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## International Panel Discussion

# Research Progress and Challenging Issues in Climate Change Impacts on Water Resources and Adaptation in China

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# Outlines

- 1. National actions on coping with climate change and adaptation in China**
- 2. Research progress on climate change impacts on water resources and adaptation in China**
- 3. Several challenging issues**

# 1. National actions on coping with climate change and adaptation in China

## 1.1 "National Plan to Cope with Climate Change (2014-2020)" – promulgated by the State Council of China in September, 2014

The plan consists of 11 chapters, including targets in 2020, control of greenhouse gas emission, adaptation to climate change, pilot projects, policies, capability building, international cooperation and so on.

- ❑ **Targets in 2020:** compared with 2005, CO<sub>2</sub> emission decreases 40-45%, non fossil energy accounts for about 15% of primary energy consumption, forest area and stock volume increases by 40 million ha and 1.3 billion m<sup>3</sup> respectively, which had been reached in 2019.
- ❑ **Related to water resources:** 1) enhancing water resources management including comprehensive water-saving, utilization of rainwater and recycled water etc.; 2) constructing hydraulic works for rural drinking water, urban water supply pipeline, emergent water source for drought-fighting, flood-control works for snow melting etc.
- ❑ **Pilot projects:** climate disaster prevention in urban areas and coastal areas, wetland protection and rehabilitation etc.

# 1. National actions on coping with climate change and adaptation in China

## 1.2 "Global Change and Adaptation" – a key program of National Key Research & Development Plan of China (2016-2020) – involving climate, water, land, ecosystem, economy etc.

Financial fund of central government: 1.658 Billion Yuan, 65 projects (over 80%) had been implemented at the end of 2018, including 5 tasks:

- ❑ **Task 1:** Development and application of Integrated measurement, data assimilation, big data platform of global change
- ❑ **Task 2:** Facts, key processes and dynamic mechanism research on global change
- ❑ **Task 3:** Development, forecast and prediction of Global System Model
- ❑ **Task 4:** Impacts and risk evaluation of global change
- ❑ **Task 5:** Mitigation and adaptation to global change and sustainable transformation

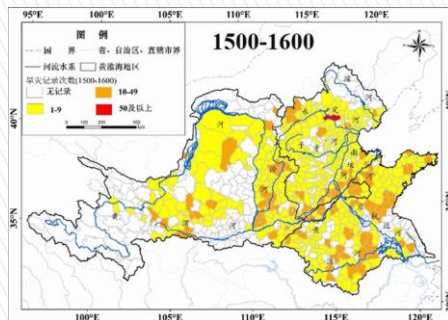
## 2. Research progress on climate change impacts on water resources and adaptation in China

### 2.1 Key Technologies for Climate Change Impacts on Regional Water Resources, Droughts and Floods and Risk-coping

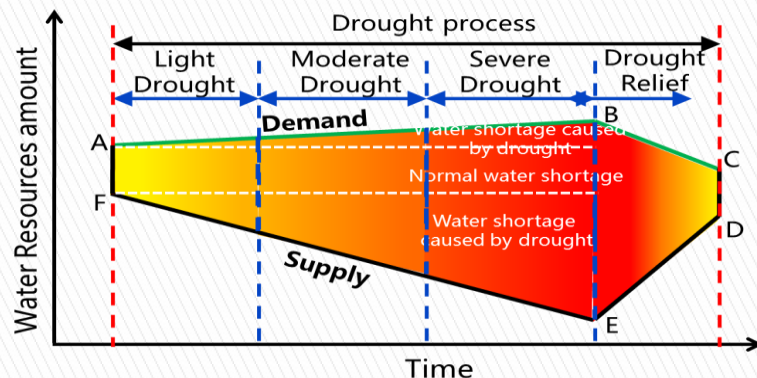
(by IWHR, got National Award for Science and Technology Progress of China in 2018)

#### □ Main achievements

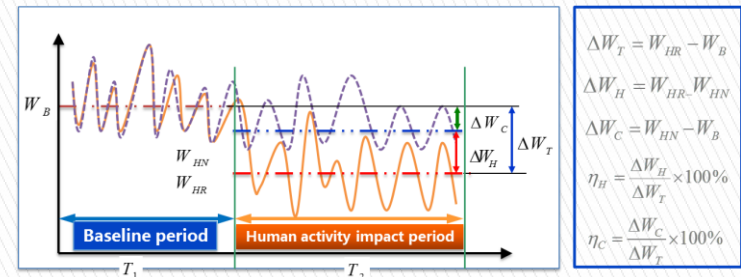
##### A. Evaluation methods of droughts/ floods and risk



Historical Drought events in the Huang-Huai-Hai Region



##### B. Attribution of runoff change and driving mechanism of droughts and floods

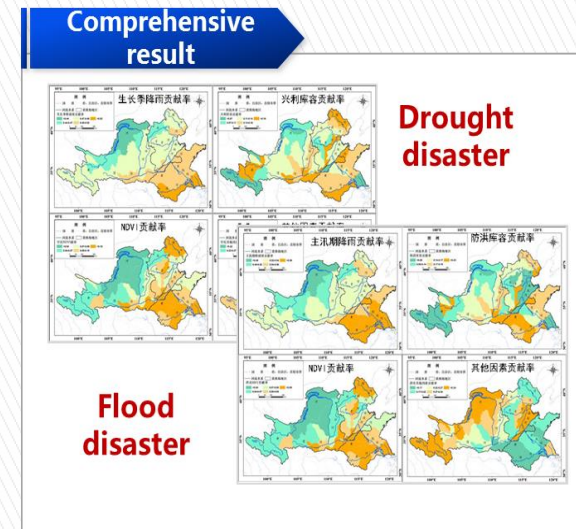
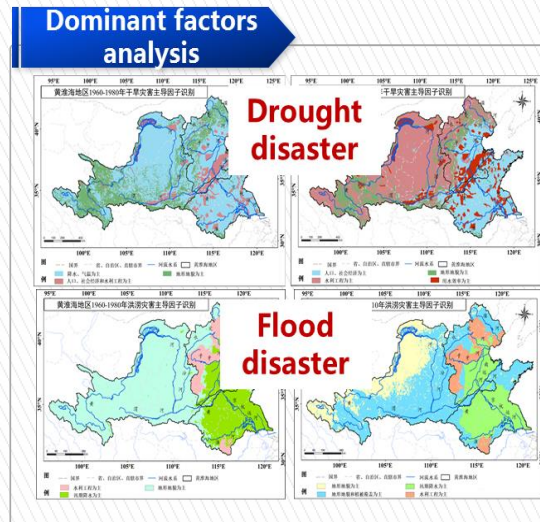
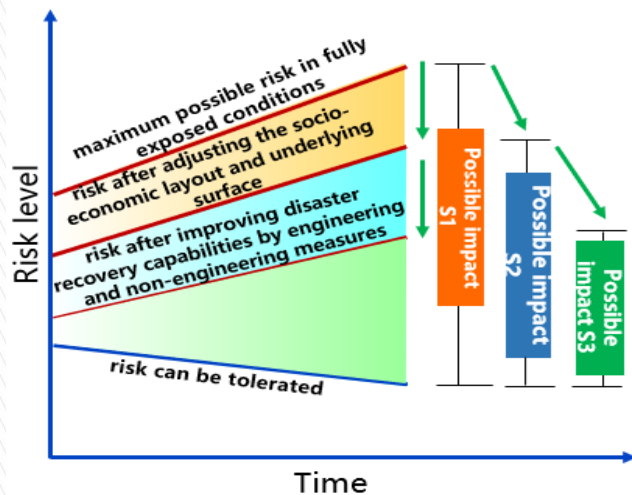


- A **mathematical model for attribution** of river runoff change based on long sequence diagnosis
- A **identification technology of the driving mechanism** of regional water resources, droughts and floods based on “separation-coupling” method
- **Case study** of driving mechanism of water resources, droughts and floods evolution in **China and especially in the Huang-Huai-Hai Region**



## 2. Research progress on climate change impacts on water resources and adaptation in China

### C. Risk-coping strategies



- **Proposed comprehensive risk-coping strategies** of regional water resources, droughts and floods based on “three-layer risk” assessment
- **Prepared a risk adaptation plan** to address climate change impacts on regulation of water resources, droughts and floods in the Huang-Huai-Hai Region
- **Put forward a program for standardized stereoscopic storage engineering** of water resources in the Huaibei Plain was

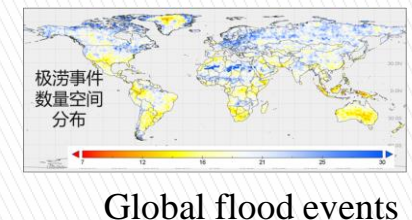
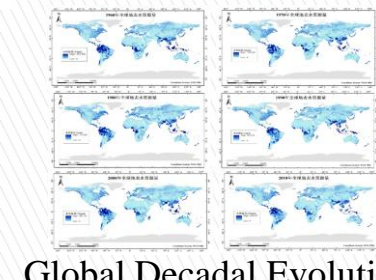
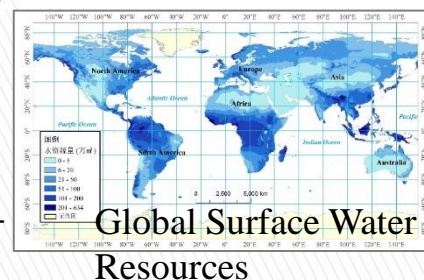
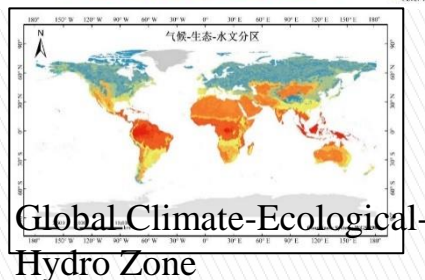
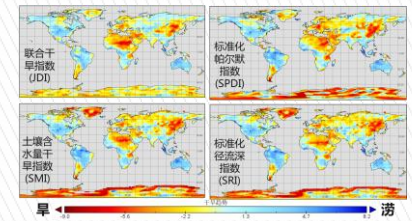
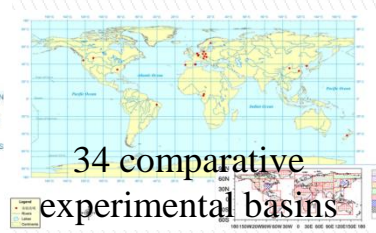
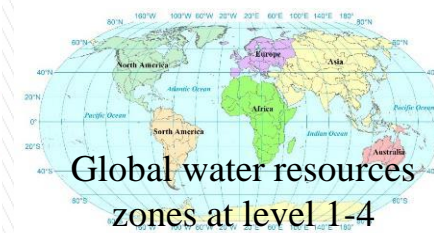
# 2. Research progress on climate change impacts on water resources and adaptation in China

## 2.2 Evolution of Terrestrial Water Cycle and its Role in Global Change

- ◆ **An ongoing IWHR-leading project and funded by :** "Global Change and Adaptation" program of National Key R & D of China:      **Study area:** Global;      **Study duration:** 07/2016-06/2021
- ◆ **Main research contents:** 1) updating the spatial distribution of global basic information, constructing the basic **database platform**, 2) identifying the **mutual feedback mechanism** of the terrestrial water cycle and global change, 3) improving the **atmospheric-land surface-hydrological coupling models** with a unified physical mechanism, 4) exploring the **evolution laws of terrestrial water resources** in global scale, various continents and the five BRICS countries, and 5) carrying out the collective **assessment of drought and flood events**

### ◆ **Scientific concerns :**

Mutual feedback mechanism between global change and water cycle, especially human-hydrol. interactions  
Evolution mechanism of global terrestrial water resources, droughts and floods  
**(socio-hydrology)**



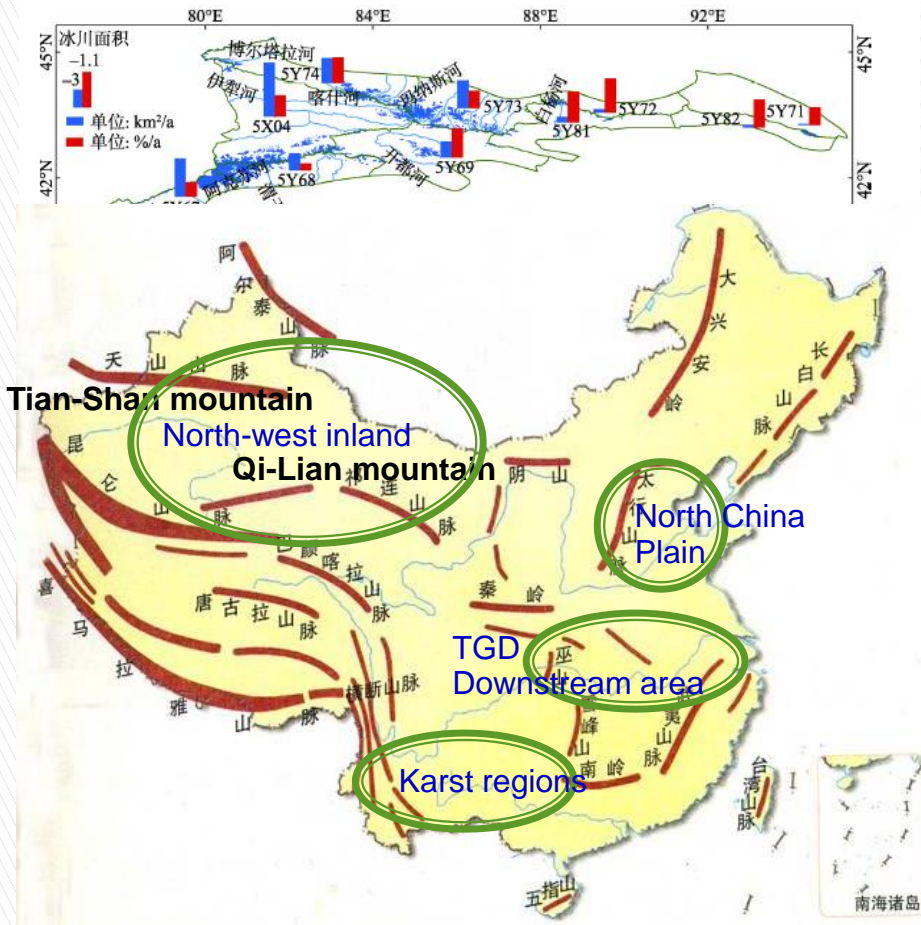


### 3. Several challenging issues

- ❑ **Issue 1:** Impacts of glacier melting on sustainable water resources utilization in North-west inland mountains of China under climate change
- ❑ **Issue 2:** Extreme droughts in groundwater-overexploited North China Plain, in Karst regions of South-west China and the downstream area of Three-Gorges Dam under climate change
- ❑ **Issue 3:** Quantitative reflection of climate change and prediction uncertainty in planning and design of water projects

**Suggestions:** more researches and international cooperation are needed.

Glacier area of Tian-shan mountain, 18% reduction from 1960 to 2010 (Xing and Li et al, 2017)



Main mountains in China (in red lines)