

## Impacts of human activities on hydrological cycle in arid regions of Northwestern China

Tomohiro AKIYAMA

(International Center for Chinese Studies, Aichi University)

### Abstract:

We focus on interaction between human activities and groundwater resource during past 50 years in the lower desert reaches of the Heihe River basin, Northwestern China. We collected hydro-meteorological data, such as precipitation, river discharge and groundwater level including satellite data in the basin. We also conducted observations of evaporation and soil water content from 2002 to 2005. At the same time, we made water sampling and anthropological survey. Stable isotopic data illustrated the groundwater recharge system is different in between the desert area with a source of high intensity precipitation and the riverside area with a source of the river water. Anthropological data also supported the finding. Water balance analysis showed that decrease of the river discharge in 1990's caused rapid decline of the groundwater level mainly in the terminal area. Satellite data and anthropological analyses revealed degradation of natural vegetation in response to the decline of the groundwater level in the terminal area. We propose a viewpoint to improve environmental degradation.

**Keywords:** Hydrological cycle; Water use; Stable isotopes; Hyper-arid environment; Northwestern China

ICCS International Symposium (Dec., 7, 2008)

## Impacts of human activities on hydrological cycle in arid region of Northwestern China

**Tomohiro AKIYAMA**<sup>\*1</sup>

<sup>\*1</sup> International Center for Chinese Studies, Aichi University, JAPAN

# 1. Introduction

## Introduction

There are several vast inland river basins in northwestern China where people's survival has heavily depended on limited water resources.

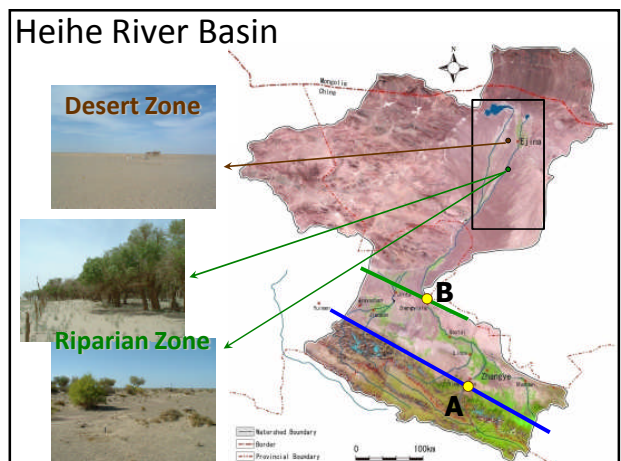
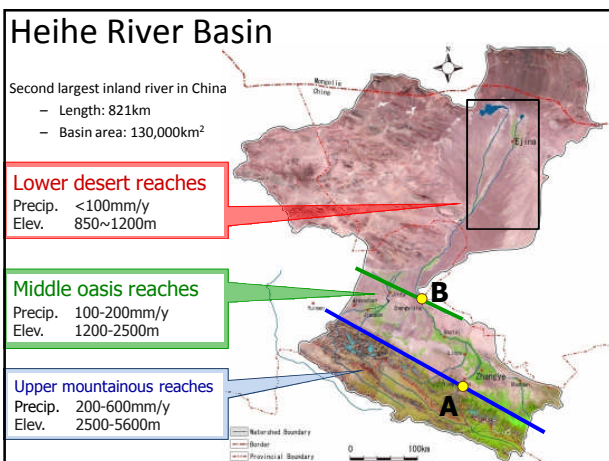
**Recently,**

- Many river courses have dried up.
- Terminal lakes have vanished.
- Serious degradation of land and vegetation has occurred.

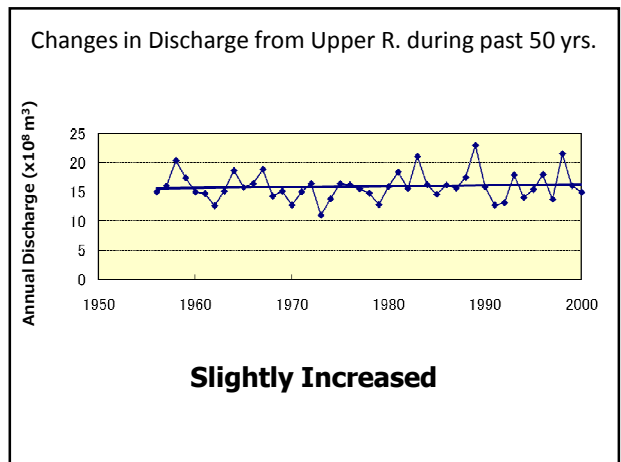
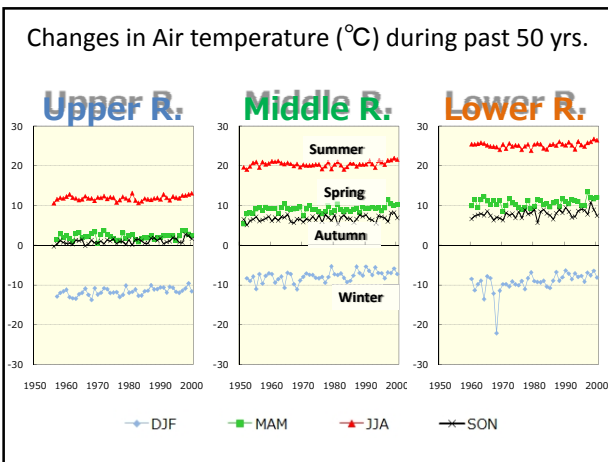
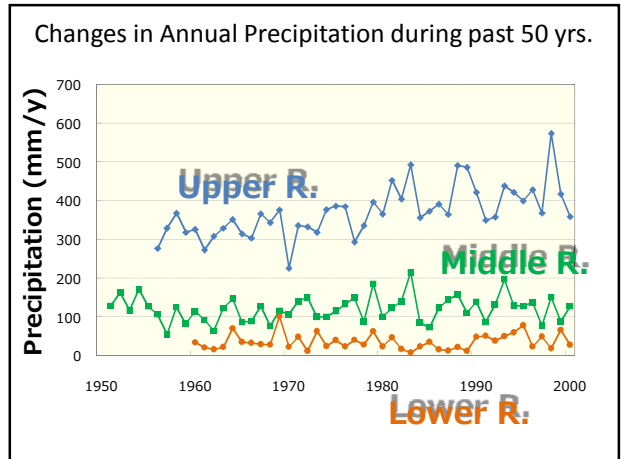
**Questions:**

- How has hydrological cycle changed in the Heihe River basin during past 50 years?
- Are those changes due to the impacts of climate change or human activities?

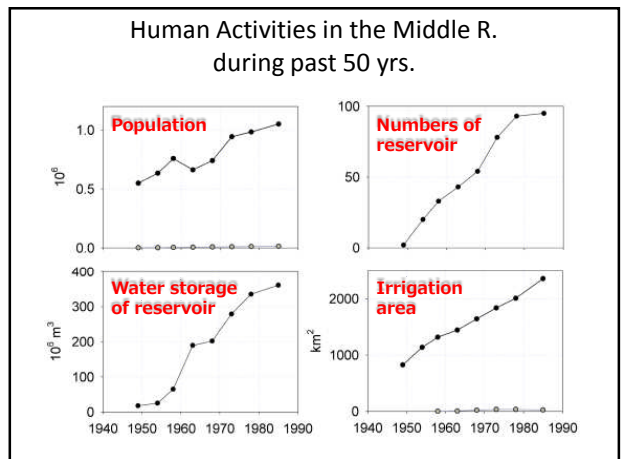
# 2. Study Area

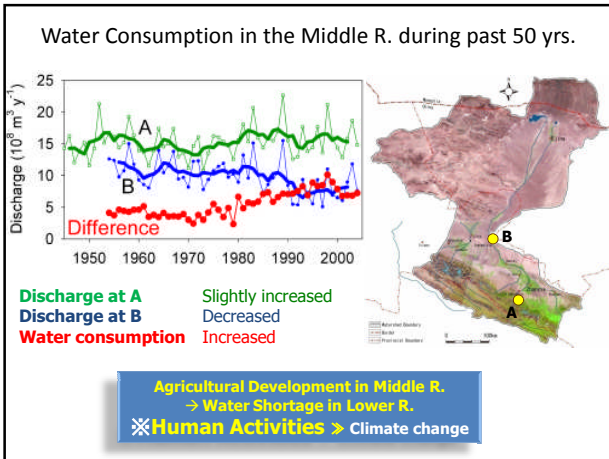


### 3. Climate Change



### 4. Human Activities

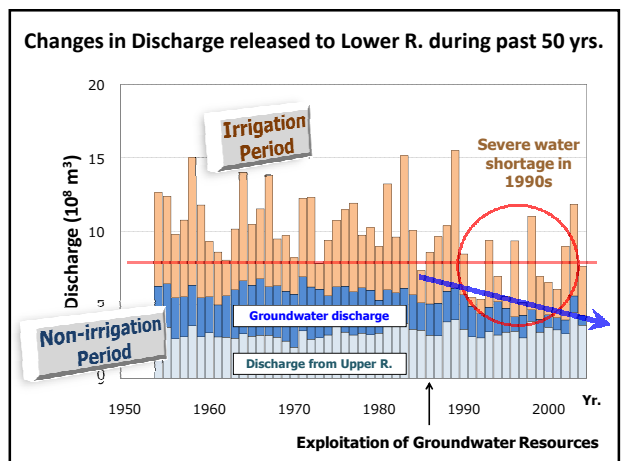
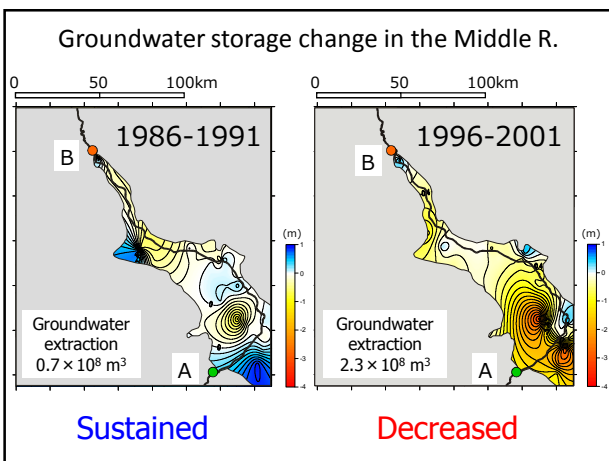
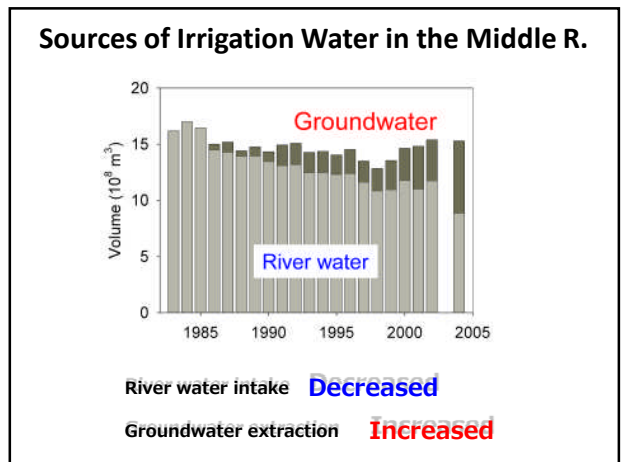


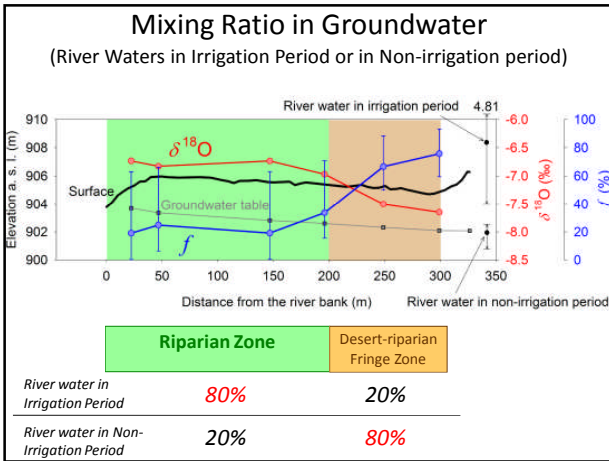
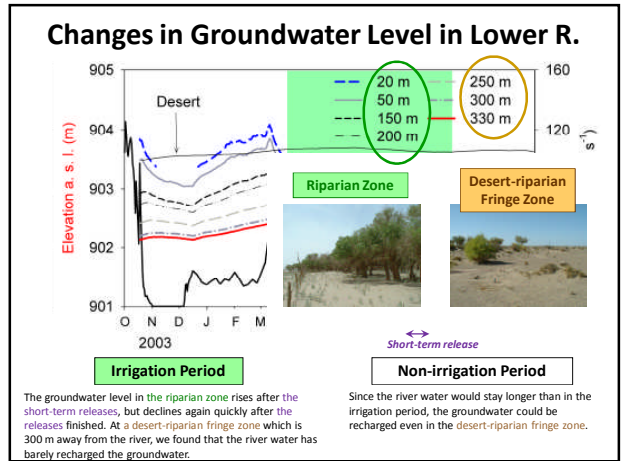
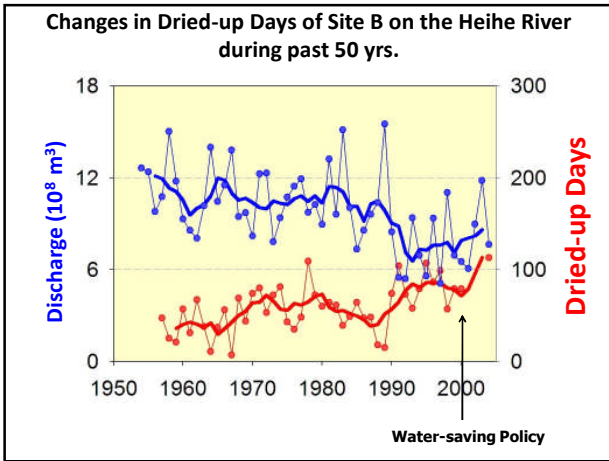


### Water-saving Policy adopted in Middle R. to ensure Discharge in Lower R.

- Changing from river water use to groundwater use
- Saving irrigation water
- Changing to crops consuming less water including cash crops
- Improving efficiency of water-transfer (e.g. Construction of Concrete Channel)
- Issuing water coupon
- Allowing the trading of water right

5. Have Water-saving Policies improved the Hydrological Cycle in Lower R.?





## 6. Summary

