

Jogo Welang

a comprehensive master plan for
inclusive river resiliency



Welang Rangers

Our Team



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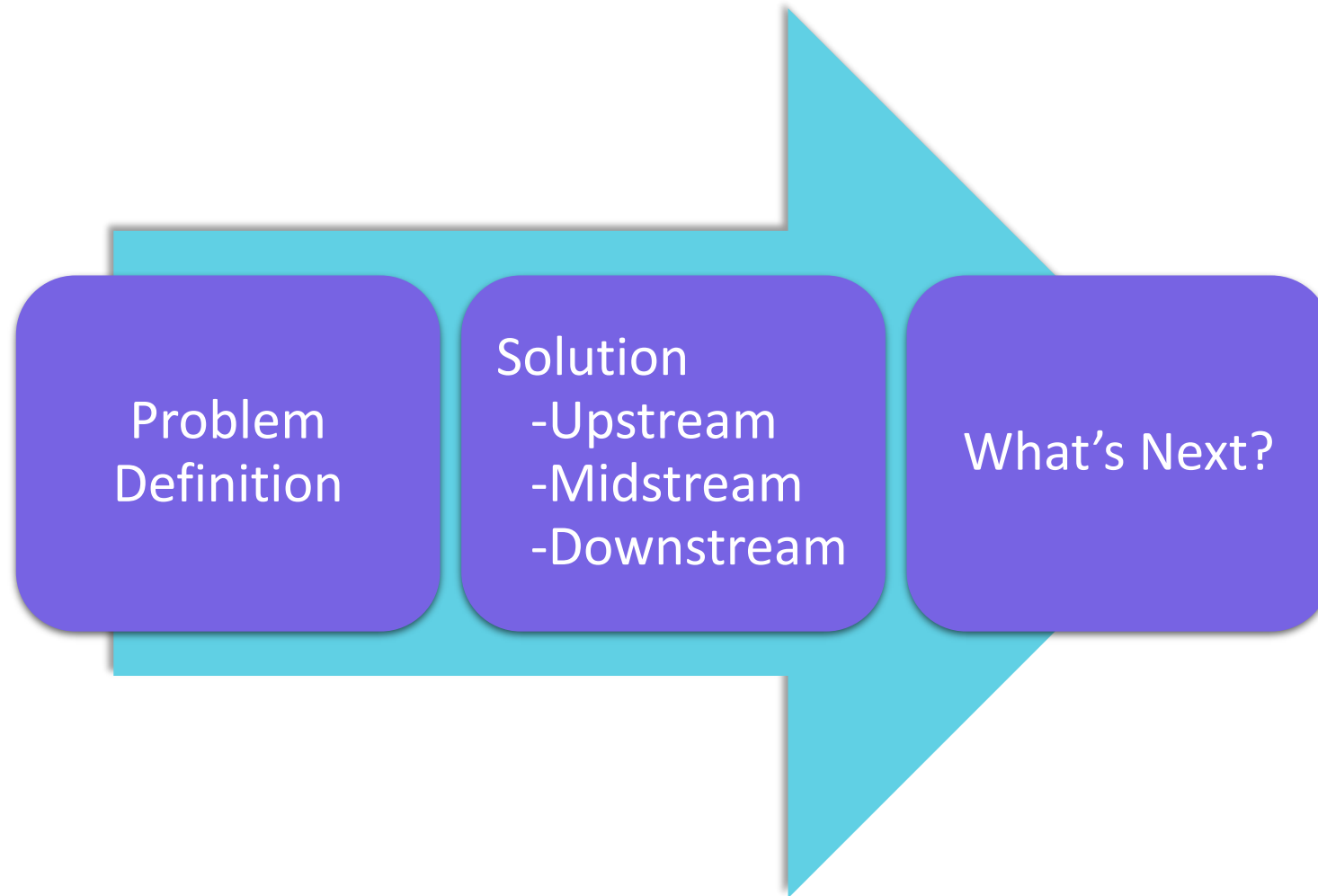
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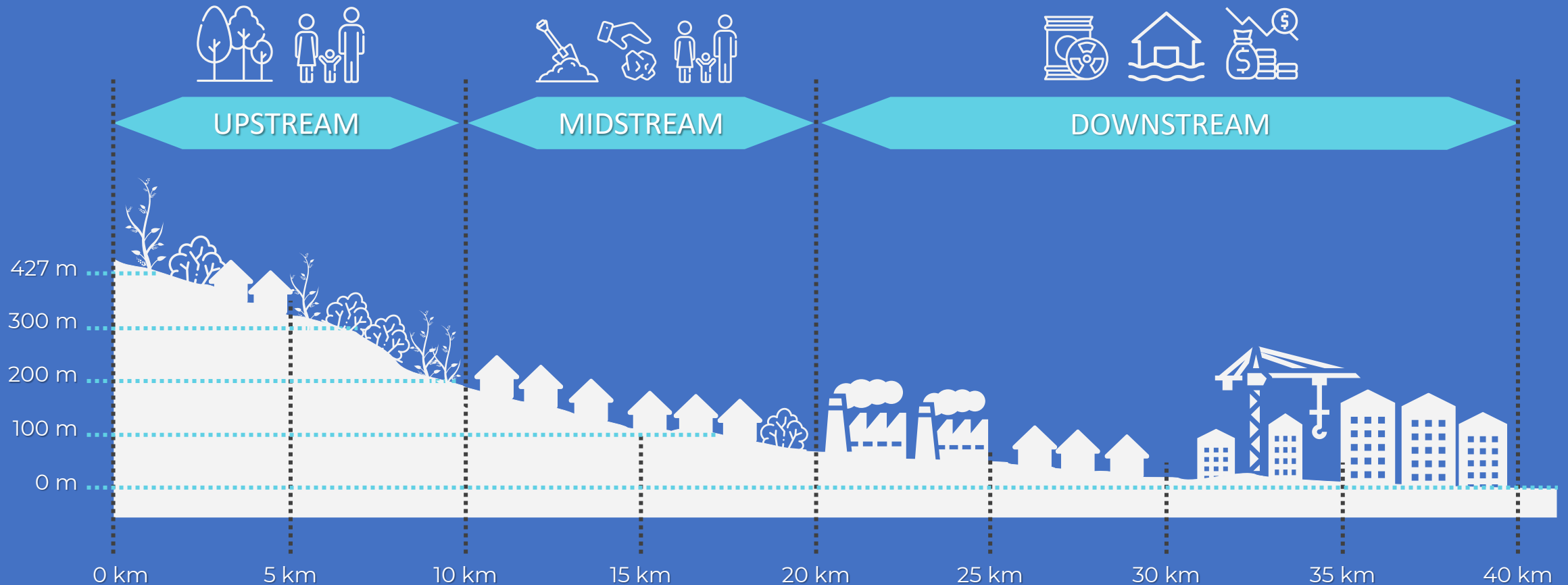
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Outline of The Presentation



Problem Definition



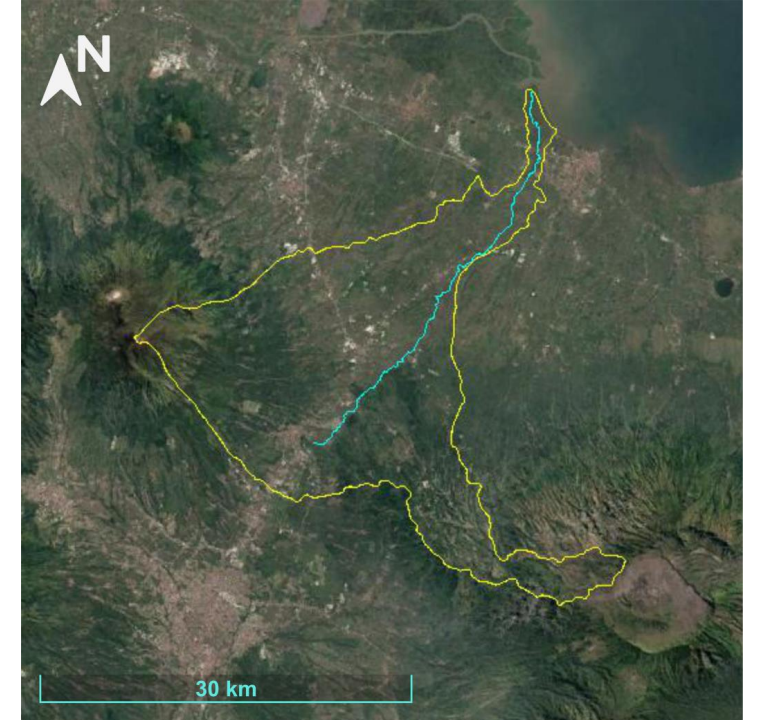
Land Use Change



2000

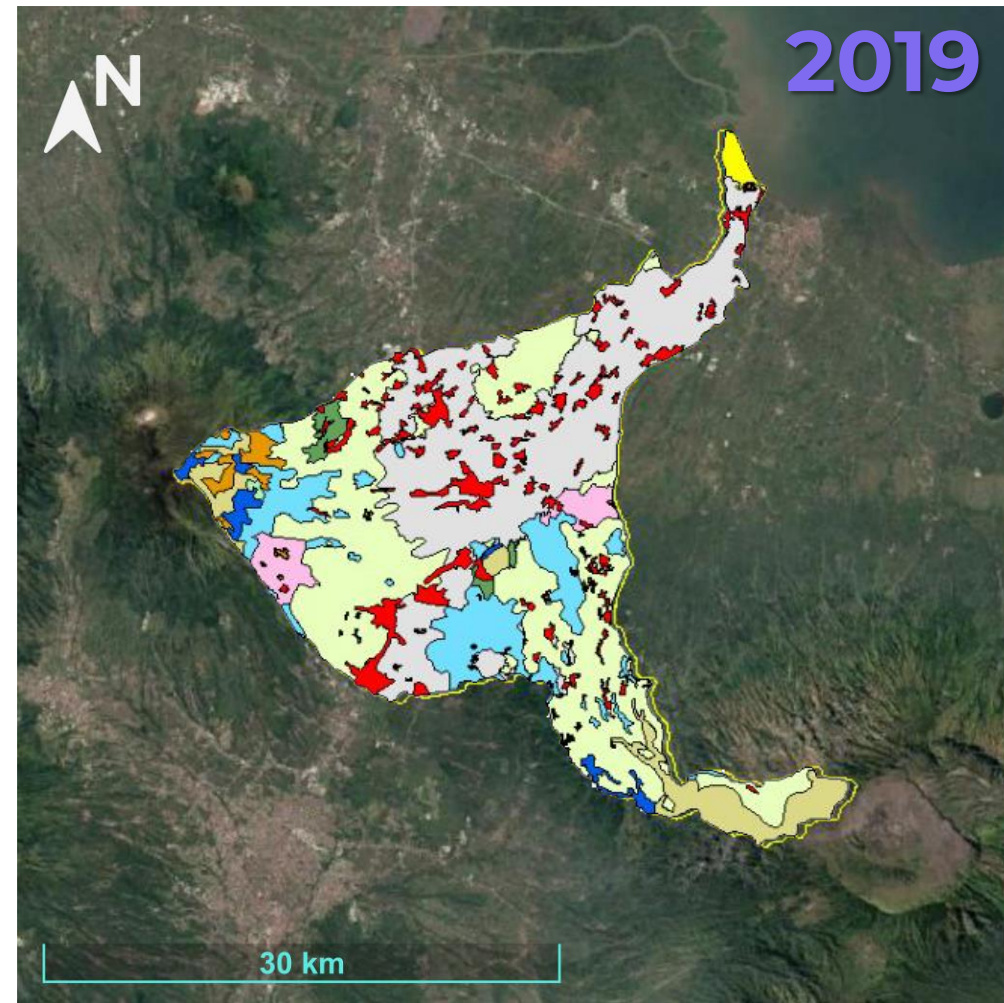
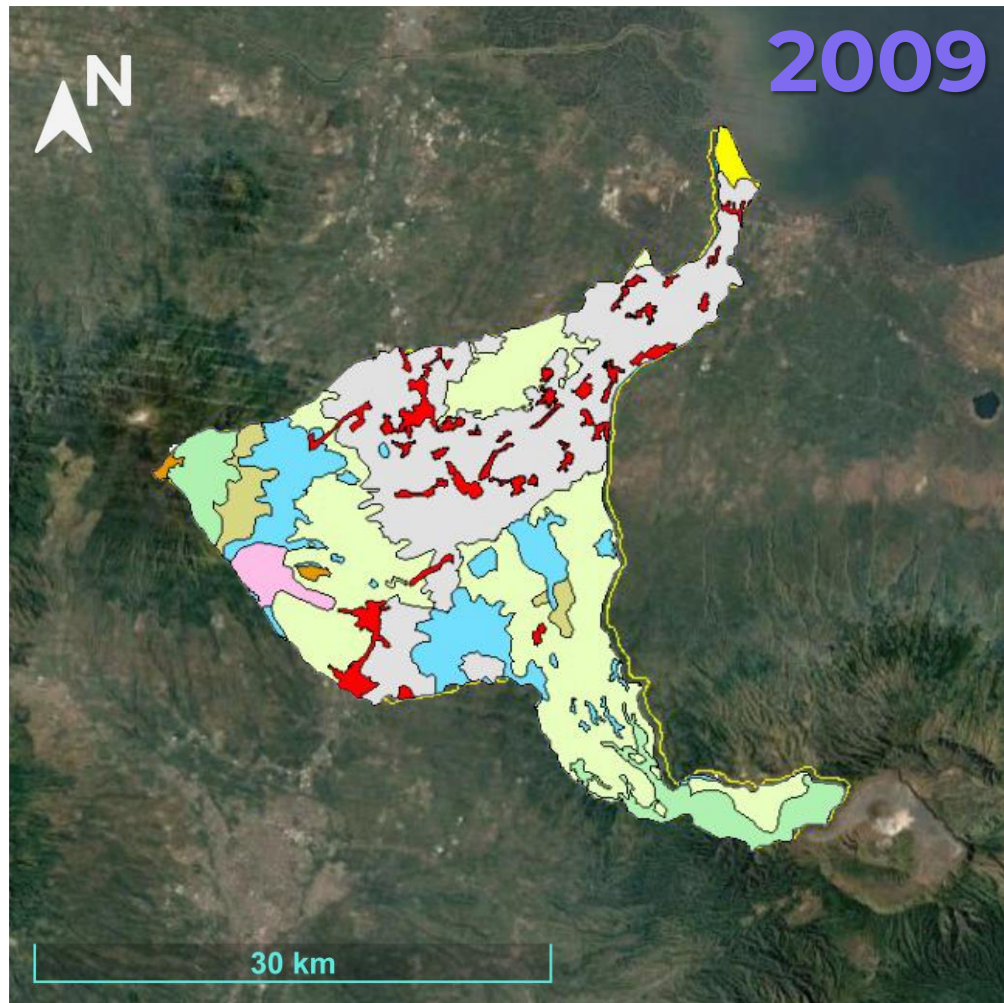


2007



2016

Land Use Change



Source: WebGIS Kehutanan

Land Use Change

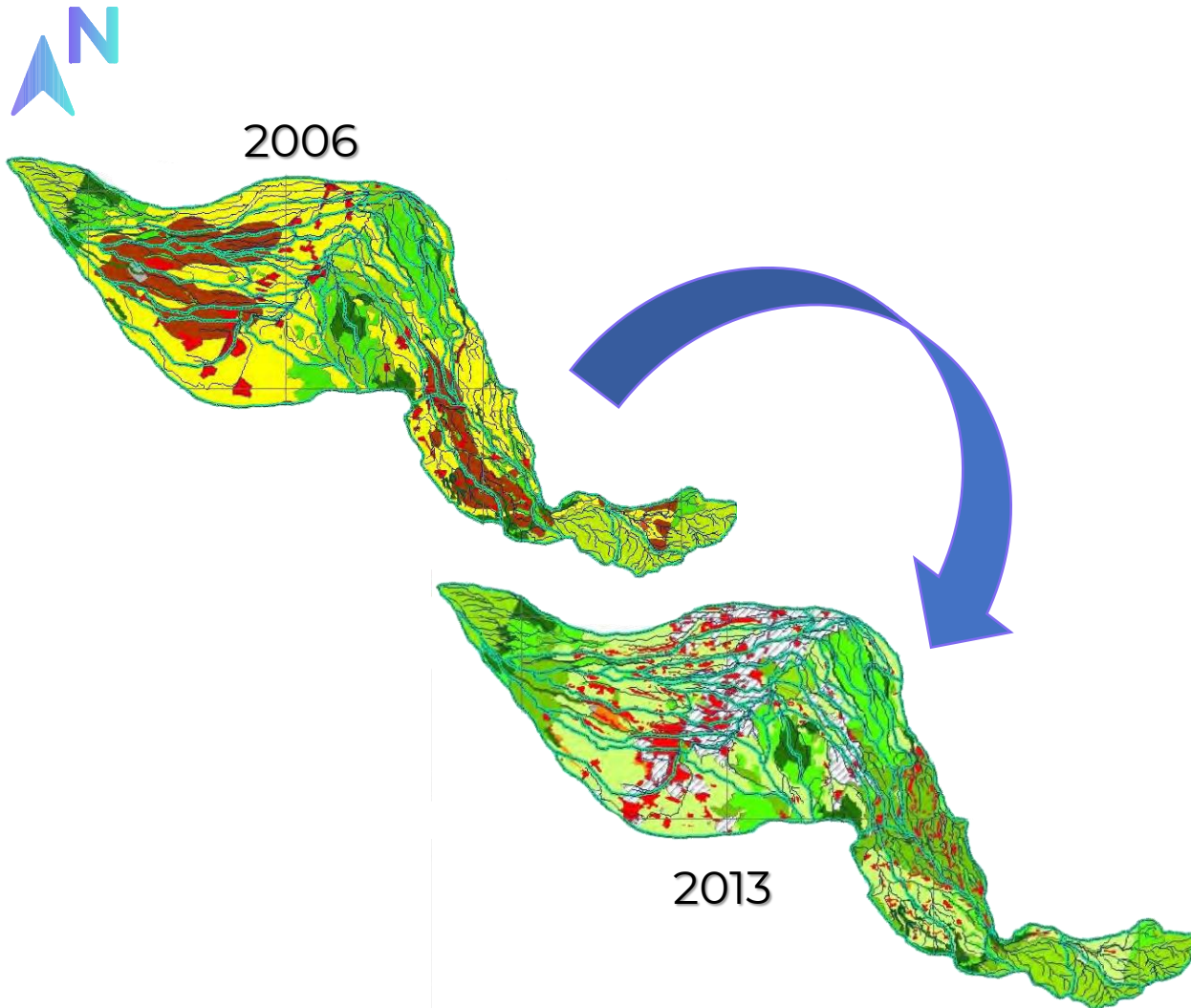
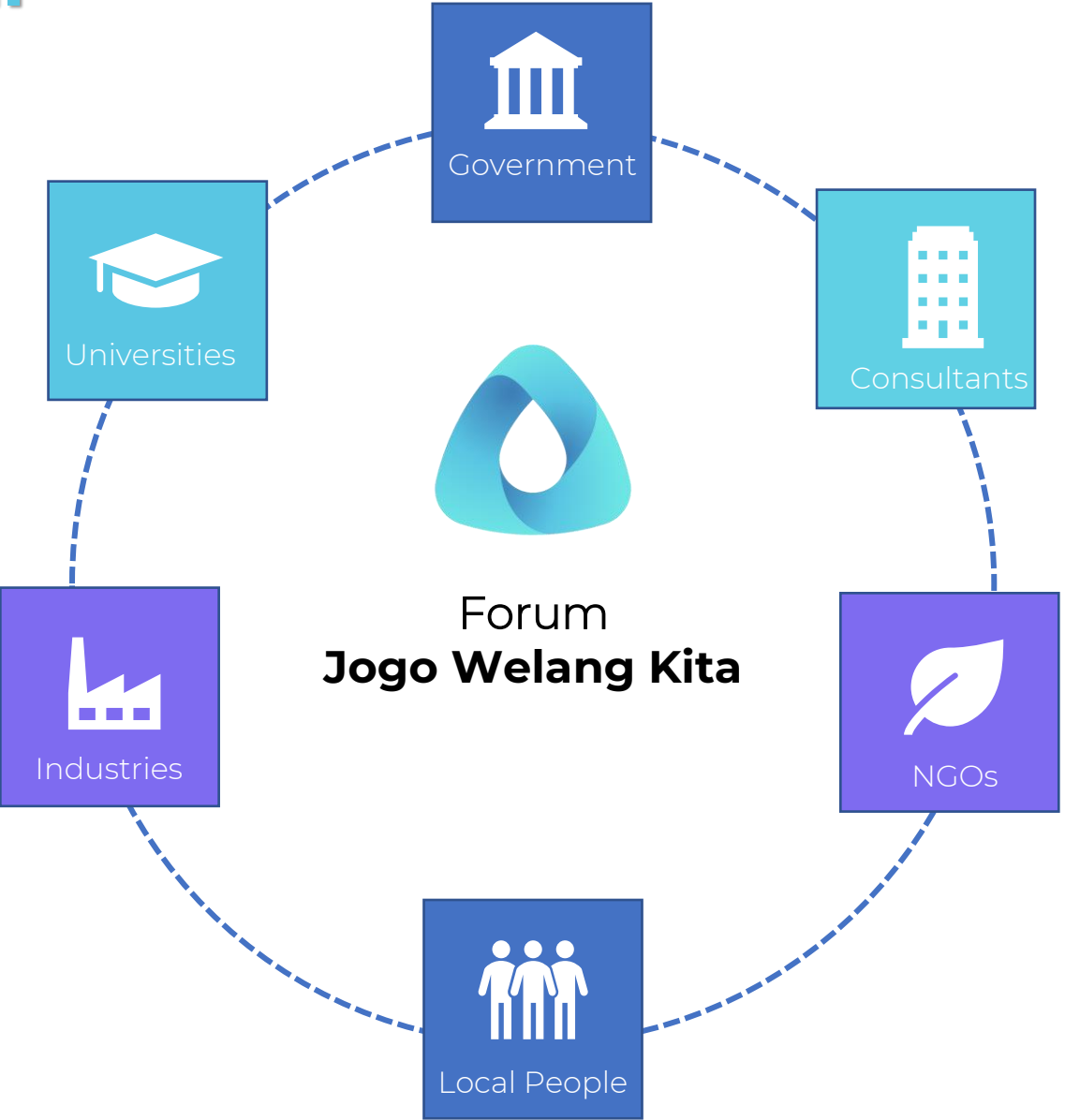


Table: Percentage of Land Use in the Upstream Welang Watershed

No.	Land Use	Percentage (%)		
		2006	2013	Change
1	Protected Forest	5,81	5,78	-0,03
2	Production Forest	13,45	13,41	-0,04
3	Nature Reserve Are	10,97	10,98	0,01
4	Annual Plants	42,62	0,00	-42,62
5	Community Forest	5,39	0,10	-5,29
6	Settlement	4,88	12,84	7,96
7	Agriculture	16,56	30,21	13,64
8	Open Land	0,10	0,13	0,03
9	Industry	0,21	0,12	-0,10
10	Rice Fields	-	11,62	11,62
11	Plantation	-	14,82	14,82
Total		100,00	100,00	0,00

Source: Ningsih, 2015

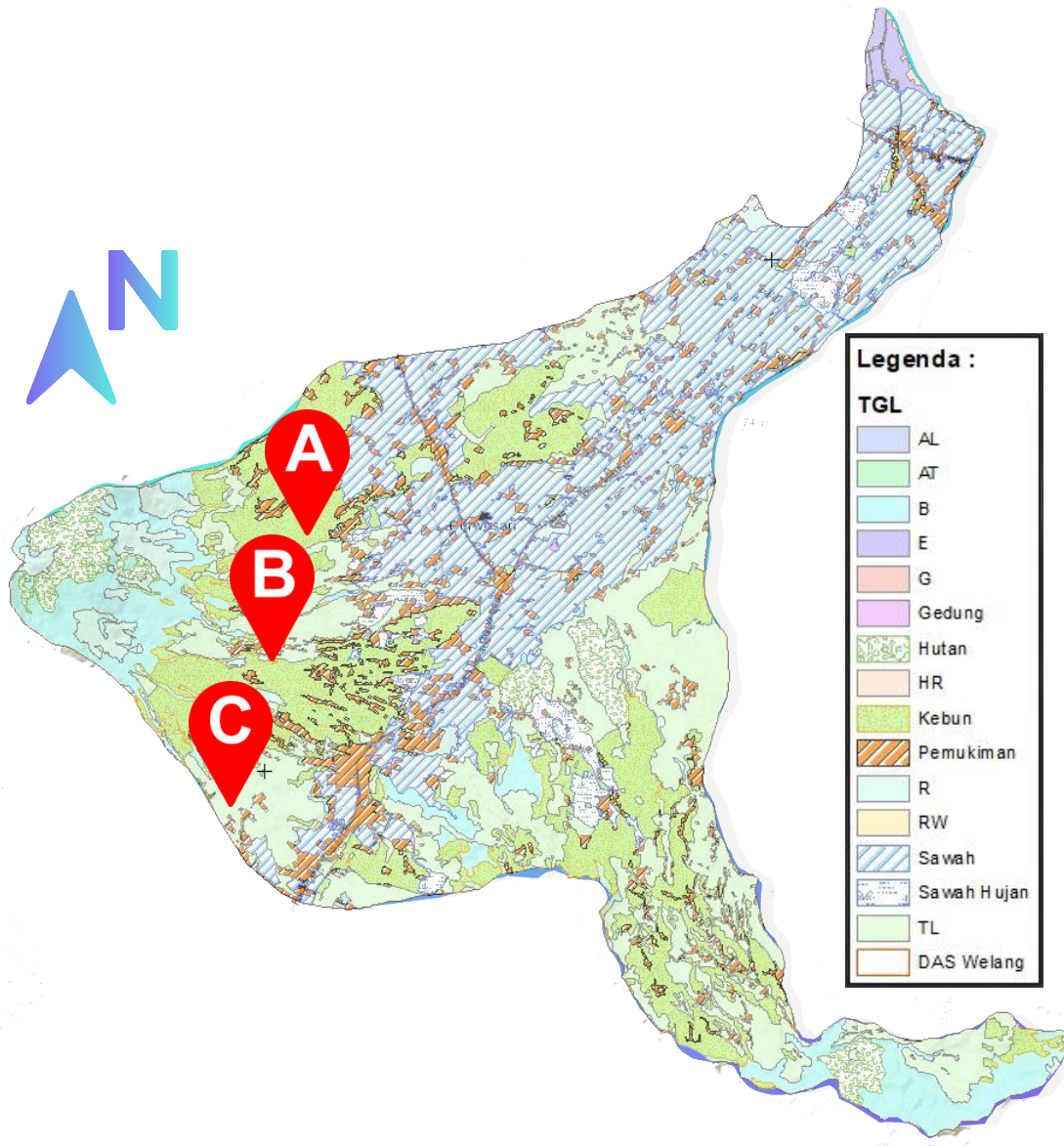
Stakeholder and Organizational Approach





UPSTREAM

Upstream: Collaborative Reforestation



Location:

East & Southeast of Gunung Arjuna

A. Prigen, Pasuruan Regency

B. Tambaksari Village, Purwodadi, Pasuruan Regency

C. Wonorejo Village, Lawang, Malang Regency

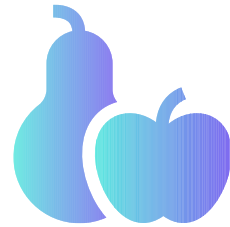
Trees will be planted in gardens/kebun (dark green) and moor/tegalan (bright green)

Productive Plants



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Productive plants are all types of plants that can produce (fruits) so it can be used by humans and can also be used as greening. Productive plants which are commodities in Pasuruan Regency, Apples, Mangoes, and Durians (*)



Productive plants are chosen so it can be economically beneficial to farmers or the communities involved.





Agroforestry

Agroforestry: a method of optimizing land use in an area, through the integration of forestry enterprises and rural development (annual crops, farming, etc). In agroforestry, 2 (two) commodities or types of crops can be carried out simultaneously.



Advantages

- Some of the elements K, Mg, N and a little P can be reused by plants through plant residues.
- The contribution of nutrients from woody plants (especially from the leguminosae species) contributes nitrogen to seasonal crops.
- Improvement of soil physical biology properties.
- Erosion will be reduced when forming a green belt.



Dis-advantages

- Reduced land area for forestry or annual crops, and vice versa.
- There is competition for nutrients, water and light
- If there are pests and diseases, it is possible if it is developed in one type of plant and it will interfere to other types of plants.

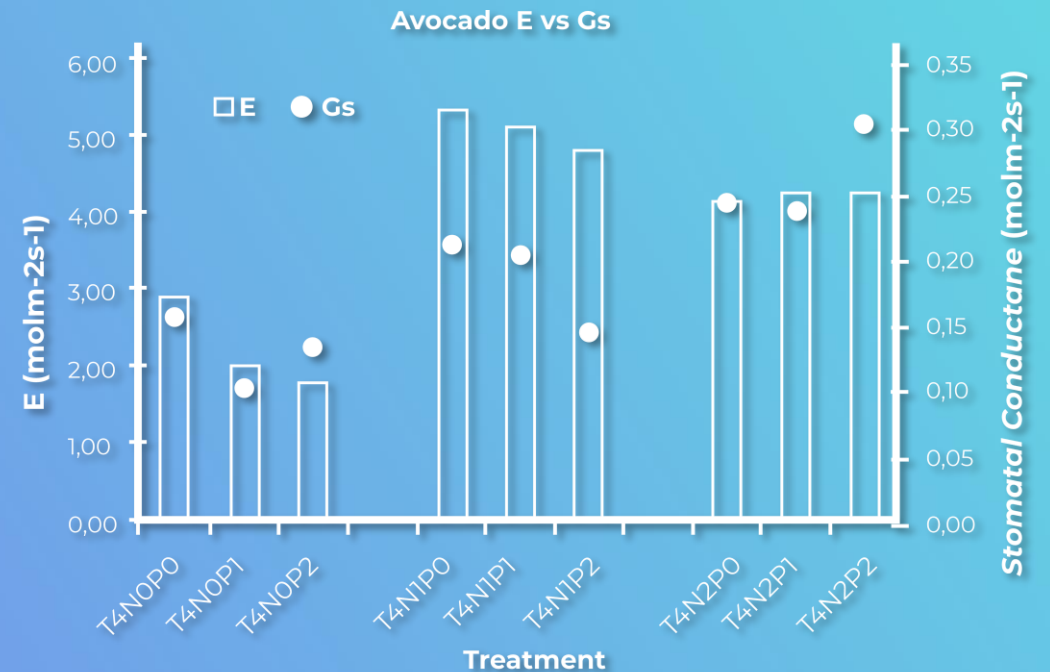
Upstream: Collaborative Reforestation

PLANTING SCHEME

According to Pusat Penelitian Biologi LIPI (2015), Plants with highest transpiration index (E) are avocado, followed by durian, rambutan and mango

Avocado will be planted for Welang Watershed reforestation program

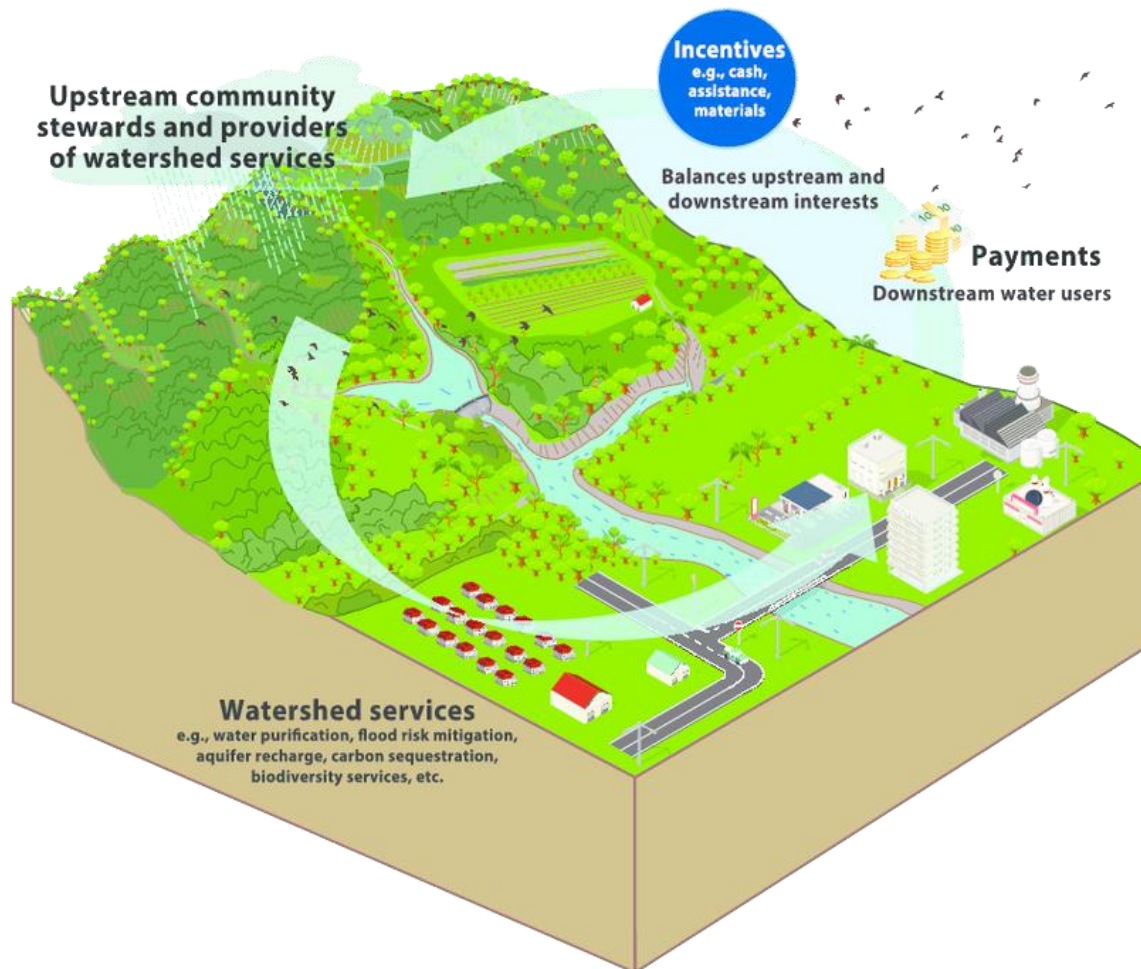
1 Hectares: 20-30 trees



The relationship between transpiration and conductivity of stomata in avocados

Upstream: Collaborative Reforestation

COLLABORATION SCHEME



Works of NGO & Government, along with local society, using **Payment for Ecosystem Services (PES)** scheme

PES: A scheme where ecosystem service users (NGO) pays to ecosystem service providers (farmers)

Target: individuals, communities, businesses, or government

Upstream: Collaborative Reforestation

PAYMENT SCHEME





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Upstream: Collaborative Reforestation

PAYMENT SCHEME

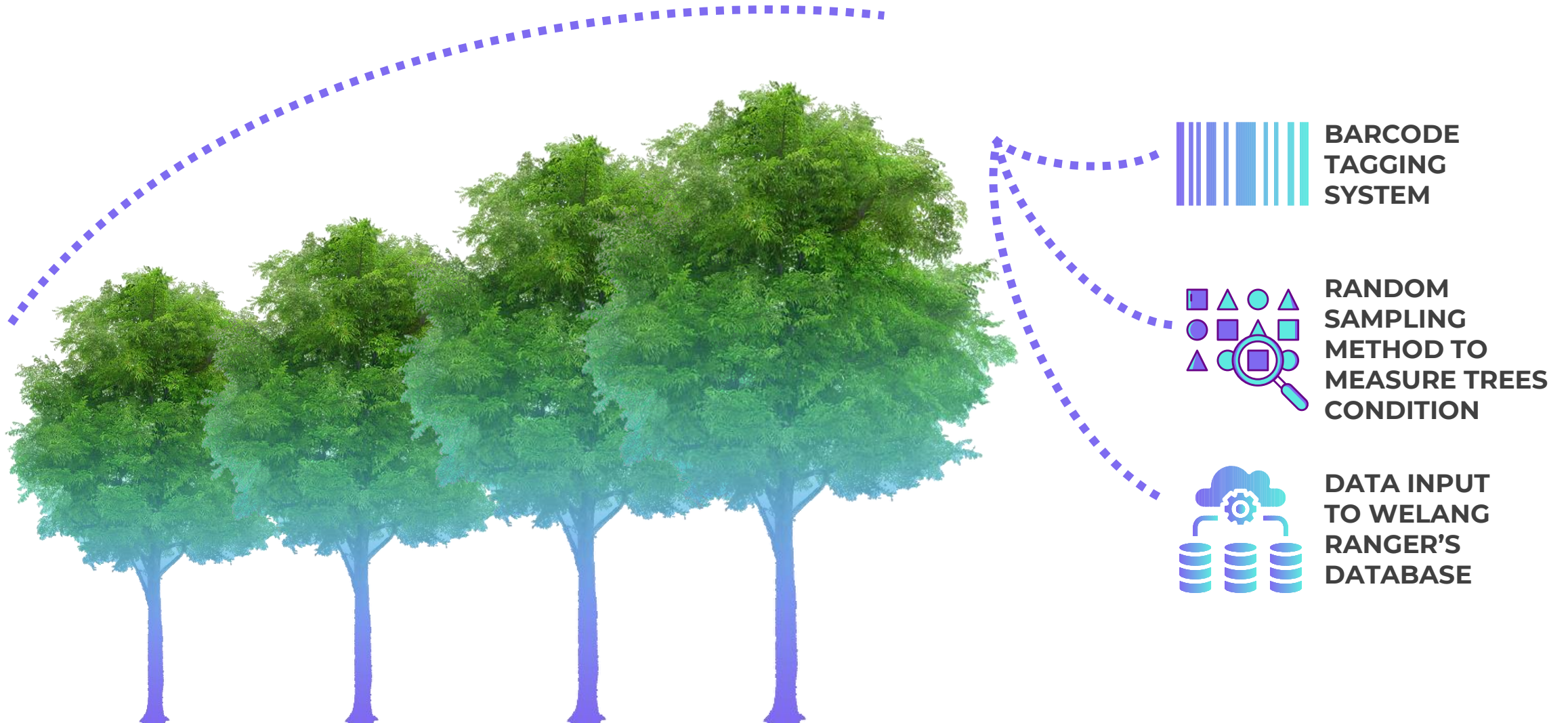


Upstream: Collaborative Reforestation

MAINTAINING SCHEME



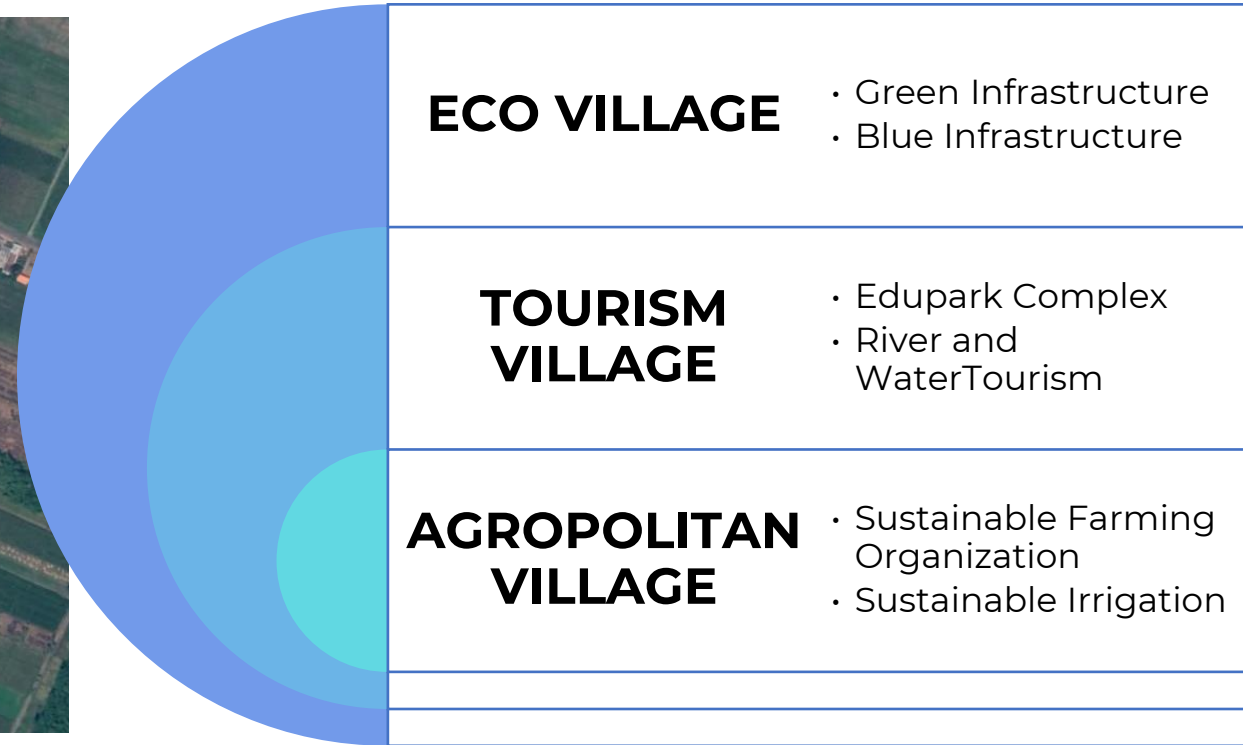
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MIDSTREAM

Middlestream: Eco Kampongs



Pilot Project: Desa Plinggisan

Possible Replication: Desa Dhompo

Middlestream: Eco Kampongs

ECO VILLAGE



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**ZERO
RUNOFF**

**ZERO
NET-CARBON**



**BLUE
INFRASTRUCTURE**

**GREEN
INFRASTRUCTURE**

Detention pond, rainwater harvesting,
biopore hole, infiltration wells

Open spaces, bioswales,



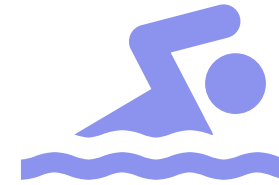
Middlestream: Eco Kampongs

TOURISM VILLAGE



EDUCATIONAL TOURISM

Non-formal education
for the people in regards
to sustainable water
management



RIVER AND WATER TOURISM

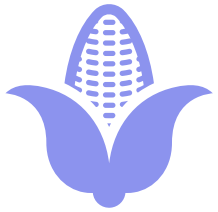
Provision of recreational
services for tourists (eg:
fish pond, river rafting,
etc)



Middlestream: Eco Kampongs

AGROPOLITAN VILLAGE

SOCIO-ECONOMIC APPROACH

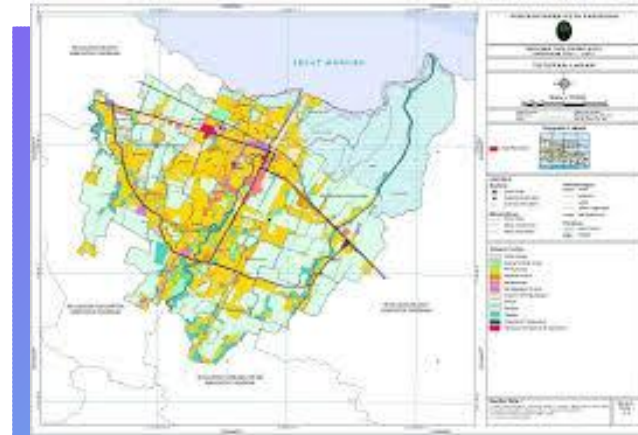


- **Participatory platform** for local people and Department of Agriculture
- **Ultra-micro financing** for farming family



- **SOEs work programs** (Woman empowerment)

INFRASTRUCTURE APPROACH

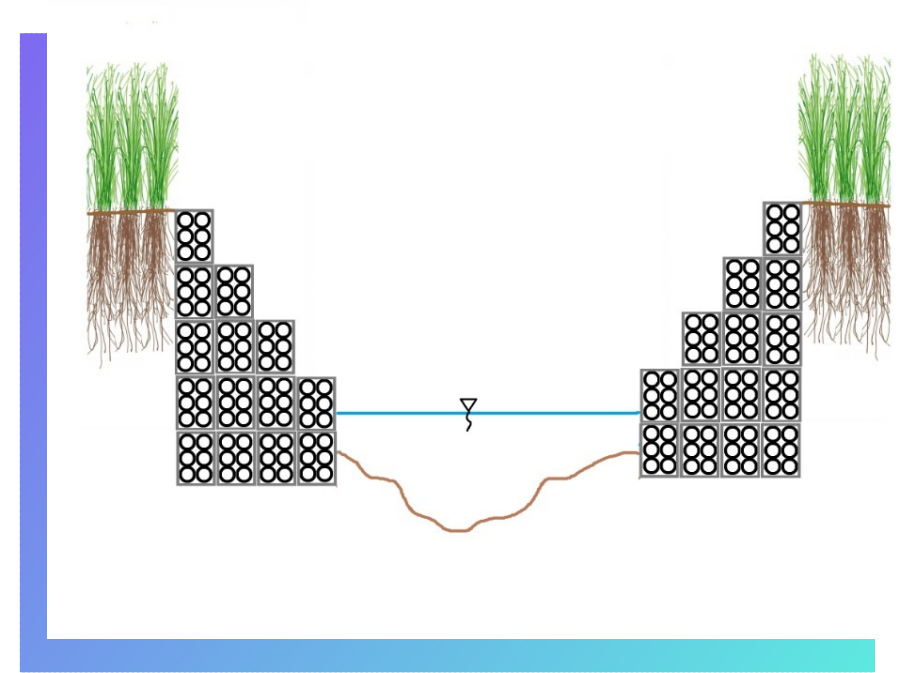


- **Sustainable Irrigation and Irrigation Networks Rehabilitation**



DOWNTREAM

Downstream: Hybrid Flood Control



River normalization in conjunction with **gabion** and **vetiver** (*vetiveria zizanioides*) construction

Purpose:

- Prevent slopes erosion
- Reduce the flow velocity of the excess run-off

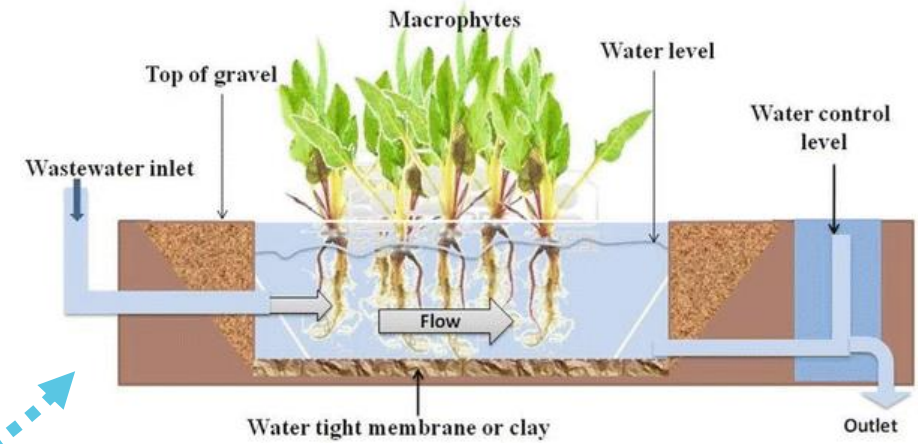
Downstream: Hybrid Flood Control



 **Vertiver & Gabion**

 **Nomalization**

Downstream: Water Treatment



Using **Phytoremediation** Method

Phytoremediation also uses vetiver grass (*Vetiveria zizanioides*), effective for removing contaminants in polluted water.

Target: Industries at Welang Watershed



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What's Next?

Draft Budget

Detailed budget needed to maintain Welang's watershed program from upstream to middlestream

Detailed Engineering Design

Engineering designs outlining the detail of the design (also eg considering hydraulic variables, etc)

Detailed Master Plan

Master plan outlining the spatial planning and development phases of the plan

Community Action Plan Document

Guidelining socio-economic action plans and its measures



THANK YOU!



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