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Manifestation of Future Human (Culture) – Nature Relationship
in The Context of Toba Caldera Geopark, Indonesia

Abstract

The evolutions of human culture–nature relationships from histories demonstrate all changes in how people manage and perceive their land. In the past, the relationship between humans and nature was known to have high interdependency reflected by integrating people's activities and behaviour towards nature. This integration can be seen through rituals, rules, and folktales, including awareness, responsibility, and respect between nature and humans. However, some influences gradually alter the relationship and nature by entering the Anthropocene era and industrialization, modernity, and globalization. Thus, it becomes divisible and changes the ways humans perceive and manage landscape (McHarg, 1992).

On the other hand, rich natural and cultural land, namely Toba Caldera Geopark, is facing shifts in its economic scheme: becoming the main priority in the tourism sector in Indonesia for national economic growth. Thus, it raises three main challenges that need to be addressed to achieve sustainable and inclusive tourism while also promoting socio-ecological resilience within local society. The first is about revealing nature capacity, continuity, and limit in order to address biophysical integration. The second is about unfolding the changing of human cultural identity that is presently (and in the past) becoming tourism assets and vulnerably to loss because of sharing culture, social well-being, and prosperity in order to promote social resiliency. And third is about determining the in-between systems that have a relatively huge influence on this nature-culture interrelationship and its evolution. Moreover, these challenges align with the existing master plan to give synergic feedback to present tourism development within the area.

Furthermore, the design explorations in this project aim to balance the present and future ecosystem services (provisioning, regulating, and cultural services) embedded in the landscape and local culture since the past. The understanding starts by theoretical formulation, including all elements that influence the evolution of human culture – nature relationship. Then, this theory is used from analysis to strategic design. Firstly, the deconstruction of the performative landscape from the past to present and its relation to culture. The deconstruction is classified into softscape and hardscape and tested in two different areas with different characteristics. Second, the re-construction of all interventions by proposing new schemes of strategic pathways by considering governance systems, uncertainties, collaborative management, and evaluation of existing masterplan. Lastly, projecting feasibility and acceptance by using a local perspective to grasp the limitation of this thesis which is site visiting.

Keywords: Tourism, Human-Culture, Evolutionary, Resilience, Co-Management

Table of Contents

Abstract	2
Motivation	7
1. Introduction	8
1.1. The Culture - Nature Relationship	10
1.2. The Evolution of Culture and Landscape in The Tourism Area	12
2. Toba Lake as General Context	14
2.1. Toba Lake Description	16
2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake	18
3. The Questions	54
3.1. Problem Fields	56
3.2. Research Aims	57
3.3. Proposed Research Outputs	58
3.4. Research Questions	60
3.5. Conceptual Framework & Research Methodology	62
3.6. Literature Framework	64
3.7. Research Methods	67
3.8. Sub-Research Questions, Research Methods, and Intended Outcomes	68
4. Samosir Island as The Project Area	70
4.1. The Background of The Selection	78
4.2. The Breakdown of Human (Culture) - Nature Relationship in Samosir Island	80
4.3. Conclusion	90
5. Dynamic Systems	92
5.1. Present Conditions: Biophysical System Deconstruction	94
5.2. Present Conditions: Socio-Economic System Deconstruction	114
5.3. Present Conditions: Tourism Masterplan Deconstruction	120
5.4. Multiscalar Interrelationship	122
5.5. Conclusion and Vision	124
6. Design Interventions	126
6.1. Introduction	128
6.2. Transformation Kit Construction	130
6.3. Sites Deconstruction	148
6.3.1. Sites Selection	148
6.3.2. Biophysical and Socio-culture Systems	150
6.4. Potential Transformation Implementation	154
6.4.1. Ambarita Village	154
6.4.2. Cinta Dame / Simanindo Village	162
6.5. Implementation Strategy & Phasing	164
6.6. Participatory Scheme	168
6.7. Conclusion	170
7. Appendices	172
7.1. Literature Frameworks	174
7.2. Transformation Kit Bundles	180
7.3. Thesis Reflection	212
Bibliography	214

Motivation

As an Indonesian, I understand that my country consists of diverse cultures that determine every region's characteristics. Therefore, the manifestation of these characteristics through values, stories, and artefacts becomes something that I highly appreciate. As if by understanding this, the general concept of living becomes easier to define, like how humans relate to other humans, humans to other living creatures, and humans and God.

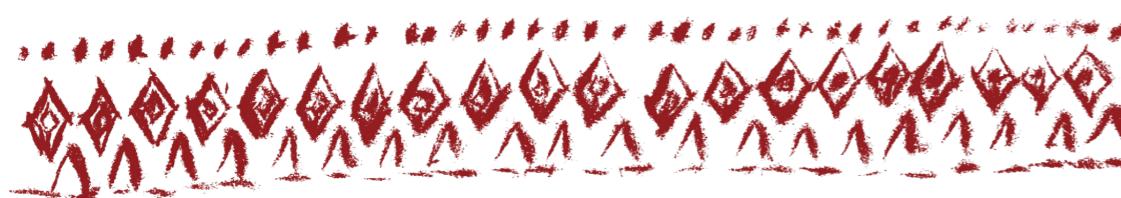
However, as an architect and soon to be urban designer, I always wonder what my preposition should be, especially when knowing that built developments and poor land management have high potential in causing land eradication. Furthermore, the knowledge about how to understand nature's capacity, how it works, and how it may be in the future is known to be complex, vague, and even need some simplifications when it comes to scientific measurement.

In addition, observing the current developments shows that the globalization and economic growth pressures influence the orientation of Indonesia development. It is resulting in too much global reference adaptation with relatively limited consideration of local context. It is ironic since the lands of Indonesia are embedded with rich cultures with its traditional wisdom understood by its local people, and the culture itself is only seen as romanticization on the image branding of tourism development.

To conclude, my motivation is based on three things: 1. How can cultures of people are seen as tools to understand nature management?; 2. How to understand the capacity and limit of nature?; and 3. how can we understand from the culture-nature relationship and use it as a tool to develop a different approach in future development to achieve common goods?



1. Batak Culture Art. Source: Author



1. Introduction

1.1. The Culture - Nature Relationship

1.2. The Evolution of Culture and Landscape in The Tourism Area

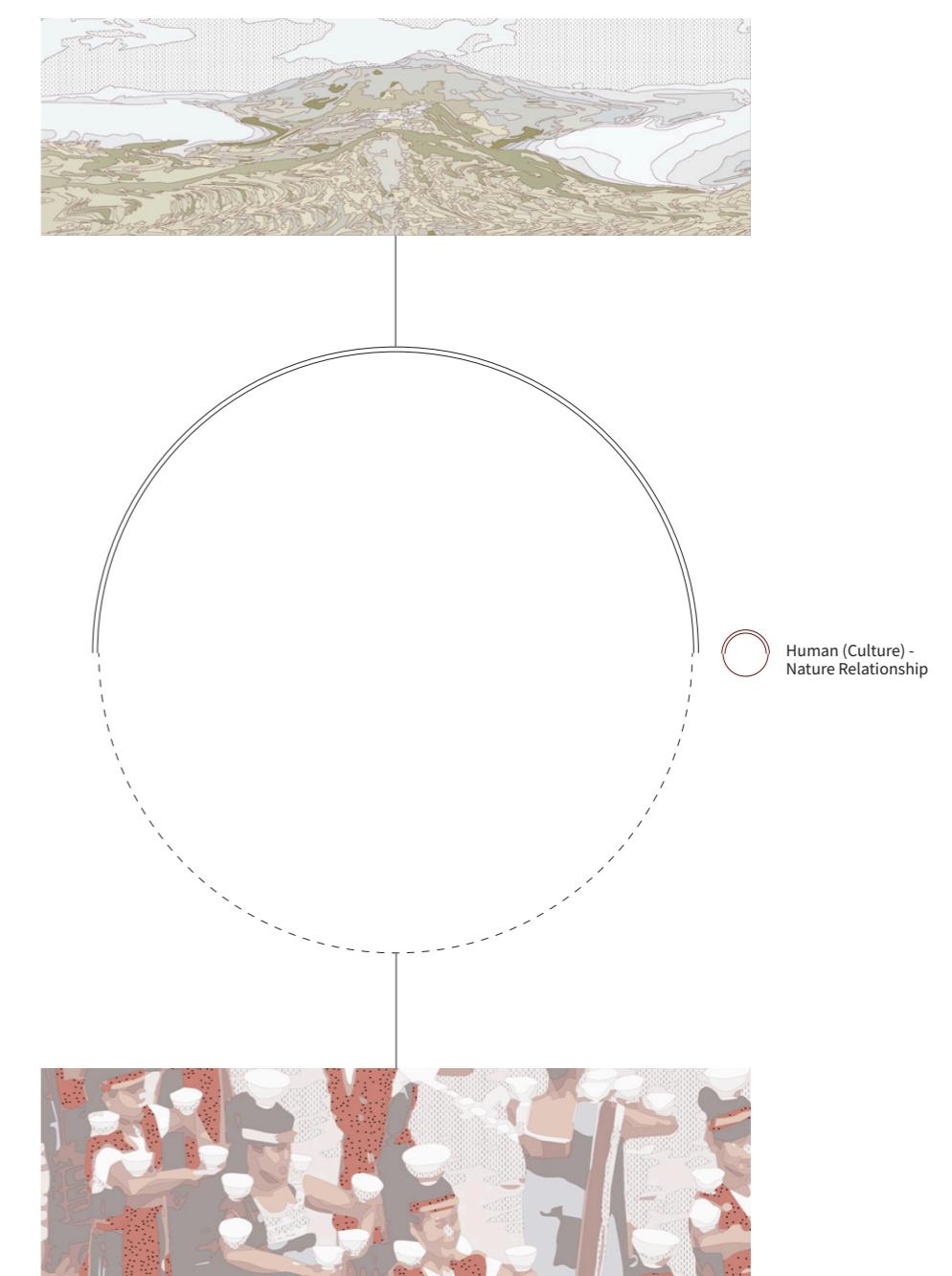
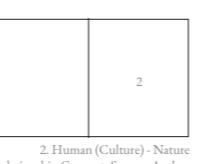
1.1. The Nature - Human Culture Relationship

Since Aristotle, a paradigm of nature seen as human culture's counterpart or something independent from human influence, has dominated the Western world. This past concept defines that nature is a separate element from human activity and not working in a harmonious (Prominski, 2014). The separation or not separation of nature-culture is elaborately explained by De Grot et al. Their study found that both culture and religion also play a role in defining the human-nature relationship that influences how they perceive and manage nature.

The differences of human-nature relationships are determined through nature's sacredness and spirituality views. In the study, almost all Protestants and Muslims considered nature without concepts of sacred or spiritual. Instead, they consider that nature is a gift from God. This view made these people believe that humans hold responsibility for nature and solve the environmental crisis. Buddhists, on the other hand, see nature as spiritual but not as sacred. They see a living entity in nature and personify it (De Groot & Van Den Born, 2007). In addition, the view of human-dominating view is already considered as old-fashioned and arrogant. Also, in the study, another view from Natives in Canada believe that we (humans) are nature ourselves, and damaging nature means damaging ourselves (De Groot & Van Den Born, 2007). Then, it shows that the new concept beyond dichotomies of nature-culture is needed to grasp nature and culture in a unitary concept to build a harmonious relationship with their different core values of positioning themselves (human) with their culture within or in parallel with nature (Prominski, 2014).

Besides, in the general concept, the relationship between human culture and nature can be depicted by understanding how these two opposite sides influence each other. Land in nature, or landscape inhabited by human society for a long time, created intangible relationships defined as culture, and it manifests belief, tradition, value, social behaviour, wisdom, and norms of human societies. These manifestations influence how humans perceive, give, take, manage, or protect the land.

Then, it raises a question on how different human culture-nature relationships influence how humans manage and perceive the land. Do we able to manage our nature in a more sustainable if we understand the relationship and recognised it in equilibrium? However, how can we see their relationship? Can we understand the relationship by merely examine their cultural elements such as traditions, vernacular knowledge, etc. or the nature condition separately? Or is there any internalized elements beneath their lives?



1.2. The Evolution of Nature and Human Culture Relationship in Tourism Area

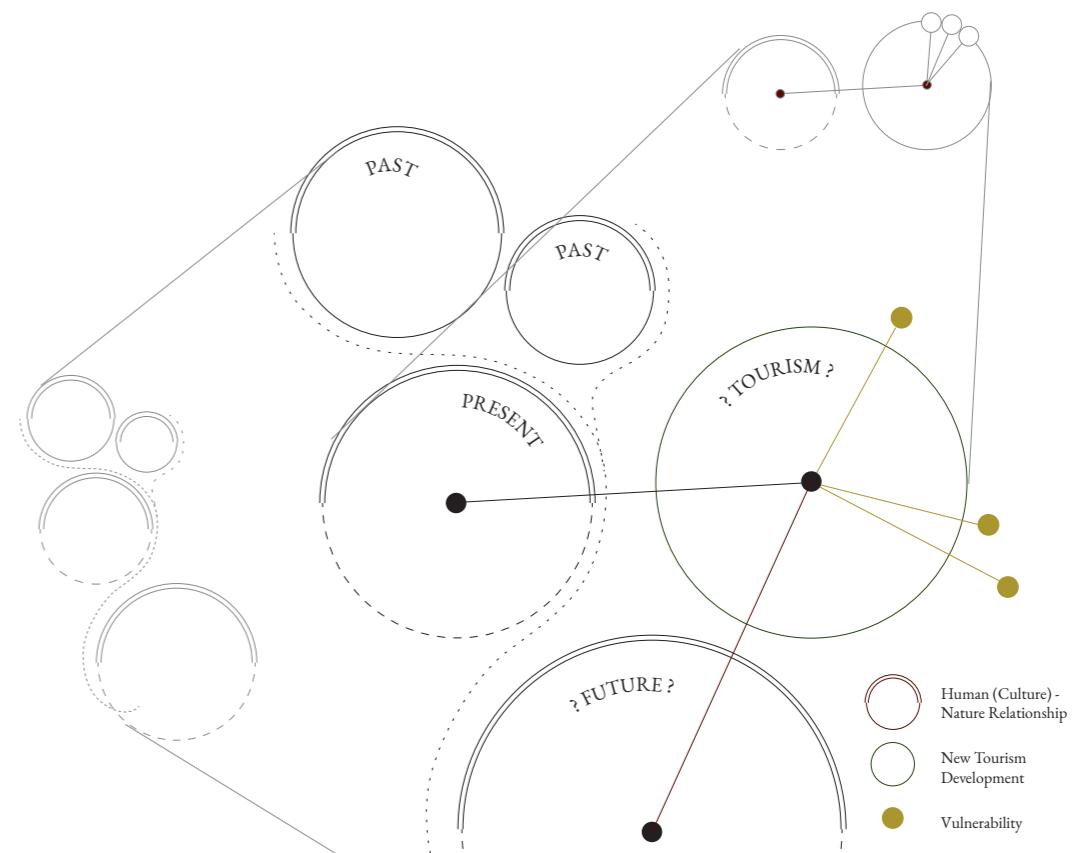
The evolution of culture and nature is inevitable. Innumerable movement of tangible and intangible elements are moving throughout the world, influencing one and another with the ground of human's evolutionary way of thinking. The urges of fulfilling human's need, improving quality of life and participating in the competition resulting on some adjustments both on human culture and also the nature. Then it determines that the relationship between human (culture) and nature are dynamically transformed in between strong and loose conditions both in different space and time circumstances.

Industrialization, new technology, and globalization are the main drivers that shape the culture and nature relationship on a global scale. (Antrop, 2005). Countries' economic cumulative output translated through GNP (Gross National Product) and GDP determines countries' performance and indirectly creates competition between them. The competitions vary including production, consumption, tourism, education system. However, GNP and GDP measures do not embrace nature capacity valuation in the measurement. Therefore, in today's world, the relationship between humans and nature is divisible, not interdependent. Although, in some countries, the loss of the human-nature relationship is influenced by cultural assimilation due to colonization.

The elevated demand for mobilization caused tourism to become a promising sector to be developed to promote national economic growth. In many developing countries, pristine nature and unique indigenous culture are seen as assets to promote economic growth through tourism. However, the tendency of massive tourism development to cause several externalities, especially in the socio and ecological sector is inevitable. In the social context, the incoming presence of tourist into the area also bring new cultures and lead to cultural fusion. And, in the ecological context, the pressure of landcover change will rise to accommodate the needs of tourism activity. Then, it will cause alteration in the local way of thinking about how they manage nature.

However, the inclusivity of local communities within the tourism development plan is still considering poor due to the dominancy of the top-down approach (Musavengane & Kloppers, 2020). Thus, increasing the potential of economic leakage phenomenon and causing local communities to have fewer benefits from their initial expectation of tourism new development. Not only that, land demands for tourism function also decreasing their natural resources for their living in the long term (Junaid et al., 2020).

The relationship between human culture - nature and tourism is illustrated through the mechanism image on the following page. The human culture-nature relationship is represented by a circle consisting of two different half-circle lines with different styles. The double line represents nature, and the dashed line represents human culture. They form a unitary relationship that influences each other. Multiple H(C)-N circles are linked with another dashed line, showing that this relationship has interlinkages from past to future. And, this interlinkage is connected with the tourism development circle embedded with potential vulnerabilities in brown circles that need to be considered.



3. Evolutionary H(C)-N Relationship with Tourism Concept. Source: Author

2. Toba Lake as General Context

2.1. Toba Lake Description

2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake

2.3. Conclusion

2.1. Toba Lake as Caldera Geopark Tourism

Toba Lake Description

Toba Lake is located in North Sumatra Province in Indonesia. The area of this lake is about 1,124 kilometres square, a volume of 256,2 kilometres cubic, and a depth of 508 metres (Garno et al., 2020). Therefore, this lake is categorised as the biggest lake in South East Asia. The location of this lake is in a geographic coordinate of $2^{\circ}41'N$ $98^{\circ}53'E$ / $2.68^{\circ}N$ $98.88^{\circ}E$, and the height is 995 metres above the sea surface. (UNESCO, 2018).

This lake is known as Toba Caldera and has become one of the most extraordinary volcanic features formed in Quaternary geologic time. The eruption of more than 2800 kilometres cubic of magma about 74,000 years ago generated a remarkable volcano crater of 100×30 km wide. As a result, a large area of North Sumatra was flooded in ignimbrite, extensive ash sediments covered large portions of Southeast Asia, including India's entire sub-continent, and a dust cloud encompassed the Earth. This eruption also has significant effects on both flora and fauna in North Sumatra due to its ash fall, regional to global temperature change, and other related environmental impacts.



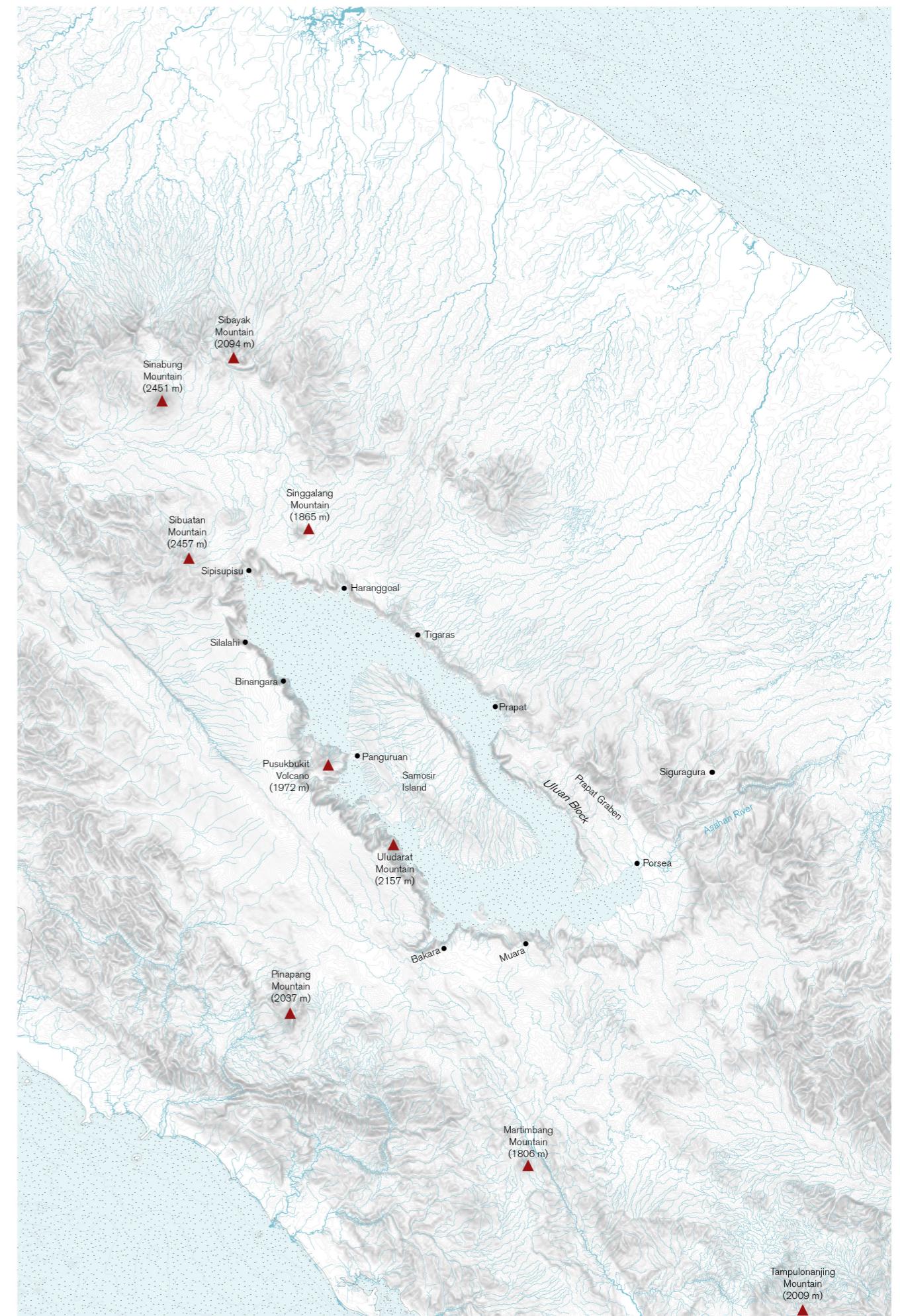
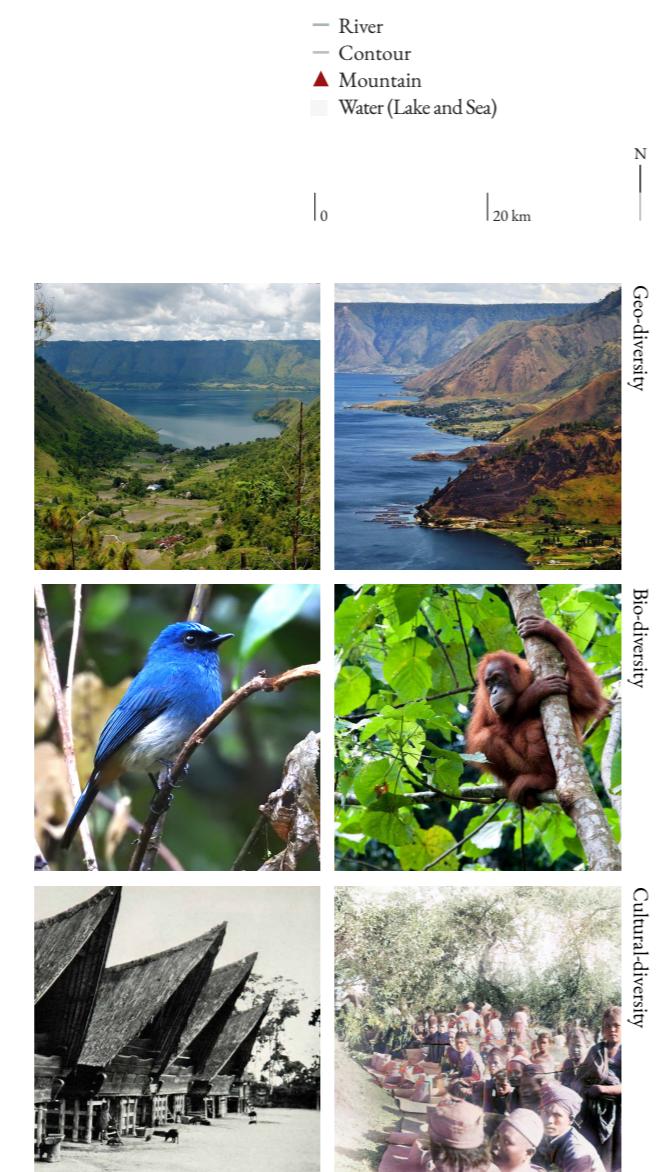
No.	Parameter	Dimension	Sources
1	Surface area (km ²)		1,124 Citra Landsat
2	Perimeter length (km)		428.7 Citra Landsat
3	Maximum length (km)		50.2 Citra Landsat
4	Maximum width (km)		26.8 Citra Landsat
5	Maximum depth (km)		508 Bathymetric Map
6	Volume (km ³)		256.2 Bathymetric Map
7	Average depth (km)		228 Self-Calculation
8	Catchment area (km ²)		2,468 Citra Landsat
9	Catchment / surface area ratio		2.21 Self-Calculation
10	Coastline development (SLD)		3.61 Self-Calculation

Source: Lukman & Ridwansyah (2010)

In addition, in this area of Toba Lake. It is inhabited by a collective of people, namely the Batak community, that already embedded their culture and built a strong bond with their land. Diverse varians of Batak Community spreaded on the perimeter of Toba Lake, which are Batak Karo, Batak Toba, Batak Mandaling, Batak Simalungun, and Batak Pakpak. These Batak ethnic groups have different local languages and specific cultures (UNESCO, 2018).

Toba Caldera Geopark Tourism

In 2013, the Government of Indonesia formed Toba Caldera Geopark after got an agreement from seven Head of Regencies which surround the Toba Caldera Lake. The formal inauguration of this geopark was held in 2014 by Republic of Indonesia's President and in 2019 succeededly become part of UNESCO Global Geopark Network. The potetials of Toba Lake to become one of Global Geopark are because of its geo-diversity, biodiversity, and cultural diversity.



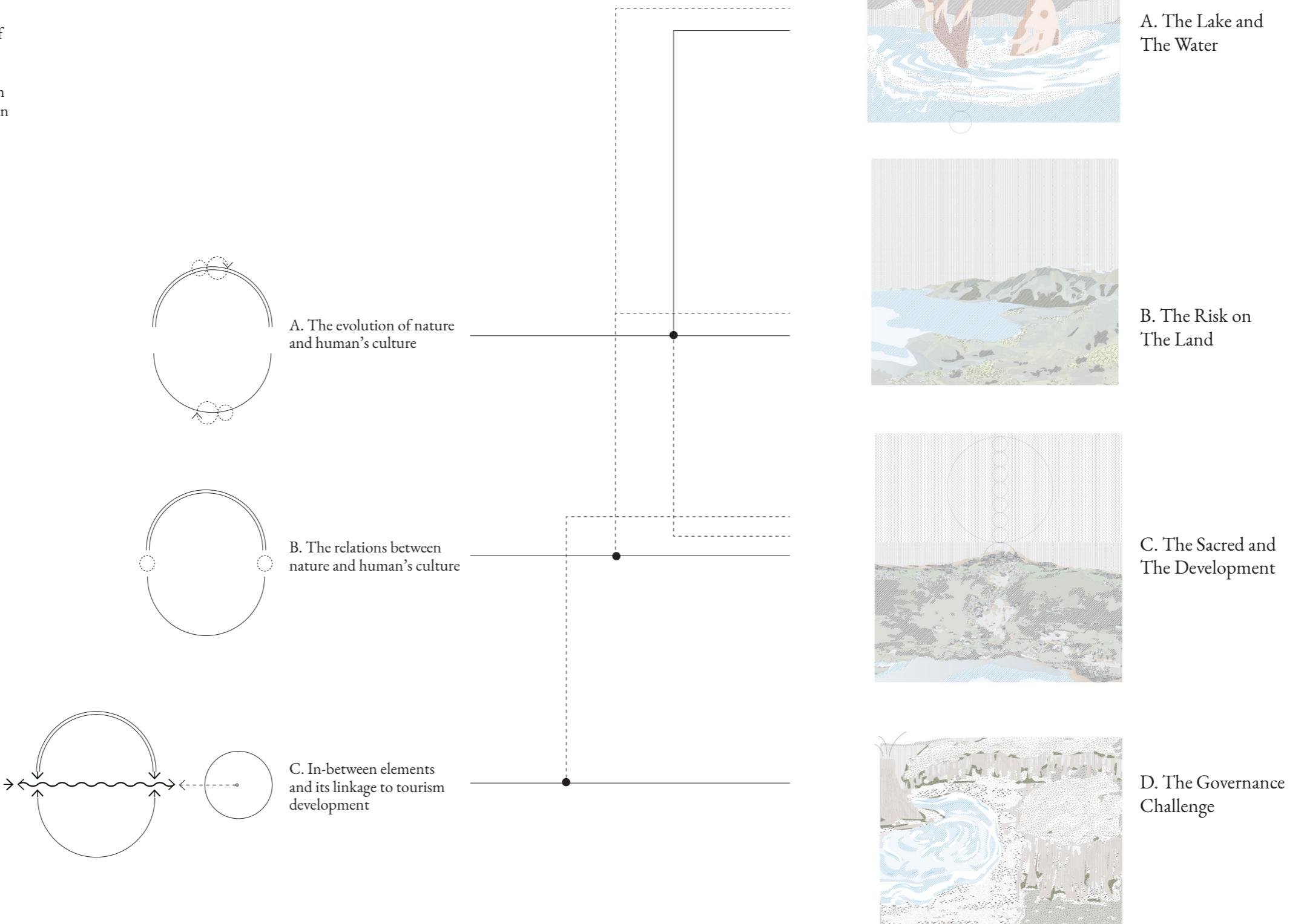
2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake

Identifying the current human culture-nature relationship needs a holistic understanding of its characteristics through three deconstructions. The deconstructions embody main concepts to reveal the equilibrium of nature and people. The first deconstruction depicts the evolution of nature and human culture through “The Lake and The Water” and “The Risk on The Land” subchapters. These two subchapters elaborate on the biophysical system embedded in the Toba Lake area. Next, the second deconstruction is the depiction of the interrelationship between nature and human’s culture through the subchapter of “The Sacred and The Development”. This sub-chapter focuses on explaining the evolution of culture from past to future with tourism as projection development. And the last deconstruction is about unveiling in-between elements that influence the human culture-nature relationship and how to define interlinkages between the H(C)-N relationship and tourism that will be elaborated through “The Governance Challenges” sub-chapter.

Explanations from other subchapters also support all the deconstructions (dashed lines) since H(C)-N is an integrated concept and cannot be explained separately. In addition, there will be a story related to the subchapter context in each subchapter to emphasize the meaning and value behind nature and culture in Toba Lake.



7. The Breakdown of H(C)-N Relationship Concept in the Lake Toba Context. Source: Author



2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake

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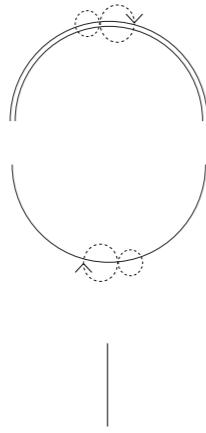
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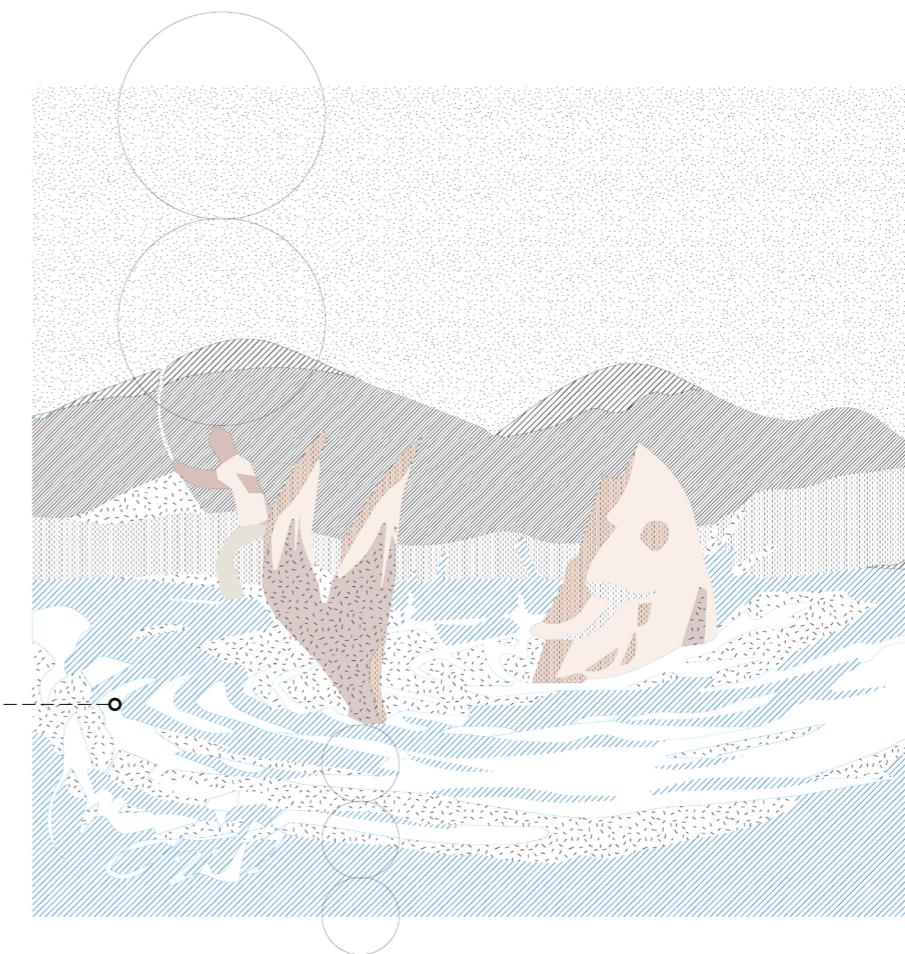
The Evolution of Nature and Human's Culture



A. The Lake and The Water

The Gold Fish – Lake Toba Folklore

Lake Toba plays a considerable role for society as defined through the legendary folktale: The GoldFish. This story is about a farmer who lived nearby a river humbly sufficient with crops he grew. One day, he caught a goldfish that was a cursed princess. Because of the farmer's kindness that allowed the princess free, the princess was very grateful and willing to marry him under one condition of not telling her secret curse. They were married and had one child. One day, when his child upset the farmer, he was angry and called him "the son of the fish". Knowing that the farmer was breaking the promise, then the fish left him. Suddenly a long and intense rain fell and caused water overflow which eventually turned into a lake.



A. 1. Water Lake Capacity

The flow pattern of the river that becomes the inlet of Lake Toba is dominated by small rivers with a total of 289 rivers, although only 71 rivers are permanent rivers and the rest are seasonal rivers. From mainland Sumatra, 177 rivers flow and from Samosir Island 122 rivers (Soedarsono, 1989, as cited in Rustini et al., 2014).

There are main inflow and outflow points which are indicated through the map. Salang Simangira River has the highest debit with $\pm 10.0 \text{ m}^3/\text{s}$ for the inflow. And, for the outflow, Asahan River as the only outflow river has $100 \text{ m}^3/\text{s}$ debit. Thus, this flow becomes sources for Sigura-Gura hydro-power plant with capacity up to 286 MW (Kompas, 22 September 2005).

The current pattern in the northern part of Lake Toba tends to circulate locally, indicating that pollutants entering the north of the lake will take a long time to be removed from the lake. This geomorphology is not beneficial since currently the number of fish farming in the northern part of the lake is relatively high comparing to the other parts of the lake.

On the other hand, it can be seen that productive landscape in the surrounding of Toba Lake is dominating the area. In Toba Lake water catchment area, about 48.6% of the area are productive landscape (Lukman, 2013). In this sense, traditional

methods of agriculture and applied on the area will cause further impacts such as soil degradation and water quality decrease due to fertilizers leak. Moreover, an enormous livestock area (mainly located on the Samosir island) is also potential to contribute on the water pollution for the lake.

To conclude, the need to revitalize water quality of Toba Lake is highly important due to the dependency of local people to the water (used for washing clothes, water sources for agriculture, drinking water, etc). In addition, it is also influencing the water quality in the downstream area within Toba Samosir Water Catchment Area since it is connected through Asahan River (Lukman, 2017).

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Base Map
 — River
 — Contour
 → Water Flow
 — Regency (Kabupaten)
 — District (Kecamatan)
 — Village (Desa)
 ... Water Catchment Area Boundary
 • National Activity Center
 • Regional Activity Center
 • Local Activity Center
 ○ Center Development Area
 ■ Water (Sea and Lake)

Waterbody
 0 - 50 m
 50 - 100 m
 100 - 200 m
 200 - 300 m
 300 - 400 m
 400 - 500 m

Land Use
 ■ Plantation
 ■ Wetland Agriculture
 ■ Dryland Agriculture
 ■ Dryland Agriculture with Marsh

Hydropower Plant
 ○ Hydropower Plant
 ○ Micro Hydropower Plant
 ○ Mini Hydropower Plant

Pollution Concentration in Lake (August 2010)

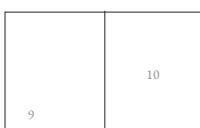
○ Phosphorus
 ○ Nitrogen
 □ Oligotrophic
 □ Mesotrophic
 □ Eutrophic
 □ Hypereutrophic

Pollution Concentration in Riverflow

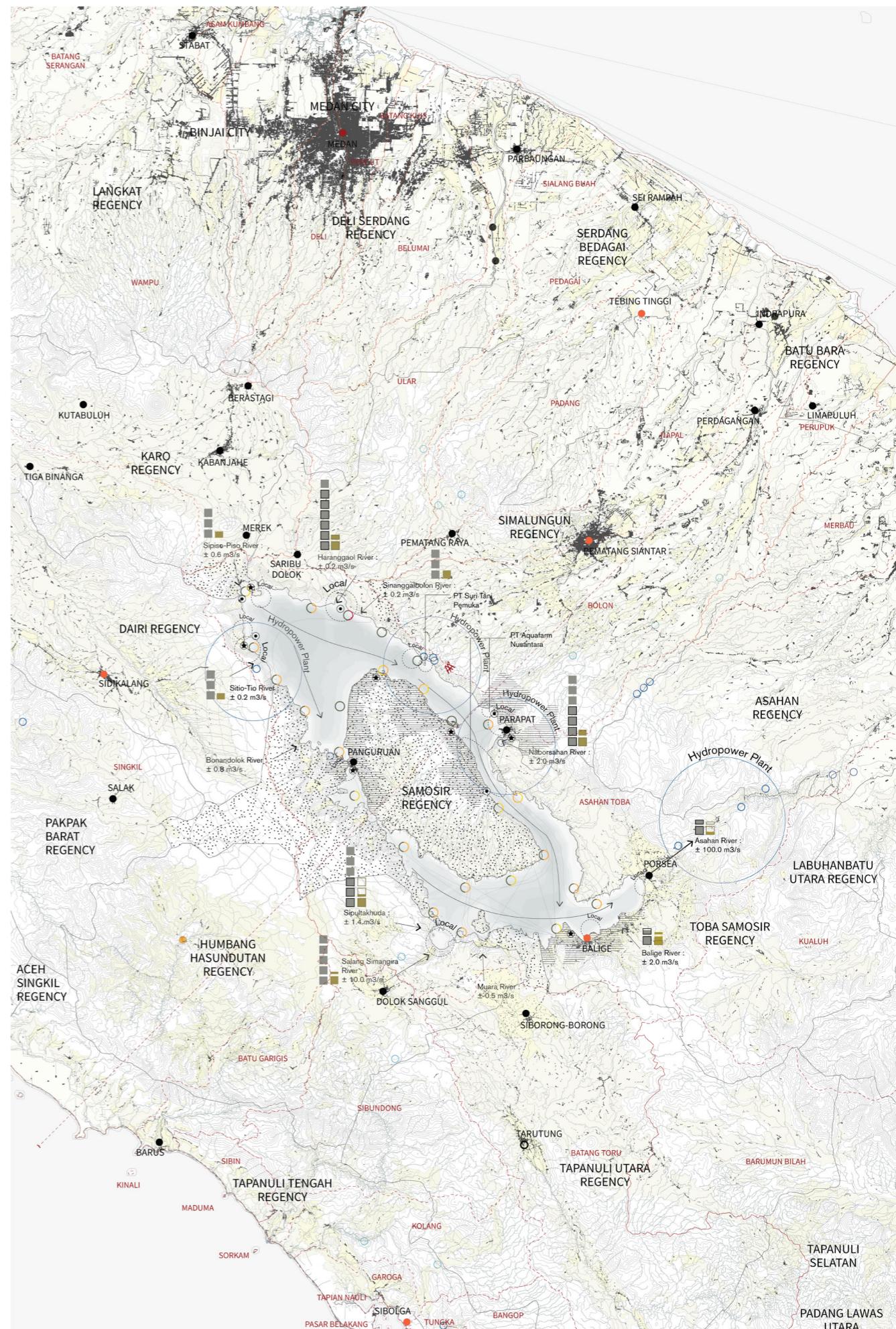
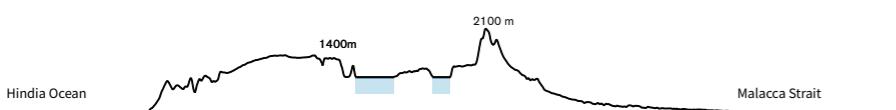
■ Phosphorus in October - 0.02 mg/L
 ■ Nitrogen in October - 0.2 mg/L

Water Quality Pressures
 ○ Aquaculture Spot (with ownership)
 ■ Livestock Area : Densities = 301 - 3176
 ■ Main Tourism Areas

0 20 km
 N



9. A-A' Section. Source: Author
 10. Water Lake Capacity. Source: Author. Data Source: Badan Informasi Geospasial (<https://tanahair.indonesia.go.id/>); Lukman, 2013;



A. 2. Water Quality

The water quality of Lake Toba is influenced by four primary drivers: aquaculture, domestic & tourism, livestock, and agriculture (Image 13). The image also indicates that the leading causes are lack of water treatment, poor water management, and a traditional approach to agriculture (using a high amount of fertilizers). Because of this, direct discharge of pollution into the rivers and lakes may result in high nutrients loading. Moreover, climate change also is projected to influence the number of primary and secondary producers decays due to the change of parameters of lake conditions. Next, the state of the lake and river alter in its nutrient concentration, biomass production, water transparency, the oxygen level in the hypolimnion, and nutrients and metal recycling. As a result, it causes some impacts such as flooding, algal bloom, turbid water, oxygen depletion, and gas eruption on the lake bed (World Bank Group, 2018).

Moreover, by referring to Image 11, it can be understood that there was a double increase in fish farming units between 2005 to 2007. It means that the number of fish farming units is predicted to increase in future years. In addition, fish pellets (image 12) are harmful to the lake water since about 62.3% of the initial phosphorous concentration

within the pallets become waste. So then, the pollution caused by fish farming will significantly rise and increase the number of fish farming units.

To conclude, there is an urgency for re-thinking the sustainability of the main drivers of aquaculture, domestic & tourism, livestock, and agriculture. Despite the most influential driver present is aquaculture, the others potentially have a more significant impact along with tourism development growth.

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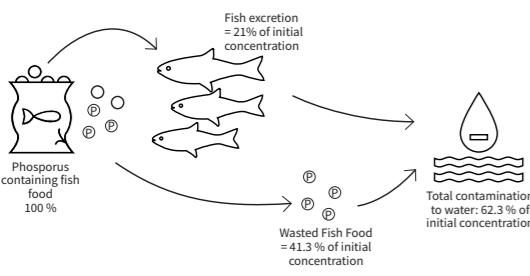
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Fish Farming Number (2005 and 2007)			
No.	District Name	2005* (Unit)	2007** (Unit)
1	Toba Samosir	878	1,732
2	Samosir	1,105	2,180
3	Tapanuli Utara	24	47
4	Humbahas	45	89
5	Dairi	65	128
6	Karo	75	148
7	Simalungun	653	1,288
Total		2,845	5,612

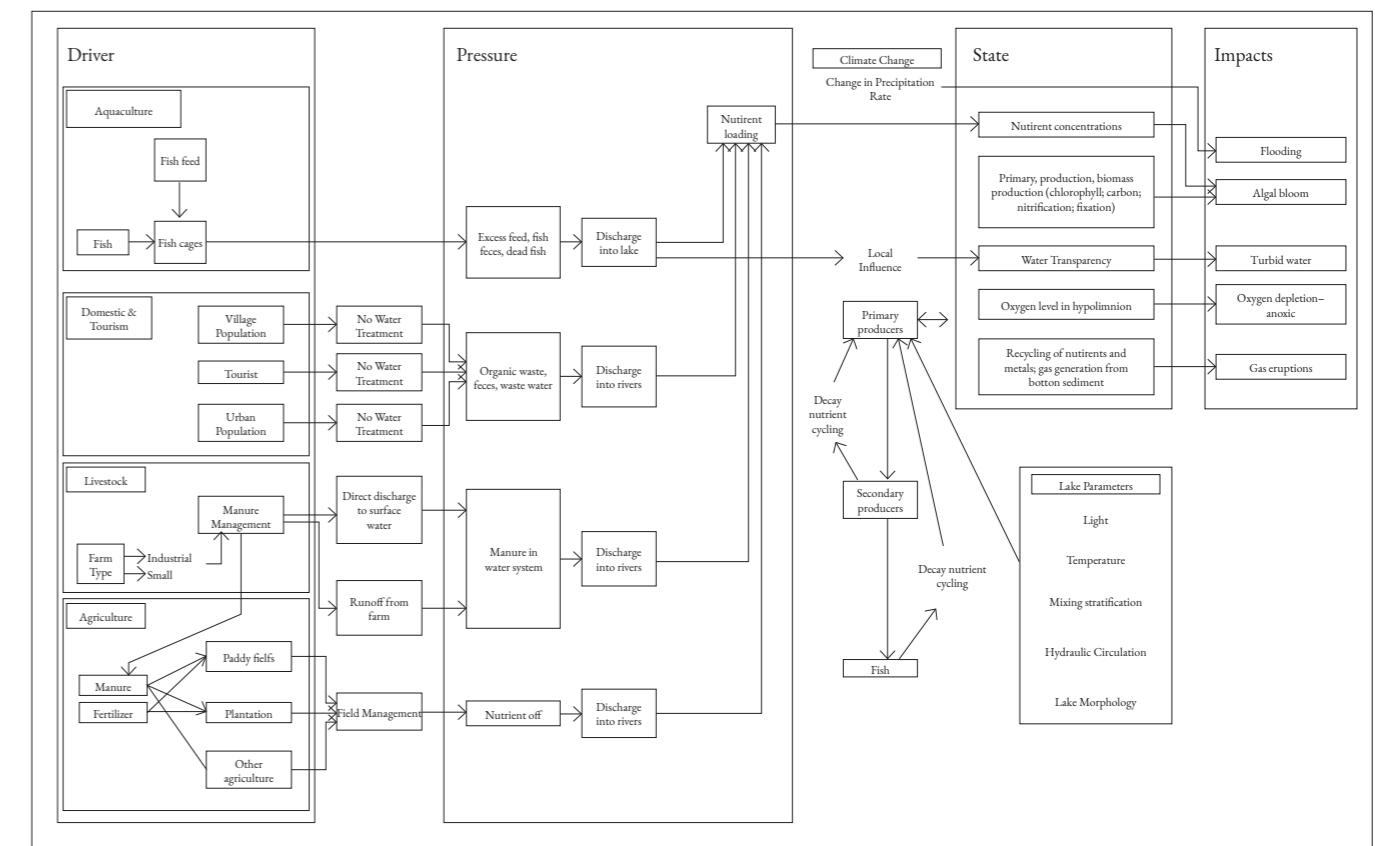
*)BPS Kabupaten in EKDT, 2006
**) Bappedaldasu Survey Report, 2007

Fish Pallettes Use and Phosphorous Concentration



11	13
12	

11. Fish Farming Population (2005 and 2007). Source: World Bank, 2018
12. Fish Pallettes Use and Phosphorous Concentration. Source: Author. Reference: Lukman, 2013
13. The Drivers, Pressures, States, and Impact of Lake Toba Water Quality. Source: World Bank Group, 2018



A.3. The Need of Water Height Level Control

The water level of Toba Lake is influenced by water inflow, direct rainfall, evaporation, and water outflow through the Asahan River. The transformation of the Asahan River is explained as follows:

1977 - 1978
The water level of Toba lake is 906 meters above sea level.

1983 The status of Toba Lake become the largest natural dam in the world at that time. The dam's control is located in Siruar. This dam controller can mechanically control Toba's water level from 901m to 905.8m above sea level. Efforts to maintain the stability of water flow entering the turbine were carried out by dredging the Asahan River along the 13.6 km from Porsea to the Siruar Dam. Dredging the Asahan riverbed causes a change in the cross-sectional area of the water passage so that the original water flow capacity of 75 m³/s (905 m) was transformed into 153 m³/s (902.4 m).

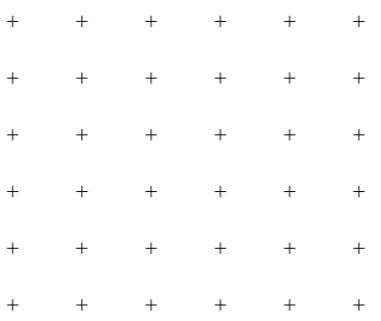
1987
The rainfall was below normal. The importance of the turbine's operation caused Lake Toba's water level to decrease until 902.87 in 1999 continuously.

2009

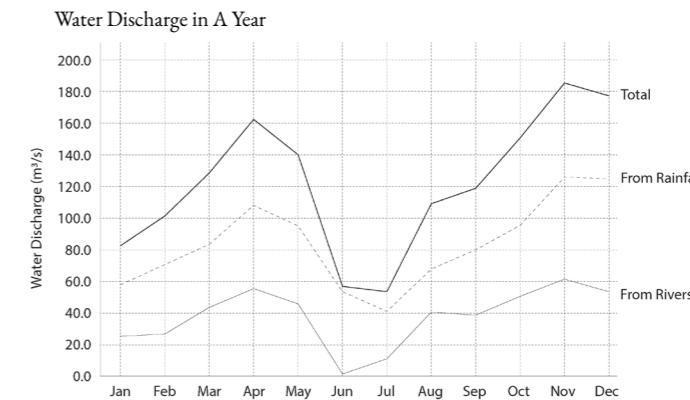
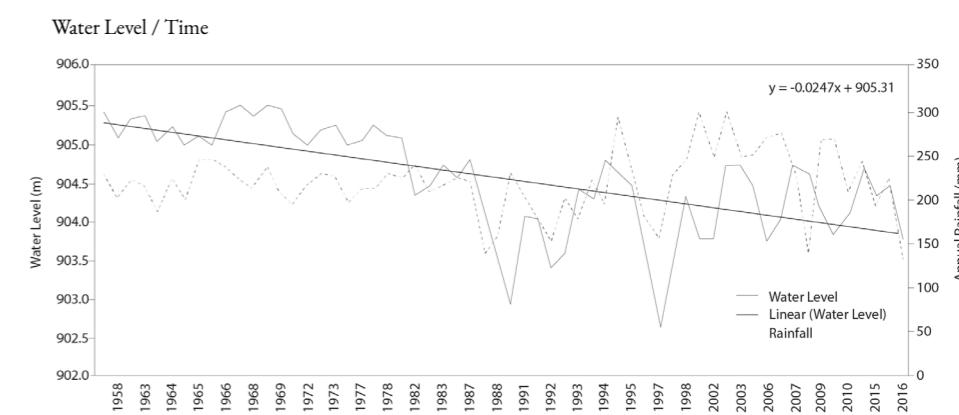
The rainfall returned to normal and even above normal due to the La Niña phenomenon. As a result, the Lake Toba water level has reached 905.3 m.

In addition, with the entry of Lae Renun hydro-power into Lake Toba (minimum discharge 10 m³/s), the natural equilibrium of Lake Toba has been disturbed. Then, there will no longer be a drop in Lake Toba's water level because its input is always above normal (Arjuna, 2013).

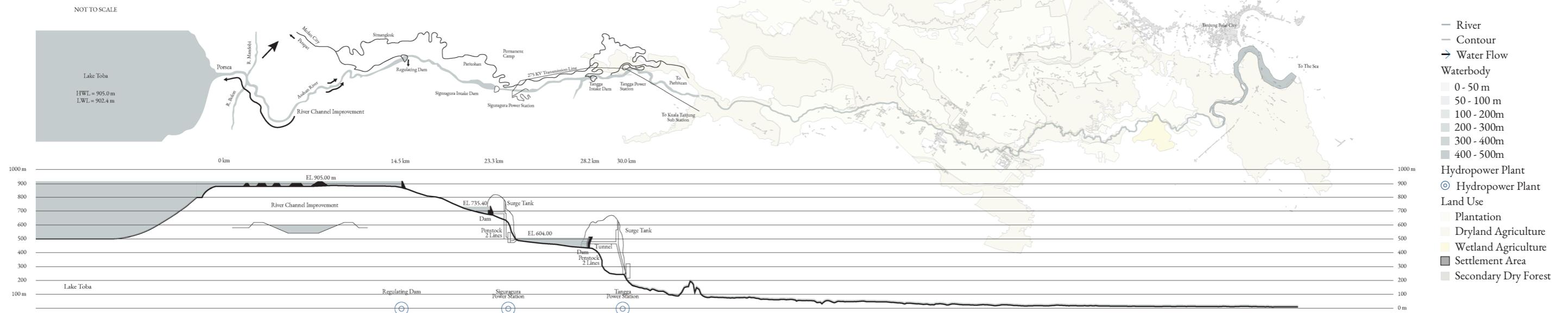
Therefore, control of the dam as a regulator of released and transferred water is needed. It is to maintain the water level not higher than normal to prevent disturbance to the settlements along the edge. Moreover, there is a potential due to climate change that rainfall rate may change and causes unpredictable water lake height.



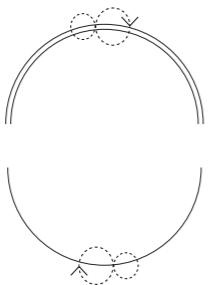
14. Asahan River Section. Source: Author. Reference: <https://inalum.id>
15. Water Level Over The Years. Source: World Bank Group
16. Water Discharge In A Year. Source: ITTEMP 2013



Asahan River Section



2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake

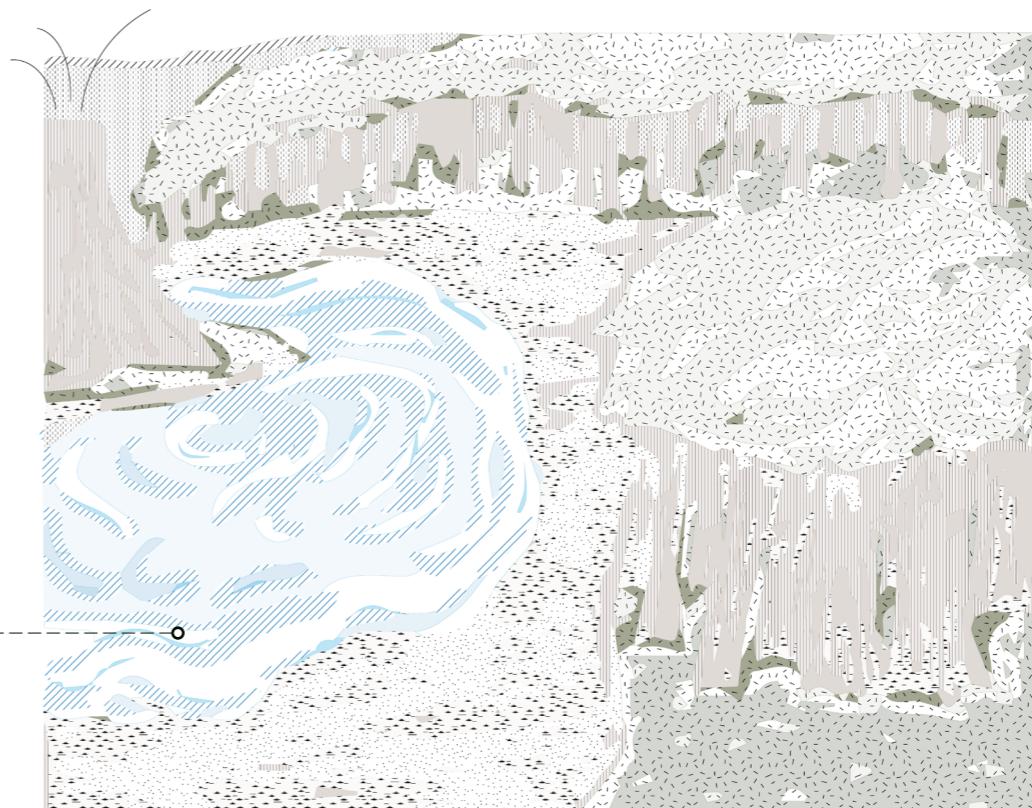


The Evolution of Nature and Human's Culture

B. The Risk on The Land

Super Volcano

Lake Toba was formed due to an explosion of one of the most powerful volcanic eruptions about 100,000 to 75,000 years ago. The lake and the island of Samosir were also formed after the subsequent series explosion about 30,000 years ago. According to local folklore, a mythical mountain called Mount Tuahawoeba (also used as the name of a type of pepper) is believed to be the origin of this Lake Toba.

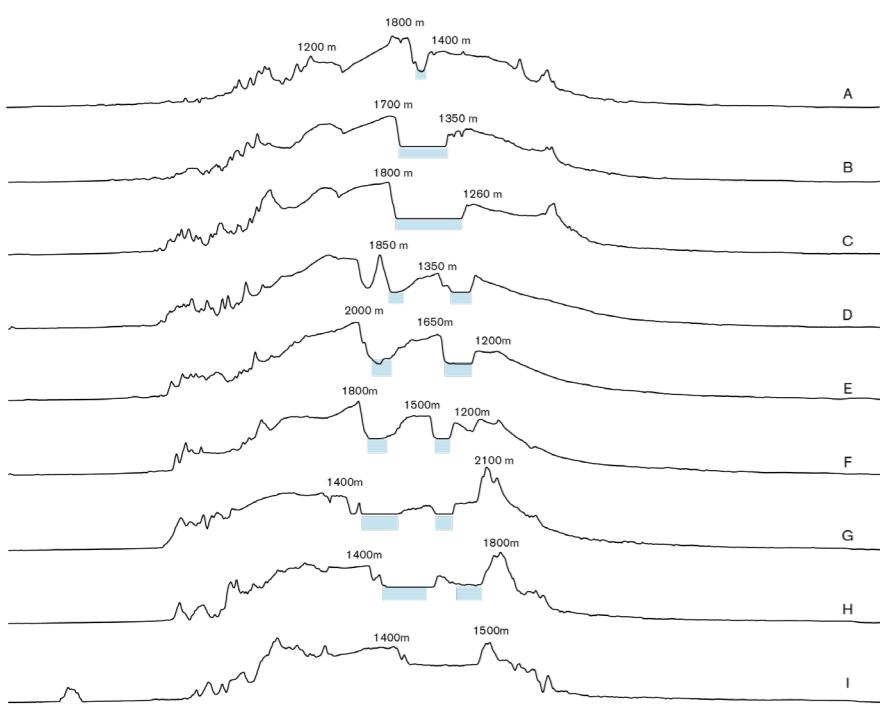


B.1. The Geo-Formation

Supervolcano Eruption

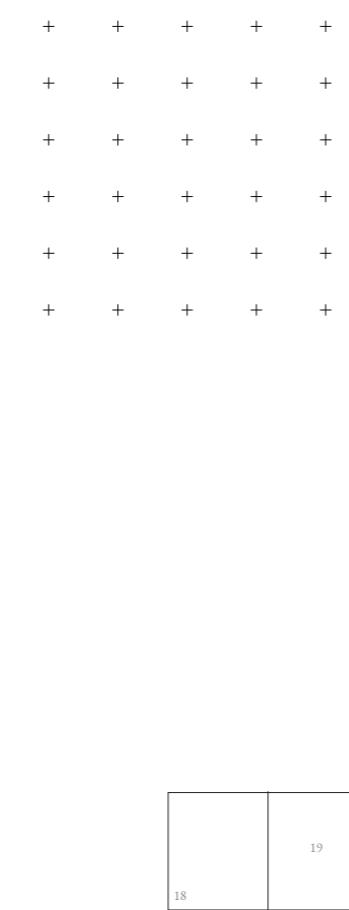
About 74,000 years ago, The Toba Caldera was formed through volcano-tectonic explosives followed by a pattern of continuous ring fractures. Next, the collapse of the volcano's body (flare-up) happened due to the vacuumed in the magma chamber (UNESCO, 2018). Afterwards, the rainwater filled the caldera and formed the largest volcanic lake in the world with 240 km³ of freshwater.

Besides, this volcanic activity continued with the several cone volcanoes formation along the western edge of the caldera (Sibandang-Pardepur Mountain, Pusik Buhit Mountain, and Sipiso-Piso Mountain). The island of Samosir in the centre of this caldera was formed afterwards about 33,000 years ago, along with a resurgent doming to achieve a new equilibrium post-supervolcano eruption. This supervolcano eruption formed geothermal nodes found within this area and a unique landscape trail with different soil types.

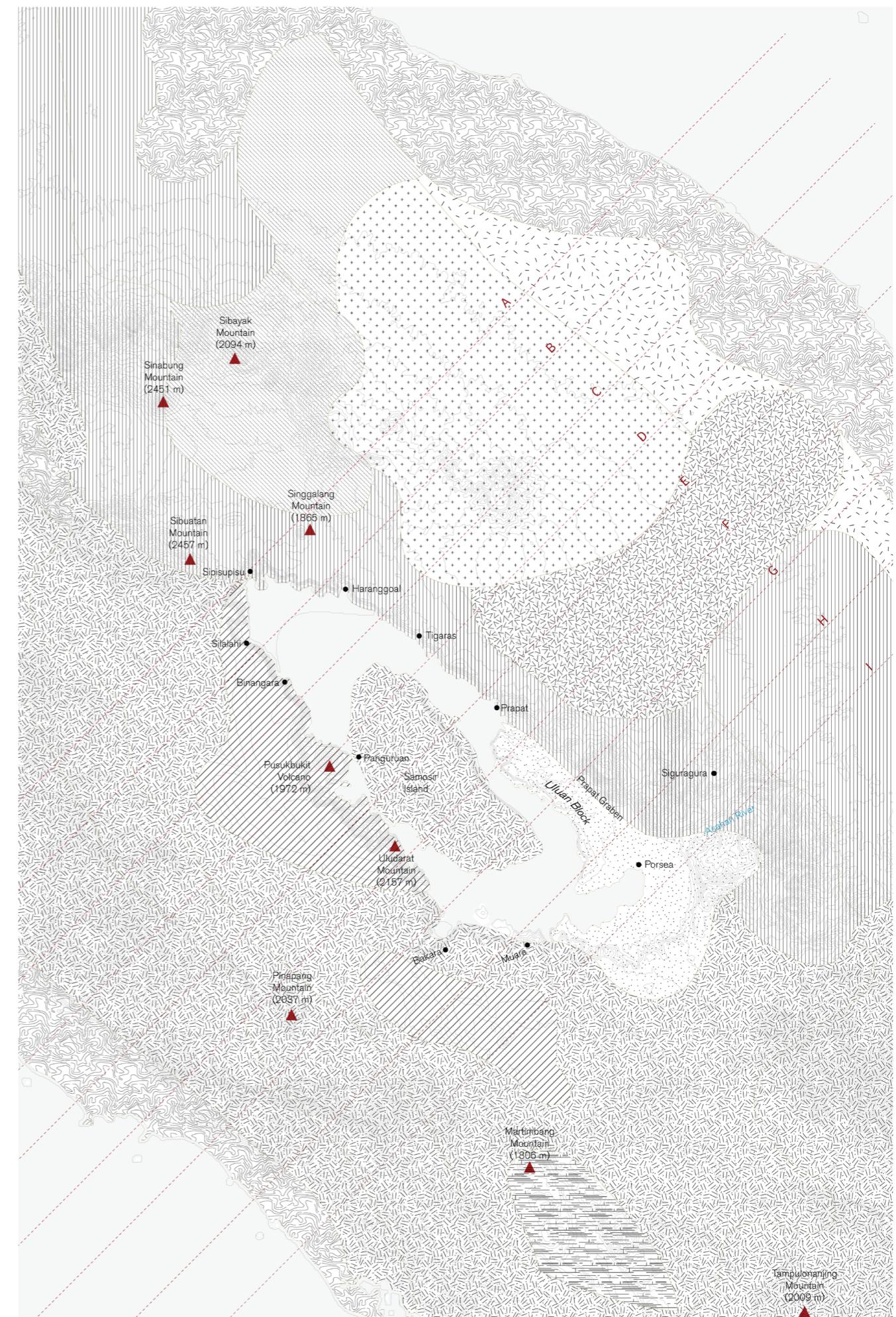


— River
 — Contour
 ▲ Mountain
 ■ Water (Lake and Sea)
Soil Type
 Bh – Humic Cambisols
 Bd – Dystric Cambisols
 Th – Humic Andosols
 Ao – Orthic Acrisols
 Ah – Humic Acrisols
 Af – Ferric Acrisols
 Jd – Dystric Fluvisols
 Po – Orthic Podzols
 Fo – Orthic Ferrasols
Slope
 ■ High
 ■ Medium - High

30
 0 20 km
 N



18 19
 18. Topography Sections. Source: Author with GIS software
 19. The Geo-Formation Map. Source: Author. Data Source: Badan Informasi Geospasial (<https://tanahair.indonesia.go.id>); FAO (<http://www.fao.org>)



B.1. The Geo-Formation

The evolution of the Toba Caldera

The formation of Toba Caldera is characterized through three sequences of last volcanic eruptions, which are the Oldest Toba Tufa (OTT in 0,84 Ma), the Medium Tufa Toba (MTT in 0,5 Ma), and the Youngest Tufa Toba (YTT in 0,074 Ma) and collapsed caldera structures, become the main terraforming of Toba Caldera. Afterwards, since 0,074 Ma, a gradual process of caldera floor uplifting happened until achieving a new equilibrium within 33,000 years (Chesner & Rose, 1991, as cited in UNESCO, 2018).

Samosir Resurgent

The dynamics of the Samosir island process resulted in an en-echelon fracture pattern in the eastern part of the island, lake cliffs, and the accumulation of thick lacustrine sediment (Aldiss & Gazali, 1984, as cited in UNESCO, 2018). Thus, until now, this island has been uplifted and 'tipped' +700 m from its original position, tilted to the west.

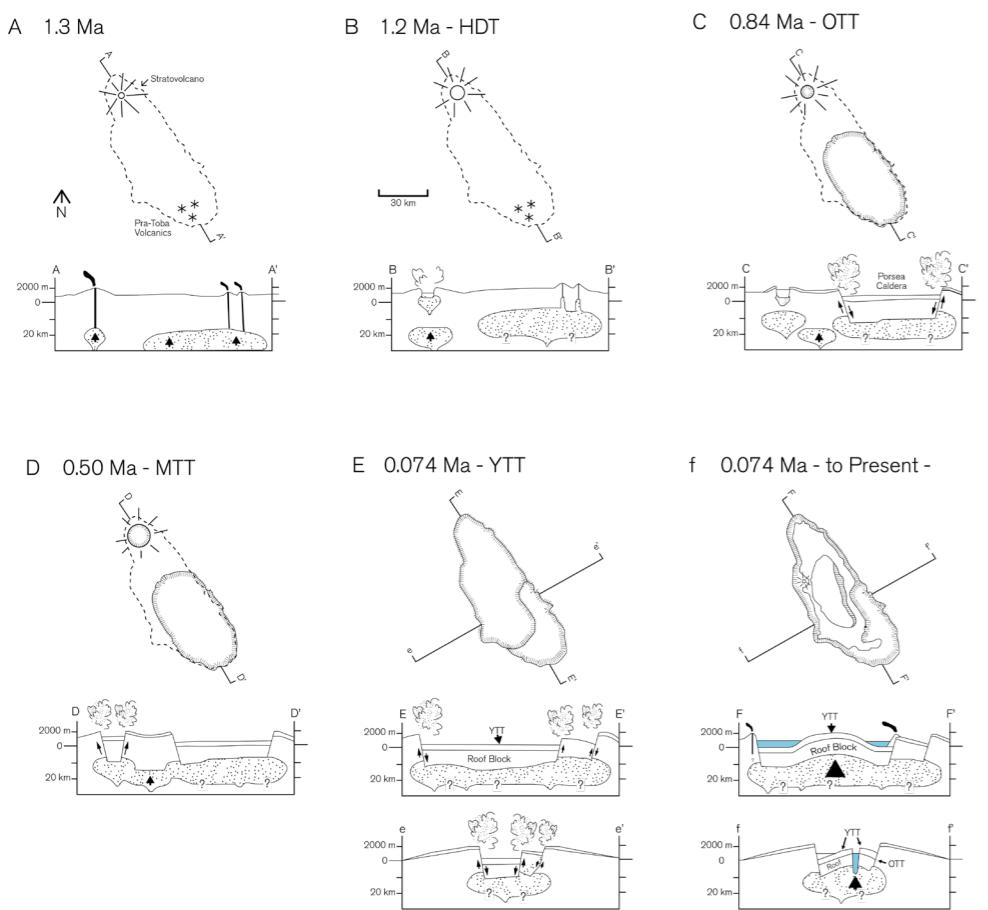


Image 6 – Terraforming of Lake Toba in 75,000 years ago

The Rock Type

The types of the rocks were classified based on their formation. Most of the region is formed with sedimentary rock with low to nonexistent porosity. As a result, the water is hard to be infiltrated by the soil, hence numerous fault lines are spreaded over the area to allow water filtrated into the soil. In addition, some areas along the lake have igneous rock type instead with high bearing capacity that is suitable for building construction. But, the rock type within the samosir island is different from any other part of the region, which is Non-Clastic Sedimentary Rock that has low to medium bearing capacity.

+	+	+	+	+	+	+
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+	+	+	+	+	+	+
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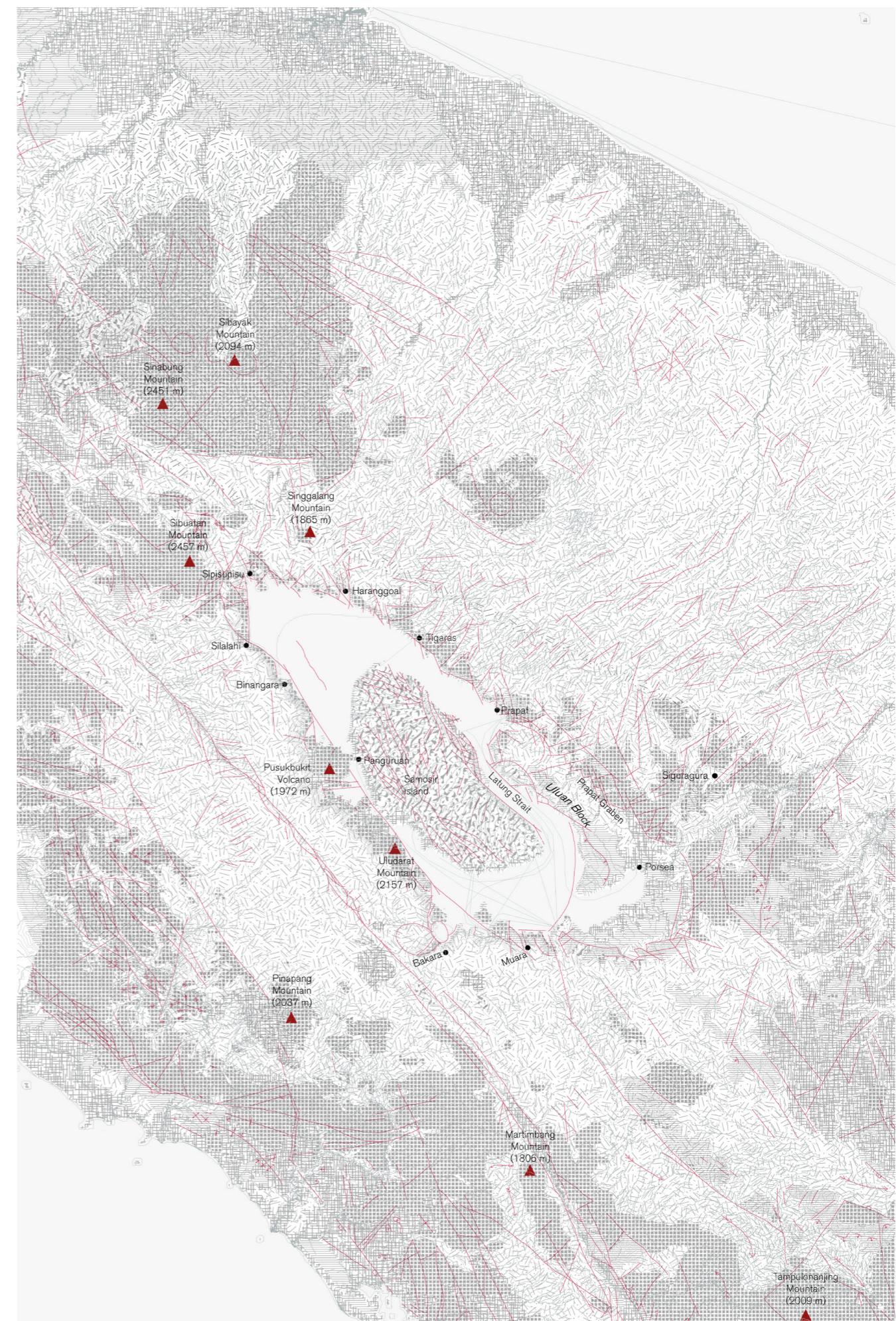


20. The formation of Lake Toba.
Source: Author with reference from An Application Dossier for UNESCO Global Geopark (2018).

21. The Geo-Formation Map 2.
Source: Author. Data Source: Badan Informasi Geospasial (<https://tanahair.indonesia.go.id>); FAO (<http://www.fao.org>)

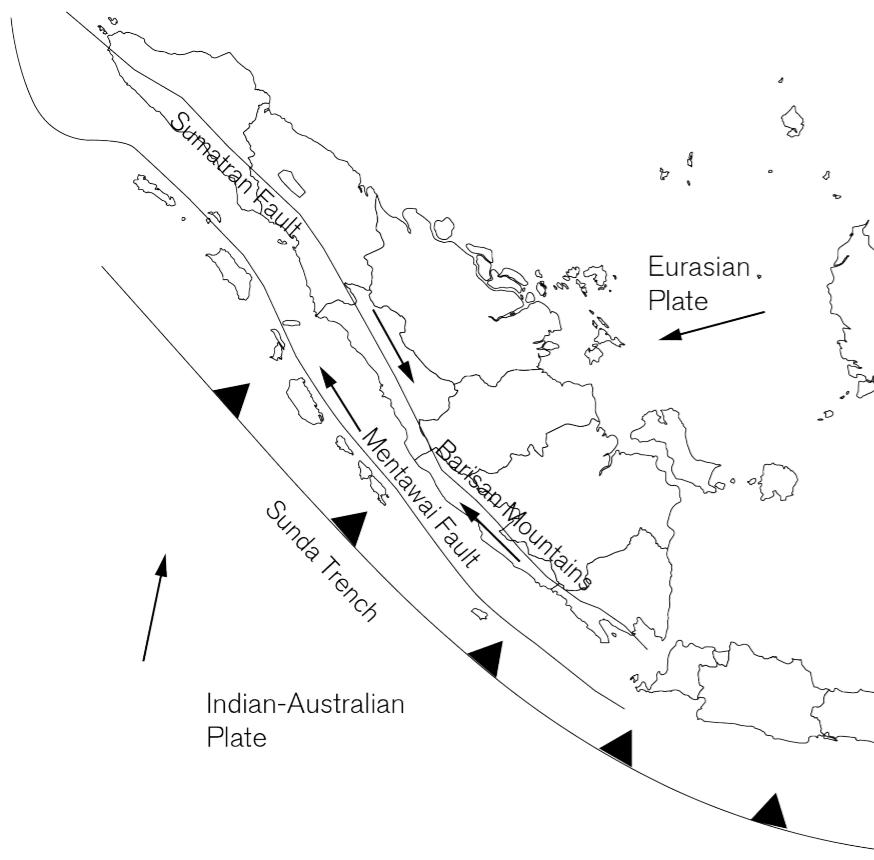
- River
- Contour
- Fault Lines
- ▲ Mountain
- Water (Lake and Sea)
- Rock Type
- Igneous Rock – High Bearing Capacity
- Sedimentary Rock – Low to Nonexistent Porosity
- Sedimentary Rock – Porous and Permeable
- Non-Clastic Sedimentary Rock – Low to Medium Bearing Capacity
- Volcanic Eruption Rock – High Bearing Capacity

0
20 km
N



B.2. The Geological Vulnerability

Due to the location of Sumatera Island, which has two main faults along the island (Mentawai Fault and Sumatran Fault), a mountain range – Barisan Mountain that transversely spread the island cause the area to have a high risk of natural disasters such as earthquake and landslides. Moreover, intensive agriculture and land cover change from forestry to productive landscape also created pressure on soil quality as illustrated within the critical zone area and flooding in the coastal areas near the adjacent sea.



34



22. Parallel Faults with Sumatra Island. Source: Author with reference Shouhrtari A, et al, 2018
 23. Geological Vulnerability. Source: Author. Data Source: Badan Informasi Geospasial (<https://tanahair.indonesia.go.id>);

- River
- Contour
- Fault Lines
- ▲ Mountain
- Water (Lake and Sea)
- Settlement

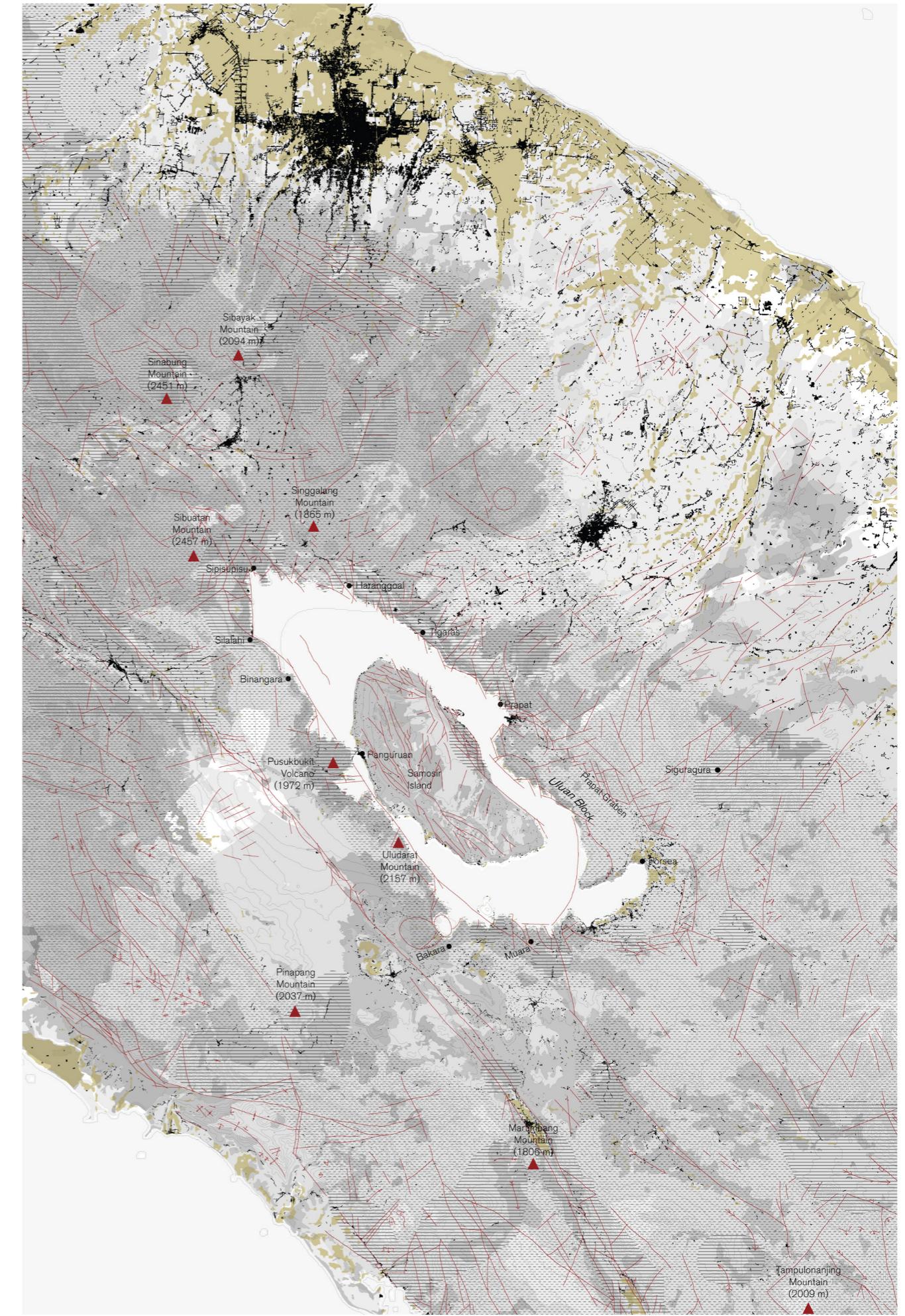
Risk

- Flooding
- Landslide - Medium Risk
- Landslide - High Risk

Critical Zone

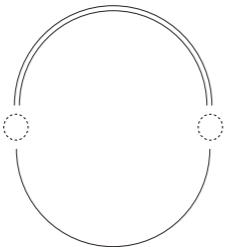
- Not Critical
- Very Critical

0 20 km
N



35

2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake

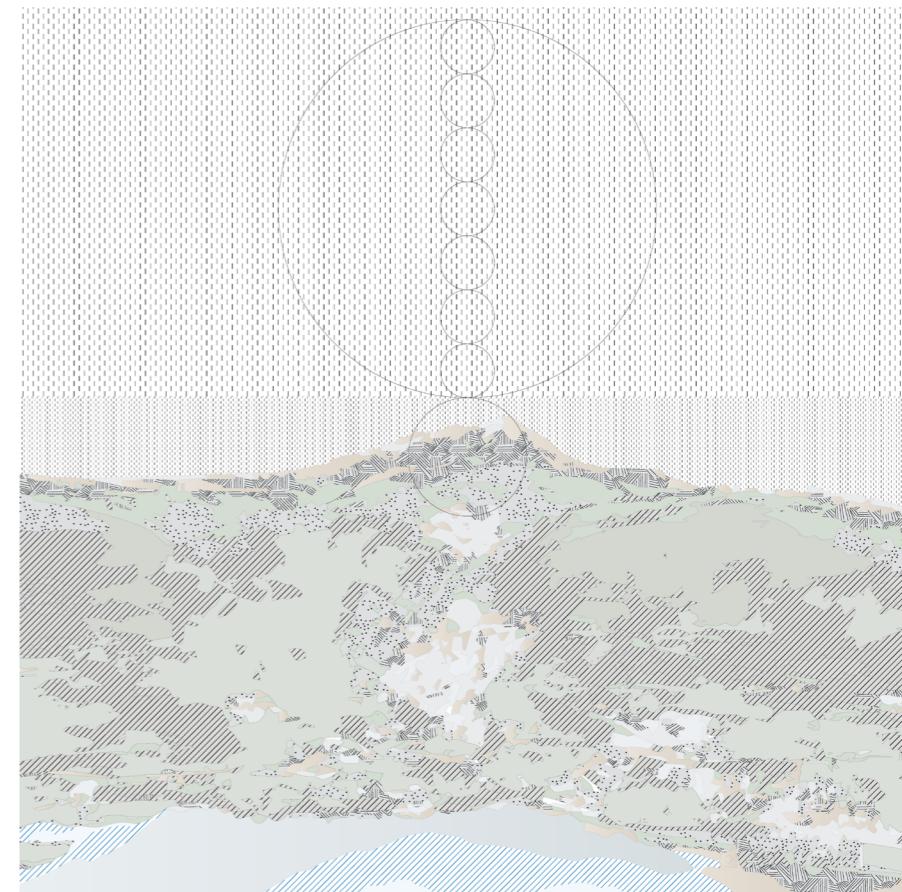


The Relations Between Nature and Human's Culture

C. The Sacred Land and The Development

Pusuk Buhit

Pusuk Buhit is a sacred mountain believed to be where the initial Batak Community was born through the highest goddess: Mulajadi Na Bolon. Due to its sacredness and the dislike of land intrusion by Toba Batak Community, Toba Lake was once not be included on the map. However, in about 1850, the lake finally was recognized and officially put on the map.



C.1. Composition - The Land and Culture

The culture of Batak Community is manifested in the space. The firm belief of their connectedness to The God Realm created self-consciousness always to protect the nature they live. It is represented through their core values of believing levels of macrocosm and microcosm of Homoraun (wealth), Hasangpaun (dignity), and Hagabean (descendants). Based on their core values, the representation also reflects on their ceremonial tradition before agriculture harvesting and some deity stones located in some spaces inside the forest (Simanjutak, 2014).

Moreover, the manifestation is embodied through vernacular wisdom, for example, in their way of settle. From the section, it can be understood that their wisdom has adapted the land terraforming and lead them to choose flat land for their houses with the mountain as building orientation. However, their wisdom also defines the limits of their choices for settlement and production areas (Simanjutak, 2014).

Furthermore, the manifestation of their governance system is represented through their community living system with the same family clan. Commonly, about 5-8 families live together within one housing complex (Huta) they built from zero in a small space in a forest. Each huta has one king who acts as a leader trusted to become Huta's members' decision-maker. On a larger scale, several Huta forms a more extensive community called Horja and Bius. Horja is a large community with the same family clan, while Bius has a different clan(s). Previously, there were fewer conflicts

between family clans due to gathering, creating informal markets between women, or strategy-making for war in an open public space, namely Onan (Simanjutak, 2006).

The evolution started from the colonization era. New religion and education had significant influences on the way of thinking of Batak (Simanjutak, 2014). Not only that, globalization and new technology also play a significant role in the change. This influence may explain that in some parts of Toba Lake, the surrounding area has different urban fabrics despite the higher pressure of new development, such as Balige City.

Therefore how we can understand the real meanings of vernacular wisdom? What is the role of vernacular wisdom in today's living, economy, governance system? To what extent should we preserve the wisdom or maybe just let them evolve?

+	+	+	+	+	+	+
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+	+	+	+	+	+	+
+	+	+	+	+	+	+



24

24. The Land and the Culture. Source: Author. Data Source: Si Batak Jalan-Jalan (<https://www.sibatakjalanjalan.com>); Google Maps Satelite Image (maps.google.com); Badan Informasi Geospasial (<https://tanahair.indonesia.go.id>);

C.2. Pixels of Land Use

Referring to the Toba Lake Tourism Plan, there are four main areas of north, west, east, and south that become the main priorities. It is divided based on the location, potential tourism activities, and the area readiness of tourism development (ITMP Lake Toba, 2020).

The pixels colours illustrate land use types and the size illustrates the area size in an approximation. Smaller sizes can also be interpreted as areas that have higher changing dynamic. The patches close to the lakeside are smaller comparing to the areas further from the lake. It means that land use conversion is more dynamic within the area nearby the lakeside as settlements growing start from the lake. Agriculture is known as the main activity of local people since history and can be captured through the characters of wetland agriculture are small in area, nearby the settlements and dryland agriculture due (this may caused by soil types differences).

Other characteristics of all land use type is explained in Table 2 below. The main concern that can be concluded is that the

unsustainable management of agriculture area within Lake Toba Area. There are some misconceptions such as terraces implementation not in parallel to the contours of the land, not applying cultivation of crop rotation, and burning the land for clearing the planting fields. In addition, due to the tourism plan, there are spatial pressure of development especially to the agriculture areas (Nasution, Z. & Damanik, S., 2009).

To conclude, the development becomes more dynamic as the development getting close to the coastline. This dynamic may disrupt nature continuity that is represented by small pixels. Also, most areas were developed to become agricultural areas with unsustainable management may cause pressure on the land condition. Therefore, re-structuring dryland agriculture management is highly encouraged.

+	+	+	+	+	+	+
+	+	+	+	+	+	+
+	+	+	+	+	+	+
+	+	+	+	+	+	+
+	+	+	+	+	+	+



25. Land Use Characteristics. Source: Nasution, Z. & Damanik, S., 2009
26. Pixels of Land Use. Source: Author. Data source: Badan Informasi Geospasial (<https://tanahair.indonesia.go.id>);



- River
- Contour
- Provincial Road
- Regional Road
- Toll Road
- Toll Road (Plan)
- Rail Road (Plan)
- Water (Lake and Sea)

Land Use

- Primary Dry Forest
- Secondary Dry Forest
- Plantation Forest
- Shrub
- Open Land
- Plantation Field
- Dryland Agriculture
- Dryland Agriculture with Shrubs
- Wetland Agriculture

Settlement

- Settlement

Family Clan

- BK Batak Karo
- BT Batak Toba
- BS Batak Simalungun
- BP Batak Pakpak

Port

- Geosite Area

View Point

- View Point

Geo Diversity

- Geo Diversity

Bio Diversity

- Bio Diversity

Culture Diversity

- Culture Diversity

Airport

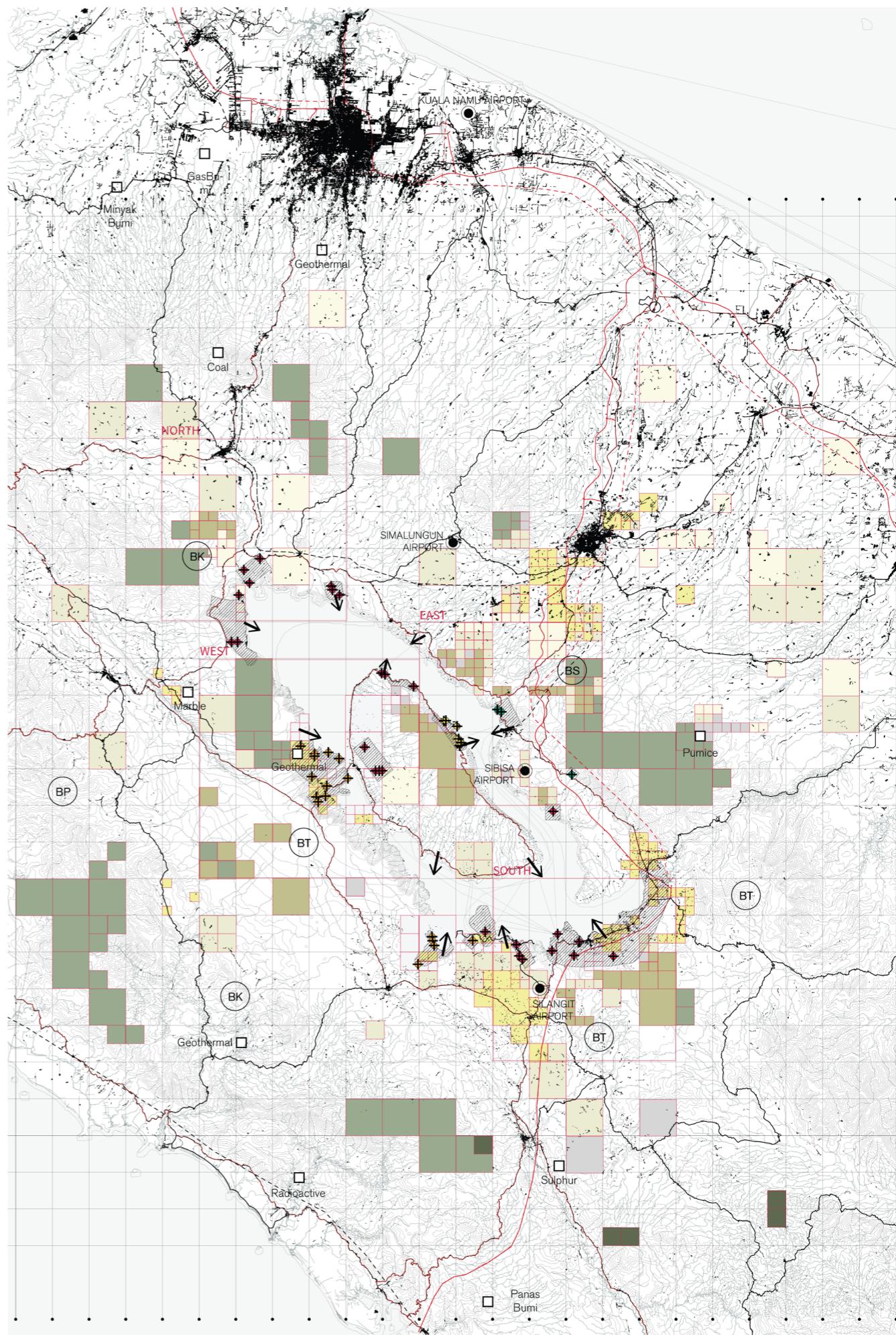
Area Characteristic

Mining Point

N

0 20 km

Natural Forest	Primary Dry Forest	- Most of the natural forests in the Lake Toba Ecosystem Area are located in Protected Forest areas which have been demarcated.	
	Secondary Dry Forest	- Some are in Forest / Protected Areas areas that have not been demarcated	
Plantation Forest	Industrial Plantation Forest	Plantation Forest - Industrial Plantation Forest managed by PT. Toba Pulp Lestari, Tbk which is located around Tele (Samosir Regency), - Replacement plantations around Onan Runggu and Simanindo (Samosir Regency) - Reforestation products carried out by the Toba-Samosir branch of the XII Forestry Agency.	
Mixed Plantation and Shrubs	Plantation Field	Mixed Plantation - Perennial crops – a type of fruit tree that is generally located not far from residential areas (villages) and on the edge of both protected and production forests in scattered ways	
	Shrubs	- Found in lands where the slope of the land is not good for seasonal crops. - Located on the edge of both protected and production forests. Shrubs - Formed after natural succession after forest fires or logging. - Found around the forest.	
Dryland Agriculture and Shrub	Dryland Agriculture	Dryland Agriculture - Cultivating seasonal crops both on flat land and on sloping land at the foot of mountains or hills with steep slopes in dry land areas.	
	Dryland Agriculture with Shrubs	- Traditional technical culture in the agriculture and not environmentally sustainable (inconsideration on soil conservation, misconception on terraces implementation—not parallel to the contours of the land, not cultivated crop rotation or resting the land, and burning in cleaning their planting fields)	
Wetlands Agriculture and Marsh	Wetland Agriculture	Wetland Agriculture - The rice fields cultivated by the people in the Lake Toba Ecosystem are generally relatively flat areas, in some places on the sidelines of the hills where terraces are made.	
		- Located in Humbang Hasundutan, North Tapanuli, Toba Samosir and Samosir districts. The most extensive rice fields are in Toba Samosir Regency, namely in Balige, Laguboti, Silaen and Porsea Districts. - The existence of rice fields in the 3 sub-districts is increasingly pressed by settlement construction and other developments.	
Open Field	Open Field (Grassland, Pasture, Infrastructure, Urban Settlement, Tourism)	Land cover by reeds and other grass apart from the ridges is also found on relatively flat land. Large areas of reeds are found in Pangururan and Simanindo districts, Samosir regency. The grasslands are used by residents for grazing areas for cattle, buffalo and goats. It is found on the ridge on the edge of Lake Toba between Haranggaol, Simalungun Regency and Tongging, Karo Regency, as well as on the ridge in Silalahi District (Dairi Regency).	



C.3. Unfolding The Interrelation

The Main Economy: Agriculture, Fish farming, or Tourism

Farming, cash crops production, fishery, raising animals, and the tourism industry are the main economic activities in the Lake Toba basin. Until today, the agricultural sector remains the primary economic sector for people living in the Lake Toba basin even during the economic crisis of 1997, while the tourism industry declined (Meodjodo H. et al., 2006). In addition, despite tourism yearly growth increase doubled than agriculture (11.0% for tourism and 4.5% for agriculture), the need to intensify agriculture is highly encouraged due to local people high dependency on agriculture sectors.

The intensification of agriculture and tourism sectors is promoted by infrastructure developments of roads, two airports, and ports connecting Sumatra and Samosir Island. However, these infrastructure developments somehow also influence other elements: culture and water.

Industry Sector and The Environment

PT Inti Indorayon Utama (IIU) plays a significant role in deforestation and pollution within the Toba Lake area. Forests exploitation began in 1985 due to establishing a pulp-and-rayon processing plant and took the raw materials from the forests in the surrounding six districts (Kabupaten). This high exploitation is identified as the main reason for the water level decrease of the lake. Moreover, waste materials from the plant also affected the quality of the Asahan River due to the toxic substances emission of the AOX category (Absorbable Organic Halides) (Lake Toba Heritage Foundation, 2000 as cited in Moedjodo H., et al., 2006).

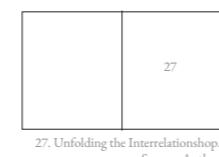
The Water

There are four major problems caused by development that may influence water conditions in the Lake Toba regions. The first is water quality and water balance due to the operation of industries and water use by inhabitants. The second is land-use changes that disregard conservation principles that may cause critical land erosion. The third is a land tenure by the clans resulting in challenges in practising sustainable land use and soil conservation measures. And the last land clearing activities that produce not only air pollution but also land and water systems degradation that are eventually causing natural disasters of flooding and landslides and reduce the biodiversity.

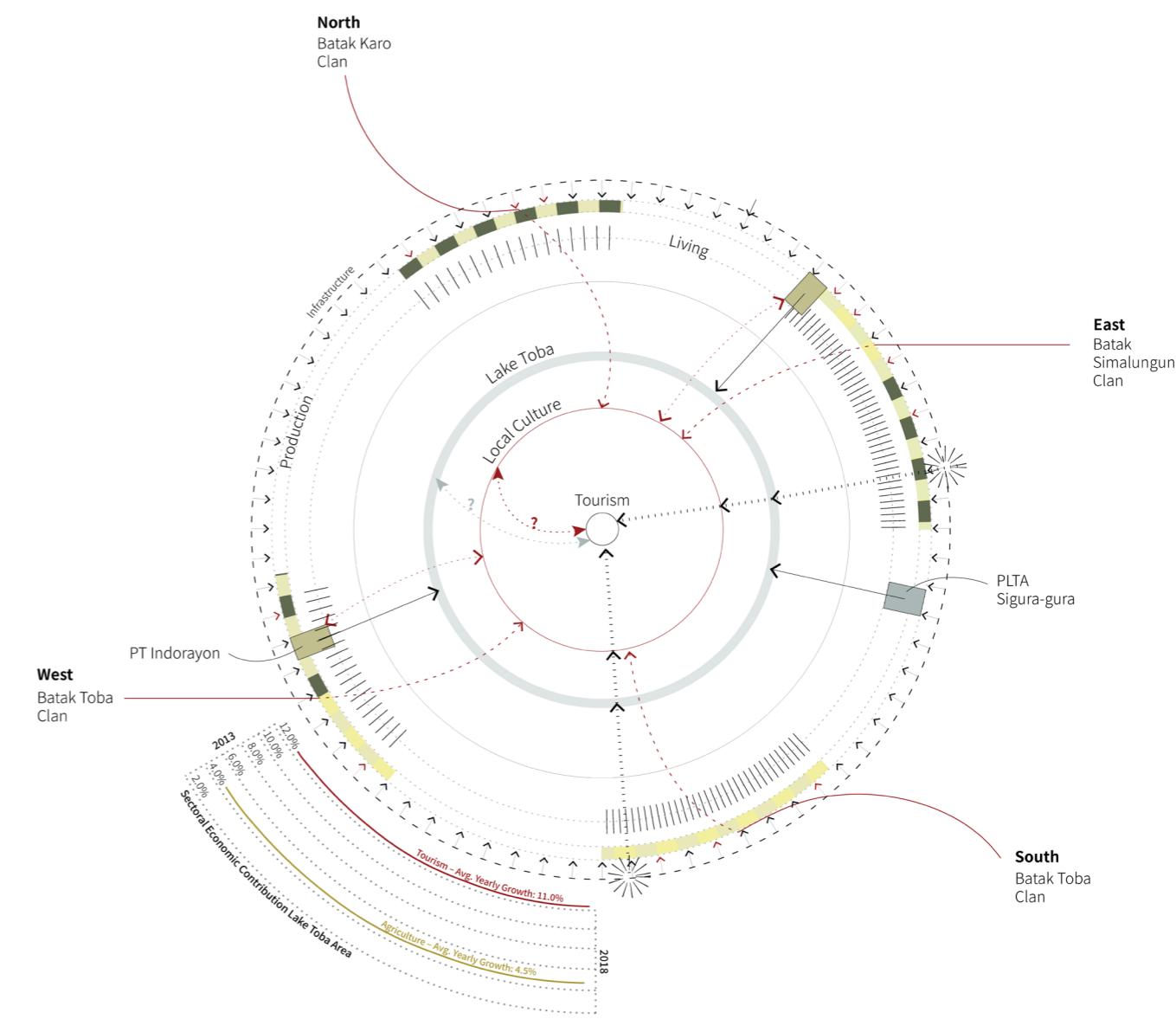
The culture

Tourism is projected to increase economic growth, both national and local. In addition, the development of tourism opens job opportunities that may change the perception of local occupation and local values. Besides, the change in the land also may influence the heritage land and eventually may influence local values. Therefore, planning and management of tourism development must be critically assessed to the spatial justice, especially for local people.

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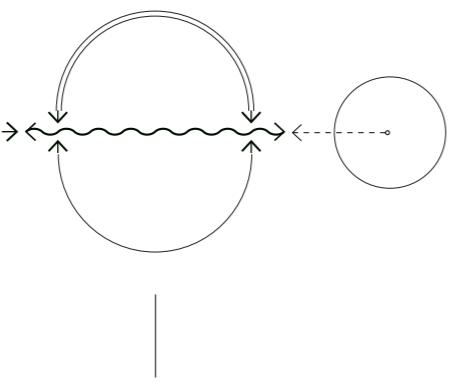
27. Unfolding the Interrelationship.
Source: Author



2.2. The Breakdown of Human (Culture) - Nature Relationship in The Context of Toba Lake

+	+	+	+
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In-Between Elements and Its Relationship to Tourism Development

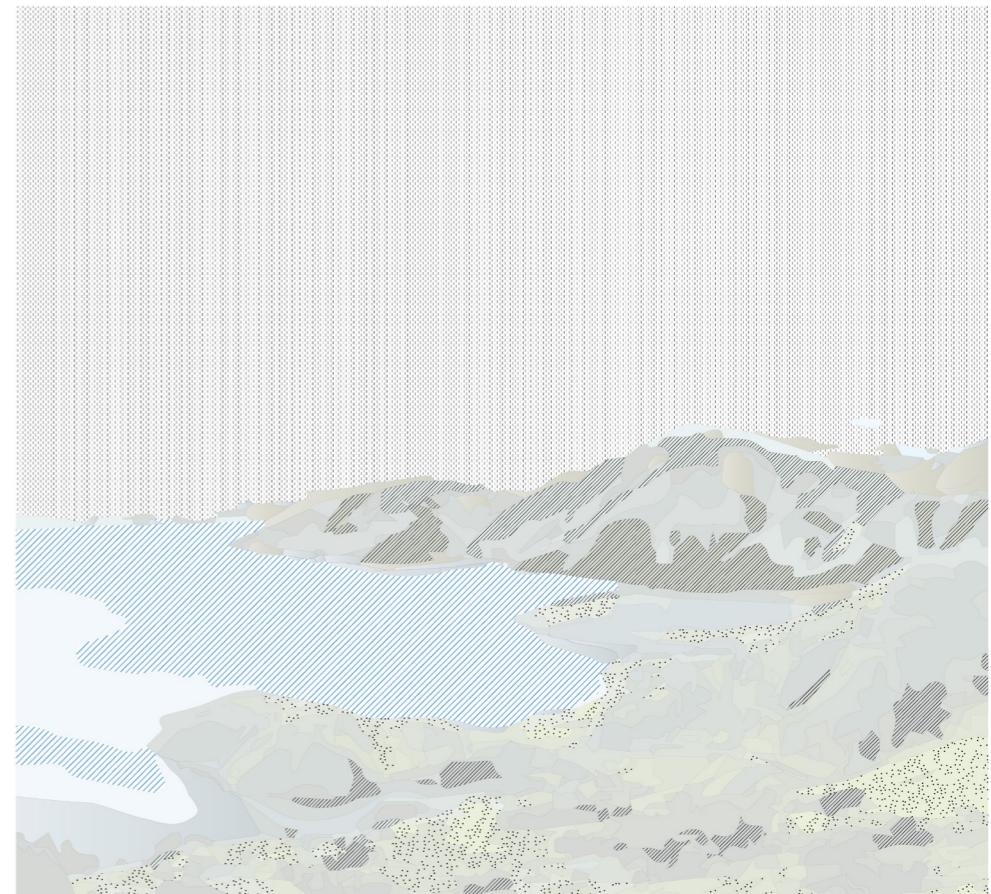


D. The Governance Challenge

Land of Batak

Some land conflicts become the main issues, especially in future development. The main reason is the differences in the land ownership system between national regulation and community beliefs.

Then, how to define the land, whether it is part of community identity or national economic growth assets?



D.1. The Scales of Territories and The Regulations

Territories Scale

Toba Lake Area is determined by following Toba Lake Catchment Area Treatment (CAT) delineation, located at $2^{\circ} 10'3^{\circ}$ "North Latitude and $98^{\circ} 24'$ East Longitude. Referring to this regulation, the Lake Toba Area covers 8 (eight) districts in North Sumatra Province, consisting of Karo, Simalungun, Toba Samosir, North Tapanuli, Humbang Hasundutan, Samosir, Pakpak Bharat, and Dairi districts.

In addition, the Lake Toba area is further defined administratively by 31 Districts in 7 Regencies surround the lake area. Lastly, the intangible territory is based on the Batak family clan, which is essential due to the potential synergy between family clans.

Tourism Development

Toba Lake is a national strategic area with tourism program directed by the National Government to become one of most priorities in national tourism development. By this, comprehensive development grasps all scales from building to the regional level, including eight districts in North Sumatra. Therefore, multiple regulations

are prominent to be work aligned. Thus, integration of all regulations in every scale is compiled in one document, namely "Integrated Tourism Master Plan Danau Toba", and the derivations of how this master plan is arranged is explained through the scheme in Image 29.

In the master plan, the development of Toba Lake is elaborated in three prominent scenarios. The first scenario is based on the tourist number growth projection and divided into three alternatives: moderate, optimistic, and Toba reborn. Next, the second scenario is based on spatial distribution. Three alternatives of this scenario are whole concentrated (concentrated in 4 centres of development, as shown in the map), partial dispersed (concentrated in 6 centres of development), and fully dispersed (encompassing all centres of development and 31 sub-districts).

To conclude, territories scales have been changed historically from past colonialism until today. Today, territories character of development are determined by Intergrated Tourism Master Plan, so then this document act as the main orientation of future development.



29. Integrated Tourism Master Plan of Danau Toba Formulation Scheme. Source: ITMP Danau Toba 2020
30. The Scales of Territories. Source: Pixels of Land Use. Source: Author. Data Source: Badan Informasi Geospasial (<https://tanahair.indonesia.go.id>);

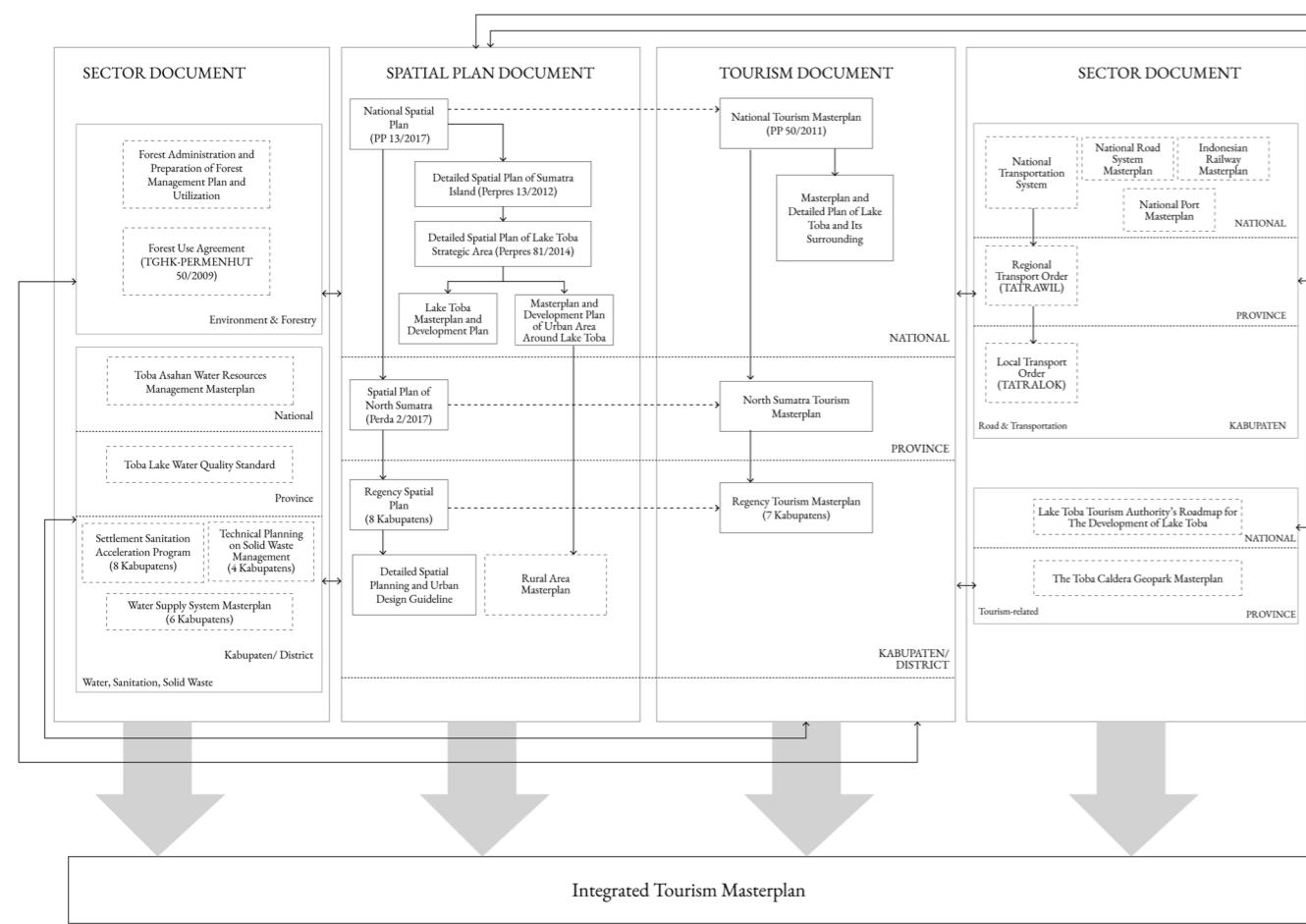
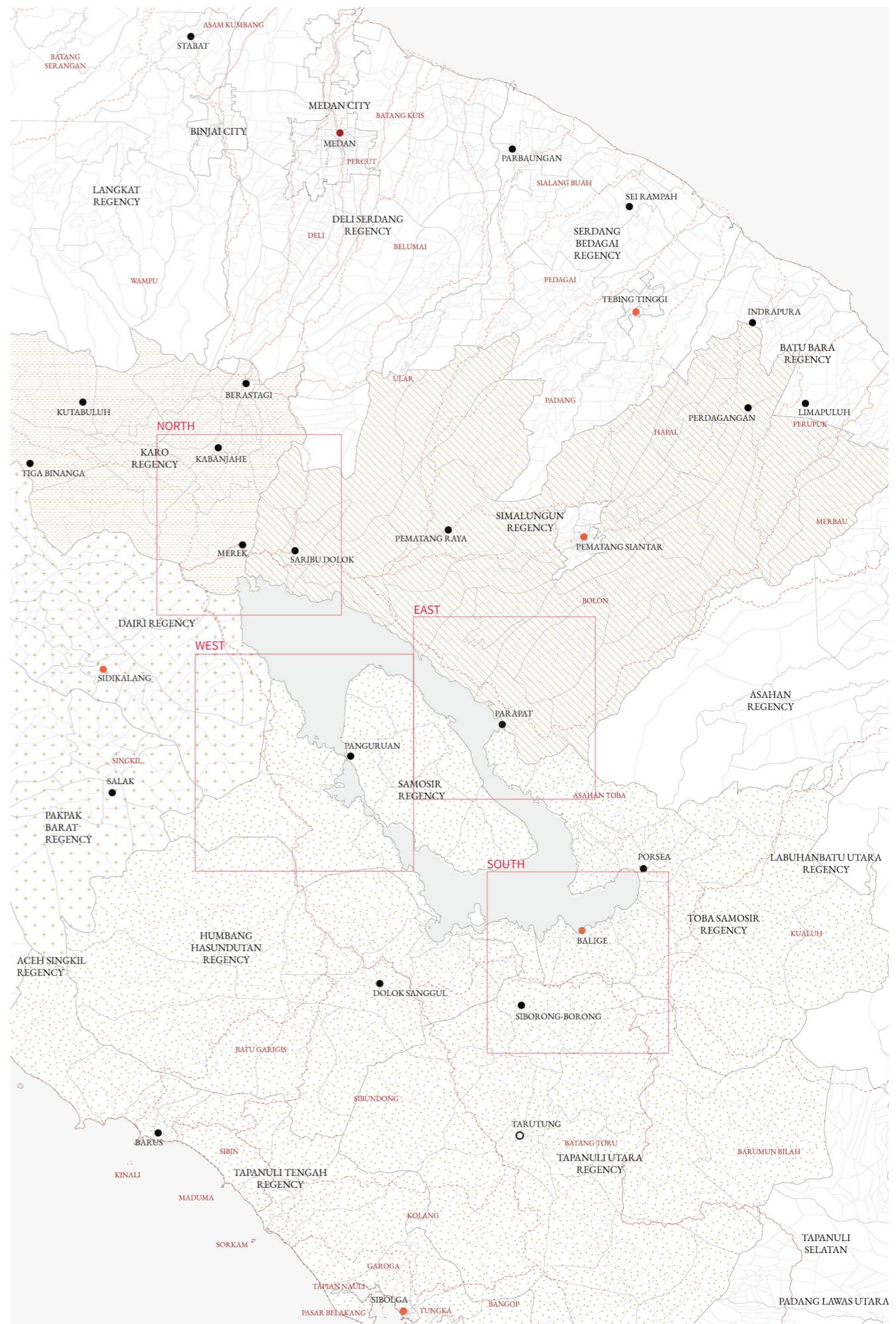
Base Map

- Regency (Kabupaten)
- District (Kecamatan)
- Village (Desa)
- ... Water Catchment Area Boundary
- National Activity Center
- Regional Activity Center
- Local Activity Center
- Center Development Area
- Water (Sea and Lake)

Batak Clan

- Batak Toba
- Batak Pakpak
- Batak Karo
- Batak Simalungun

0 20 km N



D.2. The Time Dimension, The Interferences, and The Projected Development

How can we understand the evolution of politics from past to future?

Past – The community of Batak Family Clan plays a significant role in determining land and water use. Major alteration happened during the colonization era, in which centralization governance setting was gradually injected into the social system.

Present – The projection of tourism development plan widens up the spectrum of drivers in multiple scales and multi institutions. While in parallel, the cultural system of the family clans of Batak still rooting within the social system.

Future – In the future, the synergies of stakeholders need to be aligned in order to be able to face future external uncertainties such as the development of information technology and climate change. Besides, the potential alteration of identity, meaning, and values must be continuously assessed to project what kind of future Toba Lake Area will be.

The Involvement

The classification of stakeholders can be divided into two sides: internal and external.

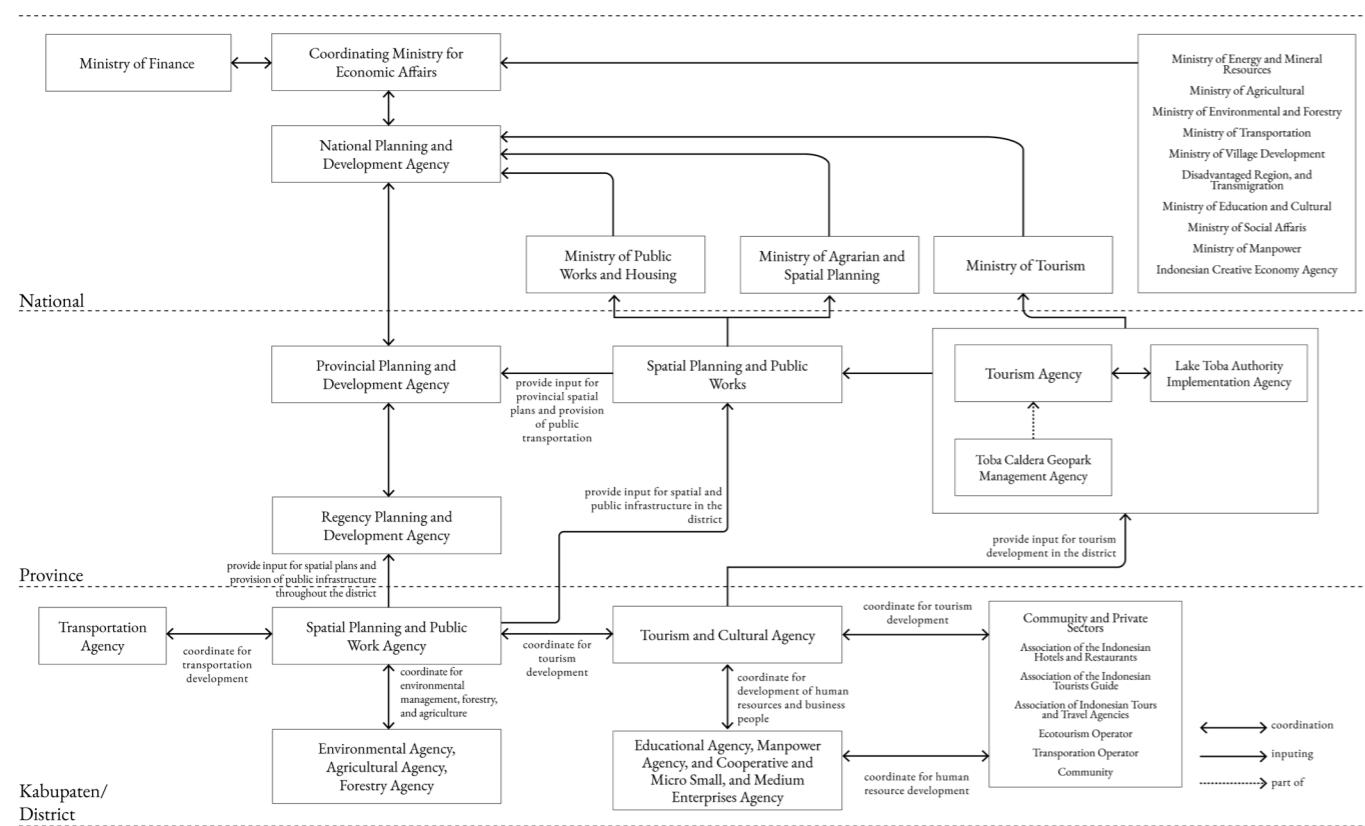
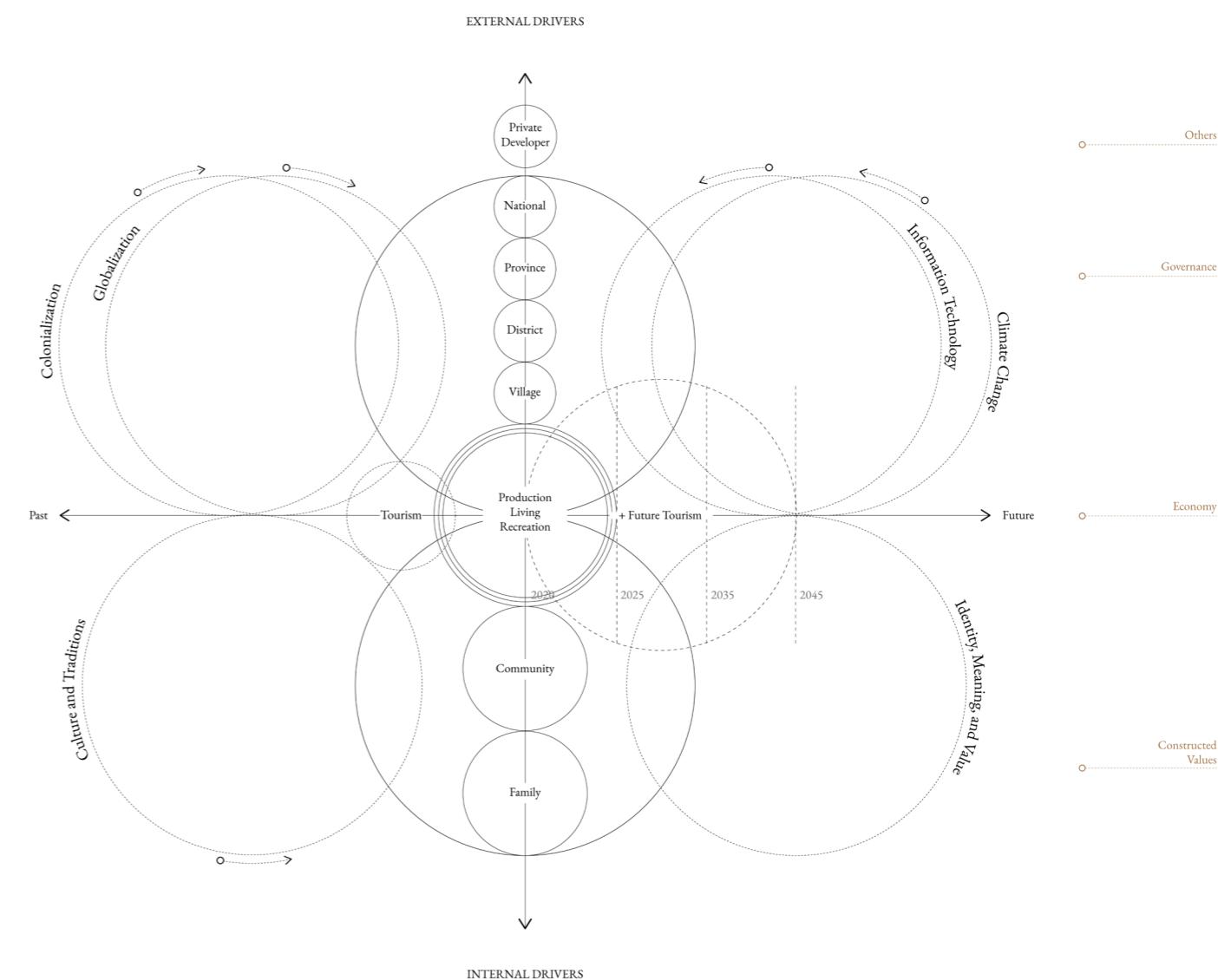


Image X – Governance Systems of Toba Lake Tourism Development. Source: ITMP Danau Toba 2020



31. Governance Systems of Toba Lake Tourism Development. Source: ITMP Danau Toba 2020
 32. The Time Dimension, The Interferences, and The Development. Source: Author



D.3. The Existing Governance Conflicts from Land Uses to Geopolitics

Variation of interest in specific land capacities has ignited some conflicts. These conflicts happened because of inconsideration of land capacity extraction that may negatively impact both in the short and long term. By understanding existing geopolitics and conflicts through environmental issues, the arrangement of tourism to achieve sustainability will increase its potential to be addressed (Butarbutar, 2018).

The classification is divided into three different spatial characteristics: forestry, non-forestry land, and water. The main issues in forestry are forest use conversion from protection to production, the differences in species development opinion in certain areas, and conflicts in the customary forest due to unclear legal status. Then it is recommended to build up more coordination and collaboration between the government, company, and the local community in this context (Butarbutar, 2018).

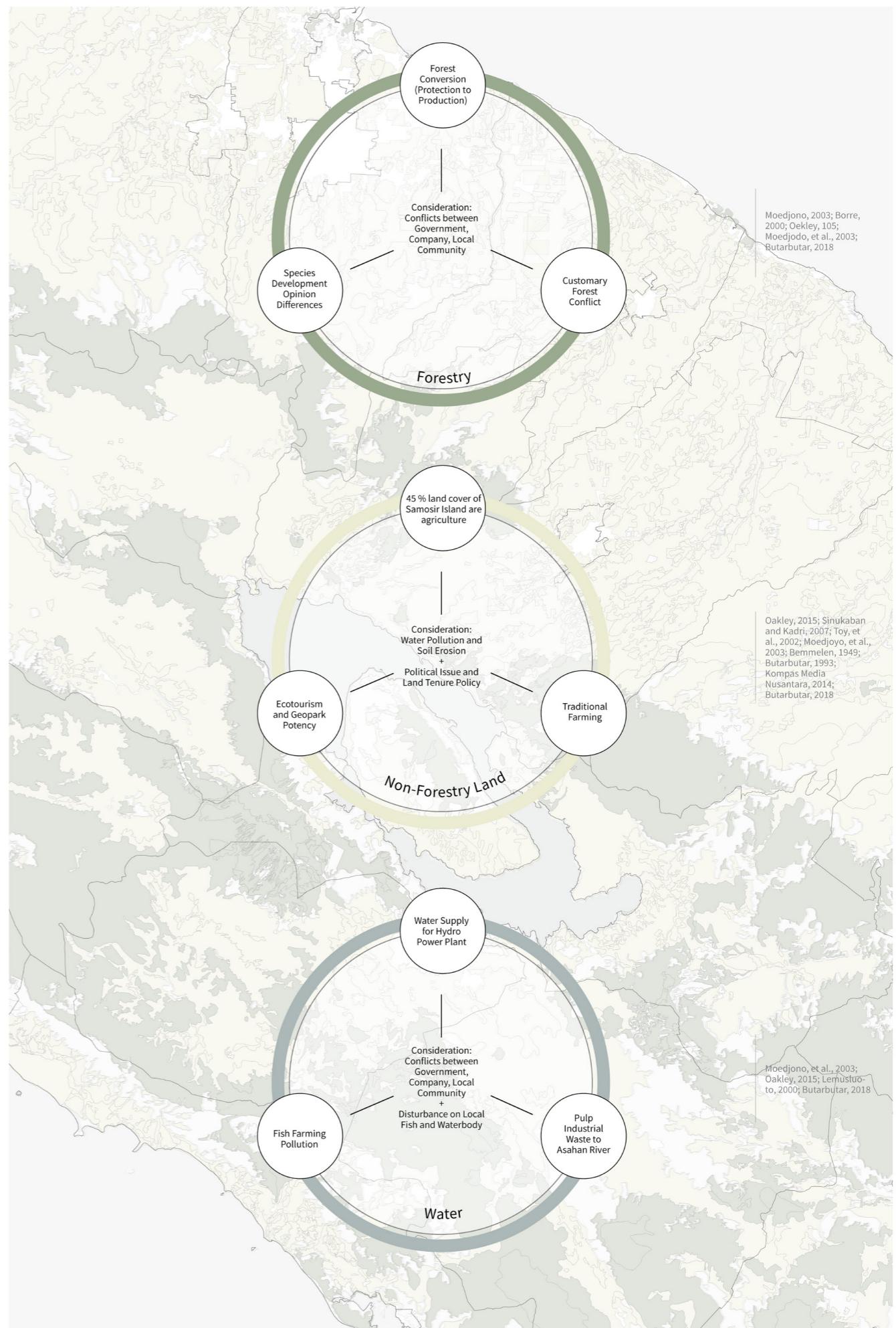
In the non-forestry land (other land use besides forest), all the main issues have high water pollution and soil erosion tendency. The issues are unsustainable use in agricultural land use (which dominate Samosir Island with 45% of total land cover) and the land-use change for ecotourism and geopark (Butarbutar, 2018).

The last classification is water. In this classification, conflicts between government, company, and local community may happen, and biodiversity is on the verge. The leading causes are less responsibility of the hydro plant system, fish farming pollution, and the waste produced by the pulp industry (Butarbutar, 2018).

To conclude, environmental issues (forestry, non-forestry, and water) act as an entry points to arrange sustainability strategies for Lake Toba areas that will be integrated to the tourism master plan (Butarbutar, 2018).

33. The Existing Governance Conflicts from Land Uses to Geopolitics. Source: Butarbutar, 2018.

0
20 km
N



2.3. Conclusion

A. The Interrelation of Nature and Human's Culture and Its Evolutionary

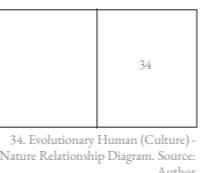
"The changing of nature and human's culture is interrelated, not working separately." (Corner & Hirsch, 2014)

The changes of nature will influence how humans manage and that eventually influence the culture. Plus, the culture change will also influence nature eventually. For example, it is reflected in society's dependency on the Lake Toba water elaborated in the first sub-chapter, "The Lake and The Water". This chapter elaborates on the evolution of nature's capacity service. At first, lake water extracted accommodates Batak people's well-being in the form of water for drinking, clothes washing, and others. Then, Batak people put high respect for water that is indicated by the folklore attached in society. However, later, external interests (dam water extraction, agriculture use) used significant services from Lake Toba caused alteration in the ecosystem balance and now exposing the limit through pollution evidence and extreme changes on lake height level. In addition, the formation of land by a volcanic eruption also influence how they manage the land. For example, the high nutrients from volcanic eruptions caused the land suitable for agriculture despite not all areas, such as steep slope areas, that cannot be transformed due to steep slope.

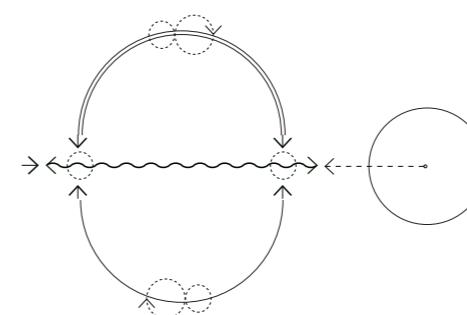
B. The Changes of In Between Elements

The main changes of the H(C)-N relationship happened mainly due to the change of governance system, economic system, values of belief, education, and religion. Implications of these changes in spatial pattern are the land-use change settings, territorial border change, and related government regulations. In the future, the tourism development program will also influence governance setting, economic views and values.

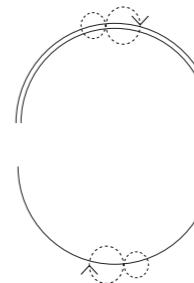
Then, how can we predict the future H(C)-N relationship by understanding the evolution in the specific tourism area as is illustrated through "The Overall Concept" diagram in image 34? And, how can we predict the possibilities of the changes and align them into strategies to achieve sustainability and inclusive tourism?



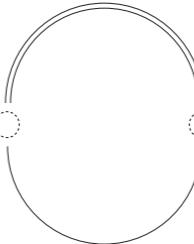
34. Evolutionary Human (Culture) - Nature Relationship Diagram. Source: Author



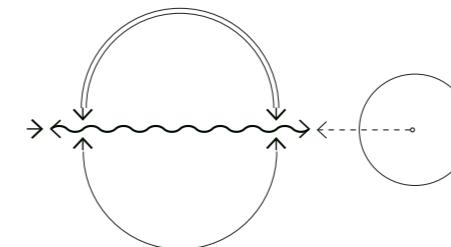
The Overall Concept



A. The evolution of nature and human's culture



B. The relations between nature and human's culture



C. In-between elements and its linkage to tourism development

3. Problematization and Research Questions

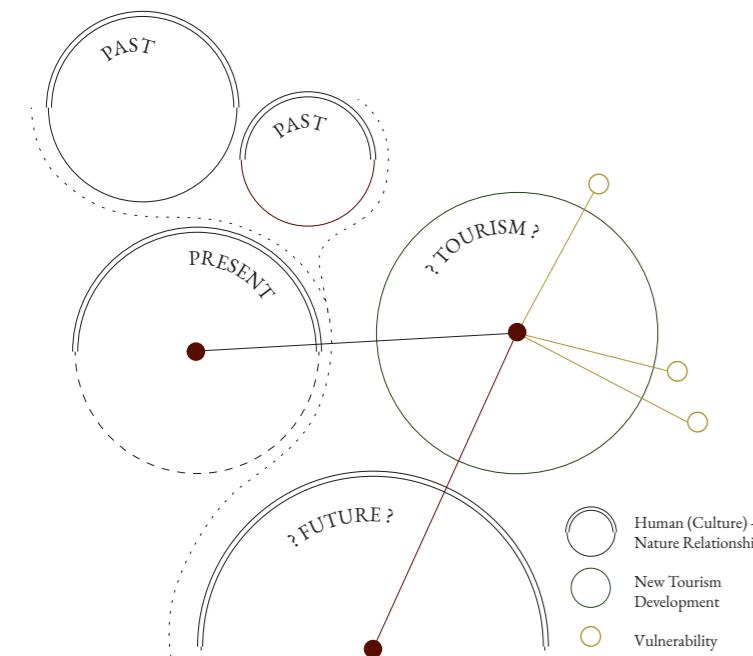
- 3.1. Problem Fields
- 3.2. Research Aims
- 3.3. Intended Research Outputs
- 3.4. Research Questions
- 3.5. Research Methodology
- 3.6. Research Methods
- 3.7. Sub-Research Questions, Research Methods, and Intended Outcomes
- 3.8. Theoretical Framework
- 3.9. Conceptual Framework
- 3.10. Conclusion

3.1. Problem Fields

Toba Caldera Geopark is one of the five priorities of Indonesia new tourism developments. Together with other tourism areas throughout the country, the development is projected to boost Indonesia's economic growth within the tourism sector. Therefore, an enormous amount of investment is allocated from the government to fasten and upscale the development.

Committing an ambitious tourism development can be illustrated as an intertwinement machine illustrated in the image below. A machine that consists of a human (culture)-nature relationship evolutionary system and its intertwinement into the new tourism development plan. From the illustration, it can be noticed that the past culture-nature relationship existence also plays a role in the present and the future relationship, or interconnected. Also, the united circle shape of Human (Culture) - Nature Relationship represents achieving a symbiosis relationship of culture and nature needs a robust socio-ecology system embedded within two opposite sides of nature and culture, with additions of other associated determinants such as economic, governance, land use, and constructed values. Moreover, another circle depicting the new tourism development is creating imaginary strings into the culture-nature relationship in the present and future and revealing (or creating possibility) strings of vulnerabilities within the area.

Therefore it leads to how to generate the future H(C)-N relationship equilibrium and robust hidden beneath this systematic machine to address potential vulnerabilities by harmonizing valuable vernacular adaptation extracted from human(culture)-nature evolutionary?



3.2. Research Aims

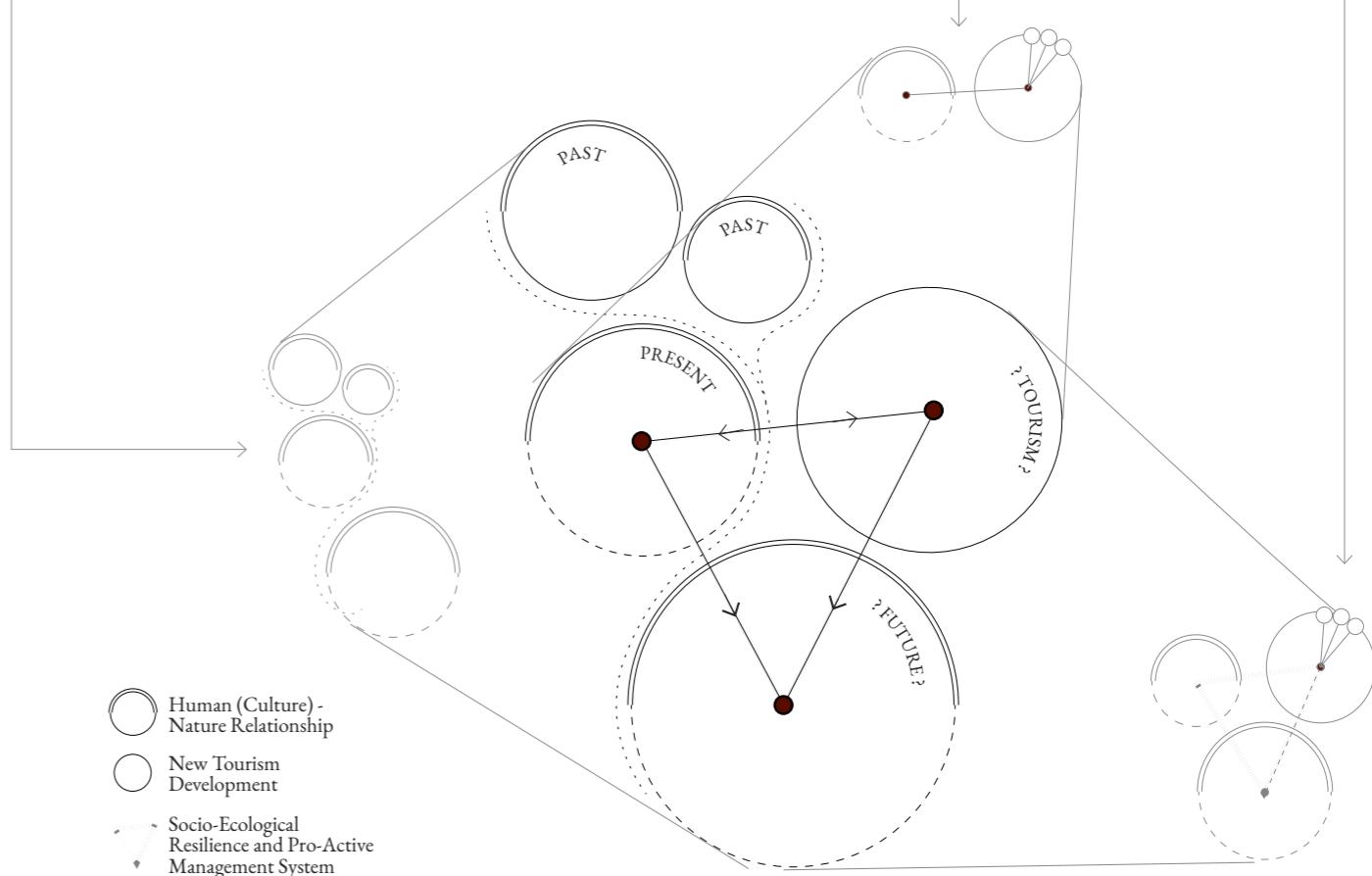
This research is illustrated as a comprehensive mechanism through the illustration below. The main concept of this mechanism is that the tourism development is strongly influence and is influenced by the evolutionary of human (culture) - nature relationship in the past, present and future. This mechanism envisions robust future human (culture)-relationship in the tourism area illustrated by a strong triangle that links the core of tourism development plan, present, and future conditions.

The definition of robust future human (culture) - nature relationship in the tourism area is by projecting socio-ecological resilience and pro-active management based on theoretical research that is explained through the essay (see Appendix). This projection includes the interlinkages of three main elements of this mechanism that will be explored in this thesis, which are:

1. The evolutionary human (culture) - nature relationship;
2. The interrelationship between present human (culture) - nature relationship and existing tourism planning;
3. Potential projections of future human (culture) - nature relationship with the concept of socio-ecological resilience and pro-activa management system after tourism development has been implemented within the area.



35. Evolutionary H(C)-N Relationship in Tourism Development 1. Source: Author
36. Evolutionary H(C)-N Relationship in Tourism Development 2. Source: Author

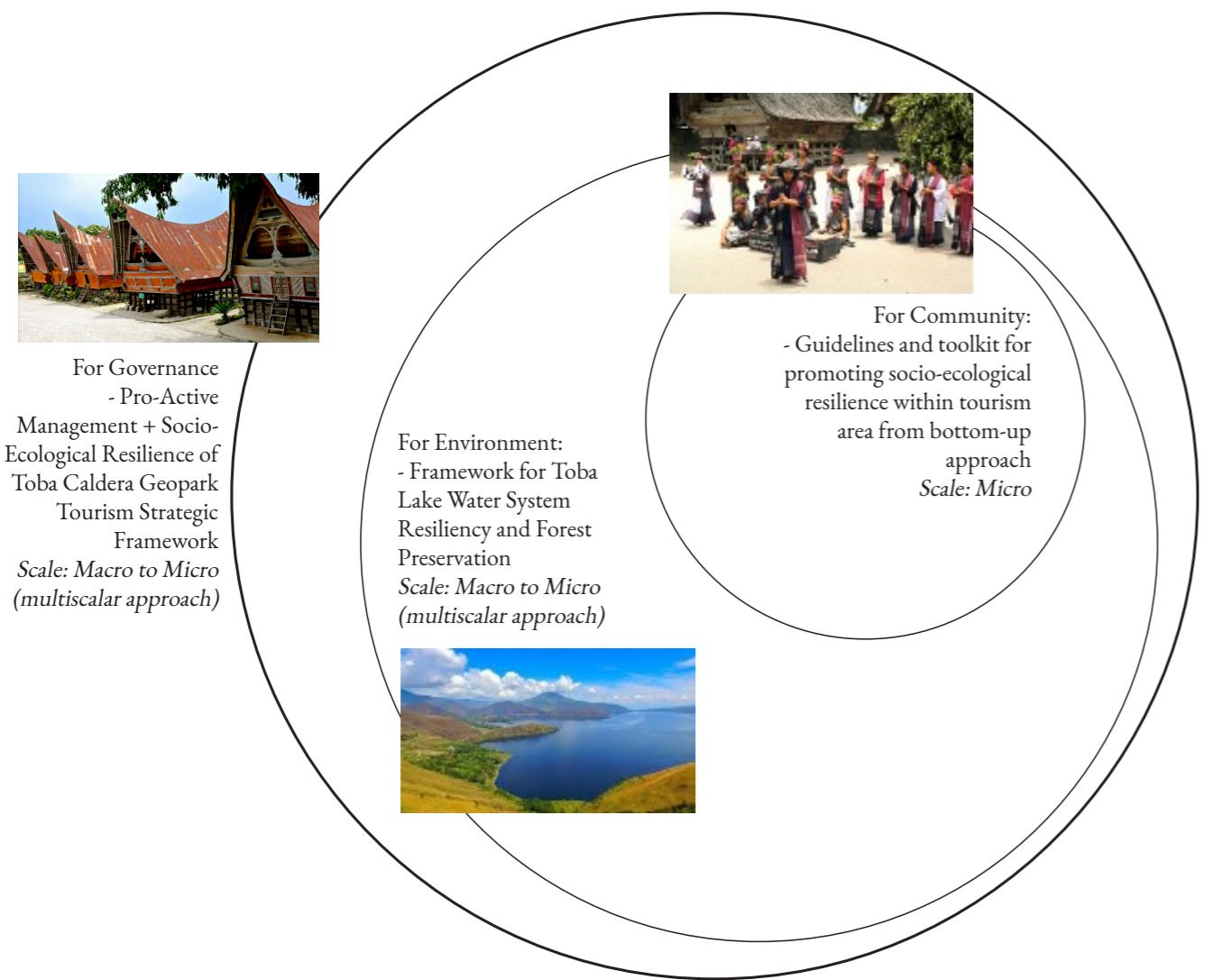


3.3. Proposed Research Outputs

The outputs are projected to answer three main pillars of research aims that can be used for all stakeholders (public, private, non-private, local communities, and civil societies) within tourism development in Toba Caldera Geopark. First, understanding the evolution of the human (culture) - nature relationship can reveal potential traditional wisdom and the embedded dynamic systems from the past that need to be considered for future development. Second, the interrelationship between the present human (culture) - nature relationship and existing tourism planning can unveil risks and vulnerabilities that need to be addressed in the design proposal. Third, the projections of future human (culture)-nature relationship with theoretical frameworks adaptation may unfold strategies of how to create resiliency for both nature (water system and forest) and human (local culture and economy) in the context of sustainable and inclusive tourism development. In addition, the use of the multiscalar approach in specific of geographic scales from macro to nano that is explained in Image 38 is to create a synergy between top-down and bottom-up to promote

multidiscipline collaboration.

To conclude, the outputs will be a comprehensive Pro-Active Management plus Socio-Ecological Resilience of Toba Caldera Geopark Tourism Strategic Framework that is aimed for the governance. In this document includes benefits for both environment (for toba lake water system resiliency and forest preservation) and community (consist of guideline and toolkit using bottom up approach) as is illustrated in the Image 37.



37. Proposed Research Outputs.
Source: Author. Photo sources:
Traditional Huts (merahputih.com);
Lake Toba (wikimedia.org); Batak
people (indonesia-tourism.com)
38. The geographic Scales. Source:
Author

THE SCALES

GEOGRAPHIC SCALES

MACRO

Sub-District of Simanindo and Pangururan

MESO

Comparison of Ambarita and Cinta Dame Villages (through transect)

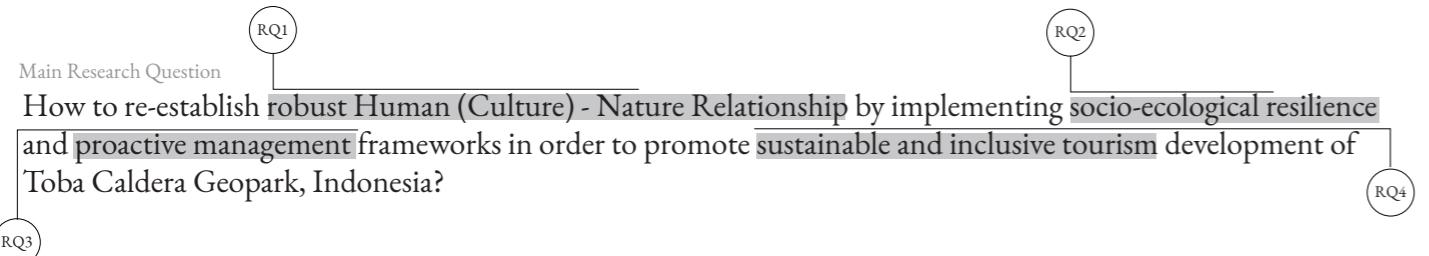
MICRO

Biophysical System
Socio-cultural System

NANO

Human, Culture, and Their Daily Activities

3.4. Research Questions



Research Questions

RQ1: Which culture-nature systemic relationship in the context of Toba Caldera Geopark development can contribute both in the present and in towards sustainable future?

How is current culture-nature relationship in Toba Caldera? Who are the actors? What are the systems involved?

How can past to present culture-nature relationship influence the regional sustainable development?

How to reveal and define the evolution of culture-nature relationship in the future?

RQ2: What aspects determine socio-ecological resilience in the context of Toba Caldera Geopark Tourism?

How to assess socio-ecological condition in the context of Toba Caldera region?

How is socio-ecology relation with tourism context?

What kind of diverse pathways can be considered in the implementing process of socio-ecological resilience within the tourism and how this resilience evolve towards an integrated future in the region?

RQ3: How to implement proactive management in the context of Toba Caldera Geopark Tourism in Indonesia?

What are elements in the current condition that can be projected with proactive management in the evolutionary implementation processes?

How does proactive management be beneficial in the tourism sector? What are the key aspects? Who are the key actors?

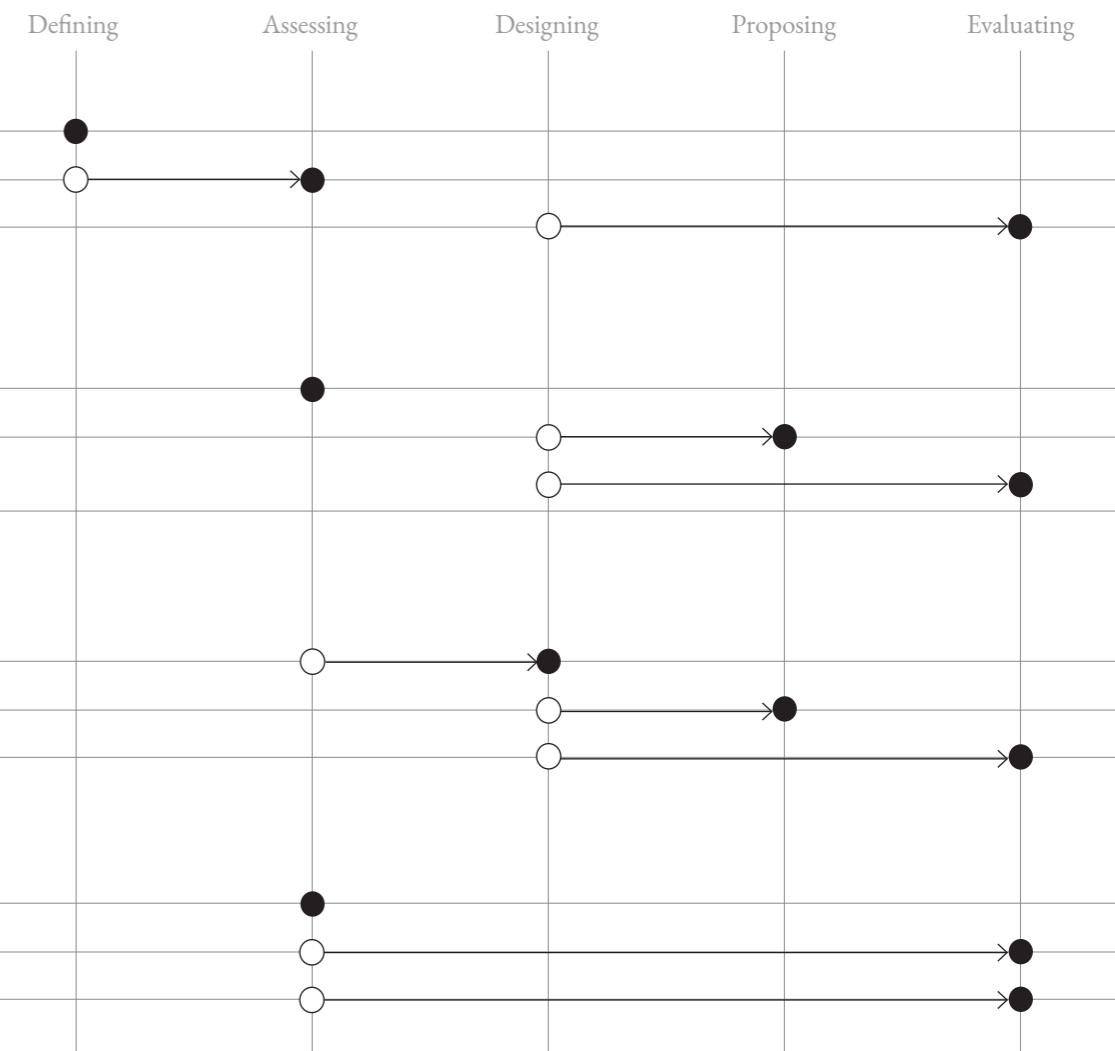
What kind of diverse disciplinary can be considered in the evolutionary implementation process of proactive management within the tourism plan?

RQ4: To what extend tourism development of Toba Caldera Geopark can be sustainable and inclusive?

What are missing links in the process of creating sustainable and inclusive tourism development plan in Toba Caldera Geopark?

What are the possible risk within the current and future sectoral plan?

What kind of governance, economic, ecological, and social system that needs to be assessed and projected in order to achieve sustainability and inclusivity of Toba Caldera Geopark Tourism Development?



3.5. Conceptual Framework & Research Methodology

The scheme of conceptual framework and research methodology is aligned and interrelated. The reason is that every step of research methodology has aims to validate part(s) of the conceptual framework. All theoretical frameworks are also aligned to explain the support of theoretical framework in every phase of research.

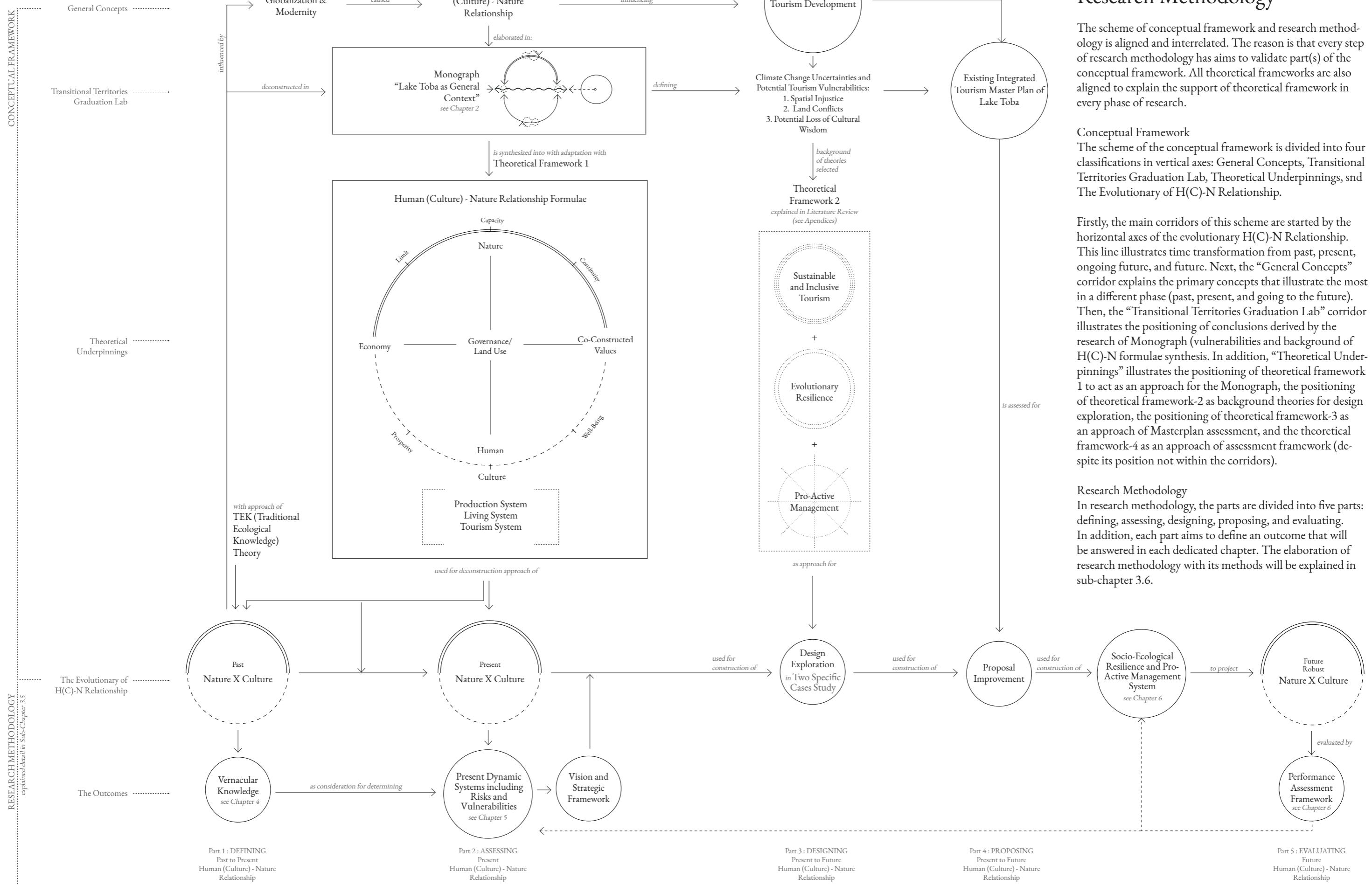
Conceptual Framework

The scheme of the conceptual framework is divided into four classifications in vertical axes: General Concepts, Transitional Territories Graduation Lab, Theoretical Underpinnings, and The Evolutionary of H(C)-N Relationship.

Firstly, the main corridors of this scheme are started by the horizontal axes of the evolutionary H(C)-N Relationship. This line illustrates time transformation from past, present, ongoing future, and future. Next, the “General Concepts” corridor explains the primary concepts that illustrate the most in a different phase (past, present, and going to the future). Then, the “Transitional Territories Graduation Lab” corridor illustrates the positioning of conclusions derived by the research of Monograph (vulnerabilities and background of H(C)-N formulae synthesis. In addition, “Theoretical Underpinnings” illustrates the positioning of theoretical framework 1 to act as an approach for the Monograph, the positioning of theoretical framework-2 as background theories for design exploration, the positioning of theoretical framework-3 as an approach of Masterplan assessment, and the theoretical framework-4 as an approach of assessment framework (despite its position not within the corridors).

Research Methodology

In research methodology, the parts are divided into five parts: defining, assessing, designing, proposing, and evaluating. In addition, each part aims to define an outcome that will be answered in each dedicated chapter. The elaboration of research methodology with its methods will be explained in sub-chapter 3.6.



3.7. Theoretical Frameworks

All theories are formulated to answer the three pillars of research aims. These theories are extracted from an essay of "The Manifestation of Future Human (Culture) - Nature Relationship: Towards Sustainable and Inclusive Tourism Development Plan in Developing Countries." All theoretical frameworks are arranged in circle diagrams that consists of two opposite sides: nature and human culture, to explicitly show the principal notion of the (non)divisible human culture - nature relationship.

The first theoretical framework is dedicated to unveiling how to understand the interrelation and evolution of the Human (Culture) - Nature Relationship by the alignment with conclusion from Monograph deconstruction in Chapter 2. The result of the first theoretical framework is a H(C)-N Relationship formulae that is used for deconstruction the past, the past to present evolution, and the present H(C)-N relationship. Next, the second theoretical framework integrates evolutionary resilience, adaptive co-management, sustainable and inclusive tourism and pro-active management adapted from Krebs Cycle of Creativity. And this framework is dedicated as an elements reference in the design exploration phase.

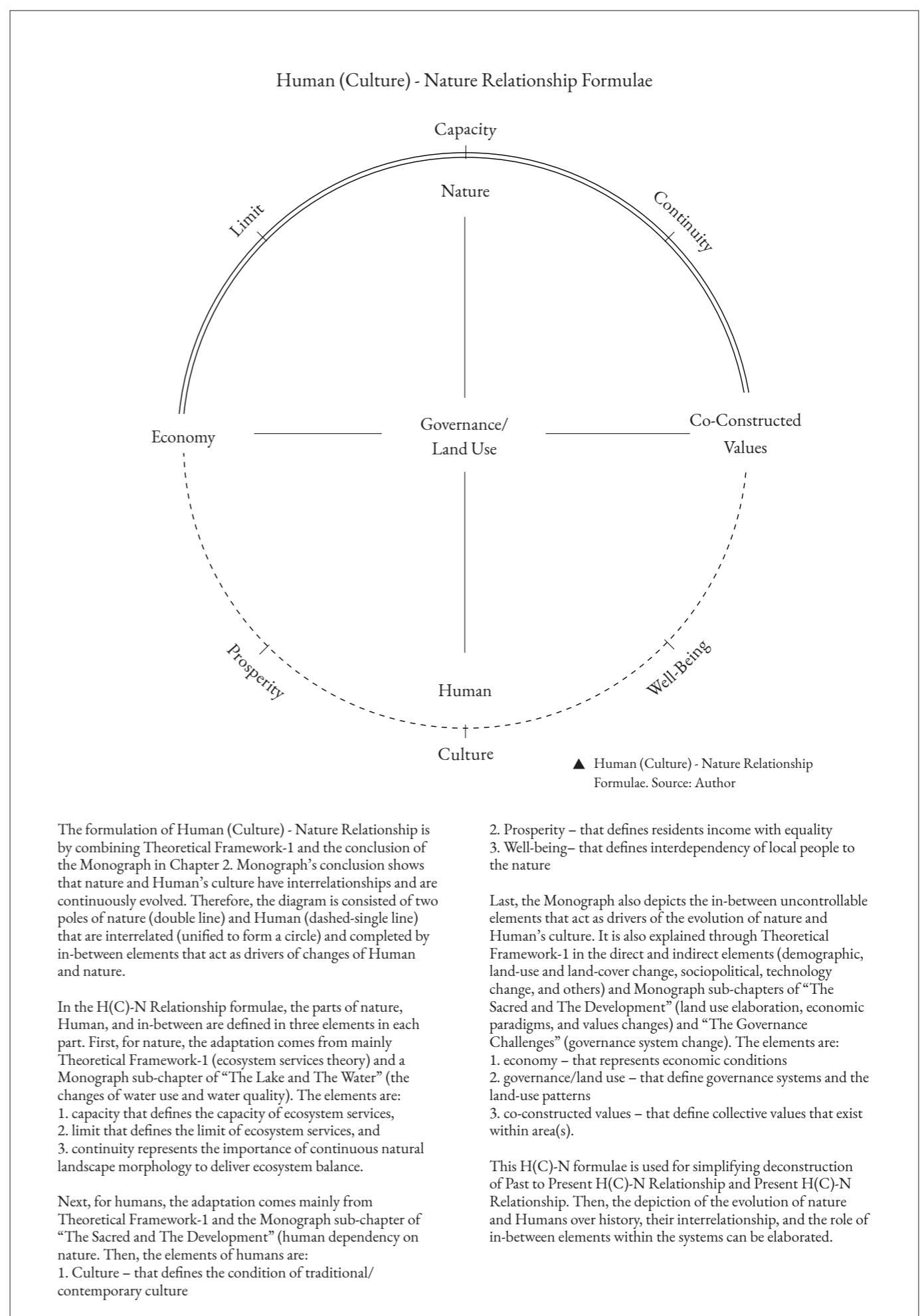
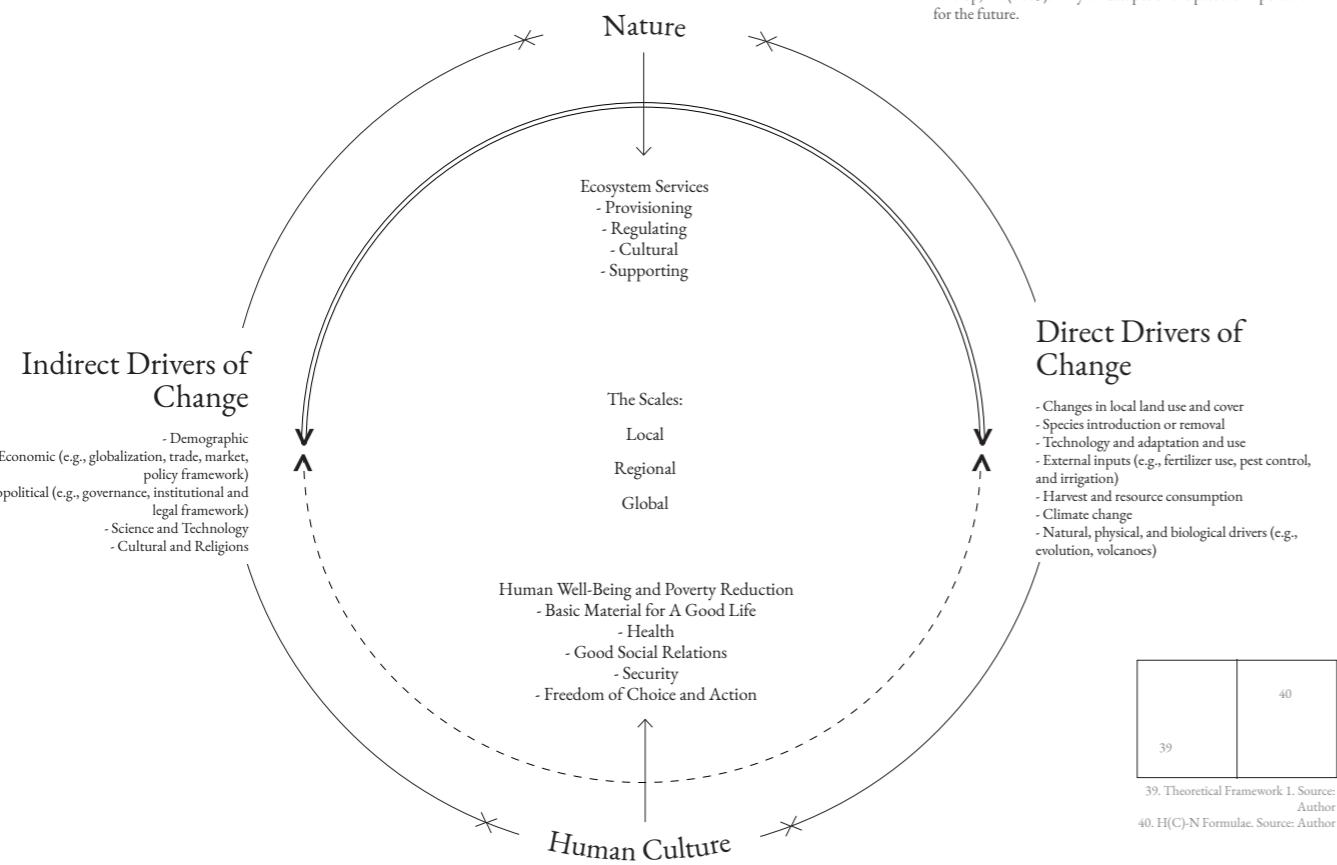
Theoretical Framework 1

Evolutionary of Human (Culture) - Nature Relationship

The evolutionary of Human(Culture)-Nature Relationship is illustrated through Image 39 that is adapted from the Millennium Ecosystem Assessment Framework (2005). It shows that nature and human culture are influencing each other on multiple scales starting from local to global. The nature conditions can be determined through a theory of Ecosystem Services and Human Culture condition can be examined by analysis of human well-being and poverty condition. The external drivers of change that can work toward both sides (human culture and nature) will influence the relationship as well. Then, according to the diagram, for example, changes in local land use and cover may influence human well-being in the human culture aspect whether to the positive direction or the otherwise that possible to generate vulnerabilities.

▼ Understanding the relationship and the co-dependence between culture and nature.

References: Millennium Ecosystem Assessment Framework (2005). Ecosystems and human well-being: wetlands and water synthesis.; Antrop, M. (2005). Why landscapes of the past are important for the future.

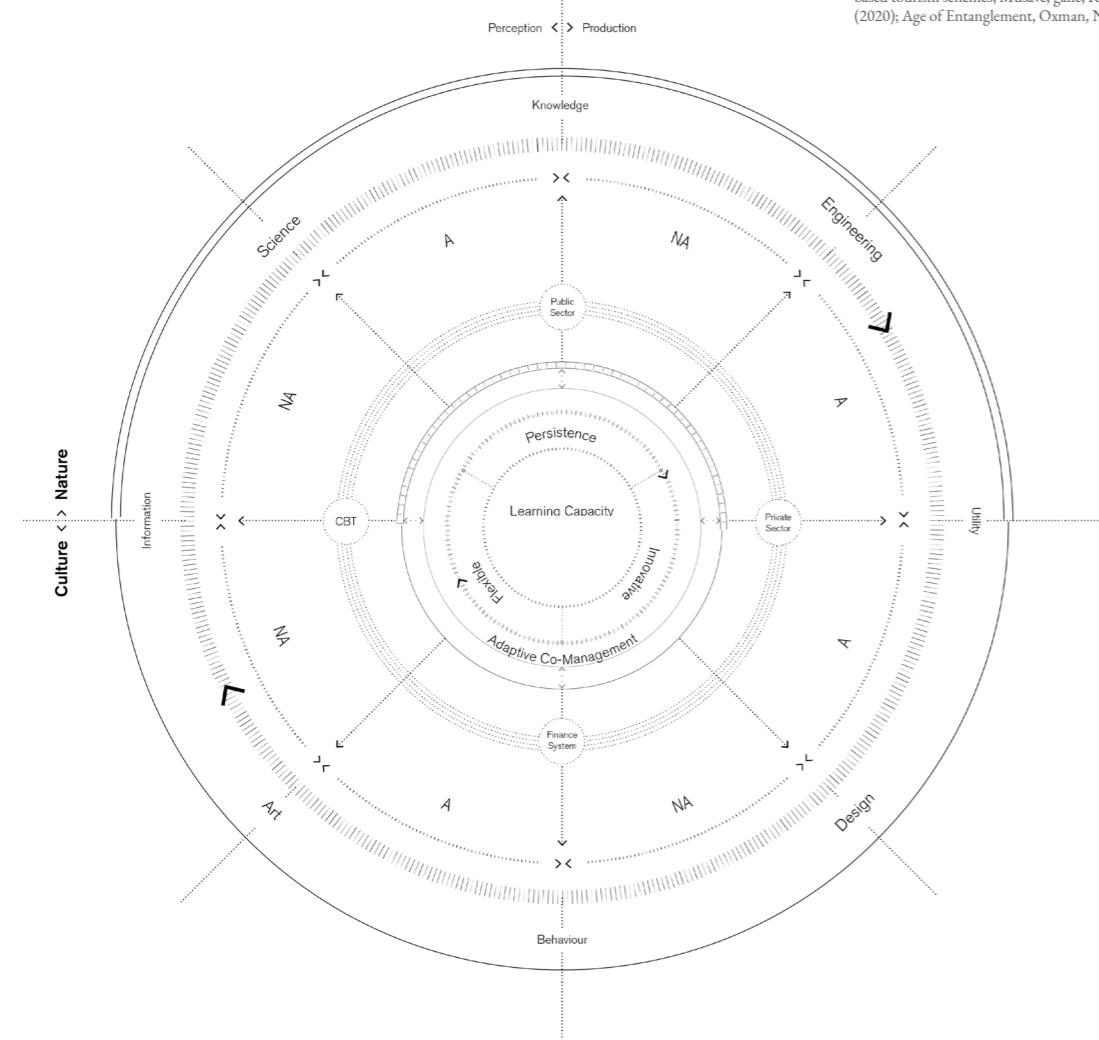


Theoretical Framework 2

Socio-Ecological Resilience and Pro-Active Management Framework in tourism development is a combination of theories illustrated through layers from core to edge in the theoretical framework-2. This theoretical framework acts as the basis for design exploration.

The theories are:

1. evolutionary resilience (Davoudi et al., 2013) – as the first layer that represents the integration of ecological and social resilience through persistency, adaptability, and transformability of ecological values across scales and time frames and learning capacity of social context to promote co-dependency of human to the ecological system.
2. adaptive co-management (Plummer, R., & Armitage, D., 2007) – as the second layer that represents the prominence of collective and adaptive processes in the implementation and management systems
3. sustainable and inclusive tourism (UNWTO, & UNDP, 2007) – as the third layer that defines four pillars of public sectors, private sectors, finance system, and community-based tourism to promote sustainability and inclusivity;
4. Pro-active management (Oxman, 2016) – as the fourth layer that defines the involvement of multi-actors with a variety of disciplines to anticipate missing links between disciplines.



41. Theoretical Framework 2. Source: Author

3.6. Research Methodology and Research Methods

The research methodology is classified into 5 parts: defining, assessing, designing, proposing, and evaluating. In each part, there is one or more targeted outcomes that become the base of next research part. The main methods also explained in a box under each part.

Research Methodology

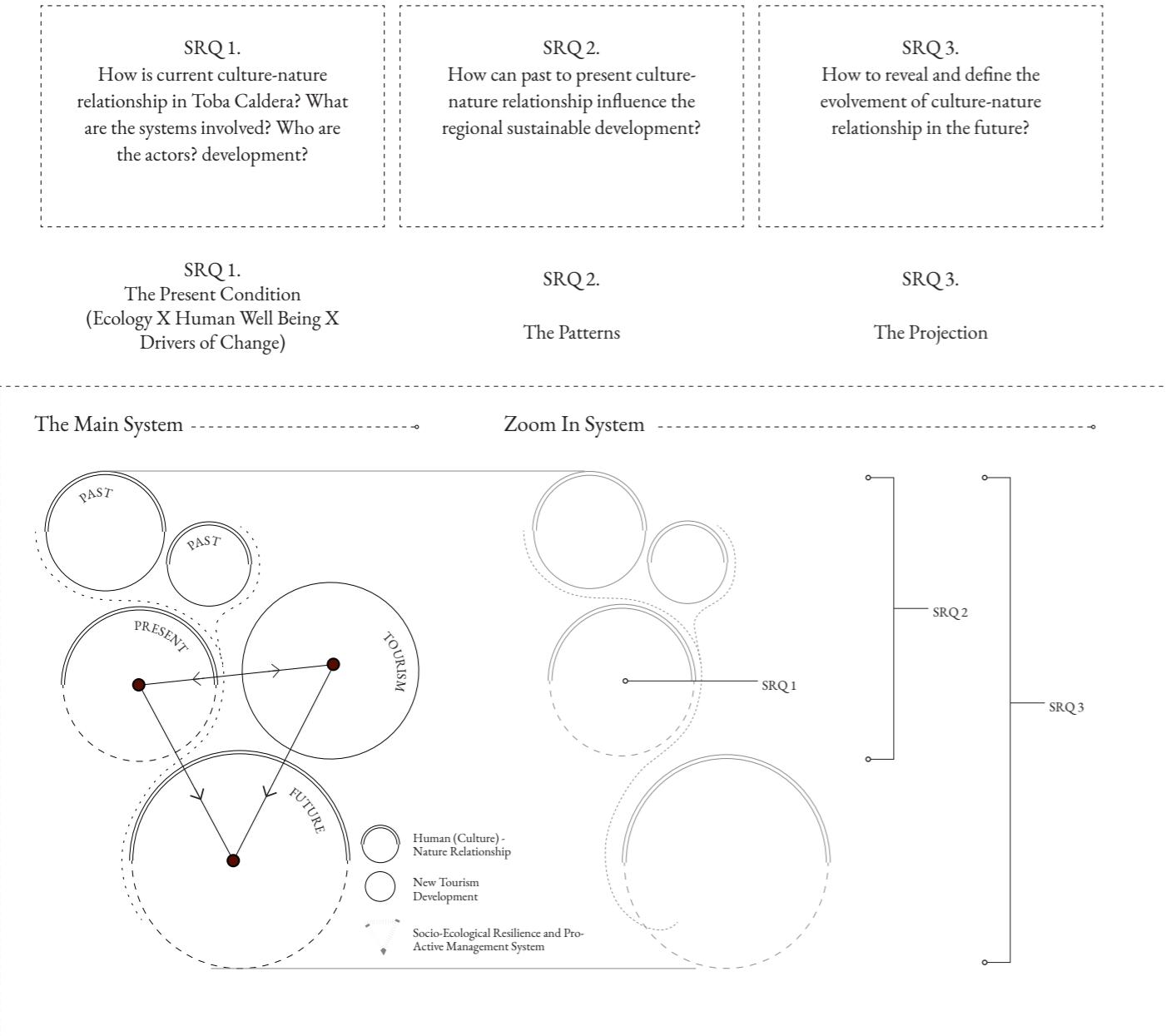
Part 1: Defining / Past to Present Human (Culture) - Nature Relationship	Part 2: Assessing / Present Human (Culture) - Nature Relationship	Part 3: Designing / Present Condition & Tourism Master Plan + Risk Including 1. Biophysical Capacity 2. Socio-Economy Capacity 3. Governance and Land Use System	Part 4: Proposing / Present to Future Human (Culture) - Nature Relationship	Part 5: Evaluating / Future Robust Human (Culture) - Nature Relationship
History + Folklore	Present Condition & Tourism Master Plan + Risk Including 1. Biophysical Capacity 2. Socio-Economy Capacity 3. Governance and Land Use System	Definitive Dynamic Element & Systems	Strategic Framework Space, people, and time	Proposal for Tourism Masterplan
X	X	X	X	X
Present Condition (Systems X People)	Vernacular Knowledge + Challenge (especially in aligning process with Vernacular Knowledge)	Adapting theories of: 1. Socio-ecological resilience 2. Co-Adaptive Management 3. Proactive Management	Tourism Master Plan	Performance Assessment Framework
= Vernacular Knowledge	= Dynamic Elements and Systems Definition	= Vision + Strategic Framework Space, people, and time	= Proposal Improvement	= Evolutionary Robust Human (Culture) - Nature Relationship Assessment Framework

Research Methods

Problem Analysis Literature Research, Online Interviews, GIS Mapping	Landscape and Cultural Systems Deconstruction -aligned with Vernacular Knowledge Literature Research, GIS Exploration, Interview, Mapping Exploration	System Construction with Scenarios Exploration of: 1. Local Culture and Economy Preservation 2. Water System 3. Densification	Tourism Master Plan Assessment Defining missing links by comparing existing masterplan	Participatory Assessment Media Communication Exploration
Vernacular Knowledge Analysis - Folklore interpretation - Literature Research - Interviews	Nature and Social Capacity Mapping + Qualitative and Quantitative Analysis Literature & Document Research, Online Interviews, GIS Mapping	Vision and Strategic Framework Exploration		

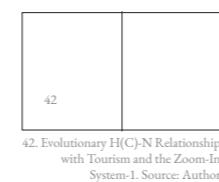
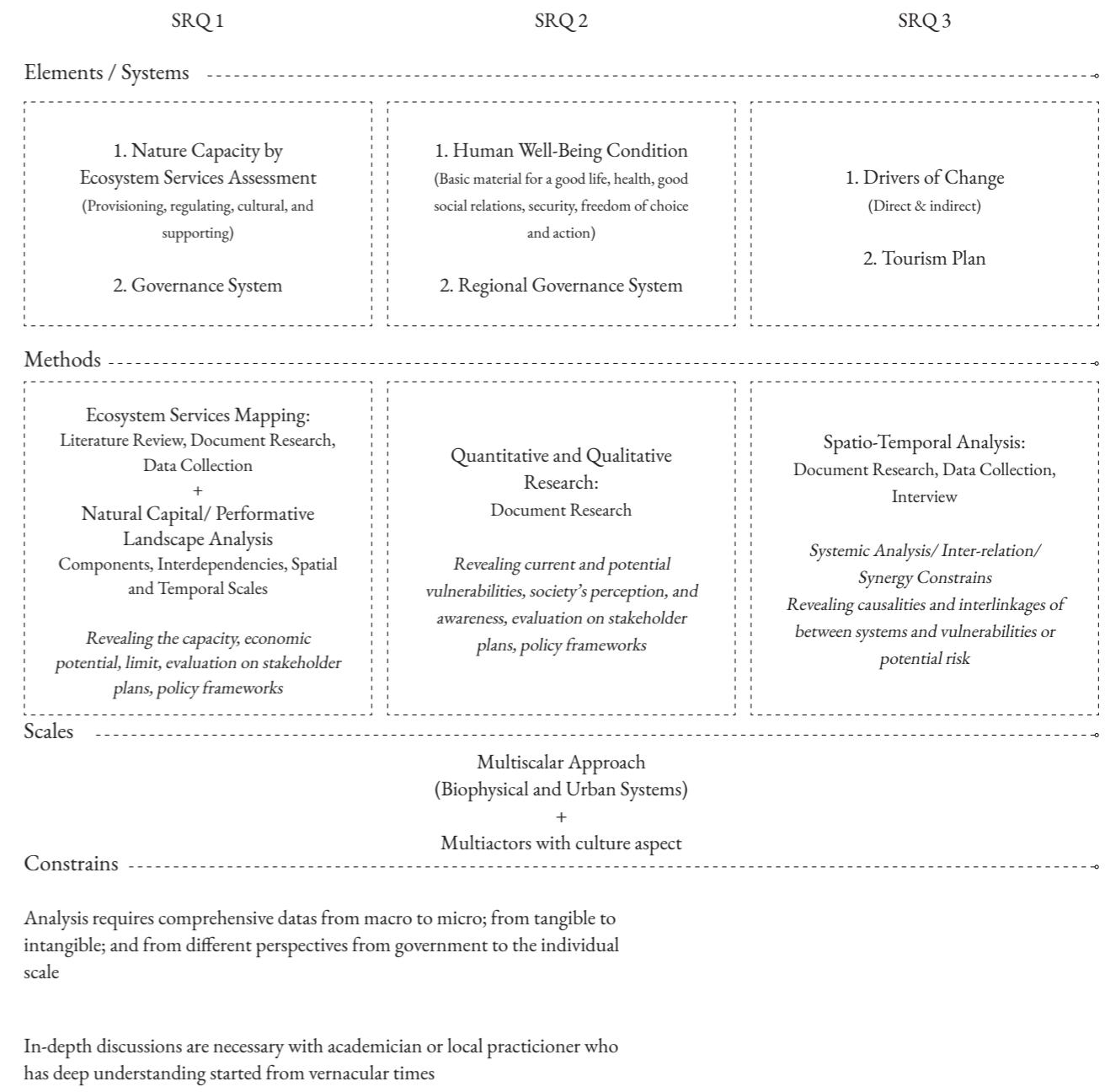
3.8. Sub-Research Questions, Research Methods and Intended Outcomes

RQ1: Which culture-nature systemic relationship in the context of Toba Caldera Geopark development can contribute both in the present and in towards sustainable future?



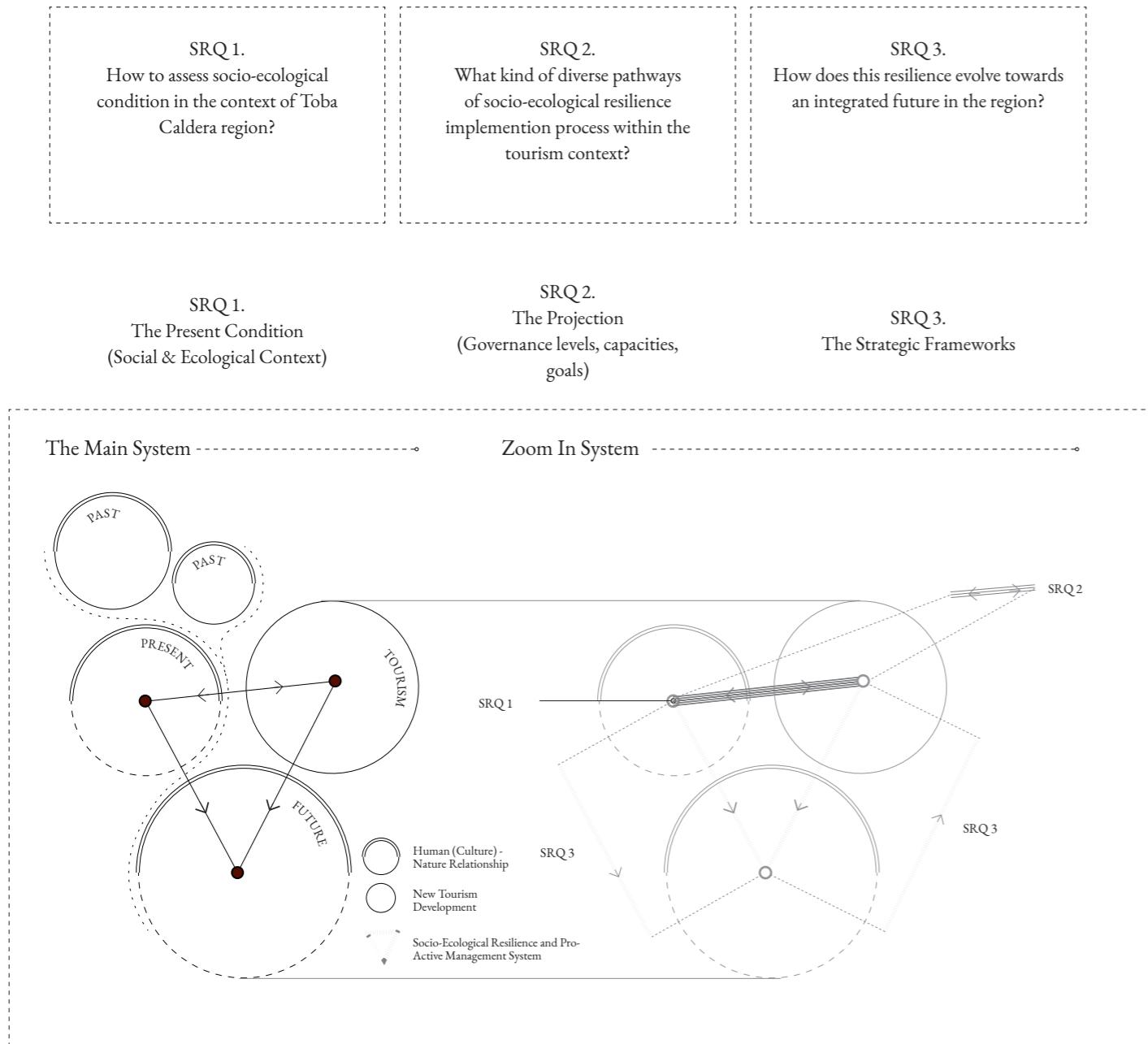
Intended Outcome

To understand the co-dependence between human (culture) and nature and the evolutionary system of H(C) - N relationship. The understanding covers all qualitative and quantitative measurement with alignment to the drivers of change to reveal the causalities and interlinkages. Thus, potential drivers that may have influences in the future can be addressed into the future development system.



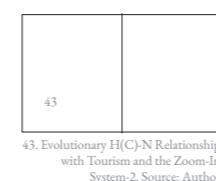
3.7. Sub-Research Questions, Research Methods and Intended Outcomes

RQ2: What aspects determine socio-ecological resilience in the context of Toba Caldera Geopark Tourism?

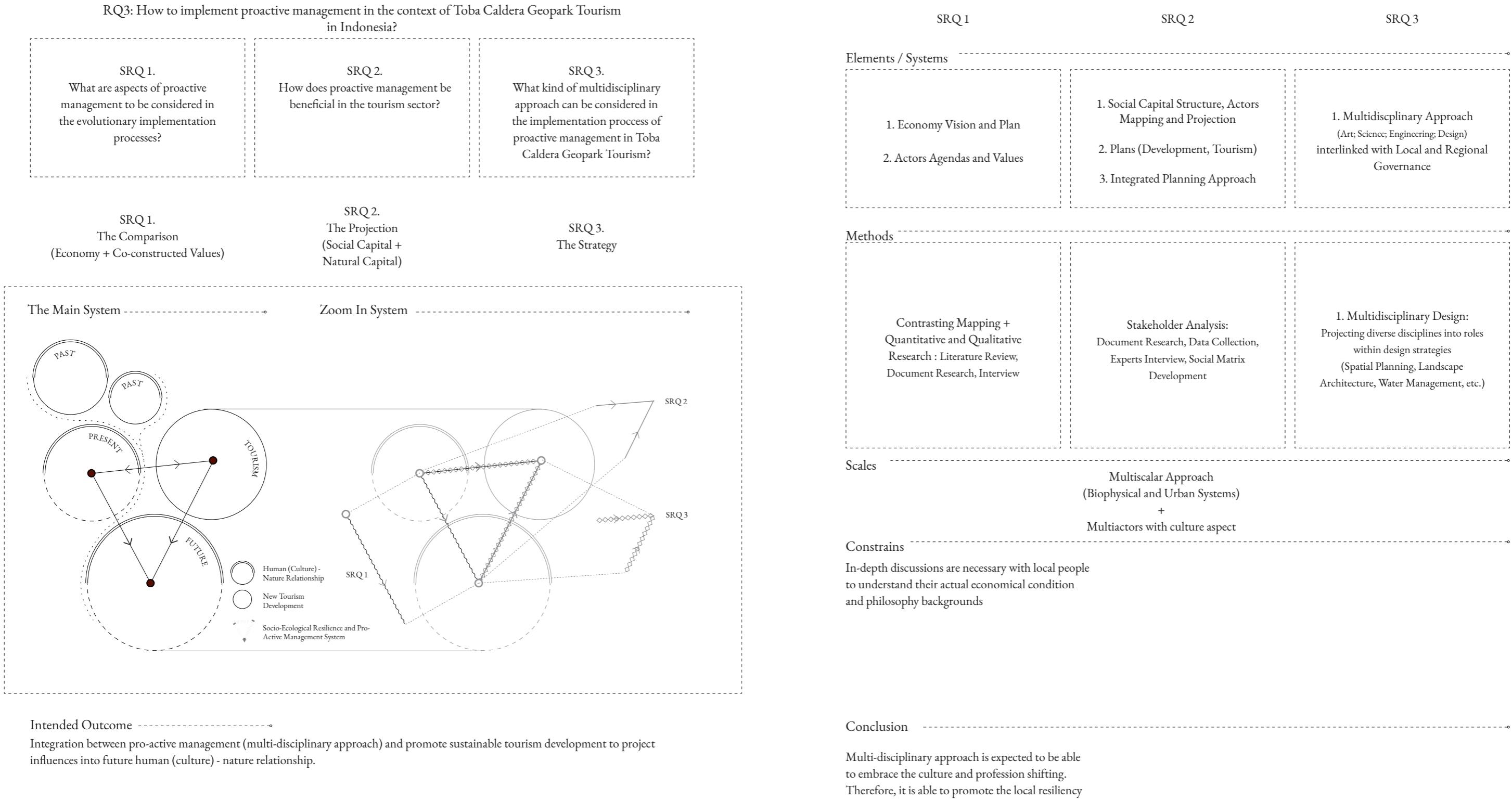


Intended Outcome

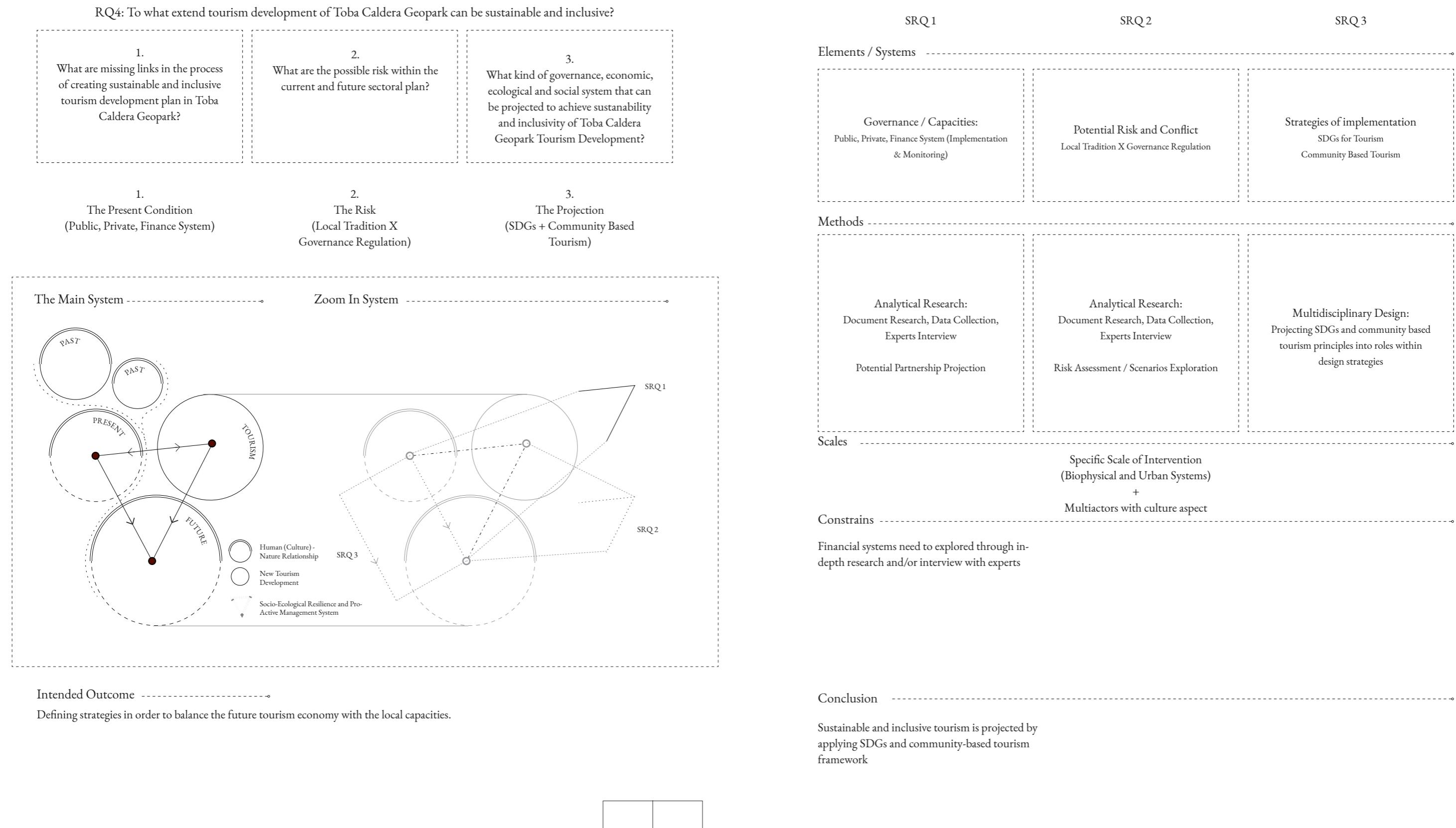
Projection of potential system to be adapted with socio-ecological resilience framework to promote sustainable tourism development. Then, the influence of socio-ecological resilience implementation to the human (culture) - nature relationship can be discovered.



3.7. Sub-Research Questions, Research Methods and Intended Outcomes



3.7. Sub-Research Questions, Research Methods and Intended Outcomes



4. Samosir Island as The Project Area

4.1. The Background of The Selection

4.2. [DEFINING] : The Breakdown of Past to Present of Human (Culture) -
Nature Relationship in Samosir Island

4.3. Conclusion

4.1. The Background of The Site Selection

The selection of macro scale begins with several considerations:

1. The area that is not too urbanized to understand the original landscape morphology;
2. The base knowledge of Mount Pusuk Buhit as the origins area of Batak Community;
3. Primary development area determined within Integrated Tourism Master Plan of Lake Toba (east and west area); and
4. Data accessibility

Then, due to the limitation of thesis project period, specific areas needs also to be defined. In this case, the area of Ambarita and Cinta Dame subdistricts are selected to compare two different characteristics both in nature and phase of development. Further elaboration on the analysis will be explained in next subchapters of 4.2 and 4.3.

Base Map

- River
- Contour
- Main Road
- Coastline
- Toll Road
- Artery Road
- Local Road
- Water (Lake)
- Settlements Area

Focus Areas

- Regional Focus
- Village Focus

Tourism Nodes

- Geo Diversity
- Culture Diversity
- Bio Diversity
- View Point

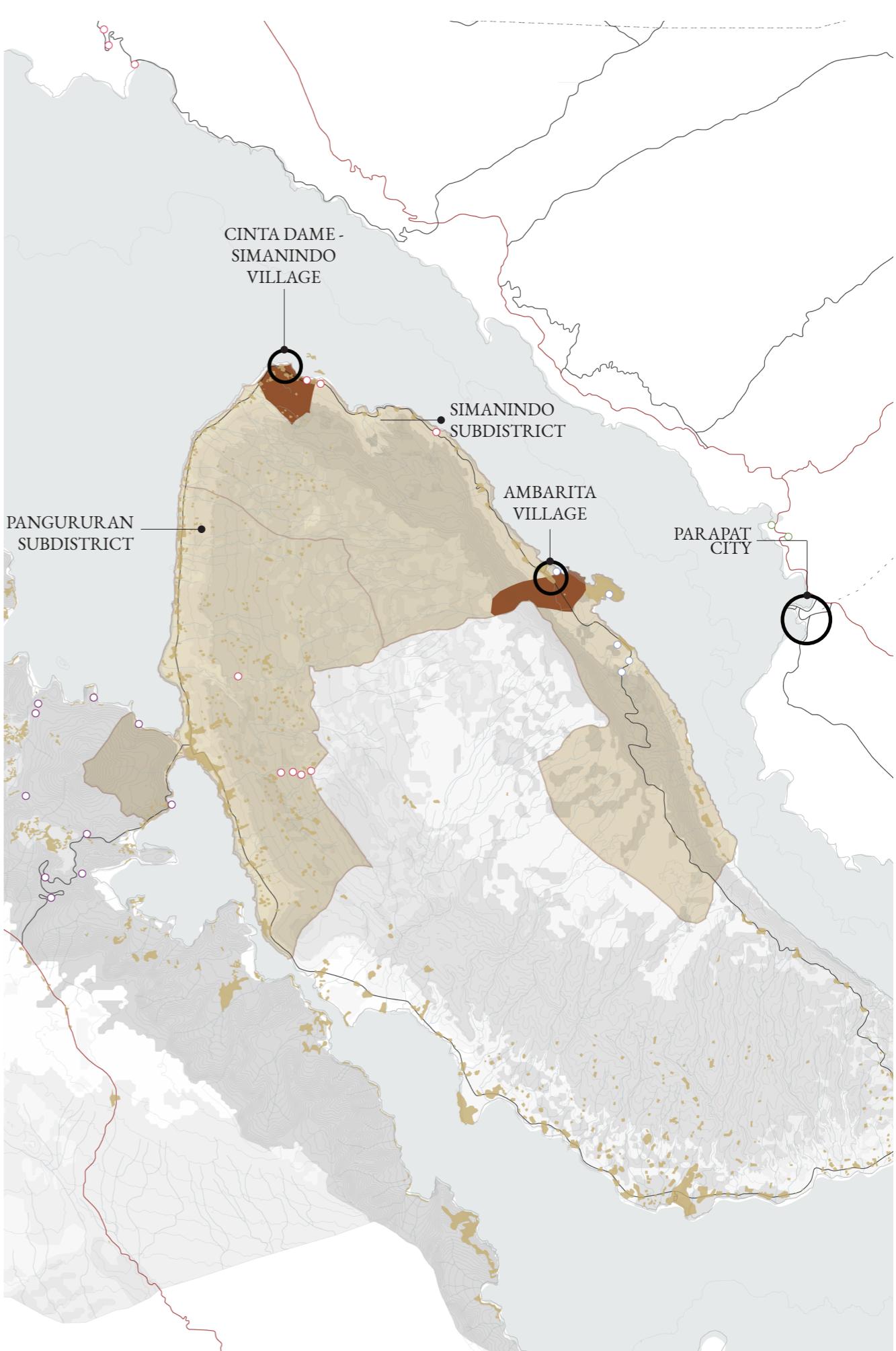
Slopes (degree)

- 0-2
- 2-8
- 8-15
- 15-25
- 25-45
- >45

0 5 km

N

46
46. Site Selection. Source: Author.
Data Source: Badan Informasi
Geospasial (<https://tanahair.indonesia.go.id/>)

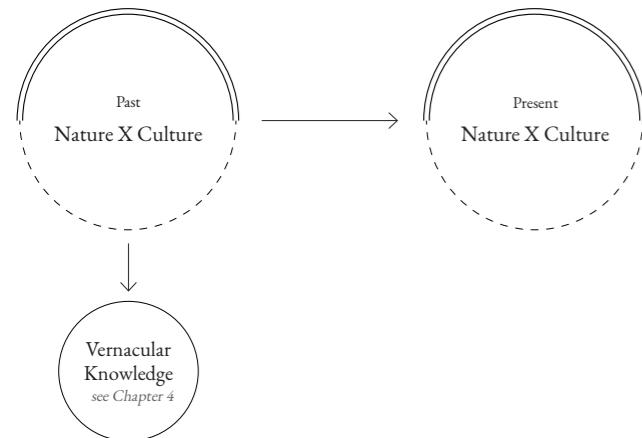


4.2. The Breakdown of Past to Present of Human (Culture) - Nature Relationship in Samosir Island

Deconstructing past to present Human (Culture)-Nature Relationship is mainly based on literature research and interviewing culture experts. The literature research process includes a comprehensive understanding that compares multiple writings and photographs analyses from online sources. Sequential conversations with local architects also were conducted to validate literature readings.

An enormous amount of pieces of information are processed by using the formulated theory of Human (Culture) - Nature Relationship derived from Theoretical Framework 1 (page 65) and Monograph conclusion (page 52). In depicting past H(C)-N Relationship, the choice of Economy, Governance/Land Use, and Co-Constructed Values Classification is selected because these three elements are identified as in between elements that influence both nature and human evolution. The deconstruction will evolve around production, living, and tourism systems and finalized with past to present evolutionary elaboration afterwards.

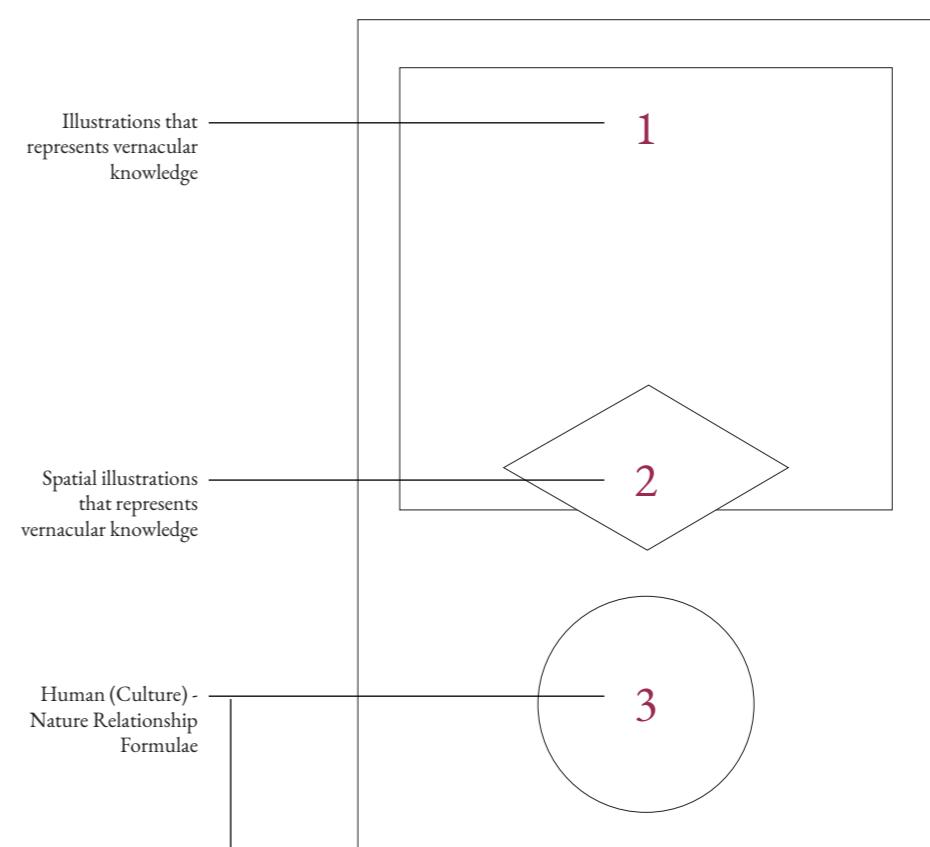
Furthermore, after the deconstruction, the following classification method to simplify complex Traditional Ecological Knowledge that Fikret Derkes formulated will be held to understand the simplification of vernacular knowledge. The classification is called Knowledge-Practice-Belief Complex that consists of four interrelated hierarchy levels, and each level is essential in maintaining a symbiosis between humans and nature (Berkes, 2000).



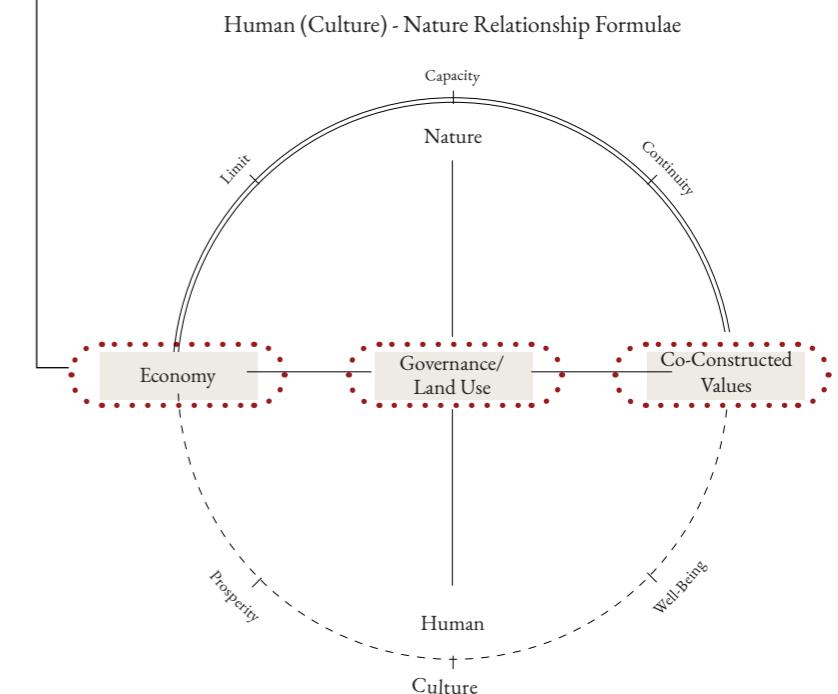
80
Part 1 : DEFINING
Past to Present
Human (Culture) - Nature
Relationship

The layers are:

1. The local knowledge of animals, plants, soils and plants.
2. Resource management comprises local environmental knowledge, practices, tools, and techniques, and an understanding of ecological processes and performances.
3. Community and social organization, offering coordination, cooperation, and governance.
4. A worldview, which involves religion, ethics, and general belief systems. A worldview that provides guidance to interpret our observation of the world around us.



47
48
47. Defining Diagram. Source: Author
48. The Breakdown of Past to Present
H(C)-N Relationship Explanation
Diagram. Source: Author



4.2.1. Co-Constructed Values

Values are the essential element in Batak society. It defines synergy between a human's microcosm and macrocosm. Their identities are identified and influence how they interact with their surroundings. Batak society put their primary values under their family clan. The values are Hamoraun (wealth), Hasangpaun (dignity), and Hagabean (Descendants). As a result, Toba Batak parents will attempt to send their children to academies if they can afford it (Wiradnyana et al., 2016). Their philosophy of life is that their son is the main wealth (anakhonhi do hamoraon di au). They believe that educated people will have more significant opportunities in strengthening the nation's character (Simanjutak, 2014).

Their beliefs influence the interaction between individuals and the environment that what they do in this World will impact the afterworld. They believe that there are seven layers of hereafter worlds. The first level, Begu World, is inhabited by devil people who have cursed to become Begu, a ghost with its head down and its feet up. The second level, or Liars World, will be inhabited with all liars whose tongues will be pulled until 100 m long. The third level, or Chaotic World, is a place of chaos for loan sharks and slanders. The fourth level is a graced world, a place for good people with blessings. Next is the fifth level, in which the Tree of Life is planted here by God. And last, the seventh layer is where God lives with honourable people with good conscience. Then, by knowing this, Toba's character is guarded while in the world to avoid unwanted placement in the afterworld (Simanjutak, 2014).

Furthermore, the Batak people firmly believe that their ancestors were descended from God. The descendant of God was sent down by the almighty named Debata Mula Jadi Na Bolon to earth on a sacred mountain, namely Pusuk Buhit, a mountain in the west of Samosir Island. It is 1000 m above sea level (Simanjutak, 2014).

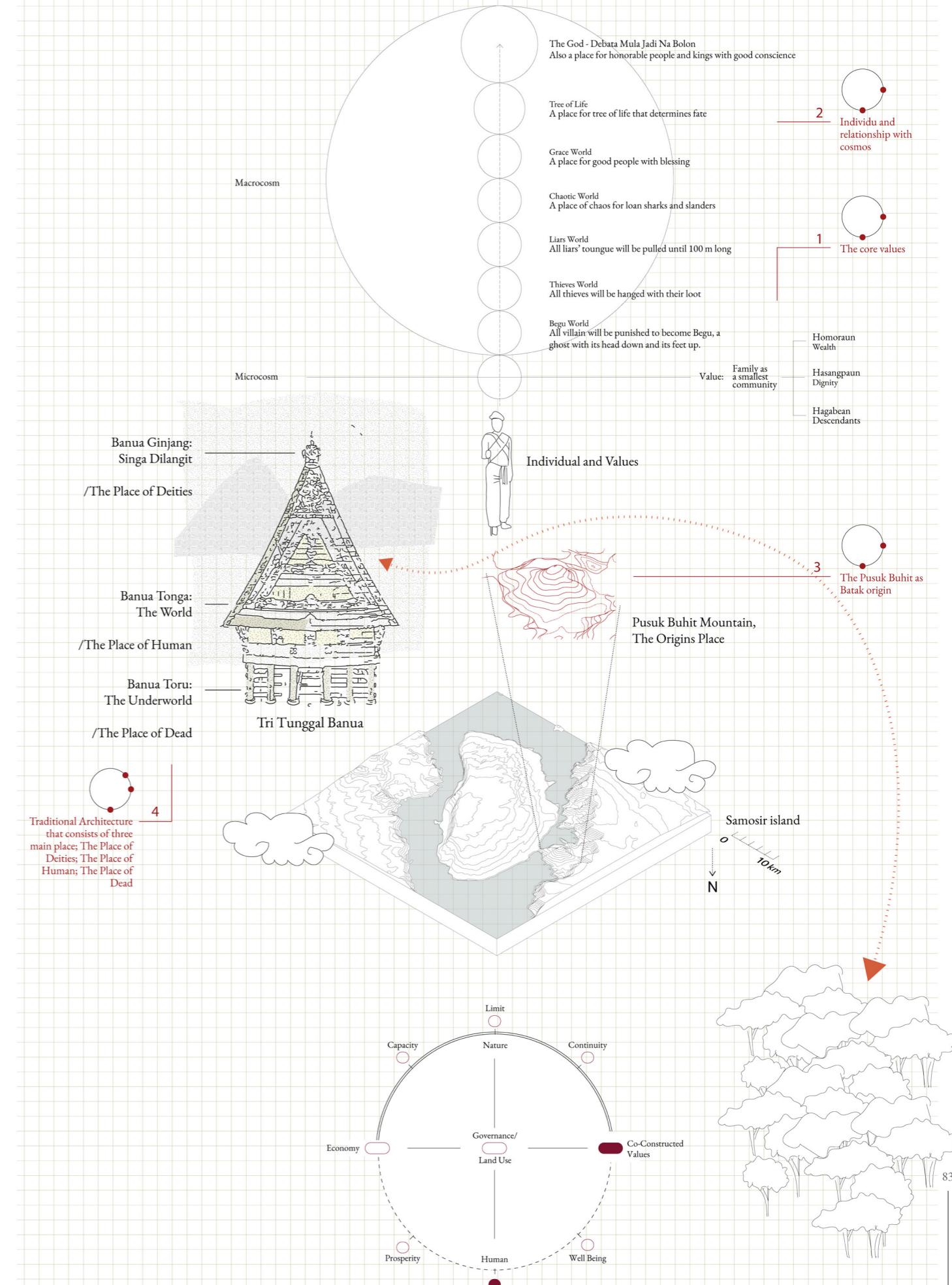
Moreover, Batak people have a primary conception called Tri Tunggal Banua and believe that the universe consists of Banua Ginjang or the upper world, Banua Tonga or this world, and Banua Toru or the underworld. The world above is a place where there is the Na Bolon Debate and the Na Tolu Debate. Banua Tengah is a place where humans live, and the underworld is a place where the dead and ghosts live. This conception is applied to the traditional architecture (Simanjutak, 2014).

1

2

3

4



4.2.2. Economy

The Toba Batak people are an agrarian society. About more than 83.8% of society work as farmers and the rest work in the sectors of industry, trading, services, and others (Wiradnyana et al., 2016). Then, this cause their high dependency to the land. The land in the Batak area is hilly and infertile, located between 300-2000 meters above sea level, so clan groups tend to look for valleys where there is water to manage rice fields. The poverty of the Batak land forces the Batak Toba people to work hard, and this is a survival mechanism. Alternatively, quickly migrate to a new place (Simanjutak, 2014).

Rice fields, *hauma*, *saba*, and dry fields, are the main production areas and the primary source of livelihood for farmers. The main crop in the rice fields is rice, and sometimes it is rotated with secondary crops, onions, vegetables, and goldfish farms. On the other hand, the dry fields produce rice, sweet potatoes, onions, chilli, coffee vegetables, and fruits like papaya, oranges, and pineapples (Simanjutak, 2015).

Around the houses and Huta inner-courtyard, lumbung padi (rice storage barns) and lesung (mortars) were found to pound rice into the rice. The lower part of the traditional house also functions as a cage for livestock such as buffalo, chickens, and pigs that help in the farming process. At the back of the house, there is usually a piece of land planted with various daily necessities such as sweet potatoes, coconut, guava, papaya, mango, and various herbs such as galangal, ginger, turmeric, chilli, etc. One type of plant typical of the Batak community, which is always found in the garden behind Huta, is lemongrass called napuran (Simanjutak, 2015).

Lesung used together in a Huta is a form of solidarity with Huta residents who are relatives and a basic social unit (localized patrilineage). Processing of foodstuffs (rice) in mortar has been carried out from a long time ago by a group of teenage girls (Vergouwen, 1986, as cited in Wiradnyana et al., 2016). It is also done to prepare young girls to replace their mother's position in a household so that if the teenager is married, they already have the same skills as their mothers. This tradition helps build and strengthen family relationships, especially establishing communication between Huta women in helping to solve various problems of young women and for housewives will help solve various household problems. Lesung is also a location where teenage women cook various food and meet young men and women. Such a model is also found in the Karo people called Nakinaki (Wiradnyana et al., 2016).

For additional income, women usually work weaving Ulos textiles in their yards. In addition, Batak people also gather forest products and people who live close to Lake Toba also catch fish to earn extra (Simanjutak, 2015).

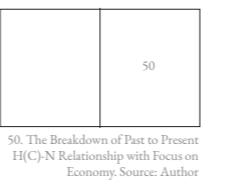
84 Forest is a conservation space and a reserve for the expansion of residential land and production land. It is represented by the land use pattern that is dominated by agriculture area. In the past, it was the forest that was taken little by little to

be used as their fields. If they wanted to build a house, they could take wood in the forest to use as house poles, boards, and fibres (Sinaga, 2016). The products obtained from the forest are wood, boards, fibres for building materials, rattan, firewood, animals, and fish. Another forest product is cinnamon which has been known to foreign countries. Residents also plant palm trees and Bagot trees, originally forest plants, and used as tuak drink and palm sugar (aren sugar). Tuak is a traditional drink that is often served as a drink in traditional ceremonies, while the palm sugar business, called Sakka sugar, or Aren sugar, is an additional source of income that has a higher value than palm wine. In addition, rivers and Lake Toba are sources of fish for residents on the shores of Lake Toba. The catch of fish is to meet their own needs and to be traded or marketed (Simanjutak, 2015).

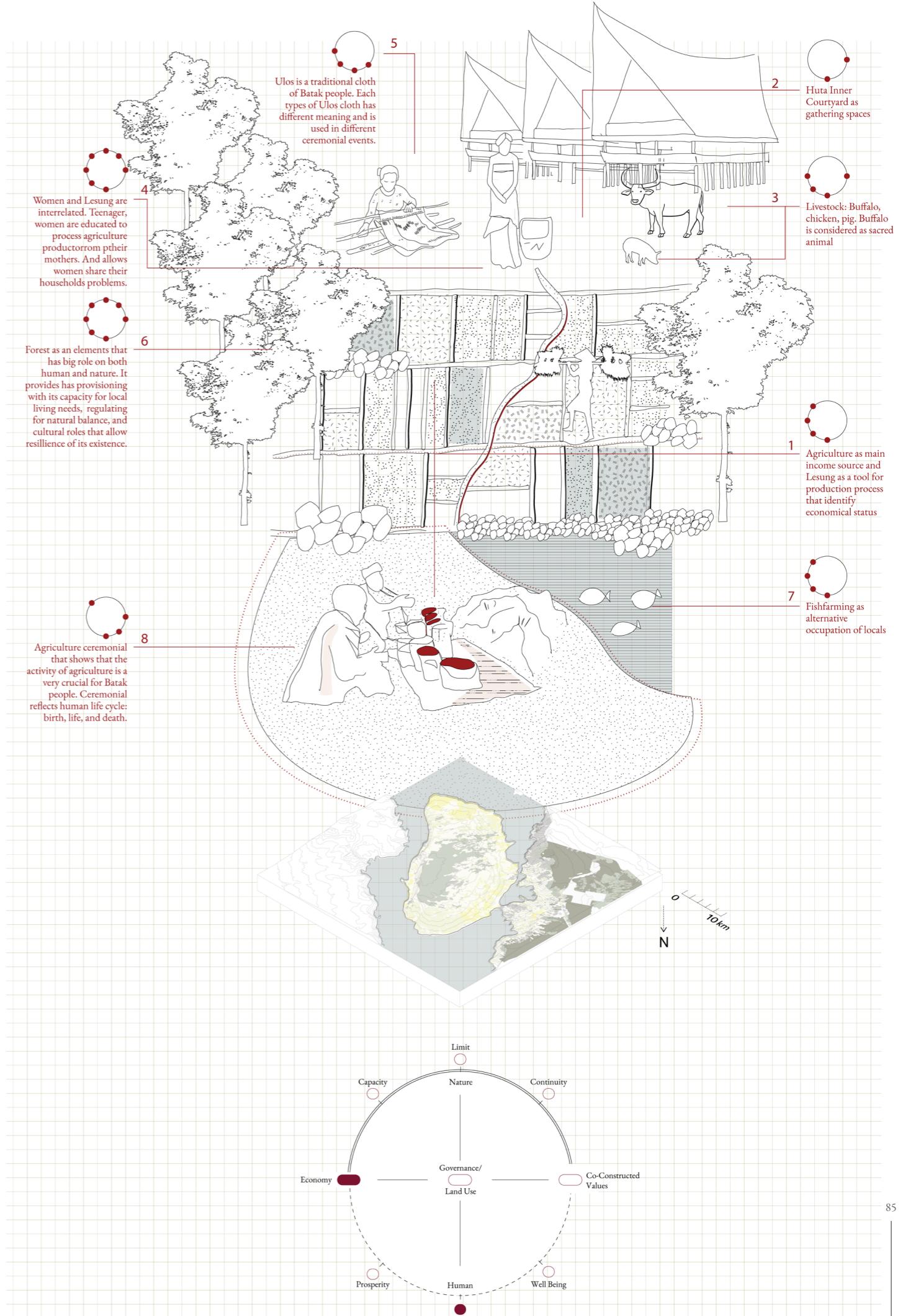
However, agriculture is a crucial part of life within the human life cycle: birth, life, and death. Therefore, in the agricultural ceremonial procession of the Toba Batak people, the three cycles are not only manifested in the sculpture of three human faces as symbols of the rulers but also describes the three periods in the agricultural cycle, namely preparation, planting and harvesting, so that these three processes are always carried out more substantial than the other agriculture procession (Wiradnyana et al., 2016).

8

1 2 3 4 5 6 7 8



50. The Breakdown of Past to Present H(C)-N Relationship with Focus on Economy. Source: Author



4.2.3. Governance/Land Use

Migration of population from the slopes of Pusuk Buhit can spread to the proximity of Pusuk Buhit and go somewhere far from the slopes of Pusuk Buhit, including those who immediately look for new land in the Simanindo District area. This spread's considerations possibly depend on ideal criteria for making new Huta and skilled sculptors or a group of Lesung makers (stone carvers) (Wiradnyana et al., 2016).

The tendency of the Toba Batak people in the past to choose residential locations is to focus on low elevations areas, mainly along the coastlines, due to its potential for a place to live and grow crops. Soil condition at low elevations mostly is black-grey alluvium type which is more widely used for agricultural activities with its high fertility soil. Other types of soil on Samosir Island, namely podzolic soil with low to very low fertility, is not the priority. Thus, flat and sloping areas (slopes between 0-15%) were the places most used by people at that time to place their activity centres. In such areas, the freedom of people to move is easy to obtain compared to areas with steeper slopes (more than 15%) (Wiradnyana et al., 2016).

The establishment of a village must pay attention to macro occupancy requirements, which are agricultural land, plantations, fields, livestock, and others. While in the community of Samosir Island, the main biotic-abiotic requirements that must be considered including a mountain; water (in the form of water sources, rivers, lakes, swamps, and others); land for food crops, livestock and hunting grounds; a blacksmith; and must be able to look around (Wiradnyana et al., 2016).

However, the people of Batak also avoid the area directly next to river lines due to avoidance in the exposure of other family clans that may potentially ignite some conflicts. In addition, there is a Batak law regarding forest clearing to be used as agricultural fields that are always associated with the positive or negative hunch of the forest opener's dream. If the dream is positive, then the forest is continued with cleaning and work and vice versa (Sinaga, 2016).

In one Huta complex, there are several houses inhabited by one family. This clan land is also called bona ni pinasa (a place where jackfruit trees grow) and bona ni posigit (a place for rites to honour the spirits of ancestors) (Vergouwen, 1964, as cited in Simanjutak, 2014). Jackfruit trees are usually planted in Huta because they are productive for the needs of daily life. For example, the wood is used as a tiang sopo (morning storage area); the leaves to wrap the cake (lampet); its young fruits can be used as a vegetable ingredient, and when the mature fruit the taste is sweet and delicious (Sibarani, 1984, as cited in Simanjutak, 2014). No wonder the Toba Batak people use this jackfruit tree as a representation of their Huta. And in bona ni posigit, they perform rites to honor their ancestors and celebrate family rites. Therefore, clan land is a source of life and a place to carry out many rituals (Vergouwen, 1933, as cited in Simanjutak 2014).

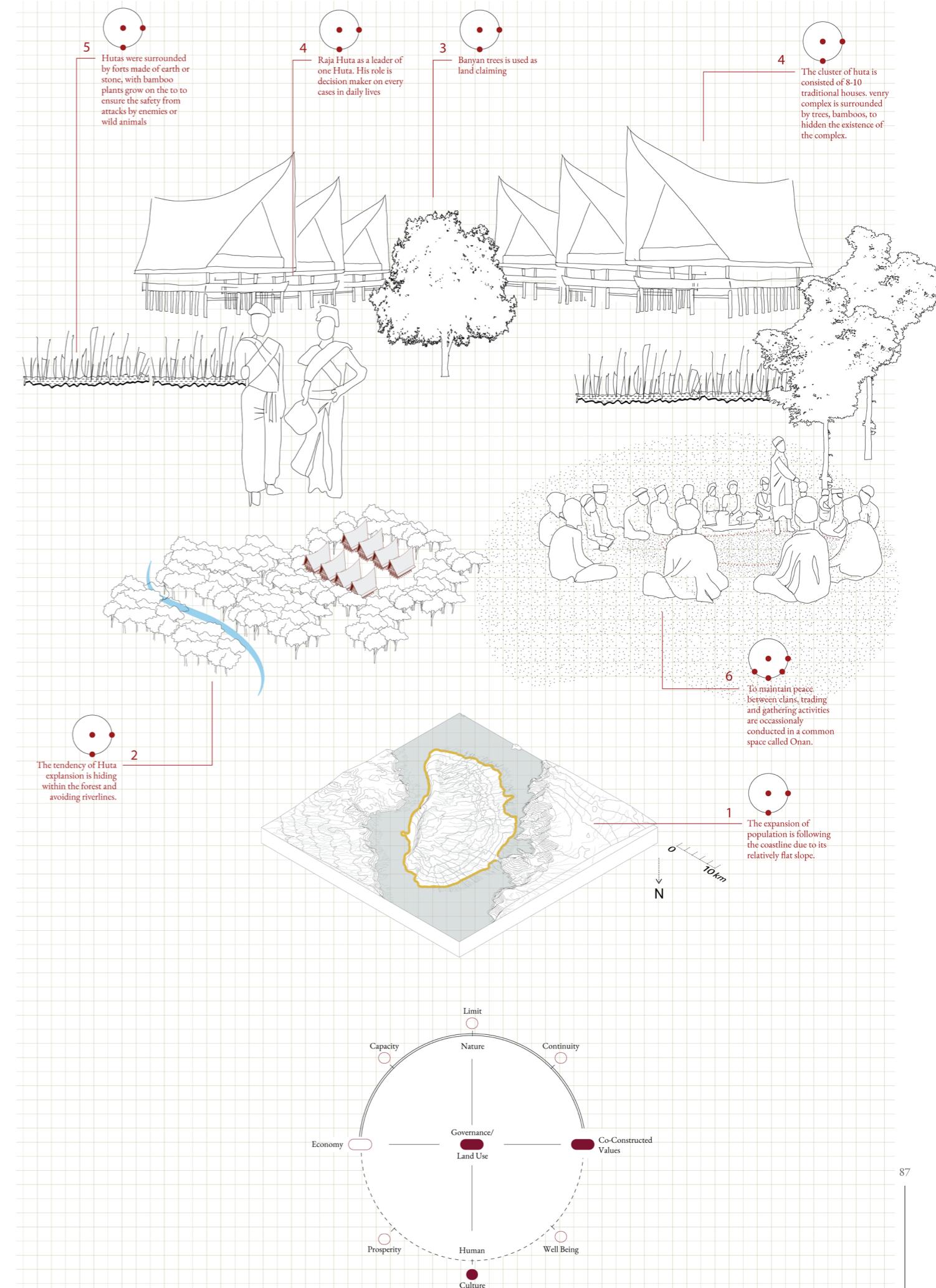
In the interior of the Huta, there are two or more rows of

houses that are lined up (at first from north to south) and facing each other. The distance between two opposite rows of houses is separated by a relatively enormous yard. The yard's functions are as a place for holding various traditional activities or ceremonies, for drying various agricultural products and as a place for children to play.

In the past, Hutas were surrounded by forts made of earth or stone, with bamboo plants grow on the top. This fort was necessary to ensure the safety of the Huta from attacks by enemies or wild animals (Vergouwen, 1964, as cited in Sinaga, 2016). However, some of these forts have collapsed and are not rebuilt again, along with less frequent inter-huta wars. Also, there are few traditional houses and no new ones since people build modern Indonesian houses more.

The increase in clan members also increased the Huta, which was scattered around the first Huta. Unity of several Huta is called Horja (village). And if this Horja group gets bigger with the formation of a new clan or clan branch, then the unit is called Bius (regio). The interrelationship between people within a Bius is determined by activities held in their public space, commonly called Onan (market). The Onan is used as agricultural products trade, gathering in making wars strategy, or others. After the Dutch controlled the Batak lands, onan still had functions like before. However, the organization is getting more organized with taxes collecting for the state treasury.

51. The Breakdown of Past to Present H(C)-N Relationship with Focus on Governance/Land Use. Source: Author



4.2.4. The Evolution

In the context of the development of national character and character, the shift in values as a result of the influence of globalization can be observed, where the goal of people's lives today is not how to become a virtuous person (good value) but a successful person (use-value). So in the strategy of strengthening the nation's character, one must formulate a response to this phenomenon.

Education and Religion Shift

At the end of the 19th century, Dutch and German missionaries arrived in the Batak lands. Since this year, education that developed rapidly in the Batak lands was due to the efforts and great work of the missionaries sent by the German society, namely the Rheinische Missionsgesellschaft (RMG). The missionaries have been strategically prepared to spread religious teachings with four approaches: religious, health, education, and economic approaches. The four approaches are carried out through an activity centre called Pargodungan, which is the centre for establishing the church. In the land of Pargondungan, the courtyard is enormous and becomes the residence place of priests or Huria teachers. In addition, the pastor built a pilot farm on the land for growing vegetables, sweet potatoes, and medicinal plants (Simanjuntak, 2014).

Two main factors caused education to be quickly developed in Batak land: the need for Christianity to spread and the need of colonial government's to promote capabilities of office workers to know how to read and write for government administration duties. Afterwards, a new social class was also formed in the Batak community, namely a group of government employees called "Ambtenaren". The desire to enter the new social class caused competition and raised the need for formal schooling in educational institutions established by the colonial government or Christian Zending parties (Simanjuntak, 2014). To conclude, the primary shifts in this period are the change in culture, value (the need to get higher education), and economy (the ambition to enter a new social class created by colonial government) resulted from the induction of education and religion.

Centralized Governance

The Dutch East Indies government did not intervene in the Huta governance system as it is the original Batak government organization and based on genealogical traits. However, in the administration of the Dutch government, only a village head was known to be in charge of several Huta. Therefore, the village head is the lowest Dutch centralized governance system. However, the king of Huta cannot be replaced by the Dutch due to his position rooted in tradition, while the village head could easily be overthrown if the Dutch did not like him (Simanjuntak, 2006).

At the smallest government unit or village level, local cultural and historical wealth is marginalized because there is too much emphasis on the centralization of the governance system. It is shown by minimum appreciation and conservation efforts for many local heritages that are extinct or not maintained. However, this local heritage is one of

the effective sources of reference for developing the nation's character because it is close and attached to the collective ties of the community.

Administration Border

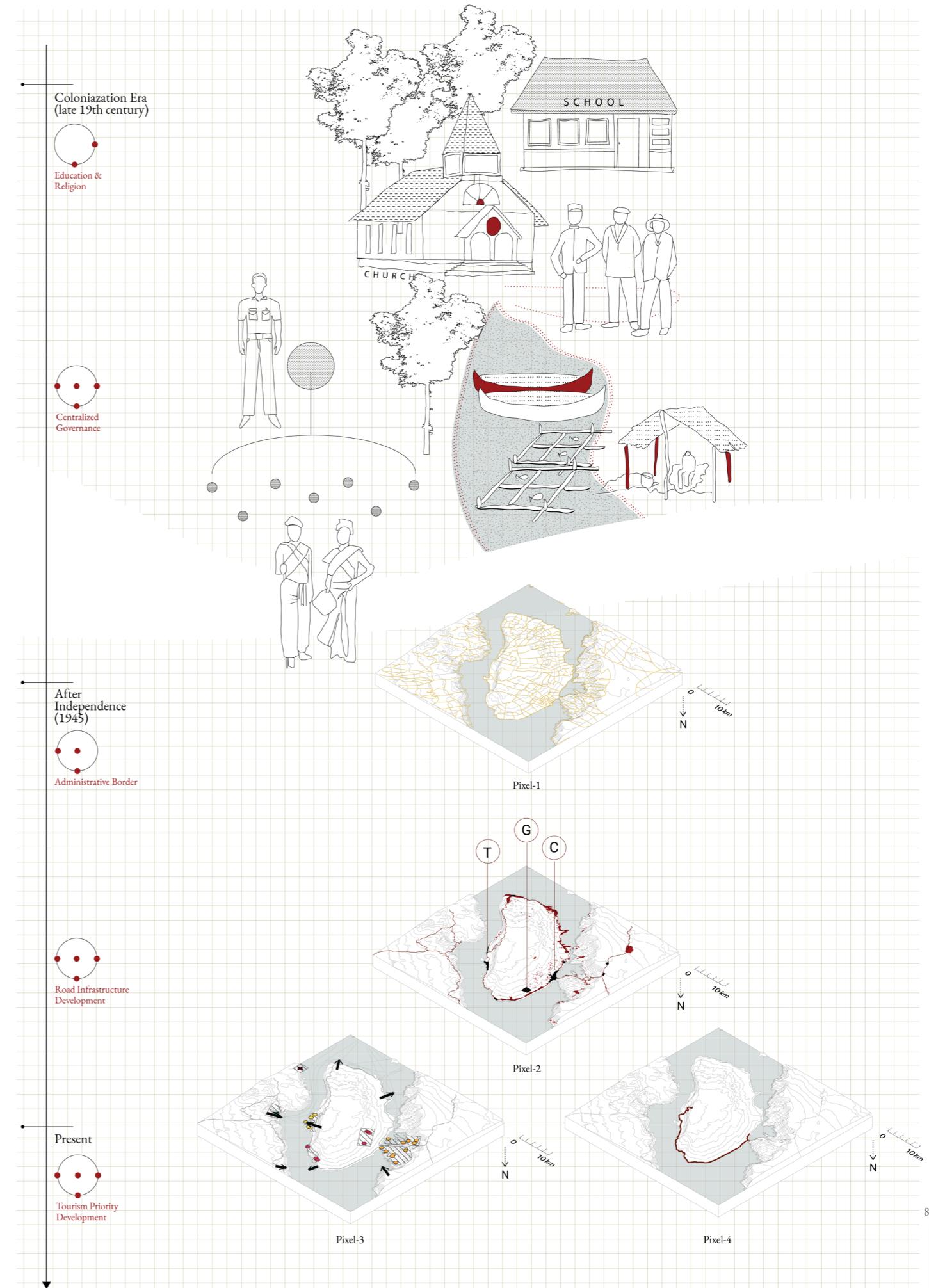
After the Independence of Indonesia, the governance system of Indonesia adapted Dutch governance system or the centralized. A new and smallest territorial border, namely village. It was consist of families with same family clan.

Road Infrastructure Development

After the independence of Indonesia, the infrastructure development of the Samosir Island main road was promoted to increase accessibility for regional to national economic sectors. The development is spread along the Samosir Island perimeter line. As a result, the subsequent developments have the characteristic tendency of ribbon development with main road orientation. It is indicated by pixel-2 that shows traditional settlements (red hatch) and the urban areas (black hatch) that are collectively grouped along with the main road infrastructure. To add, three main urban areas (black hatch) have three characteristics: tourism, government, and commercial areas.

Tourism Priority Development

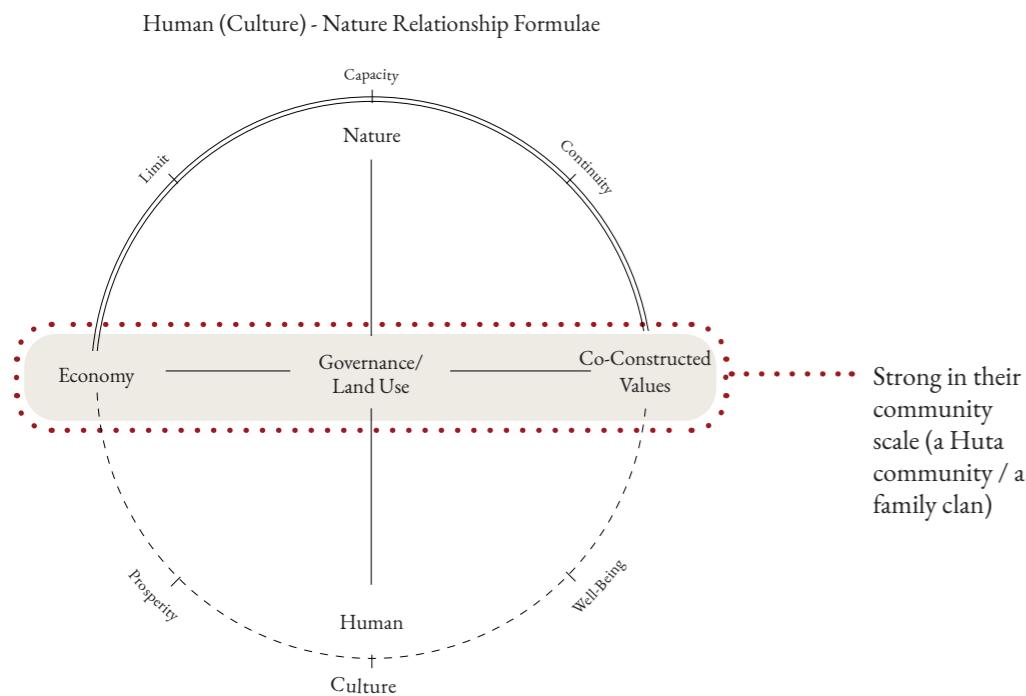
From the national tourism program that prioritizes the Lake Toba area, multiple ports connecting Samosir Island and Sumatra Island are upgraded. In addition, areas with high cultural and tourism values are also identified, clustered, and promoted, as shown through pixel-3. Moreover, by understanding the high cultural and tourism value that happened in the north-west area and east area, the north part of Samosir tends to have more tourism development in the future (pixel-4).



4.3. Conclusion

The deconstruction of past to present human (culture) - nature relationship in Samosir Island by using the H(C)-N Relationship formulae indicates that every tradition, activity, or regulation created by human customs (culture) is linked with their economy and governance system, or co-constructed values. In addition, human culture also has connections in defining the capacity, continuity, and limit of nature and the well-being and prosperity of humans. Moreover, these cultural customs have high interdependency systems with the Huta community based on their family clan. So then it concludes that Huta or family clan is the most influential factor of Batak community in determining governance system, economy, and co-constructed values. In addition, the economic system is fused into other elements in a traditional society, including religious elements (Koentjaraningrat, 1990, as cited in Wiradnyana et al., 2016).

Next, the table in the following page shows the classification of Knowledge-Practice-Belief Complex that depicts vernacular knowledge classified into four hierarchical levels. All elements inside each level are derived from findings in the deconstruction phase with H(C)-N Relationship



Formulae. This vernacular knowledge becomes the basis for synthesizing tourism programs as by acknowledging each aspect of vernacular knowledge, it will allow us to reimagine our coevolution by maintaining a symbiosis between nature and human (Watson, 2019).

Knowledge-Practice-Belief Complex Hierarchy Levels

1. The local knowledge of animals, plants, soils and plants.
 - Crops in rice field: rice, onions, vegetables, goldfish farms
 - Crops in dry fields: rice, sweet potatoes, onions, chilli, coffee, vegetables, and fruits (papaya, oranges, pineapples)
 - Animals: pig, chicken, buffallo
 - Plants in garden: sweet potatoes, coconut, guava, papaya, mango, herbs: galangal, ginger, turmeric, chilli, lemongrass, etc.
 - Building materials: wood, fibres, rattan
 - Forest products: cinnamon, aren sugar, sakka sugar
 - Soil: black-grey alluvium
2. Resource management comprises local environmental knowledge, practices, tools, and techniques, and an understanding of ecological processes and performances.
 - Main production area: Rice fields, hauma, saba, dry fields
 - Household tools: lesung, hudon, balanga, panutuan, tutu, andalu, poting sonduk, sapa baibahul, rere, lage, lampu, amak
 - Agriculture tools: pakkur, ninggala, auga, sisir, hudali, siduraja, gupak, raut, belati, sasabi, kotam, ompong, pardegean
 - Animal hunting tools: tombak, prang, senapang, jerat, godung, lobang besar, others
 - Practices: fish farming, agriculture, ulos textiles weaving
3. Community and social organization, offering coordination, cooperation, and governance.
 - Hierarchy of community: Huta, Bius, Horja, Lumban
 - Gathering places: onan, inner courtyard of Huta
 - Ceremonial: agriculture process, marriage, death
 - Land Management: ownership and use regulation (mamola pinang, libe, rimba oma, rimba arung, dondon, pate)
4. A worldview, which involves religion, ethics, and general belief systems. A worldview that provides guidance to interpret our observation of the world around us.
 - Religion: Parmalim, Christian, Moslem, others
 - Ethics: harvesting forest, agricultural process,

5. Assessing the Interrelations/ System Dynamics

5.1. Present Conditions: Biophysical System Deconstruction

5.1.1. Understanding Land Use and Land Cover Pattern

5.1.2. Understanding Vernacular Landscape

5.1.3. Understanding Hardscape Elements

5.1.4. Biophysical Risk and Vulnerability

5.1.5. Conclusion: Biophysical System Transect

5.2. Present Conditions: Socio-Economic System Deconstruction

5.2.1. Cultural and Governance System

5.2.2. Land Ownership System

5.2.3. Socio-Economic Capacity

5.3. Present Conditions: Tourism Masterplan Deconstruction

5.4. Multiscalar Interrelationship

5.5. Conclusion and Vision

5.1.1. Understanding Land Use and Land Cover Pattern

This sub-chapter validates definition from chapter 4, that mentions the spread of Huta settlement in the past started from the origin's location, or the Pusuk Buhit Mountain, to all over along the coastline. The analysis is through deconstruction processes of Samosir District topography, land use, and land cover patterns by GIS mapping from Urban Land Use Plan (Rencana Tata Ruang Wilayah/RTRW) data with aims of depicting traces of historical spread and land management pattern.

Trace of Historical Spread

The critical mapping reveals the Batak origin's space of Pusuk Buhit Mountain that is represented by cultural heritage in its land use (purple hatch). Next, the spread of Batak settlement is represented by developed settlements that are mainly nearby to the coastline (see pink hatch as a representative of urban areas and orange hatch as a representative of rural areas). These urban settlements exist in Pasar Pangururan (an area with intensive trading activity), Pardomuan, and Ambarita Villages, and the rural settlement exists in Lumban Suhi-Suhi Toruan Village.

Land Management Pattern

A diagram in image XXX below formulates land use and land cover analysis along the north area of Samosir Island. The formulation defines interrelationship of several elements of:

1. functions: settlement, production, and preservation

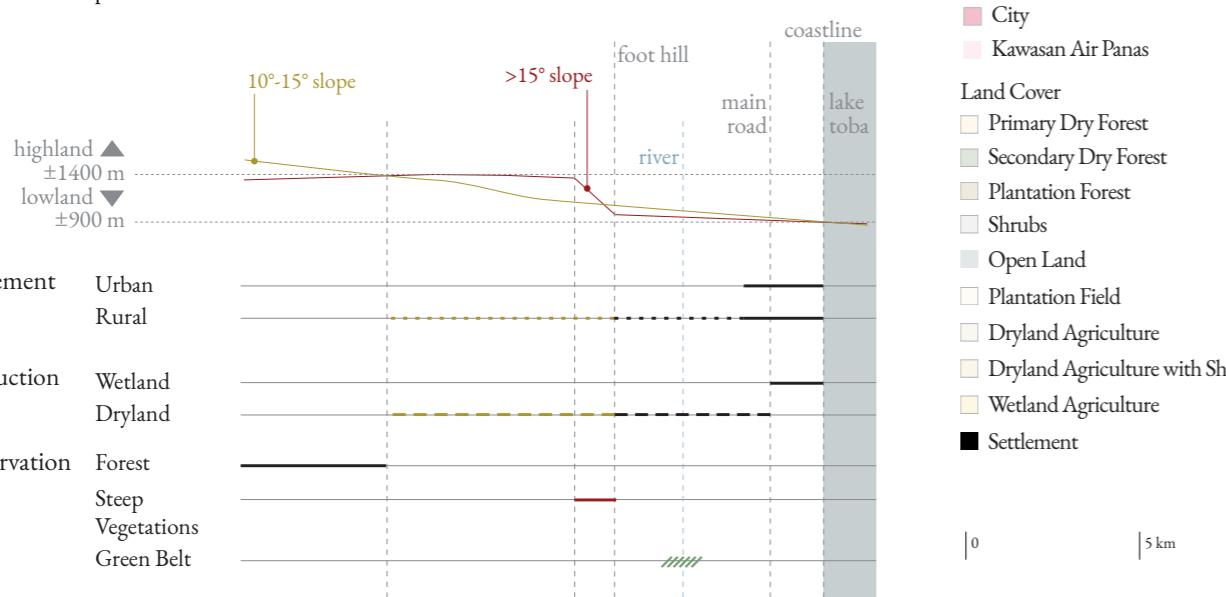
2. height:

- highland ($>\pm 1400$ m height above sea surface)
- lowland ($\pm 900 - \pm 1400$ m height above sea surface)

3. topography:

- high slope topography (red line) with more than 15° slope (see also sections C-C' and F-F' on the map drawing) that occurs mainly in the east part of Samosir Island
- medium slope topography (brown line) with 10° to 15° slope (see sections A-A', B-B', C-C', D-D', and E-E' on the map drawing) that occurs mainly in the north-west part of Samosir Island

4. important harscape lines: main road and coastline.

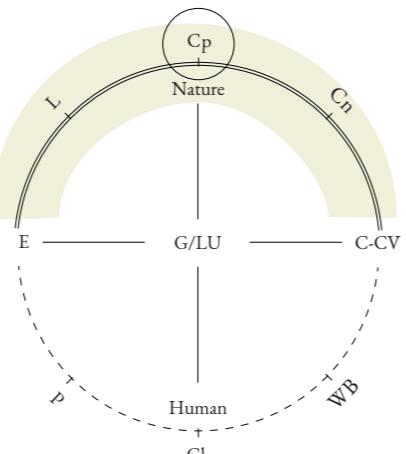


Next, the analysis will define land management characteristic of settlement, production, and preservation areas. For the settlement, the two types of urban and rural happened differently on the two topography types. Most urban and rural spread along the main road until reaching the coastline areas in both topography types. However, some rural areas or Huta settlements spread from the main road line to the higher elevations (represented by dashed lines).

For the production, wetland agriculture only happened between the main road line and coastline, while dryland agriculture occurred from the main road line up to 1400 m height because of its existence following the Huta settlement spread. As a result, the water sources of wetland and dryland agriculture are different. Wetland agriculture mainly extracts water from Lake Toba, while dryland agriculture uses rain harvesting technology.

For preservation, registered and unregistered protected forests exist above ± 1400 m in height. Moreover, specific vegetations exist only on the steep contours to protect from land erosion. Also, in the Pangururan Sub-district, land use of the green belt is implemented along the river lines to preserve the quality of blue corridors.

To conclude, by using Human (Culture)-Nature Relationship formulae, the lowland of Samosir has its highest capacity on the provisioning services due to human skills and knowledge in managing land of medium to low slope. Besides, in the highland, the existence of protected forest contribute capacity on regulating and supporting services. However, some areas have higher capacity on cultural services such as areas with land use of cultural heritage and tourism area. By understanding the landscape types and the capacity, it give notions for design projection of what kind of integrated functions to accommodate future activities demands while also targeting on services capacity balance.



Base Map

- River
- Contour
- Toll Road
- Artery Road
- Local Road
- Water (Lake)
- Settlements Area
- Tourism Nodes
- Contour Projection

Slopes (degree)

- 0-2
- 2-8
- 8-15
- 15-25
- 25-45
- >45

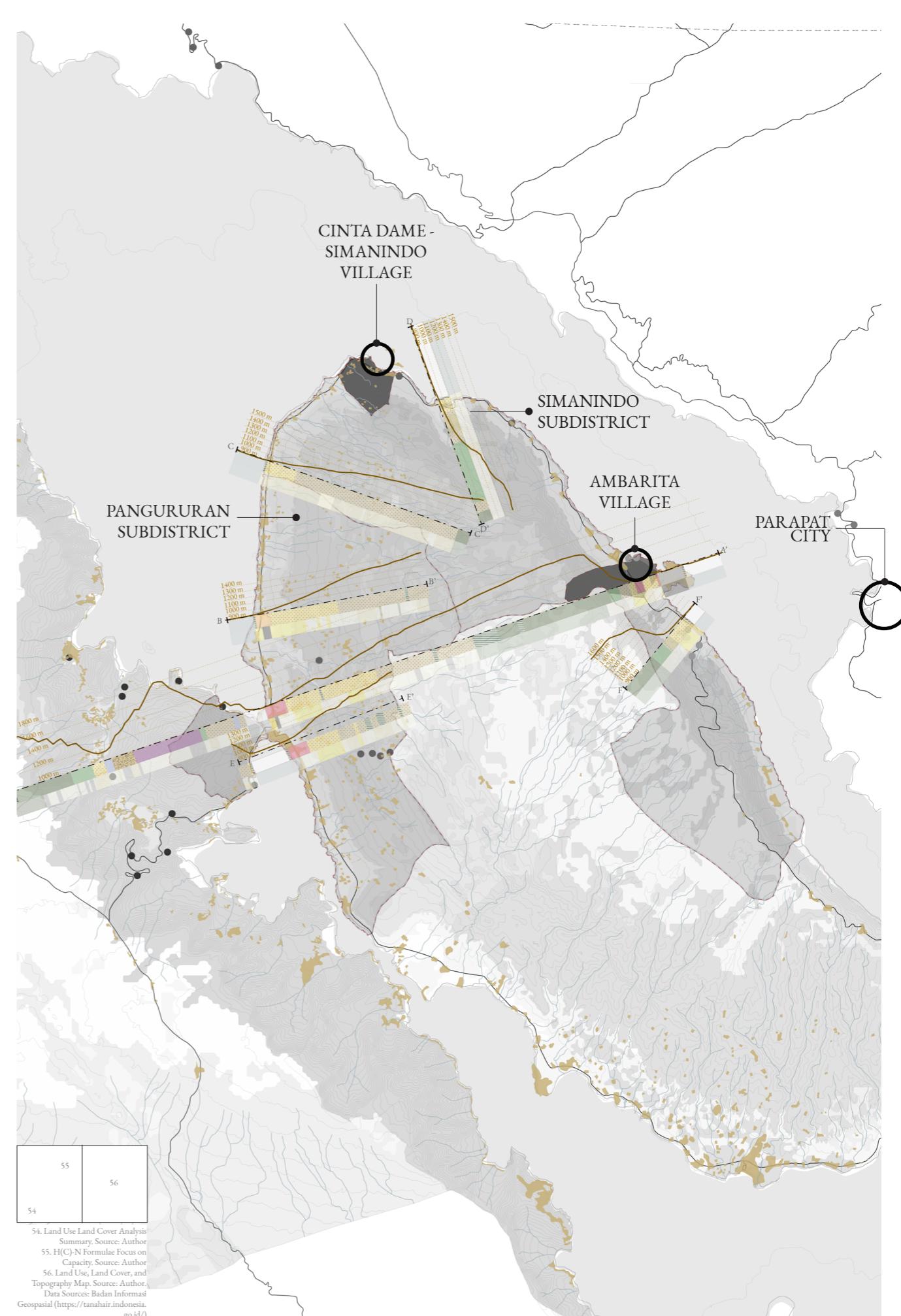
Land Use

- Registered Protected Forest
- Protected Forest
- Urban Forest
- Agroforestry
- Green Belt
- Agropolitan
- Plantation
- Agriculture
- Livestock
- Tourism Area
- Cultural Heritage
- Water Catchment Area
- Village
- City
- Kawasan Air Panas

Land Cover

- Primary Dry Forest
- Secondary Dry Forest
- Plantation Forest
- Shrubs
- Open Land
- Plantation Field
- Dryland Agriculture
- Dryland Agriculture with Shrubs
- Wetland Agriculture

Settlement

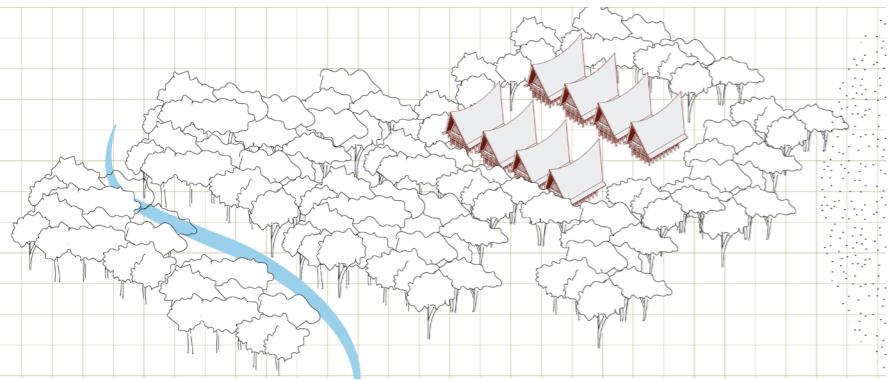


5.1.2. Understanding Vernacular Landscape

Introduction

Deconstruction of systems in multiscalar is needed to depict systems and their criticality (Davoudi, 2013). The defined systems will unveil adaptation potentialities to achieve dynamic synchronization that grasps local consideration, such as cohabitation, and generate systemic expansion. Referring to Chapter 4 analysis, the Batak community has the historical character of their settlements spread in the past: avoiding river lines to have less exposure to other family clans (image XXXX). Hence, starting from this historical concept, the development patterns are deconstructed through a lower scale analysis on four transects on the four most critical areas with different characteristics (sacred, trading, tourism-1 and tourism-2) located on different topography types (high and medium slope).

The elaboration on four areas is on the following pages and divided into general analysis and landscape analysis. First, the general analysis aims to depict the development characters and tourism development potentiality by the interrelationship analysis of land use type (cultural heritage, urban, and tourism), geosites points, location proximation, port existence and tourism plan programs. This analysis is done through a critical research method supported by GIS mapping, Integrated Tourism Master Plan (ITMP) Lake Toba 2020 critical reading, and Google Maps observation. Second, through transect deconstruction by sketching on satellite drawing from Google Maps, Landscape analysis depicts cultural history influences on landscape morphology with categorization of settlement, production, and natural preservation patterns.



96



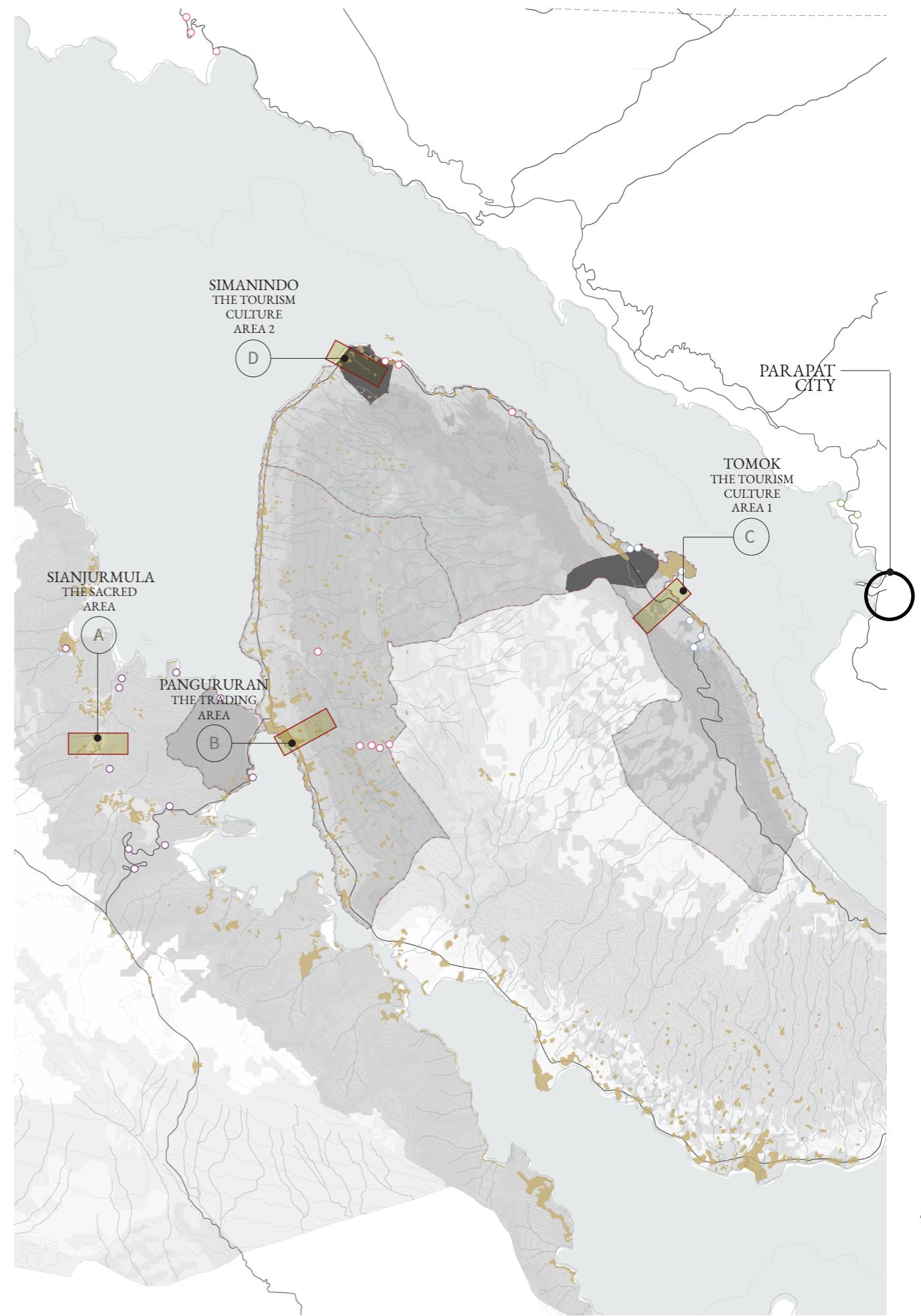
57. The Avoidance of Huta Cluster from Riverline. Source: Author
58. Critical Transects Selections. Source: Author. Data Source: RTRW Kabupaten Samosir (2020)

Base Map
 — River
 — Contour
 — Toll Road
 — Artery Road
 — Local Road
 ■ Water (Lake)
 ■ Settlements Area

Tourism Nodes
 ○ Geo Diversity
 ○ Culture Diversity
 ○ Bio Diversity
 ○ View Point

Slopes (degree)
 □ 0-2
 □ 2-8
 □ 8-15
 □ 15-25
 □ 25-45
 ■ >45

0 5 km
N

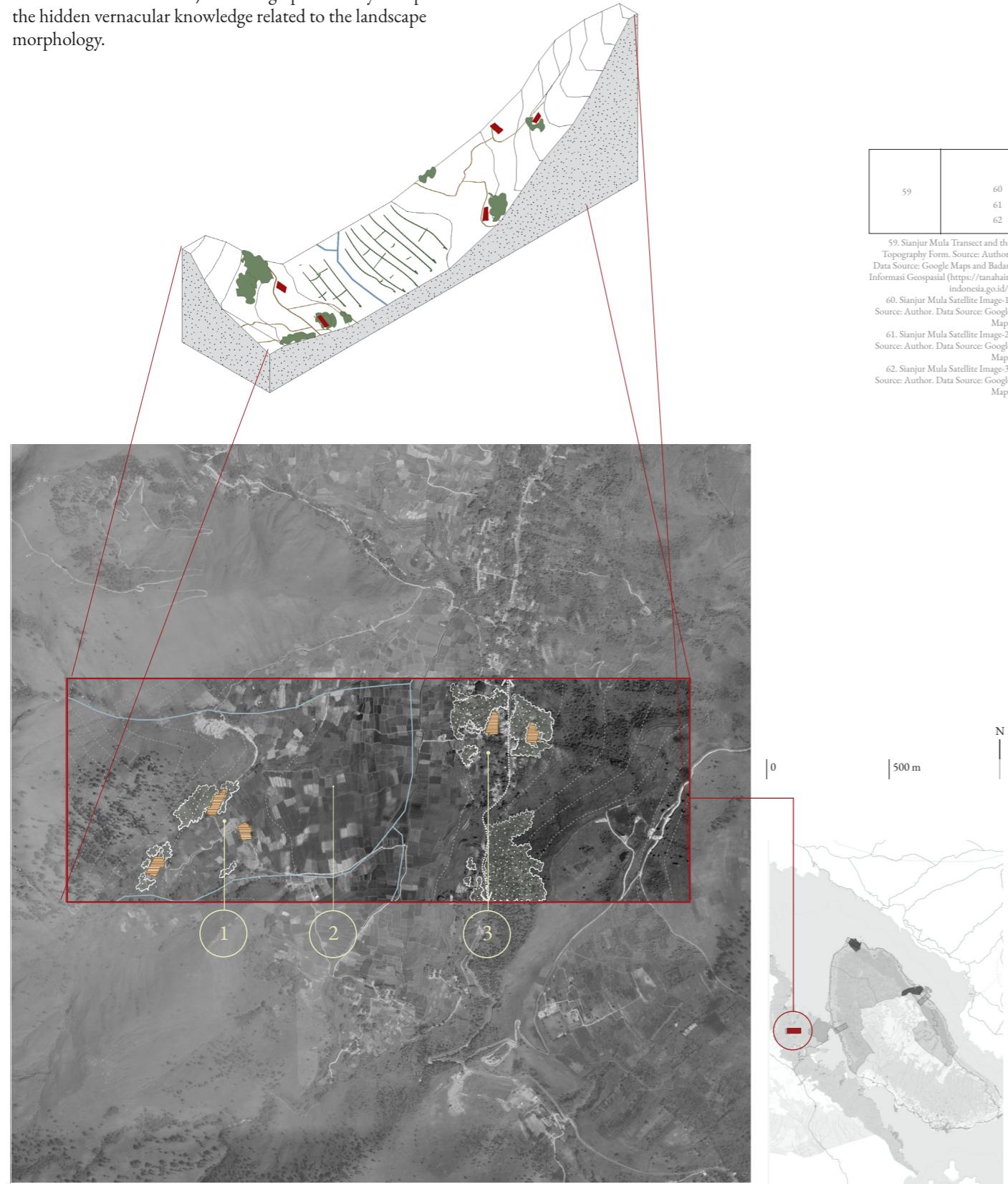


97

5.1.2. Understanding Vernacular Landscape

A. SIANJUR MULA - THE SACRED AREA

The belief of this area as the origin's makes Sianjur Mula prominent to be elaborated. The contour also depicts nature exquisites that illustrates the main tendency of Batak community manage their lands by using the foothill as their settlements location and the flat land as agriculture area. Moreover, the relatively stagnant development due to the topography (extreme contour) and low accessibility (hidden behind moutain and hills) makes high potentiality to expose the hidden vernacular knowledge related to the landscape morphology.



/General Analysis
>Topography
High slope ($>15^\circ$)

>Activity Characteristic: Sacred Area
- based on cultural heritage land use and its close approximation to Pusuk Buhit Mountain (the origins of Batak community)

>Accessibility: Low
- 95.6 km from Silangit Airport or 2.5 hours by car
- 65.1 km from Parapat City or 2.0 hours by car and ferry (port of Tomok-Parapat)

>Tourism Plan Priority: Low priority, part of KWU Pangururan Tourism Development Plan (based on ITMP Lake Toba 2020)

Findings:

1. Development characters: the growth is relatively stagnant due to its accessibility
2. Tourism development potentiality: relatively high because of its historical values with constrain of accessibility

/Landscape Analysis

1. Settlement

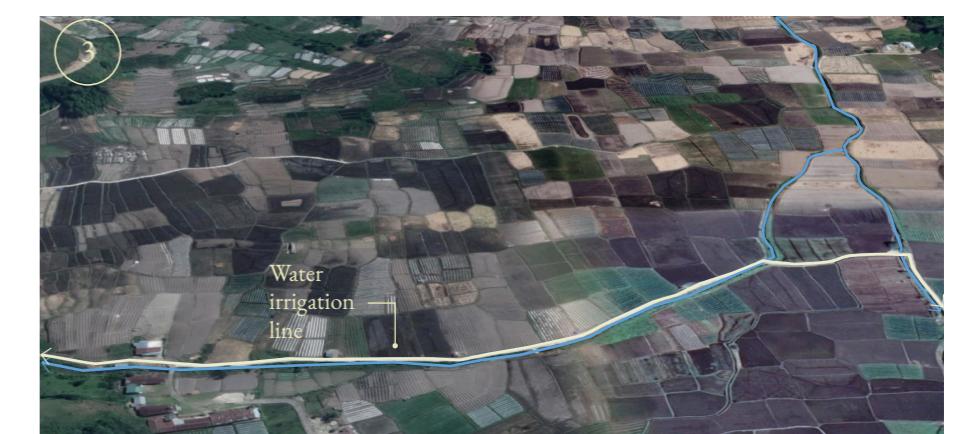
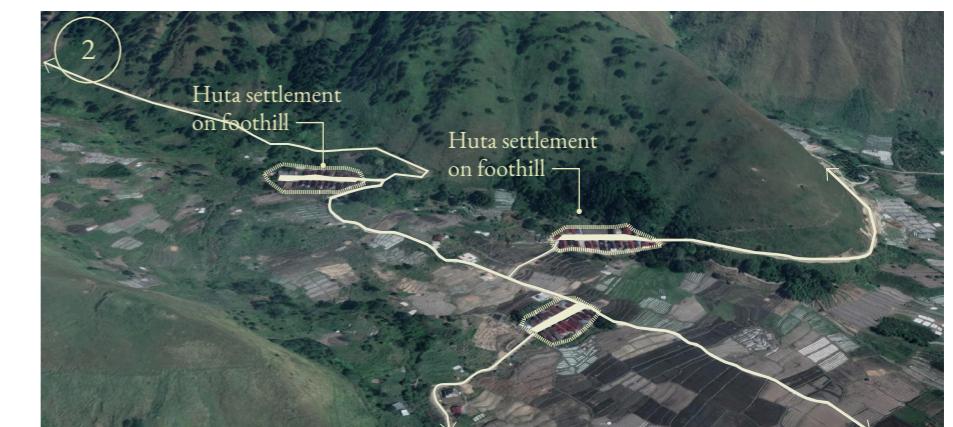
Huta settlements in sacred area are spreaded on foothill (image 61) and its building orientation is by following the mountain orientation (image 60). Thus, huta settlement in this area can be considered still preserving its traditional form that is indicated by trees cluster surrounding Huta (image 60). Moreover, the fabric of the settlement in the area close to the Pusuk Buhit foothill (Image 60) also indicates that the base of main road development is the existing huta locations.

2. Production

The land for production is depending on the close approximation with Huta settlement and located on the flat contour (image 60). The water system is by irrigation extracting from rivers. The lines of irrigation follow road infrastructure line. In addition, agriculture patches adapt riverlines, with rectangle shape with its longer side in parallel with riverline (image 61).

3. Nature Preservation

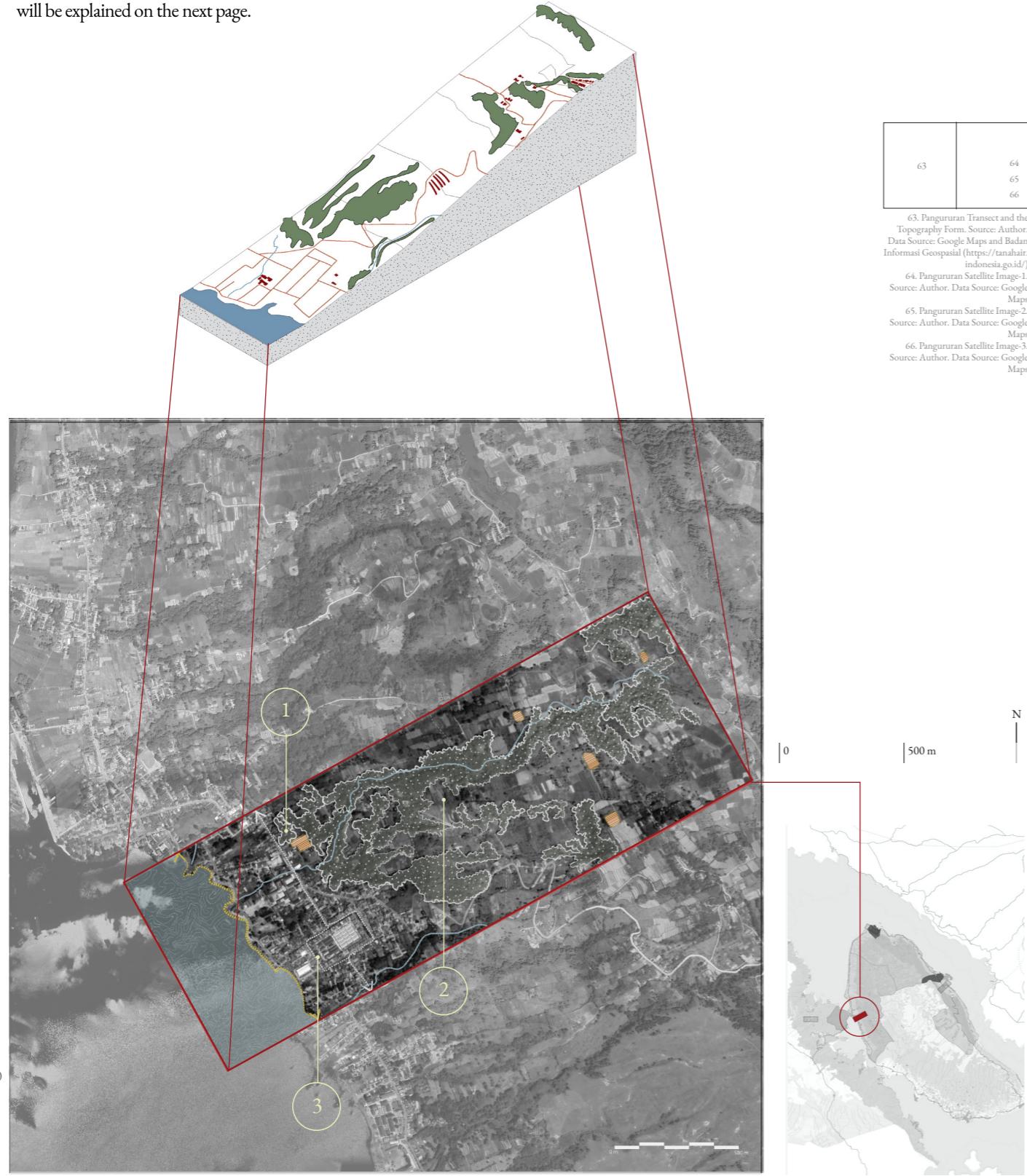
The dependency of nature can be seen from the road lines from Huta settlement to the uphill (image 62). The riverlines captured in the image 62 are in the lowest contour than its surrounding but have no vegetations to restore ground water and it may causes critical on land.



5.1.2. Understanding Vernacular Landscape

B. PANGURURAN - THE TRADING AREA

This area is perceived as trading area due to the existence of Pasar Pangururan (Pangururan Market) that act as the main market of Samosir Island. Moreover, this area also is relatively close to the Batak community origin's place: Pusuk Buhit Mountain. As a result, the settlement in this area is categorised as the most developed comparing to other areas. In this trading area, the contour is medium slope (10°-15°). Thus resulting most of the areas are converted into human's space: settlements and agriculture area. Other detailed landscape elements will be explained on the next page.



/General Analysis

>Topography
Medium slope (10°-15°)

>Activity Characteristic: Trading Area Sacred Area

- based on urban land use and the existence of Pasar Pangururan (Samosir Island's main public market) within the area

>Accessibility: Low

- 93.5 km from Silangit Airport or 2.25 hours by car
- 50.2 km from Parapat City or 1.75 hours by car and ferry (port of Tomok-Parapat)

>Tourism Plan Priority: Main priority, part of KWU Pangururan Tourism Development Plan (based on ITMP Lake Toba 2020)

Findings:

1. Development characters: the growth is relatively high because of its accessibility (port) and historically become the trading centre.
2. Tourism development potentiality: relatively high because of some tourism attractions on highland areas.

/Landscape Analysis

1. Settlement

Image 64 shows the aerial perspective of Pangururan area. The yellow lines indicate main roads and the yellow dashed line represent Huta cluster. From this, it can be understand that urban expansion was uncontrolled with orientation of main road and expanded to the coastline following agriculture field line geometry. In the huta settlement, the existence traditional architecture also has diminished and replaced by the new ones.

2. Production

Dryland agriculture practices still happened on the contour higher than main road. In addition, clusters of residual forest still existed in harmony with dryland agriculture patches (image 65). Besides, economic activity mainly happened here by the presence of Pangururan market (image 66). By analysing the urban morphology, it can be understand that the market has strong integration to the port on the coastline. Moreover, this 1.8 Ha market is assumedly used to be Onan or the public spaces for trading activity in the past.

3. Preservation

By observing image 65 and image 66, it translates that the continuity of green corridors of residual forest is disconnected by the urban expansion as the existence of the forest mainly lost in the area between main road and coastline. Resulting to the unpreservation of some area of riverplain within the urbanized part.



5.1.2. Understanding Vernacular Landscape

C. TOMOK - THE TOURISM AREA

Tomok village is an important location due to a ferry port that connects Parapat City, the urbanized city in the Lake Toba region. The distance is only about 30 minutes by ferry. Moreover, the topography form at this village is very high ($>15^\circ$). Thus, the way people managed their land is similar to that in Sianjur Mula Village that they built their Huta clusters along the foothills, and the flatland is used for agriculture fields. The only difference is that the Huta also spread close to the coastline, and it is similar to the analysis in Chapter 4 that the spread of Batak people followed the coastline.



/General Analysis

>Topography
High slope ($>15^\circ$)

>Activity Characteristic: Tourism Area

- based on the existence of Hutabolon Batak Museum and Batu Hoda YTT Sediment Geosite within the area

>Accessibility: High

- 27.0 km from Sibisa Airport or 1.00 hour by car and ferry (port of Tomok-Parapat)
- 8.8 km from Parapat City or 0.50 hours by car and ferry (port of Tomok-Parapat)
- Close approximation to port of Tomok-Parapat (8.8 km)

>Tourism Plan Priority: High priority, part of KWU Simanindo Tourism Development Plan (based on ITMP Lake Toba 2020)

Findings:

1. Development characters: the growth is relatively high because of its close proximation to developed tourism area of Tuktuk, Parapat City and airport and high accessibility (port).
2. Tourism development potentiality: relatively high because of its high accessibility

/Landscape Analysis

1. Settlement

In image 68 indicates the spread of Huta settlements are close to the coastline. After the built of main road infrastructure, urban expansion had orientation to the main road line causing ribbon development. Some traditional housings are still preserved within a Huta cluster.

2. Production

In image 69, dryland agriculture dominates the production land. There are also several parts of wetland agriculture along the coastline. The dryland agriculture in this area is using rain-water harvesting system while the wetland is by extracting water from the lake.

3. Preservation

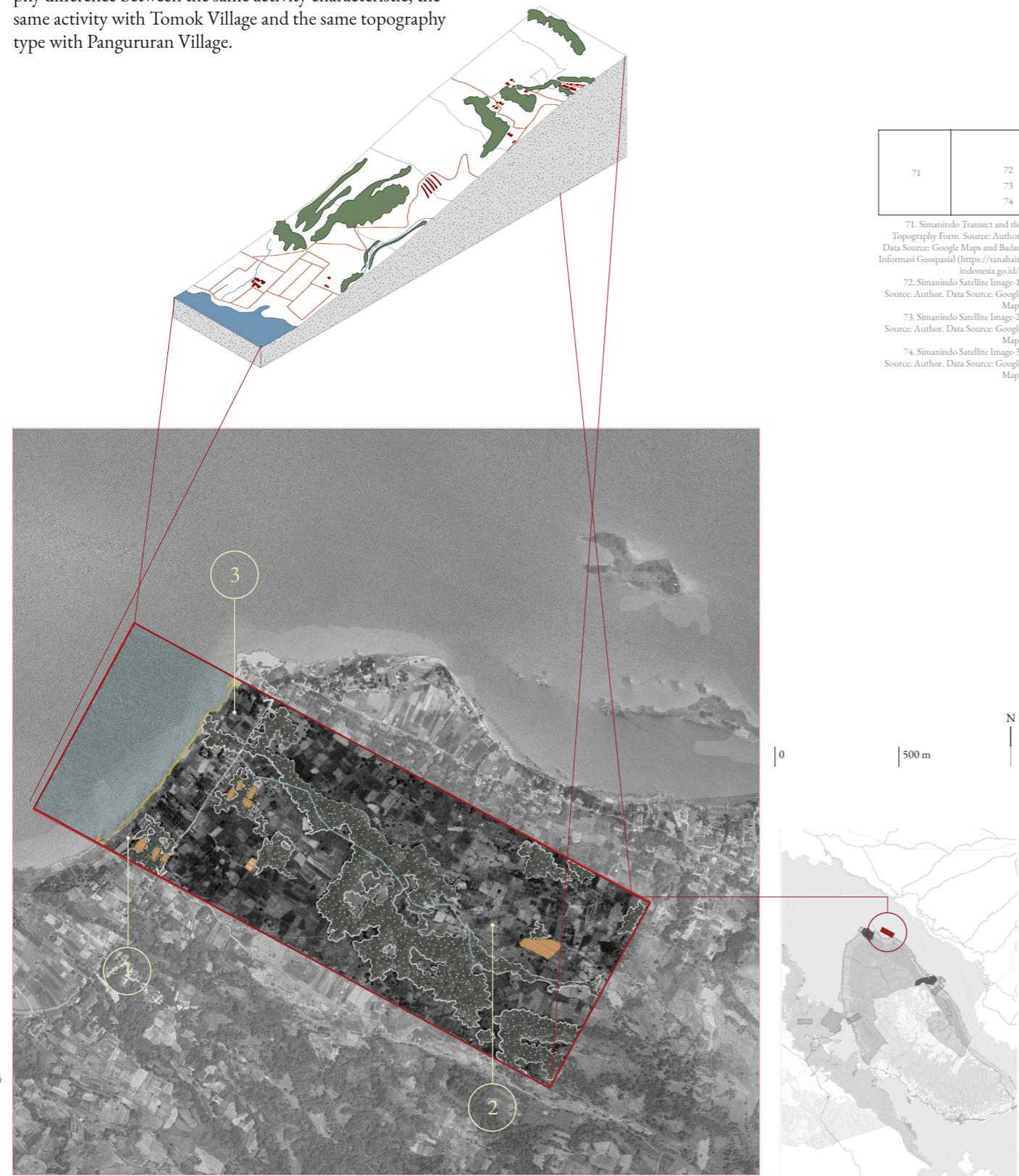
Residual forest corridors are still exist connecting coastline and foothill despite main of the land already converted into agriculture area (image 69). In addition, trees vegetation along the foothill are still preserved for land erosion prevention (image 70).



5.1.2. Understanding Vernacular Landscape

D. SIMANINDO - THE TOURISM AREA

Simanindo area has a port that connects Samosir Island to Sumatra Island through Tigaras port. This area also has a Hutabolon Batak Museum and Batu Hoda YTT Sediment Geosite, which is projected to become the main tourism area in the north part of Samosir but the second priority after the Ambarita-Tomok-Tuktuk region within the Tourism Priority Area of Simanindo. Another argument in selecting this area to be elaborated is to unveil the topography difference between the same activity characteristic, the same activity with Tomok Village and the same topography type with Pangururan Village.



/General Analysis

>Topography
Medium slope (10°-15°)

>Activity Characteristic: Tourism Area
- based on Hutabolon Batak Museum and Batu Hoda YTT Sediment Geosite within the area

>Accessibility: High
- 178.7 km from Medan or 4.5 hours by car and ferry (Port of Tigaras-Simanindo)
- 44.3 km from Sibisa Airport or 1.75 hours by car and ferry (port of Tomok-Parapat)
- 30.5 km from Parapat City or 1.00 hour by car and ferry (port of Tomok-Parapat)
- Close approximation to port of Tigaras-Simanindo (2.1 km)

>Tourism Plan Priority: Low priority, part of KWU Simanindo Tourism Development Plan (based on ITMP Lake Toba 2020)

Findings:

1. Development characters: the growth is relatively medium-high because of its connectivity to other important areas but not in close proximation with developed areas.
2. Tourism development potentiality: medium-high because of its priority on tourism master plan but existing development pace is still one step behind Tuk-Tuk/Tomok/Ambarita areas.

/Landscape Analysis

1. Settlement

Image 72 indicates the spread of Huta settlements are close to the coastline. After the built of main road infrastructure, urban expansion had orientation to the main road line causing ribbon development, despite the expansion is less vigorous comparing to Tomok region. Some traditional housings are still preserved within a Huta cluster.

2. Production

In image 73, dryland agriculture dominates the production land. Most of the land in the high contour are converted into dryland agriculture despite the number of huta settlement is low. This shows that dryland agriculture is still suitable for medium slope (10°-15°). There are also several parts of wetland agriculture along the coastline (image 74).

3. Preservation

The green corridors of residual forest continuously preserve the riverlines from high land to the lowest part (estuary). The lowest part still preserved mainly because wetland agriculture has interdependency system with this green corridors to expand their landscape performance (image 74).



5.1.2. Understanding Vernacular Landscape

Conclusion

Analysis from this sub-chapter shows that the vernacular landscape indicates three main patterns that define the continuity of nature replicated along the north part of Samosir Island. First, residual forests or unmanaged areas build vertical continuity for the vernacular landscape from the highland to the coastline. However, in some developed areas, built elements (buildings, streets, agriculture) caused disconnections on this landscape continuity that may disrupt climatic equilibrium.

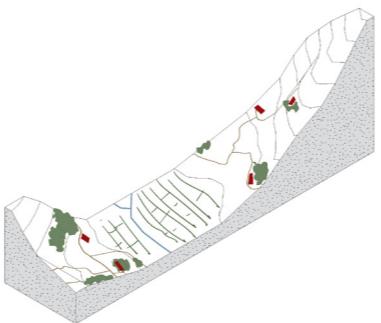
Second, the spread of Huta settlements are located on three areas, which are on the foot-hill areas (within the sacred area and tourism culture area-1), dispersed on medium slope areas (trading and tourism culture area-2), and areas close to the coastline (all areas except the sacred area). The Huta cluster conditions vary depending on the level of development (developed or undeveloped), resulting in differences in expansion and traditional housing preservation levels. These Huta locations and condition differences are important to identify stakeholders and approach strategies in different specific areas.

Third, mapping analysis implies that Huta cluster and production areas are integrated due to the close location approximation, and some Huta clusters on the lowland have areas for backyard farms. The existence of residual forest can perceive the integration of preservation to the settlement and production areas to promote agriculture quality. Thus, it can be understood that the management of agri-

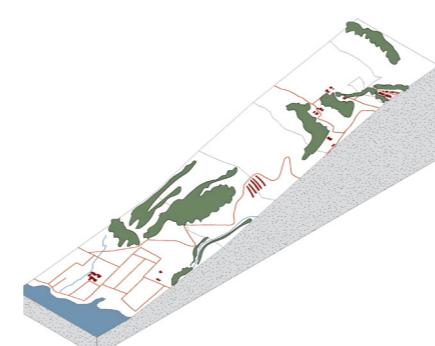
culture, plantation and residual forest areas depends on the nearby Huta cluster.

To conclude, recognizing the patterns of vernacular landscape is highly encouraged within the tourism planning to grasp performative landscape systems that has been embedded over the history. Moreover, the analysis of different phase of development shows expansion tendencies in Samosir Island. It is shown through the trading area analysis that shows uncontrolled ribbon development resulting nature's continuity disconnection by urban development. Therefore, future tourism development also need to put high consideration on this systemic expansion.

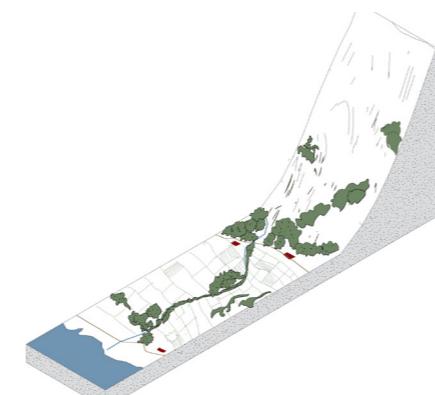
Topography



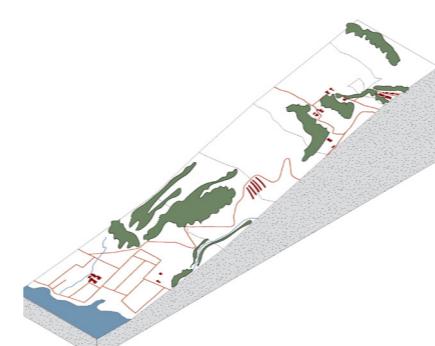
Type 1



Type 2

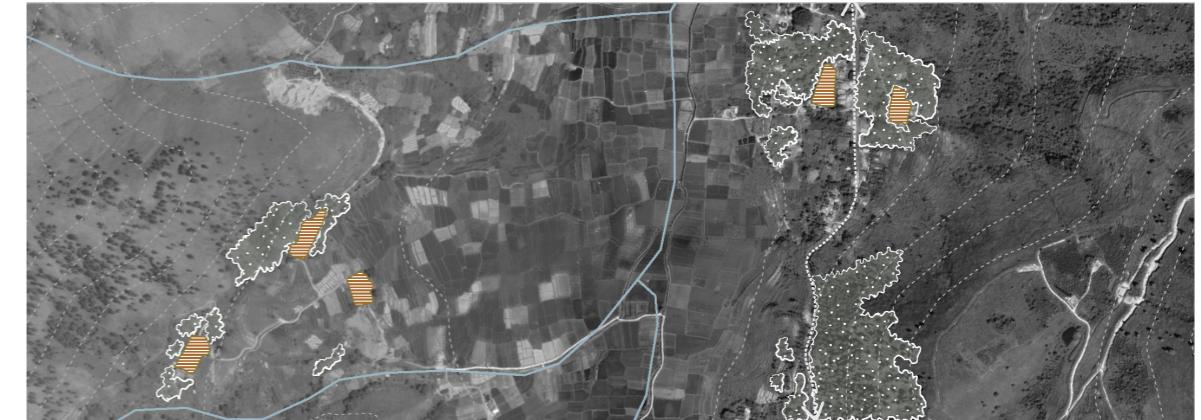


Type 3

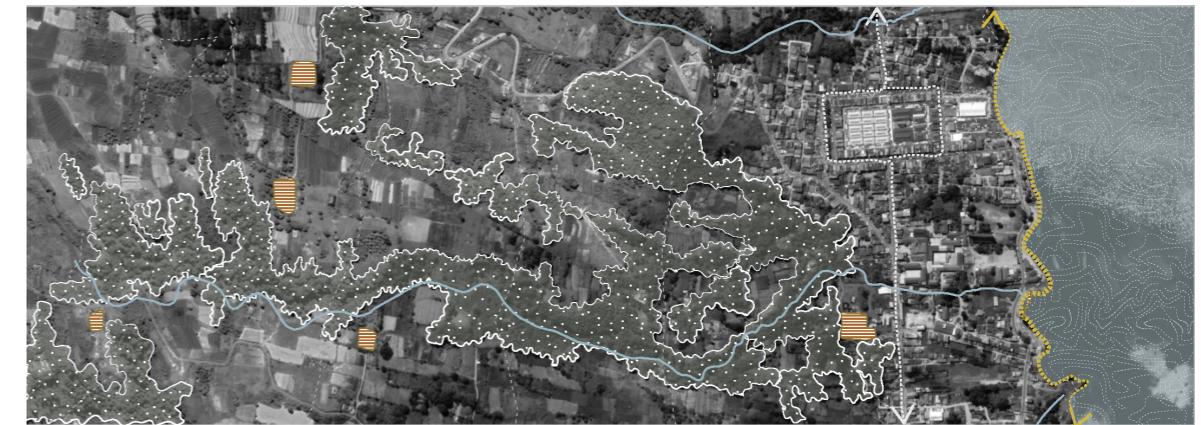


Type 2

Transect Analysis



A. The Sacred Area



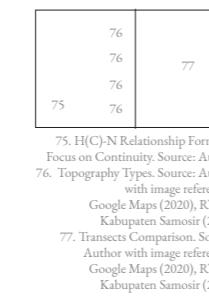
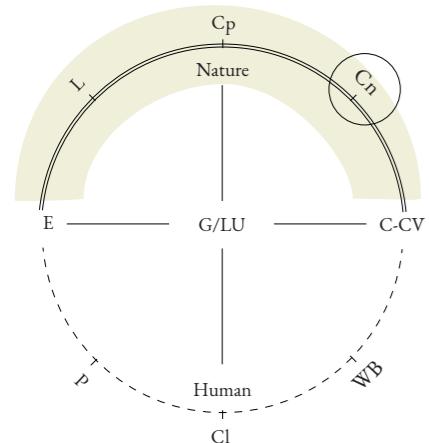
B. Trading Area



C. Tourism Culture Area 1



D. Tourism Culture Area 2

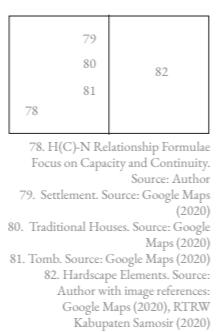
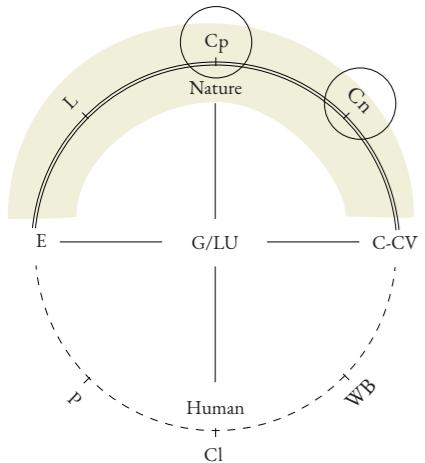


5.1.3. Understanding Hardscape Elements

Examining built environment can give reflection on socio-economic conditions of an area. Referring to the historical analysis in Chapter 4, coastline and main road are two main development orientations. In the past, the alternative occupation of Batak people and their capacity became the background of coastline oriented development. In the present, the built main road alters development orientation due to its function as the main infrastructure of human mobilization. However, the coastline and its capacity of spatial quality due to Toba Lake make its influence the development orientation still exist.

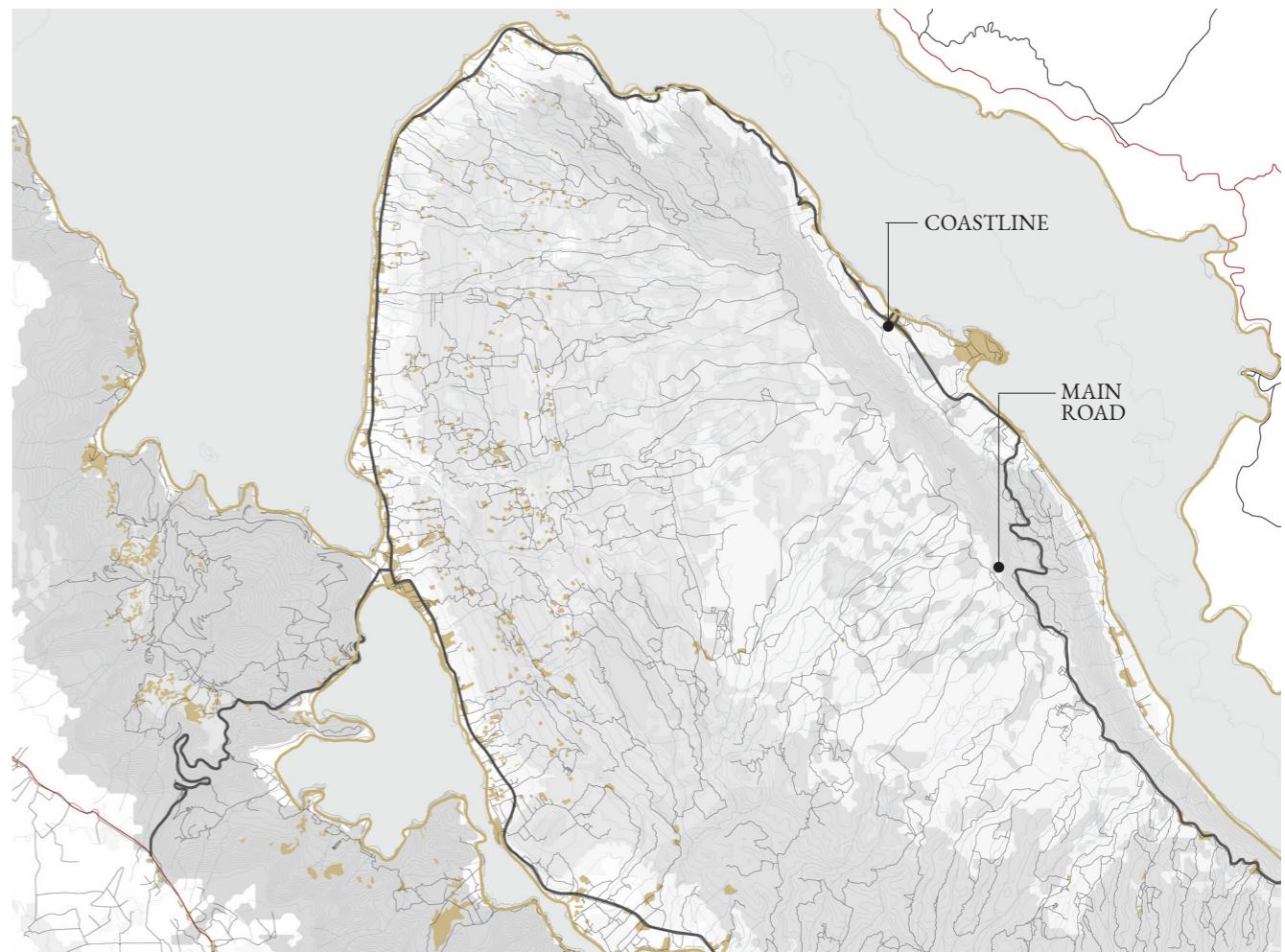
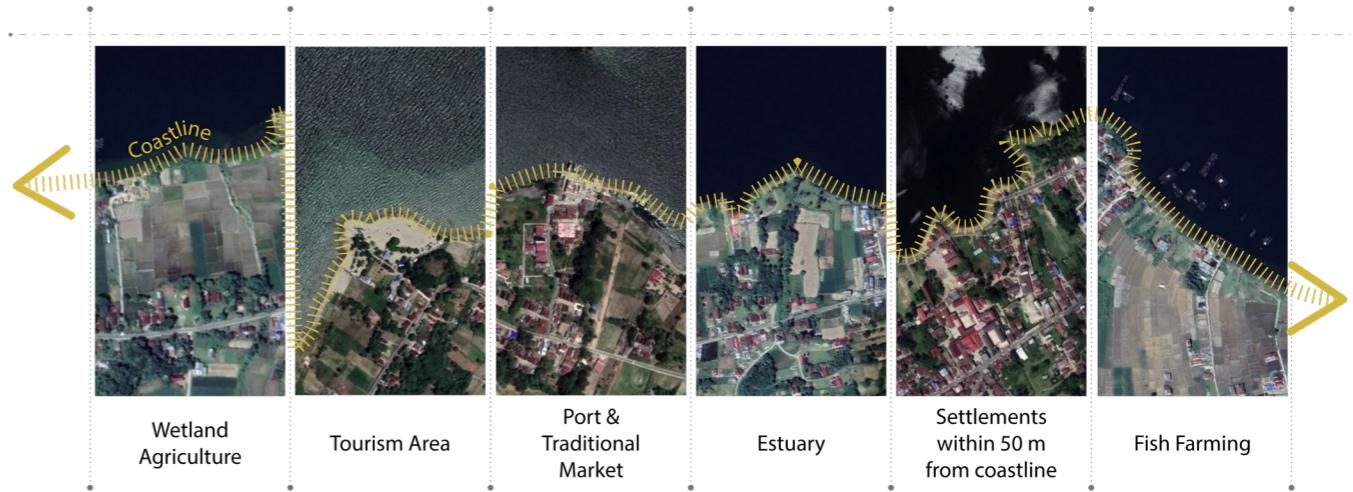
By examining Google maps with satellite layer, built and non-built elements developed along the coastline, and the main road can be classified into several categories (image 82). On the coastline, the elements are wetland agriculture, tourism area, port and traditional market, estuary, settlement within 50 m from the coastline, and fish farming. On the main road, the elements are: urban settlement (image 81), public amenity, agriculture area, small forest, cultural nodes or tombs (image 79), and adapted Huta that is indicated by traditional housing (image 80). Then, it can be referred that housing provision and economy accommodation are the main background of coastline and main road development expansion.

In the future, it can be projected that tourism has these two main lines as their orientation for built development and mobility infrastructure. All elements defined can also be projected to accommodate tourism function by implementing adaptive and multifunctionality values with benefits of maximizing existing potentials in terms of buildings and cooperation of the owners.



78. H(C)-N Relationship Formulae
Focus on Capacity and Continuity.
Source: Author
79. Settlement. Source: Google Maps
(2020)
80. Traditional Houses. Source: Google
Maps (2020)
81. Tomb. Source: Google Maps (2020)
82. Hardscape Elements. Source:
Author with image references:
Google Maps (2020), RTRW
Kabupaten Samosir (2020)

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0 5 km N
109



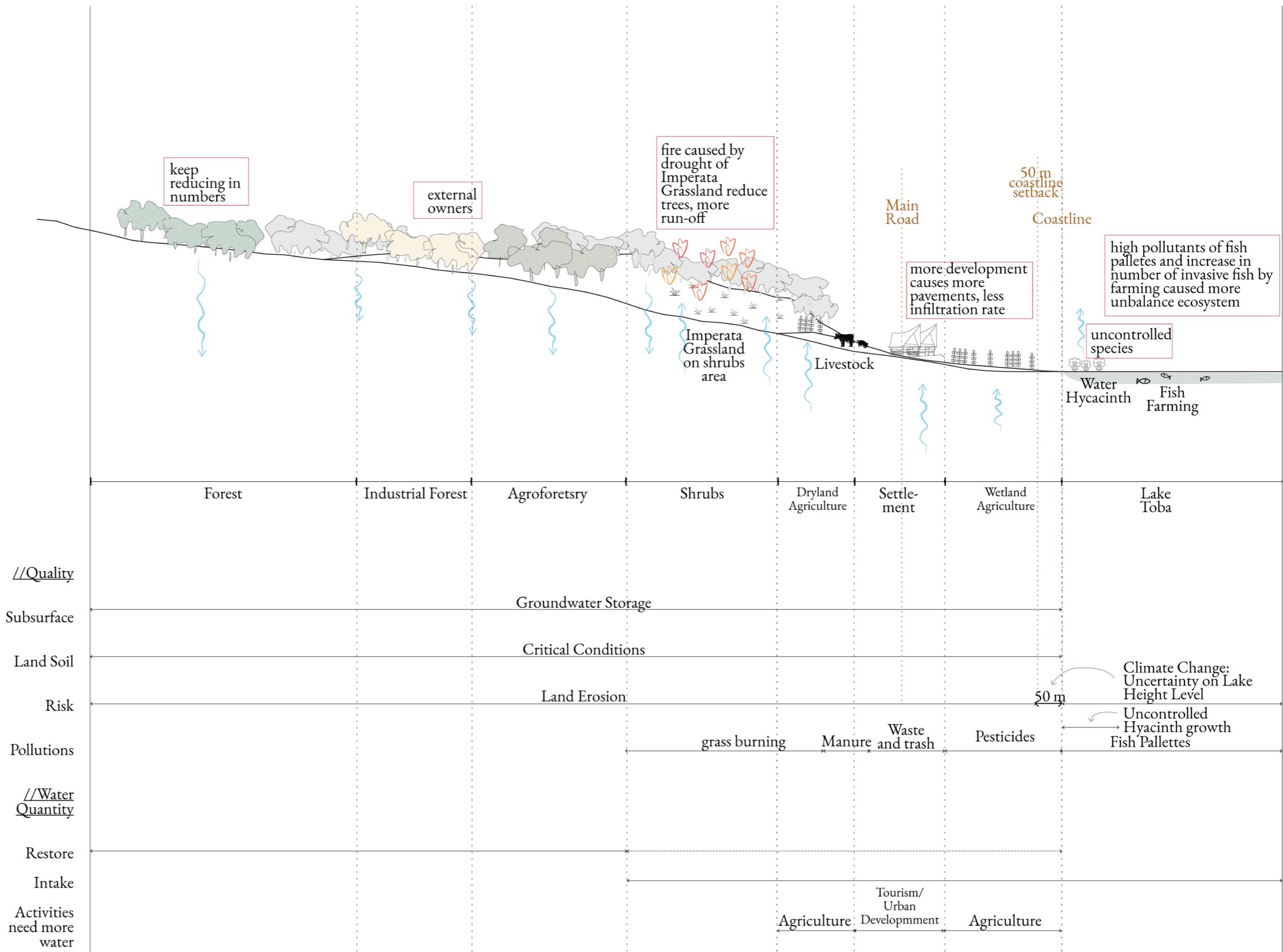
5.1.4. Biophysical Risk and Vulnerability

These are vertical continuity of nature's system that is illustrated through image 84. The sub-systems are forest, industrial forest, agroforestry, shrubs, dryland agriculture or plantation, settlement, wetland agriculture, and lake toba. In each sub-systems, potentialities of risk and vulnerability are important to be considered by future planning. In the illustration, three main vertical lines of main road, coastline, and setback of coastline define the hardscape. And, in the horizontal part, the upstream downstream is classified into eight elements of land use: forest (preserved and not preserved), industrial forest, agroforestry, shrubs, dryland agriculture, settlements area, wetland agriculture, and the Lake Toba. Below the illustration, a table shows soil and water quality and risks both existing and potential.

The first part explains soil and water quality. It can be understood that groundwater storage exists in the subsurface layer, and the soil condition is in critical conditions (ITMP Lake Toba, 2020). In addition, the risks of land erosion (ITMP Lake Toba, 2020) and unpredictable lake height levels due to climate change (Arjuna, 2013) also need to be considered. Furthermore, some existing and potential pollutions of grass burning (Jablonski, 1933), manure, waste, pesticides, fish pellets (World Bank Group, 2018), and water hyacinth uncontrolled growth (Arjuna, 2013) are the other things that need to be recognised.

Next, the second part explains about water quantity balance along the section. It shows that water restore mainly happens in the upstream area, and water intake mostly occurs in the downstream area. However, the potential of further downstream water extraction due to tourism development may increase its quantity. Furthermore, it happens due to unsustainable water management in the downstream area that may cause degradation in the quality of rivers and estuary that will eventually influence lake Toba water quality.

In conclusion, all the risk and vulnerability potential explained reveal the limit of nature systems and sub-systems. Thus, re-envisioning of nature's capacity and continuity are needed in order to re-establish robust dynamic system that, in this case, is aligned with future tourism development plan.



5.1.5. Biophysical System Transect

After defining capacities, continuities, and limits of each sub-system and also by reflecting on the dependency of people to nature that is depicted in Chapter 4, it shows that landscape is perceived as infrastructure to accommodate the delivery of elements that eventually extracted as services for human. The continuity on its morphology allows the performance on working in integration. And the limit is indicated through its minimum performance due to disturbance that caused inability to restore or to connect. Therefore, a main biophysical system and its sub-systems are formulated.

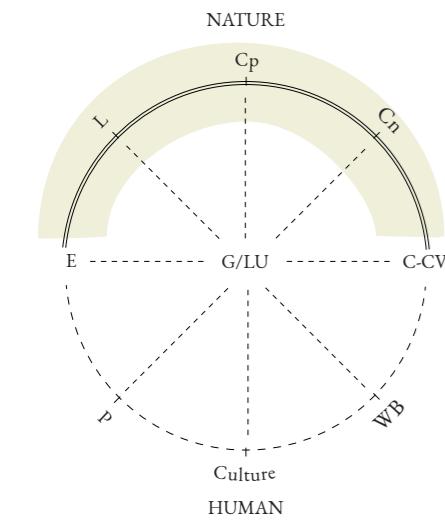
The main biophysical system transect represents the dynamic landscape system of the northern part of Samosir Island as it is replicated over the northern part. Within the main biophysical system, hardscapes and softscapes sub-systems are defined and working synergically. The softscape is consisted of residual forest, shrub, and river line. And, hardscape is consisted of main and local road, and coastline. Each sub-system underlying specific nature's capacity, continuity, and limit synergistically aligned with other sub-systems. Then, these defined biophysical system and sub-systems become the main basis of design projection that grasp evolutionary of integrated biophysical systems aligned with the tourism master plan.

The residual forest sub-system

The main importance of forest is its capacity on giving ecosystem services (provisioning, regulating, cultural, and supporting) for humans. Moreover, the landscape morphology of residual forest shows vernacular landscape continuity from highland to lowland and also indicates historical characters of Samosir Island. However, the challenges of this sub-system is that the number of forest area has high tendency to decrease to accommodate other human activities.

The shrubs sub-system

Tackling on imperata grassland species becomes the main challenge in the shrubs sub-system. The characteristics of Imperata grassland are highly water absorbent, prone to burn, invasive, preventing land erosion on slope areas. These characteristics cause this species to be beneficial for preventing land erosion but cause unproductive land (because it absorbs more water than other farm vegetation species) and fires due to fire expansion. Possible solution on facing the harms caused by this species is by converting imperata grassland to agroforestry areas



to increase productivity, preventing fires, and increase biomass storage while also able to preventing land erosion (Jablonski, 1933).

The riverline sub-system

River conditions define the capacity of the river to give services for human activity such as agriculture and housing settlements. By referring the analysis in sub-chapter 5.1.2., some areas are failed to preserve the quality of riverline system especially on the estuary part caused by settlement development. Besides, the challenge of pollution and climate change may potentially influence the quality and quantity of rivers that eventually impact on the Lake Toba water quality.

The main road and local road sub-system

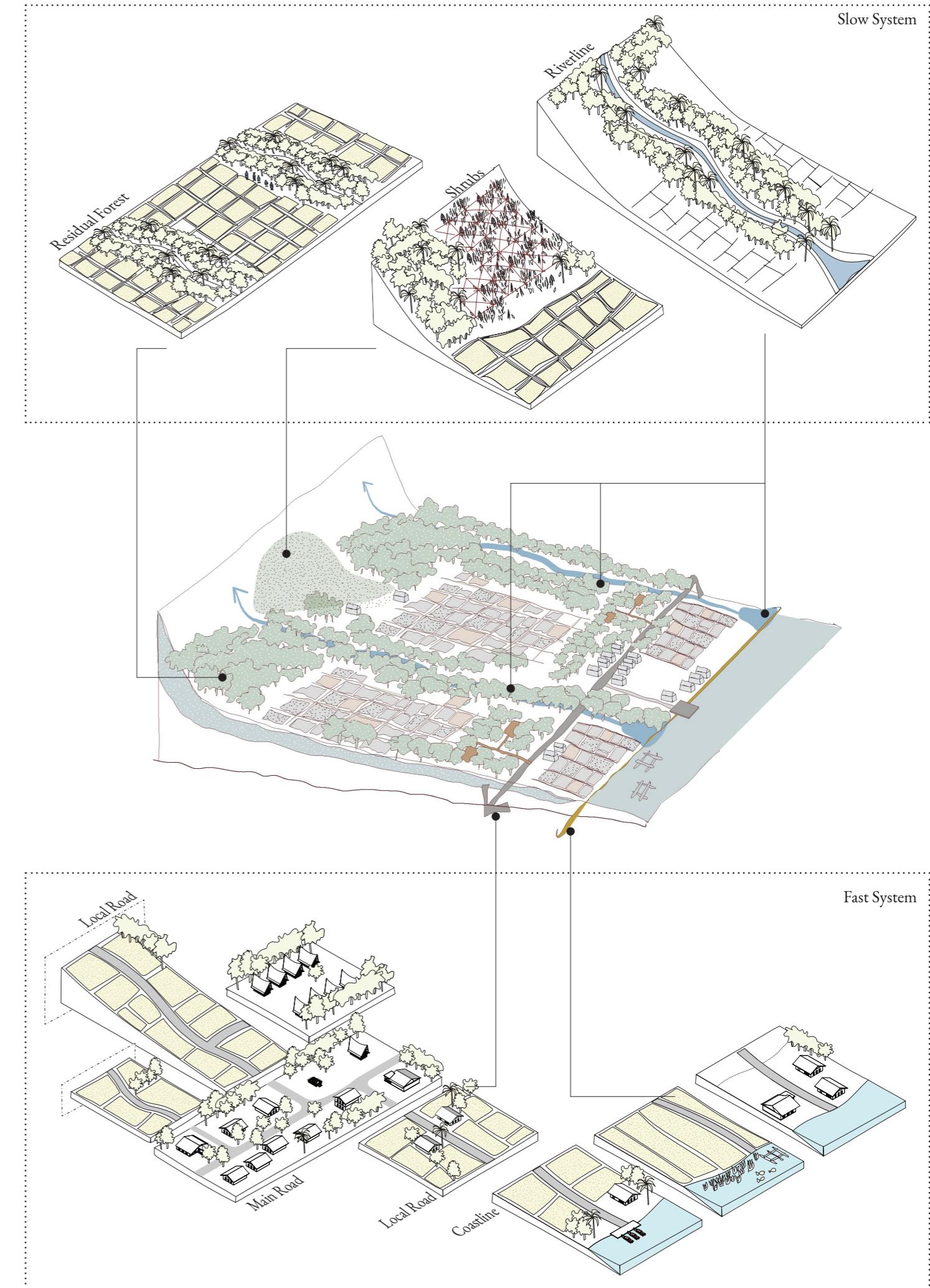
The main road is the main built environment that becomes development orientation. Integrating this sub-system to the holistic biophysical system can anticipate landscape performance disconnection due to uncontrollable urban expansion. In addition, local roads act as the expansion of the main road to connects destination nodes. Therefore, prior planning of this local road can anticipate uncontrollable urban expansion of tourism development that may harm local people privacy.

Coastline sub-system

The sub-system of the coastline is highly prominent due to the high tendency of expansion along this line and the provided capacity from the coastline that covers provisioning, regulating, supporting, and cultural services. The main issues are the settlements within 50 metres from coastline and unsustainable management of fish farming and wetland agriculture that may cause degradation on coastline and Toba Lake water quality. Thus, future sustainable tourism can be implemented through the integration of existing issues and potential capacities.

The Interrelationship

Managing challenges of each sub-system will enhance biophysical system performance and thus creating ecological resiliency. However, the existence of hardscape in current biophysical system is imposing the softscape continuity that eventually decreasing performative landscape. Thus, intertwining softscape element in the hardscape systems is highly encouraged to allow more cohesiveness to the landscape performance.



85. H(C)-N Relationship Formulae
Focus on Biophysical Integration.
Source: Author
86. Biophysical Systems and Sub-
Systems. Source: Author

5.2. Present Conditions: Socio-Economic System Deconstruction

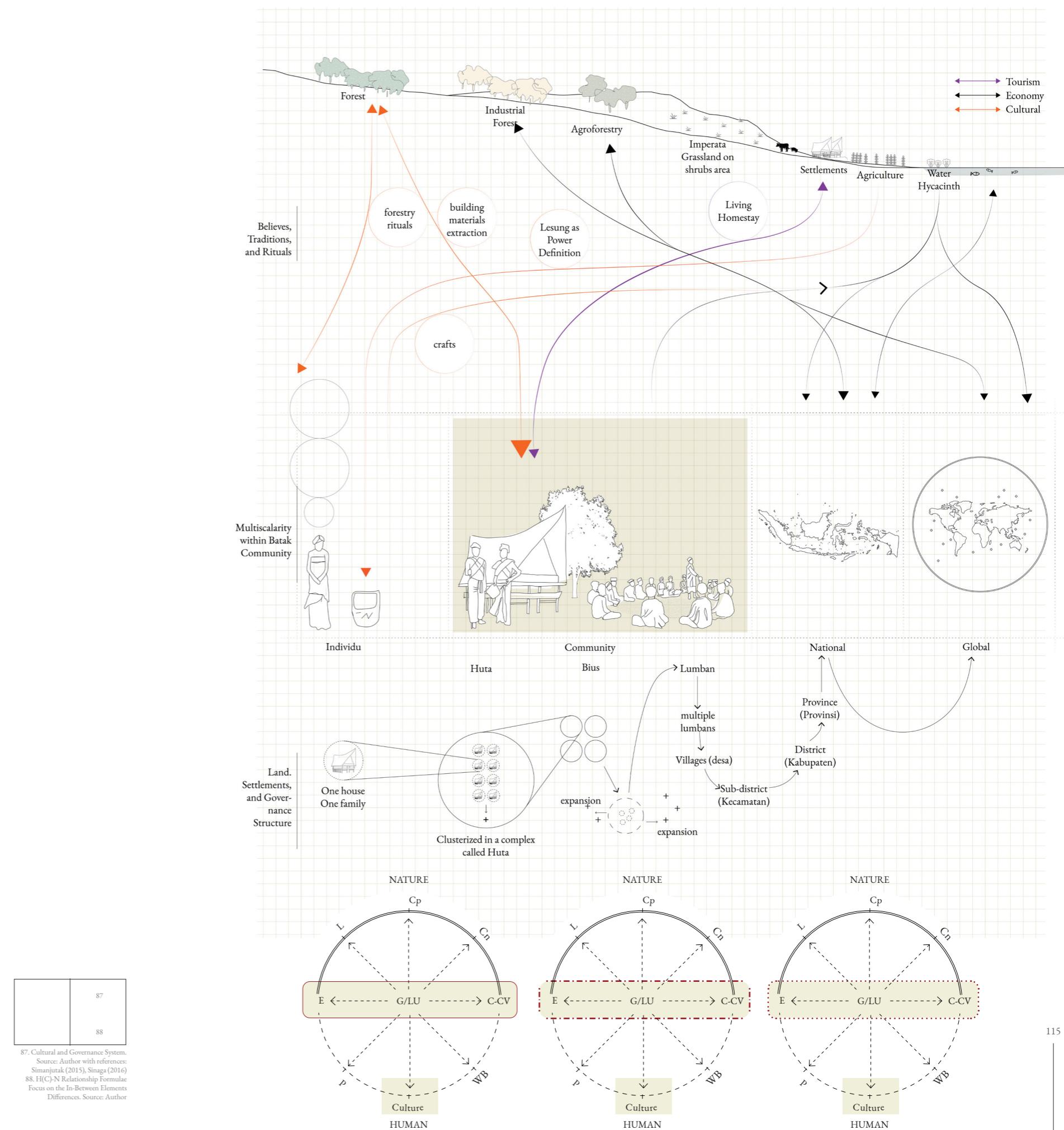
5.2.1. Cultural and Governance System

The image represents the interrelationship between landscape performance continuity, the multi level of stakeholders, and the traditional land settlements and the diverse governance systems. The main notions that can be depicted are, from the scale of individual to community, the traditional customs are still embedded and shown by their relationship to nature and their way of settling. For example, for making their houses, the Batak traditional houses, Batak people need to extract building materials such as wood, boards, and fibres by doing some ritual processes (Simanjutak, 2015) (Sinaga, 2016). In addition, the use of Lesung, a tool for rice pounding, as power and wealth definition due to making it need a huge amount of money that only can be afforded by wealthy Raja Huta and using it can produce more rice that will be sold and eventually achieving more income.

On the other hand, when it comes to the higher governance scale, starting from community to the global, economy become the main orientation and the main driver in determining land-use change. For example, in this case, agriculture, industrial forest, and fish farming will benefit regional and national economic growth. Thus, the tendency of land-use change to accommodate these economic sectors is inevitable. However, on higher scales, traditions and rituals are also not prominent. Then, the tendency of land-use change will be oriented on mainly economic development.

Moreover, the centralized governance system on a national and global scale may cause frictions on the community scale in terms of multiple pressures (traditional and national pressures). This friction is because the value of community from individual and national levels is different, which may cause conflicts of different interests in future developments.

However, in the current situation, several Huta revitalization acts as a tourism development program shows that benefits that work in two directions (from community to individual and community to global) are possible. By this program, individuals can still preserve their identity and strengths in preserving the nature that sustains their well-being and potentially increases economic growth through tourism sectors on the regional and national scales. Therefore, the community scale is projected to be significantly impactful in every scale, whether in cultural identity, economic, and sustainability values. Thus, adaptation of transformation of governance and land use system with orientation of community scale may has biggest potentials to overcome potential friction on multiscale of governance system. This projection is also supported by the fact that the Batak community put their values the most within the same family clan.



5.2.2. Land Ownership System

The Batak community perceives land as a space for production or settlement and a family clan's identity. Handing over land is through family line inheritance or a gift that is given in marriage. In customary law, two land rights define ownership of lands. First is an individual right that an individual owns inherited through a gift or inheritance. The second is a collective right. Thus, a person can own the land, and he/she can own the product from the land, but if the owner leaves the land, the land will be returned to collective ownership. This land law of collective ownership is called "Golat law", and individual land ownership is generally not acknowledged in Batak land. Golat ownership of this land means that one father and one grandfather own it, so it will be difficult to certify in a personal name. If this law is forced, it will lead to sibling conflict or sasaompu conflict.

Individual properties in residential spaces include lots of houses, yards, fields around the surface. These spaces are managed, utilized, and assigned by an individual or an extended family. On the other hand, The collective properties include roads, village yards, cemeteries, meeting places, bathing banks, fences, and ditches. Properties that are owned by both individual and collective that are used, regulated, and accounted for collectively are rice fields and dry fields. However, public property cannot be inherited or transferred to individuals. Therefore, interests concerning these common places must be collectively discussed as they relate to community identity and part of the village common property.

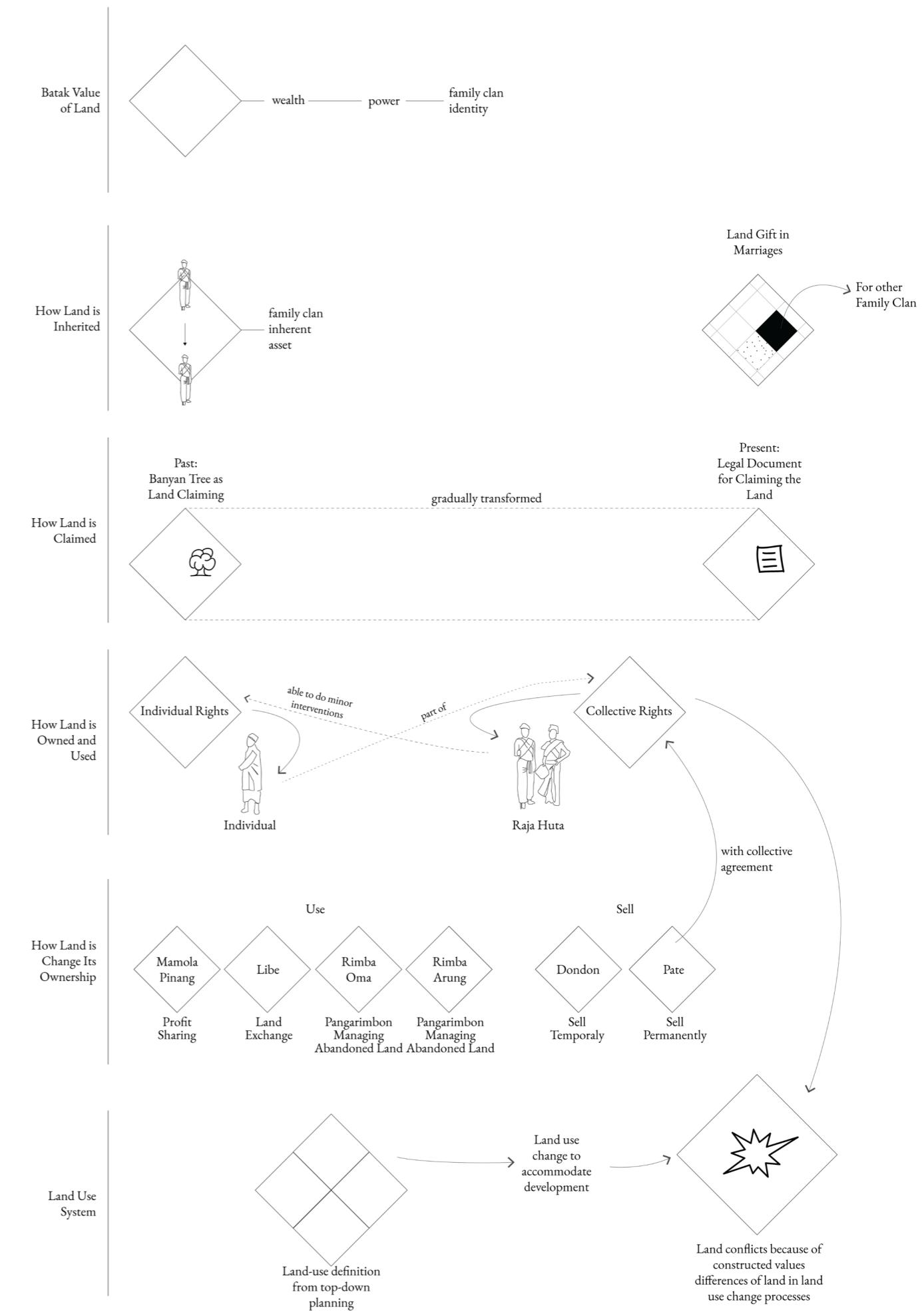
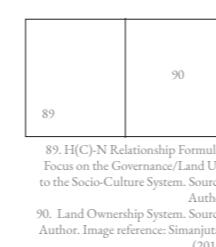
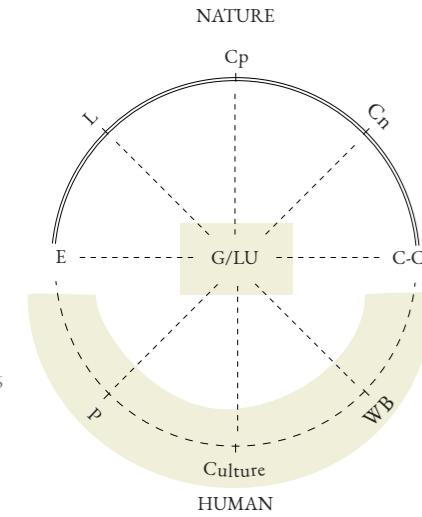
Moreover, several customary laws regulate how land is managed. The first is called "Mamola Pinang". This condition happens when the owner or the relatives of the owner of a large field cannot work on the field. As a result, they gave up their fields to be worked on by someone else with a profit-sharing system, and the size of the division in this system depends on the agreement they make. The second is called "Libe", field exchange. This exchange mainly happens because of the far distance between the owner's residence and his rice fields. The third is called

"Pangarimbon", or managing abandoned land, which is divided into "Rimba Oma" and "Rimba Arung". Rimba Oma means others (not the owner) manage abandoned land for 12 years, while Rimba Arung is for 18 years. After that, the land must be returned to the first owner.

Moreover, two laws determining land selling, which are "Dondon" and "Pate". Dondon is a land mortgage to get the money needed. It is carried out between fellow villagers, one extended family, or with other clans. The length of time can be years with a minimum of two years, depending on the ability of the borrower to repay the loan. Pate is the sale and purchase of rice fields permanently and can no longer be redeemed. The implementation is carried out in a traditional manner attended by relatives of both parties and neighbours who act as witnesses. Factors causing pate, rice fields that have been pawned in the form of Dondon cannot be redeemed, the landowners need cash for school or marriage, or the owners leave the village forever.

Land Use systems arranged by the national and regional planning give direction to future land-use change to accommodate tourism development. However, by comparing the different notions of land in the Batak community's perspective and from national and regional planning, potential conflicts have a high tendency to happen in claiming land in accommodating tourism development.

However, the potential conflict caused by different national and traditional governance systems may be potentially overcome by adapting customary law and local values in the tourism implementation. This adaptation will allow more collaboration potentials between external stakeholders and local people, in parallel with cultural identity preservation, sharing knowledge and prosperity promotion of local people that eventually achieve local resiliency.

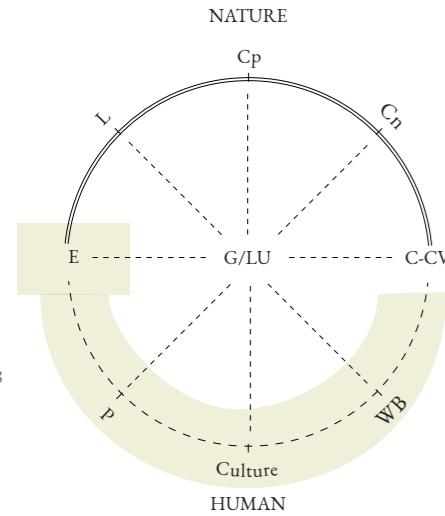


5.2.3. Socio-Economic Capacity

This chapter elaborates on socio-economic capacity and its challenge in future evolution along with tourism development. The evolution of the socio-economic capacity of the Batak community is represented by the graph below. The graph elaborates population, well-being, prosperity, job, daily cultural activity, and tourism exposure conditions. First, it is known that the population is relatively stagnant from independence to the present, and the high dependency rate being relatively high since 2007 (74%). The reason is that most young people migrate to the bigger cities to get higher education, while some go back to their hometown in elderly age (ITMP Lake Toba, 2020). Moreover, young adult residents with tourism backgrounds prefer to work in other regions such as Batam Island due to higher salary and this causing the need of imported tourism workers from other areas.

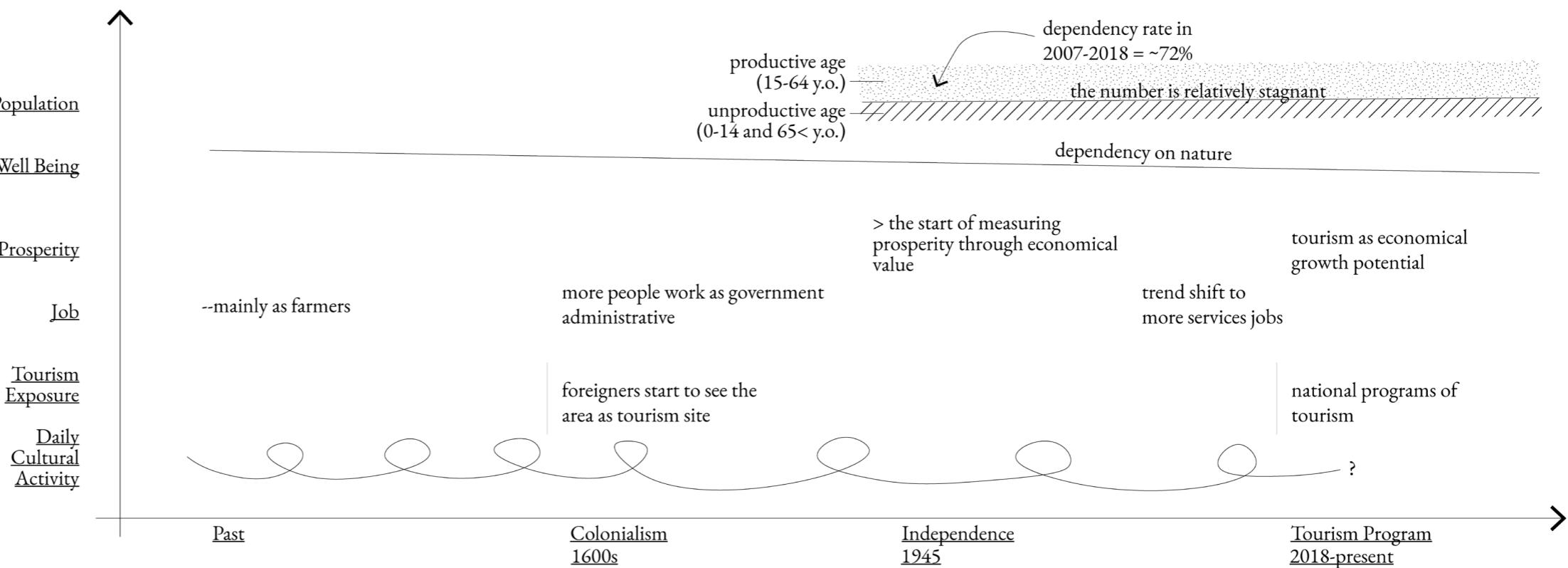
Next, the well-being of the Batak community is getting lessened over time. Well-being is linked with the community dependency on nature, and in today's conditions, nature capacity decreases as the forest percentage decrease. Thus, the need for an integrated management system for nature is encouraged (Saragih & Sunito, 2001). For the prosperity, since the independence era (1945-present), as the change of governance systems to national centralization, prosperity is defined through economical value not again measured in community-scale only. Furthermore, since the implementation of the new tourism program in 2018, the tourism sector has become the main focus.

Moreover, job sectors are also experiencing shifts. In the past, most people work as farmers. However, after the shifts of



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values influenced by education and religion brought in the colonialization era, more people recognized that government administrative work offered promising benefits. It gains more wealth and power by not following traditional customs. This shift was also adopted after Indonesia independence with some adjustments to the national needs. And after the globalization era, in between colonialization and the present, job trends altered to more services jobs.

For daily cultural activity, from the past until present still performed with some adjustment with today's culture. Some traditions and rituals that come from traditional culture are conducted, but some parts have been left. The concept of culture keeps evolving (Prominski, 2014) and influences from internal and external factors cause uncertainties in future culture. Knowing that tourism will be promoted in its development in the future, resulting in more exposure to diverse cultures brought by tourists. Also, territorial spaces do not limit external influence since today's society can pass through the dimension of virtual spaces by the internet.

These elaborations of population, well being, prosperity, job, tourism exposure, and daily cultural activity reveal several risks related to the socio-economic system such as cultural identity loss and prosperity reduction due to changes in occupation offers (mainly tourism-related) with less consideration of local potentials. And, eventually, cultural identity loss will result in a well-being reduction as the diminishing of interdependency between humans and nature. Therefore, in projecting robust socio-economic conditions, it needs to consider a new approach

to tourism occupation that is integrated with local identities to increase local well-being and prosperity in parallel with cultural preservation. For example, part-time occupation to give farmers/fish farmers additional income, tourism programs that are related to local activities, community capacity buildings and participation increase to give local's sense of belonging strengthened their identity, and new collaborative approaches of cultural preservation through technology and tourism programs.

91	92
91. H(C)-N Relationship Formulae Focus on the Socio-Culture System. Source: Author	

92. Socio-Economic Capacity. Source: Author. Image reference: Simanjutak (2015)

5.3. Present Conditions: Critical Assessment on Tourism Masterplan

The existence of biophysical and socio-economic systems define the identity and potentialities of the Batak community and their land. However, the economic focus of tourism development as a priority alters the governance system and land use that eventually causes changes in co-constructed values. Therefore, after deconstructing the tourism master plan through critical readings by focusing on the context of the biophysical and socio-economic system, critical assessment on the tourism master plan is classified into cultural values and biophysical integration.

Cultural Values

The integrated master plan elaborates diverse cultural assets embedded in Lake Toba's area, including traditional types, ceremonial, traditional textiles, foods, crafts, traditional architecture, artefacts, and many more. All cultural assets are listed and are projected to be tourism attractions for future tourism development. However, the clarity on these cultural values adaptations to the tourism planning, besides acting as tourism attraction assets, is still unspecific. As if the same that seeing cultural values as an "object", while it has high potential to act as a "subject".

However, the deconstruction of cultural values by the past to present and present H(C)-N relationship analysis shows underlying potentialities: locals interdependency to nature responsible for nature preservation and strong connections of Batak community with same core values that may act as the drivers. Moreover, traditional knowledge that acts as a local's identity may be adapted for tourism programs to promote the socio-economic conditions of local people.

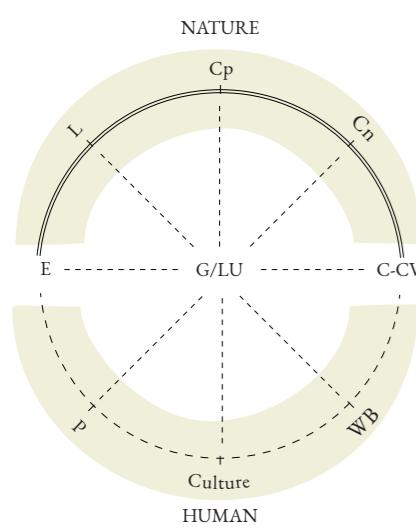
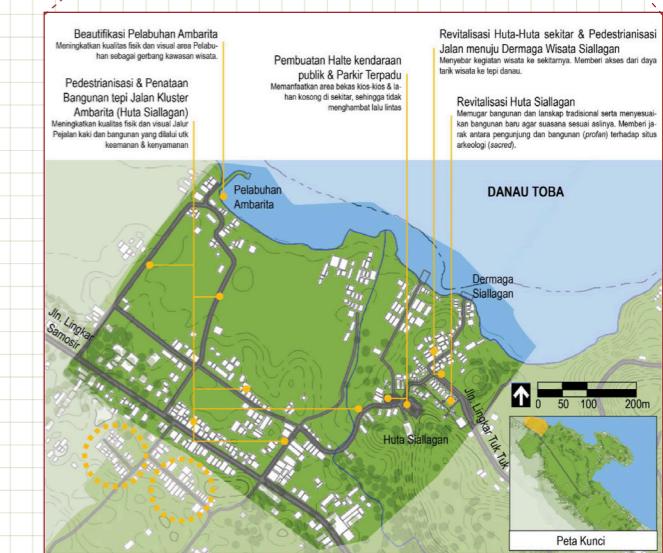
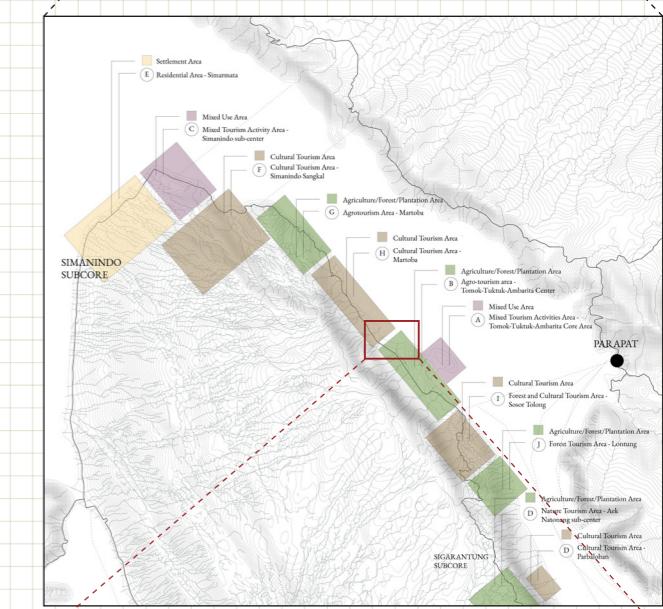
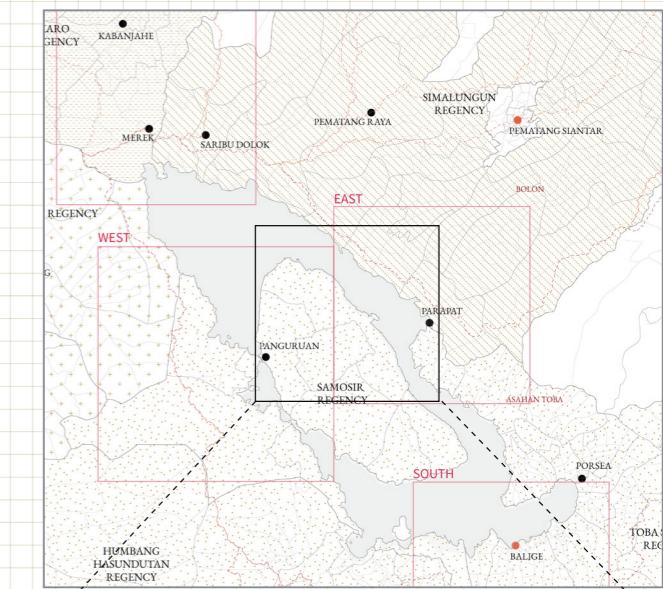
Biophysical Integration

Moreover, not only culture, nature becomes tourism assets for future Lake Toba tourism development. Therefore, many points of location with geosites, types of vegetation, and exquisite view-seeing are listed in the Integrated Tourism Master Plan. In addition, analyzing multiscalar interrelationship in the

master plan strategy shows that every scale points out mainly related to tourism programs. For example, on the macro scale, Samosir Island is part of two main tourism main priorities. In the mesoscale, each sub-district has a main theme potential that is projected through the master plan. And, on the micro-scale, all interventions are related to infrastructure development (public transportation, street, drainage, drinking water, waste management, electricity, and information system).

Referring to sub-chapter 5.1.5., biophysical systems and subsystems shows multiscale landscape performance capacities to overcome potential risks and vulnerabilities. Then, designing transformation adaptation of tourism masterplan by recognizing biophysical integration is encouraged due to its capacity in creating robust natural systems and socio-economic alignment.

Therefore, the proposal is to re-align the masterplan to project tourism programs as a tool for integrating biophysical and human culture systems in order to give socio-ecological resiliency to the Batak community and Samosir Island by re-thinking economy, governance / land use, and co-constructed values of systems.



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93. H(C)-N Relationship Formula
Focus on the Biophysical and Socio-Culture Systems. Source: Author
94. Critical Assessment on Tourism Masterplan. Source: Author. Image reference: ITMP (2020)

5.4. Multiscale Interrelationship

The evolutionary past to present human-culture relationship depicts vernacular knowledge and cultural systems mainly on the local scale. This evolution is framed through the existing landscape topography and land-use system on a macro scale. Next, after examining the correlation of vernacular knowledge to the lower scale of micro-scale, specific capacity, continuity, and limit of the biophysical system is formulated. In addition, critical analysis of

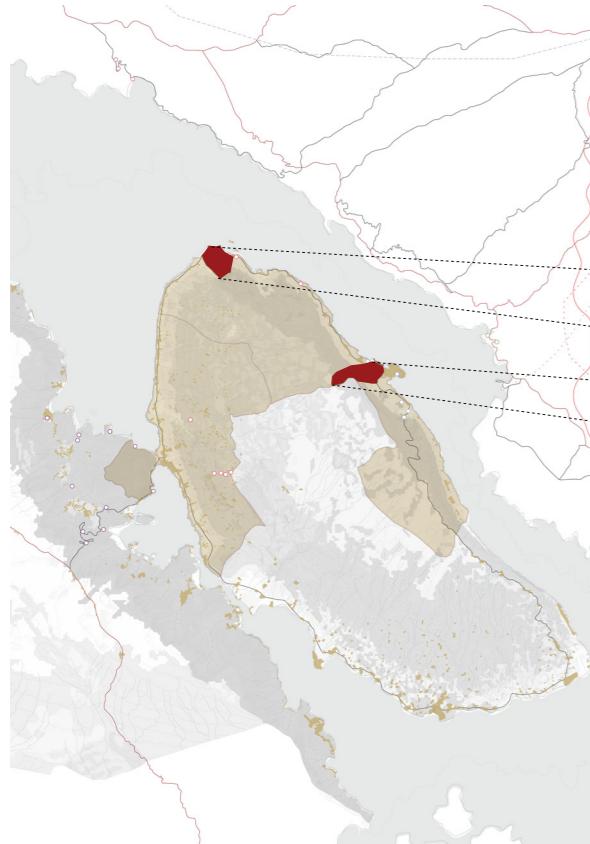
the interrelationship of landscape system aligned with cultural values that determine the land management system exposed potentialities to overcome the existing challenge of land tenure conflicts and spatial justice. Then, the question is how to align the depicted biophysical and socio-cultural system to the tourism master plan to promote evolutionary socio-ecological resiliency?

A design exploration within two study locations of Ambarita Village and the crossing border of Cinta Dame and Simanindo Villages will be focused on mesoscale through two transects. The exploration will begin with transformation kit construction, the intertwinement strategy between systems, and be finalized with design simulation in the real practices by defined assumptions. At last, an evaluation framework will be assessed to improve the

performance of this multiscalar tourism proposal. Therefore, by this design exploration, it can reveal the potentialities of local adaptation that will enhance dynamic systemic equilibrium.

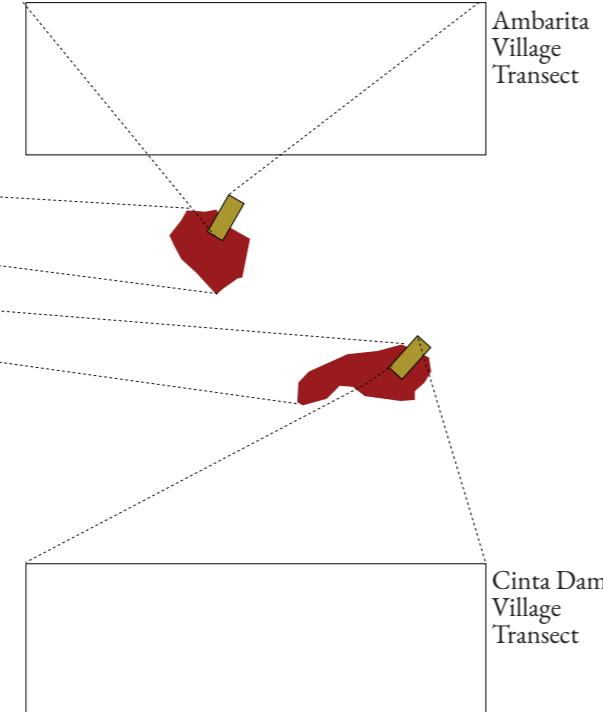
Macro

Sub-district of Simanindo and Pangururan in Samosir Island



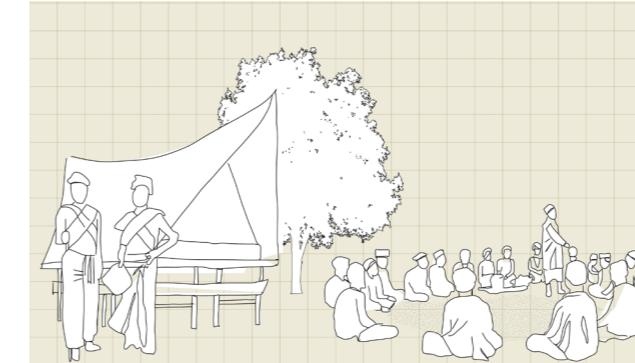
Meso

Comparison of Ambarita and Cinta Dame - Simanindo Villages Through Transects



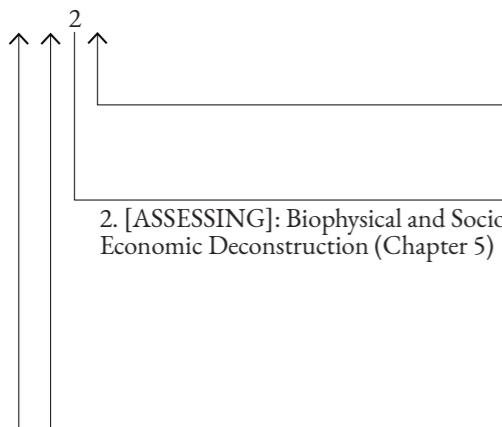
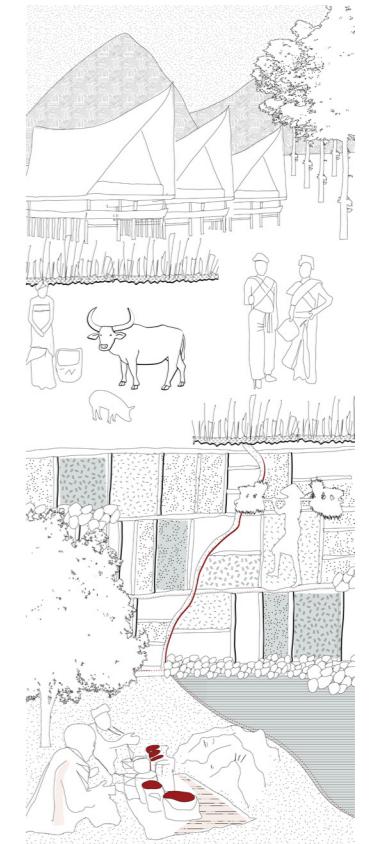
Micro

Biophysical and socioculture system



Nano

Human and Nature Interactions



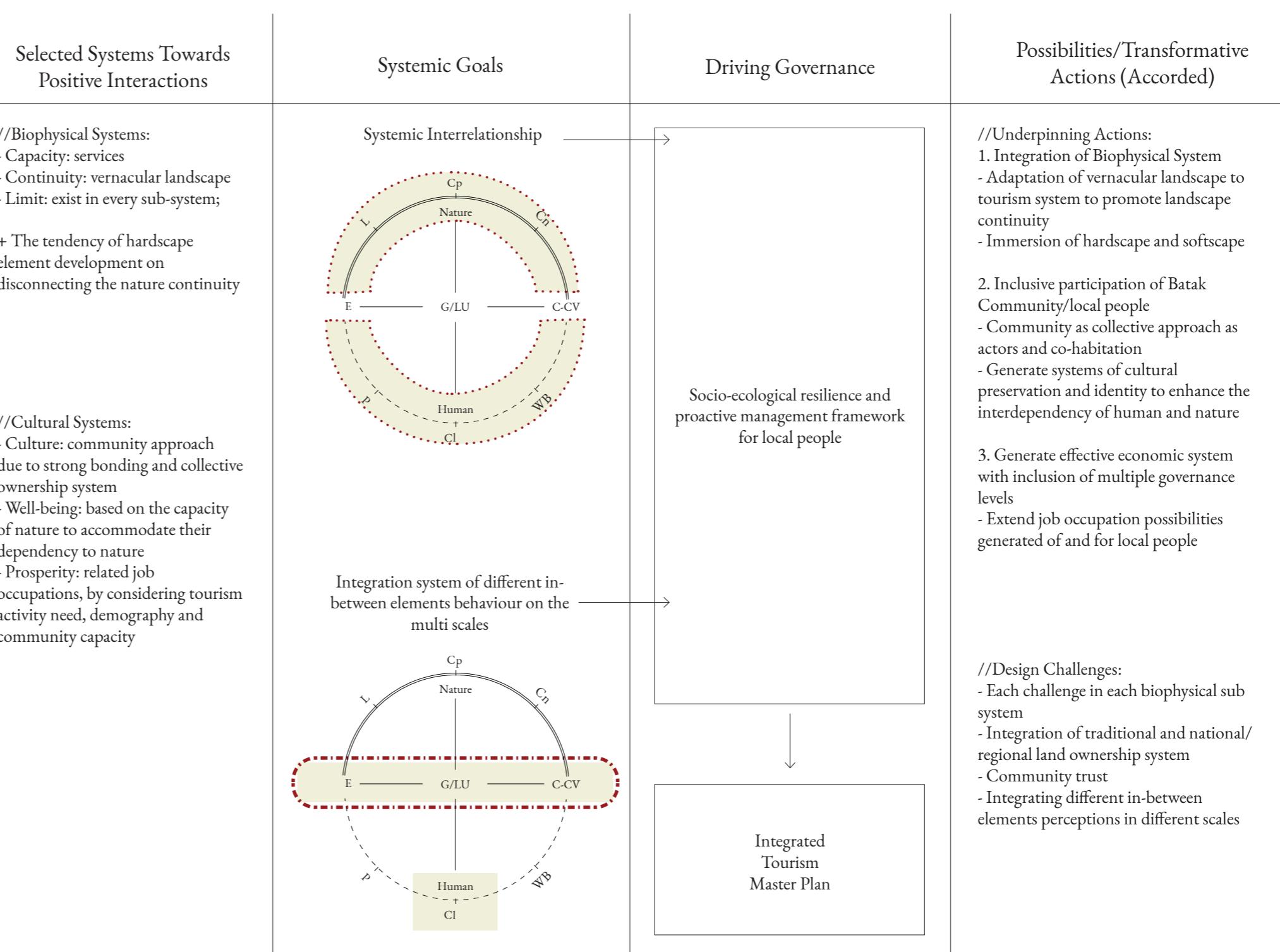
5.5. Conclusion and Vision

In the past H(C)-N deconstruction, the analysis focus on the in-between elements of economy, governance/land use, and the co-constructed values because these three elements can be controlled and are able to be depicted through found literature research.

In the present H(C)-N deconstruction, the methods of critical mapping through google maps and GIS, and data analysis from national statistic data are able to depict consequence on elements of human and nature elements from direct and indirect drivers in the past. And, three elements of economy, governance/land use, and constructed values are currently defined through Tourism Master Plan as the main economic drivers in the area.

The deconstruction of biophysical systems shows that northern part of Samosir Island have vernacular landscape system from highland to lowland that is replicated along the perimeter. This vernacular system has several sub-systems that by preserving and promoting its capacities are able to overcome risks and vulnerability. Moreover, the deconstruction of socio-economic systems shows that community plays significant role that is potential to deliver every scale of interventions through some traditional adaptation transformation such as local identity in terms of cultural and living practices.

Therefore, the recognition of identities and potentialities of biophysical system and socio-economic systems owned by Batak community and their land that generate tourism master plan adjustment is highly encouraged. Then, it concludes on a vision of "To create socio-ecological resilience and proactive management framework for local people in order to promote sustainable and inclusive tourism development in Toba Lake, Indonesia"



6. Design Approach Towards Intervention and Scale-Up

6.1. Introduction

6.2. Transformation Kit Construction

6.3. Sites Deconstruction

6.3.1. Sites Selection

6.3.2. Biophysical and Socio-culture Systems

6.4. Potential Transformation Implementation

6.4.1. Ambarita Village

6.4.2. Cinta Dame/Simanindo Village

6.5. Implementation Strategy & Phasing

6.6. Participatory Schemes

6.7. Conclusion

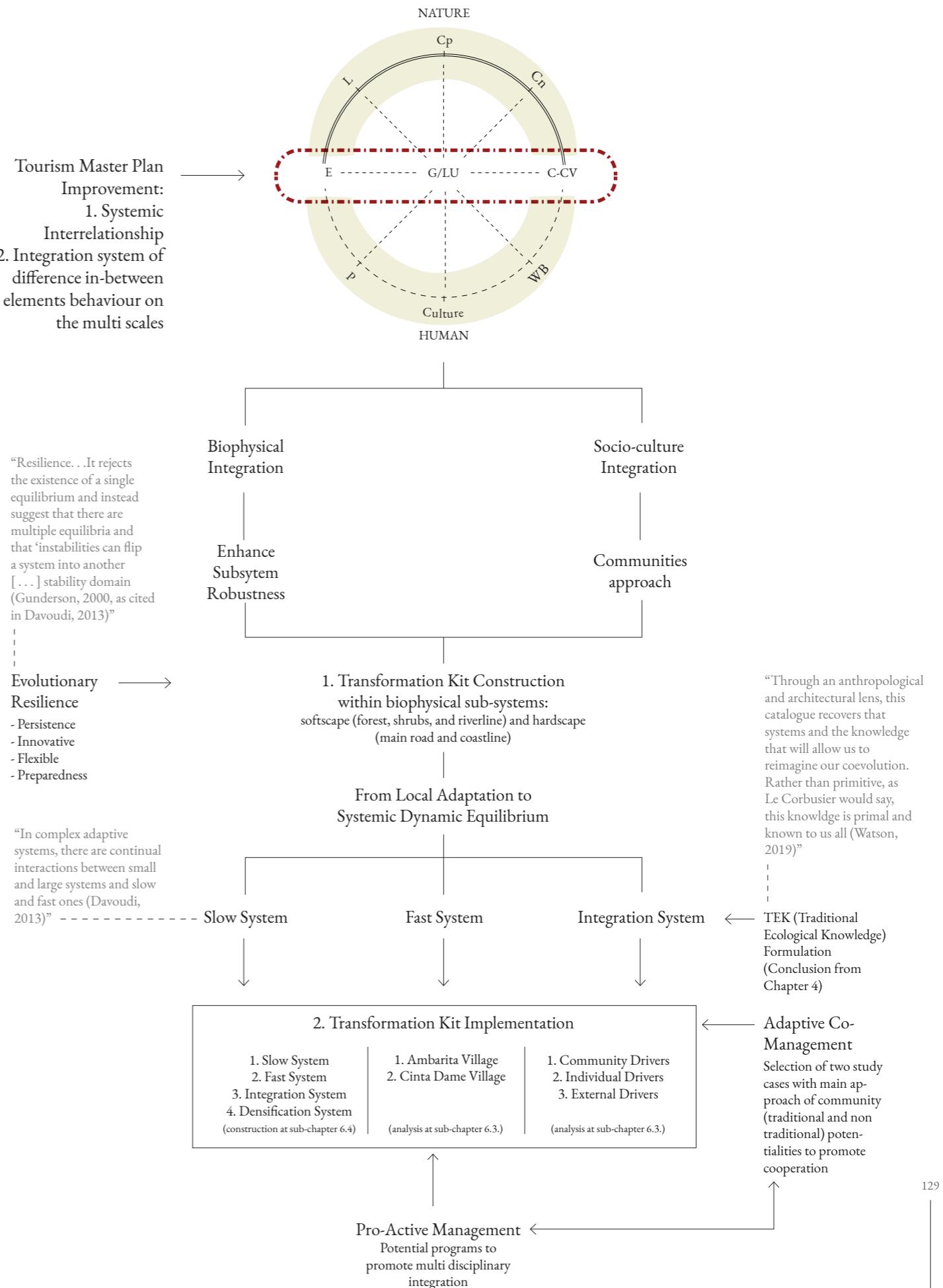
6.1. Introduction

This chapter focuses on constructing transformation possibilities to generate socio-ecological resilience in the Toba Lake in Indonesia. It begins with the conclusion composed in Chapter 5, an improvement proposal with the goals of systemic interrelationship and integration system of differences in between elements behaviour on the multi scales. (illustrated in the image on the next page). These goals are translated into:

1. generating robust systemic interrelationship of biophysical and socio-cultural systems by enhancing sub-system robustness and using the communities approach, and
2. generating integration systems that grasp multi-scale disparities in determining economy, governance or land use, and co-constructed values. All these elements are aligned with tourism programs.

Next, the construction of the the proposal transformation kit towards socio-ecological resilience is defined based on spatial types in different sub-systems of softscape (forest, shrubs, and riverline) and hardscape (main road, and coastline). In each sub-system, potential transformations are formulated by considering sub-systems' potentialities, challenges, and the theory of evolutionary resilience (persistence, innovative, flexible, and preparedness). Persistence is translated as local scale adaptation influencing the higher systems, innovative is translated as openness to novelty, flexible is translated as adaptive to different conditions and changes, and preparedness is translated as the learning capacity of its community. Then, these transformation kits are projected to allow local adaptations that work synergically to accomplish systemic dynamic equilibrium in multiple governance systems.

After possibilities of transformation are constructed, simulations are conducted to reveal different compositions by referring to Theoretical Framework-2 (sub-chapter 3.7). It starts with the use of two study locations with various conditions. The reason is that testing in two study locations will unfold a variety of strategic implementations used to formulate the socio-ecological resilience framework. In addition, unveiling multiple systems underlying will depict the interaction between systems (Davoudi, 2013) and how to integrate with the vernacular knowledge (Berkes, 2000) is represented as evolving systems that linking together which includes slow, fast, and integrating systems. Moreover, the expectation of slow systems transformation to fast systems causes the need to unfold the densification system. Finally, this simulation is completed by revealing the potentiality in promoting inclusivity that grasps multi scales and types of internal (community and individual) and external drivers.

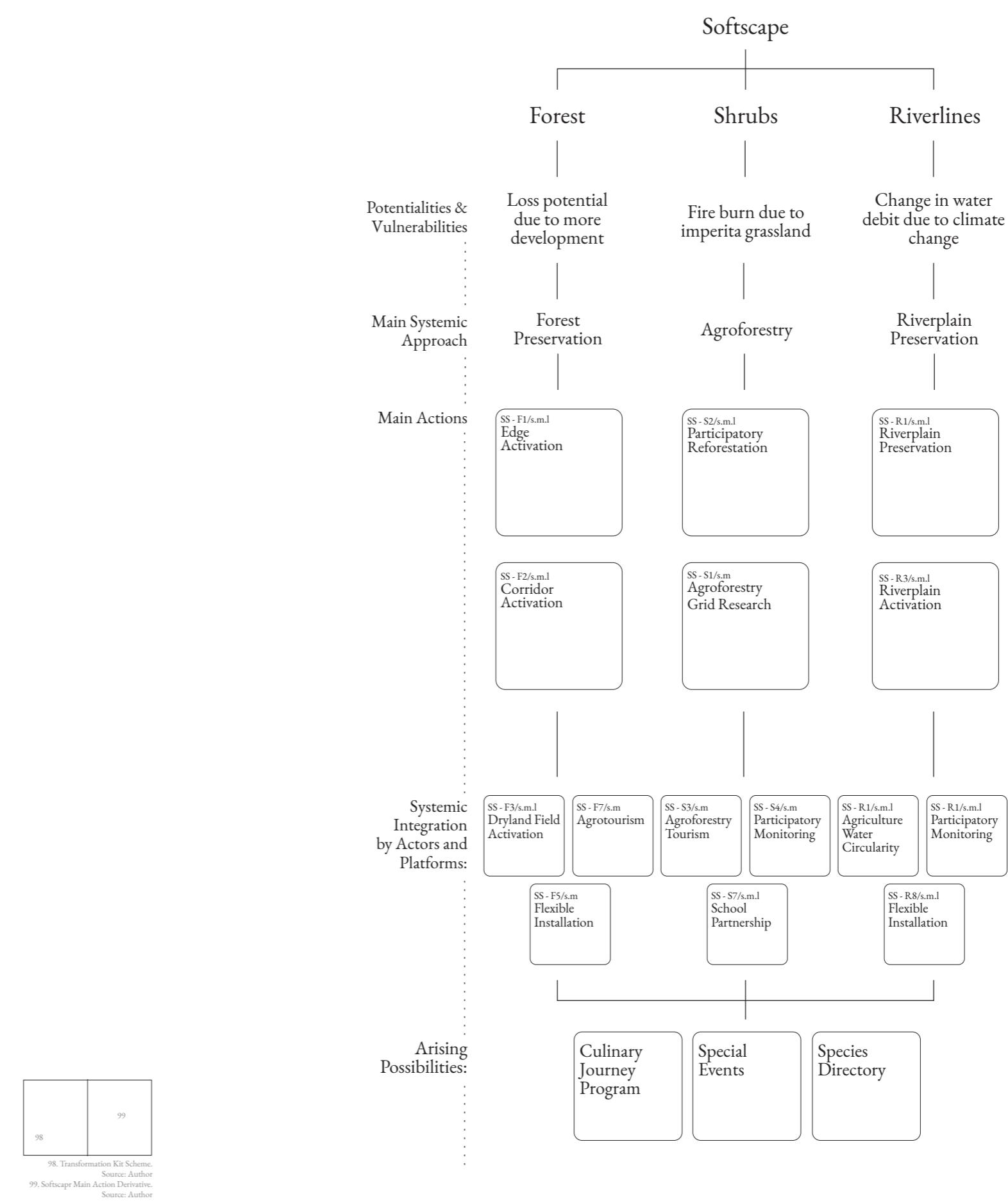
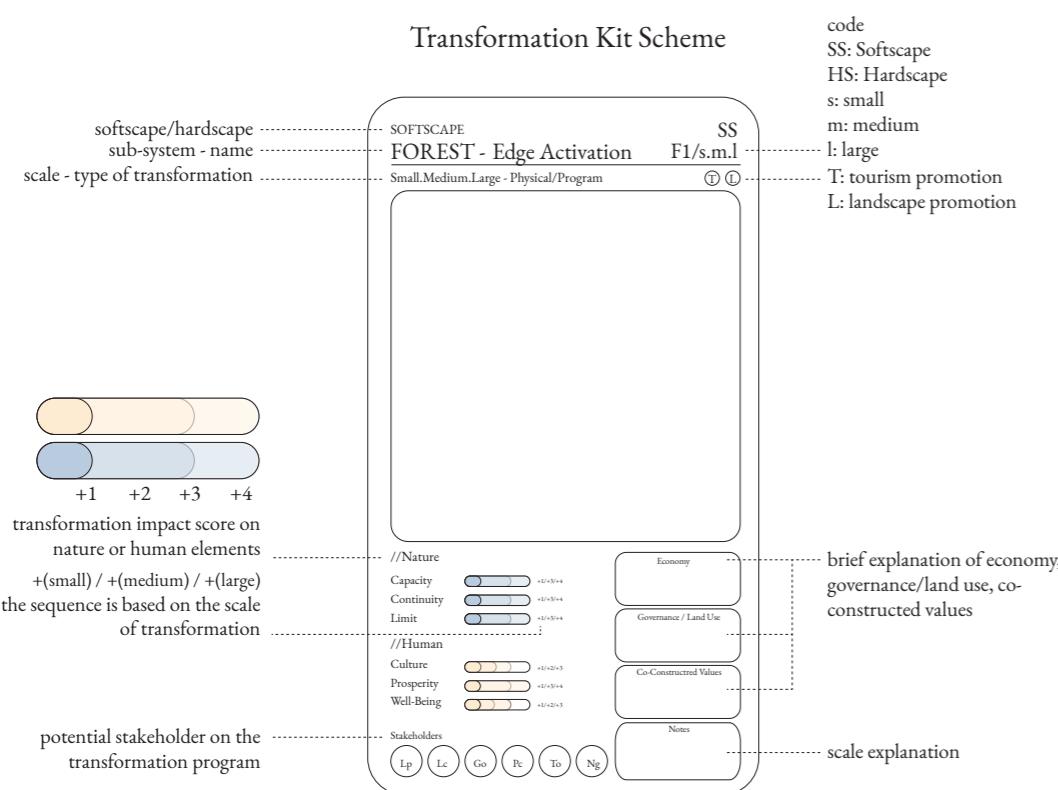


6.2. Transformation Kit Construction

6.2.1. Softscape

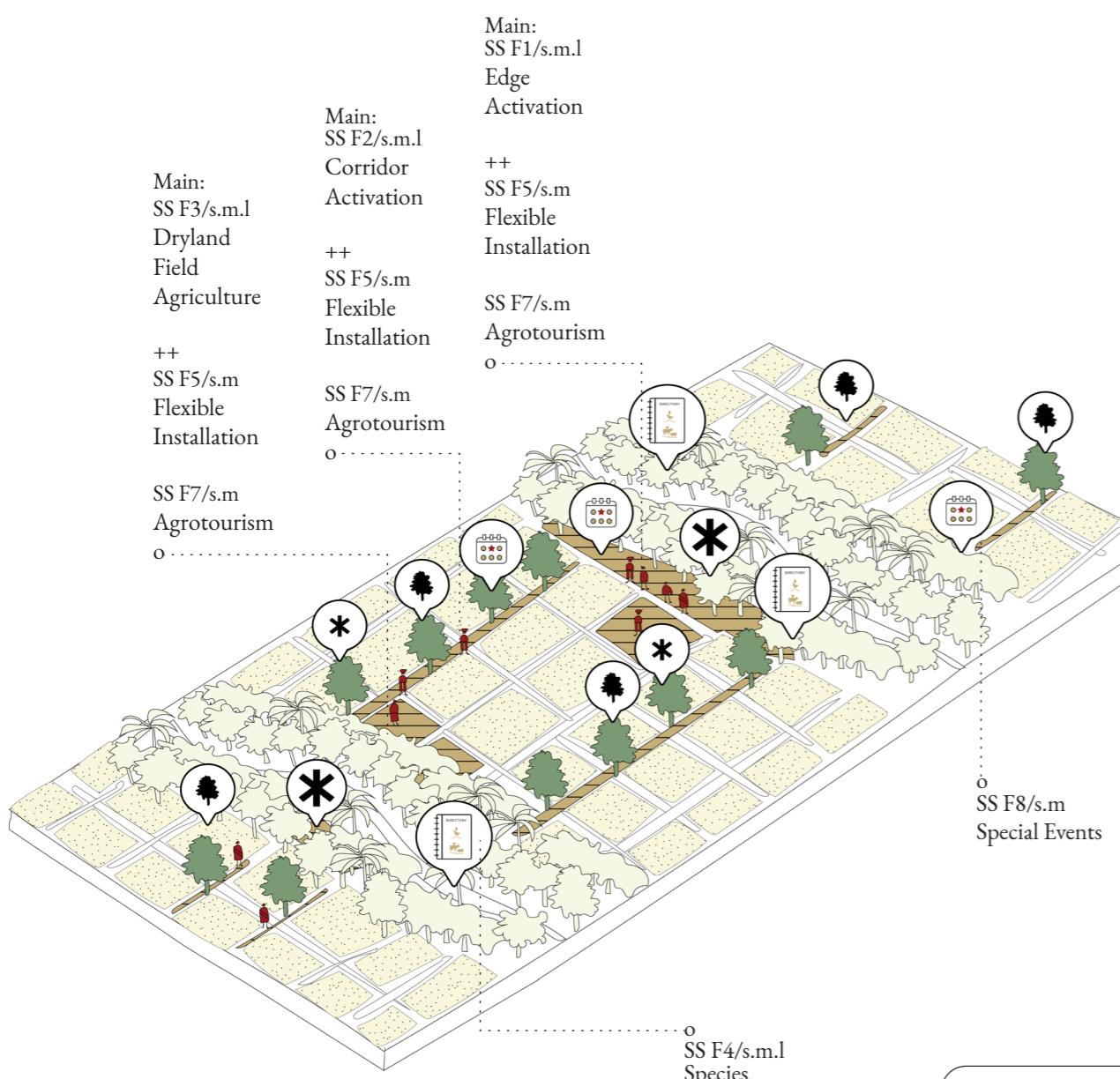
Softscape elements are defined as natural forms that have relationships with Batak historical and today's daily living: forest, shrubs, and riverline. Then, main systemic approaches are generated by potentialities and vulnerabilities in each subsystem. Then, the main actions following systemic integration and arising possibilities are induced to form a transformation kit.

The transformation kit is designed similar to a card game to give a summary of the implementation's impacts to nature elements (capacity, continuity, limit), human elements (well-being, culture, and prosperity), and in between elements (economy, governance/land use, and co-constructed values). The score of the impact of every scale is generated by a speculative assumption based on analysis research that needs to be re-formulated in the real project. In addition, all detailed explanation is elaborated by the image below.

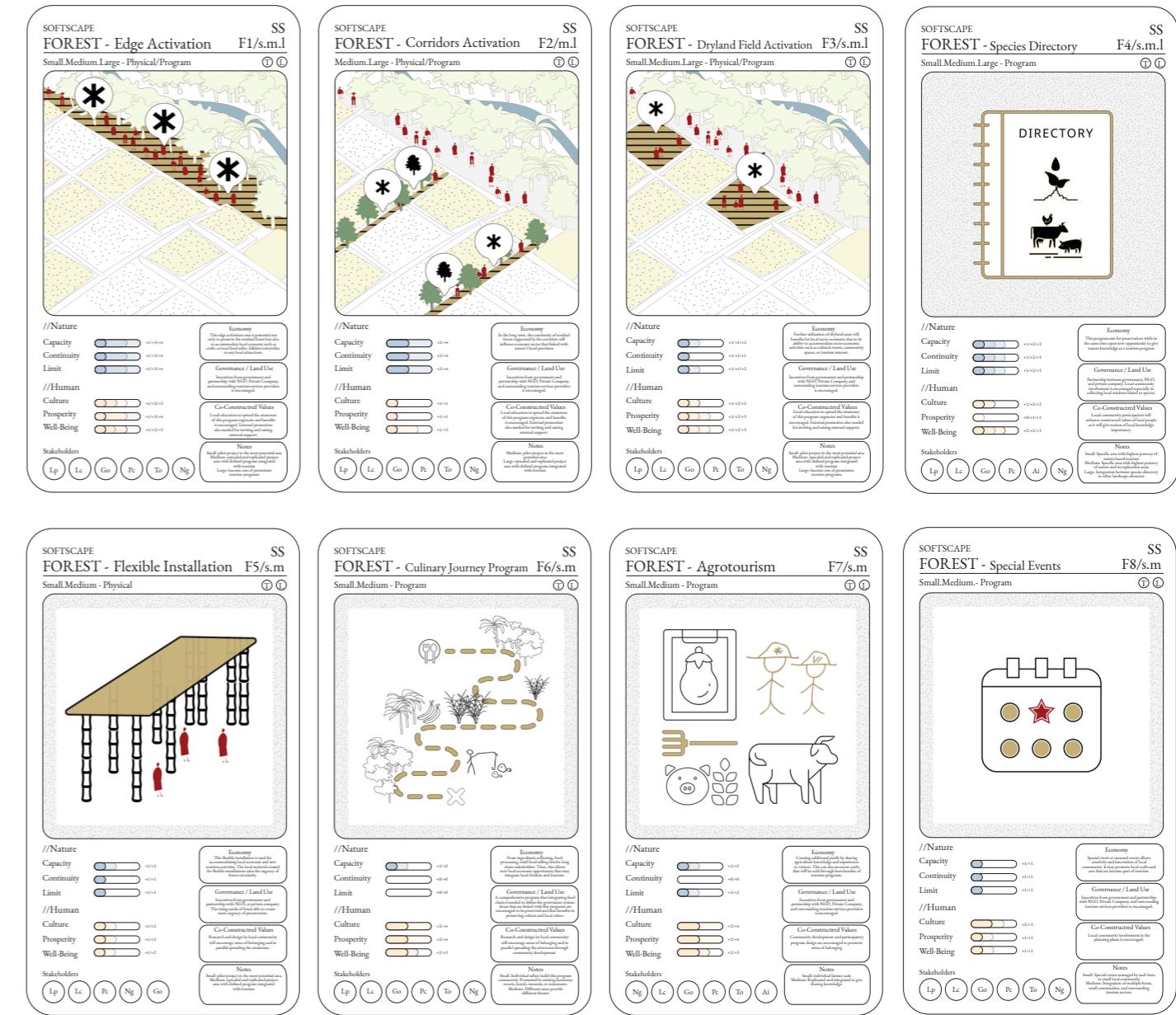


6.2.1. Softscape - Forest

The main challenge in the residual forest sub-system is that the area has a high tendency to decrease as the need for human activities increases, especially in tourism development. Overcoming this tendency is possible by using vernacular landscape morphology with the idea of activating the perimeter of the forest and synergy it with surrounding spaces' potentialities and challenges by tourism programs. The programs extend from agrotourism to cultural events that are explained through the kits on the next pages. These kits are catalyst samples and are open to other possibilities. Then, activating new tourism programs within the residual forest introduces new governance and economic systems that can integrate biophysical and socio-cultural systems.

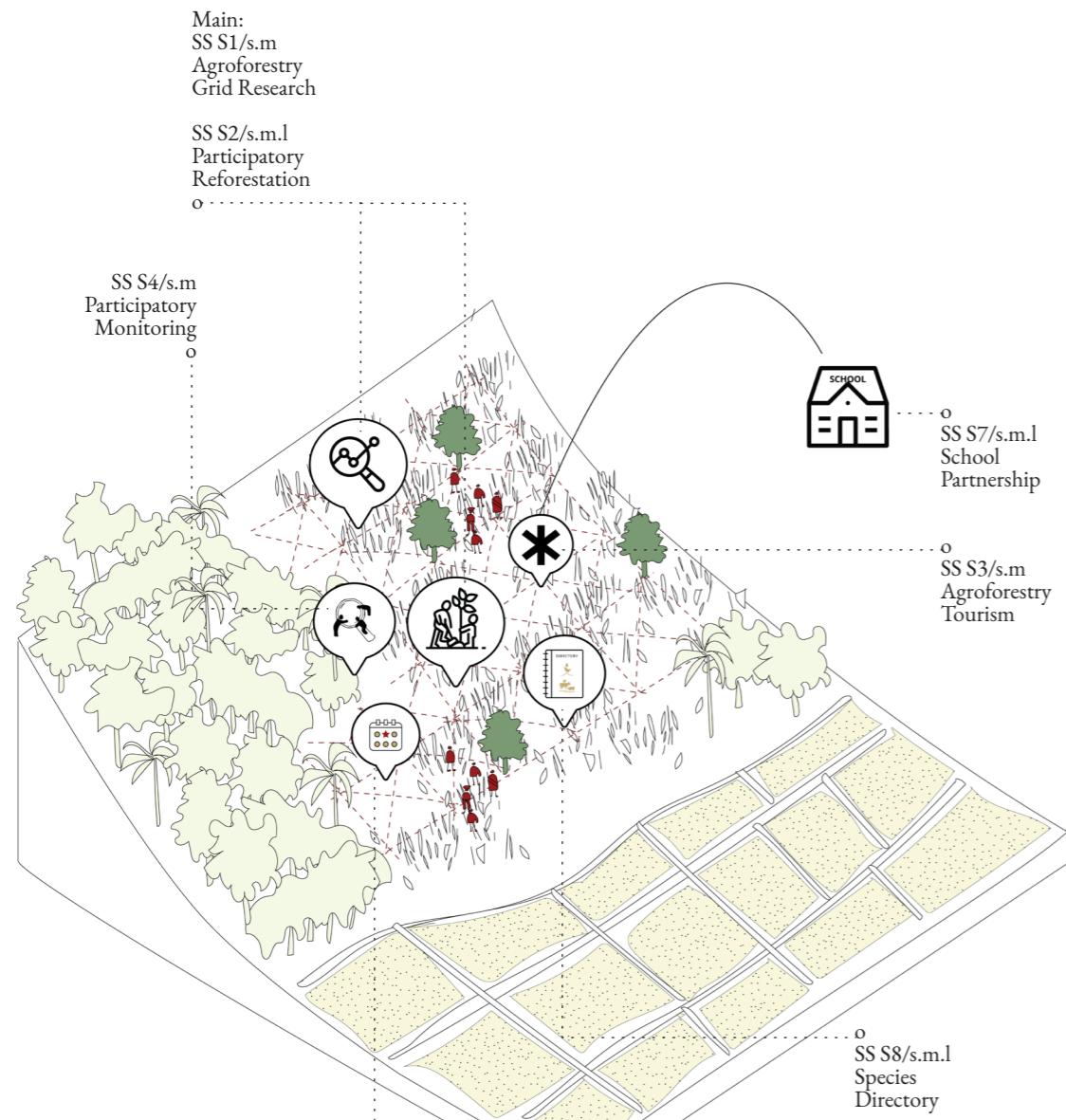


Stakeholders:
 Go: Government
 Pc: Private Company
 Lp: Local people
 Lc: Lumban Community
 To: Tourist
 Ng: NGO
 Ai: Academic
 Institution/ Researcher

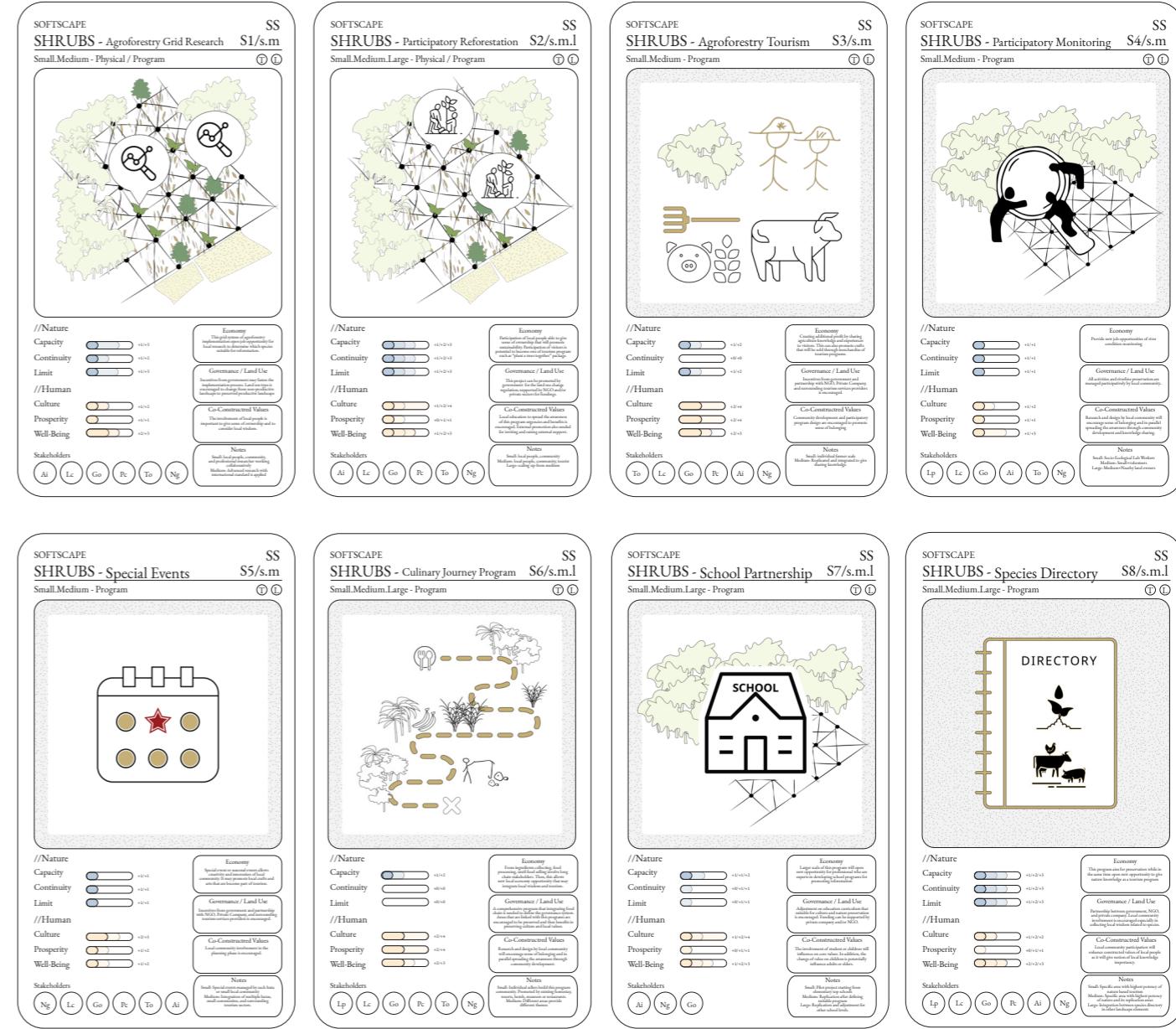


6.2.1. Softscape - Shrubs

The challenge of Imperata grassland species is prone to burn, and it has become the main challenge in the shrub sub-system. By referring to the recommendation from Jablonski (1933), this species also need much time for clearing to be used for agriculture. Besides, planting crops next to this species will hinder the growth as this species characteristic is highly water absorbent. Thus, converting shrubs spaces into agroforestry is recommended. The research and planting processes can be contributed by various stakeholders, especially local people, students, children, elders, and tourists. This reforestation also has high potential to be promoted online and invite green fighters to save the forest movement. Then, several potential transformation kits are arranged on the next page. All the transformation kits need to be adapted to the real situation and open to other possibilities.



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6.2.1. Softscape - Riverlines

Referring to the analysis in sub-chapter 5.1.2., some areas are failed to preserve the quality of the river, especially on the estuary part caused by settlement development. In addition, the challenge of pollution from agriculture and human activity and climate change may potentially influence the quality and quantity of rivers. However, the potentialities of most of the riverline that is covered by forest due to Batak history can be used as an approach in the preservation action. The main concept of actions is to preserve the original form in its morphology and focus on the river plain areas since it is the most influential to

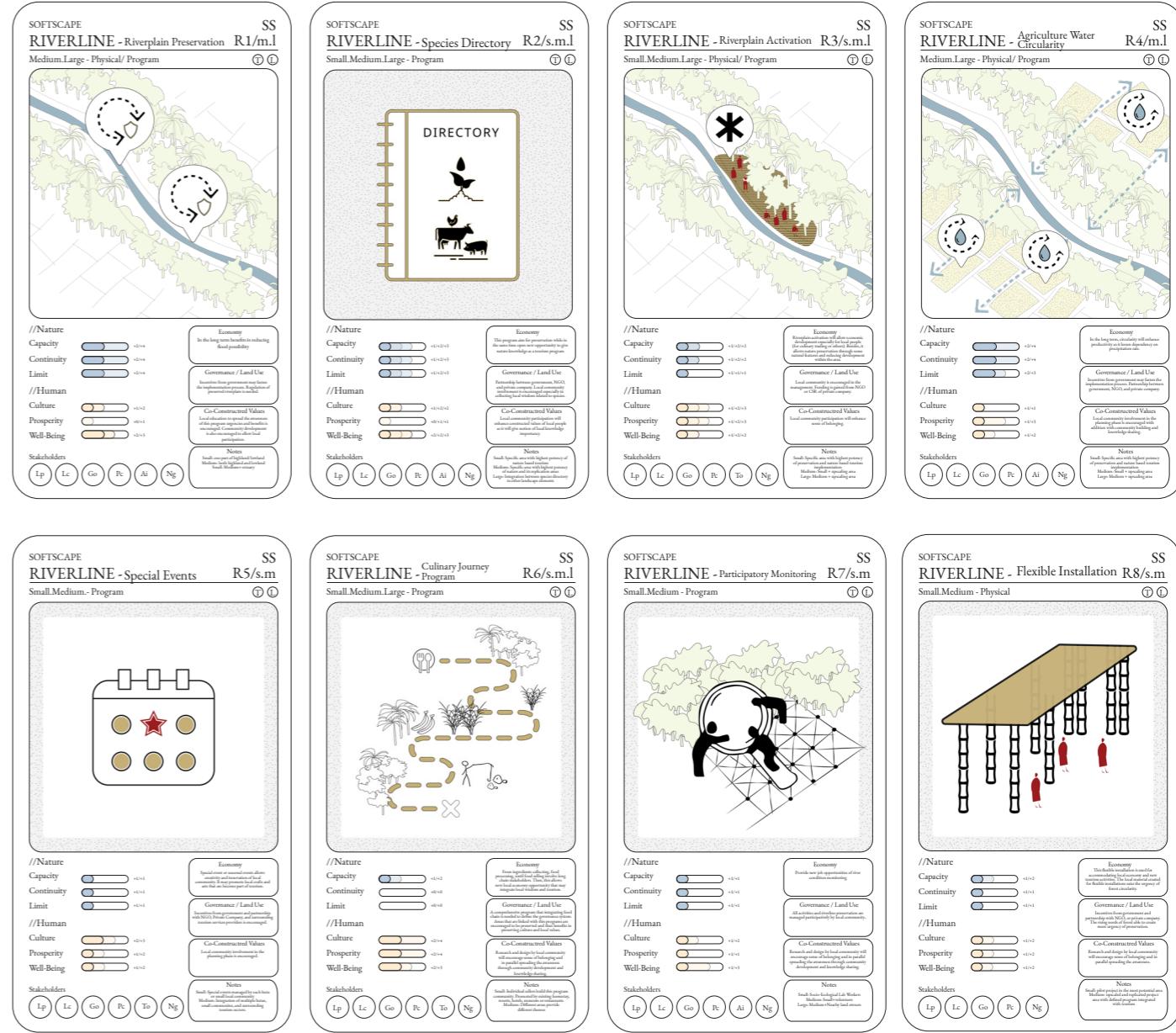
Main:
SS R1/m.l
Riverplain
Preservation

SS R3/s.m.l
Riverplain
Activation



the whole river system. Furthermore, the preservation is aligned with the tourism plan through activating the riverplain area with tourism programs. The benefits cover preserving nature capacity, increasing local income sources, emphasizing the capacity of river plain spaces to level up the awareness, and preserving the sense of belonging through participation from planning to maintaining. Other transformation possibilities to support the main actions are explained on the next page to create a comprehensive in the whole system.

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Institution/ Researcher



6.2. Transformation Kit Construction

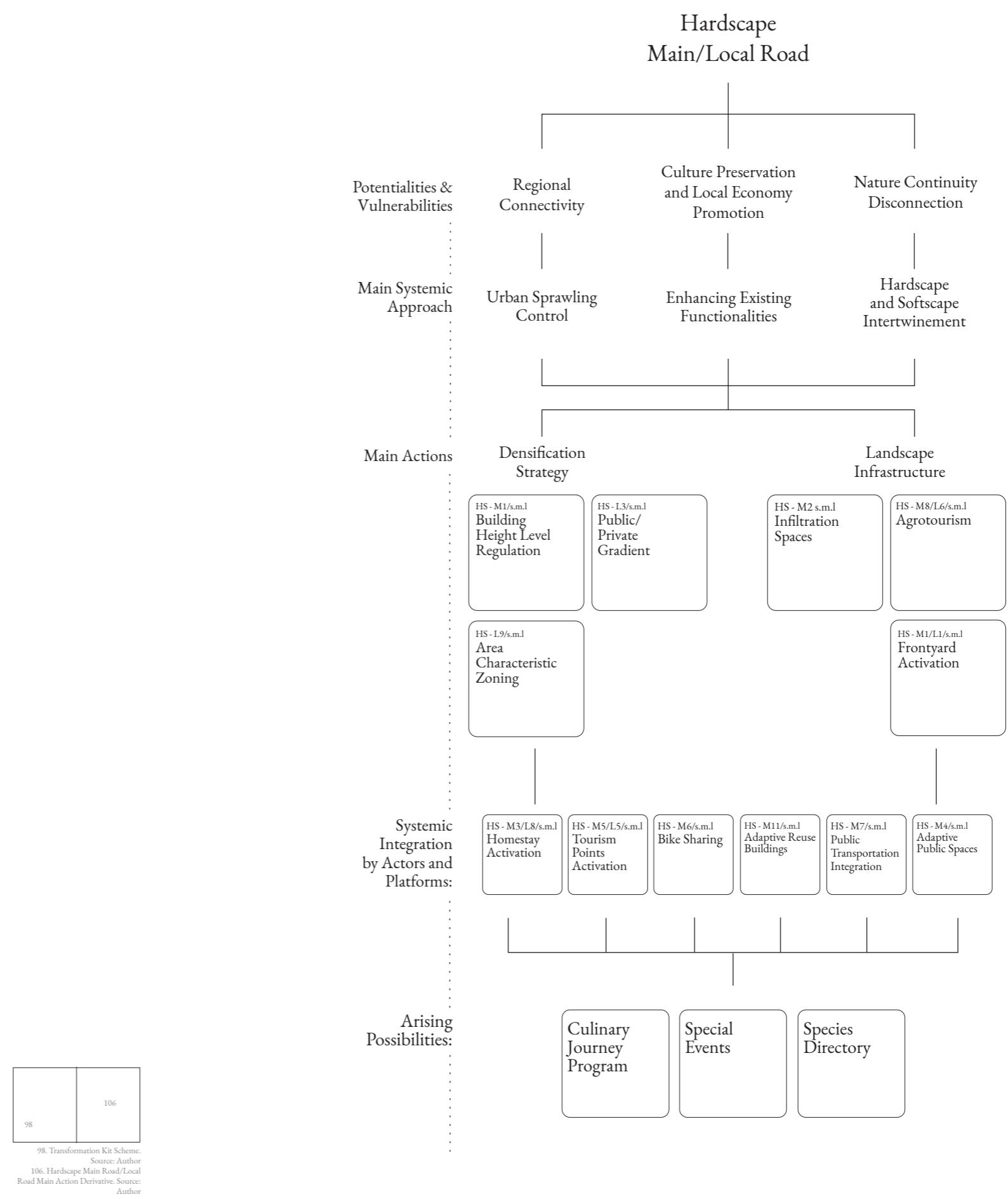
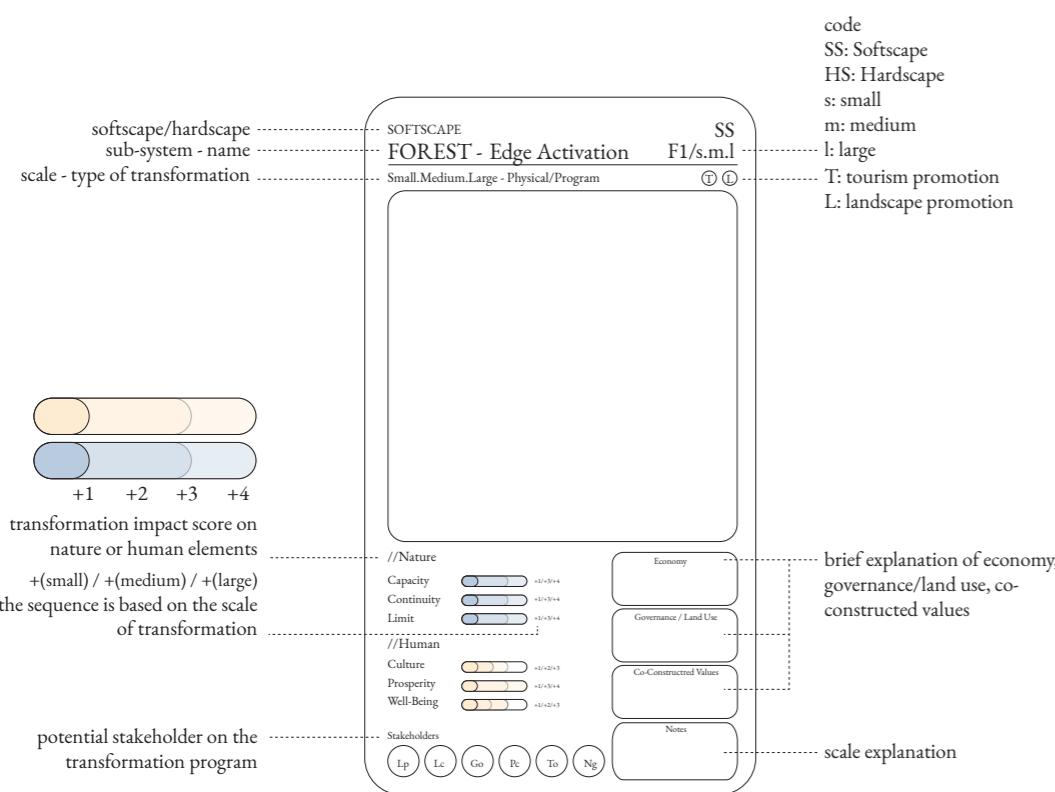
6.2.2. Hardscape

Hardscape elements are built-environment forms that have relationships with Batak's historical, daily living and tourism plan: main road, local road, and coastline. This sub-chapter focuses on the main and local roads as the hardscape sub-system since they have strong interrelationships. First, the main systemic approaches are generated by potentialities and vulnerabilities in each sub-system:

1. urban sprawling control from regional connectivity potentiality,
2. enhancing existing functionality from culture preservation and local economy promotion, and
3. hardscape and softscape intertwinement from nature continuity disconnection.

Then, the main actions of densification strategy and landscape infrastructure are followed by systemic integration and arising possibilities in a transformation kit.

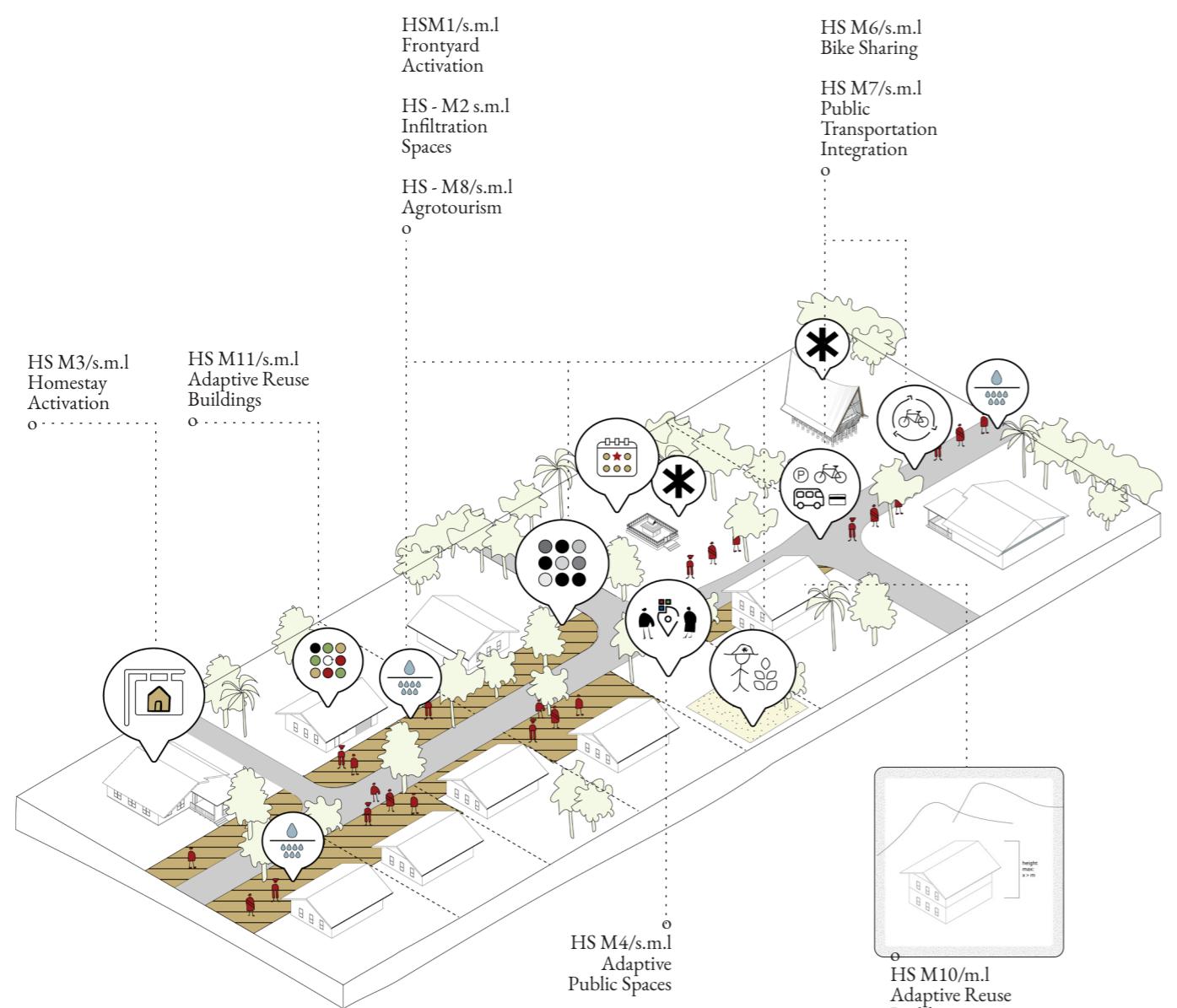
The transformation kit is designed similar to a card game to give a summary of the implementation's impacts to nature elements (capacity, continuity, limit), human elements (well-being, culture, and prosperity), and in between elements (economy, governance/land use, and co-constructed values). The score of the impact of every scale is generated by a speculative assumption based on analysis research that needs to be re-formulated in the real project. In addition, all detailed explanation is elaborated by the image below.



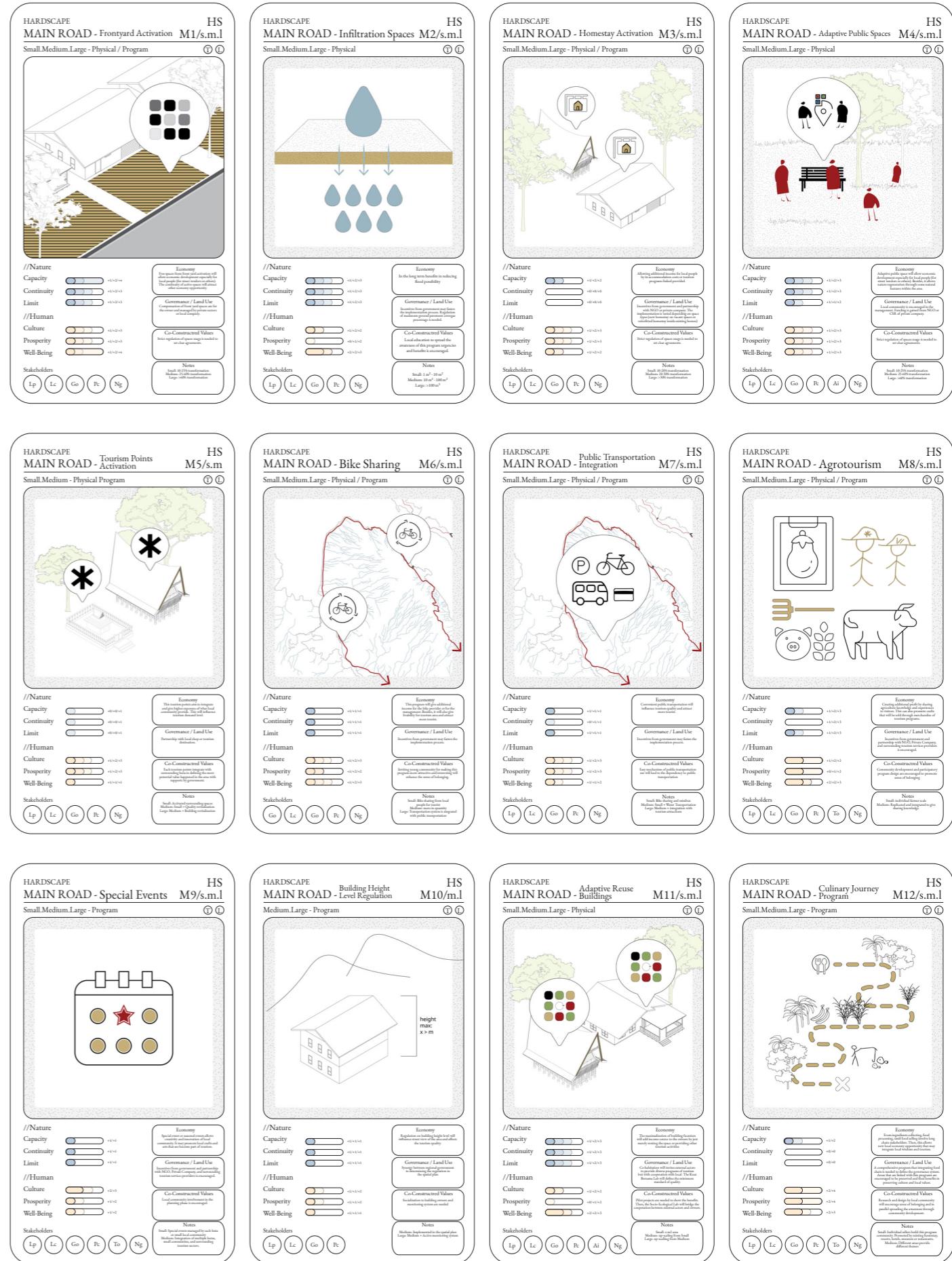
6.2.2. Hardscape - Main Road

The main potential of the main road is that this structure becomes the main access to connects human and goods flows. It can be indicated by the development that spread over the main road corridor in some areas. Besides, this corridor acts as the main access for connecting tourism programs. However, sprawl anticipation is encouraged in order to preserve spatial qualities that enhance not only livability quality but also tourism quality. In the Integrated Master Plan 2020, most of the interventions are related to enhancing pedestrian path quality. Thus, it is possible to address these interventions explained in the master plan to be combined with other transformation kits on the

next page to promote socio-ecological resilience. Therefore the transformation kit within his sub-system is related to the main actions of densification strategy that elaborate possible transformation to maximize spaces by introducing multi-functionalities by cohabitation in every possible typologies (commercial, residential, cultural nodes, and others) and landscape infrastructure that provide new connections of green-blue corridors for the main road.



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 Institution/ Researcher

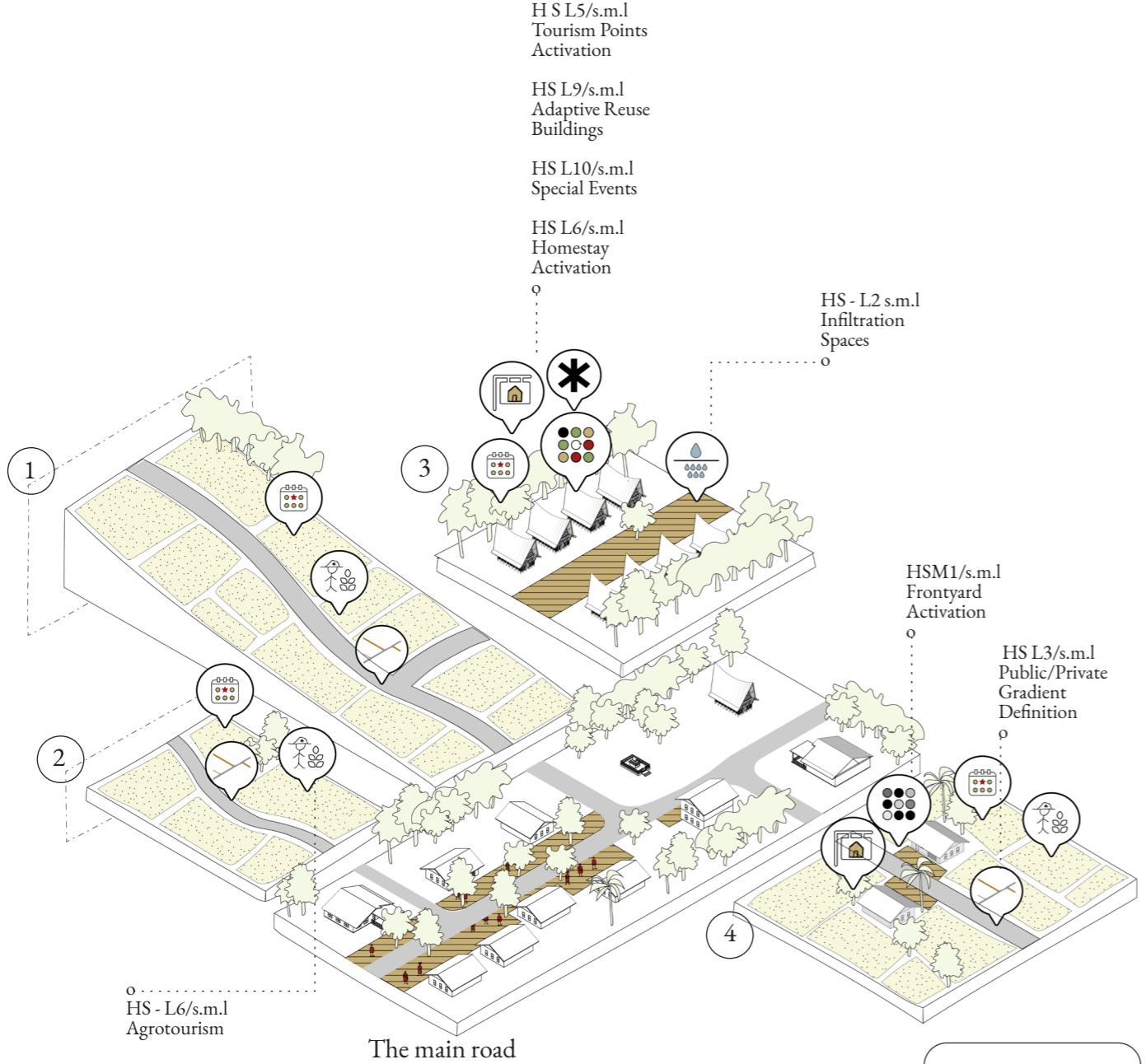


6.2.2. Hardscape - Local Road

The potency of Huta expansion occurs along the main road and the local roads both in the highland and in the lowland. It is reflected by the dense development in the Pangaruran area following the local road until reaching the coastline. However, this expansion is inevitable but impacts green-blue corridors in the lowland. The Huta clusters will also be influenced by it despite the original form of Huta may contribute to local identity preservation.

Therefore, the local road sub-system can be classified into four types:

1. local road with defined path and with agriculture fields only,



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 Lp: Local people
 Lc: Lumban Community
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 Institution/ Researcher

2. local road with undefined path,
3. Huta cluster, and
4. local road with agriculture field and some settlements (mostly happens close to the coastline).

Next, potential transformation with main actions of densification strategy and landscape infrastructure is formulated. Most of the kits are similar to the main road system. The difference is the kit of "Public/Private Gradient" with communities approach is needed to make sure that the tourism programs to set clear boundaries between areas with tourism program and the areas preserved for just local people.



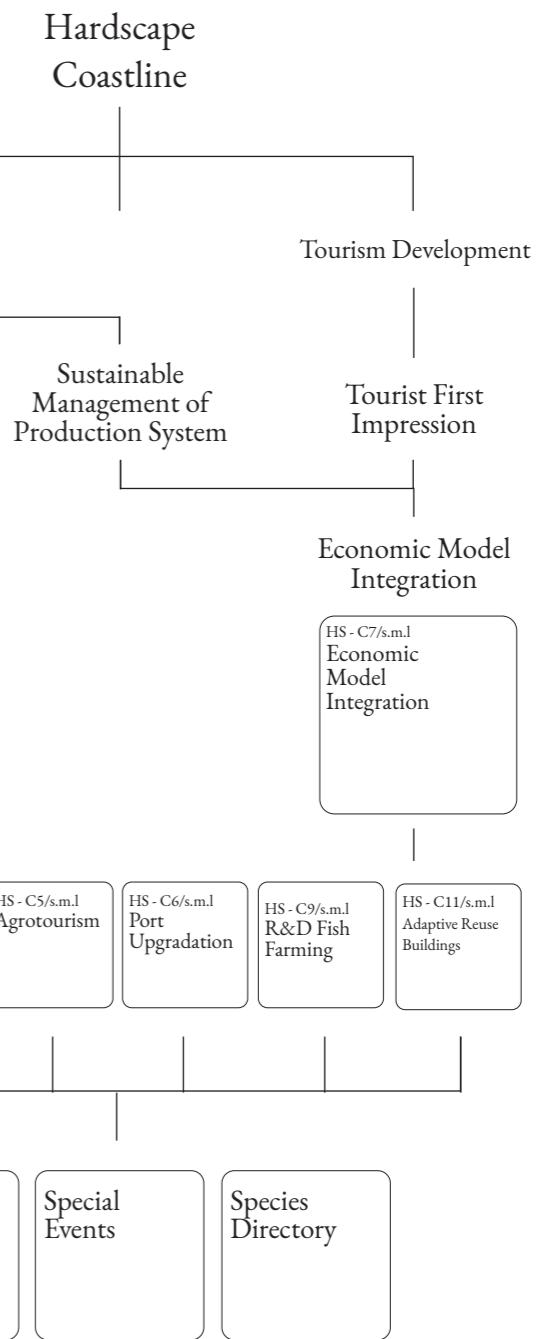
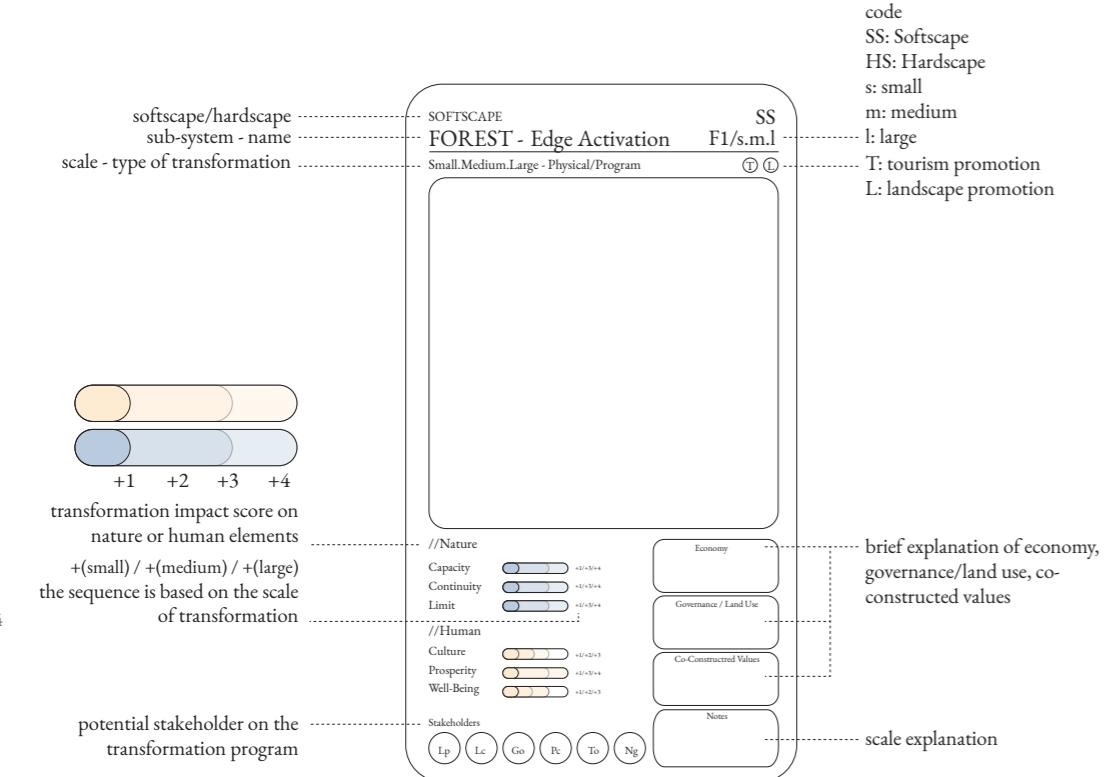
6.2. Transformation Kit Construction

6.2.2. Hardscape - Coastlines

Hardscape elements are built-environment forms that have relationships with Batak's historical, daily living and tourism plan: main road, local road, and coastline. This sub-chapter focuses on the coastline. The main challenge of the Coastline sub-system is that the pollution generated comes from all activities from the highland to the lowland. The first challenge is pollution contribution from fish farming activities and agriculture areas.

Coastline areas contain high tourism development potential due to their spatial quality and perform as the first space to connect Samosir Island to Sumatra Island. By seeing this challenge and potential, the possible main action is to re-structure the economy model that allows integration of any activities that use spaces along the coastline. For example, wetland agriculture needs improvement in the water circularity program, and the budget is derived from economic activities in the nearby port, market, or public spaces. Furthermore, the scheme of this economic model needs to have community involvement in giving a sense of belonging.

Moreover, the uncertainties of water height level caused by climate change also lead to the urgencies to clear 50 metres from the coastline. The targeted transformation only lies in the area without settlement, such as vacant spaces to be activated to public spaces, agriculture areas to have agrotourism programs, and others. These possible transformation benefits can address pollution challenges in fish farming with an R&D program or agriculture circularity.

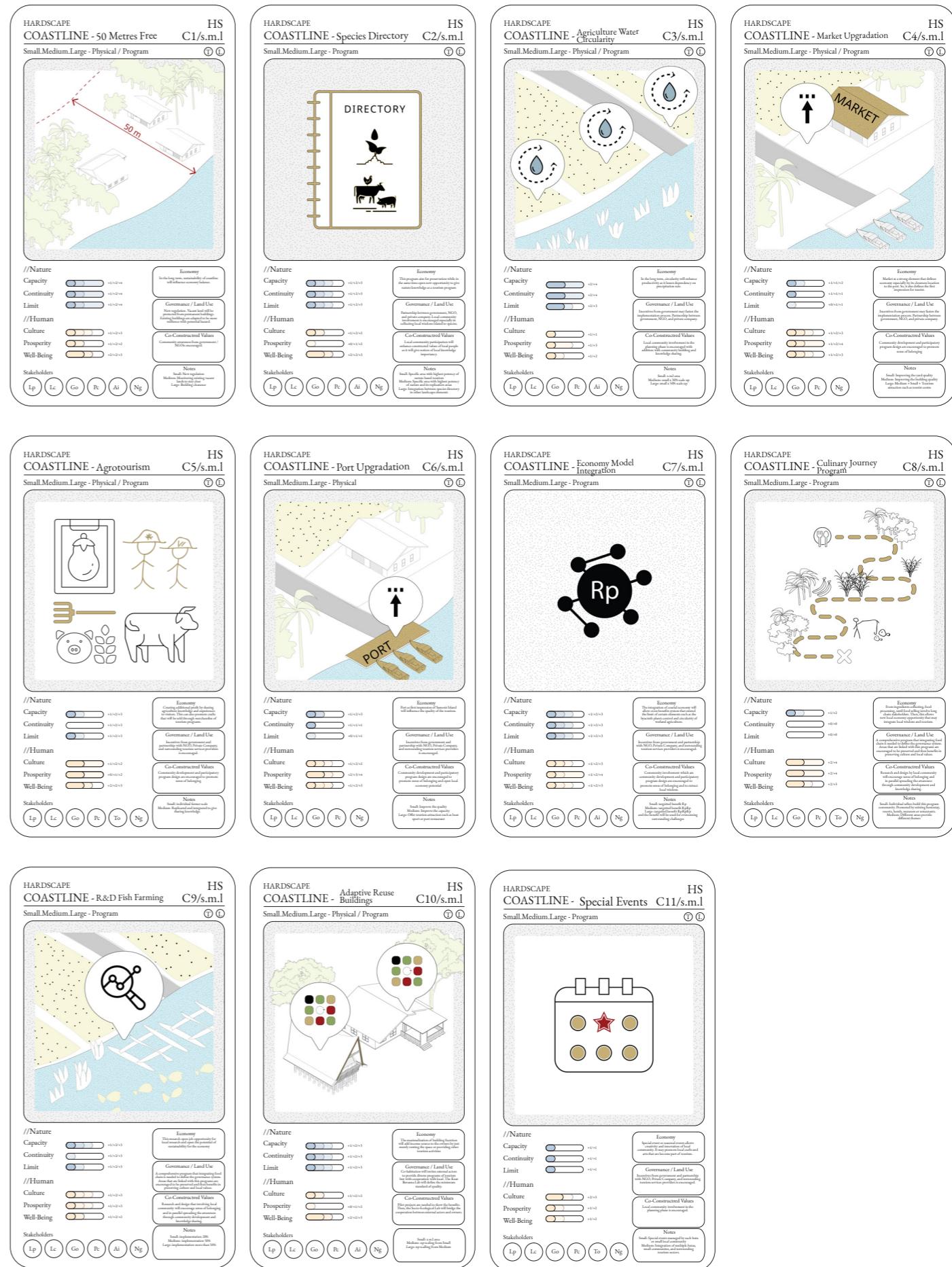
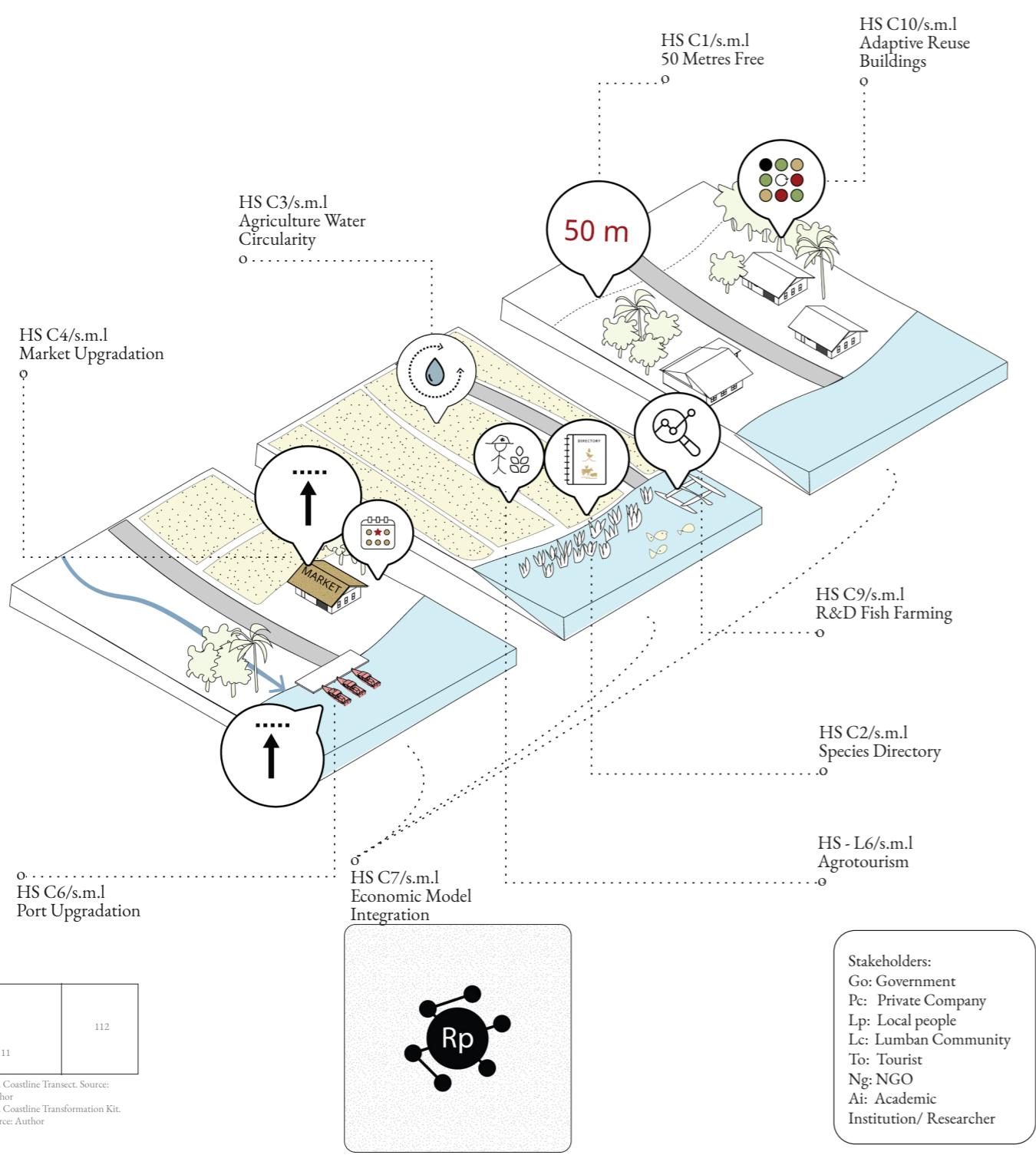


98. Transformation Kit Scheme.
Source: Author
107. Hardscape Coastline Road Main Action Derivative. Source: Author

6.2.2. Hardscapes - Coastlines

The coastline sub-system is formulated into three main spatial clusters based on their characteristic analyzed by the google maps satellite layer. The first cluster defines the economical values that are related to human mobility. It consists of port and market. These two typologies are interdependent since the market goods are transferred to and from Sumatra Island from the port. The second cluster defines all activities with the highest pollution and species invasion contributions: wetland agriculture, fish farming, and water hyacinth population. Finally, the third layer defines the urgencies of clearing 50 metres from the coastline and the challenge of existing settlements.

By classifying this, it can be shown that all elements along the coastline can stand as potentialities or challenges depending on the real situation. For example, the agriculture field can produce pesticides pollution, is desirable for agrotourism programs, and demands water circularity to promote sustainability. However, in real conditions, the gain of one element is sometimes unable to overcome the damage cost caused by this element. Thus, by conceptualizing crossing benefits from potential activities, a more resilient system will be elevated.



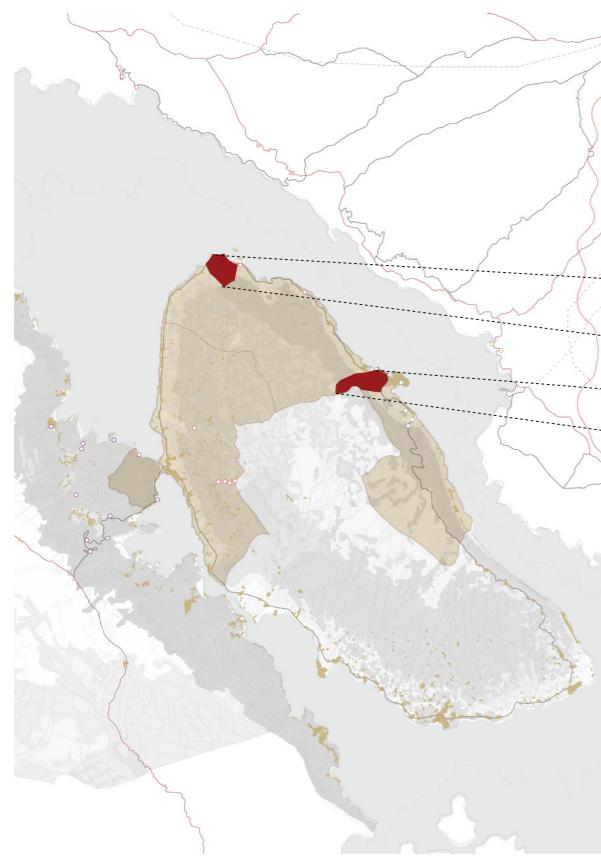
6.3. Sites Deconstruction

6.3.1. Sites Selection

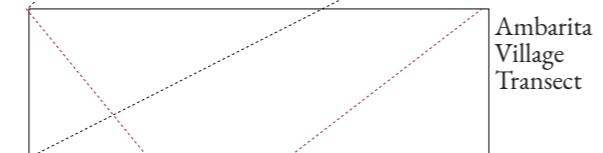
The sites selected are the sub-district of Ambarita and the sub-district border of Cinta Dame and Simanindo by considering criteria of activity and topography characteristics. Tourism activity in their activity characteristic becomes the main consideration due to the main context of this project is about tourism. In these two areas, tourism development is in different phases. Besides, these areas also become the east gates of Samosir Island due to ports that allow connections to and from Sumatra Island.

The main difference in topography characteristics is their slope degree. For example, in Ambarita, a very steep slope exists about 1 km from the coastline, while in Cinta Dame, the slope is 10-15 degrees gradually coastline. In addition, the distance between the main road and coastline also varied over the Samosir Island perimeter, which is shown in these two comparison areas. These two differences have influences in determining how people manage their land.

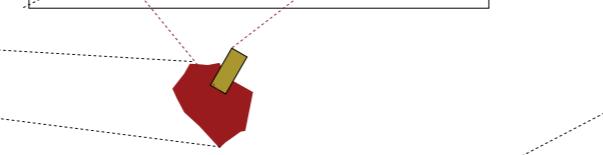
The steep contour and multiple river lines crossing the area in Ambarita cause not too much dryland agriculture in the above main road. While in Cinta Dame, the gradual slope allows the enormous spaces of dryland agriculture. The distance between the main road and coastline also somehow influences how people use space. In Ambarita, the distance between the main road and coastline is relatively wider than in Cinta Dame. This difference in distance results in the use of lowland space in Ambarita for wetland agriculture while in Cinta Dame, mainly for settlements.



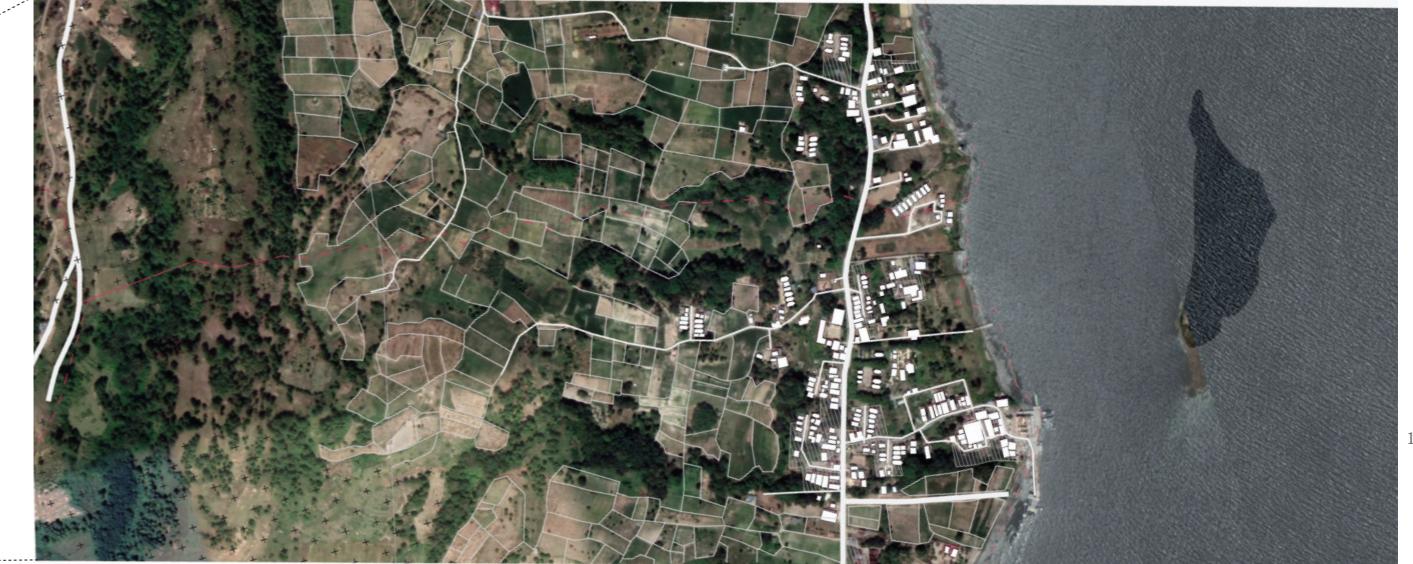
113. Macro Scale. Source: Author
114. Ambarita Topography Kit. Source: Author
115. Ambarita Village. Source: Author
116. Cinta Dame Topography Kit. Source: Author
117. Cinta Dame Village. Source: Author



Ambarita Village Transect



Cinta Dame Village Transect

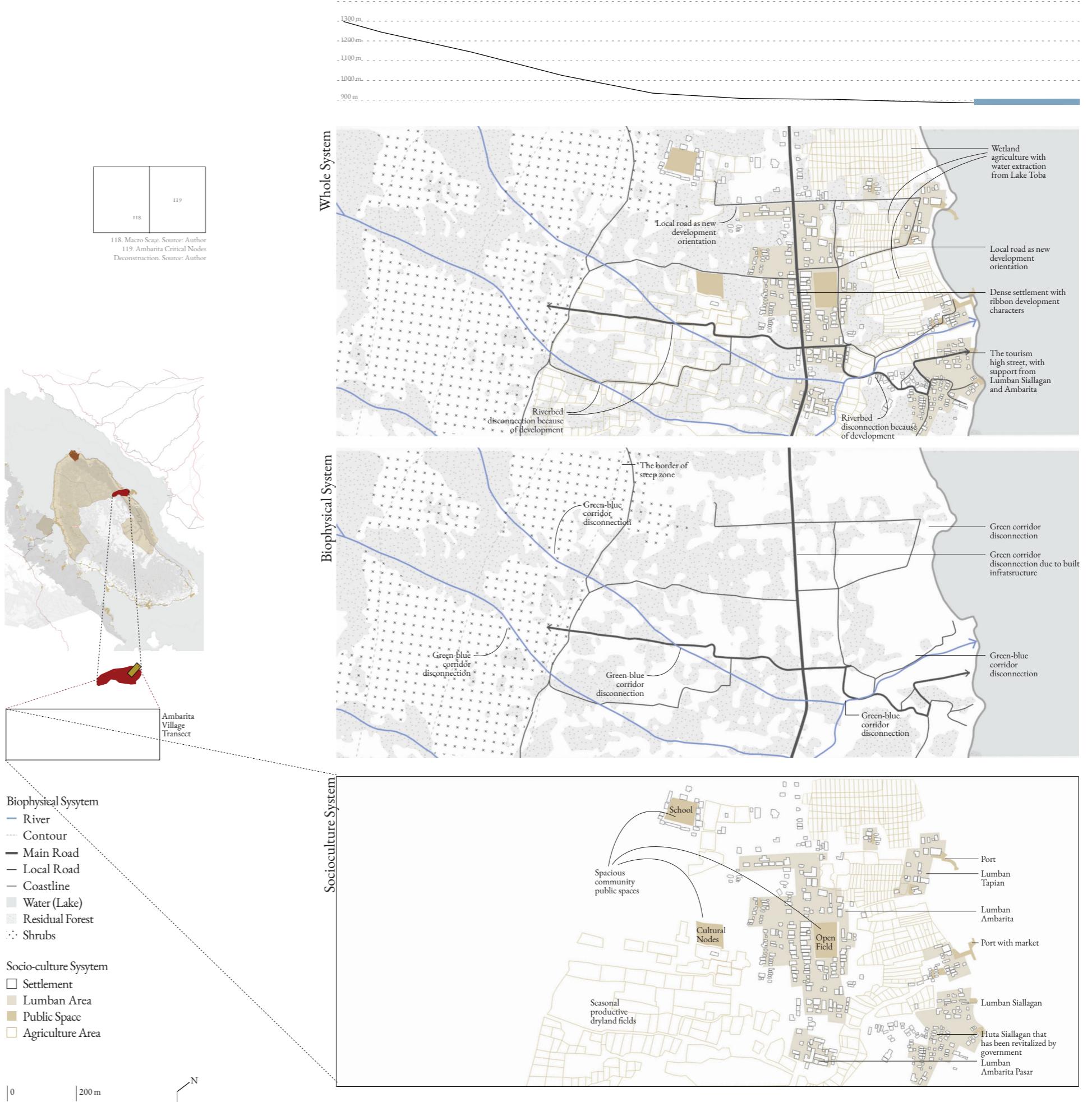


6.3.2. Biophysical and Socio-Culture Systems Ambarita Village

This chapter decomposes layers of biophysical and socio-culture systems to depict the critical nodes that may become potential or challenge in Ambarita Village. First, the socio-cultural layer shows the potentiality of community lumban clusters (Ambarita, Tapian, Siallagan, and Ambarita Pasar) and community public spaces in promoting cooperation and cohabitation. Second, the biophysical layer depicts the disconnection of residual forest and riverline or green-blue corridors because of the main road and local roads and the potential riverplain preservation by converting shrubs areas into agroforestry.

Lastly, the combined layer reveals the behaviour of the main road, local road and coastline sub-systems and their influence on the softscape system. The main influences are dense development with ribbon development characteristics along the main road and its potency to sprawl along the local roads. In addition, this combined layer also exposes the critical nodes that can be synergized to promote socio-ecological resilience, such as the areas on the coastline with a market, a port, and riverline connections. Moreover, an interview with a local architect, Mr Freddy, mentioned a projection of vertical local road connection from the coastline to the highland as tourism programs that include various activities from cultural attractions to hiking. Thus, this local road connection can be classified as critical corridors that enable the possibility to activate the highland area.

In conclusion, all critical nodes derived determine the language of fast system, slow system, integrating system, and densification system constructed in the next sub-chapter.

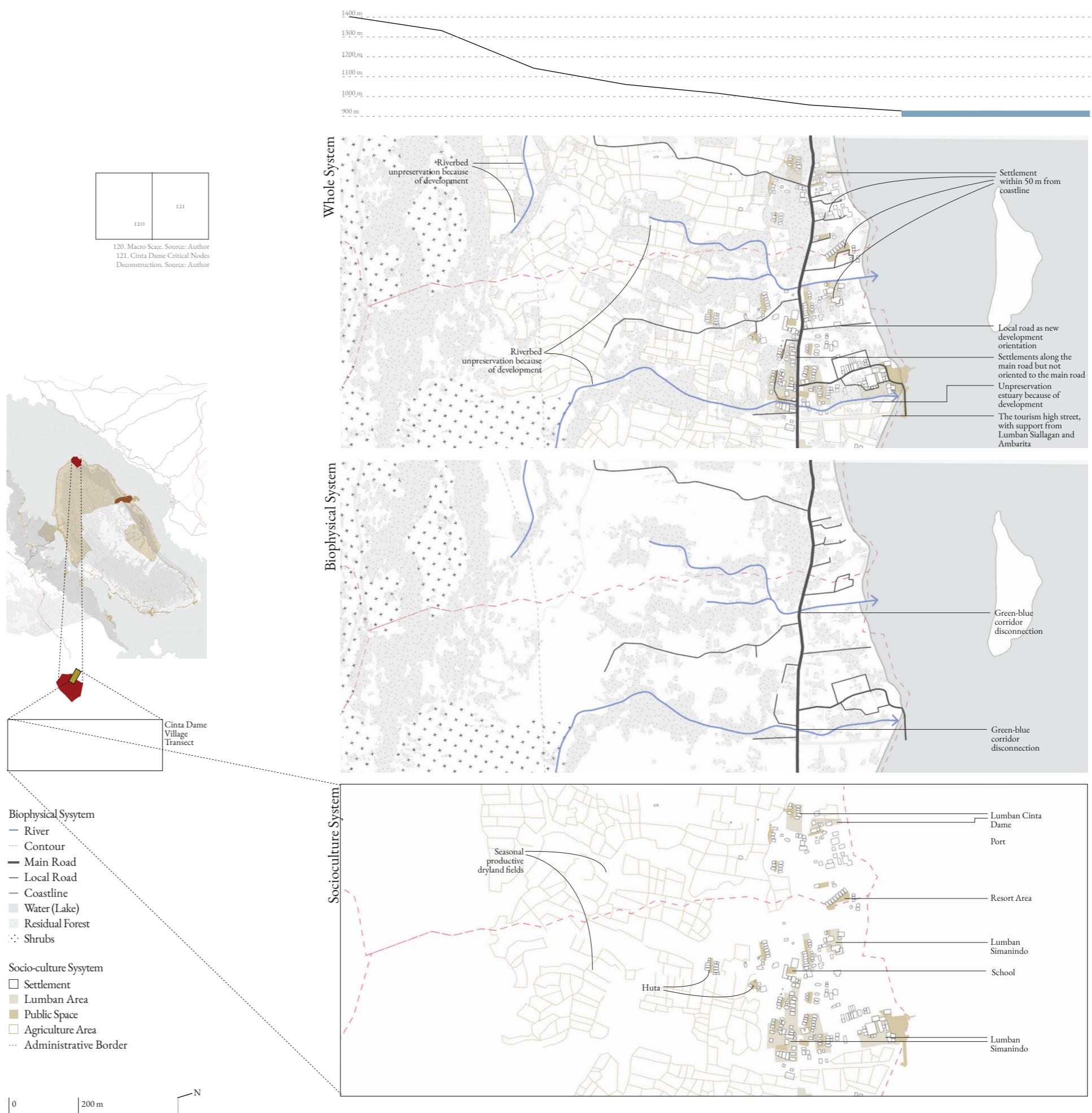


6.3.2. Biophysical and Socio-Culture Systems Cinta Dame / Simanindo Village

This chapter decomposes layers of biophysical and socio-culture systems to depict the critical nodes that may become potential or challenge in the borderline of Cinta Dame and Simanindo Villages. First, the socio-cultural layer shows the potentiality of community lumban clusters (Lumban Simanindo and Lumban Cinta Dame) and community public spaces in promoting cooperation and cohabitation. The characteristic of lumban clusters in this transect is different from the one in Ambarita Village. The fabrics of the huta sprawl are still conserving their original form, and the spread of settlement along the main road are not dense. Second, the biophysical layer depicts the disconnection of residual forest and riverline or green-blue corridors because of the main road and local roads. There are also potentialities of converting shrubs to green-blue connections, but the area is relatively wider than in Ambarita Village.

Lastly, the combined layer reveals the behaviour of the main road, local road and coastline sub-systems and their influence on the softscape system. The influences are the potentialities of ribbon development along the main road and settlements within 50 m from the coastline. Moreover, this combined layer also exposes the critical nodes that can be synergized to promote socio-ecological resilience, such as the areas on the coastline with a market, a port, and riverline connections. Also, the Huta Museum and its proximity to market and port results in a short, distanced high street that connects the coastline to the main road. This short distance is defined as unable to activate the highland but can act as a tool for other spatial drivers.

In conclusion, all critical nodes derived determine the language of fast system, slow system, integrating system, and densification system constructed in the next sub-chapter.



6.4. Potential Transformation

Implementation

6.4.1. Ambarita Village - Fast Systems

The fast system is defined as areas with a high transformation tendency. The main characteristics are high mobility access and high tourism development potentialities. Therefore, the high tendency to transform main road and coastline elements becomes the ground of fast system classification on the lowland area (see image X).

In the case of Ambarita Village, the evidence of a high transformation tendency of its coastline and main road are indicated through the dense development along the main road and urbanized cluster close to the port. Moreover, by an interview with a local architect, Mr Freddy, a special case of high street stretched along the lowland and highland projected to become tourism corridors. Therefore, the fast system in Ambarita Village includes spatial elements within the main road and coastline sub-system with the addition of indicated high street (see maps XX) within the local road sub-system.

Furthermore, this selection of spatial elements in the fast system is aligned with critical nodes defined in the previous sub-chapter to reveal potential spatial drivers. Then, three main spatial drivers formulated extends from highland to lowland with different transformation potentialities. The first space is located close to the dryland agriculture area, and potential kits are “Dryland Field Activation”, “Edge Activation”, “Participatory Monitoring”, and “Riverplain Preservation”. Activating this driver area with tourism programs as economic

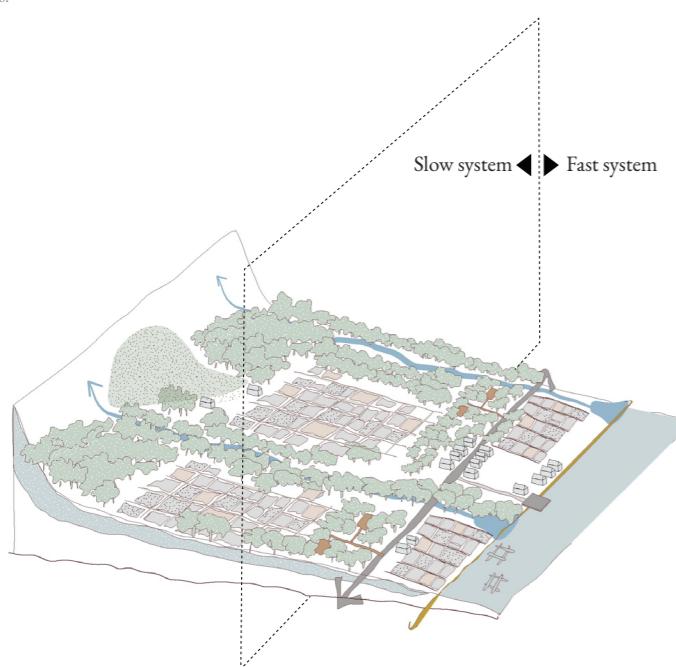
drivers will promote forest and riverline preservation, invite local collaboration, and enhance dryland agriculture field functionalities when the area is not used.

The second space is located along the main road, and the potential kits are “Frontyard Activation” and “Adaptive Reuse Building”. Activating this driver area with tourism programs as the economic driver will generate new income possibilities for local people through cohabitation. Lastly, the third space is located close to the port, and the kits are “Economy Model Integration”, “Riverplain Activation”, and Riverplain Preservation”. Activating this space will re-formulate coastal economic schemes by using potential spaces (riverplain) with a value of riverplain preservation.

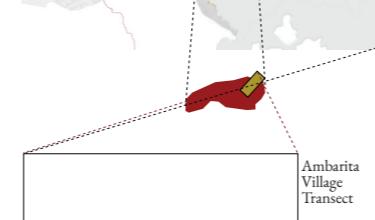
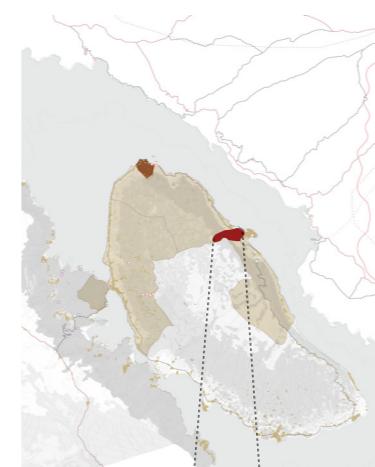
To conclude, this variation of transformation is projected to be synergized with other transformation kits within related sub-system (elaborated in sub-chapter 6.2.) to create more systemic integration. In addition, the implementation also considers involvement with various stakeholders in the different governance hierarchy levels that will be explained in the next sub-chapter of the Participatory Scheme.



122. Fast System Diagram. Source: Author
123. Macro Scale. Source: Author
124. Fast System in Ambarita Village. Source: Author

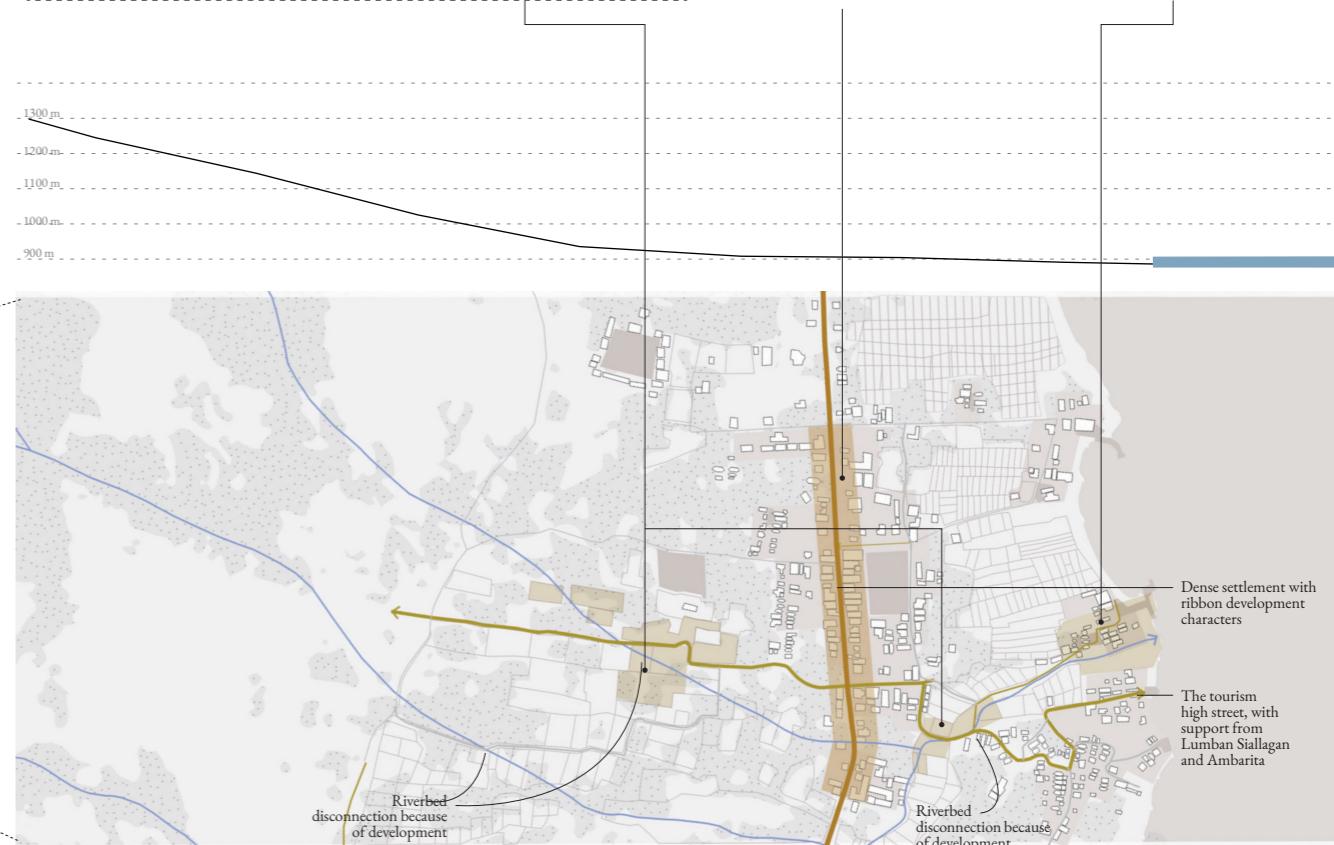
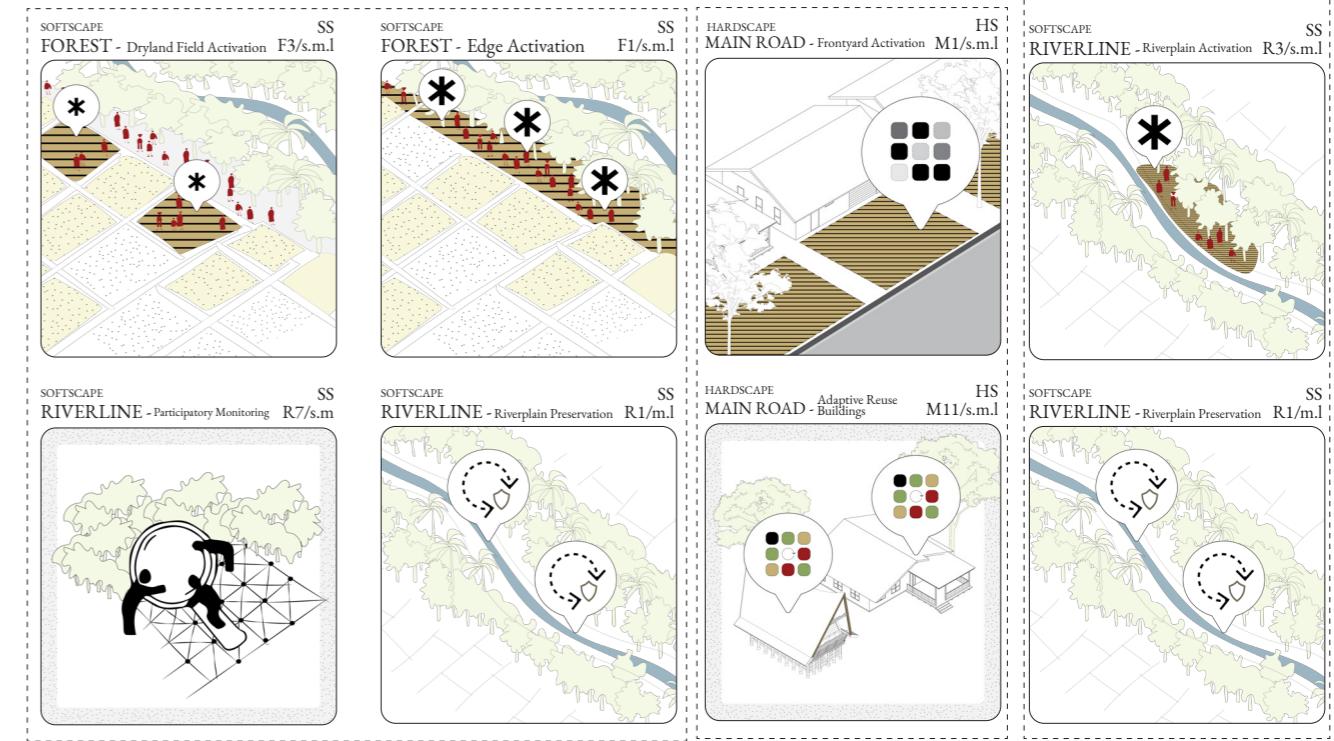


154



Fast System
— Main Road
— High Street
— Riverline
■ Critical / Potential Area
■ Most Developed Zone

0 200 m N



155

6.4.1. Ambarita Village - Slow Systems

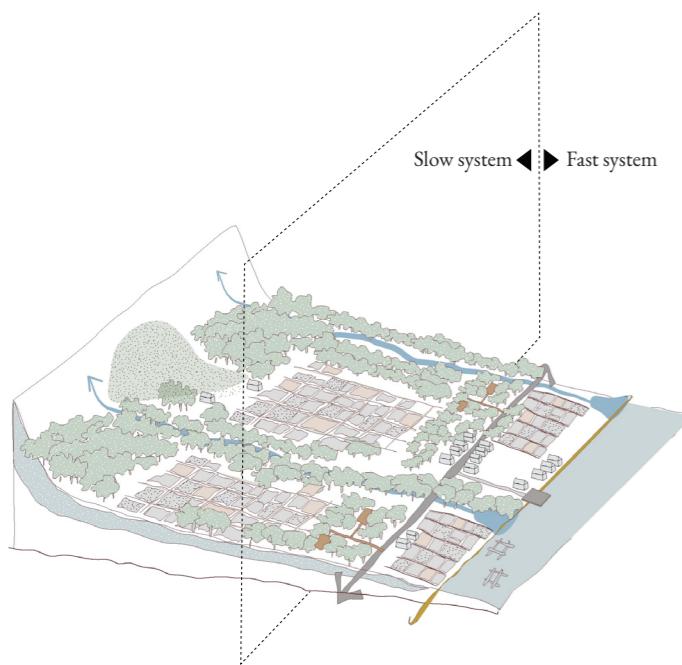
The slow system is defined as areas in critical conditions but has high potentialities to be transformed to integrate the biophysical systems. These areas are mainly located in the highland area, especially for the shrubs sub-system. However, there are exceptions for residual forest and riverline sub-systems whose locations stretched from the highland until the coastline (see image X).

In the case of Ambarita Village, the main critical conditions derived from the challenges of each sub-system. The main challenges in the highland area are Imperata grassland species existing on shrubs and abandoned dryland agriculture areas. In addition, the tendency of area reduction in forest area still occurs. Therefore, the main actions targeted in this location are “Edge Activation”, “Corridors Activation”, “Dryland Field Activation” within forest sub-system, and “Participatory Reforestation” within shrubs sub-system.

Next critical conditions happen along main road corridors. The green-blue disconnection due to this corridor built can be aligned with the challenge of sprawl tendency to project a transformation to promote green-blue corridors functionalities adapted to main road infrastructure by implementing “Infiltration Spaces” enhancement. It can be supported by the cohabitation of settlement owners along the main road to implement “Front Yard Activation” to accommodate this infiltration area enhancement. In addition, this action can also be supported by the program of “Adaptive Public Spaces” to promote spatial integration along the main road and other places.



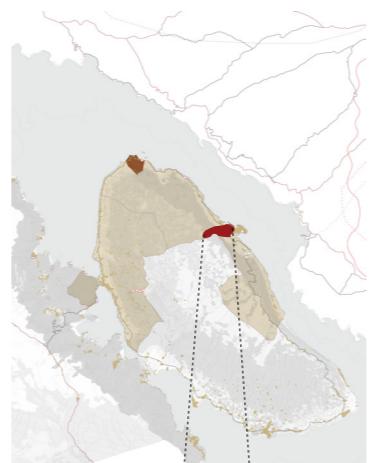
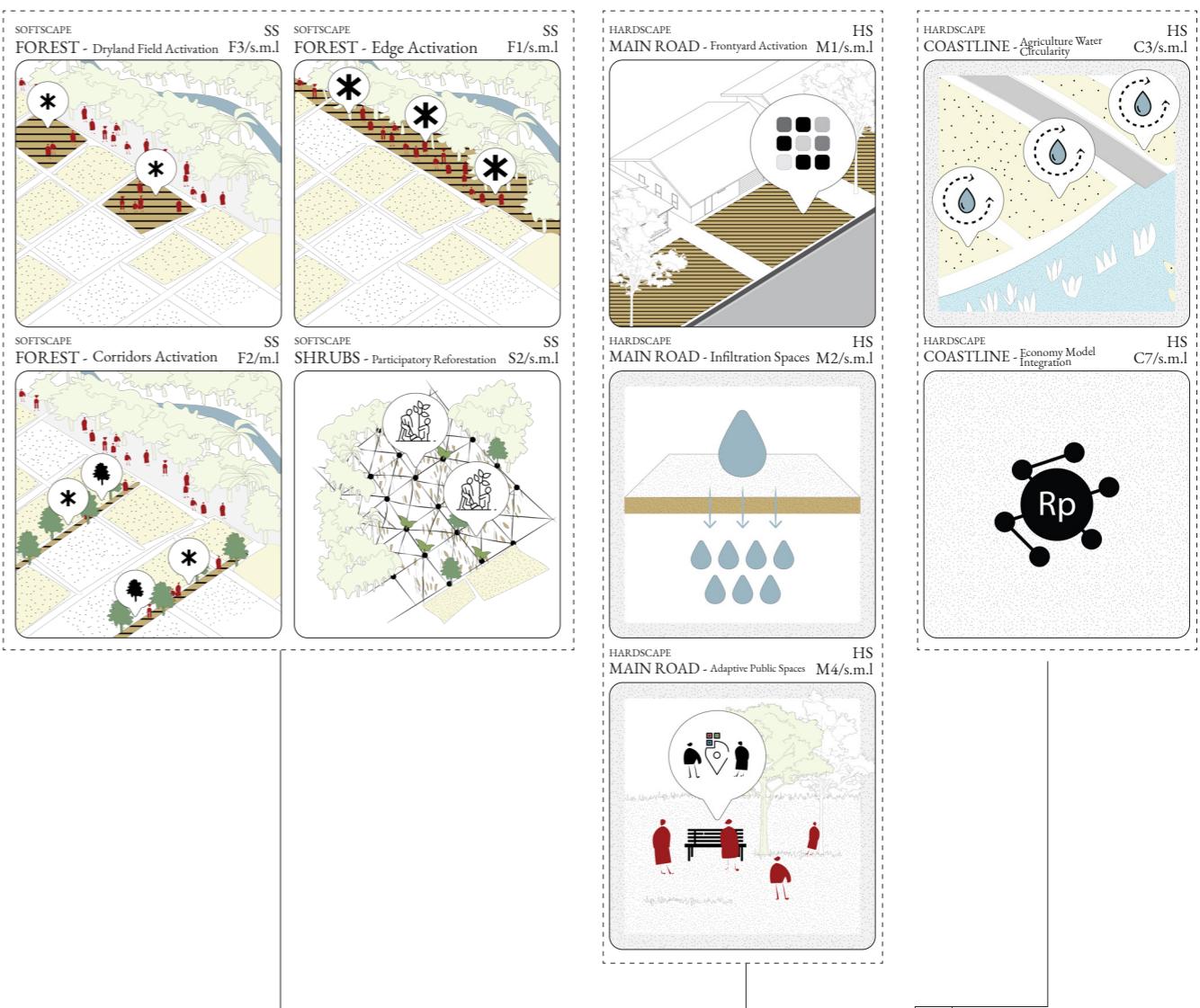
125. Slow System Diagram. Source: Author
126. Macro Scale. Source: Author
127. Slow System in Ambarita Village. Source: Author



156

The last critical condition examined is free spaces along the coastline. The “Economic Model Integration” kit can overcome the challenges of pollution generated from wetland agriculture, and unpreserved riverline corridors can be overcome through the “Economy Model Integration” kit. This kit introduces potential synergy between spaces such as free spaces supported port and market to accommodate more tourism activity as welcome point and beach experience. The benefits extracted from these new functionalities can be addressed for promoting agriculture water circularity or R&D in fish farming.

To conclude, this variation of transformation is projected to be synergized with other transformation kits within related sub-system (elaborated in sub-chapter 6.2.) to create more systemic integration. In addition, the implementation also considers involvement with various stakeholders in the different governance hierarchy levels that will be explained in the next sub-chapter of the Participatory Scheme.



Slow System
— Green-blue corridors extension on Main Road/High Street
■ Activate and preserve area on shrubs, residual forest, and agriculture area
— Green-tourism corridor / edge
■ Community public space

0 200 m N



157

6.4.1. Ambarita Village - Integrating Systems

Besides addressing challenges that lie within the fast and slow systems, other urgencies prevail in the whole system, which are:

1. cultural preservation, especially on vernacular knowledge generated from their daily living;
2. tourism tendency of more external culture immersion, and;
3. the anticipation of concentrated development.

Therefore integrating systems is formulated with the goals of:

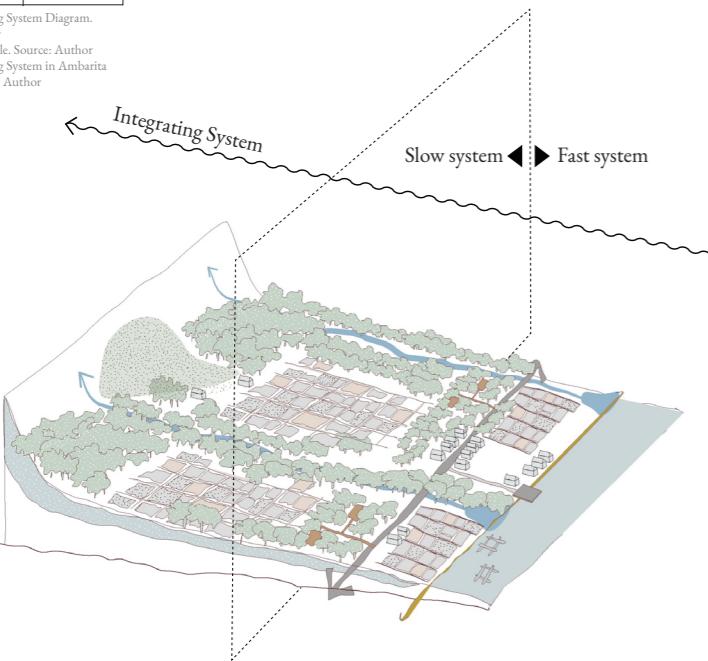
1. providing participatory culture preservation platforms; and
2. providing sharing culture between Batak community, local people, newcomers, and temporary visitors.
3. providing connection to non-interlinkage spaces, respectively.

Then, the formulation results with transformation kit: "Special Events", "Species Directory" and "Culinary Journey Program". "Special Events" kit is projected to introduce potentialities of spaces in specific seasonal time, give awareness of their rich spaces, and allow sharing culture between locals and visitors. The potential events vary from jazz musical camp to cooking competition between Huta. "Species Directory" kit is projected to achieve native species important for climate equilibrium in every sub-system. The archive can give awareness of vernacular knowledge important to the local community, especially the Batak community, and eventually strengthen their sense of cultural identity. In addition, aligning this species directory to the tourism program will promote educational values to the visitors and how culture exists in both intangible and intangible forms. Last, the "Culinary Journey Program" is projected to provide an interesting tourism experience through the culinary processes journey from harvesting raw ingredients to eating the meals. This program also allows women to participate, especially in the agriculture and cooking process.

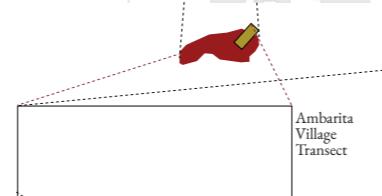
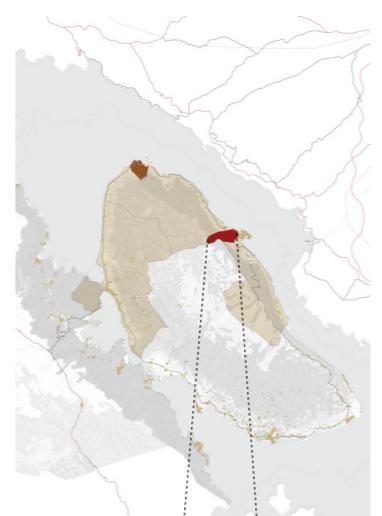
In the Ambarita case, all areas are the potential to accommodate these transformation kits. However, focus on spatial drivers is encouraged to ensure the sustainability of these areas in the long period that eventually influence other areas.



128. Integrating System Diagram.
Source: Author
129. Macro Scale. Source: Author
130. Integrating System in Ambarita Village. Source: Author

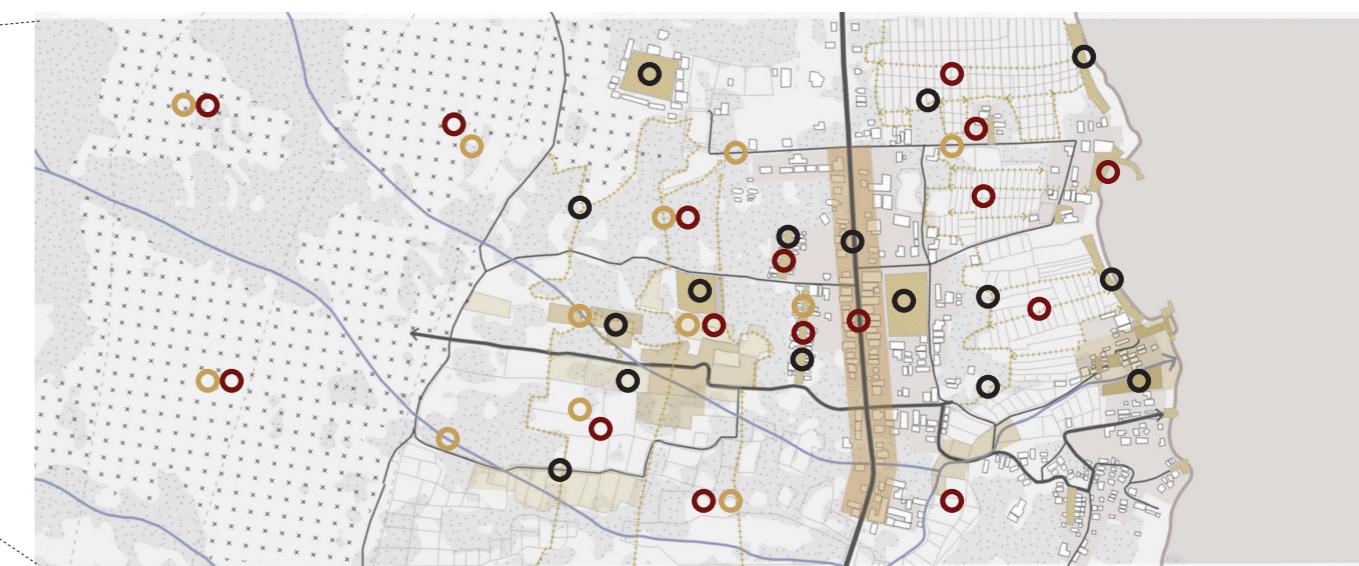
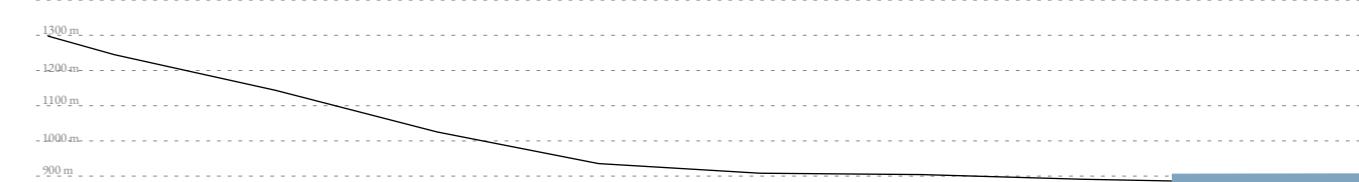
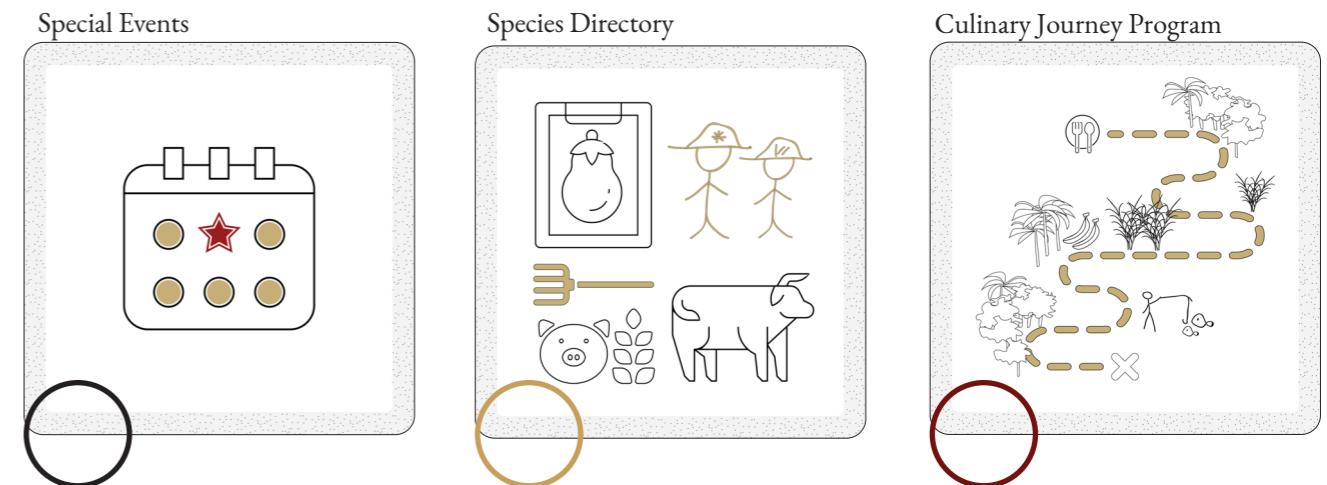


158



Integrating System
— Main Road
— Local Street
— River
... Contour
■ Water (Lake)
■ Residual Forest
■ Shrubs
□ Agriculture Area
□ Settlement
— Green-tourism corridor / edge
■ Community public space / Adaptive Coastal Public Space

0 200 m N



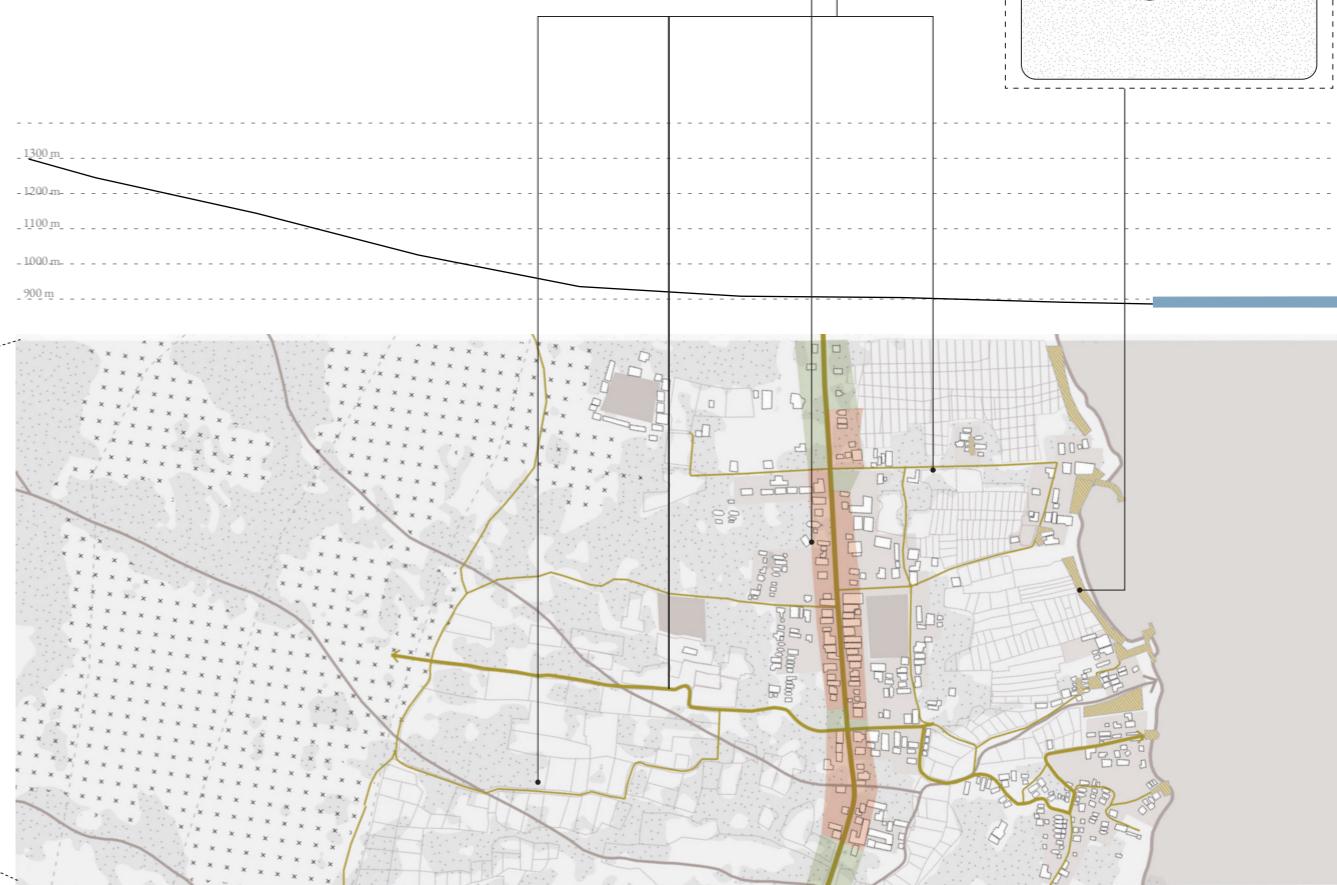
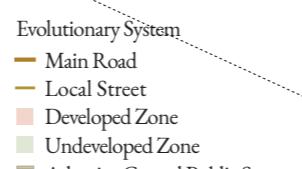
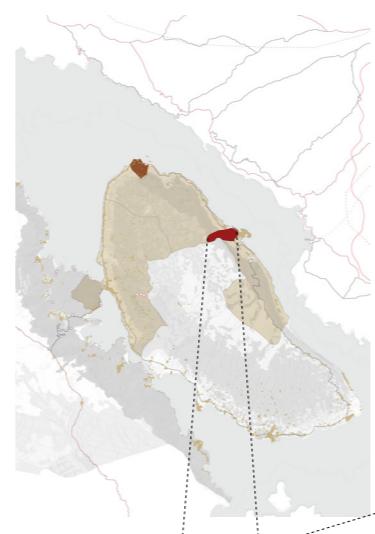
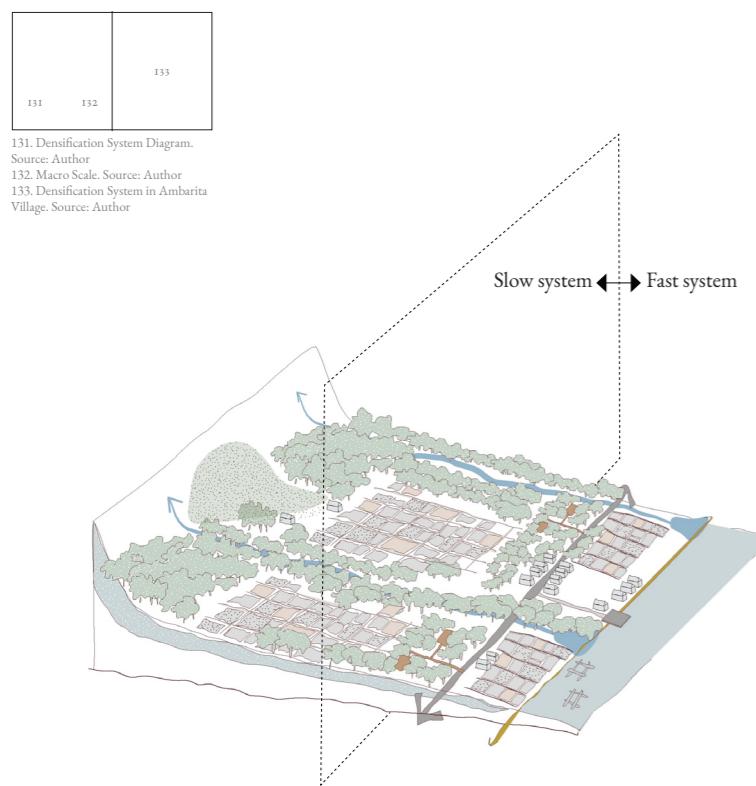
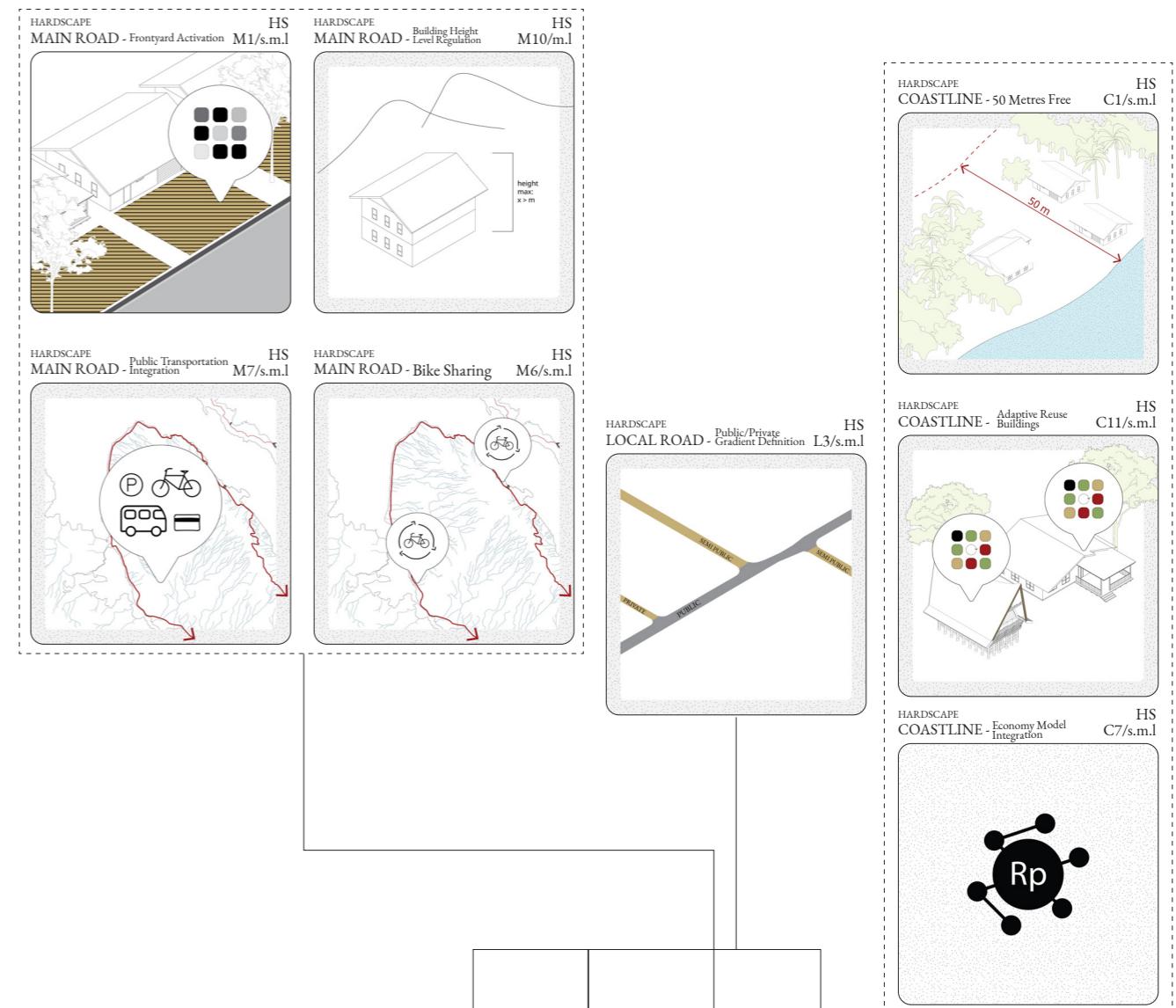
6.4.1. Ambarita Village - Densification System

There is also the possibility of spaces of a slow system evolving to become a fast system and vice versa. Therefore, addressing specific keystrokes and generating transformation strategies are encouraged. For example, in the case of Ambarita village, three main actions are:

1. Community collaboration needs to identify the “Public/Private Gradient” kit and align it to the bigger scale. This kit allows the identification of potential areas exposed in tourism or preserved just for local privacy to build up social respect. In addition, the gradient needs to be aligned with area potentialities and treated to identify tourism programs possibilities and nature preservation.

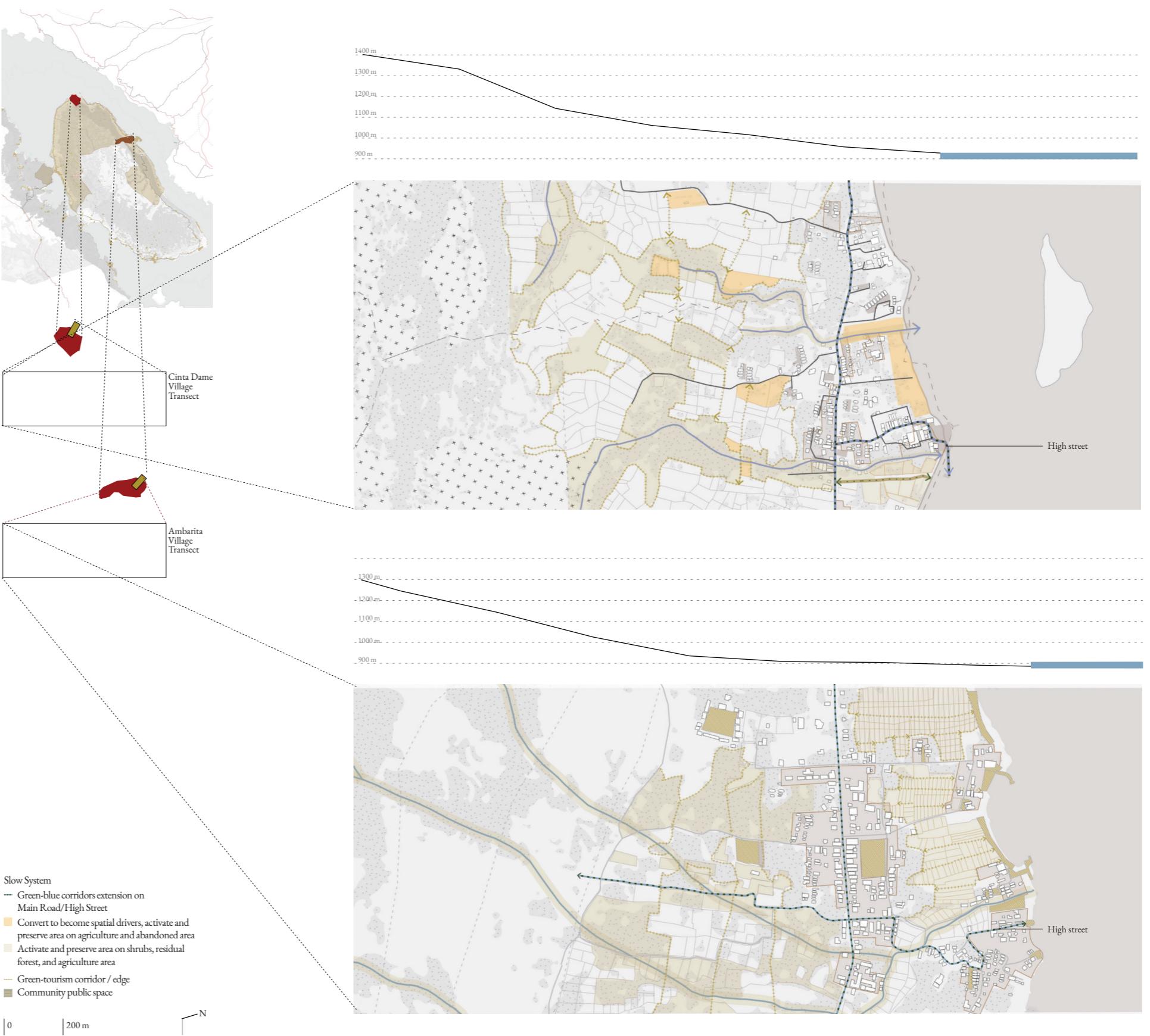
2. The main road that acts as the main regional connection is encouraged to preserve its spatial quality by preserving view sight along the road. Programming zones can do this preservation into classifications of developed or undeveloped. For the developed zone, the programs of front yard activation, building height level, adaptive reuse plan, tourism activation, and homestay activation can be options for the transformation to maintain spatial quality and accommodate more tourism activity demand. For the undeveloped zone, flexible installation and agrotourism programs can be options to maintain the spatial quality by preserving the original landscape along the main road. Next, mobility system alteration to become people-friendly is encouraged by implementing bike-sharing and public transportation programs along the main road.

3. Activating adaptive coastal public space allows prevention for coastline development to preserve 50 metres areas from the coastline as a climate adaptation strategy. This activation is encouraged to integrate with adjacent activities (wetland agriculture, port, market, or settlement) to promote a new coastal economy. For areas close to settlement, existing buildings are encouraged to be transformed to have climate resiliency, such as transforming into floating buildings.



6.4.2. Cinta Dame/Simanindo Village

The main spatial morphology differences between Ambarita and Cinta Dame/Simanindo Villages are the area's high streets behaviour. In the Ambarita Village, the high street extends from the highland to the coastline, while in Cinta Dame/ Simanindo Villages, the high street only stretches from the main road line to the coastline (image 136). This difference results in special treatment in the spatial drivers (light orange  hatch) on the highland area to activate the slow system (see the comparison of slow systems in Ambarita village and Simanindo village). In the case of Ambarita Village, the high street allows more flow in humans due to two attraction nodes lying both on highland and lowland (hiking activity and port existence, respectively). In the Cinta Dame/Simanindo Villages, special treatments can be anything. For example, more community cooperation or promising concept of spatial activation in the highland is needed to make it attractor points.



6.5. Implementation Strategy & Phasing

Adaptive Pathways and Locals Involvement

The implementation of this bottom-up approach is divided into four parts (preparation, pilot projects, scaling-up, and replication) in three breaking points that are following time-interval in the Integrated Master Plan 2020 (revival, acceleration, and maturation. The categorization and the milestone will be:

1. revival phase (2021-2025): focusing on project preparation and implementation of projects
2. acceleration (2025-2035): focusing on extending to larger scales
3. maturation (2035-2045): replication to other less priority areas along north Samosir Island.

Next, the implementations in every phase are synergic processes of multiple systems of fast, slow, integrating, and densification.

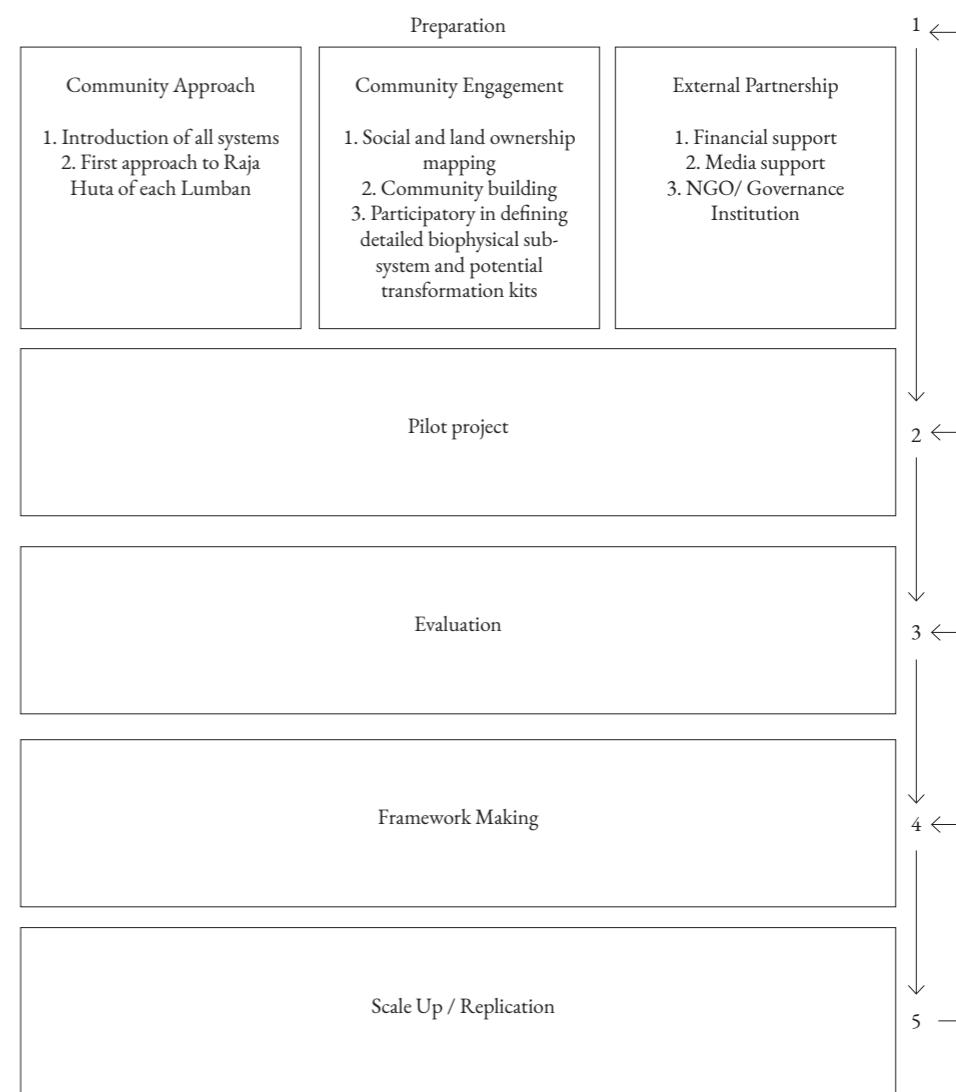
In every system, there is a milestone targetted in each phase:

1. 2021-2025: Revival
 - Fast system: well-established integrated pilot projects on priority locations
 - Slow system: activated spatial drivers on priority locations
 - Integrating system: pilot projects on spatial drivers location on priority locations
 - Densification system: participatory planning with related stakeholders, especially local people and communities on priority locations
2. 2025-2035: Acceleration
 - Fast system: well-established integrated pilot projects on less priority locations
 - Slow system: well-established integrated pilot projects on priority locations and activated spatial drivers on less priority locations
 - Integrating system: well-established system on priority locations
 - Densification system: participatory planning with related stakeholders, especially local people and communities on less priority locations
3. 2035-2045: Maturation
 - Fast system: replicated systems on north Sumatera Island area
 - Slow system: all built systems maintained and replicated
 - Integrating system: replicated on other areas
 - Densification system: re-evaluate all systems

This whole scheme begins with preparation for the participatory involvement of the local community. Thus, the programs include a community approach, community engagement, and external partnership. Also, the whole concept of implementation covers four steps: preparation, pilot projects, evaluation, framework making, and replication that will be in different phases in different locations and development areas (elaborated in the diagram on the next page).

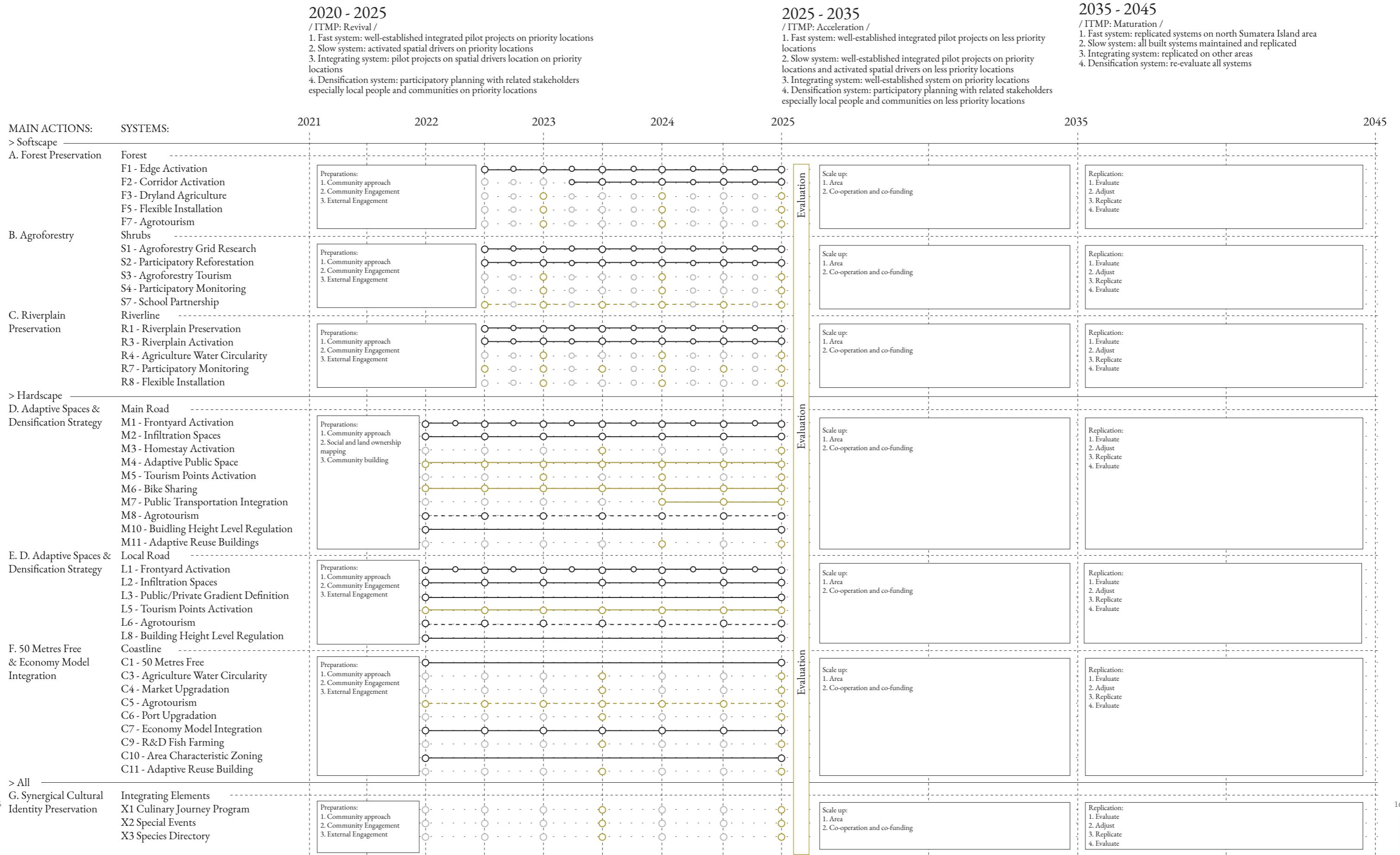
Every implementation phase uses an adaptive pathways system to allow flexibility of transformation with a gradient of importance in every kit and time. The classification of the gradient depends on the importance, which are the main action (black circle), highly recommended action (gold circle), and optional action (silver circle). In addition, the classification of the transformation frequency also is divided into three, which are obligately continuously activated (solid line), obligately activated in certain intervals continuously (dashed line), and suggested occurs at least one time during six month period (grey line). This classification invites local people to contribute collaboratively to make the pathways all active, including the suggested transformation kit and will be explained in the next sub-chapter of the participatory scheme.

The evaluation of this Socio-Ecological and Pro-Active Management through scoring mechanism per one year period. Every year, the accumulative score gained comes from the score of each transformation kit that has been implemented. The score identified in the cards are a reference that can be adjusted. By seeing the accumulation score, a sub-district can understand their collaborative performance towards socio-ecological resilience.



6.5. Implementation Strategy & Phasing

Adaptive Pathways and Locals Involvement



6.6. Participatory Schemes

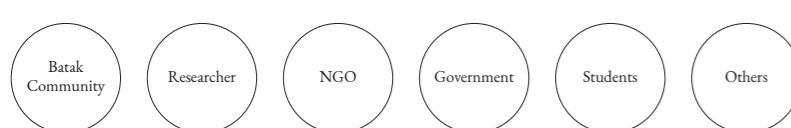
The main concept of the participatory scheme is to allow every potential stakeholder of transformation that includes local both traditional or non-traditional community involvement. To integrate this different transformation, it needs an integrating institution from Government Institute to align every transformation project and update the progress. The institution of Socio-Ecological Lab can be called "Kuat Bersama" with meaning of "Strong / Resilience Together" in Indonesian language. The institution consists of collaborators from multiple stakeholders and disciplines with responsibility of integrating, innovating, facilitating, and monitoring every projects.

On the next page, it explains step by step processes of participation. It starts with a on-going participant(s) who want to participate in the Socio-Ecological Movements. The reasons may be varies depending on their interest and values. Next, the participants go to the Kuat Bersama Lab to examine the potential kit that he/she can participate. Then, the participants have to define the potential transformation kit of their targetted area through defining their systems within the systemic group of spatial characteristics, biophysical systems, and social drivers with the help of facilitator(s). After that, the potential transformation kit will be defined, and the participants freely choose the suitable one(s).

After choosing, the participants will understand in which group project they are in since one card is a part of a group cards in order to create integrated project in a specific area. In the cards, you can see the impact on nature and human elements with economic, governance/land use, and co-constructed values consideration. In addition, the cards also shows what kind of stakeholders working collaboratively. Then, together with the group they will define the scale of the project based on their capacity. In the process, a representative from Kuat Bersama Lab will guide step by step.

A Socio-Ecological Resilience Lab
called
Kuat Bersama
or
"Strong/Resilience Together"

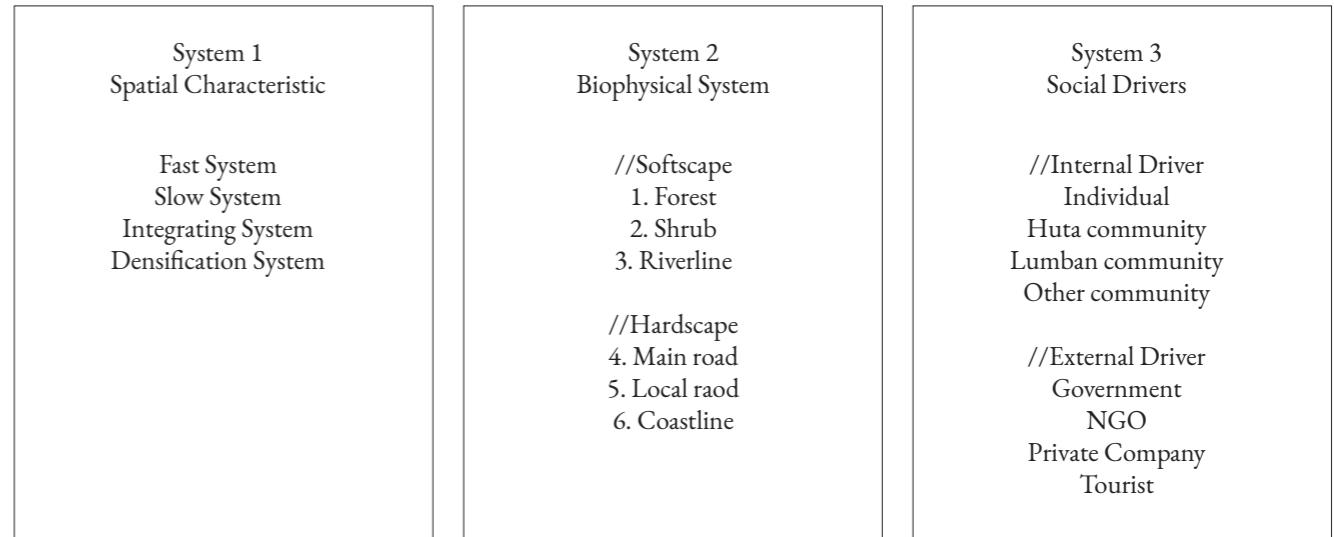
Collaborators:



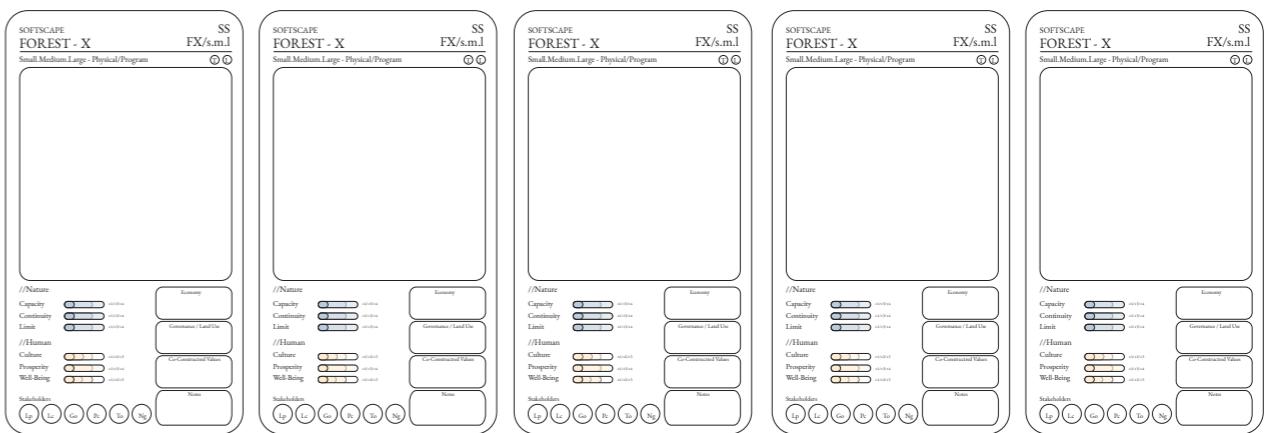
1. The transformation can be initiated by different type of stakeholders. The main idea is try to create collaborative transformation that involve local community (all transformation kits have role for Batak people/community).



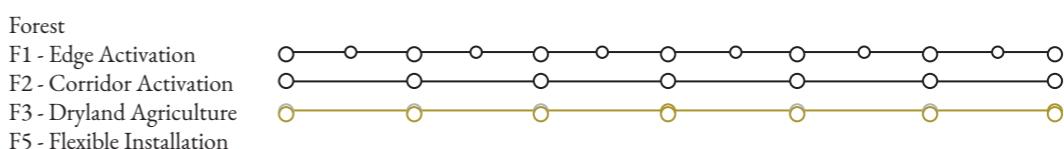
2. Define your potential transformation kit by classifying your targetted area through these three systems!



3. After defining your systems of interest, choose your potential transformation card(s)!



4. See on which project team are you in and see the progress by the adaptive pathways table.



5. Read the potential stakeholders in every transformation kit. Invite with them to collaborate!

6. Report your contribution to the Evolutionary Socio-Ecological Resiliency Institution, and see how your contribution influence on both nature and/or culture! Remember, you will always be guided by a representative from Kuat Bersama Lab!

6.7. Conclusion

The Formulae

The Human(Culture) - Nature Relationship formula become the first findings that explain the evolutionary of Human(Culture) - Nature relationship by reformulating a theory from Millenium Assessment and combining it with Mc Harg and Prominski explanation that somehow conceptualizes the relationship in the circle form with two poles. The classification of the formulae is divided into three categories: nature, human, and in-between category, with each element inside them. For nature or biophysical systems, the integration is shown by capacity, continuity, and limit. For the human, the elements are culture, prosperity, and well-being to show the livability of Batak people in the area. Last, the in-between elements become the drivers of changes both for nature and humans.

The Evolutionary

This formula is then used to define the past, present, future relationship and its evolutionary. The uses are different due to the data availability. In revealing the past and past-to-present relationship, the focus on in-between elements is selected to specify what drivers change caused to nature and human evolution.

Chapter 4 shows that the changes of in-between elements that were started by the introduction of education, religion, and centralized governance in the colonization era that continuously evolved to a stage of economic sectors in the higher governance scale level dominate the state of nature and humans. However, in the past, the existence of Huta as the smallest level of Batak Community already cover the integration of all in-between elements of the economy, governance/land use, and co-constructed values. In addition, the culture of Huta consistently preserves the robust socio-ecological system as they put high respect on their culture. Therefore, it means that Batak culture, represented by Huta clusters in the spatial form, already performs sustainability and inclusivity in the area.

In chapter 5, the deconstruction of the present The Human(Culture) - Nature Relationship shows how the past to present C_N relationship has significant potentials in the form of vernacular landscape performativity. By recognizing and improving this, the integration of the biophysical system along the north part of Samosir Island will be achieved to promote sustainability. However, the deconstruction also reveals that the changes of in-between elements caused the disintegration of biophysical indicated by the disconnection of vernacular landscape mainly on the lowland and the pollution from mismanagement in their production areas. Moreover, in the aspect of socio-culture, the deconstruction also exposes that community become the key drivers to align the synergy between governance hierarchy scales due to the strong bond in each community and also their capacity to resonate synergically with other governance scales (from individual to the global) to promote inclusivity.

The Relation to Tourism

The present tourism by understanding the Integrated Masterplan 2020, culture and nature elements are perceived as commodities and have no specificity of relation to the tourism plan. However, by referring to the analysis, the Batak culture of sense of community and the traces on the landscape that are synergically aligned in multiscalar can potentially formulate a robust framework that emphasizes real values of culture and nature towards sustainability.

In addition, the systems mentioning the participation of local people are not elaborately explained in the plan and process. Thus, it is paradoxical that the perceived culture is highly important for the tourism element but absent in considering the culture as active actors. Therefore, the relation of evolutionary human (culture) - nature relationship to tourism development is to generate possible socio-ecological resilience transformation programs by recognizing local strength preservation

through pro-active management in achieving multiscale dynamic systems equilibrium.

Socio-Ecological + Pro-Active Management Framework

The framework comprises all the adaptive possibilities, including systematic biophysical and socio-cultural, that allow the participation of diverse potential actors from local people to NGOs to tourists and others, focusing on local involvement by exposing potentials while preserving their cultural identity. First, the implementation composes the intertwinement of complex systems, consisting of fast, slow, large and small systems to create robustness (Davoudi, 2013). Next, adaptive pathways are also formulated to allow flexibility and innovation through expansive participation but still keeping the persistency by setting certain fixed projects that become the main actions. In addition, some transformation also promotes learning capacity to make the locals become resilient, active actors even with disturbances. Furthermore, The implementations also need a mediator institution or a lab with support from the local government to ensure it aligns with government regulation and maintains longevity. Finally, it also functions as co-management promotion by accommodating potential collaboration within the Lab with the help of a facilitator.

Conclusion

To conclude, implementing this socio-ecological + pro-active management framework with improvement potential from tourism plan can promote robust future human (culture) - nature relationship with the notion of integrating in-between elements for all governance hierarchical scales, and this is possible with tourism. However, the main challenge is examining and perceiving hidden vernacular knowledge that lies on tangible and intangible elements still underperformed. Thus, this evolutionary deconstruction and construction processes within multiscale can be seen as a promising approach to grasp culture-nature symbiosis (Watson, 2019).

7. Appendices

- 7.1. Literature Frameworks
- 7.2. Transformation Kit Bundles
- 7.3. Thesis Reflection

Bibliography

7.1. Literature Review

The Manifestation of Future Human Culture – Nature Relationship: Towards Sustainable and Inclusive Tourism Development Plan in Developing Countries

Asmita Puspasari / 4775198

ABSTRACT

The evolution of human culture – nature relationship from histories demonstrates changes in how people manage their land. In the past, the relationship between humans and nature had high interdependency reflected by ceremonial culture tradition. In the Anthropocene era, industrialization and globalization have huge influences on the relationship and nature gradually become divisible thus changes ways human perceive and manage landscape (McHarg, 1992).

The concept of valuing the livability of human living by using GNP (Gross National Product) as the global measurement has started in the industrial era. Each country, with the territory boundary, has varied authorization in translating and managing its natural resources to get the uppermost GNP level. Tourism is targeted to become a sector that can promote national economic growth especially in developing countries (UNWTO & UNDP, 2017). It is due to the wonderfulness of nature and the local culture uniqueness that brings identity and meaning.

However, land structure and land management alteration to accommodate new tourism functions still are predominantly having lack consideration on local context mainly in the social (culture) and ecological aspects causing socio-ecology vulnerabilities and economic. Therefore, it raises the main question that will need to address through this paper. The main question is about what kind manifestation of human (culture) - nature relationship within tourism development so then be able to mitigate economic leakage and socio-ecology vulnerability possibilities.

Keywords: *Human culture - nature relationship, tourism, developing countries, evolutionary resilience, socio-ecology vulnerability*

A. INTRODUCTION

The evolution of nature and human culture are unavoidable. For the nature aspect, there are pressures of spaces that resulted from the high acceleration of urban population growth. It leads to the growing demands to accommodate human activities expansions. Moreover, in the human's culture, the rise of the world of information allowing people to share their culture, ideas, perception, and knowledge easily on a global scale. Then, it causes unpredictable fusions in human culture.

The relationship between humans and nature is reflected in the way humans manage their territory. Human culture and social structure have a direct influence on their production system and urban settlement. It is exemplified through the agricultural system, the urban morphology, and architecture style. Thus, this relationship has established an identity of a place that is highly associated with the people's perception translated from the culture on their landscape (Hărmănescu & Enache, 2016). However, it is known that both culture and nature are always evolutionary due to unprecedented settings. Then it determines that the relationship between human (culture) and nature are dynamically transformed in between strong and loose conditions both in different space and time circumstances.

Industrialization, new technology, and globalization are the main drivers that shape the culture and nature relationship on a global scale. Countries' economic cumulative output translated through GNP (Gross National Product) and GDP determines countries' performance and indirectly creates competition between them. The competitions vary including production, consumption, tourism, education system. However, GNP and GDP measures do not embrace nature capacity valuation in the measurement. Therefore, in today's world, the relationship between humans and nature is divisible, not interdependent. Although, in some countries, the loss of the human-nature relationship is influenced by cultural assimilation due to colonization.

The elevated demand for mobilization caused tourism to become a promising sector to be developed to promote national economic growth. In many developing countries, pristine nature and unique indigenous culture are seen as assets to promote economic growth through tourism.

and contextual sense. Also, vernacular is a representation of traditional or indigenous knowledge that also has value in climate discourse. The reason is that traditional knowledge includes practices and innovation by indigenous communities that have been developed through generations in certain places and manifested into their culture and traditions (Hărmănescu & Enache, 2016).

Moreover, culture and tradition manifestation has been formulated in the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, the local language, and agricultural practices. Ignoring the former history means a waste especially when the knowledge transfer of vernacular knowledge has been conducted in a relatively long period (Hărmănescu & Enache, 2016).

The ability of traditional decisions to measure the capacity related to the everyday world to the infinite and invisible dimension of the universe becomes a big mystery that has been missed in modern resolution. Nature and culture art were synergically in line, not being antithetical, and works as a comprehensive system. Besides, traditional knowledge was also embodied in its development with the human body through physical activities and materials. They did formulation based on their body capacity and translate their rhythm of working and boundaries into their cultural practice in managing the land (Corner & Hirsch, 2014). Therefore, considering vernacular knowledge is highly necessary for depicting future evolution of sustainability.

2. The Evolution Human Culture and Nature

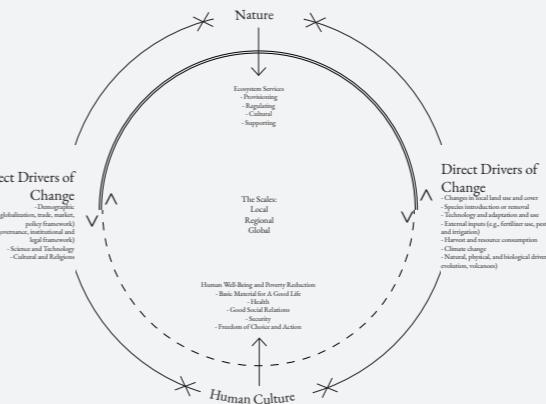


Figure 1. The Human Culture – Nature Relationship and The Drivers of Change adapting by Millennium Ecosystem Assessment Framework. Source: the author

Referring to Corner & Hirsch (2014), environment is the relationship that connects a society with space and nature, while the landscape is the term to illustrate the land shaped by a human with interpretation of in myth, language, maps, paintings, film, or other interpretation. The landscape is a medium that evolved along with the imagination and practices of specific communities in a specific time. As time goes, landscape language perceived by society varies in a wide range. The perception, meaning, and value of society are not fixed depending on the culture and time. The conclusion that landscape and society's culture are interdependent two elements that evolving (Corner & Hirsch, 2014).

The socially and symbolically derived coherency of the traditional measure began to change during the scientific revolution of the seventeenth century (Corner & Hirsch, 2014). The landscape that began in the pre-18th century that still conserved many fragments and arrangements of isolated past is called traditional landscape (Antrop, 2005). Following the radical industrialization developments from the 19th century until the Second World War that put forth by some inventors, created an autonomous system that resulting in the detachment of human experience to the culture situated origins. In this era, lifestyle and attitude towards landscape and environment changed

progressively (Antrop, 2005; Corner & Hirsch, 2014). Besides, every element in the world is quantifiable and homogenously arranged and be considered as a neutral element. As a result, the splitting of the object and subject in this world comes to the surface enabling the domination of humans over nature. Then, after the World War, landscape described by rising globalization and urbanization. And this is called the post-modern new landscape (Corner & Hirsch, 2014).

Furthermore, in today's world, the conversion pace and magnitude of landscape depend on the innovation of technology, communication media, and cultural changes. This co-dependency resulting in a significant difference between traditional and new landscape which is the dynamics change of speed and scale of the landscape users' perception, values, and behaviors (Antrop, 2005). This is supported through Corner and Hirsch (2014) writing:

We are surrounded by a space-time landscape of electronic media, images, internets, information superhighways, transglobal commutes, and rapid exchange of material both visible and invisible. It is a world of infinite communication. Everything is now available and immediate, without delay or distance. The geographical coordinates of one's place in the world are no longer simply spatial but deeply folded into the processes of speed and exchange.

3. The Current Relationship, The Drivers, and The Vulnerabilities

The current relationship between human culture and nature can be illustrated through Figure 1 that is adapted from the Millennium Ecosystem Assessment Framework (2005). It shows that nature and human culture are influencing each other on multiple scales starting from local to global. Also, there are also external drivers of change that can work toward both sides (human culture and nature) that will influence the relationship as well. Thus, according to the diagram, it represents that, for example, changes in local land use and cover may influence human well-being in the human culture aspect whether to the positive direction or the otherwise that possible to generate vulnerabilities.

C. THE PERSPECTIVE OF SUSTAINABLE AND INCLUSIVE TOURISM

1. Tourism and the Sustainable Development Goals (SDGs)

Nowadays, tourism has an extensive impact on societies, the environment, and the economy due to the activities of the crossing border of about 1.2 billion tourists every year. This sector represents 10% of world GDP and 7% of global exports. As a result, the tourism sector has become a prominent role for 2030 SDGs achievement and becomes one sector that is a vital contributor to economic growth, environmental preservation, poverty declining, and job opportunities increase. A well-designed and managed tourism is expected to be able to preserve nature and cultural heritage, community building, expanding trade opportunities, and promote peace and intercultural sharing. However, at the same time, the movement of people traveling in their tourist activities also produce pressures such as air pollution, economic leakages, cultural values, and impacts for local communities within the site (UNWTO & UNDP, 2017). In order to achieve sustainability, UNWTO and UNDP formulated guideline reports for the tourism sector to adopt the SDGs within the tourism development plan towards 2030. The use of this report is to inspire both public and private sectors while also identifies new financial approaches in order to achieve sustainable tourism.

1.1. Tourism Governance – SDGs in Public Policy

From the public sector perspective, policymakers especially in developing countries to implement SDG through their tourism sector. In addition, 41 out of 64 countries that submitted Voluntary National Reviews has recognized the value of tourism to achieve SDGs. Among the 17 SDGs pillars, opportunities, challenges, and threats for tourism are classified based on the number of mentions. SDGs 8, 9, 11, 12, 14, and 17 on 'Decent Work and Economic Growth', 'Industry, Innovation

and Infrastructure', 'Sustainable Cities and Communities', 'Responsible Consumption and Production', 'Life Below Water' and 'Partnership for the Goals' are believed to have highest potential opportunities (UNWTO & UNDP, 2017).

On the other side, when tourism is not well designed and managed, there will be negative influences on the planet, people, prosperity, and peace. Thus, challenges and threats are also possible in the advancement of SDGs. Apparently, the main challenges in addressing SDGs in Tourism lies on SDGs 12, 14, and 11 on 'Responsible Consumption and Production', 'Life Below Water', and 'Sustainable Cities and Communities', correspondingly. Besides, the challenge of sustainable consumption and production in tourism may cause carbon footprints due to the services of accommodation, transport, and food consumption. In addition to that, the main consideration of the tourism development plan still merely lies in the economic value while poorly consider environmental and social values. Next, all the threats to tourism are linked to all issues related to SDGs 16, 13, 15, 11, and 8. The issues are security and peace, climate change, loss of biodiversity, natural disasters, and economic instability. Therefore, it can be understood that economical value or prosperity growth still become the main orientation instead of others (UNWTO & UNDP, 2017).

1.2. Tourism Business Case – SDGs in Private Sectors

In the private sector perspective, sustainability in all tourism industries is demonstrated by the competitiveness and profitability supported by CSR actions that produce co-benefits for people and the environment. The activities of CSR focus on business operations and host community support. The tendency of actions to business operations and host community support specifies that competitiveness acts as the main value so then the business activities tend to generate win-win strategy in order to get the most efficient and effective cost in the terms of operational and external cost. Therefore, it can be concluded that sustainability in tourism has to embrace the idea of business as the base in order to also accommodate the social and environmental values (UNWTO & UNDP, 2017).

Furthermore, in order to generate a business model of tourism that integrate economy to the environment and social aspects in the CSR activities, it needs to consider the complexity and the immense size of tourism value chains. Then, tourism companies need to understand deeper how to embed the sustainability value into their business strategy and integrate their business chain into the local chain in the context of agriculture, food processing, and artisanal productions (UNWTO & UNDP, 2017).

1.3. Sustainable Tourism Finance for SDGs Promotion

Applying adequate financing requirements for achieving the SDGs is highly critical in order to overcome capacity gaps and resource access. In this aspect, international cooperation with developed countries or international public finance is highly recommended to address sustainable tourism development targets. For international public finance, Official Development Assistance (ODA) and Aid for Trade (AFT) for tourism need to be scaled up especially for developing countries in order to finance their SDG-oriented tourism ventures. Despite, the allocation for the tourism sector in these organizations is not too significant with 0,14% of total bilateral by ODA and 0,16% of total disbursement in the tourism sector in the year 2015 (UNWTO & UNDP, 2017). Yet, tourism growth recognition is important to increase the potential of ODA disbursement increase. Hence, the involvement of the tourism ministry with integration with tourism business, civil society, and other tourism stakeholders are highly encouraged. Moreover, international cooperation is also needed due to it allows transferring multiple sources to foster tourism contributing to SDGs especially in developing countries since tourism has a high potential to drive development. This cooperation is linked to SDG 17 on 'Partnership for the Goals' is projected to become a success through genuine and meaningful partnerships, then it is also needed to fully align the objectives from both donor and recipient countries (UNWTO & UNDP, 2017).

2. Community-Based Tourism

In the tourism industry, the community aspect needs to be integrated into the development planning and management as tourism discourses related to several community issues such as community involvement, the tourism influences on the local community, and community capacity building. Then, the tourism development plan in developing countries has adopted Community-based tourism (CBT) in order to enforce sustainable development that will benefit all people through community capacity building and participation (Junaid et al., 2020).

However, in reality, the concept of community-based tourism still in a problematic condition since communities in a destination do not get expected benefits as initial plans which are benefiting for all. The main reasons for this condition are poor preparedness and limited sources for building up a business in order to get benefits from tourism (Junaid et al., 2020). Moreover, some issues related to environmental degradation are also considered important to be addressed since extended ignorance of it will cause more inequality.

According to Hiwasaki (2006), the CBT concept is categorized into four principles that will promote the participatory level of the local community: empowerment for the local community, tourism resources conservation, socio-economic promotion for the community, and the improvement of visitor experiences quality during the trip. In addition, division of the local community into three groups based on their interest (very enthusiastic voluntarily group, financial advantage seeker group, and no interest group) is recommended to be conducted prior to the programs of local community empowerment (Junaid et al., 2020).

Moreover, community-based tourism is recognized to become the most favored option to promote community resiliency due to the idea of collaborative management of natural resources within land reformed areas. The collaborative management approach is designed to promote inclusive participation of all stakeholders within the development and prevent the trajectory of inequality due to the dominancy of the top-down approach (Chambers, 1994; Child & Barnes, 2010; Musavengane & Kloppers, 2020). Therefore, communities can have equal voices despite the underprivileged positions they have.

In the implementation of community-based tourism, most conflicts come from significant power imbalances which leads to conflicts between community heads and members (Colbry et al., 2014; Musavengane & Kloppers, 2020). Apparently, the root of these conflicts is actually associated with poor governance, poor finance, and poor skill (Musavengane & Kloppers, 2020). According to a study by Musavengane & Kloppers, strong social capital has high importance to be enforced for promoting community resilience in the management of collective natural resources. The main motives of this strategy are due to the poor transparency and integration between traditional laws and judicial policies from the government sectors that lead to the trust issue from communities, the poor skill development of the community, and lack of continuous interactions between internal and external stakeholders. To conclude, community-based tourism not only able to promote community resilience and equality, but also creating reciprocal trust between government and local communities.

3. The Combination

Tourism is indeed a promising potential to promote economic growth. Achieving sustainability and inclusivity within tourism development requires high dedications and consideration especially for underprivileged communities due to their insignificant voices. Thus, intertwining the ideas of SDGs in tourism and community-based tourism approach is projected to be able to promote both sustainability and inclusivity within tourism development plans in developing countries (Figure 2).

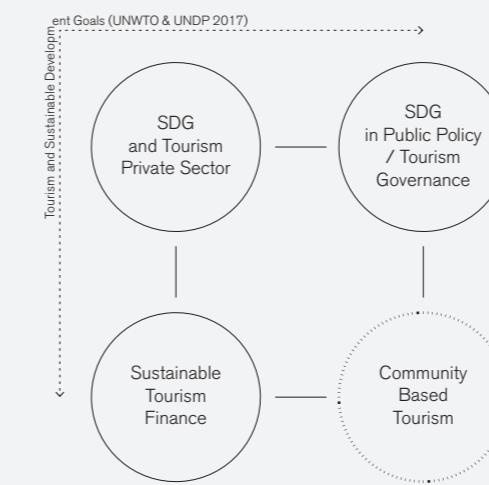


Figure 2. The intertwining of SDGs in tourism and community-based tourism. Source: Author

D. THE MANIFESTATION OF FUTURE HUMAN CULTURE - NATURE RELATIONSHIP

1. The Evolutionary Resilience Manifestation

Nature and people are continuously evolving and work as co-dependent systems (Folke et al., 2010; Davoudi et al., 2013). It can cause highly unpredictable uncertainties of evolution that leads to the importance of socio-ecological resilience approach within massive development planning. The term resilience is derived from the Latin word 'Resilire' with the meaning of rebound. It is the ability to bounce back to the stability domain after responding to the disturbance caused by possible tensions and pressures. (Gunderson, 2000; Carpenter et al., 2005; Davoudi et al., 2013). The prominence is both about the time needed for a system to bounce back to the stable condition and also about the amount of disturbance that can be taken and still in the former condition before altering to other function. Also, resilience is not merely about the ability to bounce back, but also to bounce forth into a new state (Davoudi, 2012).

Furthermore, today's challenge of climate adaptation can be approached through evolutionary resilience by understanding the dynamic and holistic characters of the systems which include both ecological and social approaches. Characters of ecology exemplified by present conservation and past recoveries reflected on the need for persistence, adaptability, and transformability values across multiple scales and time frames in natural systems (Davoudi et al., 2013). Also, the co-dependency of humans to the ecological system leads to the need of including the social context in the component of the framework which can be represented by preparedness or learning capacity. Thus, the relationship between ecology and society are interdependence and illustrated in Figure 3.

On the other hand, the notion of resolving challenges and complications through a collective process is considered to be highly important. Thus, resulting in the adaptive co-management framework which acts as a base to promote socio ecological resilience and sustainability. The process in achieving adaptive co-management is identified through three main systems: ecological system, economic system by using a sustainable livelihoods framework, and a process system that allows the involvement of institutions role and power (Plummer & Armitage, 2007).

For the ecological system, the parameters are derived from unwanted consequences from the ecological evolution which are a condition of ecological components, relationships, and functions between components, diversity, and continuity of memory. Meanwhile, for the economic system parameter, it is translated from the desired social and livelihood outcomes such as well-being increase, poverty decrease, income increase, vulnerability decrease, food security increase, and resource use sustainability. Lastly, the process system parameters are

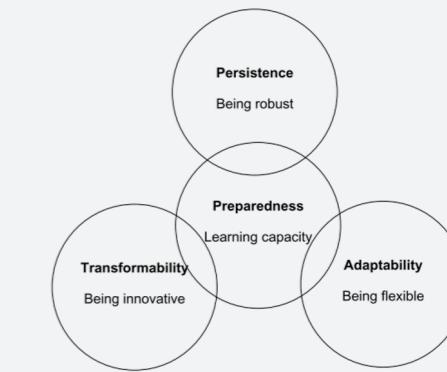


Figure 3. Framework of evolutionary resilience and climate adaptation. Source: Davoudi et al., (2013)

mainly classified into two main concerns: livelihood enhancement and ecological sustainability. These classifications are specified by three orders of tangible or intangible, the initiatives specification, and evidence that is manifested after a specific initiative is over (Plummer & Armitage, 2007).

In the adaptive co-management approach, the dynamic of the system is structured through slow-moving variables and fast variables. All elements that operate at larger spatial-temporal scales such as landscape connectivity or social systems' values are classified as slow-moving variables. These variables act as a tool to maintain the stability and enable legacy systems that are needed in evolutionary processes. And, all elements that operate at smaller spatial-temporal scales such as insect outbreaks in an ecosystem or individual preferences in the social system are classified as fast-moving variables. The relationship between slow-moving and fast-moving variables is that the fast-moving has the potential to overwhelm slower variables. Thus, clustering all systems based on these two variables can lead to a holistic understanding of different spatial and temporal scales interdependency within a complex system to meet ecological and socio-economic sustainability (Plummer & Armitage, 2007).

Therefore, it can be translated that manifesting evolutionary resilience into the human culture – nature relationship is by combining preparedness of social and natural systems and adaptive co-management concepts to promote three prominent values: learning capacity, adaptivity, and collectivity. The manifestation is illustrated in Figure 4.

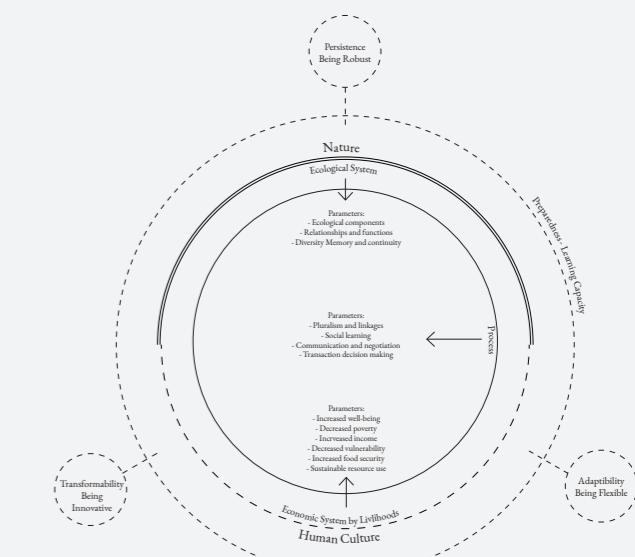


Figure 4. Human culture – nature relationship manifestation adapted from evolutionary resilience and co-adaptive management frameworks. Source: the authors.

2. Proactive Manifestation: Multidisciplinary Approach – Krebs Cycle of Creativity

In the projection of plausible futures of ecosystem and human well-being, the Millennium Ecosystem Assessment has developed four scenarios. The scenarios are explored in two different development characters: the globalized world and the regionalized world. And, each character, has two different methodologies of ecosystem management which are reactive and proactive. So then, the four scenarios are Global Orchestration, TechnoGarden, Order from Strength, and Adapting Mosaic.

Referring to the scenario, significant deterioration on ecosystems is projected to happen under the Global Orchestration scenario and Order from strength. On the other hand, a less severe decline in services is projected to happen under TechnoGarden and Adapting Mosaic since the expectation of climate change rates is low. Moreover, From the assessment, by 2050 wetlands degradation and conversion to agricultural land use are projected to increase under the reactive Global Orchestration and Order from Strength scenarios (Millennium Ecosystem Assessment, 2005). Therefore, proactive ecosystem managements are highly encouraged to increase the quality of ecosystem services.

Implementing proactive ecosystem management can be construed as the involvement of multi-actors with a variety of disciplines. The evolution of nature and culture also gives the conception that to gain a holistic picture of the human-nature system we need to find the missing links between disciplines and integrate them. Then, it leads to a new framework of Krebs Cycle of Creativity by Neri Oxman that endorses the multi-discipline integration within design or creativity processes.

The concept of Krebs Cycle of Creativity (KCC) starts with the idea that four domains of human creativity—Science, Engineering, Design, and Art—are known to have intellectual boundaries and the rising concept of the Age of Entanglement. In the Age of Entanglement, the disciplinary division dissolves, and separating one ingredient from another is likely impossible. The interrelation between four domains is imagined to be able to create comprehensive knowledge to address world challenges that are complementary and intertwined (Oxman, 2016).

The KCC (Figure 5) is designed in the circle form with two different diagonal axes that represents the four domains of human's creativity. Every domain of Science, Technology, Design, and Art lies in each

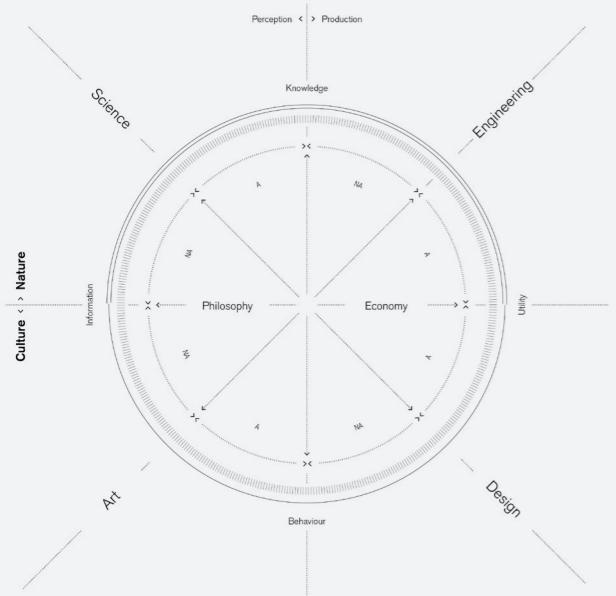


Figure 5. Manifestation of pro-active management with multi-disciplinary approach adapted from Krebs Cycle of Creativity by Neri Oxman (2016). Source: Author

direction. The vertical line illustrates two different sides of perception and production while the horizontal line illustrates the sides of culture and nature which is linked to previous diagrams (Figure 1 and 4). From the diagram, it can be understood that Science produces knowledge that will be used as sources by Engineering. Then, engineering will produce utility that will be used by Design, and so forth. Shifting two phases, for example from Art to Engineering is rarely to be happened since it requires more CreATP (the energy units of creativity) (Oxman, 2016). To conclude, by understanding this cycle, it can open the awareness of possibility to break down the boundaries between disciplinary to allow multi-disciplinary approach in the pro-active management system.

E. CONCLUSION

The exploration of future manifestation of human culture – nature relationship brings this paper into examination of the interlinkages between three main concepts. The first concept illustrates the transformation over the history of the relationship. Then, it is continued by the second concept which tells more the current discourses about sustainability and inclusive tourism. Lastly, the exploration on evolutionary resilience and pro-active management by adapting Krebs Cycle of Creativity for strengthening future human culture and nature relationship. The interdependency is illustrated through Figure 6. By referring into the integrated diagram, all discourses starting from the revelation of nature capacity, strategies for sustainable and inclusive development, and the projected future culture-nature relationship are ready to be explored further especially within the design and planning practices. In addition, this diagram is projected to accommodate further reflections to assess the current and future human culture and nature relationship and what kind of possible actions that we can do as designers, planners, or even a simple human being.

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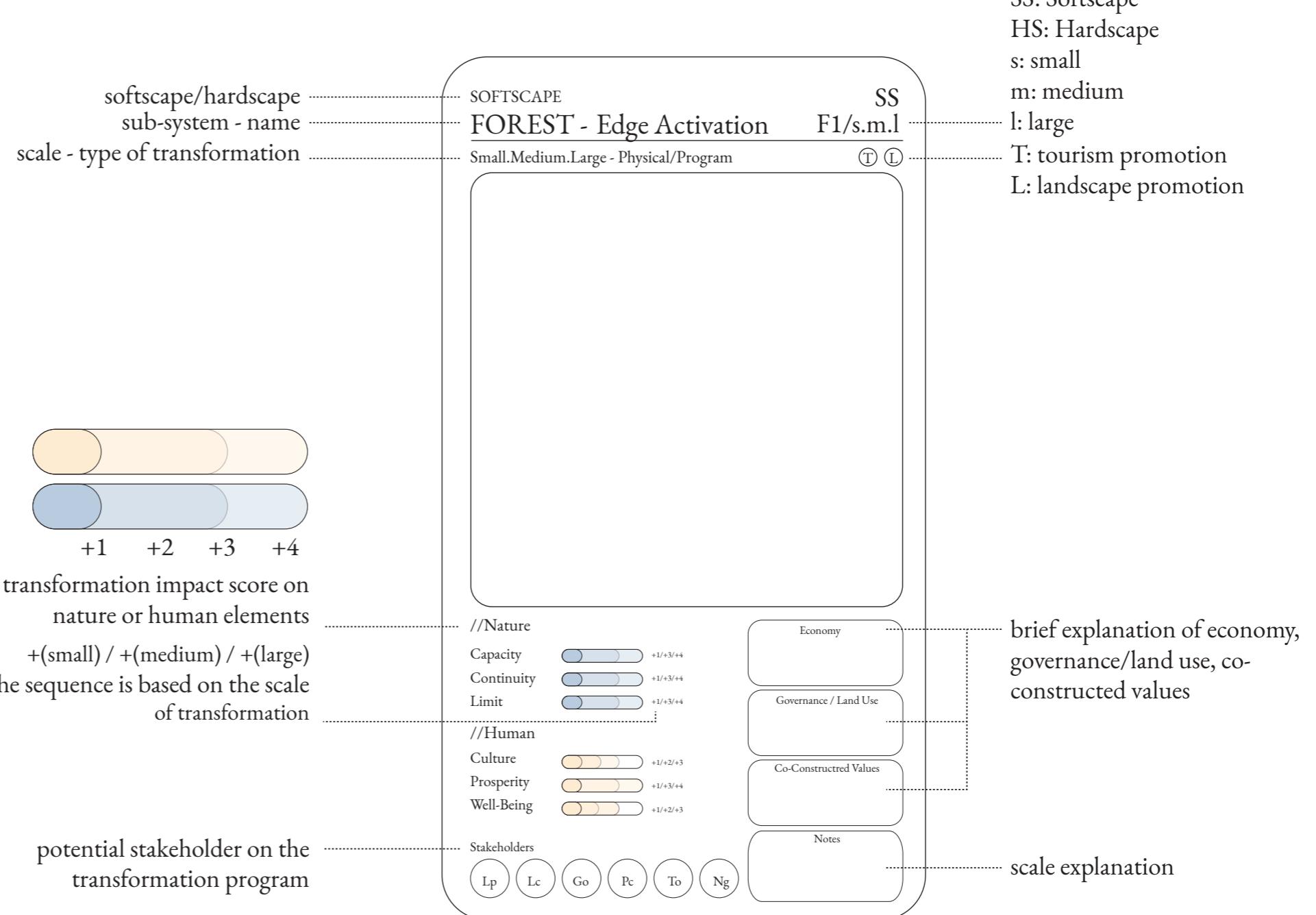
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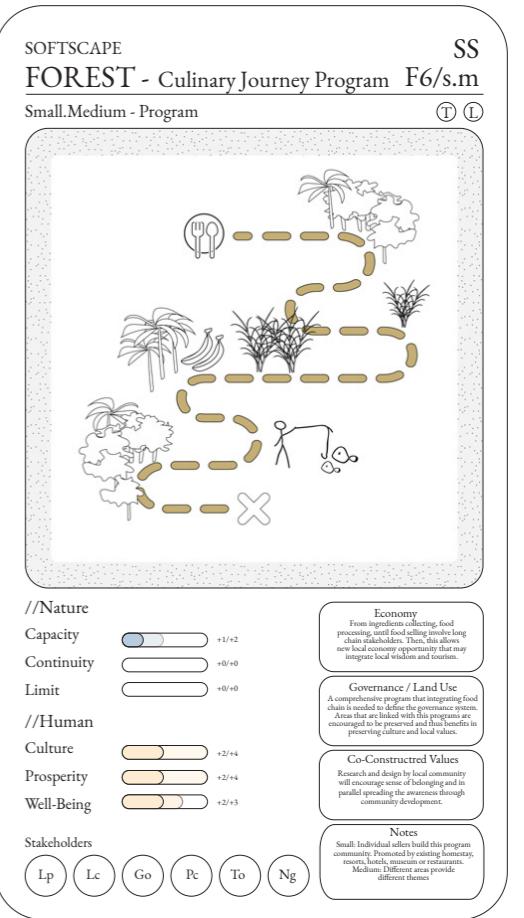
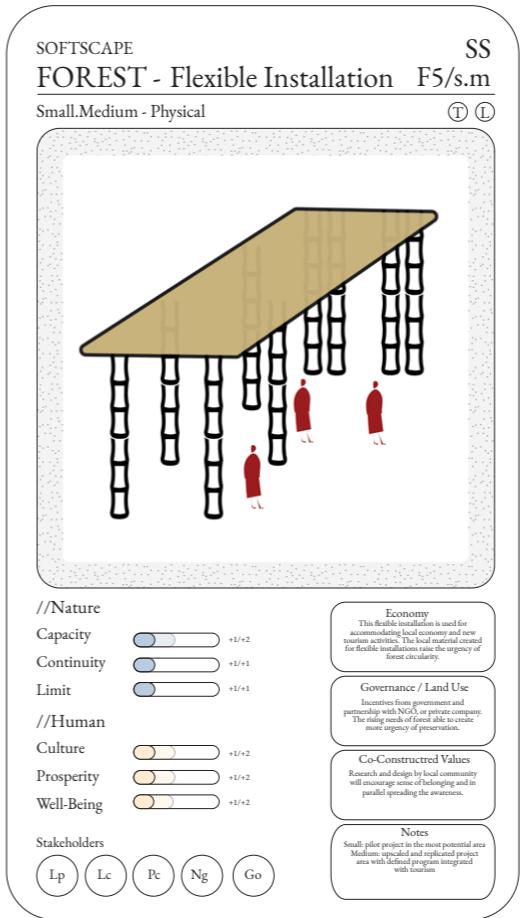
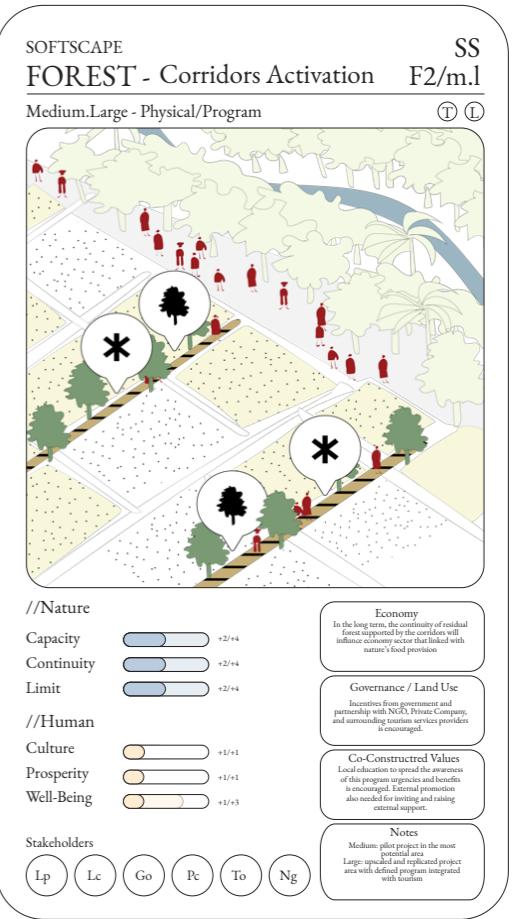
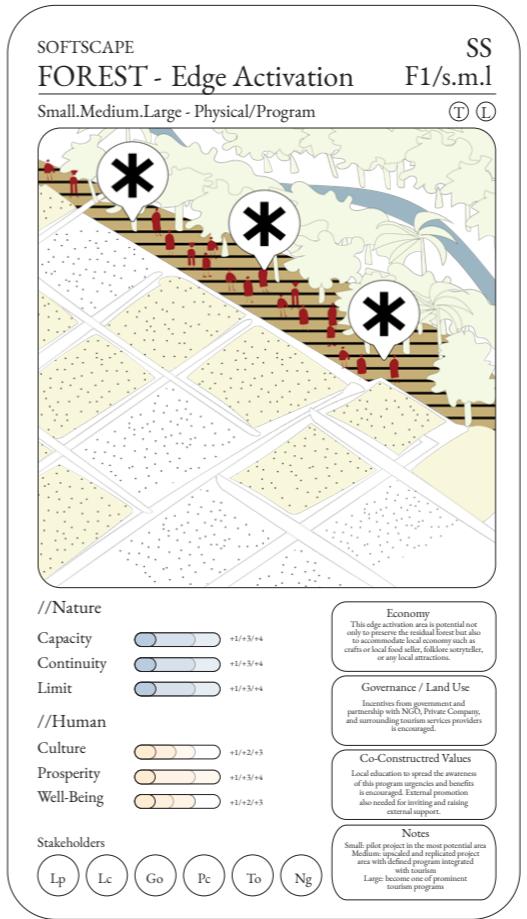
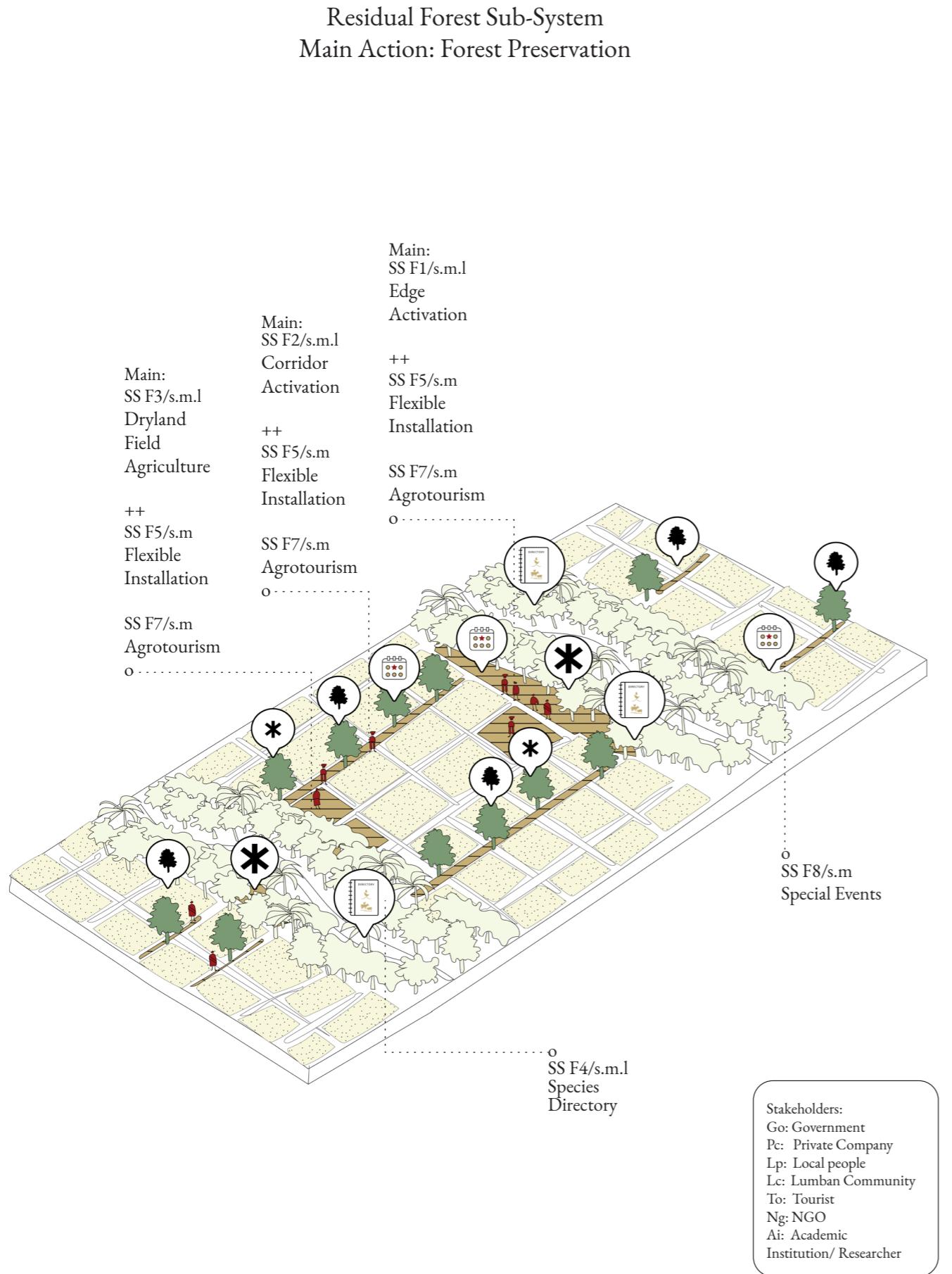
Figure 6. The manifestation of human culture – nature relationship towards sustainable and inclusive tourism. Source: the author

7.2. Transformation Kit Bundles

How to Read The Cards?

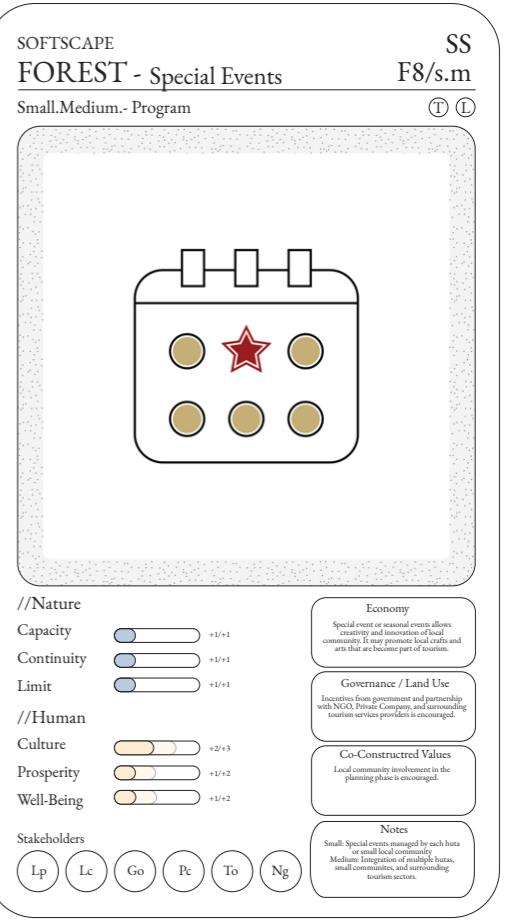
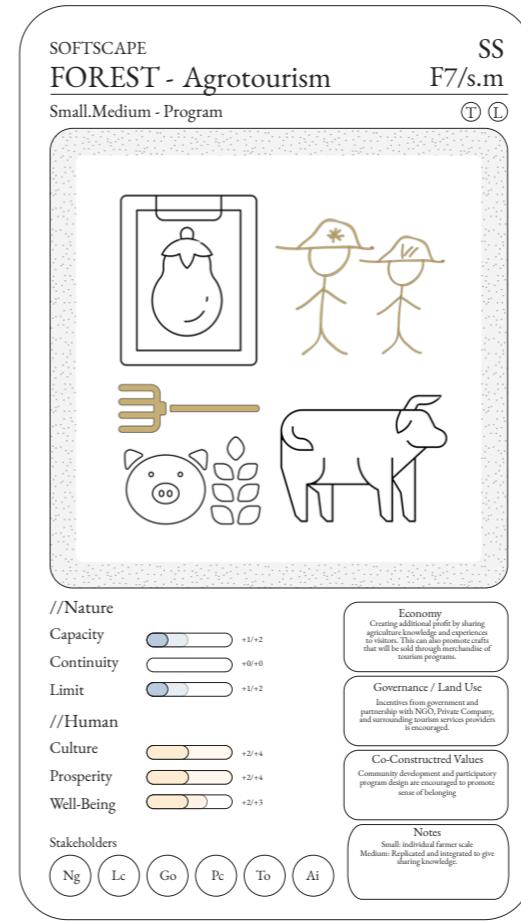
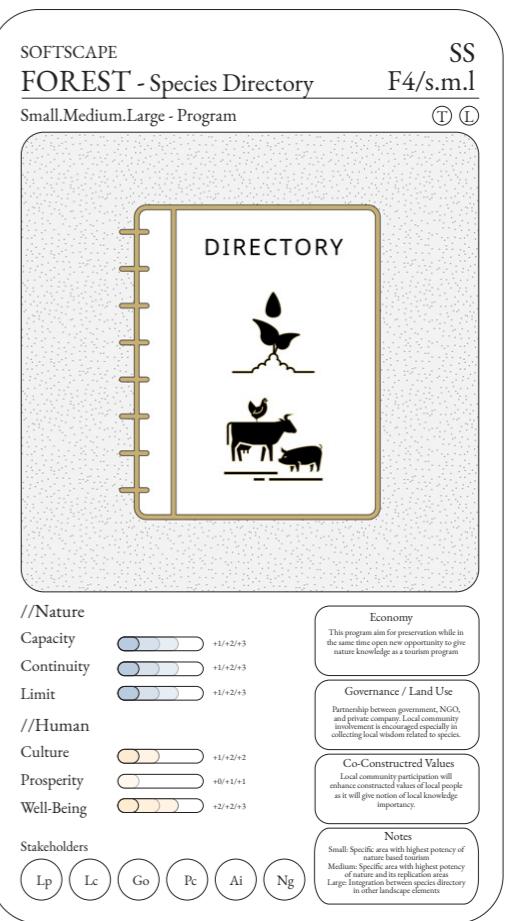
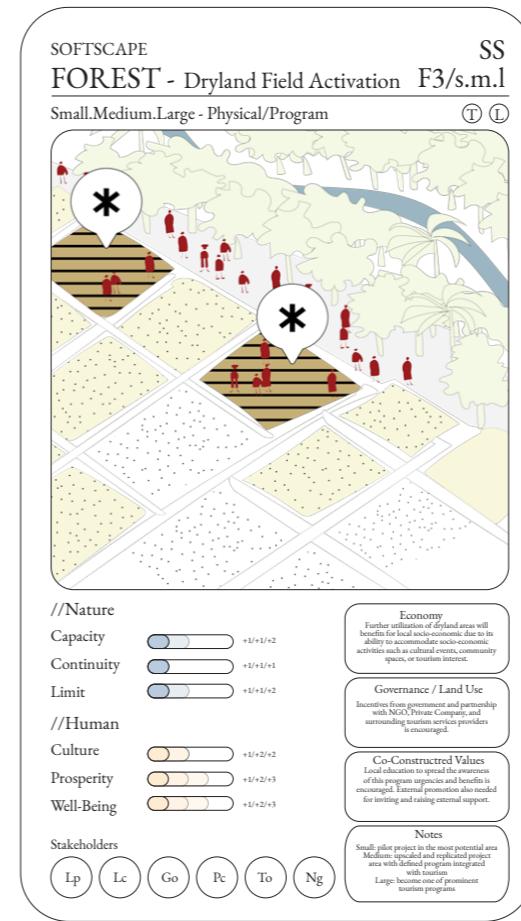
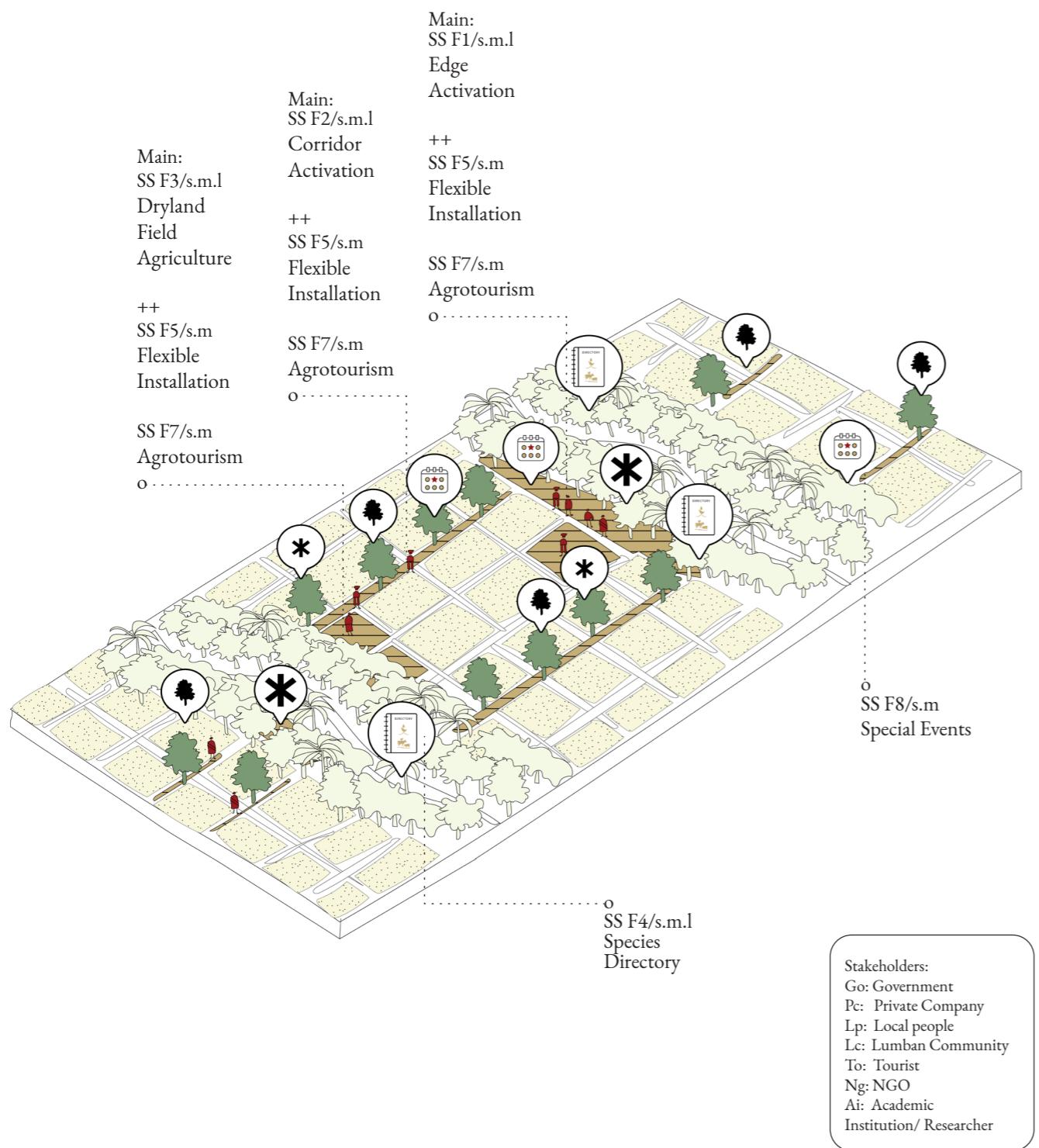


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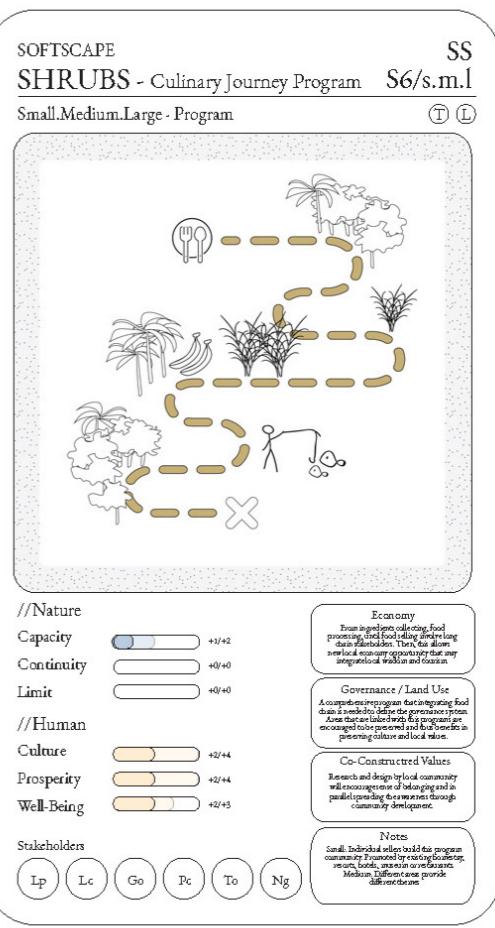
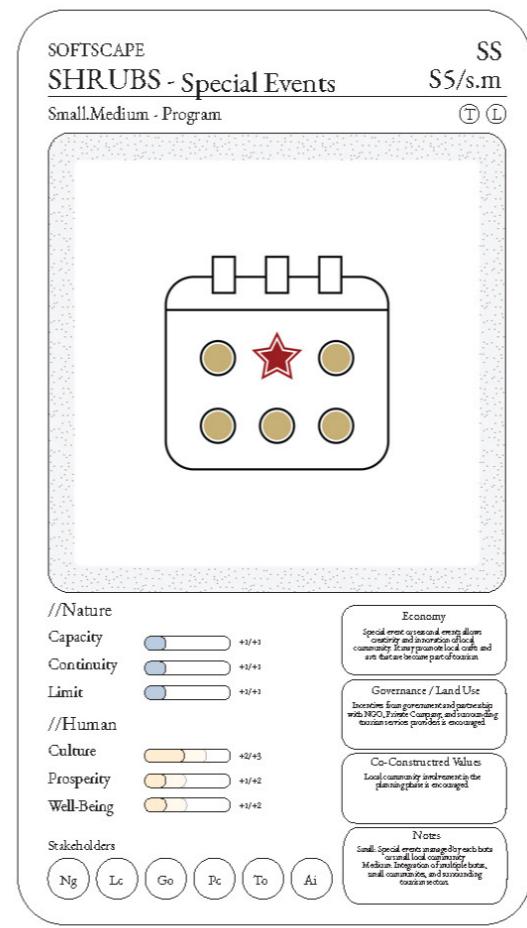
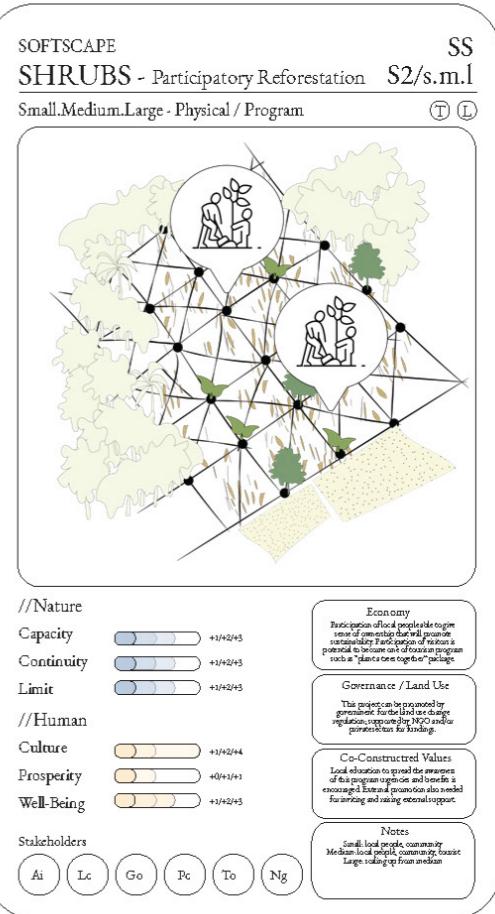
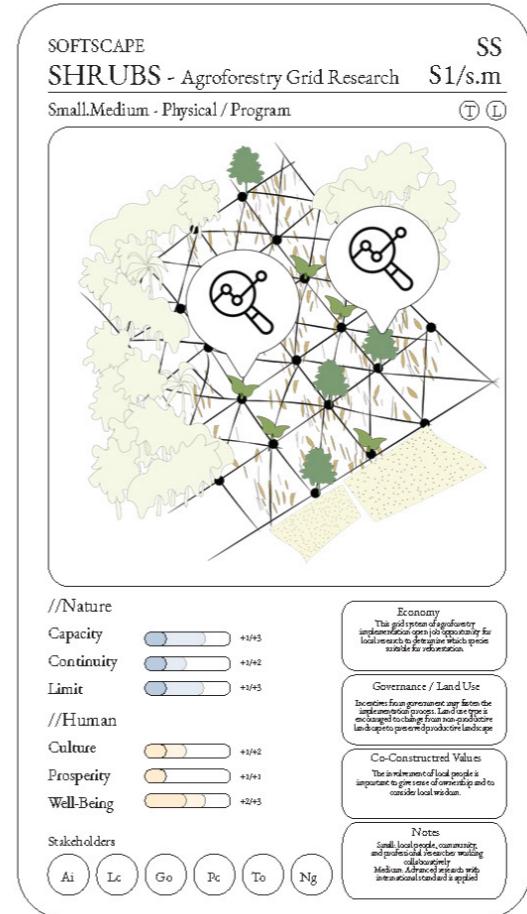
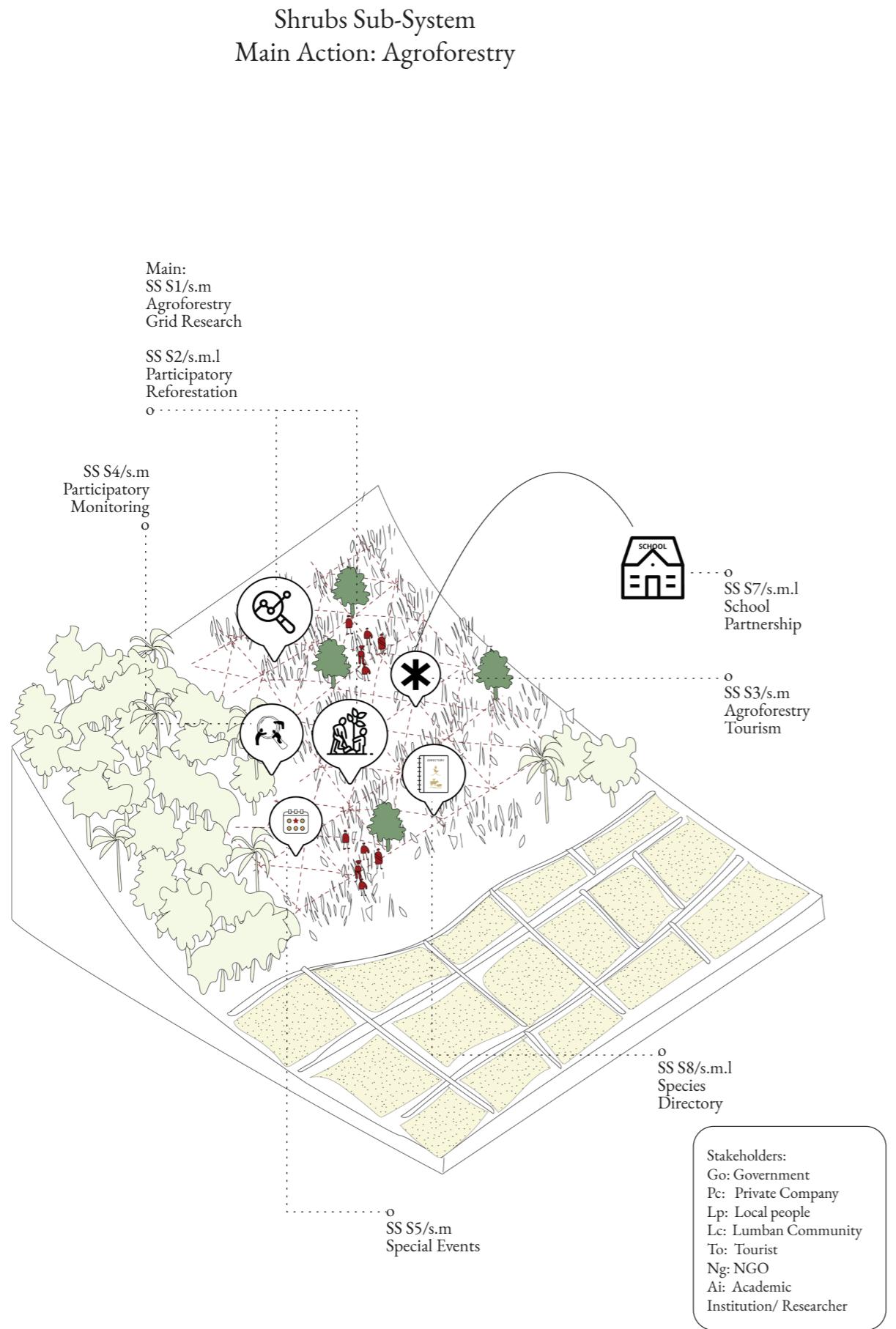


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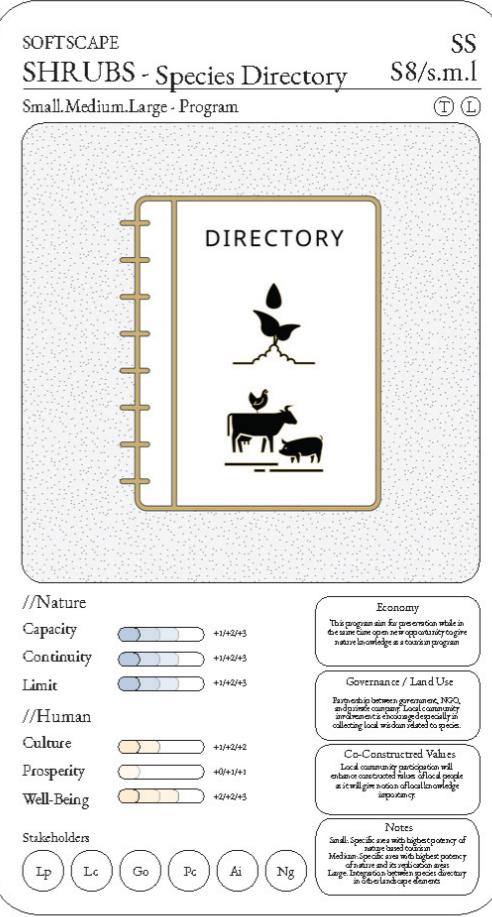
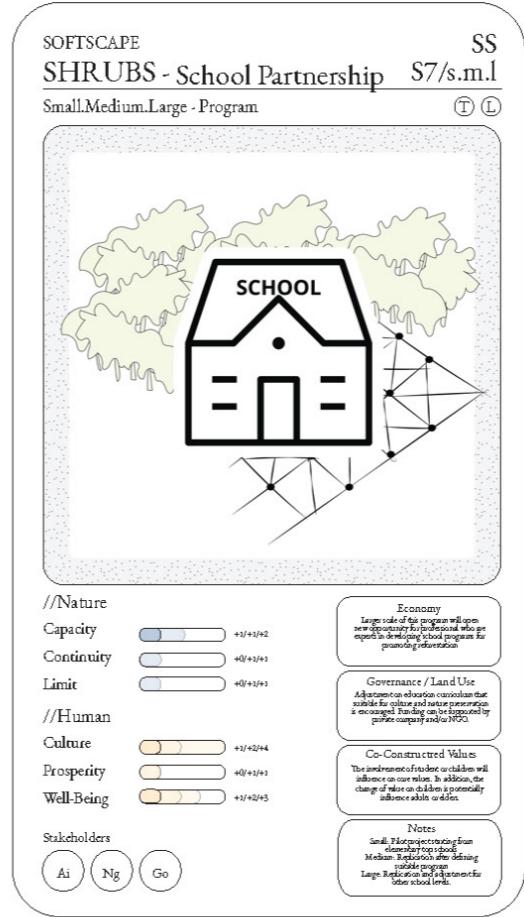
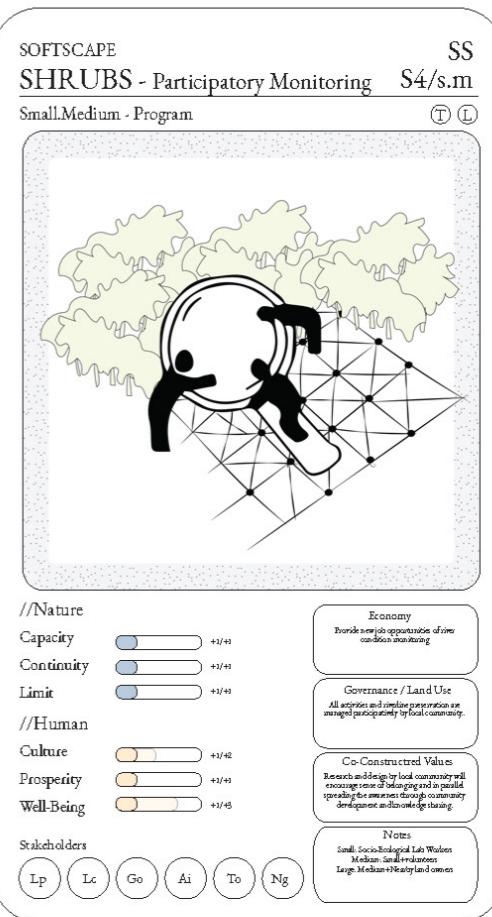
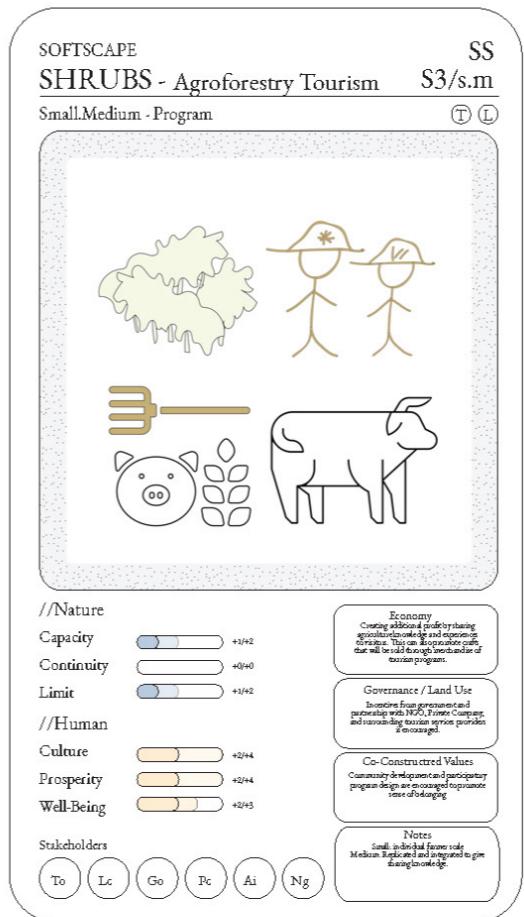
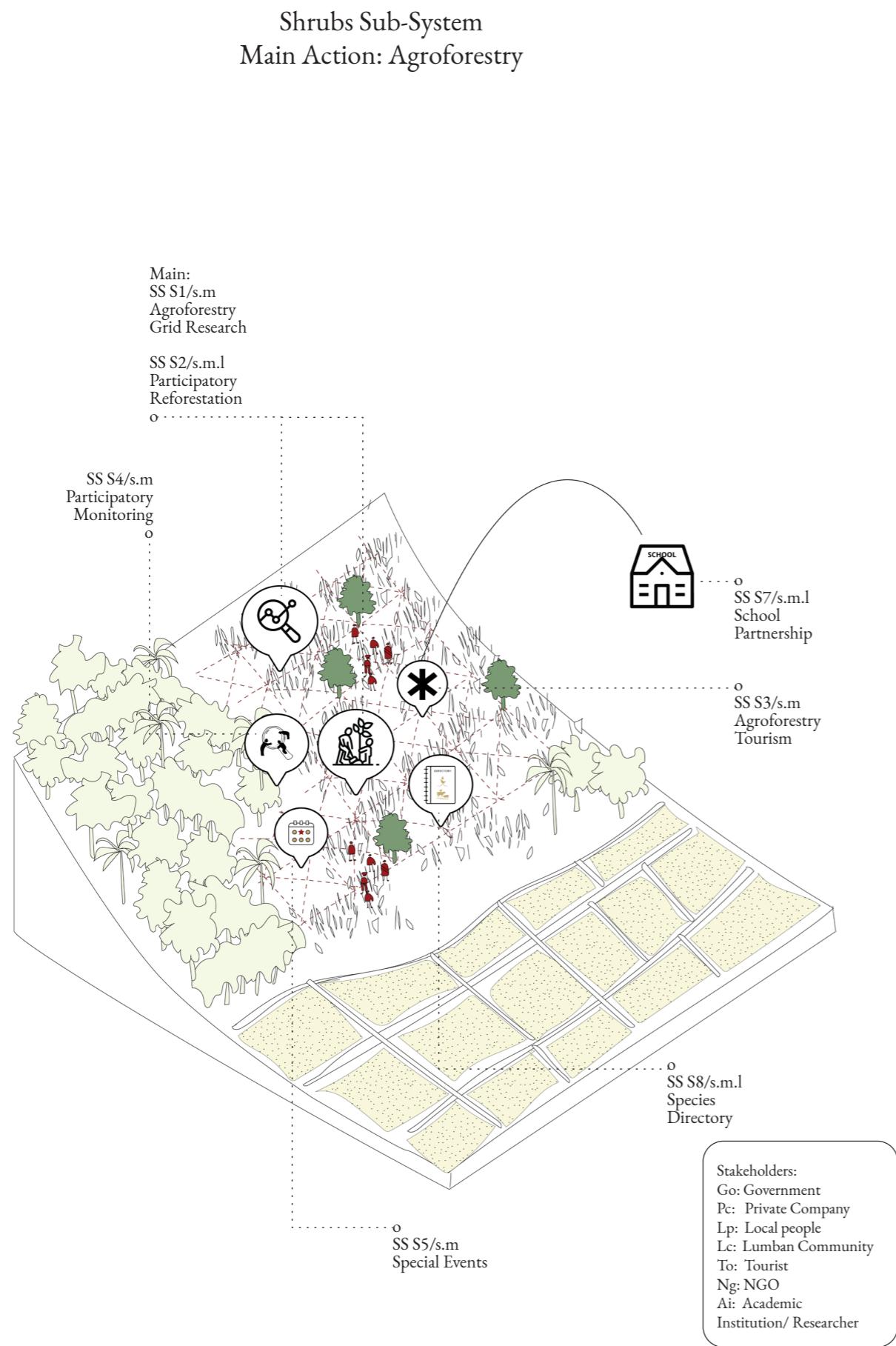
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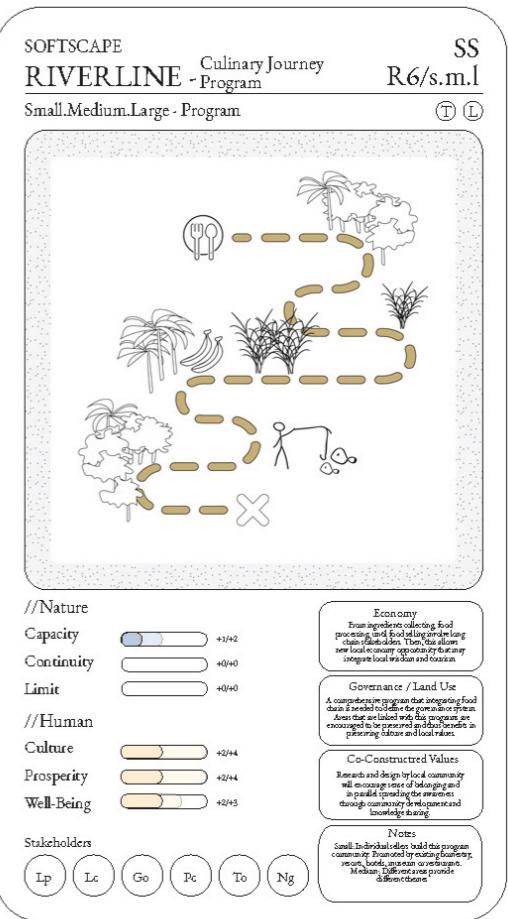
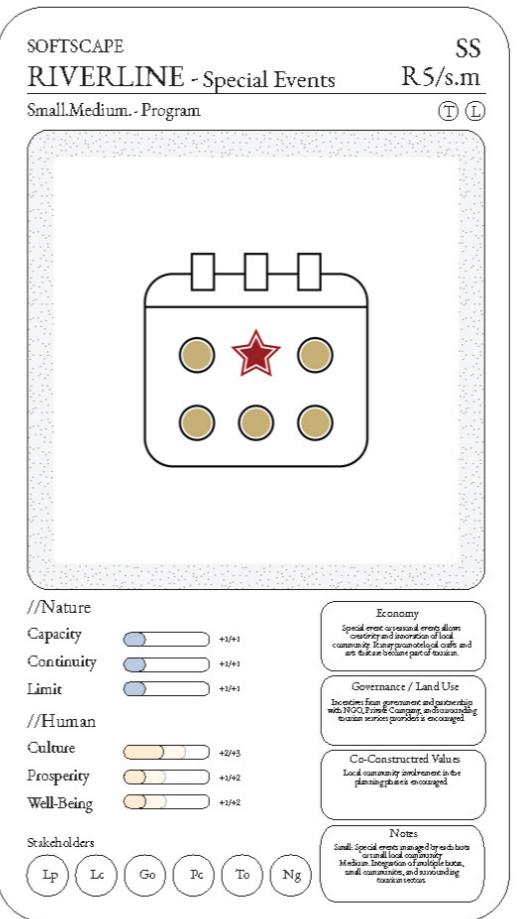
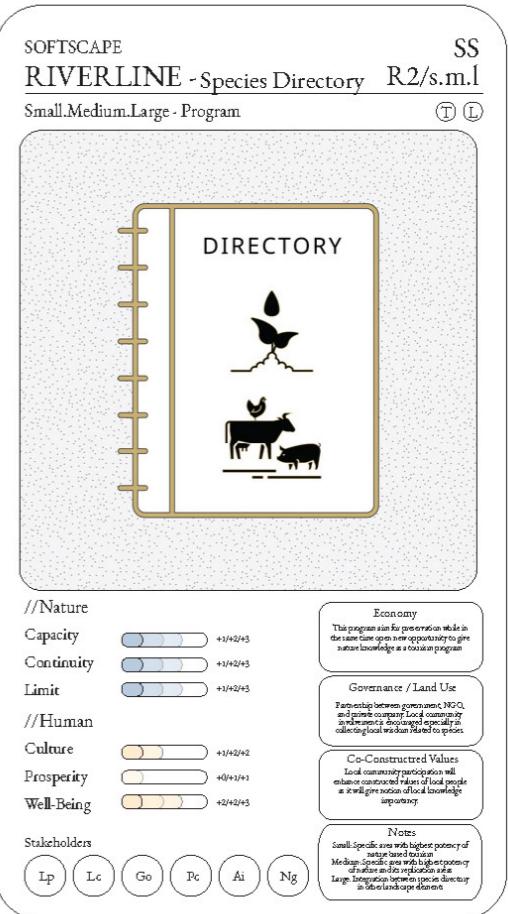
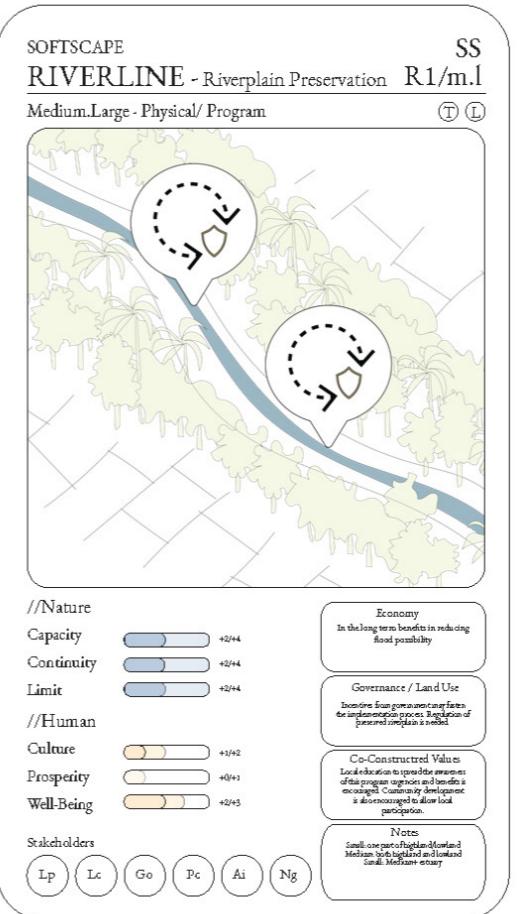
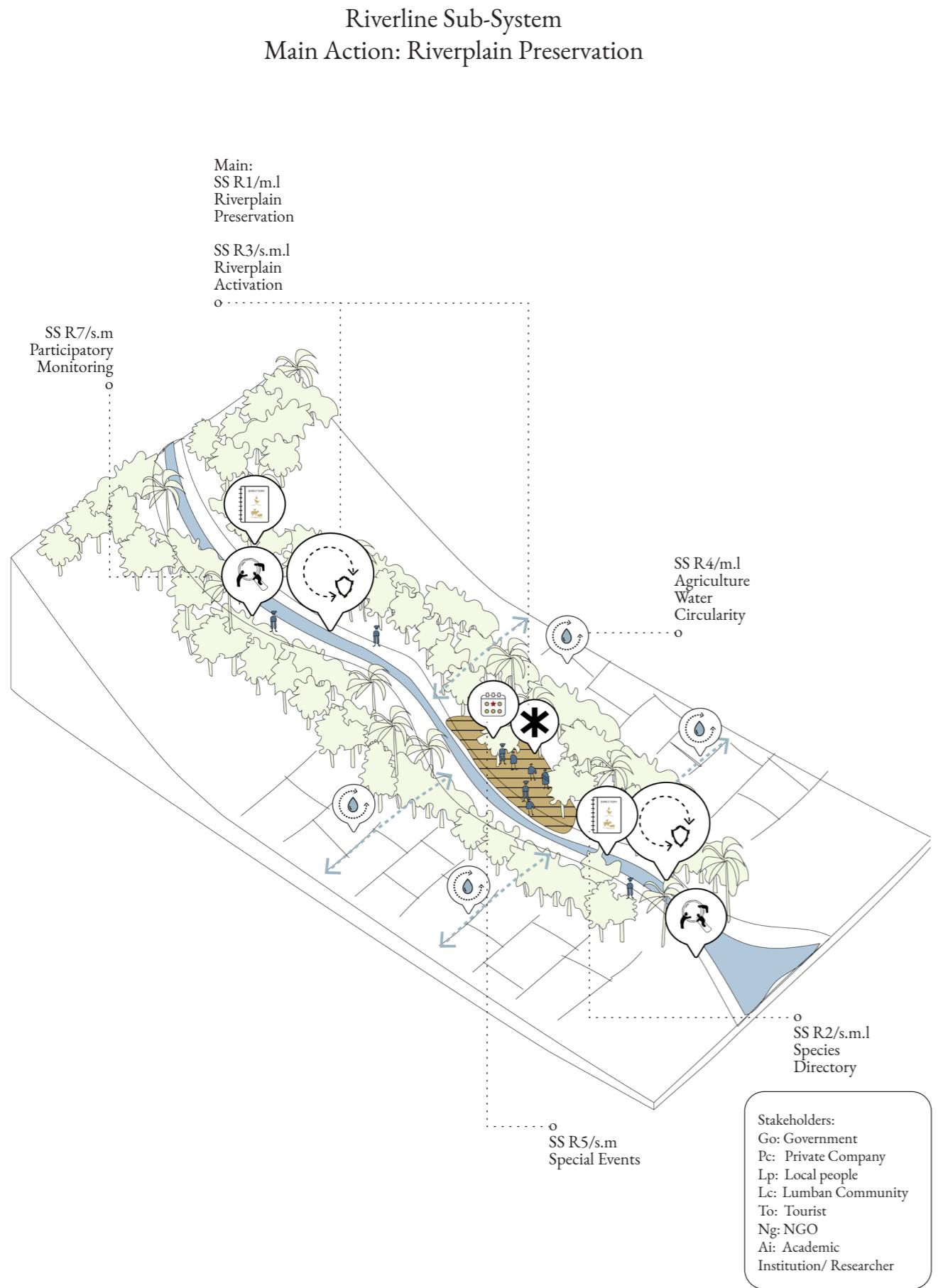
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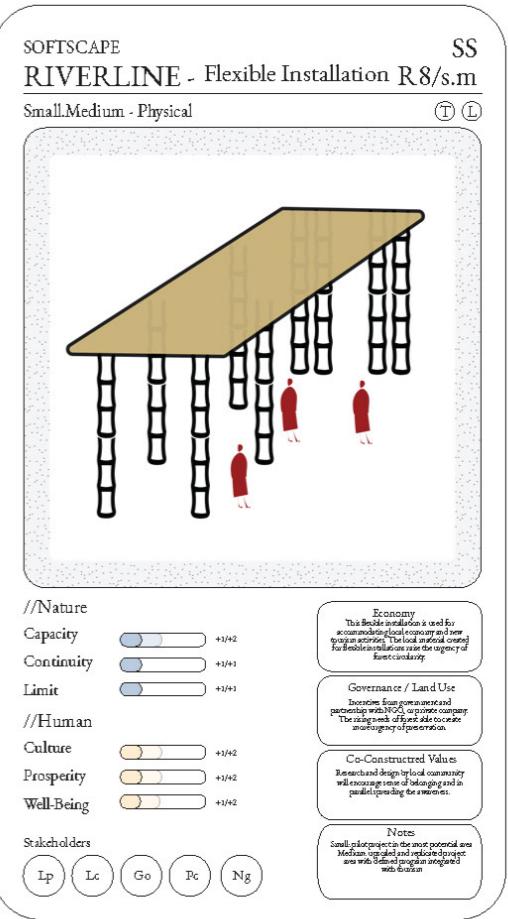
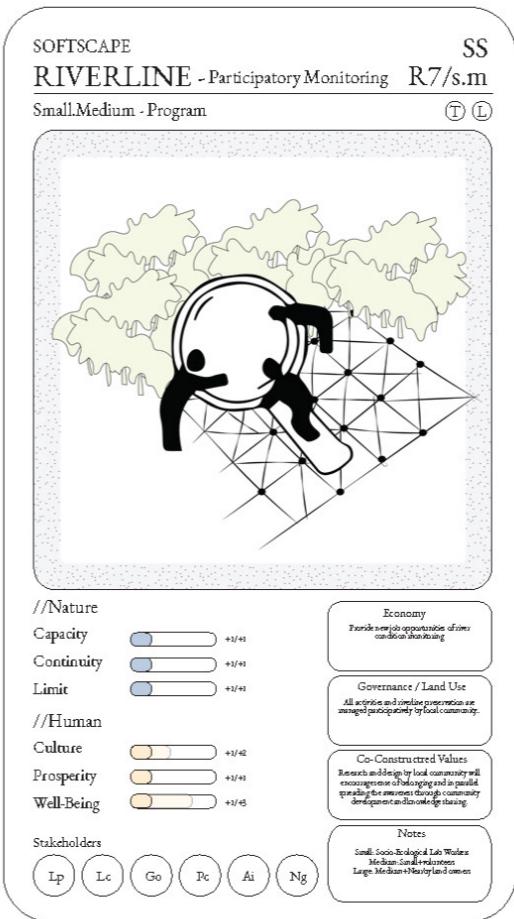
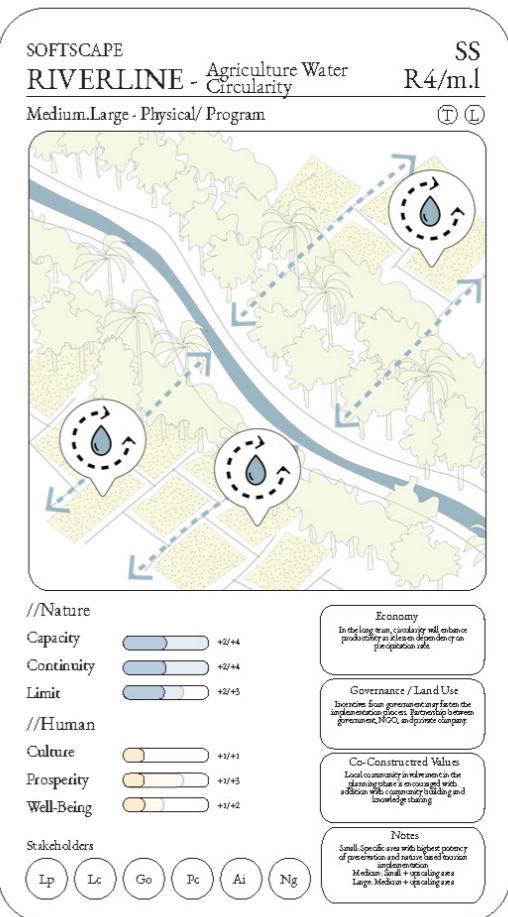
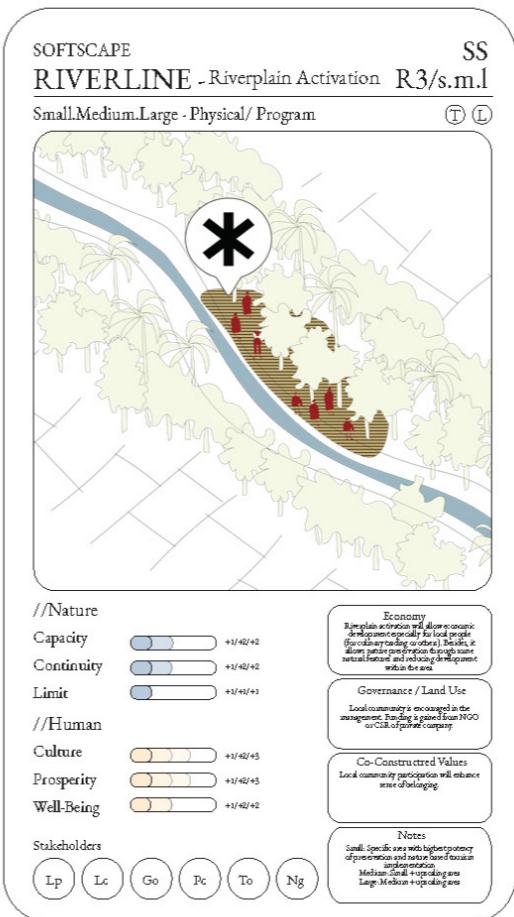
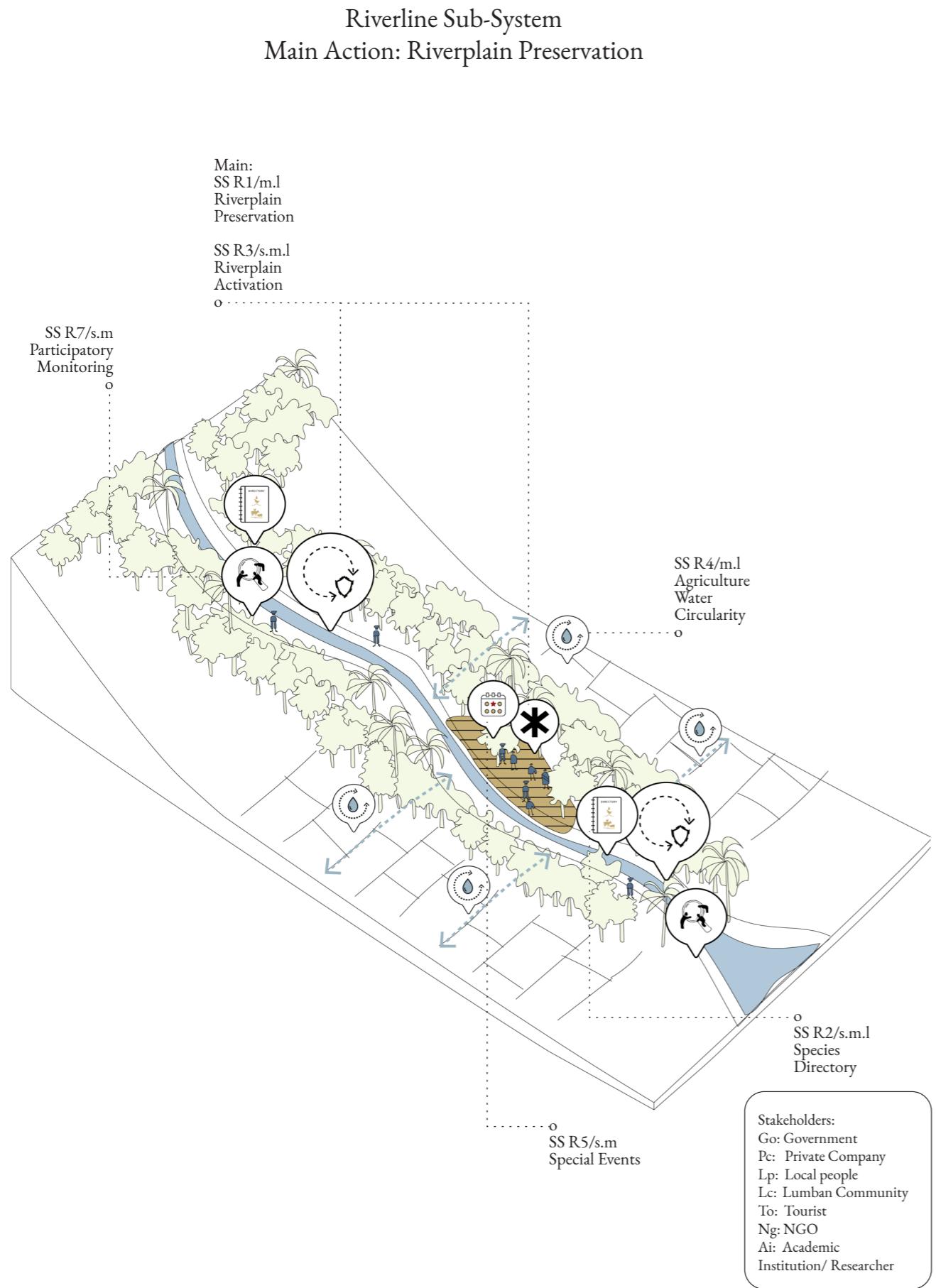
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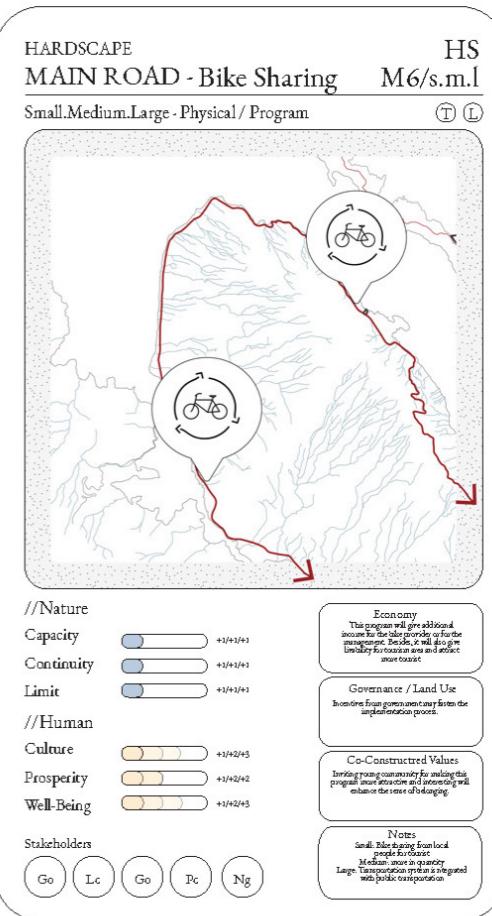
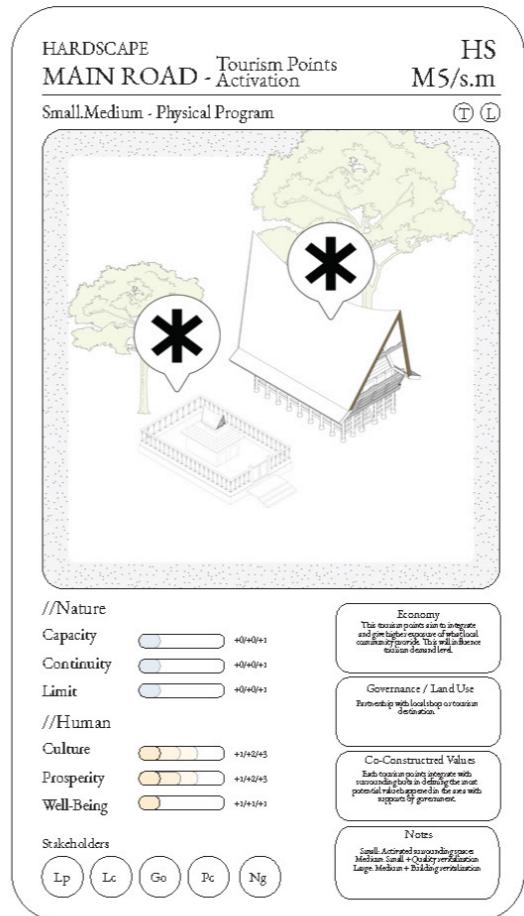
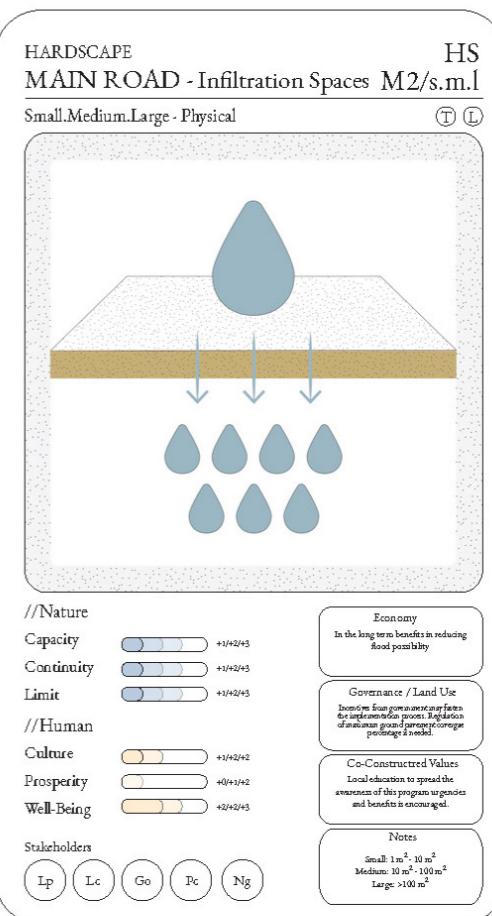
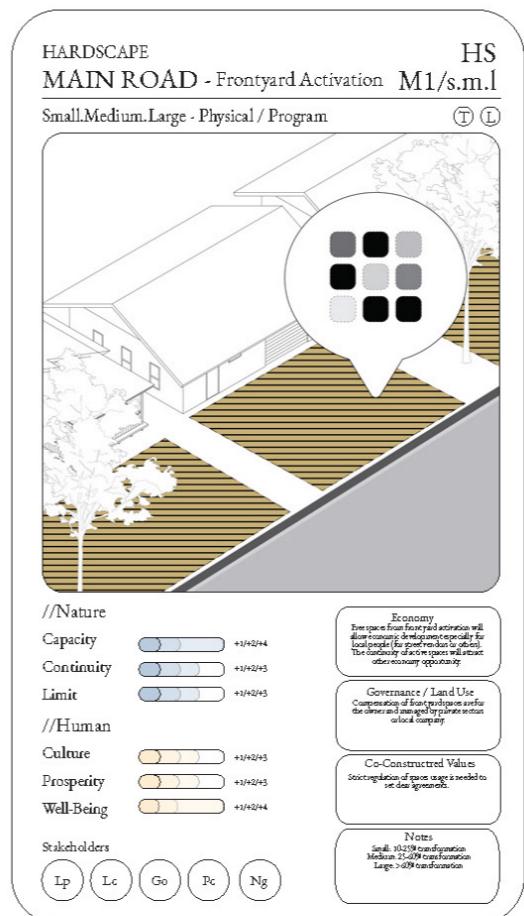
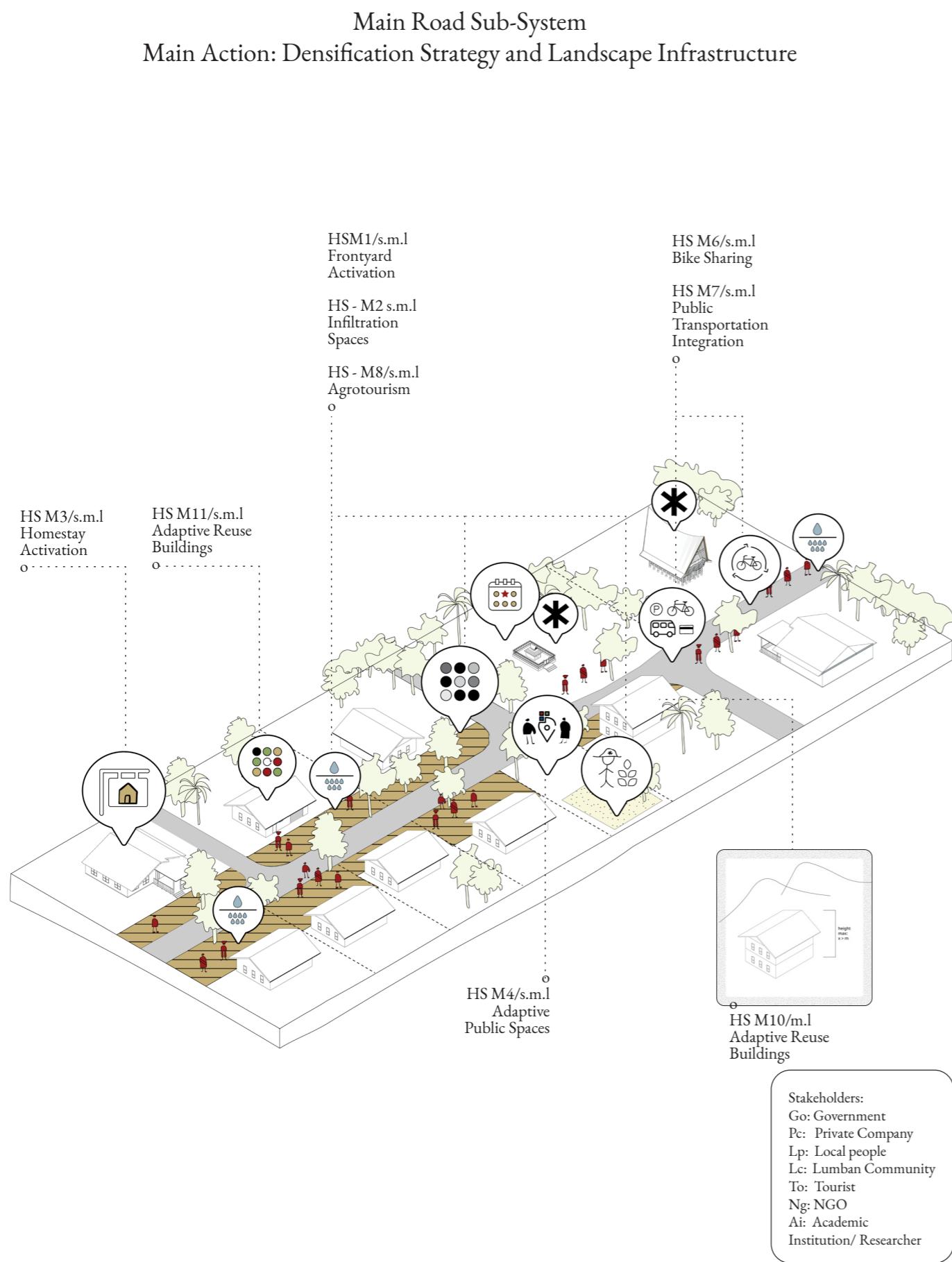
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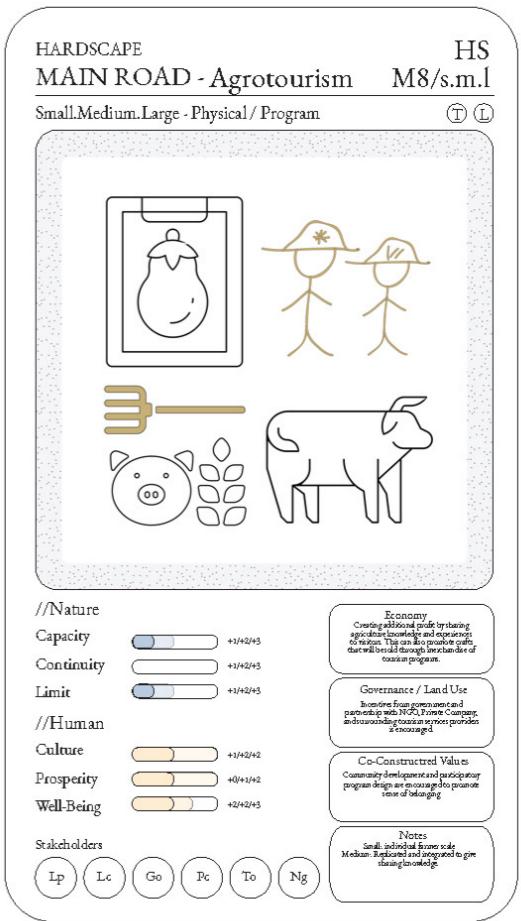
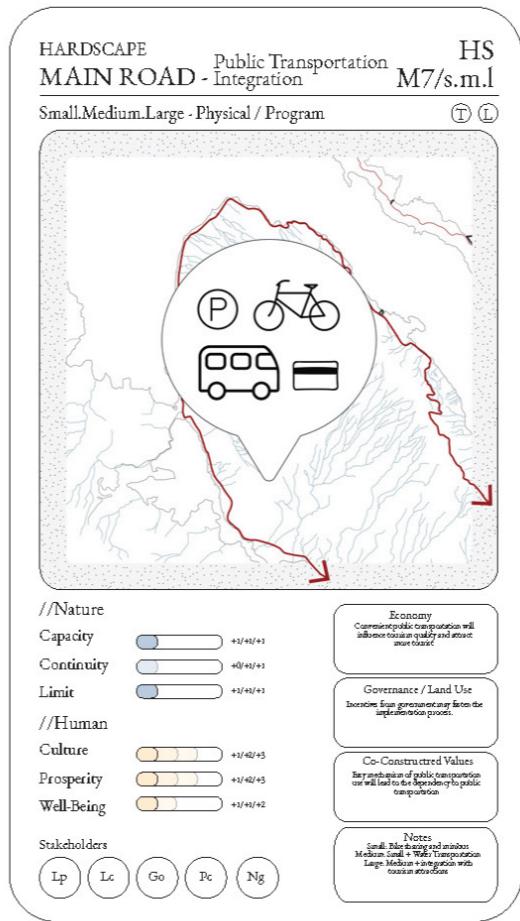
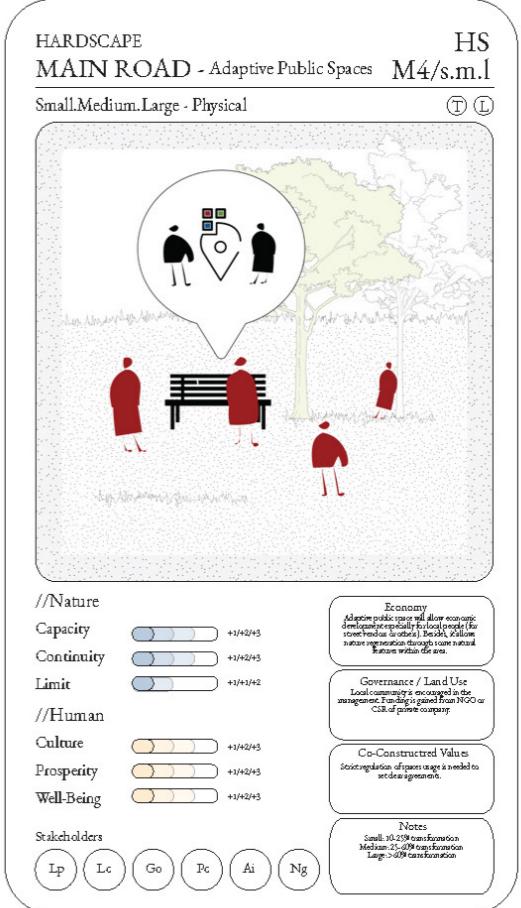
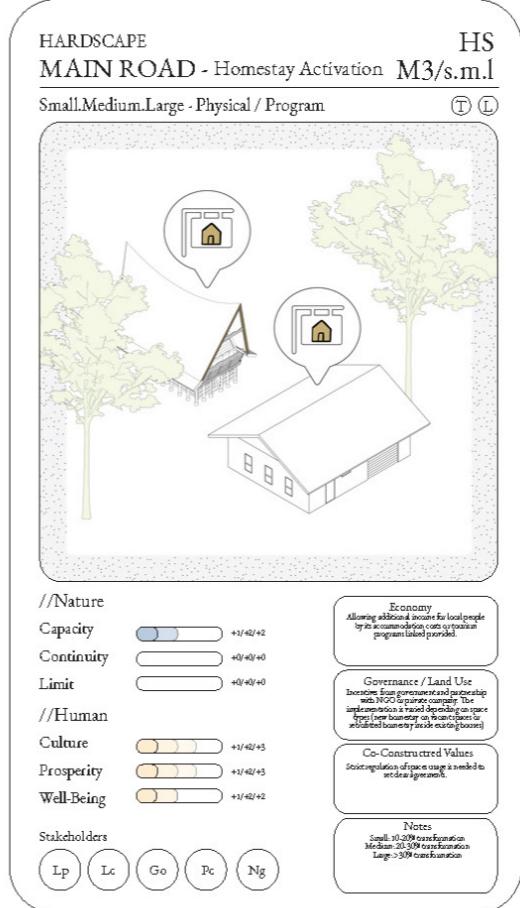
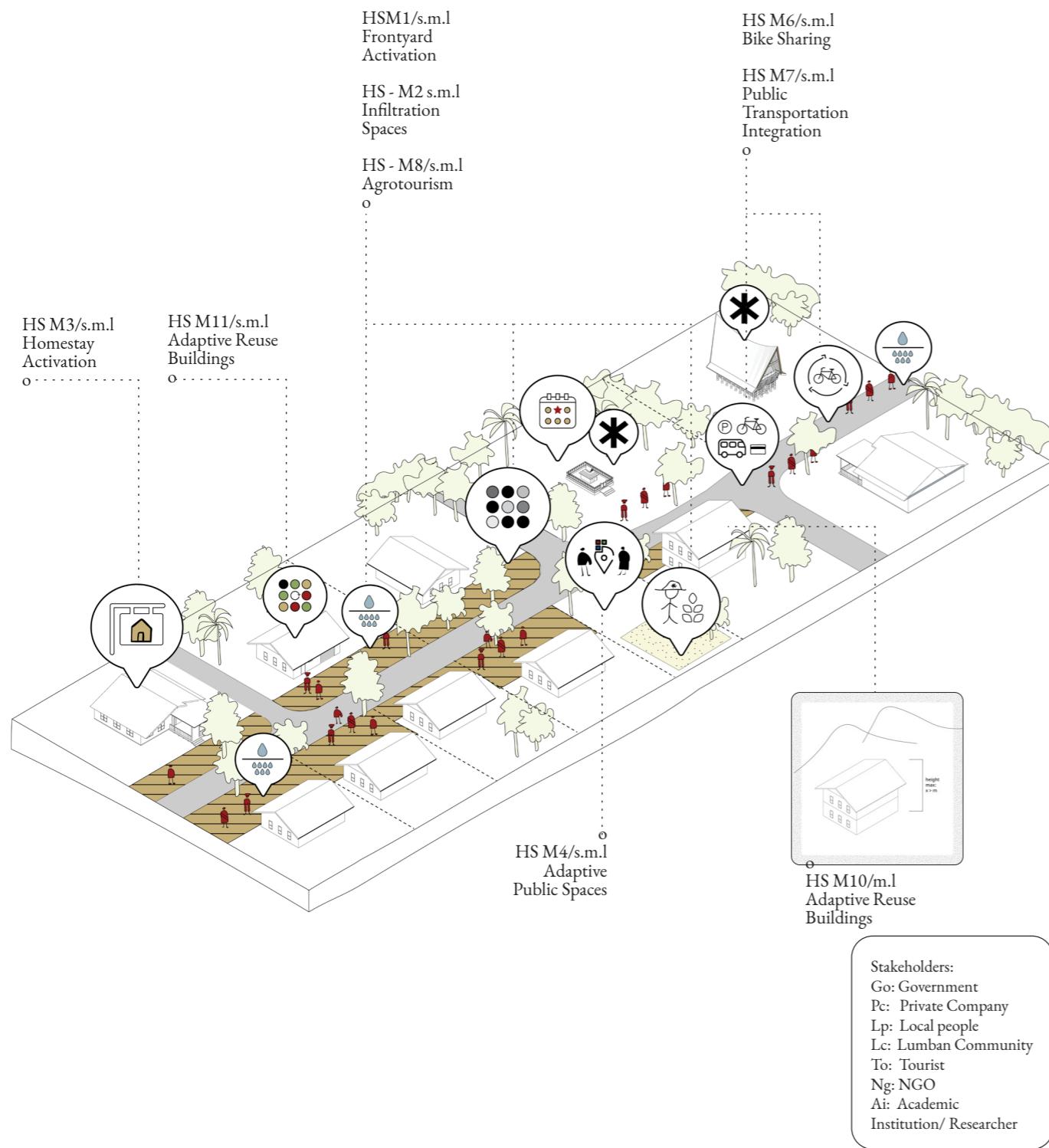


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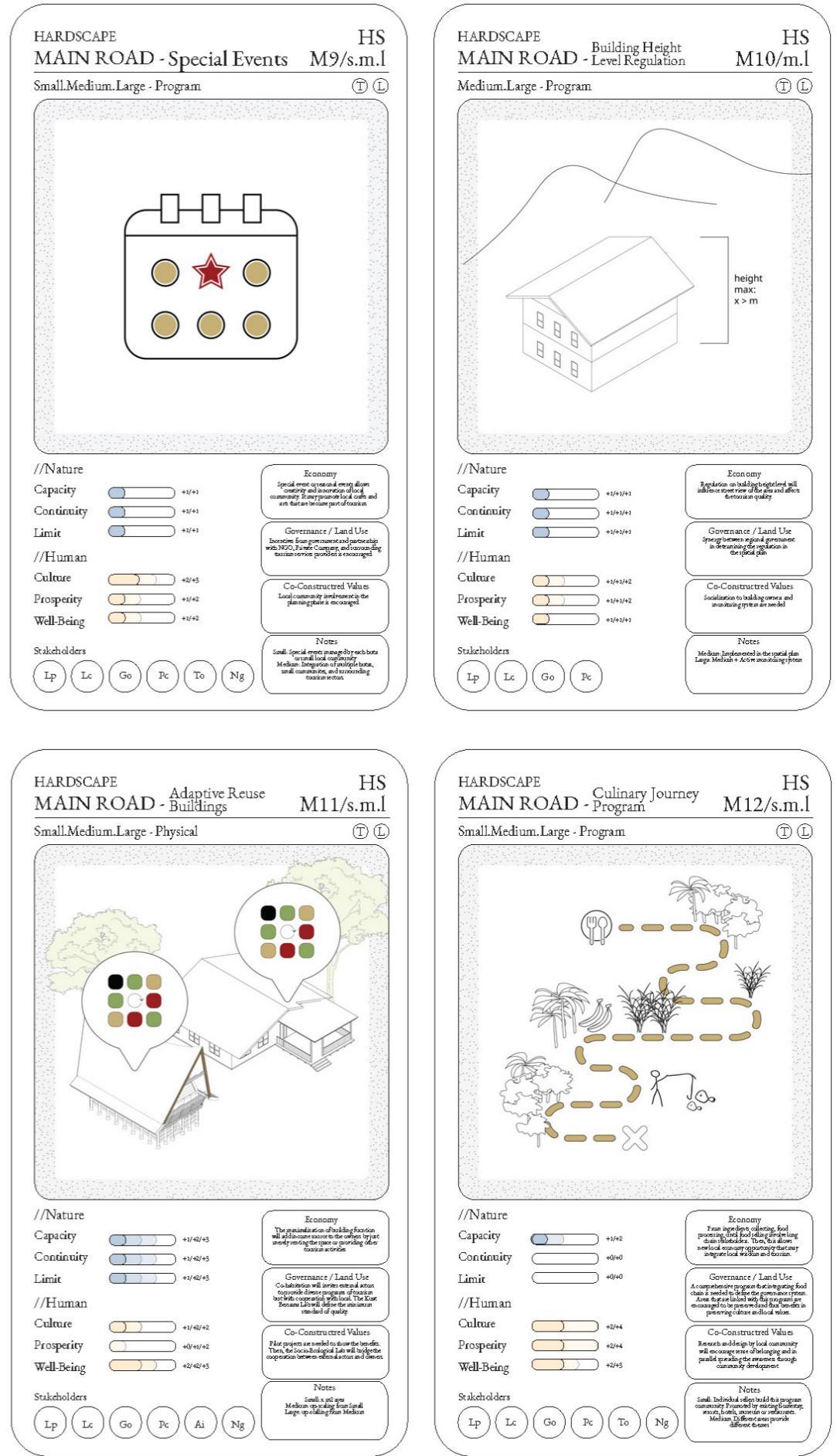
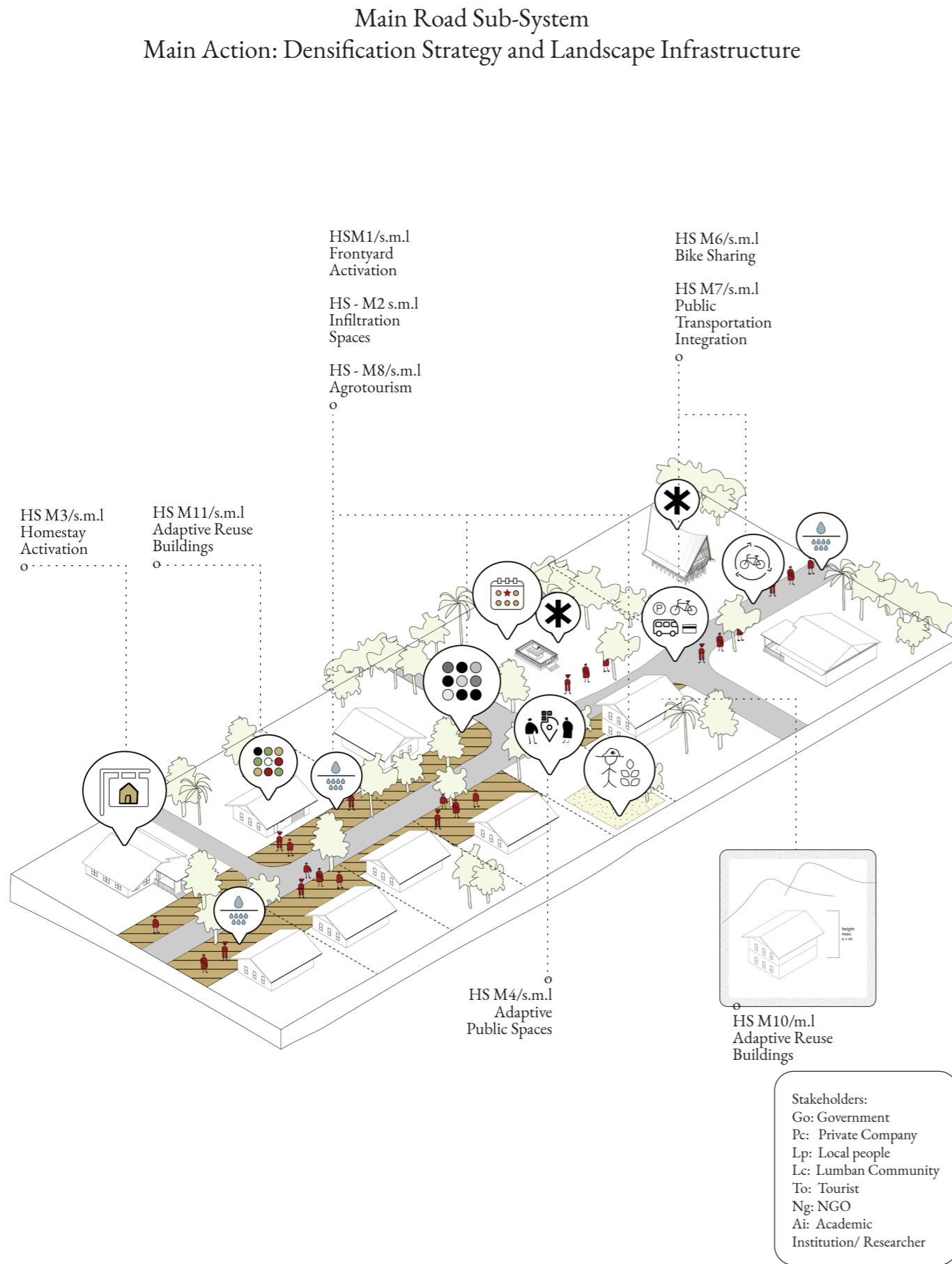


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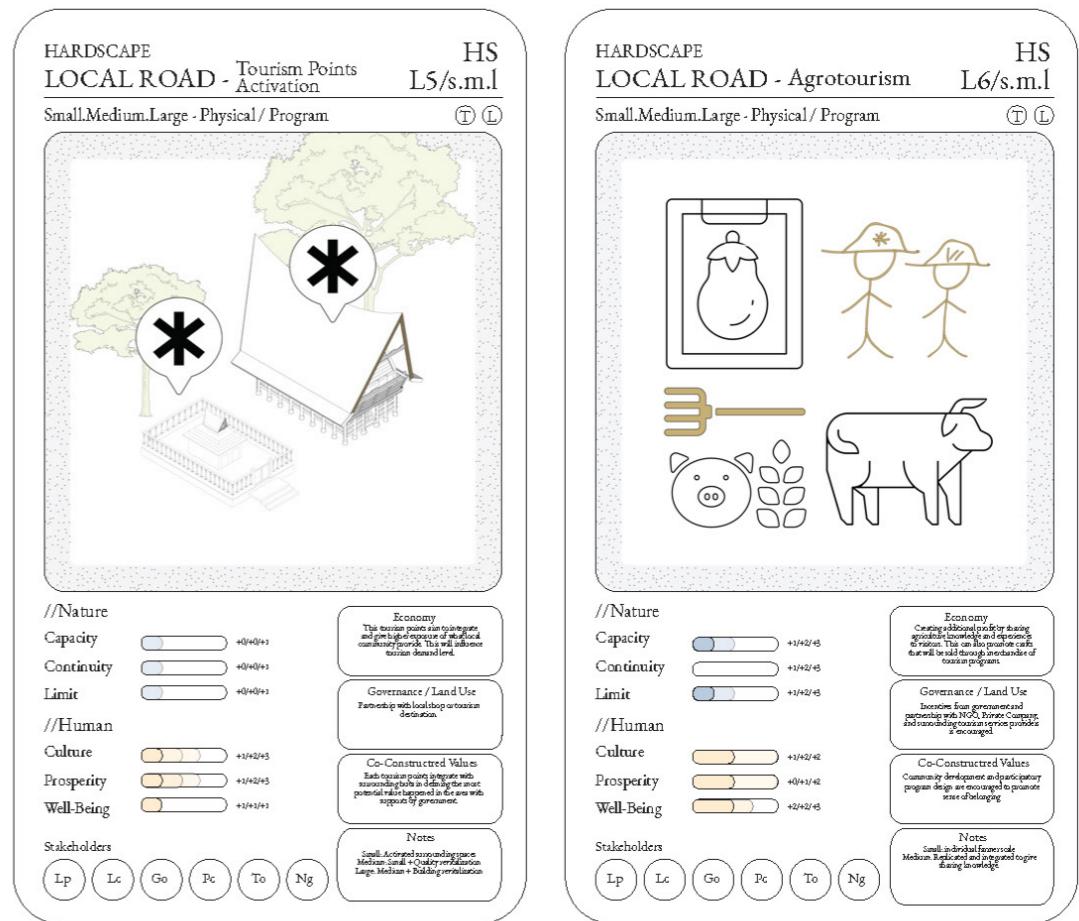
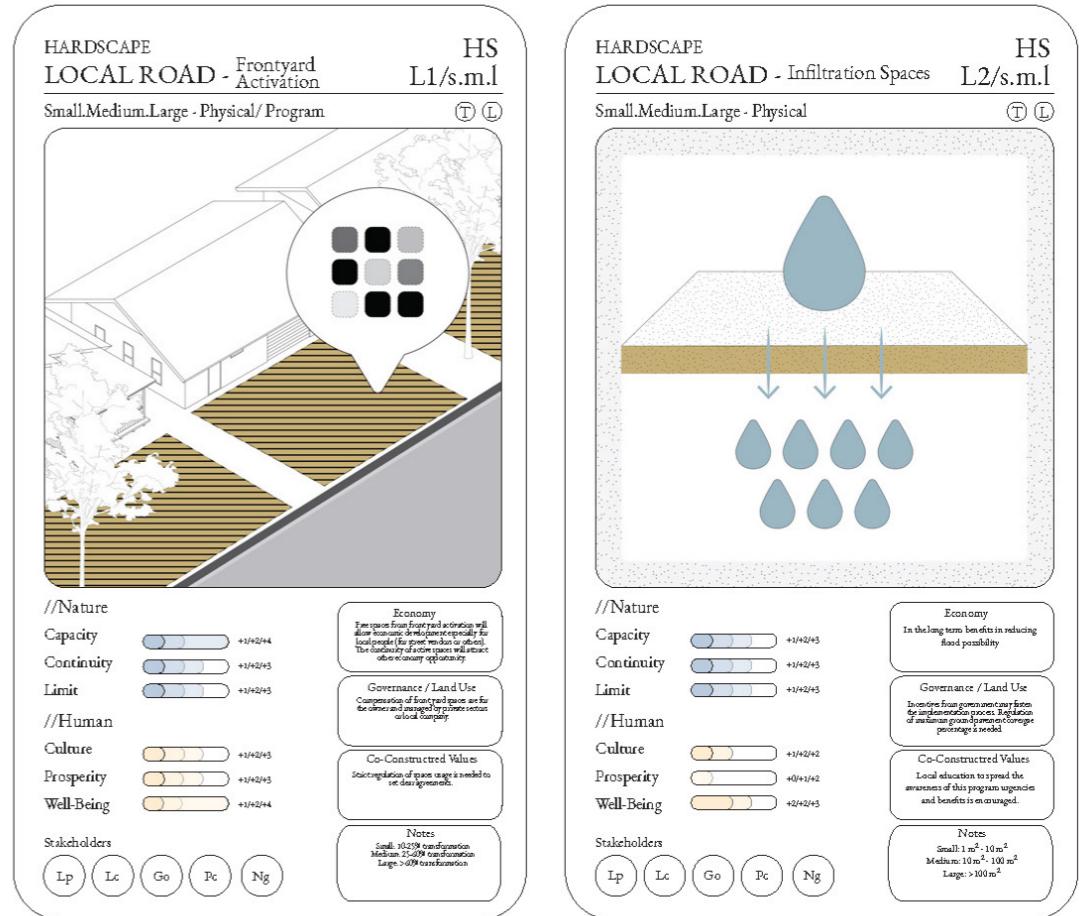
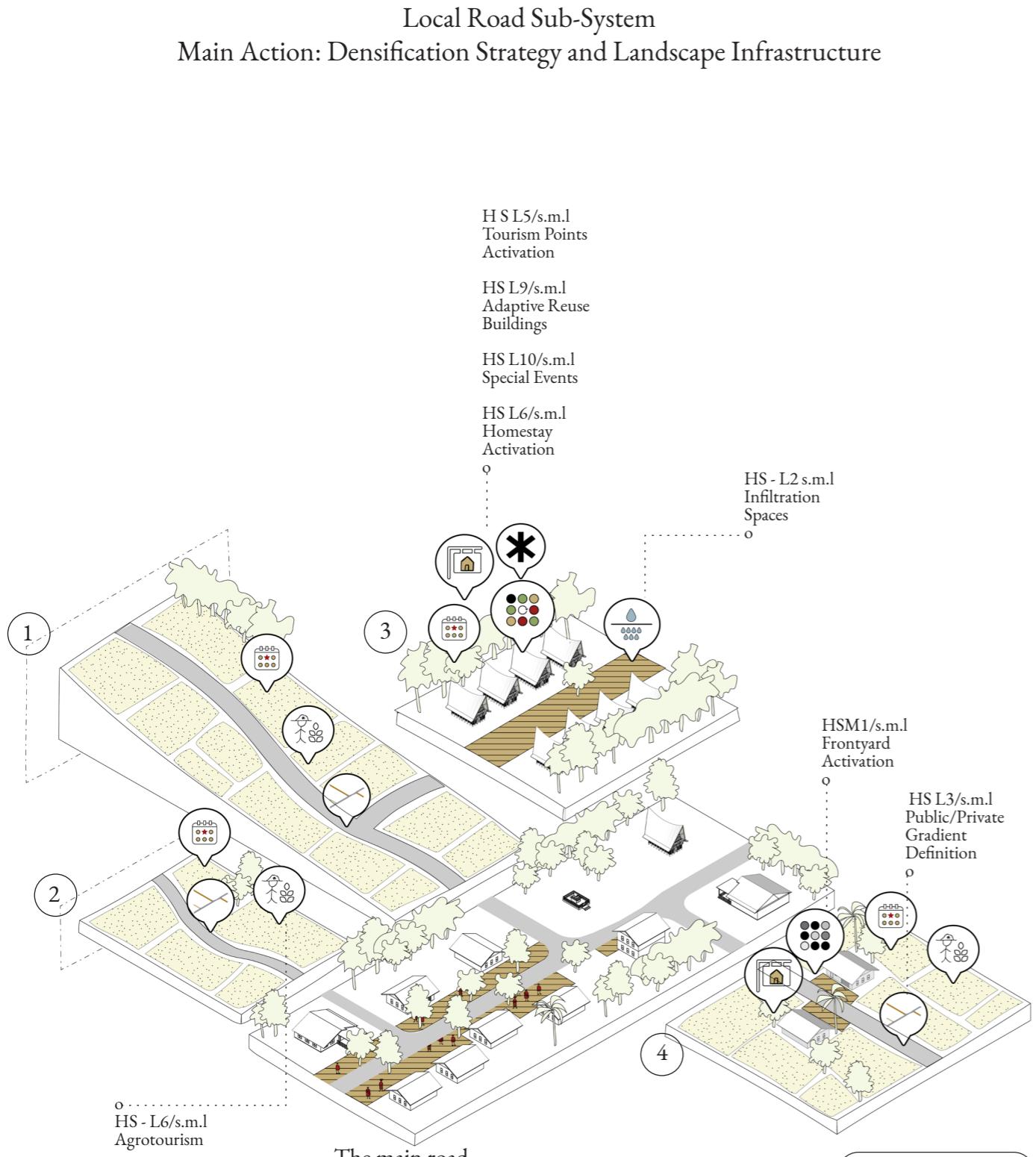
Main Road Sub-System Main Action: Densification Strategy and Landscape Infrastructure



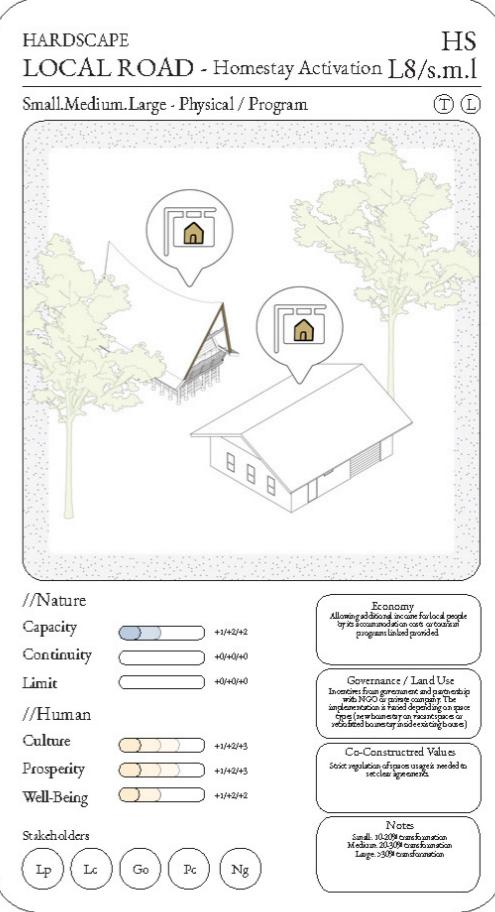
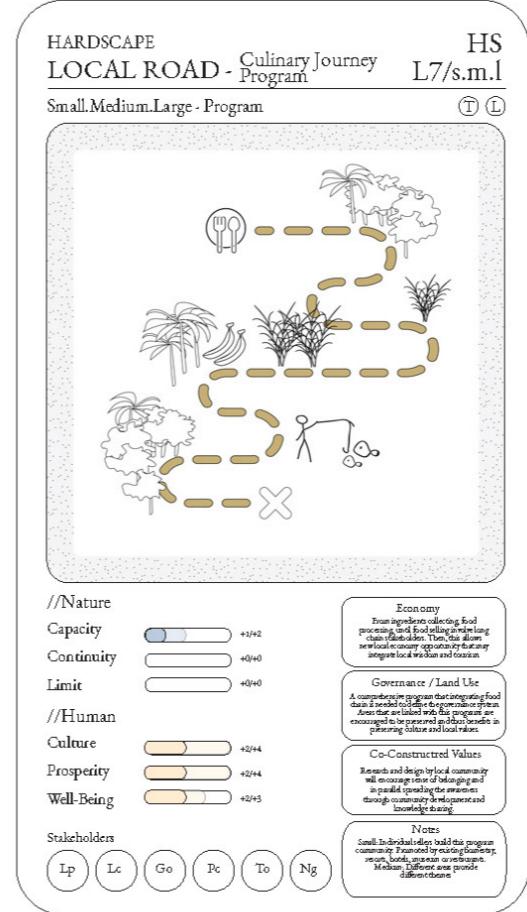
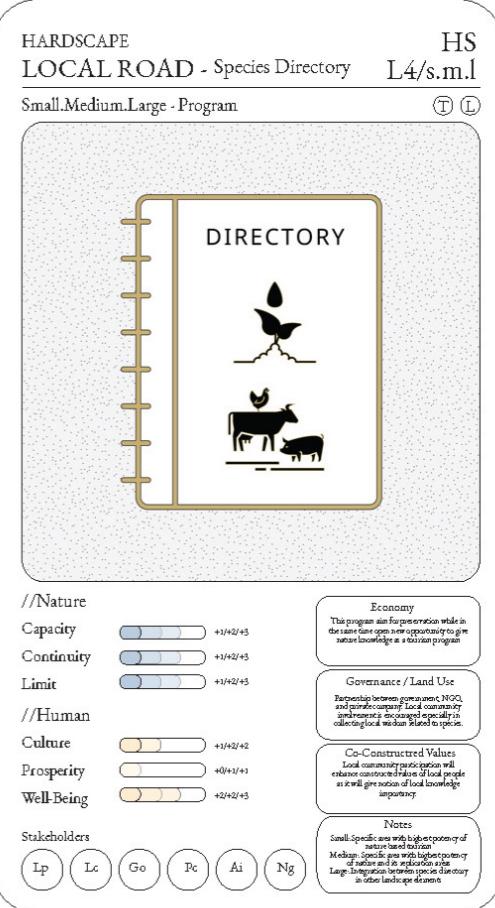
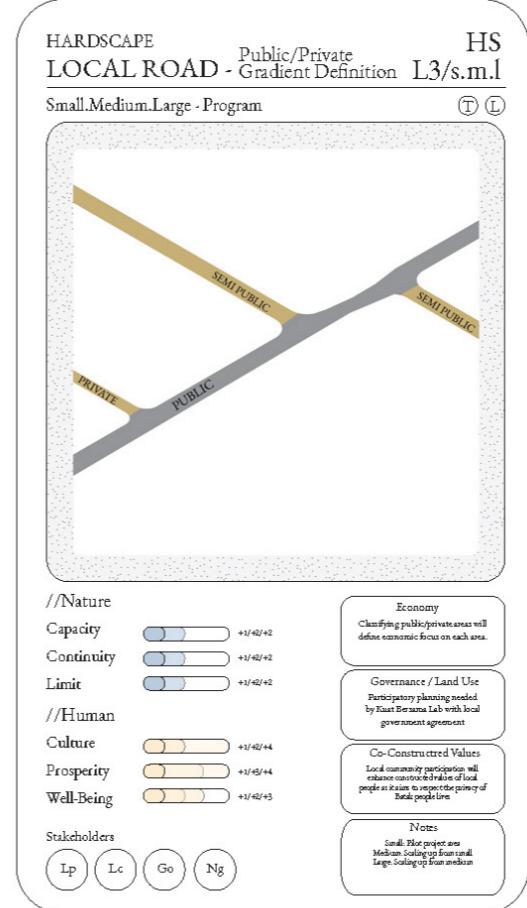
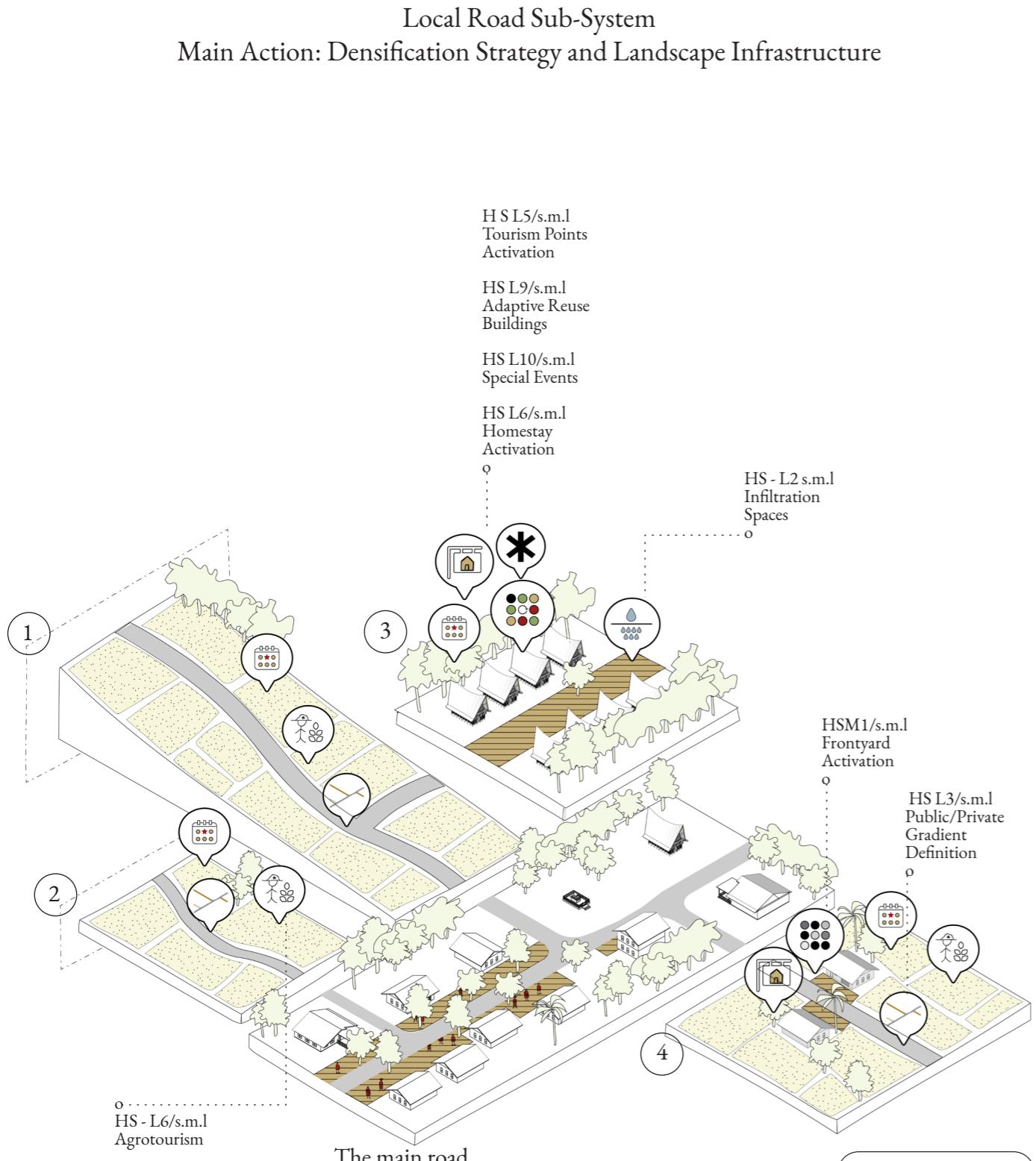
7.2. Transformation Kit Bundles



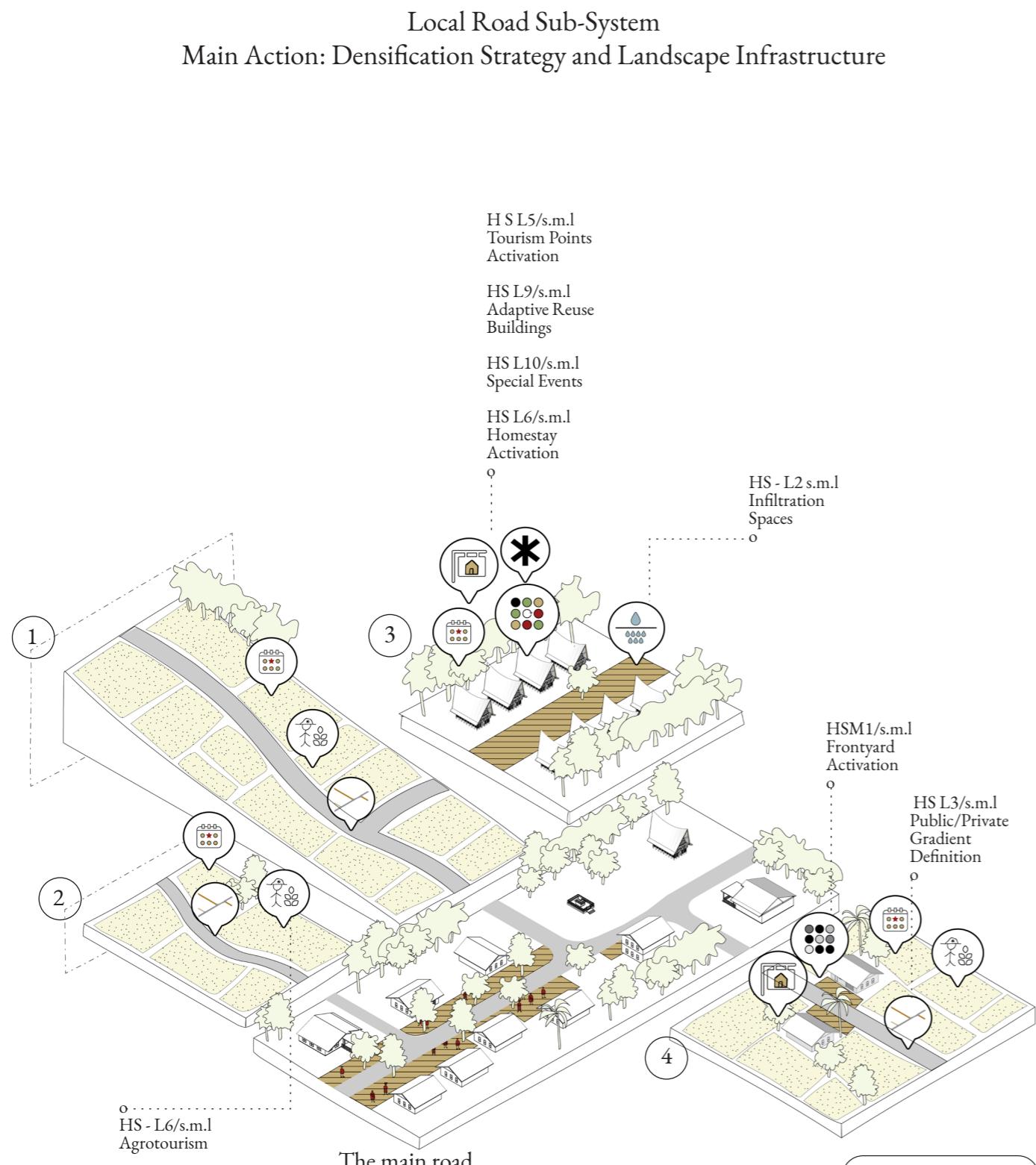
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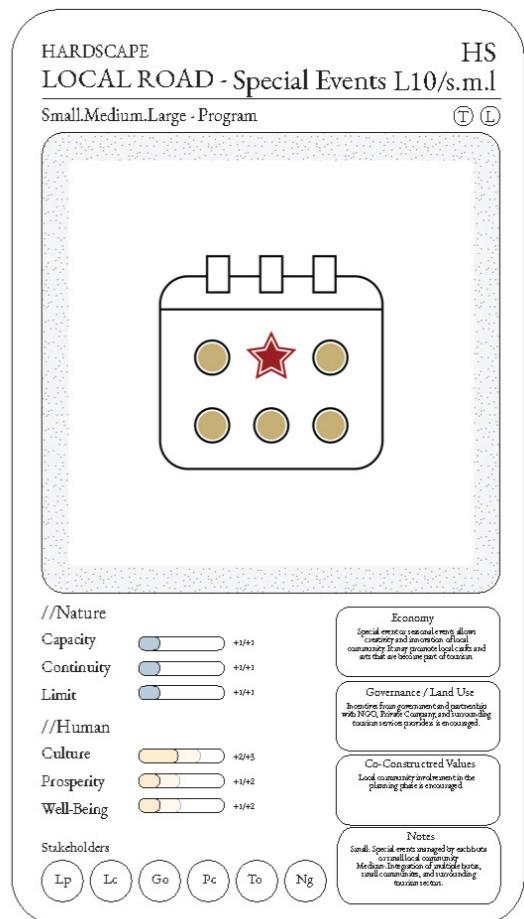
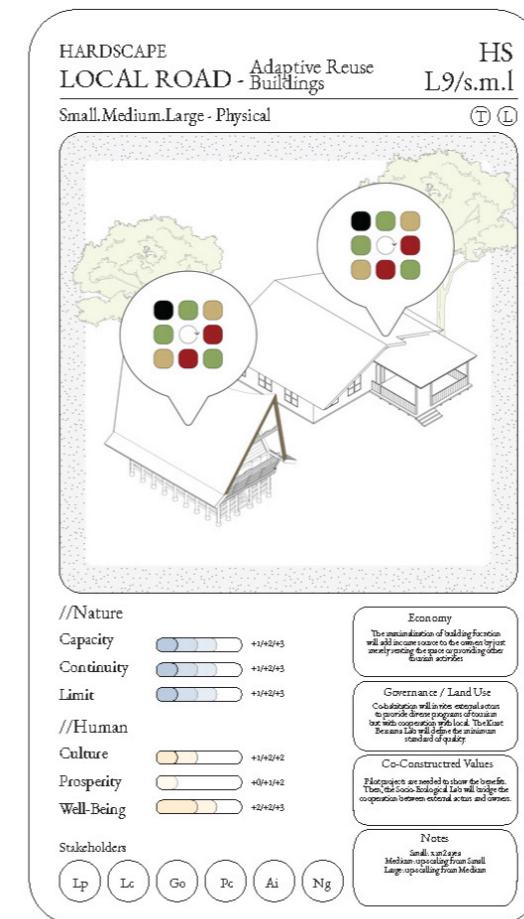
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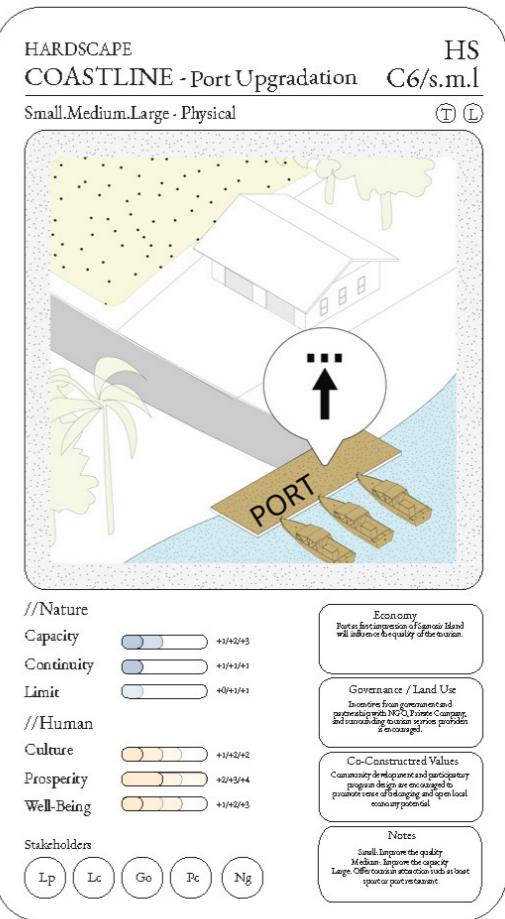
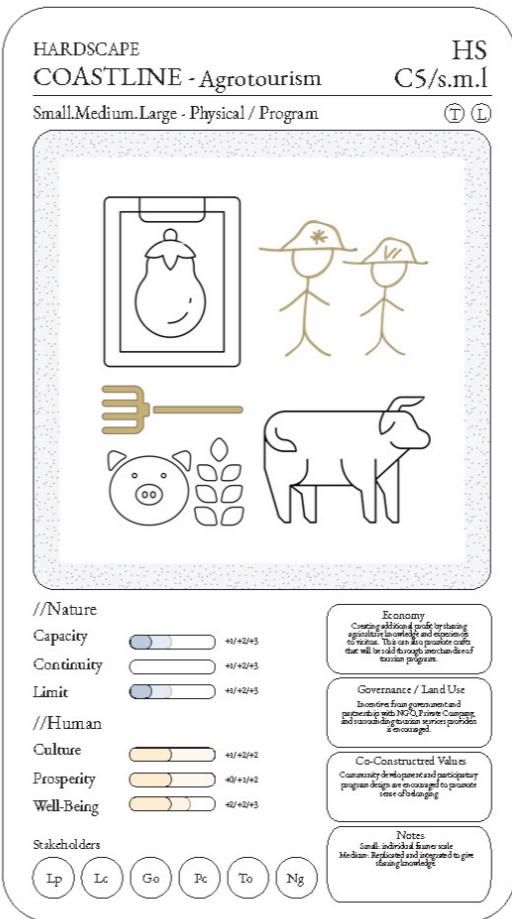
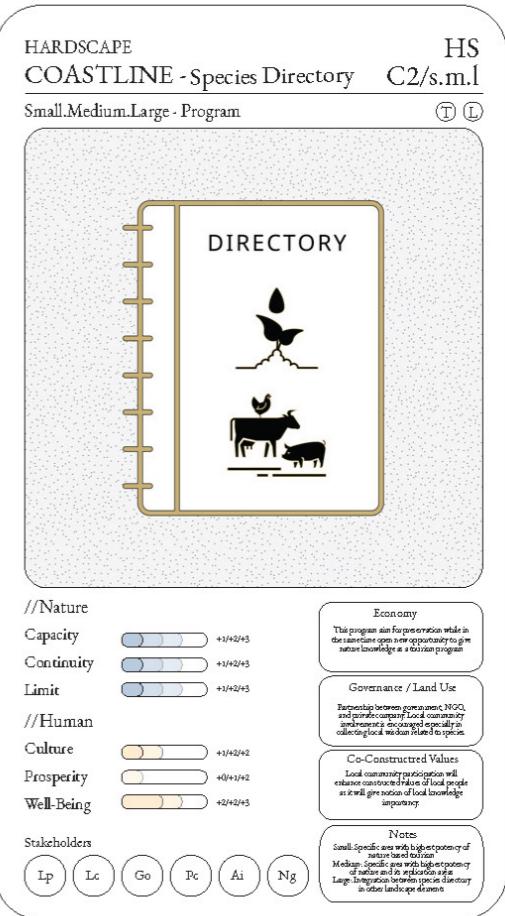
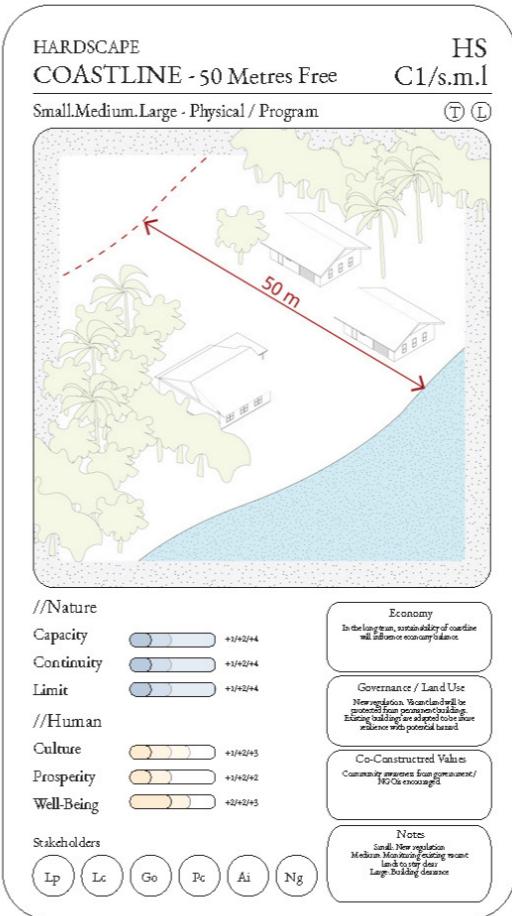
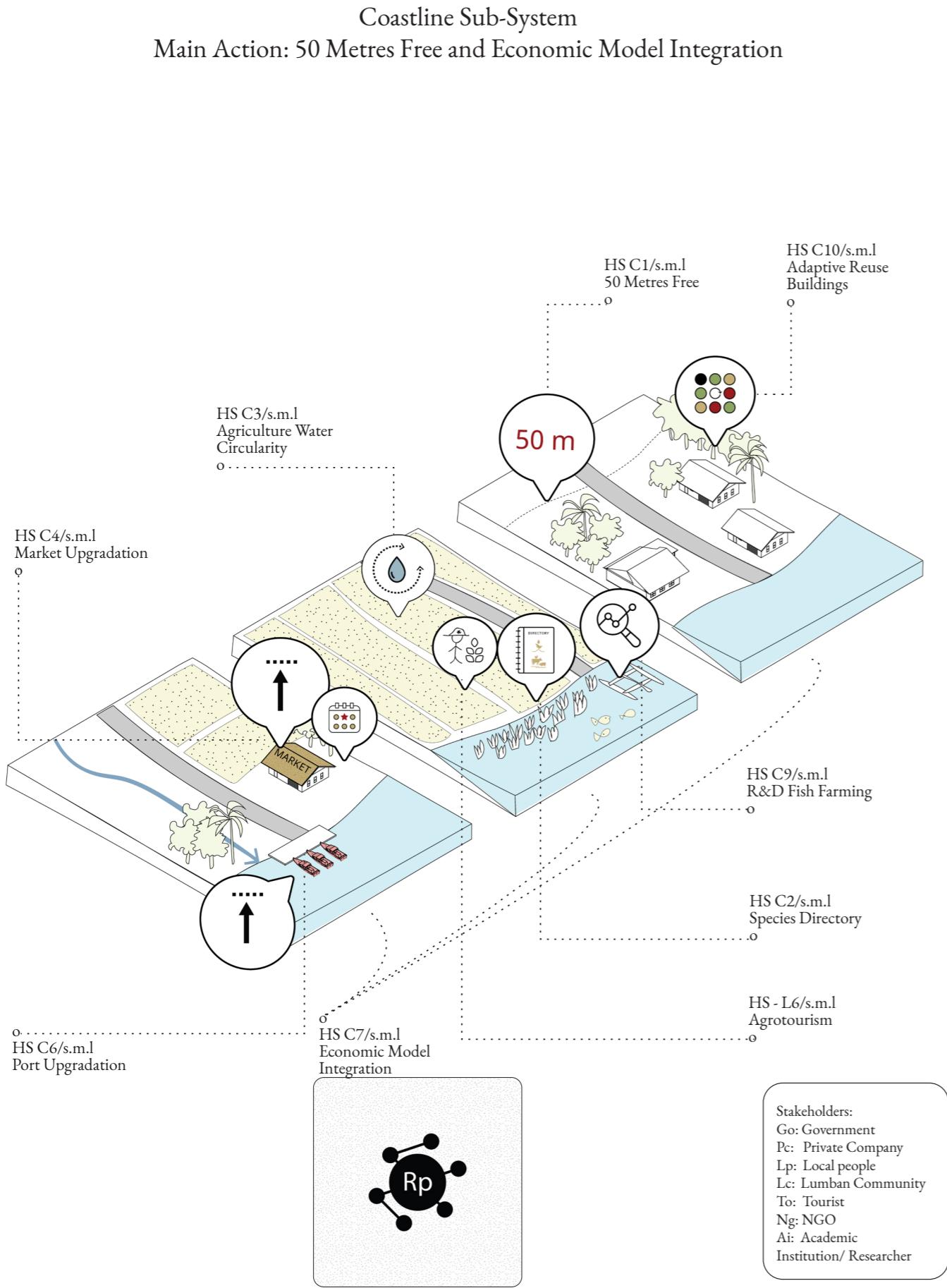
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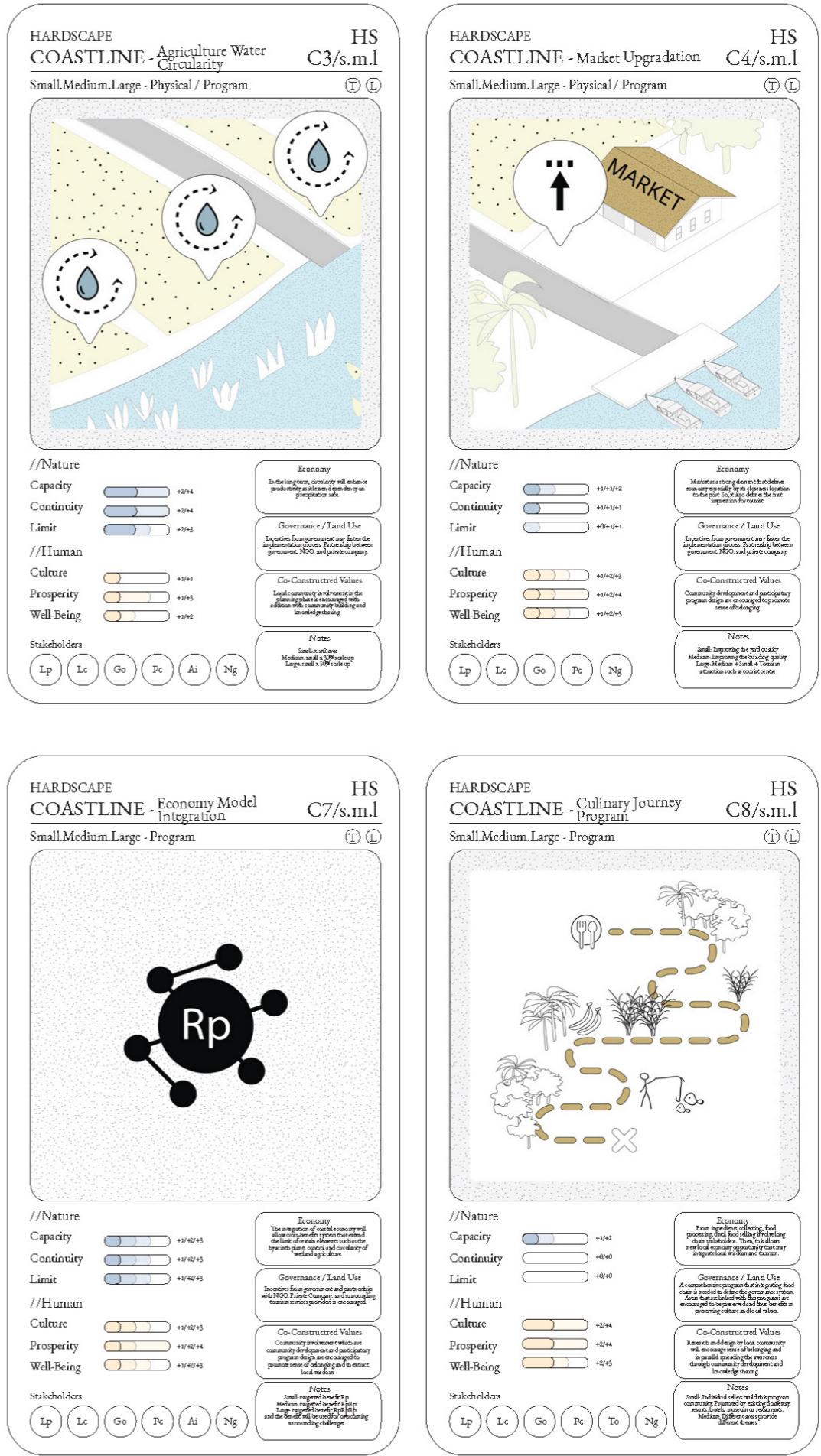
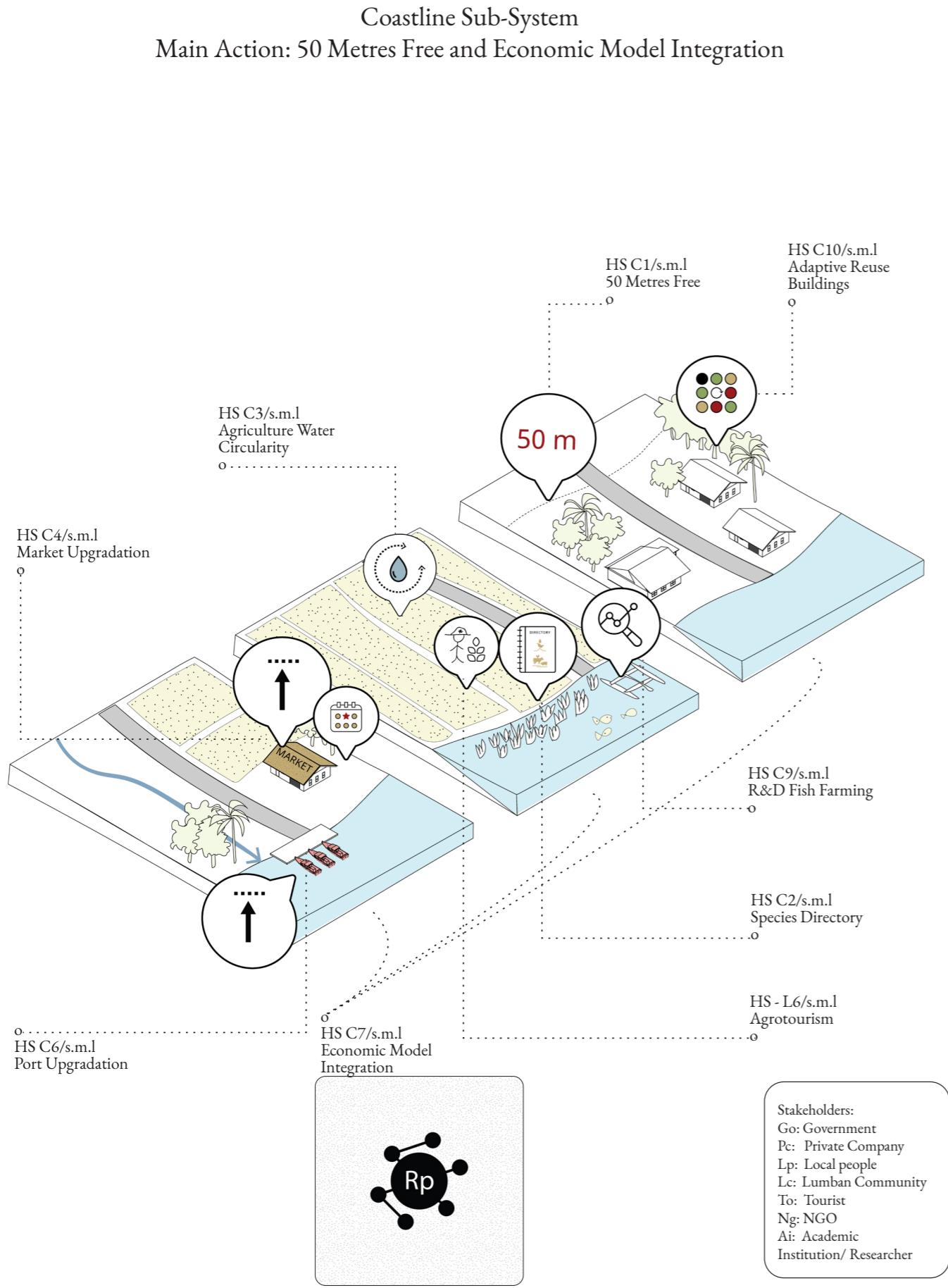
Stakeholders:
Go: Government
Pc: Private Company
Lp: Local people
Lc: Lumban Community
To: Tourist
Ng: NGO
Ai: Academic
Institution/ Researcher



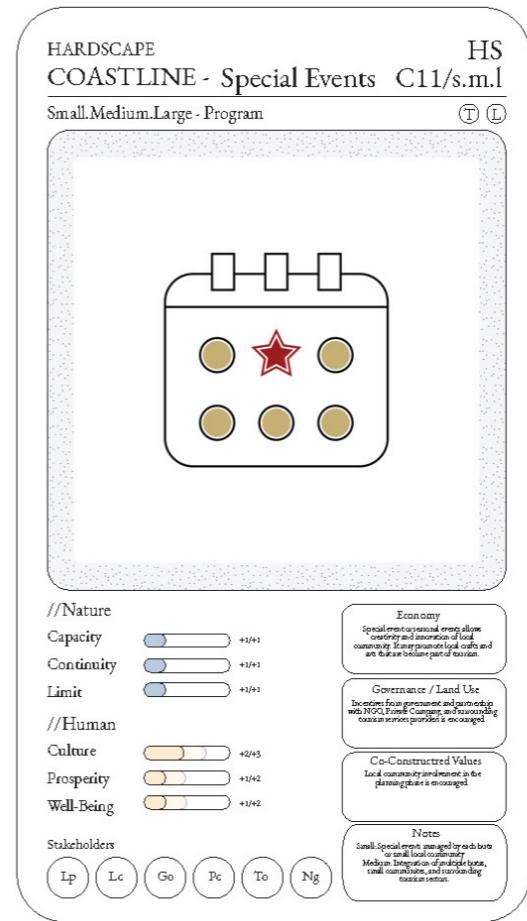
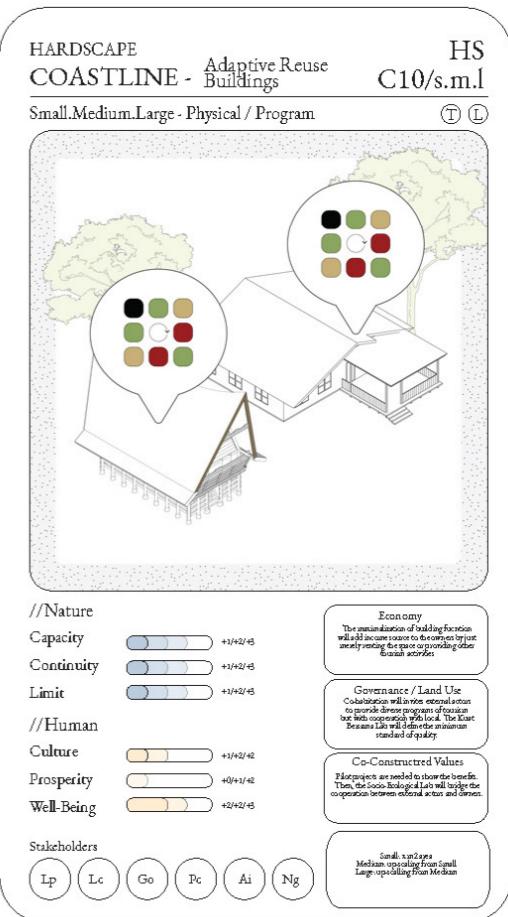
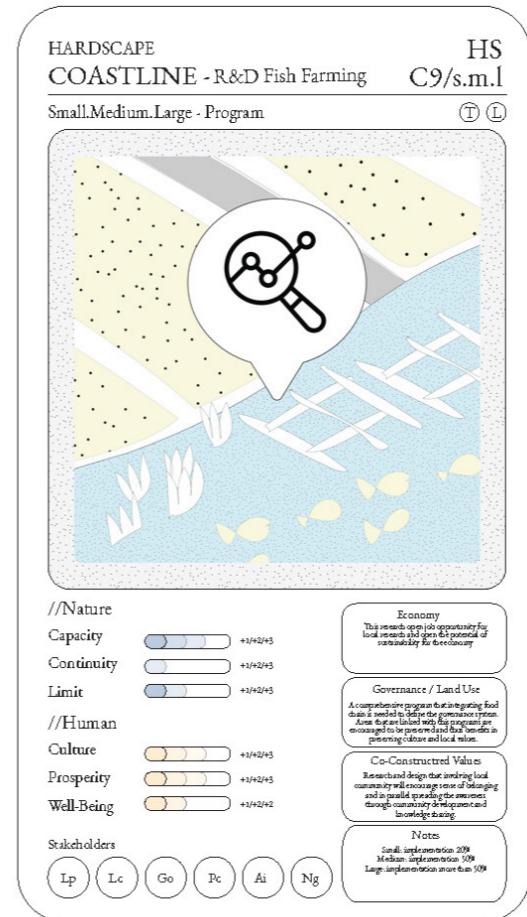
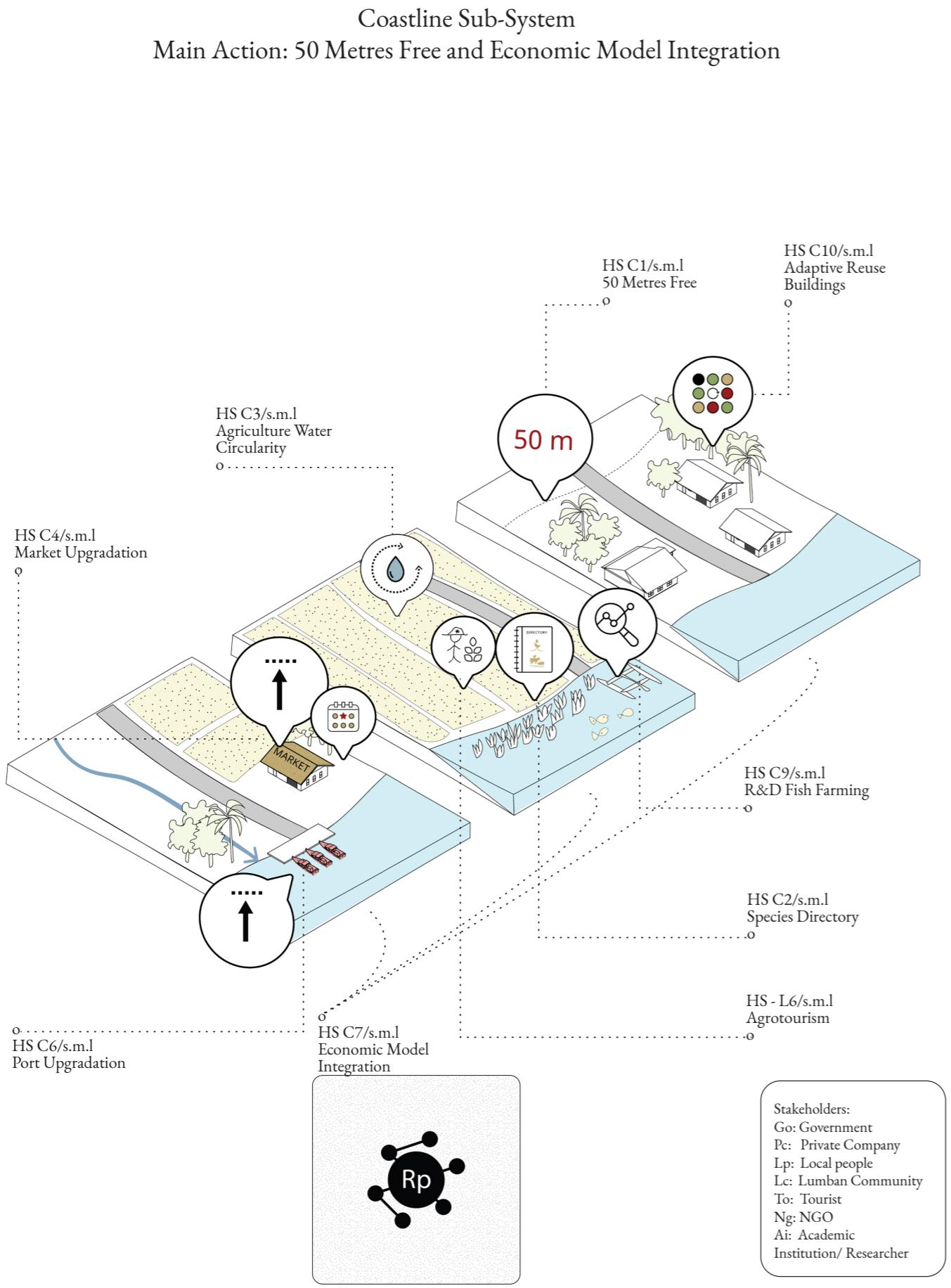
7.2. Transformation Kit Bundles



7.2. Transformation Kit Bundles



7.2. Transformation Kit Bundles



7.3. Reflections

1.1. Intention of the project

This project started with two questions for me as an Indonesian urban designer and hope for the country. The first one is about what may differentiate the western way of urban planning/design and Indonesia—a country that traditional culture has embedded from history. Moreover, the second one is from personal wonder how we as humans should preserve nature, regardless of the profession, and how it interrelates with culture—the beautiful asset from my country. Starting from these, it leads me to the project's selection process by defining criteria, which are currently developed vigorously and have high relation to Indonesian traditional-cultural assets. Then, it matches the current Indonesia national development plan, especially in the tourism sector.

The tourism sector has a high potential to increase economic growth in most developing countries. Moreover, technology invention of transportation promotes high mobility across countries and supports this potentiality of the tourism sector. Furthermore, with its ambitious plan for its tourism, Indonesia set up ten prominent locations that become priorities for future development, and one of them, Toba Lake Caldera Geopark, becomes this thesis project.

However, a massive development from external sectors undoubtedly will cause some disruption that may change the existing nature-culture systems embedded in the area since history. Moreover, it also increases the potential to invite more external parties such as investors and tourists, contributing to the evolution of future culture-nature systems. Then, it raises a big question on how the culture-nature systems in the future will be since it will define the future condition of nature and culture that become the assets of this tourism sector.

The deconstruction of Human (Culture) - Nature Relationship from the past and trying to understand the evolutionary processes lead to an understanding that the vernacular knowledge has important values in regulating the socio-ecological elements in the past and towards a sustainable future with some adaptations. The main keys to preserving the vernacular lie on the scale of community to the smaller one until the individual in the form of strong community relationship represented by Huta cluster. In addition, it also happens on the spatial consequences of every decision with different values over the history that somehow have hidden biophysical integration that is represented by vernacular landscape continuity from highland to lowland. Thus, vernacular knowledge definition extends from every species knowledge to the traditional beliefs that govern their land management. Recognizing this extension will reimagine the evolutionary processes towards sustainable symbiosis between humans and nature or socio-ecological resilience.

Moreover, participatory that acknowledge pro-active multidisciplinary management also may contribute to making other dynamic layers that strengthen the robustness of complex adaptive systems. However, the ground is that tourism still has inadequate local people participation from the planning until monitoring. Then in the proposal, the Kuat Bersama Lab represents aligning daily activities and their critical spatial conditions and examining potential collaboration between local people and expanding to the external drivers to extend potential support, especially on the funding.

Relation with graduation studio

Culture in Indonesia is an asset that potentially is used for tourism. Its attractiveness and uniqueness are seen as a novelty, especially compared to the globalization trend in urban areas. However, the understandings of culture that is already embedded in the area for a long time sometimes are forgotten caused by external disruption despite its ability to maintain the sustainability of nature. In addition,

the selection of Lake Toba as a site is due to the lake community high dependency and the potential risk and vulnerability on its nature and culture. Then, this project aims to reveal how the relationship between culture and nature in a territory at risk between land and water will be supported under Transitional Territories studio.

Through explorations of matter, topos, habitat, and geopolitics learning processes generate comprehensive understandings of complex systems within the study area from the smallest scale until intangible elements of value and governance. In this project, Lake Toba's choice as General Context explored through Monograph elaborate robust notions that become ground for making the Human (Culture) and Nature Relationship Formula that is used in all deconstruction processes from the past up to the future.

Relation with master track urbanism

Master track in Urbanism has a long tradition in addressing the integration of city and landscape in the design process. The motivation comes from Dutch tradition that conceives urban landscape as a multiscale phenomenon with the multidiscipline approach. Moreover, the 'research through design' method allows creative processes to produce underlying ideas and principles that may become further analysis that did not exist initially. Also, the design process depicts spatial problems visually, reveals possibilities, and generates design solutions. Besides, through the research process through design, the designer allows the designer to use heuristics or a relatively simple method for a complex decision (Nijhuis et al., 2016). Then, through this well-formulated approach and method that becomes the tradition within Urbanism, Master Track can deconstruct the existing embedded system in the project and construct responsible recommendations.

1.2. Process and method of the project

The process is challenging, mainly because there were always dualities or paradoxes in every part. First, designing an area with high culture embedded put me in a transition between knowing and not knowing during the process. In every conclusion or decision making, I keep questioning myself, "How then can I move forwards when so little is visible and so much things are unknown." Therefore, I keep convincing myself that knowing everything is a process to grasp and understand the whole picture. As a result, not knowing everything brings me to the final concept of focusing on the background system of socio-ecological resilience and proactive management first and trying to propose extensive potential transformations includes the past evolution recognition that will support the dynamic systemic equilibrium.

The second is that I am transitioning between being local and an outsider. Toba Lake is in Indonesia, which means I am familiar with the culture and traditions of Indonesia. However, at the same time, Batak is not my culture, despite being surrounded by Batak people from a young age. Therefore, at the beginning of methodology planning, I expected a site visit and local interview to justify decision-making when designing. Unfortunately, the condition did not support me to conduct the initial plan. Therefore, some adjustments for methodological approach followed by methods become the typical consumption over the processes. In the end, contacting the local architect and local validation on the understanding summaries becomes the alternate method for bringing real context to the project.

Interrelation of research and design

The relationship between research and design is iterative processes—this method allows the expansion of creative processes, especially when data provision is relatively limited and scattered. Hypotheses from research are validated through several assumptions and can act as a ground for decision making in the design process. There are also

moments when research and design processes are working parallel that support each other. The specific processes that include research-design interrelation are in the designing process, providing diverse potential transformation exposes other specific new research that needs to be justified to make the transformation more reasonable, which mainly lies on the detailed research such as people's daily routines or specific details species that exists in the area.

Advantage and limitations of the methodology

The methodology is classified into five non-linear steps: defining, assessing, designing, proposing, and evaluating. These steps envision evolutionary processes from the past to the future by considering the theoretical framework structured in the initial thesis project plan. Within the methodology, some methods such as literature research and interview have low effort to be conducted. However, there were also limitations. The first challenge is changing the method from offline site visits to online. It is because of the need to consider formulating acceptable and understandable deliverability and effective communication to the local people. The second challenge is less accuracy of analysis through online data. Provided online data is less updated and has low-quality images. Third, continuous methodology changes undoubtedly cost high energy and time, sometimes creating inefficient working flow and demand for high flexibility to finish this thesis project.

1.3. Relevance of the project

Societal relevance

The main aspect in the social context of this thesis proposal is inclusivity through adaptive co-management and new media communication. However, the interrelation between top-down and bottom-up approaches still has a common challenge: synergy. Uncoordination between bottom-up initiatives frequently also causes redundancy and uncomprehensive impacts to the systemic pattern of the region. Also, the importance of synergy between disciplines in a project is sometimes limited by inefficiency and ineffective communication.

Moreover, cultural aspects become a prominent highlight that rises a specific treatment implemented to the strategy. By understanding the embedded cultural values from a community, the reciprocal relationship between local, tourist, and government will be generated to grasp the bigger meaning more than them(our)selves.

Scientific relevance

The duality of culture - nature and vernacular knowledge adaptation become international discourses in the planning development. This thesis project aims to bring up Indonesia context to these discourses that then knowledge exchange and mutual inspiration can be formulated in future scientific research. The scientific knowledge of urban planning and design has formulated certain methods, techniques, approaches, or else that can be replicated in different contexts worldwide. However, the challenge is to contextualize it into the local context. Then, this thesis promotes the bridging process step-by-step to understand the gap by first understanding the wisdom within vernacular knowledge and formulating it into regional planning.

Ethical considerations

Land tenure has become one of the critical risks in tourism development in the Toba Lake area. However, several land ownership system in the area is still following traditional system with lack of clarity in territories definition. Claiming land without understanding the value of land for the community in the Toba area is also potentially causing conflicts between locals and external parties such as the government or investors. In the project, the traditional system of

land ownership approach is proposed to create inclusivity through cooperation and cohabitation.

1.4. Role of the project for future endeavours

Transferability of project

Toba Lake is projected to become an international tourism destination with the label of Toba Caldera Geopark and is supported by UNESCO. Indonesia government supports this tourism development ambitiously due to its high priority. On the other hand, the uncertainty of climate change impact also becomes another challenge that needs to be addressed. Then, it raises the urgency of socio-ecological resiliency and proactive management manner that is expected to promote the sustainability of Toba Lake in terms of its nature and people. Then, this project outcome is new strategic approaches to answer the biophysical and socio-cultural system integration urgency and new media approach that may help bridge the communication gap between disciplines and stakeholders and, in this case, through transformation kit in the form of cards.

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