



Ksôkong Tsùn Irrigation System

A traditional irrigation system that set the
foundation of Kaohsiung City.

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Context.

Location:	Kaohsiung, Taiwan
Period:	19 Century A.D.
Function:	Agriculture irrigation, drinking water source
Area:	16000 ha
Components:	Dam, water inlet, water retention, irrigation ditch
Status:	Kaohsiung municipal heritage site

The growth of Kaohsiung is closely related to its irrigation system. The Ksôkong Tsùn irrigation system is a traditional water management and irrigation system used for the purpose of agriculture.



Figure 2
Country Scale

Taiwan is a country in East Asia. The main island of Taiwan is known historically in English as Formosa, measuring 35,808 square kilometers.

Figure 3
Municipal Scale

Located in southern Taiwan, Kaohsiung is the second largest metropolis of the country.



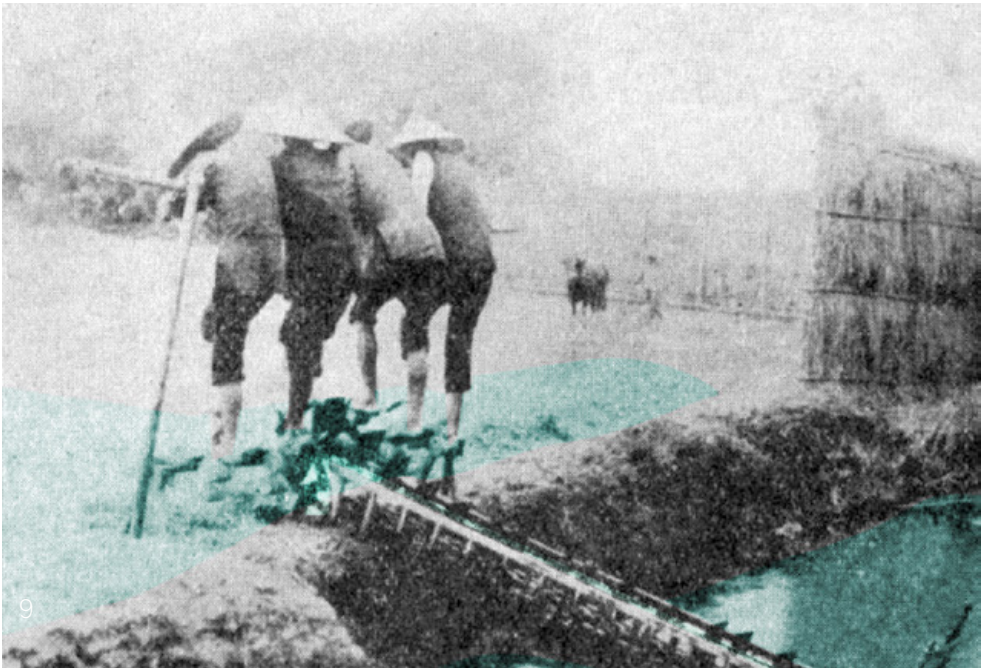
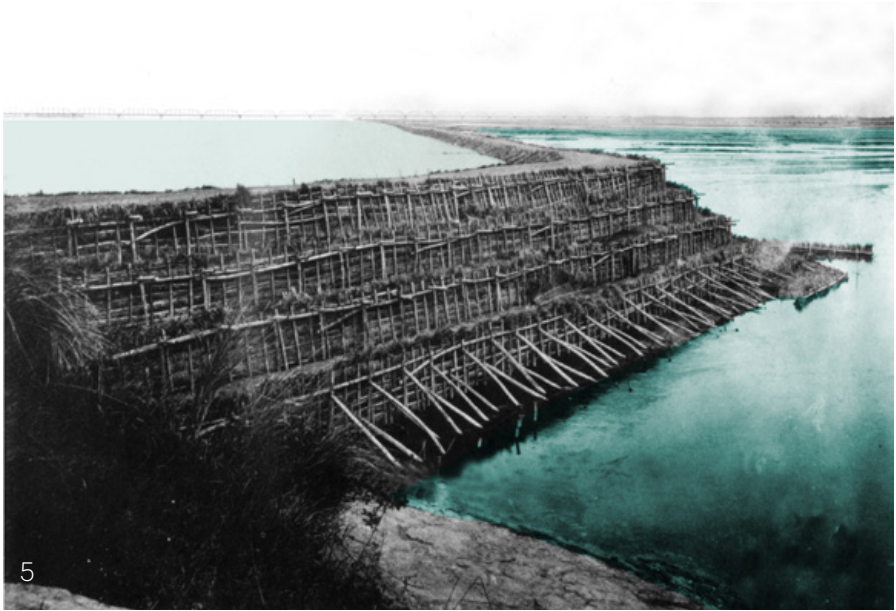
Figure 4
Regional Scale

The Cao-Gong irrigation system located in the most populated area of Kaohsiung.

Historical photos.

The Ksôkong Tsùn irrigation system consists mainly four types of elements: dam, inlet, waterway, water retention pond.

- Figure 5** top left - Thê (dam): A linear obstacle built perpendicular to a river to guild and direct water to the river water inlet for irrigation ditch.
- Figure 6** top right - Pi(water retention): An artificial water retention that is based on the naturally formed pond according to land topography. The retention was used for drinking and irrigation use. Small ones are called "Ti", larger ones are called "Pi".
- Figure 7** bottom left - Tsùn-thâu (river water inlet): A gate element that can control the amount of irrigation water intake. In typhoon season, the gate can be closed to protect crops from flooding.
- Figure 8** bottom middle - Moat: segments of waterway near city wall were use as defense system
- Figure 9** bottom right - farmer use watermill to get water from water way



Climate and catchment area.

Climate zone: Tropical
Sub-climate: Tropical Savanna Climate with dry-winter characteristics

Climate & Weather Averages

High t°: 32.4°C
Low t°: 15.7°C
Mean t°: 25.1°C
Precipitation: 13.6mm
Humidity: 75.9%
Dew point: 20°C
Wind: 7.56-9.36 km/h
Pressure: 1012.0 mbar
Visibility: 8 km
Hottest Month: July (29.2°C avg)
Coldest Month: January (19.3°C avg)
Wettest Month: August (416.7 mm avg)
Windiest Month: July (12 km/h avg)
Annual Rainfall: 1884.9 mm per year

The island of Taiwan is geologically formed on a complex convergent boundary between the Eurasian Plate and the Philippine Plate. Located on the Circum-Pacific belt, which is a major area in the basin of the Pacific Ocean where many earthquakes and volcanic eruptions occur. Therefore, watershed of rivers are vertically steep. The watershed of Tām-tsui-khe river, which CaoGong Tsun obtains water from, also falls into this criteria above.

Southern Taiwan has the climate type of “Tropical savanna climate with dry-winter characteristics”, and falls into the frequent typhoon zone. The rain-dry season is clearly apart. High slope and concentrated rain season bring redundant and rapid rainfall in the summer, and lack of water resources during the winter.

Figure 10
Climate of Kaohsiung

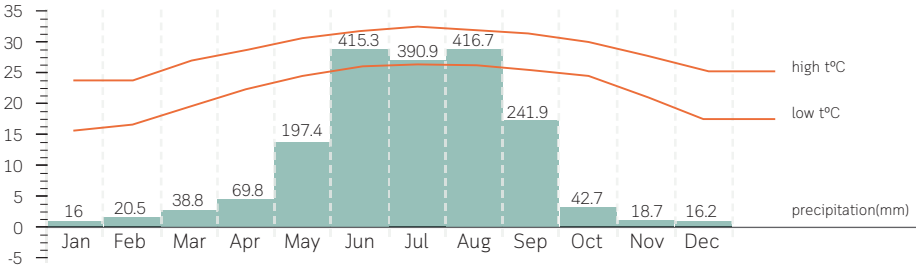


Figure 11
Rain Distribution in driest and wettest month (monthly average rainfall).
Left: January, Right: August.

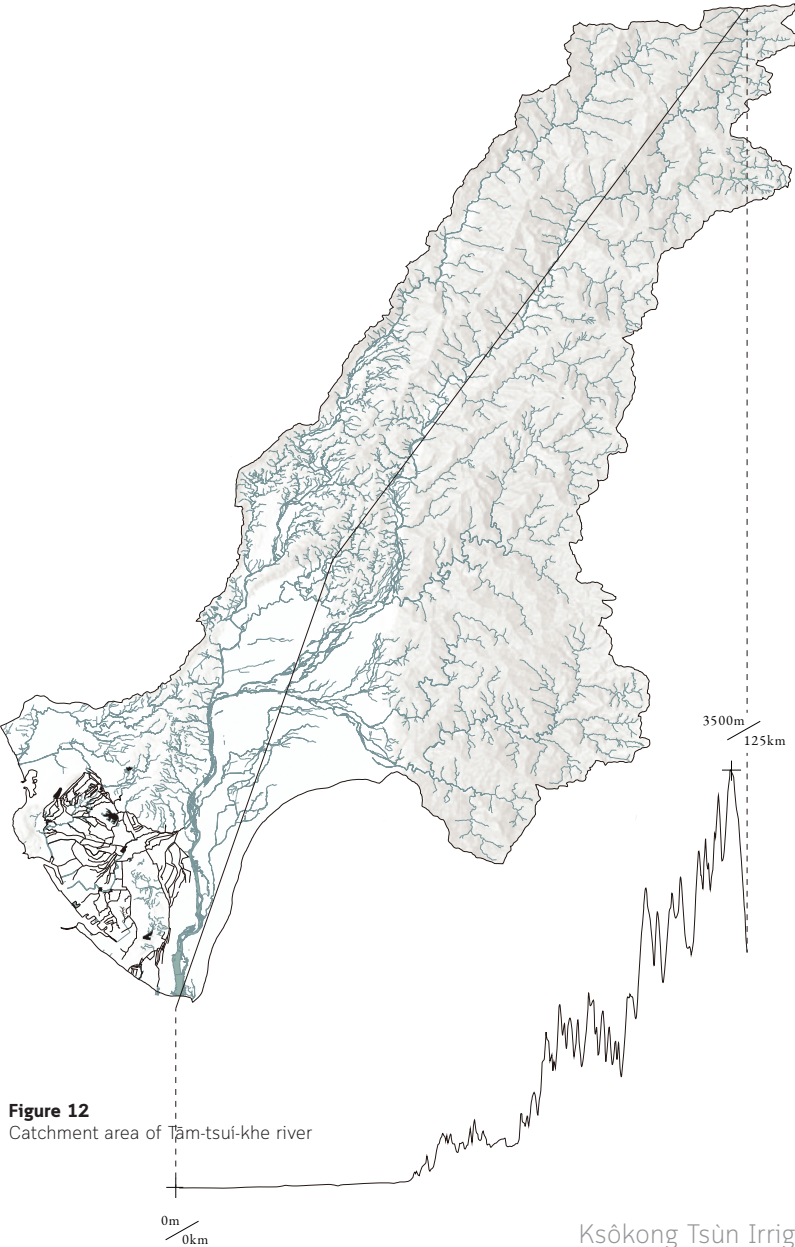
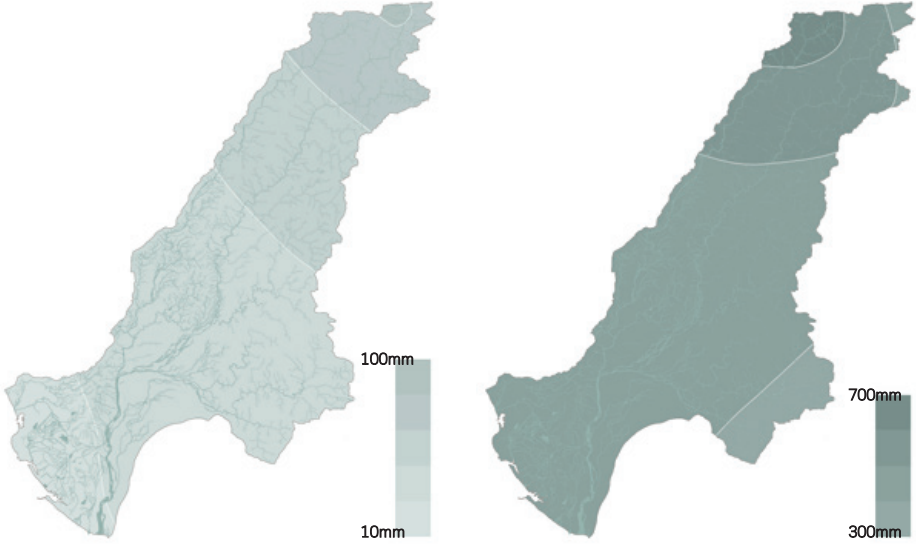


Figure 12
Catchment area of Tām-tsui-khe river

Development.

The Ksôkong Tsùn irrigation system was the solution for an uneven distribution of water resources in Kaohsiung. Water retention ponds (Pi) were dug out to reserve water before a systematic intervention. In 1837, the Cao-Gong irrigation system transferred water from an east side river, Tam-Tsui-khe, to start weaving a water web in Kaohsiung and the process continued expanding until the last canal was completed in 1931.

Figure 13
Spatial development order of Ksôkong Tsùn irrigation system.



Water System Plan.

A formation of water networks consisted of canals and ponds contributing to the establishment of agricultural production of 16000 ha. Agriculture in Kaohsiung was transformed from being weather dependent on a stable two-yield-per-year. Therefore, the establishment of steady agriculture consequently set the foundation for economic growth and accelerated industrialization process.

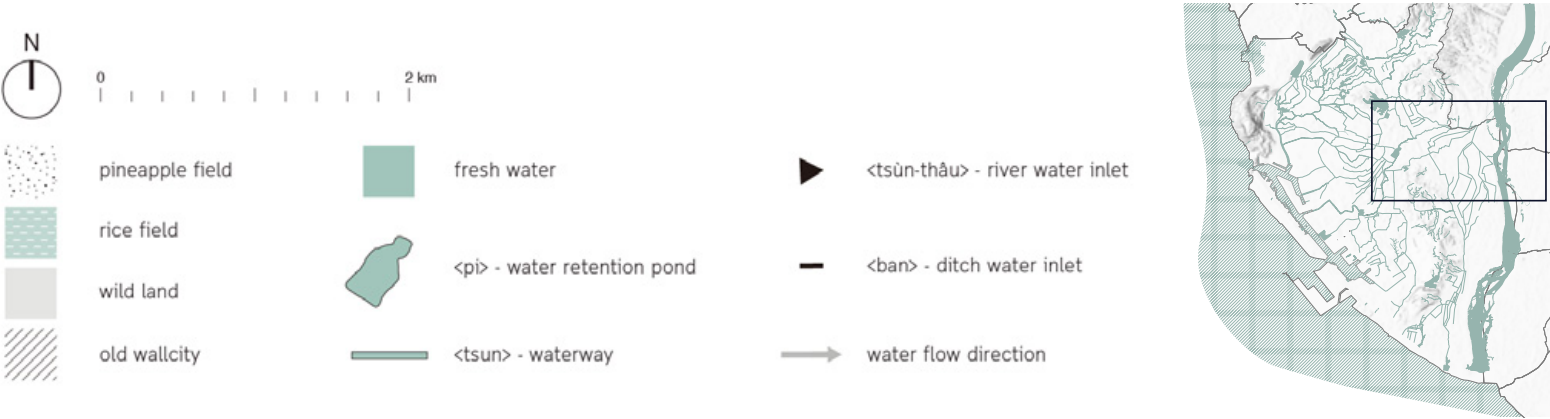
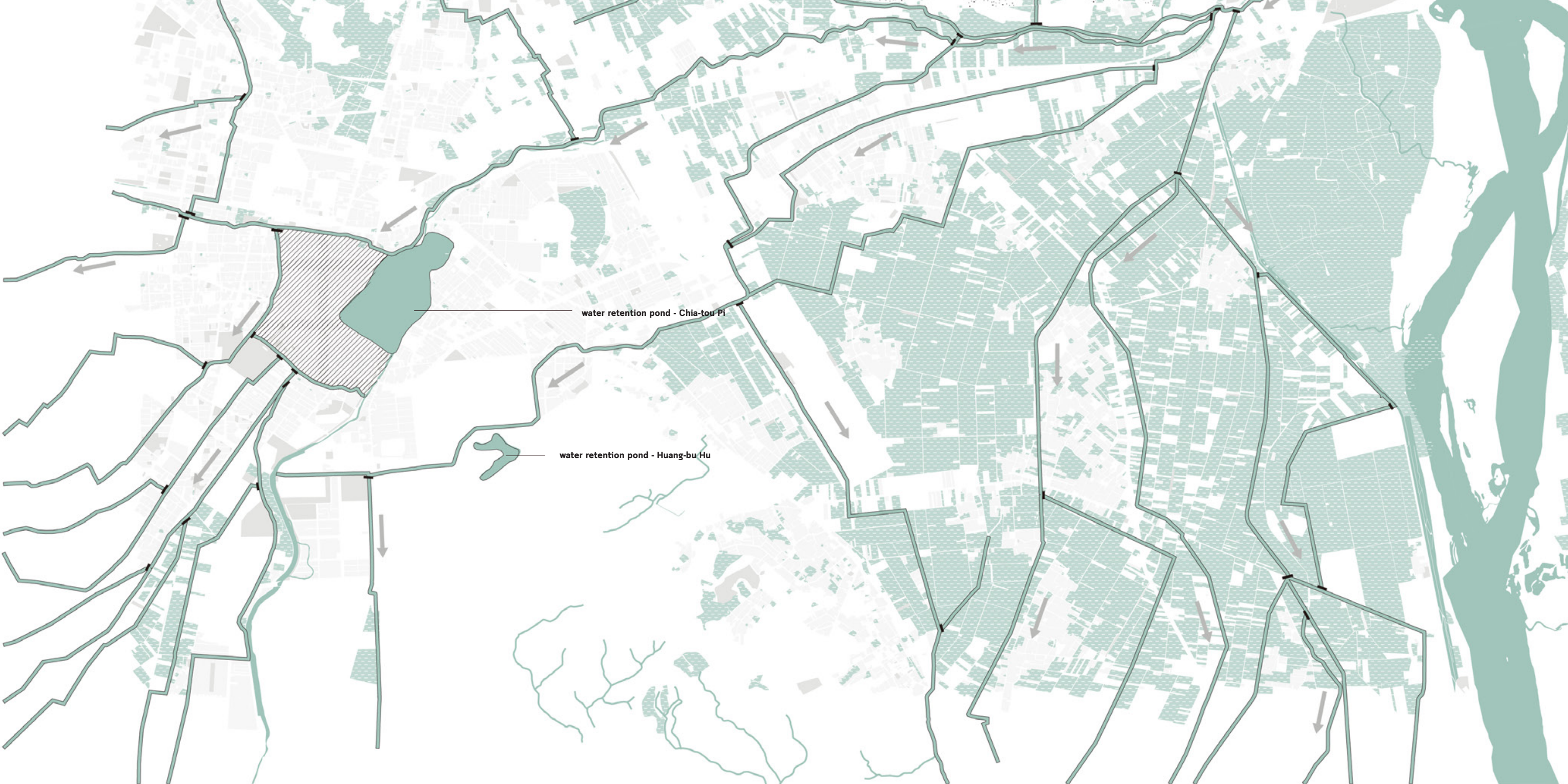


Figure 14
Plan showing zoom in detail of Cao-Gong irrigation system.





water retention pond - Chia-tou Pi

water retention pond - Huang-bu Hu

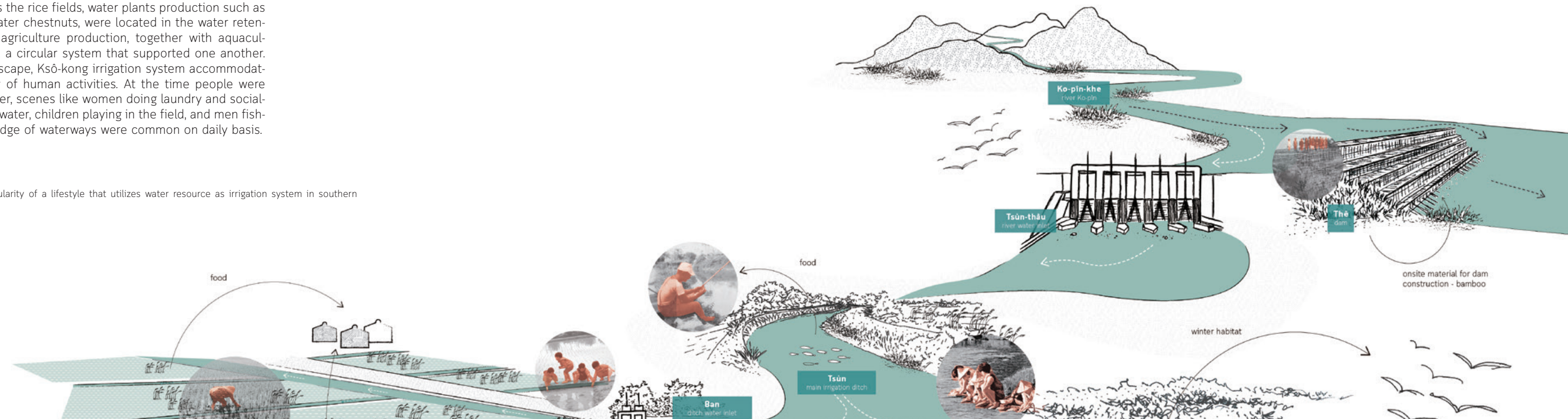
Details and Circularity.

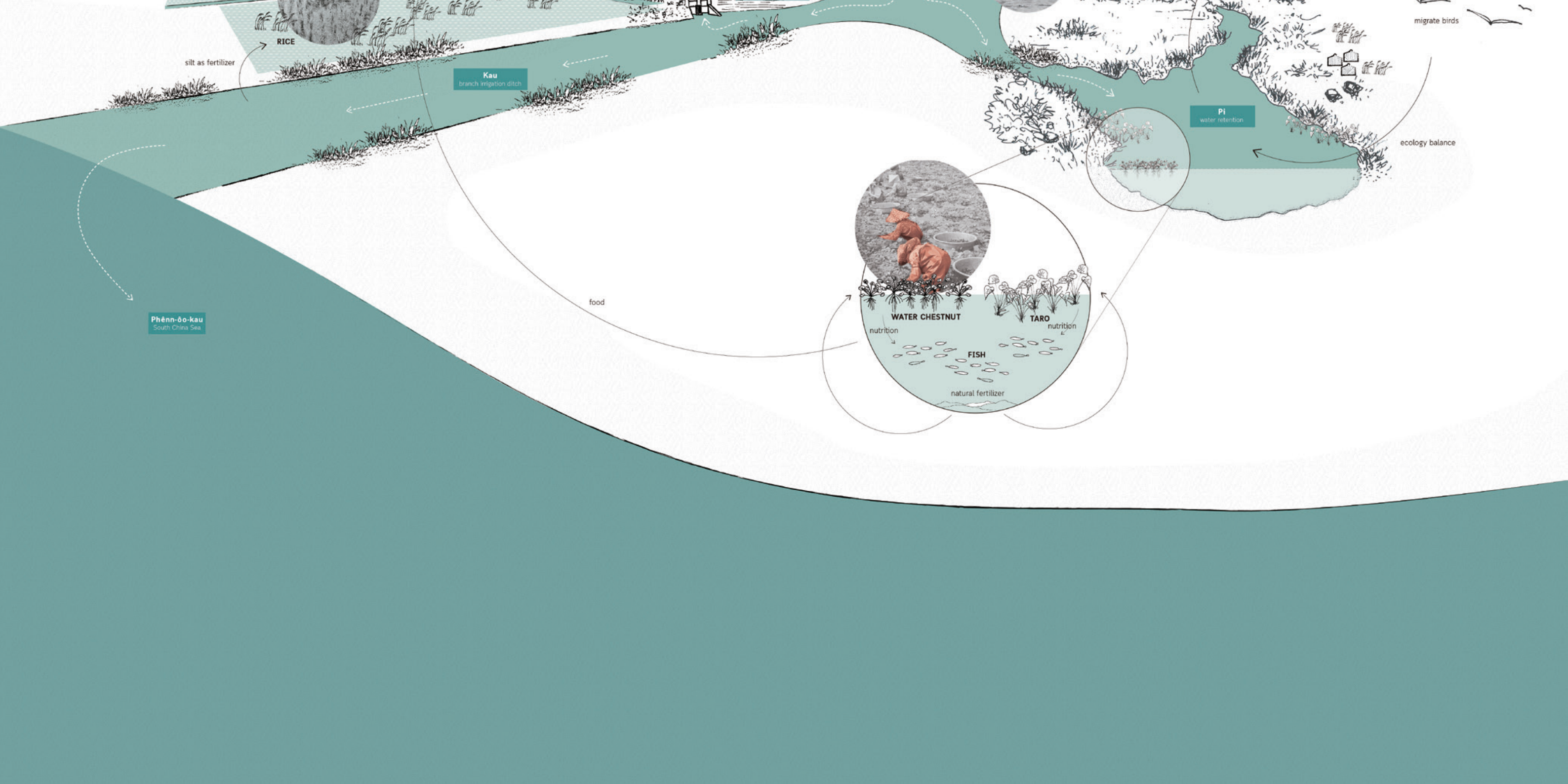
In Taiwan, the connection between land and people was once profound and unbreakable, especially in the agricultural society before modernization. At the time, people lived closely with the landscape that intertwined by water and fields and constituted a complex living lifestyle consisting of several social and cultural aspects. From food yield, settlement arrangement, daily leisure and religious beliefs, ways of living evolved intensely around the landscape.

Water from river Ko-pin-khe is obtained from a dam, regulated using inlets, directed through ditches, then transported to irrigate rice fields following natural topography on-site and weaved an aquatic landscape to flourish food production. Besides the rice fields, water plants production such as taros and water chestnuts, were located in the water retention. These agriculture production, together with aquaculture, formed a circular system that supported one another. On the landscape, Ksô-kong irrigation system accommodated a variety of human activities. At the time people were close to water, scenes like women doing laundry and socializing by the water, children playing in the field, and men fishing on the edge of waterways were common on daily basis.

Figure 15

A story of circularity of a lifestyle that utilizes water resource as irrigation system in southern Taiwan.





Conclusion.

Ksôkong Tsùn irrigation system shows how people live closely by/with water and the living way is adaptive to the changing landscape. The system portrayed three special values including functionality value, value of sustainability and landscape value.

Functionality value - The purpose of Ksôkong Tsùn irrigation system was to provide clean water source for the city. By using simple form such as line, surface, and point: water is directed by a network of lines, retained by surface of ponds, and regulated by points of water inlets. Regarding the change of climate and city content, these functional values could possibly help transforming the system into a climate adaptive network in Kaohsiung.

Value of sustainability - The project showed the circularity of the water system. The natural resources and human resources are carefully used. Water has been used to water crops, the aquatic plants are used as food for both humans and fish, and the waste of fish as fertilizer for crops. Most of the elements performed more than double function and this wisdom should be sustainably inherited from generation to generation.

Landscape value - The river flooding plain was developed based on Ksôkong Tsùn irrigation system which then became a major city in Taiwan.

Lessons to learn - Looking towards the future, the acknowledgment of the traditional water system in Kaohsiung could possibly contribute to adding a valuable layer to the city's planning.

The process of modernization in Asia oftentimes resulted in rapid urbanization and brought landscape morphology change in a short period of time. Oftentimes, urban spaces didn't have time to adapt to the ever-changing social-economical transition with a well-planned spatial strategy and led to a featureless cityscape. Since the water was no longer clean, people lost their intimate attachment with it. However, through a brief understanding of the water system, it is evident that the water system provided a place far beyond a source of water, but also culture, economy, art and memory. Perhaps, this study could provide a thread that leads to an action of retrieving a sense of place and builds up a passage from past to future, memory to hope (Harvey, 2009).

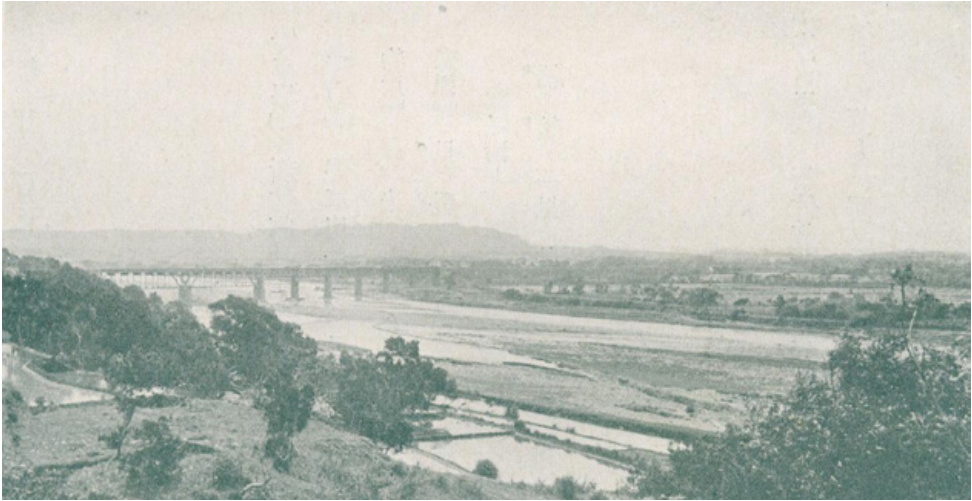


Figure 16
Ko-pîn-khe River.
From this point on, through Ksôkong Tsùn irrigation system, the river water starts a different journey on the land of Kaohsiung, intertwined with culture, art, economy and memory, narrated a tale of the city.

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