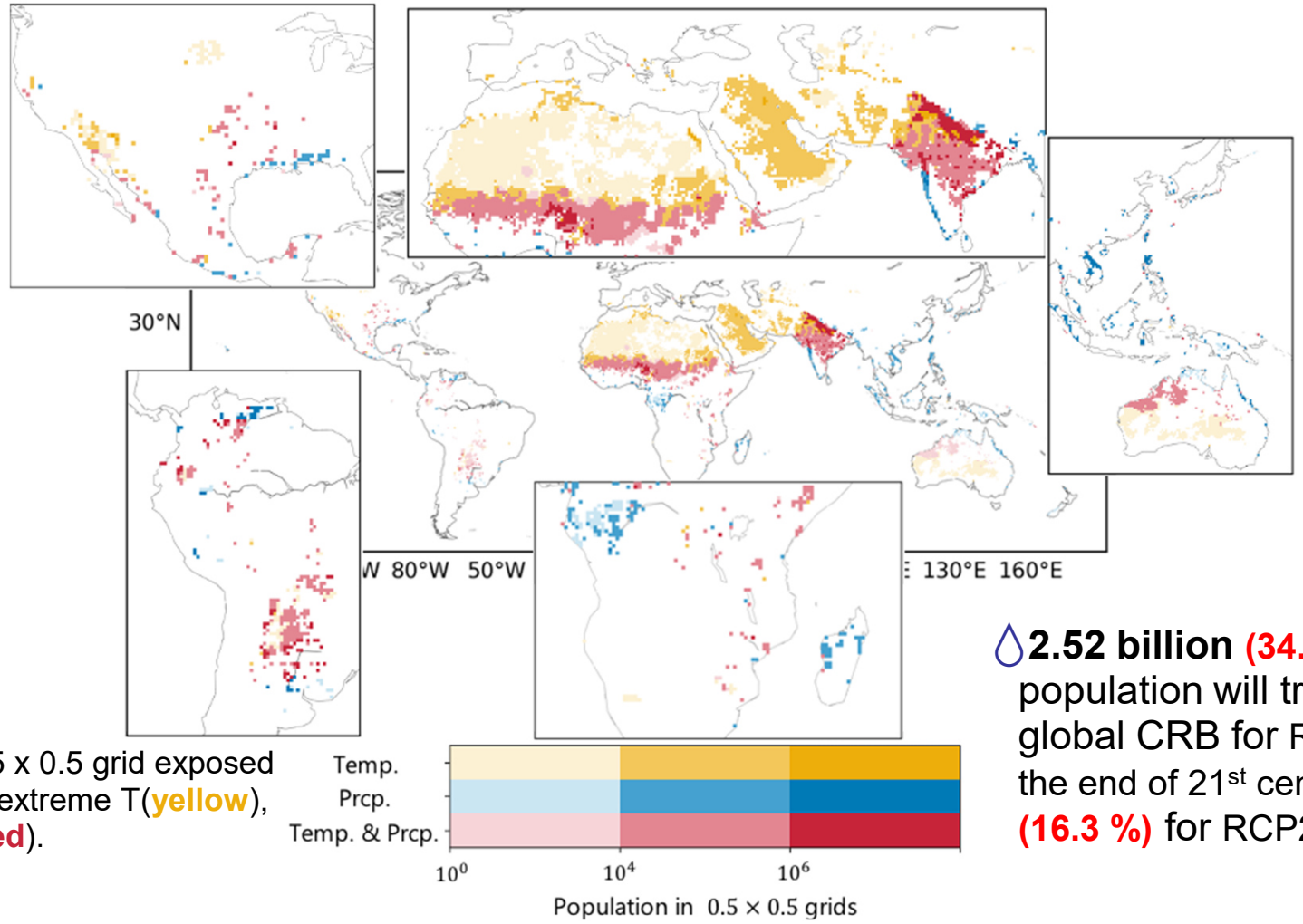


- ↑Projected change in the population exposed to extreme weather risks of the 20-year Temp. and Precip. by bins of 0.5 °C and 10 mm, respectively.
- Current (1980–2009; blue) and future (2070-2099; red) for the RCP8.5-SSP5 scenario.

- ↑Change in the climatic risk boundaries of the 20-year maximum daily temperature and precipitation in East Asia.
- Arrows show the shifts in extreme climatic risks in large cities represented by the direction of the arrow from the present climatic conditions (1980–2009) to the future climatic conditions (2070–2099) under RCP8.5-SSP5 scenario.

(Sano and Oki, *Environ. Res. Commun.*, in press, 2022,)

Population transgress the CRB



- Population in a 0.5 x 0.5 grid exposed to unprecedented extreme T(**yellow**), P(**blue**), or both(**red**).

- **2.52 billion** **(34.2%)** of world population will transgress the global CRB for RCP8.5-SSP5 at the end of 21st century. **1.1 billion** **(16.3 %)** for RCP2.6-SSP1.

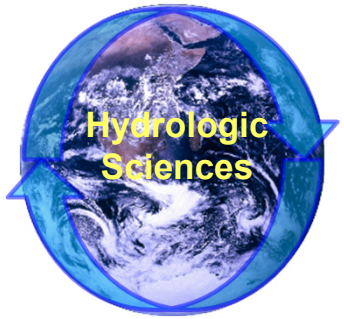
Socio-hydrology can mean various studies

Influences

e.g., required for engineering design

Interactions

in physical, social, & cyber spaces



Human Society

Interventions

out of scope in the past

Water Cycles

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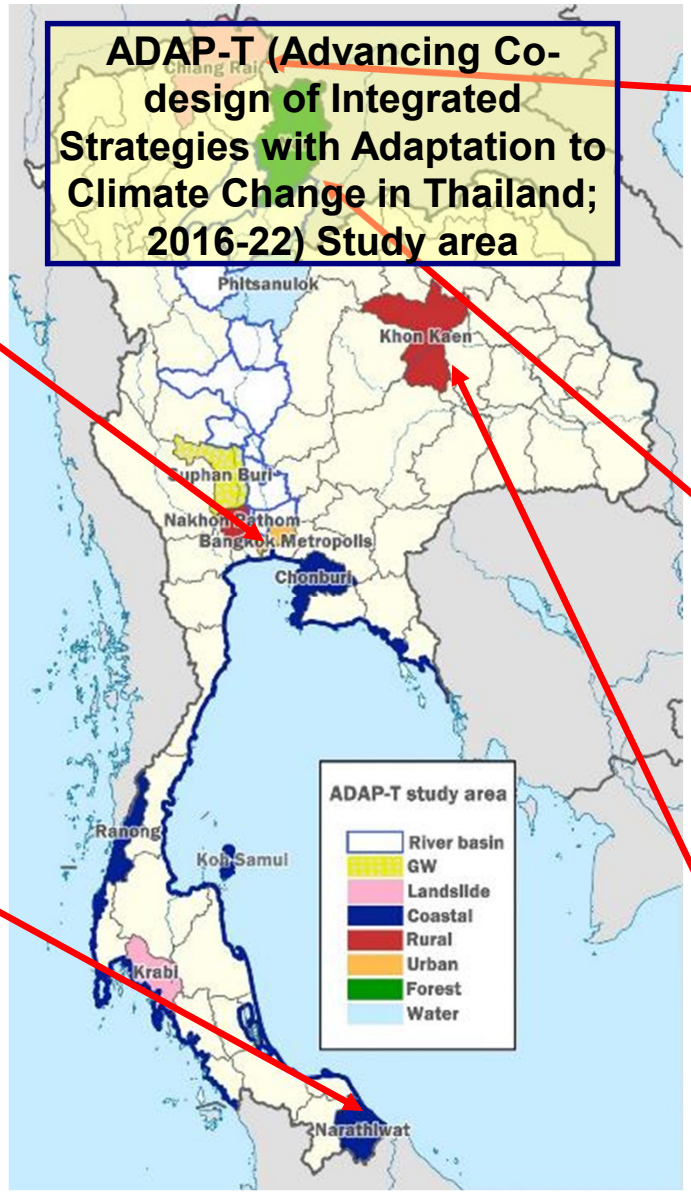
ADAP-T (Advancing Co-design of Integrated Strategies with Adaptation to Climate Change in Thailand; 2016-22) Study area



Urban

Economic damage by urban flood ➔ Adaptation measures, e.g. elevated road.

Coastal

Beach erosion by sea level rise ➔ Monitoring changes in past decade

Sediment

Install landslide early warning system ➔ Hazard map based on risk assessment

Fresh Water Forest

Overlooking local heavy rain by low density ➔ Strengthening automatic weather station (AWS) network

Rural

Monitoring risk of salinity by satellite ➔ Salt accumulation data for accuracy improvement

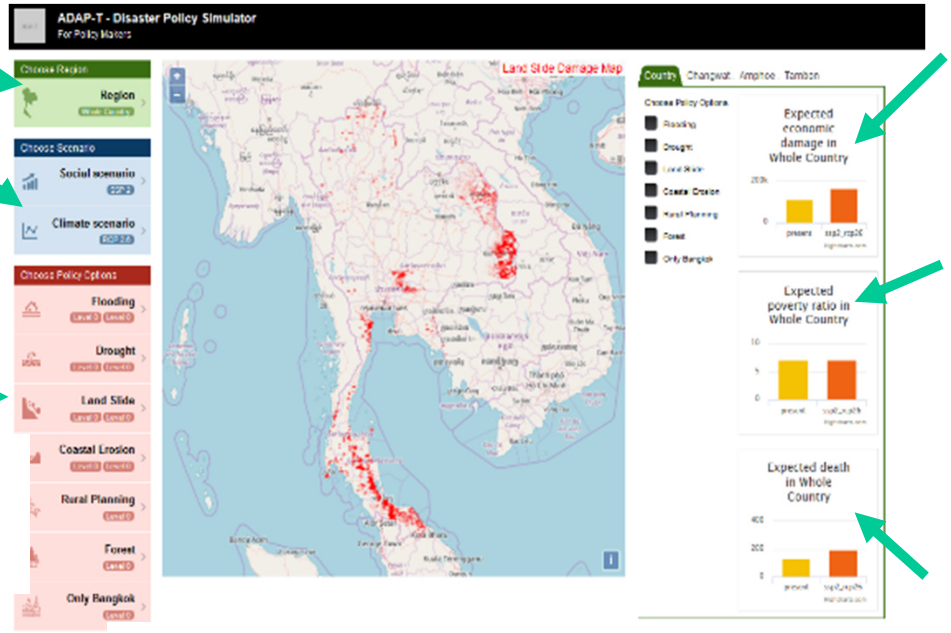
Web application

- Interactive tool for evidence-based policy making.
- Show the map with cost & benefit of adaptation in major sectors for supporting making decision well-balanced adaptation portfolio.

Select Region

Select Shared Socioeconomic Pathways and Climate change scenarios

Select Adaptation to each disaster (Example. Coastal erosion >nourishment)



Assessment of economic loss

Assessment of impact to poverty

Assessment of human damage

Map of risk and economic loss

Dr. Hiroaki Shirakawa (Nagoya Univ.), Dr. Weerakaset Suanpaga (Kasetsart Univ.)

Remarks

- We cannot solve any issue we cannot sense.
- Water is the focal point of sustainable development.
  - ❄ Water is also the delivering mechanism of climate change impacts to society.
- Water is a pilot; integrate and lead our world for the better future.
- Smooth exchanges of knowledge and technologies through global partnerships based on multilateralism is critically relevant for implementing applicable and efficient adaptation measures to climate change.