

## GOOD PRACTICE STORY

**Title:** Dancing with Water - Wetlands and Water Control Reappeared After the Typhoon

**Destination, Country:** Southwest Coast National Scenic Area, Taiwan

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**In the category:** Nature & Scenery

### **The Story in a picture:**

Renewed thinking on living in harmony with nature began with the creation of an ecological flood detention pond.



### **Summary:**

Kouhu Township is situated along Taiwan's west coast. Besides contending with strong winds, the area features low-lying terrain with poor drainage. Consequently, typhoons and heavy rains directly or indirectly result in severe flooding, impacting public safety and causing property losses. In southeastern Kouhu, there is a large area of farmland on which sugarcane was once grown. As a source of sugar, it was important to the local economy. In 1986, Typhoon Wayne led to major seawater intrusion. Due to decades-long land subsidence, the floodwaters did not recede. Now, it is a lagoon and wetland. Due to frequent flooding, there was loss of farmland, in addition to loss of jobs and income.

Thus, we first had to solve the problem of long-term flooding. Using environmentally-friendly engineering methods, the lagoon created by accumulated floodwaters was transformed into an ecological flood detention pond. By integrating environmental education and sustainable tourism concepts, while avoiding highly sensitive areas, habitats have been preserved. We added some basic infrastructure around this pond, where appropriate, such as platforms for getting close to the water, bird watching pavilions, explanatory panels, foot paths, cycling paths, and accessibility ramps. Next, we found ways to generate local income, creating a landscape design based on the fluttering wings of water birds and building the Kouhu Visitor Center in a low sensitivity area. A local organization has been commissioned to manage and operate it, providing guided tours, themed itineraries, shrimp fishing and clam digging experiences, specialty meals based on local ingredients, and local agricultural and fisheries products, increasing job opportunities for residents.

## Good Practice Story:

### Destination description

*Brief background of the destination.*

The Southwest Coast National Scenic Area is where the Chinese pioneers first settled after crossing the Taiwan Strait. The nutrient-rich sediment deposited by the rivers, the rise of the salt industry, and the development of tidal flats left the area with rich agricultural and fishery resources, creating the image of a coastal "homeland of farming and fishing."

### Issues faced

*Problems/issues solved with the Good Practice Story.*

Kouhu Township is located in Yunlin County, along Taiwan's west coast. The main livelihood here is aquaculture (e.g., fish, shrimp, and clams). In addition to strong winds, there is low-lying terrain with poor drainage. Therefore, typhoons and heavy rains directly or indirectly lead to severe flooding, impacting public safety and causing property losses. In addition, coastal residents engaged in aquaculture over-pumped groundwater for a long time, resulting in significant land subsidence. A road in this township has been closed due to long periods of and frequent water accumulation following typhoons, with telephone poles left standing in seawater.

In 1845, a typhoon struck Kouhu Township, leading to massive flooding and the deadliest flood related disaster in Taiwan's history. To commemorate these victims, a folk belief ritual based on this historical event developed and continues to be regularly held. As the whole township participates, it has become the largest water disaster-related ceremony in Taiwan. Known as the Kouhu Qian Shui Zhuang, it is an important folk cultural event.

In southeastern Kouhu, there is a large area of farmland on which sugarcane was once grown. As a source of sugar, it was important to the local economy. In 1986, Typhoon Wayne led to major seawater intrusion. Due to decades-long land subsidence, the floodwaters did not recede. Long-term flooding resulted in serious salinization and this land could no longer be cultivated. Now, it is a lagoon and wetland. Due to frequent flooding, there was loss of farmland, in addition to loss of jobs and income. The population declined as people moved elsewhere in order to survive and now it is mostly the elderly who remain.

Thus, we first had to solve the problem of long-term flooding. Using environmentally-friendly engineering methods, the lagoon created by accumulated floodwaters was transformed into an ecological flood detention pond. By integrating environmental education and sustainable tourism concepts, while avoiding highly sensitive areas, habitats have been preserved. We added some basic infrastructure around this pond, where appropriate, such as platforms for getting close to the water, bird watching pavilions, explanatory panels, foot paths, cycling paths, and accessibility ramps. Low post lamps were installed for nighttime activities, instead of high post lamps, to reduce the impact on habitats.

Next, we found ways to generate local income, creating a landscape design based on the fluttering wings of water birds and building the Kouhu Visitor Center in a low sensitivity area. A local organization, the Jinhu Leisure Agriculture Development Association, has been commissioned to manage and operate it, providing guided tours, themed itineraries, shrimp fishing and clam digging experiences, specialty meals based on local ingredients, and local agricultural and fisheries products, increasing job opportunities for residents. Stakeholders (Kouhu Township Office, local workshops) have joined in the effort to promote this area, reusing waste materials collected during beach clean-up activities and transforming an old farm office into a large-scale art installation. In addition, the Kouhu Visitor Center provides free bicycle rentals. In the beginning, there were 526 rentals per month, increasing to 3,418 in December, with an average of 27,000 rentals per year. We strive to create a low-carbon tourism environment, while highlighting the importance of energy savings and carbon reduction.

## Methods, steps, and tools applied

*Solutions implemented to address the sustainability problems or issues.*

**1. Division of labor and collaboration among stakeholders:** We collaborate with many stakeholders (local conservation groups, community representatives, industry representatives, NGOs, Yunlin County Government, and Water Resources Agency, etc.) while following a clear division of labor. Such collaborations are based on two aspects, environment/ecology and local economy, as well as the concept of “working together with water, room for water.”

**2. Monitoring and information station:** Through the disaster prevention information network of the Water Resources Agency under the Ministry of Economic Affairs, data from each monitoring point is posted online for public viewing, including monitoring data (real-time rainfall, real-time water level) and warnings (flood warnings and water level warnings).

**3. Ecological monitoring:** The Yunlin County Government commissioned professionals to assist in the collection of flood detention pond ecological data, conduct habitat assessments, and establish ecological conservation principles. Based on ecological survey results and ecological conservation issues, ecological consultation was provided and ecological conservation work was conducted during construction.

**4. Maintenance of biodiversity:** Before planting began around the flood detention pond, an ecological survey proposal called for consultation by experts, investigations of tree planting cases along Taiwan’s west coast, and soil salinity testing. Windbreaks were erected and oyster shells were buried in soil or improved soil was used. Drainage facilities for collecting surface runoff were created to strengthen infiltration of freshwater, in addition to irrigation facilities. Native coastal plants increased, such as Indian almond trees and looking-glass mangroves. Gradually, through natural succession, there has been transformation from single species beefwood or coast hibiscus forest to biologically diverse environments.

**5. Transportation network:** Integrating local agriculture and tourism and leisure activities, abandoned roads around the original lagoon were paved to create around 3.5 kilometers of roads and paths (including service roads, cycling paths, and walking paths) to fulfill the recreational needs of tourists and residents.

## Key success factors

*Critical elements that led to successfully solving the issues.*

**1. Ecologically-friendly engineering methods:** During the planning stage of the man-made flood detention pond, a stakeholder (Yunlin County Government) conducted a basic ecological survey of the surroundings to understand the ecological issues and impacts of this project and to assess the feasibility of avoidance, reduction, and compensation measures. Moreover, opinions were gathered from experts, scholars, and residents (6 local briefings, 2 workshops, and 3 project awareness meetings were held from 2017 to 2020) to reduce the ecological impact. The result is a flood detention pond with flood control capabilities and a rich ecology that attracts flocks of migratory birds every year.

**2. Increased local buying:** Local agriculture has brought in tourists, creating income for residents. The Southwest Coast National Scenic Area Administration has created a salt worker bento brand that incorporates local ingredients, as well as supported a local savory (salt-based) foods brand. With increases in tourist numbers, a local recreation and tourism industry has developed.

**3. Public-private partnerships and resource assistance:** Public sector resources are allocated with consideration given to economic sustainability. Residents operate visitor information stations and design itineraries. Through itinerary planning, they understand the stories of this area and how to coexist with them. Visitor information stations also serve as platforms for direct sales of local agricultural specialty products.

## Lessons learned

*Challenges faced while implementing the Good Practice and their solutions.*

**1. Kouhu** was originally composed of a lagoon and wetland. Due to reclamation of land in the Haipu area to create more farms, the original lagoon disappeared, affecting drainage. Whenever there

were heavy rains or at high tide, farmland flooded. In the past, people competed with water by building embankments and dams, changing the course of waterways, or using infill techniques to develop fish ponds, fields, or communities in water flow areas. It is now necessary to face the phenomena of climate change against the backdrop of the long-term negative effects of these artificial and improper development projects.

2. Renewed thinking on living in harmony with nature began with the creation of an ecological flood detention pond. Ecologically friendly techniques have improved the environment and the integration of sustainability concepts is reflected in appropriate changes. In addition to environmental benefits, economic balance has been achieved.

3. Each stakeholder plays a role, making use of their respective abilities to pursue shared goals. Through division of labor, stakeholders create greater benefits. With appropriate education, publicity, and introductions to tourist attractions, visitors learn the life knowledge imparted in Nature's classroom and are encouraged to adjust their behaviors. We can no longer have a wait-and-see attitude when it comes to climate change, but must deal with it head on.

## Achievements and Results

*Direct and indirect results of the Good Practice.*

### **Restoration of nature – Increasing numbers of bird species and biodiversity**

According to the eBird database, 37 species of birds were observed in the Yiwu Wetland from 2016, increasing to 73 from 2021 to 2023, making it one of the most important bird-watching sites in Taiwan. In addition, during a 2020 ecological survey, 2,119 birds were recorded, belonging to 18 families, 20 genera, and 24 species. Among them were 1,971 water birds of 12 species, as well as 8 species of winter migratory birds.

The Yiwu Wetland is diverse, consisting of natural estuary and coastal wetland, abandoned farmland, fish ponds, artificial flood detention pond, and woodland. It is a migratory bird rest stop. Following overall planning and design, along with the integration of human activity and nature, environmental education, life experience, industry development, and tourism, as well as unique landscapes, a rich wetland has been created.

In this area, around 4,000 trees and 9,000 shrubs have been planted, along with 25,000 square meters of grassland. Native tree species include Indian almond, coast hibiscus, Taiwan nato tree, beach calophyllum, Taiwan date palm, Oldham Elaeagnus, milky mangrove, white-flowered black mangrove, and seashore dropseed, etc. They protect the embankments and increase the detention pond's biodiversity.

A wetland database has been developed and, as of 2023, contains records of a total of 2,396 species of organisms, 124 records related to water quality, and a directory of 263 species.

### **Flood control example – Living in harmony with water**

The construction of the Yiwu Detention Pond has greatly reduced flooding in Kouhu. Total drainage area is around 100 hectares, with a water depth of 2.5 feet and an effective storage capacity of 2.5 million cubic meters. It can adjust area water levels during a typhoon or heavy rains. According to disaster monitoring data, although the frequency of heavy rain has increased due to climate change, there have been significant decreases in deaths and property losses, which is encouraging for the development of flood detention pond-related policies in low-lying areas. In recent years, aquaculture methods have changed. With the completion of this flood detention pond, water is effectively collected during the rainy season to supplement groundwater levels and used for aquaculture during the dry season to eliminate the need to pump groundwater, gradually resolving the land subsidence issue.

### **Local economic benefits**

According to Kouhu Visitor Center visitor survey data, in 2021 visitors are 140,000 (low due to the COVID-19 pandemic) and in 2022 are 220,000. On average, daily spending by visitors is estimated to be NT\$2,062. In 2022, about NT\$450 million in output value was created. Integrating local characteristics, two vendors received guidance in the development of salt workers' bento (lunchboxes). In 2022, a total of 11,000 units were sold, creating a local output value of NT\$4 million.

The Jinhu Leisure Agriculture Development Association, which has been commissioned to manage and operate the Kouhu Visitor Center, received a bronze medal in a 2022 national rural village competition. Using local materials, artists designed an installation, entitled *Crown of the Sea General*, which was recognized with a DNA Design Award in 2020. In 2017, the Kouhu Visitor Center was awarded the Green Building label.

### *Tips for other destinations*

*Your suggestions or recommendations for other destinations facing the same issues or implementing similar solutions*

The water that bears the boat is the same that swallows it up. Human beings have to rethink the way of getting along with nature. If appropriate sustainable measures are taken for man-made facilities, not only will they help the environment, but they will also be able to sustain the economy in a way that coexists with nature.

### *Recognitions and Additional references*

*Recognitions and awards the Good Practice received and supporting evidence.* <https://dmap.ncdr.nat.gov.tw/1109/map/#>  
<https://wetland-db.tcd.gov.tw/#/story/%E6%A4%AC%E6%A2%A7%E9%87%8D%E8%A6%81%E6%BF%95%E5%9C%B0>