

Rivers, Streams & Waterways: Opportunities + Challenges

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« OPPORTUNITIES

Waterfronts have social and economic values and they create identities for cities. With a well **integrated river-oriented development strategy** and **alignment of investment** on water-related infrastructure, many of the urban stresses can be resolved to create a more livable outcome.

- Restored Flow Regime
- Improved Water Quality
- Integrated Flood Control
- Ecological Enhancement



- Enhanced Livability
- Drives Economic
- More residents living, working and playing near water

- Recreation
- Healthy Places
- Social Parity
- Public Accessibility

An aerial photograph of a city featuring a wide river flowing through the center. On the left bank, there is a large, historic building with a red-tiled roof and a prominent dome. A green and white bus is visible on the road adjacent to the building. On the right bank, another large building with a red-tiled roof and multiple domes is visible. The river is bordered by a concrete wall on the left and a paved walkway on the right. The sky is clear, and the overall scene depicts a well-developed urban area with a focus on water and historic architecture.

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Imagine it.
Delivered.

River of Life

Kuala Lumpur



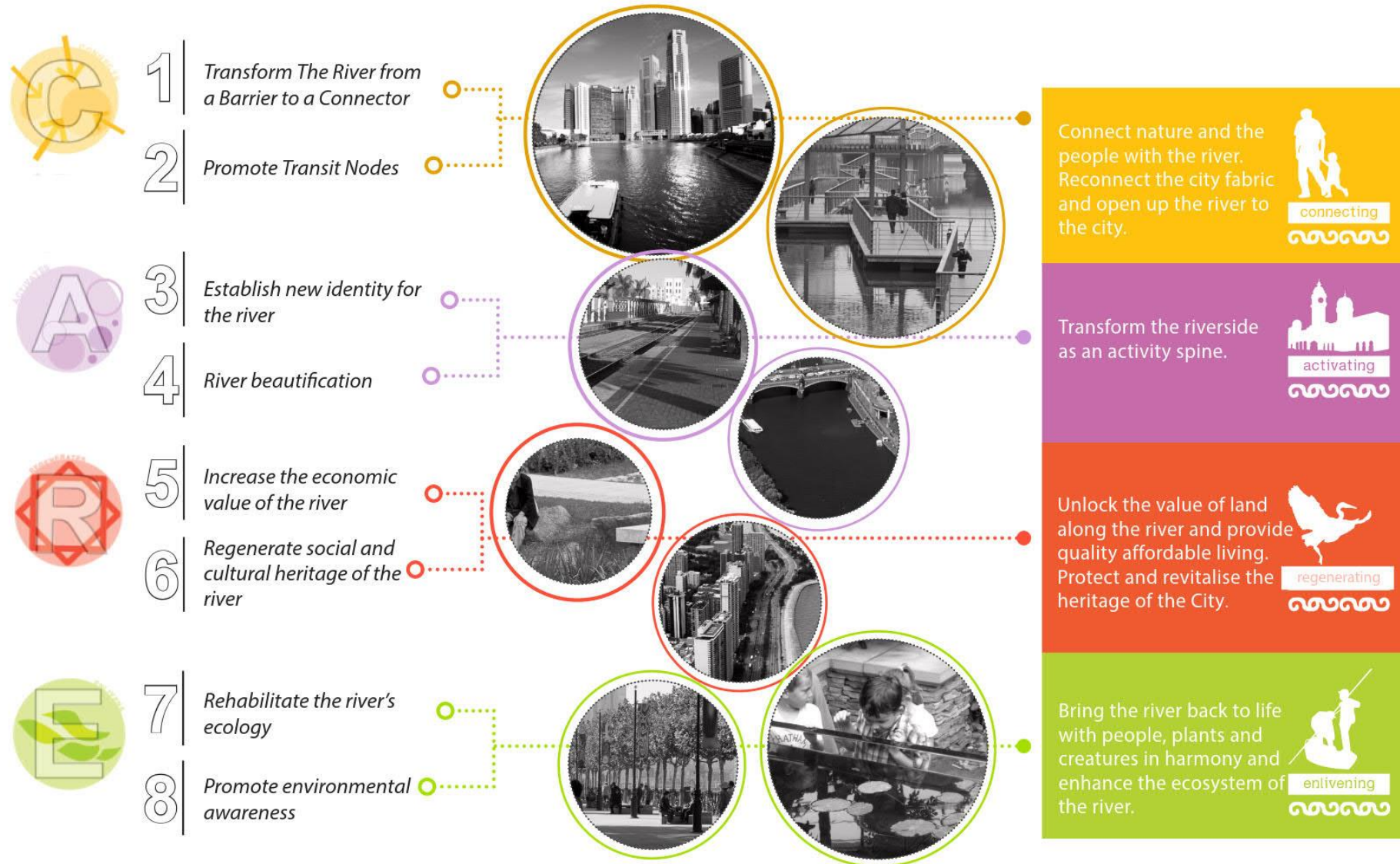
Three components

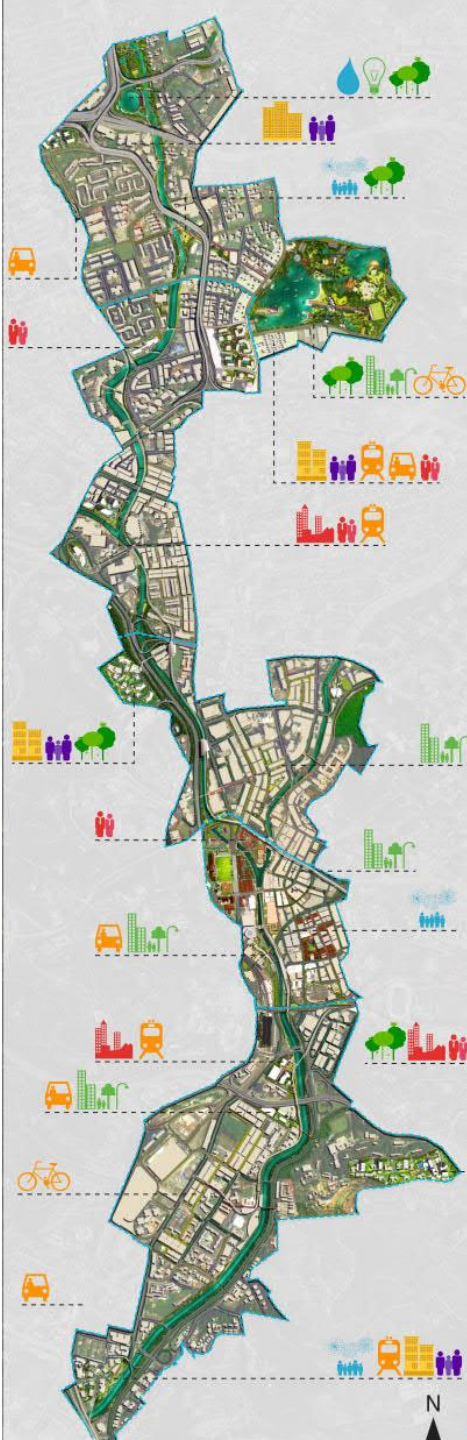


Entry Point Project (EPP) in the Greater Kuala Lumpur/Klang Valley National Key Economic Area under the Economic Transformation Programme.

The goal is to transform the rivers into a vibrant and thriving waterfront by 2020.







River of Life

AECOM Imagine it.
Delivered.

● Masjid Jamek

● Bangunan Sultan Abdul Samad

Jalan Raja

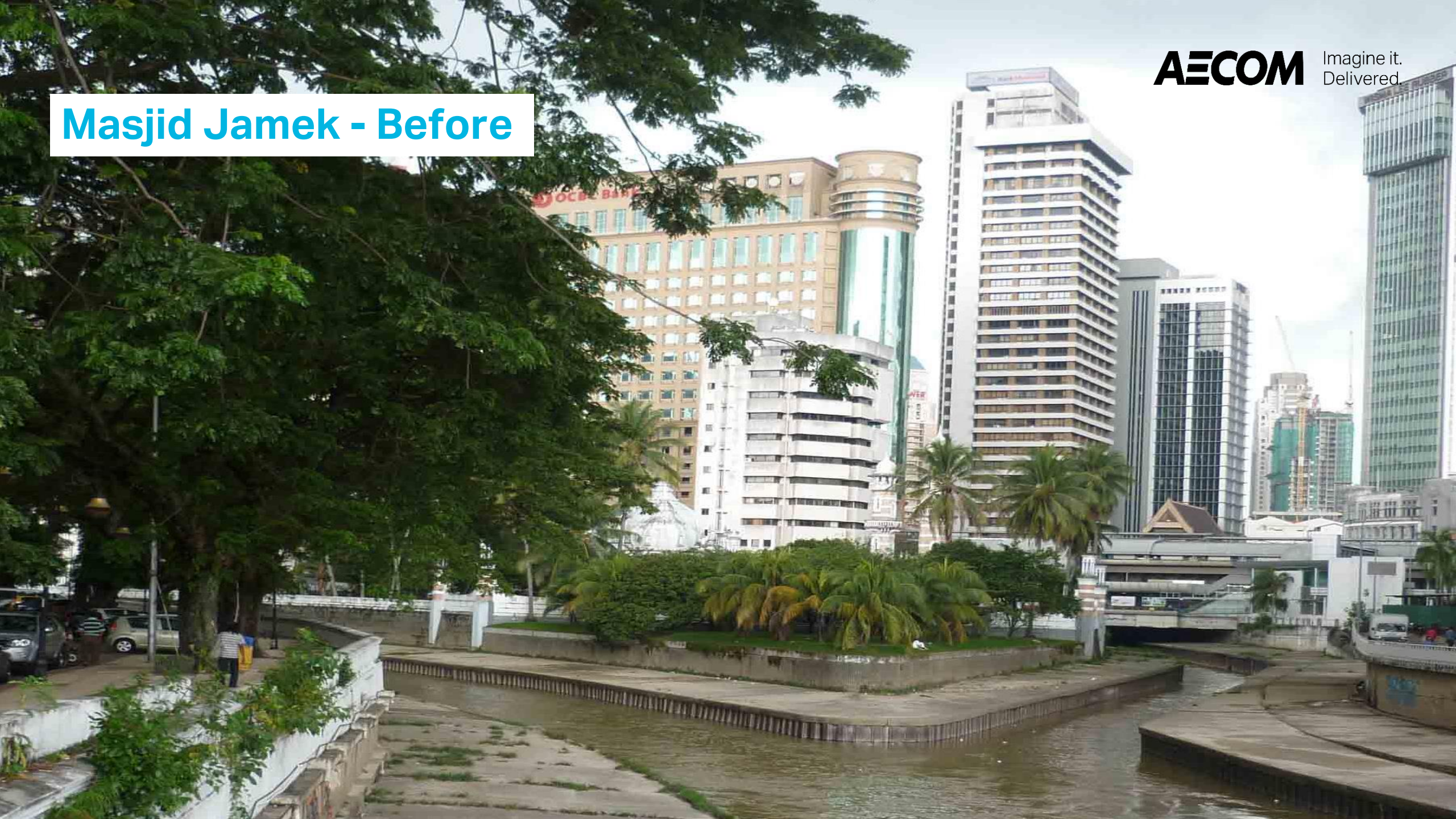


River of Life

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Masjid Jamek - Before



Masjid Jamek - After

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Masjid Jamek

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Opening to public transit

Opening to the river



"This new bridge enables
me to travel from Merdeka
Square to the Masjid
Jamek in just 5 minutes"

Bangunan Sultan Abdul Samad

Pedestrian Waterfront | Accessible History

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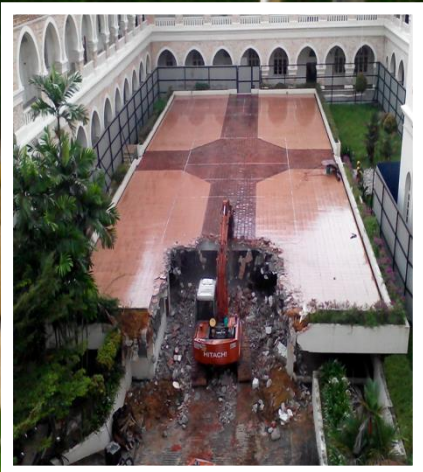


**"It's such a nice walk
along the river with the
preserved Heritage
trees"**

PRESERVING THE COLONIAL HERITAGE

Sunken Garden

AECOM Imagine it.
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Urban Intervention

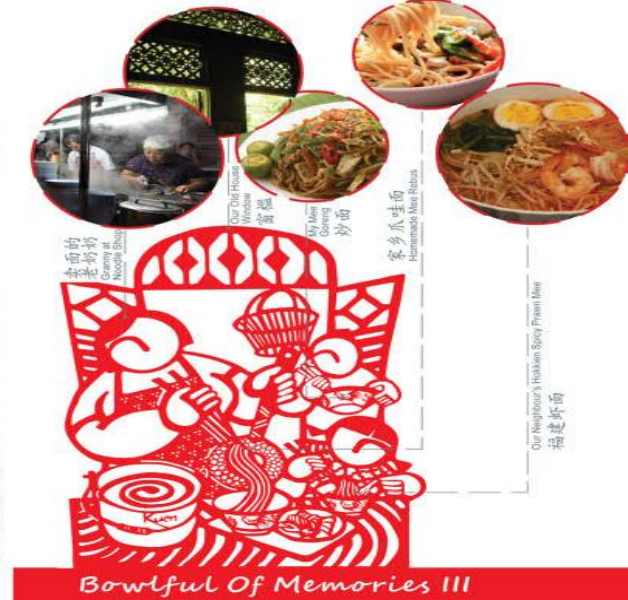
Navigating the urban environment through the Guiding Gallery and Guiding Lights



AECOM Imagine it.
Delivered.

GUIDING GALLERY AND GUIDING LIGHTS AS VISUAL MARKERS THAT CONNECT BACK TO DESTINATIONS ALONG THE RIVERFRONT

Urban Intervention Artwork / Sculptures



AECOM Imagine it.
Delivered.



**LOCAL ARTIST /
CULTURAL ARTS**

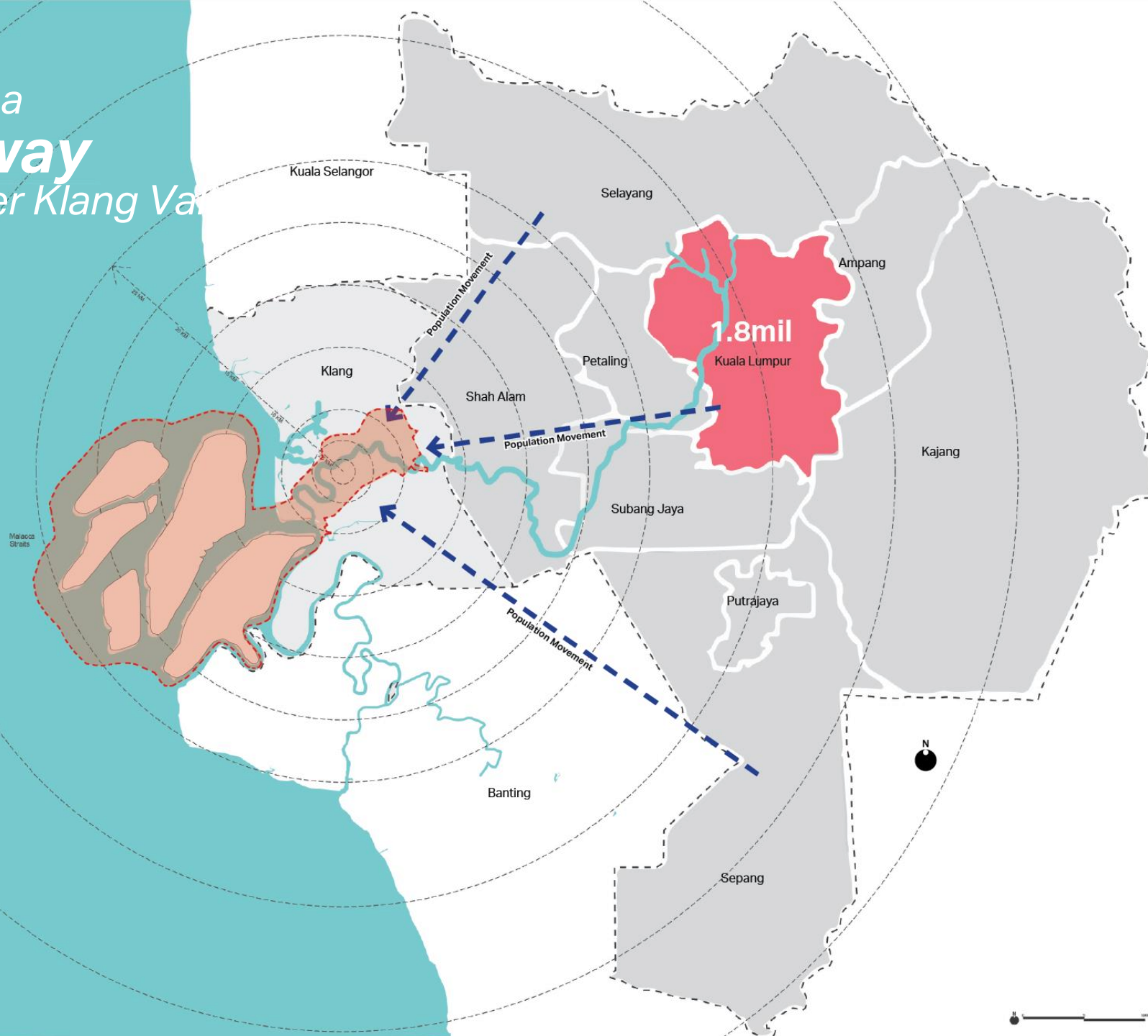


THE STORY "BOWLFUL OF MEMORIES"



SERIES OF SCULPTURES THAT EMBODY THE PERSONALITY AND BUZZ OF CHINATOWN STREET LIFE

Klang as a Gateway to Greater Klang Valley



573km²
Total District Area



744,062
Population (2010)



4th Largest
City in Malaysia



16th Busiest
Port in the World

88,000 ACRES SELANGOR MARITIME GATEWAY MASTERPLAN

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Delivered.



ZONE 02
Klang River Mouth

ZONE 03
Eco-City

ZONE 04
North Riverfront

ZONE 05
Grand Bazaar

ZONE 06
Heritage Quarter

AECOM Image Delivery



An aerial photograph of Penang, Malaysia, at sunset. The city skyline is visible in the background, with numerous high-rise buildings. The foreground shows a large body of water, likely the Penang Harbour, with a long, straight breakwater or causeway extending from the shore. The sky is filled with soft, colorful clouds in shades of orange, pink, and purple. The water reflects the city lights and the sunset colors. The text "Penang: Challenges + Opportunities" is overlaid in the center of the image.

Penang: Challenges + Opportunities

All over the world – rivers + waterfronts are transforming

AECOM Imagine it.
Delivered.



Marina Bay and Greater Southern Waterfront, Singapore



LA River Gateway Master Plan, USA



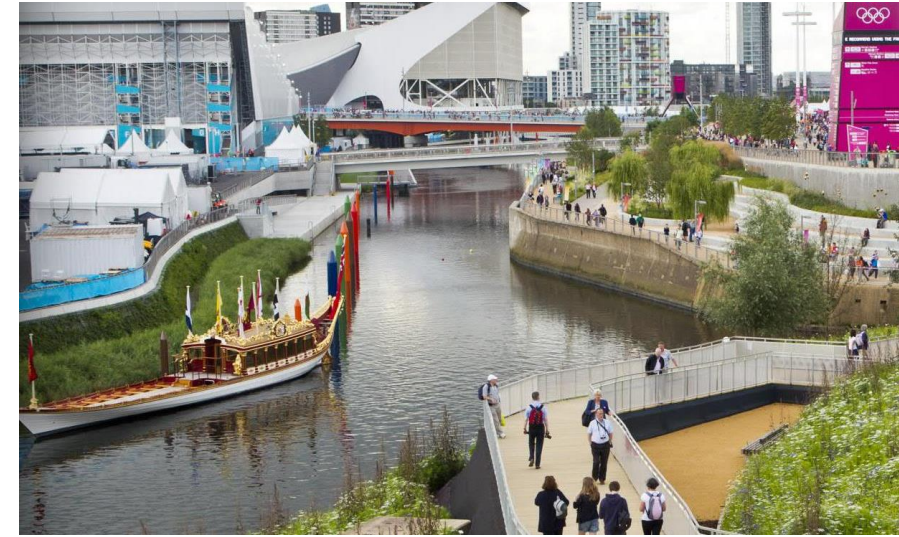
ABC Waters, Singapore



Red Hook Master Plan, Brooklyn, New York, USA

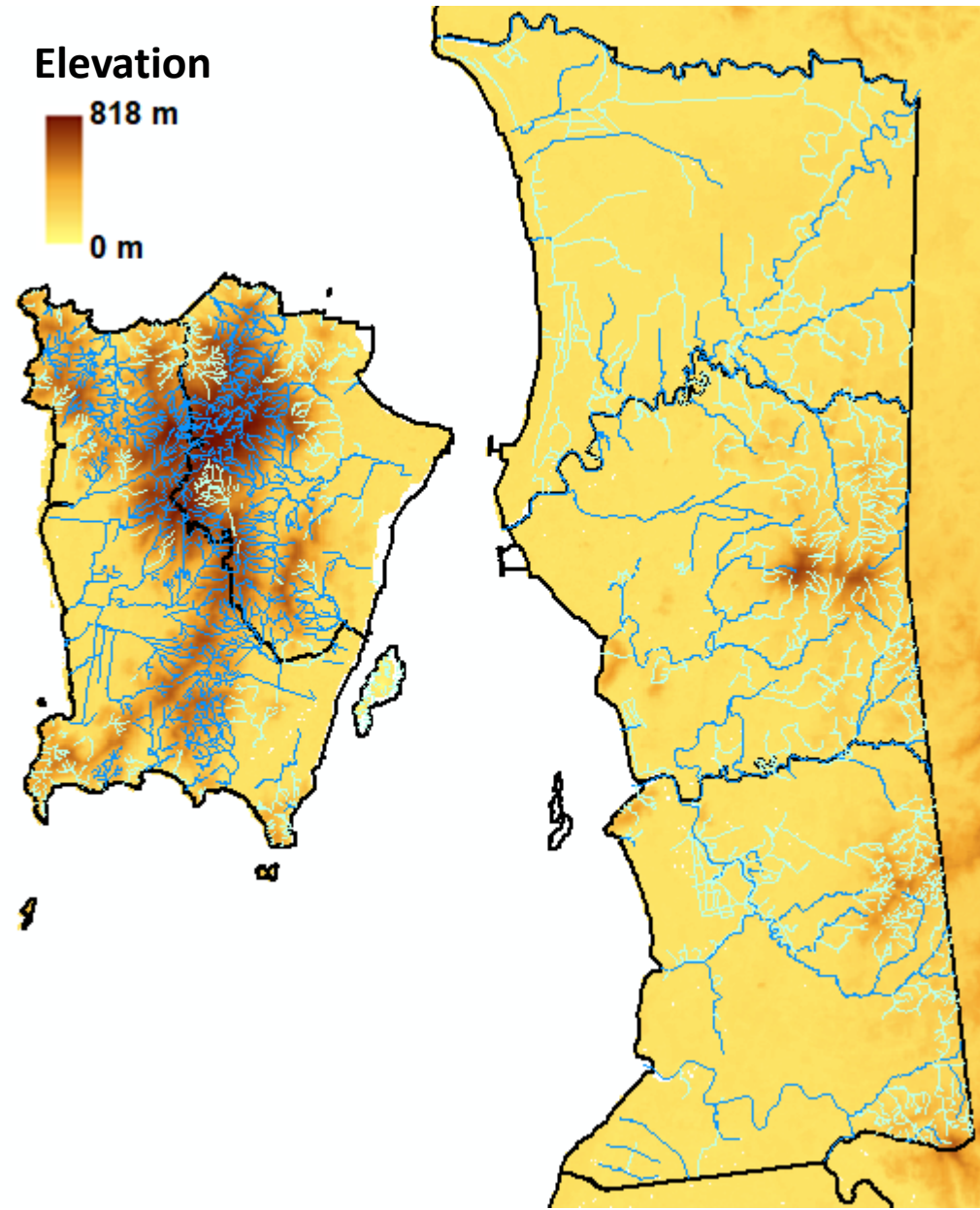


San Antonio River Floodplains, Texas, USA

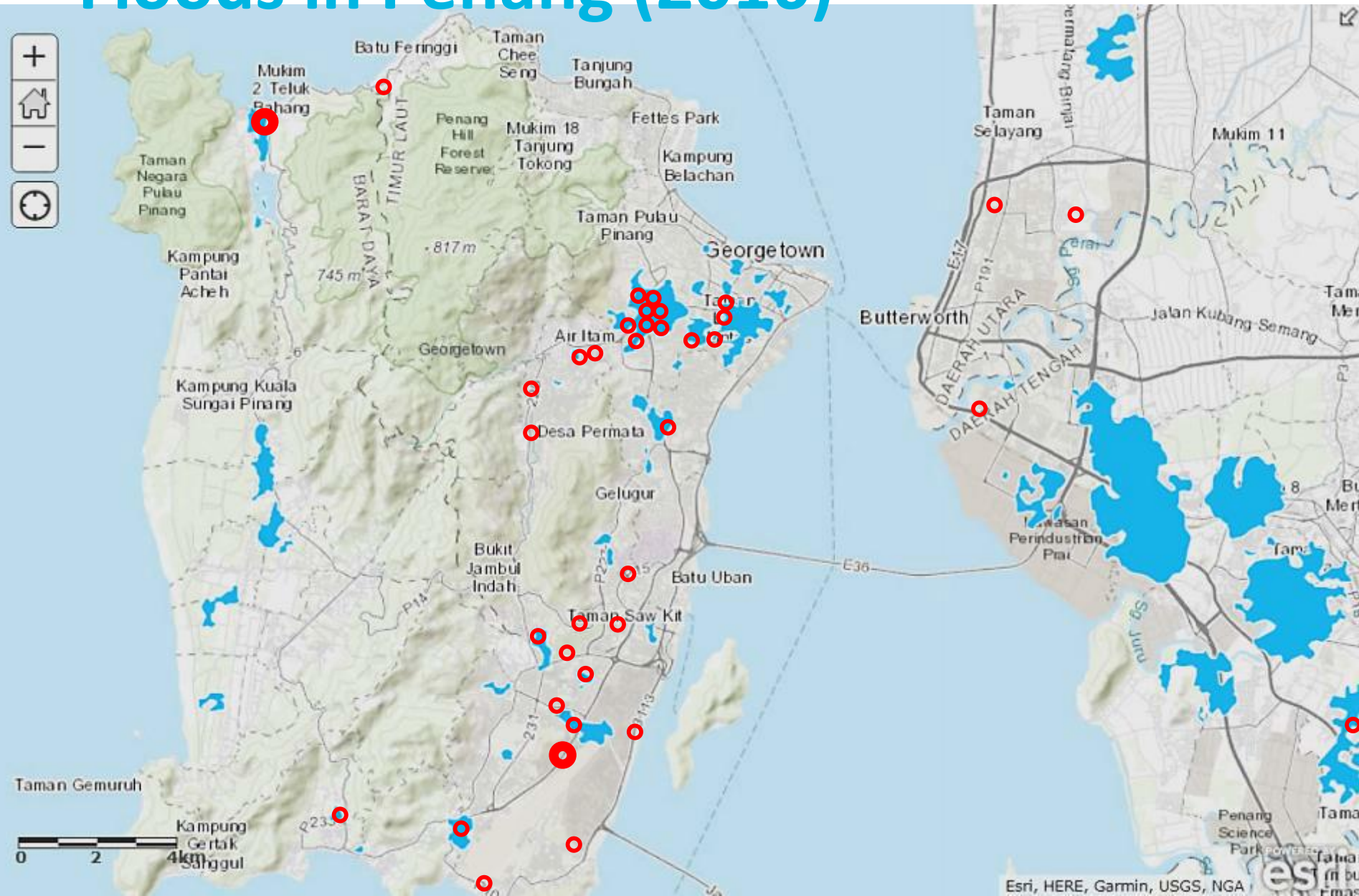


Lea Valley, London, UK

Topography and hydrology of Penang

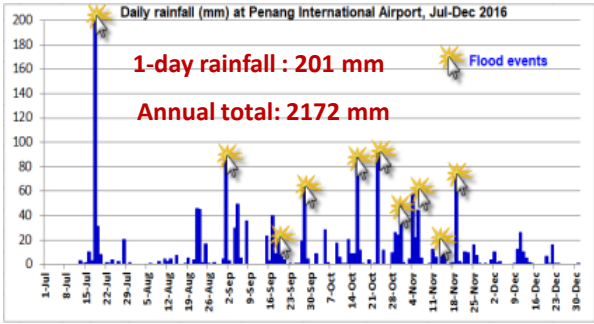


Floods in Penang (2016)

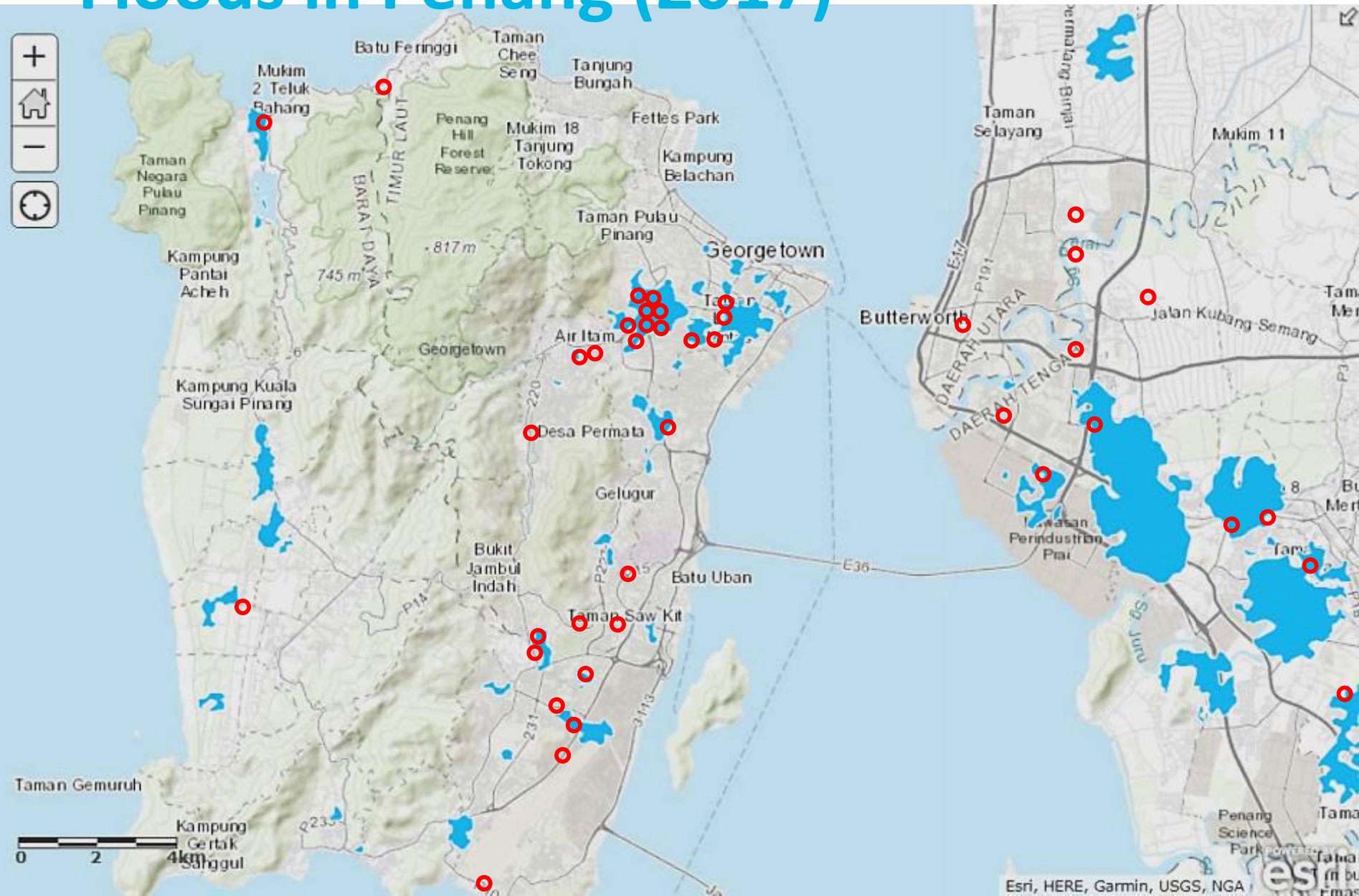


2008 flooded area extent

Reported flood event in 2016

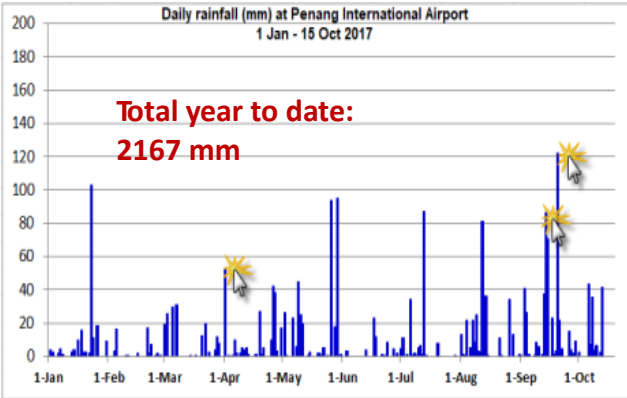


Floods in Penang (2017)



AECOM Imagine it.
Delivered.

- 2008 flooded area extent
- Reported flood event in 2017



Sg Air Itam

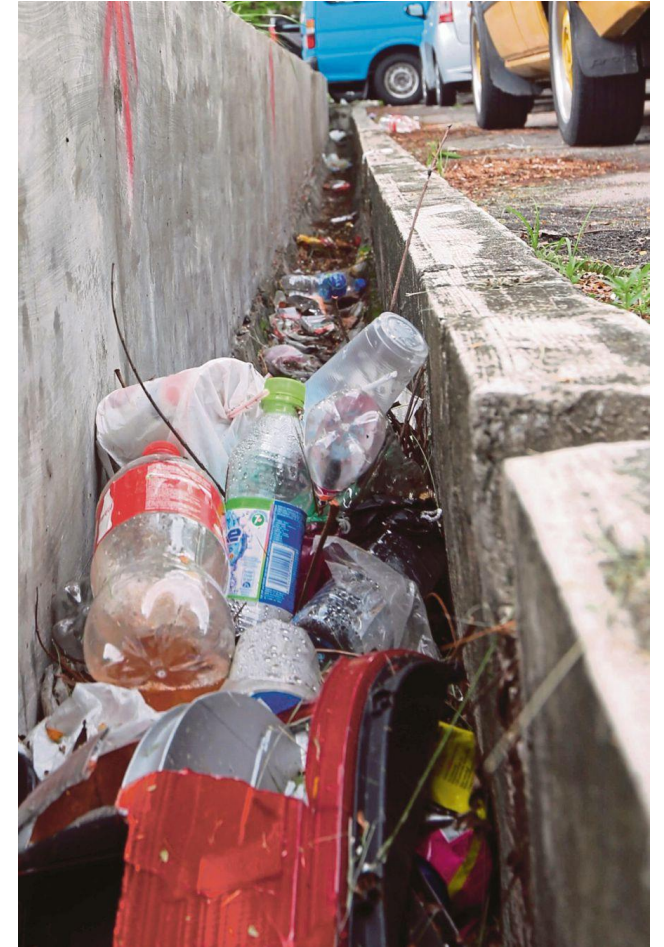


Map credit: Penang Forum

Floods in Penang (2017)



Clogged drains are an issue



Case Study: Taichung LiuChuan River, Taiwan



Past

A picturesque shade corridor degraded down to an unapproachable urban drainage way

A Picturesque Past



Use to nickname as the scenic creek of little Kyoto

Rise of the Illegal Housing



Polluted due to the population surge and free discharge of sewage

Renovation and Decline



Demolishment of the illegal housing drove away human activities

Present

Cementation of the Canal



The goal was to bring the reminiscent scenery back to Liuchuan

Yanagawa River: Taichung City Taiwan



Goals to enhance livability

Flood Prevention

Increase Channel Cross-Section
Restore the Watercourse

Water Quality Improvement

Establish Water Quality Level
Reduce Pollution Level

Landscape Enhancement

Enrich Planting
Create Habitats

Environmental Education

Demonstration with Ecological
River Engineering Methods

Integrated Community

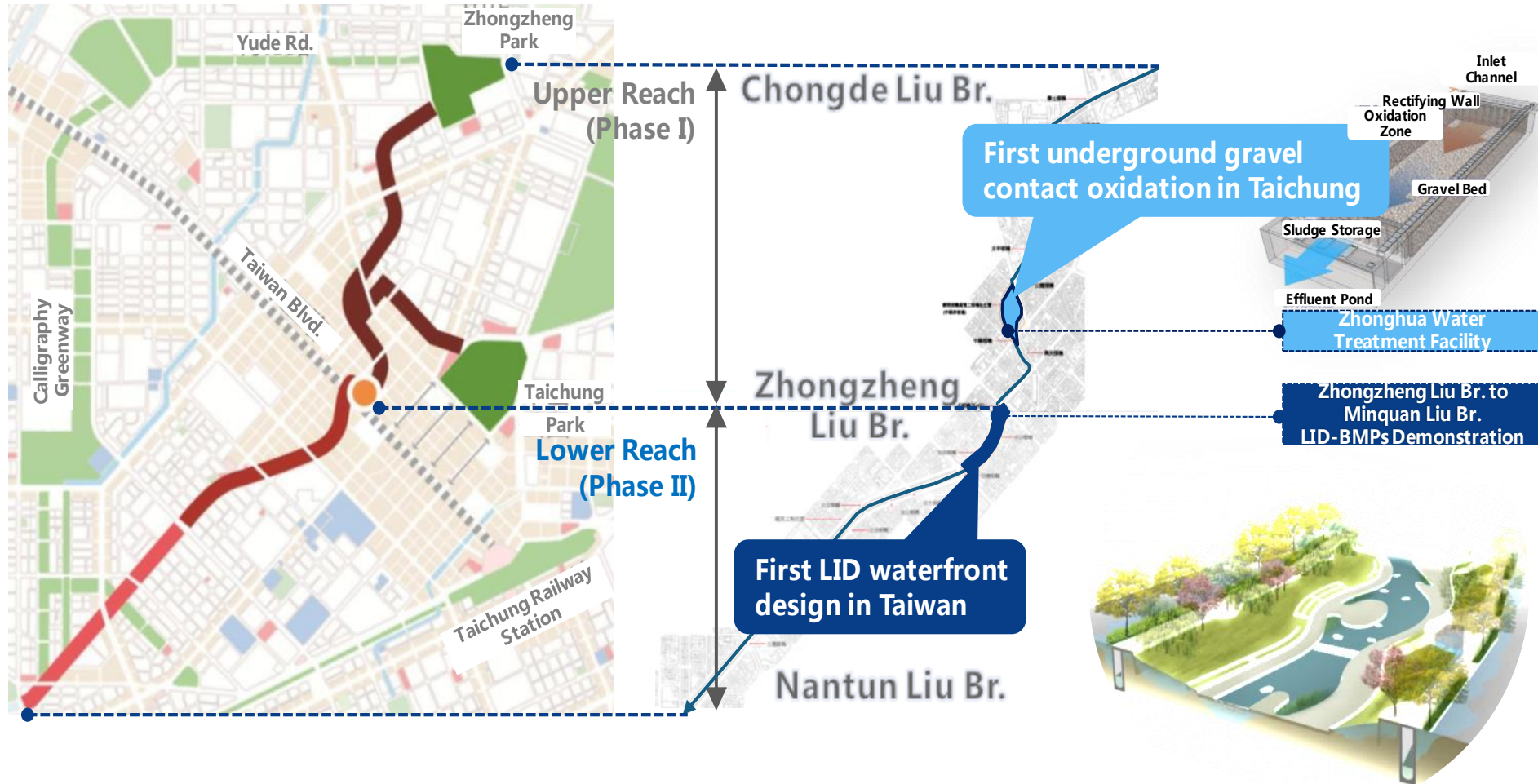
Social Hubs for Cross-Field Exchange
Community Interaction Areas

Enhance City Brand

A Cultural and Aquatic City Built Upon
Symbiosis Relationship with the River

Project Objectives

Gradually improve Liuchuan in different sections and phases



Design Concept

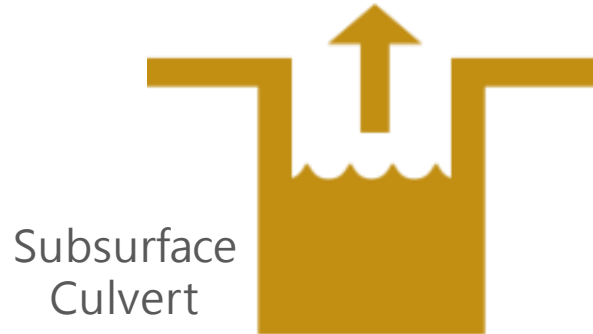
STEP1 Safe

Flood
Prevention

Urban
Drainage



Channel Widening



Subsurface
Culvert

STEP2 Clean

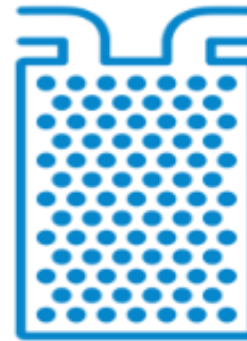
Pollution
Reduction

Water
Clarification



Sewage
Interception

Gravel Contact
Oxidation



STEP3 Eco-Friendly

Landscape

Ecology

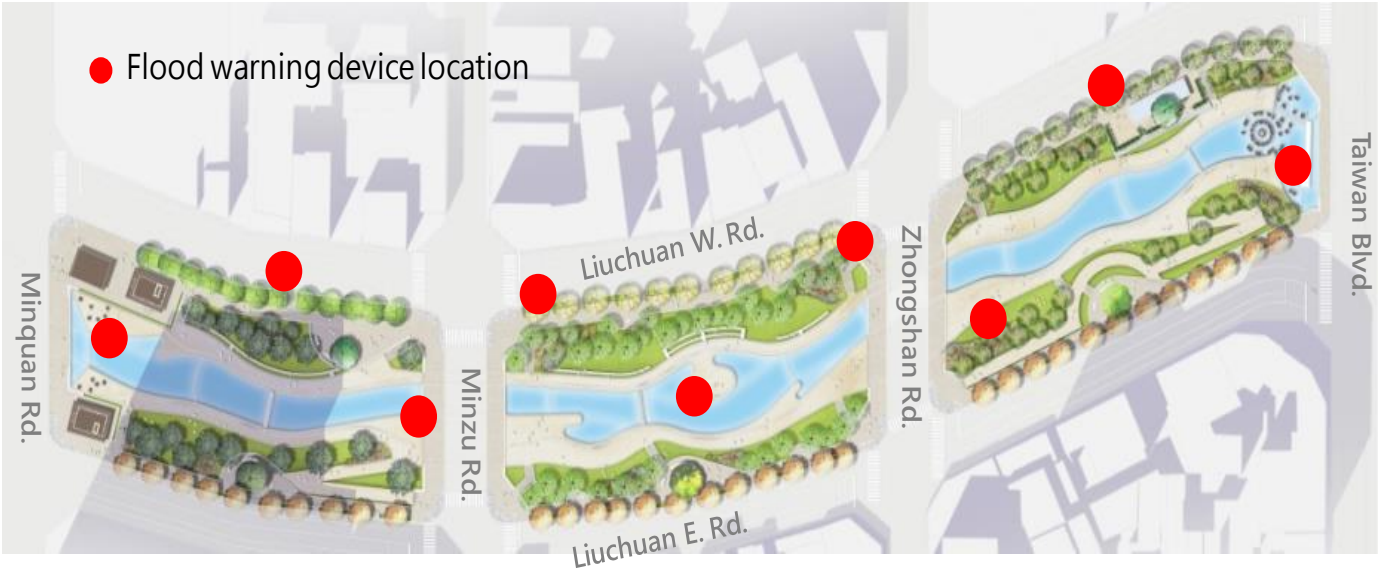


Ecological Engineering
Method

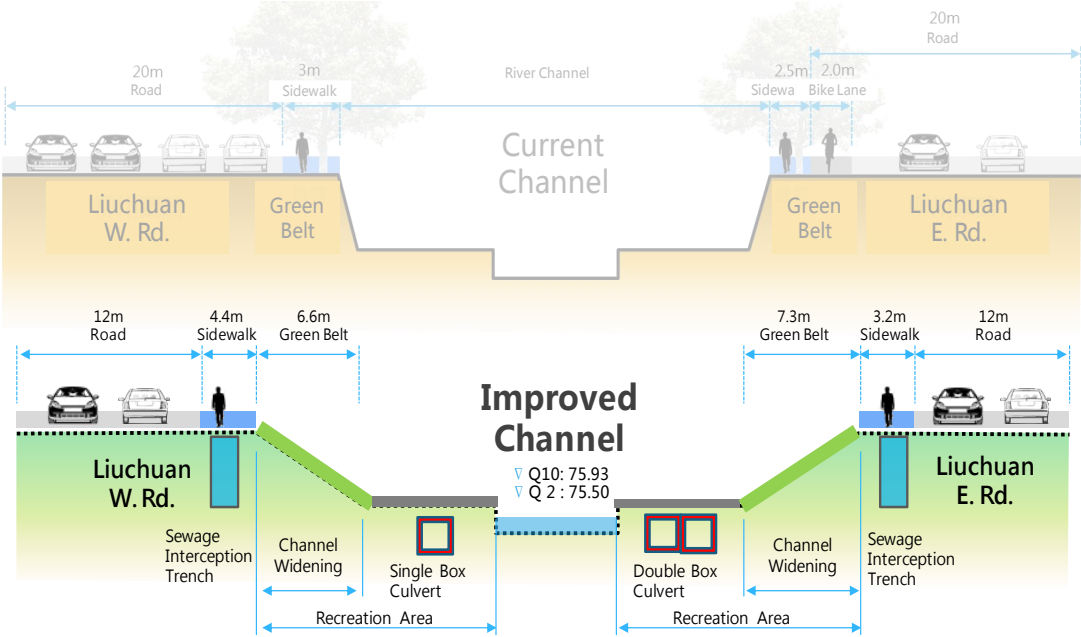
Micro
Habitat



Flood Prevention & Drainage

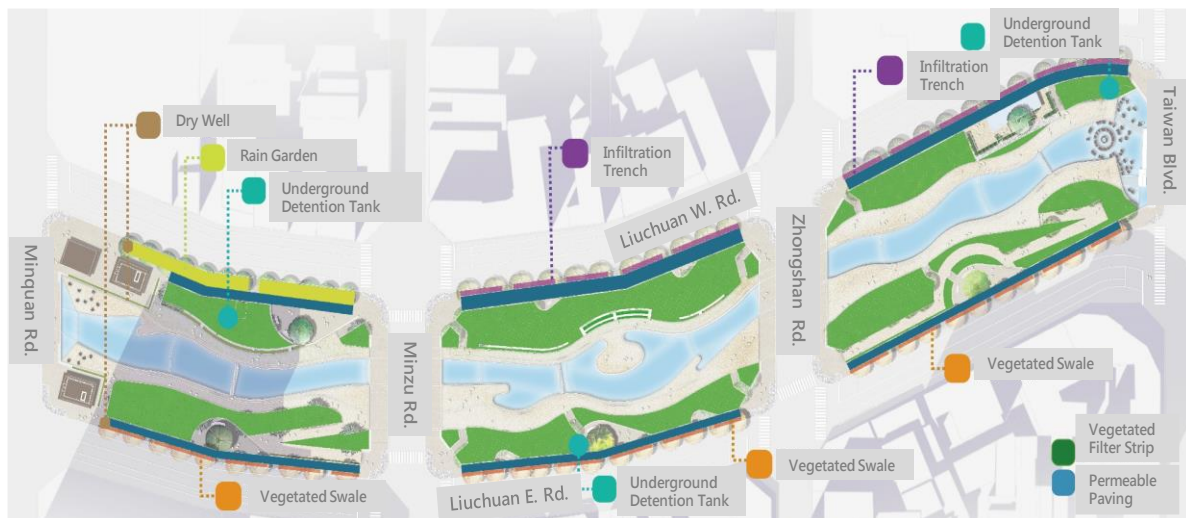


Flood warning



Safe waterfront

Water Cleaning



Water Collecting Devices and Area provided (Unit: m²)

| Devices Area | Infiltration Trench | Permeable Paving | Rain Garden | Vegetated Swale | Dry Well | Vegetated Filter Strip |
|-----------------|---------------------|------------------|-------------|-----------------|----------|------------------------|
| Device Area | 224 | 626 | 250 | 201 | 0.32 | 2,647 |
| Collection Area | 1,122 | 626 | 705 | 716 | 70.32 | 2,647 |

■ Increase Infiltration Area

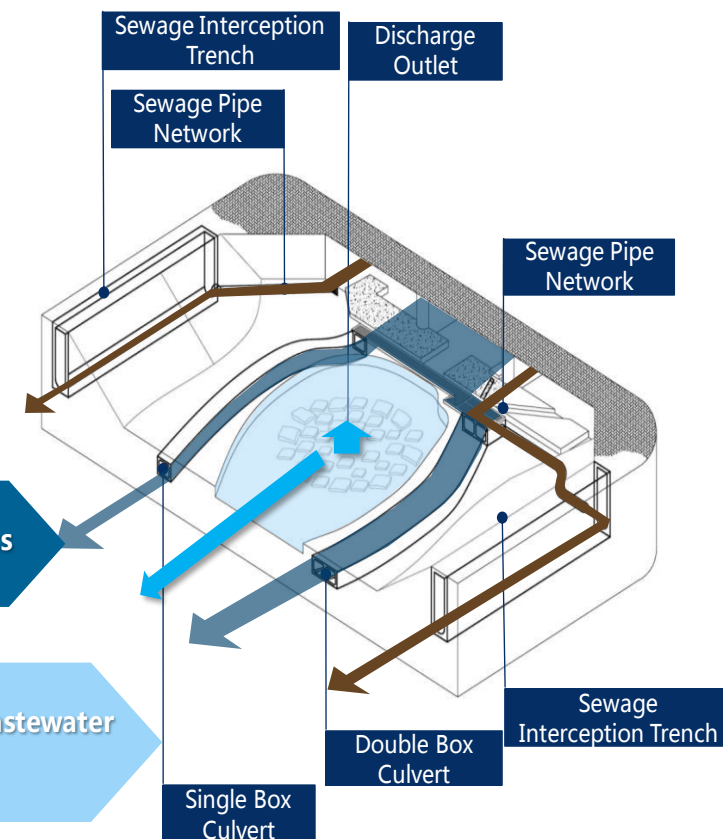
■ Reduce Surface Runoff

■ Decrease Non-Point Source Pollution

1. Sewage Via Sewage Pipe Network to Futien Water Reclamation Center

2. Regional Drainage Via Box Culverts to Lower Reach of Minquan Liu Br.

3. Water Source Via Zhonghua Wastewater Treatment Facility to Zone A Discharge Point



Eco-friendly Approach



Taichung Liu Chuan River, Taiwan

Low-Impact Development, Urban Drainage Improvement

Liu Chuan is the first river improvement project in Taiwan using Low Impact Development(LID) method to improve water environment. Three goals including flood prevention, water quality improvement, landscape enhancement were set by Water Resources Bureau of Taichung City Government to pursue save water environment, clean and odorless water quality and sustainable ecological and landscape environment. The improvement approaches are as follows:

1. **Safety:** the concrete revetments were moved outward for 8 meters on each side of the channel with mild sides slope to increase cross section area for flood conveyance.
2. **Water quality:** The polluted water in the channel was improved by installing sewage interceptor and on-site treatment plant. LID methods were installed to improve overland runoff quality.
3. **Landscape:** Green belt river corridor was established by planting of seasonal plants to create seasonal landscape. Ecological habitants were also created by using natural materials.

Taichung Liou Chuan River, Taiwan



Old Trees Protection, Ecological Conservation

In addition to provide public nostalgia and leisure environment, old trees along the channel banks were preserved to become old tree plazas. Native trees and aquatic plants were planted to enrich riparian ecological habitat and improve ecological diversity. Different scenery in different season were created by planting seasonal plants.

Environmental Education Platform, Water Quality Improvement

Through volunteer and information boards, tourists could be really understand the improvement scheme and the benefits of the improvement project including sewage interception, on-site treatment and runoff treatment by the LID methods.

Landscape corridor, Blue Belt, Sponge City

The reach of LiouChuan was widen 8m on each side of the channel through revision of city plan, in addition, the utilization of LID has increased the pervious area, reduced ecological impacts. The conservation of old trees along channel banks has further enhanced the ecological and landscape values. The native species have come back to LiouChuan since the completion of the improvement work. The construction of sewage interceptors and on-site wastewater treatment facility has resulted in clean water to the channel and improved space utilization in the vicinity to achieve the goal of close to water environment.



Taichung LiuChuan Canal River Improvement Project, Taiwan

AECOM Imagine it.
Delivered.





An aerial photograph of a river winding through a dense, lush green forest. The river's water is a vibrant turquoise color, contrasting sharply with the surrounding greenery. The riverbed is visible in some areas, showing rocks and small rapids. The forest appears thick and healthy, with various shades of green foliage.

Connecting to collaborate

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Delivered.

**Stakeholders
Financing
Legislation
Authority**

**Consultants
Contractors
Operators
End Users**

Segitiga Bersejarah
Historic Triangle

Thank you

Laluan
Pekan
Cina
China
Town
Walk

