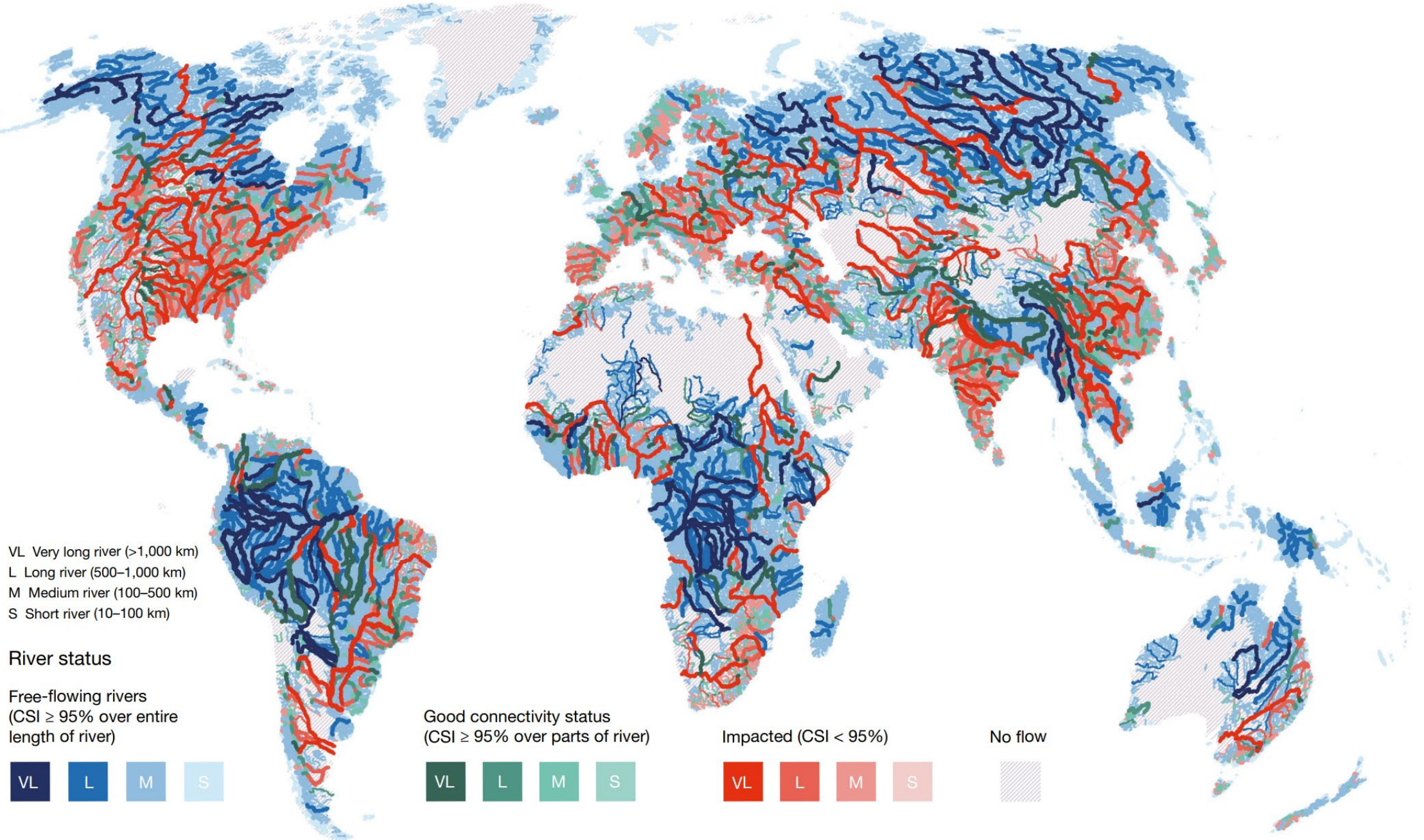




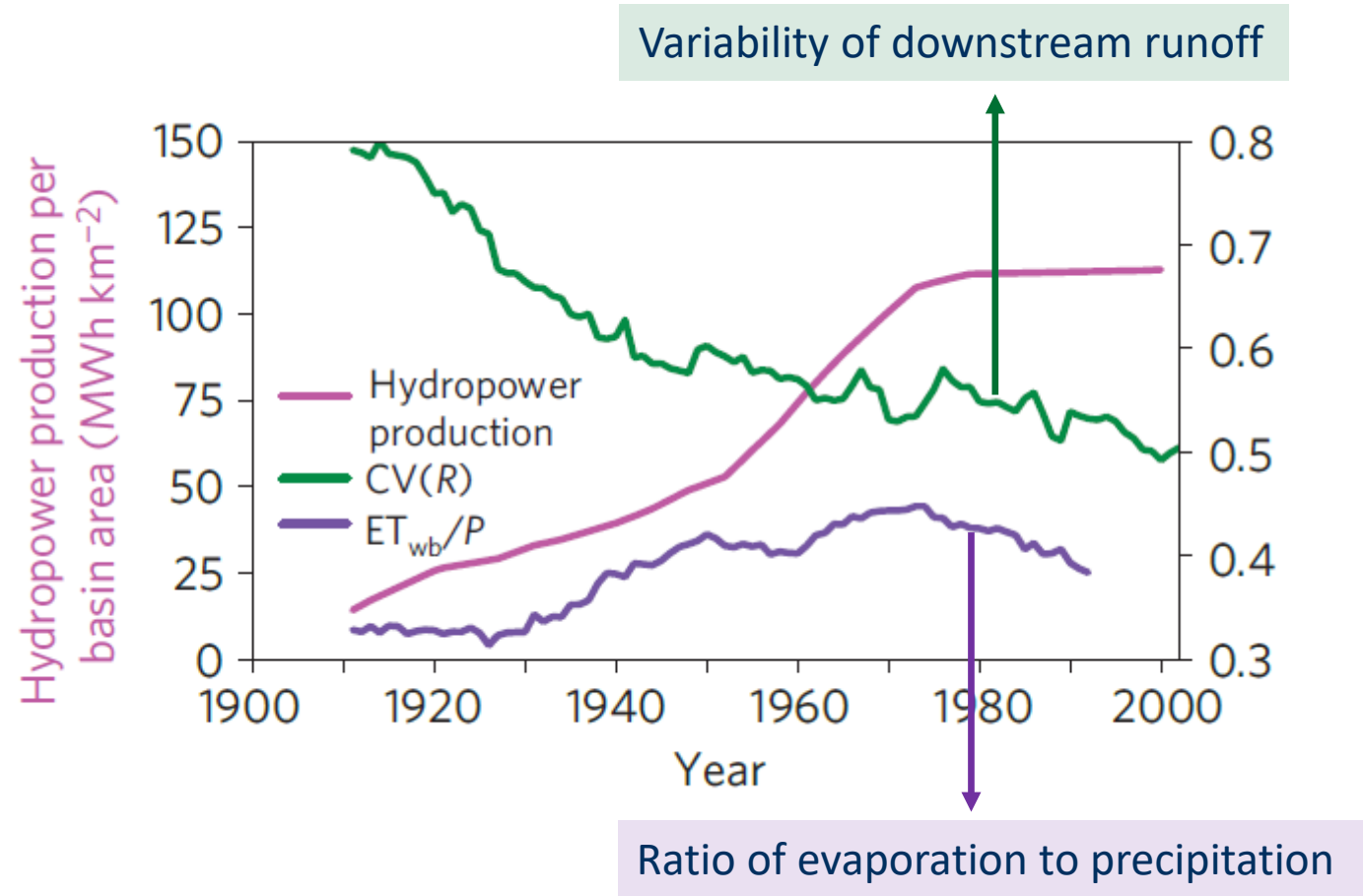
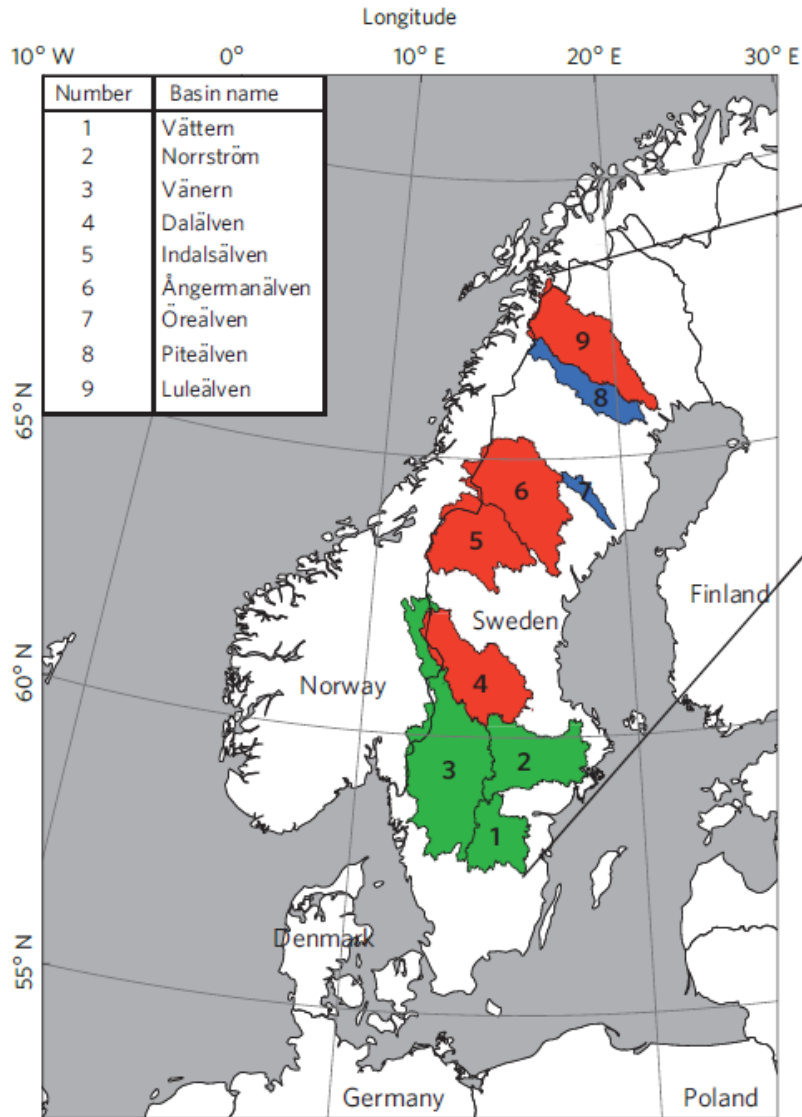
# Hidden effects of water impoundment on surrounding vegetation and water consumption

Fernando Jaramillo, Stockholm University

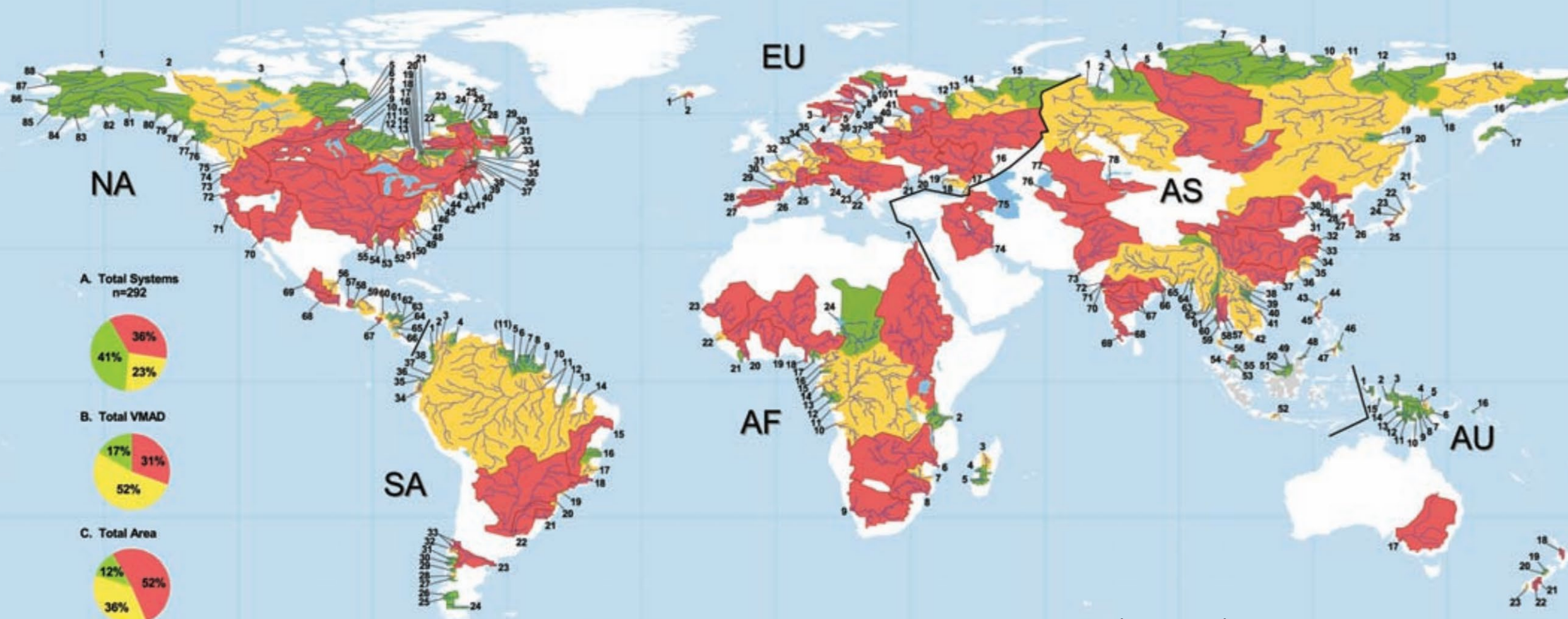




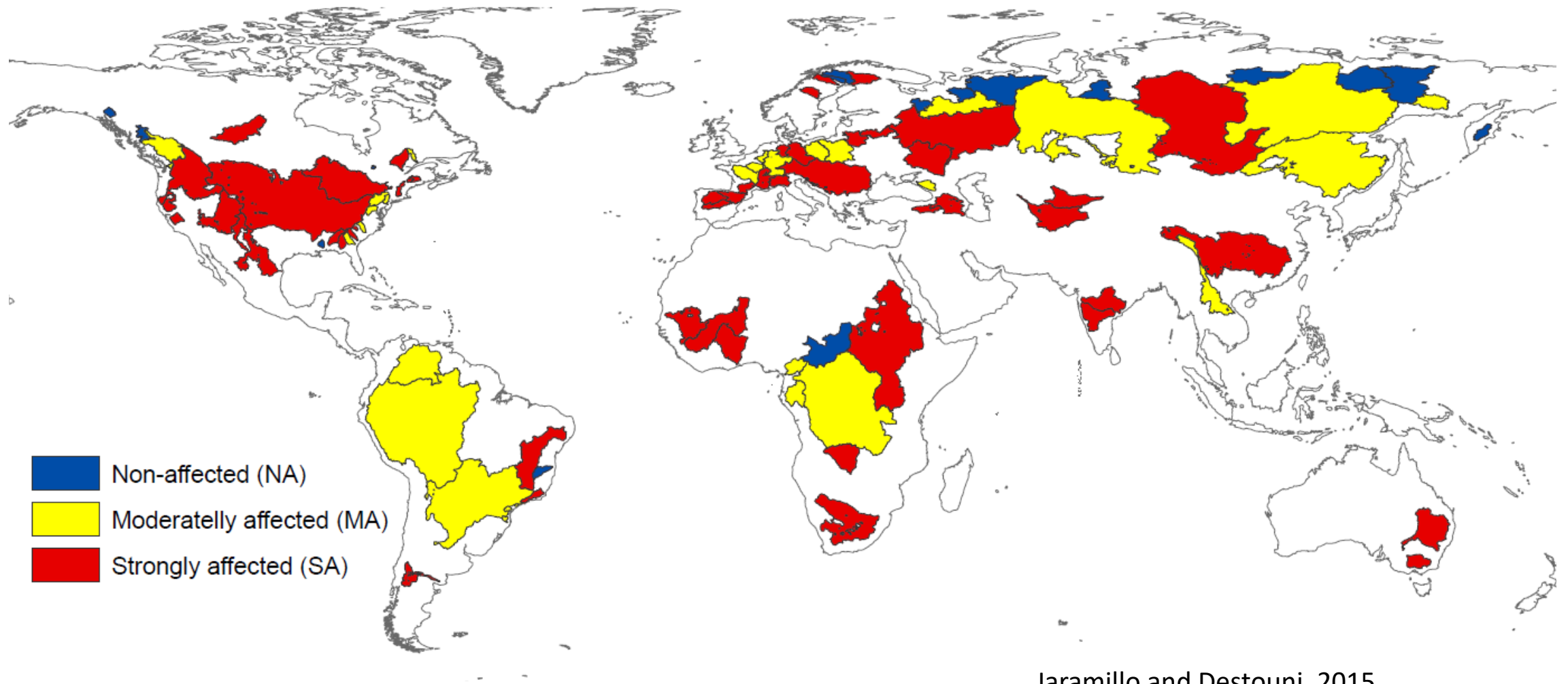
# Hydroclimatic effects of impounded reservoirs and regulation

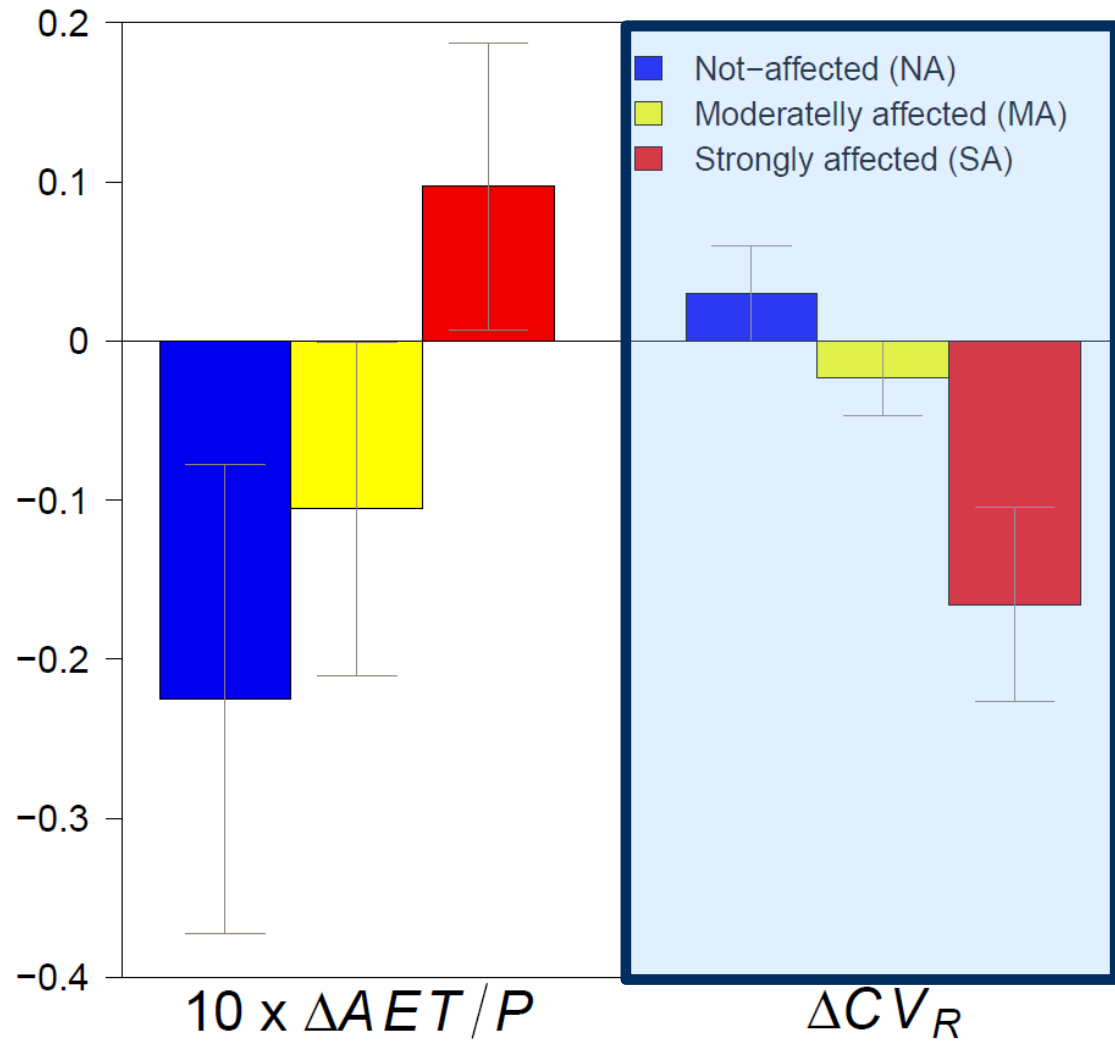




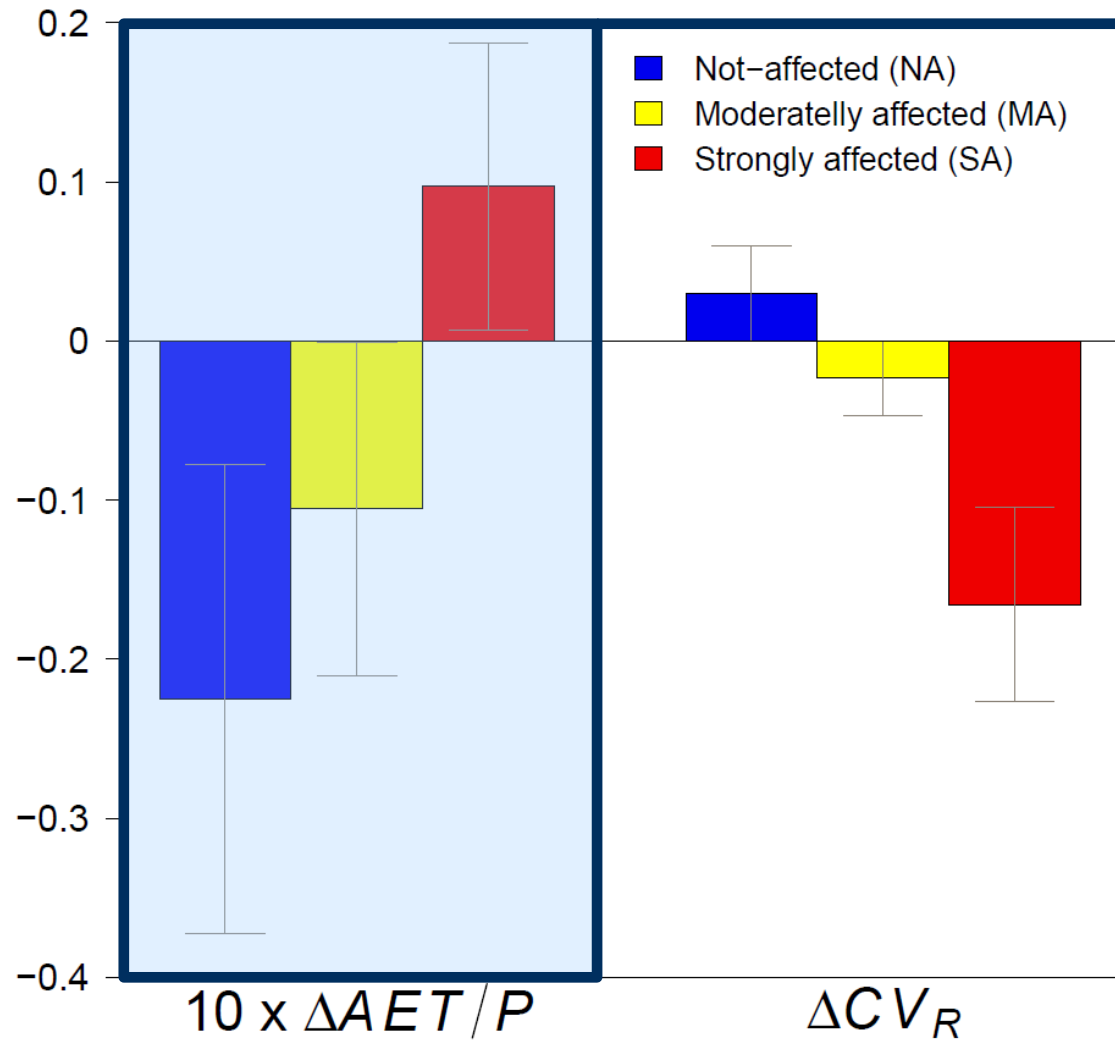


Nilsson et al., 2005



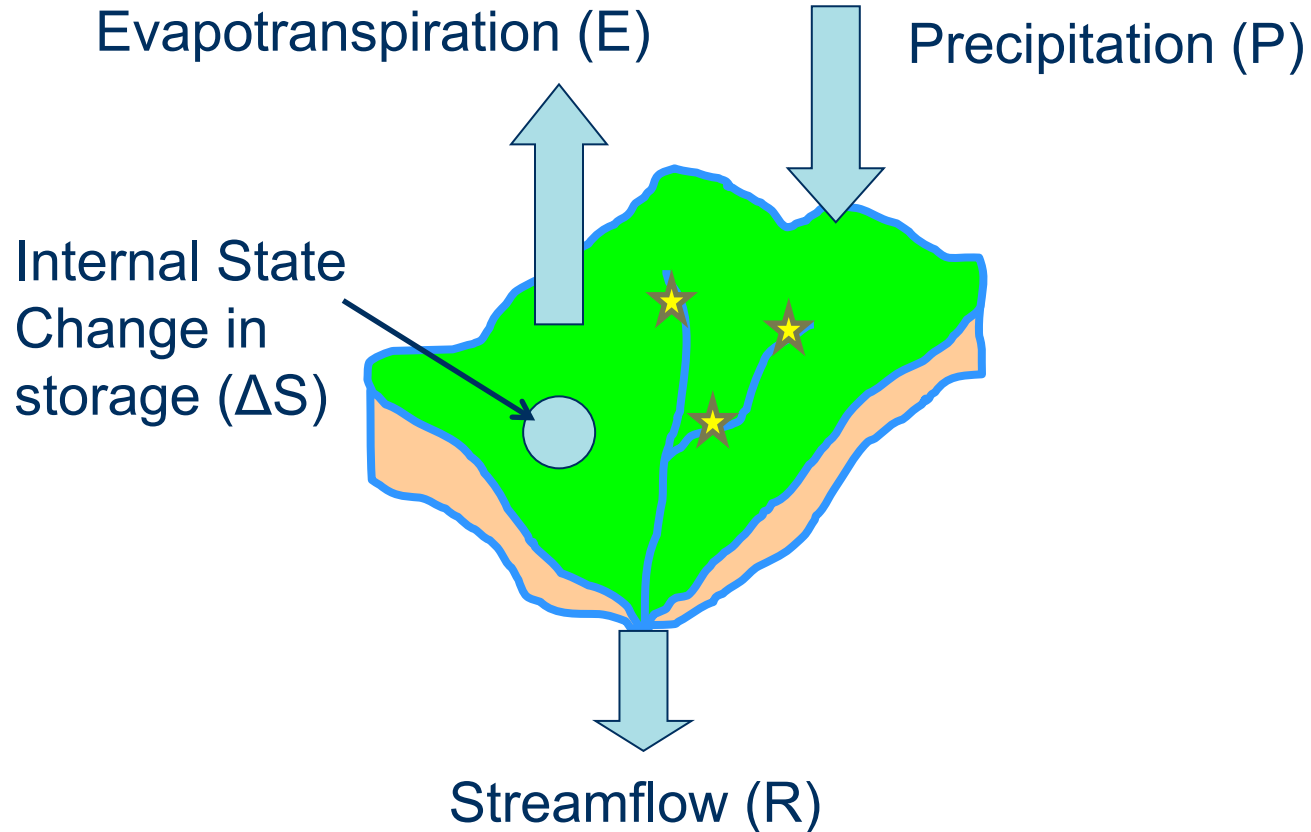


Regulated basins have decreased the variability of runoff downstream



Regulated basins have increased their evaporation to precipitation ratio much more than unregulated basins

# Water balance to estimate unknown observed evaporation (ET)



$$ET = P - R - \Delta S$$



## **Research question:**

Why is there an **increase in evaporation** from reservoir impoundment if **reservoirs** are only dots in a large hydrological basin?

### **Hypothesis 1:**

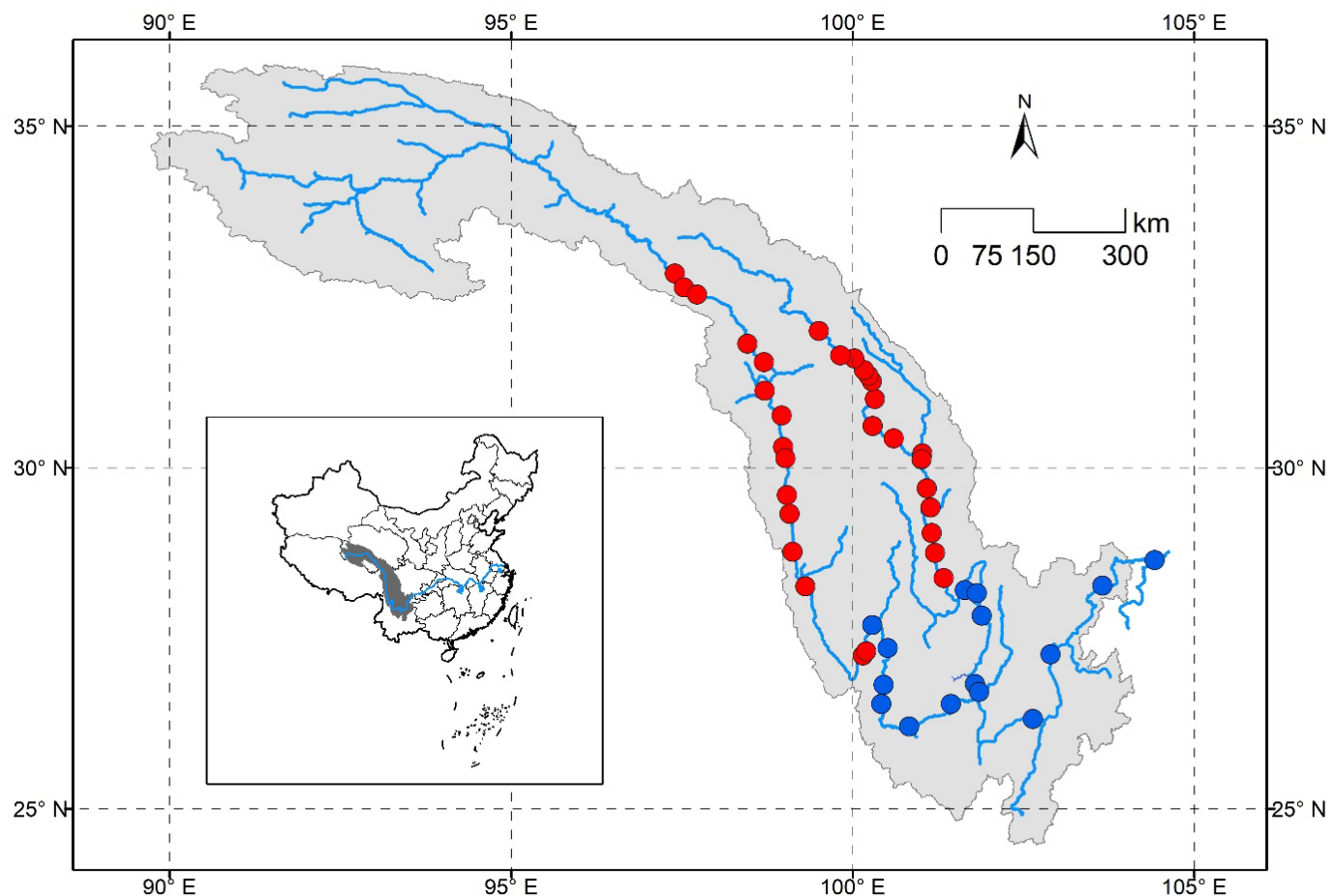
Reservoirs increase in some way evaporation beyond their water surface.

### **Hypothesis 2:**

Reservoirs may store more water than thought, which from a water balance reflects as an increase in evaporation.

# Hypothesis 1:

Reservoirs increase in some way evaporation beyond their water surface.



Jinsha River Basin



Sun et al, 2020

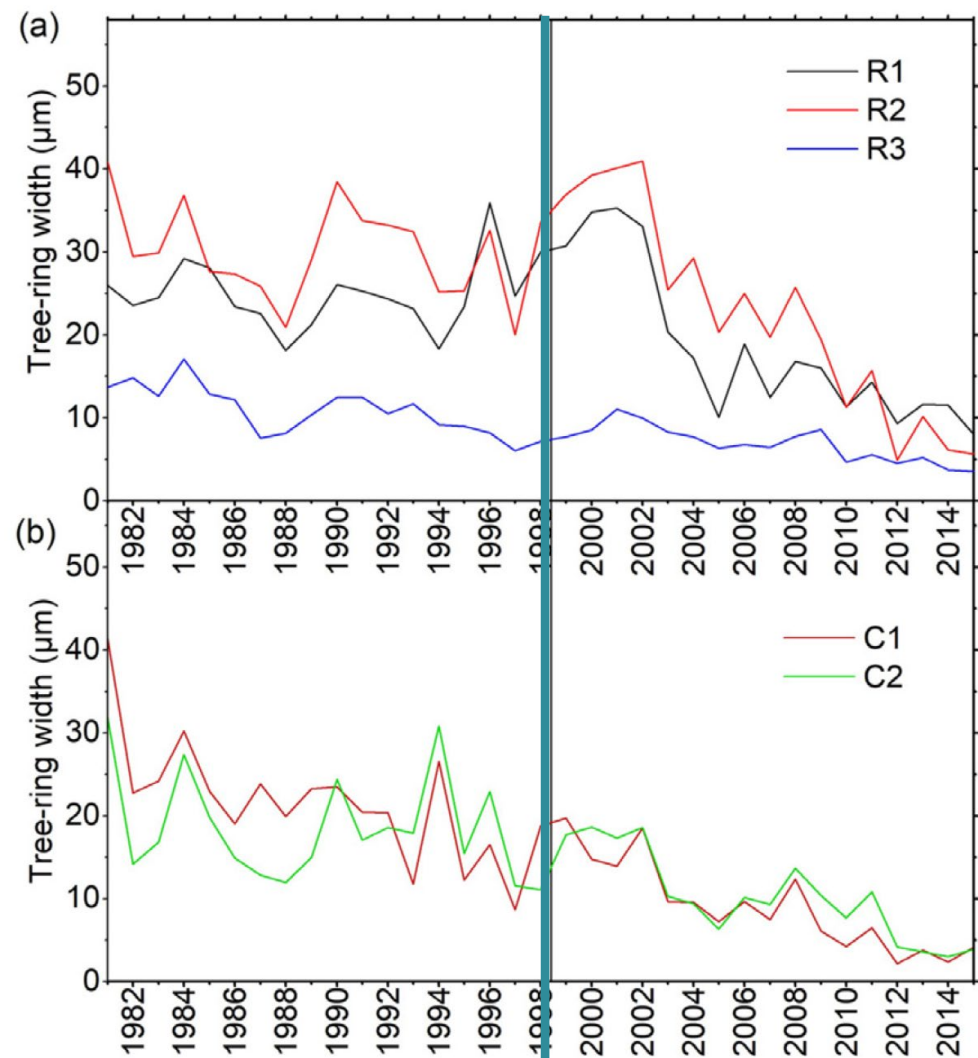
## Hypothesis 1:

Reservoirs increase in some way evaporation beyond their water surface.

**CONTROL**



**SITES AROUND THE RESERVOIR**



Impoundment of reservoir



## Hypothesis 2:

Reservoirs may store more water than thought, which from a water balance reflects as an increase in evaporation.

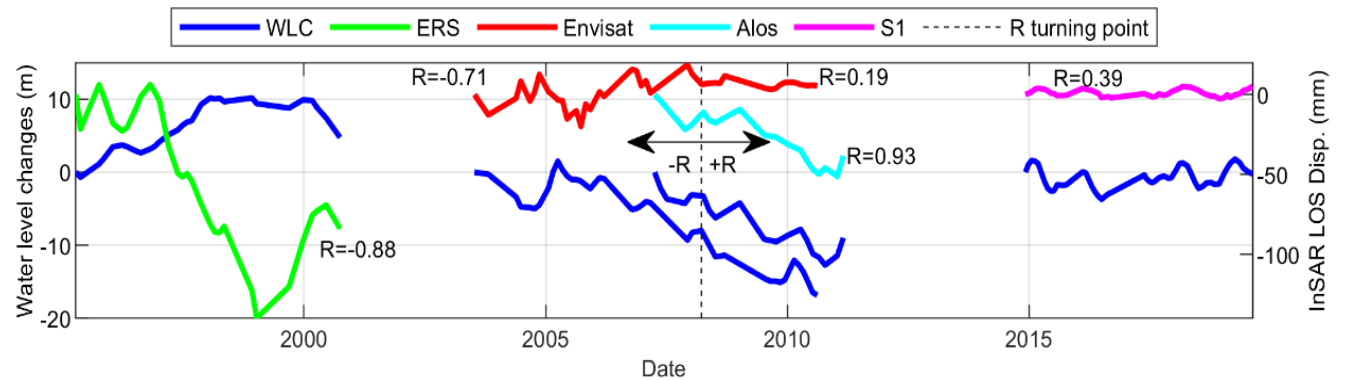
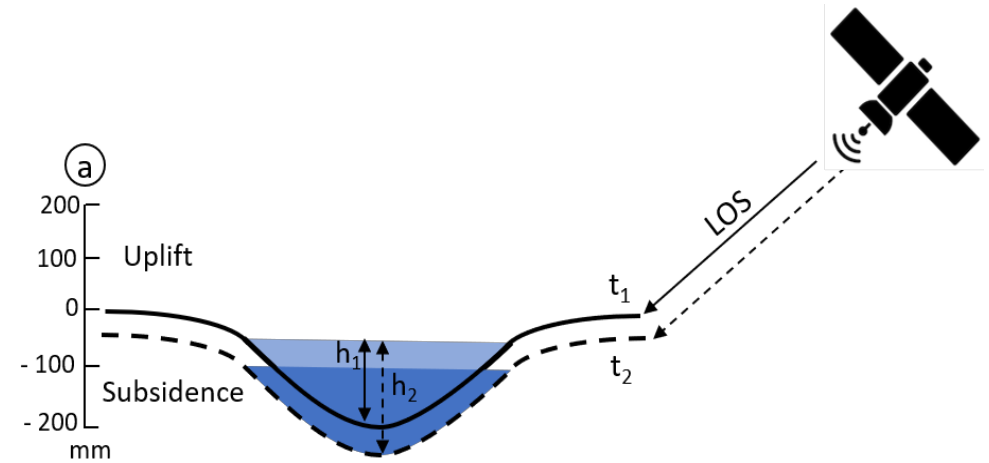
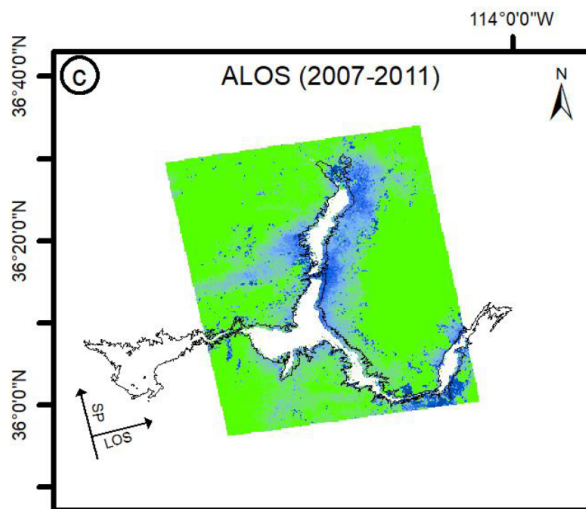
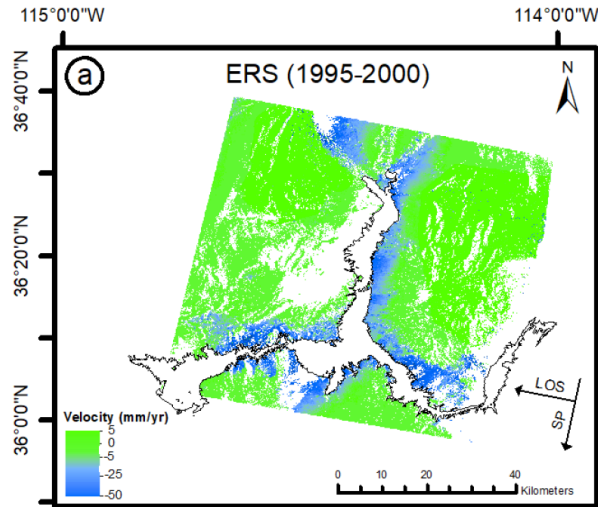


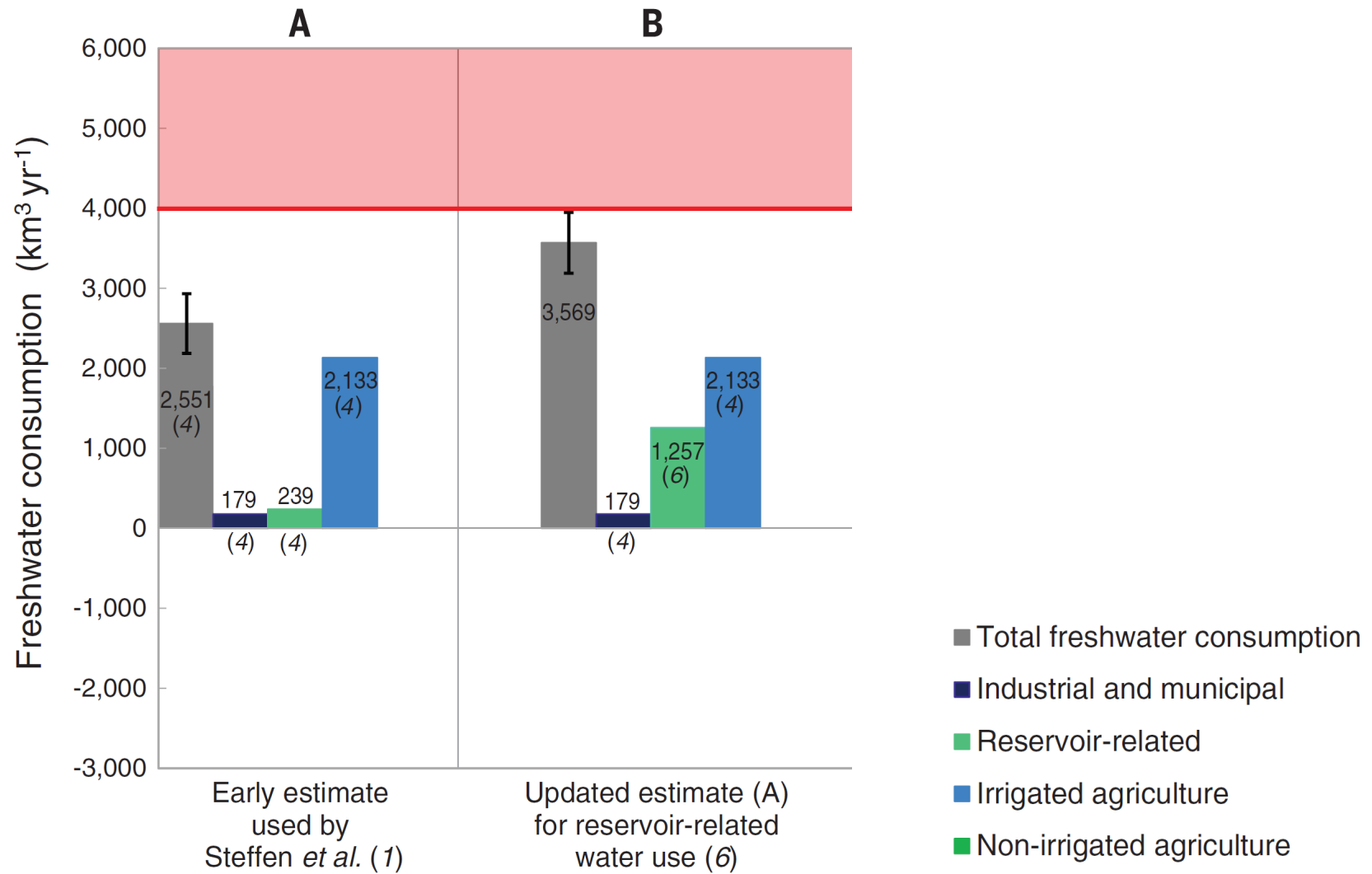
Lake Mead Monthly Elevation at Hoover Dam (ft)



# Hypothesis 2:

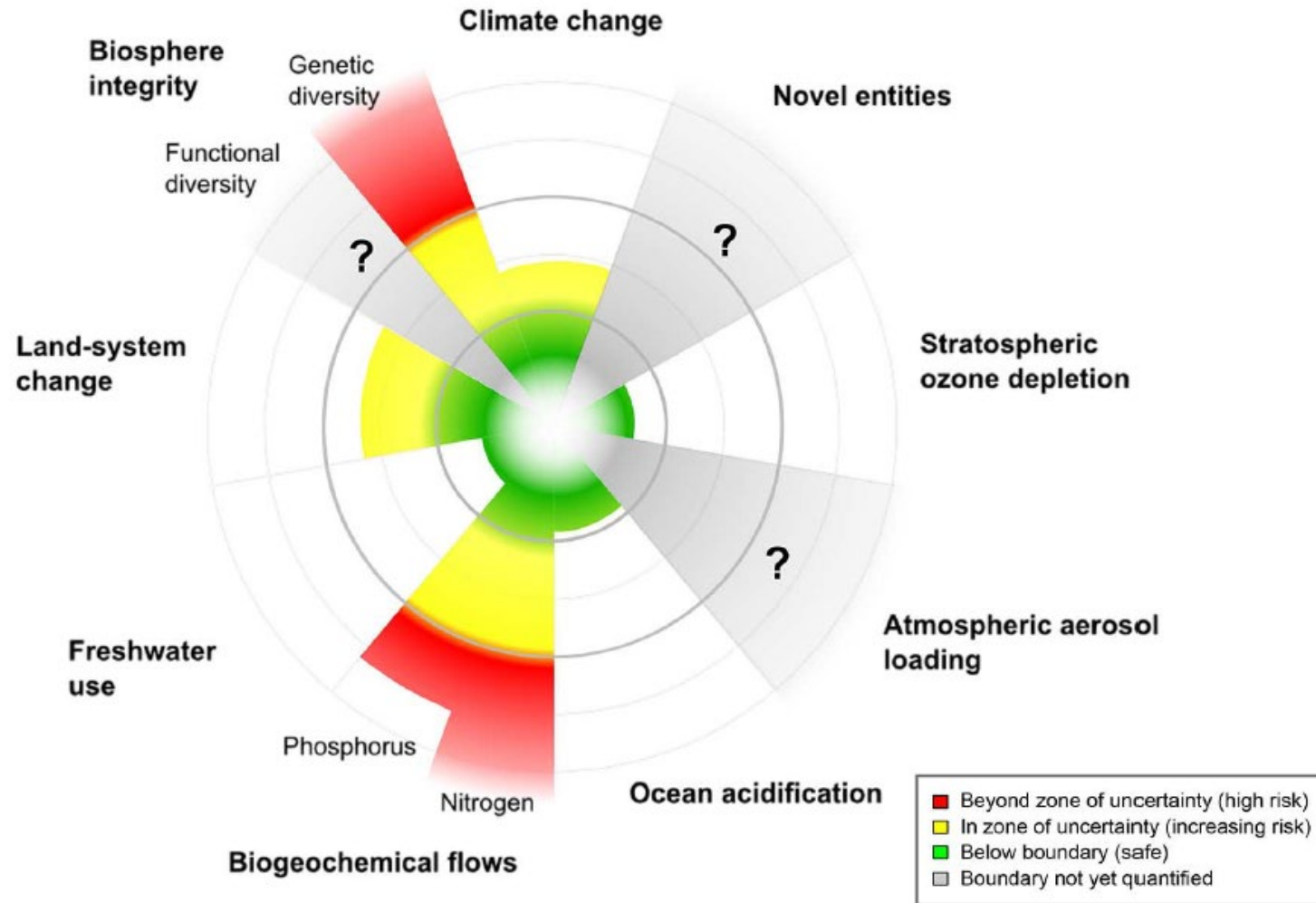
Reservoirs may store more water than thought, which from a water balance reflects as an increase in evaporation.



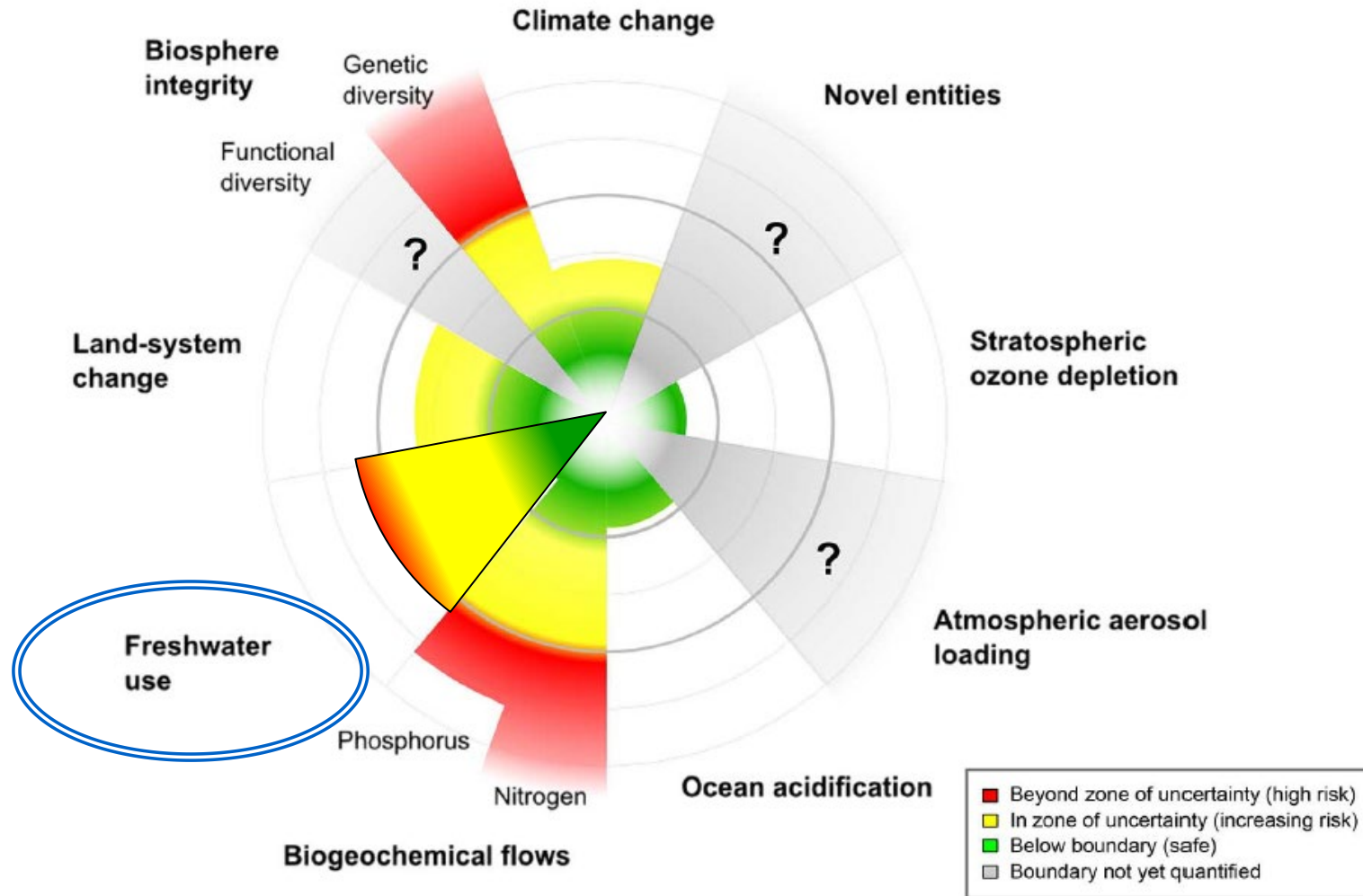




# Freshwater planetary boundary



# Freshwater planetary boundary



# Conclusions

1. The large-scale implications of water regulation need to be better understood. Hydrological balances sometimes don't add up!
2. Reservoirs may enhance growth and change of vegetation in the surroundings, increasing evaporation.
3. More research is needed to quantify the real amount of water stored behind dams (including seepage).



# Acknowledgements

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