TaiSugar Circular Village Landscape Design in Tainan, Taiwan

Bird’s eye view

Taiwan

Tainan city

Guiren District
Shalun

Site Location

Project Statement

TaiSugar Circular Village is located within the Shalun Smart Green Energy Science City, Tainan, Taiwan. This residential project accommodating 351 studio apartments is the first in Taiwan focusing on circular economy concept in the built environment. In addition to incorporating green and smart building techniques, the design team also planned “building material bank”, “circular system”, “disassembly and reuse of building materials”, “BIM application”, and “innovative business models”. The project adopts the concept of “leasehold instead of sale” within the circular economy framework for self-operation and management of rental housing.

The landscape design integrates the concept of circular economy and sharing, combining community development, agricultural education, energy conservation and waste reduction, to plan a collective residential community that encompasses ecological, lifestyle, and productive landscapes. In addition to the general residential communal spaces and landscape elements, the project also purifies community reclaimed water and rainwater through aquatic plants/gravel-purified landscape waterways, recycling them for irrigation purposes. Simultaneously, the community plans non-toxic multilayer/vertical gardens as edible landscapes, introducing urban beekeeping, aquaponics, solitary bee hotels, black soldier fly breeding for kitchen waste disposal, leaf and fruit composting, and other waste reduction facilities that comply with ecological, biodiversity, and circular economy principles.

Originally a leased pineapple field.

Site Plan

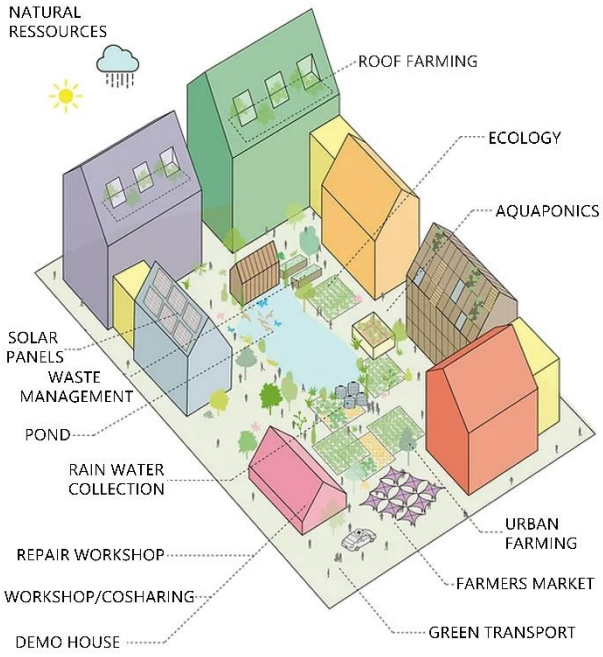
1. Main Entrance Plaza
2. Autumn Maple Square
3. Southern Eco-Pond
4. Aquatic Plants
5. Water Resource Interpretation Platform
6. Pond Trail
7. Water Outlet
8. Water Purification Channel
9. Northern Pond
10. Water Channel Ending
11. Sunny Lawns
12. Courtyard Farmland
13. Roofed Outdoor Corridor
14. Pocket Square
15. Resting Area
16. Farm Entrance
17. Tree-Shaded Seating Area
18. Eco-House (Aquaponics+ Shared Kitchen)
19. Outdoor Deck (Bee Keeping+ Black Soldier Fly Food Waste Decomposition)
20. Stairs to Basement
21. Bicycle Parking
22. Corner Plaza
23. Corner Plaza
24. External Tree-Lined Pedestrian Sidewalk

Location : Guiren District, Tainan City
Area : 1.4 Hectares
Purpose : Collective housing
Design : Oct. ,2017~Dec., 2018
Construction: Apr., 2019~Jun., 2021

Expense : About 942,000 USD
Materials : Granite, permeable bricks, steel pipes, beech wood, reinforced concrete, recycled rails, Landscape irrigation, drip irrigation equipment, lighting device, beekeeping equipment, aquaponics equipment, vegetable planters, black soldier fly cultivation and kitchen waste decomposition equipment, organic waste treatment equipment, solitary bee hotel, trees, shrubs, vines, perennials, turf, fruit trees, vegetables.

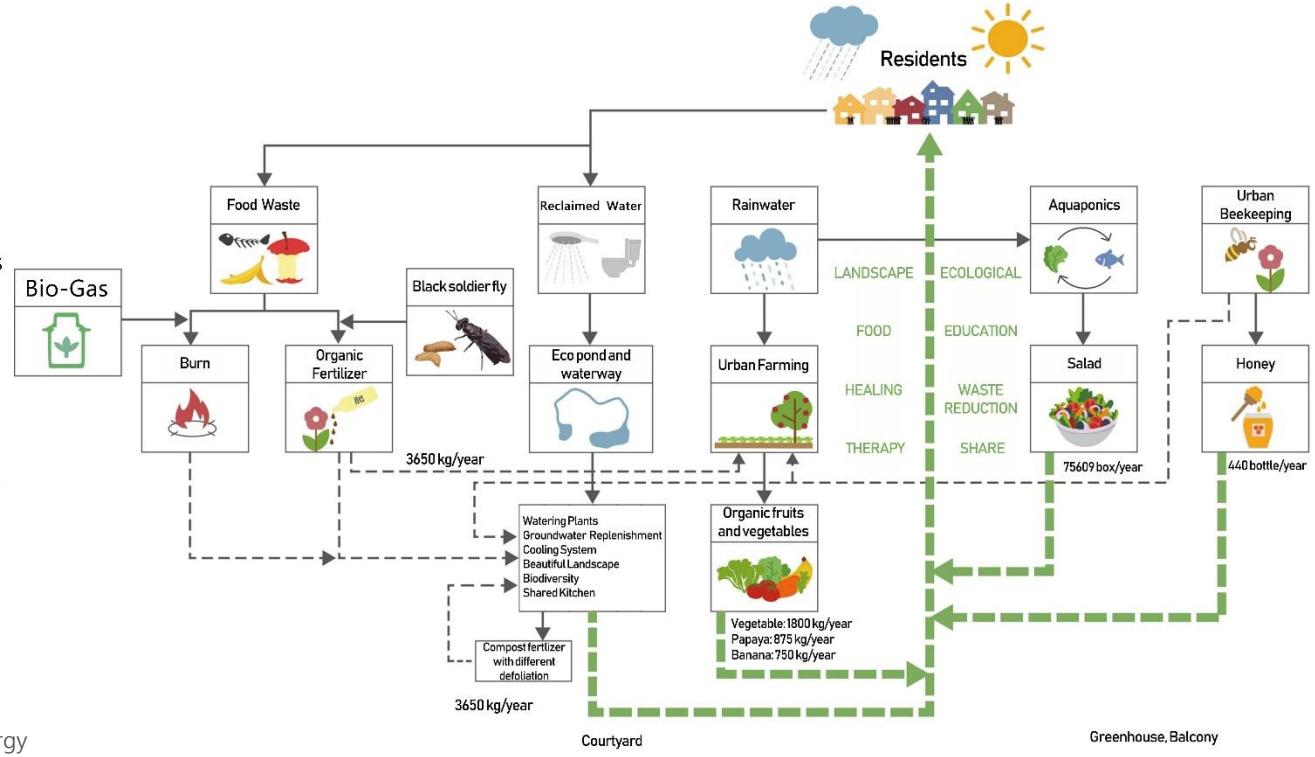
Planning and Design Concepts

This project studies and analyze the landscape circular system within a collective residential community, focusing primarily on water circulation, biomass energy circulation, food circulation, etc. It also takes into account the integration of local agriculture in the neighboring Guiren District into education, operation, and management, in order to plan and design the circular landscape.



Cozy Home+Co-Housing+Urban Farming+Renuable Energy

Schematic diagram of the overall planning concept

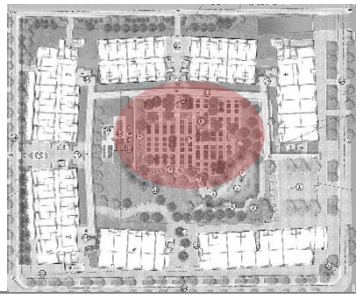


Schematic diagram of the landscape circular system

1.1

Establishing An Eco-friendly Edible Landscape for Collective Residential Community

Courtyard Community Gardens , Non-toxic Agriculture and Biological Pest Control



Safe and Non-toxic Soil Improvement

Considering the site's previous use as a leased pineapple field, professional soil testing was conducted to understand soil characteristics and ensure no pesticide residues. pH adjustments were made, and organic fertilizers were blended to improve the soil, laying the groundwork for ecological landscapes and the non-toxic courtyard gardens.

Designing with Biological Pest Control

The courtyard community edible gardens are structured in modular units for easy management, incorporating concepts of organic agricultural biological pest control. Nectar Plant areas, vegetable gardens, and orchards are interwoven to enhance biodiversity while providing concealed spaces for beneficial insects with hedges. Solitary bee hotels are strategically placed as a means of pollination and pest suppression.

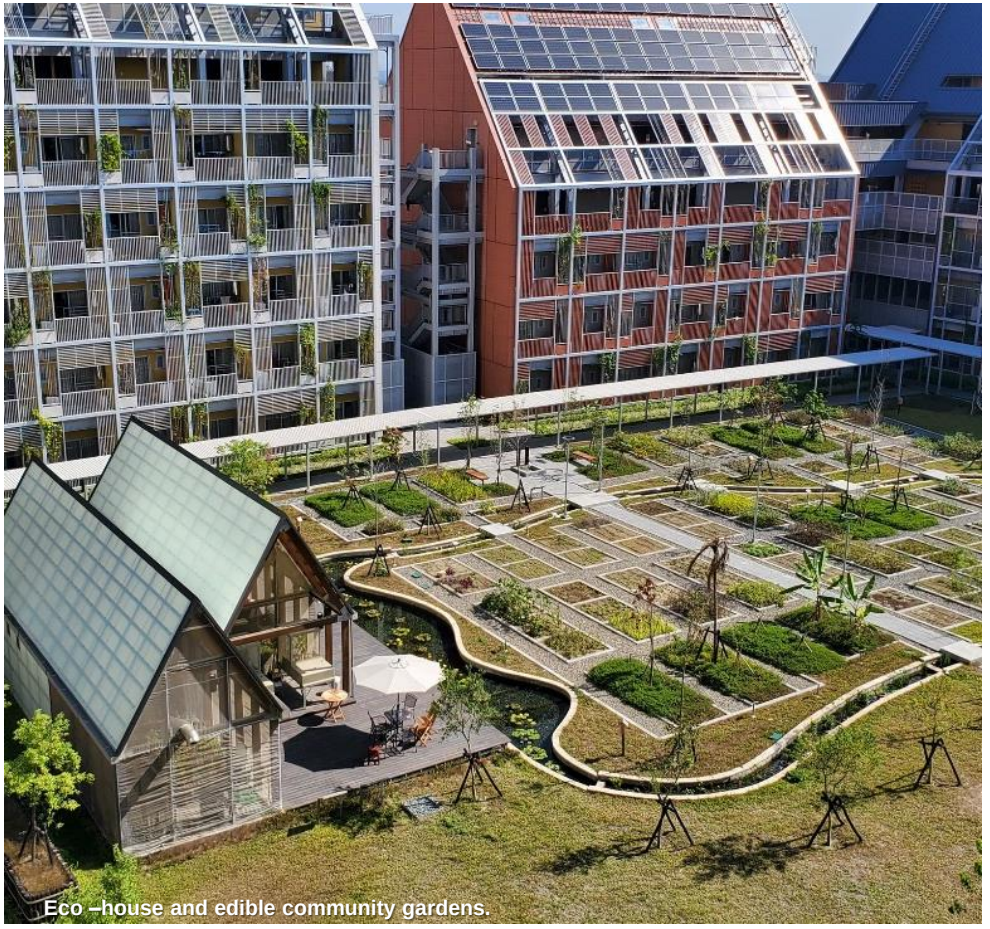
Optimizing Plant Selection for Less Diseases and Pests and High Yield

Orchards are planted with leguminous ground cover to fix nitrogen, suppress weeds, and reduce management costs. Fruit tree varieties are selected based on high yield and easy maintenance, complemented by betel nut palms to enrich the courtyard skyline, echoing the common landscape of betel nut boundaries in the flatlands of southern Taiwan. Vegetable selections are based on combinations of herbs, leafy greens, root vegetables, and legumes to provide seasonal planting choices.

Solitary bee hotels

Courtyard community gardens

Orchards are planted with leguminous groundcover

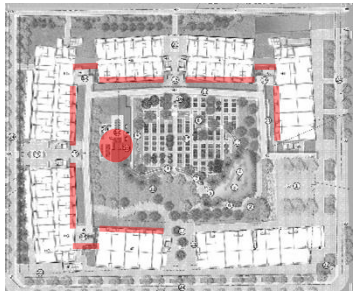


Eco –house and edible community gardens.

1.2

Establishing An Eco-friendly Edible Landscape for Collective Residential Community

Aquaponics Systems, Rooftop Farms and Organic Food Waste Treatment

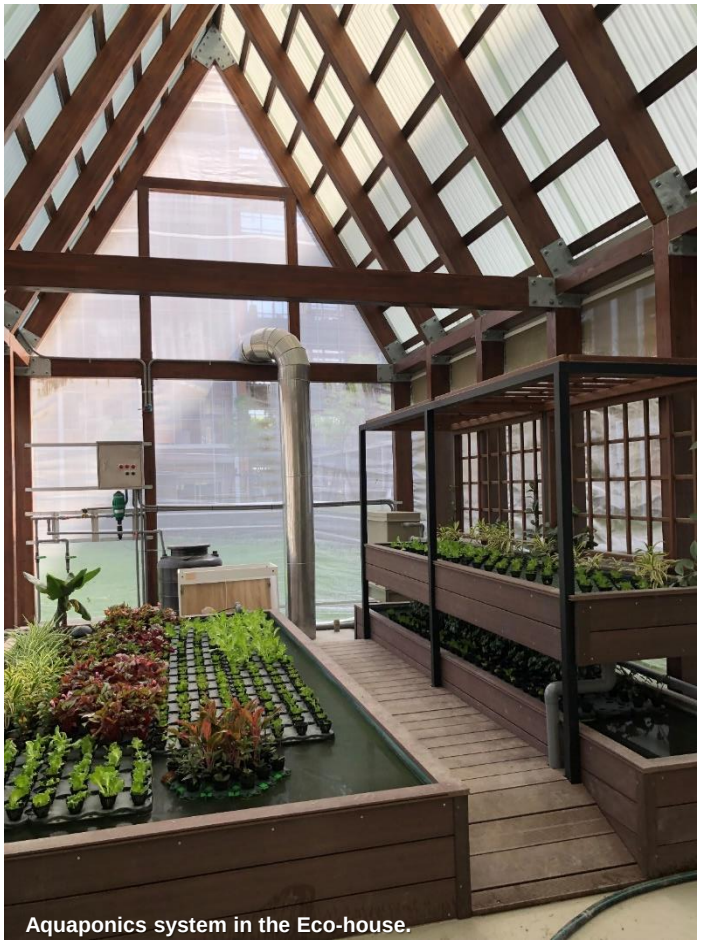


Rooftop Farms
Raised vegetable planters are arranged in modular units to facilitate rooftop vegetable cultivation.

Aquaponics Systems
The Eco-house overlooking the courtyard edible garden contains the community kitchen and aquaponics equipment for hydroponic vegetable production.

Black Soldier Fly Cultivation Equipment and Organic Waste Treatment Machine
The outdoor deck is set up with equipment for processing kitchen waste using the life cycle of black soldier flies, yielding chitin from insect molts, protein from insect pupae, and organic fertilizer from insect grass. Additionally, landscaping and agriculture organic waste is processed by machine into fertilizer to meet the needs of farms and forms a sustainable cycle.


Aquaponics pond.


Aquaponics system in the Eco-house.

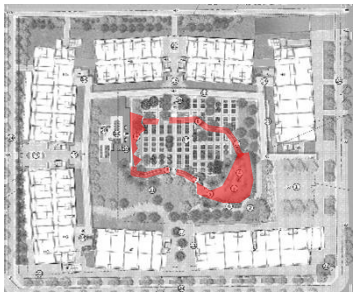

Rooftop raised vegetable planters


Black soldier fly cultivation equipment.

2

Water Recycling and Utilization:

Rainwater Harvesting and Reclaimed Water Purification

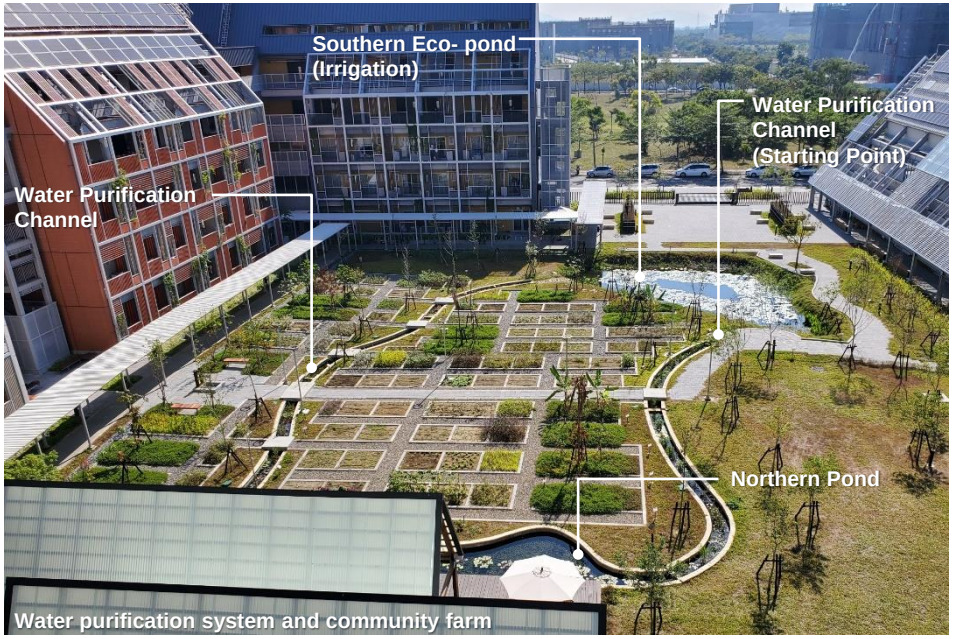


Rainwater is collected from the roof and stores in the underground mat foundation for farmland irrigation. The community's reclaimed water, after treatment to meet effluent standards, enters the water purification channel with aquatic plants and gravel beds for further purification. Flowing through drop-down sections, it passes the northern pond, creating a water lily landscape in front of the outdoor deck, before reaching the southern eco-pond. This water then serves as irrigation for the entire community's landscaping, simultaneously adjusting the microclimate, improving environmental comfort and energy conservation. The eco-pond also has the function of retention pond during the rainstorm.

The southern eco-pond

Water purification channel.

Water flows into the eco-pond.



Water purification system and community farm

The northern pond with various water lily species.

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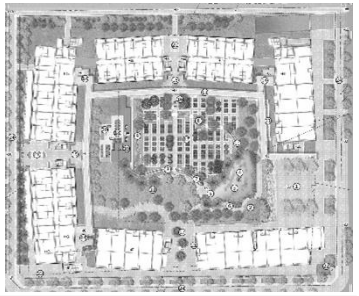
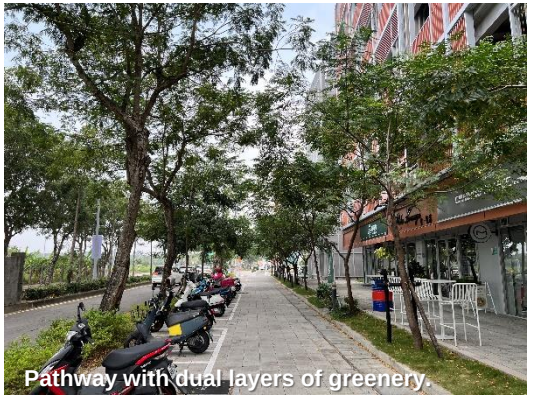
Well Established Internal and External Circulation and Rest Spaces



The buildings are divided into four house groups: A, B, C, and D. Except the ground-floor shops, house A to C are designated for residential use, while D serves as shared space. Buildings and railway rail fences enclose the internal courtyard. The exterior landscape complements street-level shops by providing corner plazas and continuous planting strips, with newly planted and existing sidewalk trees forming dual layers of greenery, offering comfortable pedestrian and bicycle pathways.
The entrance plaza serves the dual purpose of firetruck parking and as a venue for large community events. Flowerbed seating is arranged to see the views of the courtyard landscape.
The roofed outdoor corridors act as the outer loop of the courtyard, connecting the main entrance to pocket spaces, resting areas and the entrances of each buildings. Between the pathways and water features, sunny lawns are also provided, with planted trees along the edges to provide a sense of enclosure, offering a grassland for various activities.


Corner plaza.


Pathway with dual layers of greenery.


Sunny lawns


Community pathway


The roofed outdoor corridor

4

Vertical Greening

Facade Green Wall with Vines

Primarily using climbing and twining vines with long flowering period, they are planted in planters on each floor balcony, guiding them to climb the building facade's Invisible grilles to achieve the effect of three-dimensional greening and reduces solar absorption during the summer.

The planting species are mainly grouped according to the amount of sunlight needed. Vines with full sunlight exposure are planted along the western and southern sides of the street-facing building perimeter and the southern-facing facade of the courtyard. Among them, Coral Vines and Passionflowers are planted to make full use of the rooftop's slanted Invisible grilles and sunlight exposure. Passionflower as a fruiting vine also demonstrate the agricultural characteristics of the courtyard garden and rooftop garden.

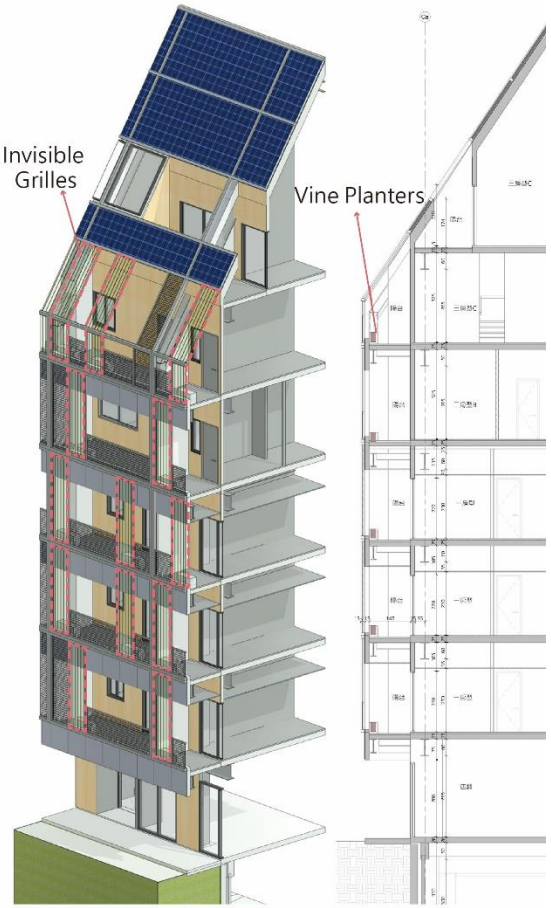
Garlic vine

Coral Vine

Morning Glory

Passion fruit

Honeysuckle



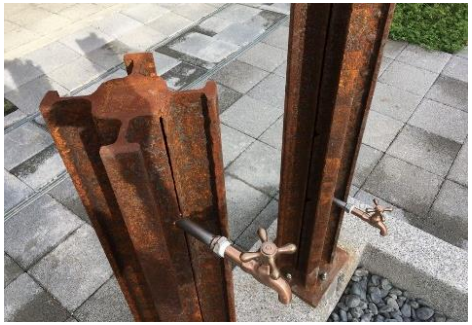
Building façade with Invisible grilles and vine planters

5

Reuse of Existing Materials

TaiSugar Railway Rails

In this project, TaiSugar railway rails in storage are recycled and repurposed. They are used in different types of community fences, gates, handwashing stations within the community courtyard, and water outlets for water purification channels, enhancing the community's unique design style.



6

Diverse and Multi-layered Planting

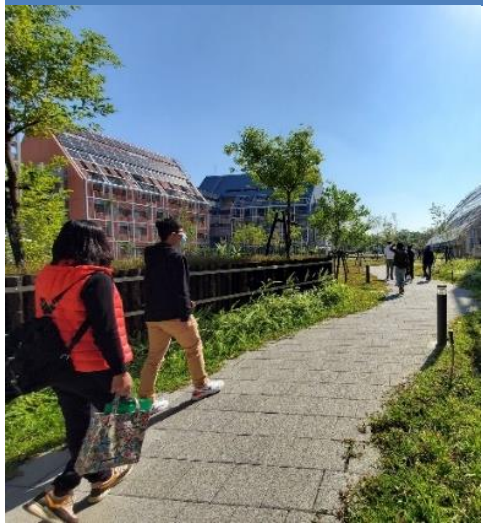
All the plantings in this project are either native or designed to attract birds and butterflies. Planting design between buildings and fences is dense-layered to enhance residential privacy. The variety of plant species throughout the area is abundant, resulting in an annual carbon sequestration of approximately 4 million kilograms.

The façade of the buildings is designed with flowering climbing vines to enhance green coverage and diversity. Viewing from the entrance plaza, the mirrored image of pond reflection, and further with the water channels, the farm, the eco-house and the background vine-covered buildings , all enrich layered sense of depth in landscape . In accordance with various plant species, Interpretive signs are also placed in the community to provide self-guided learning opportunities.

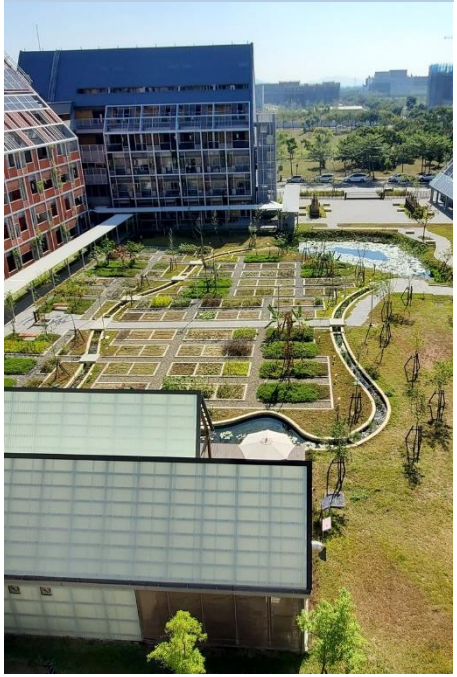
Project Benefits

Direct Benefits

- The first residential community in Taiwan built on the concept of "circular economy".
- Planting of 259 new trees and 31 fruit trees, resulting in an annual carbon sequestration of approximately 4 million kilograms.
- Approximately 400 kg/year of vegetables produced from aquaponics.
- Approximately 1800 kg/year of fruits and vegetables produced by the community and rooftop farms.

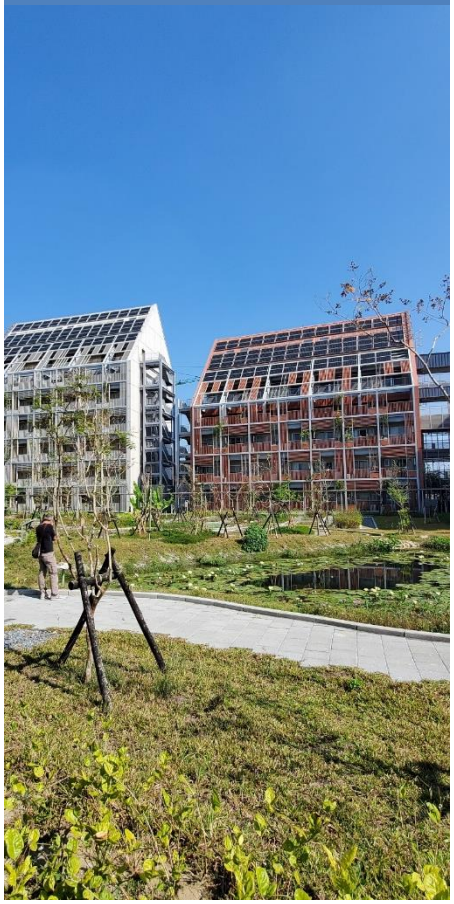


- Approximately 6.8 kg/day of organic compost produced from kitchen waste.
- Recycling of 70 tons/day of reclaimed water.
- Safe and non-toxic ecological green spaces.



Indirect Benefits

- Serving as a model for future circular economy housing.
- Increasing the value of the surrounding area.
- Providing a place for food and agricultural education.



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