

THE CONSTRUCTED ECOSYSTEM

NATURE SYSTEMS

• Biophilic Interior improve Indoor Air Quality (IAQ) using indoor plants

Use of indoor plants to absorb the Volatile Organic Compounds (VOCs) to improve Indoor Air Quality (IAQ) and enhance the health and well-being of the occupants.

TVOCs target: $\approx < 200-300 \mu\text{g}/\text{m}^3$



HUMAN SOCIETY SYSTEMS

• Human Happiness and Well-being

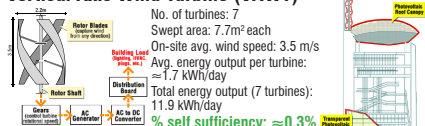


ENERGY SYSTEMS

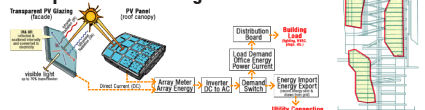
• Mixed-mode Energy

- Optimize site conditions (e.g., wind direction and sun path).
- Adopt bioclimatic design strategies (such as building orientation, sunshading devices, naturally ventilated spaces and openings).
- Reduce reliance on M&E systems (e.g., HVAC and artificial lighting).
- Maximize renewable energy integration (e.g., solar and wind).

• Renewable Energy Integration Vertical Axis Wind Turbine (VAWT)



Photovoltaic Roof Canopy & Transparent PV Glazing



Photovoltaic energy performance:

	PV Roof Canopy	Transparent PV Glazing
Area of PV panel	230m^2	576m^2
PV solar insolation	$4.5\text{kWh}/\text{m}^2/\text{day}$	$3\text{kWh}/\text{m}^2/\text{day}$
Total energy output	$1,035\text{kWh}/\text{day}$	$1,728\text{kWh}/\text{day}$
Total daily energy consumption	$4,397 \text{ kWh}$	
Energy Use Intensity (EUI)	$\approx 266\text{kWh}/\text{m}^2/\text{year}$	
% self sufficiency	$\approx 62.8\%$ of daily demand	

Sewage-to-biogas Plant

Estimated Sludge = 230 litres per Population Equivalent (PE.) per day
Sewage is processed on-site through anaerobic digestion to generate:
Compost (converted into fertilizer for external use)
Biogas (used as a renewable fuel for energy generation)

HYDROLOGY SYSTEMS

• Rainwater Harvesting water collection, purification & reuse

Rainwater harvesting system comprises of 'roof-catchment-pan' and layers of 'scallop' located at the building's facade.
Water flows through gravity-fed water-purification system, using soil-bed filters.
The filtered water accumulates in a basement storage water tank, and is pumped to the upper-level storage-tank for reuse (only here for potable needs, e.g. plants maintenance and toilet-flushing).

Rain-fall catchment area = 560 m^2
Estimated Rainwater Collection: $13,126 \text{ m}^3/\text{year}$
Estimated Water Demand: $22,019 \text{ m}^3/\text{year}$
Water Self-Sufficiency: 59%
(by rainwater collection & grey-water reuse)

BUILT SYSTEMS

• Closed-loop Building Material Cycle

The building is designed with mechanically-joined materials. The building's materials and resources are:

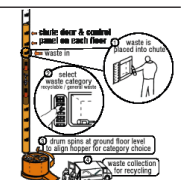
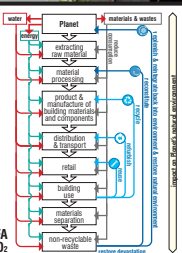
- Selected for durability, non-toxicity & renewability.
- Assembled with mechanical fixings (instead of adhesives) to allow easy disassembly.
- Reused or recycled into new products or building components at end of life.
- Benignly reintegrated into the natural environment if no longer useful.

Total embodied energy: $142,841 \text{ GJ}$
Embodied energy intensity: $14.2 \text{ GJ}/\text{m}^2 \text{ GFA}$
Estimated CO₂ emissions: $\approx 11,500 \text{ tonnes CO}_2$

• Solid-waste Recycling System 3-way chute system

- Organics: food scraps, food-soiled paper.
- Recyclables: paper, plastics, metals, glass
- Residuals: non-recyclable waste.

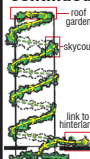
Expected recyclable waste collected /annum:
paper / cardboard: 41.5 mt
glass / ceramic: 7.0 mt
metal: 10.4 mt



MICROHABITATS

• Habitats Creation within Builtform continuous vegetated spiral ramp

Green Ratio: 0.5 of GFA
Building envelope green coverage: 63%
% of green increase on site: $\approx 358\%$
The vegetation extends from street level to the roof level, forming a connected ecosystem that enables species to migrate between habitats, fostering more diverse ecosystem and enhances local biodiversity.
Non-invasive flora species are selected and arranged according to the microclimatic zones with the aim to attract native fauna.



ECOLOGICAL DESIGN REINVENTS OUR BUILT ENVIRONMENT AS CONSTRUCTED ECOSYSTEM