

Water sustainability: the prospect of transfer projects in China

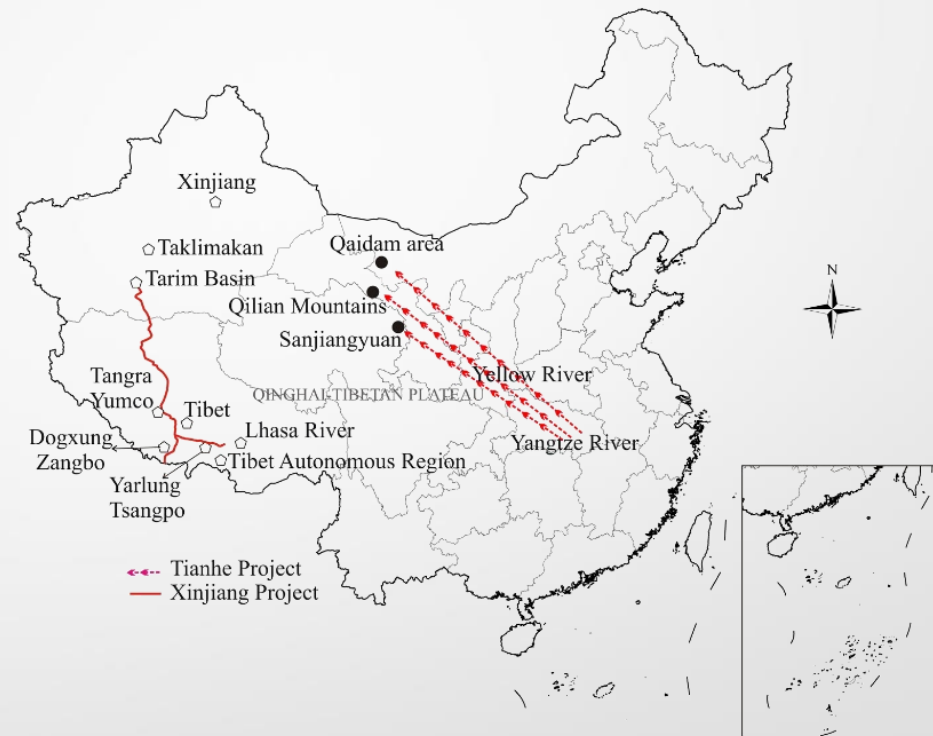
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Overview

- Ray of hope, the Tianhai and Tunnel project to solve the water shortage problem in northern areas of China
- The Tunnel and Tianhai projects are currently going on to solve the problem of water, food and drought in the country.
- A telecoupling framework helps to effectively understand and manage ecosystem services, as well as different challenges associated with them.



Bird eye view of the Tianhe and Tunnel projects

Tianhe Project: to carry water vapour through the sky

- The scientific communities have been involved in the research of weather modification for many decades.
- The Tianhe Project will challenge to increase annual precipitation to effectively utilize the water vapour transport on the southern boundary or even on the western and northern boundaries by an via an artificial intervention in the weather.
- The project is expected to bring 2.5, 200, and 120 billion cubic meters of precipitation in the Sanjiangyuan, Qilian Mountains and Qaidam areas every year, respectively

Tibet-Xinjiang Tunnel: the longest water divert tunnel in the world

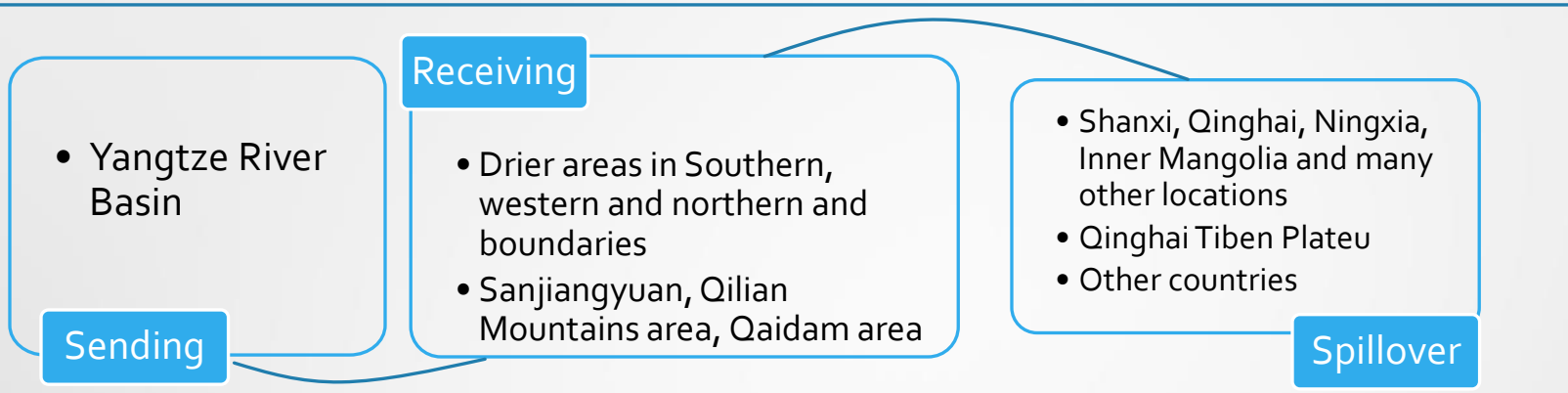
- The 1000-kilometer (621-mile) tunnel to divert water from the Yarlung Tsangpo River of Tibet to Xinjiang is expected to “turn Xinjiang into California”.
- The tunnel would divert water from the longest river of Tibet, the Yarlung Tsangpo River, to the Taklamakan Desert through underground sections that could carry 10 to 15 billion tons of water each year
- In the first stage, 29 reservoirs with a capacity of 21.8 billion cubic meters of water would be built in Xinjiang

Telecoupling Anthropocene

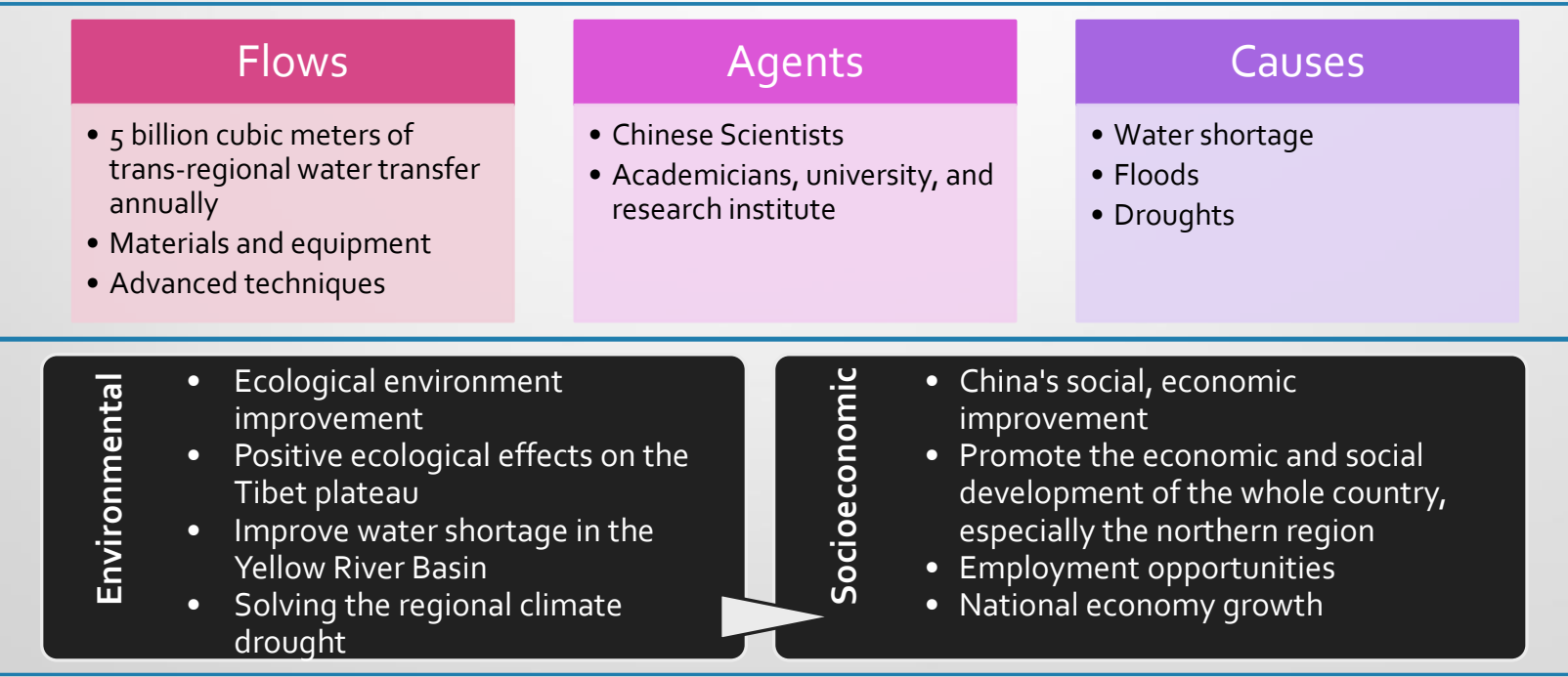
- As the water source, the Yangtze River Basin and Yarlung Tsangpo Rivers are regarded as the sending systems, and the drier areas in the southern, western and northern and boundaries and Xinjiang region and North-Western parts as the receiving system.
- Three system are depicted, each of which can simultaneously function as sending, receiving or spillover system depending on the flow being analyzed.
- The spillover system may be classified according to positive or negative environmental spillovers, which can have significant impacts on Shanxi, Qinghai, Ningxia, Inner Mangolia, Xinjiang provinces, and it might affect the adjacent areas, i.e. Bangladesh and India.

Telecoupling framework under Tianhe Project

SYSTEMS

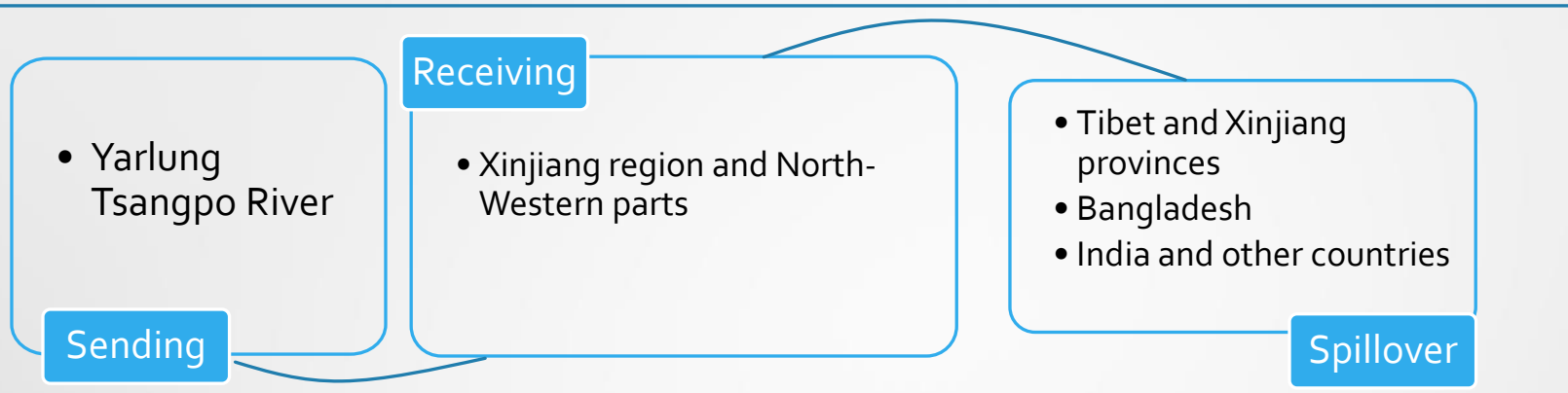


EFFECTS

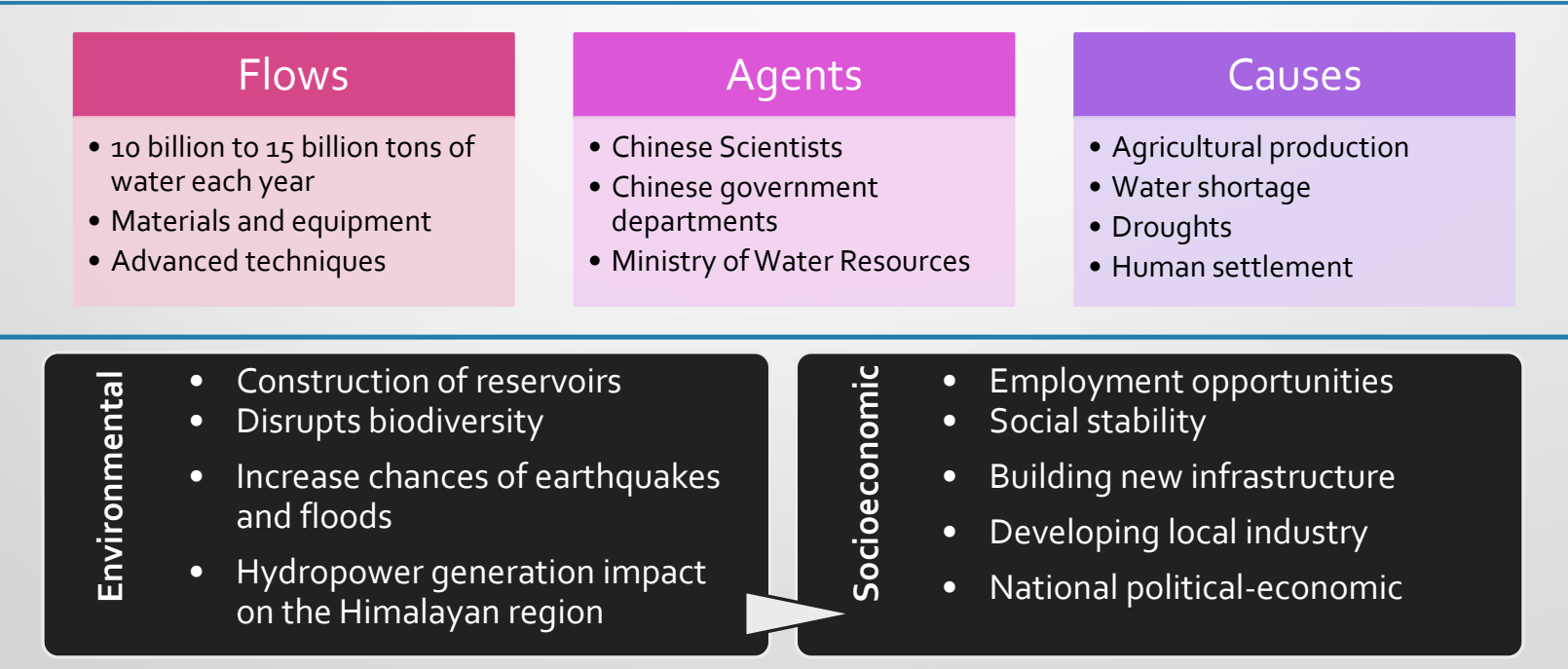


Telecoupling framework under Tunnel Project

SYSTEMS



EFFECTS



Conclusions

- **Tianhe Project**

- Generally, it is relatively simple and easy to change the spatial and temporal distribution of natural rainfall in the adjacent area by artificial weather technology
- In order to get the air-water, it is needed to solve a series of problems, including:
 - distribution of the air-water resources,
 - mechanism and regularity of the water cycle from sky to land,
 - how to get the air-water resources, effects of the air-water on the processes of the land surface while the rainfall landing

• **Tibet-Xinjiang Tunnel**

- A concern is the construction of dam in a highly earthquake prone area.
- With the decline of the glacier and loss of water, the project may also have an impact on the hydropower generation of the dam in the Yangtze River Basin
- In addition, there is no major problem in the geology, topography, hydrology, meteorology and existing conditions of traffic, power, and construction technology.
- Even for a diversion tunnel with a length of 120 km, if using double-shield Tunnel Boring Machine (TBM) construction technology, selecting 3 to 4 excavation surfaces are to be excavated at the same time, and the completion withing 3 years.
- There should be no problem in completion of 120 km tunnel