



Welang Apik

*The Ideas for a Healthier Welang
River*

PARAMASTRI
RAHMA
SYAFINA

ENVIRONMENTAL
ENGINEERING

Bandung Institute of
Technology

VANESSA

WATER RESOURCES
ENGINEERING AND
MANAGEMENT

Bandung Institute of
Technology

YANANG
SURYA PUTRA
HARDYANTO

BIOLOGY

State University of
Malang

ZAFIRAH ATIKA
HAMSYAH

CIVIL
ENGINEERING

Gajah Mada University

NAUFAL
HISYAM

CIVIL
ENGINEERING

Malang National
Institute of Technology

ROSALINE
ANGGITA ELSA

RESOURCES AND
ENVIRONMENTAL
ECONOMICS

Bogor Agriculture
University

TEAM E



STRENGTHS

- Abundant amount of water
- Source of irrigation
- High number of young productive people

WEAKNESSES

- Lack of water catchment area
- Bad habit
- Lack of awareness from various parties
- Pollution

OPPORTUNITIES

- Tourism potential
- Raw material supply of brick stone
- Kupang shell
- Eco-pesantren

THREATS

Global warming
(heavy rainfall, sea level rise)

Our Vision

"Creating a beautiful and flood-free Welang River through a sustainable development that balanced social, economy, natural, and built infrastructures with smart and integrated solutions."

Our Missions

- 1. Optimization of Water Infiltration Areas**
- 2. Improvement of community's well-being and awareness**
- 3. Utilization of Waste as Resources**
- 4. Water and Sedimentation Storage**
- 5. Resilient Estuary**
- 6. Integrated smart mitigation system**



Upstream



PROBLEMS

- Waste
- High Rainfall Intensity
- Land Use Change



SOLUTIONS

Short Term

- Terrace Riverside Agriculture
- Infiltration Wells

*less than 5 years

Mid Term

- Riverside Parks

*5-10 years

Long Term

- Riparian Zone Protection and Rehabilitation

*more than 10 years

Terrace Riverside Agriculture

- Decrease both erosion and surface runoff.
- Used to support growing crops that require irrigation, such as rice.
- Helps in ecosystem restoration and enriches recreational options by creating aesthetic landscapes.
- Irrigation system managed by local people based on religious and environmental approach.



source: sustainableconference.org



source: [pinterest](https://pinterest.com)



Inspired by:
Traditional Subak Irrigation in Bali



Riverside Parks



source : vimeo.com

- **Habitat preservation** keeping threatened natural habitat and protects native floral and fauna biodiversity that may be lost to a planned urban development.
- **Infiltration Area**, to accommodate and absorb rainwater.
- **Education Park**, to learn knowledge about environmental conservation such as making bio-phores, vertical gardens, composting etc.



source : bbksdajatim.org



Inspired by:
• Kallang River

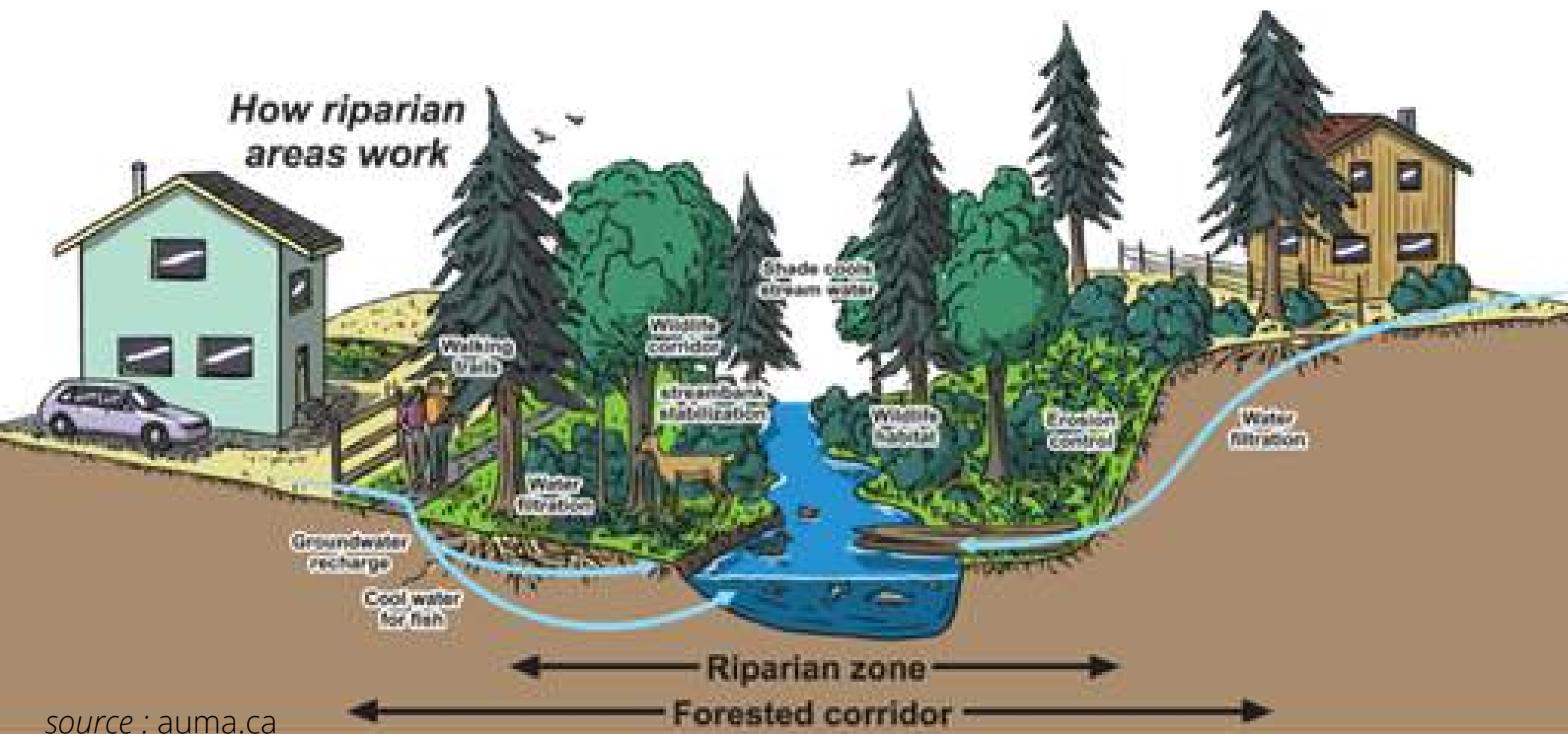


Riparian Zone Protection and Rehabilitation

As buffers between upland areas and open water to help filter pollutants such as nutrients and sediment, helps to reduce stream bank erosion and also maintain stable stream.



source : lakescientist.com



source : auma.ca

- Restore the riparian zone with local vegetation.
- Afforestation with the local vegetation.
- Provide 100 m for the riparian zone in the residential, agricultural or industrial area.



Midstream



PROBLEMS

- Waste
- Sedimentation
- Flood
- Drought



SOLUTIONS

Short Term

- Rainwater Harvesting and Rooftop Garden
- Drainage System

*less than 5 years

Mid Term

- Detention Pond Park
- Sedimentation Retention Pond
- Brick Industry

*5-10 years

Long Term

- Integrated Flood System

*more than 10 years

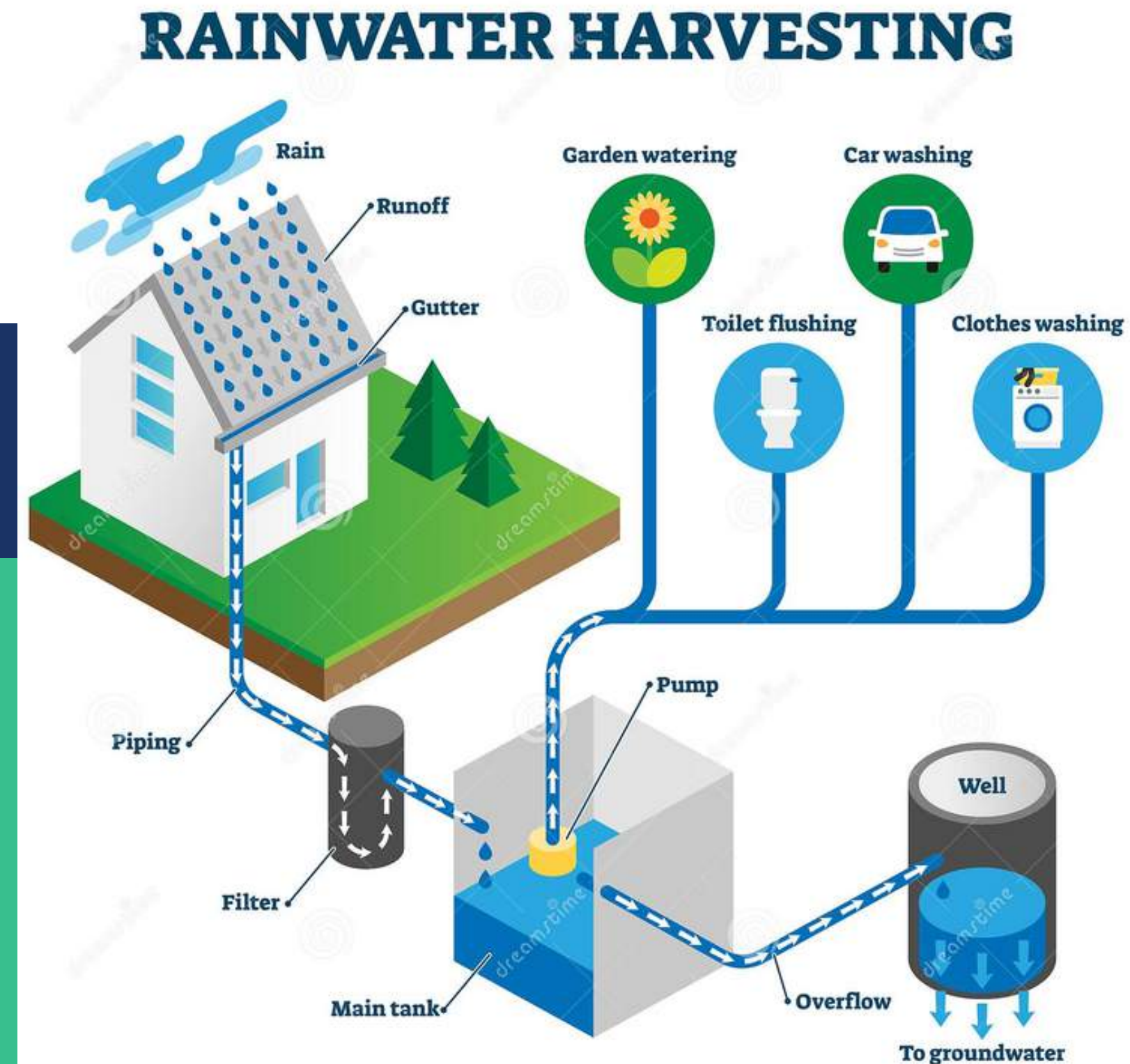
"Independent and sustainable solution for water needs"

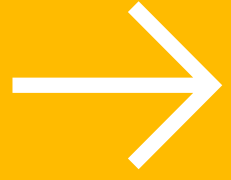
- Every house around the river apply rainwater harvesting to prevent flood and drought.
- Decrease the expenses for water needs.



A resident of Bengaluru, has not paid a penny for his family's water needs for the last 20 years by using rainwater harvesting.

Rainwater Harvesting





Rooftop Garden

"Small step to improve food security"

- Produce your own food
- Lower the overall temperature of your house by 7 percent
- Lower the overall water consumption and make use of harvested rainwater
- Decreases your food miles to zero



source: greenhandle.in

Detention Pond Park



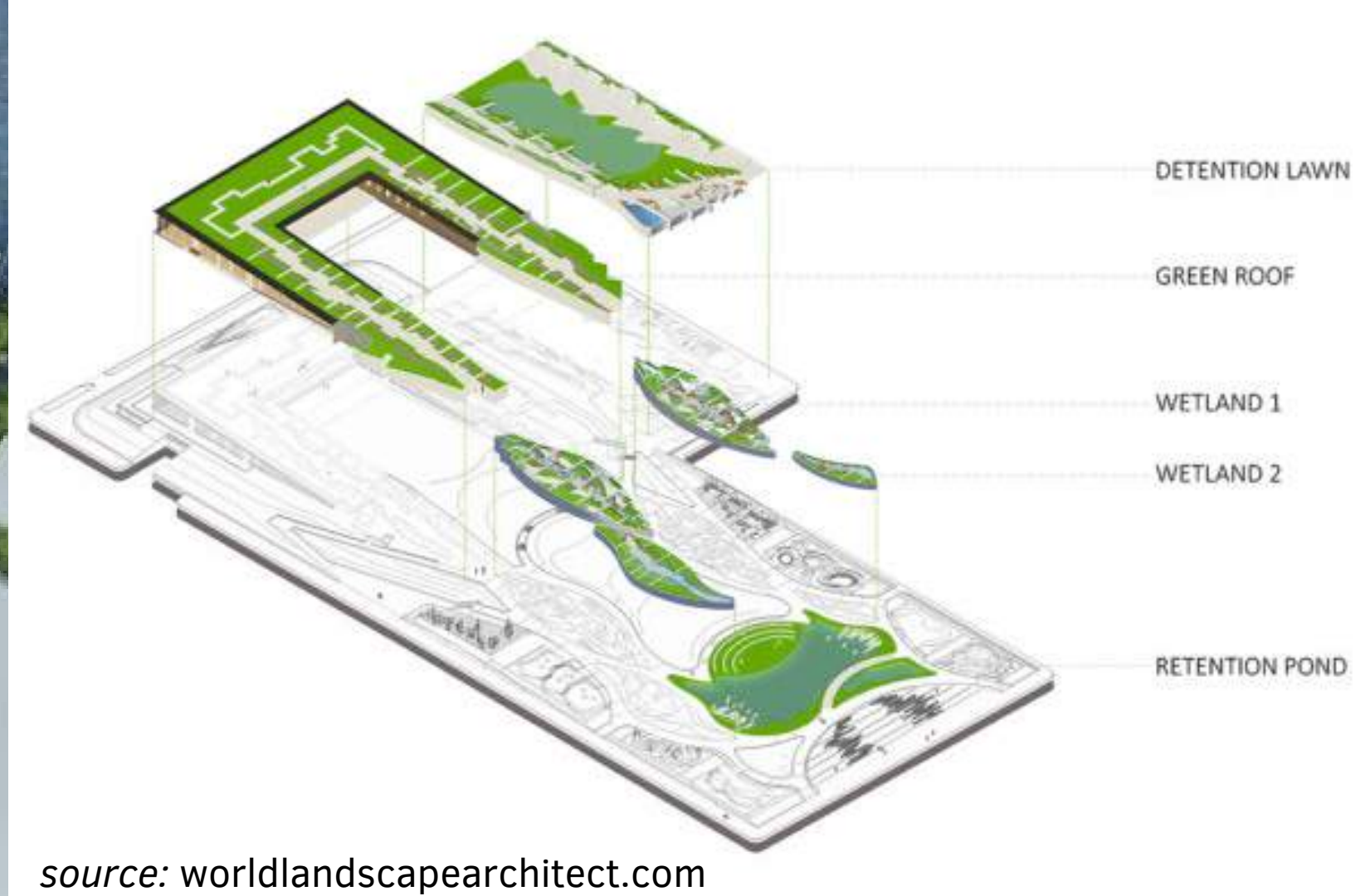
"Use of natural ecology to manage water"

Aside prevent flooding by holding water flow, detention pond park used for public area to increase the tourism around the residence area.

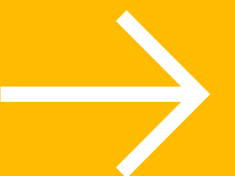
- Park as rain tree
- Park as detention area
- Park as water treatment system
- Park as outdoor classroom



Inspired by:
Chulalongkorn University Centenary Park, Bangkok



- Made by lifting the garden area on one side and tilting the surface of the land on the other.
- It functions as a giant rain garden that delivers flowing water and is connected to an area with zero-discharge built as a wetlands in the form of a water purification pool (water recycle) and storage water tank (water storage) for future use.
- The park has also been developed into an exhibition space.





Sedimentation Retention Pond

Rainy Season

- The discharge from the upstream is high and carry a lot of sediment.
- Water directed into Sedimentation Retention Pond.
- Trap the sediment and reduce the flood discharge.

Dry Season

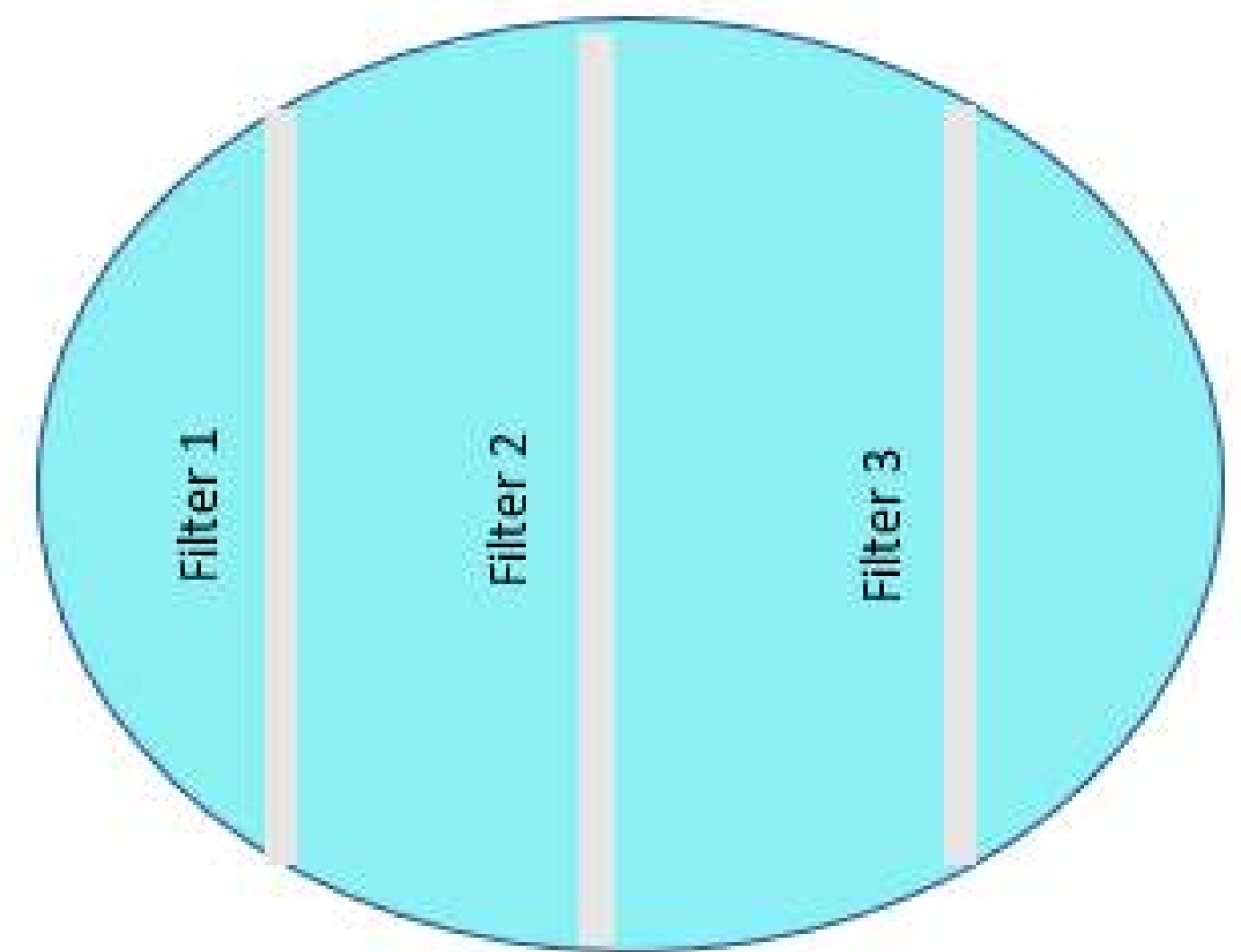
- The discharge from the upstream is low and don't carry a lot of sediment.
- Water keeps flowing in the track.
- Collect all the sediment to supply material for brick industry



SEDIMENTATION RETENTION POND

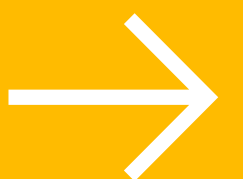
- Equipped with 3 filters to trap and filter the sediment.
- Each filter has a different size.

Water Flow



ROOFTOP FARM

- Applied rooftop farm in the brick industry.
- Produce food.
- Reduce the urban heat effect.



Downstream

PROBLEMS

- Waste
- Sedimentation
- Flood
- Rob



SOLUTIONS

Short Term

- Bamboo Retaining Wall
- Dredging
- Drainage System

*less than 5 years

Mid Term

- Dike
- Mangrove Eco-tourism
- Artifical Lake & Shortcut

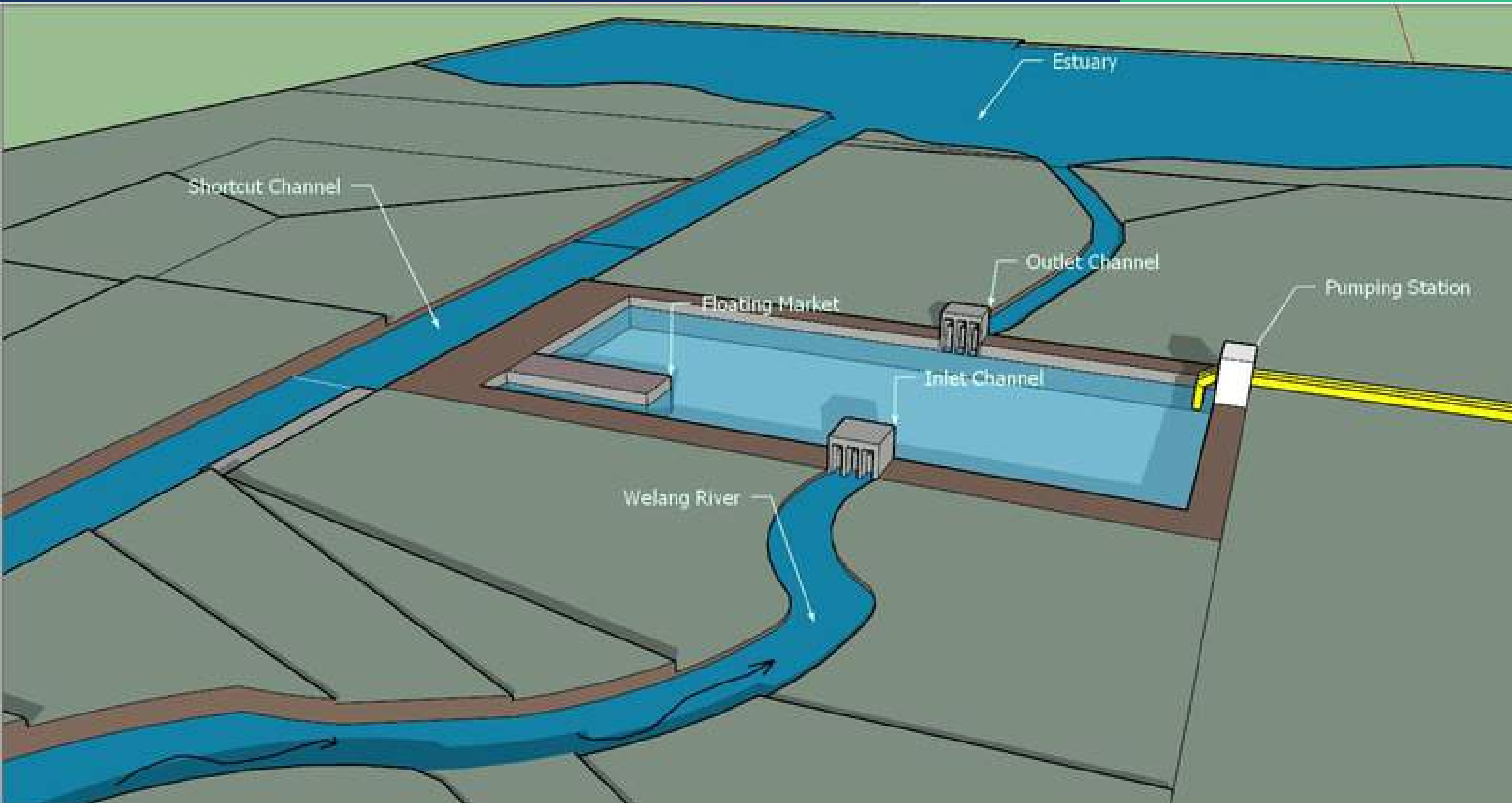
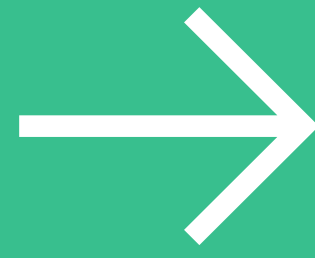
*5-10 years

Long Term

- Integrated Flood Infrastructure

*more than 10 years

Artificial Lake & Shortcut



This infrastucture can integrated with drainage and irrigation facillities.
To reduce flood need another pump station that built in strategic location.

source: author

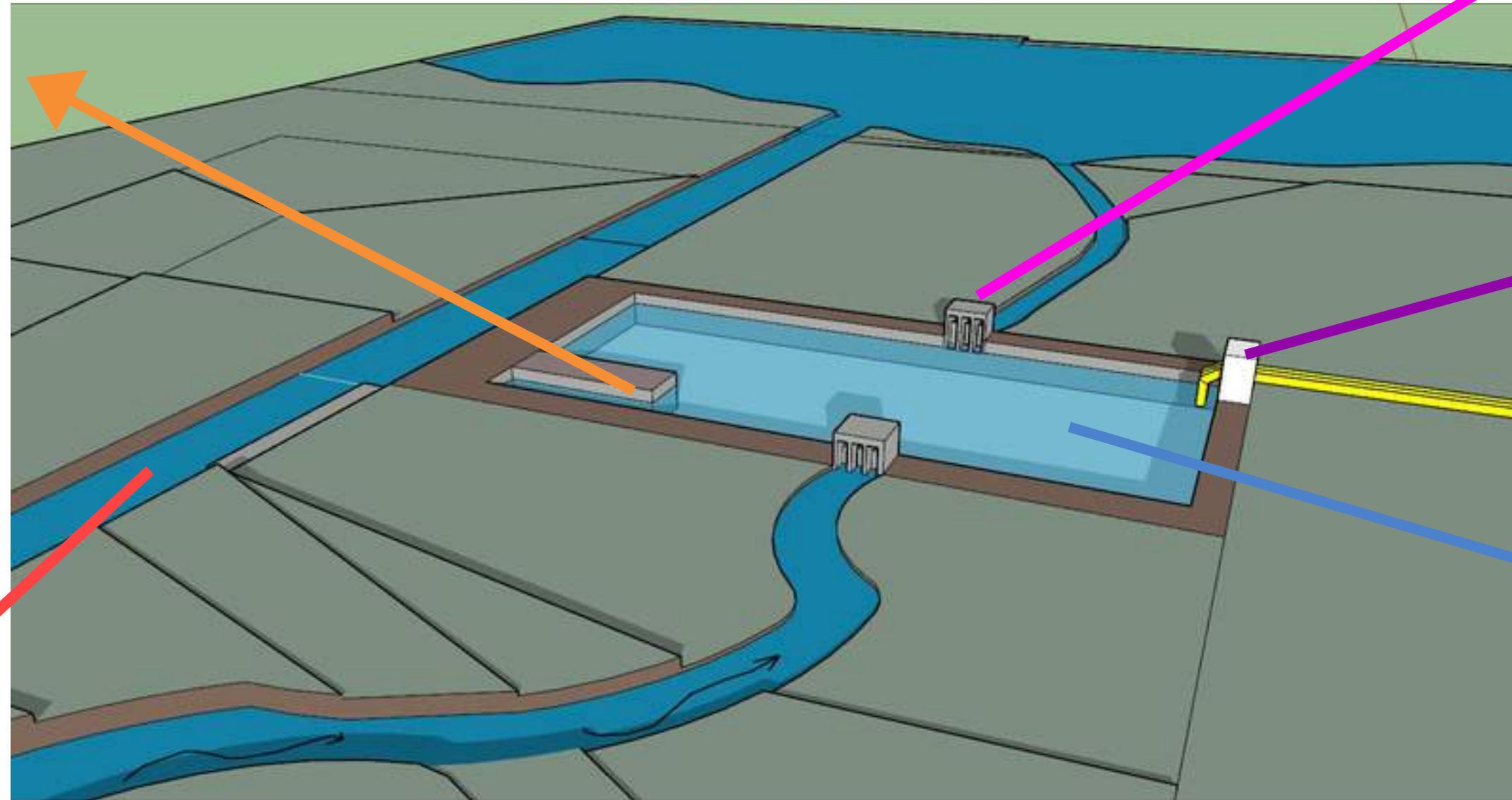


Floating Market

Beside for flood control structure, this facilities can be tourism area.

Shortcut Channel

Access for fisherman and tourism boat.



Sluice

To control inflow or outflow water.

Pumping Station

Pump water from lake to the sea to maintain a stable volume of the lake.

Artificial Lake

Storage for water from drainage channel. river that effected of high rainfall intensity, and rob.



Mangrove Eco-Tourism



Mangroves are sustainable solution to reduce flood risk, erosion, and saline intrusion also can be a potential tourism destination.



source: hellosingaporetours.com

source: sarahbeekmans.com

Integrated Issues



PROBLEMS

- Waste
- Ineffective Operation & Maintenance
- Lack of awareness from various parties
- Flood



SOLUTIONS

Short Term

- Pro Apik Movement
- Trash Boom
- Biopore Hole

*less than 5 years

Mid Term

- "WelangApik" Application

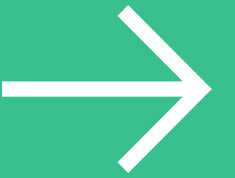
*5-10 years

Long Term

- Integrated Flood Infrastructure

*more than 10 years

"PROAPIK" Movement



*"TO INCREASE AWARENESS
AND PARTICIPATION OF
THE COMMUNITY"*



Proapik Bersih



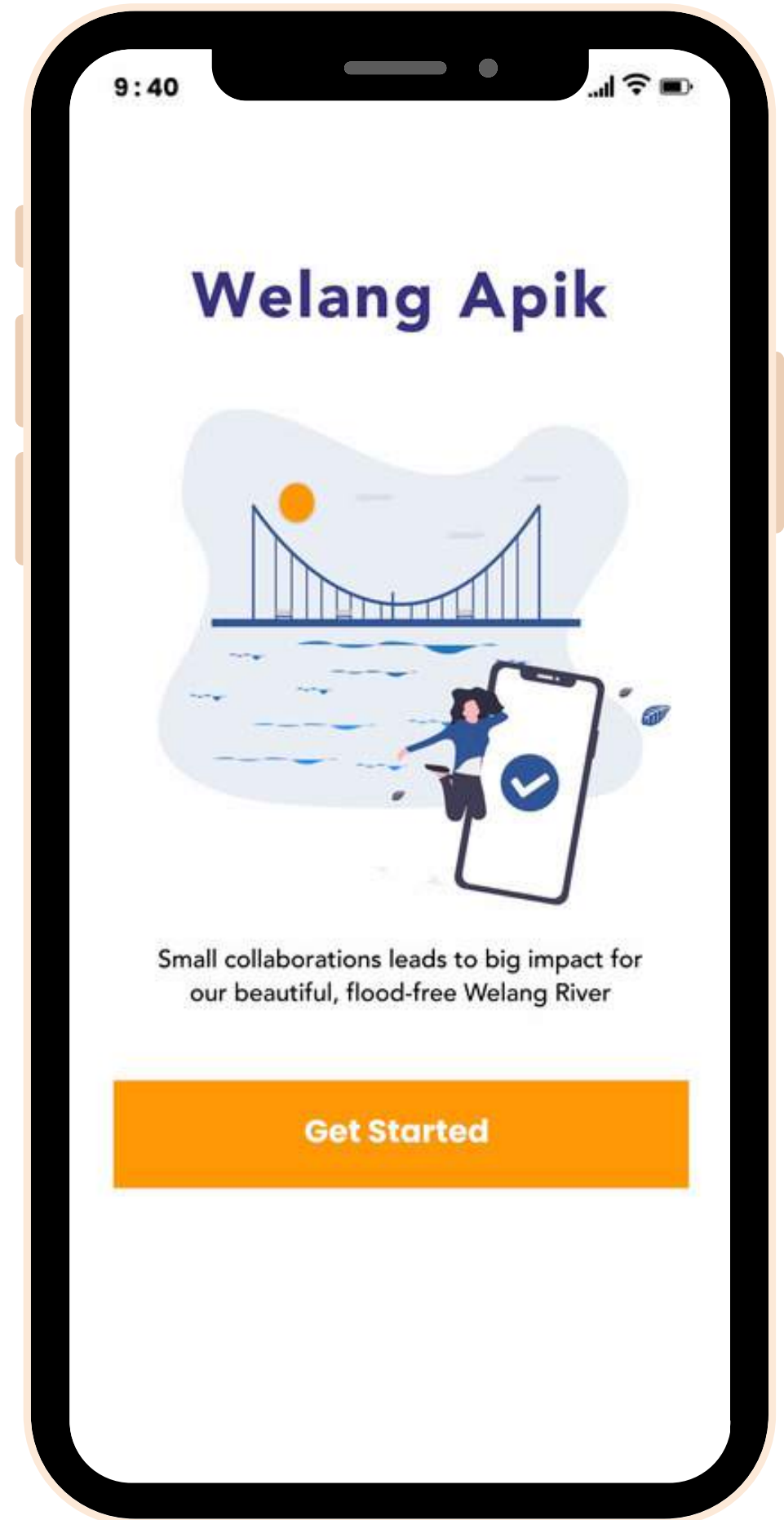
Proapik Juara



Proapik Hijau



"WELANG APIK" Application



WELL BOAT

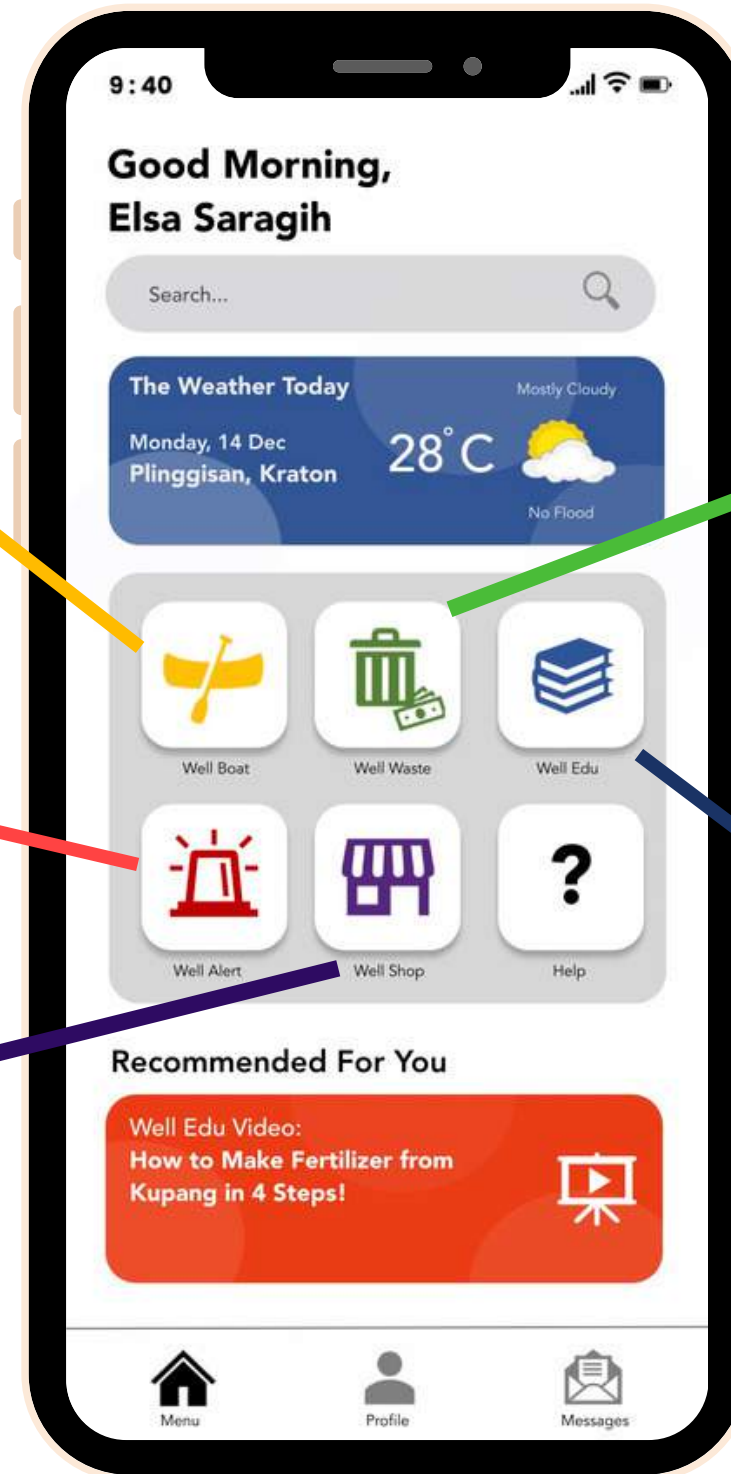
to order the boat to go to Lusi Island and Floating Market.

WELL ALERT

early warning system and flood forecasting.

WELL SHOP

e-commerce that sell products made from *kupang* shell and recycled waste that is produced by local community.



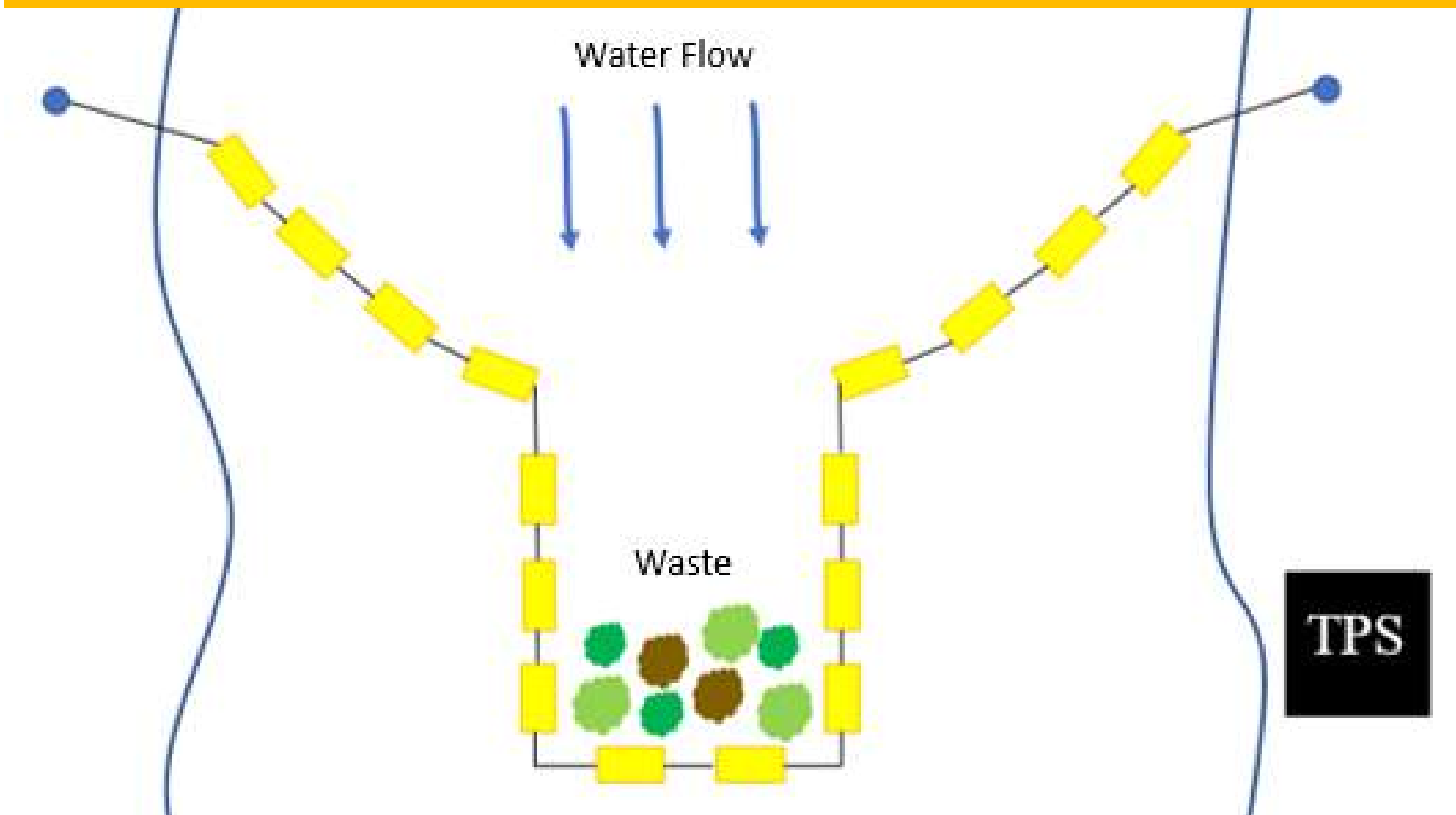
WELL WASTE

facilitates the local community to sell their sorted waste to collector. the collector continue to sell the waste to industries.

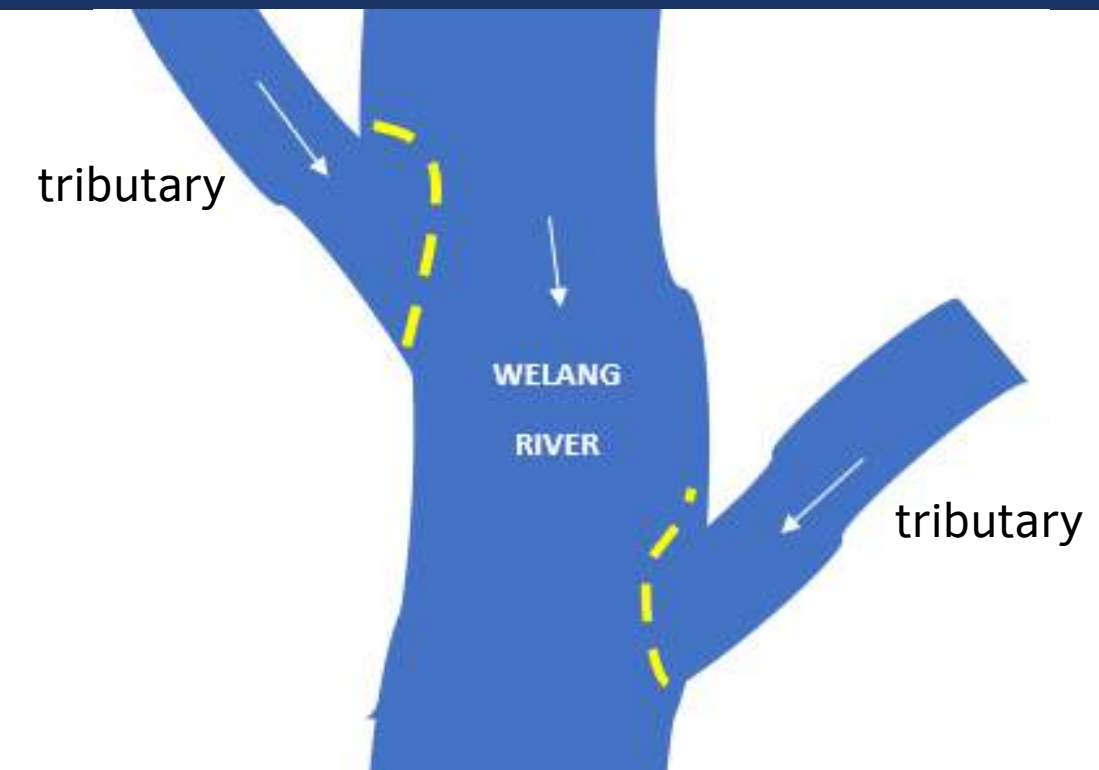
WELL EDU

to educate people through interactive medias.

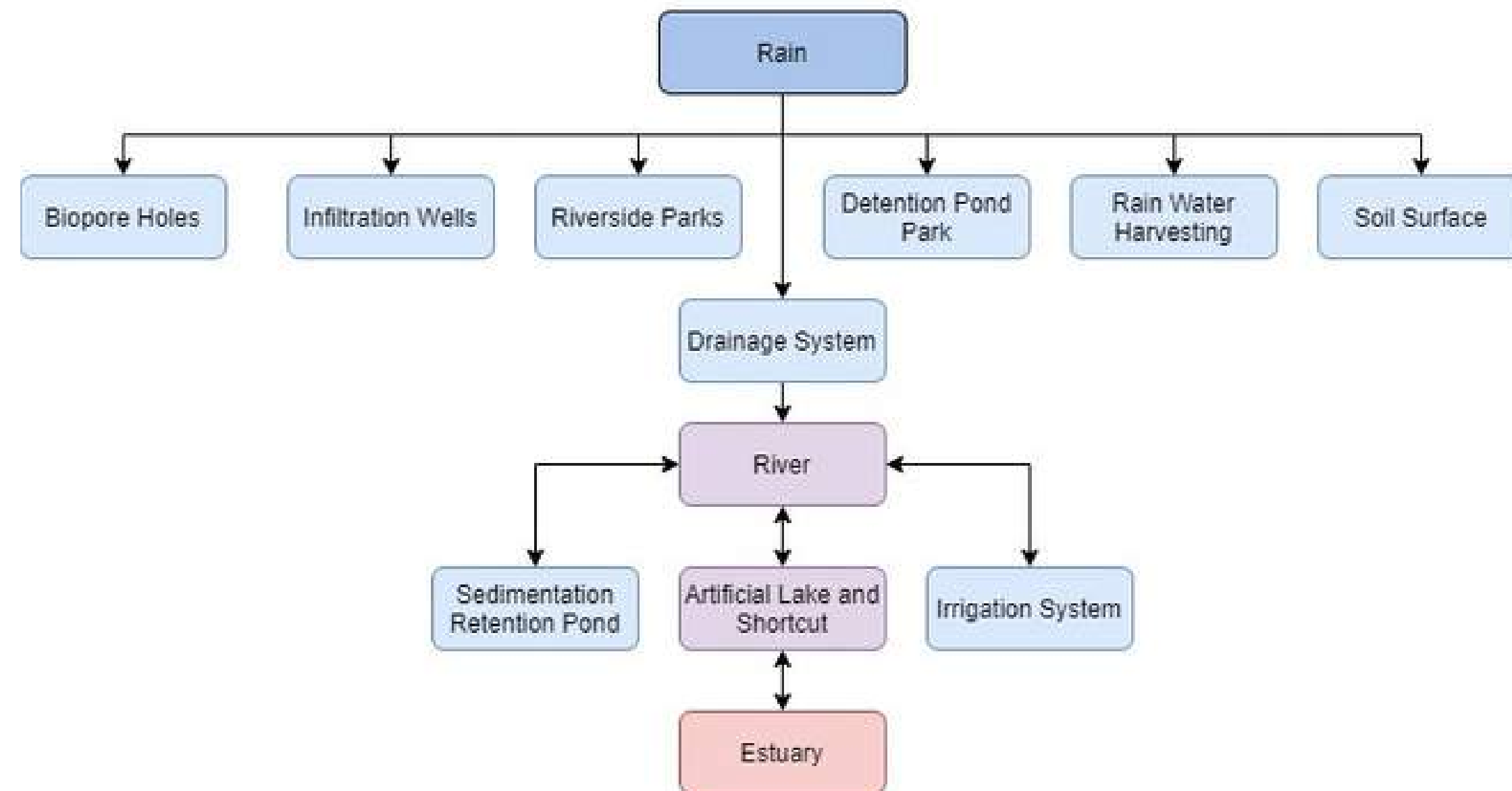
Trash Boom



- Used for the containment of trash, debris, aquatic plants, branches, leaves and other floating items.
- Located at the meeting point between a tributary and the main river.



Integrated Flood Infrastructure



Integrated flood infrastructure ensure that every infrastructure work together and maximize the productivity and efficient use of flood infrastructure.

CONCLUSION

NATURAL ENVIRONMENT

- Riparian Zone
- Terrace Riverside Agriculture
- Mangrove Eco-Tourism
- Rooftop Garden
- Bamboo Retaining Wall
- Riverside Park



BUILT ENVIRONMENT

- Sedimentation Retention Pond
- Trash Boom
- Dredging
- Rain Water Harvesting
- Detention Pond Park
- Infiltration Wells
- Drainage System
- Dike
- Artificial Lake & Shortcut
- Integrated Flood System
- Biopore Holes



ECONOMIC ENVIRONMENT

- Circular Economy from "Welang Apik" Application
- Brick Industry
- Eco-tourism



SOCIAL ENVIRONMENT

- Education from "Welang Apik" Application
- Education from "Proapik" Movements
- Public Space





Team E - Healthy Rivers Challenge



Thank you!