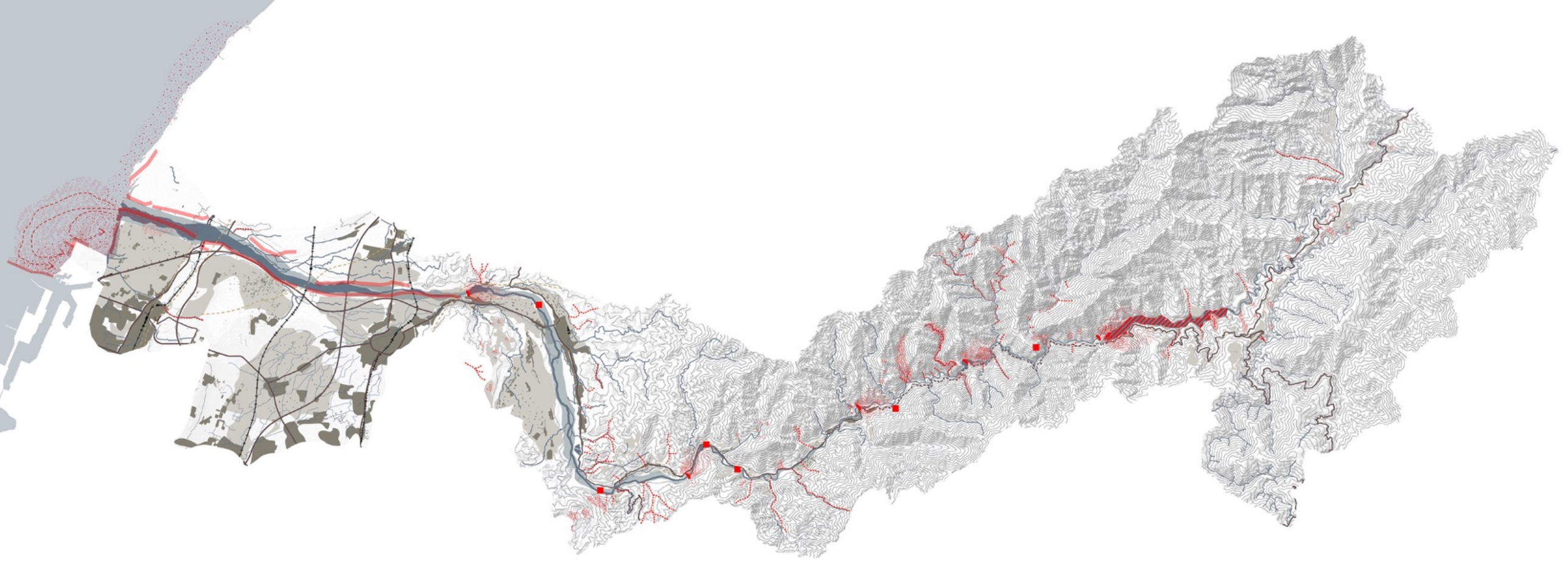


The sensitive river scape, the sinuous territory

Transforming Dajia River Basin as a Water-Sensitive Landscape Infrastructure

Yun-shih Chen

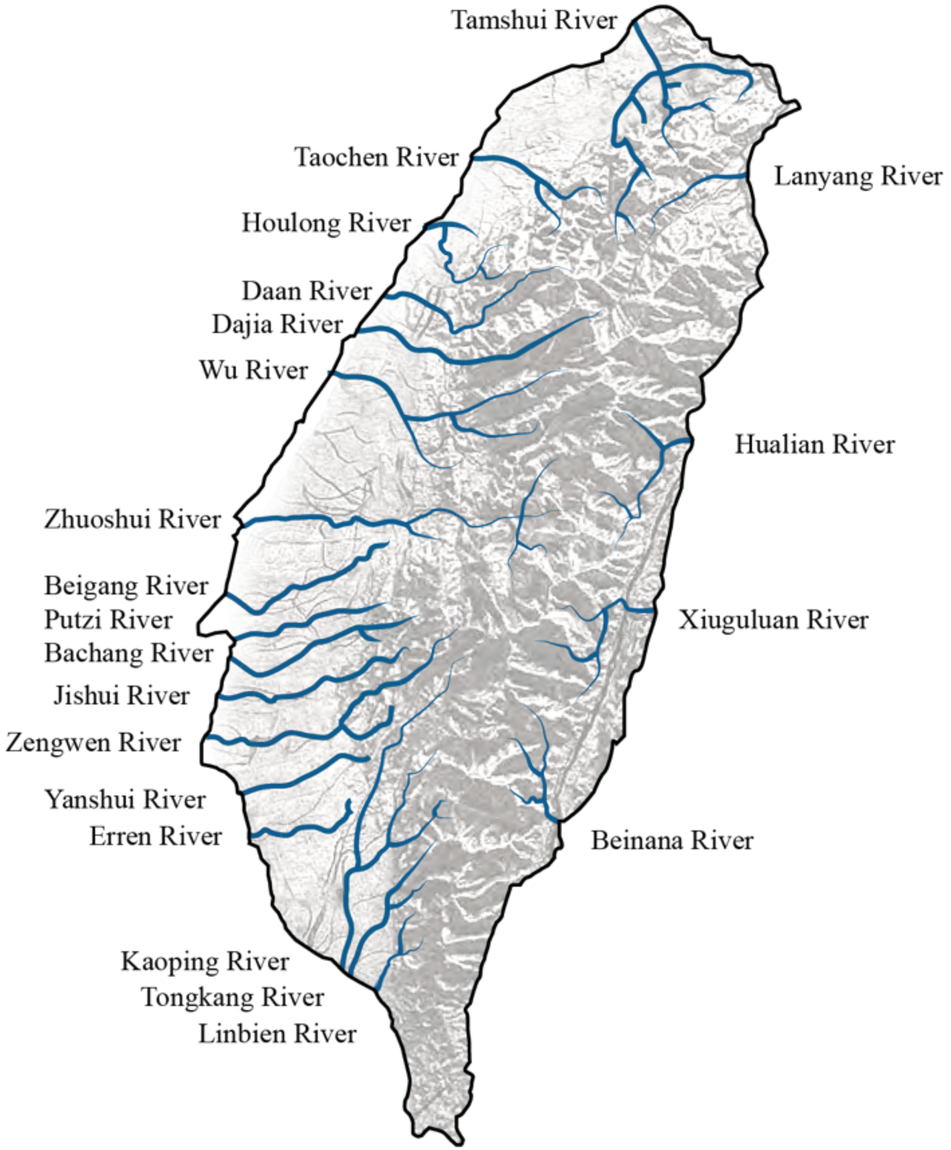
EMU graduation thesis presentation


EXCESS WATER
source: photo from video clip by 吳彥熹


FREQUENT DROUGHT
source: photo from LTN News

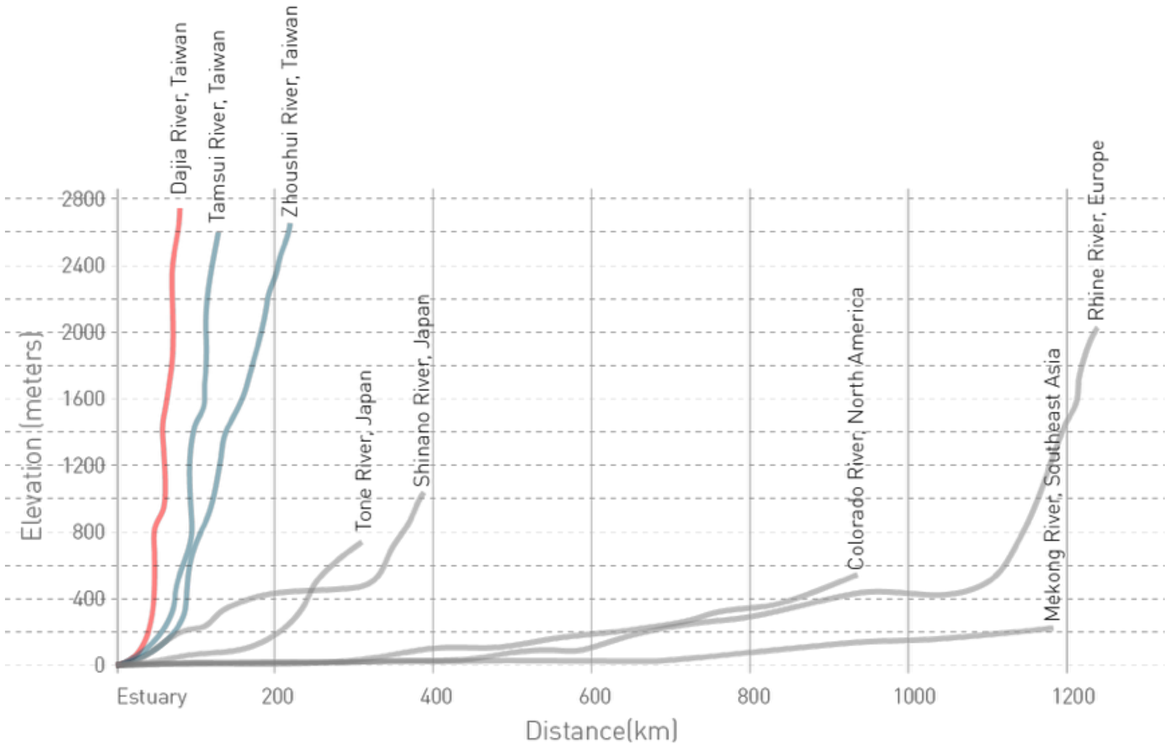
PROBLEM: RIVER + MOUNTAIN = OBSTACLE

River



LANDSCAPE CHARACTER

- short and steep river

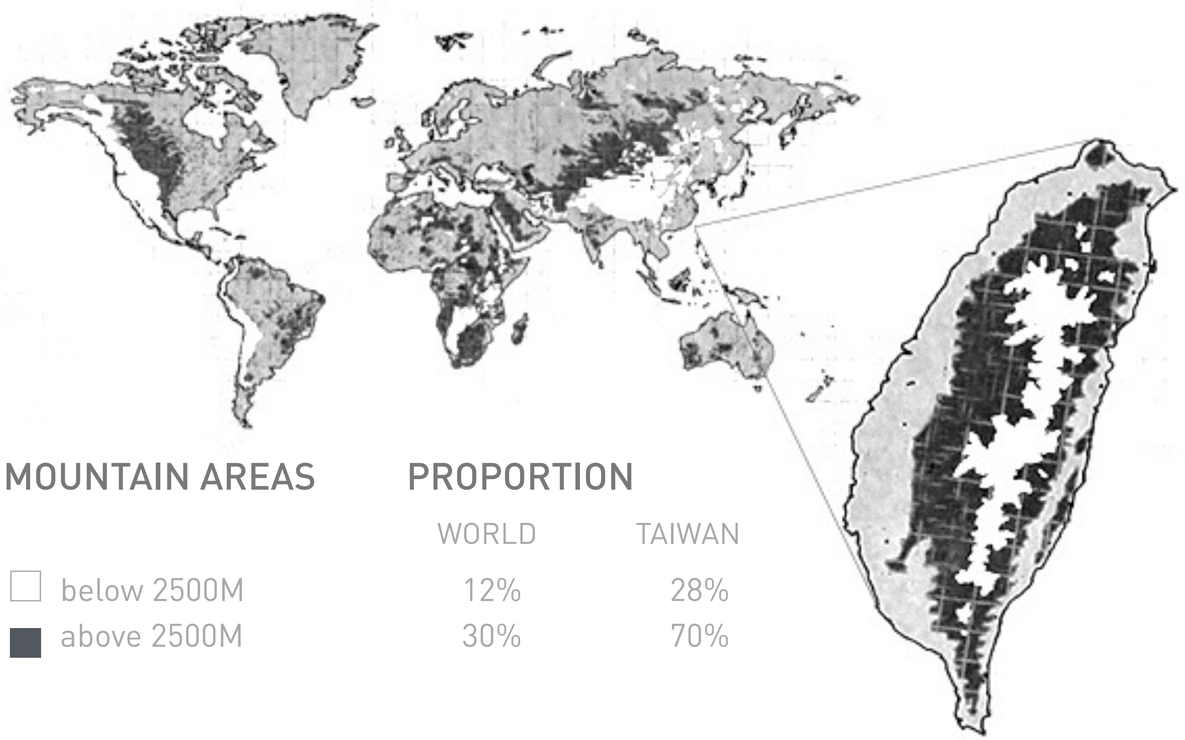


Rivers in the world

Source: edited by author based on data from Water Resources Agency, MOEA, Taiwan Government

PROBLEM: RIVER + MOUNTAIN = OBSTACLE

Land

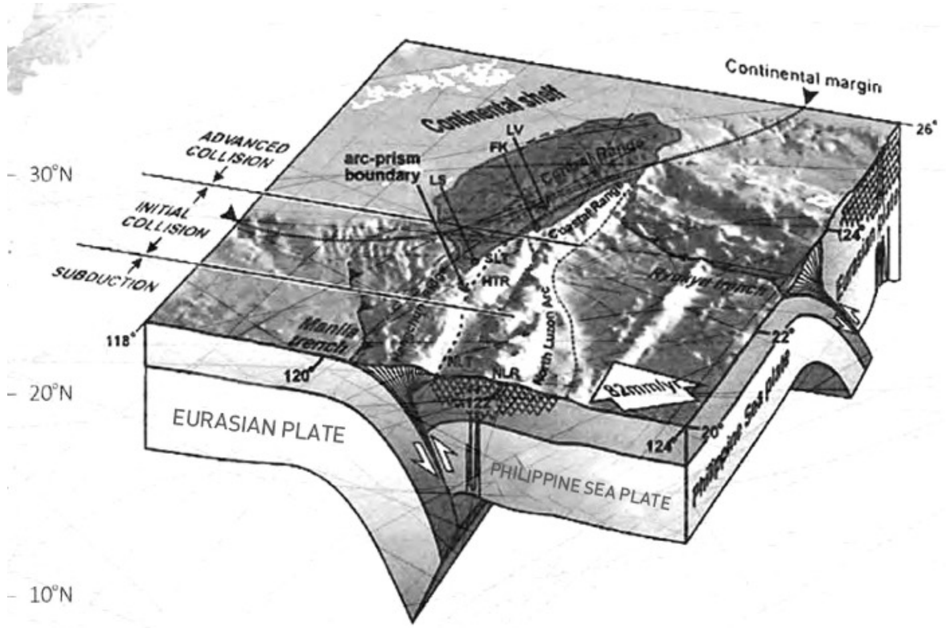


MOUNTAIN AREAS	PROPORTION	
	WORLD	TAIWAN
☐ below 2500M	12%	28%
■ above 2500M	30%	70%

LANDSCAPE CHARACTER

- short and steep river
- highly dynamic, sensitive, and fragile

DIFFICULT TO KEEP WATER



PROBLEM: RIVER + MOUNTAIN = OBSTACLE

WATER INFRASTRUCTURE

- ineffective / inefficient model

Rain

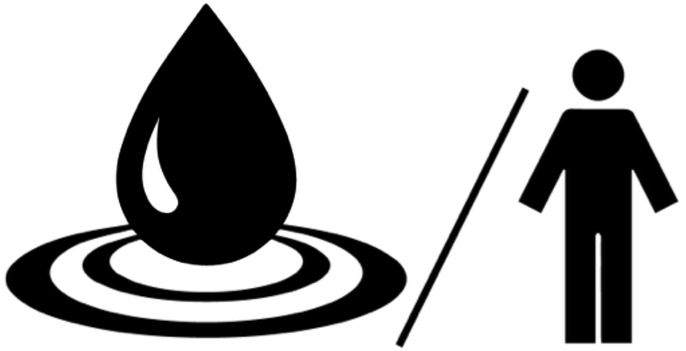
Unit-area Yearly Rainfall (mm/year)	Country	Water resource per capita (cubic meter/year/person)
830	U.S.A	36,500
800	U.K.	3,490
760	France	7,810
810	Germany	3,360
980	Italy	5,330
790	Canada	344,000
660	Spain	9,470
840	China	9,720
1,220	India	6,600
1,630	Brazil	130,000
1,820	Japan	6,060
2,510	Taiwan	4,595

2,000 1,000 — 20,000 40,000

3.4 x — 0.16 x

world average: 730 — world average: 28,300

Source: edited by author based on Data from National Taiwan Museum Water Resource exhibition



PROBLEM: RIVER + MOUNTAIN = OBSTACLE

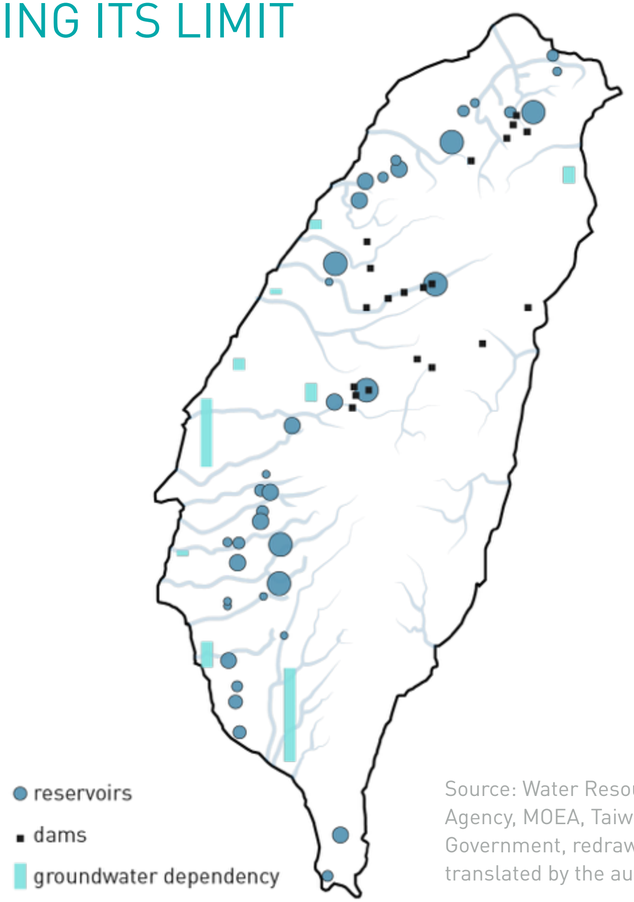
WATER INFRASTRUCTURE

- ineffective / inefficient model
- reservoir capacity decreased 50% in 2030

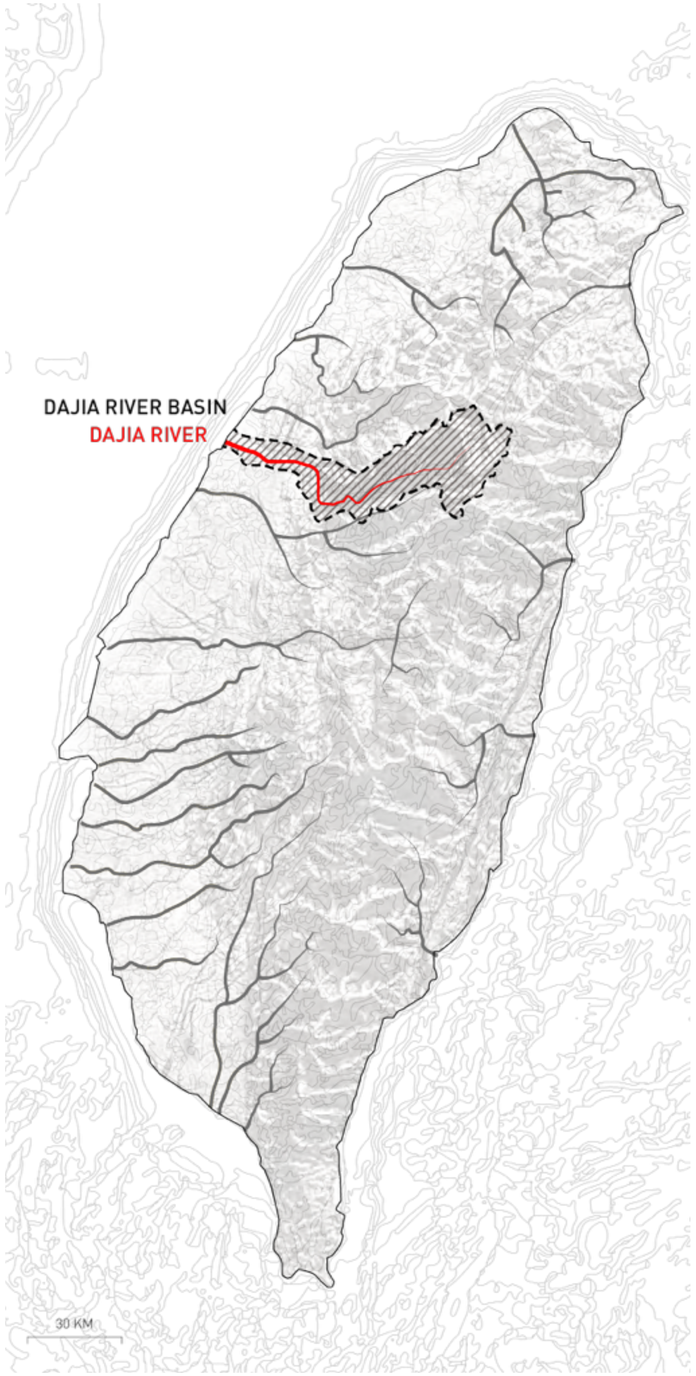
Reservoirs & dams

Source: Taiwan Academy of Ecology epaper (2013)

HARD-ENGINEERED APPROACH REACHING ITS LIMIT

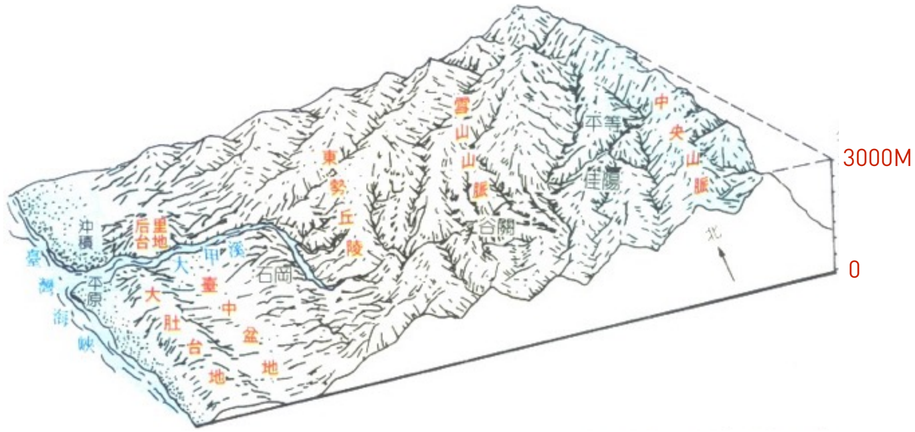


Source: Water Resources Agency, MOEA, Taiwan Government, redraw and translated by the author



DAJIA RIVER VALLEY: AN EXTREME CASE

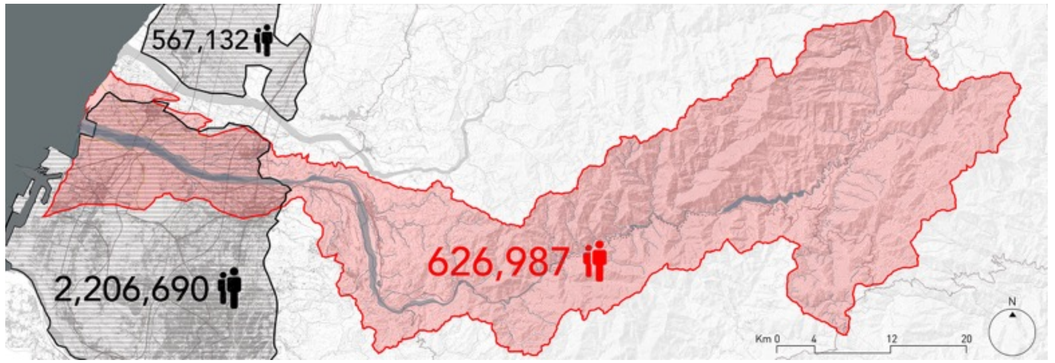
- Illustrative Taiwanese river landscape



DAJIA RIVER VALLEY: AN EXTREME CASE

Source: photo from Yannlinphoto

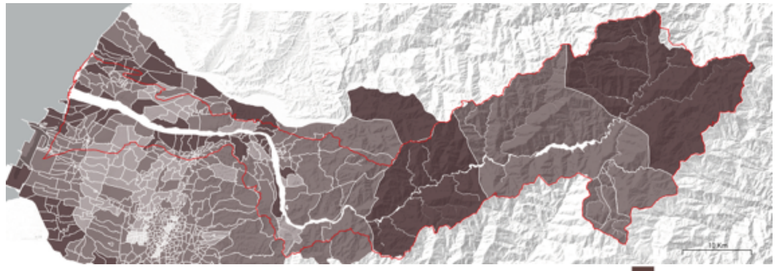
- Illustrative Taiwanese river landscape
- Diverse interaction of human & nature
- Heavy-engineered infrastructuralization



Dajia catchment boundary

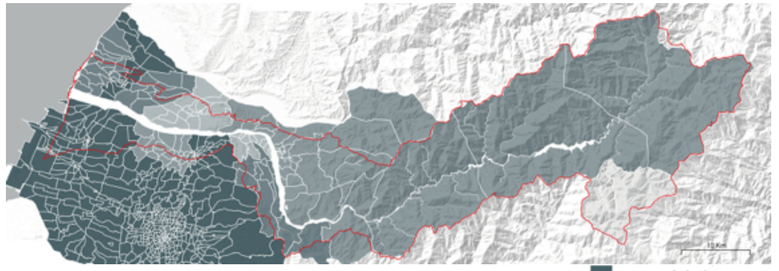
Concerned neighboring urban area

DAJIA RIVER VALLEY: AN EXTREME CASE



LIFE RISK

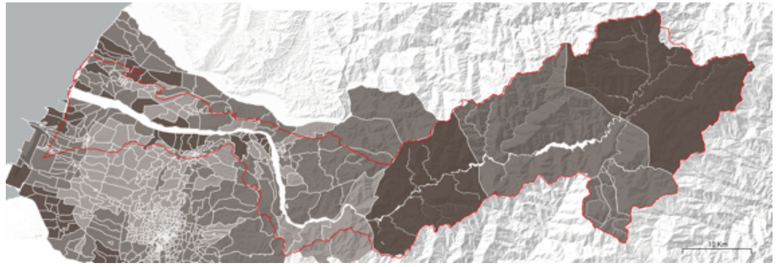
very high
high
medium
low



DRINKING WATER RISKS

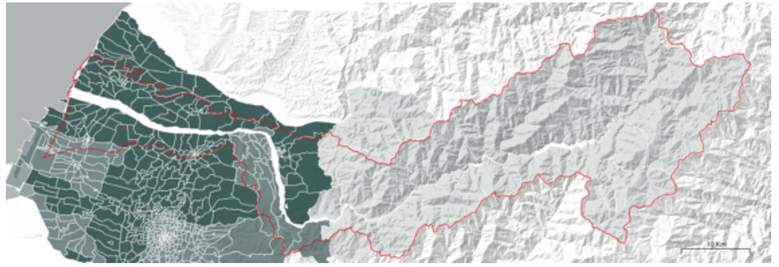
very high
high
medium
low
very low

- Illustrative Taiwanese river landscape
- Diverse interaction of human & nature
- Heavy-engineered infrastructuralization
- Threats of coming changes



PROPERTY RISK

very high
high
medium
low



AGRICULTURE WATER RISKS

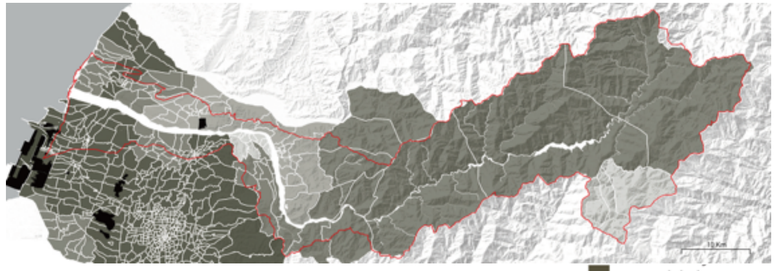
very high
high
medium
low
very low

WATER RISKS ESTIMATION IN 2035:
LIFE / PROPERTY / FLOOD
WATER USAGE OF DIFFERENT SECTORS

(200-year return rainstorm in 24 hours)

FLOOD SIMULATION

Flooding depth
more than 2 meters
1-2 meters
0.5 - 1 meters



INDUSTRIAL WATER RISKS

very high
high
medium
low
very low

source: map redrawn by the author based on data from National Science and Technology Center for Disaster Reduction, Taiwan Government.

RESEARCH OBJECTIVE

EXTERNAL THREATS

climate changes

socio-economic shifts

PROBLEM FIELD

fragile and sensitive landscape

current approach of water infrastructure

RIVER + MOUNTAIN = OBSTACLE

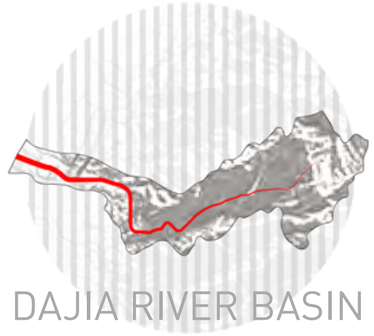
TAIWAN

hypothesis

RIVER + MOUNTAIN = OPPORTUNITY

- **THEORY**: landscape urbanism
- **APPROACH**: landscape infrastructure

TESTING CASE



DAJIA RIVER BASIN

Research by design

PROPOSAL: Dajia River Basin as water infrastructure

- operative landscape structures
- transformation strategies
- design interventions

RESEARCH QUESTION

MAIN RESEARCH QUESTIONS:

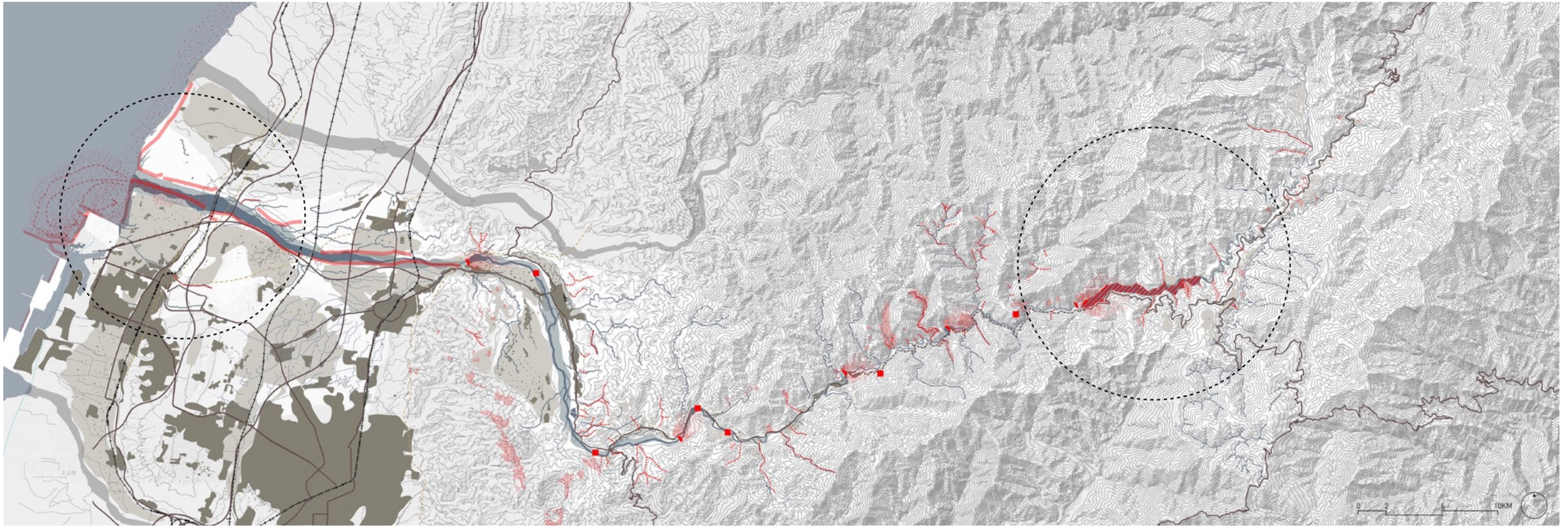
How to rethink the mountainous river landscape as opportunities instead of obstacles, so as to achieve a more sustainable integration between artifact and nature?

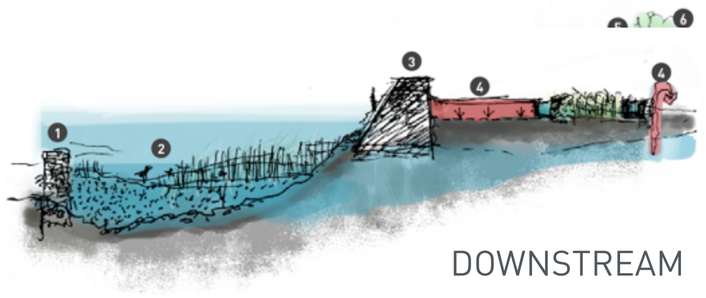
Further on, how to build a stronger identity through the process of redesigning the mountainous riverscape as a water-sensitive infrastructure?

THE CHANGING PATTERN

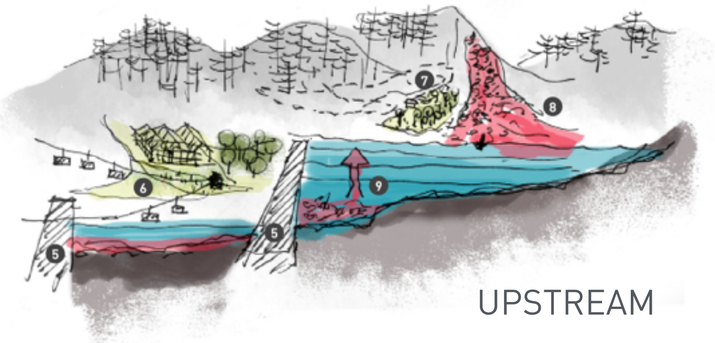
BEFORE 1850s → **1850s - 1950s** → **TODAY**

nature-guided lifestyle → nature as resource repository → heavy-engineered infrastructures





DOWNSTREAM



UPSTREAM

Rivers
Geological faults
Sediments accumulation

Rivers
Geological faults
Human settlements
Agricultural cultivation

Anti-sediment dikes
River dikes
Potential landslide
Water power plant

Primary roads
Primary roads (controlled)
Railway
Geological faults

Sediment accumulation
Collapsing area
Reservoir

LEARNING FROM THEORIES

THEORETICAL FOUNDATION:

LANDSCAPE URBANISM

"Landscape has the capacity to critically engage the meta-physical and political programs that operate in a given society, that landscape architecture is not simply a reflection of culture but more ***an active instrument in the shaping of modern culture.****"*

--- James Corner, 1999

APPROACH:

LANDSCAPE INFRASTRUCTURE

"Standardization, mono-functionality, permanence, (characters of the 19-20th Century infrastructures) ... that ***overlook the powerful ecological flows and geographic patterns operating at large scales****"*

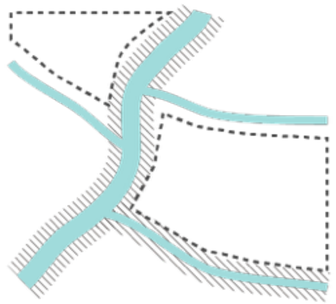
--- Pierre Bélanger, 2009

"Landscape infrastructural design can be redefined as interdisciplinary design effort to ***establish a local identity that has tangible relationships to the region.****"*

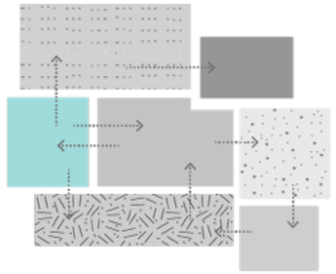
--- Steffen Nijhuis & Daniel Jauslin, 2015

LEARNING FROM THEORIES & PRACTICES

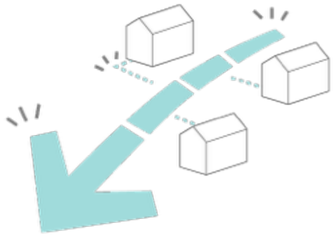
PRINCIPLES



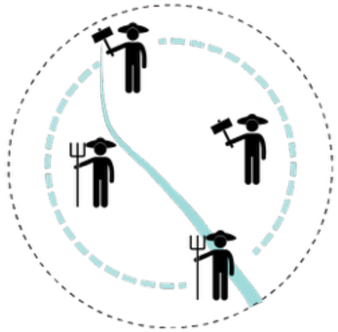
Operative landscape structures as future spatial framework



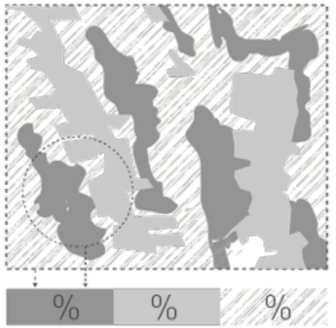
Hybrid complexity & establish connection between activities



Water infrastructure as visible, multi-functional daily-life spaces

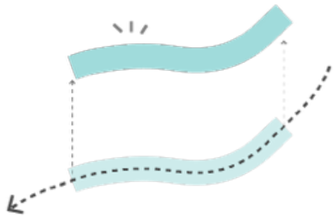


Water management as local collective work / autonomous units



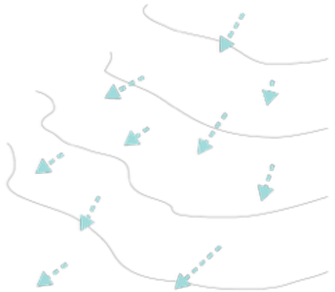
Balanced proportion of diverse land uses

STRATEGIC TOOLS

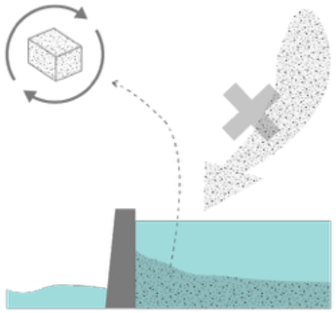


(underflow water)

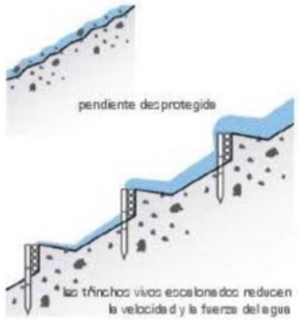
Recover hidden flows



Gravity as carrier

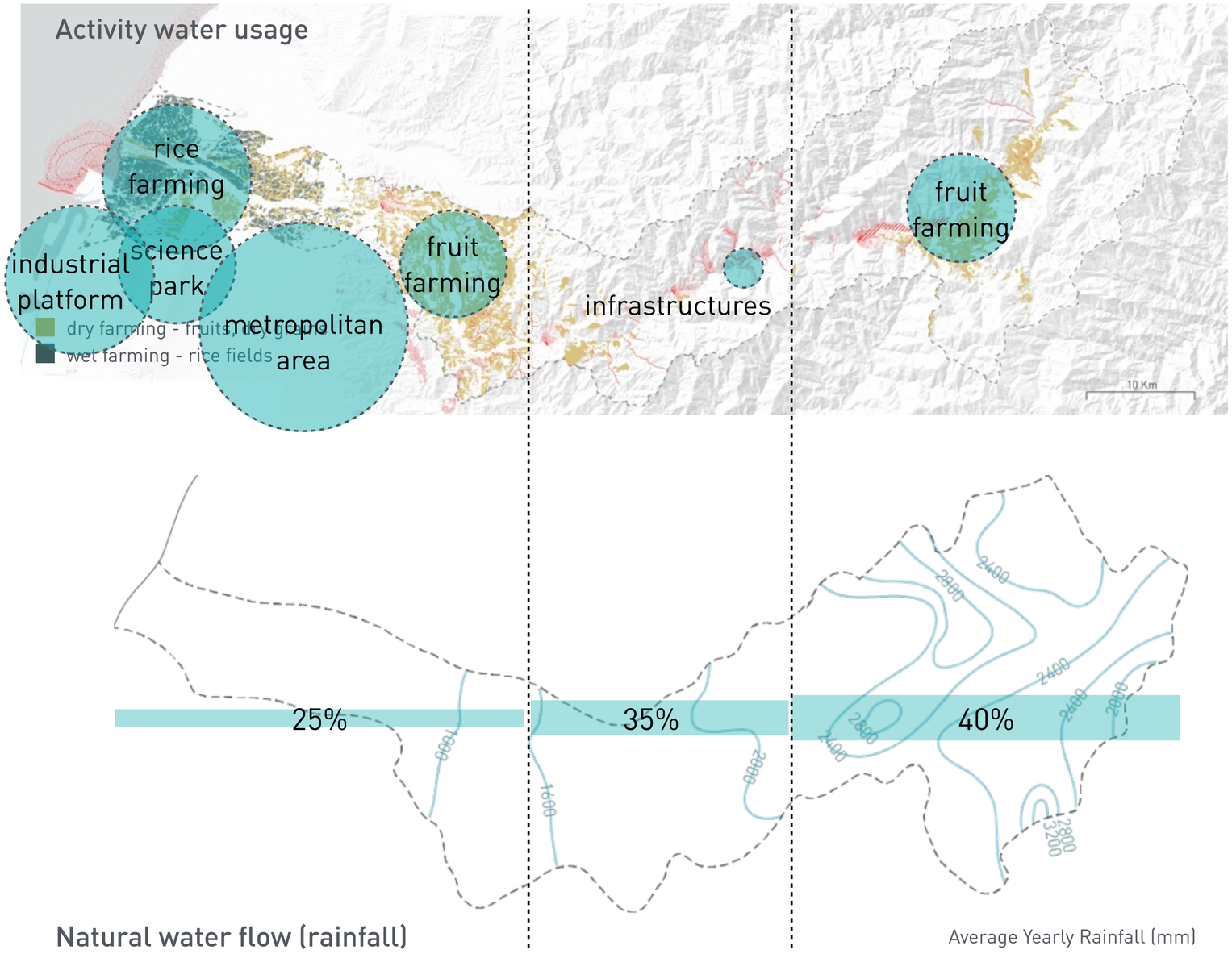


Sediment recycle and reduction



Slope stabilization by local material & simple construction technique

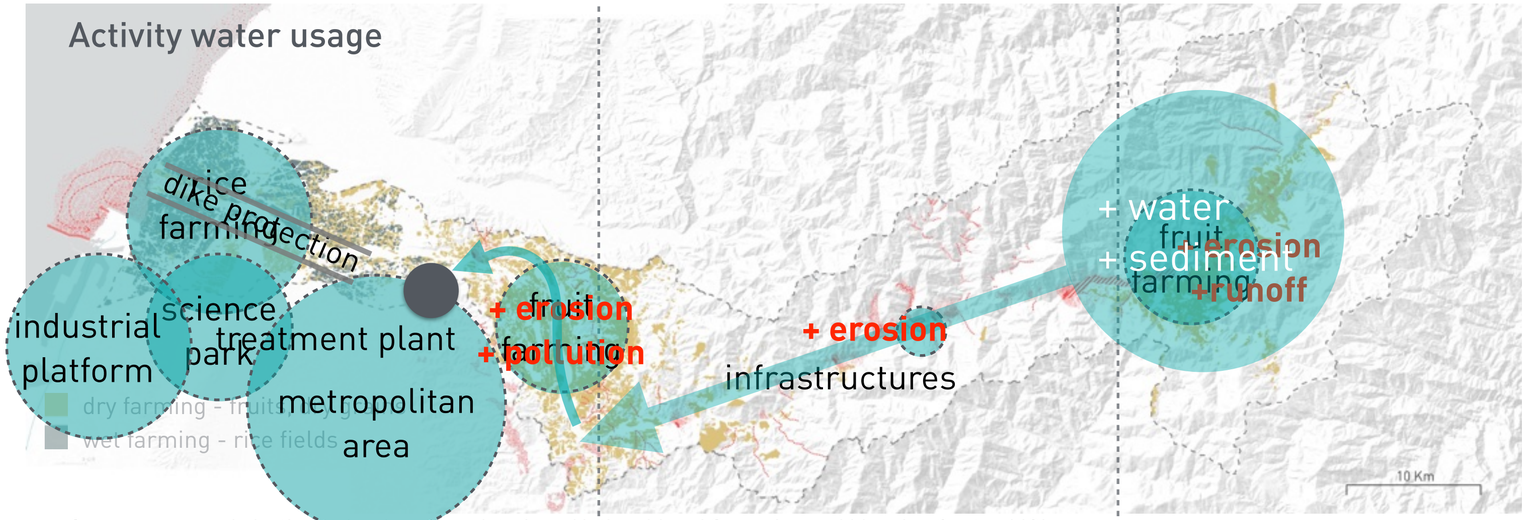
DISCORDANCE OF NATURAL & CULTURAL WATER FLOW



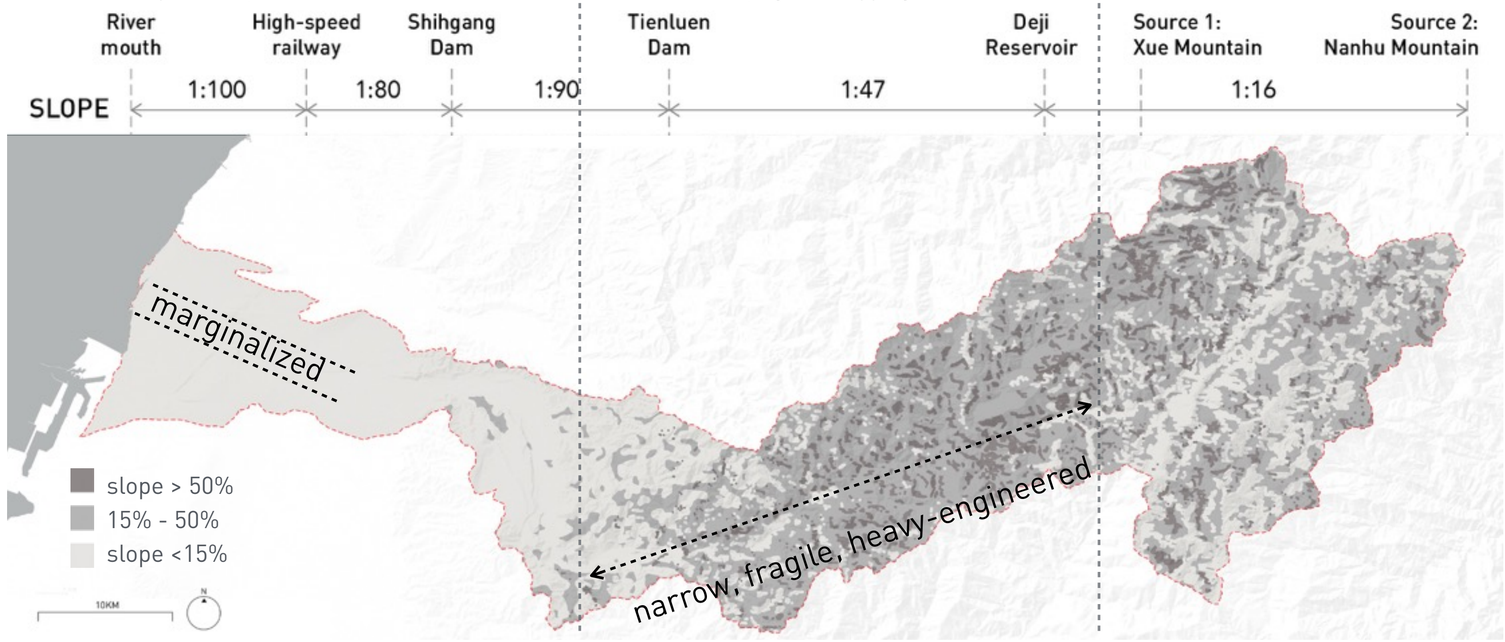
Source: map made by the author based on data from National Land Surveying and Mapping Center, MOI.

- Activities that increase runoff
  at areas with intense & abundant water flow

DISCORDANCE OF NATURAL & CULTURAL WATER FLOW



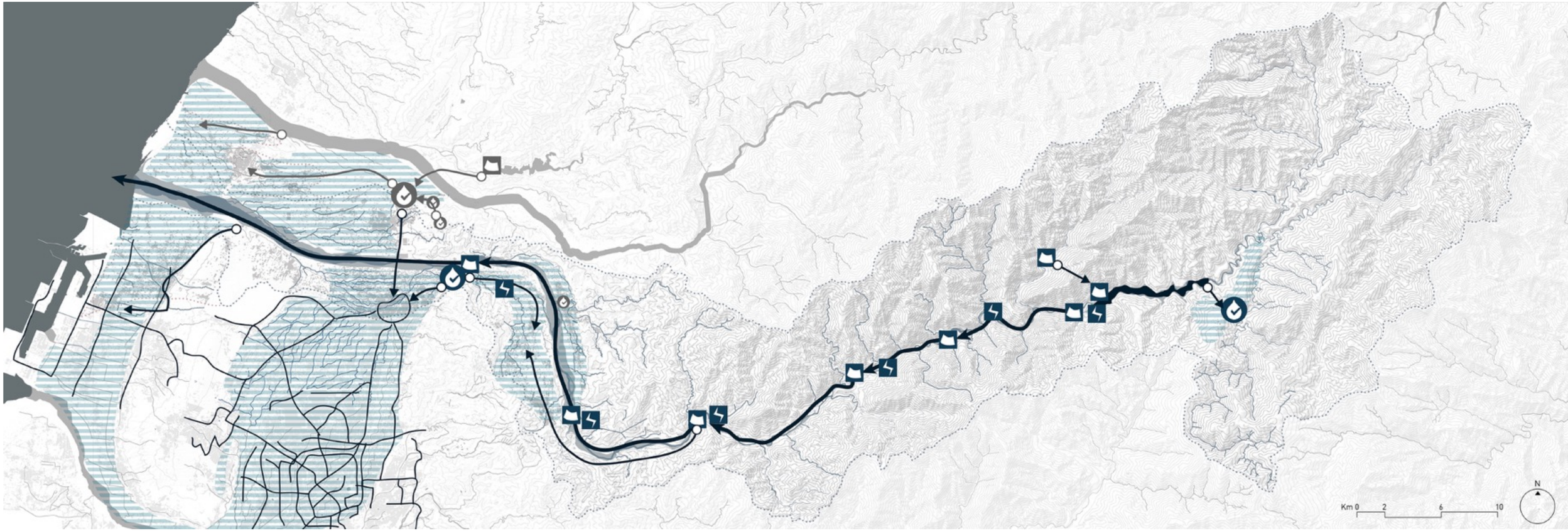
Source: map made by the author based on data from National Land Surveying and Mapping Center, MOI.



Source: map made by the author based on data from Central Geological Survey, MOEA, Taiwan Government.

- large amount of water passing through the bottleneck section of the river
- decreased quality of water (pollution, sediment) requires heavy treatment cost
- sediment paralyzed the river flow, requires large maintenance and protection spaces

THE HEAVY-ENGINEERED INFRASTRUCTURALIZATION



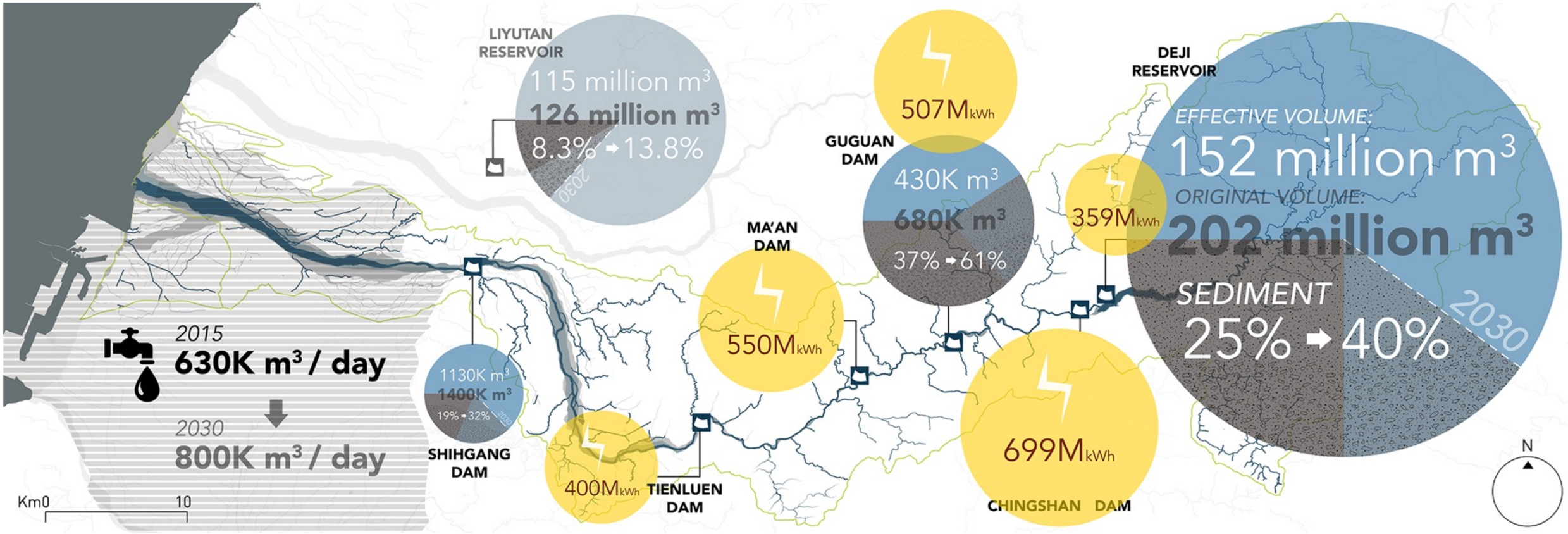
Source: by the author based on data from WRA, MOEA, google maps, and GIS databases.

WATER INFRASTRUCTURE SYSTEM

- Dam or reservoir along Dajia river
- Dam or reservoir of other river
- Hydro-power plants
- Agricultural irrigation demanded areas
- Water treatment plant for Dajia river
- Water treatment plant for other rivers
- Source or water supply
- Main line or pipes of water supply

- Linear & mono-functional water infrastructure system
  -> fragile and unadaptable

THE HEAVY-ENGINEERED INFRASTRUCTURALIZATION



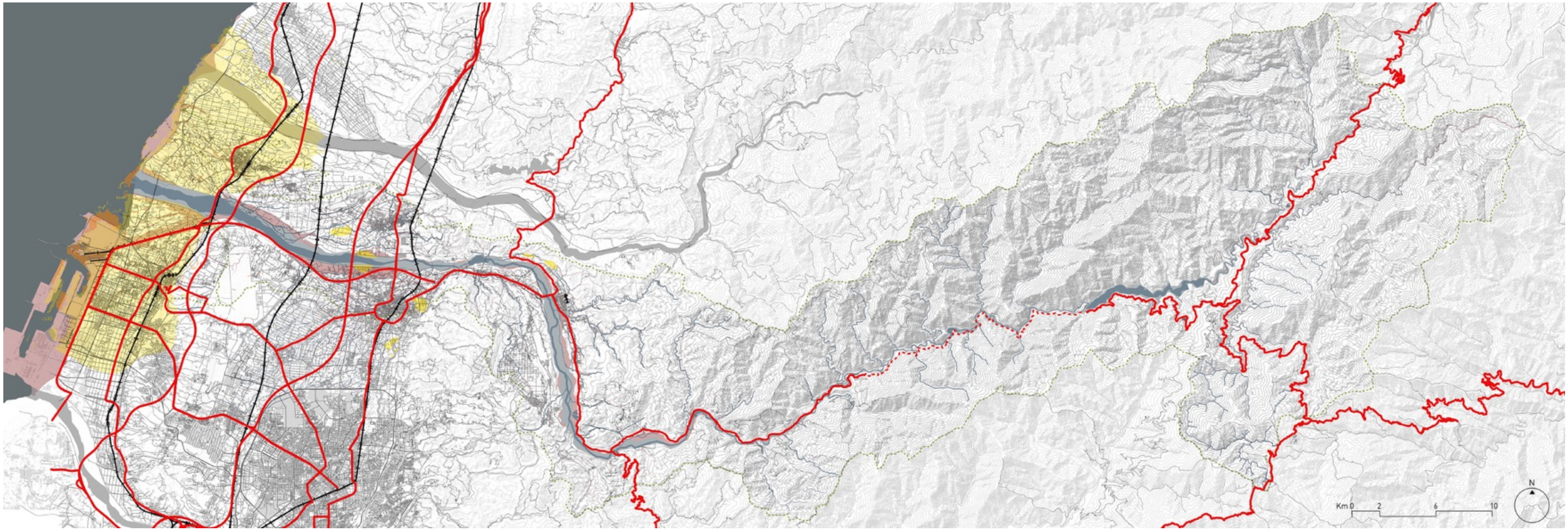
THREAT OF DEPENDENCY ON THE CURRENT INFRASTRUCTURE

Source: by the author based on data from WRA, MOEA.

- Dam or reservoir along Dajia river
- Dam or reservoir of other river
- Hydro-power plants
- Dajia river
- Flooding plain

- Hydropower generates less than 1% of total electricity; high maintenance costs
- High density of infrastructures -> environmental damages + high maintenance costs

THE HEAVY-ENGINEERED INFRASTRUCTURALIZATION



Source: by the author based on data from GIS databases.

INFRASTRUCTURE OF TRANSPORTATION

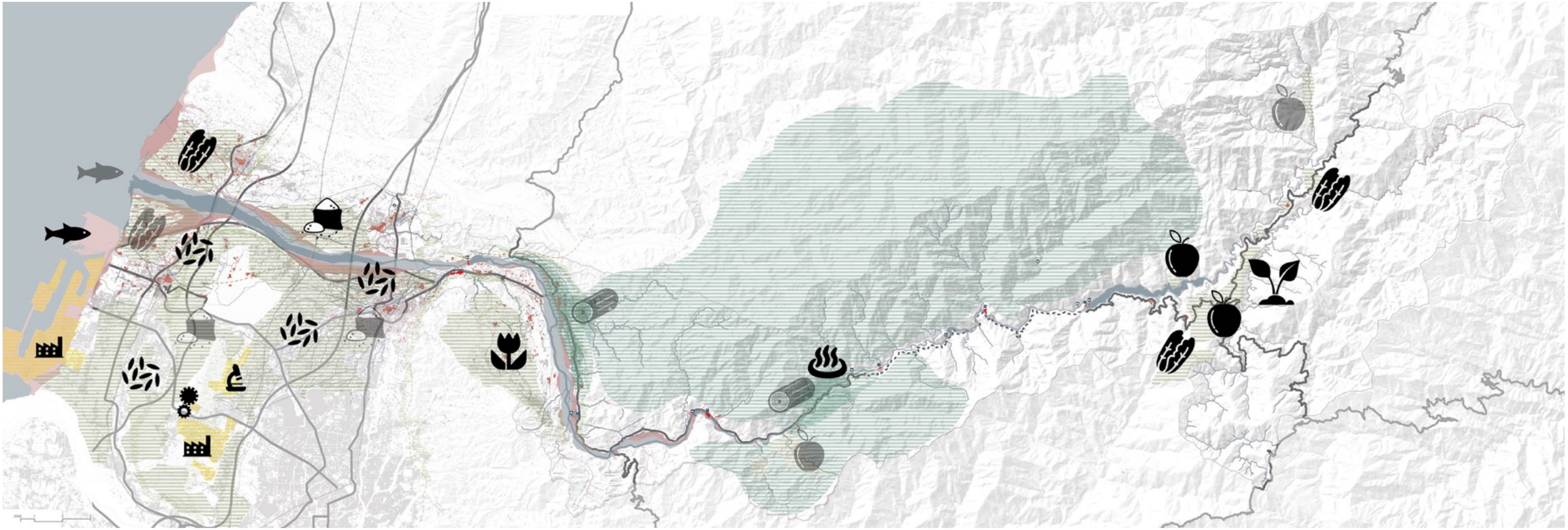
- Railway and high-speed railway
- Primary roads and motorway
- Other roads
- Dajia river catchment boundary

Flooding in case of 600mm/day rainfall

- 1-2m
- 0.5-1m

- Upstream: recurrent road breakdown, nature taking back its dominance.
- Downstream: high density of infrastructure, deterioration of river landscape.

LOCAL INDUSTRY AND HUMAN ACTIVITIES



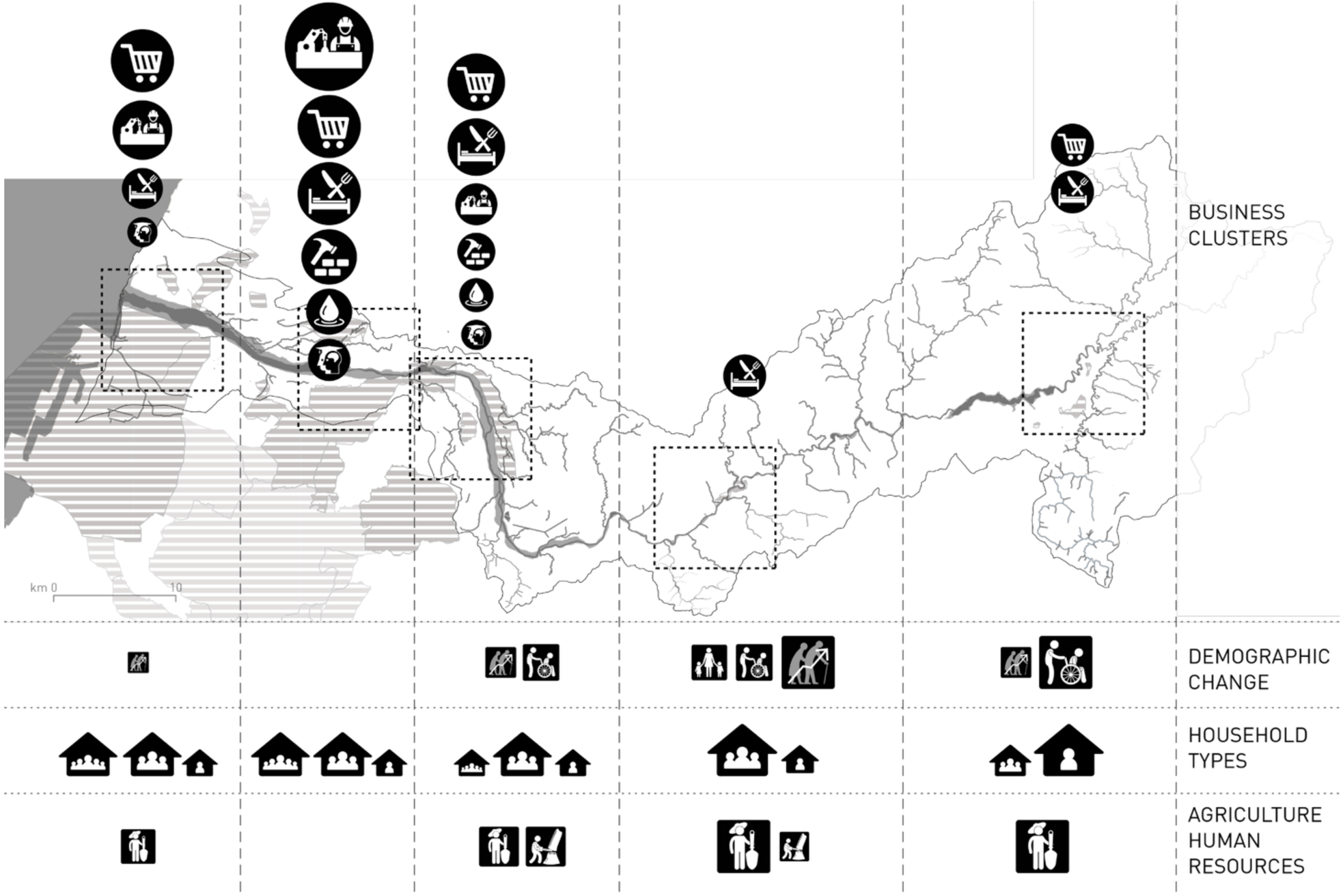
Forest conservation areas
- Forestry
- Hot-spring recreation tourism

Agricultural areas
- Paddy rice farms
- Sugar canes
- Flower
- Vegetable
- Fruits
- Tea
- Fishery

Industrial and technological areas
- Science park
- Precision Machinery Innovation Technology
- Industrial area

Source: made by the author based on GIS data and statistic data from SEGIS (https://segis.moi.gov.tw)

LOCAL INDUSTRY AND HUMAN ACTIVITIES



- retail, local commercials
- catering, accommodation
- construction
- manufacturing
- education, research
- water supply, pollution treatment

Source: made by the author based on GIS data and statistic data from SEGIS (https://segis.moi.gov.tw)

DIAGNOSIS CONCLUSION


Source: photo by ccl.smai


Source: photo from Nature Campus

THE HEAVY-ENGINEERED INFRASTRUCTURALIZATION

Source: photo from http://www.taiwanhot.net/

Continuous conflict between human life and nature

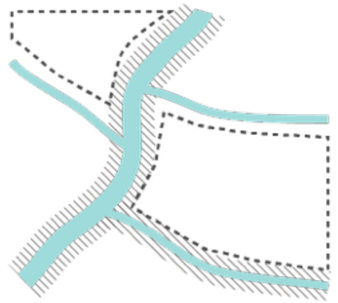

Source: photo from Yannlinphoto

DISCORDANCE OF NATURAL & CULTURAL WATER FLOW

Source: photo from Appledaily news

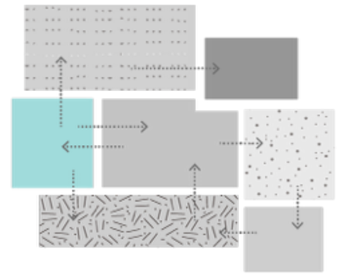
Social conflicts in competing for water resources

OVERALL STRATEGY



WATER FLOW / SYSTEM

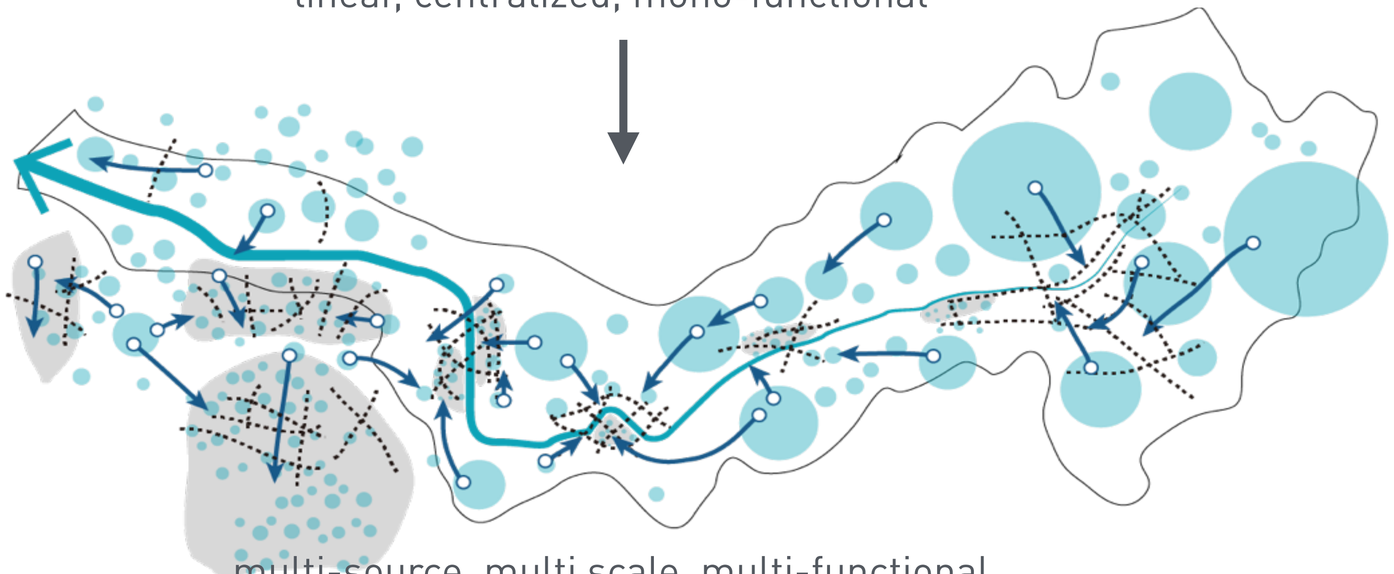
establish tangible connection



ACTIVITY PATTERNS

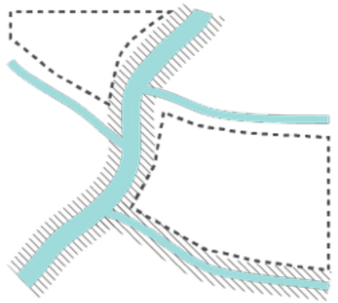
CONCEPT #1: WATER SYSTEM TRANSFORMATION

linear, centralized, mono-functional



multi-source, multi scale, multi-functional

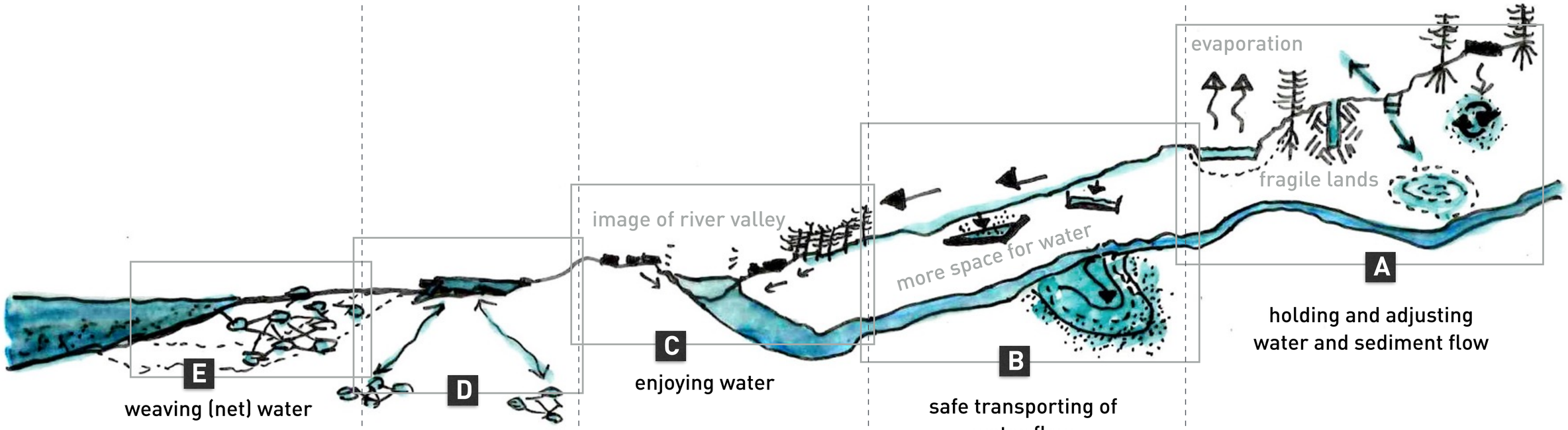
- landscape infrastructure as future spatial framework



- Gradually reduce the reliance on heavy-engineered infrastructures (dams and reservoirs)
- Multi-source, multi scale, multi-functional

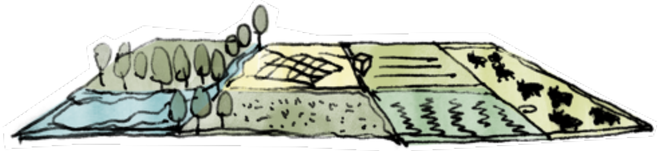
Source: by the author based on GIS data and information from WRA, Taiwan.

ROLES OF DIFFERENT PARTS OF THE RIVER



CONCEPT #2: ACTIVITY HYBRIDIZATION

extensive, single cropping



hybridized multi-activity farming

integrating other activities

recycling

reduce waste, biomass

facility sharing

reduce enter-cost

attract young people

education

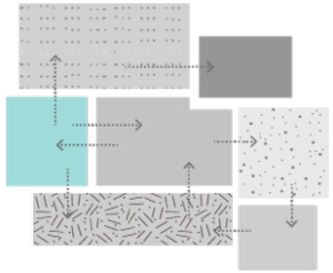
agricultural research testing fields

natural-farming method consultation

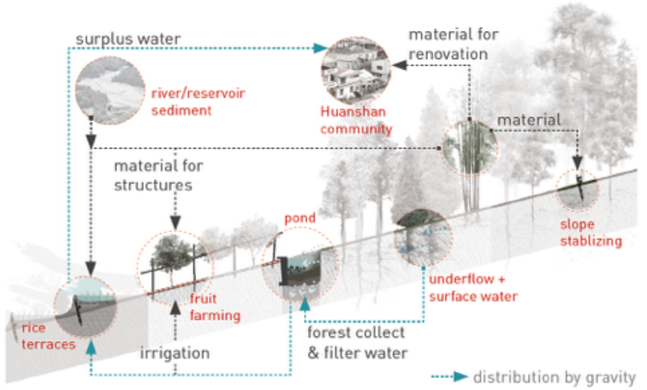
contract platform

ensure revenue and rights of farming activity

- Agricultural hybridization as initiating thread/axis



- Establish connections between activities

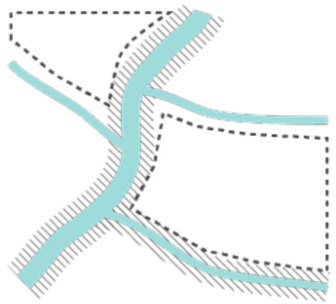


- Enable incremental change and combination of local opportunities
- Betterment of environmental diversity and resilience to external impacts

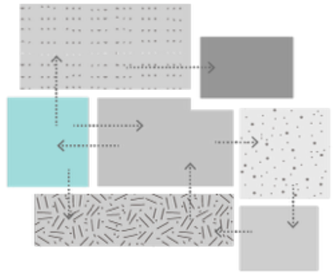
Source: by the author based on GIS data and information from WRA, Taiwan.

STRATEGY: INTEGRATING THE ACTIVITY WITH WATER FLOW

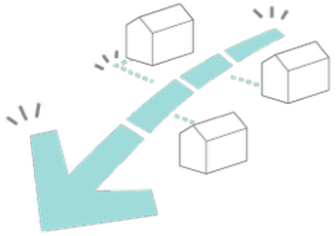
PRINCIPLES



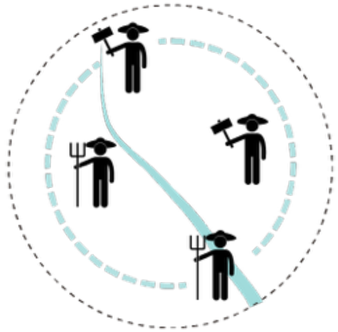
Landscape operative structures as future spatial framework



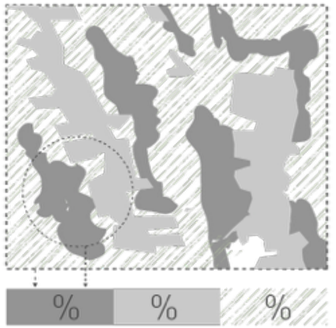
Hybrid complexity & establish connection between activities



Water infrastructure as visible, multi-functional daily-life spaces

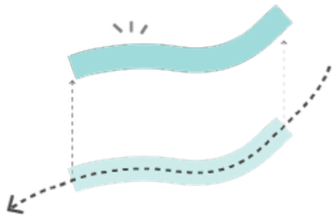


Water management as local collective work / autonomous units

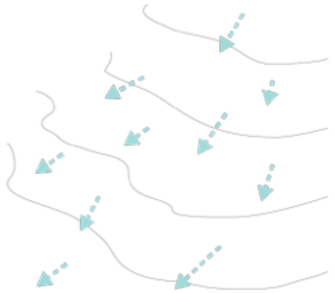


Balanced proportion of diverse land uses

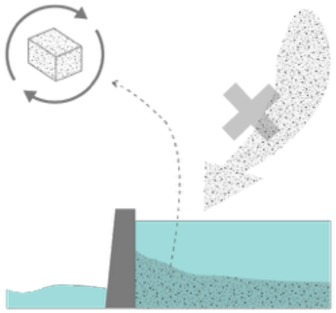
STRATEGIC TOOLS



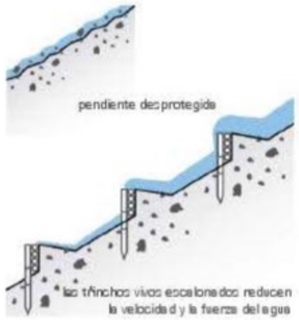
Recover hidden flows



Gravity as carrier

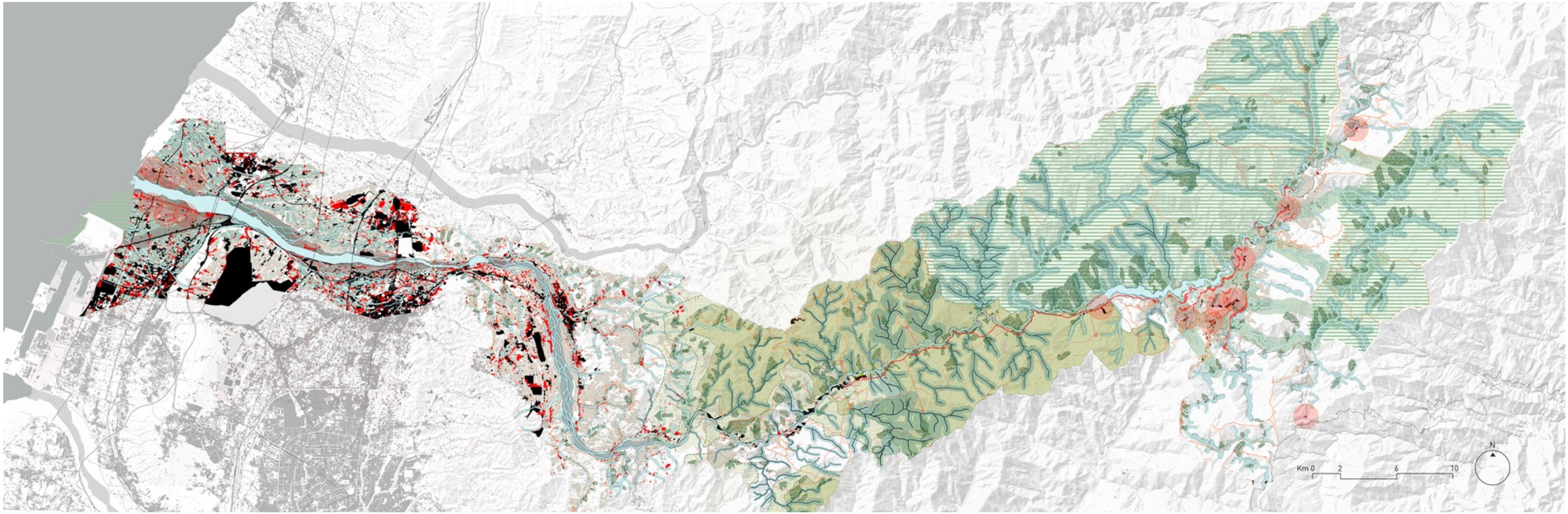


Sediment recycle and reduction



Slope stabilization by local material & simple construction technique

STRATEGIC PLAN



Agriculture - dry farming (fruits / grains)
Agriculture - wet farming (rice)
Existing habitation
Historical river courses

4 X OPERATIVE LANDSCAPE STRUCTURES

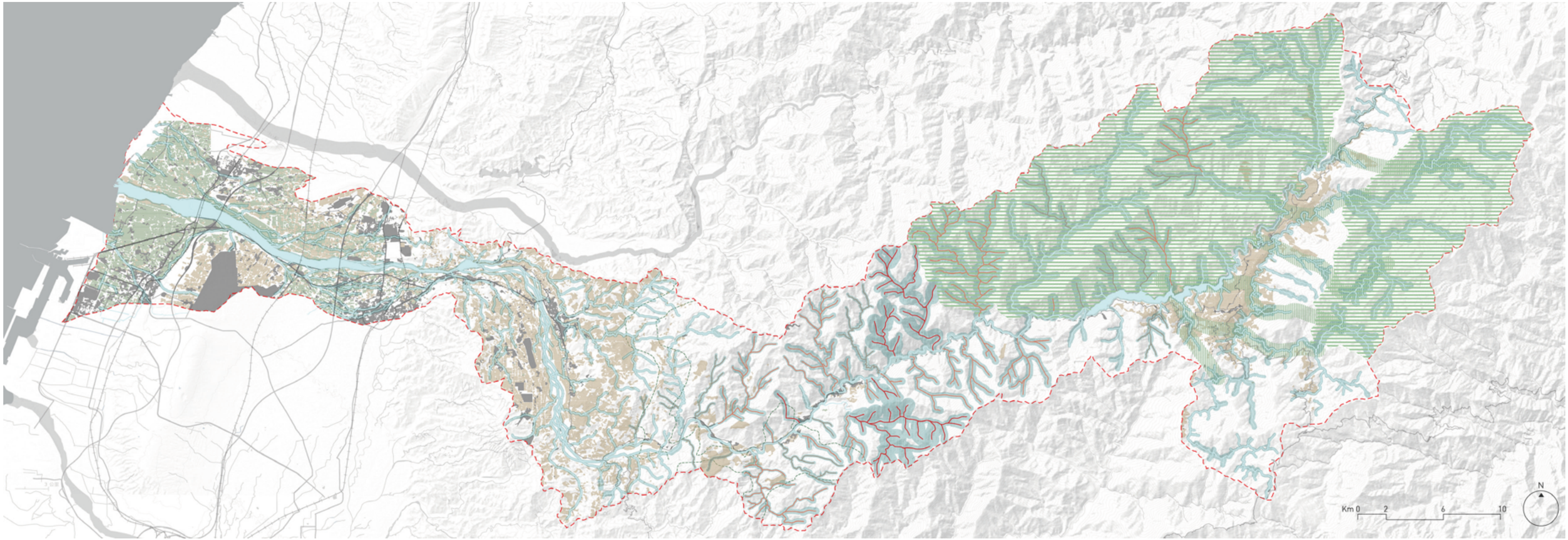
Corridor
- National Park
- Horizontal corridor between national parks
- Vertical corridors along streams
- normal streams
- low mudslide risk streams
- medium mudslide risk streams
- high mudslide risk streams

Slope
- Slope stablization
- Existing protected forestry
- Prospering forestry
- Existing forestry trails
- New forestry / slopework trails
- Maintainence points

Mobility
- Machinary track for shipping
- Maintainence points
- Public transportation stops + moving kiosk & evacuation points (1km coverage)

Public Spaces
- Water infrastructure interventions
- Groundwater infrastructures

OPERATIVE LANDSCAPE STRUCTURES



CORRIDOR

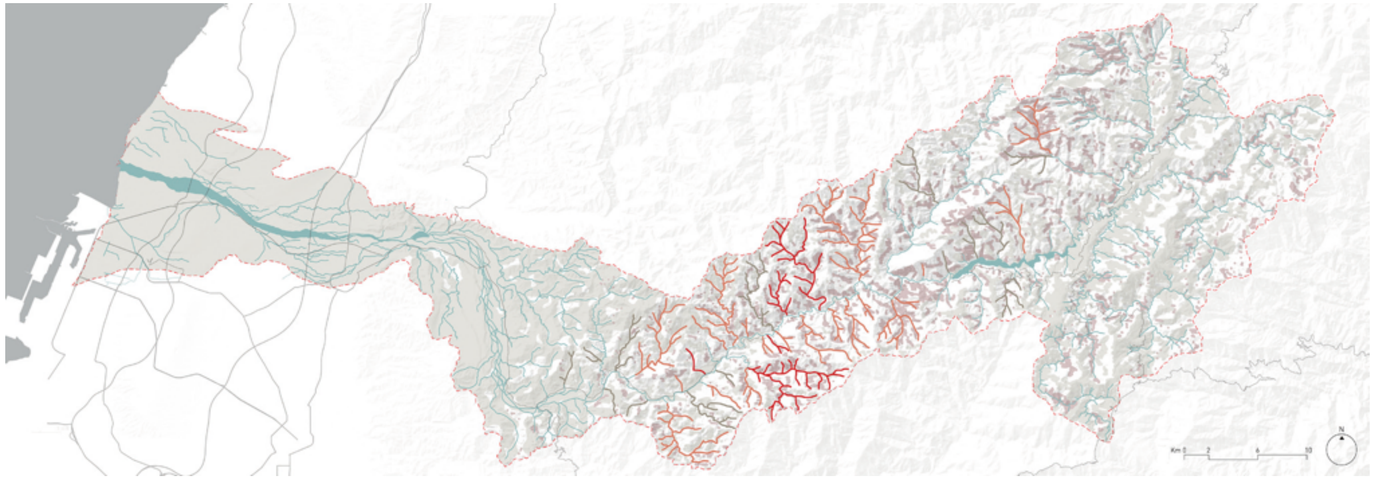
- National Park
- Horizontal corridors
- Agriculture - dry farming (fruits/grains)
- Agriculture - wet farming (rice)
- Existing habitation
- Vertical corridors along streams
- normal streams
- low mudslide risk streams
- medium mudslide risk streams
- high mudslide risk streams
- Dajia river catchment

- vertical and horizontal ecological continuity
- allows permeability of elements and interaction of activities
- river landscape as the determinant framework for corridor structure

OPERATIVE LANDSCAPE STRUCTURES

CORRIDOR

Source: map made by the author based on GIS data and data from Water Resources Agency, MOEA, and Central Geological Survey, MOEA, Taiwan Government.



low mudslide risk streams

medium mudslide risk streams

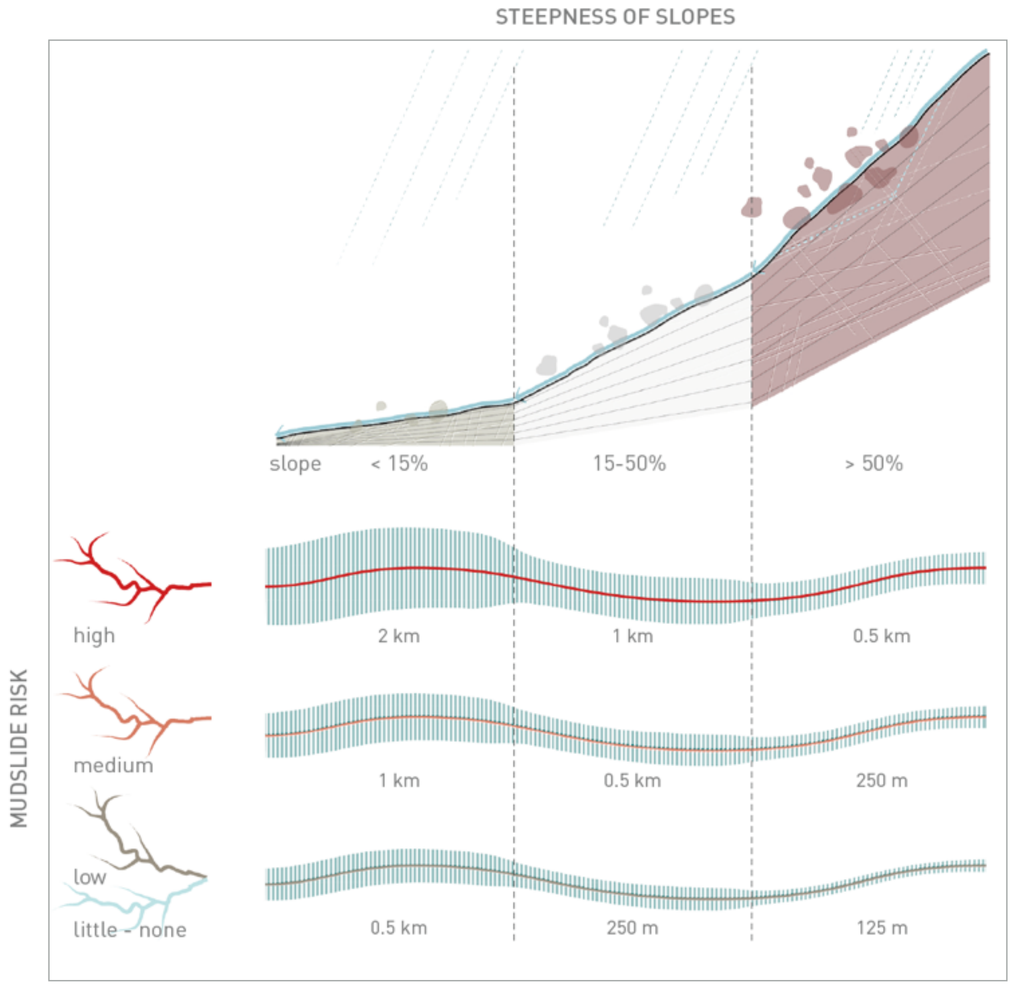
high mudslide risk streams

Slope > 50% areas

Slope < 15% areas

Dajia river catchment

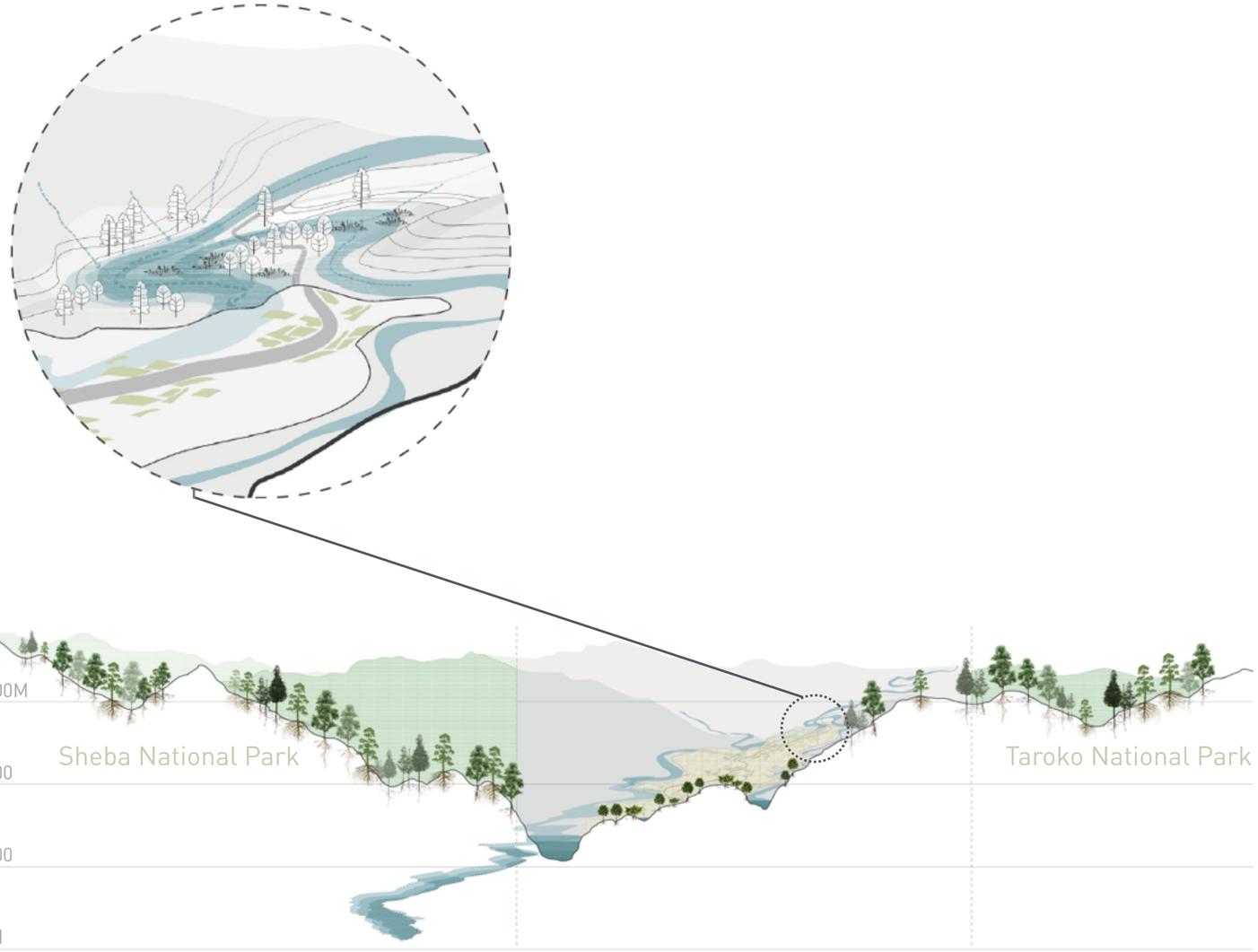
- Mudslide risk of streams
- Steepness of slopes

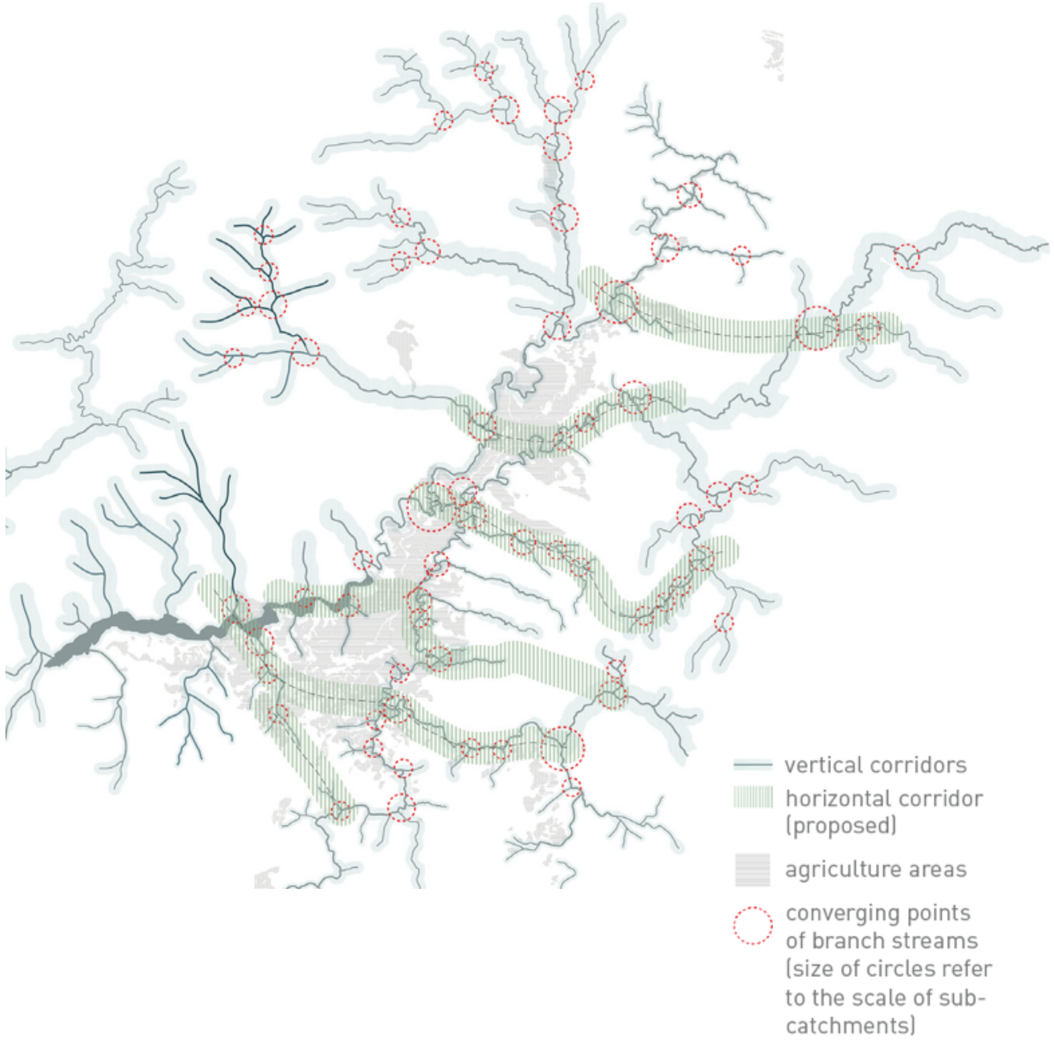


Determine the scales of vertical corridors

OPERATIVE LANDSCAPE STRUCTURES

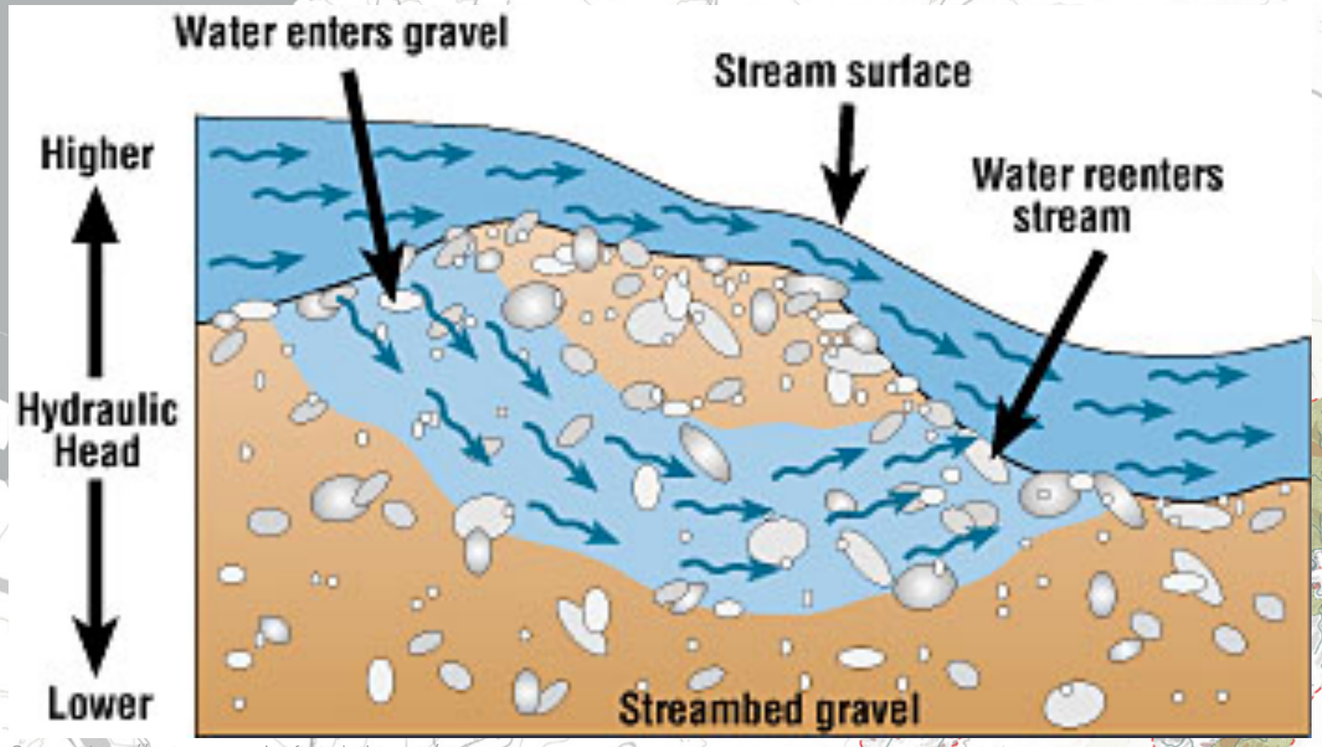
CORRIDOR



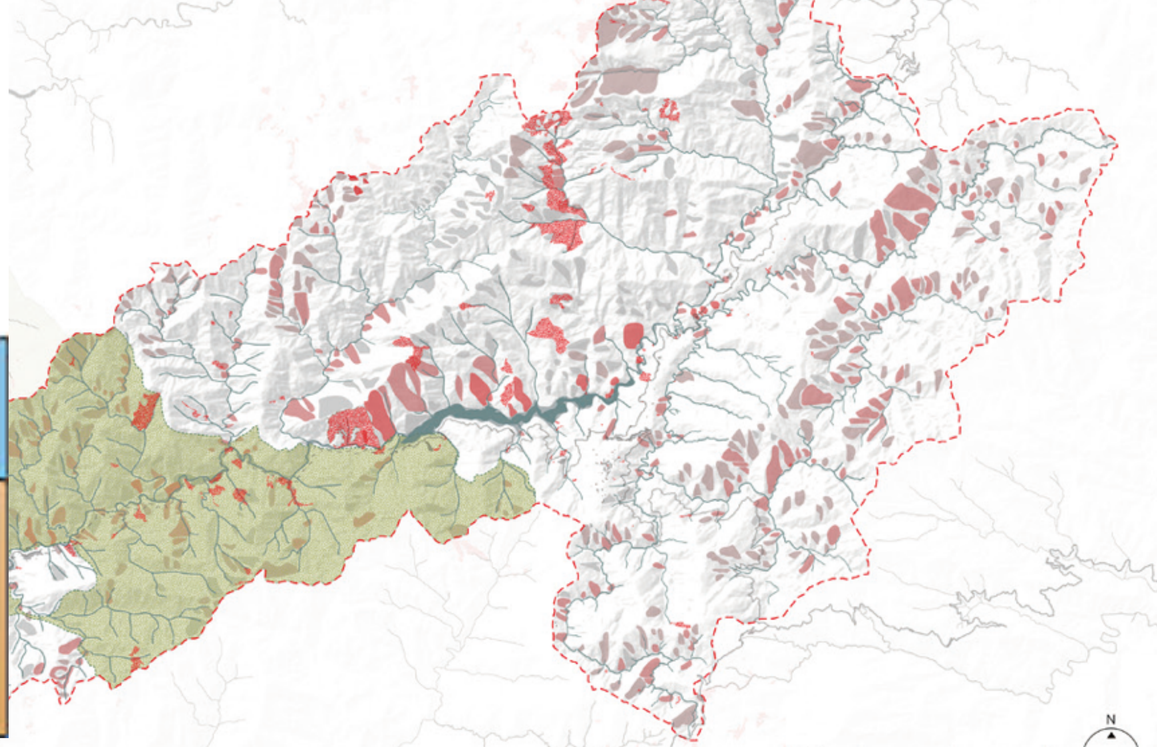


Design the links for horizontal corridors

OPERATIVE LANDSCAPE STRUCTURES



Source: http://naturemappingfoundation.org/



SLOPE

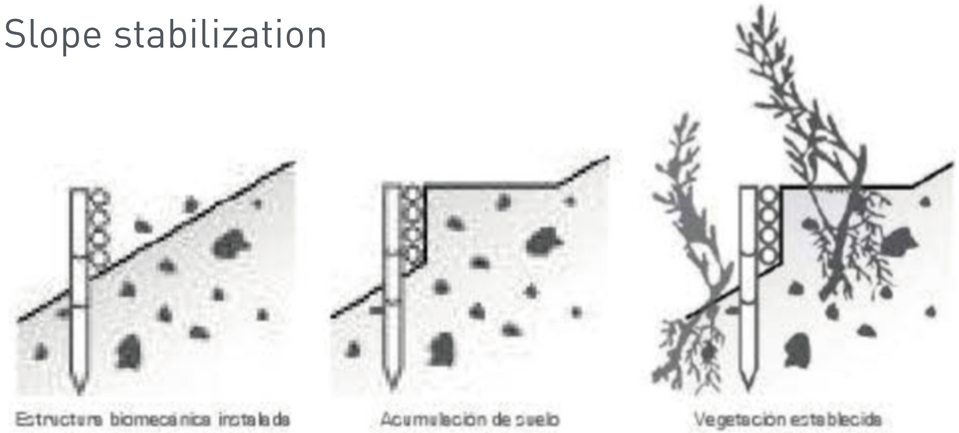
- National Park
- Horizontal corridors
- Agriculture - dry farming (fruits/grains)
- Agriculture - wet farming (rice)
- Existing habitation
- Vertical corridors along streams
- normal streams
- low mudslide risk streams
- medium mudslide risk streams
- high mudslide risk streams
- Dajia river catchment
- Dipslope - high risks
- Dipslope - meduim risks
- Dipslope - low risks
- Dipslope - almost no risks
- Avalanched areas

- Prospering sustainable forestry to suppress agricultural sprawl

OPERATIVE LANDSCAPE STRUCTURES

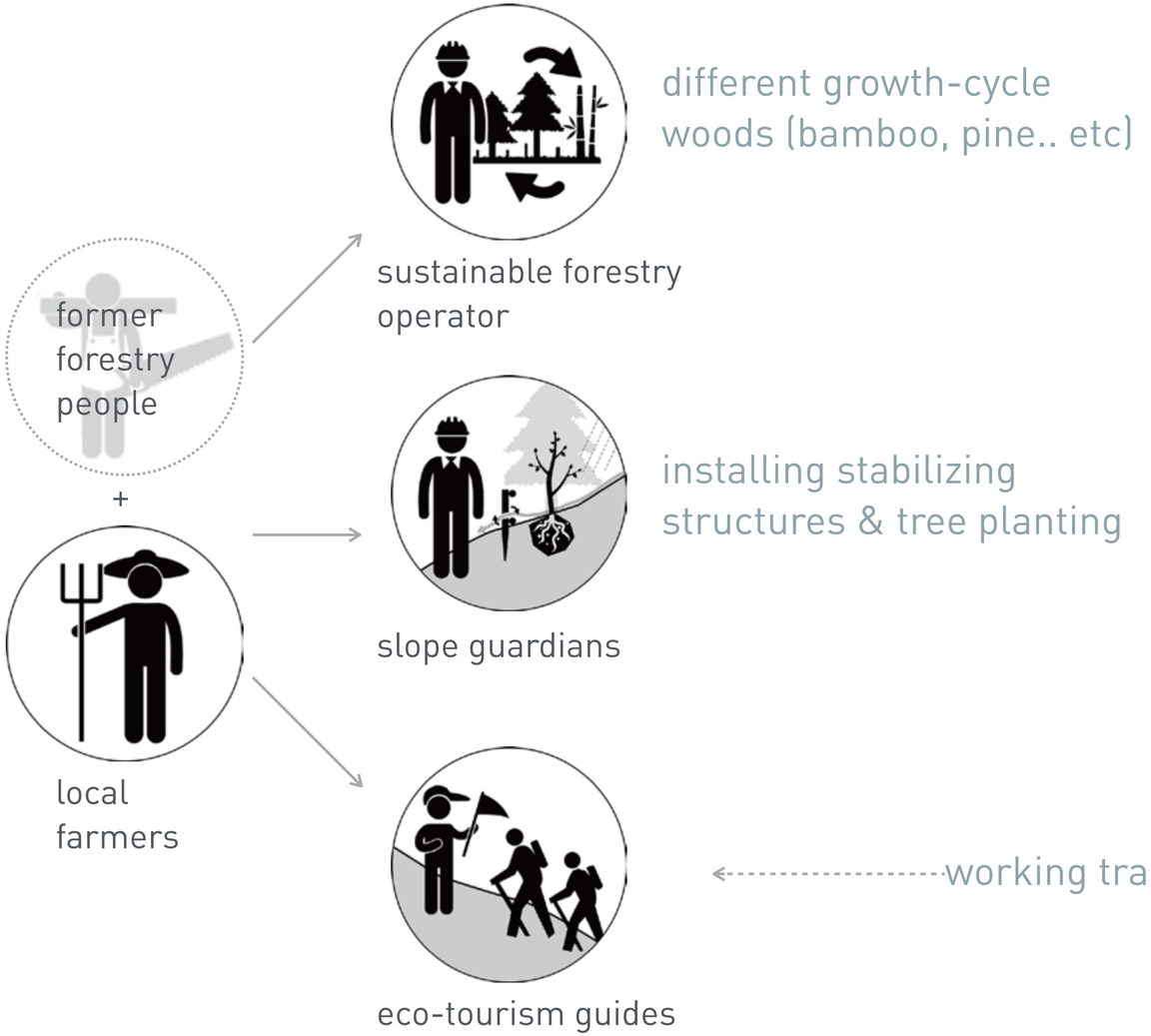
SLOPE

- Slope stabilization

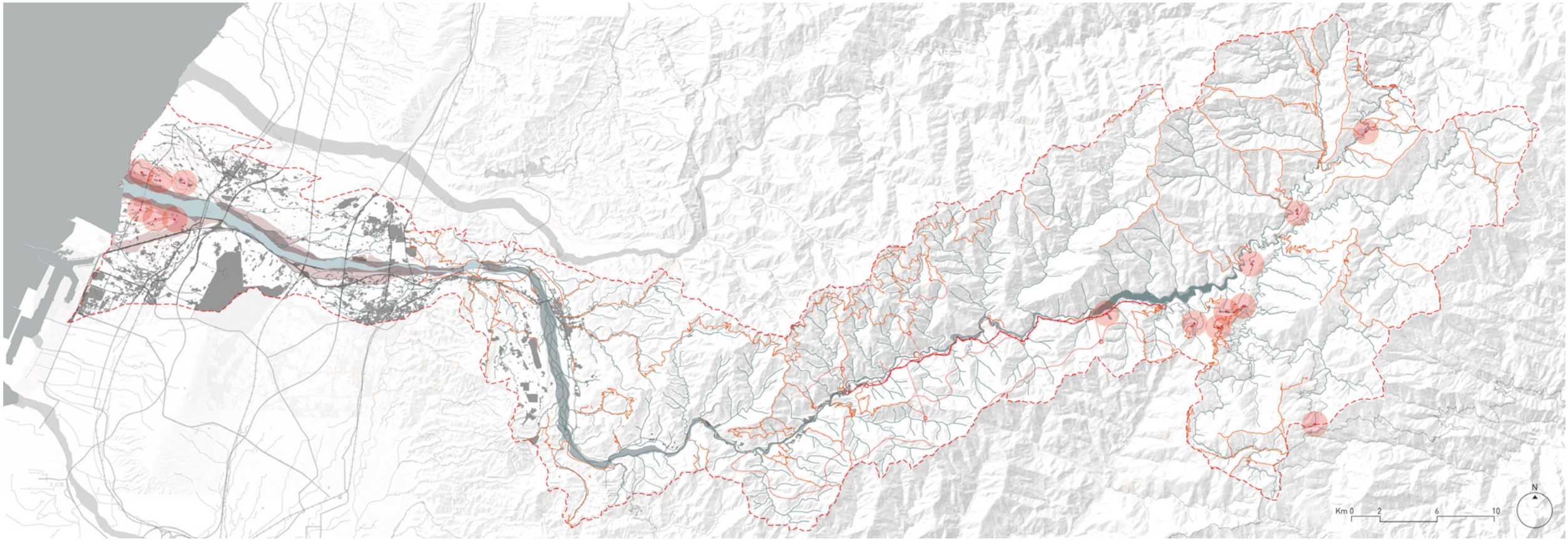



Source: Report of "Rehabilitar la Montana", municipality of Medellin.

- Potential actors



OPERATIVE LANDSCAPE STRUCTURES



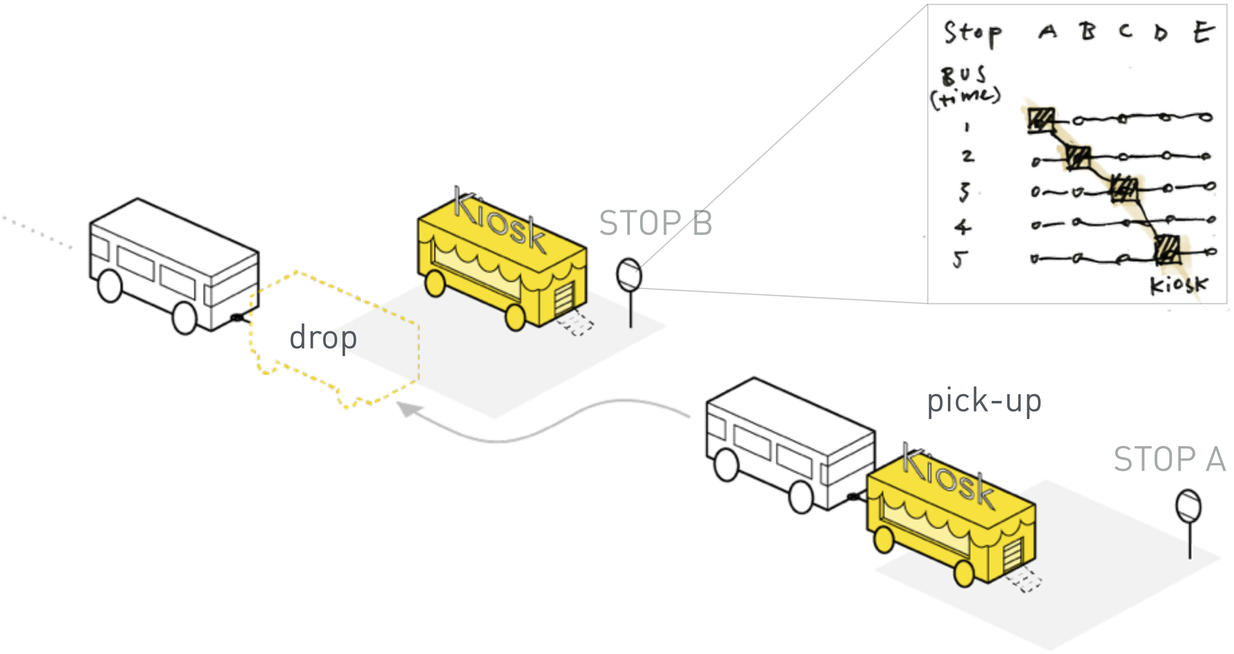
MOBILITY

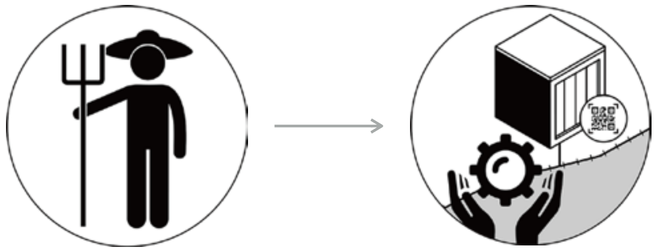
- Existing forestry trails
- New forestry / slopework trails
- Maintainence points
- Machinary track for shipping
- Public transporation stops + moving kiosk & evacuation points (1 km coverage)
- Existing habitation
- Dajia River catchment
- Historical river courses

OPERATIVE LANDSCAPE STRUCTURES

MOBILITY

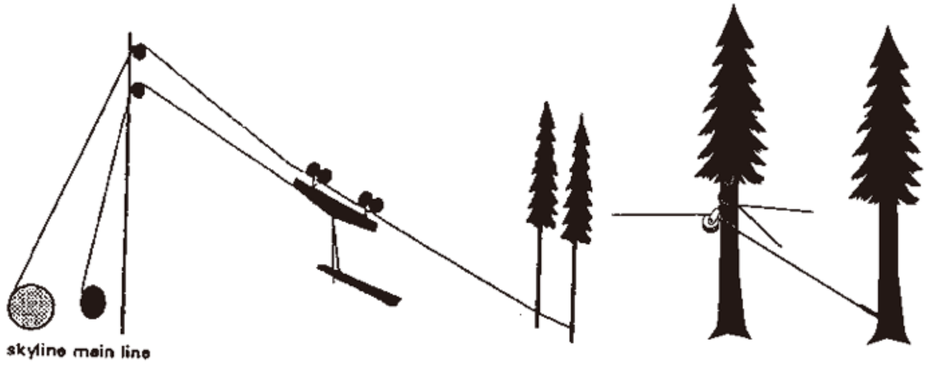
- Moving kiosks at public transportation





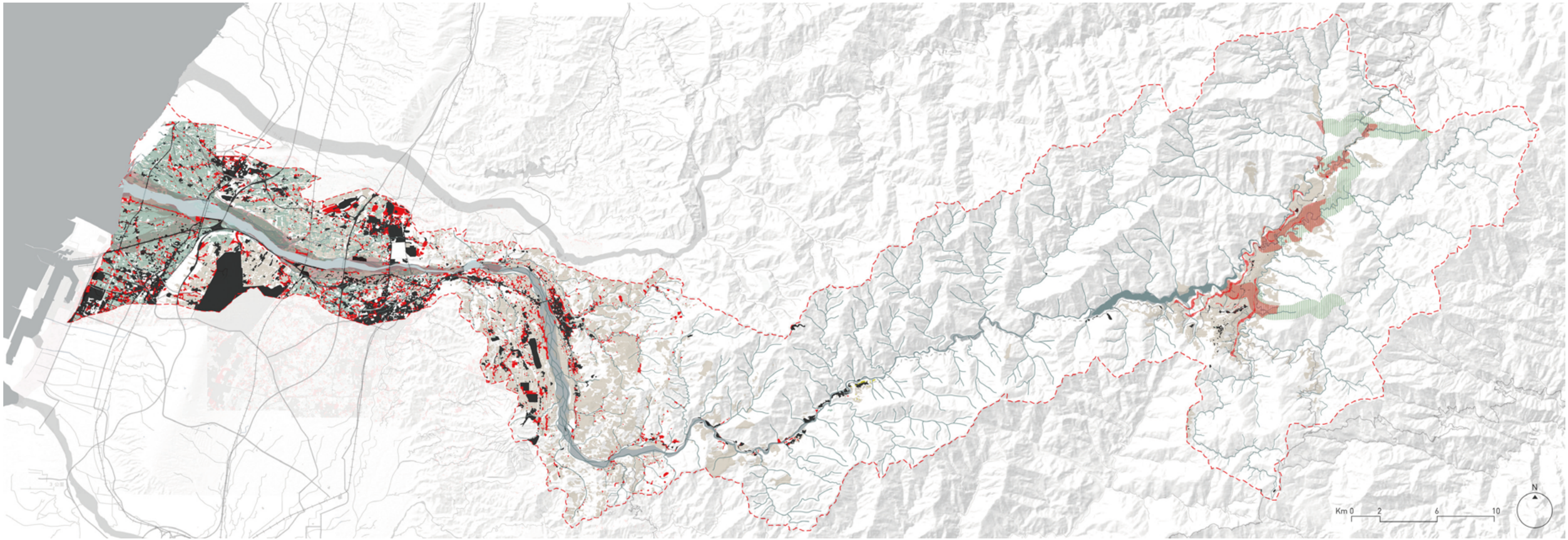
maintenance and management of the machinery track for shipping agricultural products.

- Light shipping infrastructure



Source: FAO, UN.

OPERATIVE LANDSCAPE STRUCTURES



PUBLIC SPACES

- Horizontal corridors
- Targeted agricultural transformation
- Water infrastructure interventions
- Groundwater infrastructures
- Historical river courses
- Existing habitation
- Dajia River catchment

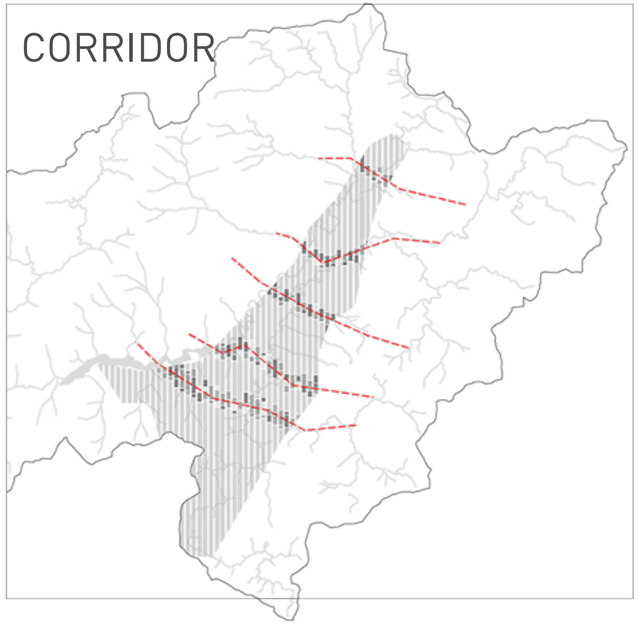
DESIGN INTERVENTION

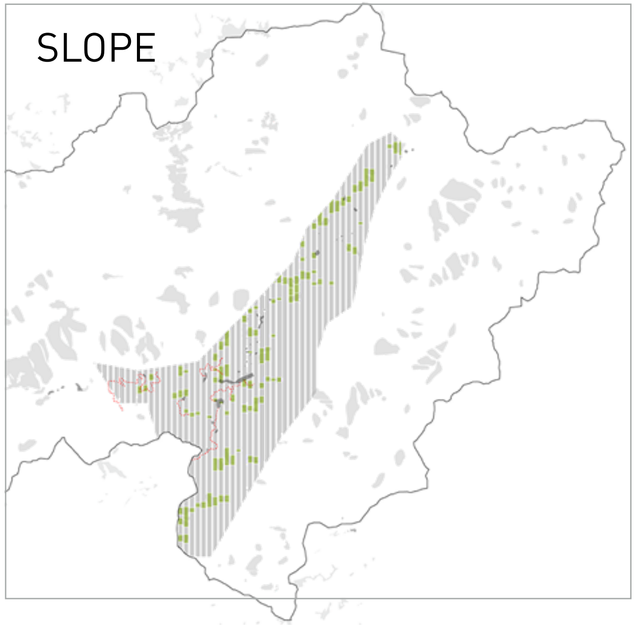
landscape operative structures

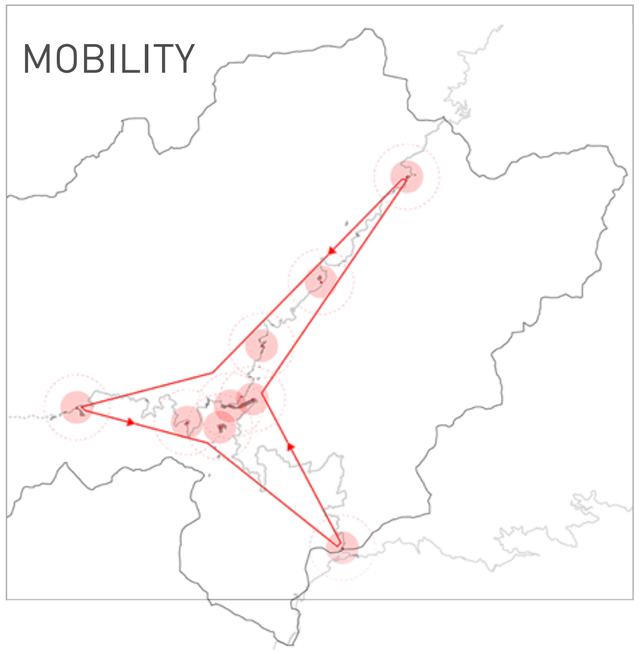
local area strategic plans

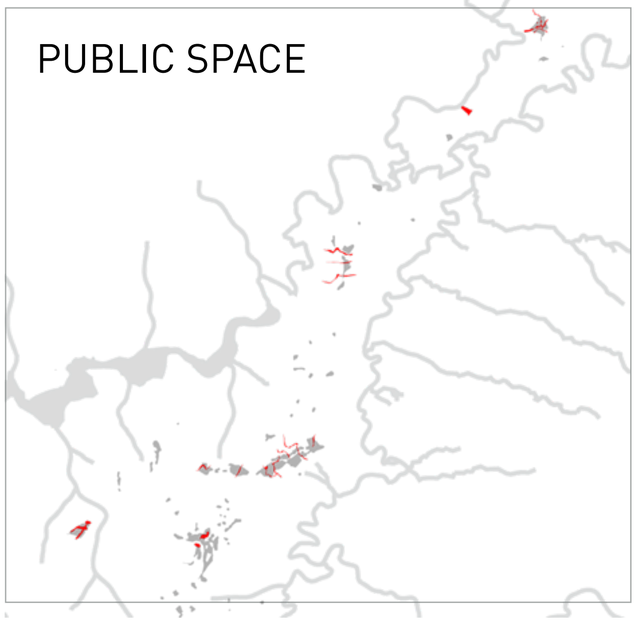
zoom-in site interventions

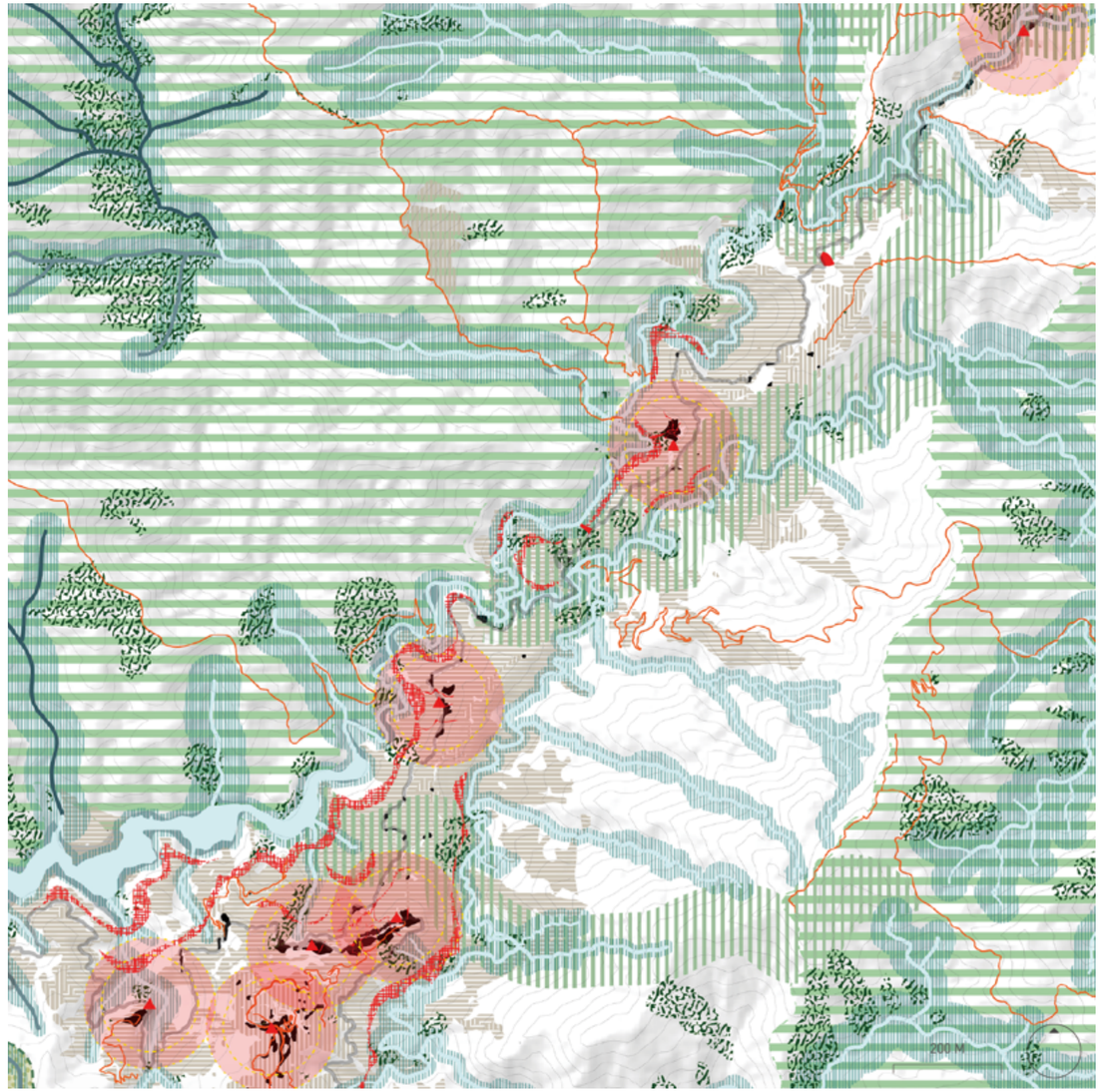
UPSTREAM DESIGN INTERVENTION











UPSTREAM DESIGN INTERVENTION

1850s TODAY

Source: screenshot from video clip by Shen [https://www.youtube.com/watch?v=MISj8s-6S...]

historical river courses
historical urbanized area
forest

current river courses
river flooding plain
urbanized area
forest
avalanched slopes
mudslide-risk streams
motorway
landslide threatened community
better connection
poorer connection

- Fruit farming since 1950s
- After road breakdown, sprawled extensively
- Increased erosion of rain -> landslide risks

Source: walkerland.com.tw

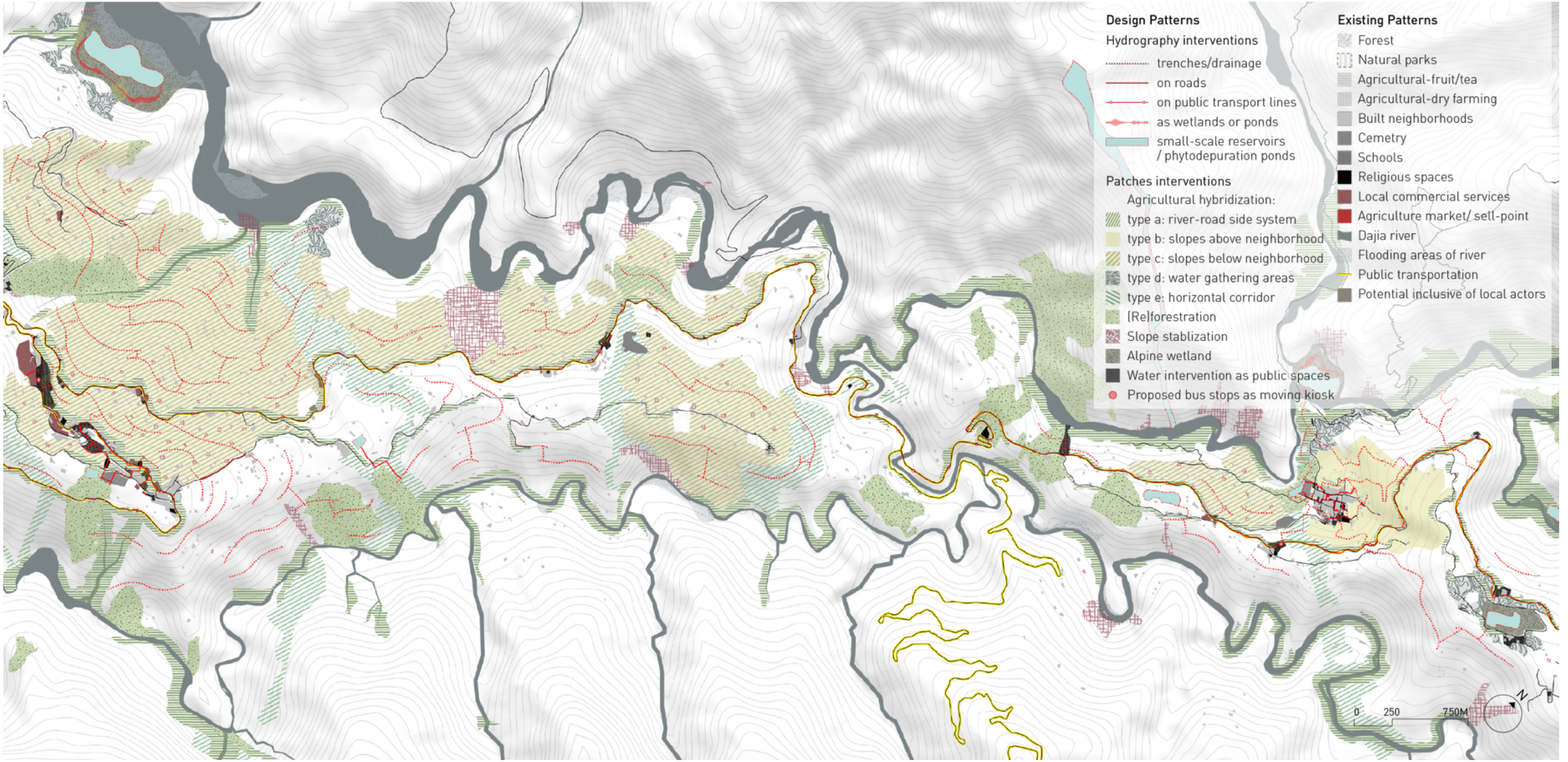
UPSTREAM DESIGN INTERVENTION

WATER INFRASTRUCTURES

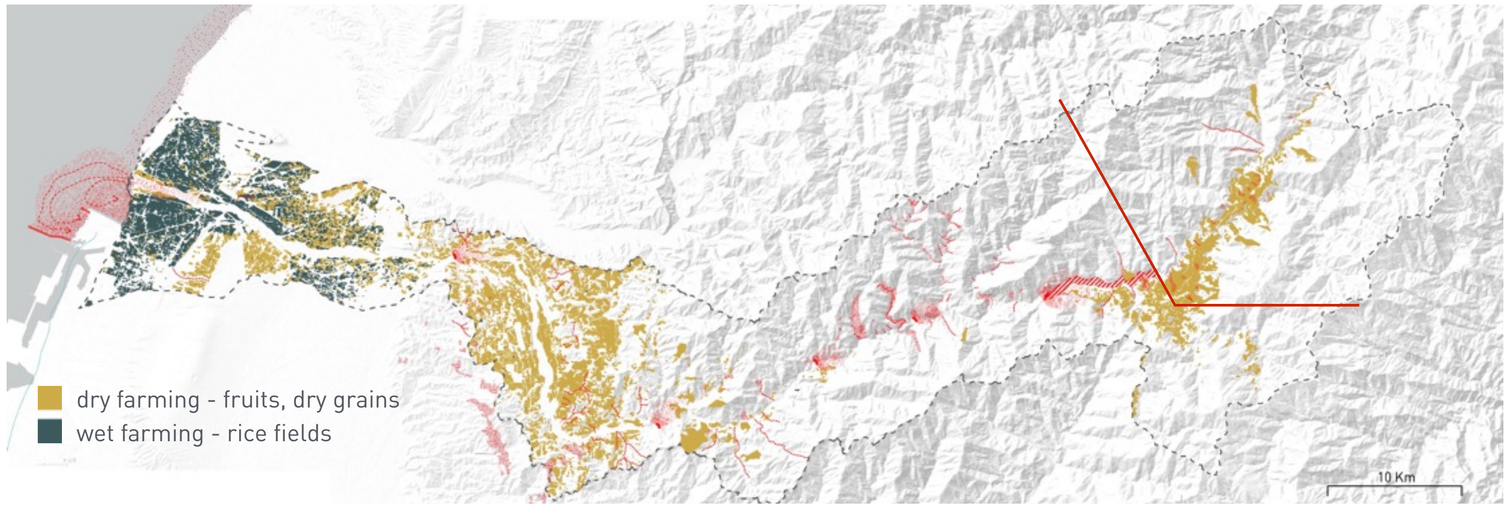
- self-installed facilities
- easily destroyed by rain
- could not ensure steady supply

Source: Google Earth photos

UPSTREAM DESIGN INTERVENTION

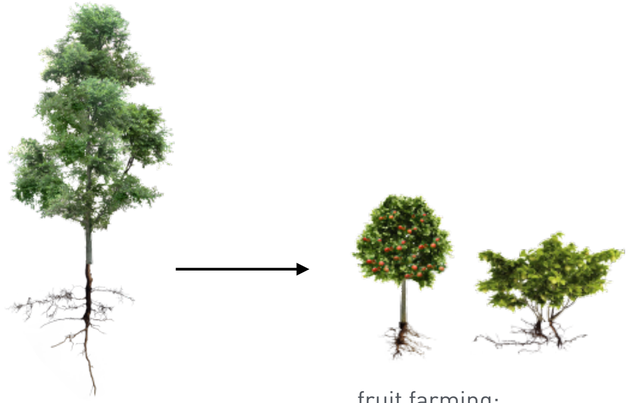


UPSTREAM DESIGN INTERVENTION



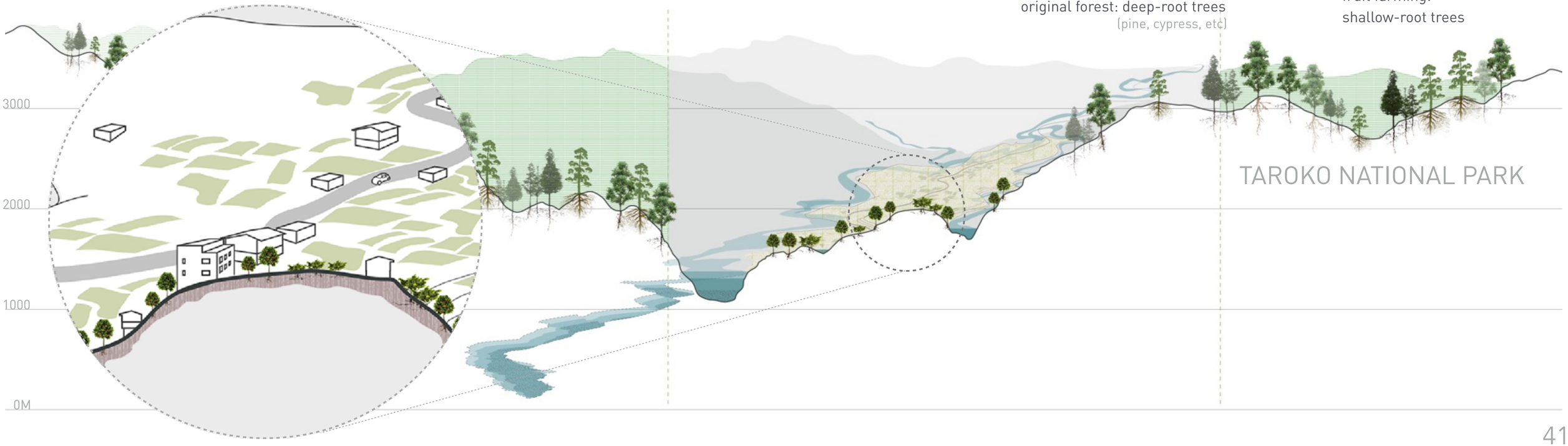
Source: map made by the author based on data from National Land Surveying and Mapping Center, MOI.

- Increasing of water and sediment flow threatened human life and ecology corridor

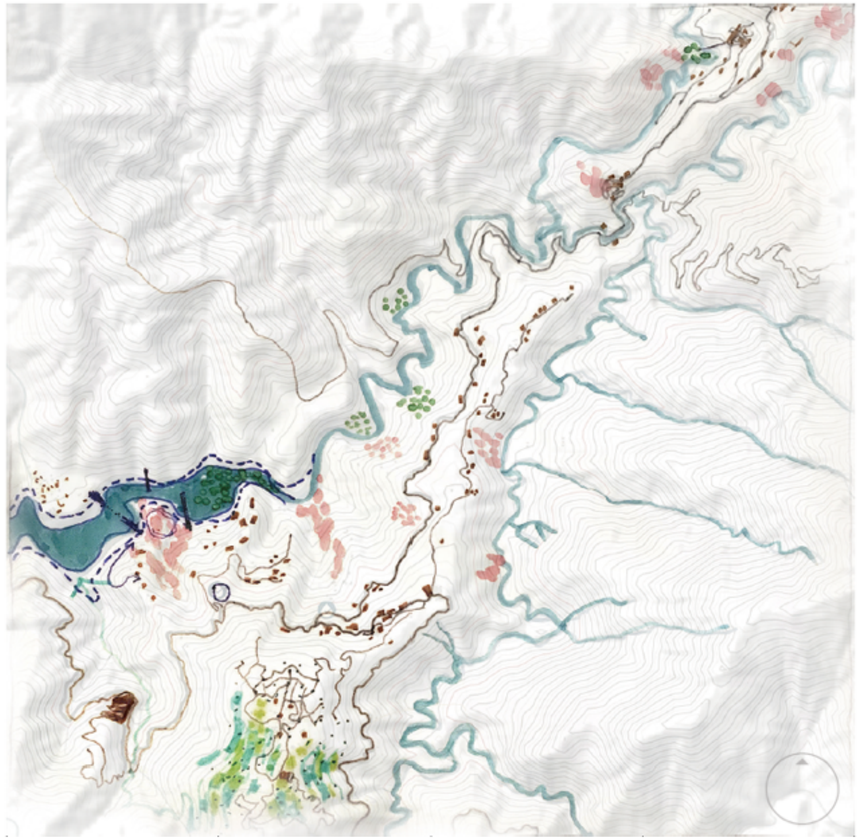


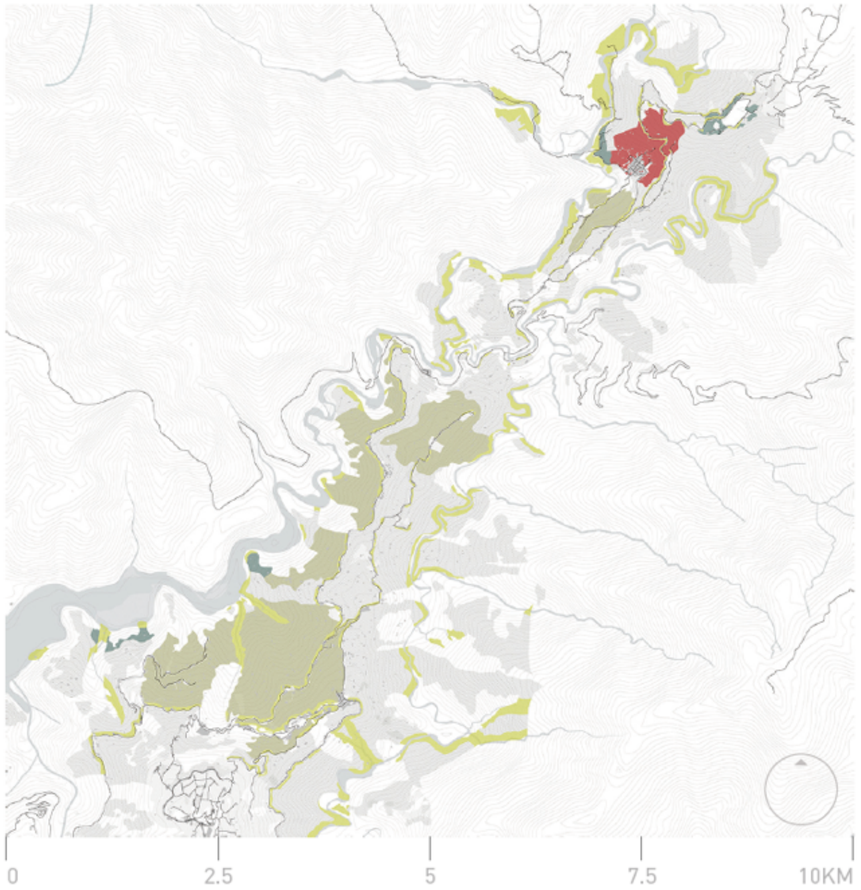
original forest: deep-root trees
(pine, cypress, etc)

fruit farming:
shallow-root trees



UPSTREAM DESIGN INTERVENTION



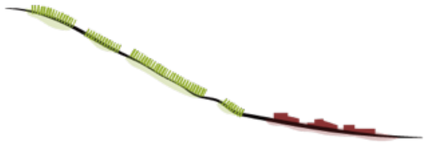


PROPOSAL

- design with natural water flows

A: road-side/ riverside agricultures

B: agriculture on slopes above community



C: agriculture on slopes below community

D: converging points of branch streams

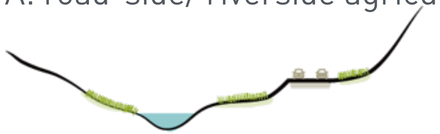
Alpine wetland

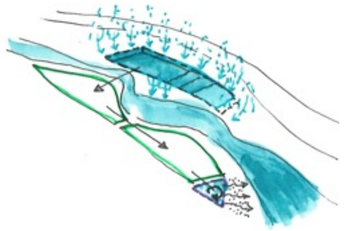
Source: https://kknews.cc

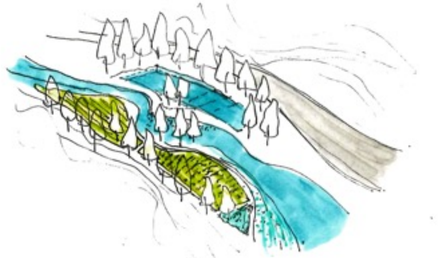
existing slope agriculture (fruit/dry crops)

UPSTREAM DESIGN INTERVENTION

A: road-side/ riverside agricultures



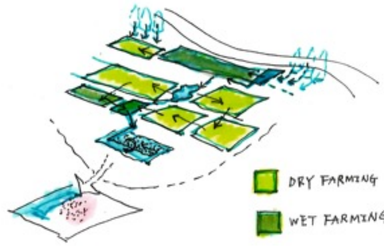


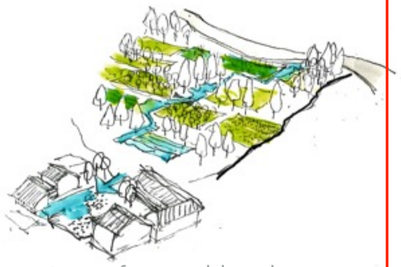


water X activity system

transformed landscape

B: agriculture on slopes above community



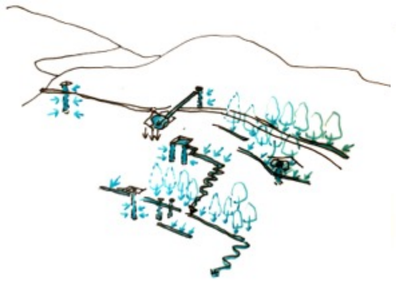


water X activity system

transformed landscape

HUANSHAN VILLAGE

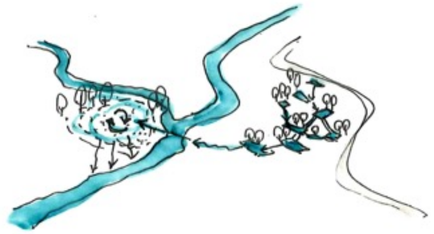
C: agriculture on slopes below community

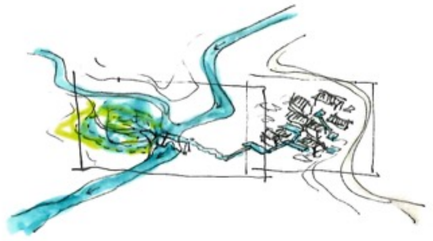


water X activity system

transformed landscape

D: converging points of branch streams





water X activity system

transformed landscape

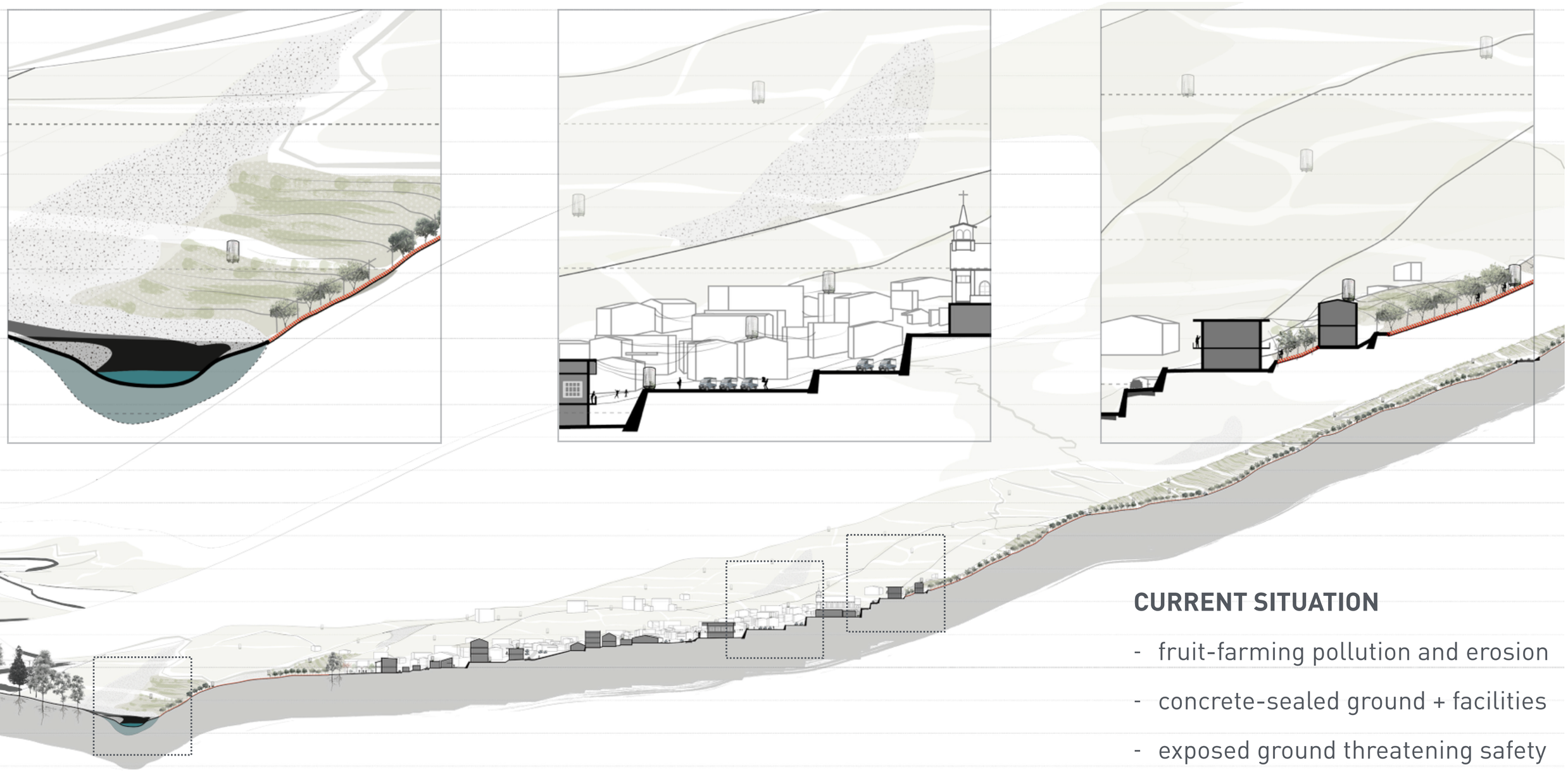
UPSTREAM DESIGN INTERVENTION

HUANSHAN VILLAGE

- population around 800
- past: hunting, mixed rice farming
  present: extensive fruit-farming

river (Dajia upstream)
existing forest
fruit farming
built area
motor roads
buildings

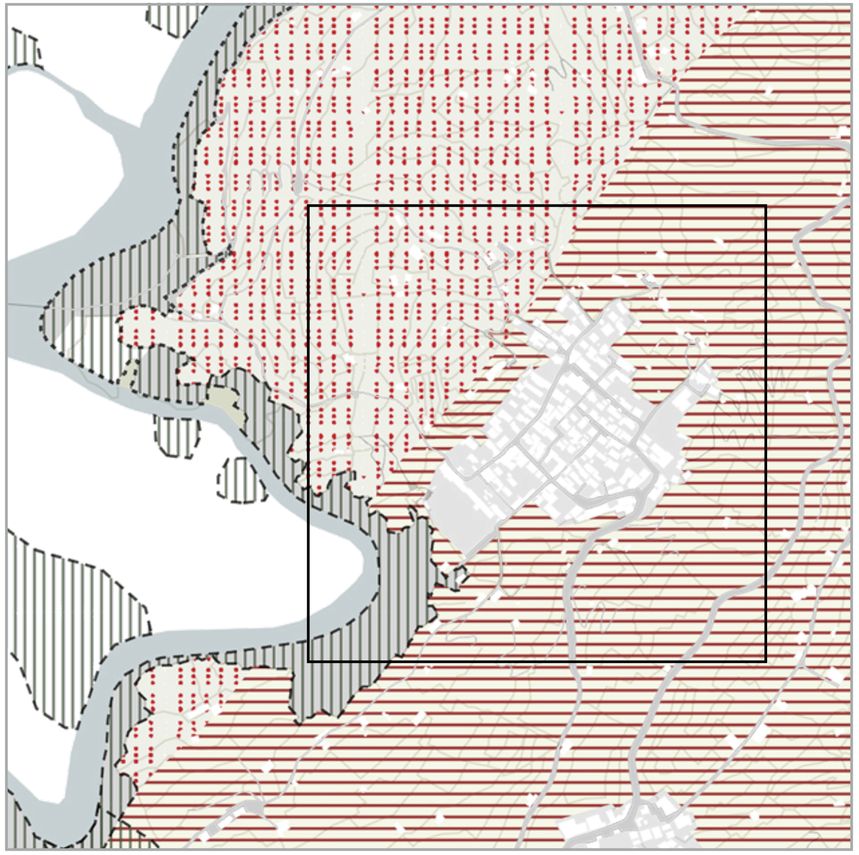
UPSTREAM DESIGN INTERVENTION



CURRENT SITUATION

- fruit-farming pollution and erosion
- concrete-sealed ground + facilities
- exposed ground threatening safety

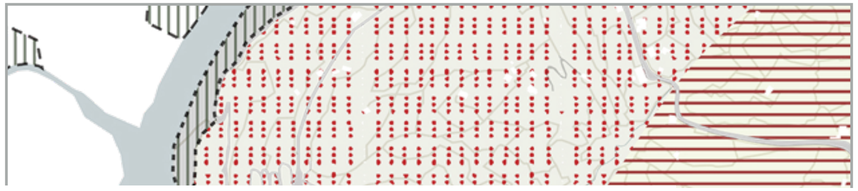
UPSTREAM DESIGN INTERVENTION

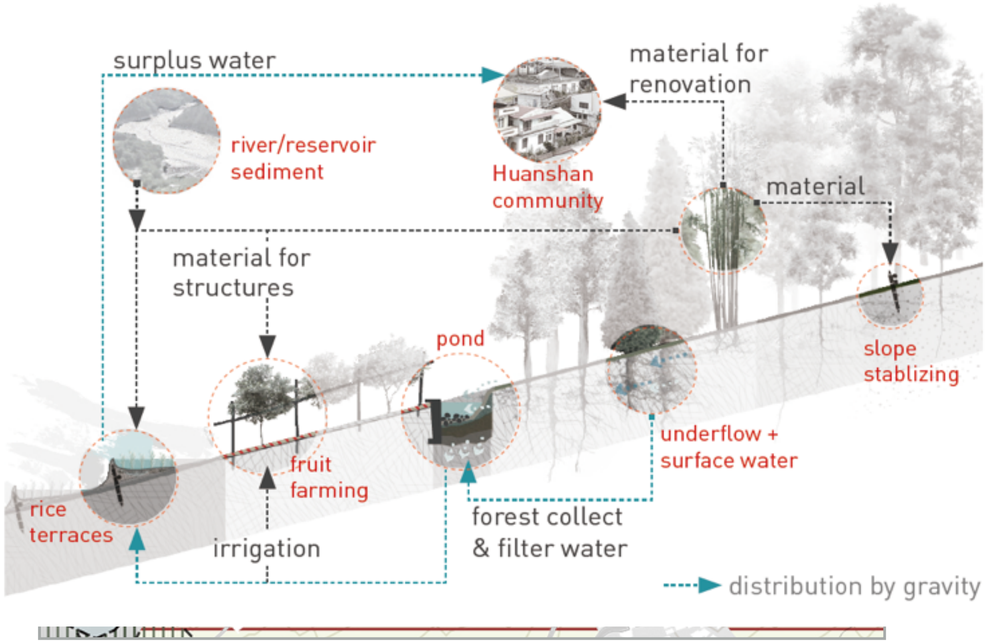


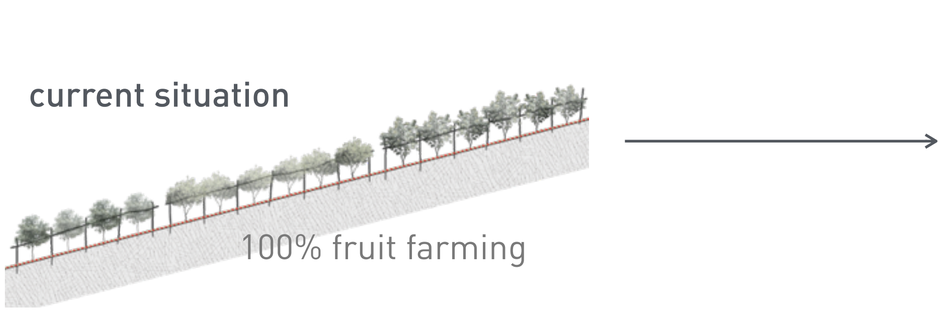
MAIN CONCEPTS

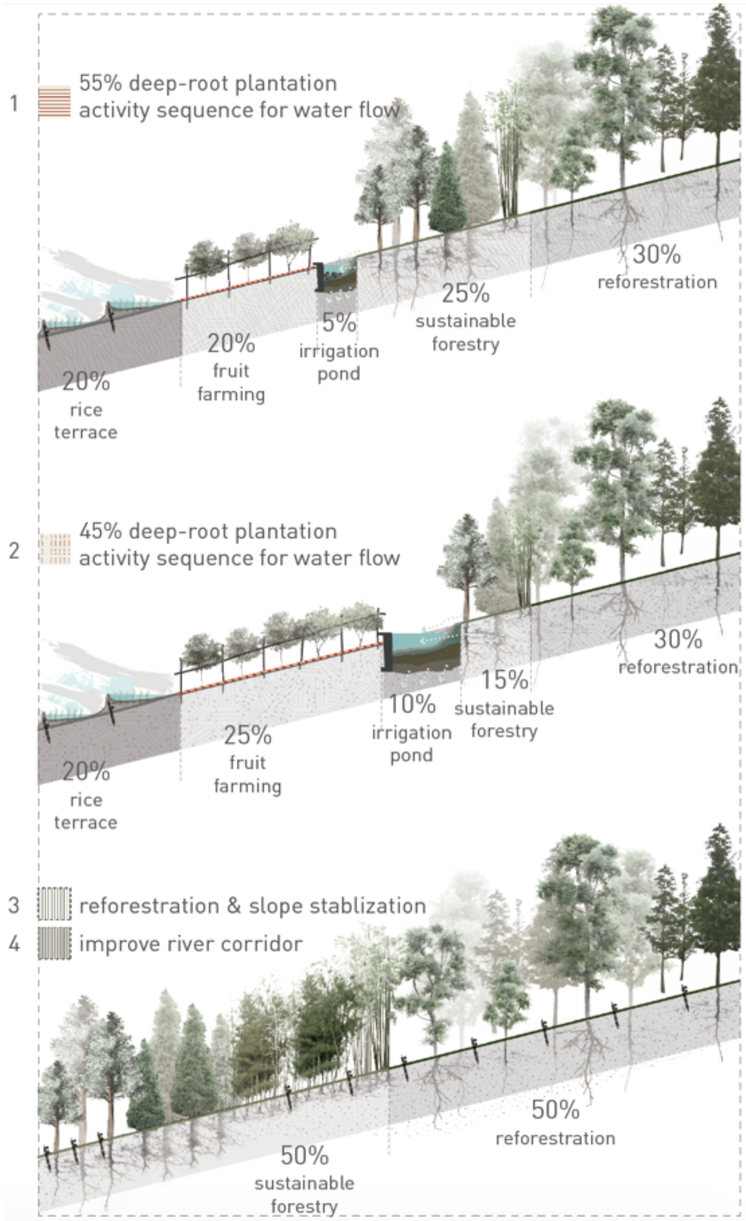
1. slope activity hybridization
2. self-sufficient water system

UPSTREAM DESIGN INTERVENTION



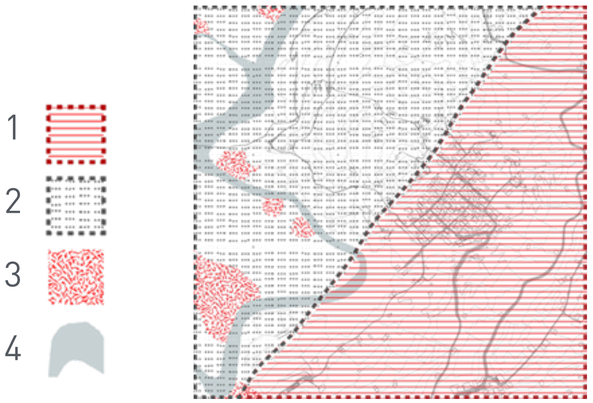






1. SLOPE ACTIVITY HYBRIDIZATION

slope geomorphology

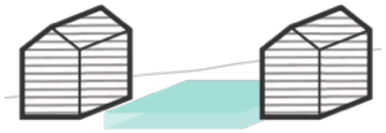


1. younger geology (Miocene) weaker land structure
2. older geology (Eocene) stabler land structure
3. avalanched area
4. river

UPSTREAM DESIGN INTERVENTION

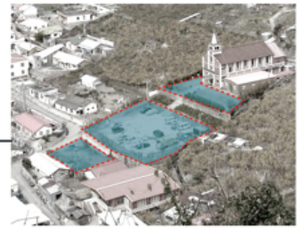
2. SELF-SUFFICIENT WATER SYSTEM

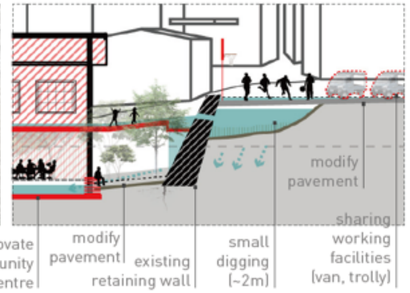
joined renovation



DIY rain gardens

know-how





community public/water space

public / public-oriented buildings (schools, church, community centre)

public or public-oriented buildings (schools, church, community centre)

private households

monthly water demand

drinking water: ~ 8,000m^3

slope activity: ~ 13,110m^3

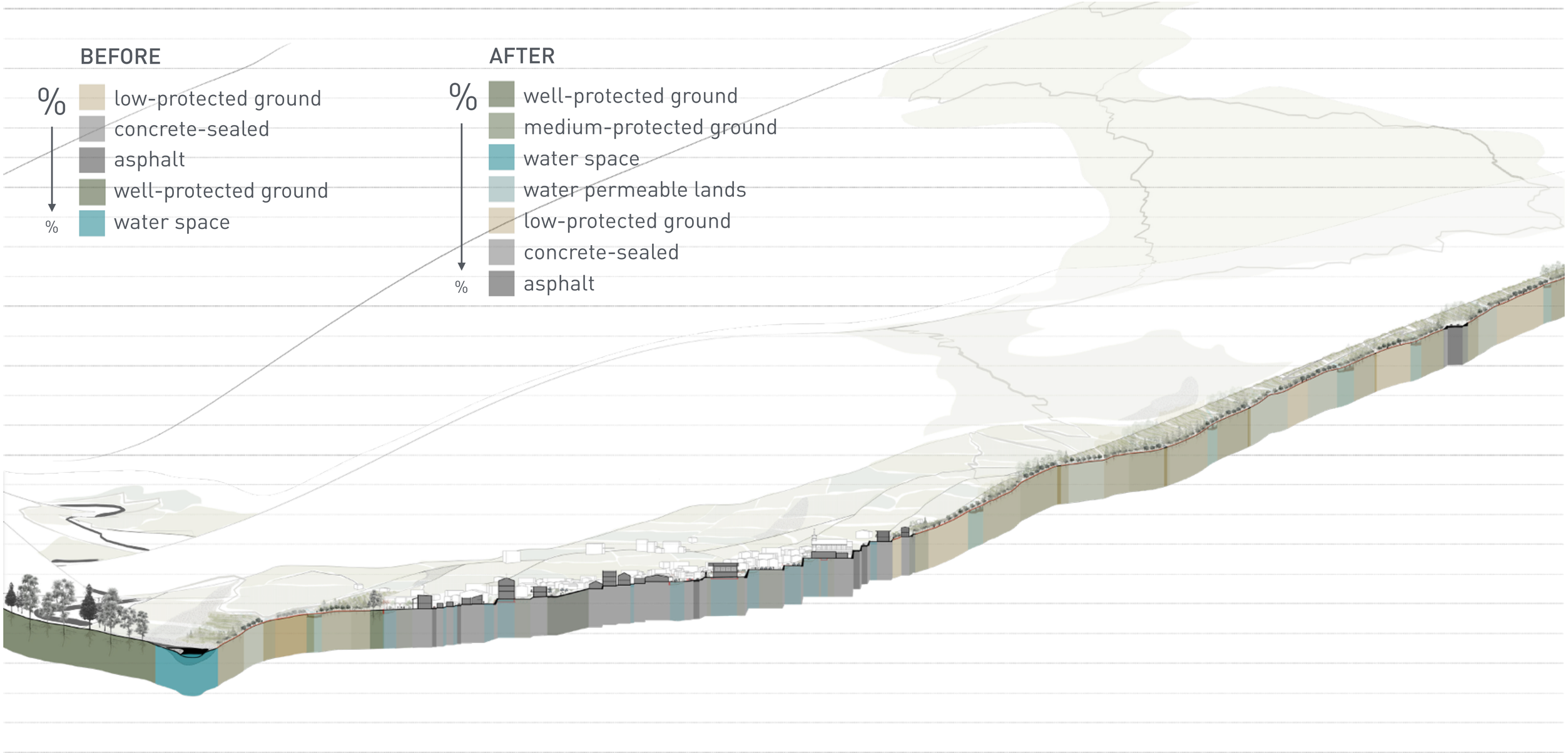
1M depth / 50% for water

10,100m^3

9,250 m^3

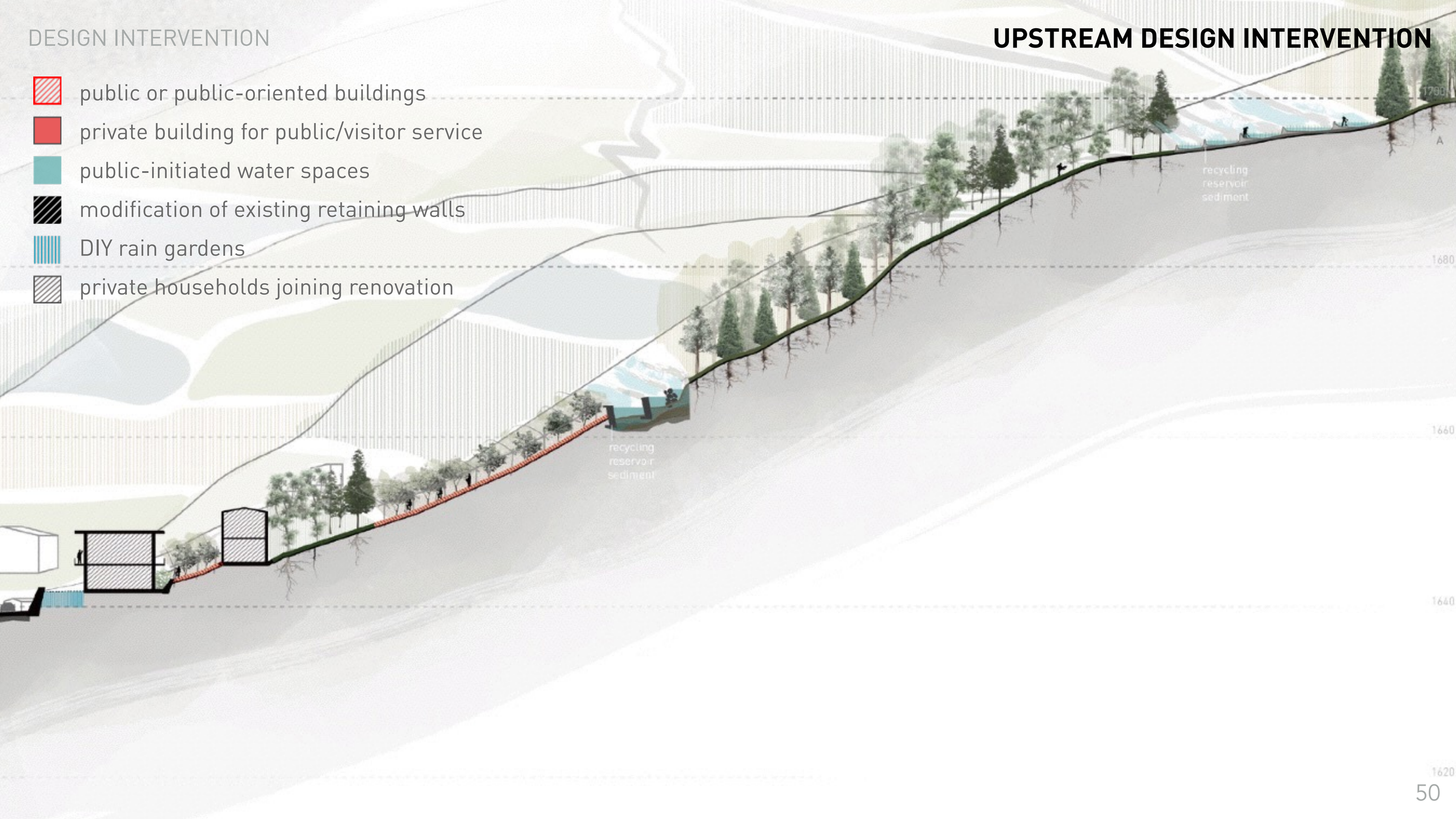
self-sufficient water supply

UPSTREAM DESIGN INTERVENTION



UPSTREAM DESIGN INTERVENTION

- public or public-oriented buildings
- private building for public/visitor service
- public-initiated water spaces
- modification of existing retaining walls
- DIY rain gardens
- private households joining renovation

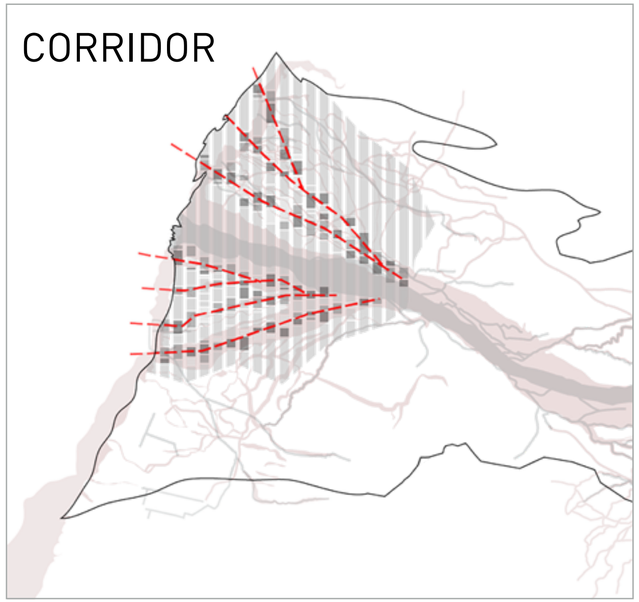


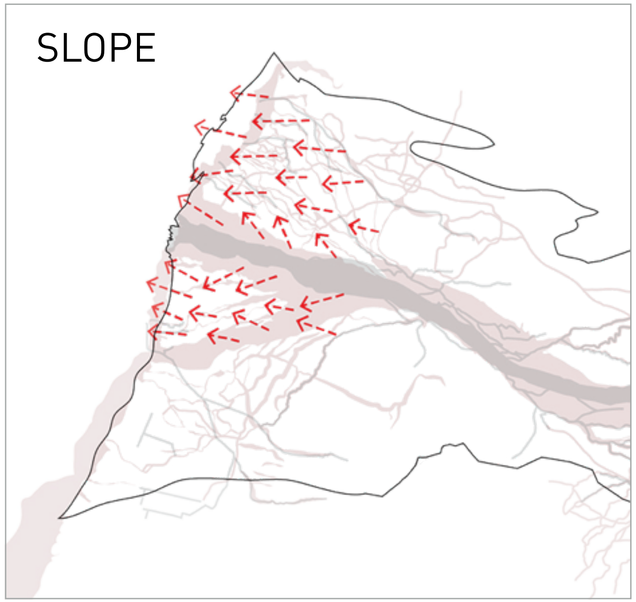
UPSTREAM DESIGN INTERVENTION

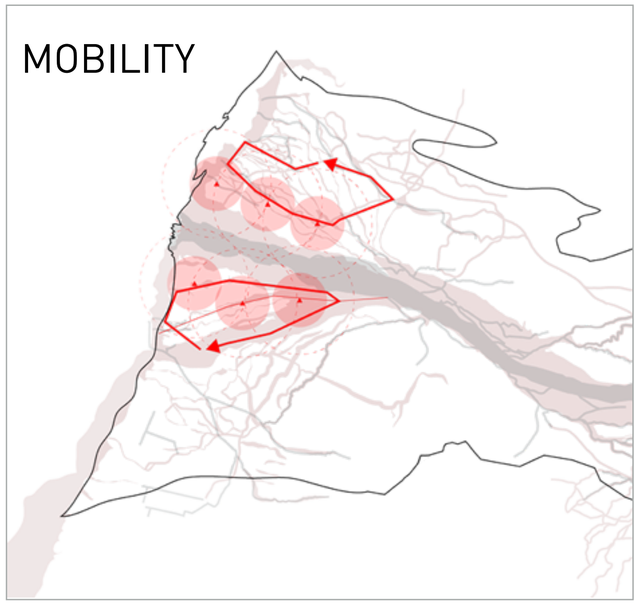
LANDSCAPE TRANSFORMATION

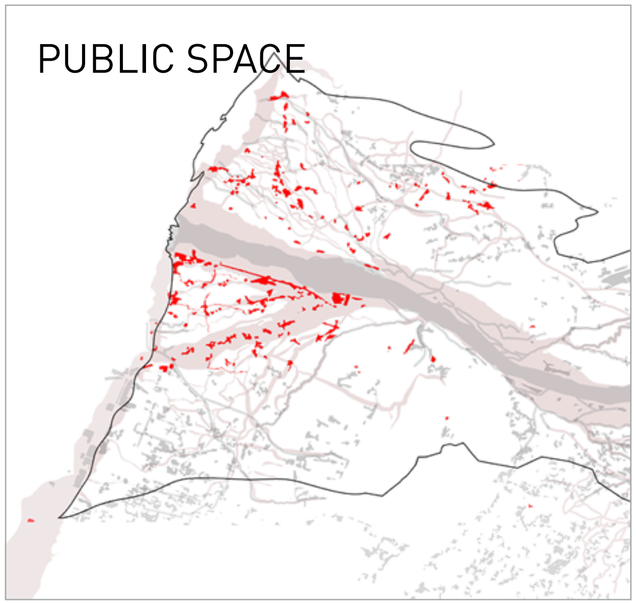
FINAL IMAGE

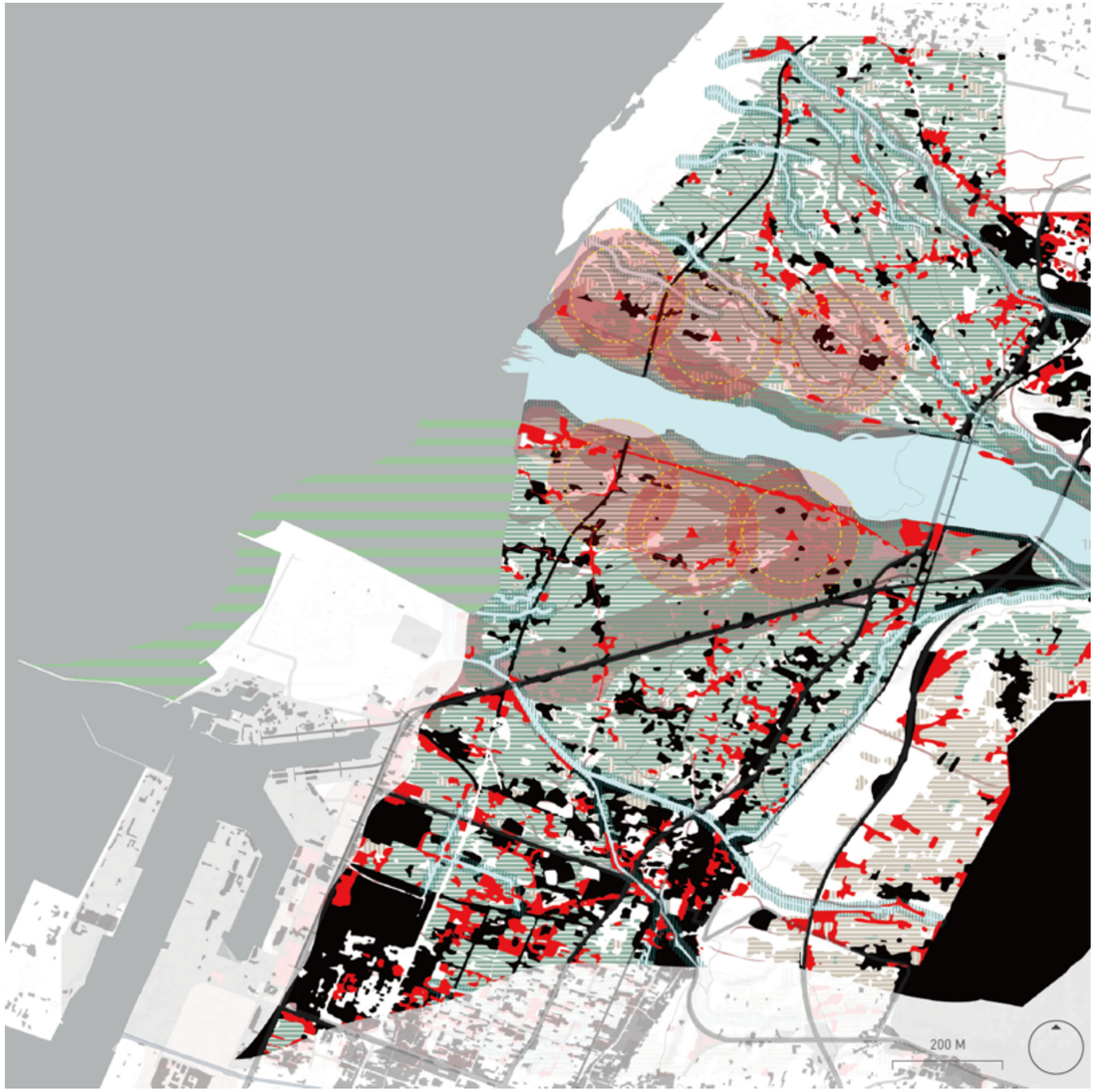
DOWNSTREAM DESIGN INTERVENTION





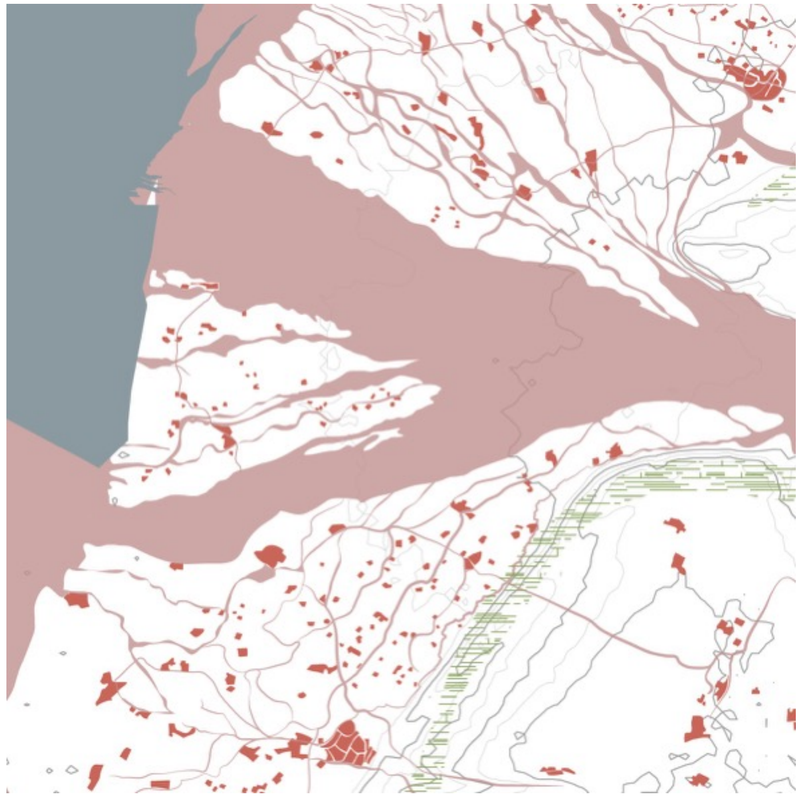






DOWNSTREAM DESIGN INTERVENTION

1850s



contact of mountain and plain
historical river courses
historical urbanized area

TODAY

primary roads
railway
contact of mountain and plain
current river courses
flooding plain
urbanized area

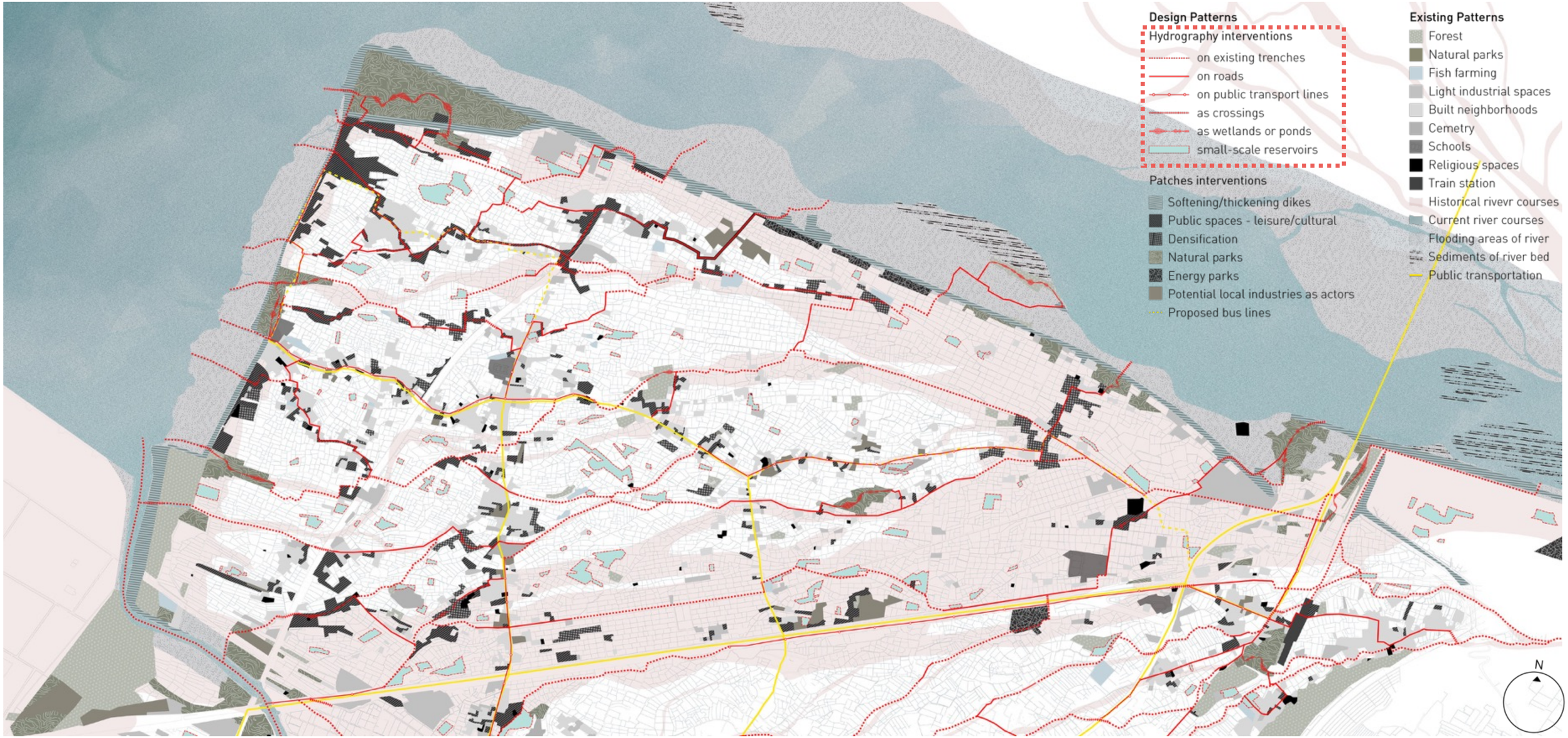
- River constrained
- Marginalized and deteriorated living spaces
- Main economic activity often forced to fallow

Source: google earth

Source: google earth

Source: made by the author based on GIS data, google maps, & historical maps.

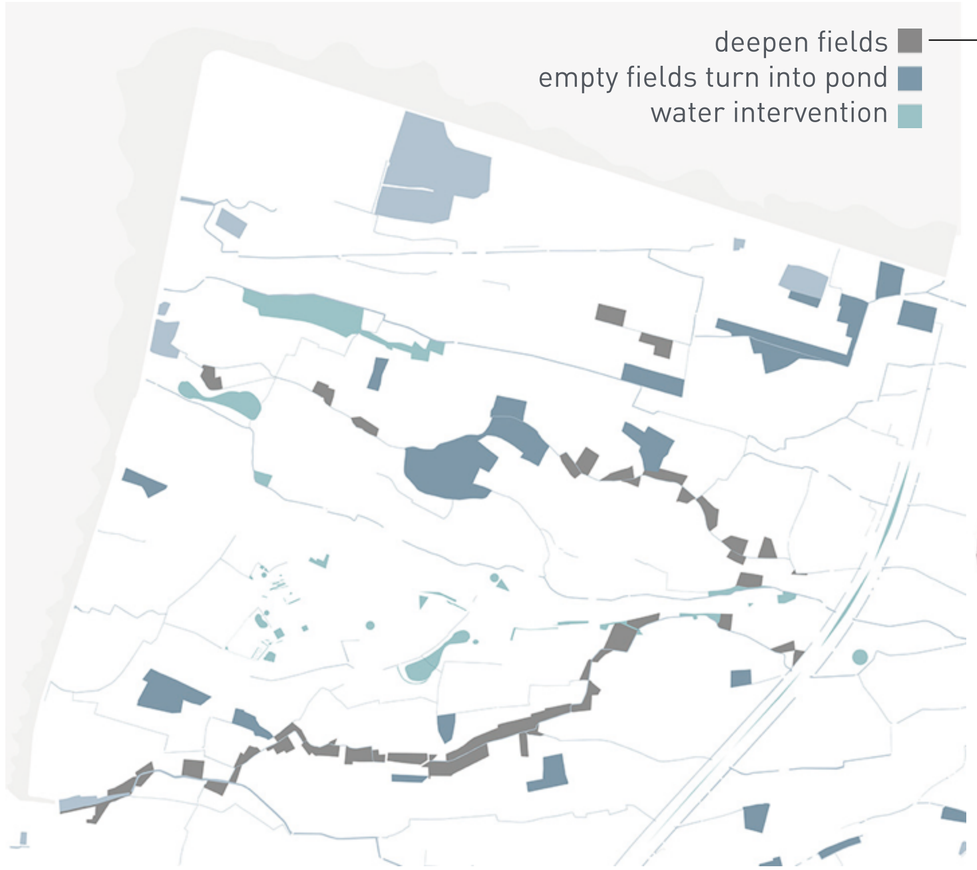
DOWNSTREAM DESIGN INTERVENTION



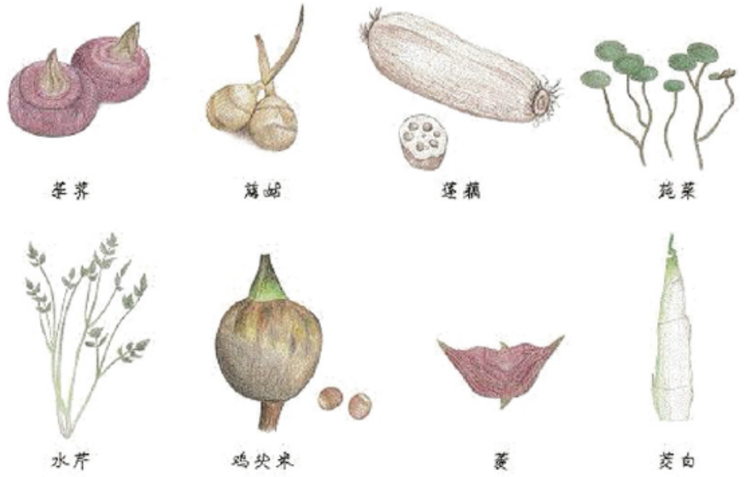
- Recover* the historical river courses

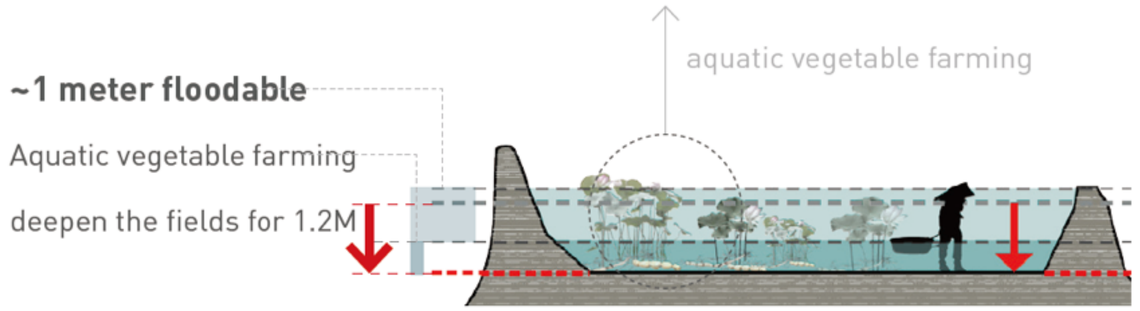
**[Recover]: something once lost, devalued, forgotten, or misplaced has been found again, retrieved, and brought forward with renewed vitality.* — James Corner, 1999

DOWNSTREAM DESIGN INTERVENTION



Source: Daidaichuancheng New Media

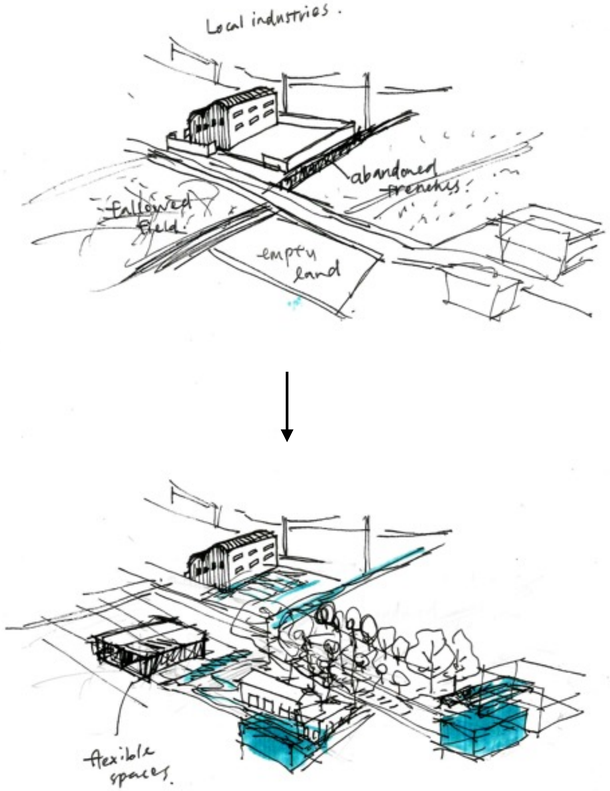




MAIN CONCEPTS

1. recover historical river courses as the activating vein

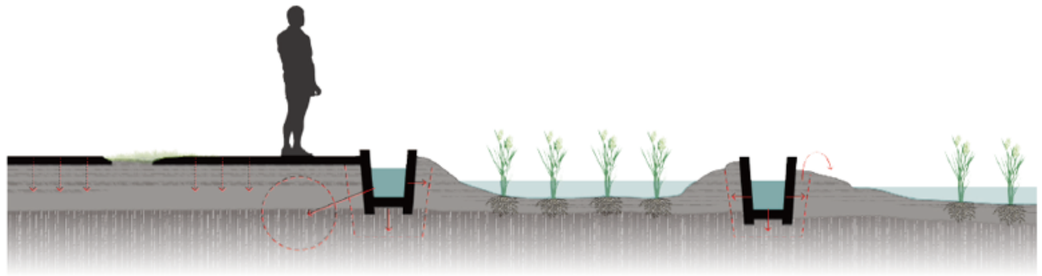
2. collaboration of local patches

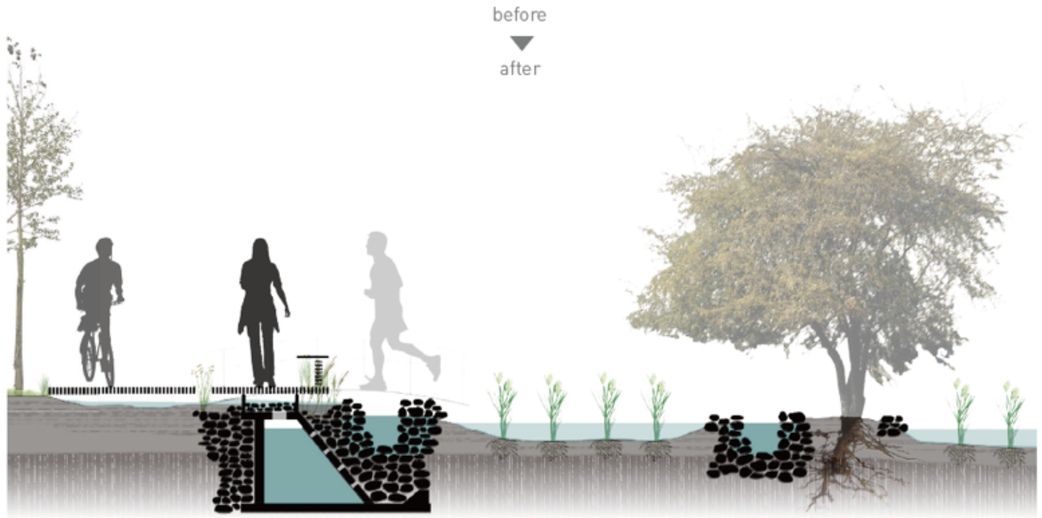


DOWNSTREAM DESIGN INTERVENTION

Hydrography interventions

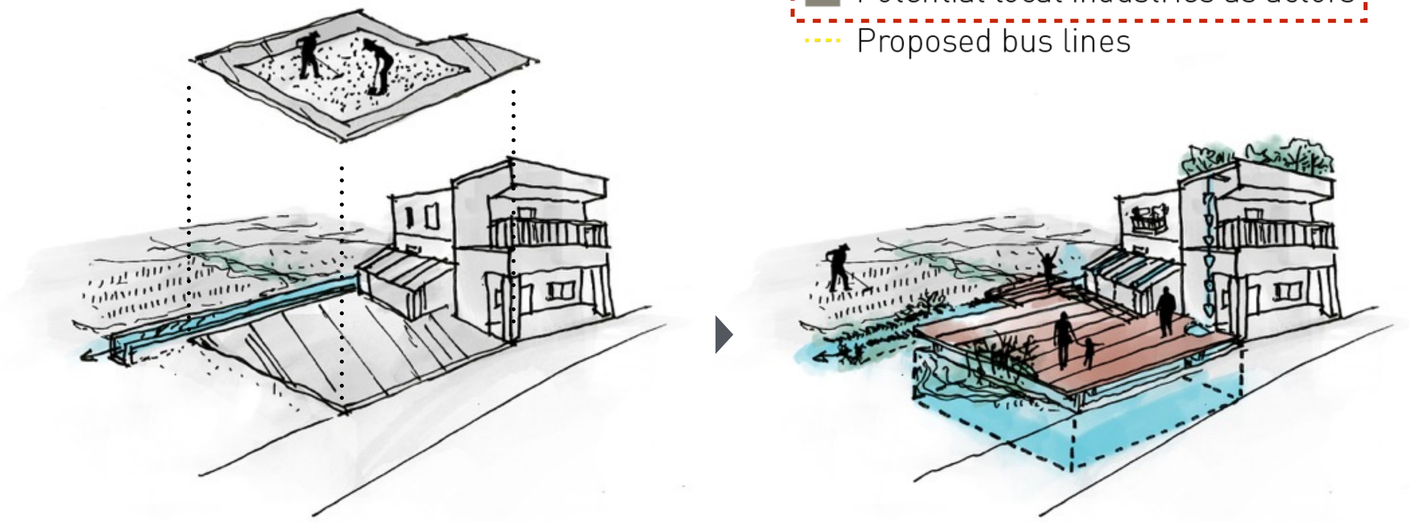
- on existing trenches
- on roads
- on public transport lines
- as crossings
- as wetlands or ponds
- small-scale reservoirs





Patches interventions

- Softening/thickening dikes
- Public spaces - leisure/cultural
- Densification
- Natural parks
- Energy parks
- Potential local industries as actors
- Proposed bus lines



Grain sunning places + residential buildings

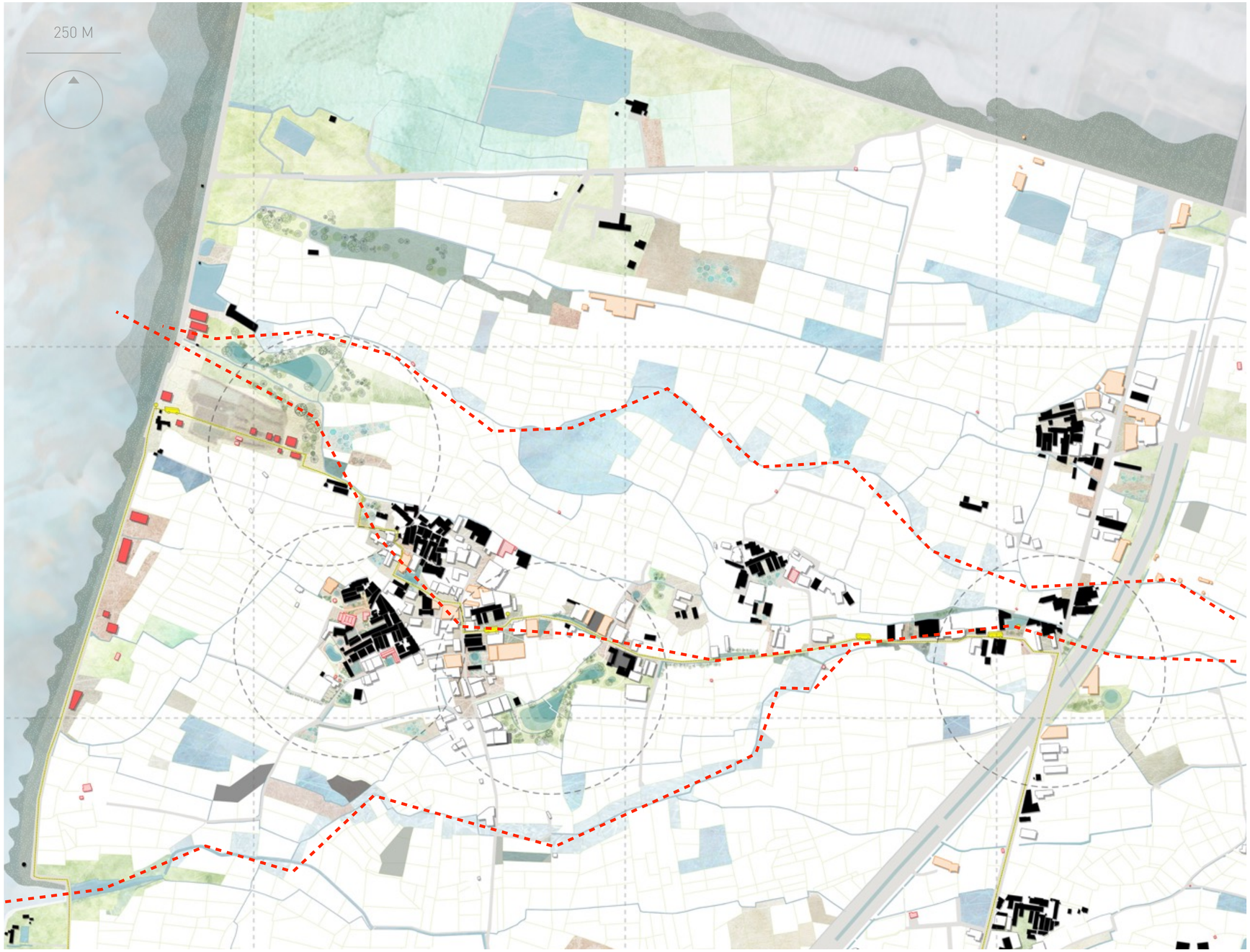
Hydrography intervention

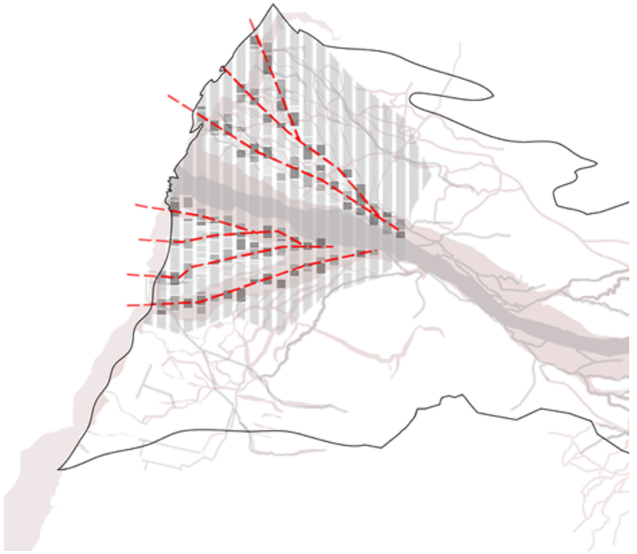
- on roads
- irrigation/drainage
- small reservoirs

Operative structure

- corridor
- public space

DOWNSTREAM DESIGN INTERVENTION





- Incentivized new buildings
- Potential regeneration of private properties
- Religious buildings
- Small industrial factories
- Proposed bus route

DOWNSTREAM DESIGN INTERVENTION

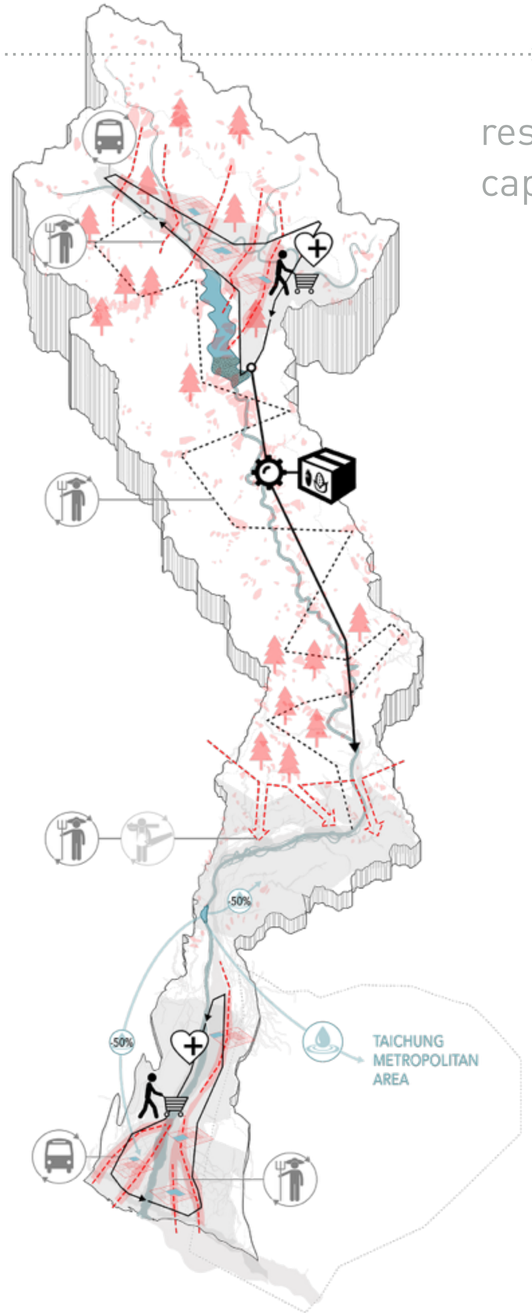
PHASING THE TRANSFORMATION

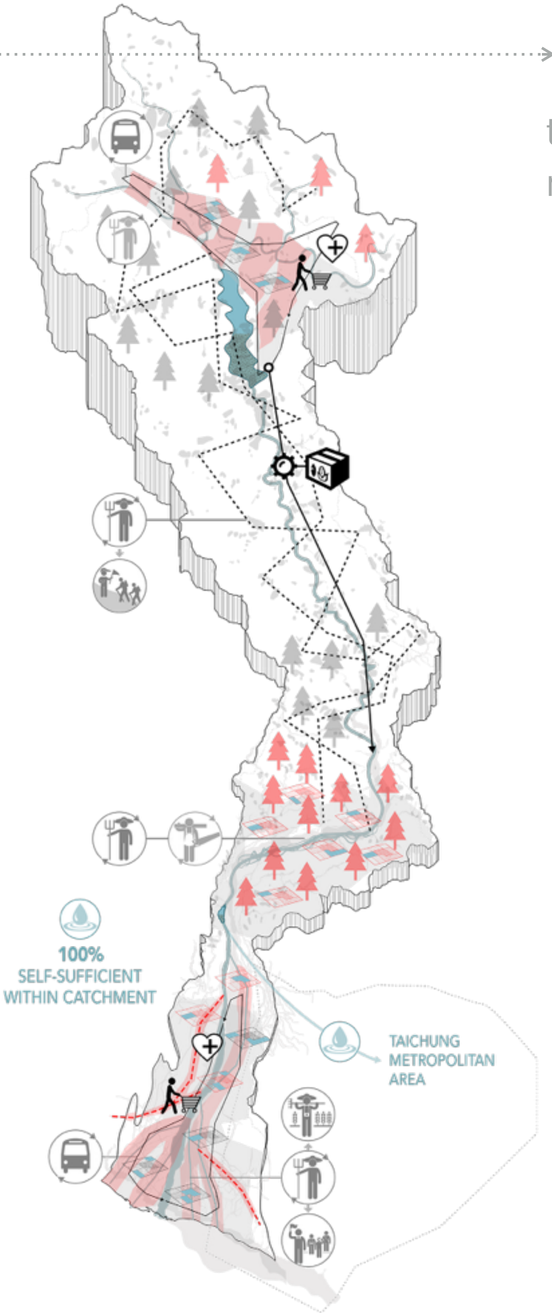
TODAY - 2030 → 2050 → 2100

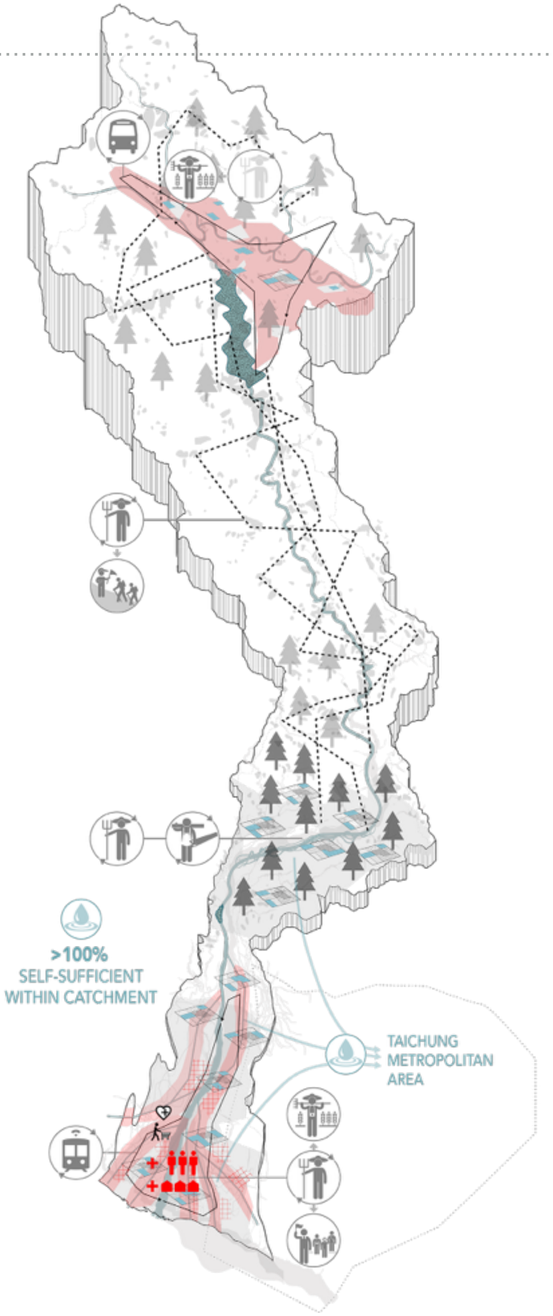
mitigate the urgent problems

reservoir capacity - 50%

the post-reservoir era

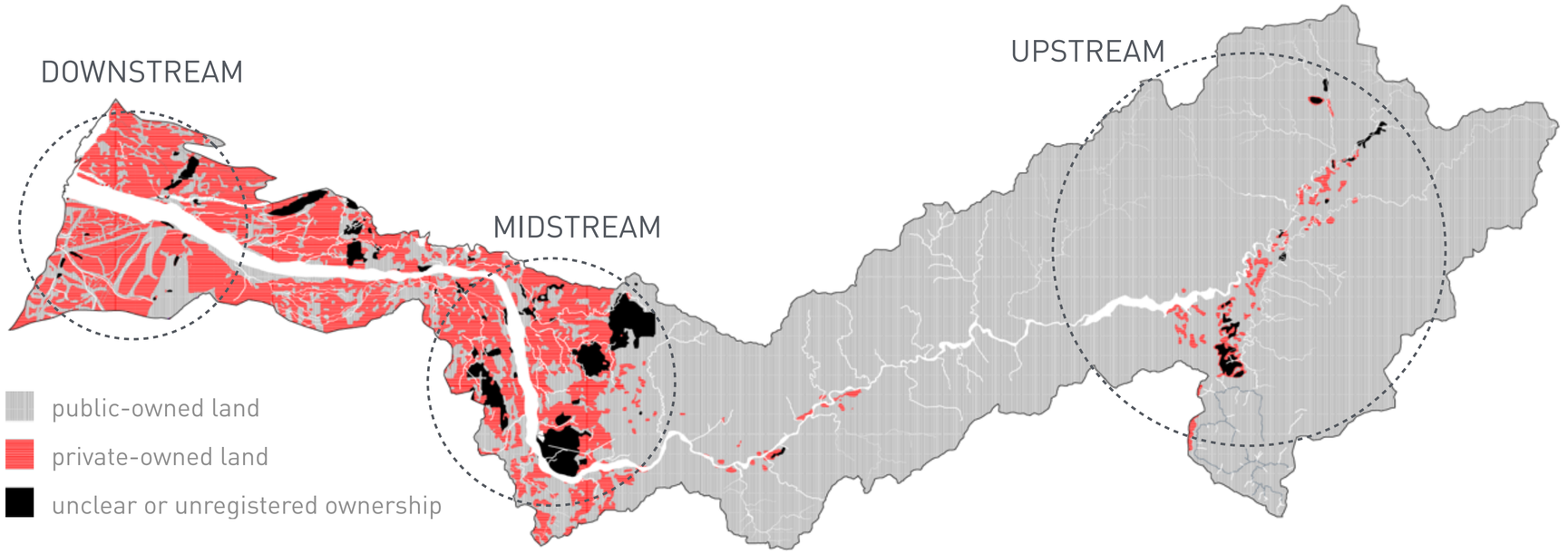






INSTITUTIONAL FRAMEWORK

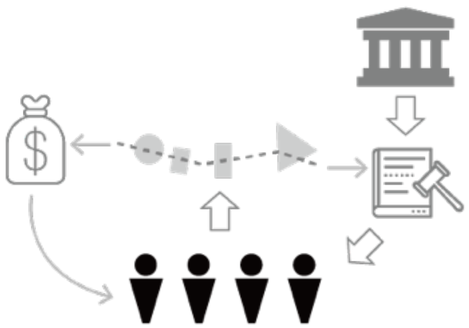
LAND OWNERSHIP

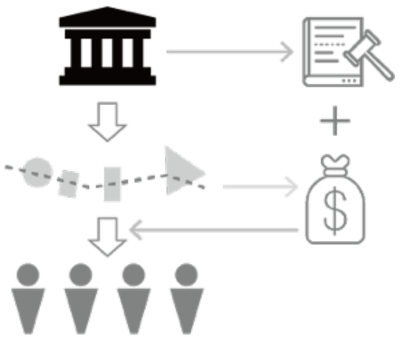


Source: map made by the author based on data from National Land Surveying and Mapping Center, MOI.

POTENTIAL ACTORS

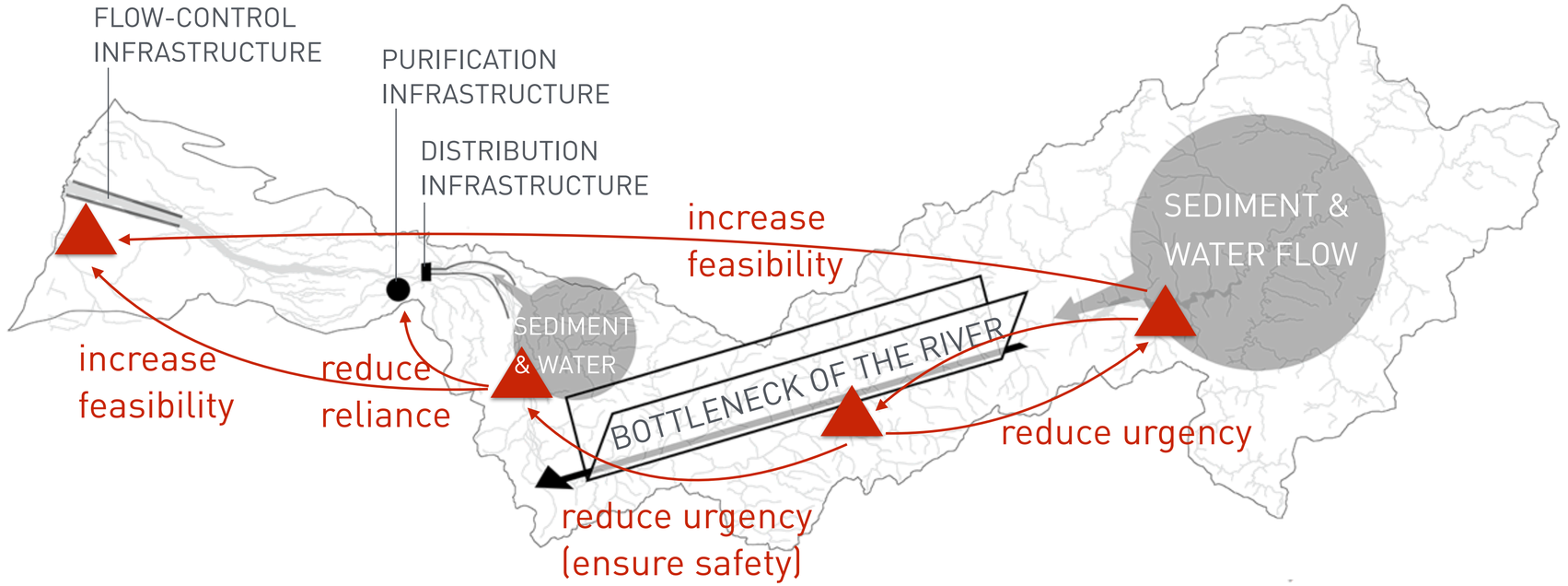
PROPOSED INSTITUTIONAL MECHANISM



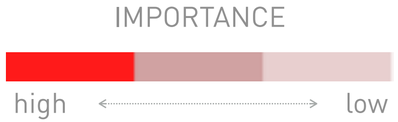


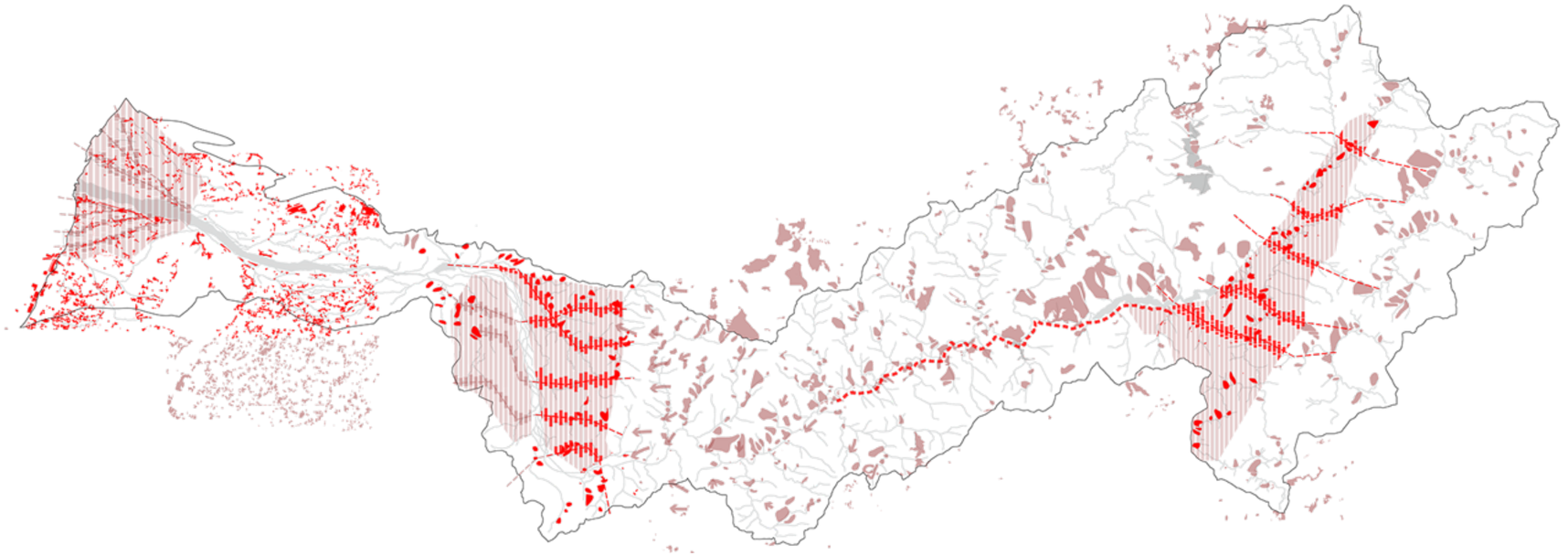
MUTUAL INFLUENCES OF THE INTERVENTIONS

GEOMORPHOLOGY AND INFLUENCES BETWEEN INTERVENTIONS



LEVEL OF IMPORTANCE





REFLECTION

MAIN RESEARCH QUESTIONS:

How to rethink the river landscape as opportunities instead of obstacles, so as to achieve a more sustainable integration between artifact and nature?

Further on, how to build a stronger identity for the living environment through the process of redesigning a mountainous river landscape as water-sensitive infrastructure?

RIVER + MOUNTAIN = OPPORTUNITY

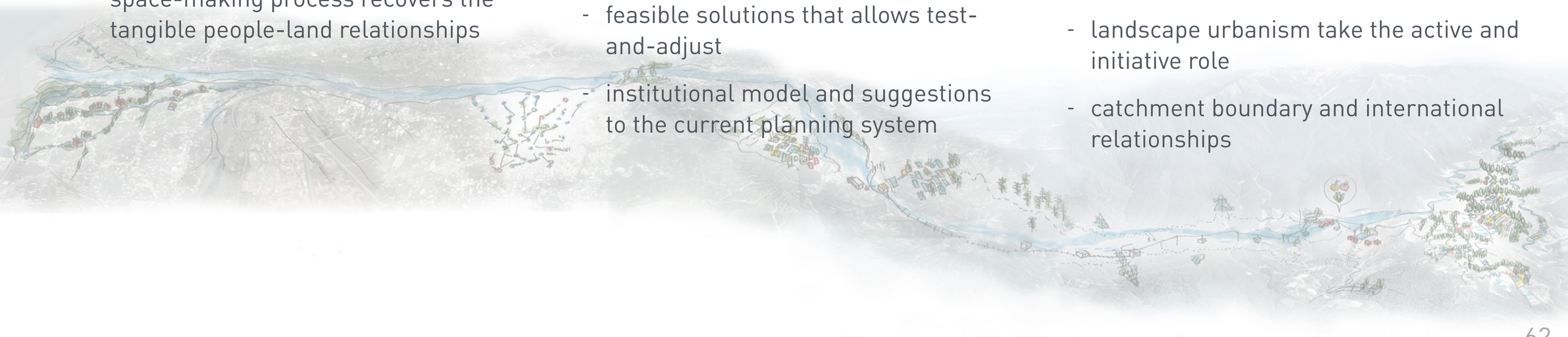
- connection-establishing process = the incremental transformation of landscape as infrastructure
- space-making process recovers the tangible people-land relationships

CONTRIBUTION

- identify the urgency and necessity
- possibility of connection establishing and spatial influences
- feasible solutions that allows test-and-adjust
- institutional model and suggestions to the current planning system

RECOMMENDATIONS FOR FURTHER RESEARCH

- related disciplines: hydrology, technology, ecology, and innovation of enterprises
- landscape urbanism take the active and initiative role
- catchment boundary and international relationships



THANK YOU