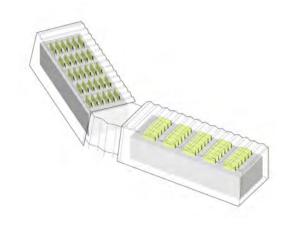
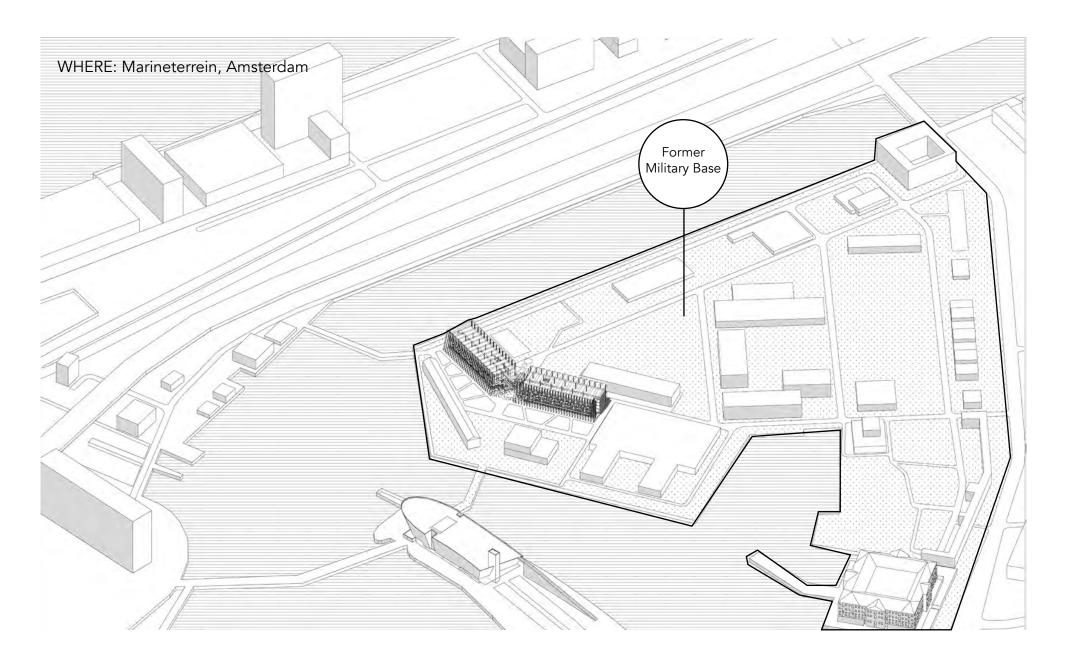
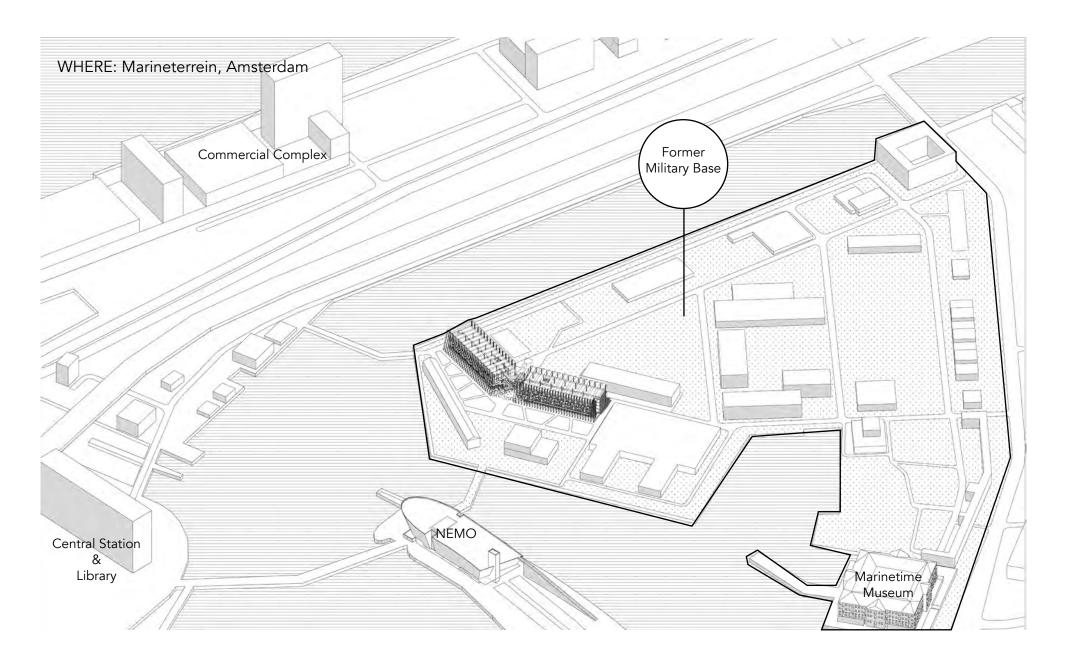
Shell

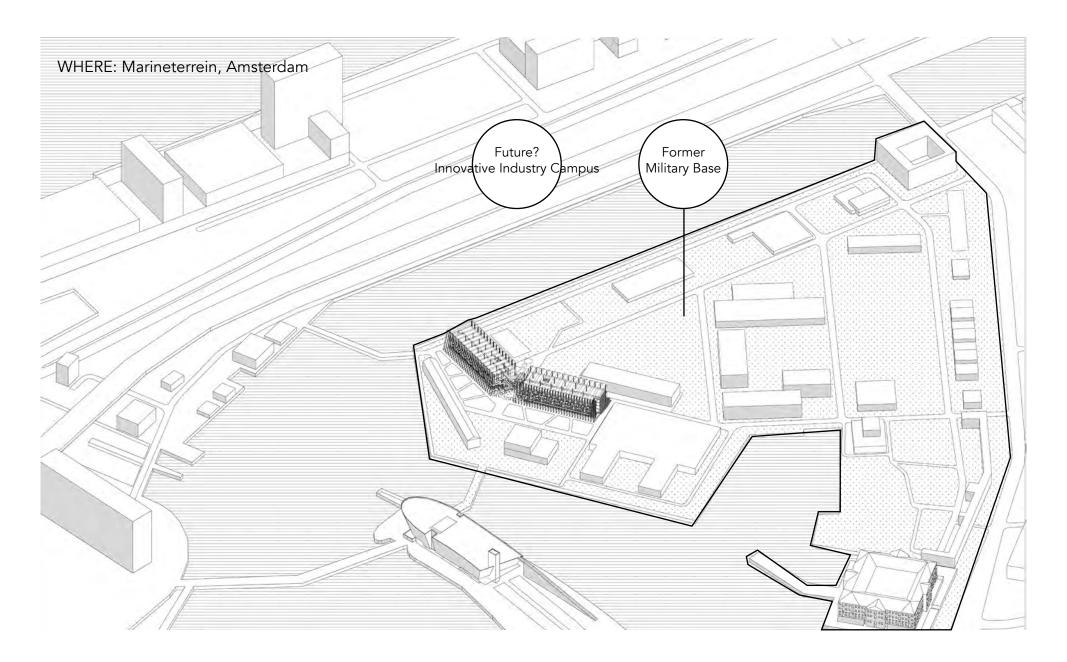
A Farm integrated dwelling with Greenhouse Envelope

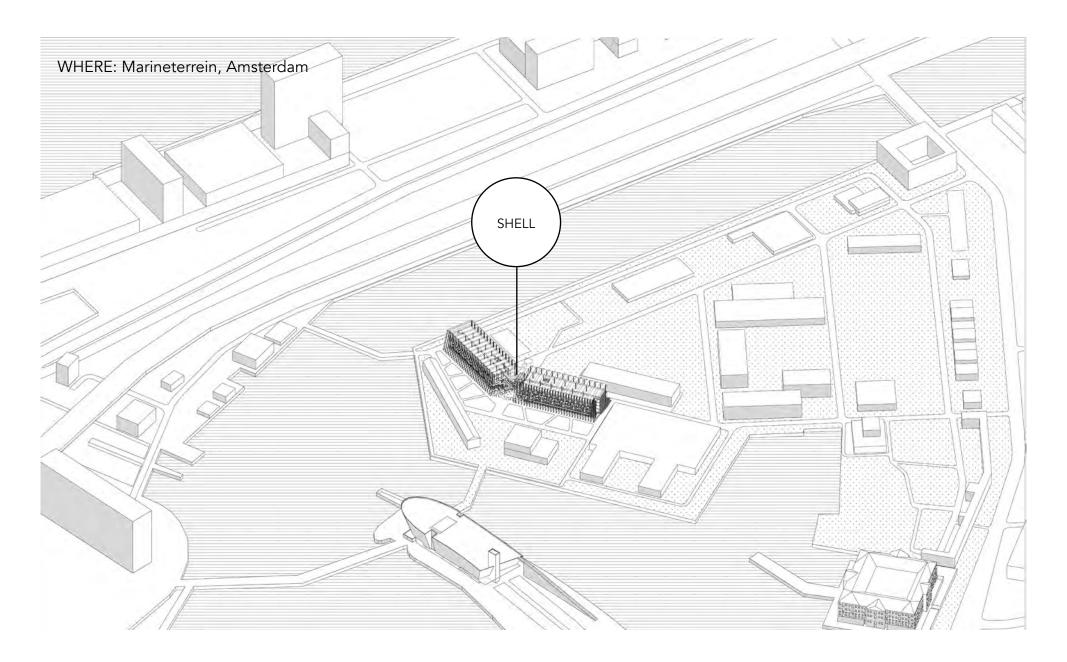
Ruoning Ni

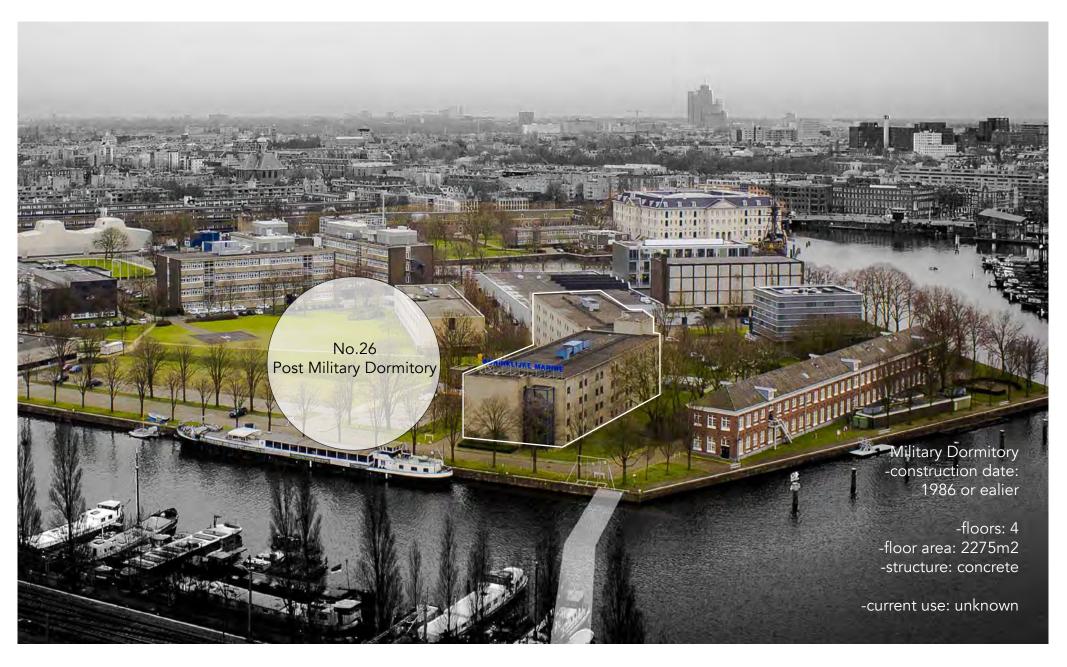




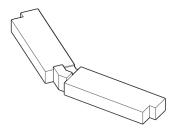




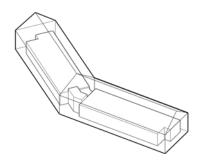




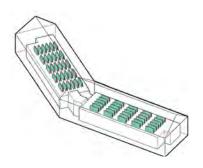
The Existing Building



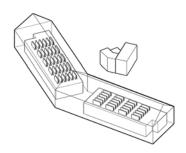
Greenhouse Envelope Added



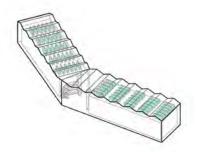
Rooftop Vertical Farm



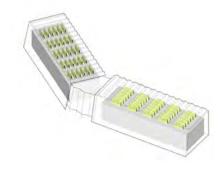
Remove the central hall



Greenhouse roof model applied



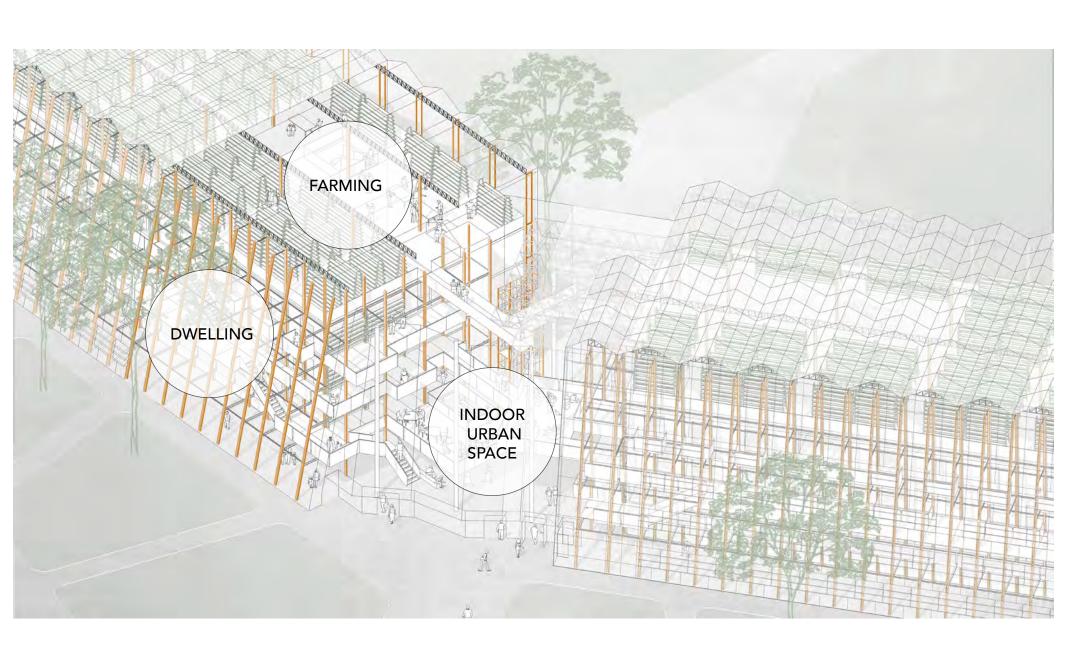
Form Revised

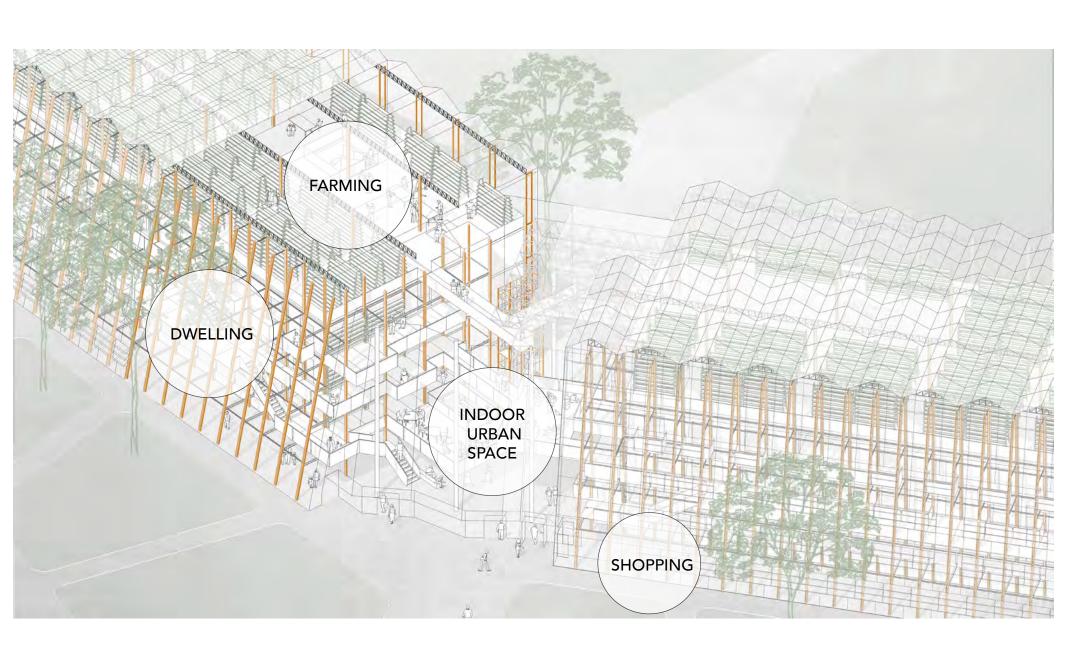






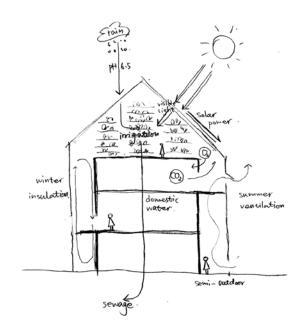






RESEARCH:

High-efficient material flow in a building integrated agriculture system based on existing building stocks



Universal Issues → ? ← Local Issues (Marineterrein)

A BORADER URBAN CONTEXT

Universal



growing demand for local food

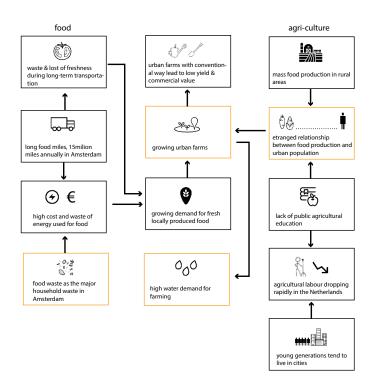
huge cost for food transportation



intensive urban land use

wasted rooftop space

Food Production Chain



exiting issues

key facts with potentials to be integrated in one system

Universal



growing demand for local food

huge cost for food transportation



intensive urban land use

wasted rooftop space



rooftop farming



Oppoturnity

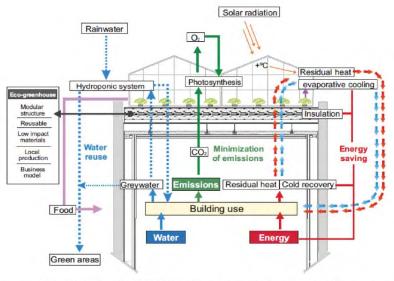


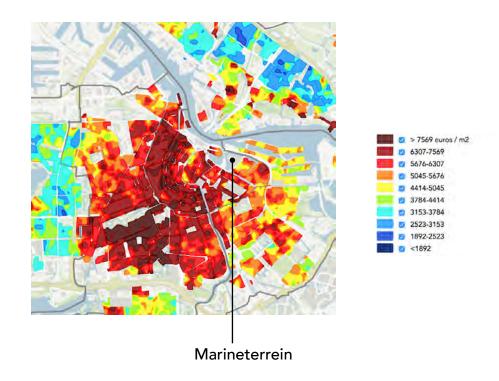
Figure 2: Conceptualization of RTEG. The illustration emphasizes the interchange of water, energy and gas (e.g., CO₂) flows between the rooftop greenhouse and the associated building.

The Rooftop Eco-Greenhouse System

Local (Marineterrein)



Housing value in euros/m2

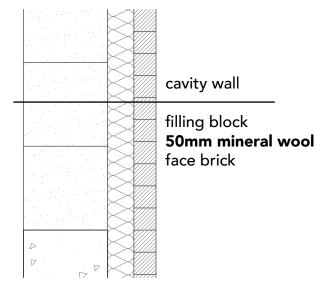


Local (Marineterrein)

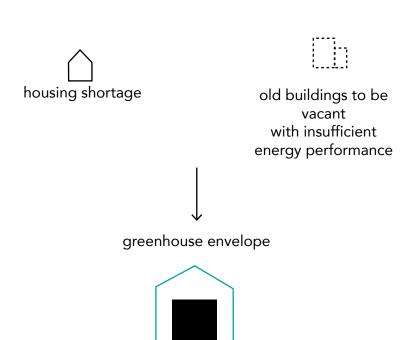
housing shortage



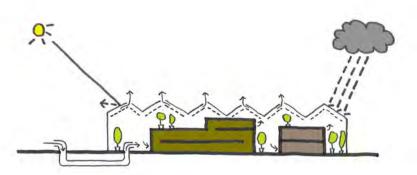
old buildings to be vacant with insufficient energy performance



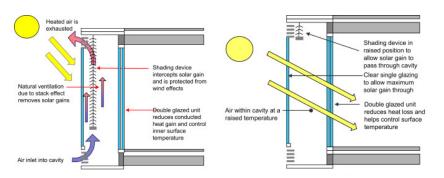
Local (Marineterrein)



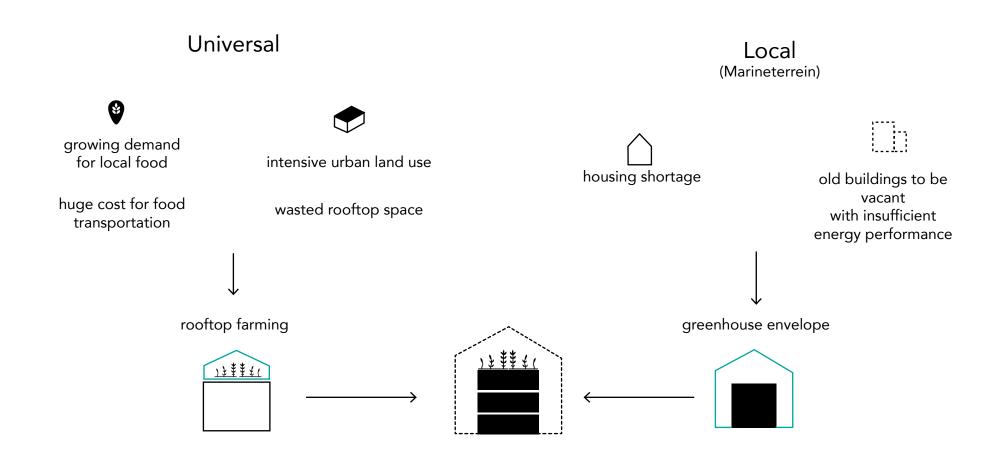
Oppoturnity



An Intermediate Climate Envelope

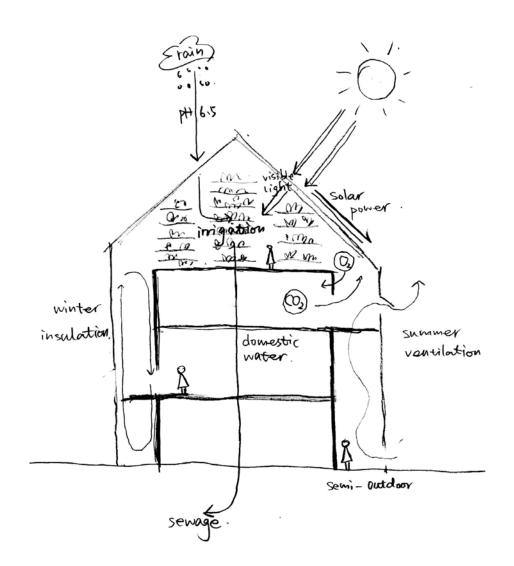


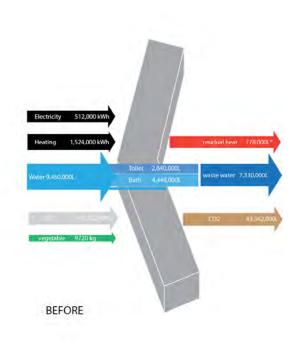
Double Skin Facade System

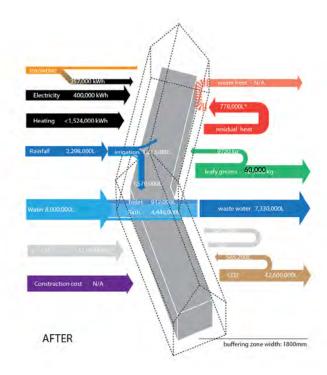


RESEARCH:

High-efficient material flow in a building integrated agriculture system based on existing building stocks







SAVE

90% Greenhouse Heating cost

? Residential Heating cost 100% Irrigation water

11% domestic water

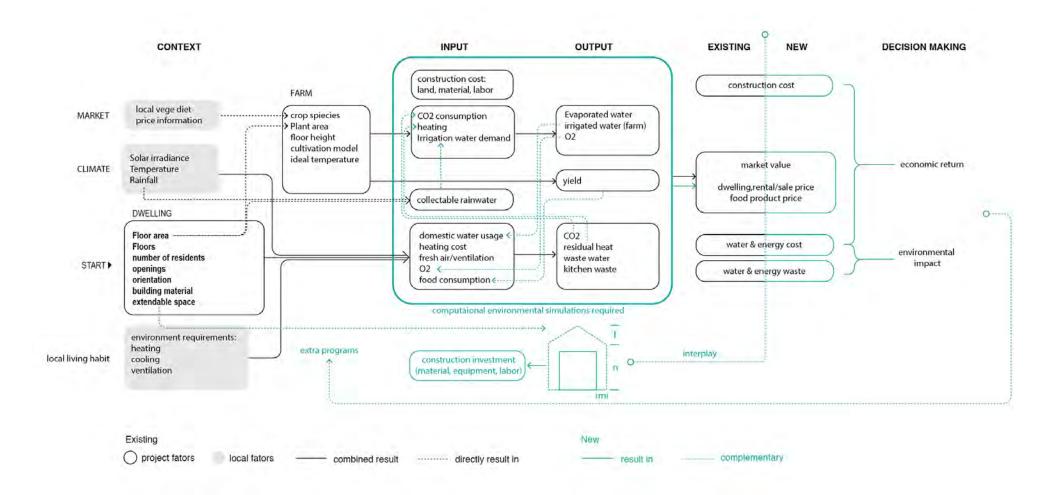
PRODUCE



565.200L O2

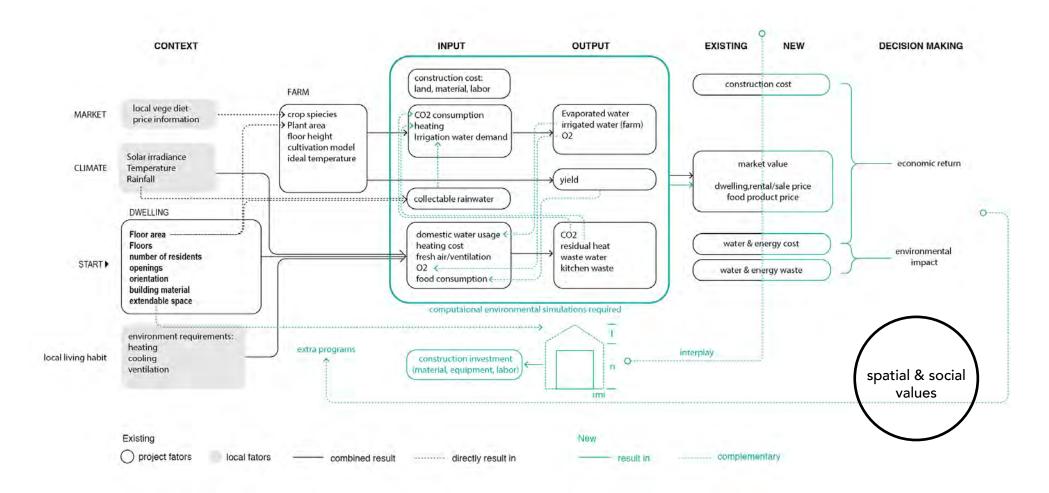
WHAT'S MORE

workflow for value assessment & decision making



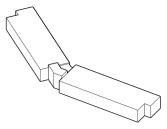
WHAT'S MORE

workflow for value assessment & decision making

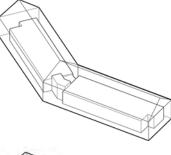


THE RESEARCH

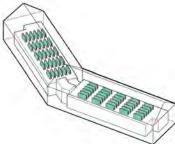
The Existing Building



Greenhouse Envelope Added



Rooftop Vertical Farm



BEYOND THE RESEARCH

SPATIAL VALUE

Intermediate Space

- -Fresh Air
- -Open View
- -Protected from the weather

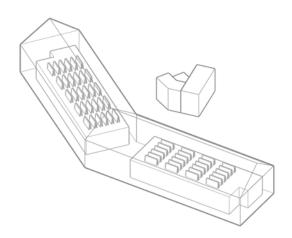
SOCIAL & EDUCATIONAL VALUE

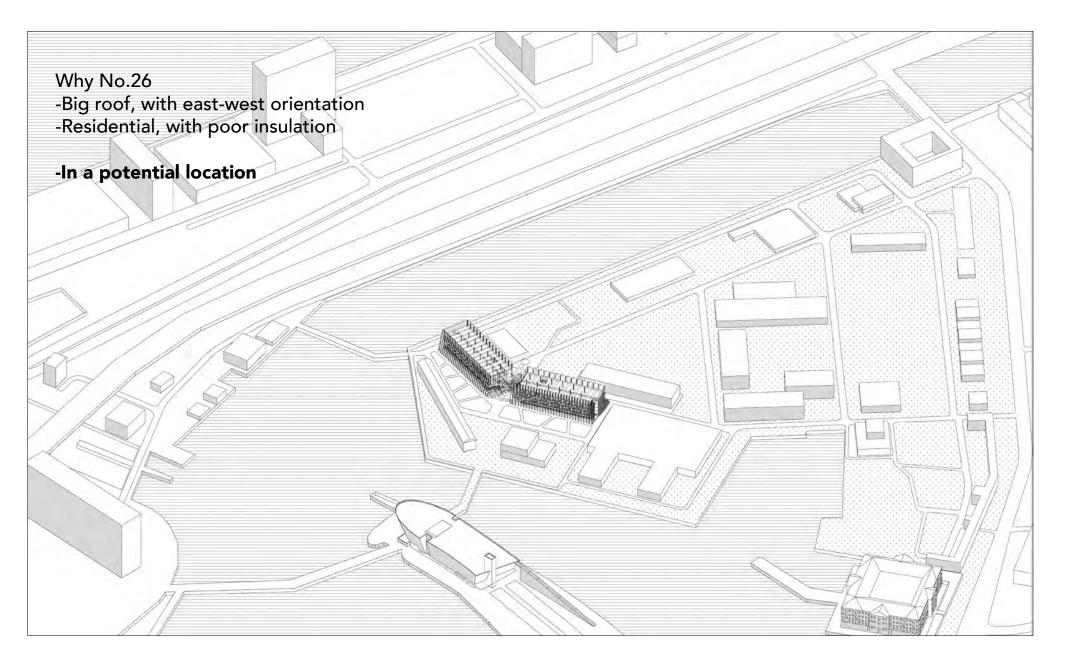
- -Connect the neighbourhood
- -An urban agricultural culture

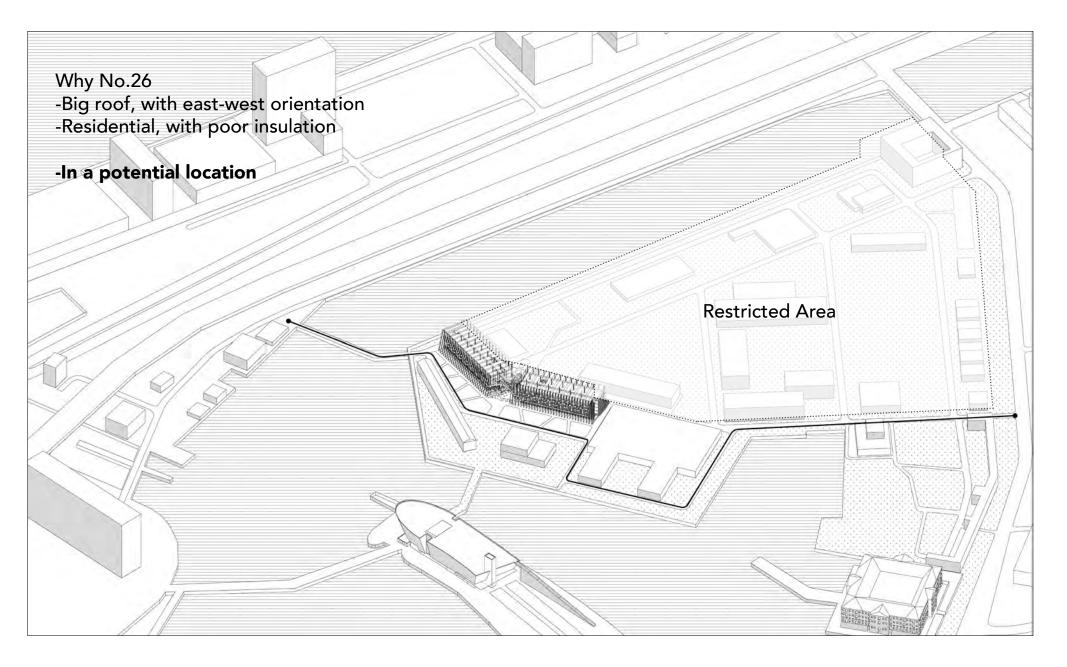
BUILDING PERFORMANCE

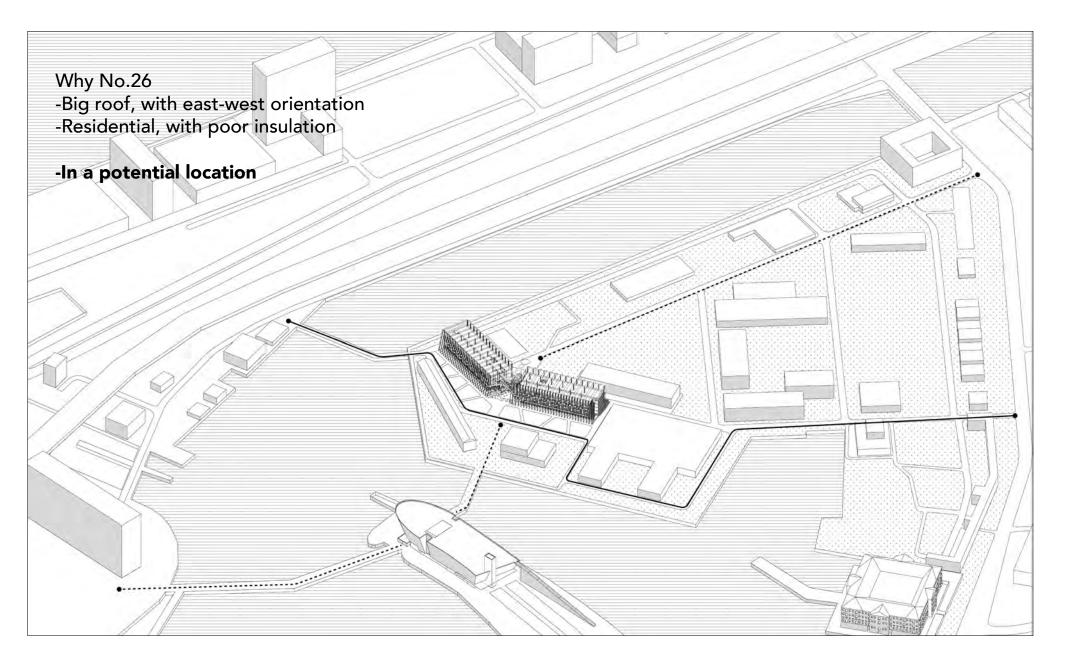
- -Efficient material flows
- -Light-weight, flexible, multi-functional structure

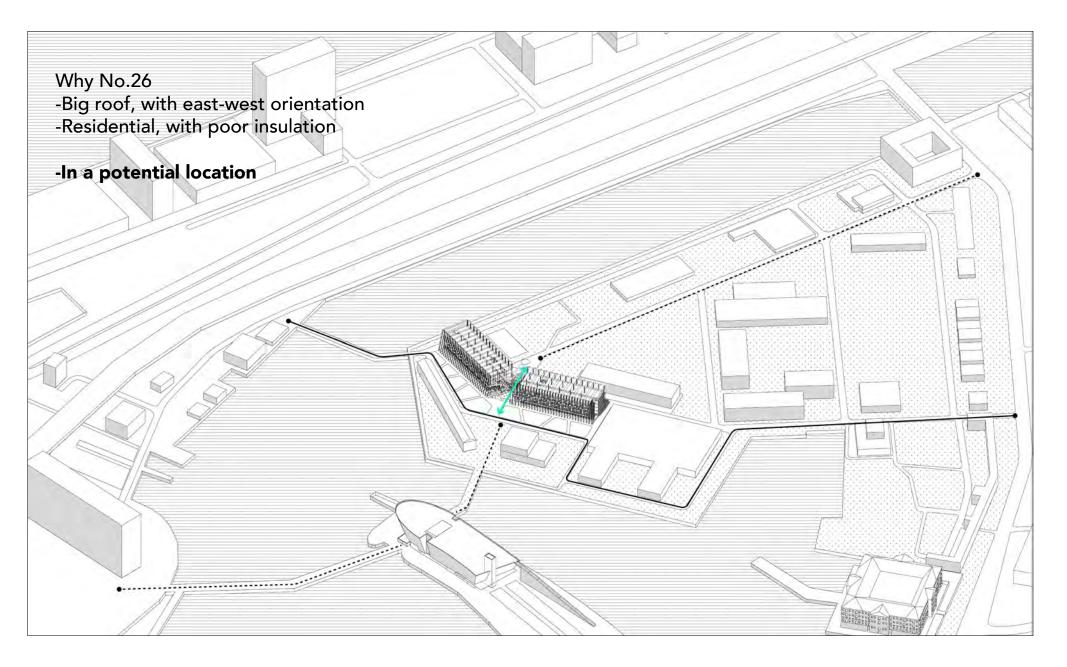
Remove the existing central hall

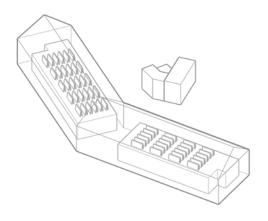






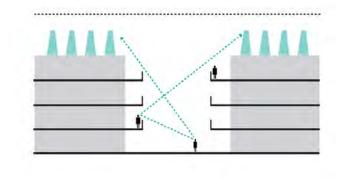




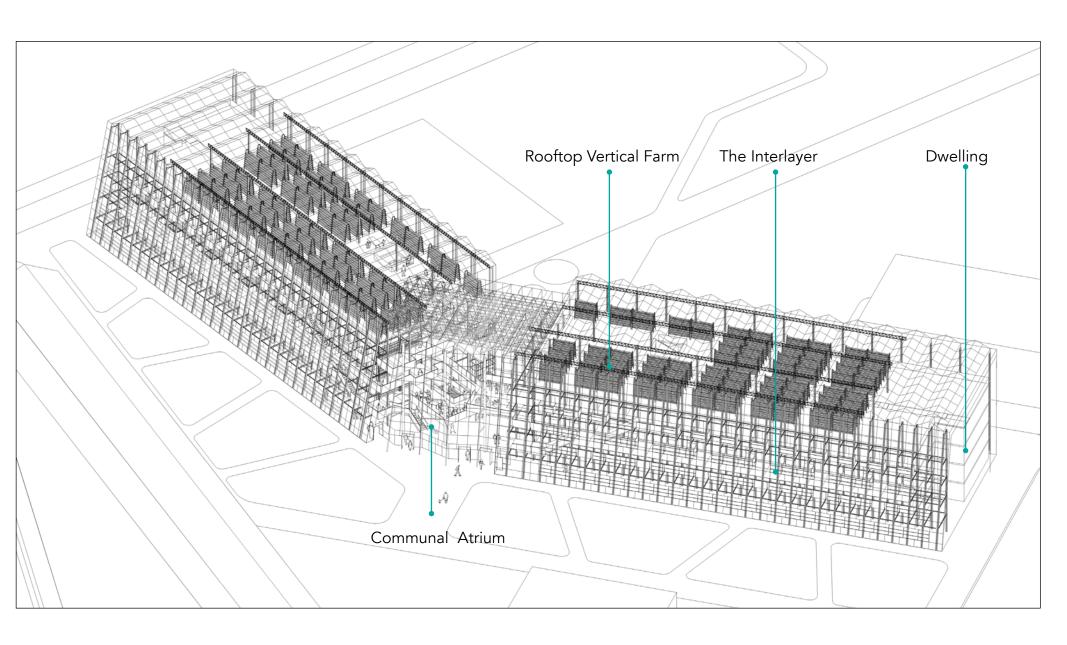


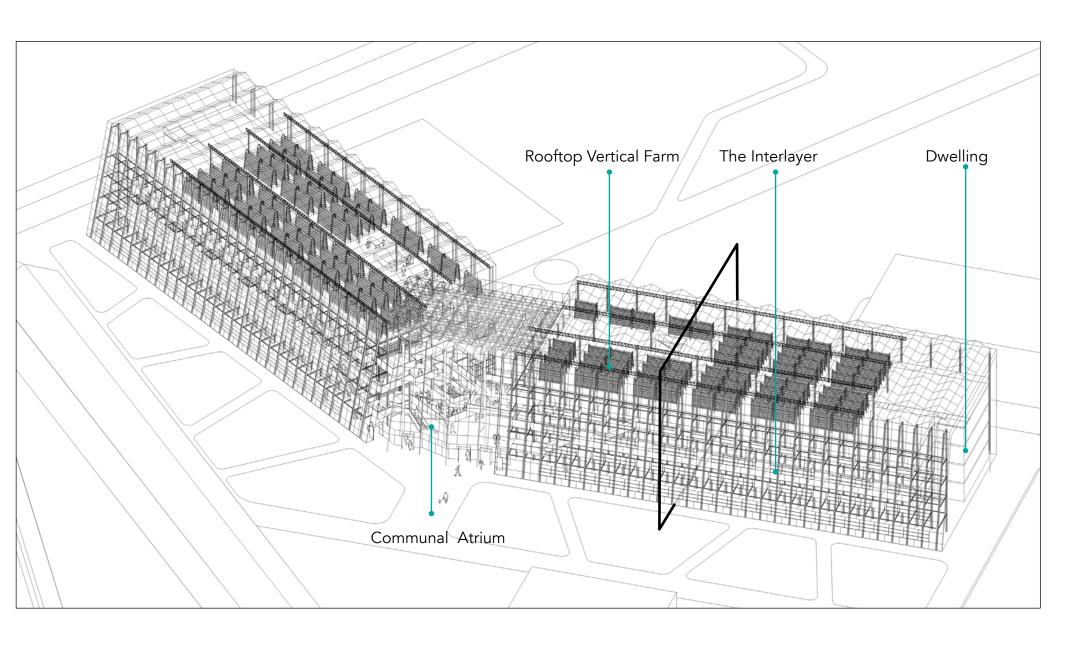




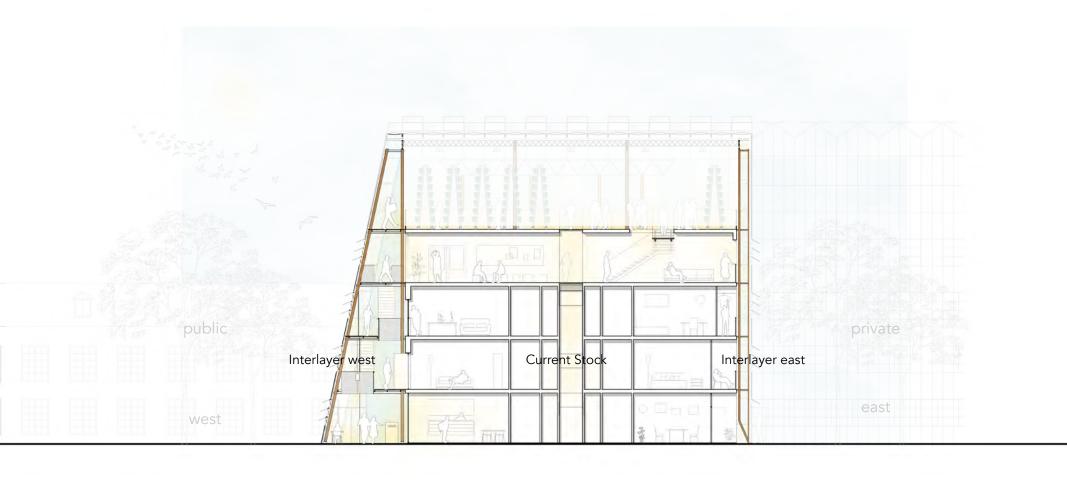


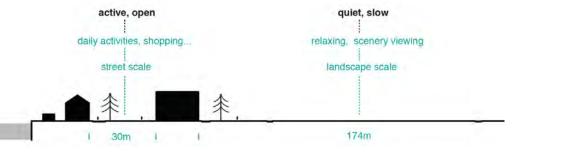
Inside

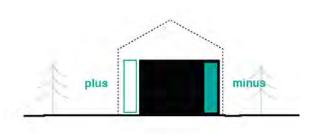


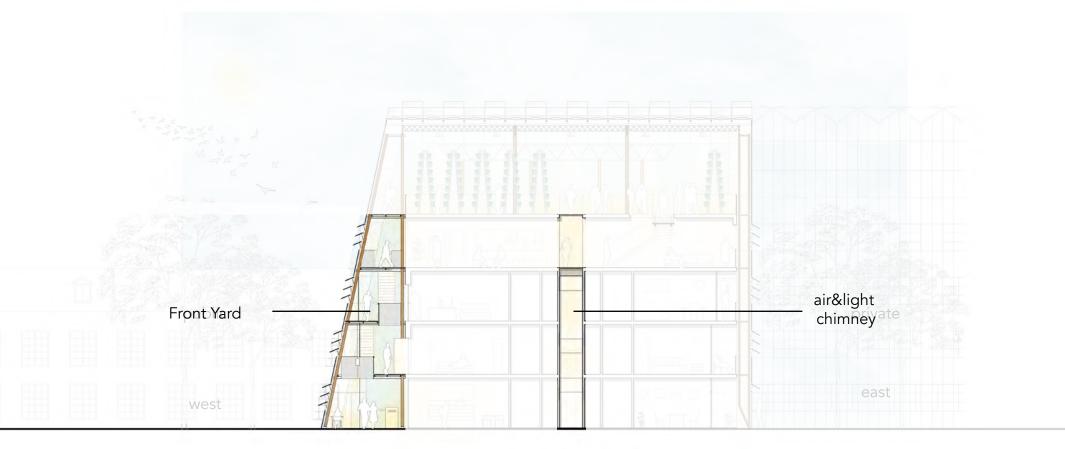


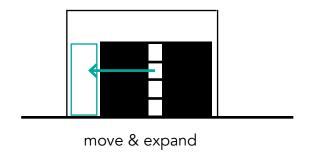


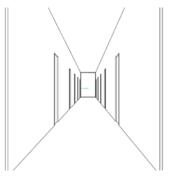


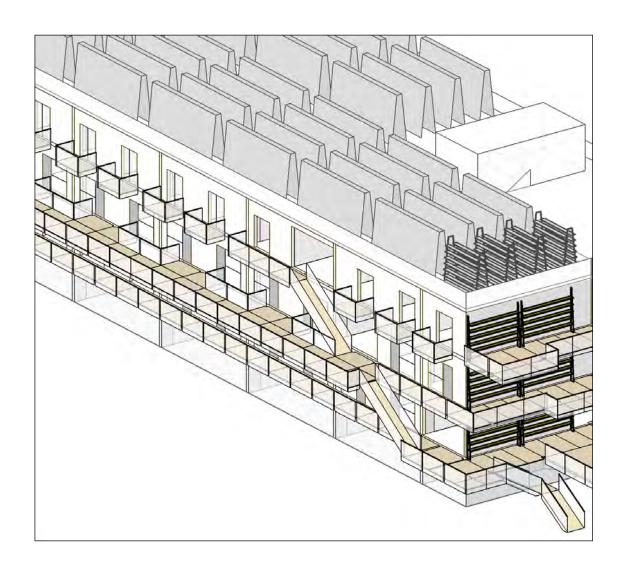


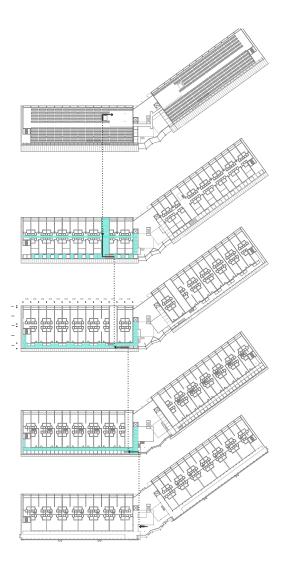


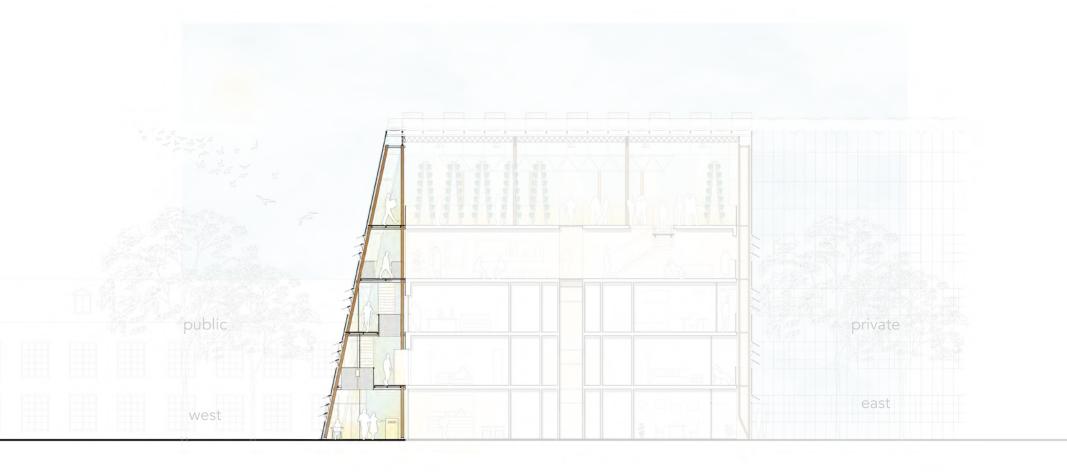






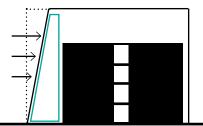


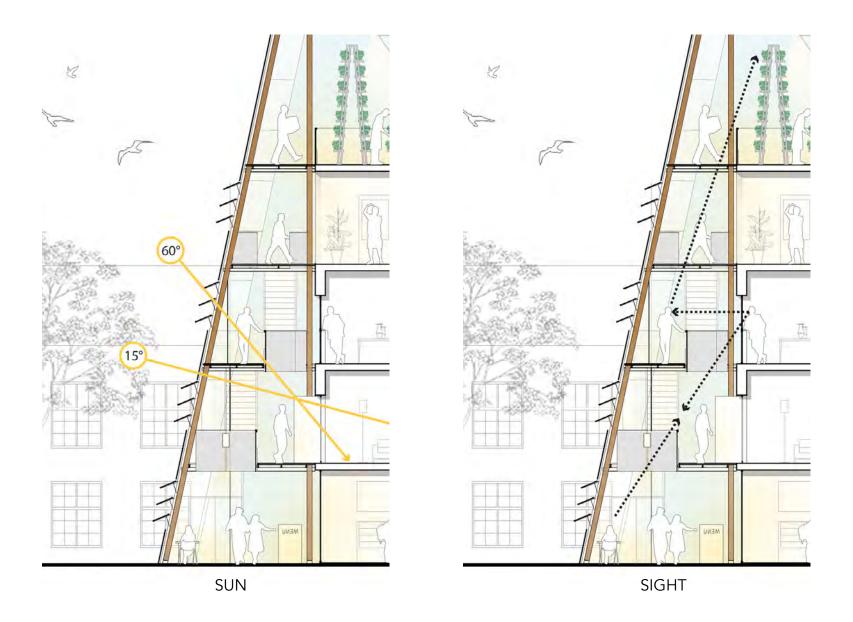




Less wind force

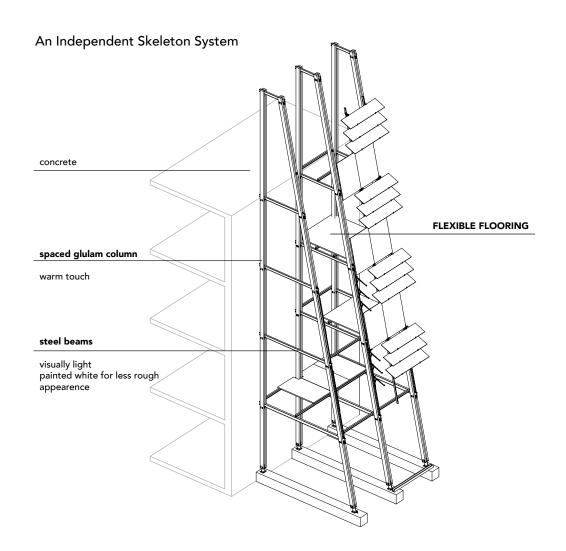
More structural stability







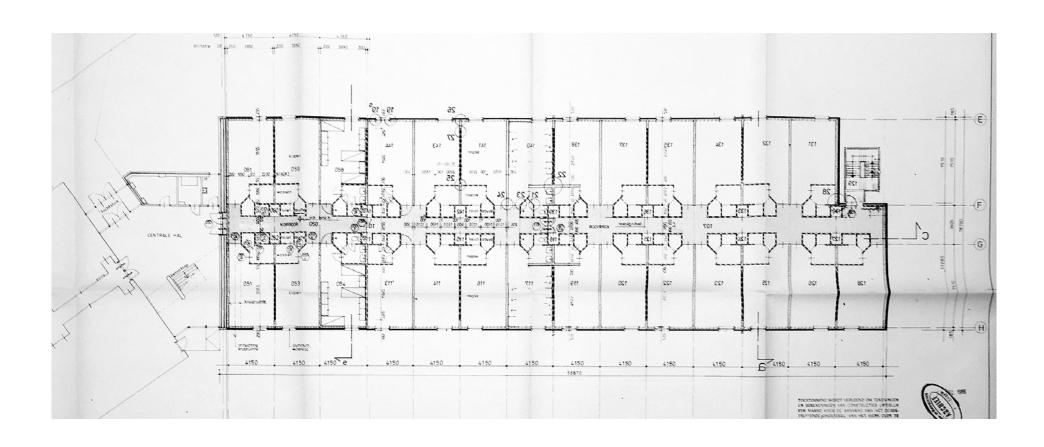
STRUCTURE







GROUND FLOOR (CURRENT)

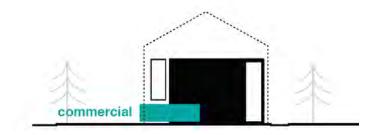


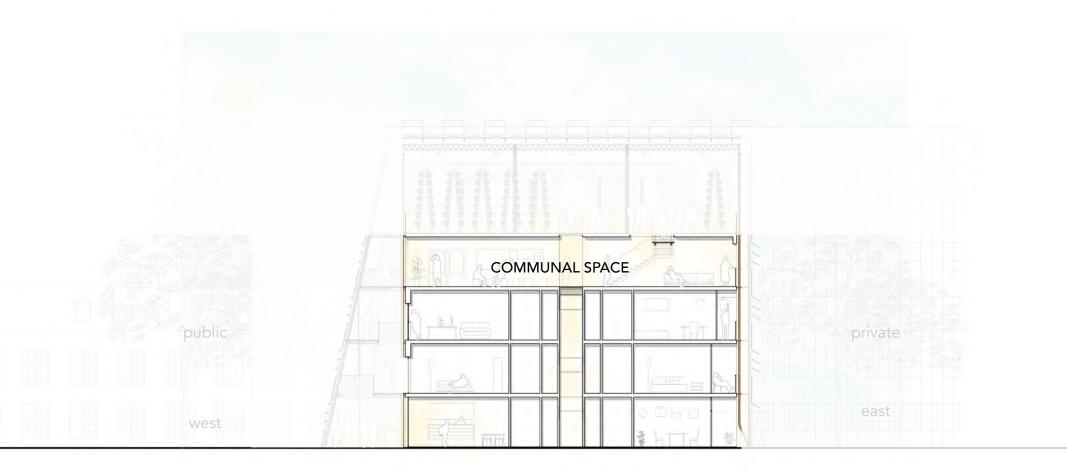


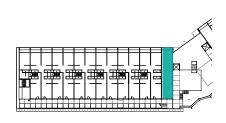
shops/offices

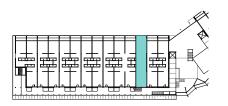
various room types residential communal space

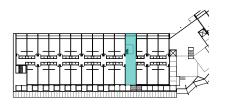




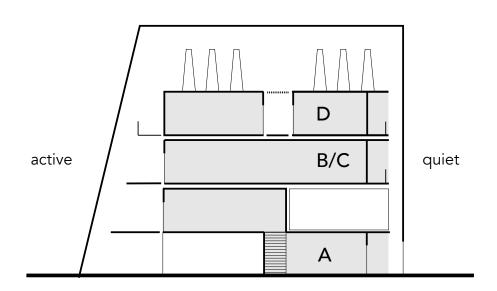


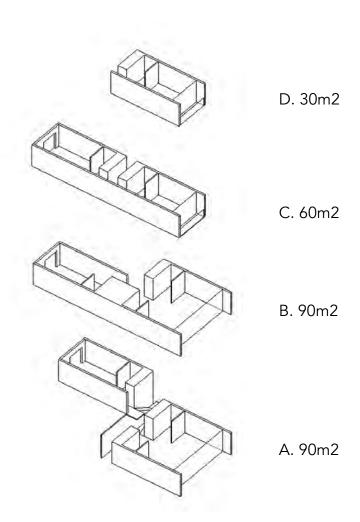






THE INTERLAYER - HOUSE TYPES





WEST EAST





FARM



A farm for production & experience

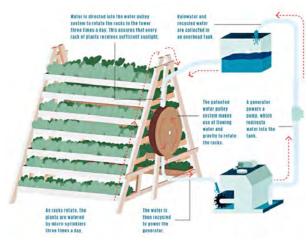
FARM



A farm for production & **experience**



A daylighting vertical farming system



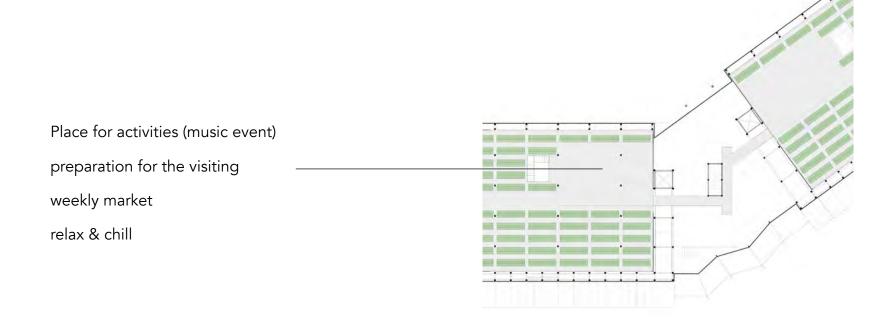
Yield: **60600** kg/yr

dutch vege consumption: 46 kg /capita/yr

1320 ppl yearly vegetable demand

 $designed\ residents\ number: \textbf{216}$

ROOF FARM

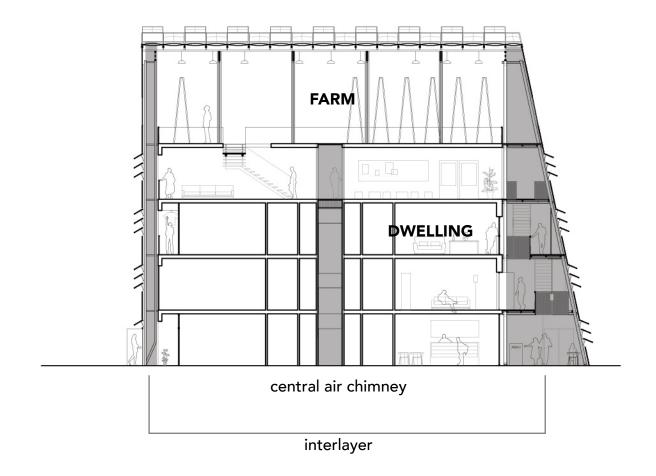




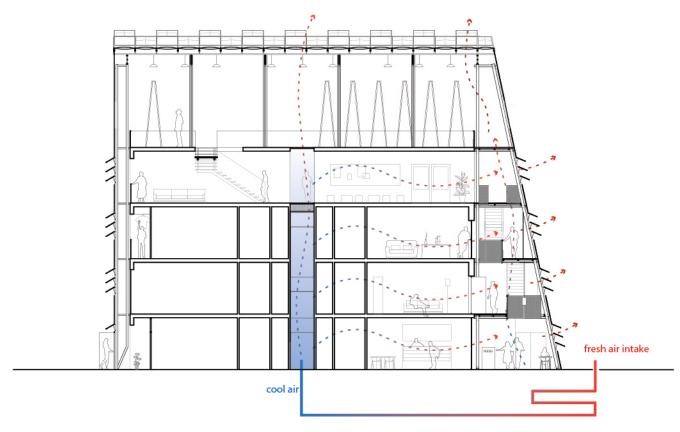


HOW IS THE RESEARCH APPLIED?

CLIMATE - AIR & HEAT



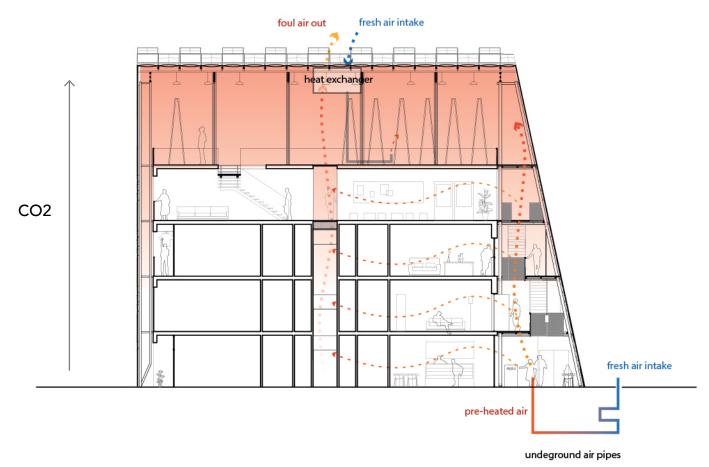
CLIMATE - AIR & HEAT



undeground air pipes

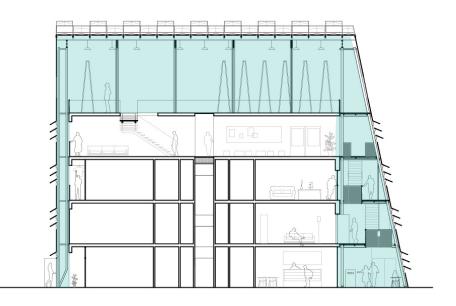
SUMMER

CLIMATE - AIR & HEAT

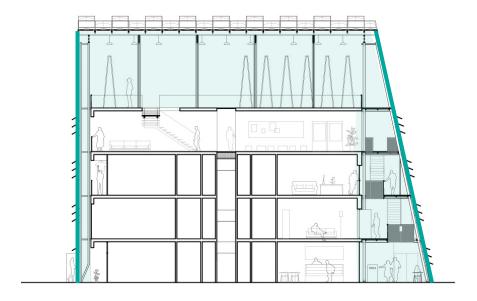


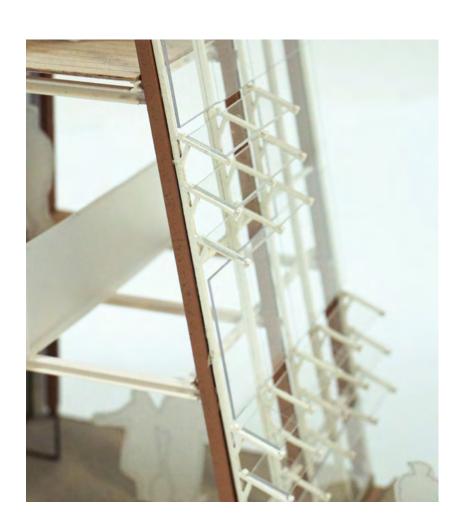
WINTER

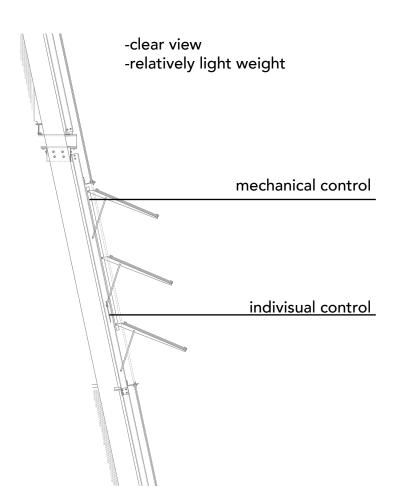
An **intermediate climate** between indoor & outdoor



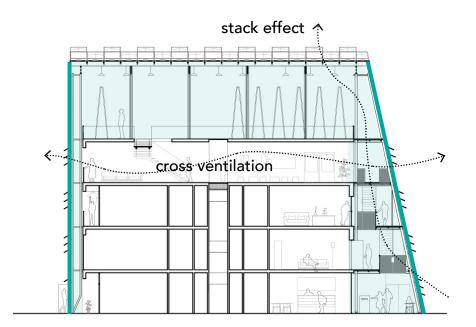
Facade: single glazing



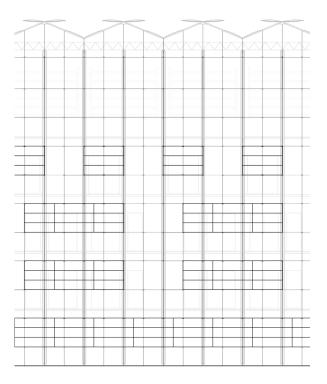




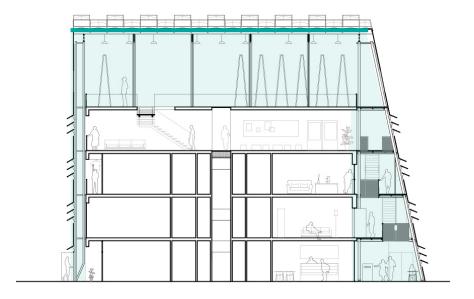
Facade: single glazing



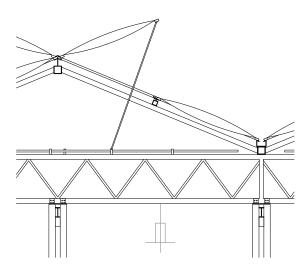
Fenestration

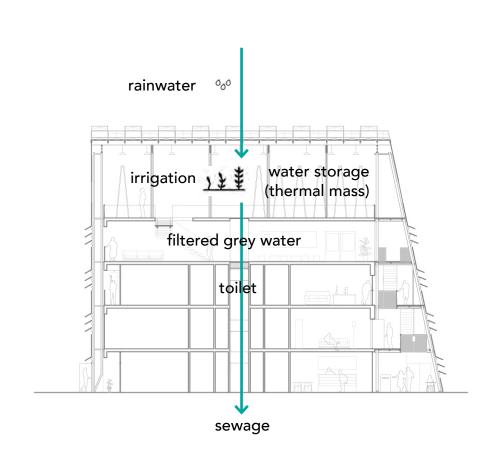


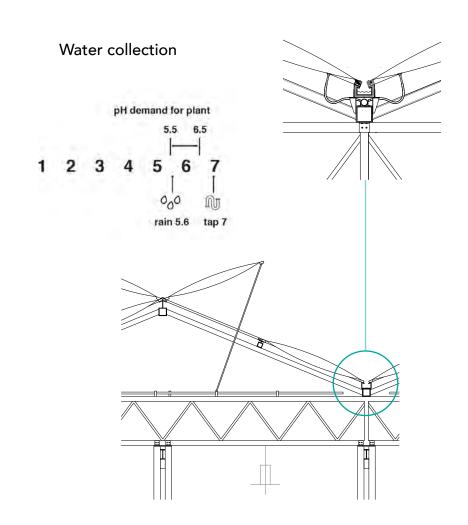
Roof: ETFE cushion

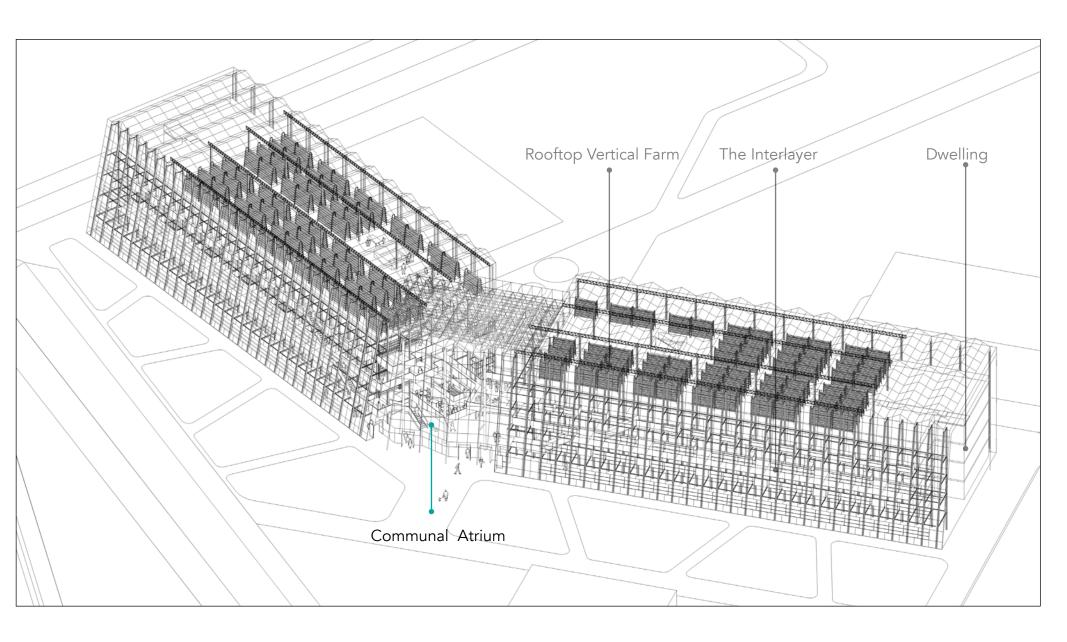


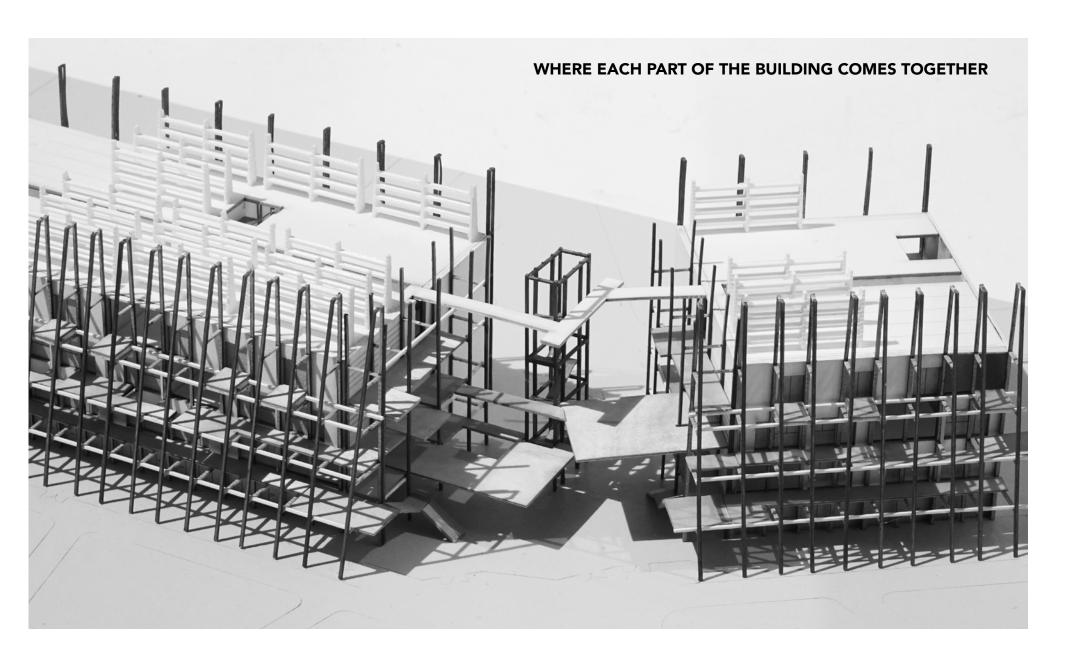
- -Efficient insulation for roof farm
- -Defuse sunlight, avoid sun burn, filter ultraviolet
- -Light-weight

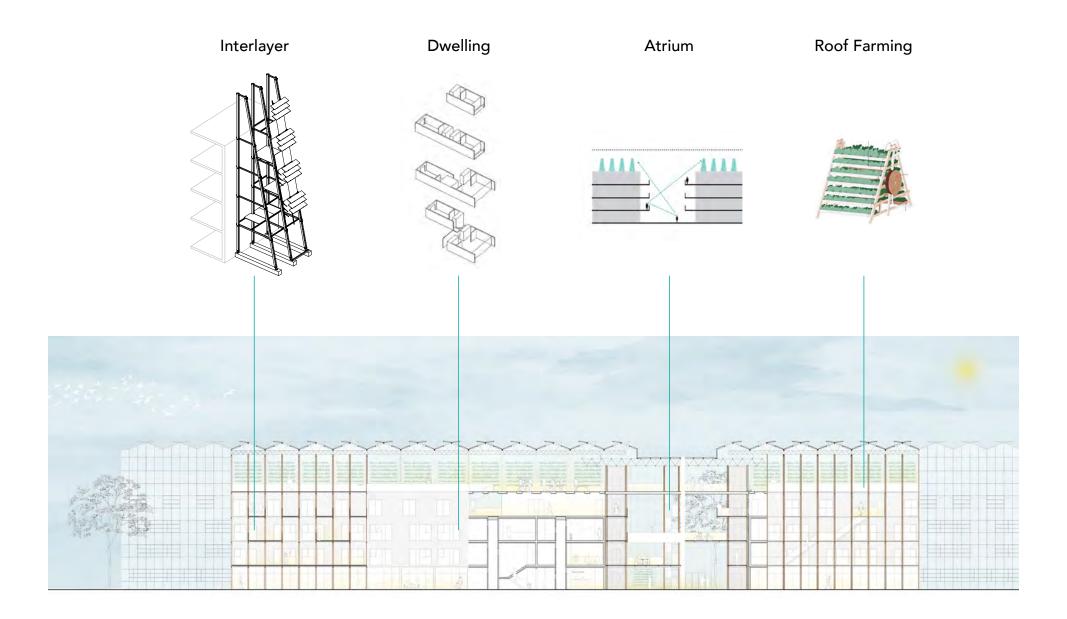




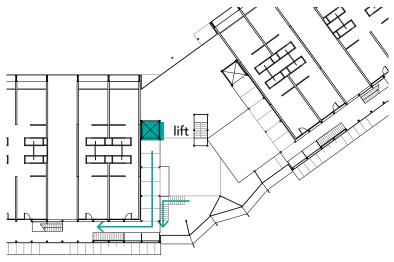




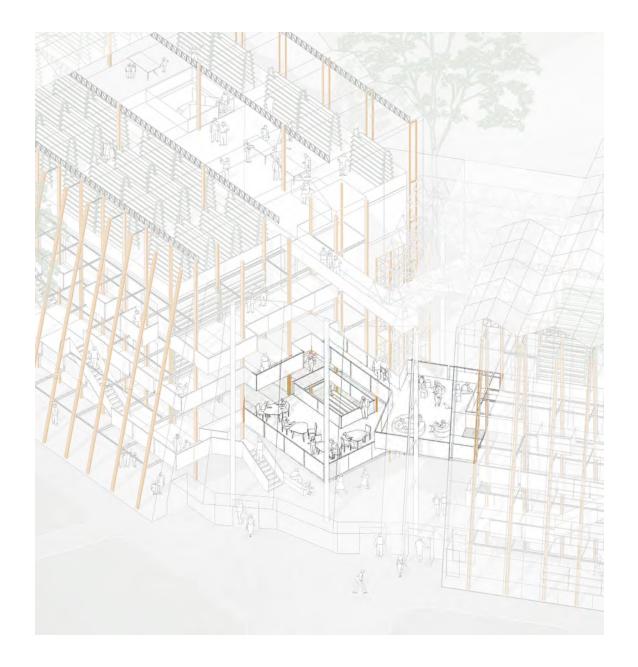


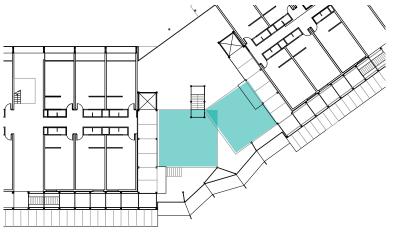






BALCONIES TO THE SIDE CORRIDORS



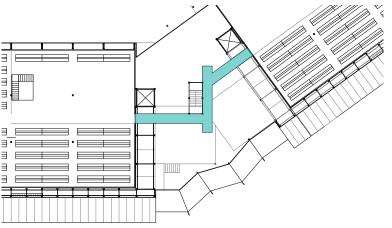


EXTENDED BALCONIES FOR VISITORS & RESIDENTS

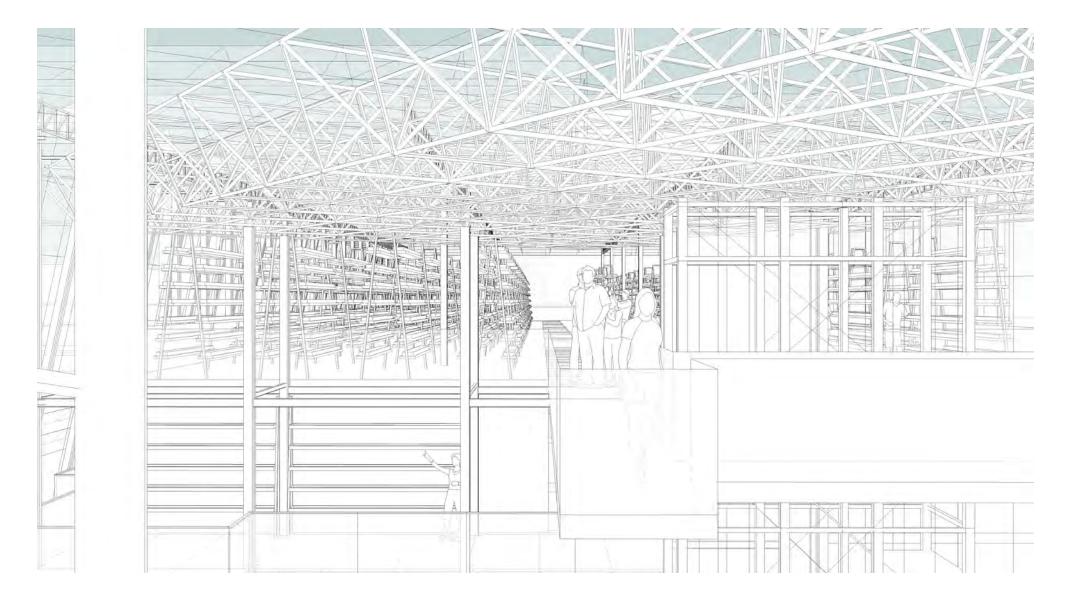


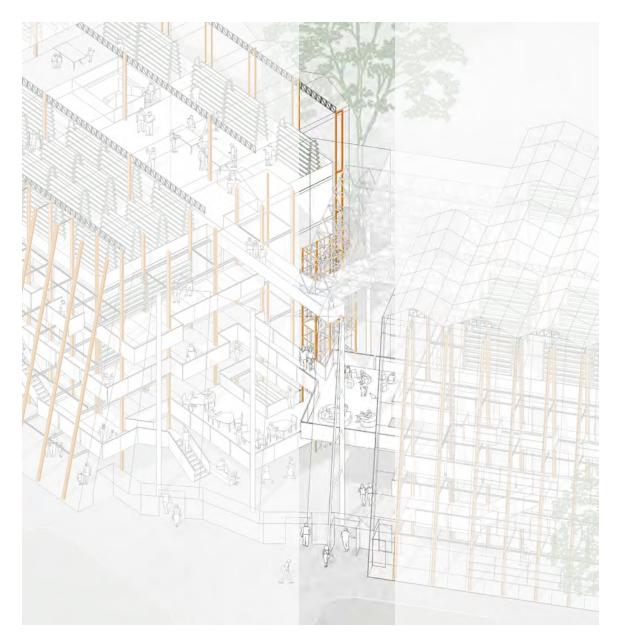


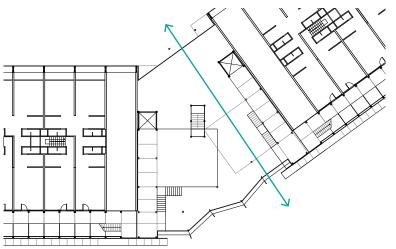




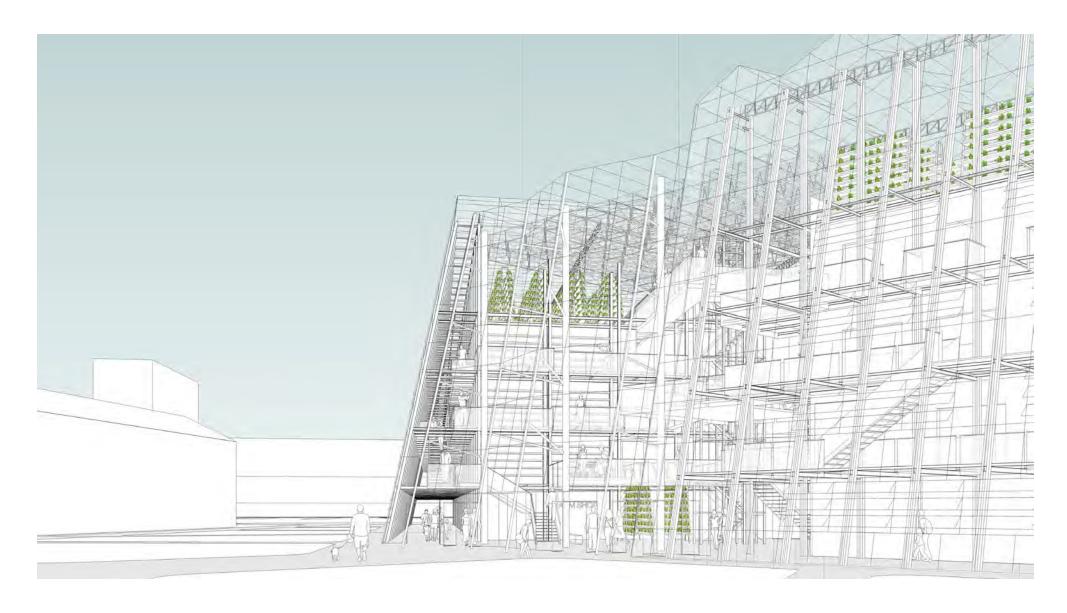
CONNECTION BETWEEN 2 ROOFS

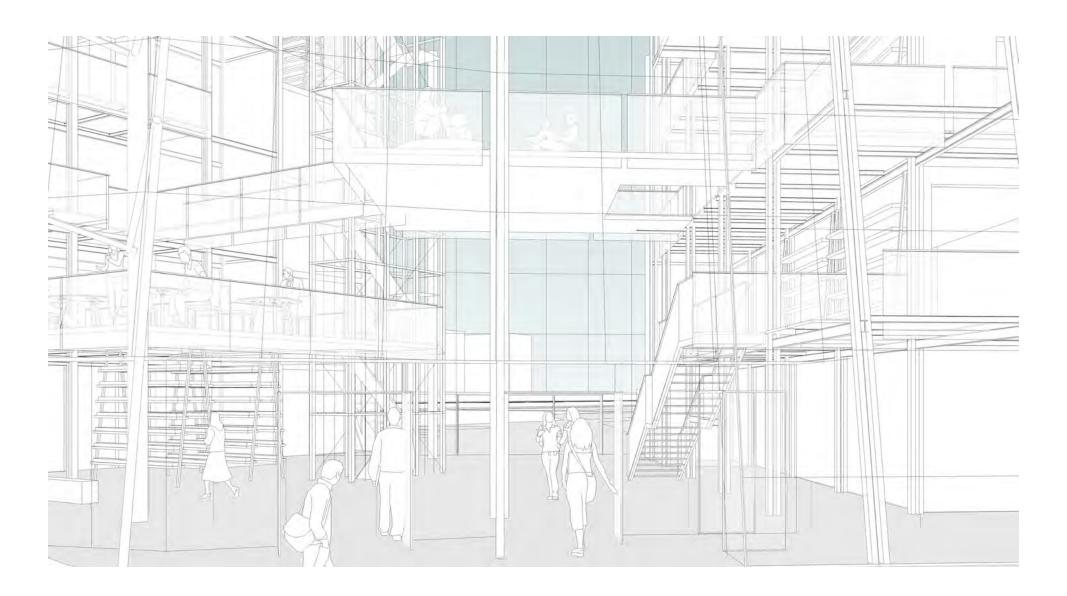


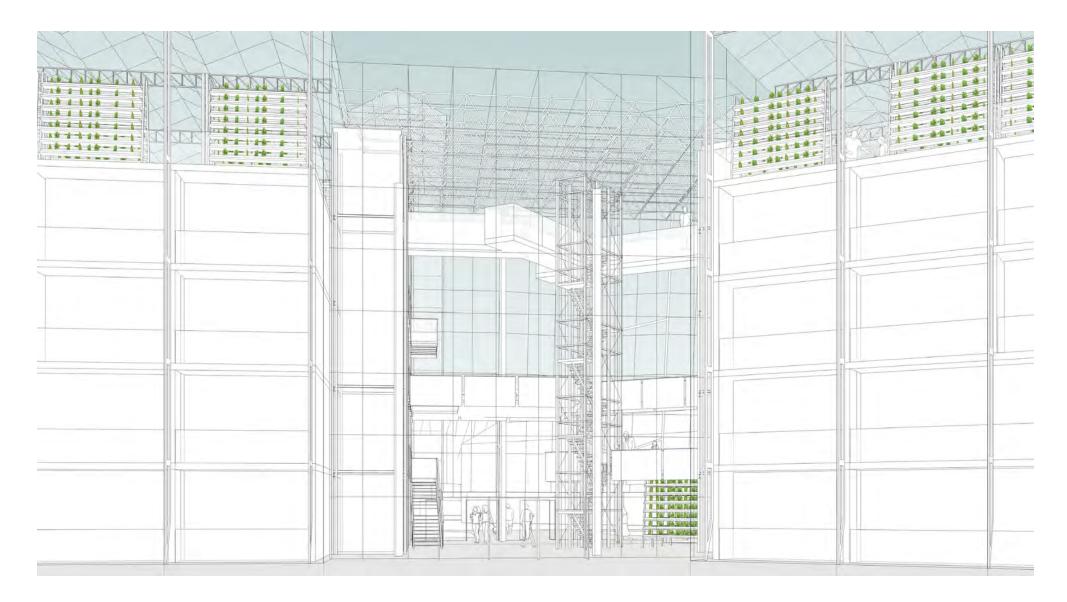


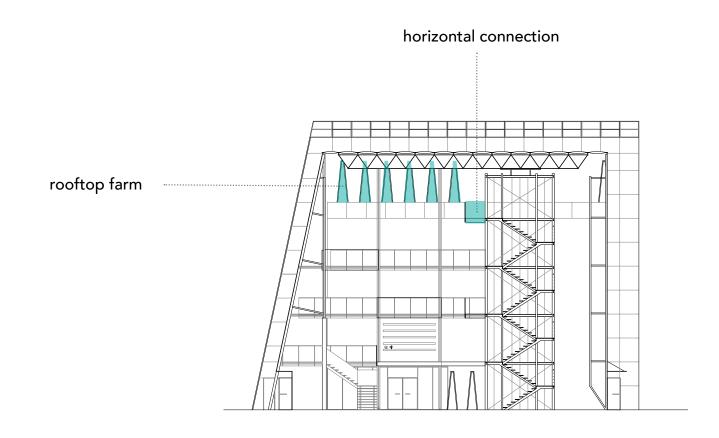


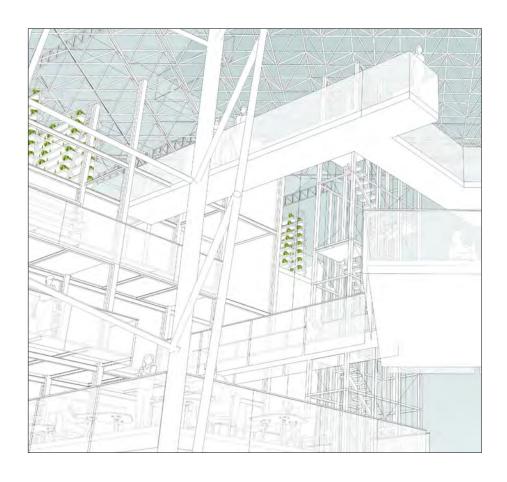
FORMED A EAST TO WEST PASSAGE

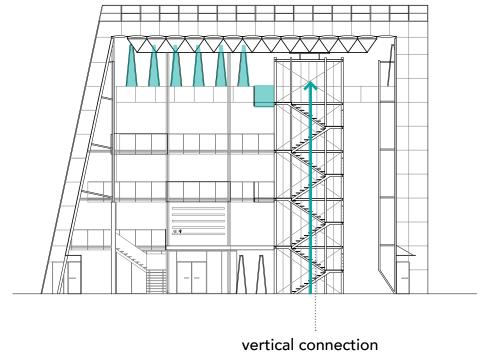








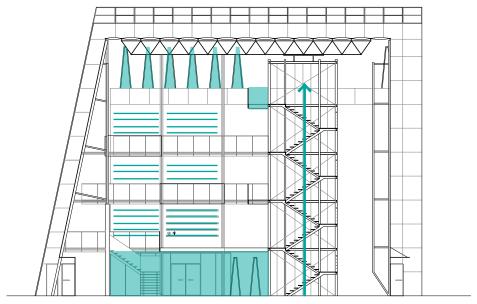




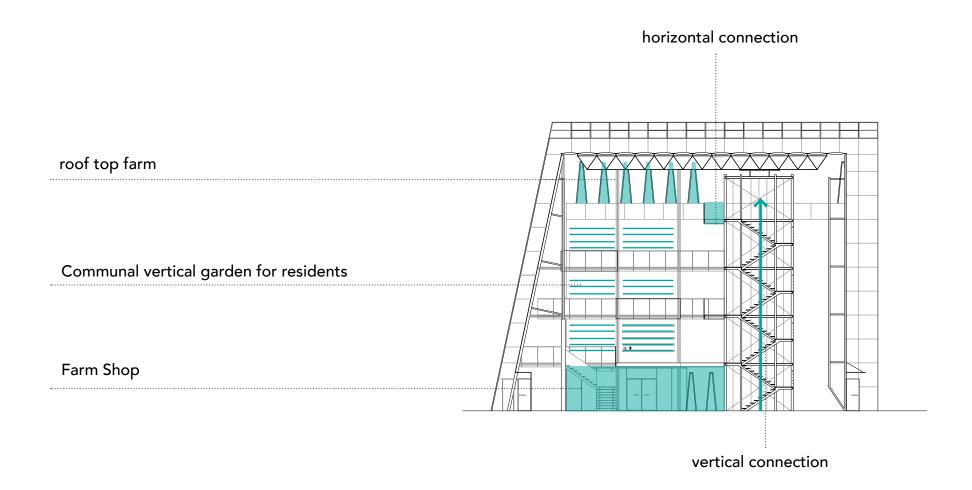


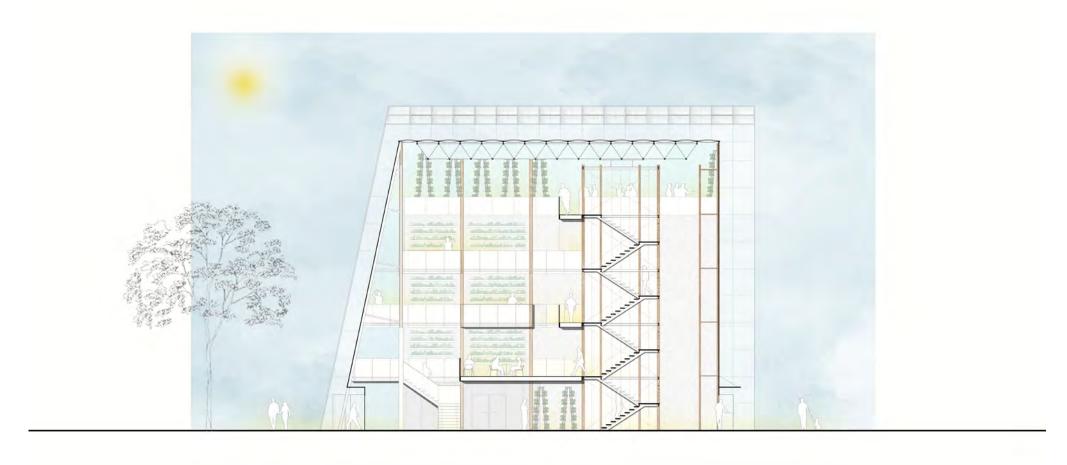






Communal vertical garden for residents



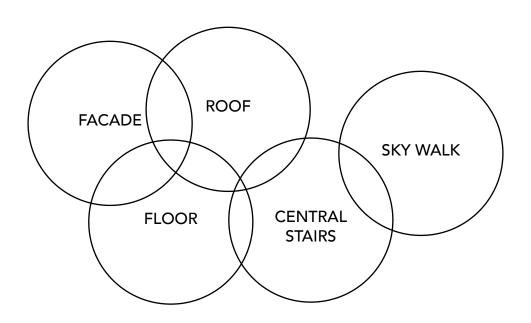


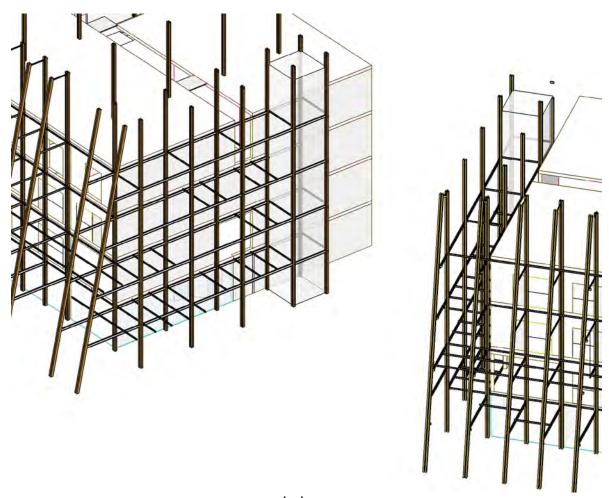


AN INDOOR URBAN SPACE

HOW IS IT SUPPORTED?

FLOW OF THE LOAD

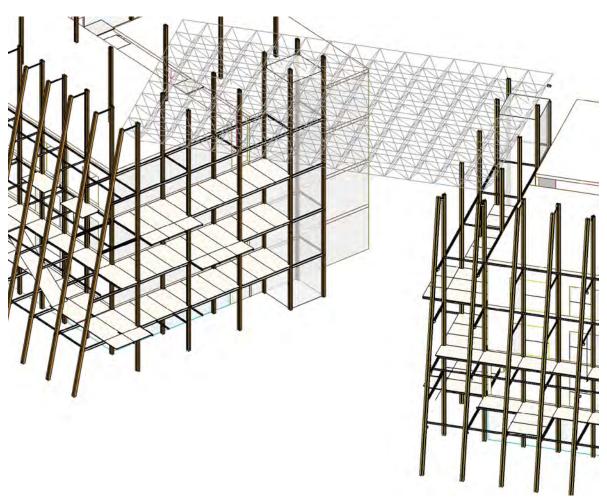




skeleton



balconies



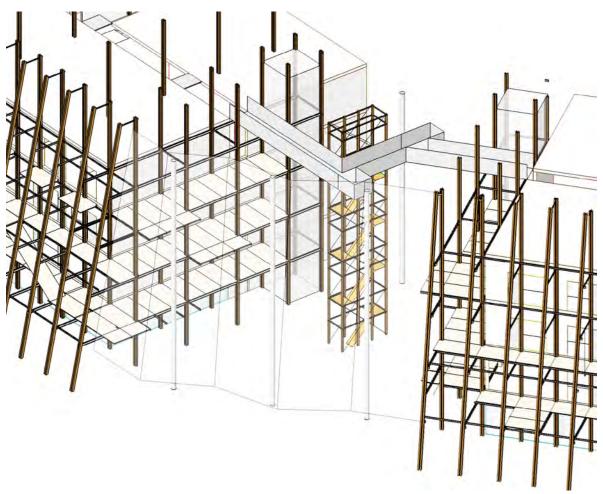
roof space frame



horizontal passage



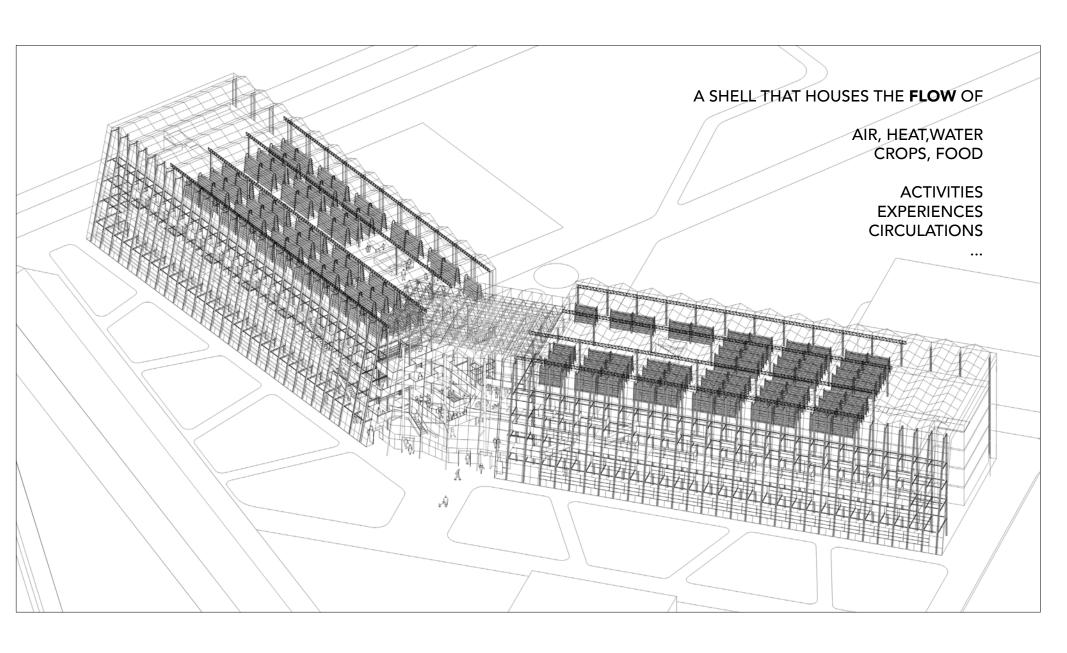
curtain wall support

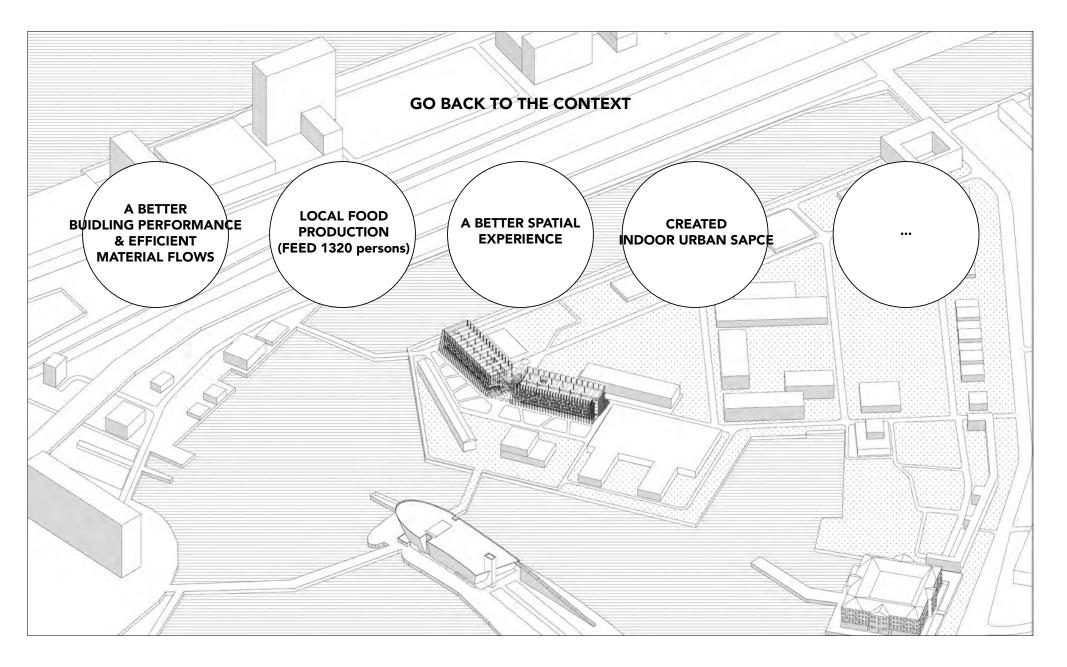


curtain wall support

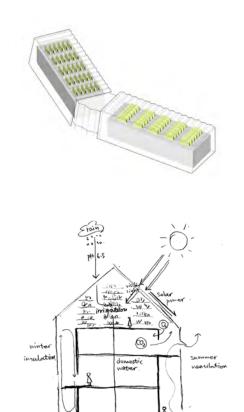


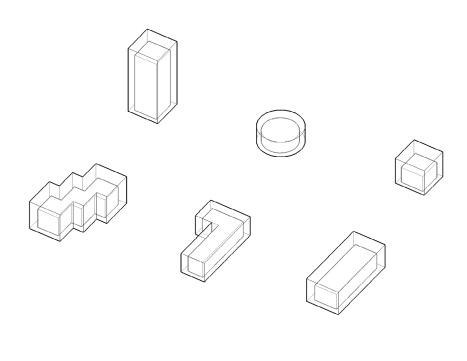
terraces





BROADER APPLICATIONS?





CHALLENGIESworkflow for value assessment & decision making

