



TEAM C PRESENT

The Rainbow Shot Solution in The Welang Watershed

WELANG SEHAT LIMA SEMPURNA

Hi !



MILE

RHEYZA

PUGUH

ANGGIE

RIA

FATHIYA

FADEL



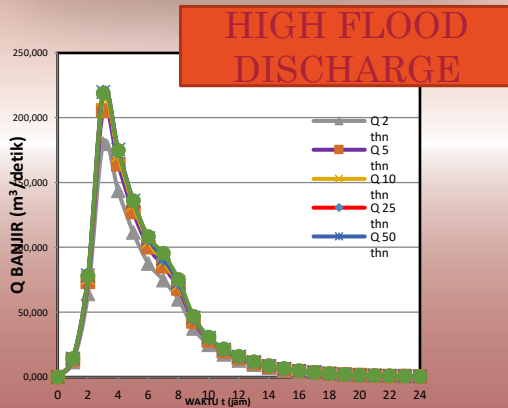
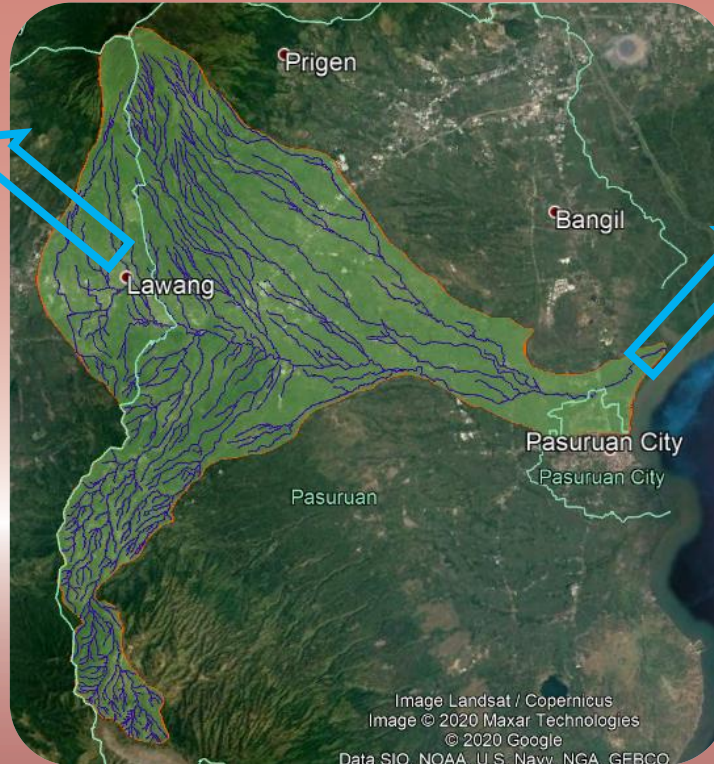


Problem



- **Flood**
- **Land use Change**
- **Sedimentation**
- **River Pollution**
- **Unprocessed Waste**

FLOOD



FLOOD

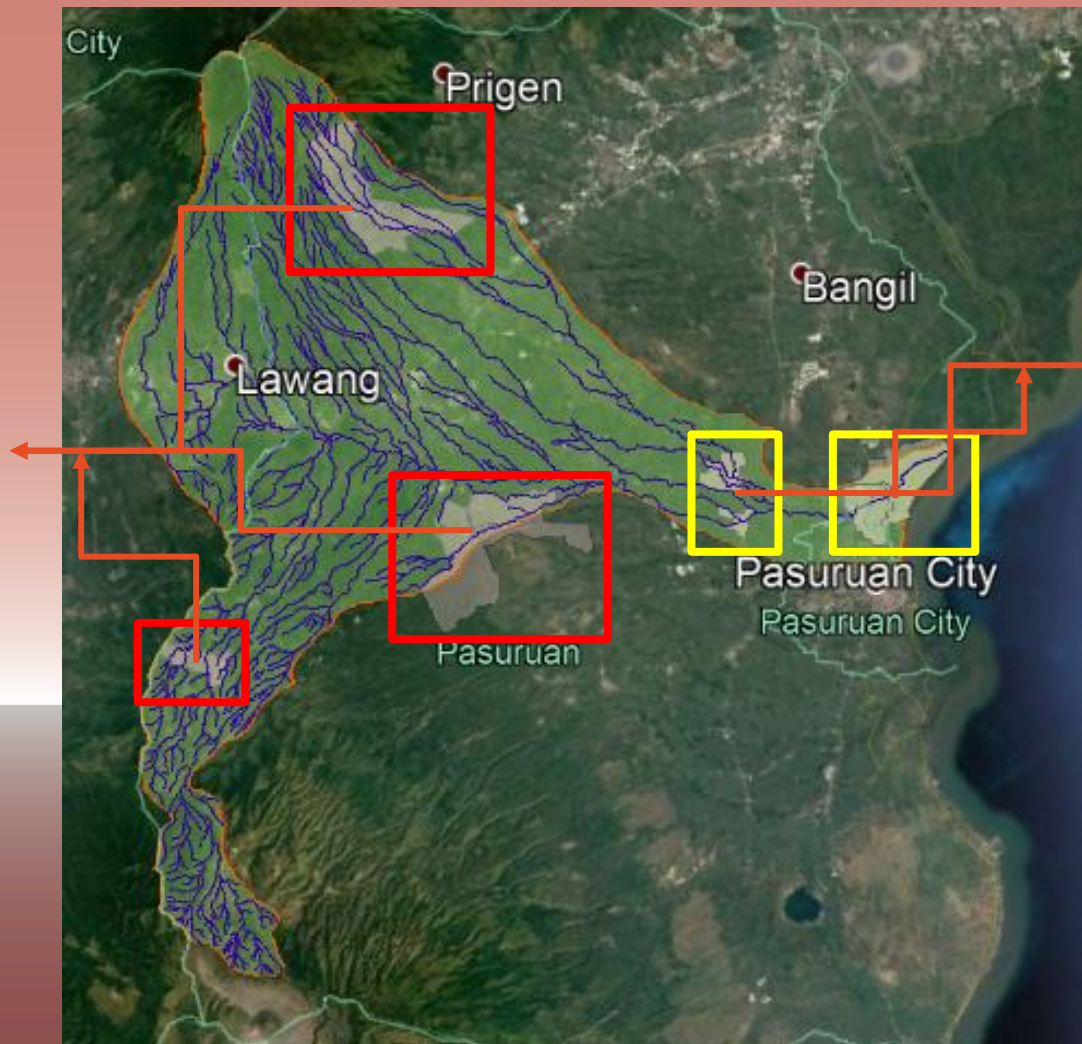


HIGH FLOOD RISK:

- MIDDLESTRE
AM
- DOWNTREA



JERUK
SIDOGIRO
PLINGISAN
KARANGKET
UG
TAMBAKREJ
O
PULOKERTO
KRATON
SAMARRE



HIGH DRIED RISK:

-UPSTREAM
- MIDDLESTRE
AM



SAPULANTE
AMBAL
AMBIL
KLONGRONG
JATIARJO
GENDRO



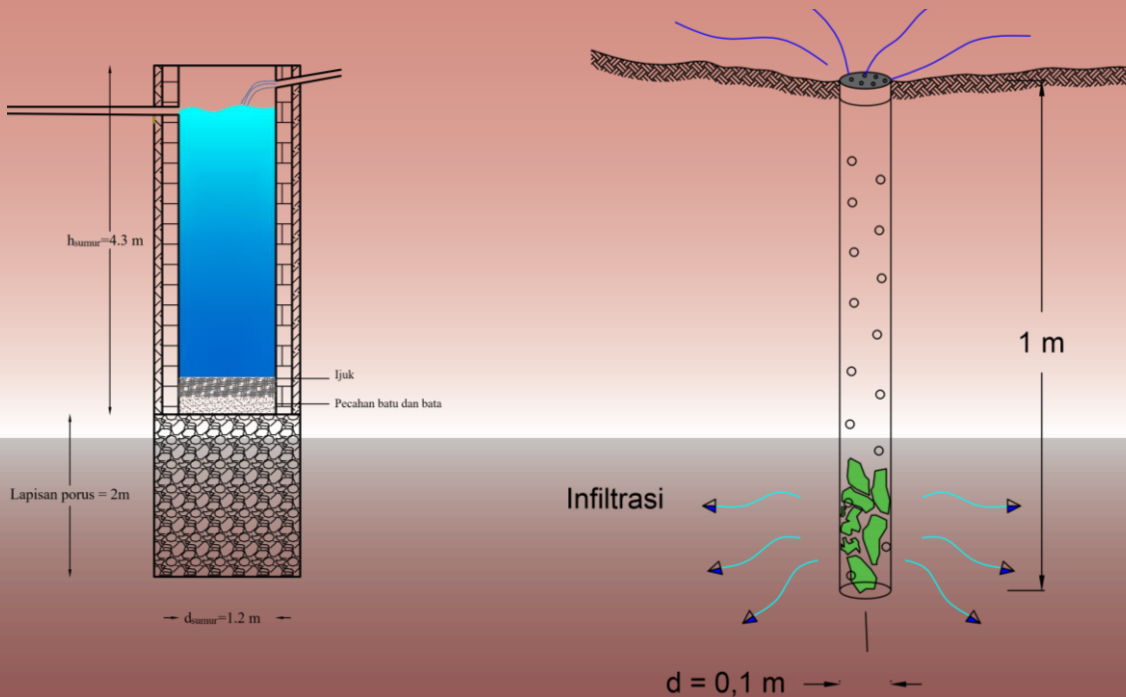
FLOOD CONTROL MASTERPLAN

1. **RAIN WATER HARVESTING AND RECHARGE THE SOIL WATER IN THE UPSTREAM (FOCUSED AREA IN LAWANG)**
2. **ECO-DRAINAGE IN SETTLEMENTS AROUND THE RIVERBANKS**
3. **CASCADING RESERVOIR BY USING AUTOMATIC SLUICE GATE THAT INTEGRATED BY APPLICATION**
4. **RIVER FRONT CONCEPT ON EMBANKMENTS CONSTRUCTION**

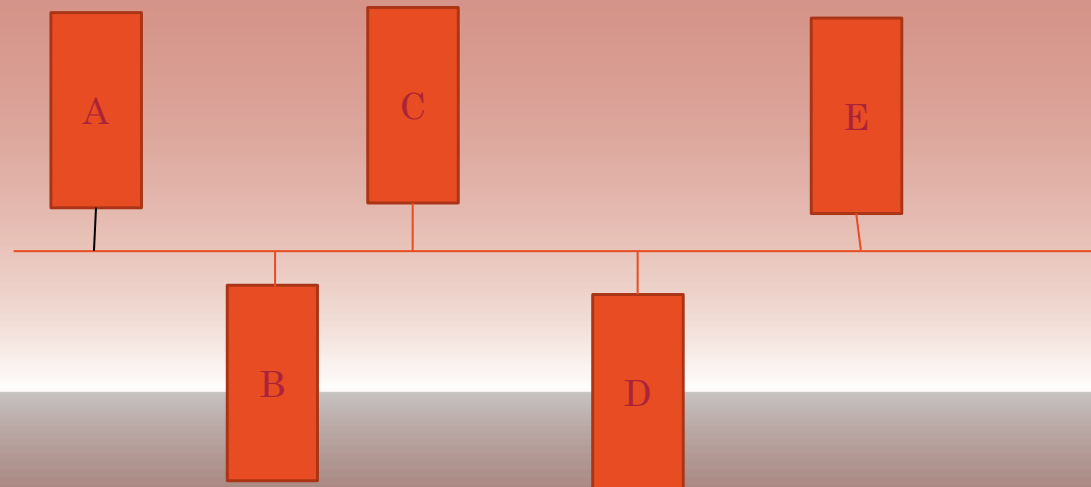
FLOOD



RAIN WATER HARVESTING AND RECHARGE THE SOIL WATER IN THE UPSTREAM (FOCUSED AREA IN LAWANG)



CASCADING RESERVOIR BY USING AUTOMATIC SLUICE GATE THAT INTEGRATED BY APPLICATION



✈ FLOOD ✈



RIVER FRONT CONCEPT ON EMBANKMENTS CONSTRUCTION

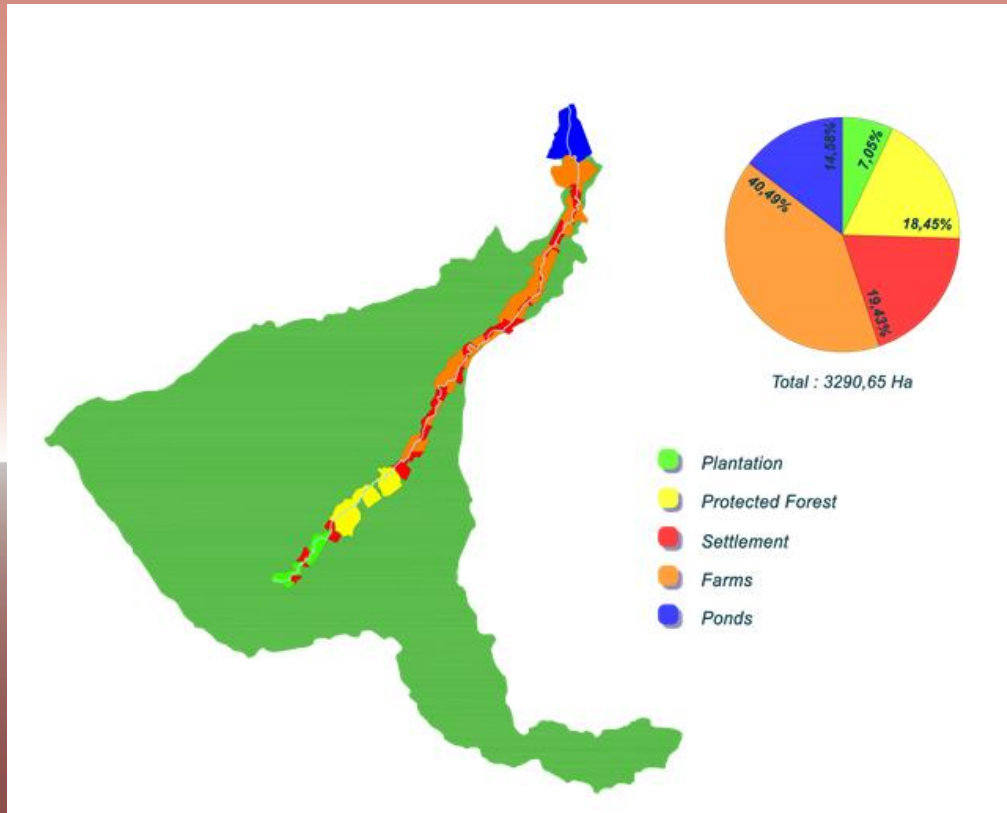


LAND USE CHANGE

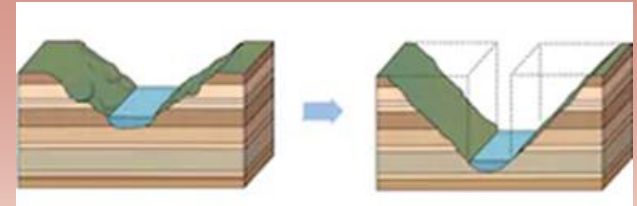


Erosion

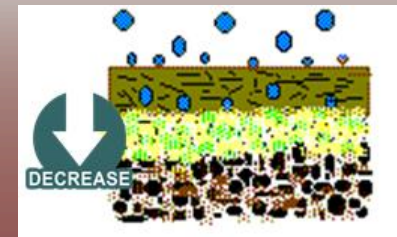
Existing Condition



Erosion



Infiltration

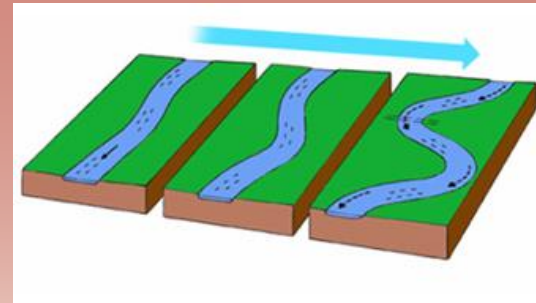
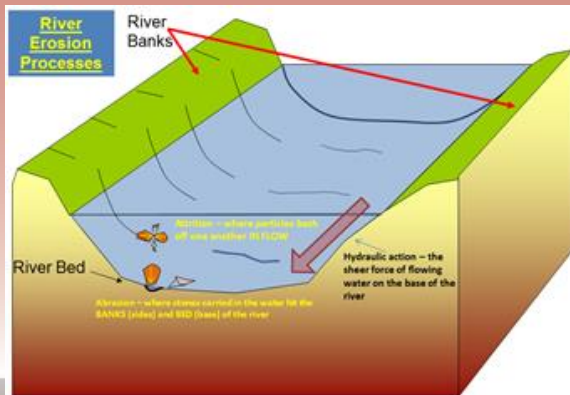


Erosion

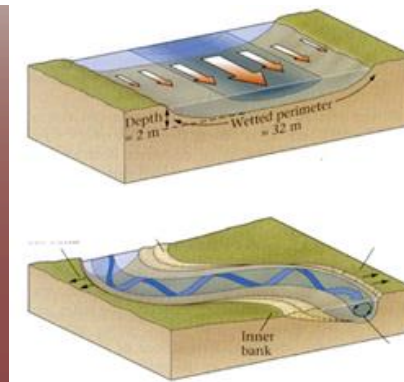
LAND USE CHANGE



River Deflection

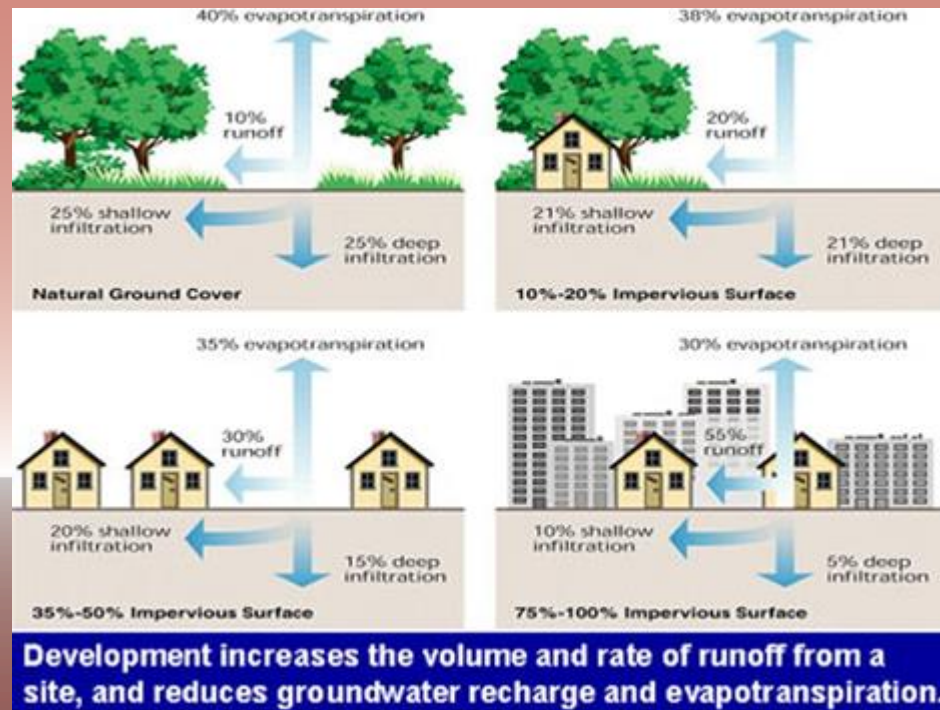


reduction of river cross section in Downstream



Erosion

LAND USE CHANGE





SEDIMENTATION



What is the problem?

Sediments, erosion, narrowing

1. Base Line

a. Kondisi eksisting

Erosion happen in upstream because landuse change (from acacia forest to farming)



It brings **sediments** to mid and downstream



It causes some problems, such as: **sedimentation** at the mid and down stream



Finally it causes the **narrowing**



Local people usually **takes the sediments**, then make it profitable materials



Local people intentionally **destroy the flood barrier** structure to take the sediments



SEDIMENTATION



Demand dan gap analisis

Demand :

Reduce erosion in upstream

Take the sediment (reduce sedimentation and profitable for people)

River should be **sustainably** regenerated to tackle **narrowing**

Gap :

The **upstream's farming** has been **existed** since a long time ago

There is **no critical part** where **sedimentation** happen the most

There is **no identification** where river regeneration (normalization) should be done (downstream)



SEDIMENTATION



- **Wetland terracing dan bio-pore**

Compared to bare soil, thyme and native spontaneous vegetation plant covers **reduced the runoff** with **94% and 93%** and **declined erosion** with **71% and 79%**.

- **Sustainably regenerated river by River Front**

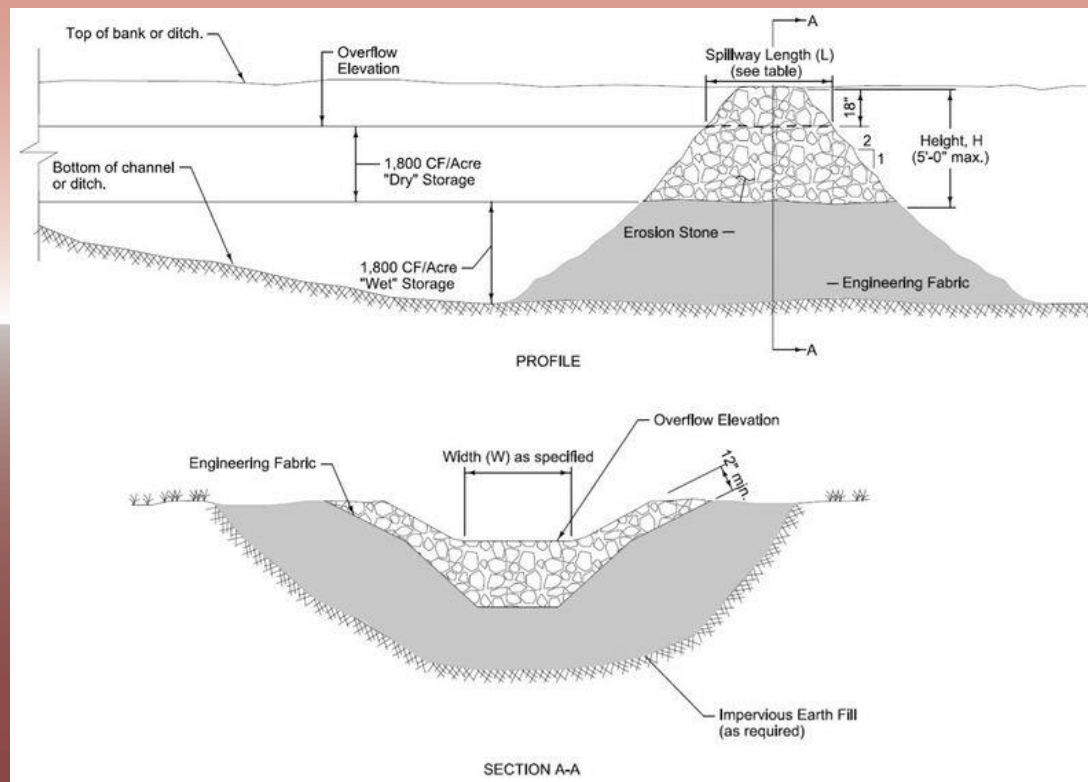


SEDIMENTATION



- **Sediment trap structure**

When designed, installed, and maintained properly, sediment traps and basins have sediment-trapping efficiencies typically between **60 and 80 percent**.





SEDIMENTATION



Sedimentation Trap

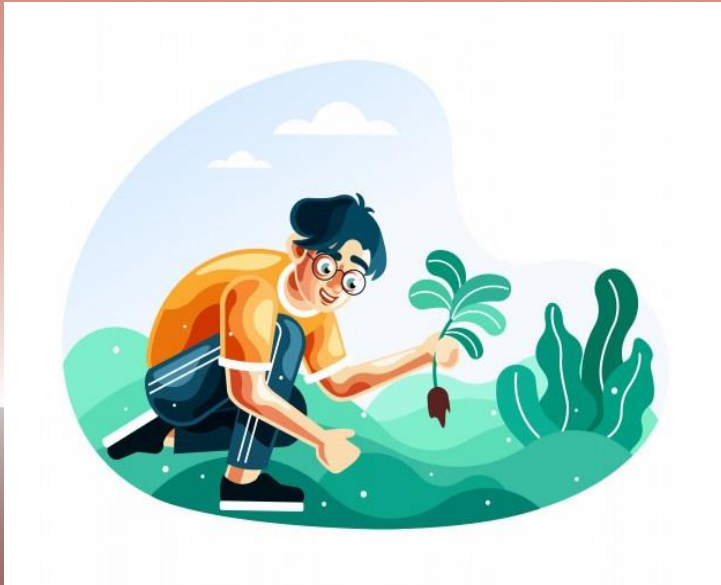
Item description	Units	Average price
Temporary sediment trap	each	\$605.00
Excavation – subgrade	cubic meter	\$7.33
Granular embankment (CV)	cubic meter	\$6.51

Sedimentation Trap could be linked to cascading retarding basin in the upstream and downstream
Budget could be minimized

Source:

https://stormwater.pca.state.mn.us/index.php?title=Sediment_control_practices_-_Sediment_traps_and_basins#:~:text=Sediment%20traps%20must%20have%20an,outlet%2C%20or%20other%20suitable%20structure.&text=Sediment%20trap%20sizing%20is%20dependent,volume%20of%20stormwater%20to%20treat.

Erosio Solution Vegetation



vegetation is a long-term solution as soft engineering and becomes an organic infiltration

Linked to solution of sedimentation scope

RIVER POLLUTION



THE PROBLEMS

BAD SANITATION

Islamic Boarding School

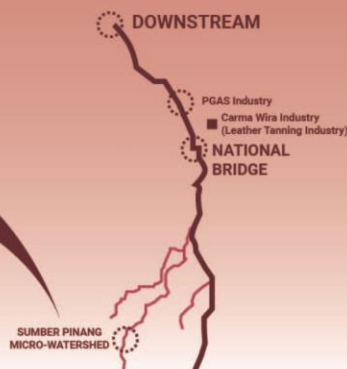
BASELINE

- Total Capacity : 20.000
- The Biggest Problems :
Lack of Sanitation Room

INDUSTRY

PGAS Industry
Carma Wira Industry

- The Biggest Problems :
Waste from the Leather Tannery Industry



UPSTREAM

RIVER POLLUTION



DEMAND + SOLUTION

- Increase the Number of Sanitation Rooms
- Manage Domestic Waste with Communal Wastewater Treatment Plant
- Enforcement of industrial wastewater regulations

GAP

- Coordination with the Pondok Pesantren was difficult and received resistance
- There is no reliable recent research on the results of PT. Carma Wira Jatim and other industries around the Welang watershed

RIVER POLLUTION



PRICE TAG

1

Bath Wash Toilet
= Rp66.125.000

2

**Communal Wastewater
Treatment Plan**
= Rp485.000.000

2

Enforcement Regulation
= Rp0

Notes :

- Total 5 pieces
- Size 4 m x 2 m x 4 m
- Activity Unit Price based on Malang Regency
- Source : Budget Plan for Bath-Wash-Toilet in Sidoarsi, Sumbermanjing Wetan, Malang, East Java (2014)

Notes :

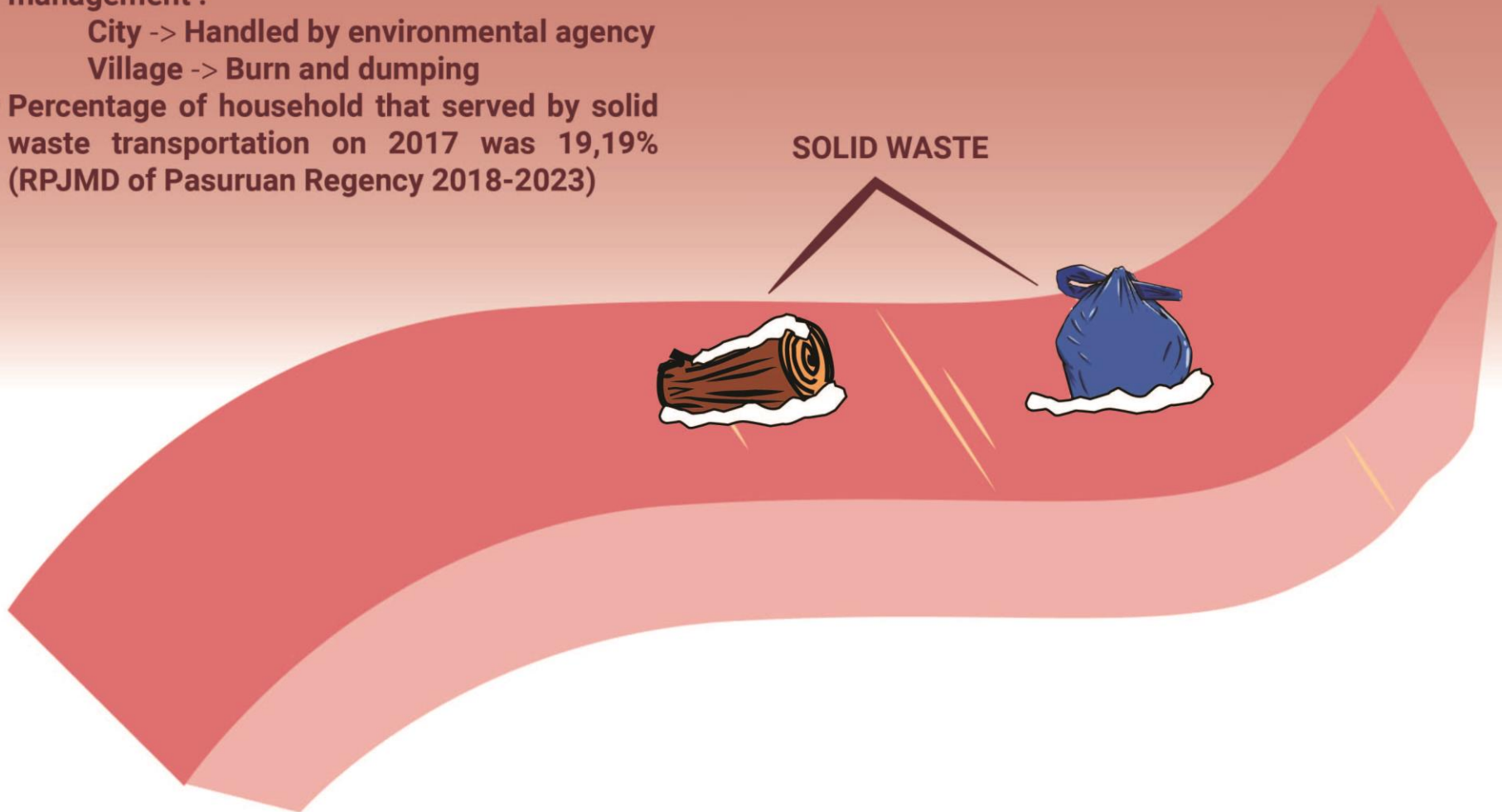
- Including the cost of building a Wastewater Distribution System
- Source : Planning of Wastewater Channeling Systems and Communal Wastewater Management Plants in Ngawi Regency (2014)

UNPROCESSED WASTE



Baseline

- Existing condition of Municipal solid waste management :
 - City -> Handled by environmental agency
 - Village -> Burn and dumping
- Percentage of household that served by solid waste transportation on 2017 was 19,19% (RPJMD of Pasuruan Regency 2018-2023)



UNPROCESSED WASTE



BASELINE

- **Lack of solid waste treatment facilities**
 - 3R Waste Temporary Storage (TPS 3R) = 46 units*
 - Landfill = 2 units (TPA Wonokerto in Pasuruan Regency and TPA Blandongan in Pasuruan City)
- **Retribution for Cleaning**
(Peraturan Daerah Kabupaten Pasuruan Nomor 4 tahun 2012)
 - Class I (>70 m²) = Rp 2.500,-/month
 - Class II (45-70 m²) = Rp 2.500,-/month
 - Class III (<45 m²) = Rp. 1.000,-/month
- **REGULATION**
 - Governor Regulation of East Java No. 106/2018 about Region Policy and Strategy of Household Waste and Allied Treatment.
 - Pasuruan Regency Regulation No. 12 year 2010 about Rencana Tata Ruang Wilayah (RTRW) of Pasuruan Regency 2009-2029
 - Pasuruan Regency Regulation No. 3 year 2010 about Solid Waste Management in Pasuruan Regency
 - Middle Term Development Plan / Rencana Pembangunan Jangka Menengah Daerah (RPJMD) of Pasuruan Regency 2018-2023

UNPROCESSED WASTE



DEMAND

- River clean
- 100% of Municipal Solid Waste handled
- Waste Treatment Facilities

Reuse, Reduce, Recycle Waste Temporary Storage (TPS 3R) Demand

Formula for Metropolitan City/Regency with Population >1.000.000 person
(Direktorat Jendral Cipta Karya, Kementrian PUPR, 2016 with modification)

TPS 3R Demand (unit) = $(25\% \times \text{Population}) / 2000$

Population in Pasuruan Regency on 2019 = 1.627.396 person

Population projected on 2040 = 1.872.383 person

TPS 3R Demand (unit) = $(25\% \times 1.872.383) / 2000 = 234$ units

Serving 25% of population (Capacity 2.000 person/unit)

UNPROCESSED WASTE



GAP

- Gap 1 : Lot of people dump their solid waste to the river
- Gap 2 : 80,81% household was not served by proper solid waste management
- Gap 3 : Lack of environmental awareness in the community
- Gap 4 : 188 units of Solid Waste Treatment Facilities needed

UNPROCESSED WASTE



SOLUTION

1. River clean up (Gap 1)

•Dredging Waste

Waste from the river can be treated by TOSS technology with peuyeumisasi process to transform the waste into energy (bricket)

Manager : Satgas (PU SDA Agency, Environmental Agency)

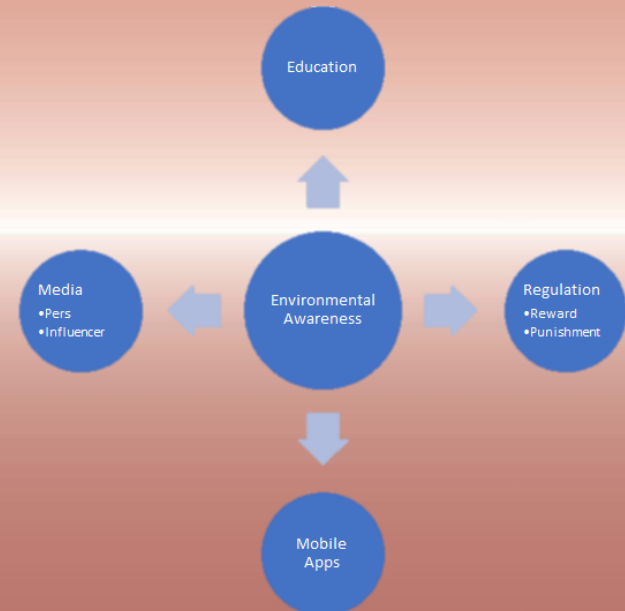
•Sekolah Sungai

Education

Competition

Manager : Satgas (Environmental Agency)

2. Raise community environmental awareness (Gap 1 and Gap 3)



UNPROCESSED WASTE



SOLUTION

3. Municipal Solid Waste Management Facilities (Gap 1, Gap 2 and 4)

- Trash Bank in every RW
- Collecting high quality (separated and clean) plastic waste
 - Plastic bottle -> cooperating with company as EPR
 - Plastic packaging -> Handcraft
 - Another waste (paper, metal, etc) -> send to TPS 3R, collector, or recycle company
- Integrated with mobile apps : People can collect the points and will get some rewards (such as e-money)
- Manager : Satgas (Environmental Agency and NGO)

- TPS 3R in every Village
- Provide solid waste transport from household
- Collecting low quality waste
- Specific waste separating
 - Organic waste -> composting
 - Plastic bottle ☒ -> cooperating with company as EPR
 - Another waste (paper, metal, etc) -> self recycling or send to collector or recycle company
 - Residual waste -> sent to TPA
- Manager : Satgas (Cipta Karya Agency of PUPR, Environmental Agency)

UNPROCESSED WASTE



Program	Equipment	Quantity	Price per unit	Price
Dredging waste	Excavator	4	Rp 150.000/unit/jam	Rp 288.000.000
Trash Bank	Building	1679	Rp 36.000.000/unit	Rp 60.444.000.000
TPS 3R	Investment	209	Rp 550.000.000/unit	Rp 114.950.000.000
	Operational - Maintentance		Rp102.254.604/tahun /unit	Rp 21.371.212.236



QUICK WINS OF WELANG SEHAT 5 SEMPURNA

1. Make a “Satuan Tugas” for Welang River Handling

2. River Normalization with dredging sediment and solid waste

3. Build a Sanitation Facility and Communal Wastewater Treatment in Pesantren Sidogiri

4. Installation of river monitoring instrumentation to get accuracy of the next action plan + **Mobile Application**

5. Cascading Reservoir

How?



Quick Wins

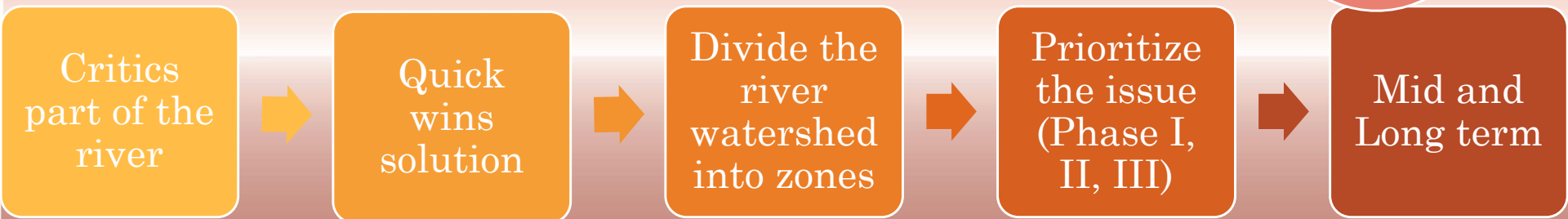
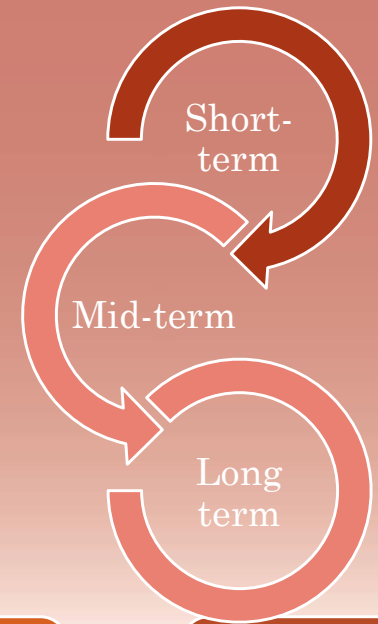
Social approach

Integration and
digitalization

Short-term

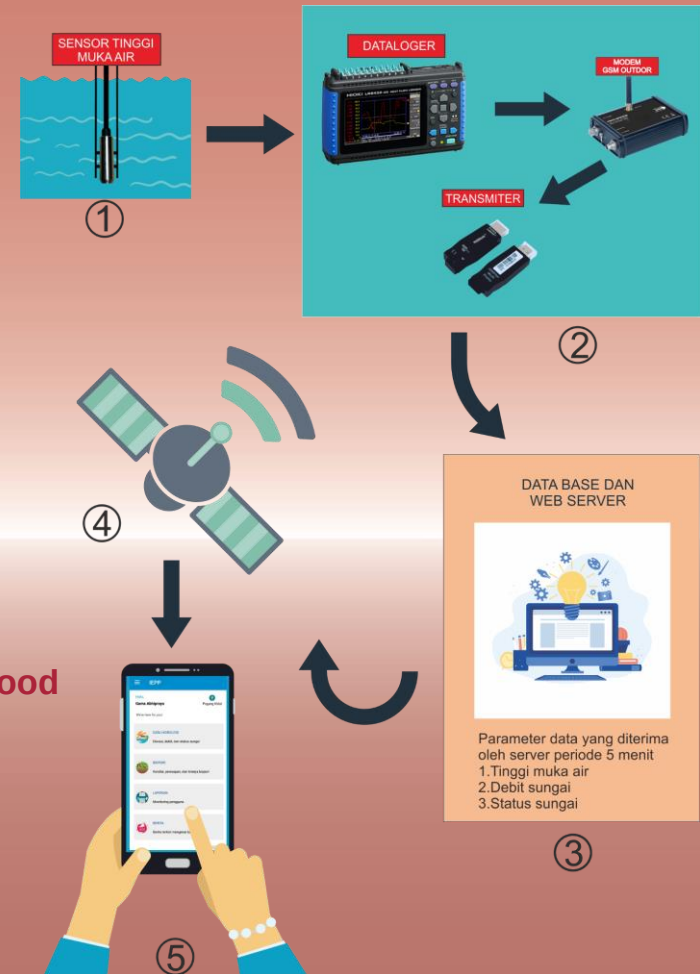
Mid-term

Long term



Quick win recommendation

1. The water level and discharge by AWLR
2. Data is sent to the data centre (database)
3. Data is managed at the web server
4. The managed data is sent to users by satellite
5. Users accept the daily update and the warning if the flood is happened





“WELANG SEHAT” LIMA SEMPURNA

WE TAKE THE CHALLENGE

BY BRINGING RAINBOW SHOT SOLUTION

THAT COMES FROM AND FOR

ONE VISION: HEALTHY WELANG RIVER

Team C always C-MILE