

# Wannian River Restoration, Taiwan

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## 1. Static Analysis – Collective action

Wannian River Restoration case is part of comparative urban river restoration analysis developed between 2019 to 2020 by Herlin Chien at United Nations University, Institute for the Advanced Study of Sustainability in Japan. The common pool resource system is the Wannian River (5.5 km) located in a medium sized city of Pingtung with 200,000 inhabitants. This case is most known as one of the [best practices of urban river restoration program](#) in Taiwan, undertaking several major river form, process and function improvements between 2007 and 2018.

### 1.1 The commons dilemma

The commons dilemma dominating the Wannian River is rooted in the urban, industrial and agricultural expansion, especially animal husbandry in the post-war era. The peak of such multifront expansion was recorded in 2004 with more than 1.5 millions of pig headcount and tripling of urban population compared to data of 1950. During a field inspection by the Taiwan Provincial Governor Huang in the late 1960s, the Wannian River was named the “Thousand Years Stinky River”, highlighting the severity of the urban river pollution problem. In the 1990s, population pressure triggered a controversial public policy debate surrounding “to cover or not to cover” the Wannian River in order to create additional parking and road space while burying the historical linkage between waterbody and human and river pollution problem underneath. Due to the unanticipated departure of Mayor who made the decision to cover up Wannian River in 1995, the river covering construction work as a consequence was halted for decades, leaving 3-4 km of relic obstructing waterway. In 2010, the unfinished construction was finally demolished. Since then, the local government has made various efforts to manage water quality, inject alternative water source, reconfigure channel and to enable the esthetics and recreation value of river to the neighborhood.

### 1.2 Biophysical Context (IAD)

**Natural Infrastructure** The natural infrastructure of the system includes not only the Wannian river and its floodplain, but also three artificial wetlands serving as the kidney of the city to purify the water source from upstream areas, including 10.3 hectares of Hai-Fong Wetland (built in 2009), 11.4 hectares of Chun-Liao Wetland (2013) and 2.14 hectares of Golden Wetland (2017). In spite of cumulative water purification effort implemented by the public sector over the past ten years, the river pollution index (RPI) of Wannian River does not reflect and match the human endeavor. The objective evidence shows that the river is still in poor health, occasionally recording a RPI score of over 6 which means severely polluted, based on measurement of dissolved oxygen (DO), biochemical oxygen demand (BOD), suspended solids (SS) and ammonia nitrogen (NH<sub>3</sub>-N). The average RPI between

2010 to 2018 is 4.46 which is medium polluted.

**Hard Infrastructure** In this case, only the public hard infrastructure was coded with no private hard infrastructure present after the 1960s due to the cease of provisioning service provided by Wannian River such as farm land irrigation or navigation operated by private fish or tourist boat. Public hard infrastructure, however, was only coded since 2001 from which the open data of public procurement database system can be sorted electronically. A total of approximately 30 million US dollars of tax payers' money was invested in the Wannian River related restoration and routine maintenance between 2002 to 2018. Nearly half of restoration budget was implemented by Water Resources Bureau and Urban Planning Bureau of Pingtung County Government, followed by other projects planned by Environmental Protection Bureau, Construction Bureau, Pingtung City Bureau, Cultural Affairs Department or Pingtung County Government in general.

### 1.3 Attributes of the Community (IAD)

**Social Infrastructure** Social infrastructure in this study was coded based on the scale of social events held by the public and private sectors. Whereas the Pingtung County local government hosted Wannian River Lantern Festival by Communication and International Affairs Bureau since 2017, attracting thousands of tourists annually, local elementary schools by the riverbend such as Ming-He Elementary School or Shin-Yi Elementary School were also involved in hosting either biking or artistic activities. In 2012, Wannian River Protection Family, constituting 37 public and private institutions were established to host river conservation related events periodically. Other Wannian river related activities include Wannian River Walking and Reading events, environmental volunteer training, bridge drawing competition, etc.

**Human Infrastructure** Pingtung County local government is the main human infrastructure in charge of managing the Wannian River through a variety of policy priority, rulemaking and project collaboration with private actor. In 2009, with the assistance and encouragement of Mayor Tsao, the first and the only Wannian River focused non-governmental organization (NGO) was founded – Wannian River Conservation Association. In 2013, this particular NGOs obtained a major government procurement bid of close to NT\$ 1 million as part of river adoption program to co-manage Wannian River with local government. Other active NGOs advocating better river management include Pingtung Hometown Loving Association, Pingtung New Hometown Cultural and Education Development Association, Pingtung Sustainable Development Association and Pingtung County Volunteering Association, etc. Wannian River Patrol Group in collaboration with local government also serves as a pivotal human infrastructure to monitor ecological status of Wannian River.

### 1.4 Rules in Use (IAD) (also Soft Human-Made Infrastructure in CIS framework)

Due to the degraded status (Meyer et al. 2005) of Wannian River and cease of provisioning service provided by river in the post-war era such as irrigation or

drinking water function, there is no specific rules passed by Pingtung County Government to regulate resource users to use water from Wannian River. There is neither co-operative formed to use the water resource. Rules in use to manage Wannian River are mostly following regulations passed by central government. There are four types of regulations pertaining to management of river watershed in general: space distribution, wetland conservation, soil and land resource and ecological protection.

### **1.5 Summary**

Wannian River has undergone major biophysical and social transformation in the post-war era. The advent of technology had created an industrialization and urbanization driven economy that eventually degraded the water quality of Wannian River and reduced the urban ecosystem services that this urban stream can offer to the urban dwellers. Luckily, this unsustainable process of human-nature interaction had been reflected and intervened by local government's policies since 2007. Multiple efforts and strategies have been devised by Pingtung County Government in consultation and collaboration with non-governmental actors. Although the water quality of Wannian River remained mostly medium polluted, at least the river restoration program had been initiated and taken into serious consideration with injection of both financial and human resources. Future efforts remain to be monitored and evaluated.

## **2. Part II. Dynamic Analysis – Robustness**

### **2.1 Update on the Commons Dilemma**

As Wannian River restoration in the urban setting transitions away from form or process river restoration toward celebration of recreational function and improvement of cityscape, the robustness of the system becomes increasingly fragile as the provision and regulation service of urban river are not sufficiently problematized in the evaluation. In specific, the documentation analysis of river restoration success, at least in the rhetoric of city government reports to city council, reveals a biased focus on the cultural service (du Bray, Stotts, Beresford, Wutich, & Brewis, 2019) of urban stream that is directly related to the well-being of residents. Overall, Wannian River riverscape revitalization is also framed with a new hope for city branding that would attract new economic development from the urban planning perspective, a human centered rather than nature centered point of view.

Furthermore, this study posits that resource user of urban stream is also voter who can grant or deny support to the Mayor in the next election. We argue that in the context of a democracy, as long as voter can appreciate the new cultural service provided as a result of urban river restoration effort, the successful re-election of mayor would reinforce this focus on cultural service of urban river, strategically neglecting the provision and regulation service that is not directly linked to the human well-being or beyond citizen's monitoring reach. In other words, if citizen remain silent or uncritical about a variety of restoration aspects of the urban river and take for granted the "business as usual" without depending on urban river for critical provision service such as drinking or irrigation, the robustness of urban

stream would be systematically compromised in the long term. Urban river would constantly remain mediumly polluted ( $3 > RPI > 6$ ) or even worse without complaint and political incentive to change.

## 2.2 Shocks, Capacities, Vulnerabilities

The system is periodically subject to the democratic routine of mayoral election – so called political turnover (Wolman, Strate, & Melchior, 1996) as exogenous driver to impose change in the political leadership. Based on the Wannian River case, there are at least three scenarios that can influence the robustness of the system:

- 1) The elected mayor pays little attention to urban river restoration (Mayor Su II 2002-2005)
- 2) The elected mayor pays abundant attention to Wannian River restoration (Mayor Tsao I 2007-2009, Mayor Tsao II 2010-2014, Mayor Pan I 2015-2018)
- 3) The elected mayor was ready to claim the last mile of restoration (Mayor Pan I 2018)
- 4) The elected mayor pays attention to urban river restoration yet not any more focus on Wannian River which has been identified as “successful” and ready to move on to restore other urban rivers such as Sha-she river (Mayor Pan II 2019-2022).

## 2.3 Robustness Summary

This study posits that the sustainability of urban river restoration is contingent to a repeated game of mayoral election, reelection of mayor (maximum two terms), the associated campaign promises, policy priority and restoration focus that followed. While Wannian River has been identified as a successful urban river restoration case in Taiwan, how the sustainability of Wannian River can be guaranteed with the present institutional arrangement is unclear. In particular, the objective data of water quality showed a slightly declining trend in spite of heavy investment in different infrastructures between 2007 to 2018 and the celebration of the last mile of restoration claimed by the local government since summer of 2018.

## 3. Case Contributors

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## 4. Source

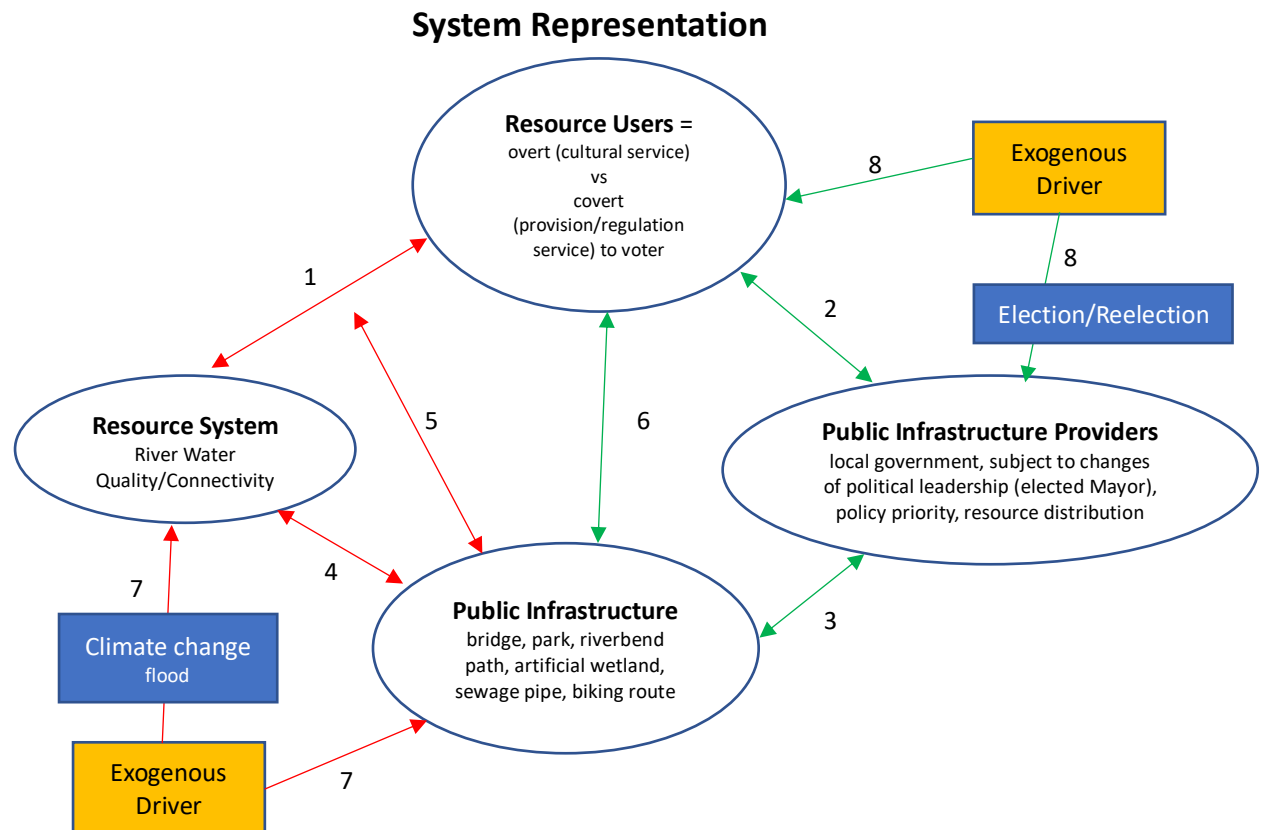
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\*green line represents positive feedback; red line represents negative feedback

\*\*decoupling of cultural service (overt to voter) and provisioning/regulation service of urban river (covert to voter).