ZENISC - ZERO EMISSION NEIGHBOURHOOD IN SMART CITY

PROJECT DESCRIPTION 01

BACKGROUND

As a highly urbanized country with minimal domestic agricultural production, Singapore heavily relies on their imports to maintain its food demands. However, Singapore is facing a presistent challenge of food security and intended to keep a regular import of nutritious food and agricultural product. Approximately 9% of Singapore's USD 17.2 billion in total agricultural product imports in 2021 came from the United States ("Singapore - Agriculture," 2022)

PROJECT BRIEF

Zenisc is a research center focusing on food and sustainability in Singapore. It addresses the city's food demands through innovative agricultural methods and advanced technologies. By leveraging cutting-edge tools like AI, AR, VR, farming sensors, and ICT, Zenisc optimizes its operations, reducing resource depletion and promoting efficient agriculture.

AR technology enables plant scanning and research, while VR provides visual data for remote monitoring and decision-making. Farming sensors collect vital information, aiding informed actions. Additionally, Zenisc promotes a proactive lifestyle by offering urban farming spaces and convenient autonomous transportation.

The integration of sustainable agriculture, advanced technology, and immersive experiences aims to transform Singapore's food production landscape. Through social educational programs, Zenisc strives to inspire and change the mindset and behaviors of the population, fostering a more sustainable future. By emphasizing sustainability and utilizing innovative methods, Zenisc contributes to mitigating resource depletion and revolutionizing the way food is produced in Singapore.

PROJECT OBJECTIVES

COLLABORATE · INNOVATION · EXPERIENCE · ENGAGE · INSPIRE

DESIGN CONCEPT

CONNECTION

Derived from the basic form of plant cells which acts as a living organism that are connected to each other

OPENNESS

Open space concept to allow connection between users

FLEXIBILITY

Create changes in form to have unpredictable experience

LAYERING

Repetition form which provide rhythm for the space

USERS

Primary Users
- Urban Planners and Designers
- Scientist
- Farmers

Secondary Users
- Professionals
- IT Department
- Admin Officials

Tertiary Users
- General Public

SITE

LEGEND
- Site Building
- Main Road
- Open Space
- River

Figure 1: Site Map by Mapstyle.wizard.com and Author

SITE INFORMATION

Address: 99 Beach Rd, Singapore 189701

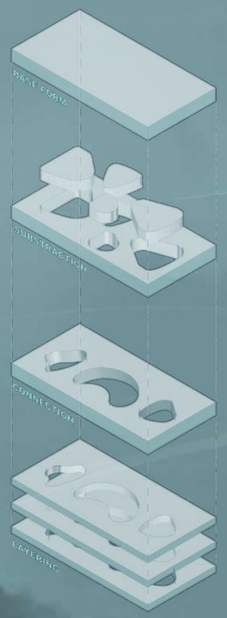
The site is located at 99 Beach Road, Singapore which was originally a former police station in the early 1930s. Today the building envelope remains unoccupied. Hence, the URA start building commercial buildings surround the district area with ease access to city centre and business areas, yet still need access to agriculture and farms.

POTENTIALS

- Strategic location, convenient area in the city
- Colonial Building
- Good accessibility & ventilation

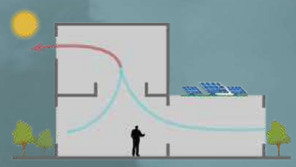
CONSTRAINTS

- High amount of noise level during peak hours due to highway
- Access to agriculture
- Congested Road



DESIGN APPROACH

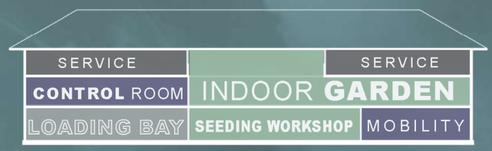
AGRITECTURE



SUSTAINABILITY

FOOD SMART CITY

PROGRAM DIAGRAM



Modern and Futuristic Design with Sustainable Elements...

Zenisc is a research project that centres around the development of a food smart-city centre in Singapore. With a strong focus on sustainability and innovative agricultural practices, Zenisc aims to tackle the city's food demands while promoting a deeper connection to nature and fostering a sense of openness and flexibility.

The primary users of the space are urban planners, designers, scientists, and farmers who engage in research and apply their findings to enhance crop production and farming techniques. These individuals play a vital role in ensuring the success and effectiveness of the sustainable agriculture initiatives within the smart-city centre. Supporting the primary users are secondary users, including IT professionals and technical experts who regulate the system, integrate AI technologies, and operate data servers. Their expertise is crucial for maintaining the seamless functioning of the infrastructure. Lastly, tertiary users encompass the general public, who have the opportunity to visit and experience the programs and offerings of the food smart city.

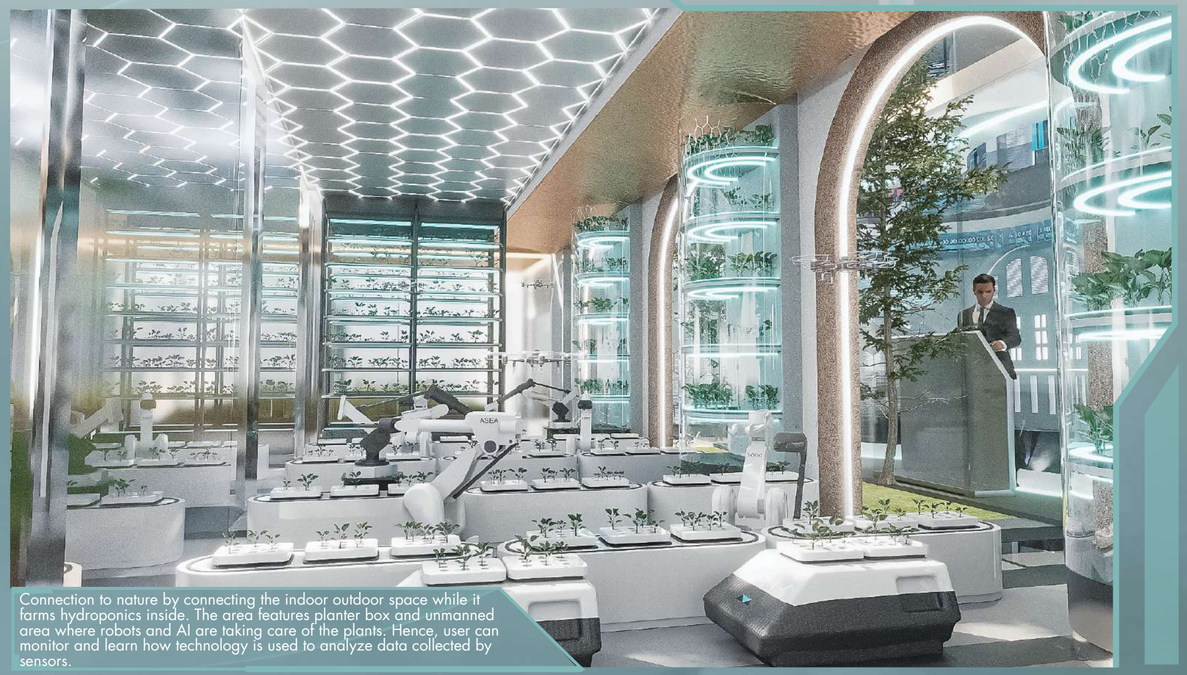
What Technology Integration?

Zenisc leverages cutting-edge technology and data collection to optimize its operations. Through the integration of Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), farming sensors, and Information and Communication Technology (ICT), Zenisc creates an ecosystem where urban infrastructure and agriculture can coexist harmoniously. The use of AR technology for plant scanning and research enables scientists to gain a comprehensive understanding of crops without the need for excessive physical resources. This approach minimizes resource depletion by reducing the requirement for extensive field trials and conserving land, water, and other inputs

VR provides valuable visual data for remote monitoring and decision-making, reducing the need for constant on-site visits and transportation, which can deplete energy and fossil fuel resources. By utilizing VR technology, Zenisc minimizes resource consumption while still effectively managing and monitoring agricultural processes. Farming sensors play a crucial role in collecting data on soil moisture, nutrient levels, and other environmental factors. This data-driven approach enables farmers to optimize resource allocation, such as water and fertilizers, preventing overuse and minimizing resource depletion.

Through its innovative approach to sustainable agriculture, connection to nature, and integration of advanced technologies, Zenisc strives to solve Singapore's food demands. By engaging users through social educational programs and immersive experiences, the project encourages individuals to embrace and appreciate the concept of living in a food smart city. Zenisc aspires to inspire and transform not only the food production landscape in Singapore but also the mindset and behaviours of its inhabitants towards a more sustainable future.

ROBOT FARM HYDROPONIC

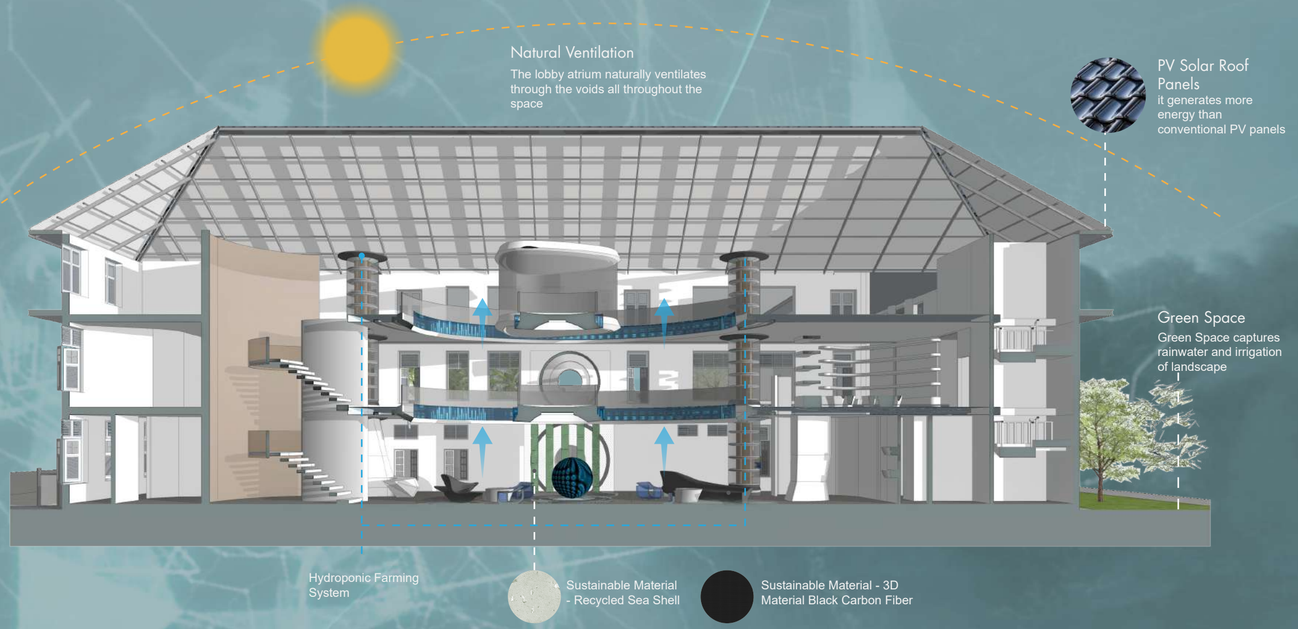


Connection to nature by connecting the indoor outdoor space while it farms hydroponics inside. The area features planter box and unmanned area where robots and AI are taking care of the plants. Hence, user can monitor and learn how technology is used to analyze data collected by sensors.

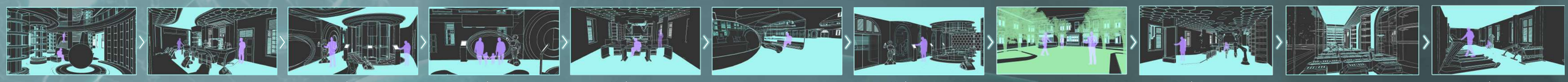
SMART CAFE

Smart robot cafe is a place where users can enjoy food and beverages to order using a smart integrated system by AI which let the robots serve the food in an orderly way which minimize manpower

SUSTAINABLE DIAGRAM



USER JOURNEY



OUTDOOR URBAN FARM

RESEARCH LABORATORY

INDOOR OUTDOOR AREA

SCAN ME

VIRTUAL TOUR

MATERIAL STATEMENT

The material statement for this design embraces a modern and futuristic style while prioritizing sustainability. The color palette predominantly features white and blue, creating a clean and contemporary aesthetic, while the accent color of orange adds a vibrant and contrasting element to the overall composition

To align with sustainable principles, the materials chosen for this design are consciously selected. By combining these sustainable materials—recycled sea shells, woven elements, recycled slate aluminum, and carbon fiber—the design achieves a harmonious balance between modern aesthetics, futuristic elements, and environmental consciousness. The color palette of white and blue establishes a contemporary ambiance, while the accent color of orange provides a striking contrast and adds a touch of energy to the space

This material statement demonstrates a commitment to sustainable design by utilizing recycled and eco-friendly materials. The combination of modern and futuristic elements with sustainable practices creates a visually captivating space that embraces innovation, environmental responsibility, and a forward-looking mindset

MATERIALS

1. Composite Panels
2. Cork
3. 3D Print Material Black Carbon Fiber
4. Transparent Wood
5. Recycled Shell Stone
6. Blue Tinted Glass
7. Blue Acrylic
8. Woven Bolon - Botanic Spearmint
9. Aluminium Panel Semi-Gloss
10. Blue Micro-Algae
11. Recycled Slate Aluminium Panel

woven

Woven elements – contribute to the overall aesthetic, bringing a sense of depth and tactility to the space. Sustainable woven materials, such as natural fibers or recycled textiles, are employed to add warmth and visual richness to the design while aligning with eco-friendly practices.

carbon fiber

Carbon fiber – a lightweight and durable material, further emphasizes the futuristic aspect of the design. Carbon fiber is known for its strength-to-weight ratio, making it an ideal choice for creating innovative and sustainable products.

recycled sea shell

Recycled sea shells – utilized as a key material, repurposing discarded shells to give them a new life and reducing waste. These shells are incorporated in various applications, adding texture and visual interest to the design

RESEARCH LABORATORY

The research laboratory conduct research specifiically on the technological innovation of the plant's condition. They use AI and smart machine learning such as the robots, and sensor drone to visualize and collect data of the plants

VR SPACE - EXHIBITION WORKSHOP

This is one of the programs of food smart city exhibition, where the users can both make their own 3D model LIDAR scans and see how it was, and developed through the drones and farmbots which take care og the plants. They also experience a full 360 view of smart agricultural solution with VR technology

ISOMETRIC

3rd

- ADMIN OFFICE
- WORKING PODS
- EMERGENCY EXIT
- GYM
- VERTICAL FARM
- RESEARCH LAB (TECH)
- STAFF OFFICIALS

2nd

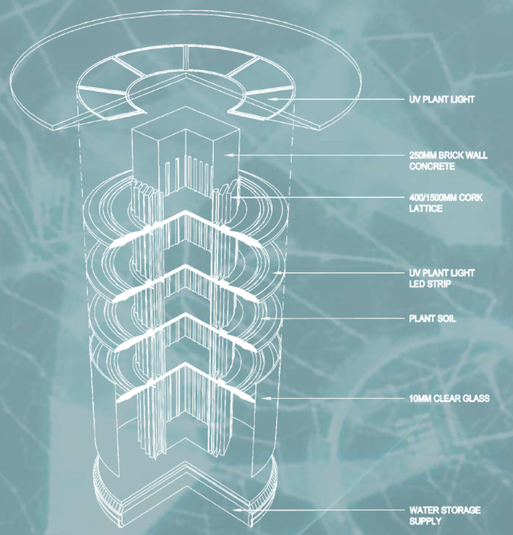
- COWORKING SPACE
- ROOFTOP GARDEN
- LIBRARY
- EMERGENCY EXIT
- DATA MANAGEMENT CENTRE
- RESEARCH LAB (FARM)
- STORAGE AREA
- TREE TOP WALK

1st

- LIDAR WORKSHOP
- VR SPACE
- SMART CAFE
- AEROPONIC WORKSHOP
- HYDROPONIC INDOOR OUTDOOR
- ROBOT FARM HYDROPONIC
- LOADING BAY
- EMERGENCY EXIT
- AV LIFT HYDRAULIC

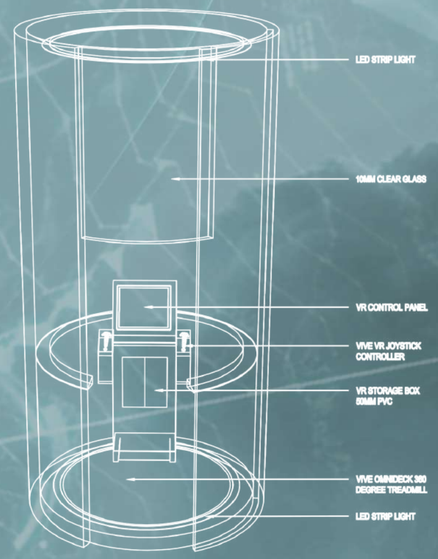
- OUTDOOR FARMING
- FOOD TRANSPORT ROUTE
- AUTONOMOUS VEHICLE ROUTE

HYDROPONIC COLUMN DETAIL



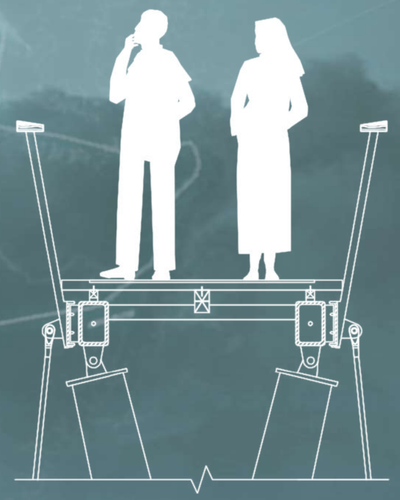
A hydroponic vertical farm that are stack throughout the columns. It features in layers of plants and a water supply chain on the bottom layer of the rack. It also uses Ultraviolet (UV) light to help perform photosynthesis

VR PODS - EXHIBITION DETAIL



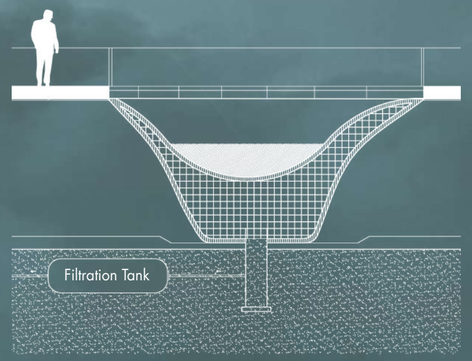
The VR pods are located in the smart city exhibition and features in VR experience using joystick controller as well as an omnidirectional 360 treadmill that allow users to navigate around freely in the virtual environment. It also controls drone use for farming

TREE TOP WALK DETAIL



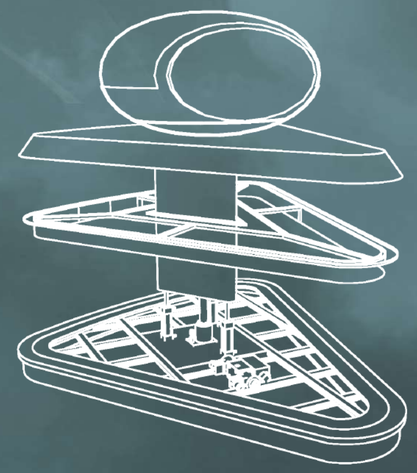
The tree top walk features glass railing and beams that connects both of the building block A and C with its structural part of the tree top walk

RAINWATER HARVESTING DETAIL



The tree top walk features a rainwater harvesting system which allow it to collect and recycle rainwater use.

AUTONOMOUS VEHICLE HYDRAULIC DETAIL



The autonomous vehicle transit offer the user a tour experience around the building. Connecting both building blocks for the ease of mobility and food transfer, the autonomous vehicle also contain hydraulic system which carries the vehicle onto the tree top walk

SCAN ME

VIDEO