July, 09th 2020
Shared Heritage Lab x Transitional Territories
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Flush and Splash:

Regenerative Capacity for Semarang Urban Water Management

Introduction to Semarang, Indonesia

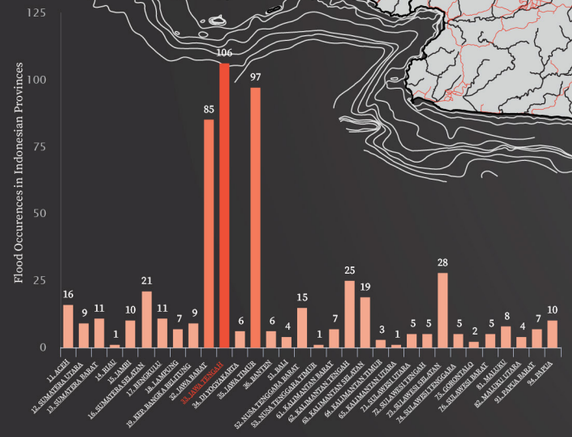
373,7 km²
municipality area

1,610,605
citizens

4,310 / km²
density

474,667
households

4,14%
under poverty



Semarang is the capital and largest city of Central Java province in Indonesia. Being located on the northern coast of Java, the city serves as a major port during the Dutch colonial era, and still an important regional centre and port today. It is also the main hub connecting Jakarta and Surabaya, as well as cities in the southern part of Java such as Surakarta and Yogyakarta. Decades after the Indonesian Independence in 1945, a number of citizens began to realize the necessity to nourish the remarkable buildings of the Old Town as the aesthetic value of the city became encapsulated by informalities. However, the extreme climate heighten the challenges. Semarang City elevation ranges from 2 meters below sea level up to 340 meters above the sea level. Together with a seasonal moonsoon climate, Semarang also deals with heavy rainfall and therefore prone with flooding. The graph above shows that Central Java has highest number of flood occurences. This report will address the extensive hazards that Semarang is facing, the consequences that are exposed to it, as well as the strategies to mitigate the water-related challenges so that Semarang could remain as an important urban centre in Indonesia with developed resilient measures.

Fieldwork Observation

rapid land subsidence have caused the houses near the coastline to be of 1m height from the street

an adaptive measure of the community that is living near the coastline

unhygienic condition of the water bodies in the Bandarharjo neighborhood

various cultural precincts are being connected by the Semarang river

decaying Ducth colonial buildings of Kota Lama bordering the street markets

waste that accumulates in Semarang River come from the marketplace and settlements nearby

Informal settlements and markets are back-facing the river

Bandarharjo

Kampung Melayu

Kota Lama

Kauman

Pecinan

Tugu Muda

Semarang River by the Old Town

Kali Semarang 1890

Flag ceremony in Jombang, August, 2018

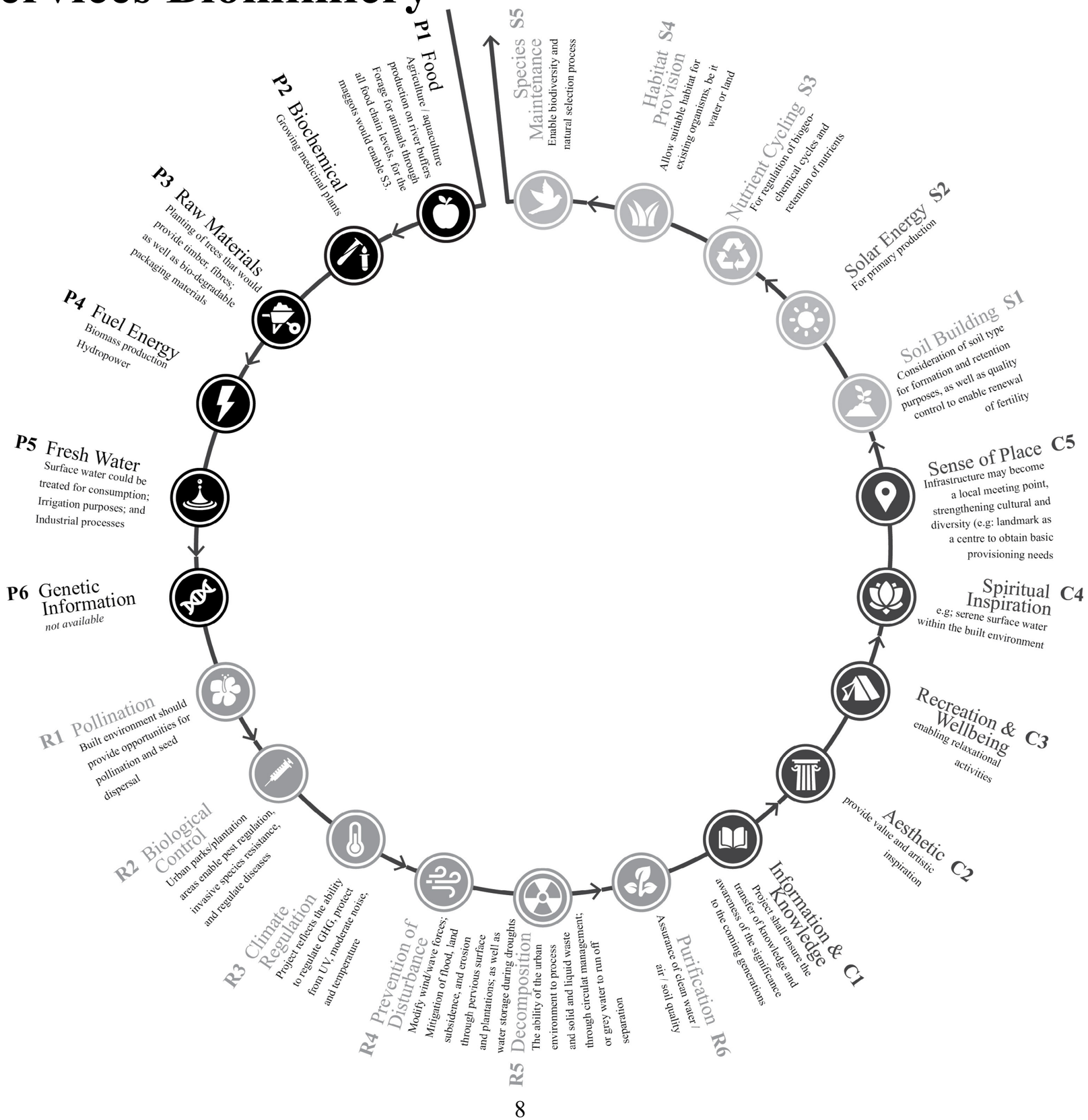
Aquaculture at Padma, West Semarang

How to achieve these aspirations?

Ecosystem Services Biomimicry

Theoretical Framework

ES + ***SER***



Legend

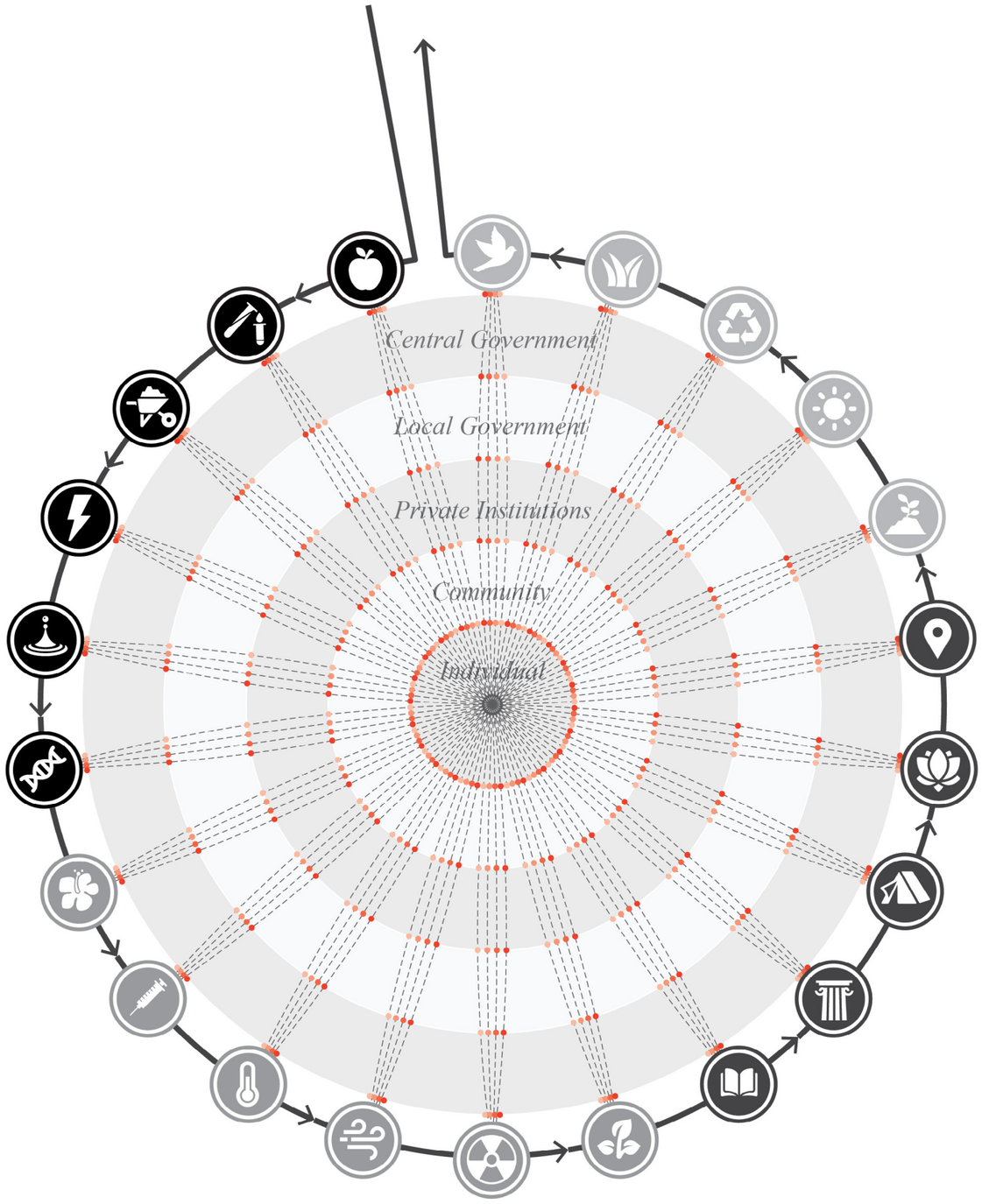
Ecosysytem Services Mimicry

- **P** Provision
- **R** Regulating
- **S** Supporting
- **C** Cultural

Socio-ecological Resilience

Theoretical Framework

ES + ***SER***



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Ecosysytem Services Mimicry

- **P** Provision
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Applicable for the following vision;

- NBS Flood Defense
- Clean Water Access
- Waste Management

Socio Ecological Implementation*

- Communication
  Are there available facilities/platform on each layer to execute the project?
- History & Values
  Does the current application contain historical relevance on how it was managed in the past?
- Ability to Act
  Are there policies to deal with the matter on each layer?
- Accessibility
  Could everyone contribute or access the knowledge of this facility?

Regenerative Capacity

Assessment Framework

ES + ***SER***

Legend

Ecosysytem Services Mimicry

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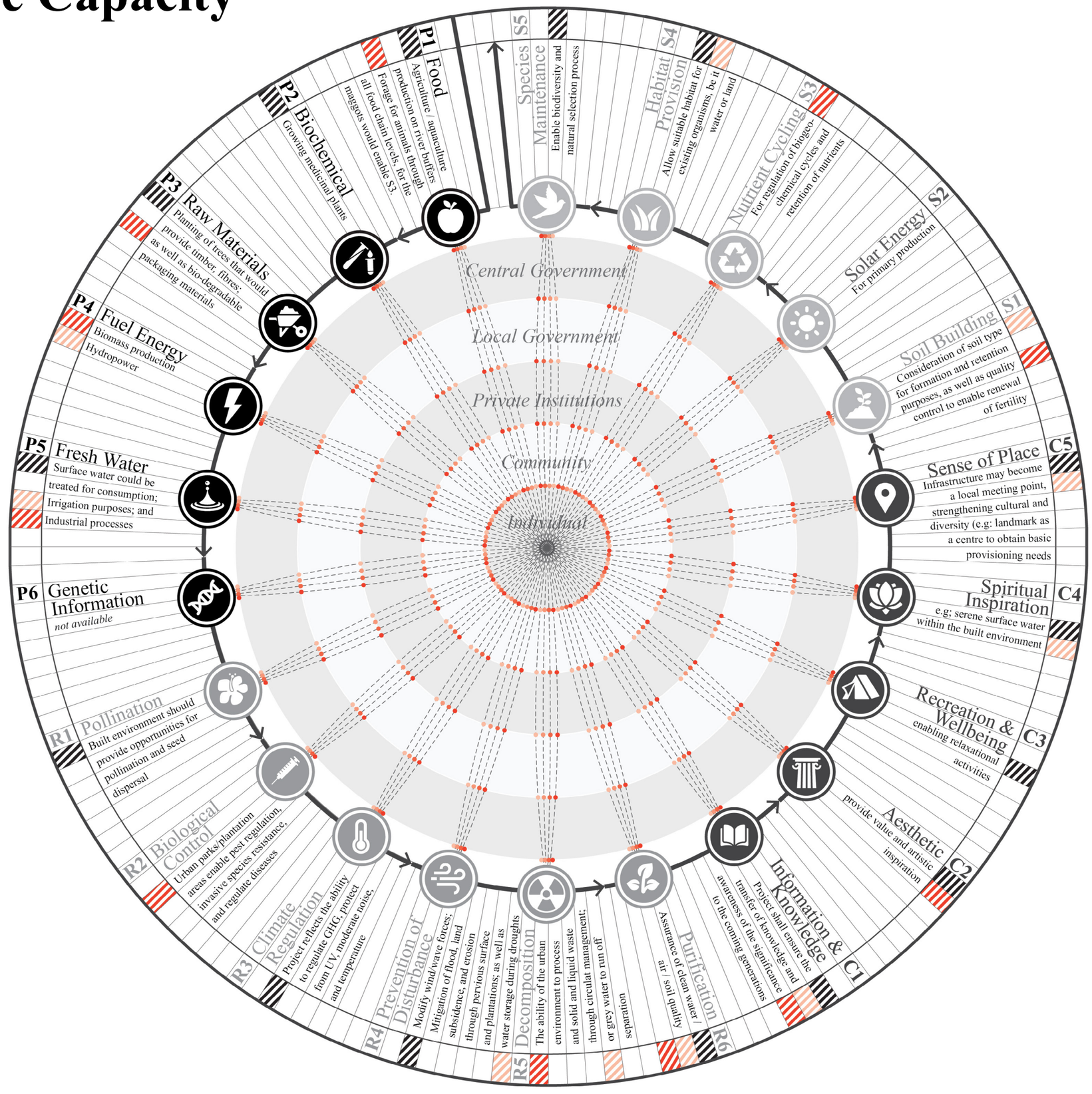
- - - - - Missing Connection
——— Established Connection

*Engagement would not be considered if it only covers a certain community group



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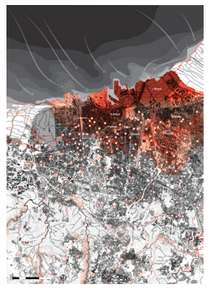
Analysis Overview

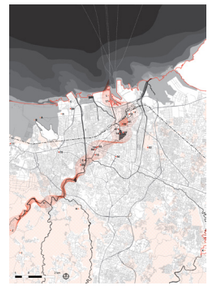
Dual Nature of Externalities

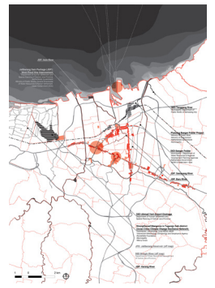
polluted grounds / extreme weather / climate uncertainty

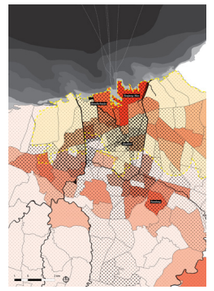


Crises of Representation

political divisions / neglected cultural heritage / assemblages and dissonances



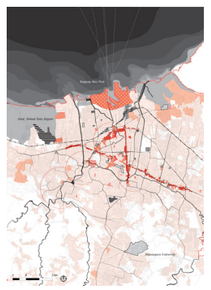


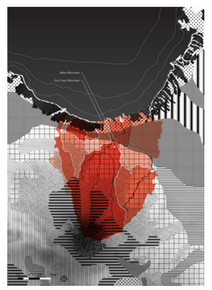


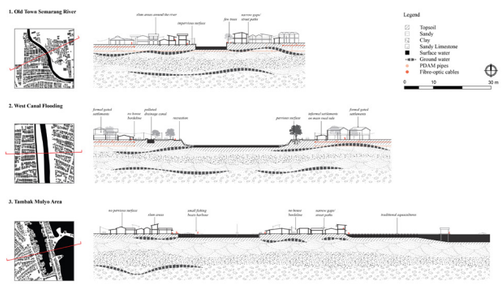
SEMARANG HYDROLOGICAL RISKS = HAZARD X VULNERABILITY / REGENERATIVE CAPACITY

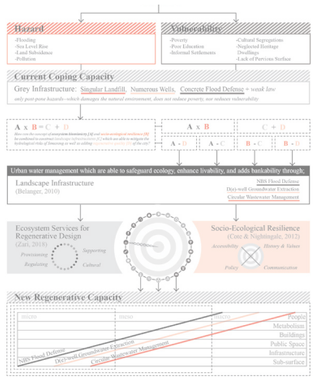
Semarang Context

city typology / landscape morphology / current hazard mitigation



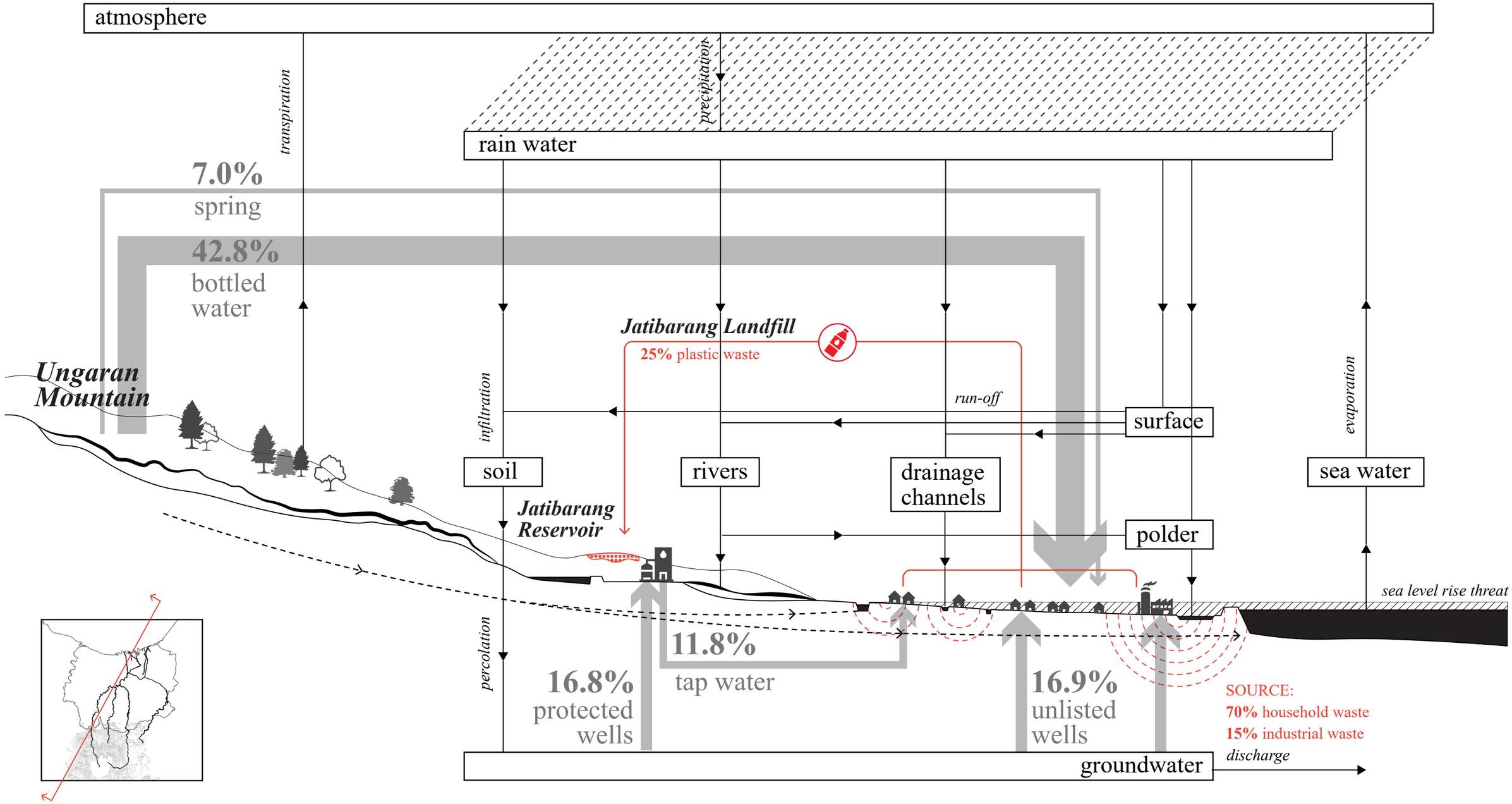






Semarang Hydrological Flow

and the concern of pollutants



The diagram above depicts the natural flow of water along the watershed of Semarang--from up the Ungaran mountain down to the coastline--and the flow to which the water are being used by the people. It also shows conceptually the areas where the water have high risk of contamination.

Source: Drinking water; https://beritagar.id/artikel/gaya-hidup/nyaris-separuh-warga-indonesia-minum-air-mineral-kemasan / Cascading Semarang, 2018.

Problem Map Summary

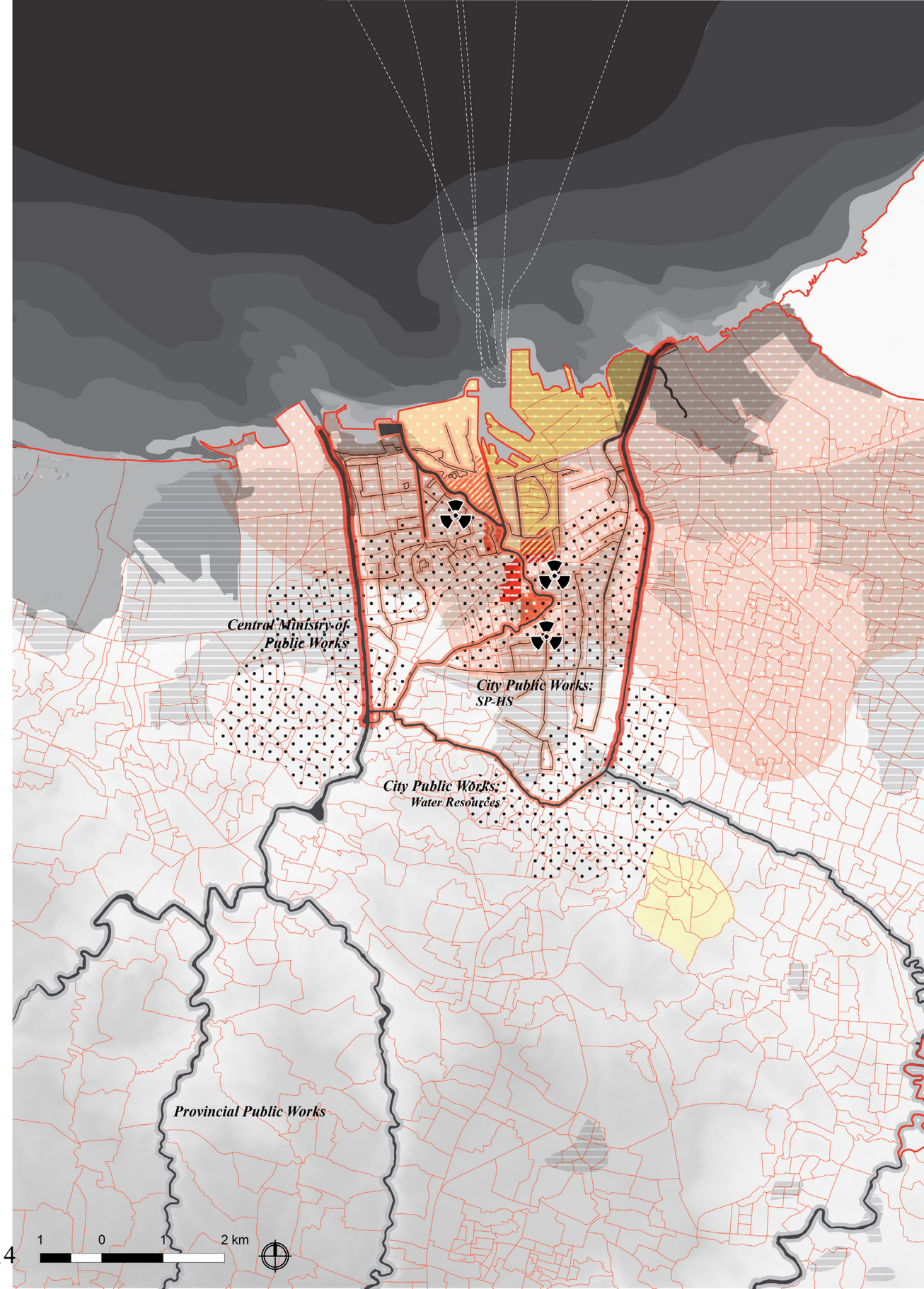
Main regional districts *Diponegoro University* *Strong community clusters* *Capital of West Java* *Implemented polder stations* *Strong cultural precincts within the main watershed* **S**	*Uncontrolled groundwater extraction* *Land subsidence* *Land and water waste management* *Clashing stakeholders* **W** *Informal settlements*
Coastal city *World Heritage listing* *Vacant valuable dwellings* *Culinary attractions* **O**	**T** ***Low number of citizens with higher education*** *Weak law* *Industrial areas by the coastline* *Financial resources* *Human resources on planning field*

Legends

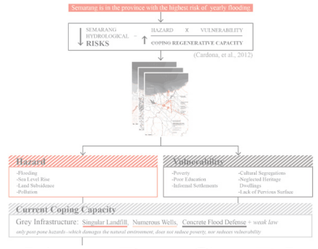
- Flood Risk
- Land Subsidence
- Highest Density
- Highest Poverty
- River Pollution

- Water network Stakeholders
- Central Ministry of Public Works (PUPR)
- Provincial Public Works
- City Public Works - Water Resources Directory
- City Public Works - Spatial Planning and Human Settlements Directory

- Cultural Precincts
- Bandarharjo
- Kampung Melayu
- Kota Lama
- Kauman
- Pecinan



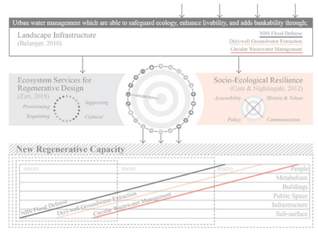
Research Question



[A x B = C + D]

How can the concept of **ecosystem biomimicry [A]** and **socio-ecological resilience [B]** be combined to construct **landscape infrastructures [C]** which are able to mitigate the hydrological risks of Semarang as well as adding **regenerative quality [D]** of the city?

An assessment framework to guide the implementation of 'Regenerative Development' in Semarang.



Research Question and Expected Outcomes

[A x B = C + D]

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An assessment framework to guide the implementation of 'Regenerative Development' in Semarang.

[A x B]

How can we further situate social system within ecosystem biomimicry?

Assurance of multilayer stakeholder feedback within each variable of ES.

[C + D]

What are the type of measures and spatial implications of landscape infrastructure that would enable regenerative manners?

Biomimicry engineering on flood-prone lands, local public gathering places (e.g; worship places), and refurbishment of existing landfills to circular manner.

[A - C]

Which form of ecosystem services could possibly be mimicked by landscape infrastructure?

Water provisioning system, habitat for human and ecology, a climate regulator zone, etc

[A - D]

What ecosystem services variables could trigger bankability projects in Semarang City?

Food provisioning; agriculture/aquaculture designated zones, decomposition and re-production of city waste, bio-mass fuel energy, establishment of natural recreation sites, etc.

[B - C]

Who are the stakeholders involved during the assessment, project construction, and monitoring of the landscape infrastructures?

The management must be centralized on community level to enhance sense of belonging.

[B - D]

How can each social layers from the highest government institutions down to the individual level contribute to the regeneration of ecosystem services?

Through multi-scalar key projects that are distributed through the different institutional level.

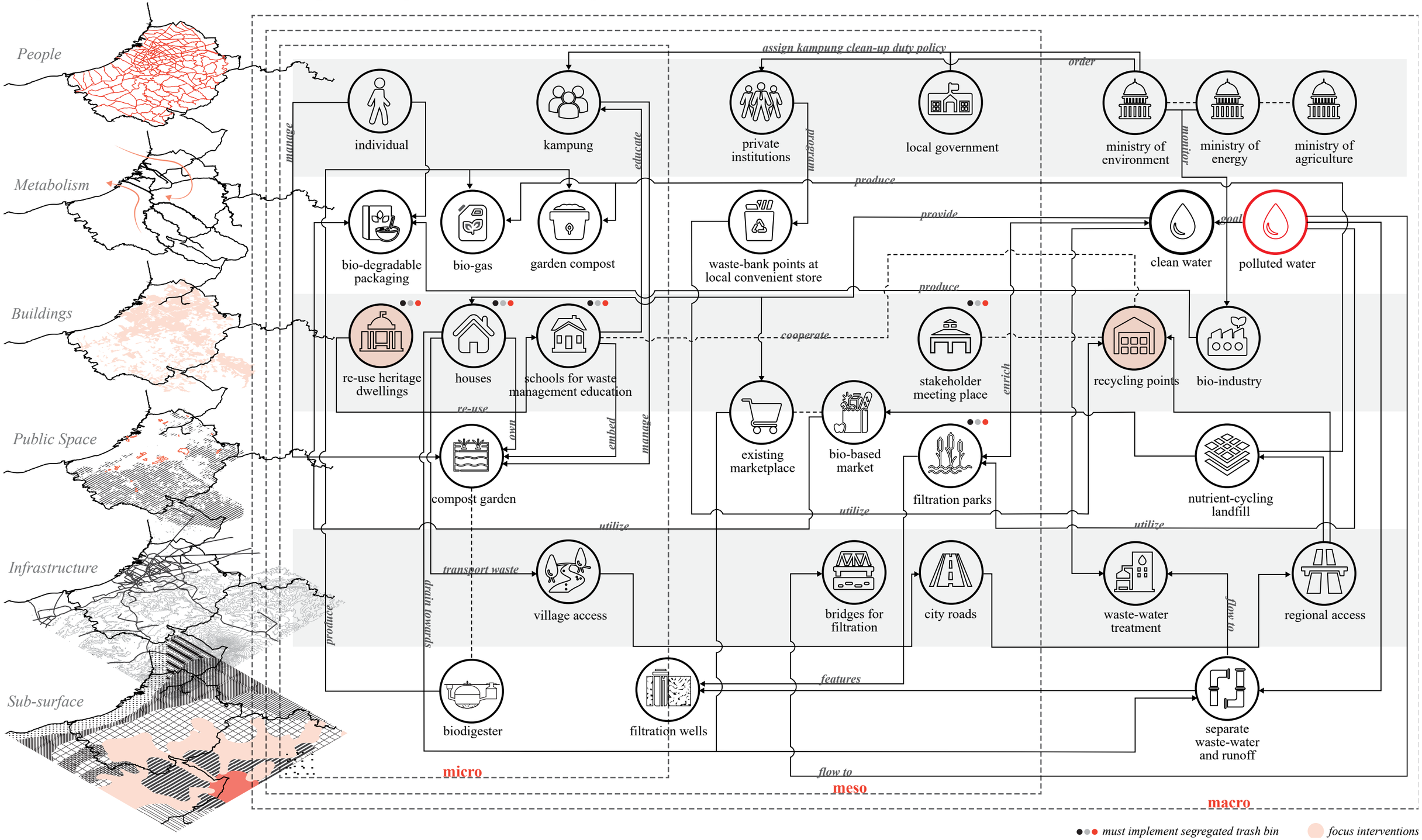
Vision

'The vision is to conduct an urban water management which are able to enhance livability by ***(i) attaining hygienic environment, (ii) safeguarding the ecology, and (iii) inducing bankability of the local community*** *in Semarang City. This will be achieved through* ***(a) fixing the waste management system alongside, (b) promoting a nature-based flood defense, as well as (c) seeking alternative water and food supply*** *with the* ***participation*** *of the community.'*

Formulating the strategies...

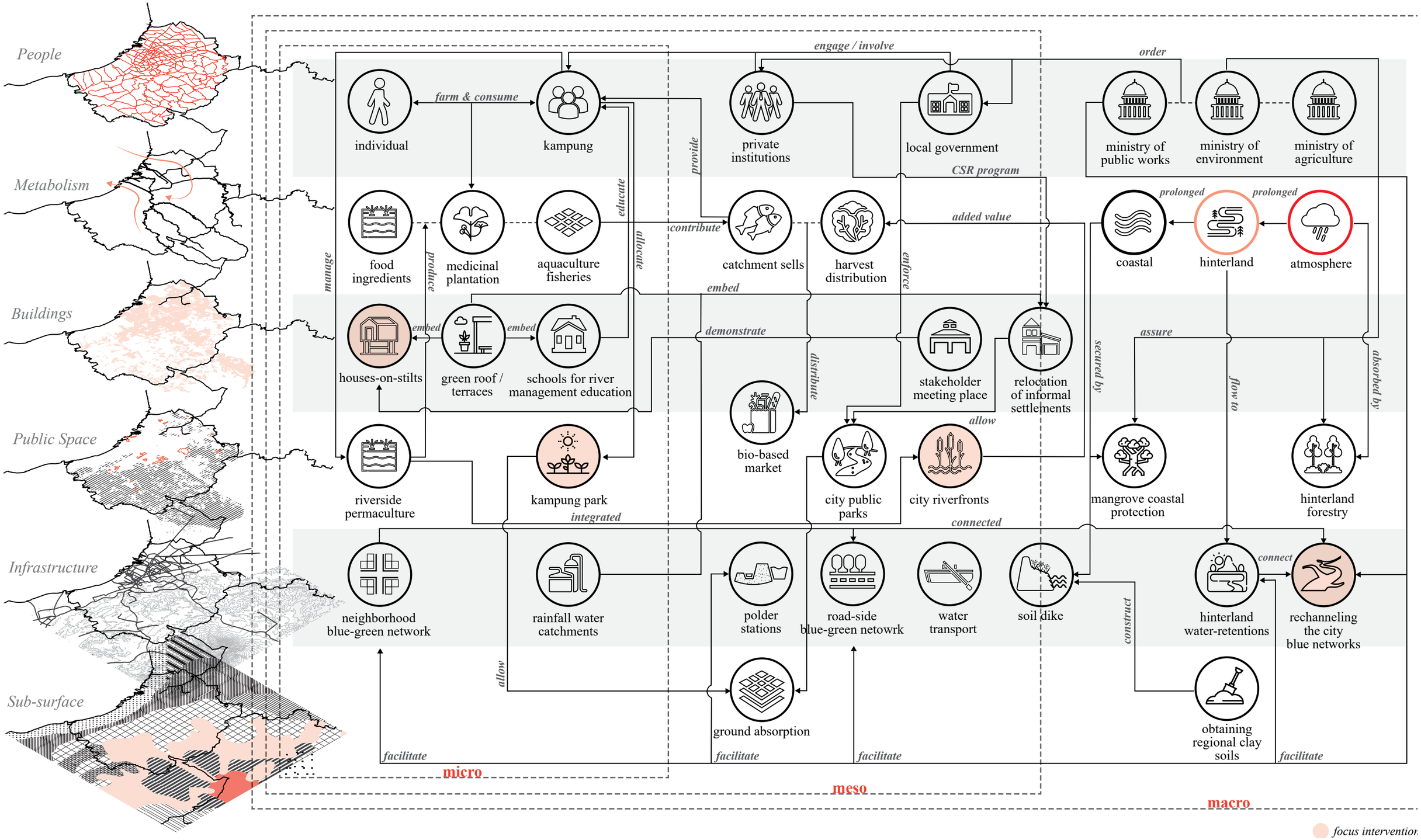
#1 **Purify:** *Semarang Circular Waste Management Project*

'It is to everyone's advantage that waste is properly taken care of; after all, no one wants rubbish piled high on the streets, not just because of the unpleasant sights and smells, but also because of the health hazard it would cause, the pests it would attract, and the potential pollution of drinking water.' -Hall, 2013



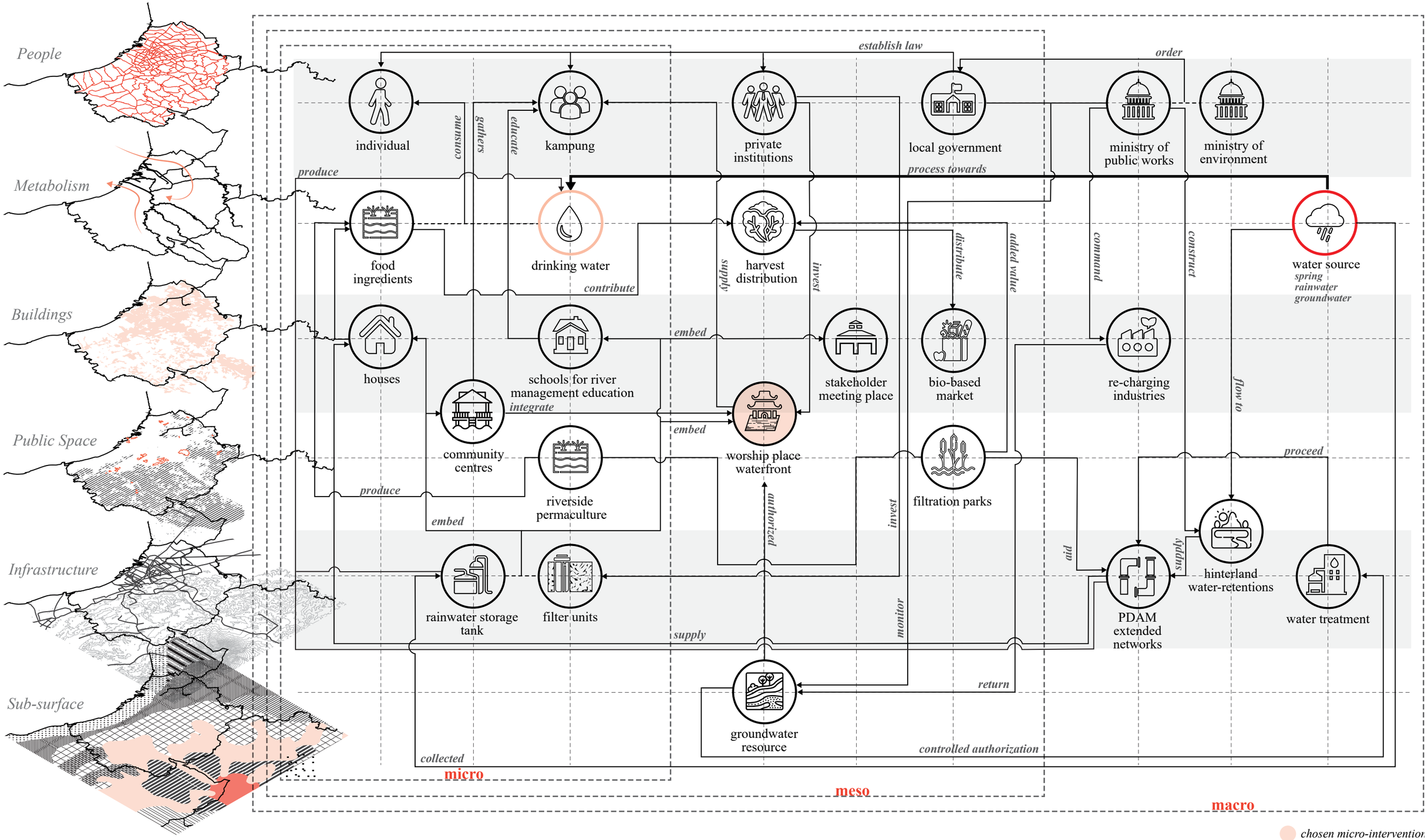
#2 **Protect:** *Nature-based Flood Defense*

Mimics of ES practices such as permaculture or mangrove ecotourism being engineered around flood prone land may provide livelihood benefits and unique opportunities for less-developed nations (Juarez-Lucas & Kibler, 2015, p. 2).



#3 **Provide:** *D(e)-well Groundwater Extractions*

'Water should not be limited to selling to those who can buy it and not to those who need it'
-FLOW documentary, 2008



How to translate these strategies spatialy?

Flush & Splash:

Overall Macro Scale Interventions

Purify

Circular waste management throughout Semarang City

- urban villages waste management and recycling centres
- grey water treatment centres
- separate run-off and waste-water system
- facilitate educational means (Diponegoro University)

Provide

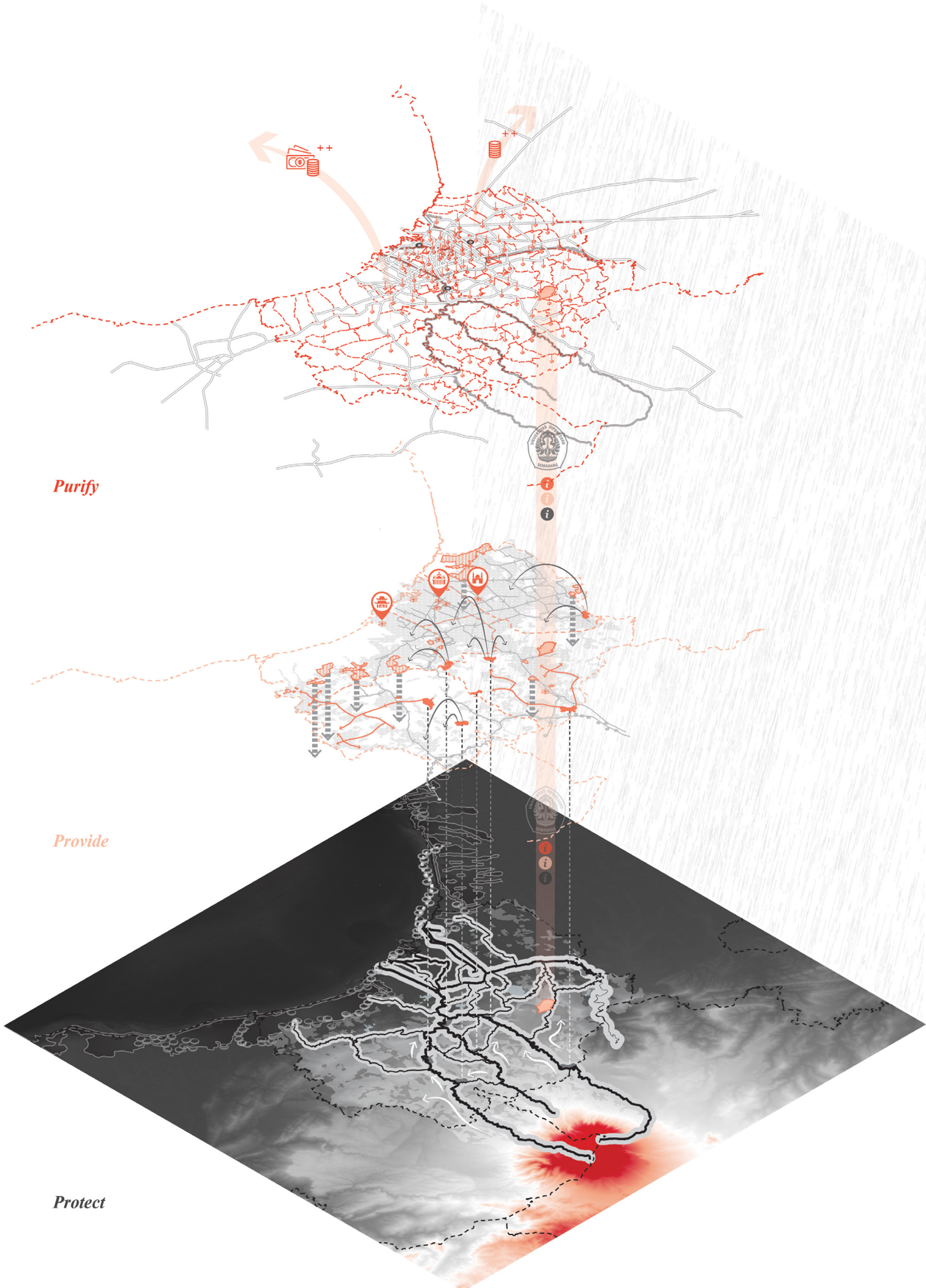
Dwelling with ground water extraction whilst providing water storage for the community

- recharging the aquifer (Cascading Semarang, 2019)
- hinterland water storages
- extended PDAM distribution through water reservoirs
- rainwater water storage / certified wells on cultural precincts
- facilitate educational means (Diponegoro University)

Protect

Nature-based flood defense throughout the watershed

- rechanneling the city (Cascading Semarang, 2019)
- protect hinterland greeneries & maximize empty plot on city
- add mangrove coastal protection
- hinterland water storages
- facilitate educational means (Diponegoro University)



Macro-scale Interventions

Space and Flows

upper hill side — *middle hill side* — *lowland and coastal area*

Reservoirs · Urban Permaculture · Waste Bank · Regulated Landfill · Place of Worship · Recycling Points · Community Biodigester · Bio-marketplace · Water Supply Treatment · Helophyte Landscape · Bio-based Industry · Adaptive Housing · Waste Water Treatment · Mangrove

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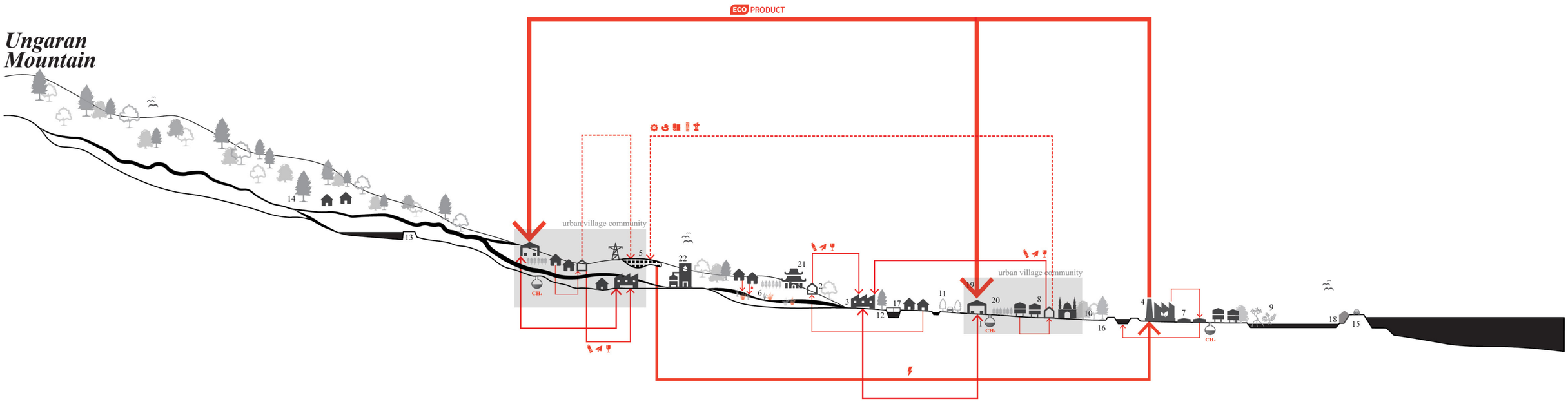

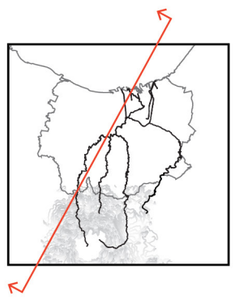

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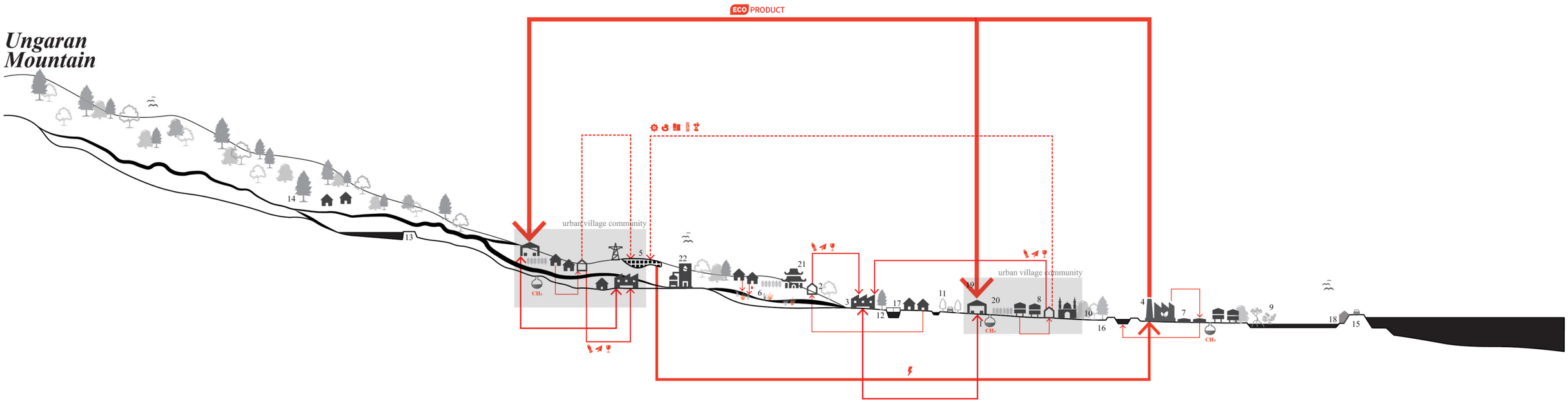
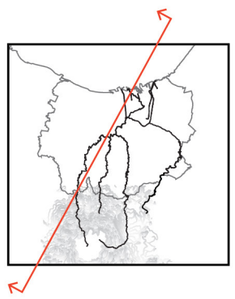
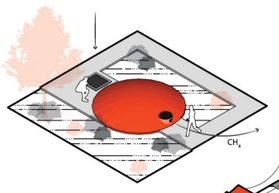
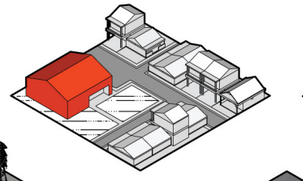




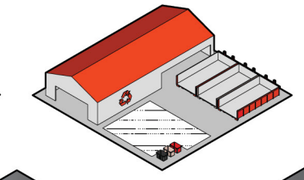
1. Community Biodigester



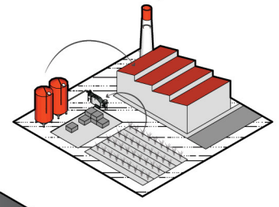
2. Waste Bank



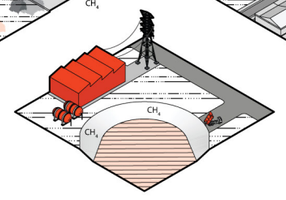
3. Recycling Points



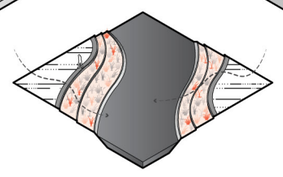
4. Bio-based Industry



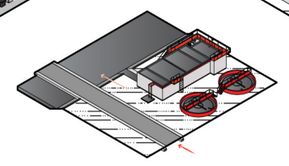
5. Regulated Landfill



6. Helophyte Landscape



7. Waste Water Treatment

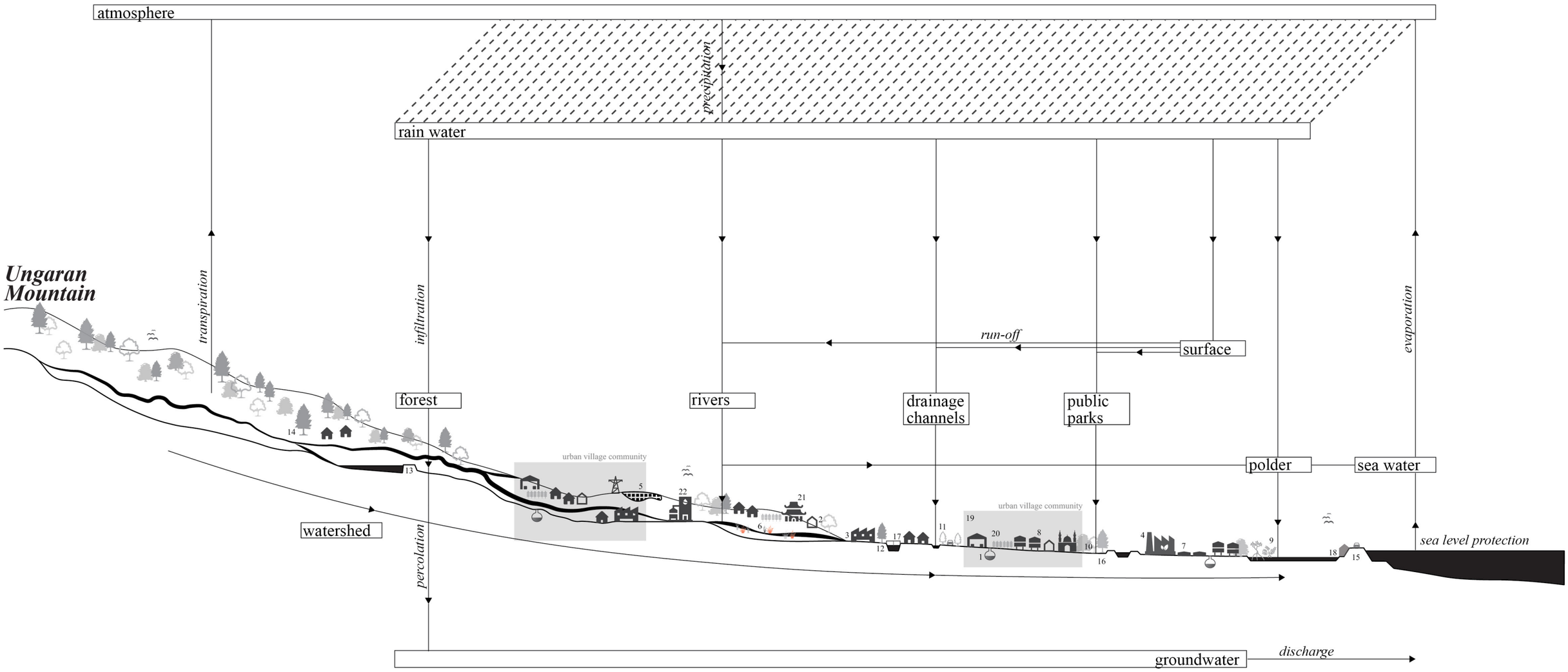


Reservoirs | Urban Permaculture | Waste Bank | Regulated Landfill | Place of Worship | Recycling Points | Community Biodigester | Bio-marketplace | Water Supply Treatment | Helophyte Landscape | Bio-based Industry | Adaptive Housing | Waste Water Treatment | Mangrove

Macro-scale Interventions

Protect Space and Flows

upper hill side — *middle hill side* — *lowland and coastal area*



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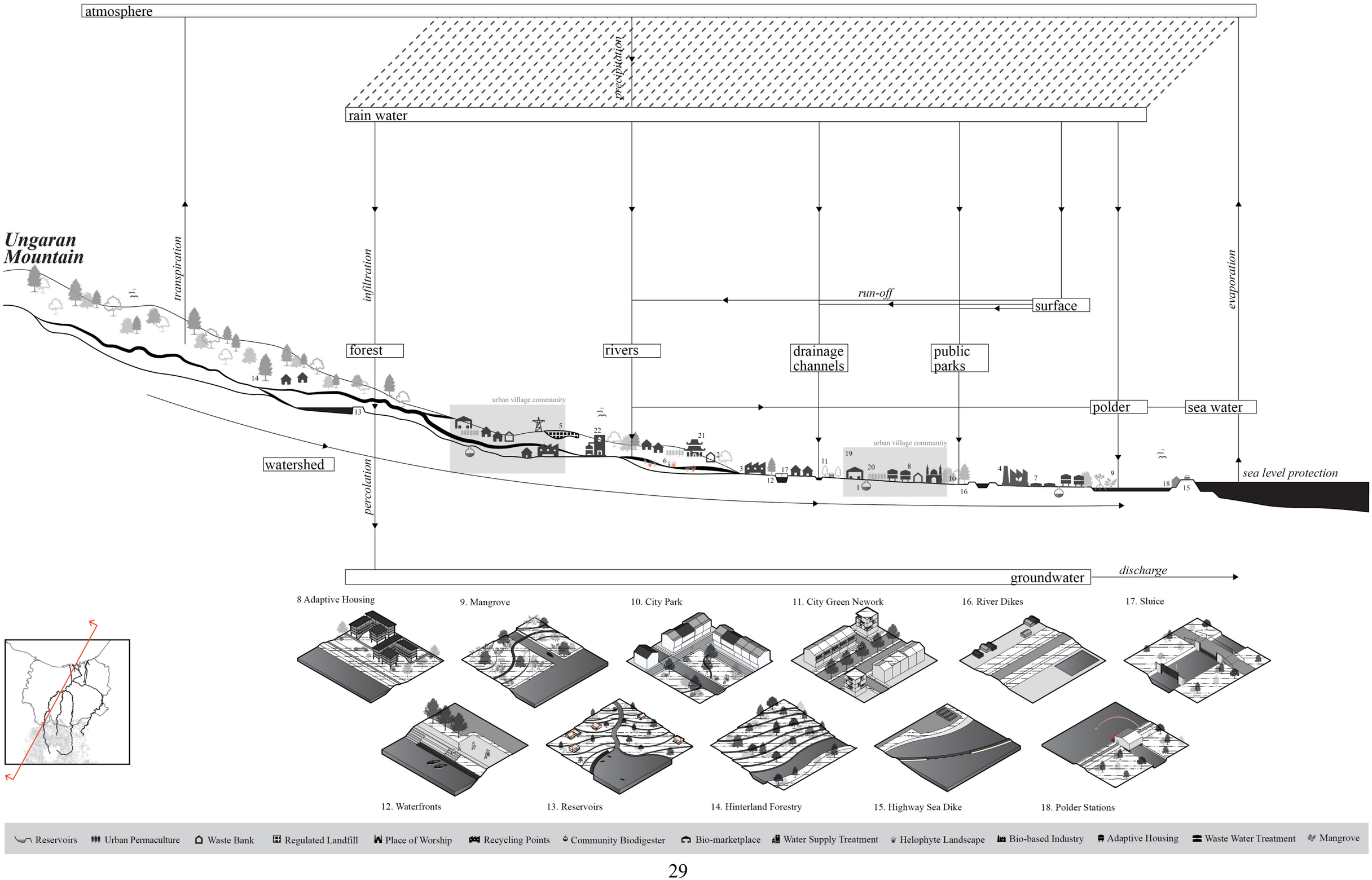

Macro-scale Interventions

Provide Space and Flows

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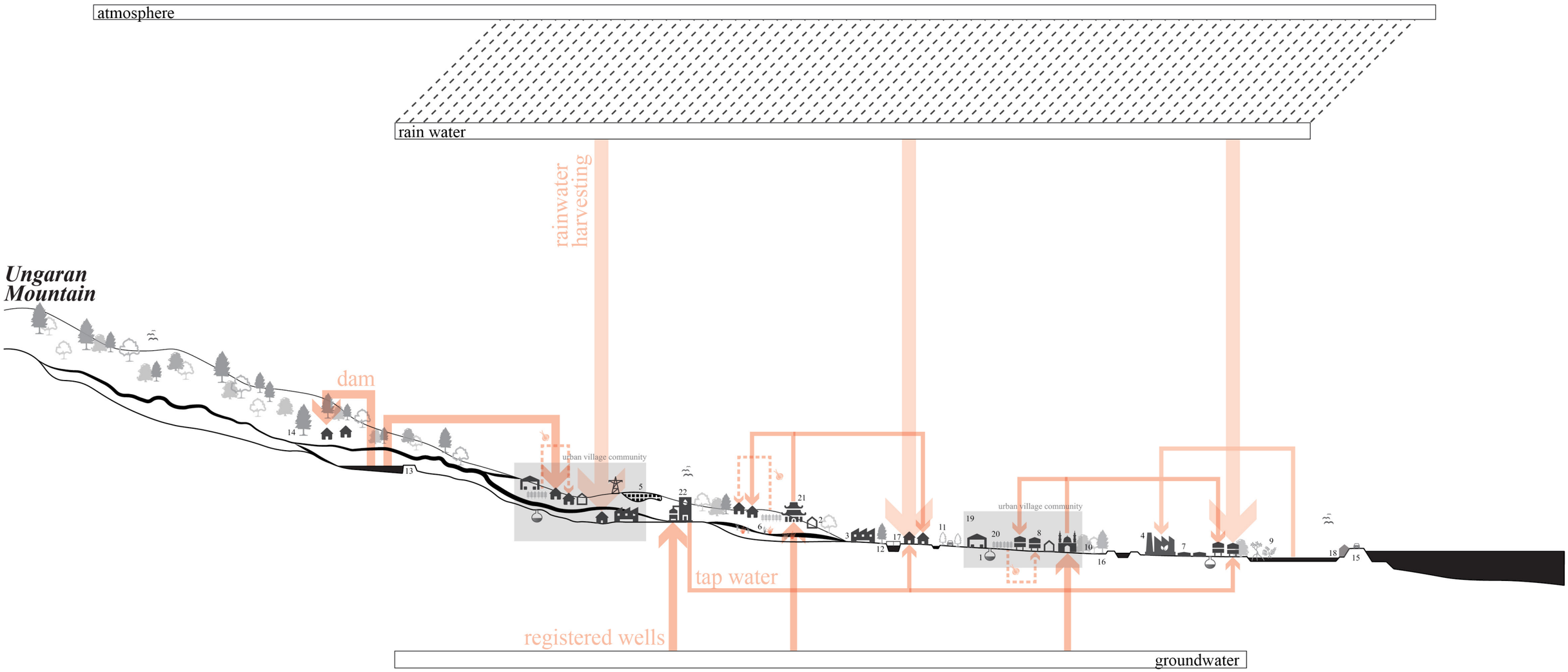

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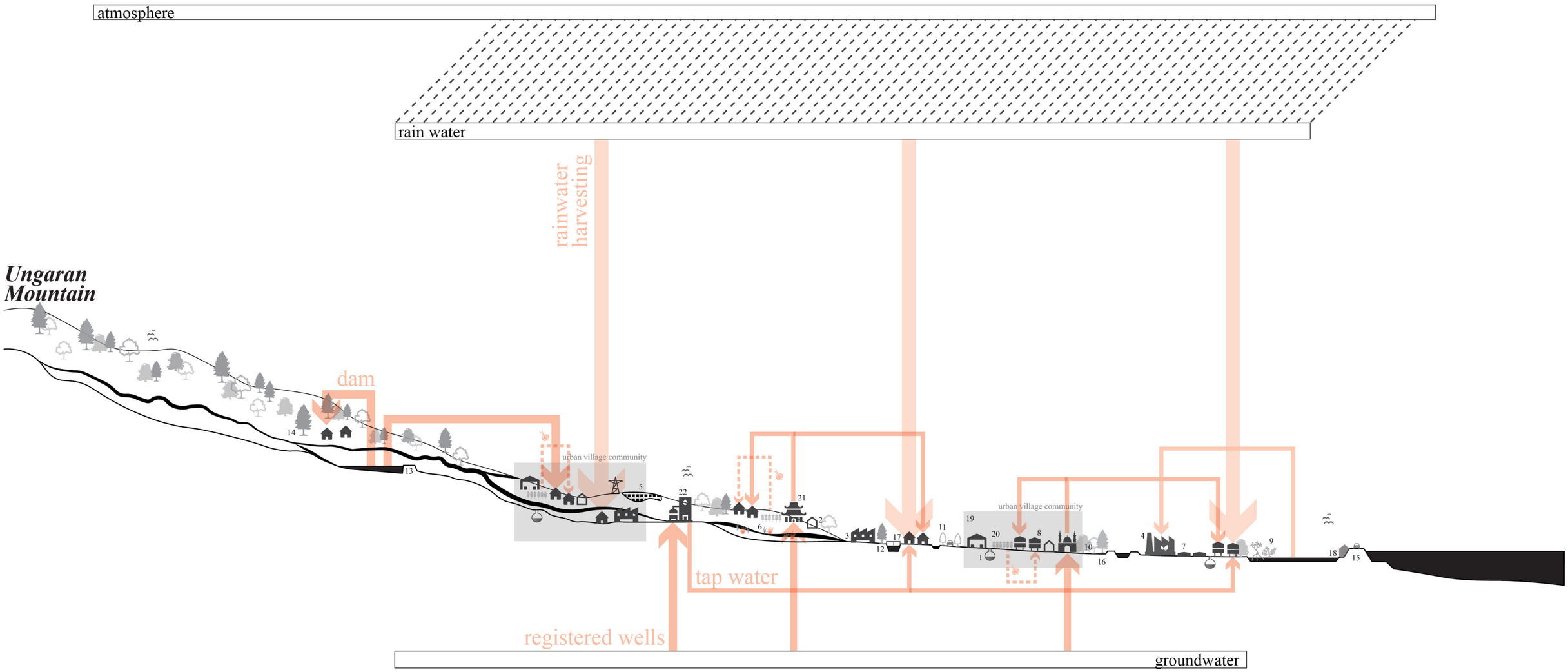
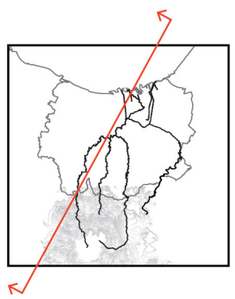
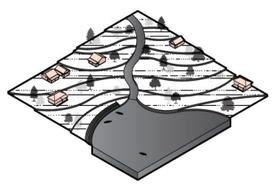
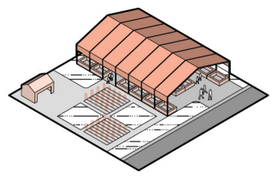


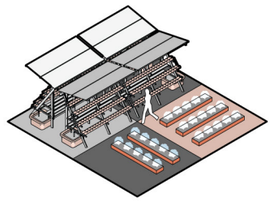




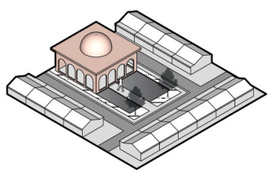
13. Reservoirs



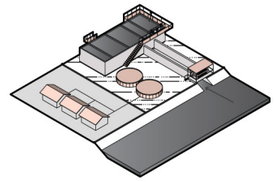
19. Bio-marketplace



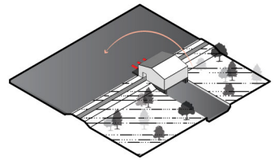
20. Urban Permaculture



21. Place of Worship



22. Water Supply Treatment



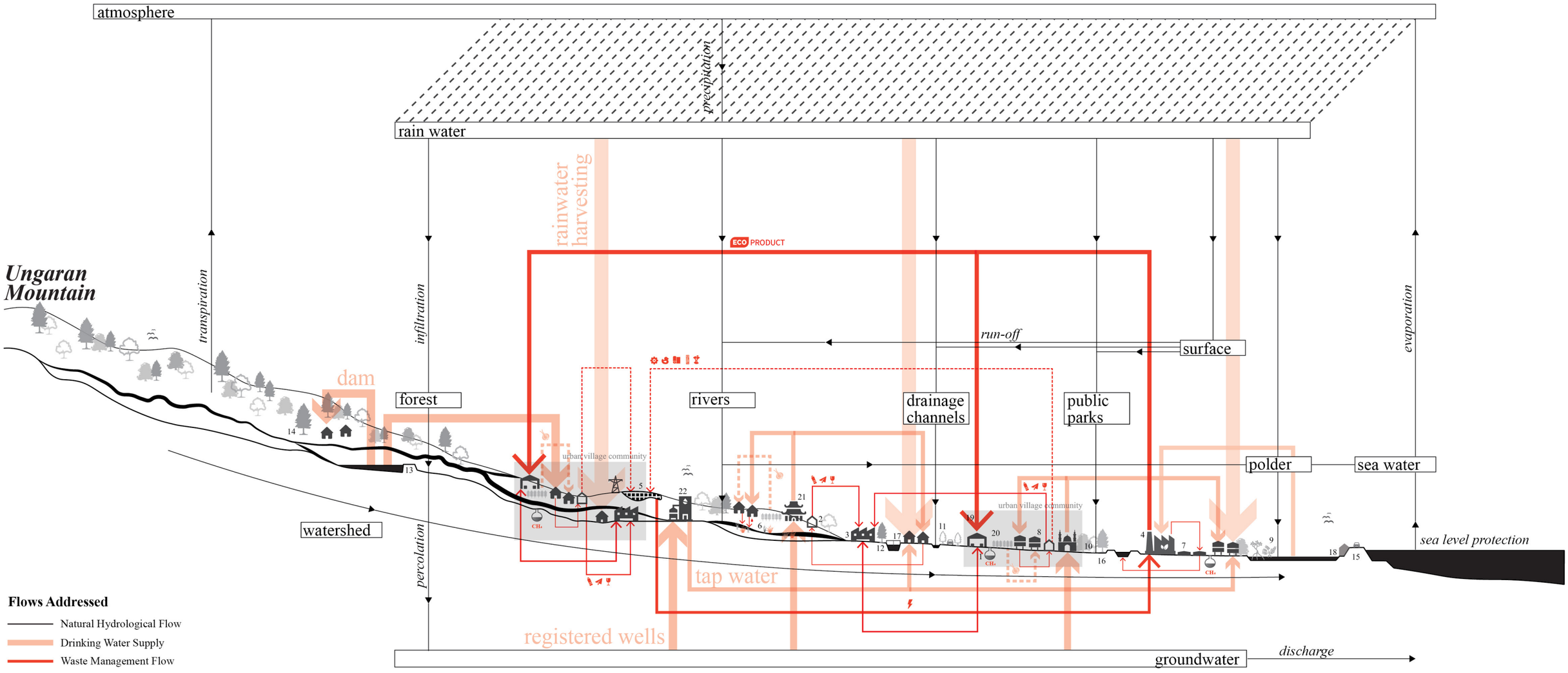
18. Polder Stations

Reservoirs | Urban Permaculture | Waste Bank | Regulated Landfill | Place of Worship | Recycling Points | Community Biodigester | Bio-marketplace | Water Supply Treatment | Helophyte Landscape | Bio-based Industry | Adaptive Housing | Waste Water Treatment | Mangrove

Macro-scale Interventions

Space and Flows

upper hill side — middle hill side — lowland and coastal area

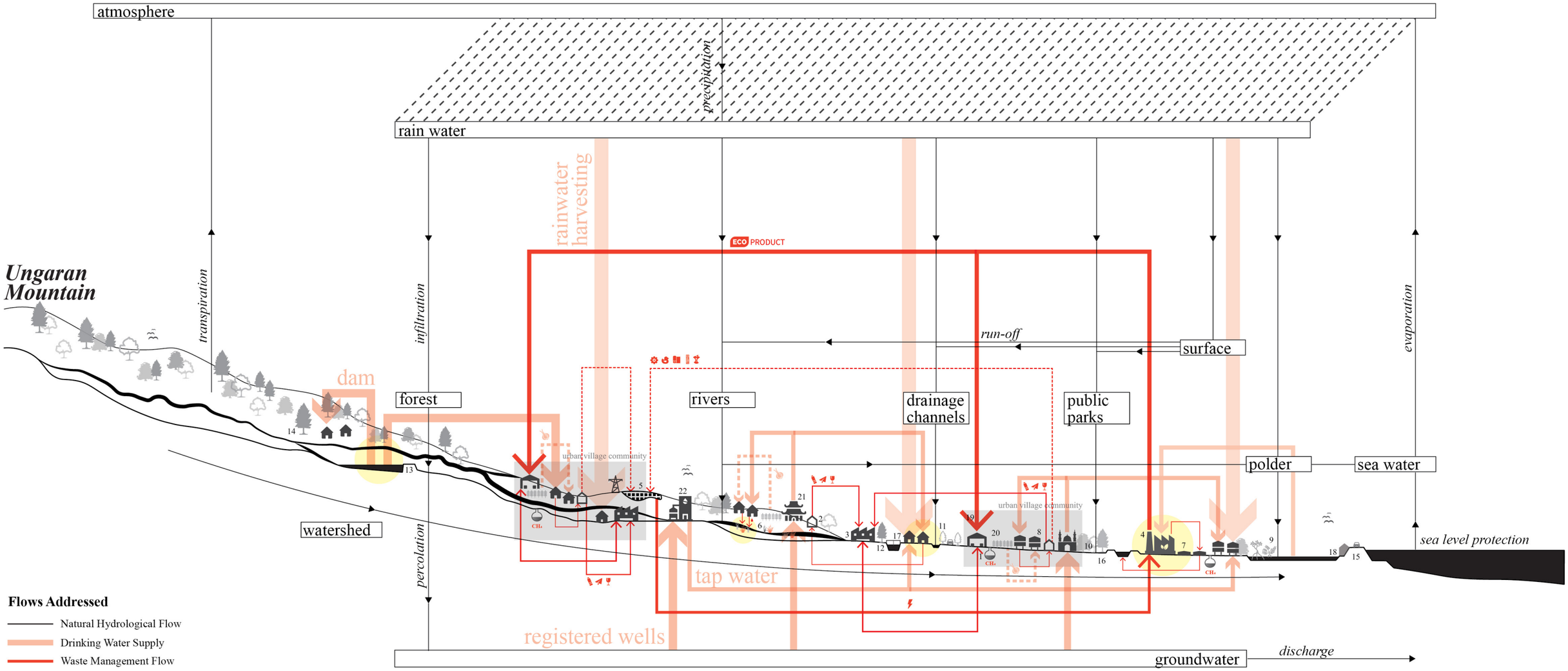


Reservoirs · Urban Permaculture · Waste Bank · Regulated Landfill · Place of Worship · Recycling Points · Community Biodigester · Bio-marketplace · Water Supply Treatment · Helophyte Landscape · Bio-based Industry · Adaptive Housing · Waste Water Treatment · Mangrove

Macro-scale Interventions

Space and Flows

upper hill side — middle hill side — lowland and coastal area

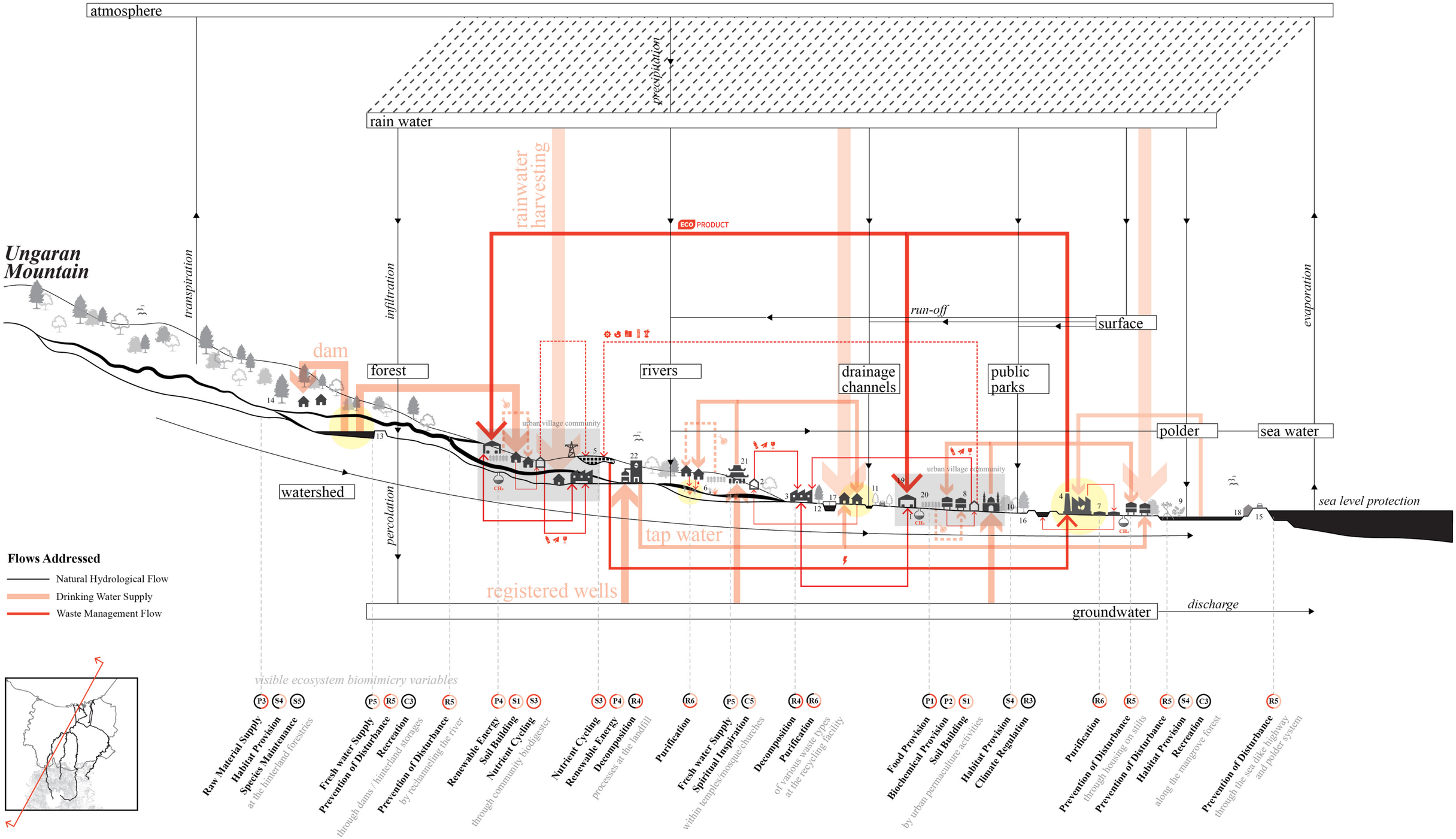


Reservoirs · Urban Permaculture · Waste Bank · Regulated Landfill · Place of Worship · Recycling Points · Community Biodigester · Bio-marketplace · Water Supply Treatment · Helophyte Landscape · Bio-based Industry · Adaptive Housing · Waste Water Treatment · Mangrove

Macro-scale Interventions

Space and Flows

upper hill side | middle hill side | lowland and coastal area



visible ecosystem biomimicry variables

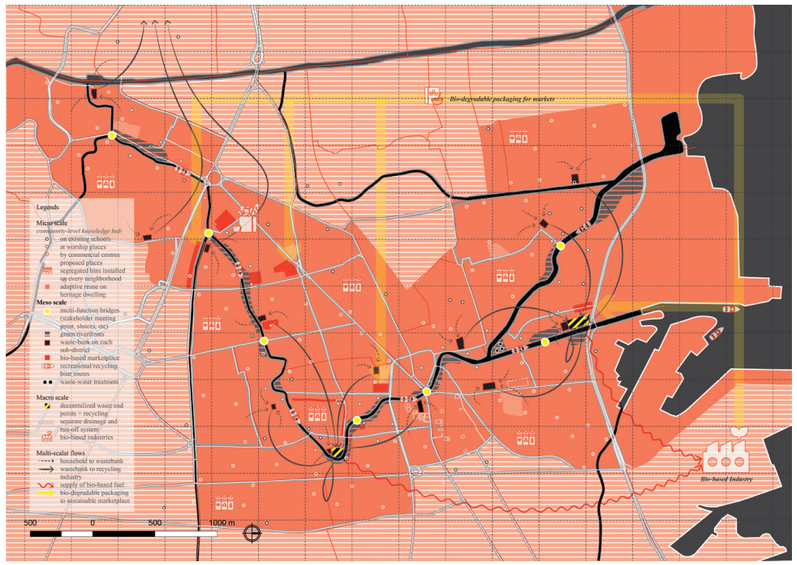
- **Raw Material Supply, Habitat Provision, Species Maintenance** — at the hinterland forestries
- **Fresh water Supply, Prevention of Disturbance, Recreation** — through dams / hinterland storages
- **Prevention of Disturbance** — by rechanneling the river
- **Renewable Energy, Soil Building, Nutrient Cycling** — through community biodigester
- **Nutrient Cycling, Renewable Energy, Decomposition** — processes at the landfill
- **Purification**
- **Fresh water Supply, Spiritual Inspiration** — within temples/mosque/churches
- **Decomposition, Purification** — of various waste types at the recycling facility
- **Food Provision, Biochemical Provision, Soil Building** — by urban permaculture activities
- **Habitat Provision, Climate Regulation**
- **Purification**
- **Prevention of Disturbance** — through housing on stilts
- **Prevention of Disturbance, Habitat Provision, Recreation** — along the mangrove forest
- **Prevention of Disturbance** — through the sea dike highway and polder system

Reservoirs | Urban Permaculture | Waste Bank | Regulated Landfill | Place of Worship | Recycling Points | Community Biodigester | Bio-marketplace | Water Supply Treatment | Helophyte Landscape | Bio-based Industry | Adaptive Housing | Waste Water Treatment | Mangrove

Meso-scale Interventions

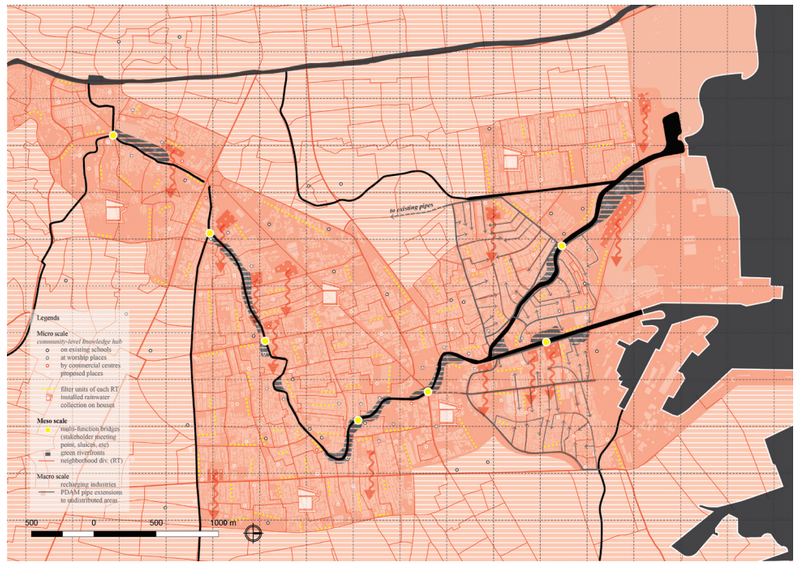
Schematic Masterplan of Semarang River

Purify



Protect

Provide



Masterplan Scenario of Semarang River

Purify, Protect, and Provide Meso-scale Interventions

Legends

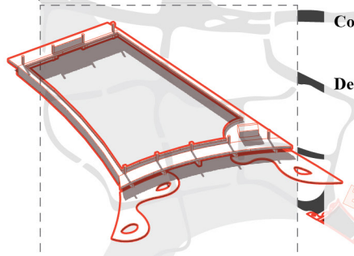
- micro bridges
- bio-based marketplace
- waste banks
- temporary relocation site
- new housing units
- worship places for community water supply
- urban permaculture
- filtration parks
- coastal mangrove
- park and green network
- hard-infra coastal dike

500 0 500 1000 m

The Bridges as Pioneering Projects

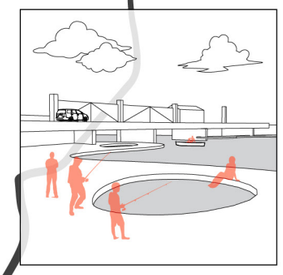
Micro-scale Interventions

9. East Canal Fishing Bay

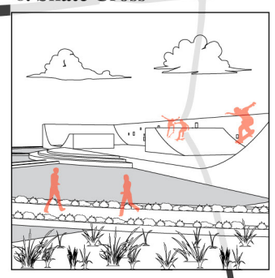


Context:
East Canal opening, residential

Description:
a set of bridge with sluices to control water entering Semarang River whilst provide fishing spots for the citizens

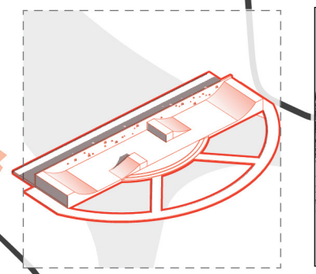


8. Skate Cross

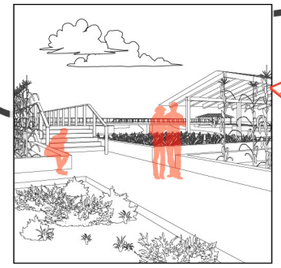


Context:
malls, shops, residential

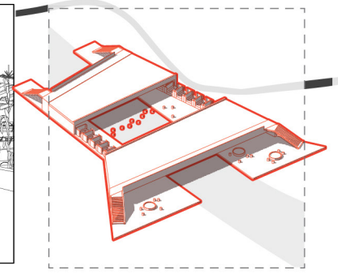
Description:
youth skate park which could be a potential node to promote the urgency of Flush & Splash measures to the youth



5. Tay Kek Sie Harvestry*



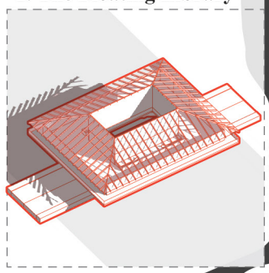
4. Kota Lama Shade

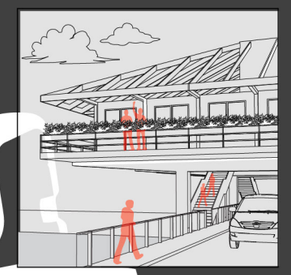


Context:
Kota Lama Heritage Precinct, Governor street

Description:
being the main bridge as an entrance to the historical precinct, the node invites the visitors to enjoy local food stalls at the riverfront underneath

1. The Floating Library





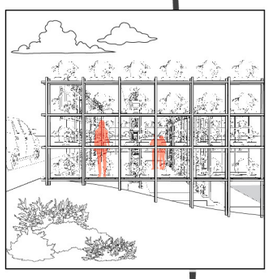
Context:
adaptive social housing, residential

Description:
facilitate educational means to increase the awareness of local hazards

7. Potted Arcade

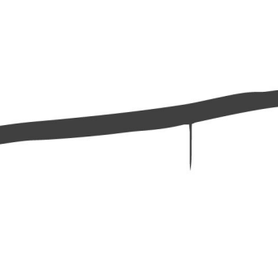
Context:
residential

Description:
promotes innovative urban permaculture within dense region



Context:
market, temple, school, Pecinan

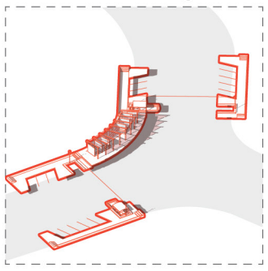
Description:
a node which promotes urban permaculture and circular metabolism flow within the neighborhood

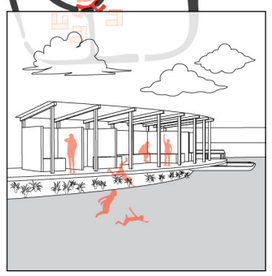


Context:
adaptive social housing, Pecinan, waste bank

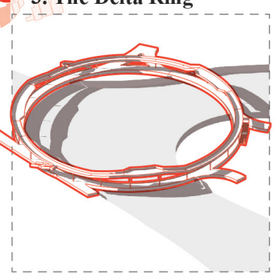
Description:
promote modes of water transport for citizens around Kali Semarang

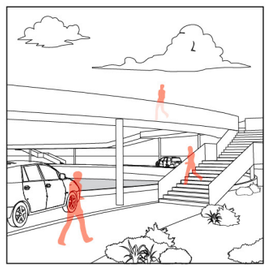
6. Pecinan's Earing*



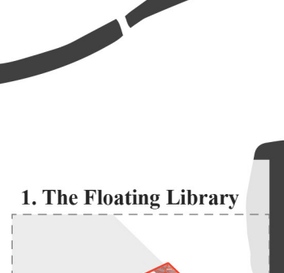


3. The Delta Ring



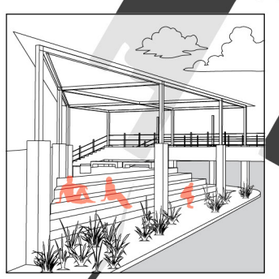


2. Marabunta Pier*



Context:
industrial area, Marabunta recycling centre, social housing

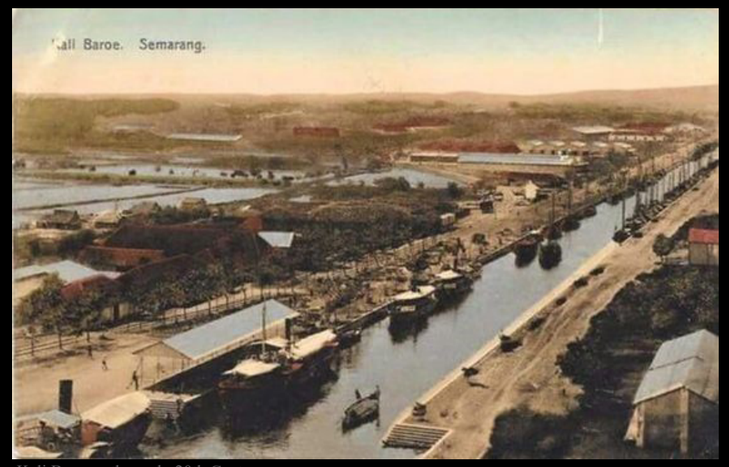
Description:
main stop for the recycling boat which collect solid waste from the river, etc to be delivered to Marabunta recycling centre



Context:
residential, industrial area, park

Description:
a double-layered node which consist of a jogging track for citizens to exercise

Get a closer look!



Kali Baru on the early 20th Century

citizens delivering recycled material to Malang Waste Bank

Tianjin Qiaoyuan phytoremediation urban park

Purify Node: *Marabunta Recycling Pier*

R4 *rechanneling*
PG + MPH + RRA

R4 *resilient housing*
PG + MPH
UVC

C5 *recreate sense of place*

C1 *training centre*
Universities

educate

C4 *spiritual facility*

S3 *waste processing*
PG + MEF + WMD

R5 *waste segregation*
PG + MEF + WMD

PAPER
WASTE BANK
PLASTIC
ORGANIC

P1 *aquaculture*

C3 *recreational marketplace*

enhance

reused water

C6 *helophyte filter*

R4 *city dike*
PG + MPH

R2 R3 *coastal park*

purify node
PG + MEF + FED

C2 *heritage view*
PG + MPH
UVC

P4 *biofuel industries*
PG + MEM

provide renewable energy to sustainable industries

Legend

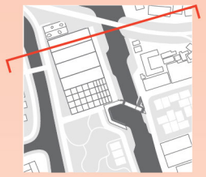
Regenerative Variables in relation to Purify
(see assessment framework)

- (P) - Provisioning
- (S) - Supporting
- (R) - Regulating
- (C) - Cultural

Stakeholders

- PG + MPH - Provincial Government + related Ministries
- UVC - Urban Village Community

Site Sectional Perspective



phytoremediation landscape section

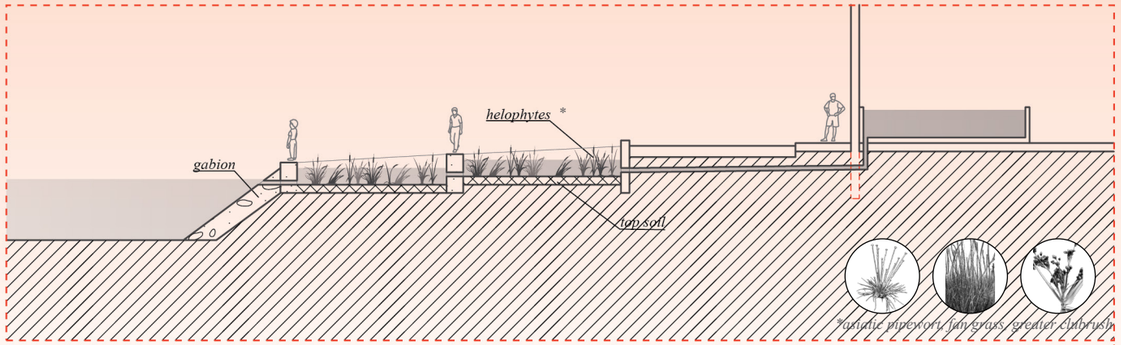


Figure 1: Marabunta zoomed-in waterfront section

waste-bank activities

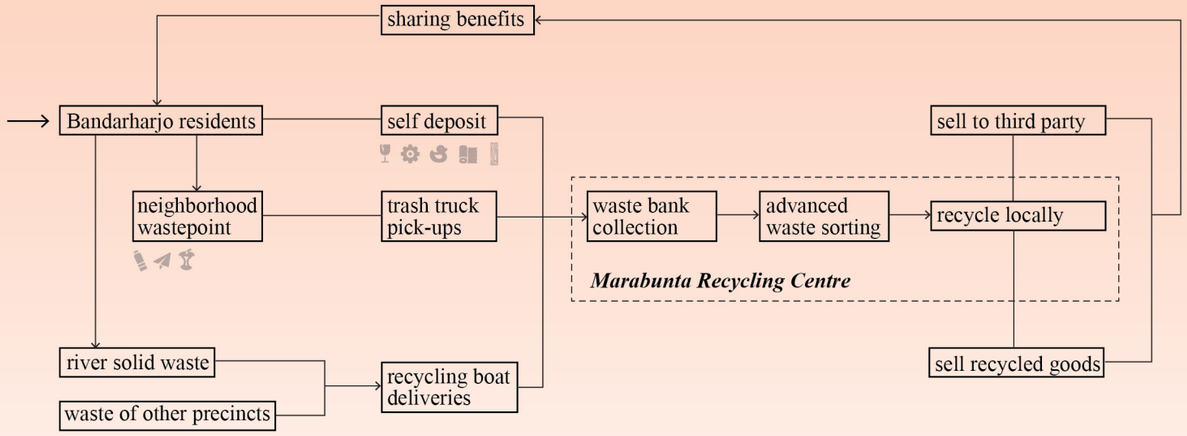
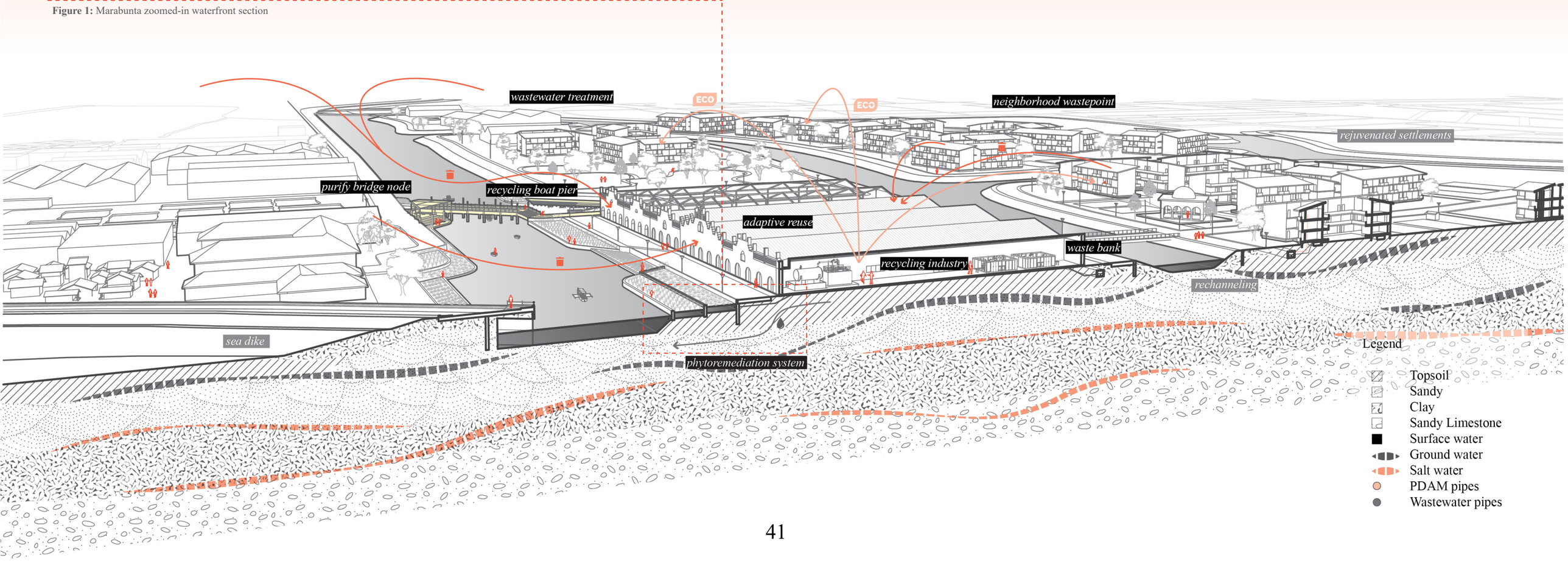


Figure 2: flow-chart of waste bank activities



Purify Node: *Marabunta Recycling Pier*

Kali Baru on the early 20th Century

water sensitive public space at Roombek, Enschede

aerial picture of Schoonship floating housing project in Amsterdam

Protect Node: *Pecinan Island Corner*

R4 P5 *rainwater harvesting*
LWC
Individual Households

C2 *urban-nature balance*

R4 *mounding + erosion resistant plants*
PG + MPH

climate change

C4 *worship corner*

VARIATION A

WASTE BANK

R5 *Pecinan waste bank*
PG + MEF + WMD

C1 *workshop hub*
PG + MPH
UVC

protect node

P5 *adequate space for humans & animals*
PG + MPH
UVC

VARIATION C

R6 *recycling boat*

VARIATION B

P5 *water storage*
LWC
UVC

C5 *waterfront for sense of space*

R4 *rechanneling river*
PG + MPH + RRA

corresponding acts

R4 *raised settlements*
PG + MPH
UVC

P1 *urban permaculture*
PG + MAS
UVC

C2 *city parks*
S5 *habitat for animals*
PG + MEF + WEC

Legend

Regenerative Variables in relation to Protect
(see assessment framework)

- P - Provisioning
- S - Supporting
- R - Regulating
- C - Cultural

Stakeholders

- PG + MPH - Provincial Government + related Ministries
- UVC - Urban Village Community
- LWC - Local Water Company

Site Sectional Perspective

mounding phases

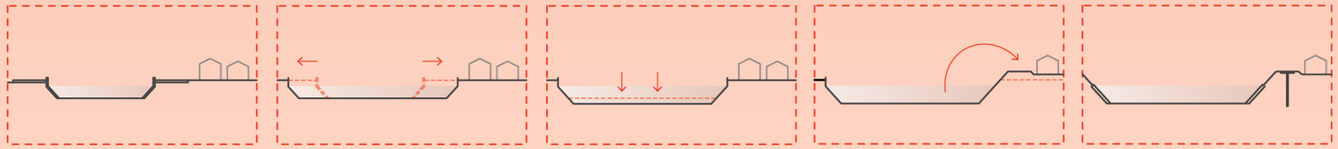


Figure 4: mounding stages of Semarang River

water transport system

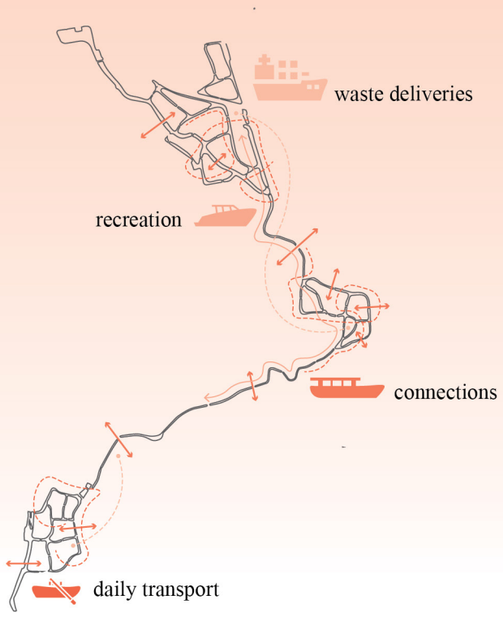
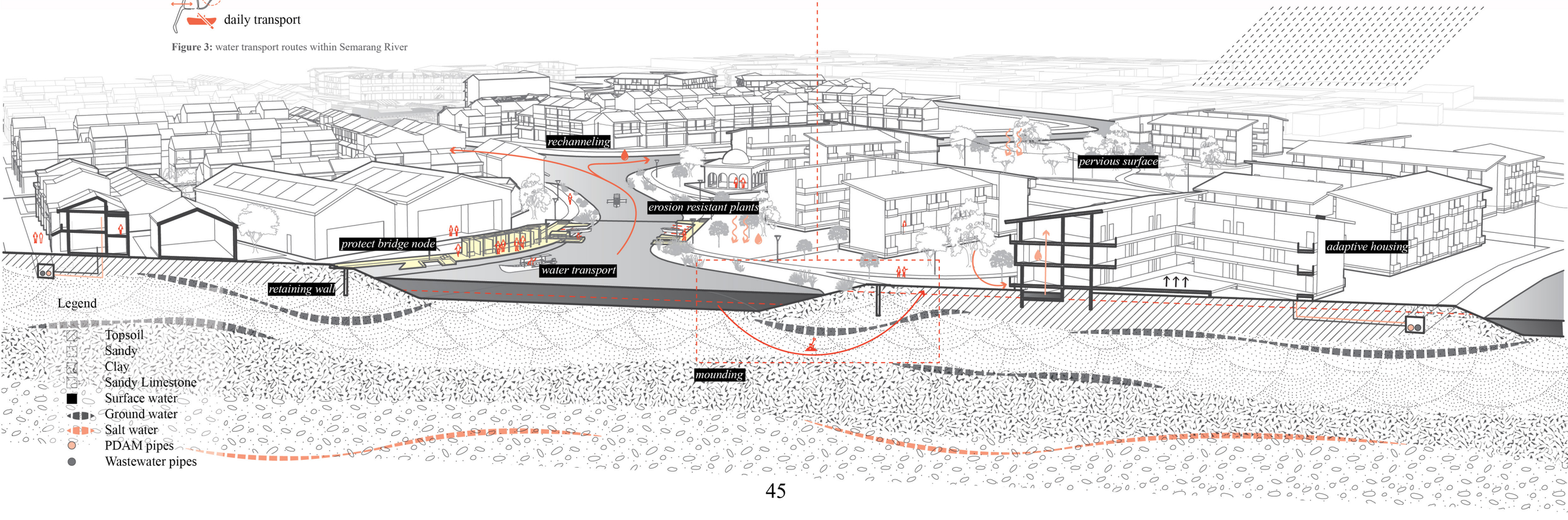


Figure 3: water transport routes within Semarang River

adaptive housing elements

Figure 5: requirements of an adaptive housing settlements
sources:
Elemental Project, Alejandro Aravena - https://www.dezeen.com/2016/01/13/key-projects-by-2016-pritzker-prize-laureate-alejandro-aravena-elemental/amp/
Baan Non Bua School, Junsekino Architect and Design - https://www.archdaily.com/776074/baan-nong-bua-school-junsekino-architect-and-design



Protect Node: *Pecinan Island Corner*

Urban permaculture landscape by Thomas Chung in Shenzhen, China

Provide Node: *Tay Kek Sie Harvestry*

C4 *Tay Kek Sie Temple enrichment*
UVC + Temple Community

R5 *market biodigester*
P4 *compost fuel*
UVC + market cooperation

to maintain

operate fuel

P5 *controlled provision of fresh water*
LWC
UVC + Temple Community

C1 *educational workshops*
School Community

to maintain

P2 *biomedical plants*

P1 *aquaponic*
PG + MA
UVC

R6 *filter plants*

provide node
PG + MPH

to market

C5 *viewpoint*

S4 *fish pond*

P1 *urban permaculture*

P4 *rechanneling river*
PG + MPH + RRA

S4 *balcony plants*

R4 *rainwater harvesting*
LWC
Individual

Legend

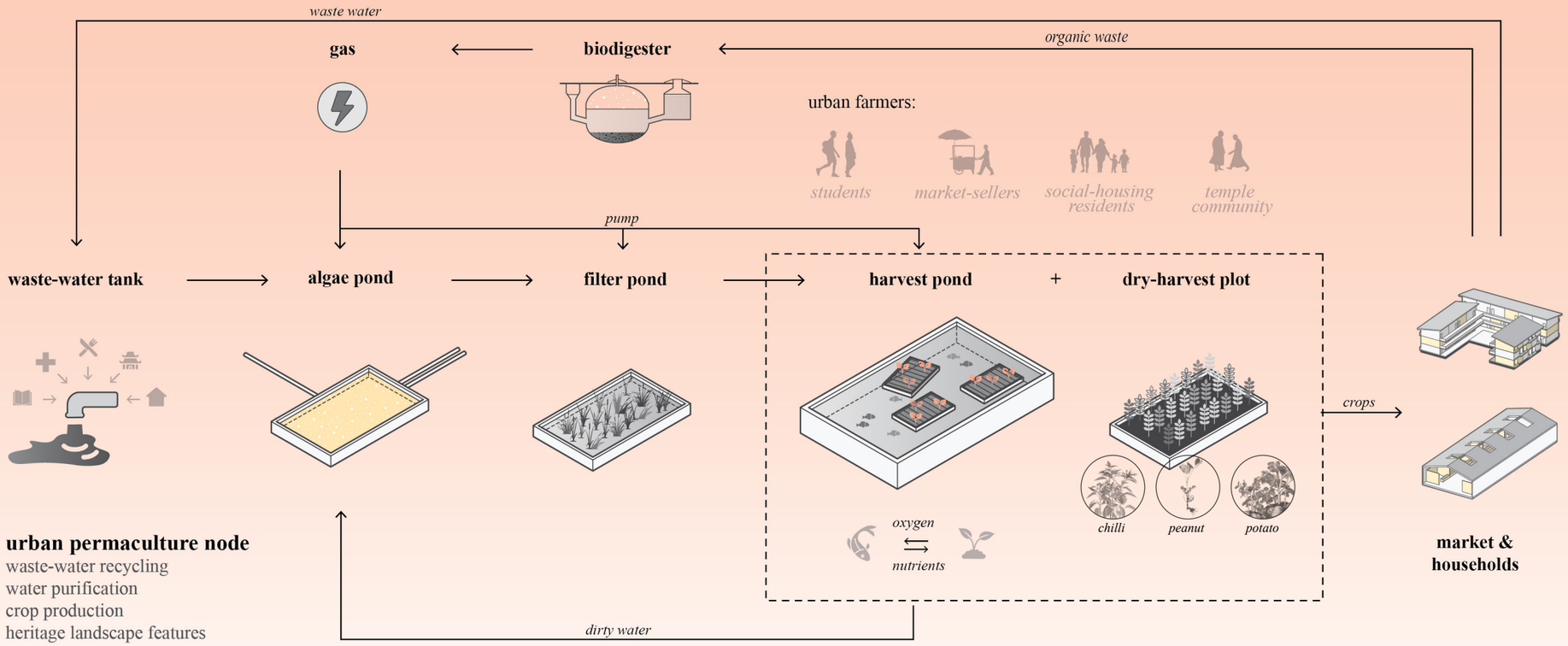
Regenerative Variables in relation to Provide
(see assessment framework)

- P - Provisioning
- S - Supporting
- R - Regulating
- C - Cultural

Stakeholders

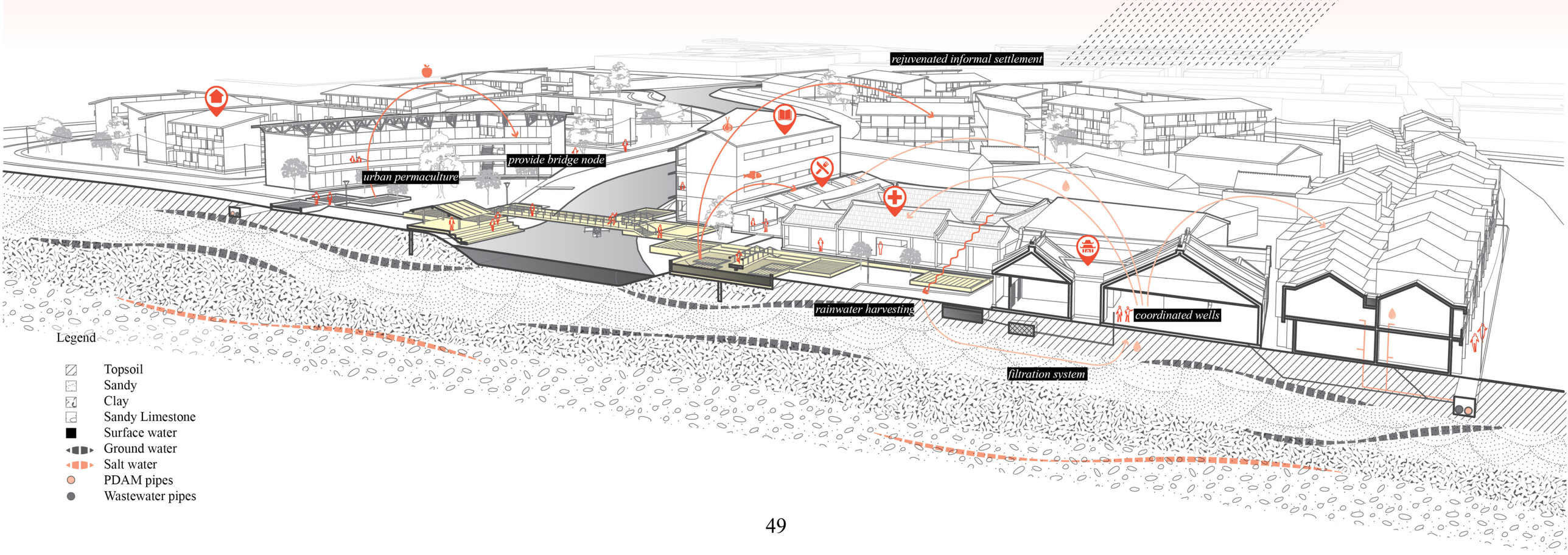
- PG + MPH - Provincial Government + related Ministries
- UVC - Urban Village Community
- LWC - Local Water Company

Site Sectional Perspective

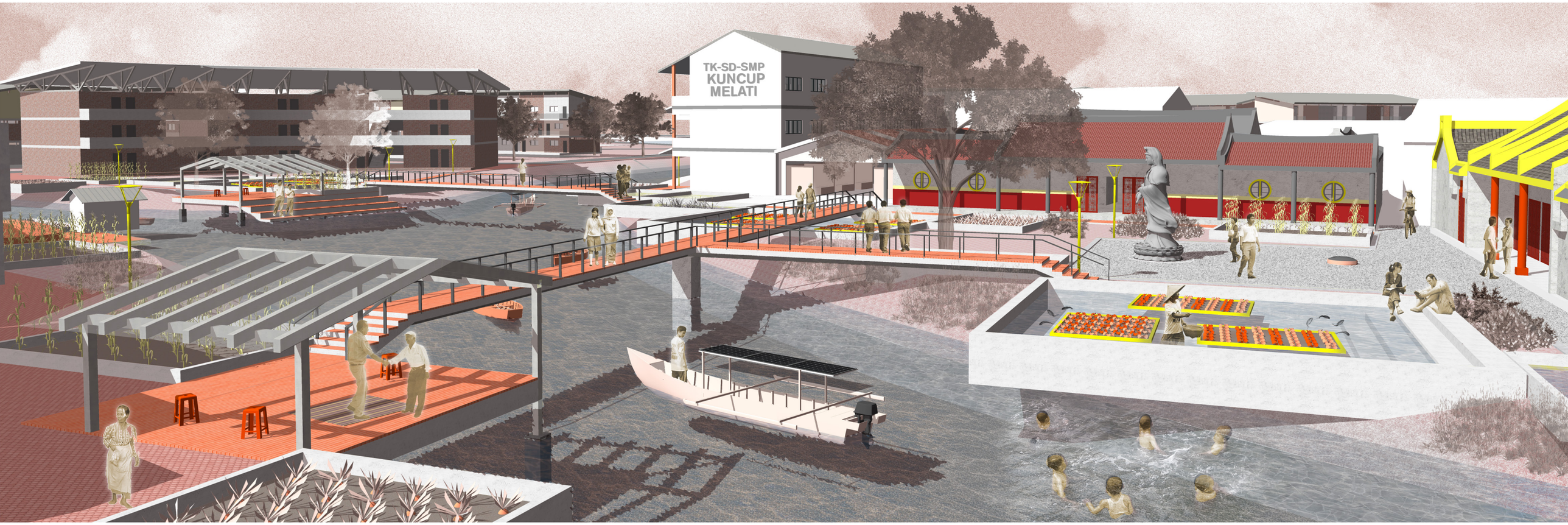


urban permaculture node
waste-water recycling
water purification
crop production
heritage landscape features

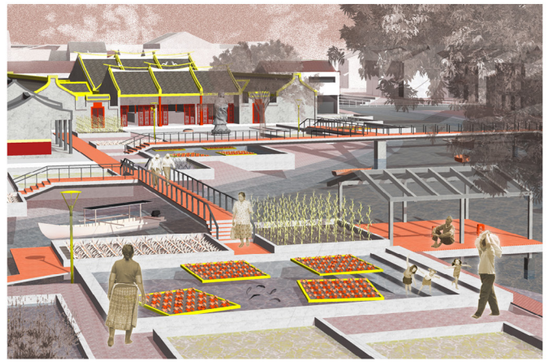
Figure 6: circular food provisioning supply at

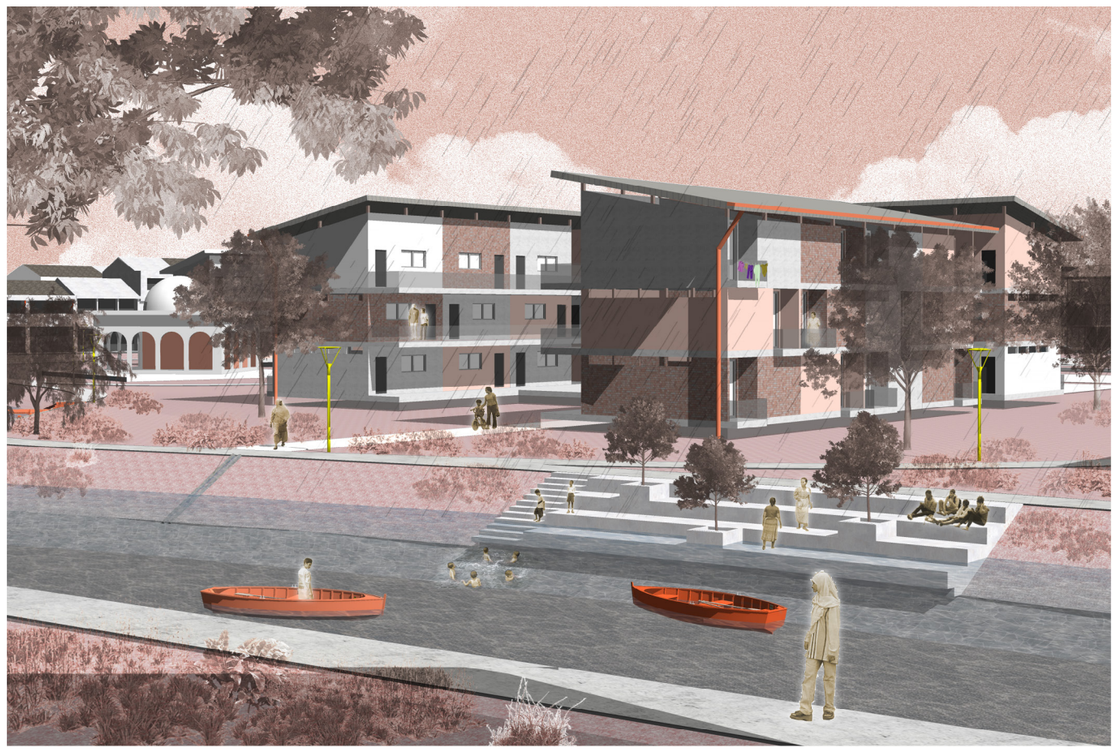


Provide Node: *Tay Kek Sie Harvestry*



Flush and Splash Sceneries





Flush and Splash Sceneries

Increased value of heritage sites

A clean Semarang watershed

Possibility of housing-on-stilts

Water as a new common ground

Bankability through recycled materials

Waste Type	Percentage	Amount per Year in Tonnes	Highest Price Paid / Tonnes*	Highest Total Market Value
	10,96%	48.004,80	Rp. 3.500.000,- € 218,75	Rp. 168.017.000.000,00 € 10.501.050,10
	16,28%	71.306,40	Rp. 1.250.000,- € 78,13	Rp. 89.133.000.000,00 € 5.570.812,50
	1,28%	5.606,40	Rp. 7.500.000,- € 468,75	Rp. 42.048.000.000,00 € 2.628.000,00
	1,78%	7.796,40	Rp. 125.000,- € 7,81	Rp. 974.550.000,00 € 60.909,36
				Rp. 300.019.111.077,-

$$\frac{300.019.111.077 \times 10\%}{1.288.084 \textit{ citizens of Semarang} \times 4.14\% \text{ living below poverty}}$$

Rp. 562.928,58 / year / person
(€ 35,18)

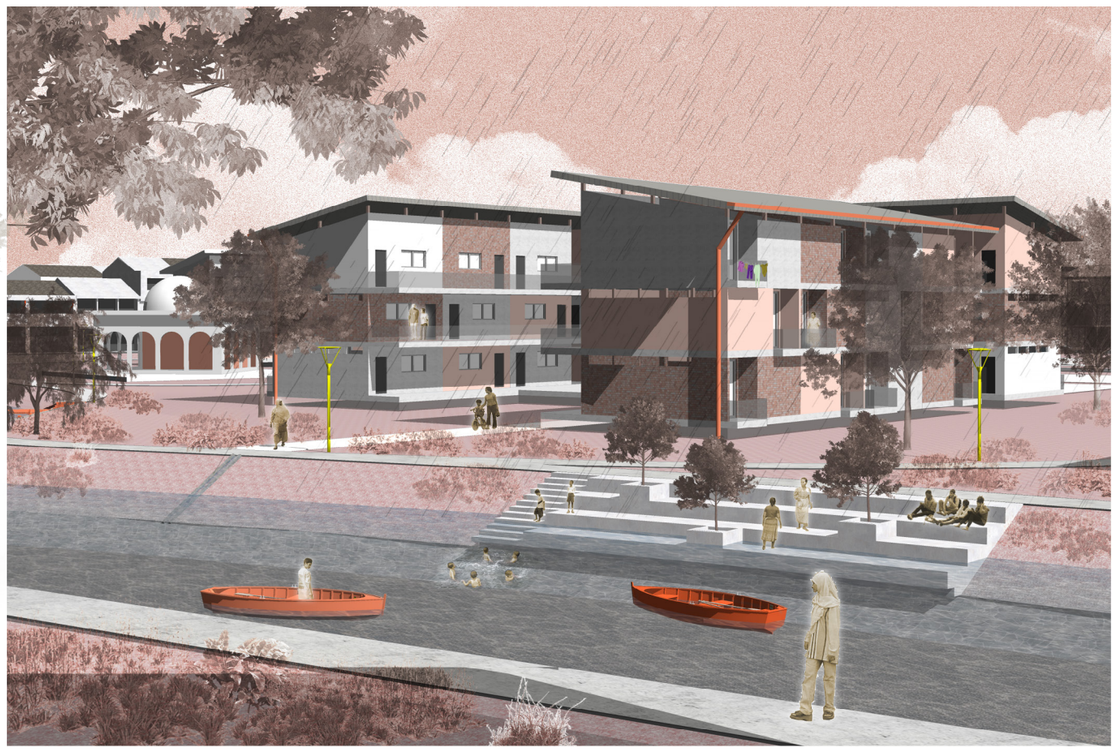
Flush and Splash Sceneries

Oneness of urban and nature

Encourage biodiversity

An added value of ecosystem provisioning service

Safer settlements



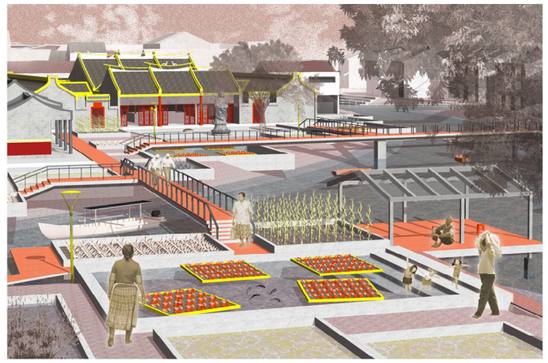
Flush and Splash Sceneries

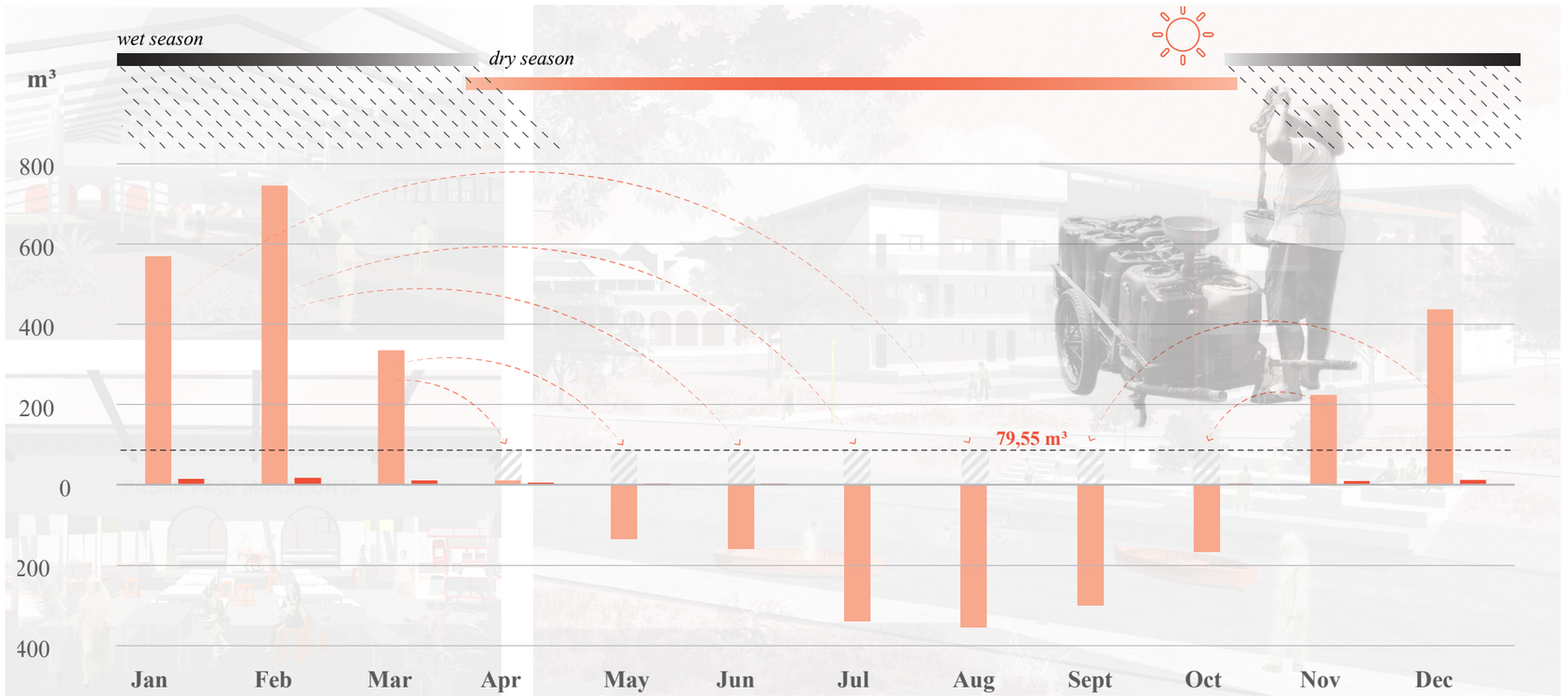
More stable ground

Clean water access for all

Increased value of heritage sites

An added value of ecosystem provisioning service





How to ensure the involvement of Local Community?

Stakeholder Engagements

Division of Roles

	Historical Values	*Communication*	*Ability to Act*	*Accessibility*
Central Government *Ministry of Environment and Forestry, Ministry of Public Works and Human Settlements, Ministry of Spatial Planning, Ministry of Agriculture, etc*	provide contextual participatory excercise guidelines	provide contextual participatory excercise guidelines address Regenerative Capacity framework	primary investment manage macro-meso infrastructure project	
Provincial Government *Structural officials of the province, district, and sub-district; Management of Sub-district Community Empowerment Institution (LPMK); members of People's Representative Council (DPRD) in Semarang; Provincial Level of Related Ministry*	archiving relevant content	inform and monitor participatory excercise coordinate with local private institutions	assessing site Regenerative Capacity manage meso-micro infrastructure project	
Private Institutions *NGO, hospitals, bank, developers, universities, schools*	relevant experties to research related content	coorporate social responsibility educational service broadcasting media	coorporate social responsibility funds	
Urban Village Community (RT/RW) *respective Urban Village committee, representatives of the sub-district Self-Supporting Body (BKM), community organizations or institutions at the sub-district to Urban Village level (Religious Assemblies, Karang Taruna, Posyandu cadre, Village Children Forum, PKK, PAUD Pos Management, Healthy Village Working Group, Village Elderly Regional Commission, etc)*	collecting information on the local tradition of water management	conduct and report results of participatory excercise coordinate gathering workshops	maintenance of facility *'gotong-royong'* construction of infrastructure	
Individual *representatives of poor citizens, professionals (teachers, doctors, entrepreneurs, etc.), local shop owners, student in school committees , religious leader, women leader of the Urban Village area concerned*	participate on design suggestions based on urgent needs and cultural tradition	attend the gathering workshops give design feedbacks	participate on design suggestions based on urgent needs and cultural tradition participate on assigned duty / job vacancy	

common graound facility: flush & splash project nodes

Participatory Planning Flow

Division of Roles

Purify

Protect

Provide

The flow highlights the events where there are strong engagements with the urban village community, whiile simultaneously showcasing how the stakeholders from the other layers could contribute to the participatory planning.

Central Government
Related ministries (see page 46)

Provincial Government

- HPG head of provincial govt.
- HCG head of city govt.
- LP community empowerment
- DPR people representative council

Private Institutions

- GIA geospatial info agency
- NDM disaster management
- LWC local water company
- NGO non-govt organisation
- HOS hospital
- DEV developers
- UNI university
- UD urban designers

Urban Village Community (RT/RW)

- UVC urban village committee
- RA religious assemblies
- KT karang taruna *youth organisation*
- PC posyandu cadre *health clinics*
- VCF village children forum

Individual

- LR local residents

Participatory Planning Flow

Division of Roles	*Construction of Project Nodes*	*Community Education*
Purify	MF MPH HCG UD	LP UNI NGO UVC LR
Protect	MF MPH HCG UD	LP UNI NGO NDM UVC LR
Provide	MF MPH HCG UD	LP UNI NGO LWC UVC LR

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Central Government *Related ministries (see page 46)*

MEF MNP EFP MAS CCC SPD WMD MPH WEC WRD RPF RRA PED MA MEM MF MHA

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UD urban designers

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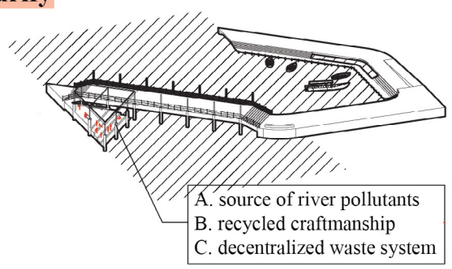
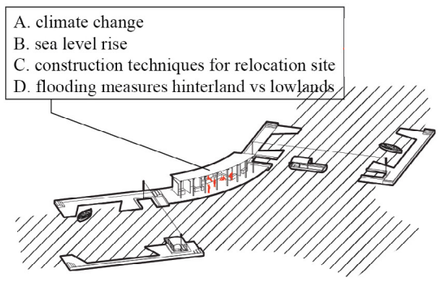
Individual

LR local residents

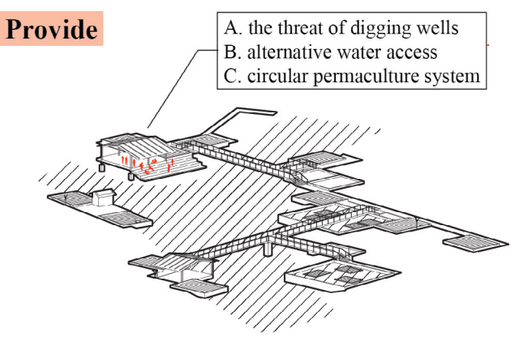
Purify



Protect



Provide



Participatory Planning Flow

Division of Roles	Construction of Project Nodes	Community Education	Participatory Exercise
Purify	MF MPH HCG UD	LP UNI NGO UVC LR	MNP MEF WMD PED UNI UD	UNI UD UVC PC KT RA VCF LR
Protect	MF MPH HCG UD	LP UNI NGO NDM UVC LR	MNP MPH RRA MAS SPD UNI UD	UNI UD DEV UVC PC KT RA VCF LR
Provide	MF MPH HCG UD	LP UNI NGO LWC UVC LR	MNP MEM MA MEF WEC UNI UD	UNI UD LWC UVC PC KT RA VCF LR

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Central Government *Provincial Government*

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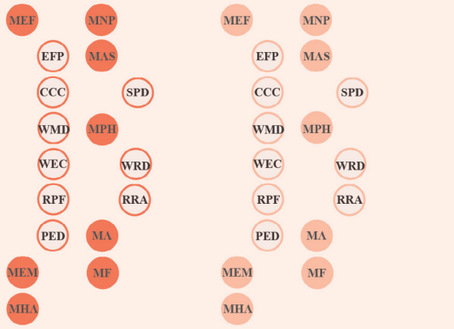

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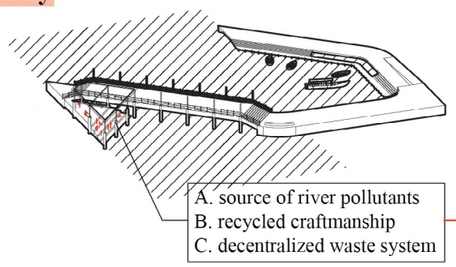
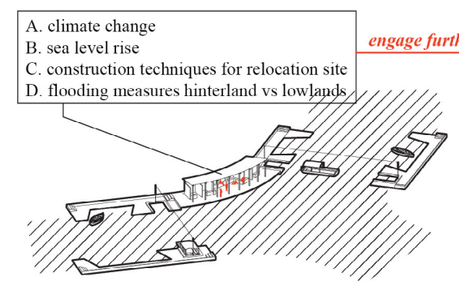
Individual

LR local residents

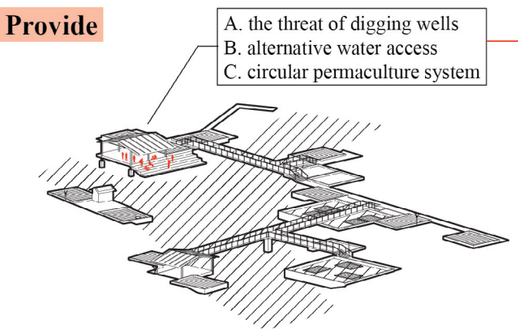
Purify



Protect

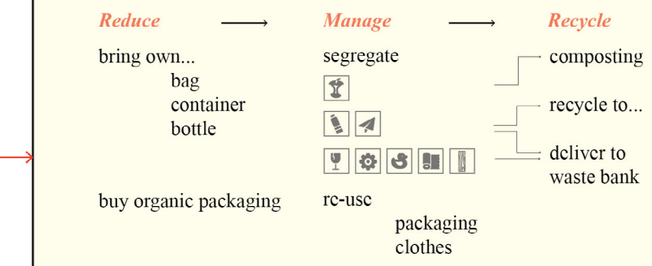


Provide

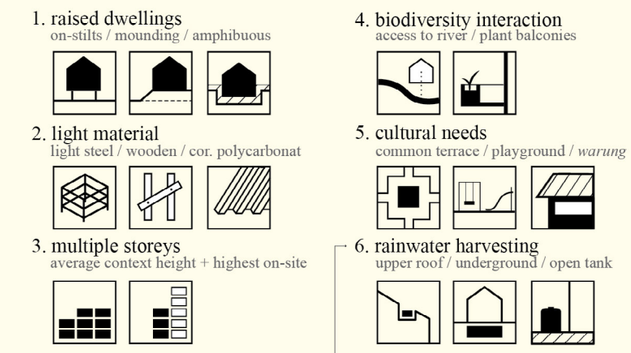


Participatory Exercise Toolkit

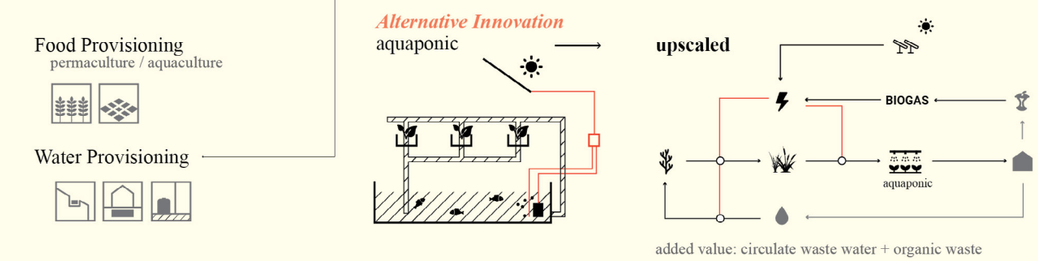
Understanding Household Metabolism



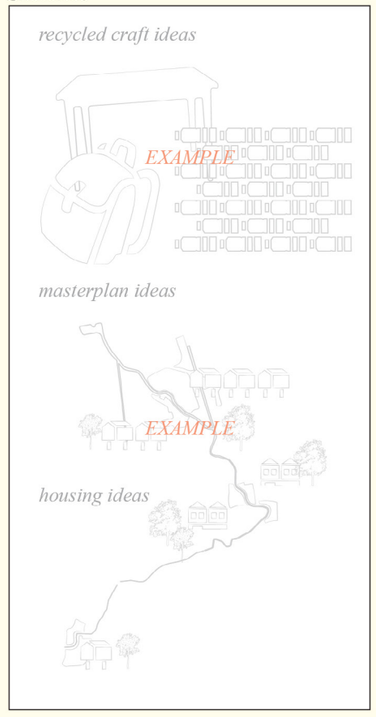
Resilient Neighborhood Toolkit



Urban Permaculture Toolkit



Sketches



Participatory Planning Flow

Participatory Exercise

Construction of Extended Measures

MNP MEF WMD PED UNI UD	UNI UD UVC PC KT RA VCF LR	MF MEF WMD MAS SPD UD KT LR	
MNP MPH RRA MAS SPD UNI UD	UNI UD DEV UVC PC KT RA VCF LR	MF MEF RPF MPH RRA MAS SPD UD DEV KT LR	
MNP MEM MA MEF WEC UNI UD	UNI UD LWC UVC PC KT RA VCF LR	MF MEF WEC MA MAS SPD UD KT LR	

Participatory Exercise Toolkit

Understanding Household Metabolism

Reduce → *Manage* → *Recycle*

bring own...
- bag
- container
- bottle

buy organic packaging

segregate

re-use
- packaging
- clothes

recycle to...
- composting
- deliver to waste bank

Resilient Neighborhood Toolkit

1. raised dwellings
   on-stilts / mounding / amphibuous
2. light material
   light steel / wooden / cor. polycarbonat
3. multiple storeys
   average context height + highest on-site
4. biodiversity interaction
   access to river / plant balconies
5. cultural needs
   common terrace / playground / *warung*
6. rainwater harvesting
   upper roof / underground / open tank

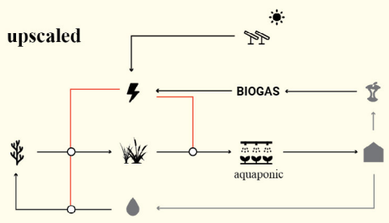
Urban Permaculture Toolkit

Food Provisioning
permaculture / aquaculture

Water Provisioning

Alternative Innovation
aquaponic

upscaled



added value: circulate waste water + organic waste

Sketches

recycled craft ideas

EXAMPLE

masterplan ideas

EXAMPLE

housing ideas

input & finalize

- waste bank
- recycling industries
- filtration parks
- separate run-off and waste water
- drainage revitalisation
- build temporary & new housings
- rechanneling the city
- compound & city parks
- apply rainwater harvesting at existing houses
- allocating urban permaculture landuse

**more measures om strategy chapter*

Participatory Planning Flow

Participatory Exercise

Construction of Extended Measures

Conduct Duties

Participatory Exercise			Construction of Extended Measures		Conduct Duties
MNP MEF WMD PED	UNI UD	UNI UD UVC PC KT RA VCF LR	MF MEF WMD	MAS SPD UD KT LR	MNP LP UVC LR
MNP MPH RRA	MAS SPD UNI UD	UNI UD DEV UVC PC KT RA VCF LR	MF MEF RPF MPH RRA	MAS SPD UD DEV KT LR	MNP LP UVC LR
MNP MEM	MA MEF WEC UNI UD	UNI UD LWC UVC PC KT RA VCF LR	MF MEF WEC MA	MAS SPD UD KT LR	MNP LP UVC LR

Participatory Exercise Toolkit

Understanding Household Metabolism

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- bring own...
  - bag
  - container
  - bottle
- buy organic packaging
- segregate
- re-use
  - packaging
  - clothes
- composting
- recycle to...
- deliver to waste bank

Resilient Neighborhood Toolkit

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Urban Permaculture Toolkit

- Food Provisioning
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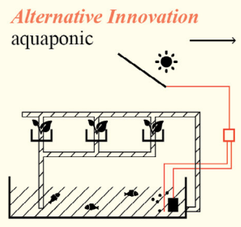
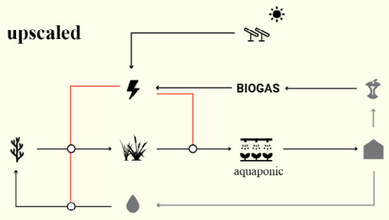
- Water Provisioning

Alternative Innovation
aquaponic



upscaled



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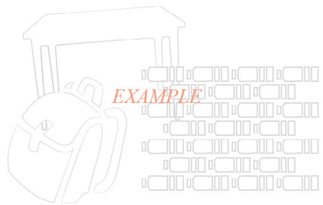
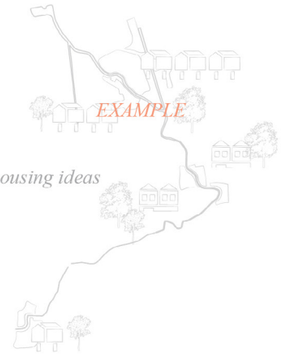


masterplan ideas



housing ideas

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weekly citizens duty

M	in-house waste segregation*
T	paper waste pick-up
W	organic waste pick-up
T	monthly control gathering
F	recycling labour training
S	waste bank collection**
S	craftmanship workshop***

* *everyday*
** *for other types of waste*
*** *optional*

- drainage revitalisation
- build temporary & new housings
- rechanneling the city
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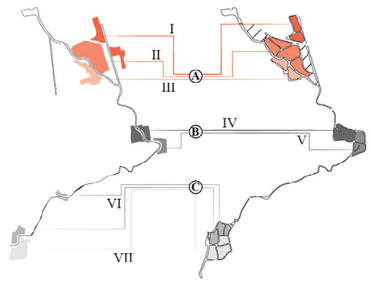
temporary relocation procedure



- apply rainwater harvesting at existing houses
- allocating urban permaculture landuse

alternative water supply

November - April	May - October
170-250l/day @ 2m³ tank	10-90l/day @ 2m³ tank
self rain water harvesting	extra weekly collection at community centre / worship centres

**more measures om strategy chapter*

→ infrastructure maintenance by locals

Participatory Planning Flow

Participatory Exercise | **Construction of Extended Measures** | **Conduct Duties** | **Local Benefits**

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Urban Permaculture Toolkit

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permaculture / aquaculture

Water Provisioning

Alternative Innovation
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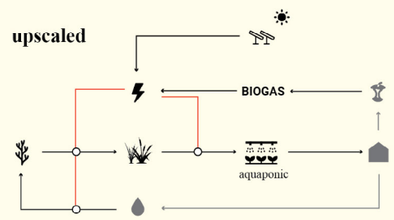
upscaled



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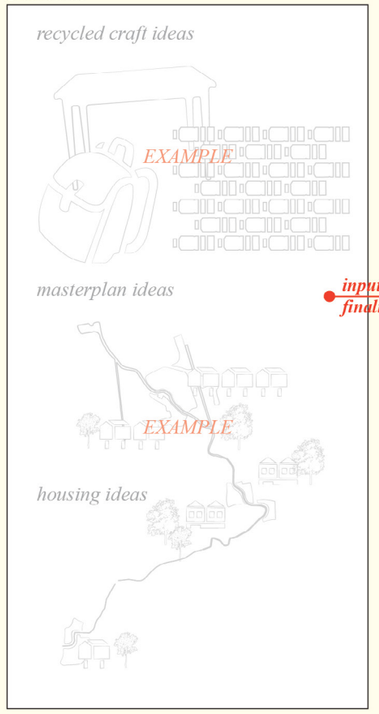

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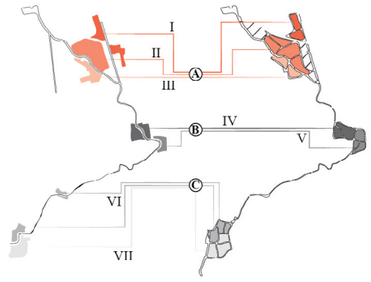

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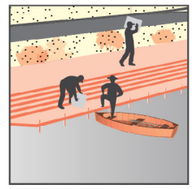
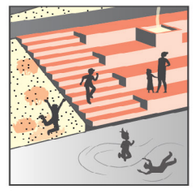
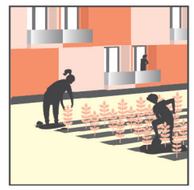
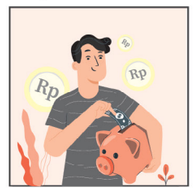
infrastructure maintenance by locals


job vacancy


hygienic environment

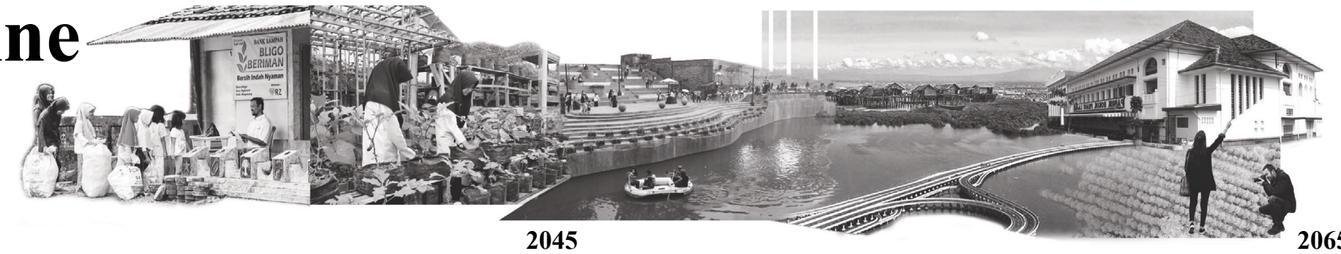

better shelter and living quality


lower carbon footprints



saves long-term expenditure

Flush and Splash Actions Timeline



2020 | 2021 | 2025 | 2045 | 2065

micro-centred interventions — *meso chain focus* — *extended macro interventions*

Purify

- recycling boat project — MEF WMD HCG
- install community biodigester — LP NGO UVC
- exercise the pioneering nodes — MPH
- waste-bank on each urban villages — MEF WMD
- run conservation and re-use heritage dwellings — UD DEV
- shift to circular marketplace — MA MEM
- install different pipings for waste-water and runoff — MPH WRD
- enrich riverbanks with helophyte landscape — MEF WEC
- landfill gas product as alternative energy — MEM
- shift industries to run with biomass — MEM
- add branches of waste-water treatment — MEF PED

→ *established decentralized waste management system*

→ *achieve market circularity*

Protect

- monitoring of city drainage system — HCG MPH
- exercise the pioneering nodes — MPH
- monitoring of protected hinterland forestry — MAS SPD MEF RPF
- establish water transport network — HCG
- temporary relocation of informal settlements — MPH MAS SPD DEV NGO UD
- expanding city green network — MEF RPF MPH
- reconstruction of vulnerable housing — MPH MAS SPD DEV NGO UD
- conserve and extend land for mangrove coastal protection — MEF RPF MPH
- rechanneling the city blue networks — MPH RRA MAS SPD MEF RPF
- extend and transform Semarang River edges to productive riverfronts — MPH RRA UD
- execution of Semarang sea dike highway — MPH
- city greeneries achieve 40% KDH

→ *flood resilient environment*

→ ***REGENERATIVE CAPACITY VISION***

→ *self-sustaining community*

Provide

- allocate community centres/worship sites on each urban villages for authorized groundwater resource — MEF WEC
- exercise the pioneering nodes — MPH
- socialize rainwater harvesting — LWC NGO
- activate riverside permaculture activities — MA UVC
- install rainwater harvesting equipment on neighborhoods — LWC UVC
- extend PDAM networks to uncovered areas — LWC MPH WRD
- stages of construction of hinterland water-retentions — MPH
- expand chain to urban village permaculture clusters — MA UVC
- enforce law for industries to use harvested water and recharging back the aquifer — MEF + INDUSTRIES

Participate

- design exercise with the community + build with community + continuous maintenance by the locals @ each strategies — UD UVC LR
- conduct local workshops for waste and river management — NGO UNI LR
- job shift to waste management sector — MEF WMD LR
- job shift to tourism sector — HCG LR

direct actions with the locals

- socialize regenerative framework — UD UNI LR
- collaborative research for contextual regenerative development — UNI LR UVC

Planning Regulation and Policy (Suggested Focus)

RPJPD 2006-2025

proposal preparation — UD

thorough cost-benefit analysis for strategies — MF

RPJMD 2021-2025

strengthen and fund research sector for regenerative development
regenerative capacity assessment must be conducted for projects

@ RTRW (Spatial Planning)
allocate zoning for waste banks
allocate zoning for riverside permaculture
allocate zoning for protected hinterland forestry
allocate zoning of vulnerable settlements

RPJPD 2026-2045

manage coorporate social responsibility to conduct research and funding towards regenerative development
strengthen policies upon circular waste management: bio-degradable packaging, community fines, operate waste banks
planning guidelines on temporary relocation and housing rejuvenation
planning guidelines for a reduced ecological footprints of food and water consumption

RPJMD 2026-2030

allocate maintenance duty for infrastructure within the Urban Village

@ RTRW
informal settlements rejuvenation planning

RPJMD 2031-2035

regenerative assessment mid-evaluation I

@ RTRW
extended river networks expand zoning for mangrove forest

RPJMD 2036-2040

@ RTRW
review the necessity and plan extensive hinterland water retentions

RPJMD 2041-2045

regenerative assessment evaluation I

@ RTRW
review the necessity for sea dike planning

RPJPD 2046-2065

review regenerative assessment evaluation and conduct adjustment
exercise laws for renewable energy source
strive for the standards of World Heritage Nomination (align with https://whc.unesco.org/en/hul/)

RPJMD 2046-2050

emphasize maintenance planning of urban water infrastructures

RPJMD 2051-2055

regenerative assessment mid-evaluation II

allow shift focus to tourism planning

RPJMD 2056-2060

plan the network for other alternative renewable energies (e.g: hydraulic energy)

RPJMD 2061-2065

regenerative assessment evaluation II

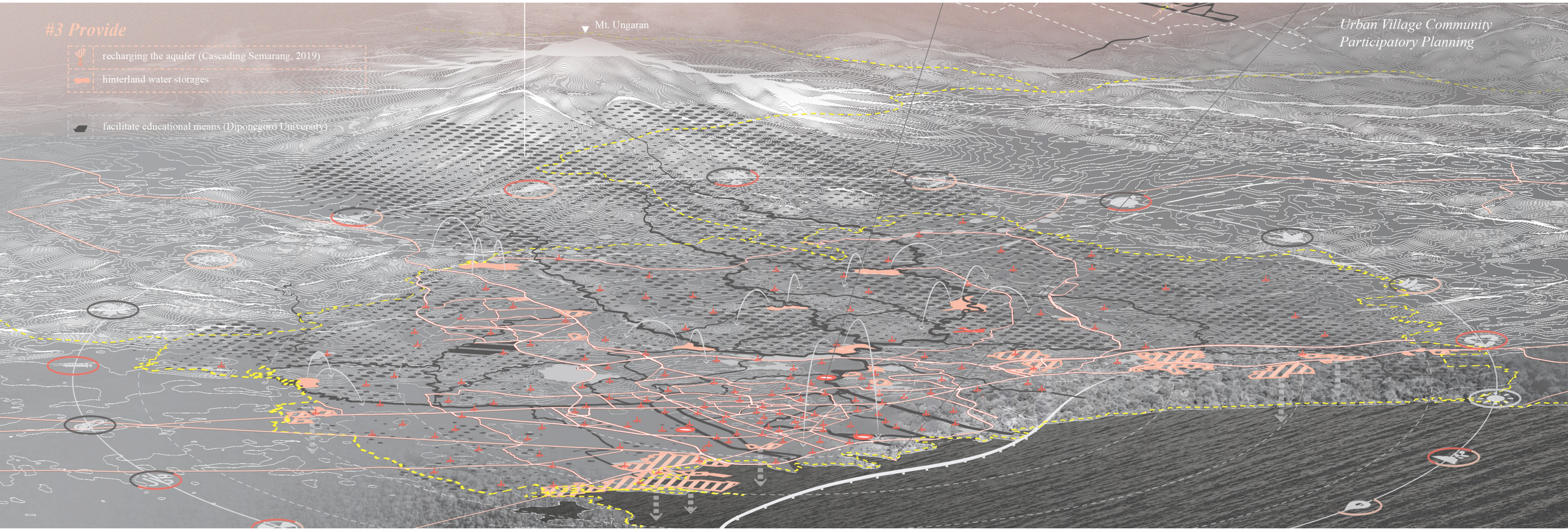
Rencana Pembangunan Jarak Panjang Daerah (RPJPD) - Long Term Development Planning of Semarang City

Rencana Pembangunan Jarak Menengah Daerah (RPJMD) - Medium Term Development Planning of Semarang City

Yearly Guidelines on the Implementation of Community Participatory Planning; *see previous page*

Summarizing Flush & Splash...

Conclusions



Problem

i. land subsidence
ii. coastal, pluvial, fluvial flooding
iii. low water quality
iv. poor urban water management

++

v. lack of awareness
vi. insufficient financial support
vii. current measures create separation between the natural and the cultural element

how to establish closer relationship between the human activities and the ecosystem services in developing countries?

Guiding Theory

risk = (hazard x vulnerability) / coping capacity

regenerative capacity > coping capacity
landscape infrastructure > hard infrastructures

ecosystem services and **socio-ecological resilience** as assessment variables of regenerative capacity.

Goal

healthy environment, safe, and self-sustaining community

Design Approach

Flush and Splash
(1) ***Purify*** (waste management)
(2) P*rotect* (NBS flood defenses)
(3) P*rovide* (alternative water supply)
across various urban design layers and scales within the city

multifunctional bridges at Kali Semarang as **pioneering interventions**

Implementation

participatory planning at the nodes

>>

extended measures by a group of professional stakeholders

What More to Explore?

execute a demo of participatory planning to create stronger design argument

observe the project replicability to other areas with similar risk

#1 Purify

- urban villages waste management and recycling centres
- grey water treatment centres
- separate run-off and waste-water system

#2 Protect

- rechanneling the city (Cascading Semarang, 2019)
- protect hinterland greeneries & maximize empty plot on city
- add mangrove coastal protection
- hinterland water storages
- sea dike

#3 Provide

- recharging the aquifer (Cascading Semarang, 2019)
- hinterland water storages
- facilitate educational means (Diponegoro University)

Multi-scalar Strategies

Micro
Multifunctional bridges as pioneering interventions

Meso
Landscape infrastructure projects along Semarang River

Macro
Regenerative interventions throughout Semarang City

Pioneering Nodes

Semarang River

Mt. Ungaran

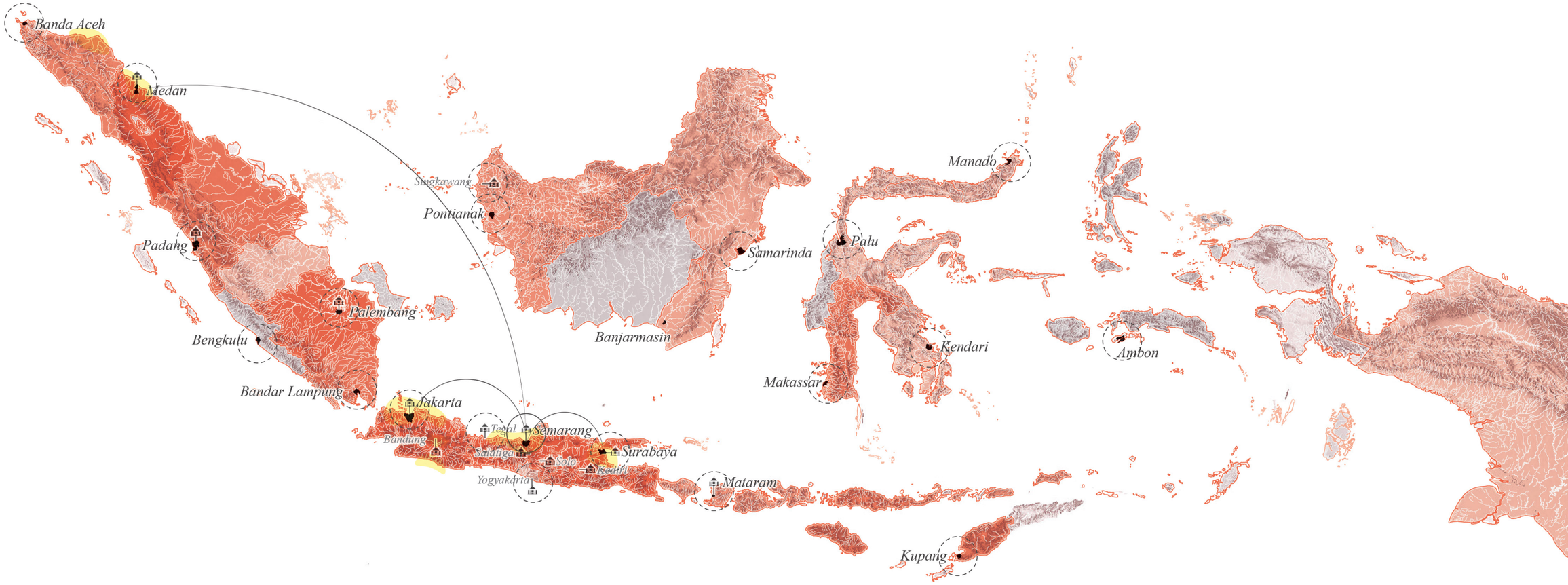
Urban Village Community Participatory Planning

Regenerative Capacity Framework

Replicability

The replicability varies amongst the different stages of the project;

(A)	The framework of Regenerative Capacity of Urban Design through Ecosystem Biomimicry (Zari, 2018) and Socio-ecological Resilience (Cote & Nightingale, 2012)	development projects worldwide	*as all individuals across the world has their part on interacting with the natural ecosystem*
(B)	Implementation of Strategies; ***Purify*** - ***Protect*** - ***Provide*** -	dense cities with waste managements issues coastal cities nearby mountaneous region cities with land subsidence issues	*the three all together would be subject to mostly **Indonesian cities** or other developing country delta cities*
(C)	Multifunctional Bridge Typologies	any river networks	*although the assigned function would depend on the site requirements.*
(D)	Participatory planning through Urban Village Gatherings	Indonesian context	*more specific to developing countries as it also involves local workshops to introduce the site hazards and project ideas to vulnerable community that barely completed the minimum education*



End of Presentation

Flush and Splash:
Regenerative Capacity for Semarang Urban Water Management

Translate:

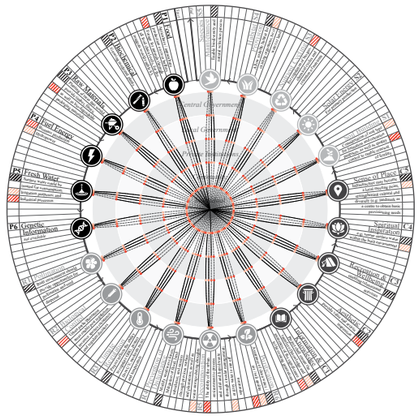
Elementary - 6 years
Middle School - 3 years
High School - 3 years
University - 5 years

Still polluting the river?
What are those 17 years for?

Appendix I: *Answer to RQs*

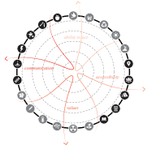
[A x B = C + D]

How can the concept of **ecosystem biomimicry [A]** and **socio-ecological resilience [B]** be combined to construct **landscape infrastructures [C]** which are able to mitigate the hydrological risks of Semarang as well as adding **regenerative quality [D]** of the city?



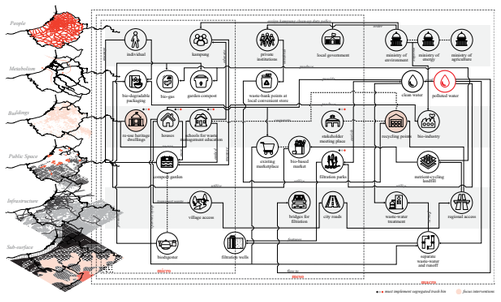
[A x B]

How can we further situate social system within ecosystem biomimicry?



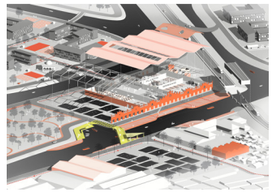
[C + D]

What are the type of measures and spatial implications of landscape infrastructure that would enable regenerative manners?



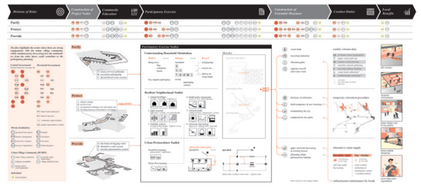
[A - C]

Which form of ecosystem services could possibly be mimicked by landscape infrastructure?



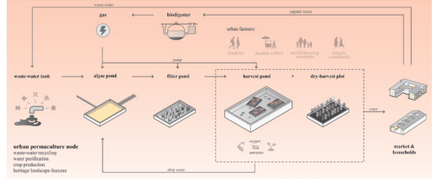
[B - C]

Who are the stakeholders involved during the assessment, project construction, and monitoring of the landscape infrastructures?



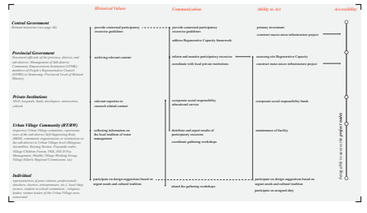
[A - D]

What ecosystem services variables could trigger bankability projects in Semarang City?

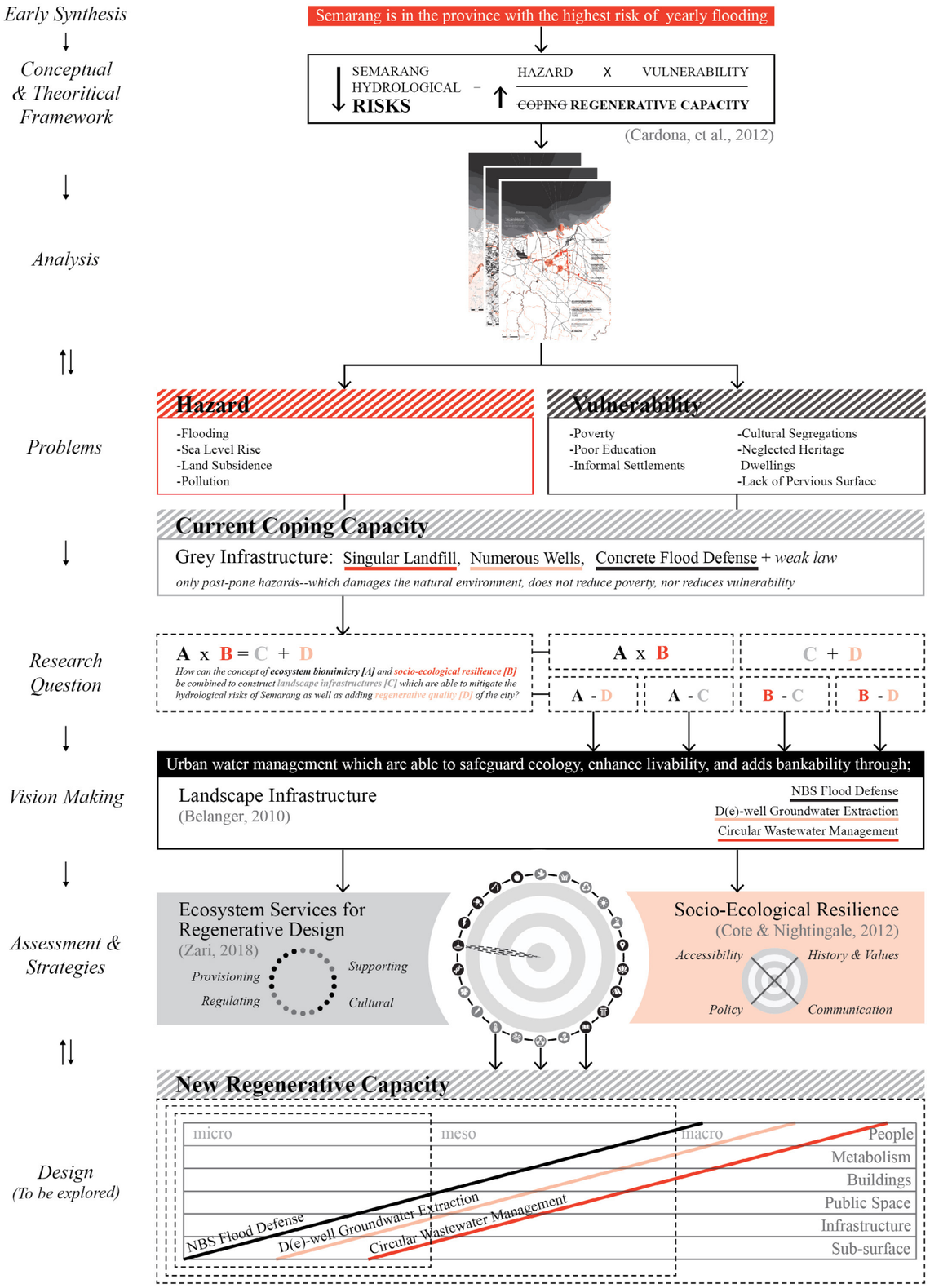


[B - D]

How can each social layers from the highest government institutions down to the individual level contribute to the regeneration of ecosystem services?



Appendix II: *Research Methodology*



⇄ LR being informed on the key issue of Semarang which is **flooding**

⇄ LR read, review, and construct theories of urban design strategies to mitigate hydrological risks

⇄ LR further reading on site problems and existing solutions that has been established to reduce the environmental, economical, and societal risks

SV obtaining personal perspective on actual key issues: **water pollution, land subsidence, and flooding** itself; documenting relevant hazards, vulnerabilities, and coping capacities; as well as validating data

I interviewing stakeholders to understand the local point of view of issues, obtaining data, and other specificities

M conduct GIS analysis to obtain quantitative data of hazards and organize relevant data to draw problem conclusions

S defining the **hierarchy of stakeholders** engaged within the planning of landscape infrastructure

⇄ LR formulate the research aims and gaps in order to progress on actions

⇄ LR read, review, and construct assessment tool with **regenerative design, ecosystem services, and socio-ecological resilience variables** to mitigate hydrological risks with **landscape infrastructures**

CS observe design precedents that use similar theoritical framework

I interview the locals in order to assess present actions of ecosystem services in Semarang city, as well as the current functioning governance

S re-defining social system based on socio-ecological resilience theory

M map and draw design strategies of **circular waste management, enhanced fresh-water systems, and nature-based flood defense** to mitigate hidrological risks in Semarang

⇄ CS observe design precedents that could be applicable on site

LR adopt design framework to implement intervention on various urban layers and scales

SV acquire necessary **measurements** for design intervention

LR Literature Review
Previous journals, books, and news for design and theory references

M Mapping
GIS drawing and analysis from open-streemap data, google maps, etc

S Stakeholders
acknowledging the parties involved throughout the project

SV Site Visits
Data taken from site trips and observations

I Interview
Experience local point of view on issues

CS Case Studies
Exemplary projects which contains similar approach