THE CATASTROPHIC ERUPTION

BACKGROUND:

On January 15, 2022, the Hunga-Tonga Hunga-Ha apai volcano was responsible for a large-scale eruption. The eruption triggered tsunami warnings across the Pacific, and its impact was felt as far as Japan, Peru, and Chile. As a result, significant damage was inflicted on Tonga's environment and industry, prompting support from many countries to help rebuild. Further volcanic activity is anticipated as the volcano remains active.

Country /City China / Chongqing

University / School Chongqing University / College of Art

Academic year 2022 / 2023

Title of the project Disaster, Diverging Point

Authors Shuai JIANG, Ziyun YAN, Xinyue LIU, Yujing WU, Sibei DONG

TECHNICAL DOSSIER

Title of the project Disaster, Diverging Point

Authors Shuai JIANG, Ziyun YAN, Xinyue LIU, Yujing WU, Sibei DONG

Title of the course Landscape architecture

Academic year 2022 / 2023

Teaching Staff Yang Ling

Department / Section / Program of belonging Department of Environmental Design / College of Art

University / School Chongqing University

12

Written statement, short description of the project in English, no more than 250 words

MIRAB is a unique economic growth model of Pacific island countries, which mainly carries out self-financing through some international rescues. But some researches show that over-reliance can lead to aid traps.

On January 15, 2022, a serious volcanic eruption disaster caused Tonga to be fully covered with volcanic ash, accompanied by local phenomena such as the collapse of houses and the pollution in water and soil resources. In addition, invisible items have been destroyed also, such as industrial circle and surrounding ecological environment.

Our project takes volcanic eruption as a diverging point for Tonga's transformation, exploring all the reusability of volcanic ash in three land use (coastal, agricultural and urban area). Introduce a small industrial chain through volcanic ash to enhance the local economic resilience, while using products to enhance the local ecological resilience also.

The project cycle is roughly divided into three stages, the disaster stage, the post-disaster reconstruction stage and the long-term development stage. Deeply refine the urban part, we improve the transformation and ecological benefits of three stages. Finally, it will provide Tonga with a sustainable development path of economic and ecological coexistence, gradually reduce dependence on international support, and finally get rid of MIRAB aid trap.

For further information

Landscape designers in China

Contact via email at:
jiangshuai4031@163.com / 1271904717@qq.com
Tel: +86 18607176996

Landscape designers in China
Chongqing University
Huxi Campus of Chongqing University
401331

12th International Biennal Landscape Barcelona

Barcelona **November 2023**

SCHOOL PRIZE

TONGA'S NEED FOR AID AND MIRAB DILEMMA

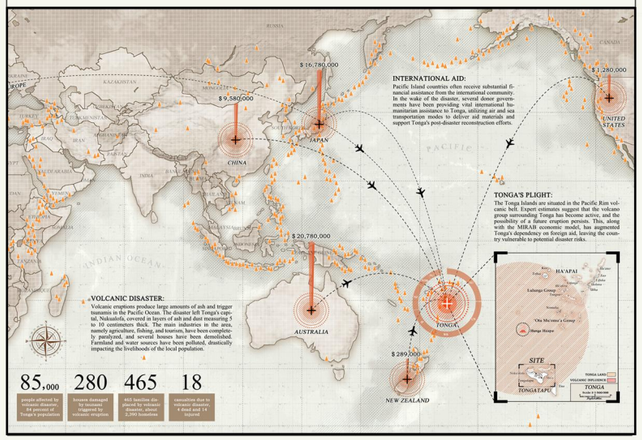
AID DEMAND	TO	AID DEPENDENT

MANY PACIFIC ISLAND COUNTRIES ARE CAUGHT IN THE MIRAB TRAP

MIRAB

MIRAB is a major potential economic structure for PIC Pacific Island countries, with four main elements:

MIGRATION REMITTANCES AID BUREAUCRATISM



1. MIGRATION AND REMITTANCES

MIGRATION

Go to other countries for better employment opportunities or higher income by participating in seasonal employment or immigration in other countries.

REMITTANCES

The remittances sent home by those who are employed outside the country contribute a lot of additional income to participating families each year.

PROBLEM: Migration and remittances contribute to income growth and development. But this could lead to a "remittance trap," which would leave economies trapped in low growth, high immigration. Countries receiving remittances may become dependent on exporting labor instead of goods produced with that labor, while leaving their countries short of working-age labor.

2. AID AND BUREAUCRACY

AID

Aid refers to the financial assistance and technical assistance provided by the international community to Pacific island countries.

BUREAUCRACY

High levels of international aid support high levels of public employment, raise wages in the public sector, and even involve governments in the production of private goods and services.

PROBLEM: Too much aid may reduce the government's incentive or need to address underlying economic problems and make necessary structural reforms. At the same time, public-sector pay and range inflation have undermined the ability of private firms to attract skilled workers at wages commensurate with their productivity. High levels of aid can even undermine good governance.

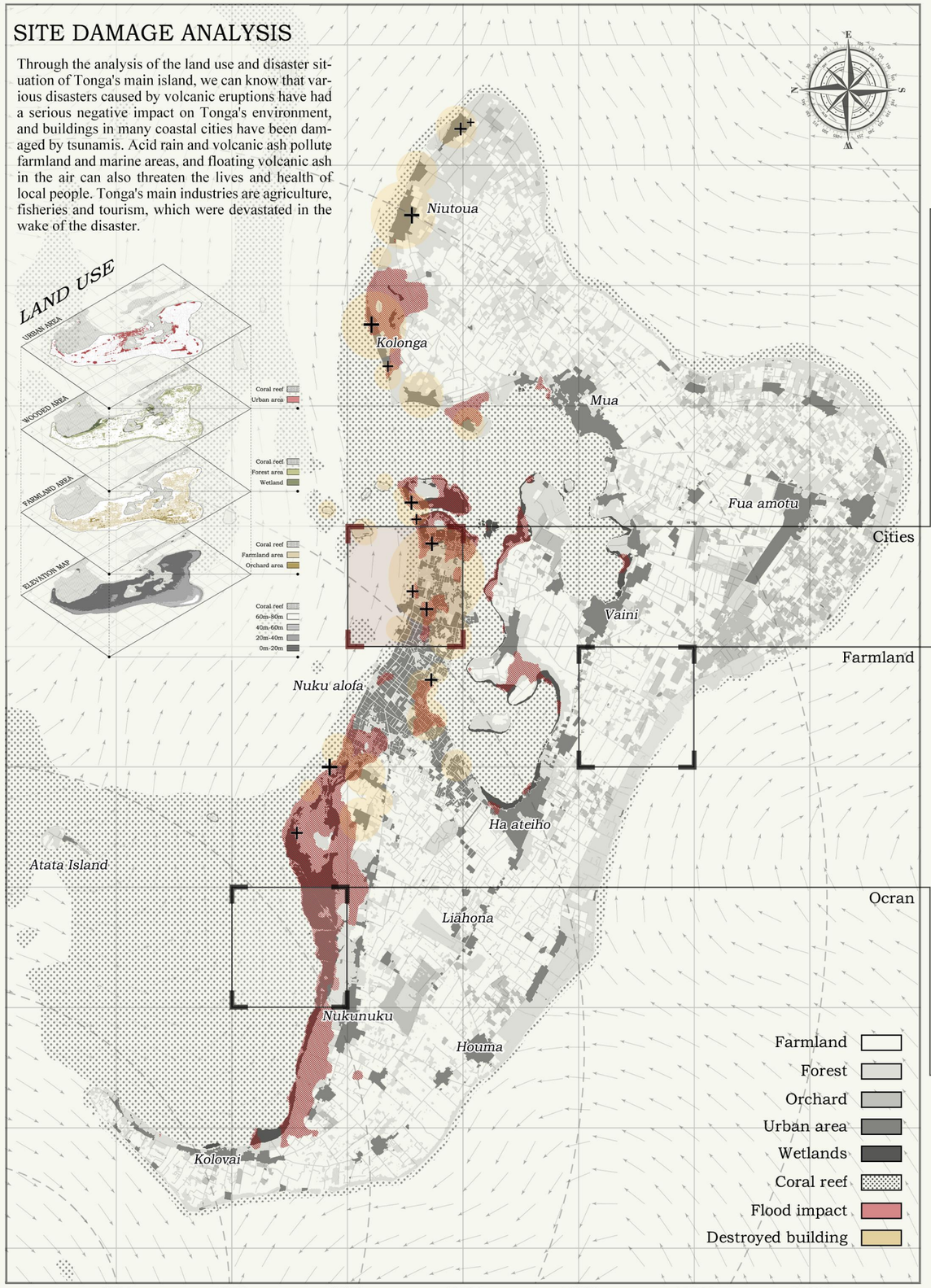
MIRAB REFLECTION

MIRAB MODEL ▶ Is there no viable alternative? ?

The MIRAB economic structure has brought short-term economic growth to many Pacific island countries, including Tonga, but is reliance on aid, remittances and rents a healthy, sustainable and preferable model for the long-term economic growth and development of islands or any society in the long run? Is there really no viable alternative?

SITE DAMAGE ANALYSIS

Through the analysis of the land use and disaster situation of Tonga's main island, we can know that various disasters caused by volcanic eruptions have had a serious negative impact on Tonga's environment, and buildings in many coastal cities have been damaged by tsunamis. Acid rain and volcanic ash pollute farmland and marine areas, and floating volcanic ash in the air can also threaten the lives and health of local people. Tonga's main industries are agriculture, fisheries and tourism, which were devastated in the wake of the disaster.

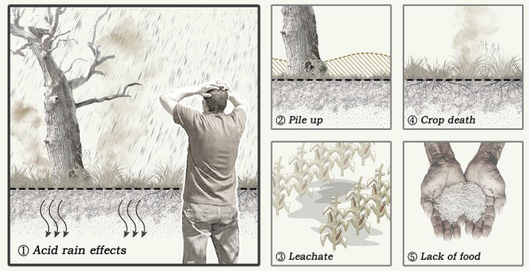


DISASTER ANALYSIS

Effects of volcanic eruptions on cities

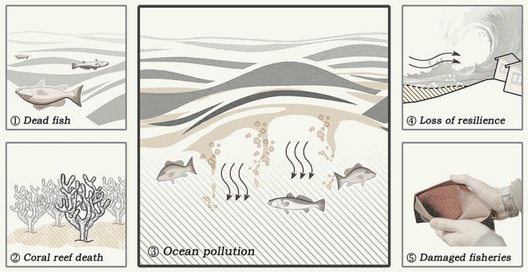
Volcanic ash from volcanic eruptions floats and accumulates in cities, posing a threat to the lives and health of local people. In addition, the tsunami caused by the volcanic eruption damaged infrastructure and buildings along Tonga's coast, leaving many people homeless.

Effects of volcanic eruptions on farmland



Volcanic ash from volcanic eruptions can cause acid rain and leachate contamination, which can seriously threaten Tonga's fresh water supply and agricultural activities, and soil erosion makes the soil unsuitable for crop growth. Tonga's agriculture has been hit hard.

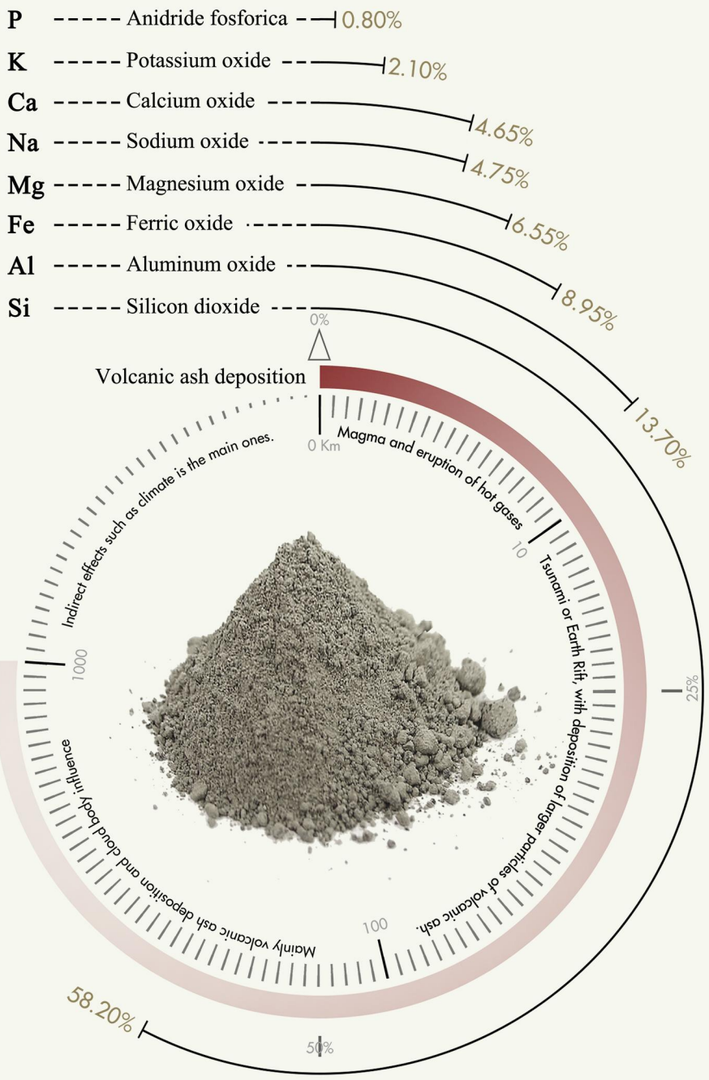
Effects of volcanic eruptions on the ocean



Volcanic disasters have caused serious damage to Tonga's marine ecosystem. The sea polluted by volcanic ash may lead to the death or migration of a large number of fish, while the death of coral reefs will further weaken T... ability to cope with disasters in the future.

PROCESS ABOUT VOLCANIC ASH

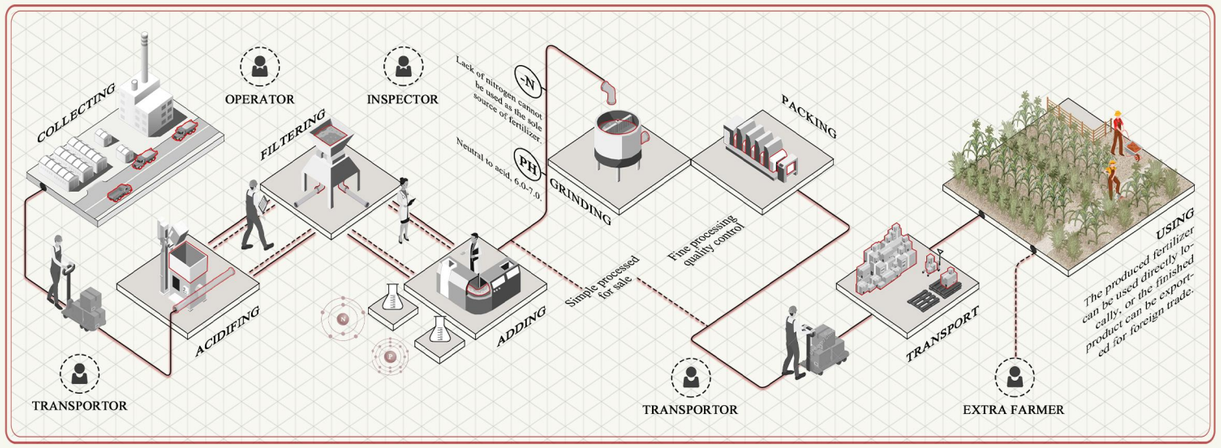
VOLCANIC ASH COMPOSITION ANALYSIS & DISTRIBUTION RANGE

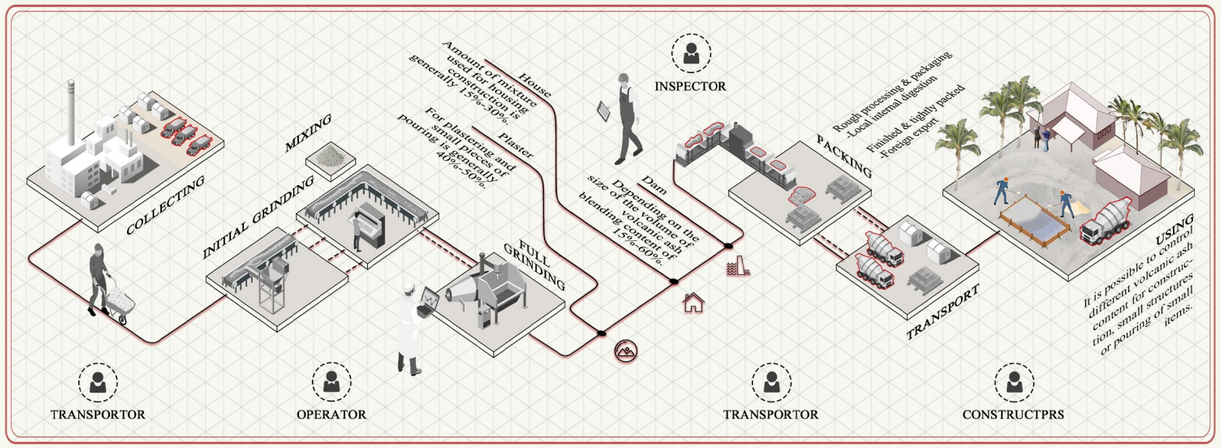


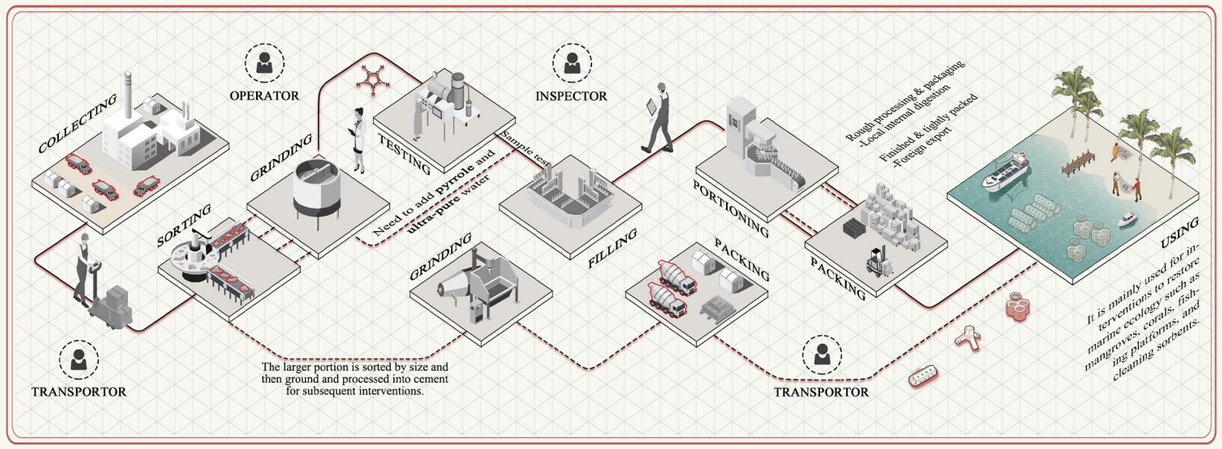
VOLCANIC ASH

VOLCANIC ASH consists of fragments of **rock**, **mineral crystals**, and **volcanic glass**, created during volcanic eruptions and measuring **less than 2 mm** in diameter. Volcanic ash is formed during explosive volcanic eruptions when **dissolved gases** in magma expand and **escape violently into the atmosphere**.

VOLCANIC ASH COMPOSITION ANALYSIS







POSITIONS OFFERING

Newly introduced positions while creating the processing chain.

COLLECTORS
A position that only appeared in the pre-stage.

TRANSPORTERS
Transportation of volcanic ash and its output, etc.

OPERATORS
Work mainly at the nodes of the processing chain.

PACKERS
Responsible for packaging output and by-products.

TRADE MERCHANT
The surplus produced can be sold by foreign trade.

SERVICE STAFF
Mainly provide services after the transformation of the factory.

RESILIENCE BOOST

Enhancing local resilience on multiple fronts.

ECONOMIC RESILIENCE
A quick response to the short-term economy to keep society running.

DISASTER RESILIENCE
Significantly reducing the damage caused by the next disaster occurrence.

ECOLOGICAL RESILIENCE
Enhancing resilience to the next disaster through ecological ways.

DEPENDS ON MIRAB

① DISASTER EMERGENCY PHASE

By integrating transregional volcanic ash industry with local agriculture, fishery, and tourism, we create an sustainable industrial model that receives technical assistance instead of financial aid overseas and optimizes the industrial structure. Thus, such measures could bridge the employment gap and help local labor return.

② AFTER-DISASTER PHASE

The volcanic ash and its processed products are widely applied to the reconstruction process of Tonga and the restoration of the eco-environment through landscape intervention. It could not only reshape the resilience of successfully adapting to adversity, but also make it possible for the recovery of the local industries.

③ LONG-TERM DEVELOPMENT PHASE

As Tonga's pillar industries are revitalized in the ecological restoration process, we seek other directions of development, such as combining industries with the three pillar industries to form new economic modules, as a way to ensure the sustainability of the chain.

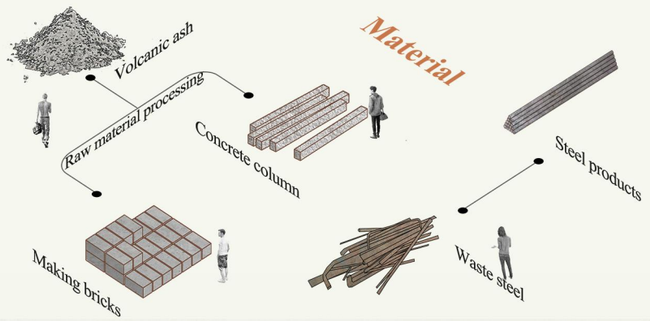
A ROBUST ECONOMY BASED ON VOLCANO ASH INDUSTRY

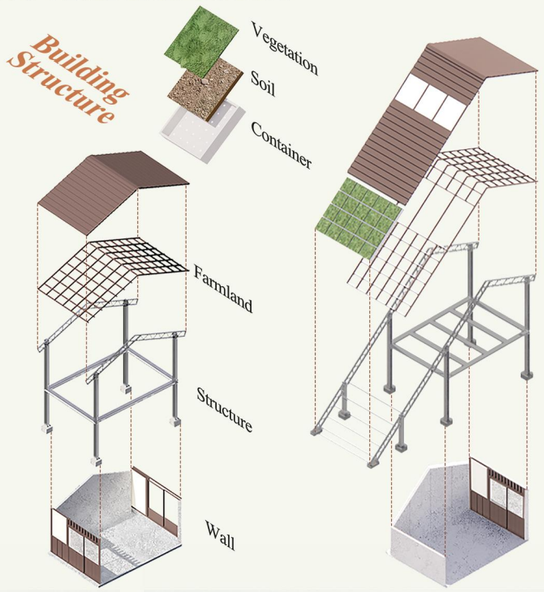
STRATEGY STATEMENT

Volcanic ash and other materials produced by the disaster are collected and roughly processed and become a shelter for people who have lost their homes in the process of post-disaster reconstruction. At the same time, different types of food supply modes are configured. After the disaster, the structures of these shelters will be preserved, and fields will be transformed into green spaces to carry out more functions.

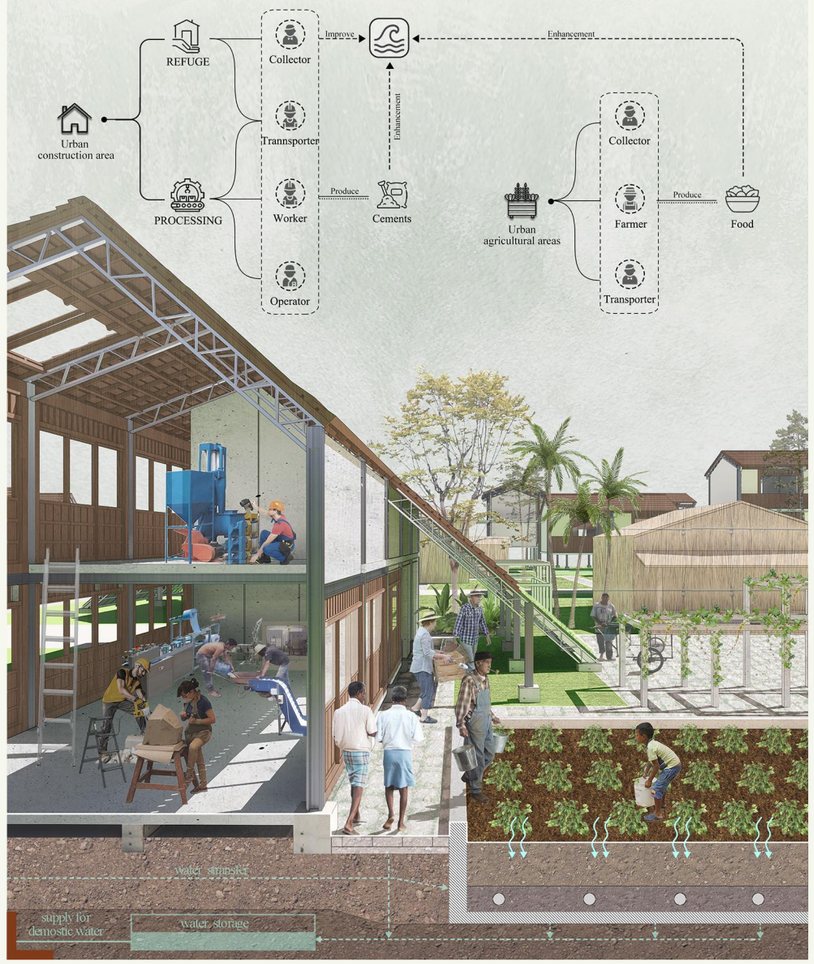
VOLCANIC ASH UTILIZATION

The collected volcanic ash is made into customized bricks, which can be used to build the outer wall of the shelter. Another part of the collected volcanic ash can be used as pillars. In addition to forming structures such as shelters, it can also be used for planting pots.The waste steel produced by the destroyed houses can be used to support the structure of the shed after recasting.

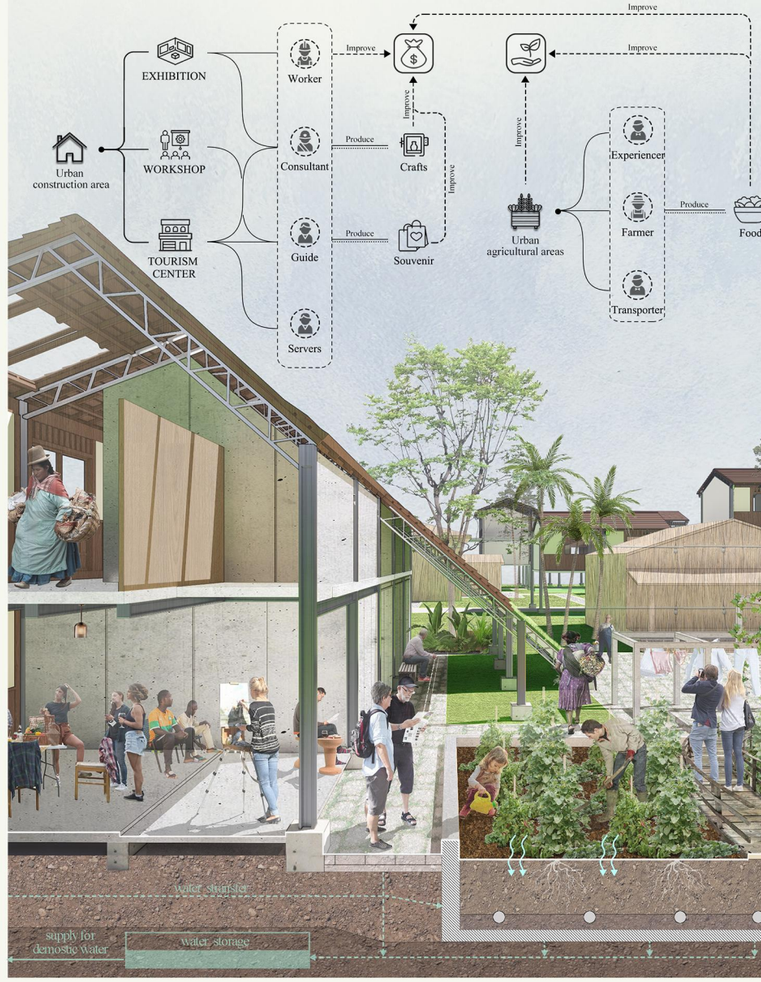




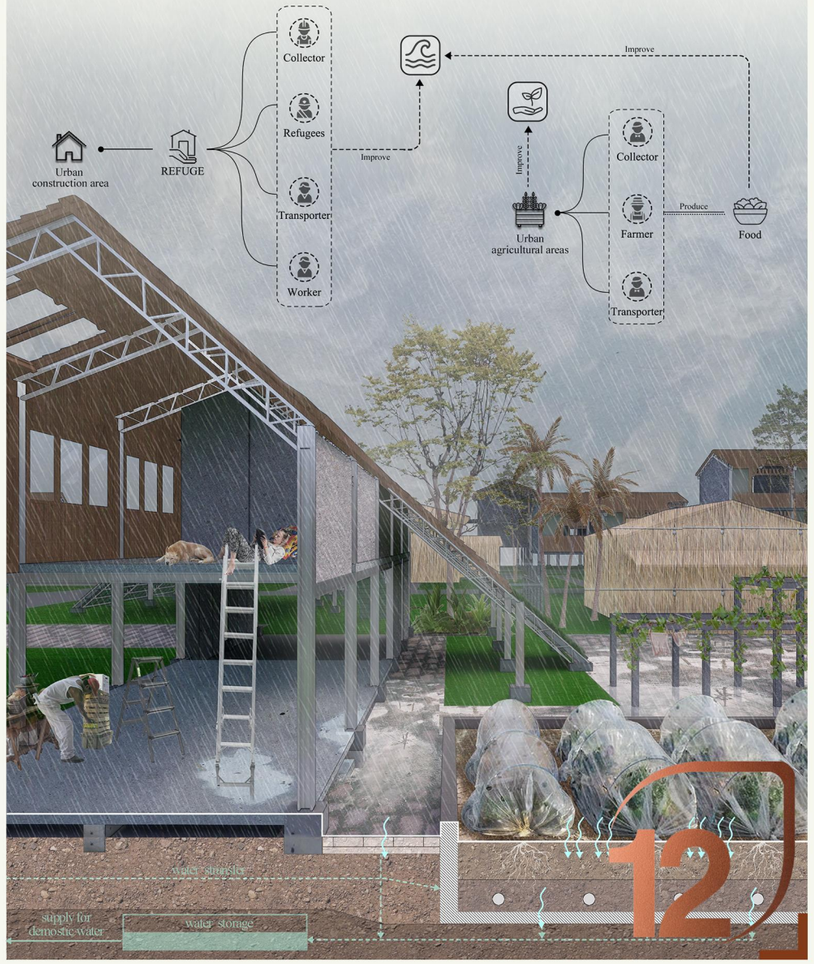
PHASE 1: AFTER-DISASTER PERIOD



PHASE 2: LONG-TERM SUSTAINABLE PLAN



PHASE 3: DISASTER EMERGENCY OCCUR

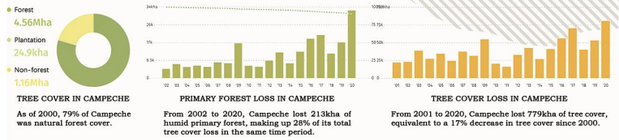


MELIPONA BEECHEII, FARMLAND AND FOREST

Strategies for the construction of symbiotic systems of agriculture, bees and forests in Campeche State

The long history of Mayan beekeeping

The Mayan beekeepers saw the native bees as a link to the spiritual world and a gift from the gods of honey, these bees are called Melipona beecheii, a stingless bee. It is said that the Maya have been keeping these bees for 3,000 years and their honey is a highly prized food and medicine for the Maya. The dense trees on the Yucatan Peninsula were originally a haven for the Melipona beecheii. But with the arrival of the Mennonites, the bee homes and bees are disappearing.



TREE COVER IN CAMPECHE

As of 2000, 79% of Campeche was natural forest cover.

PRIMARY FOREST LOSS IN CAMPECHE

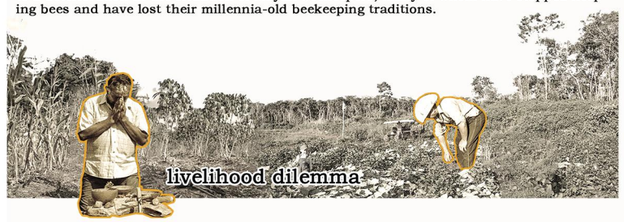
From 2002 to 2020, Campeche lost 213kha of humid primary forest, making up 28% of its total tree cover loss in the same time period.

TREE COVER LOSS IN CAMPECHE

From 2001 to 2020, Campeche lost 779kha of tree cover, equivalent to a 17% decrease in tree cover since 2000.

Conflict between beekeepers and Mennonites

Mennonites are deforesting to expand agriculture and using pesticides to grow genetically modified crops. However, the reduction in forest cover has led to the gradual loss of bee space, the use of pesticides and insecticides threatens the lives of bees, and bee products tainted with genetically modified ingredients are rejected by Europe, all of which have led to a deterioration in the situation of Mayan beekeepers, many of whom have stopped keeping bees and have lost their millennia-old beekeeping traditions.



PROJECT STATEMENT

Forests in Campeche have been ruined and devoured by Mennonites' industrial monoculture in soybean farmland, causing the loss of habitat for bees. Furthermore, bee products have been contaminated with genetically modified ingredients rejected by Europe. The tradition of Mayan beekeepers for centuries is disappearing.

Based on the perspective of landscape planning, we aim to create a symbiotic agricultural system, integrating bee and forest in Campeche State. We identified fragmentation in forest and introduced intensive agriculture, new cooperative agriculture and ecological forest beekeeping based on land-use analysis framework. This involve in long-term process with specific strategies. We encourage Mennonites and local beekeepers to work together towards a more sustainable future.

CAMPECHE STATE MAP

Analysis of Current Situation of Land Use in Campeche

Country /City China / Chongqing

University / School Chongqing University / College of Art

Academic year 2022 / 2023

Title of the project Melipona beecheii, Farmland and Forest

Authors Shuai JIANG, Tianwei LIAO, Hanyu HU

TECHNICAL DOSSIER

Title of the project Melipona beecheii, Farmland and Forest

Authors Shuai JIANG, Tianwei LIAO, Hanyu HU

Title of the course Landscape architecture

Academic year 2022 / 2023

Teaching Staff Yang Ling, Menghan ZHANG

Department / Section / Program of belonging Department of Environmental Design / College of Art

University / School Chongqing University

12

Written statement, short description of the project in English, no more than 250 words

Since the 1930s, Mayan beekeepers have made Campeche, covered with the largest virgin tropical forest with very delicate ecosystems in Mexico, a world-class honey producer. However, then the Mennonites came with genetically modified soy, pesticides and large machines, and started to deforest large parts of land where the bees feed. Campeche's forests were devoured by Mennonite monoculture soybean fields, and bees lost their habitat. Furthermore, the widespread rejection for bee products contaminated with genetically modified ingredients has been threatening the livelihoods of Mayan beekeepers. Thus, it destroyed everything of bee culture from millennia back.

Based on the perspective of landscape planning, we aim to create a symbiotic agricultural system, integrating bees and forests in Campeche. Based on the land use analysis, we identified various land-use modes according to the degree of forest fragmentation. Therefore, we introduced intensive agriculture, new cooperative agriculture and ecological forest beekeeping, involving a long-term, complex process with specific strategies. We encourage Mennonites and local beekeepers to work together towards a more sustainable future.

For further information

Landscape designers in China

Contact via email at:
jiangshuai4031@163.com / 1271904717@qq.com
Tel: +86 18607176996

Landscape designers in China
Chongqing University
Huxi Campus of Chongqing University
401331

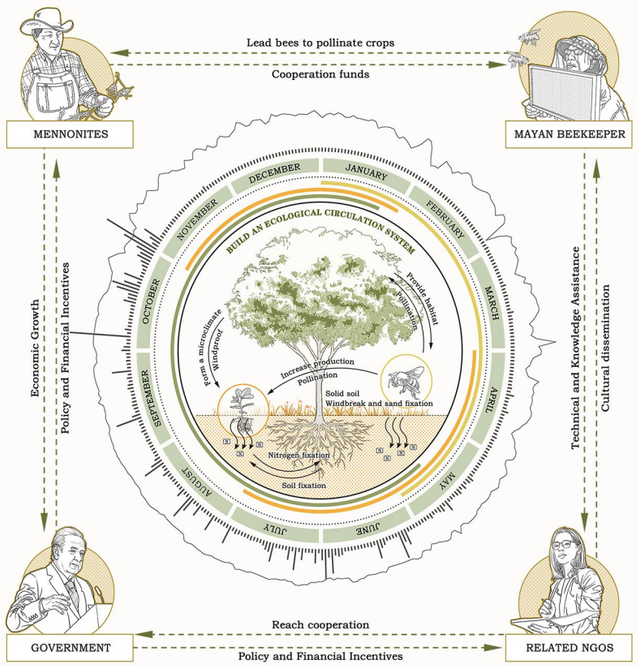
12th International Biennal Landscape Barcelona

Barcelona **November 2023**

SCHOOL PRIZE

PROGRAM GOALS

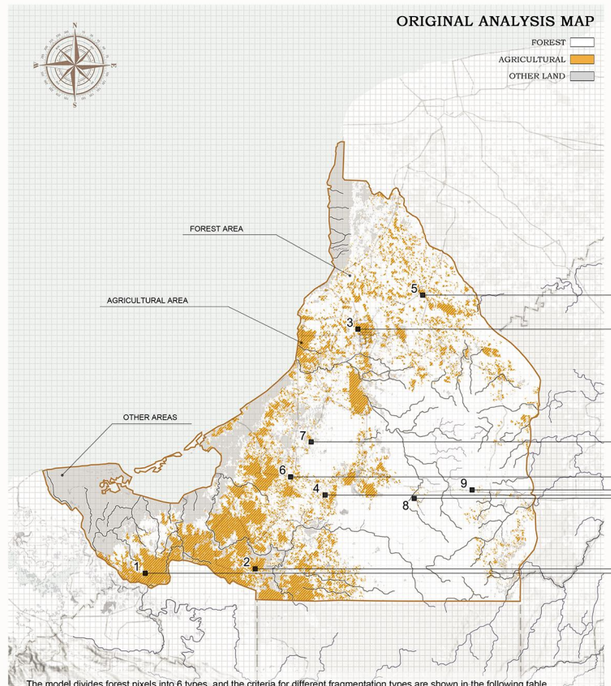
The inner circle constructs a cyclic symbiosis system among agriculture, bees and forests, and the outer circle constructs a collaborative system of socially related groups.



- Suitable for planting
- Suitable for farming
- Suitable for beekeeping
- Annual rainfall map
- Annual humidity map

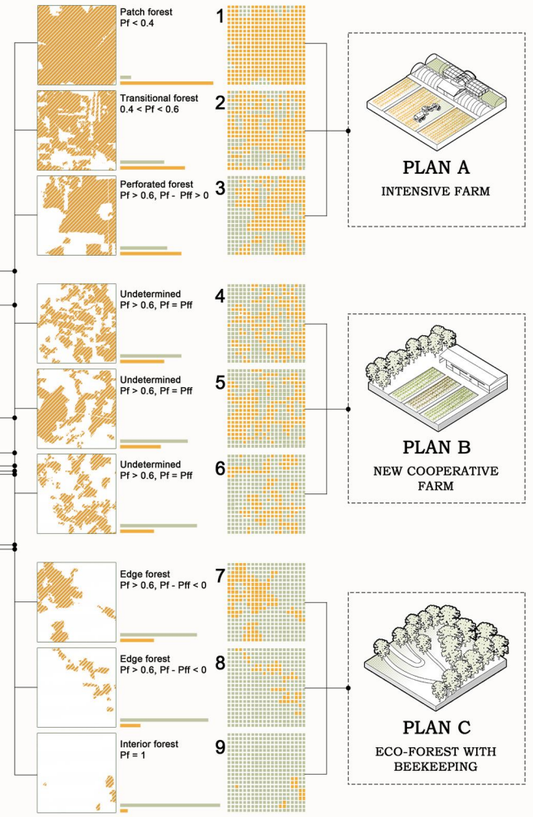
We find a co-benefit between agriculture, bees and forests, and incorporate this mutually beneficial pattern into the design site to promote natural cycles and sustainable development. At the same time, the social activities are arranged according to the appropriate time for each kind of work, and the collaboration between various social groups is promoted, so as to build a double cycle system of ecology and society.

LAND-USE FRAMEWORK



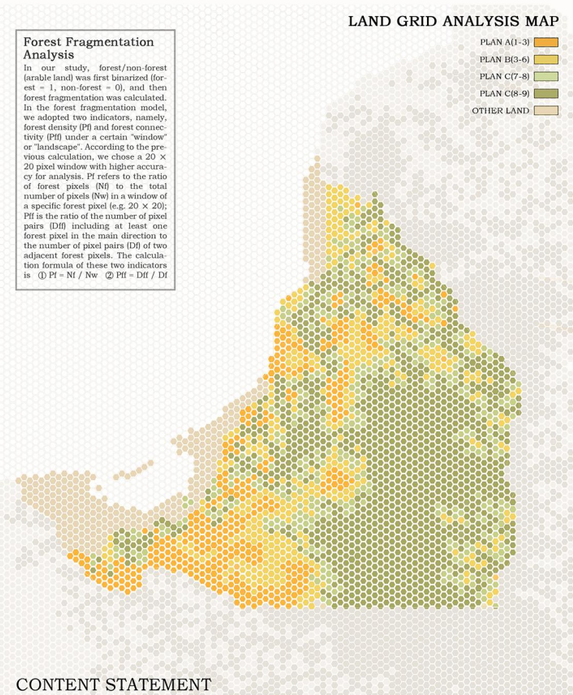
The model divides forest pixels into 6 types, and the criteria for different fragmentation types are shown in the following table.

TYPE	CRITERION	DESCRIPTION
Patch forest	$Pf < 0.4$	Forest density is less than 40%
Transitional forest	$0.4 < Pf < 0.6$	Forest density is between 40% and 60%
Perforated forest	$Pf > 0.6$, $Pf - Pff > 0$	Forest density is greater than 60%, and forest density is greater than forest connectivity
Undetermined	$Pf > 0.6$, $Pf = Pff$	Forest density is greater than 60%, and forest density is euqal to forest connectivity
Edge forest	$Pf > 0.6$, $Pf - Pff < 0$	Forest density is greater than 60%, and forest density is less than forest connectivity
Interior forest	$Pf = 1$	Forest density is 100%, and also can be known as complete forest



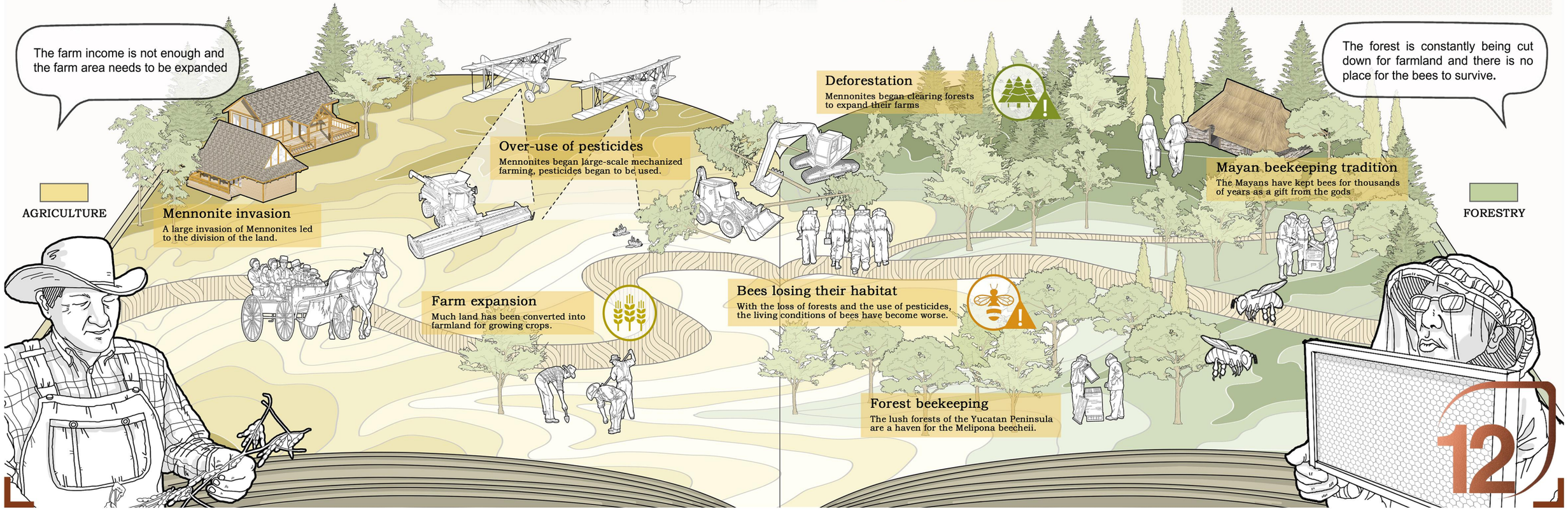
Forest Fragmentation Analysis

In our study, forest/non-forest (arable land) was first binarized (forest = 1, non-forest = 0), and then forest fragmentation was calculated. In the forest fragmentation model, we adopted two indicators, namely, forest density (Pf) and forest connectivity (Pff) under a certain "window" or "landscape". According to the previous calculation, we chose a 20 × 20 pixel window with higher accuracy for analysis. Pf refers to the ratio of forest pixels (Nf) to the total number of pixels (Nw) in a window of a specific forest pixel (e.g. 20 × 20); Pff is the ratio of the number of pixel pairs (Df) including at least one forest pixel in the main direction to the number of pixel pairs (Df) of two adjacent forest pixels. The calculation formula of these two indicators is ① Pf = Nf / Nw ② Pff = Dff / Df

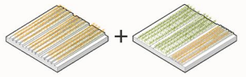


CONTENT STATEMENT

We assign scores to each area ranging 1-9 points and correspondingly classified them in to different land-use modes. Considering our strategies of landscape intervention, there are three major development models targeted to various land-use modes: A. Intensive Farm, B. New Cooperative Farm, C. Eco-forest with Beekeeping, with specific design on each. From the perspective of ecological landscape planning, we purpose is to solve the contradiction between the natural forest and monocultural land of the whole site by embedding unique models into different land-use modes, allowing for more reasonable and scientific design.

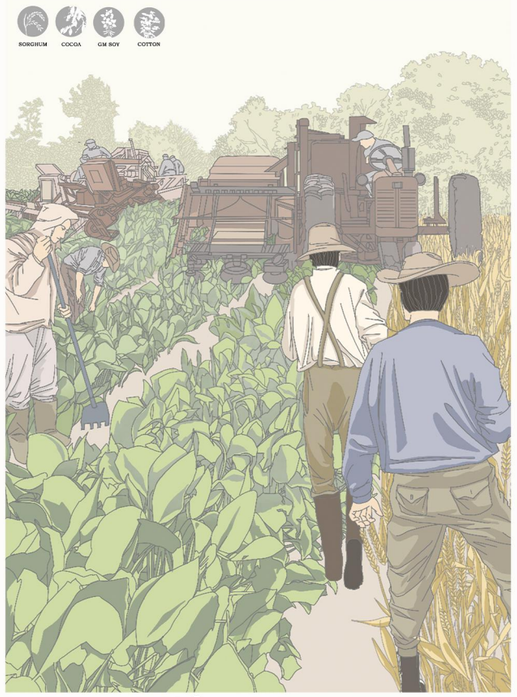


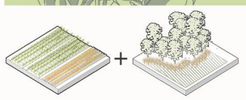
■ PLAN A——INTENSIVE FARM



Improved intensive agriculture

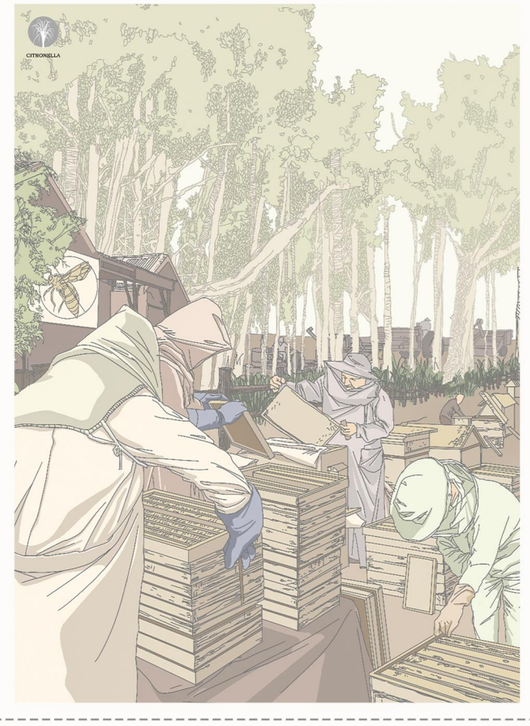
This areas retains the large-scale mechanised cropping pattern and allows GM soya to continue to be grown, but other suitable or soil-rehabilitating crop types need to be introduced each year to slowly replace GM soya, thus achieving a more sustainable agricultural pattern.



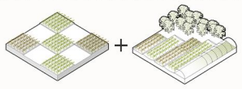


Beekeeping protected by buffer zone

As the intensive agricultural area is temporarily reserved for the cultivation of GM soybeans, a buffer zone is designed to prevent bees from entering in order to protect the living environment of bees and the livelihood of beekeepers in order to prevent bees from being exposed to GM crops and pesticides.

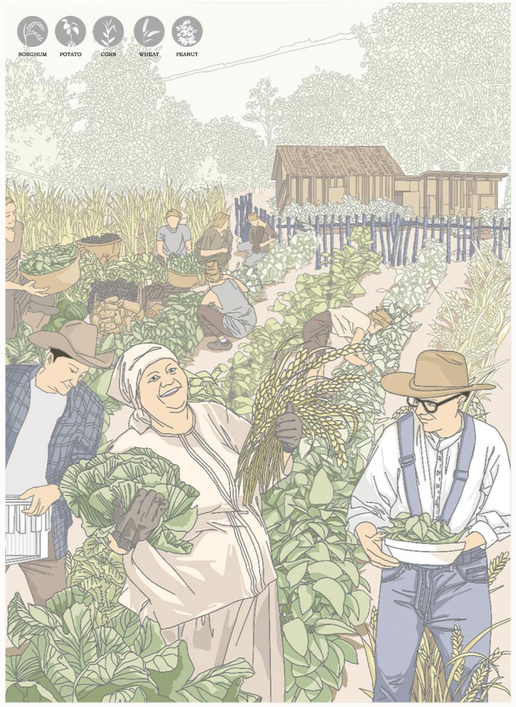


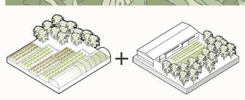
■ PLAN B——NEW COOPERATIVE FARM



Intercropping & crop rotation

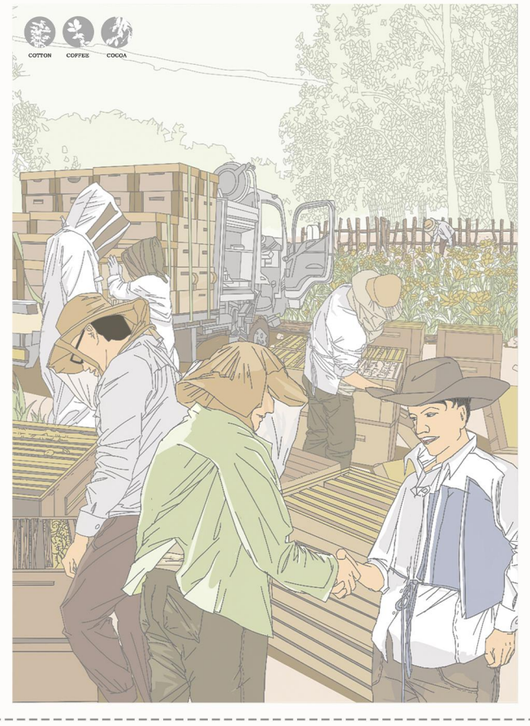
The introduction of a variety of locally appropriate cash crops and the replacement of the previous large-scale monoculture farming model with a new agricultural model of crop rotation and intercropping will help to increase crop yields and provide protection against pests.



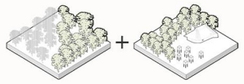


Establishment of partnership

The new farming model has a stronger pest control capability, and when pesticides are no longer used, beekeepers can enter into a partnership with Mennonites, leading bees to pollinate crops to improve crop yields and quality, in return for a profit.

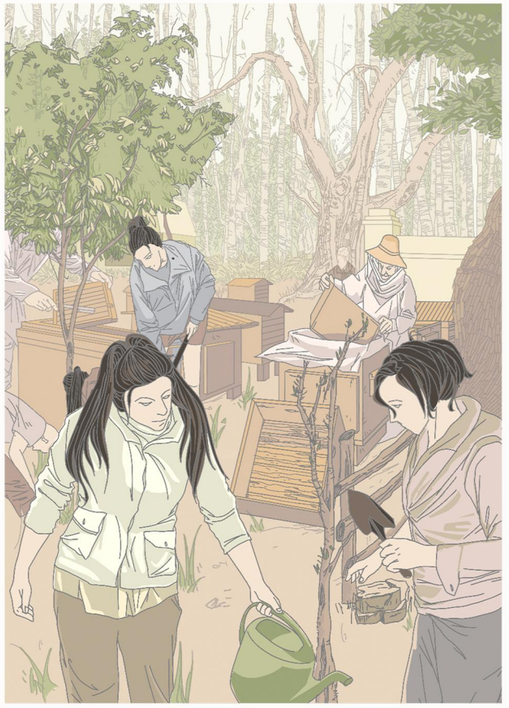


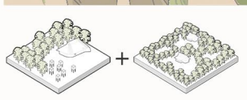
■ PLAN C——ECO-FOREST WITH BEEKEEPING



Restoration of forest

This is an ecologically sensitive area at the edge of the forest that is unsuitable for agriculture and where government incentives and community activities are used to guide the local people to restore the forest and rebuild the bees' home.

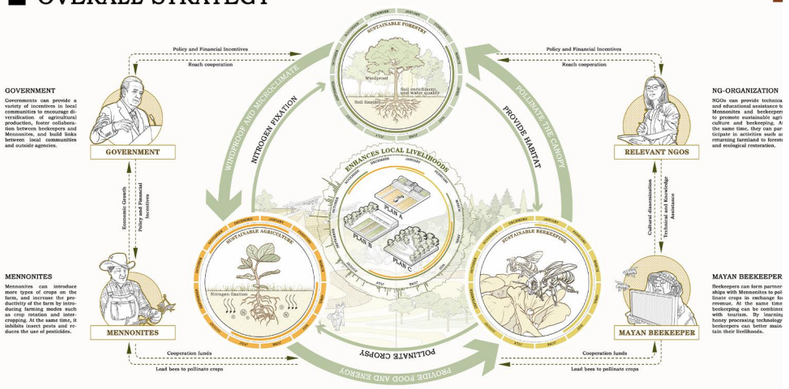




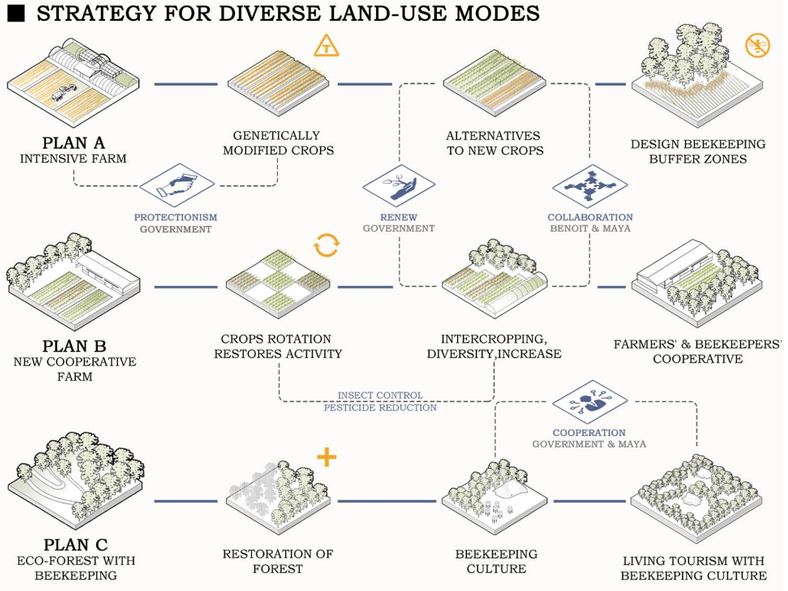
Tourism with beekeeping culture

The Mayan beekeeping industry can be transformed by combining beekeeping in the forest with cultural tourism, which can lead visitors to experience the culture of beekeeping and promote economic growth and cultural dissemination.

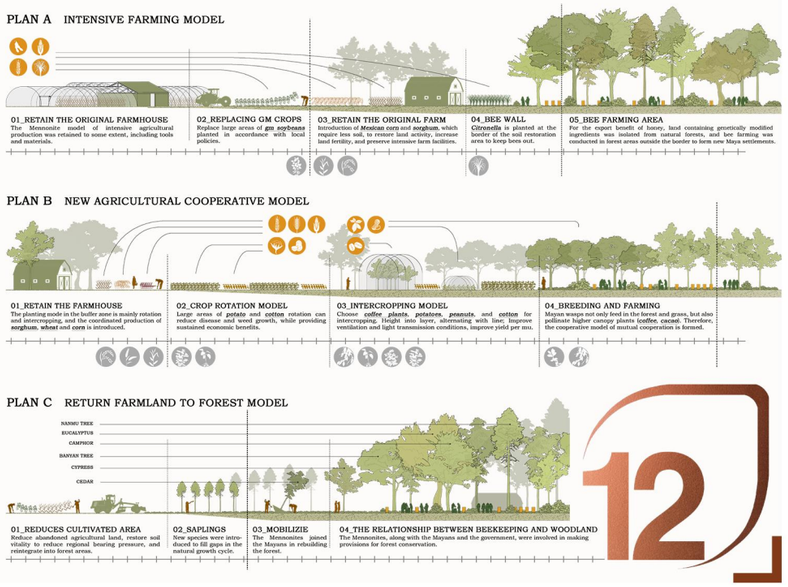
■ OVERALL STRATEGY



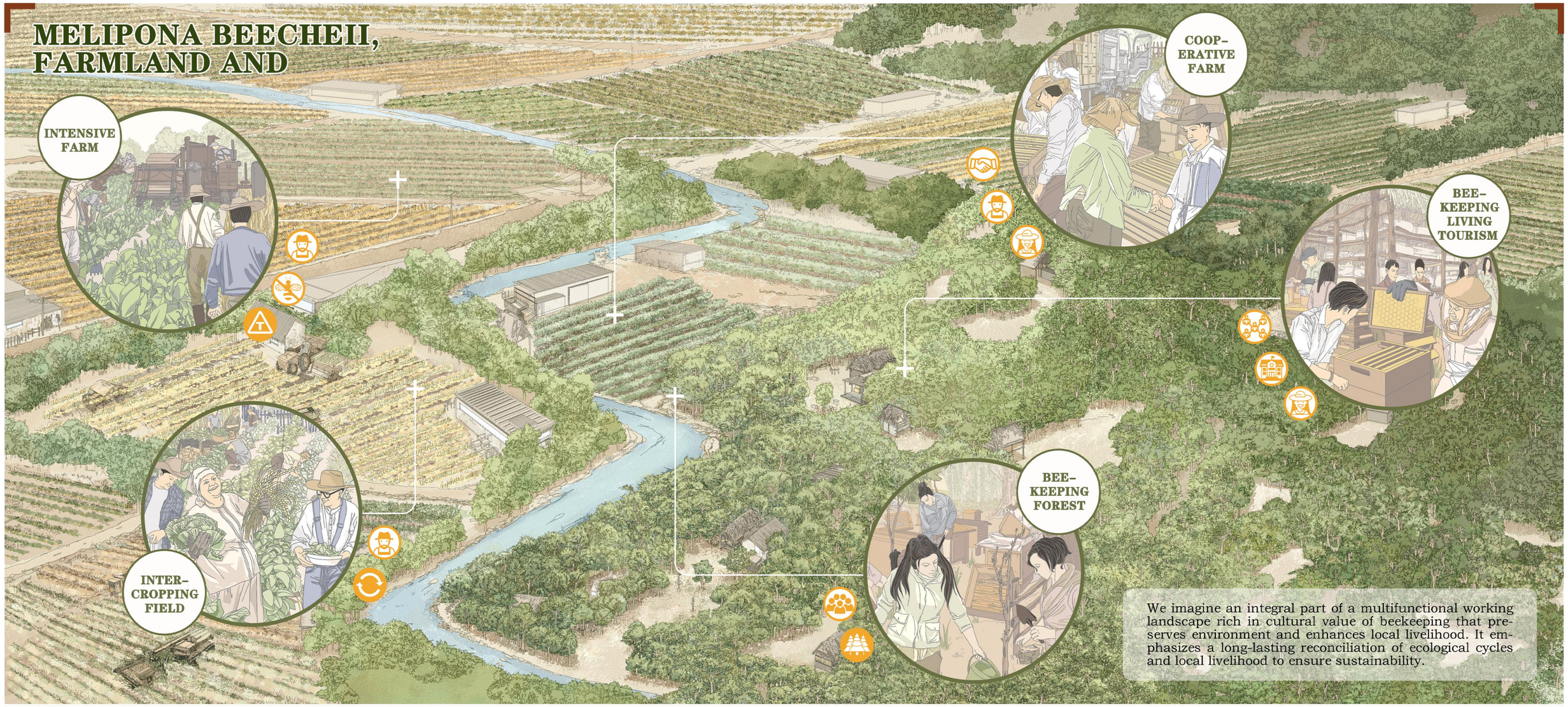
■ STRATEGY FOR DIVERSE LAND-USE MODES



■ PROCESS FOR DIVERSE LAND-USE MODES

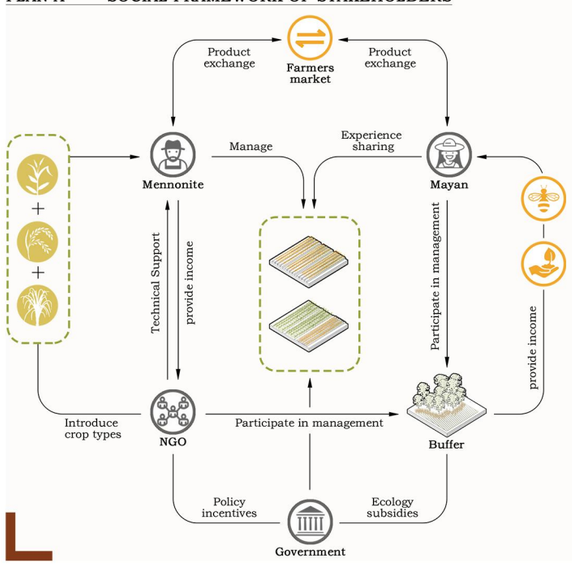


MELIPONA BEECHEII, FARMLAND AND



We imagine an integral part of a multifunctional working landscape rich in cultural value of beekeeping that preserves environment and enhances local livelihood. It emphasizes a long-lasting reconciliation of ecological cycles and local livelihood to ensure sustainability.

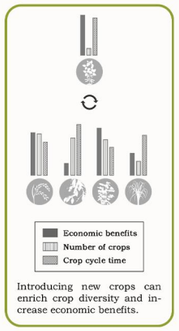
PLAN A —— SOCIAL FRAMEWORK OF STAKEHOLDERS



20%+ INCREASE OUTPUT

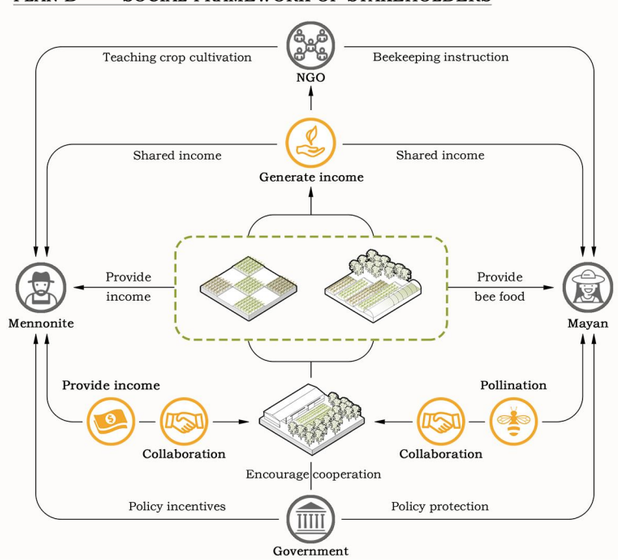
According to research, in the same farmland, mixed planting of multiple crops can increase crop yield by about 20% compared with large-scale monoculture, which not only improves land utilization, but also helps to improve economic returns.

400%+ CROP DIVERSITY



Introducing new crops can enrich crop diversity and increase economic benefits.

PLAN B —— SOCIAL FRAMEWORK OF STAKEHOLDERS



10–50% INCREASE OUTPUT

Proper crop rotation intercropping can increase crop yields by at least 10%, and high rotation patterns can increase yields by 20% to 50%. Continuous improvement of soil ecology, increased crop diversity and interaction with beekeeping.

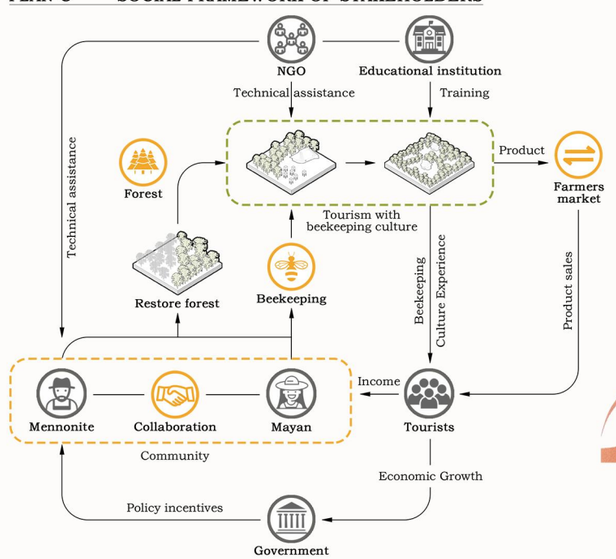
35%+ IMPROVES QUALITY

In the intercropping agricultural model, tree species and crops can provide nutrients to each other and prolong the growing season of crops. Combined with bees pollinating crops, it can improve the quality of crops by more than 35%.

30%+ INCREASE REVENUE

Through a partnership between Mennonites and Mayan beekeepers, the beekeepers will lead bees to pollinate fields of crop rotation and intercropping in exchange for payment. This could increase the Mayan beekeeper's source of income by about 30%.

PLAN C —— SOCIAL FRAMEWORK OF STAKEHOLDERS



80kha RESTORE FOREST

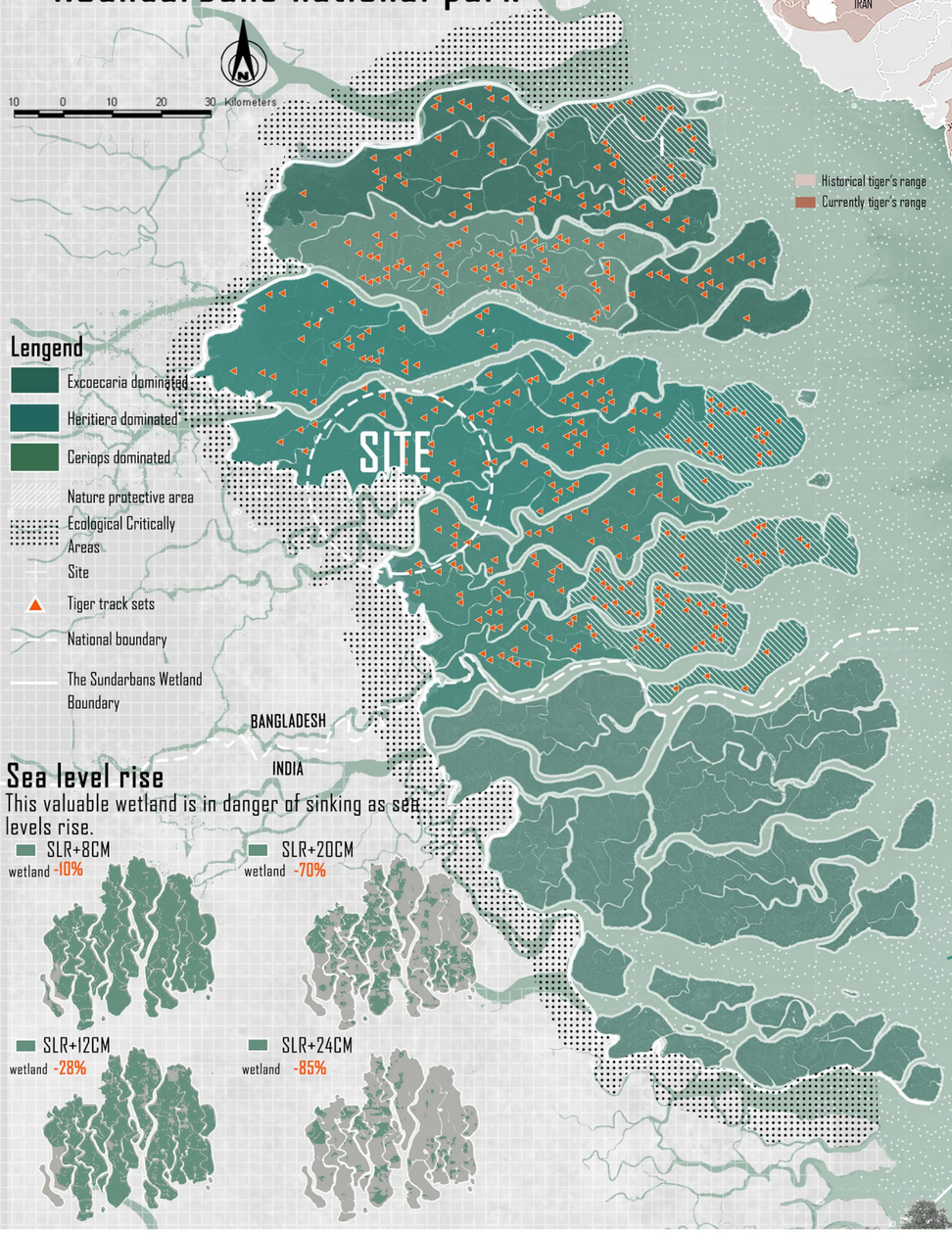
The state of Campeche has lost 779kha of forest cover over the past 20 years, equivalent to a 17% reduction in tree cover. We plan to appropriately reduce farmland and restore about 80kha of native forest for the local area in the next twenty years.

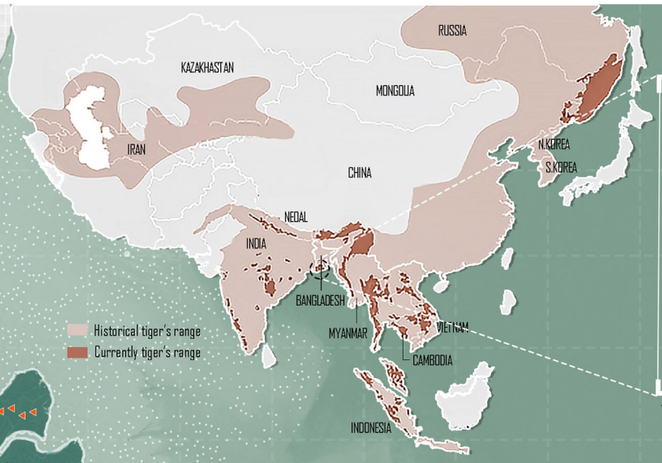
100%+ INCREASE OUTPUT

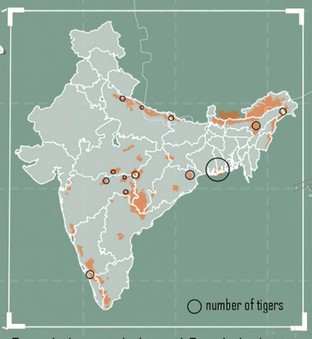
The efficiency of honey production has dropped by 100% over the past 20 years due to genetically modified soybeans and pesticides. Protecting bees through our strategies will increase the efficiency of honey production.

SYMBIOSIS WITH NATURE

1.Sundarbans national park







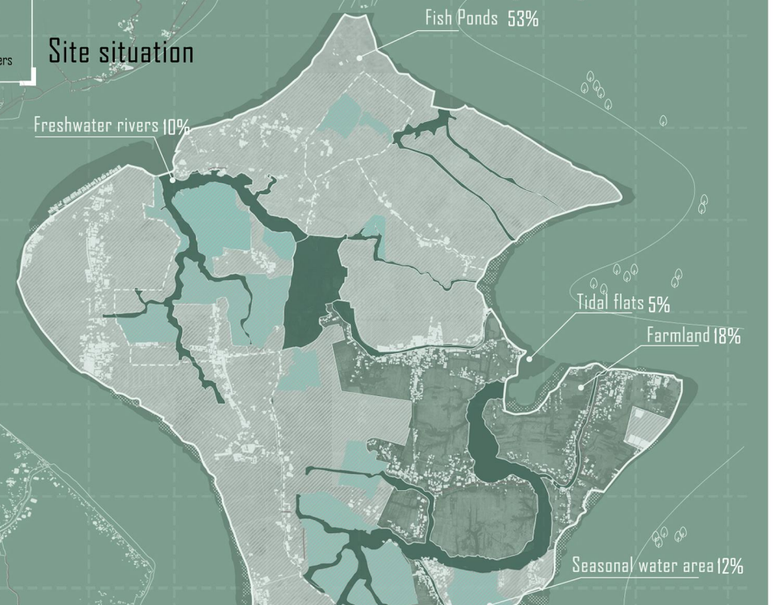
Tiger habitat in India and Bangladesh

Global Tiger Habitat

population	1900		2011
	100,000	-96.8%	3,200

Sundarbans National park is a tidal wetland forest delta with an area of about 10,200 square km across India and Bangladesh. The park is made up of the largest remaining contiguous mangrove forest in the world . The mean elevation for most of the Sundarbans is less about one meter above sea level .The Bengal tigers that live in this park are one of the only tiger populations adapted to living in these mangrove systems.Rising sea levels pose a serious threat to the endangered tiger.

Site situation



Country /City China / Chongqing

University / School Chongqing University / College of Art

Academic year 2022 / 2023

Title of the project Symbiosis with nature

Authors Tengfei YU, Shuai JIANG, Shuxian FENG

TECHNICAL DOSSIER

Title of the project Symbiosis with nature

Authors Tengfei YU, Shuai JIANG, Shuxian FENG

Title of the course Landscape architecture

Academic year 2022 / 2023

Teaching Staff Junqiao SUN

Department / Section / Program of belonging Department of Environmental Design / College of Art

University / School Chongqing University

12

Written statement, short description of the project in English, no more than 250 words

The Sundarbans, a world Natural Heritage site in the Ganges Delta, is home to one of the largest mangrove ecosystems in the world. The project focuses on the ecologically sensitive boundaries of the Sundarbans mangrove forest, where hundreds of thousands of people depend on mangroves for their well-being. Since the 19th century, due to irrational land development and use in surrounding communities, community productivity has been lost, and people have become increasingly dependent on illegally collected resources and sources of livelihood from mangroves, exacerbating forest degradation, biodiversity loss, and human-tiger conflict. The project analyzes the causes of livelihood choices and vulnerability of the surrounding communities, and promotes more adaptive and nature-based sustainable livelihood models to ensure livelihood security and mitigate risks by helping the residents to change their land use patterns and forest-dependent livelihoods.

These strategies, inspired by local traditional wisdom, use biodegradable infrastructure and water to live. All measures are local, low-cost, low-tech and sustainable, affordable for local residents. It enable maintain the balance between human beings and resources.

For further information

Landscape designers in China

Contact via email at:
jiangshuai4031@163.com / 1271904717@qq.com
Tel: +86 18607176996

Landscape designers in China
Chongqing University
Huxi Campus of Chongqing University
401331

12th International Biennal Landscape Barcelona

Barcelona **November 2023**

SCHOOL PRIZE

Floating agricultural

New boundary mangroves

The old hard dike

The new dike

New sedimentation

Economic forest belt and bee farming

Seasonal waters area

PLANNING PROPOSAL

100M 200M 400M

Strategy 1 Soften boundary

Break the border dyke

Open boundary fish ponds are used to collect sediment and plant mangroves.

Strategy 2 Increase productivity

A. Crop rotation and floating agriculture

Floating agricultural and Use of low-lying areas for fishing and agricultural rotation during the rainy and dry seasons.

B. Economic forest belt and bee farming

Cross-planting economic forest belts can provide communities with needed timber and provide a place for beekeeping.

C. Travel

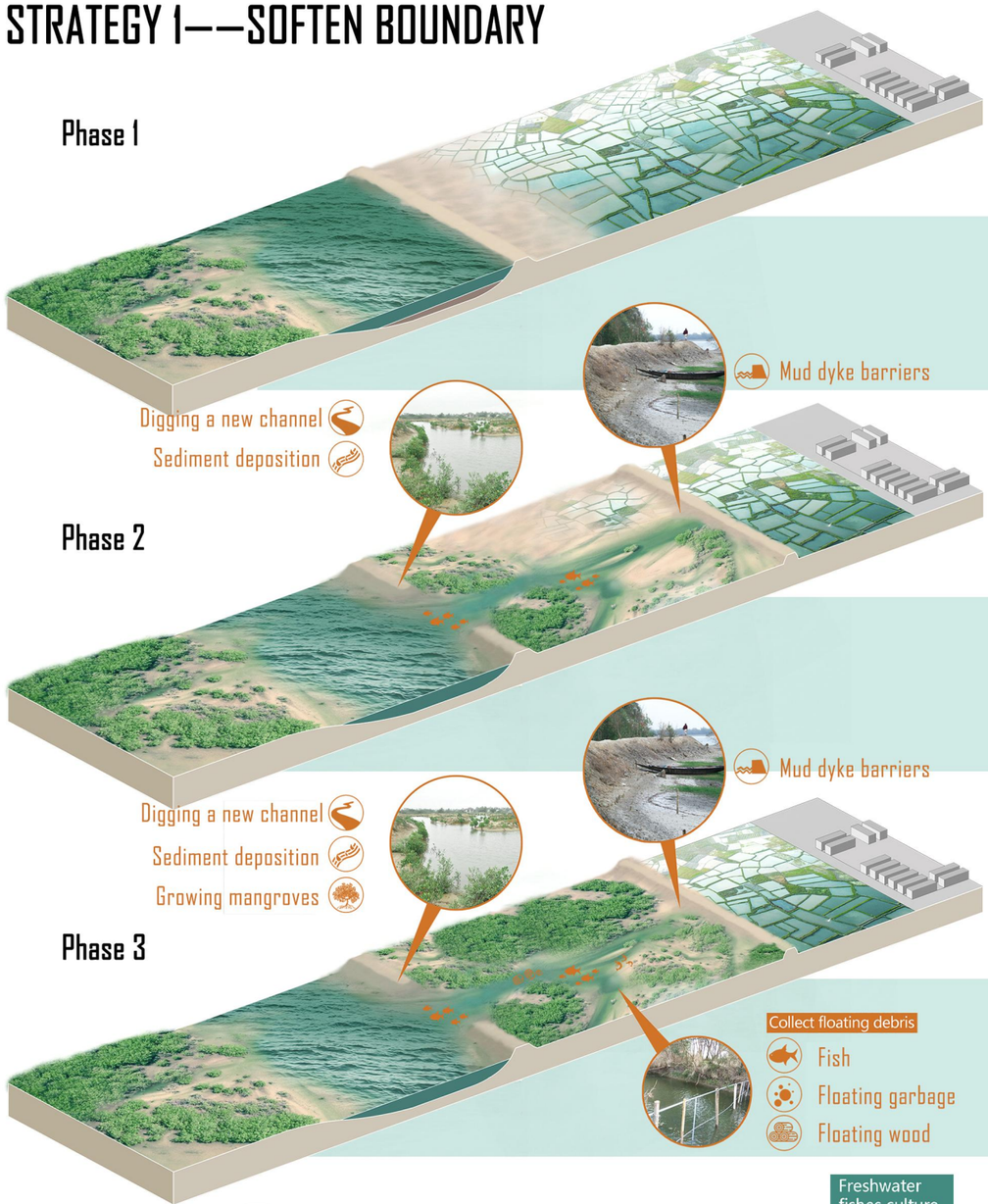
Develop local tourism ,watch tigers and tiger conservation.

Strategy 3 Mangrove retreat management

Retreating Mangroves

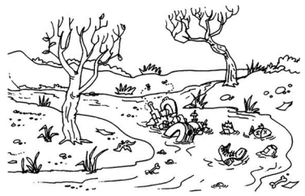
To prepare for the ecological migration of mangroves to help them cope with

STRATEGY 1——SOFTEN BOUNDARY



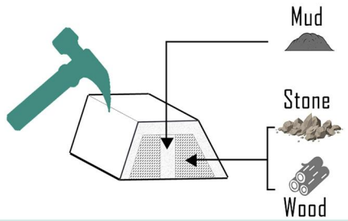
Fish pond

There are now a lot of fish ponds at the boundary of the site.



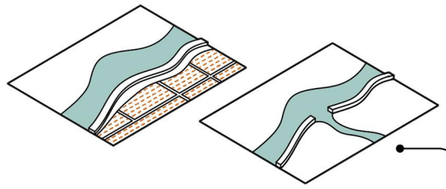
Floating garbage

There is a large amount of floating garbage in the river, causing serious river pollution.



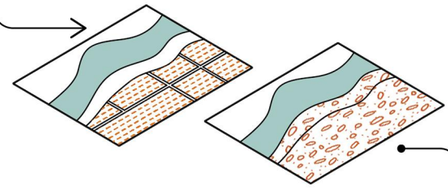
Breaking the hard boundary

Hard dykes cut off the tide from the land,Break old dykes and bring tides to the boundary.



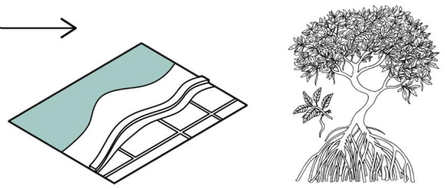
Dig the river

Break the original mud dyke and dig the river channel at the site boundary.The river sediment deposits at the site boundary and softens the boundary.



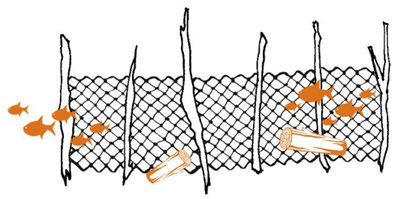
Fish pond ----→ Silt

There are now a lot of fish ponds at the boundary of the site. The river silted up and the fish ponds first turned into silt.



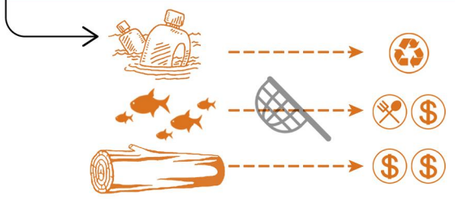
Mud Dyke Barriers

Rebuild the mud dyke barriers and move it back,Collect a large amount of garbage for processing and treatment, and reinforce the mud dyke barriers,Mangroves grow on it .



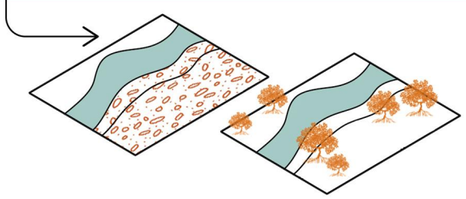
Blocking in the river

Block in the middle of the river channel dug at the boundary of the site. Due to the tide in and out of the site, a large number of fish, shrimp, garbage and floating wood can be collected.



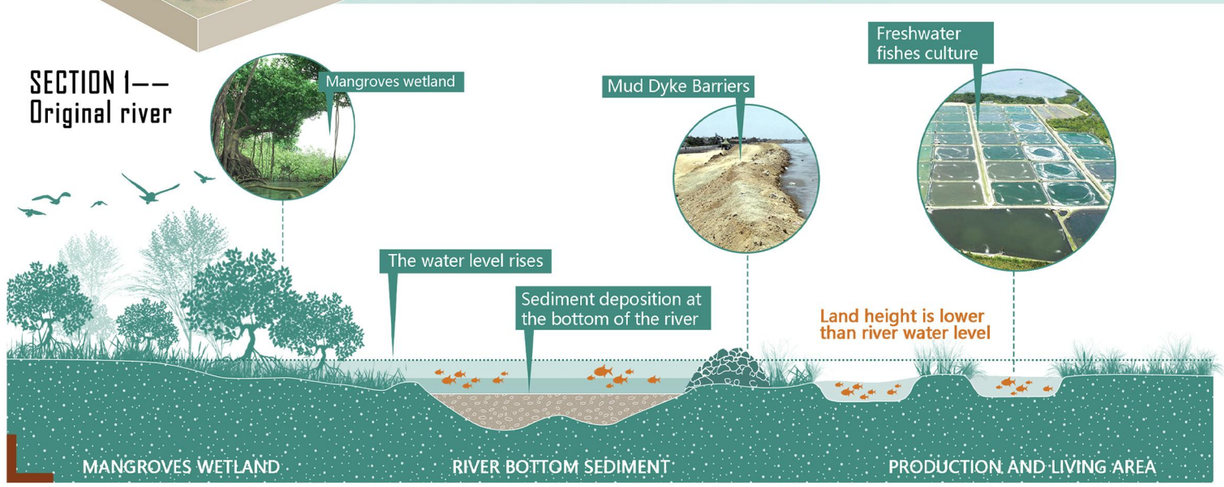
Collect floating debris

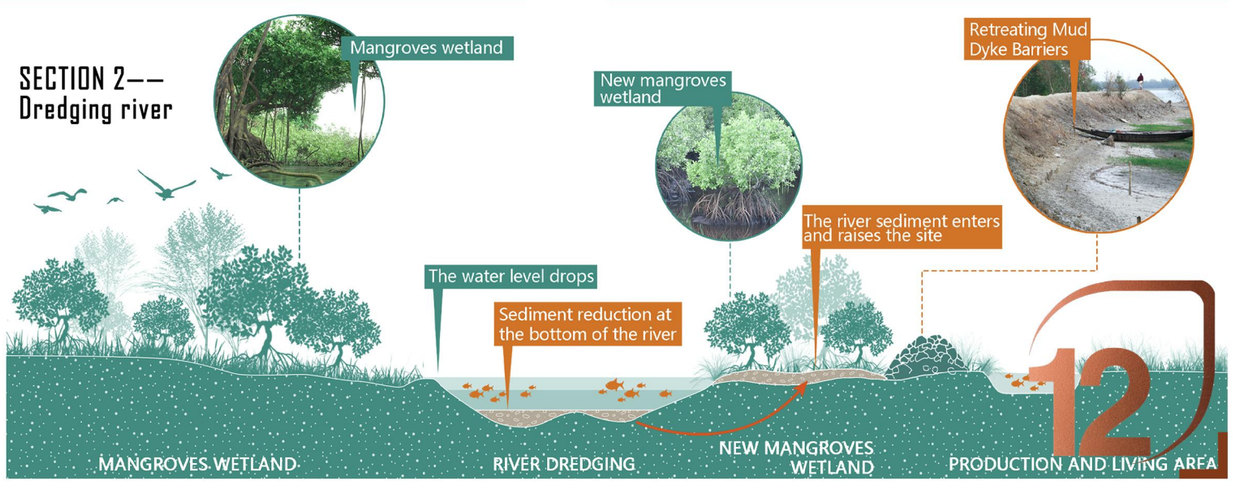
Collecting fish and shrimp can be used as food, and collecting floating wood can get economic source,and collecting garbage can be used as material for strengthening mud dyke barriers.



Silt ----→ Mangroves

Block in the middle of the river channel dug at the boundary of the site. Due to the tide in and out of the site, a large number of fish, shrimp, garbage and floating wood can be collected.





STRATEGY 2——INCREASE PRODUTIVITY

A.CROP ROTATION AND FLOATING AGRICULTURE

Rainy season
Floating agriculture
+
Freshwater aquaculture

Freshwater fish

Freshwater scallop

It is combined with the cage for raising fish to form a set of farming system.

Rain

Lake

Water storage

May -October

November-April

Dry season

Rainy season

Due to the obvious dry and rainy seasons, the site suffers from severe water shortage during the dry season.
During the rainy season, the lowlands are used to store water, and during the dry season, water is used to irrigate crops.

Dry season
Growing rice

Rice

I Manufacturing materials

Hyacinths

Weeds

People collect weeds and hyacinths before the rainy season and soak them in water to make them rot.

Materials placed in water

Silt

Community garbage

Floating garbage

People recycle community garbage and floating garbage, and then mix it with slit to make the bottom of floating bed. The sludge contains a lot of nutrients.

II Making floating bed

More water hyacinths

Garbage and Silt

Raft for fixing

SEEDLINGS PRODUCTION
Seedlings

The seedlings are wrapped in mud balls

Seedlings are placed on the floating bed

Compost

After the harvest, the floating beds are broken to provide fertilizer for dry season planting.

III Floating agricultural production

Bamboo pole fixed floating bed

Length of floating bed
6m—55m

Growing crops
- Abelmoschus esculentus
- Momordica charantia
- Spinach
- Aubergine
- Ginger

Break the floating bed

B.ECONOMIC FOREST BELT AND BEE FARMING

Forest belts alternate with farmland

Economic forests and agricultural wheels provide the community with wood and a place for beekeeping.

Agricultural

Economic forest

Bee farming under the forest

Hive structure

The topmost thatch covers the hive with the watch, protecting it from the sun.

The fence on the hive is used to support sunscreens, such as

A tin cover prevents water from entering the hive on rainy days or in special circumstances

Where bees produce honey, honey will be produced here

Additional auxiliary beehives provide more living space for

A divider separates the pri-

Where bees produce honey, honey will be produced here

Prevent the outflow of honey and ventilate the hive at the

This is the entrance and exit to the hive for bees, and a vent with a filter at the bottom.

A box with wax inside hangs from the bottom of the hive to protect it from intruders by scent

C.MANGROVE RETREAT MANAGEMENT

MATURE MANGROVE BUFFER

NEW MANGROVE

FLOATING AGRICULTURAL

DEVELOPMENT OF TOURISM

Phase 1

human active area — river — wetland

Phase 2

human active area — mangrove — river — wetland

Human retreat

Phase 3

human active area — mangrove — river — wetland

Mangroves are moving back to adapt to climate change