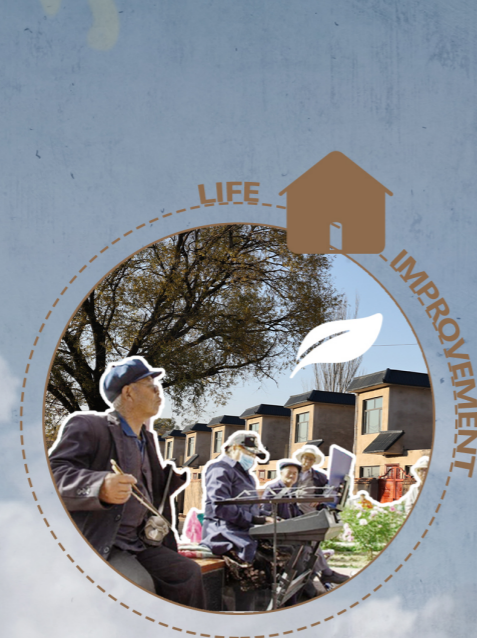


# BREATH OF THE DUNE : A LANDSCAPING APPROACH TO CONTROLLING DESERTIFICATION

After more than a decade, the site will eventually become a desert ecological demonstration area through the implementation of the project. We will measure wind direction and other related data in each area to extend the combination to the surrounding desert area to help the ecological recovery of the whole desert area.



Country /City China

University / School Shanghai Jiao Tong University

Academic year 2022/2023

Title of the project Breath of the Dune: A Landscaping Approach to Controlling Desertification

Authors Yingjie Hu, Yuxin Jiang, Zimeng Chen, Yichen Yang

## TECHNICAL DOSSIER

**Title of the project** Breath of the Dune: A Landscaping Approach to Controlling Desertification

**Authors** Yingjie Hu, Yuxin Jiang, Zimeng Chen, Yichen Yang

**Title of the course** Landscape Engineering and Digital Landscape

**Academic year** 2022/2023

**Teaching Staff** Liqing Zhu, Kai Fu

**Department / Section / Program of belonging** Landscape Architecture

**University / School** Shanghai Jiao Tong University



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

The design site is located in Minqin region, the edge of the desert zone in Gansu Province. Minqin lies in an ecologically fragile area, where decades ago, over-cultivation by the inhabitants intensified the process of land desertification and the fragile ecosystem was on the verge of collapse. Due to the degradation of vegetation, its natural resistance to wind has been greatly weakened. How to help the site block the wind and gradually recover ecologically is the main question we explore.

We used grasshopper to simulate the distribution and change of northwest wind in the original site, and compared the windbreak efficiency of six basic forms, and finally chose diamond shape as the prototype. We also combined windbreak structures, windbreak plants and crops to form three different windbreak modules.

We combined the three modules into the site. As time passes, the weaker wind area behind the windbreak wall creates opportunities for plants to grow, while it slowly disintegrates while blocking the wind itself, creating an area of sand accumulation that promotes plant growth. After ten years, when the windbreak wall has completely disintegrated, more stable plant groups have been formed. The plant groups will gradually expand outward until they are connected to adjacent plant groups. We expect the application of the three modules to achieve the effect of 'wind weakening - vegetation restoration - agricultural revival' over a period of time, realizing the vision of wind and water protection, ecological restoration, and promoting sustainable local economic development.

For further information  
**Máster d'Arquitectura del Paisatge - UPC**

Contact via email at:  
master.paisatge.comunicacio@gmail.com

biennal.paisatge@upc.edu

### **Máster d'Arquitectura del Paisatge - UPC**

Sede ETSAB - Universitat Politècnica de Catalunya

Calle Jordi Girona, 15. Edificio Omega 1-3  
08034 Barcelona - Spain

COAC - Colegi oficial d'Arquitectes de Catalunya

Carrer Arcs, 1-3  
08002 Barcelona - Spain

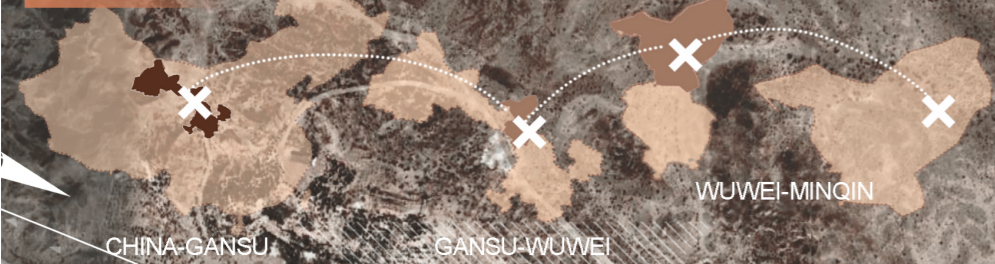
### 12th International Biennial Landscape Barcelona

Barcelona October 2023

**SCHOOL PRIZE**

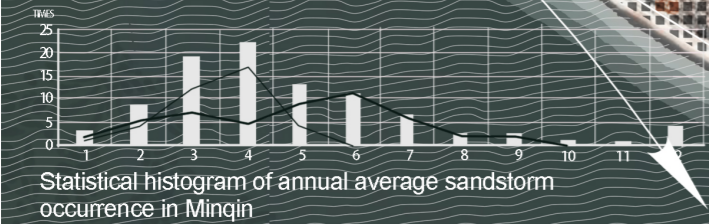
# PROJECT STATUS ANALYSIS

## Location Analysis



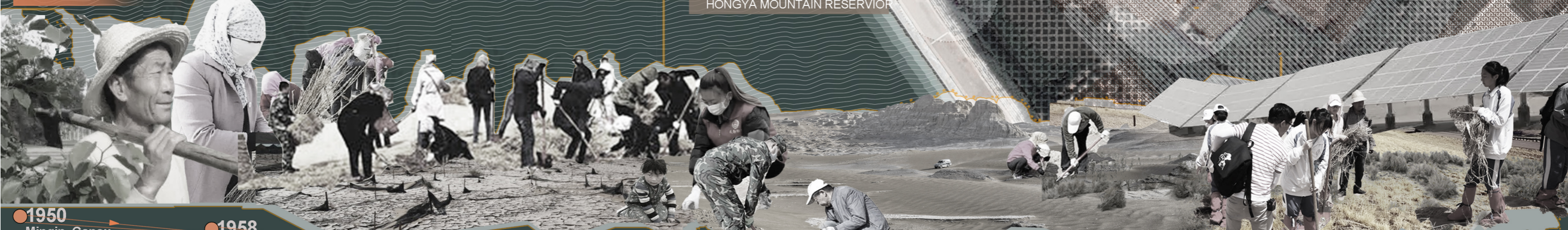
**0.5-1MM**  
Local gravel diameter

**313**  
Average annual sandstorms in Minqin



**32%**  
Current plant coverage of the site  
Current Minqin plant coverage is low. Due to wind erosion, Minqin plant coverage is gradually decreasing

## History of Minqin



**1950**  
**Minqin, Gansu, an ecological sensitive area**  
Minqin has been located on the sandstorm line in northwest China since ancient times. For a long time, due to a combination of natural and man-made factors, the ecological function of the oasis has weakened, the ecological environment as a whole has continued to deteriorate, desertification has expanded, and ecological problems have become prominent.

**1958**  
**Increase in demand for living and production**  
Due to the expansion of residents' living and production demands, groundwater exploitation has increased greatly, and the desert and desertification land in Minqin has accounted for 94.5% of the land area.

**1959**  
**Over-exploitation**  
In the 1950s, Minqin County implemented large-scale water conservancy construction projects and increased the development of water resources, the expansion of water resources utilization caused the water consumption in the middle and upper reaches of Shiyang River to increase year by year.

**1970**  
**Over-exploitation**  
Since the 1980s, large-scale deforestation and clearing of land, digging of wells and irrigation of farmland for economic development have led to a series of serious ecosystem problems.

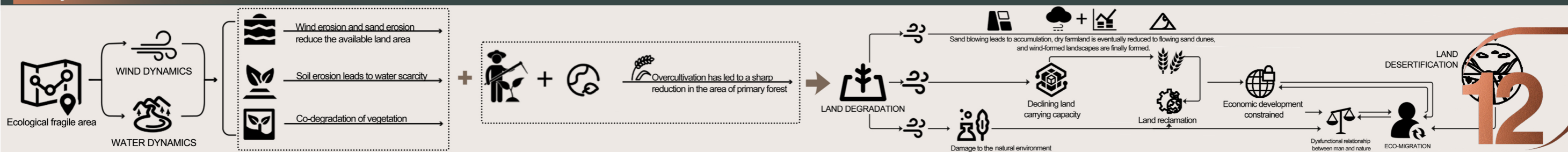
**2007**  
**Reduced vegetation, sandstorm threat**  
The reduction of vegetation in the oasis not only affects agricultural and livestock production, but also leads to the generation of sandstorm. Soil erosion restricts the economic development of the region and threatens the living environment of people.

**2007**  
**Increased desertification**  
The desertification area of Minqin still reached 94.5%, and a trend of desertification and aridification appeared in the northern part of the oasis.

**2021**  
**Scientific management**  
Minqin oasis is a green barrier to stop the windstorm from entering China's interior. In order to curb the development of desertification, Minqin County carried out a large number of key ecological construction projects, such as "Three Norths" protective forest, returning farmland to forest, etc.

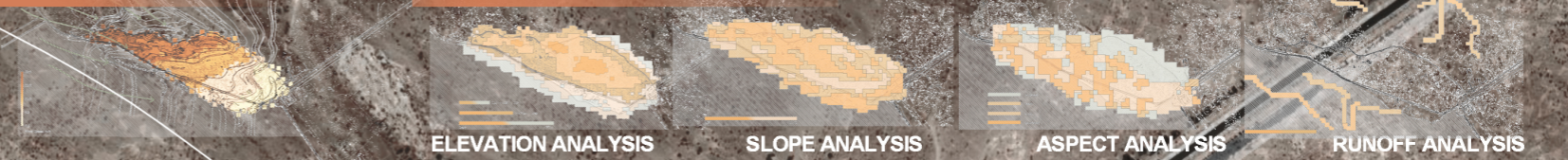
**2023**  
**The ongoing struggle against sandstorm**  
So far, Minqin's sand control action continues .....

## Cycle of Environmental and Social Deterioration



## Wind Environment Analysis

## Site Environment Analysis



**5M/YEAR**  
Degradation rate of Minqin oasis

**56%**  
Irrigation utilization rate of agricultural water in Minqin

**40%**  
Water conveyance loss rate of Minqin cana

DESERT AREA

CURRENT ROAD

PLANT COVERED AREA

SHALLOW GOBI AREA

RESIDENTIAL AREA

HONGYA MOUNTAIN RESERVIOR

**SITE CONDITIONS**

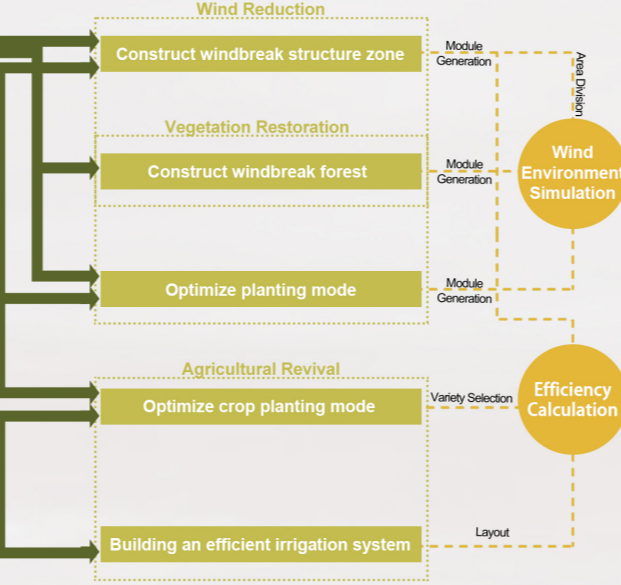
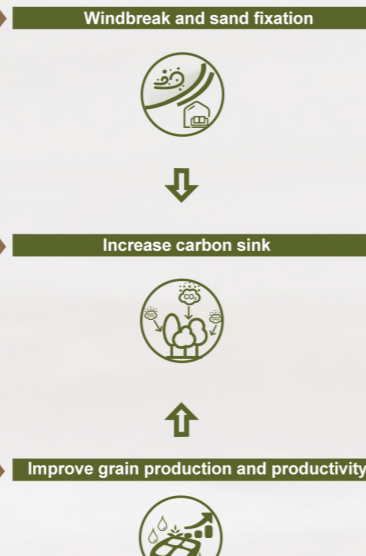
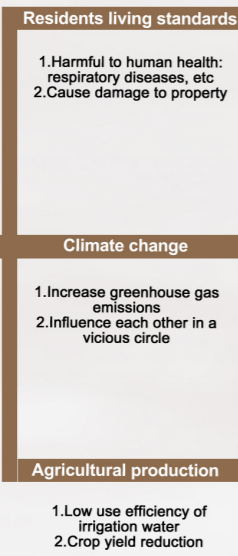
**VISIONS**

**STRATEGIES**

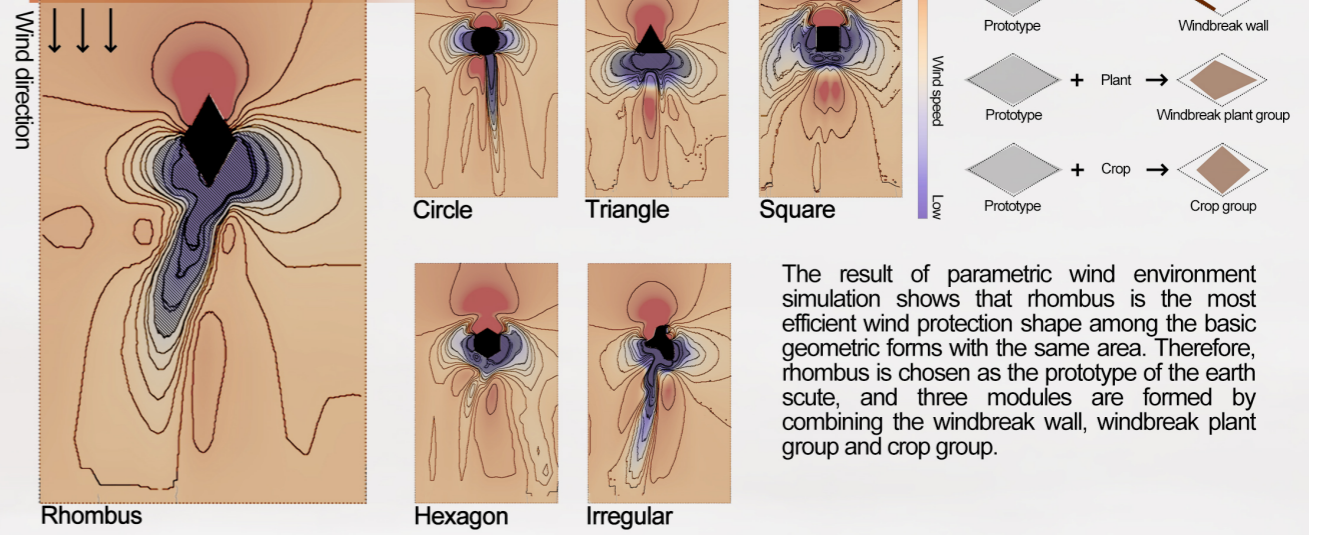
**PARAMETRIZATION**

**STRATEGY, PROTOTYPE AND MODULE**

**Design framework**

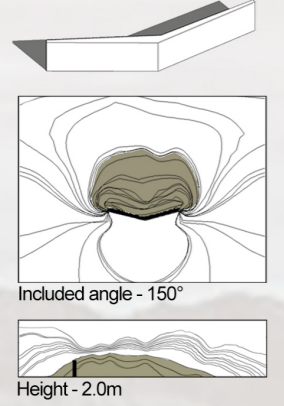


**Prototype and module generation**



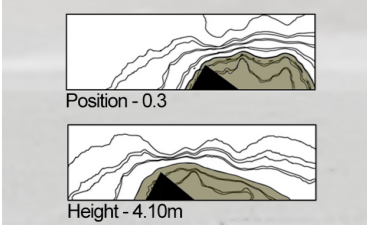
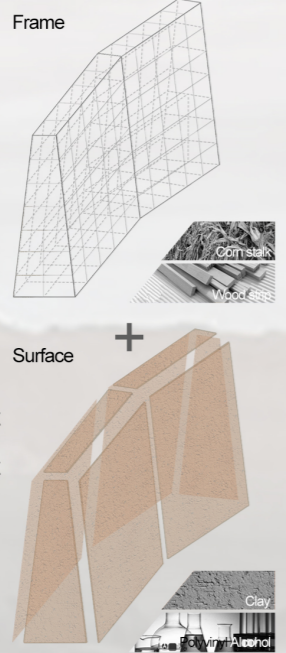
The result of parametric wind environment simulation shows that rhombus is the most efficient wind protection shape among the basic geometric forms with the same area. Therefore, rhombus is chosen as the prototype of the earth scute, and three modules are formed by combining the windbreak wall, windbreak plant group and crop group.

**Best shape selection**



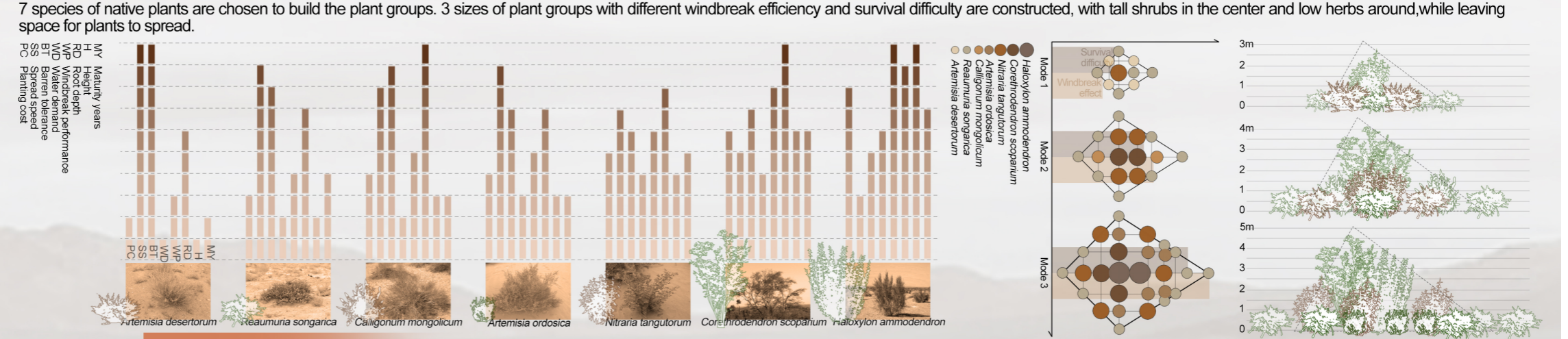
Windbreak wall: simulation result shows that a 2-meter-high wall with a 150-degree angle has the highest windbreak efficiency.

**Windbreak wall structure**



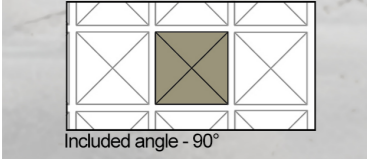
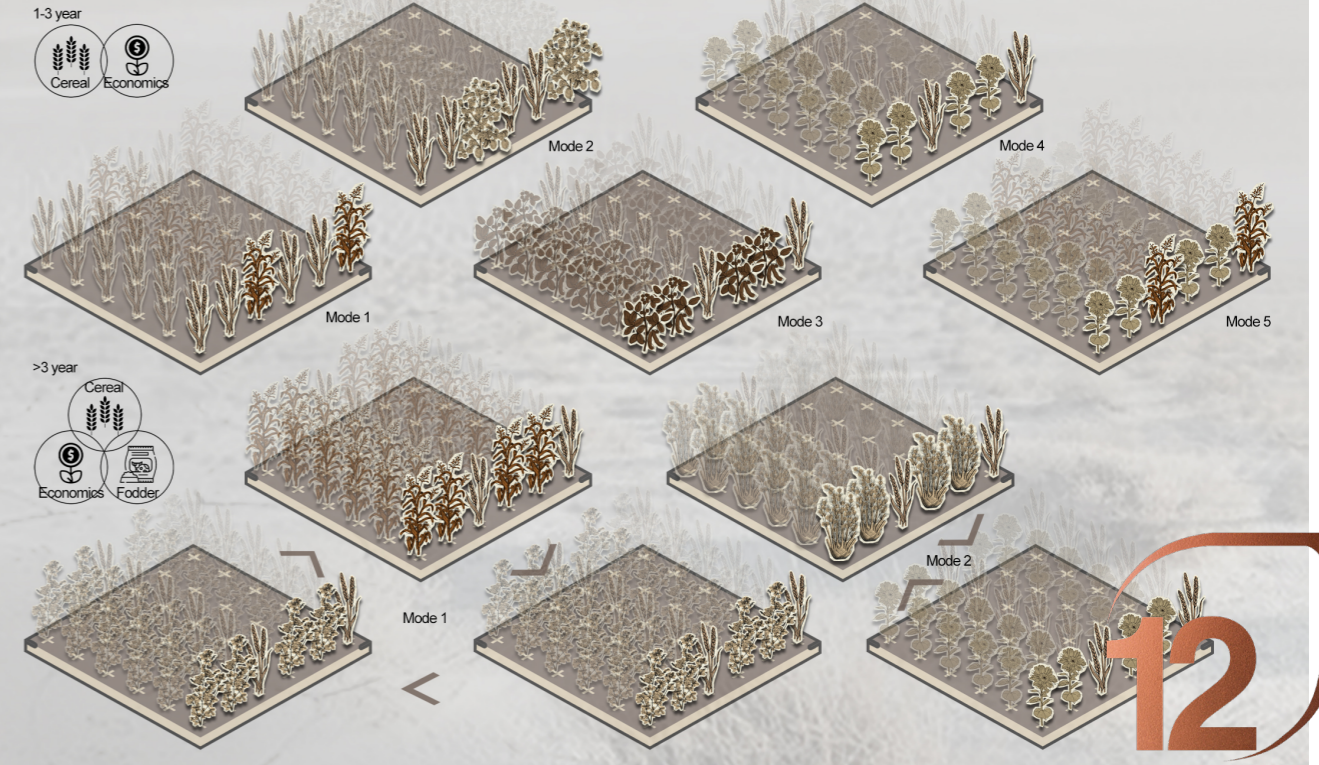
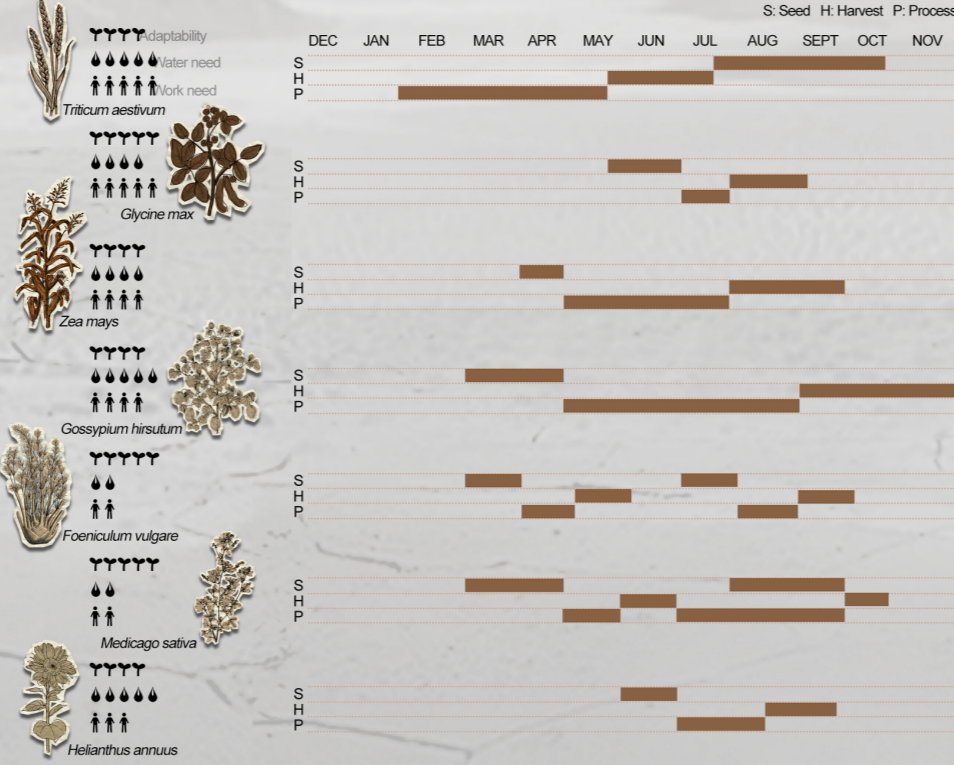
Windbreak plant group: considering plant survival difficulty, the result indicates that group with a height of about 4 meters and the highest point near the front end has the highest windbreak efficiency.

**Windbreak plant selection and composite patterns**



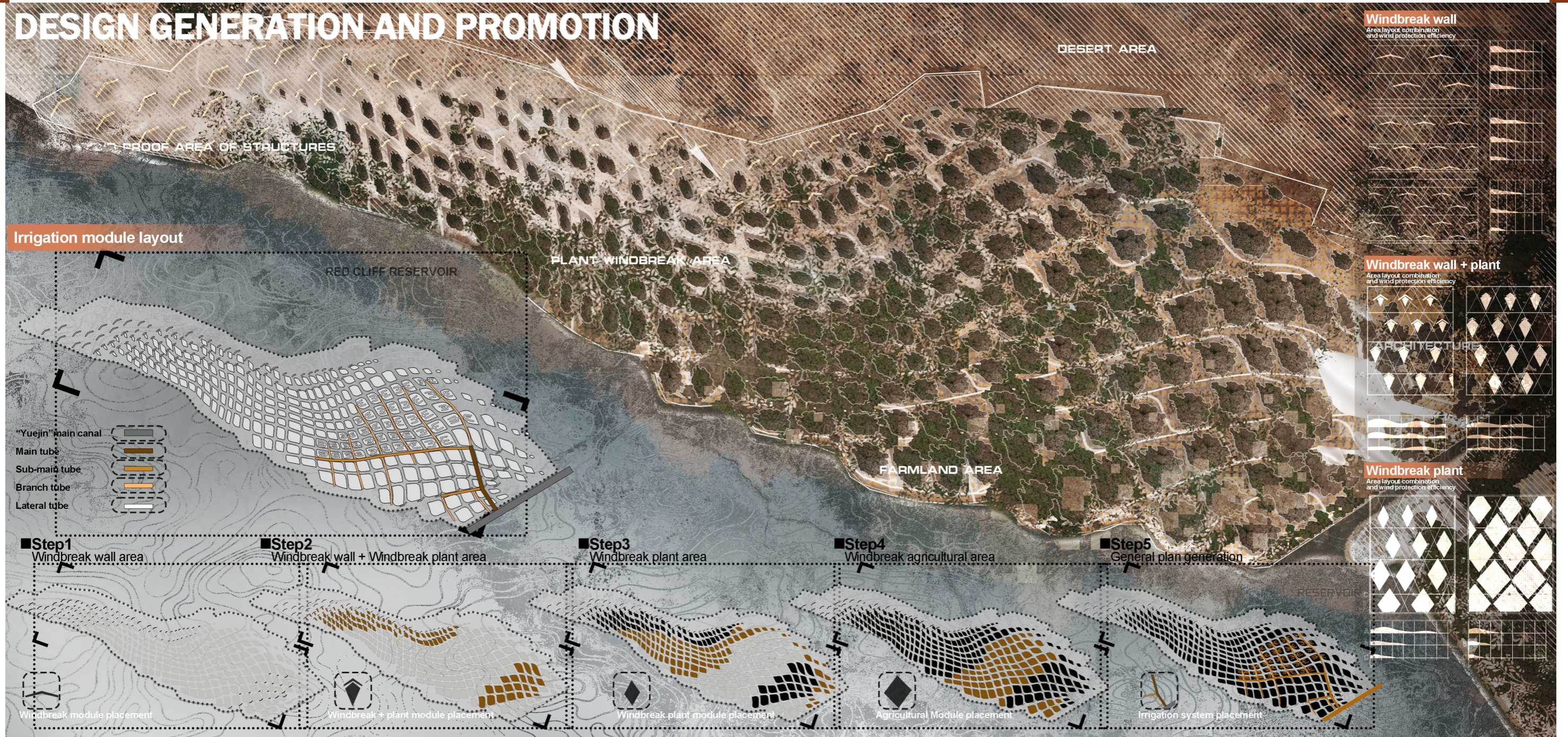
**Crop selection and cropping patterns**

After evaluating the adaptability to drought and windy conditions, water and artificial work demand and growth cycle, 7 crops: corn, soybean, wheat, cotton, fennel, alfalfa and sunflower are selected, and crop rotation and intercropping are planned in different periods according to the crops' effect on soil fertility.

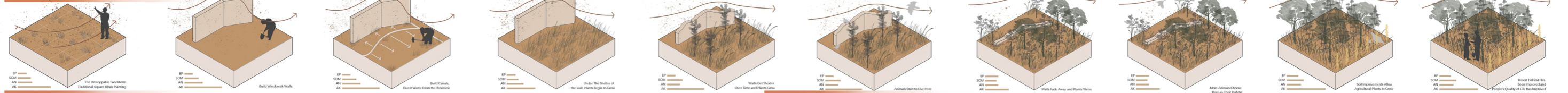


Crop group: in order to obtain the maximum planting efficiency, the shape gradually changes from rhombus to square.

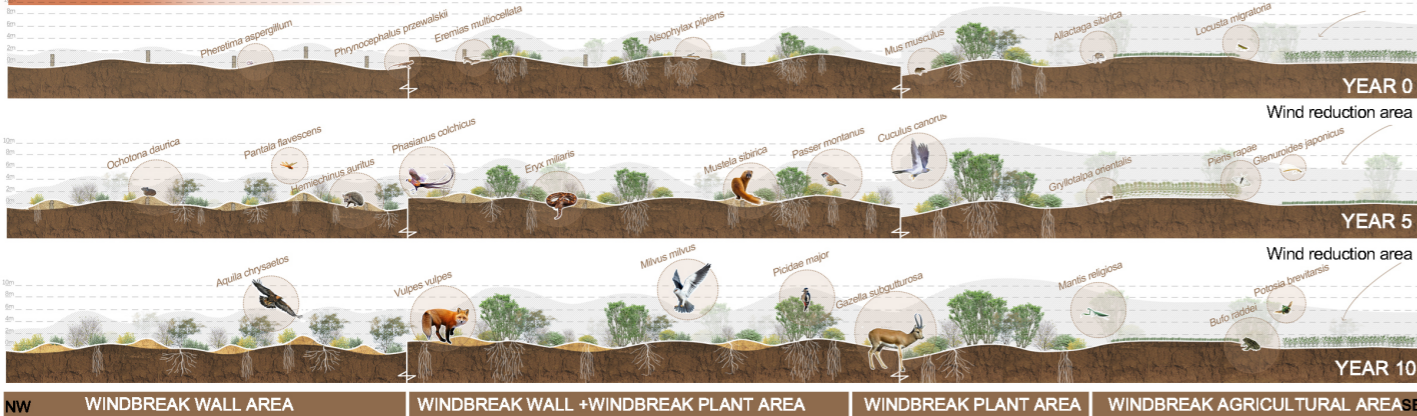
# DESIGN GENERATION AND PROMOTION



## Change of windbreak



## Habitat restoration



## Basin extension plan

