

Jing Tian/6018289/
Mentor: Ana Petrović, Diwen Tan
Delft University of Technology, Msc track Urbanism/
Graduation Lab Urbanism Studio/
Planning Complex Cities Studio 2024-2025/



INTRODUCTION / KARST LANDSCAPE



Stalactites and Stalagmites

INTRODUCTION / KARST LANDSCAPE



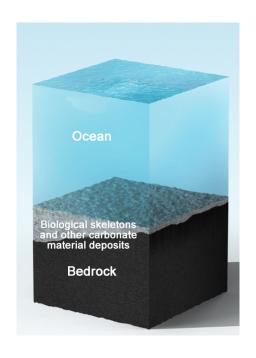
Karst hills and lakes

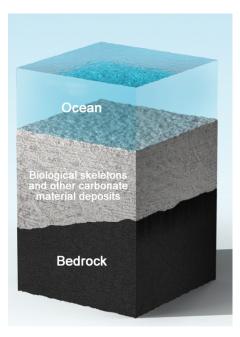
INTRODUCTION / KARST LANDSCAPE

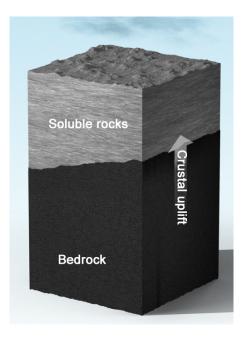


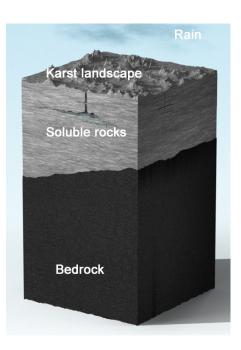
Grotta del Palatino cave

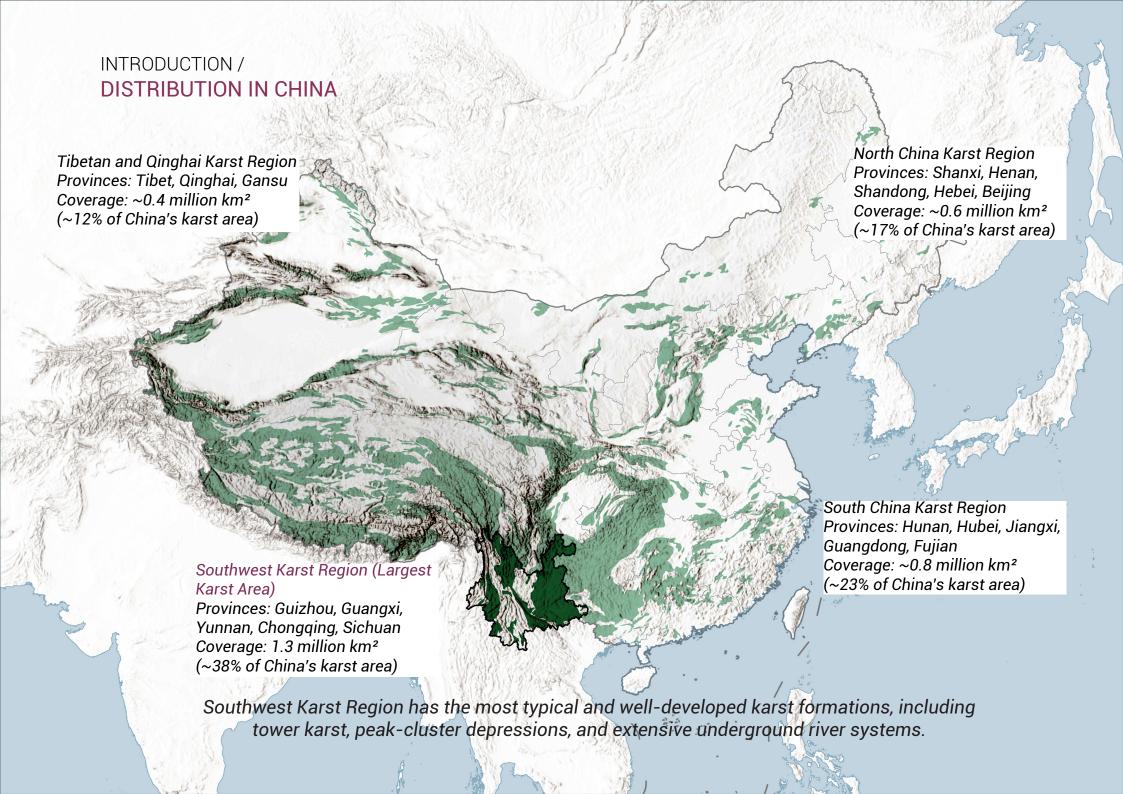
INTRODUCTION / FORMATION OF KARST LANDSCAPES











PROBLEM FOCUS / OVERTOURISM VS ECO-SYSTEM



Excessive human presence increases CO2 levels, accelerating calcium carbonate dissolution and stalactite degradation.

PROBLEM FOCUS / OVERTOURISM VS BIODIVERSITY



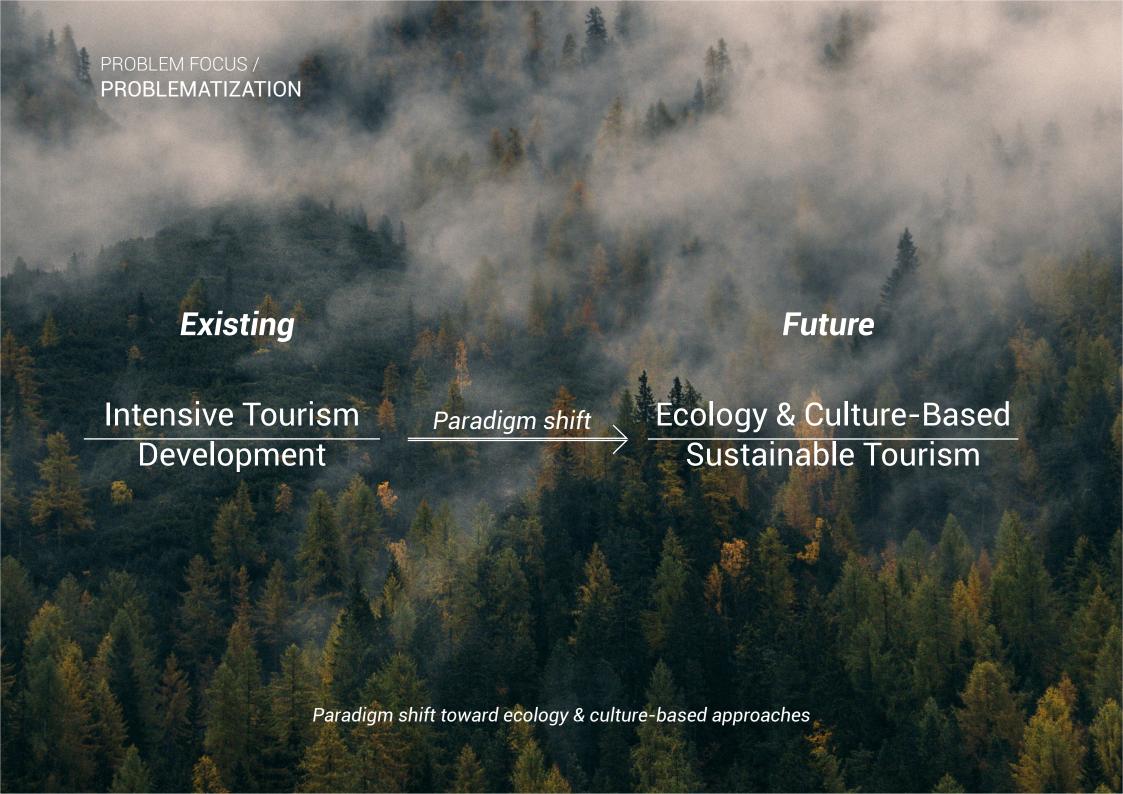
30% habitat loss for endemic bird species due to mass-tourism and wetland degradation.

PROBLEM FOCUS / OVERTOURISM VS LOCAL CULTURE



Over 50% of traditional karst villages have lost their original architectural integrity due to tourism-driven gentrification.





How to balance tourism development with ecological and cultural sustainability in Karst areas of Puzhehei?

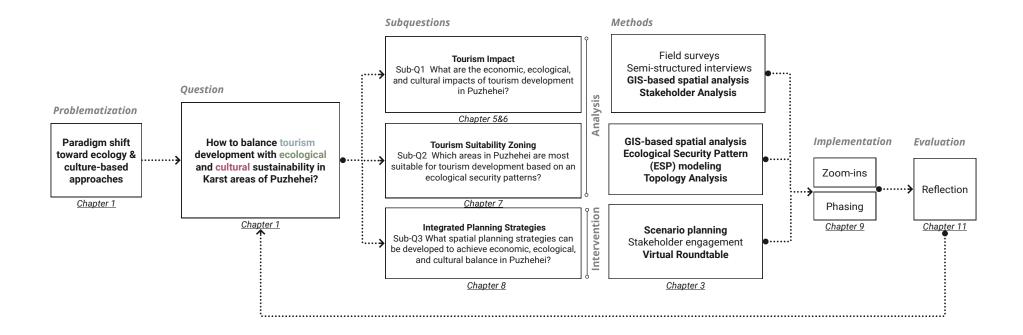
Sub-Q1 What are the economic, ecological, and cultural impacts of tourism development in Puzhehei?

Sub-Q2 Which areas in Puzhehei are most suitable for tourism development based on an ecological security pattern?

|Sub-Q3 What participatory **spatial planning strategies** can be developed to achieve economic, ecological, and cultural balance in Puzhehei?



METHODOLOGICAL FRAMEWORK



- 1.Field Surveys
- 2.Semi-Structured Interviews
- 3.GIS-Based Spatial Analysis
- 4. Stakeholder Analysis

- 5. Virtual Roundtable
- 6.Ecological Security Pattern (ESP)
- Modeling
- 7. Scenario Planning

STAKEHOLDER VOICES AND INSIGHTS / VIRTUAL ROUNDTABLE



To achieve a balance among different stakeholders.

STAKEHOLDER VOICES AND INSIGHTS / VIRTUAL ROUNDTABLE

- 1.Standardized Questions & Stakeholder Priorities
- 2.Individual Interviews for In-Depth Insights
- 3.Synthesize and Compare Responses
- 4. Virtual Roundtable Reconstruction
- 5.Actionable Recommendations













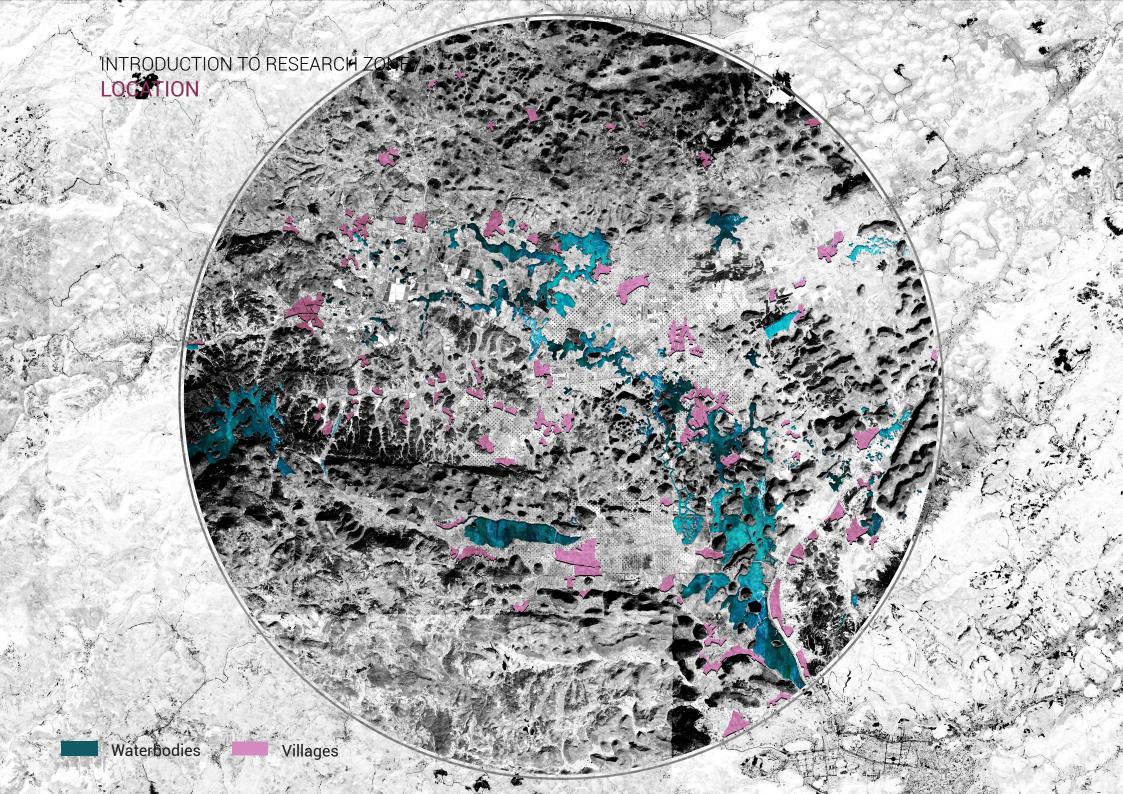
GIS-BASED SPATIAL ANALYSIS

Ecological Security Pattern-Based Tourism Suitability Assessment

Sub-Question 2: Which areas in Puzhehei are most suitable for tourism development based on an ecological security pattern?

Obtain data Spatial analysis Administrative Division Vector Data Current Land Use Vector Data DEM (Digital Elevation Model) Data Master Plan for Land Use Soil Type Distribution Typological analysis **Geological Security** Hign Attractiveness Wetland Types and Distribution Map Water Source Protection Areas Ecologically Sensitive, Priority Tourism Multivariate Water Resources Protection High-Value Sites Development Zones clustering Water Ecological Security Topology1 Topology2 Important Species Distribution Map From Core Protection (Not Suitable) - to Suitable for tourism Biodiversity Conservation Plan Strict Conservation **Biodiversity Conservation** Areas Areas **Integrated Suitability Mapping** Topology3 Topology4 Low Attractiveness **Cultural Heritage and Attractions** Landscape Protection **ECOLOGICAL SECURITY PATTERN-BASED TYPOLOGIES** Point-of-interest (POI) data Tourist Accommodation Infrastructur **Tourism Development Potential**





INTRODUCTION TO RESEARCH ZONE / REASONS FOR LOCATION

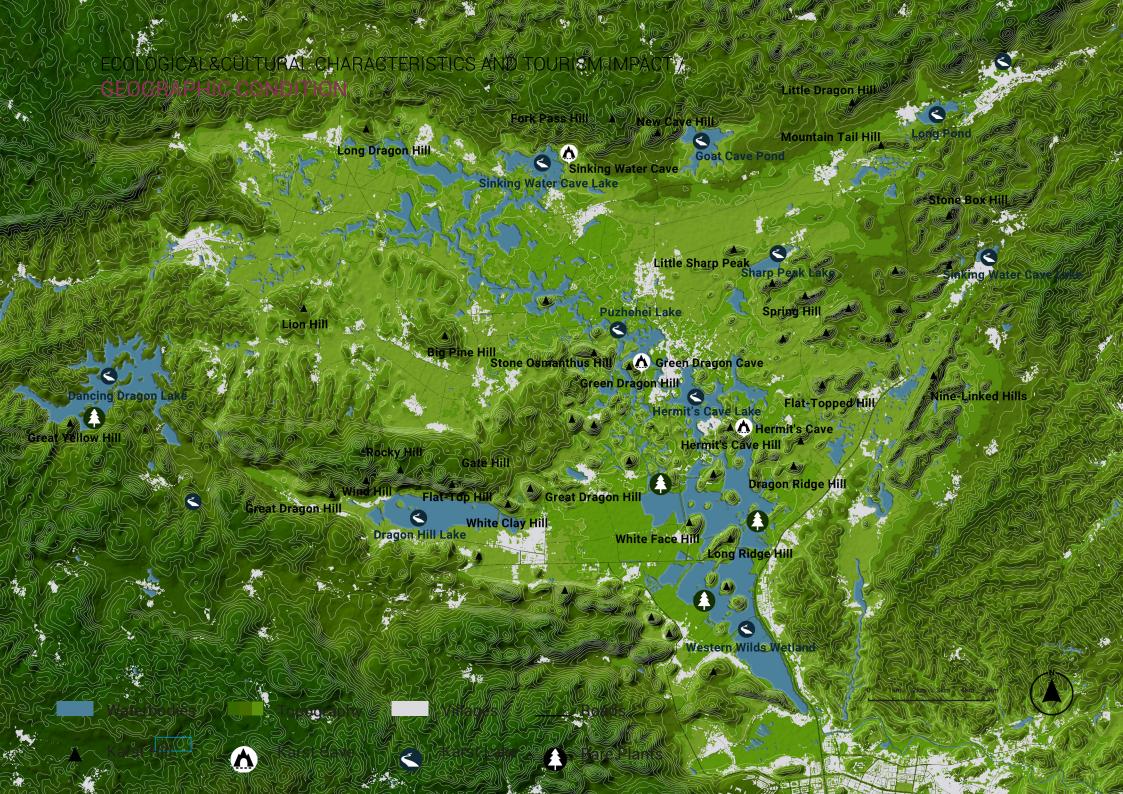
1.Peak-Cluster and Cave Ecosystem Unique Karst Geomorphology 2.Lake-Wetland Ecosystem
Hydrological Significance
and Biodiversity Hotspot

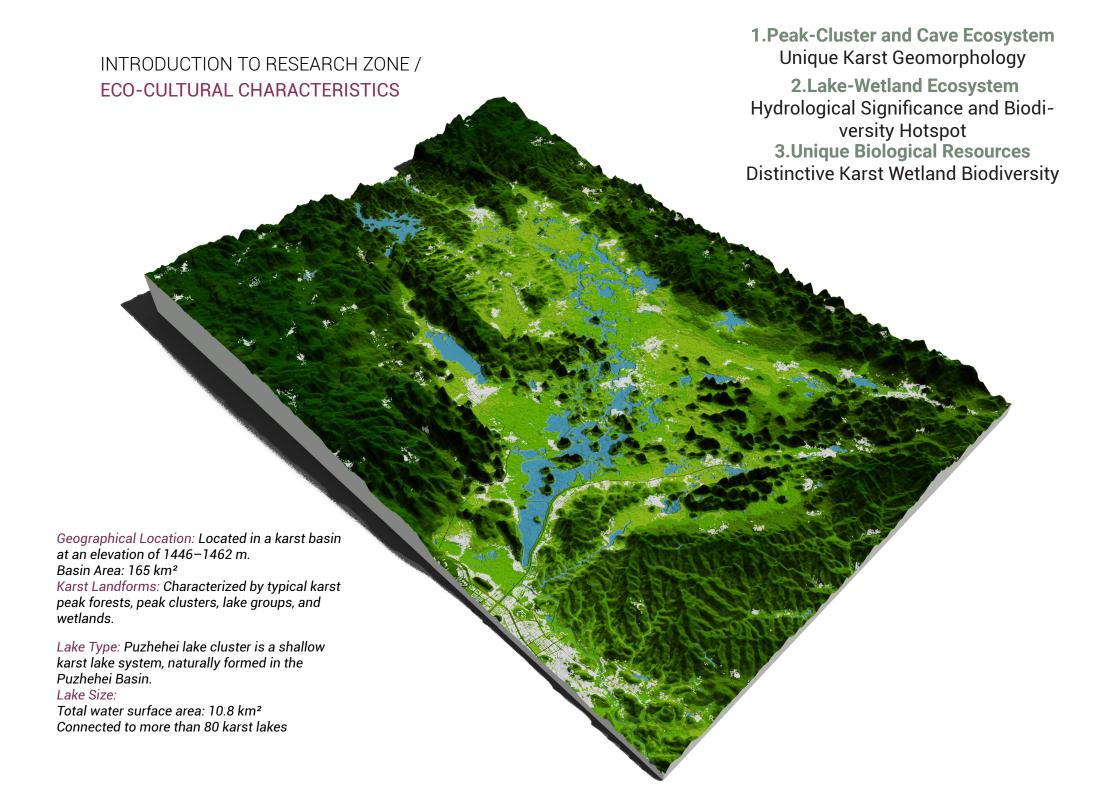
3.Unique Biological Resources
Distinctive Karst Wetland
Biodiversity

4.Multi-Ethnic Settlements
Cultural Diversity and Spatial Transformations



Puzhehei serves as a representative study area for integrating ecological conservation, sustainable tourism, and cultural resilience in karst landscapes.





INTRODUCTION TO RESEARCH ZONE / ECO-CULTURAL CHARACTERISTICS

4. Multi-Ethnic Settlements

Cultural Diversity and Spatial Transformations







1985

A cluster of small fishing villages before tourism began

1993

Beginning of tourism development

2004

Designated as a National Scenic and Historic Area

2011

Selected as a pilot National Wetland Park

2020

Rated as a

AAAAA National

Tourist

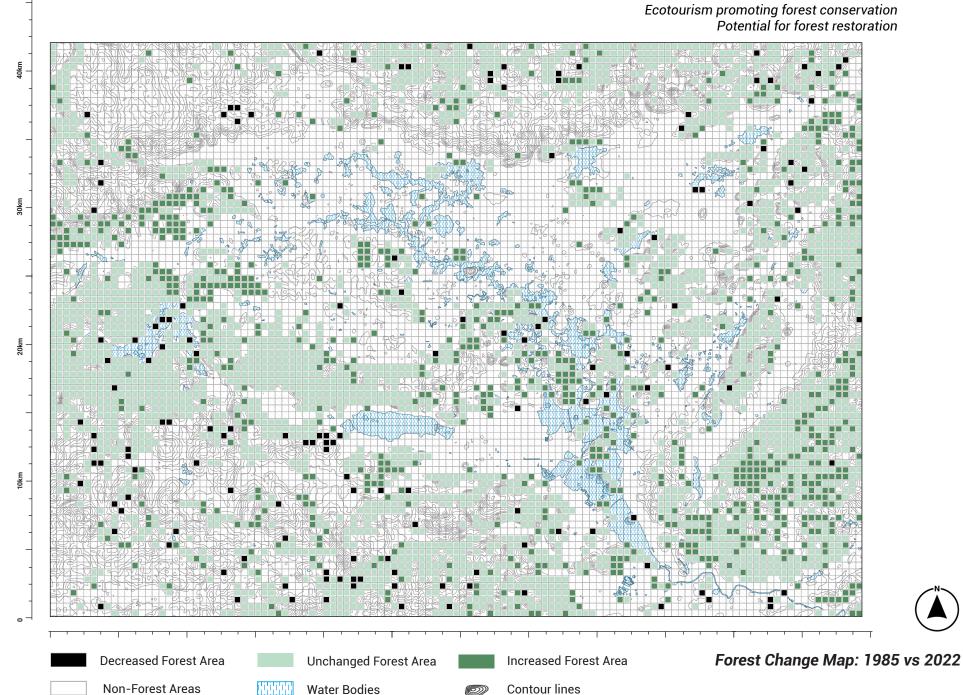
Attraction

2050

What if?

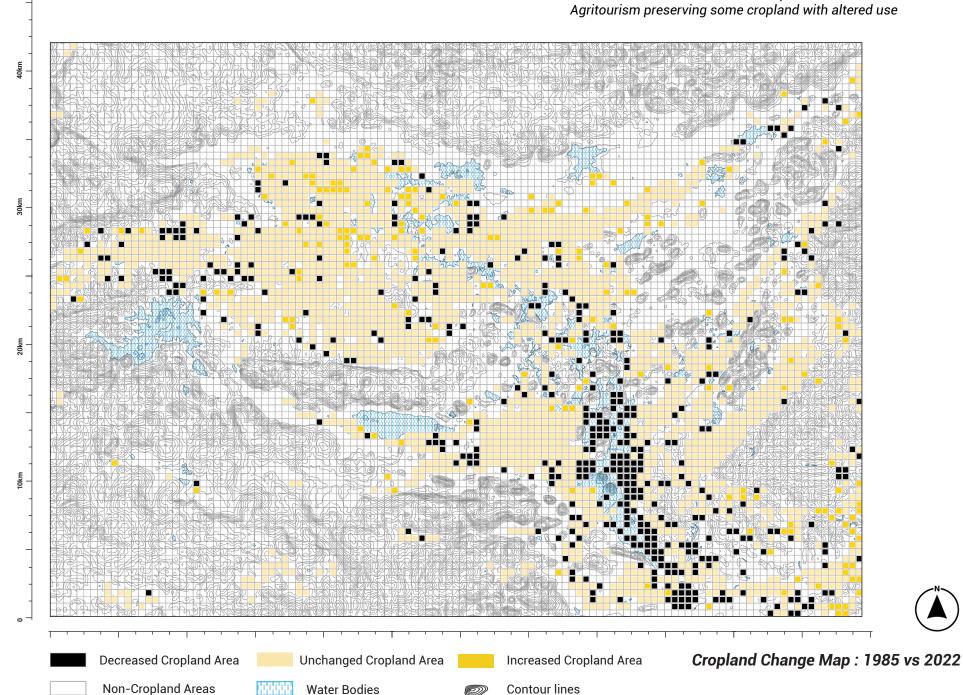
SPATIAL CHANGES IN FOREST AREAS (1985VS2022)

Changes in Forests
Forests converted into tourism facilities
Ecotourism promoting forest conservation
Potential for forest restoration



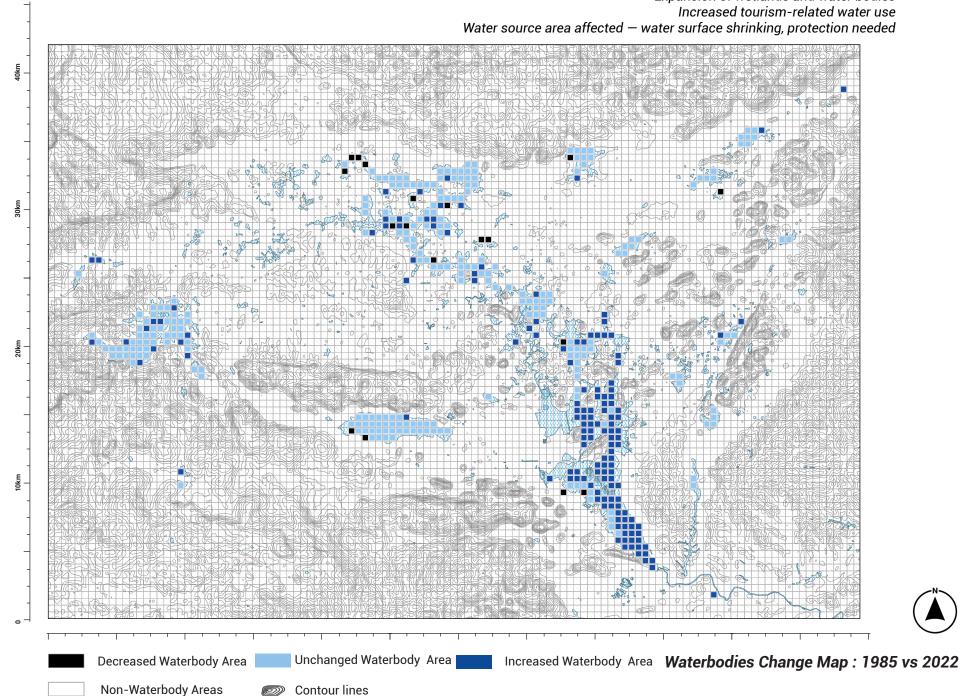
SPATIAL CHANGES IN CROPLAND AREAS (1985VS2022)

Farmland converted to tourism facilities
Transformation of cropland into wetlands
gritourism preserving some cropland with altered use



SPATIAL CHANGES IN WATERBODY AREAS (1985VS2022)

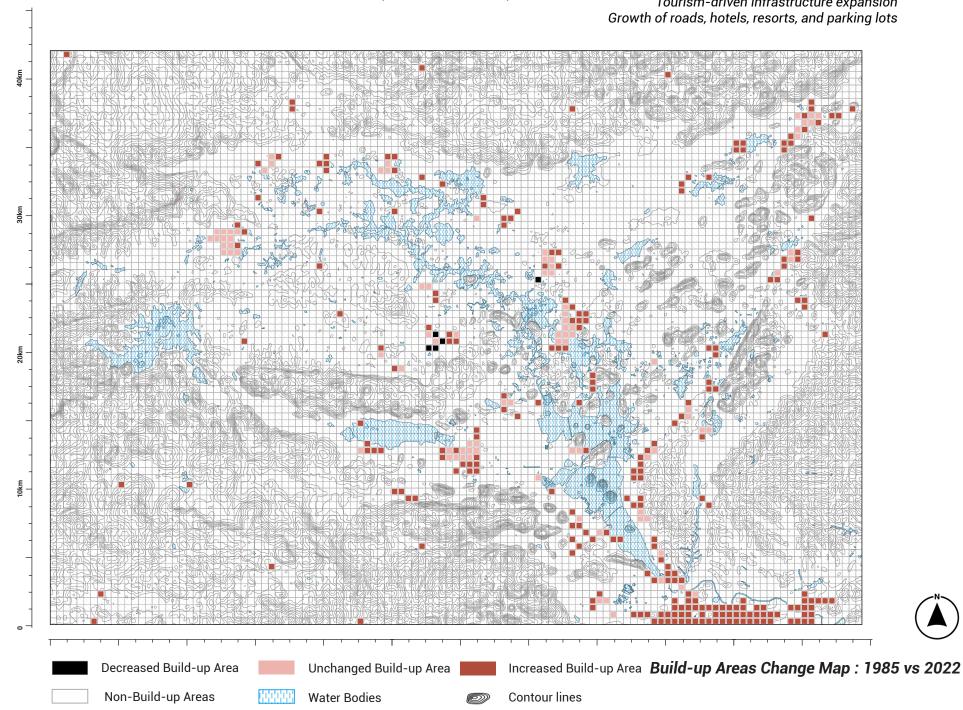
Changes in Water Bodies: Expansion of wetlands and water bodies





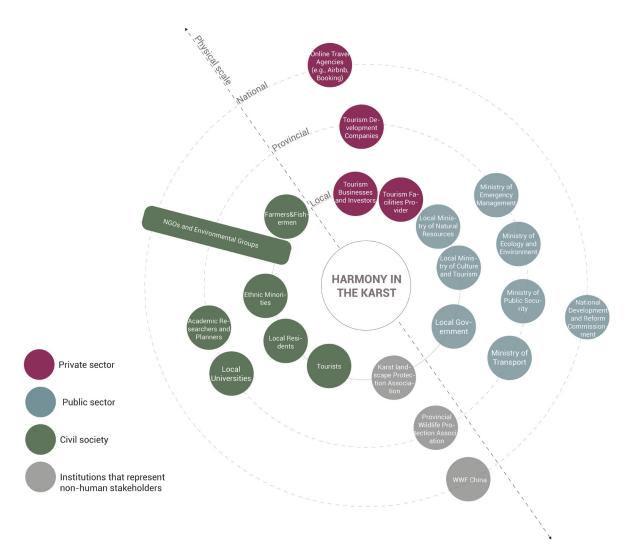


Increase in Impervious Surfaces: Tourism-driven infrastructure expansion



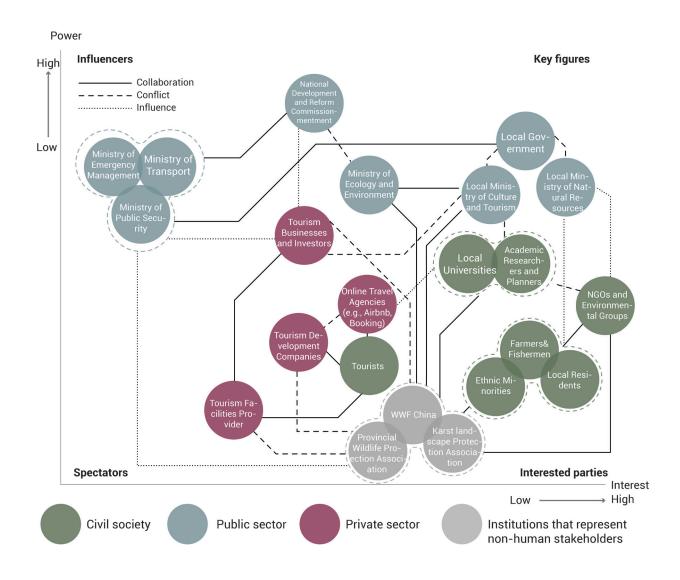


STAKEHOLDER PERCEPTIONS / STAKEHOLDER ANALYSIS



Key stakeholders in Puzhehei tourism include profit-driven private enterprises, policy-guiding public institutions, advocacy-oriented civil society groups, and ecologically vital nonhuman resources, each playing a distinct role in shaping sustainable development.

STAKEHOLDER PERCEPTIONS / STAKEHOLDER ANALYSIS

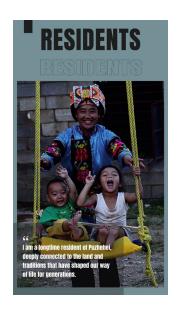


A stakeholder analysis was conducted to identify and categorize the actors influencing the development of a harmonious karst landscape, using a power-interest grid to distinguish between spectators, interested parties, influencers, and key figures

STAKEHOLDER PERCEPTIONS / STAKEHOLDER ANALYSIS

Guiding Question:

How does tourism impact Puzhehei's karst landscape and local culture, and what should be done to balance development and preservation?



Residents (Han and Ethnic Groups) — Cultural Identity

"Tourism brings income, but it is changing our way of life. Traditional villages are being commercialized, and some customs are becoming performances for tourists rather than real traditions. We need respectful tourism that benefits locals while preserving our heritage."

Tourists—Experience & Convenience

"Puzhehei is beautiful, and we want to experience its unique landscapes and ethnic culture. However, some areas feel overcrowded, and excessive development reduces authenticity. More sustainable tourism options, such as eco-tours and cultural immersion programs, would improve our experience."



STAKEHOLDER PERCEPTIONS / STAKEHOLDER ANALYSIS

Guiding Question:

How does tourism impact Puzhehei's karst landscape and local culture, and what should be done to balance development and preservation?



Local Government—Economic Growth

"Tourism is essential for local economic development, but we recognize the risks of over-commercialization and environmental degradation. We aim to promote sustainable tourism by investing in eco-friendly infrastructure, heritage conservation projects, and better visitor management strategies."

NGOs and Grassroots Organizations—Conservation

"The karst landscape is fragile and cannot withstand uncontrolled tourism. Increased foot traffic, infrastructure expansion, and pollution threaten caves, wetlands, and biodiversity. We need stricter regulations, eco-tourism initiatives, and cultural education programs to protect Puzhehei's natural and cultural assets."



Research Institutions—Sustainable Planning

"Scientific research shows that Puzhehei's karst landscape is highly sensitive to human activity. Unregulated tourism accelerates soil erosion, water pollution, and biodiversity loss. More interdisciplinary collaboration is needed to develop long-term strategies for sustainable tourism, cultural preservation, and ecological resilience."



STAKEHOLDER PERCEPTIONS /

STAKEHOLDER ANALYSIS

Guiding Question:

How does tourism impact Puzhehei's karst landscape and local culture, and what should be done to balance development and preservation?



Interview 1

Tourists

Perspective: Tourists are impressed by the economic transformation through homestay operations and cultural experiences but believe that tourism reception capacity, particularly in infrastructure and cultural promotion, needs improvement.

Support: "The ethnic charm of Xianrendong Village is remarkable, but there is a lack of off-season activities, and some homestays require better maintenance and cleanliness." Tourists proposed developing more off-season tourism projects, such as craft experiences and traditional festival activities, to diversify offerings.

Interview 2

Village Head

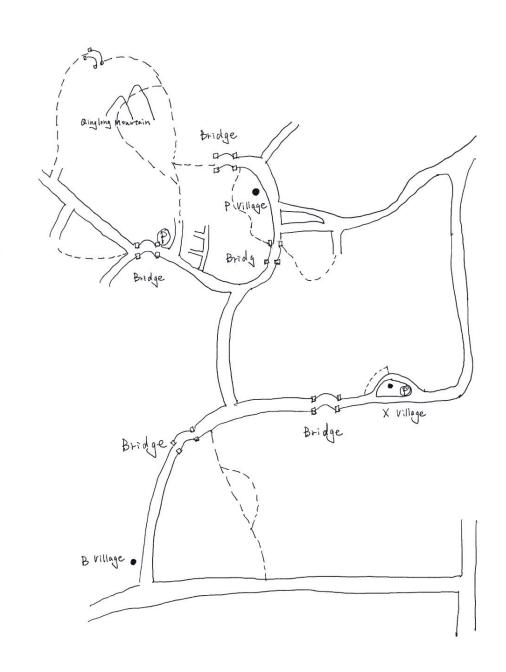
Perspective: The village head emphasized controlling village aesthetics and cultural preservation. Buildings must follow strict planning guidelines, and unauthorized renovations are prohibited to maintain ethnic characteristics. He also stressed that cultural preservation is the cornerstone of tourism development.

Support: "In village planning, we collaborated with the Kunming Paddyfield Design Team to integrate ecology and culture. However, government support remains mostly policy-based, with scarce resources, forcing villagers to self-fund aesthetic improvements." He also noted, "By preserving Yi festivals like the Flower Picking Festival and Yi weddings, we attract more tourists while enhancing villagers' cultural identity."



STAKEHOLDER PERCEPTIONS / COGNITIVE MAPPING





STAKEHOLDER PERCEPTIONS / COGNITIVE MAPPING









INDICATORS FOR TOURISM SUSTAINABILITY ASSESSMENT

Ecology Security Pattern/ Restrictive Factors

Flood Regulation

Water Source Protection

Rare Species Distribution

Soil Erosion Risk

High Flood-risk Zones Moderate Flood-riskZones Low Flood-risk Zones

Core Water Source Zones
Buffer Protection Zones
Eco-tourism-friendly Zones

Endangered Species Habitats Buffer Zones

Non-critical Ecological Zones 🗸

High Erosion-risk Zones Moderate Erosion-risk Zones Low Erosion-risk Zones

Goverment Planning Perception Attractive Resources

Attractions

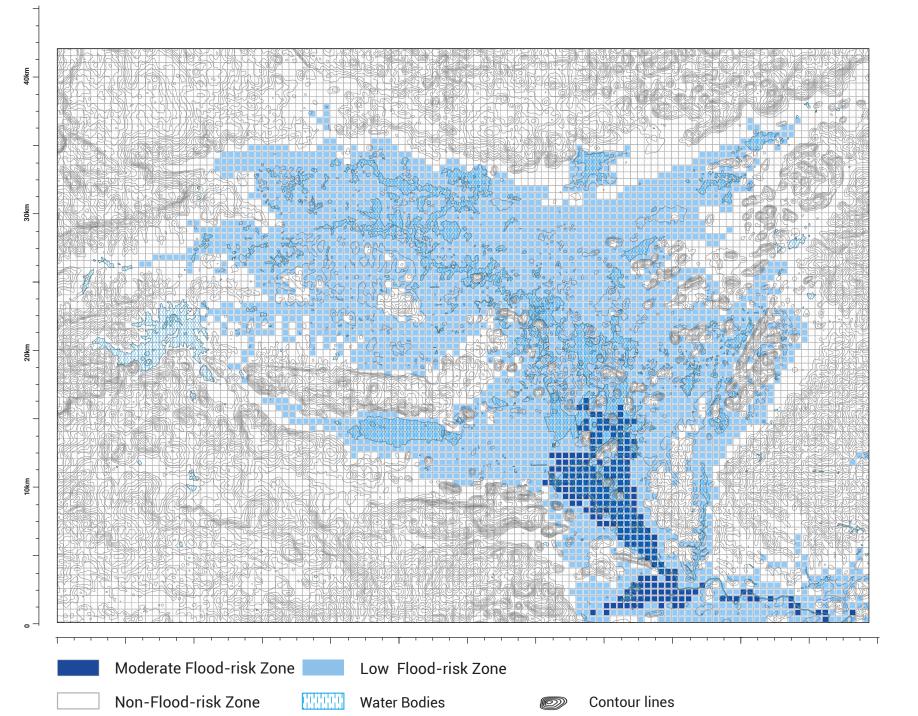
High-Density Attractions Moderate-Density Attractions Low-Density Resources

Accessibility

Infrastructure

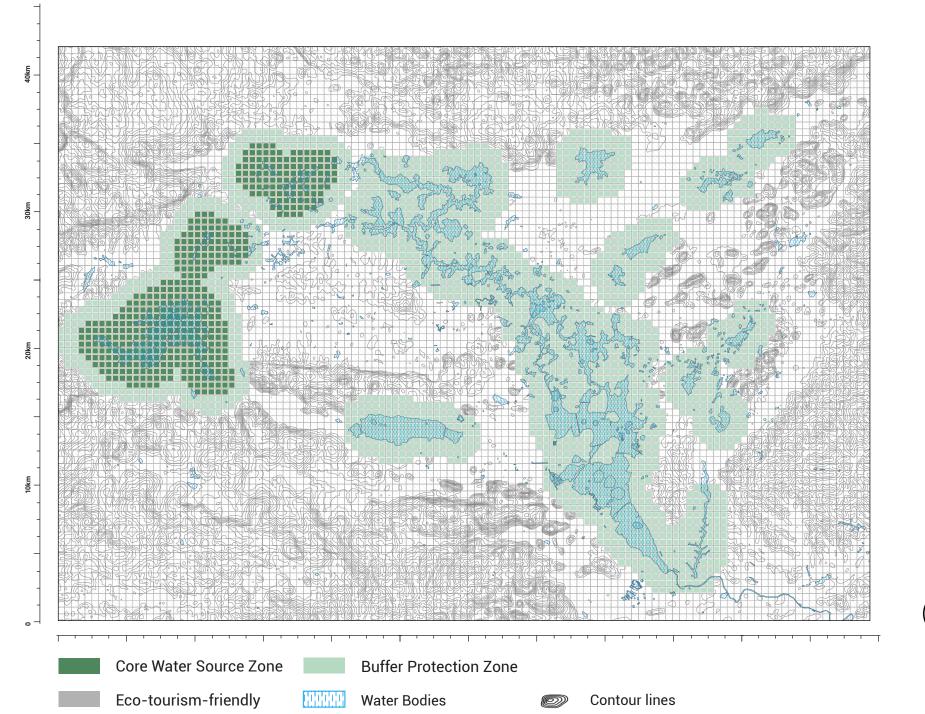
Accommodation Emergency Services Signage

FLOOD REGULATION



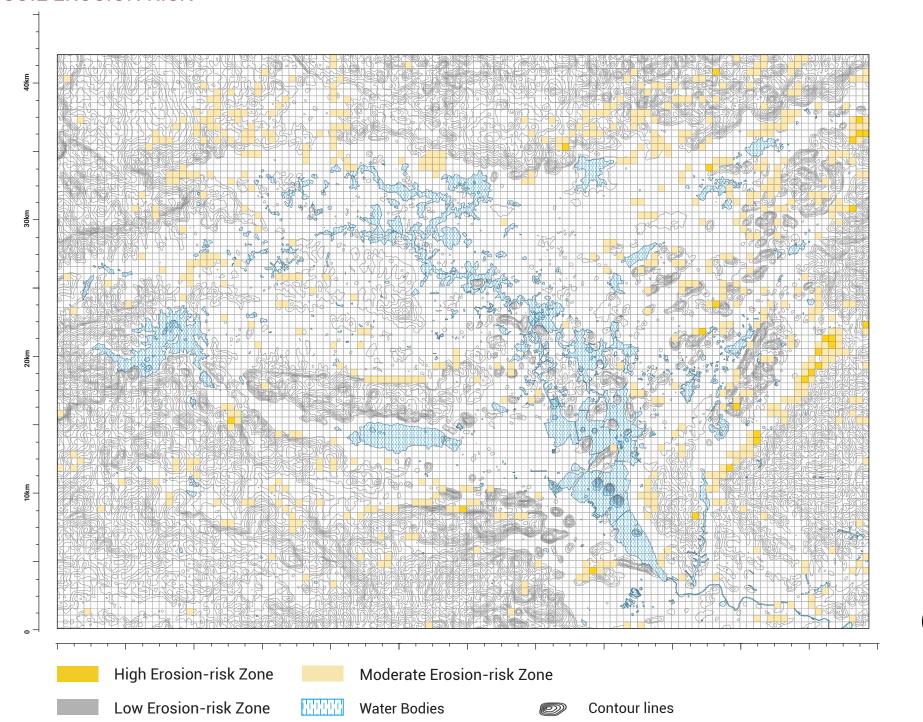


WATER SOURCE PROTECTION



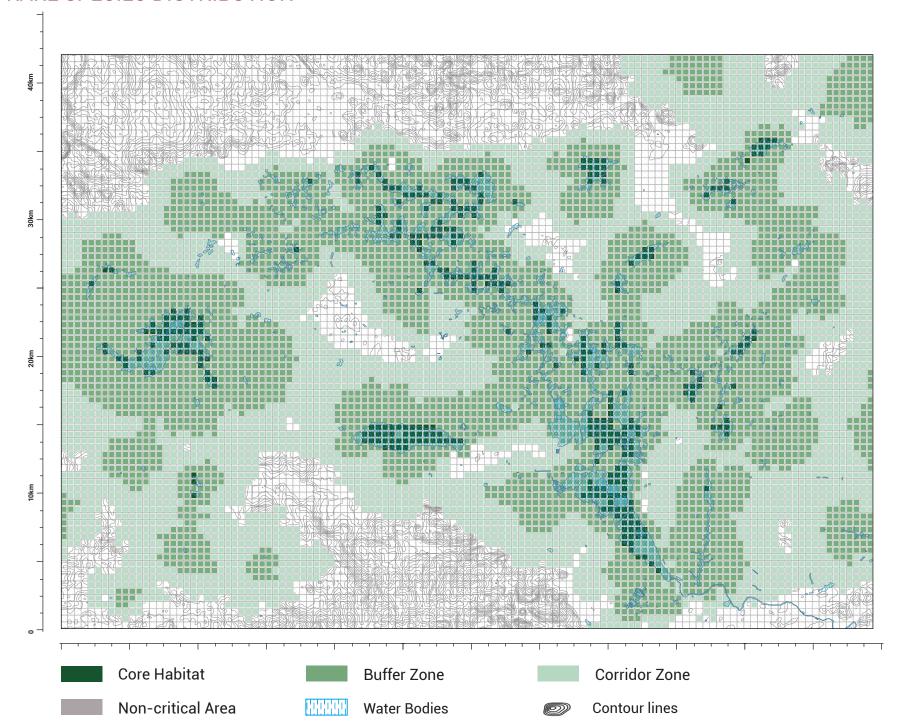


SOIL EROSION RISK



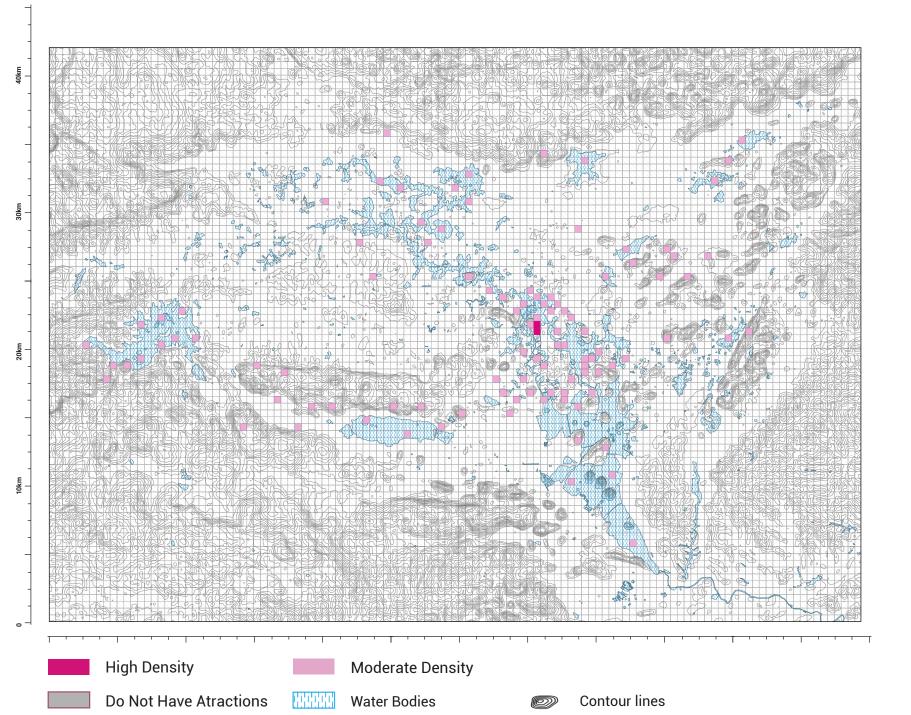


RARE SPECIES DISTRIBUTION



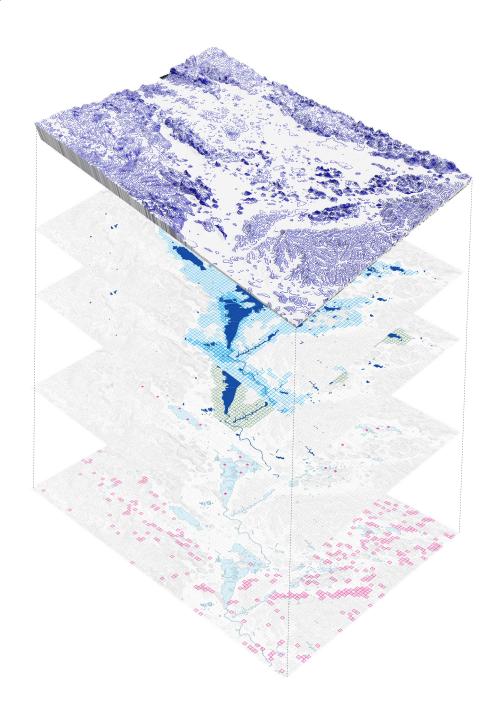


ATTRACTIONS

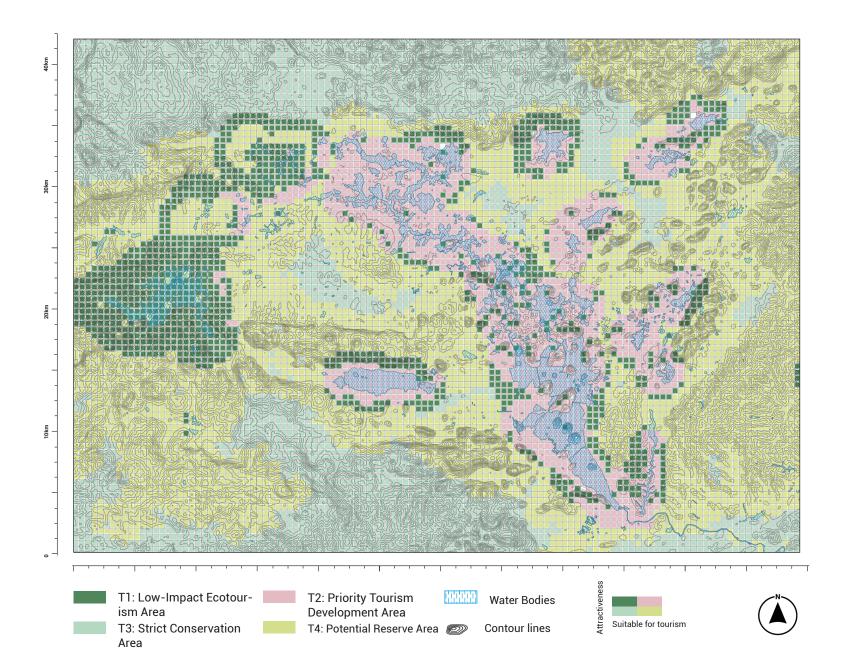


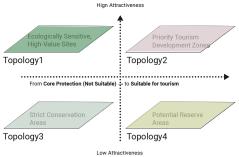


SYNTHESIS MAPPING

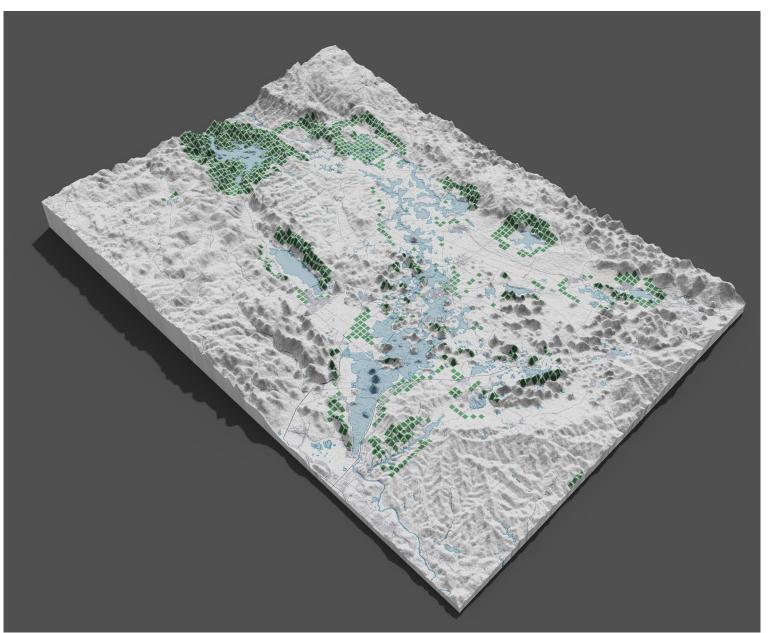


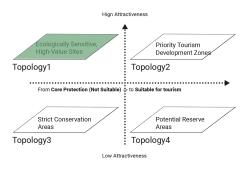
SYNTHESIS MAPPING



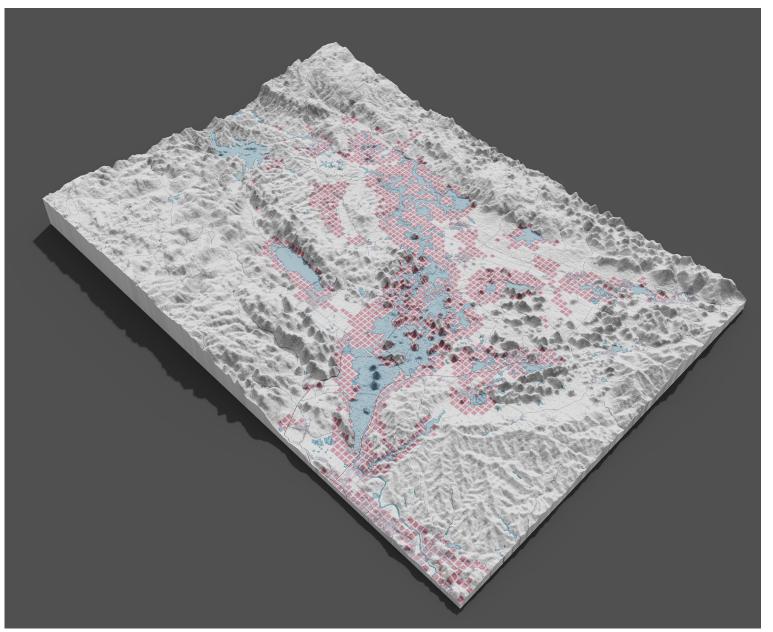


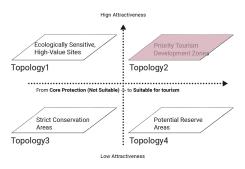
TOPOLOGY1_LOW-IMPACT ECOTOURISM ZONE



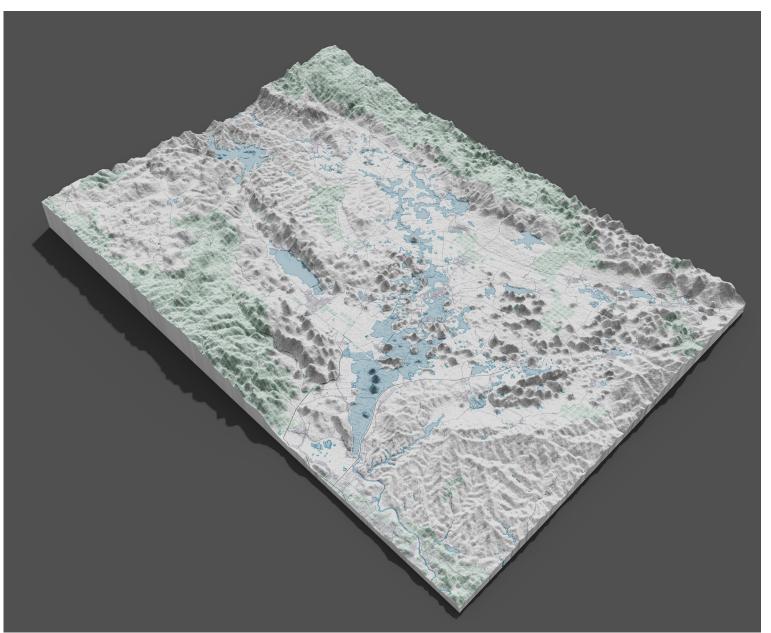


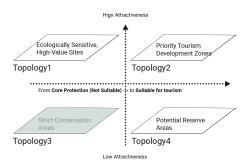
TOPOLOGY2_PRIORITY TOURISM DEVELOPMENT ZONE



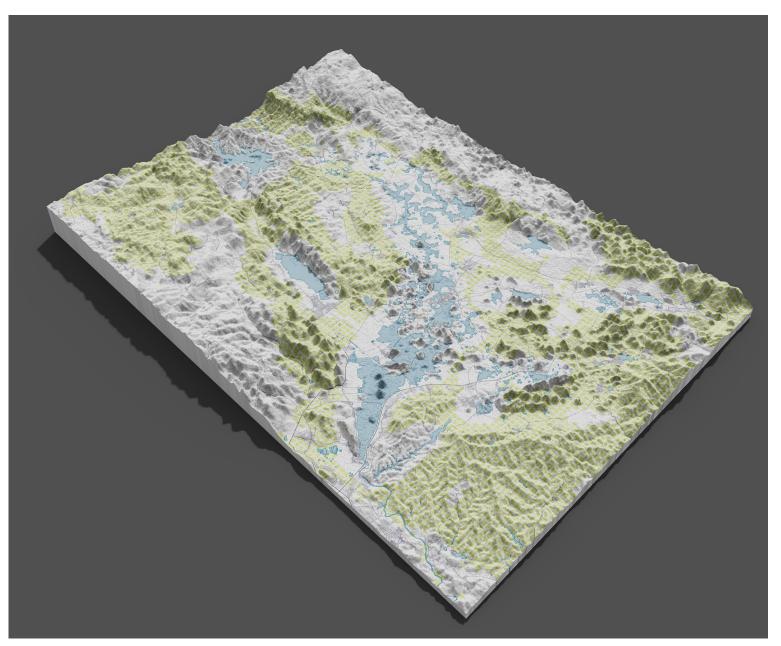


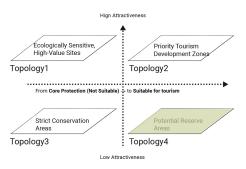
TOPOLOGY3_STRICT CONSERVATION ZONE





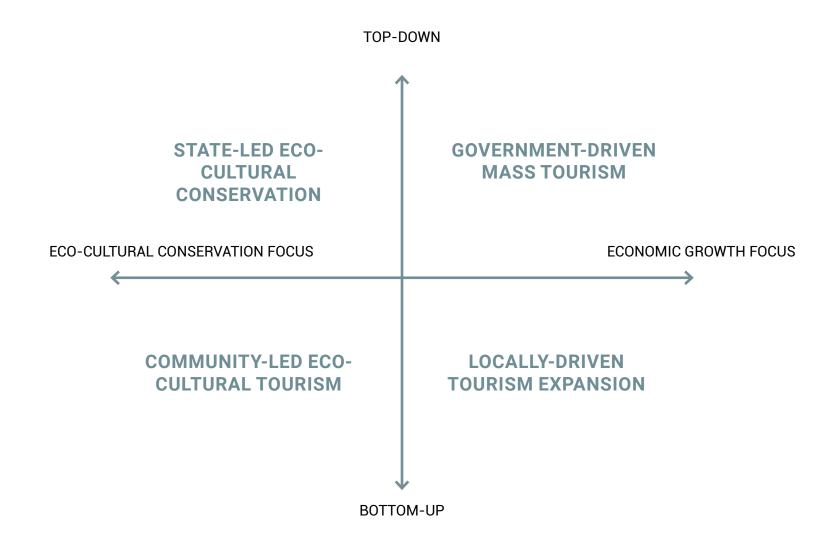
TOPOLOGY4_POTENTIAL RESERVE ZONE







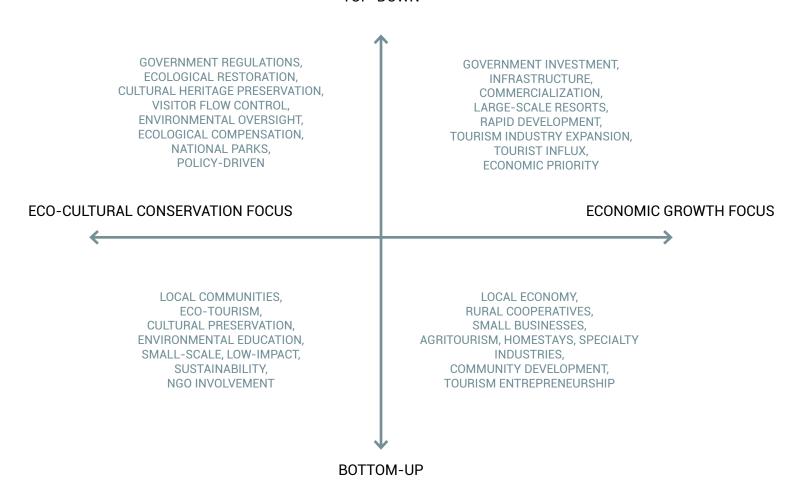
VISION: BALANCING TOURISM AND CONSERVATION / SCENARIO PLANNING: STRATEGIES FOR BALANCE



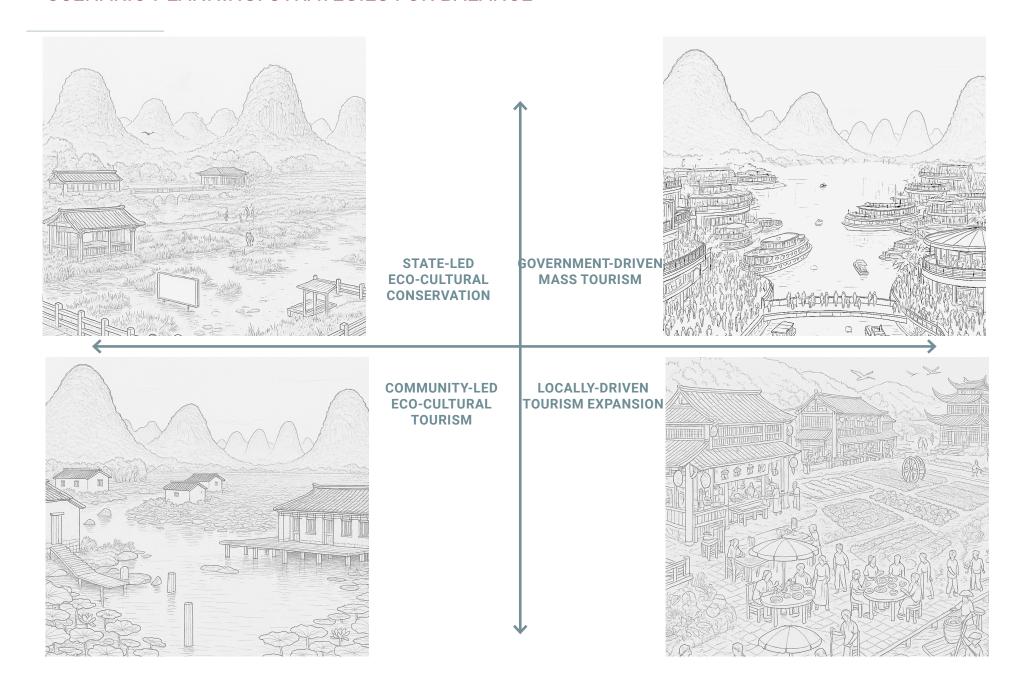
X TOURISM DEVELOPMENT FOCUS
Y GOVERNANCE MODEL

VISION: BALANCING TOURISM AND CONSERVATION / SCENARIO PLANNING: STRATEGIES FOR BALANCE

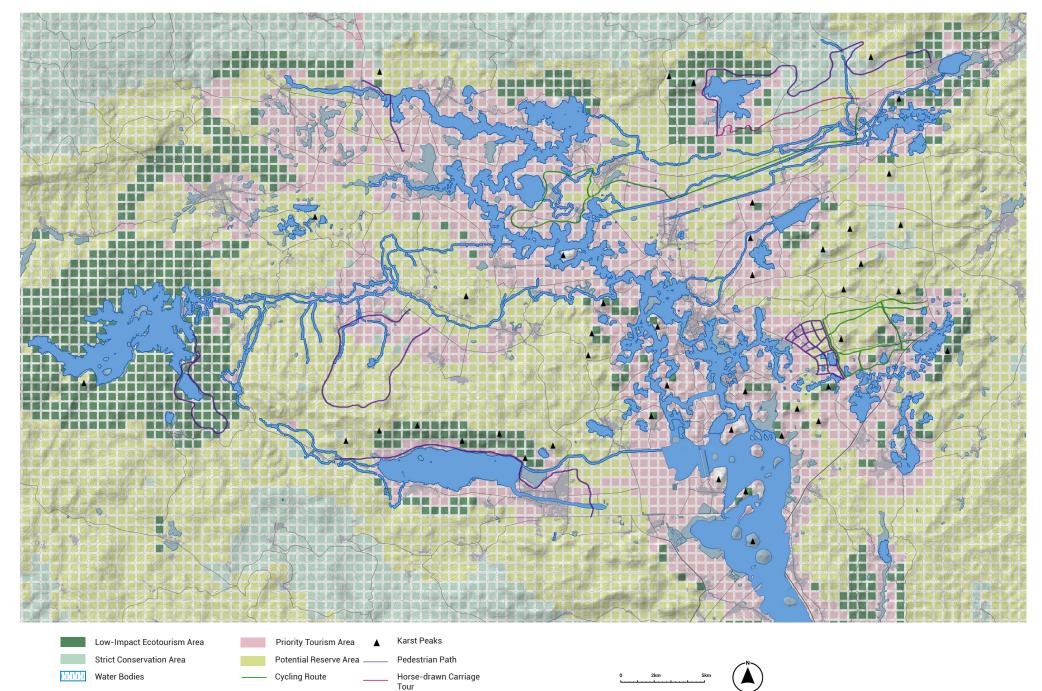
TOP-DOWN



VISION: BALANCING TOURISM AND CONSERVATION / SCENARIO PLANNING: STRATEGIES FOR BALANCE



VISION: BALANCING TOURISM AND CONSERVATION / STRATEGIES FOR BALANCE



Topology	Key Features	Recommended Strategy Logic
T1: Ecologically Sensitive + Highly Attractive	High ecological value and tourism appeal; requires strict access control and protection	 Ecological restoration Non-intrusive interactions Limited accessibility
T2: Priority Tourism Development Zone	High tourism value with acceptable ecological resilience	Market activitiesCultural experiencesInfrastructureenhancement
T3: Strict Conservation Area	Low visitor appeal but high ecological importance	✓ Full conservation✓ No development✓ Ecological monitoring
T4: Potential Reserve Area	Moderate ecological and tourism potential	Landscape restorationCultural integrationCommunityparticipation

Strategy/Tool	T1	T2	T3	T4	Notes:
1.Ecological Restoration Edge	~		~	~	Boundary restoration / wetlands / buffers
2.Scenic Interaction Edge	1	✓			Low-impact landscape interface
3.Cultural Living Edge		<u>~</u>		<u> </u>	Cultural activation along village edges
4.Interactive Installations	1	<u>~</u>			Non-intrusive, better suited for T1
5.Market Activity Edge		<u> </u>	×	1	T4 requires careful planning

Low-impact cultural storytelling routes

6.Oral History

Path

~

A

I. Typology and Strategy Logic

II. Design Toolkit vs. Typology Zones

Ecological Restoration Edge **RESIDENTS** TOURISTS NGOS AND GRASSROOTS ORGANIZATIONS NON-HUMAN RESEARCH LOCAL GOVERNMENT INSTITUTIONS Enforce redline Primary beneficia-Transition land use Participate in edu-Lead ecological Provide technical ries through habiand join commucational or volunmonitoring and and community zoning and provide compensation tat improvement nity-based restosupport teer activities

1: ECOLOGICAL RESTORATION EDGE

Scenic Interaction Edge • RESIDENTS NGOS AND GRASSROOTS ORGANIZATIONS **TOURISTS** RESEARCH INSTITUTIONS NON-HUMAN LOCAL GOVERNMENT Manage visitor flow Require low-dis-Access rich natural Evaluate ecologi-Provide technical Operate related serand safety turbance design cal thresholds and vices (e.g., rentals, and community and protection of interpretation) visitor impact support sensitive areas

2: SCENIC INTERACTION EDGE

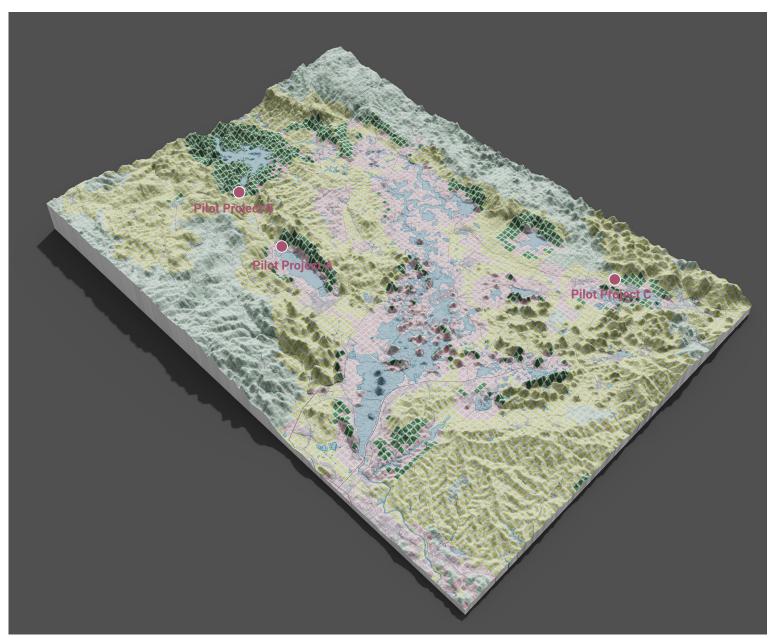
Cultural Living Edge • RESIDENTS **TOURISTS** NGOS AND GRASSROOTS ORGANIZATIONS LOCAL GOVERNMENT NON-HUMAN Manage public Designs must balance Promote respect for Core actors who Observe respectsafety and cultural daily human activity define openness fully and appreciate everyday cultural landscape preserwith nearby natural and use local rhythms

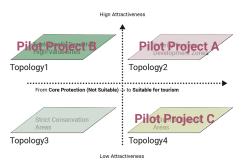
3: CULTURAL LIVING EDGE



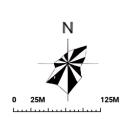
4: MARKET ACTIVITY EDGE

STRATEGIC RECOMMENDATIONS / PILOT PROJECT LOCATION





PILOT PROJECT A/ TOPOLOGY2

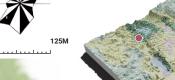






PILOT PROJECT B/ TOPOLOGY1



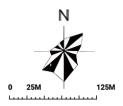


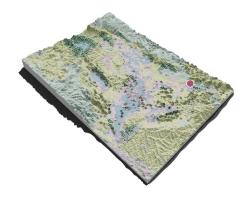


The state of the s	Strategy/Tool T1
	I. Ecological Restoration Edge
	Strategy/Tool T1 I Ecological Restoration Edge 2. Scenic Interaction Edge 3. Cultural Living Edge 4. Interactive
	3.Cultural
	4.Interactive

PA TARBON						
Š	Strategy/Tool	T1	T2	T3	T4	Notes:
権がない。	1.Ecological Restoration Edge				~	Boundary restoration / wetlands / buffers
	2.Scenic Interaction Edge	A	~			Low-impact landscape interface
8	3.Cultural Living Edge		<u>~</u>		<u>~</u>	Cultural activation along village edges
	4.Interactive Installations	<u> </u>	<u>~</u>			Non-intrusive, better suited for T1
	5.Market Activity Edge		<u>~</u>	×	<u> </u>	T4 requires careful planning
	6.Oral History Path	~	<u> </u>		✓	Low-impact cultural storytelling routes

PILOT PROJECT C/ TOPOLOGY4







Strategy/Tool	T1	T2	T3	T4	Notes:
1.Ecological Restoration Edge	>		~	~	Boundary restoration / wetlands / buffers
2.Scenic Interaction Edge	•				Low-impact landscape interface
3.Cultural Living Edge		✓		<u>~</u>	Cultural activation along village edges
4.Interactive Installations	<u> </u>	✓			Non-intrusive, better suited for T1
5.Market Activity Edge		<u> </u>	X	<u> </u>	T4 requires careful planning
6.Oral History Path	<	A		✓	Low-impact cultural storytelling routes

