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Supplementary Information for

Water resource utilization regimes at a basin scale: transition framework and development traps

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This PDF file includes:

Supplementary text
Figs. S1 to S9

Supporting Information Text

This supplementary document consists of three sections and 10 figures. Firstly, we introduced our study area, the Yellow River Basin, in the section Methods S1. Definition of study area. Then, we give a detailed description of used datasets and analysis their uncertainties in the section Methods S2. Detailed information on dataset and processing. Finally, the index along with corresponding indicators are introduced in the section Methods S3. Water Utility Regime Index.

Methods S1. Definition of study area

The study area is the Yellow River Basin (YRB), which has experienced the most intense water exploitation and the most dramatic shifts of management regime (Supplementary Fig. 1A). According to ecological zoning, landscapes types, water resource zoning et al., the Yellow River Basin can be divided into four different regions (supplementary Fig. 1B), which has been widely recognized (ref.). Using this division, there are also some differences of nature between different regions regarding water utilization regimes (supplementary Fig. 2):

- **Source Region (SR):** Over 50% of natural runoff was produced in this region. The most ecology function here is water conservation, as sparsely populated and less economically developed.
- **Upper Region (UR):** With the highest per capita irrigated land area, there are numbers of large irrigation lands in this region. However, because of backward production methods, efficiency of irrigation are used to be very low.
- **Middle Region (MR):** Crossing Loess Plateau, famous rich-sand area, Yellow River loads most of its sediments here with the highest soil erosion risk. To reverse this situation, the grain for green project changed the water utilization here strikingly.
- **Lower Region (LR):** With dense population and the traditional agricultural trajectory, lower region used to be the largest water use region. However, as the industrial transformation going, proportion of agriculture keeps decreasing, but LR is still the largest water use region in each aspect.

Introduction of Yellow River Basin.

Subarea of Yellow River Basin.

General situation of water use in the YRB.

Methods S2. Detailed information on dataset and processing

Since the Yellow River Basin consists of ten provincial areas, the above division can also maintain broad consistency with administrative divisions. Add a materials' subsection if you need to.

Methods S3. Water Utility Regime Index

Add a methods subsection if you need to.

Stress: SFV-index. Various metrics, therefore, proposed for water stress (e.g. water scarcity, water stresses index, scarcity-flexibility-variability index), where the dimensions of human impact are increasingly valued. Among of them, by taking changes of water flexibility and variability into account, the scarcity-flexibility-variability (SFV) index focus more on dynamic responses to water resources in developing perspective, which considered a valid indicator of temporal changes in water stresses.

Tendentiousness: Non-provisioning share.

1. Methods S4. Water Management Practices

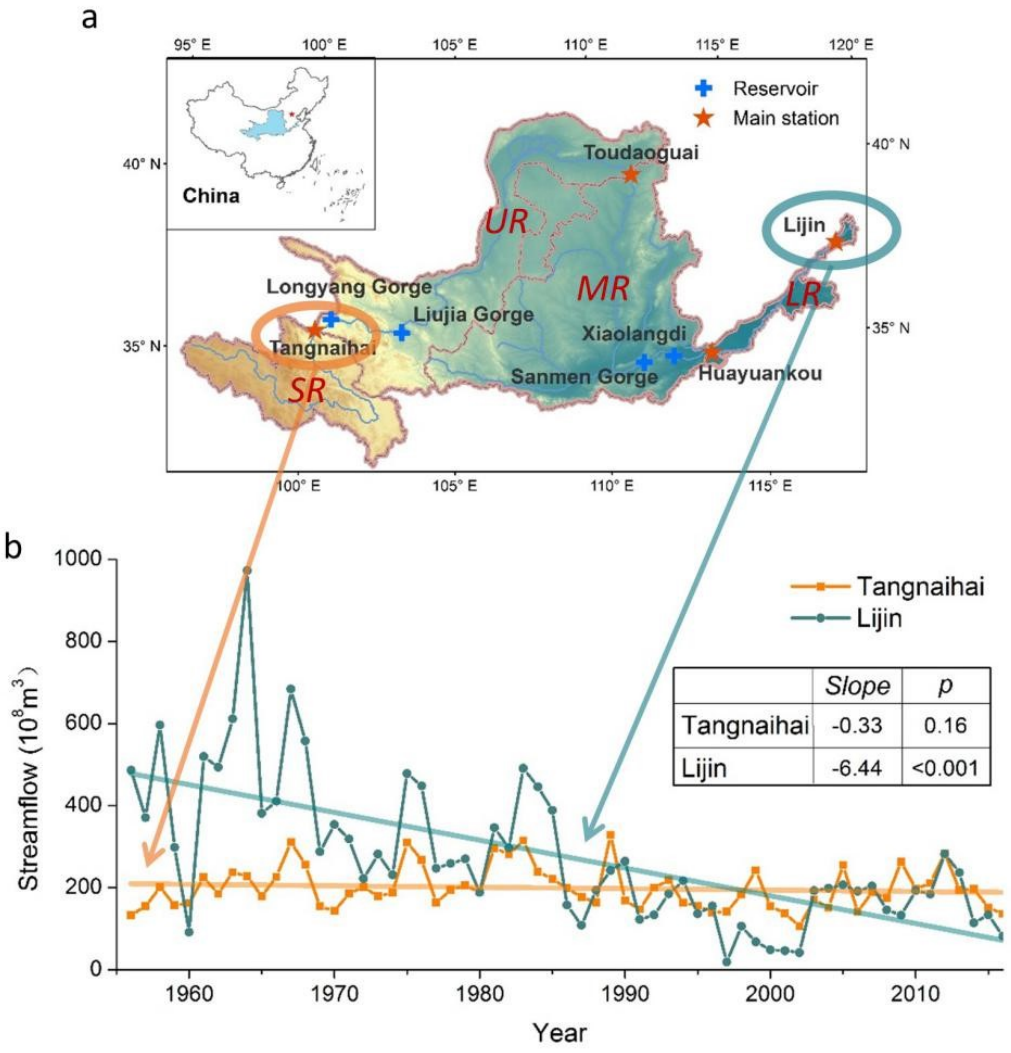

Fig. S1. Yellow River Basin

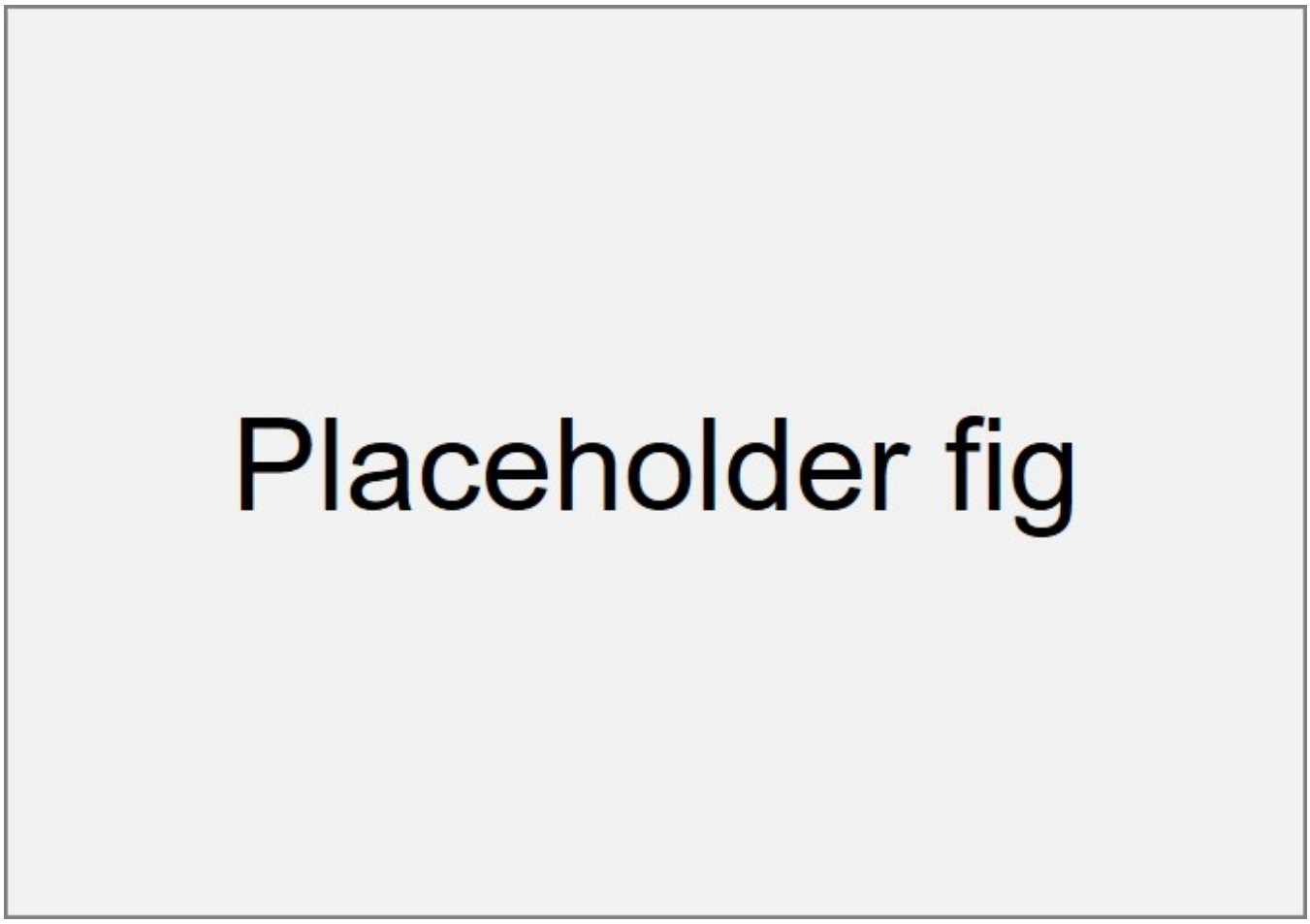

Fig. S2. Different regions

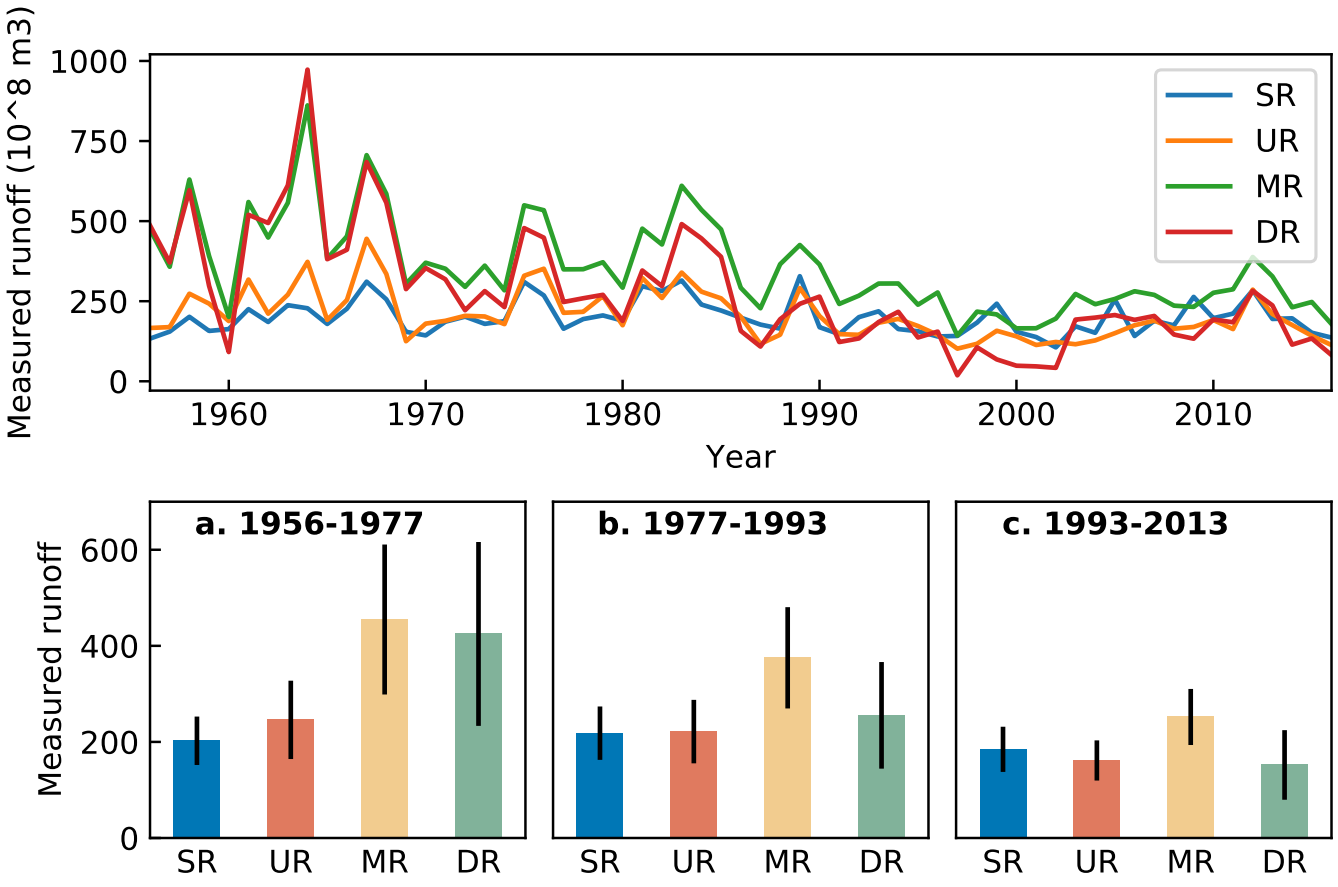

Fig. S3. Natural measured runoff of Yellow River within different periods.

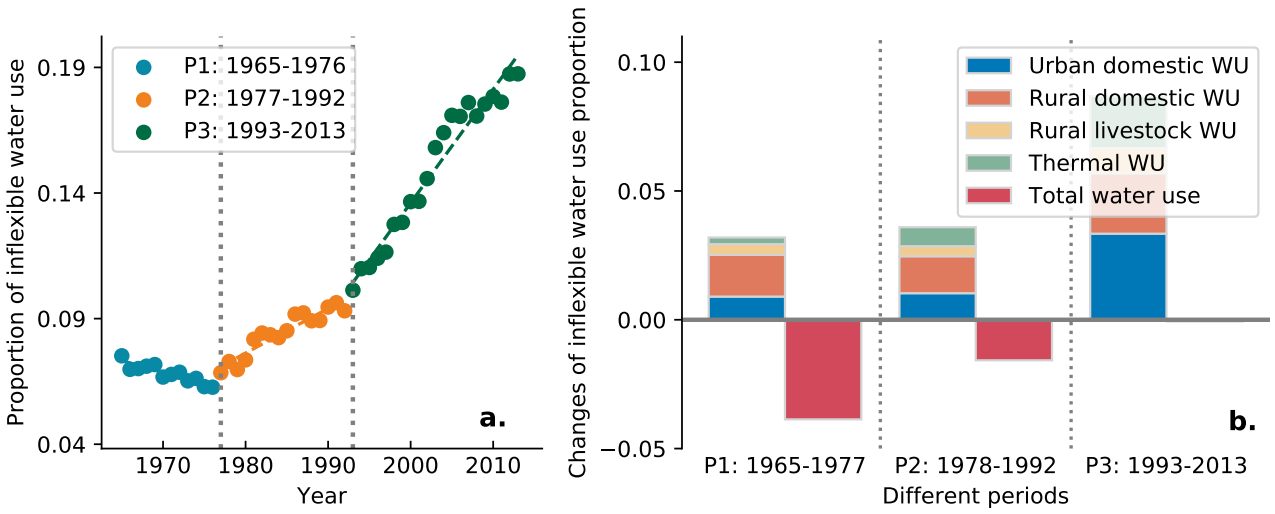

Fig. S4. Flexibility

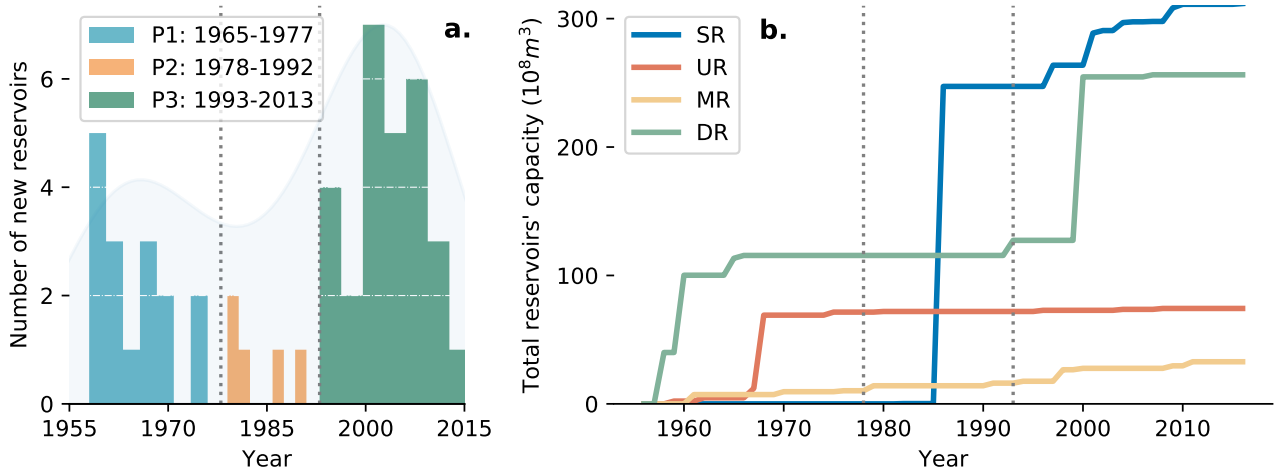

Fig. S5. Reservoirs and accumulated storage

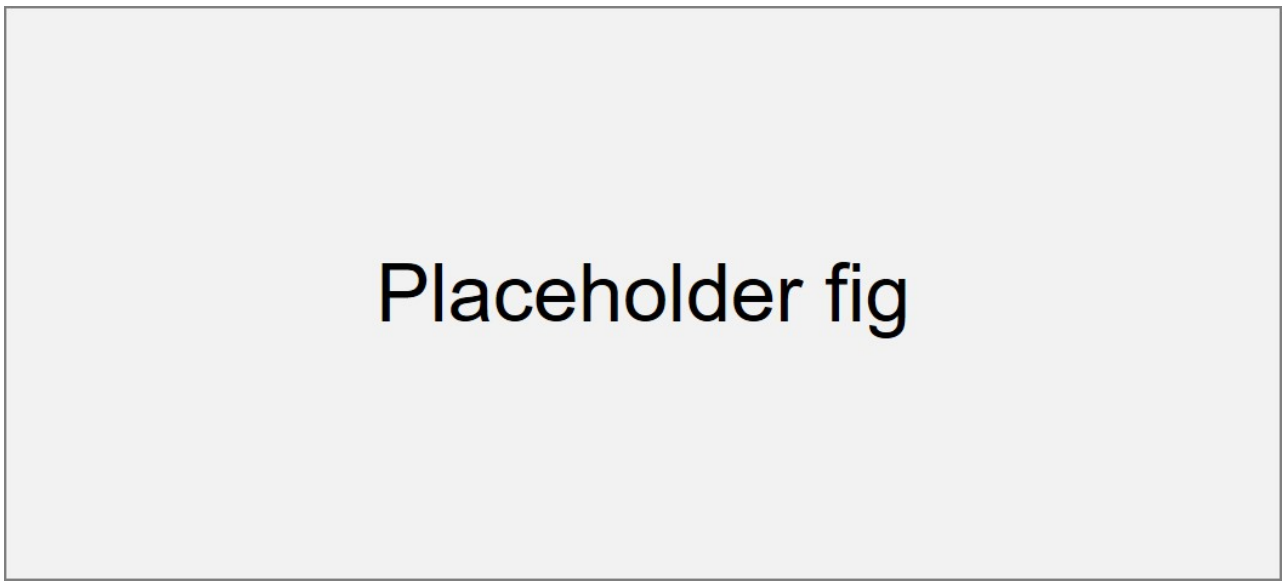

Fig. S6. technological solutions and water conservation practices

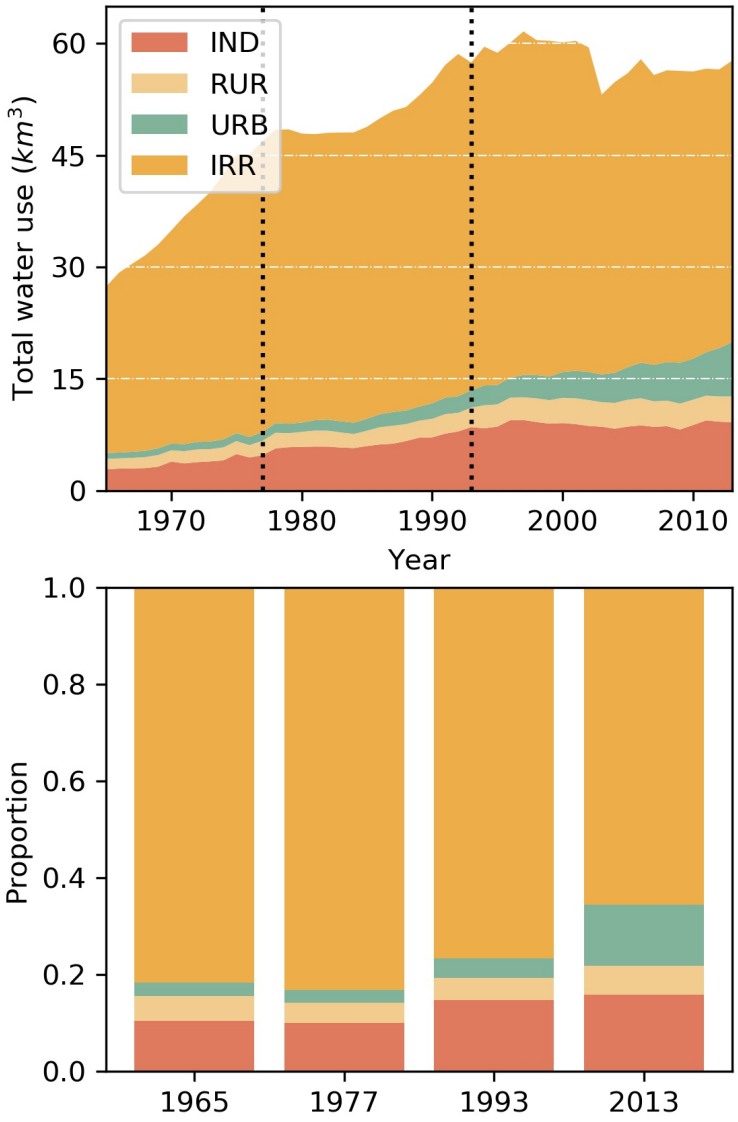

Fig. S7. Proportions of water use between the different sectors

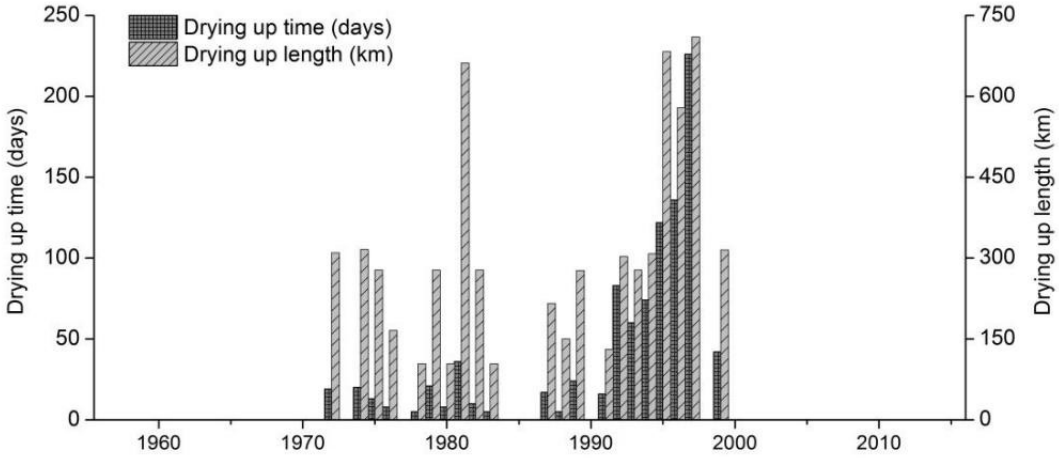

Fig. S8. Severe runoff outages and groundwater depletion

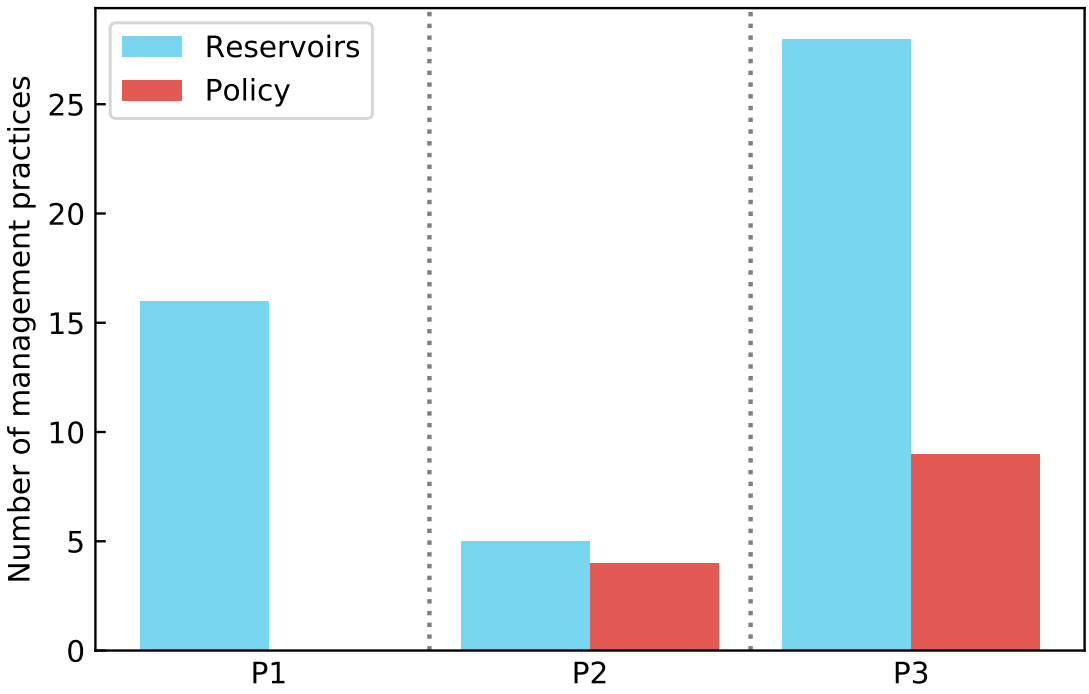

Fig. S9. Number of management practices in different periods, including policy and reservoirs.