THE COMMONWEALTH GREENHOUSE COMPOUND

FINAL DESIGN PROJECT 2022 | CACHOLA, SOFIA YSABELLE TORRES

Sustainable Socialized Housing: Urban Food Production Through Hydroponic Farming Within A Public Housing Development

BACKGROUND & RATIONALE

With the ongoing health crisis worsening and sinking millions of Filipino families deeper into the vulnerabilities of poverty, marginalized communities in the Philippines persistently experience hunger. There is a gap in literature of designs for sustainable socialized housing that not only comply with today's health and safety precautions, but also support inhabitants' basic needs for viable sources of food, water, and recreation. As a result of this gap, there are inadequate options for holistic housing that not only fulfills communities' needs for shelter but also provides inhabitants opportunities for productive recreation and readily accessible food sources.

This thesis' main purpose is to instigate the holistic and sustainable design process in which a socialized housing development could help reduce the chosen marginalized community's need for proper housing whilst providing an adequate outlet to secure residents a viable source of vegetable produce for consumption.

PROJECT SPECIFICATIONS

The development will follow a saleable to non-saleable land area ratio of 60% to 40% respectively. Saleable area set at 60% will be comprised of 3 medium rise residential buildings; each building will be seven (7) storeys high with storeys one to six intended for residential use and storey seven intended for the hydroponic farm facilities.

IMPROVEMENT ON THE CURRENT HOUSING MODEL

Onsite the development, medium rise residential buildings and community facilities were designed with the intent for the ease of future maintenance through an improved choice in building and structural materials. An improved structural system that forms the buildings' skeletons make for more disaster resilient structures, added on top of an already low-risk disaster site context. Drainage design was heavily detailed on each floor to minimize the risk of unwanted flooding and accidents. Living units and public spaces were designed with considerations for passive thermal comfort, and a sufficient amount of natural light and ventilation. Standard living space allocation was extended to afford users less congested spaces and ample spaces were given for the provision of recreational zones.

Latitude N 14°42'17.93", Longitude E 121°03'38.2"

Area: 2.5 Hectares

Topography: Predominantly Flat (0-3% Slope)
Elevation: 67M From Sea Level

Local Population: 213,229 (2020)
Annual Growth Rate: 1.17%

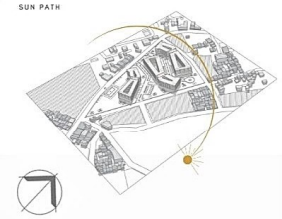
Zoning: CLUP's Zone for Socialized Housing

Climate Type I (Two pronounced seasons: dry from November to April, and wet during the rest of the year. Maximum rain period is from June to September)
Earthquake Hazard: Encompassing threat of intensity VII Only with no risk of landslide
Liquefaction Hazard: No Risk
Flood Hazard: Low/Likely
River Basin: Marikina River Basin
Soil Composition: San Luis Clay

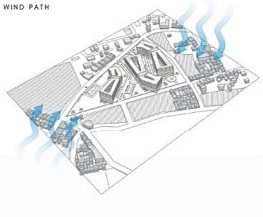
Nearby Landmarks: La Mesa Dam Watershed, Ecopark, and Batasan-NSC Growth Center

Utilities: Metropolitan Waterworks and Sewerage System (MWSS), Manila Electric Company (MERALCO), Quezon City Sanitary Landfill

SUN PATH

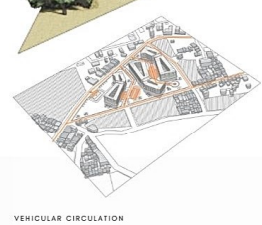


WIND PATH

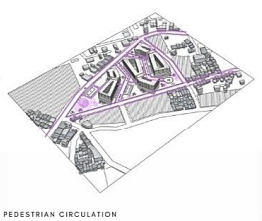


PRESERVED GREENERY

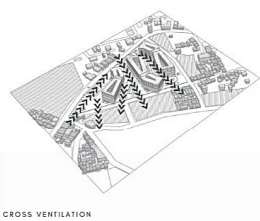
VEHICULAR CIRCULATION



PEDESTRIAN CIRCULATION



CROSS VENTILATION

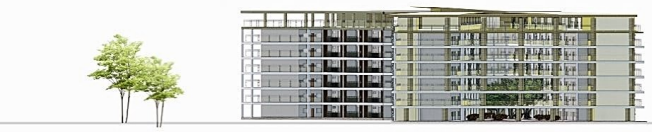


ELEVATIONS

SOUTH FACE ELEVATION

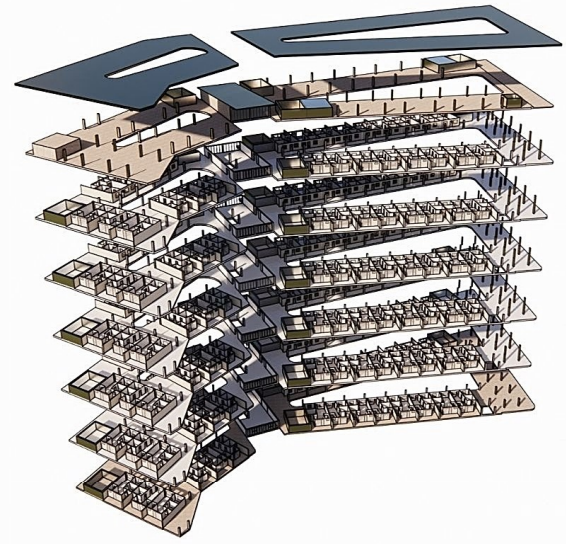
WEST FACE ELEVATION

EAST FACE ELEVATION

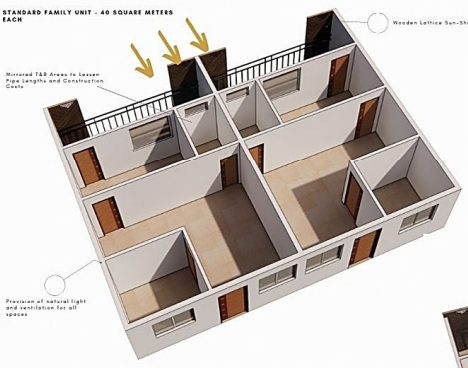


NORTH FACE ELEVATION

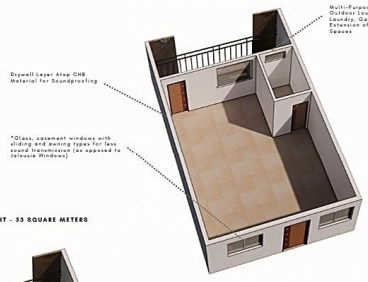
UNIT TYPES, LAYOUTS, AND FEATURES



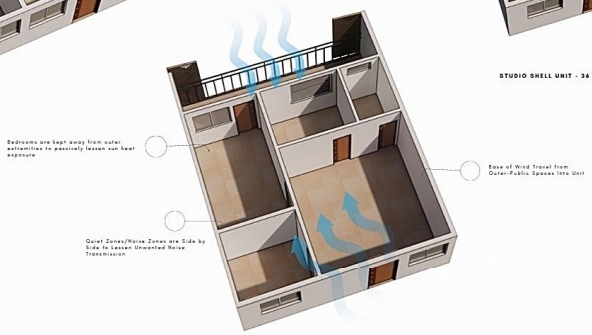
STANDARD FAMILY UNIT - 40 SQUARE METERS EACH



EXTENDED FAMILY UNIT - 53 SQUARE METERS



STUDIO SHELL UNIT - 36 SQUARE METERS



VERTICAL FARM CALCULATIONS

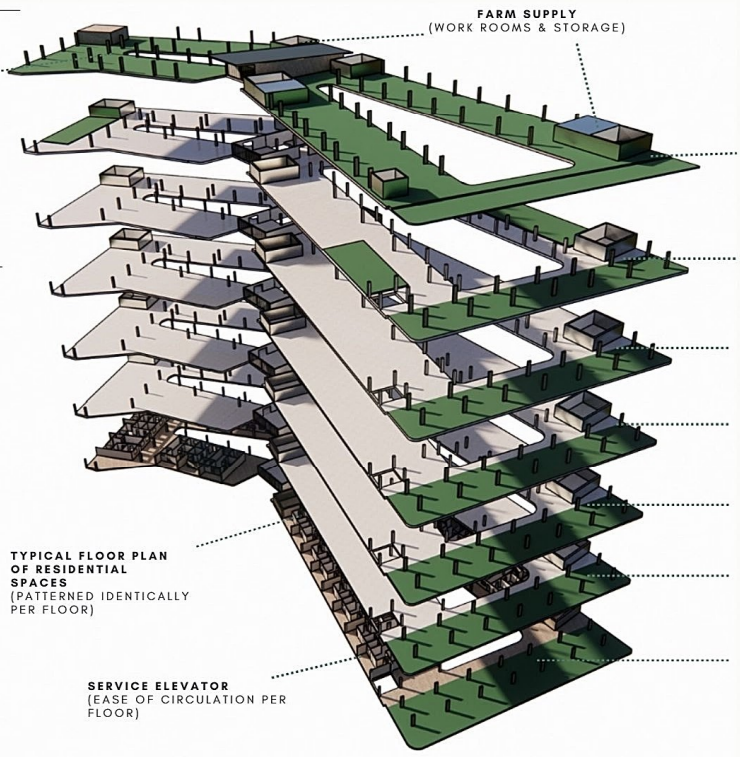
The development's estimated population was taken into account to arrive at the required growing space (space allocated solely for the cultivation of crops) to provide for half of the estimated population's yearly food consumption to help shoulder residents' daily dietary needs for vegetables and other green produce.

Experts in vertical farming suggest that on average, a full-grown adult necessitates a growing space of about 60 square meters for his or her yearly consumption (Al-Kodmany, 2018); and in effect, roughly 69,300 square meters of growing space is needed to supply half of the estimated population's yearly demand. There will be a total of three (3) vertical hydroponic farm facilities; with one facility found on each medium rise residential building, each utilizing a combination of mostly vertical plane shelving and the stacking of horizontal hydroponic beds on certain spaces to cultivate the demanded yield of produce.

FACADE DETAILS OF FARM TERRACE LEVELS

VERTICAL FARM SPECIFICATIONS

ISOMETRIC DIAGRAM



PROGRESSION OF ON-SITE APPLICATIONS

PHASE 1 (BASIC HYDRO-GROW TRAY WITH PVC COVER); **TOPFLOOR AND TERRACE**

1

PHASE 2 (VERTICAL HYDROPONIC SHELVING WITH RESERVOIR); **TOPFLOOR AND TERRACE**

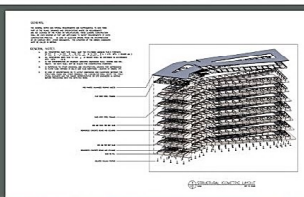
2

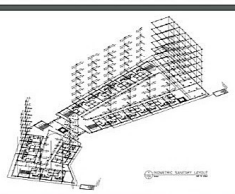
PHASE 3 (WOODEN HOUSING FRAME WITH VERTICAL SHELVING AND RESERVOIR); **TERRACE AND ON-SITE FOR EXPANSION**

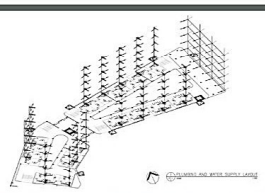
3

FOOD SUSTAINABILITY PRINCIPLES

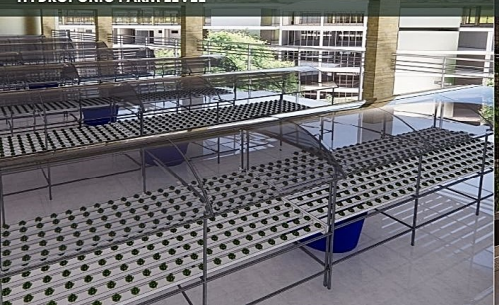
- Plot to plate eating, which essentially calls for as much vegetable produce as possible to be site grown and harvested.
- Locally sourcing seeds and young crop for hydroponic cultivation.
- Incorporating mostly plant-based produce, as this often requires less energy from fossil fuels, less land and less water than meat.
- Reducing food waste and only cultivating/harvesting food that is needed.



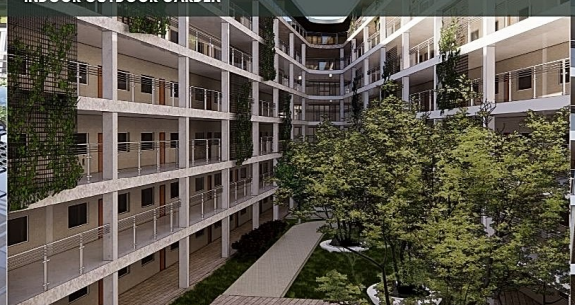




HYDROPONIC FARM LEVEL



INDOOR OUTDOOR GARDEN



UNIT EXTERIOR FACADE DETAILS