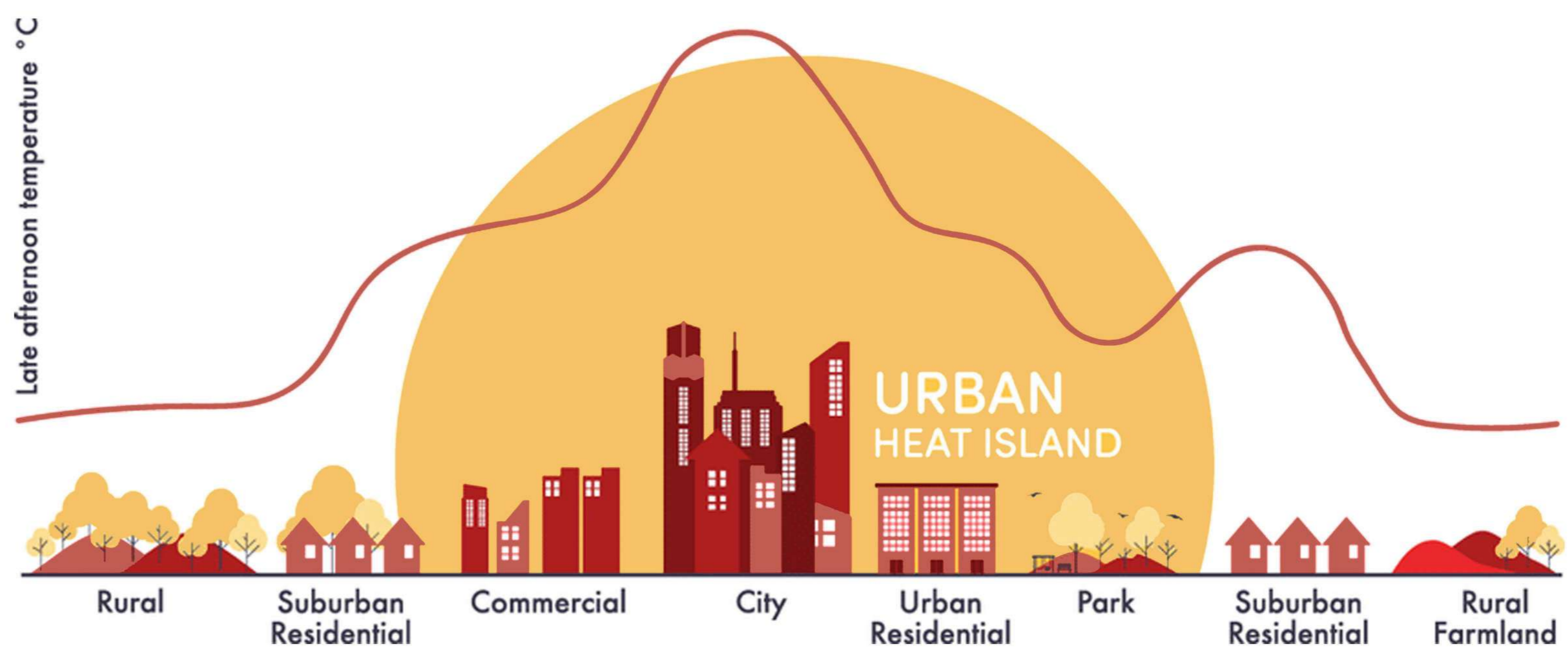


CLIMATE ACTIVISM & DISASTER MANAGEMENT CENTRE

- an adaptation strategy for the (un)certain future -



ADAPTIVE REUSE | REMEDIATION | DIDACTIC | PEDAGOGICAL |
HYDROPHILIC & BIOPHILIC | ECOLOGICAL HABITAT



Over the past four decades, South Africa has experienced more than 82 hydro-meteorological hazards (floods, storms, landslides, wildfires, droughts and extreme temperatures) that have resulted in the death of 1,692 people and affected more than 21 million people. There is overwhelming scientific evidence showing that the intensity and frequency of hydro-meteorological hazards have increased in the past four decades and will likely continue along this path under the current projected climate scenarios.

The world's urban population is also growing and Africa specifically is urbanising at a rapid rate. It is expected that South Africa will follow this trend and experience high population growth and urbanisation in the next three decades.

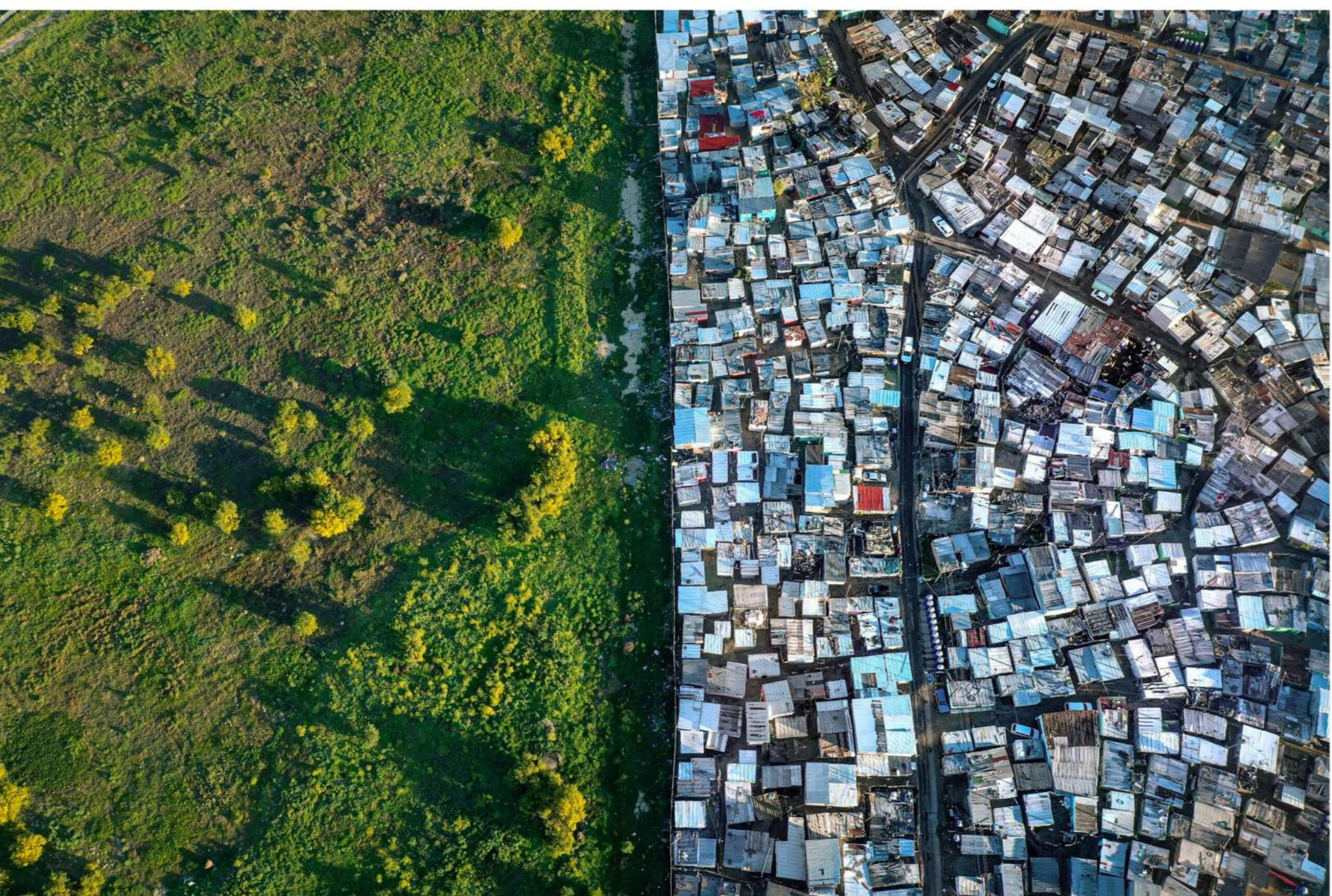
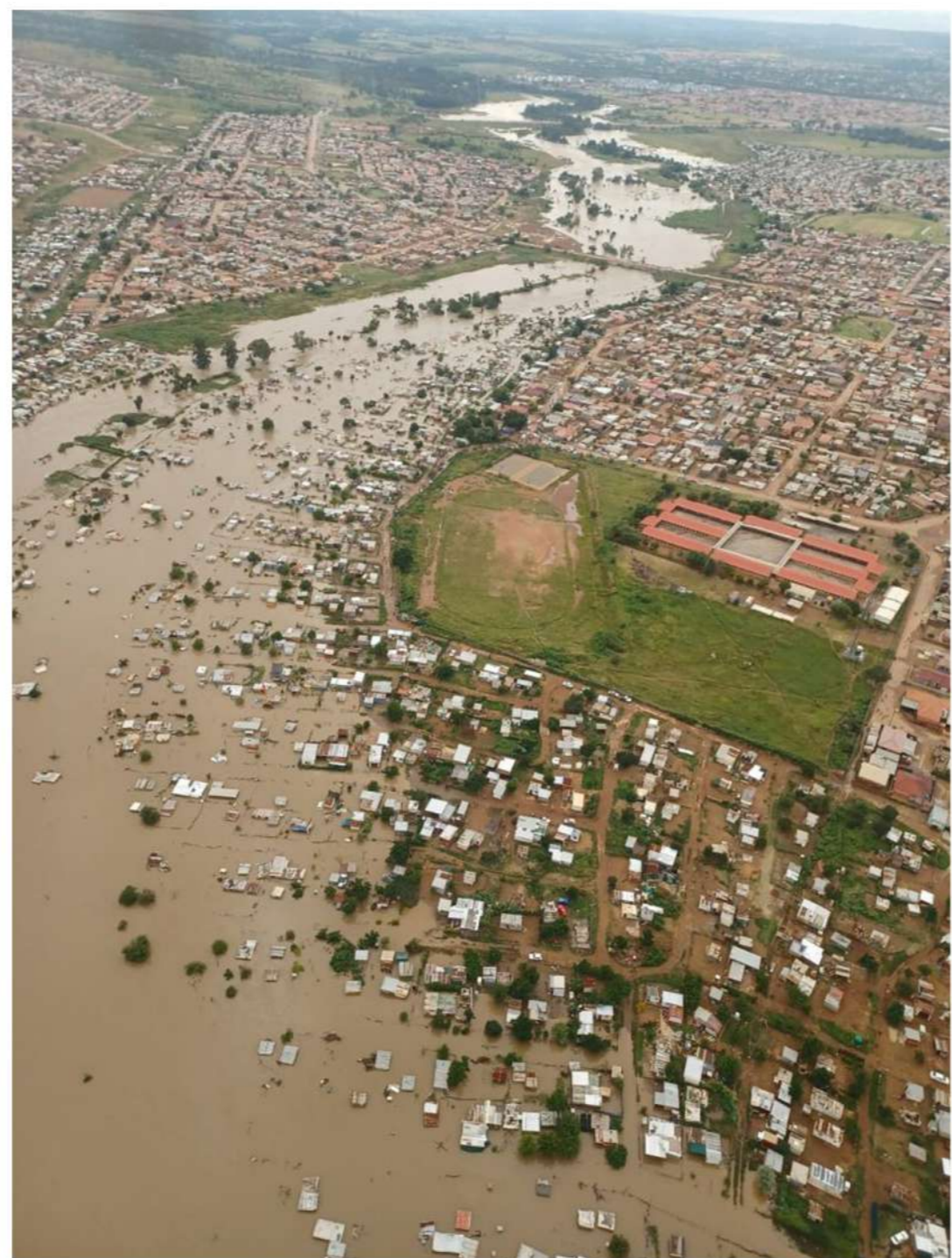
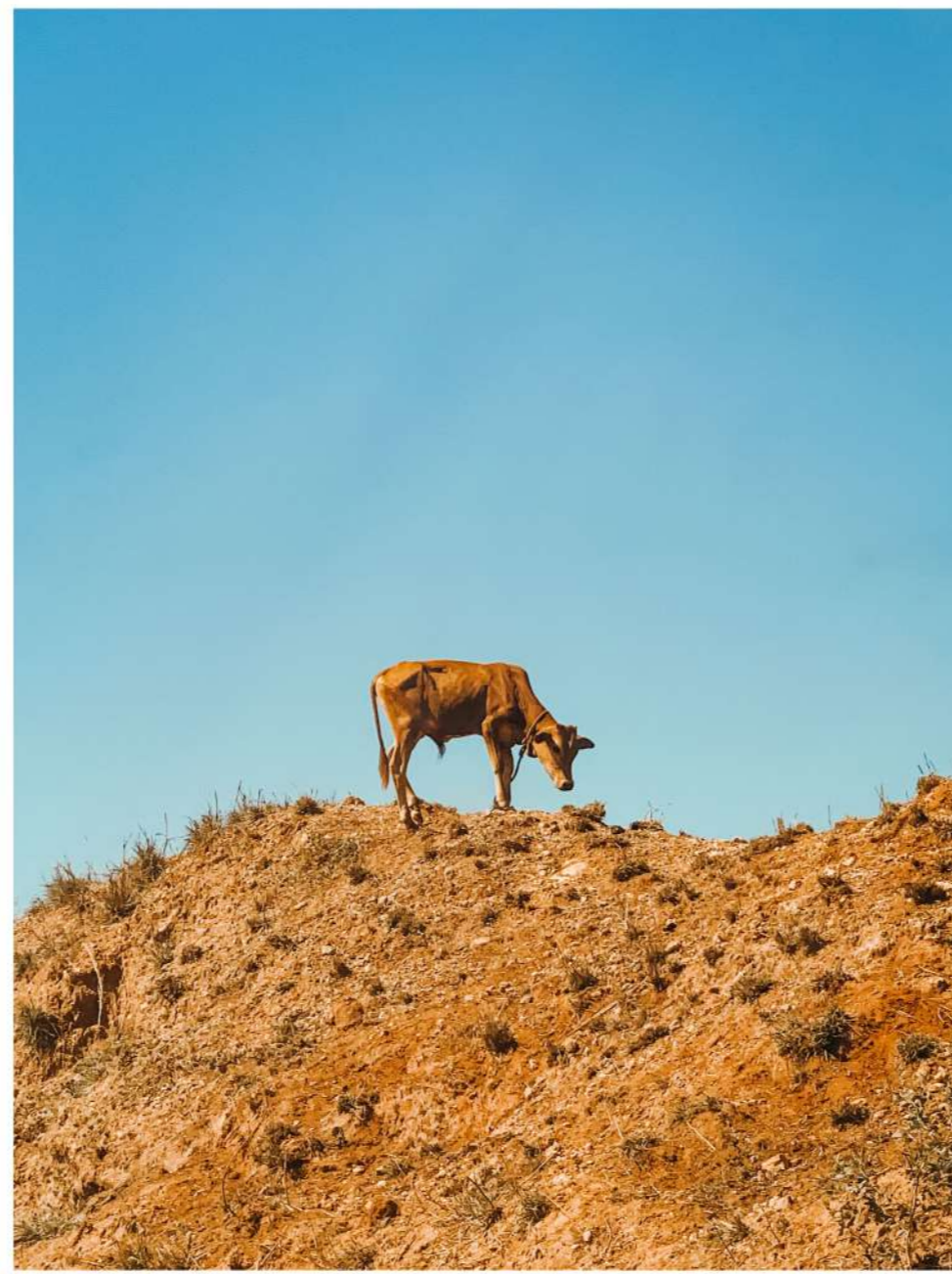
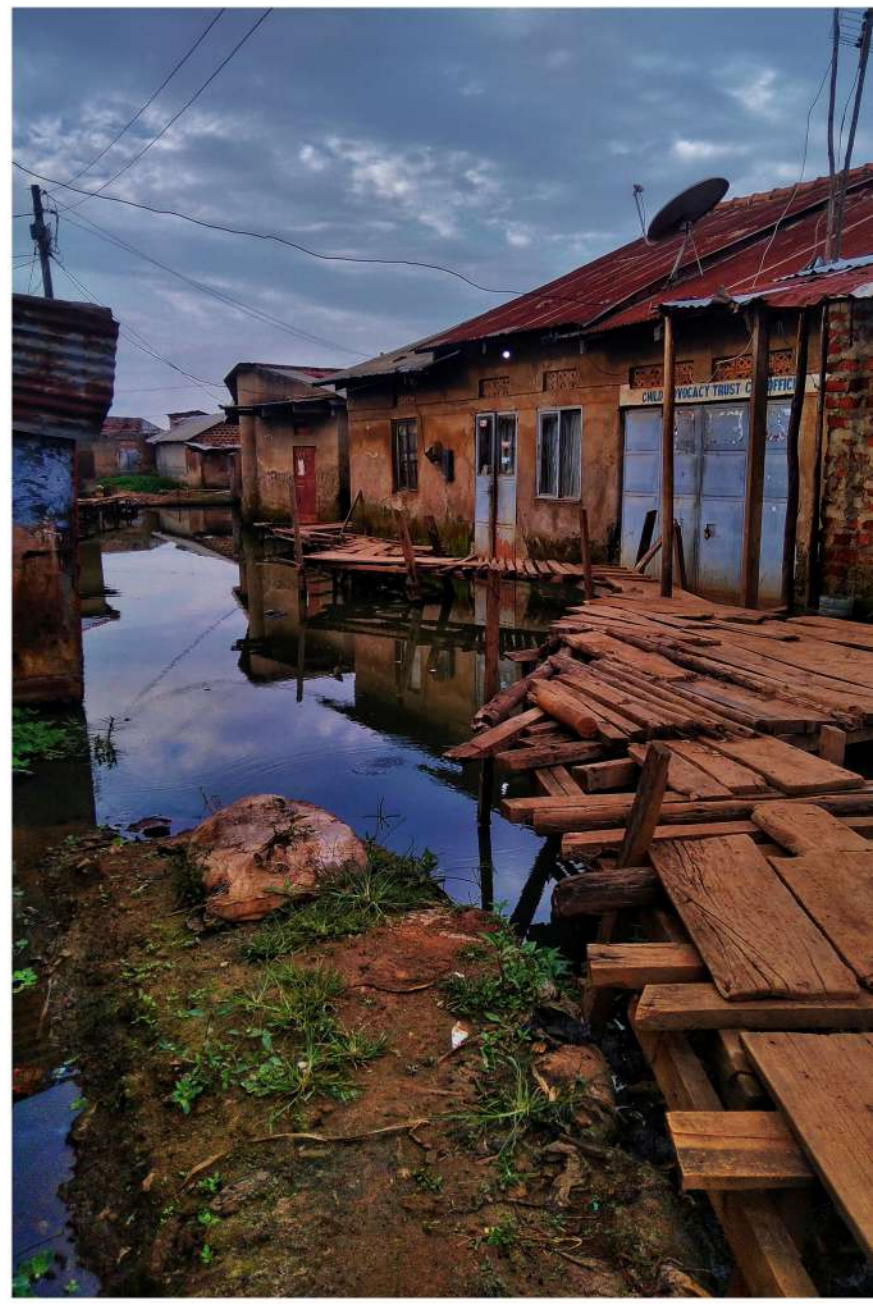
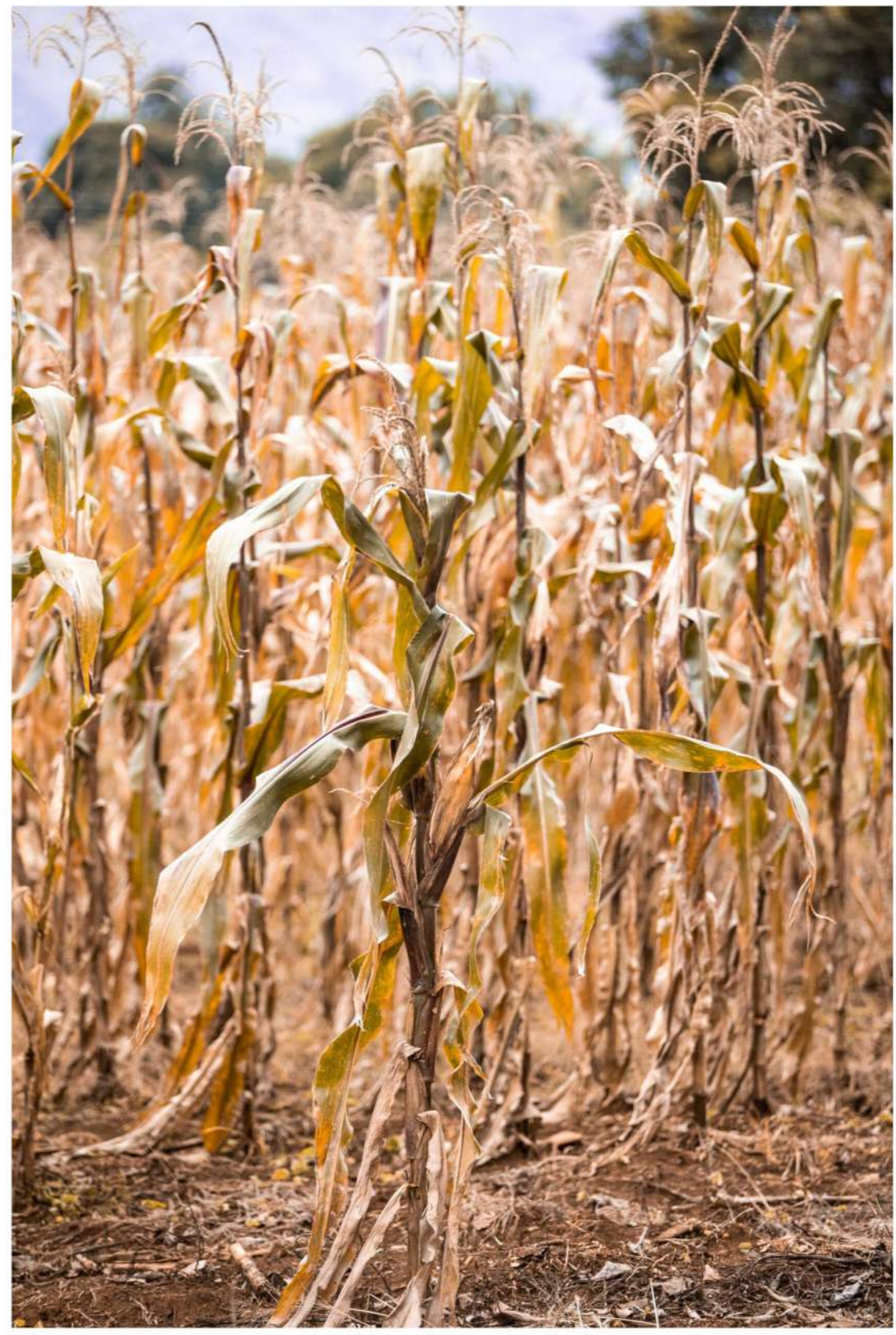
It is therefore estimated that a growing number of cities and towns will become exposed to the devastating impacts of weather-induced natural hazards; owing to growing exposure to the high socio-economic vulnerability present within settlements, a growing urbanising population, and the changes projected in the frequency and intensity of weather-related natural hazards.

We have to recognize that South African Cities are largely made up of built infrastructure and existing buildings that will need to accommodate not only developmental pressures of global urbanization, but significantly the changes that are reflected in the local climate and expressed in the heat stress effect on urban inhabitants.

Existing buildings will have to be retrofitted, to improve their capacity to adapt to these pressures, as the very climatic considerations and conditions which existing buildings were designed for, have, and are changing.

CLIMATE CHANGE

- recent disasters & hazards -



CURRENT CLIMATE SCENARIO

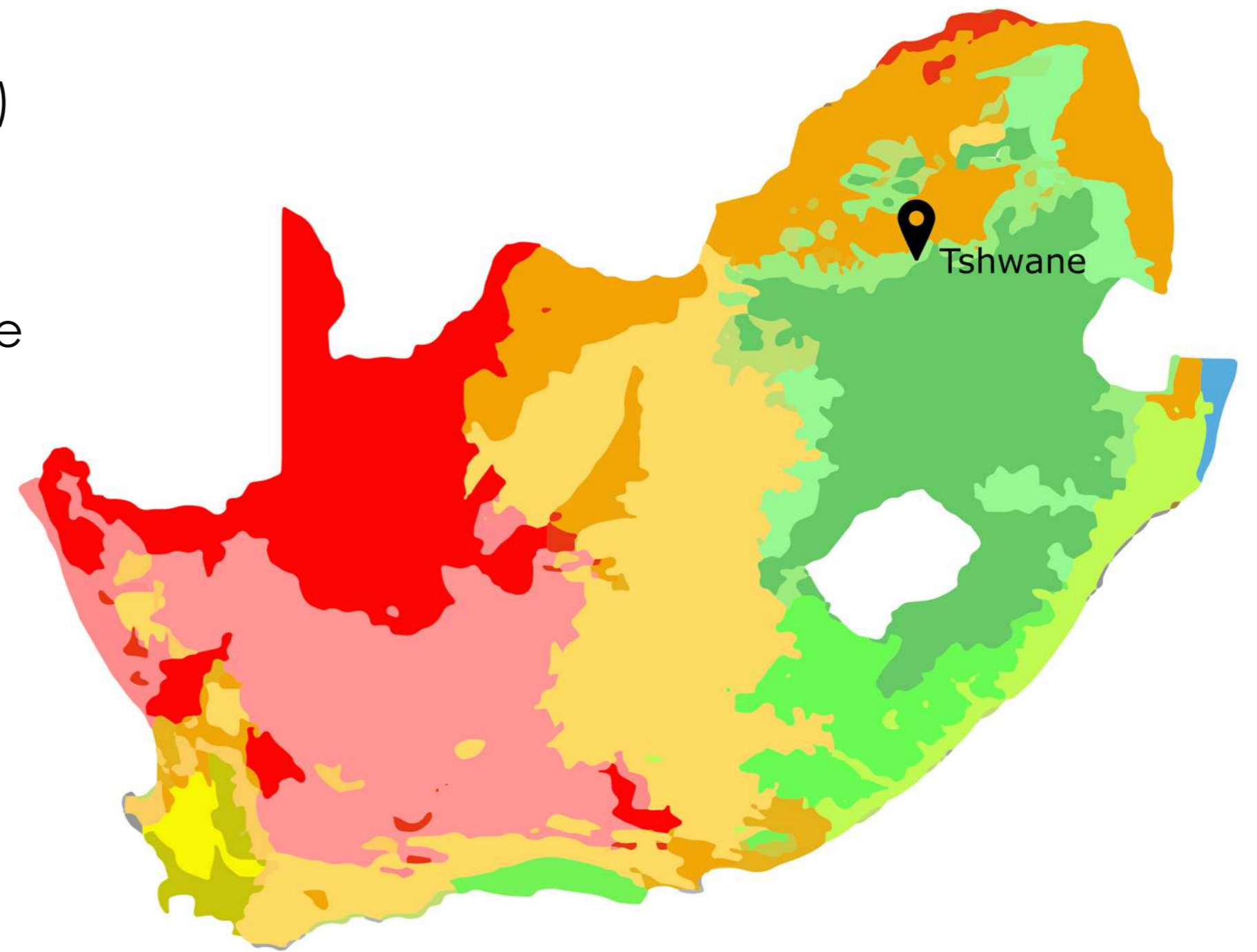
Cwa Climate Classification

Cwa – Temperate, Dry Winter, Hot Summer (Tshwane Present Classification)

The coldest month has a temperature greater than $-3\text{ }^{\circ}\text{C}$ but less than $+18\text{ }^{\circ}\text{C}$. The wettest month precipitation in summer is more than ten times that of the driest month precipitation in winter, while the wettest month precipitation in winter is less. The warmest month had a temperature greater than or equal to $+22\text{ }^{\circ}\text{C}$ (Chen & Chen, 2013).

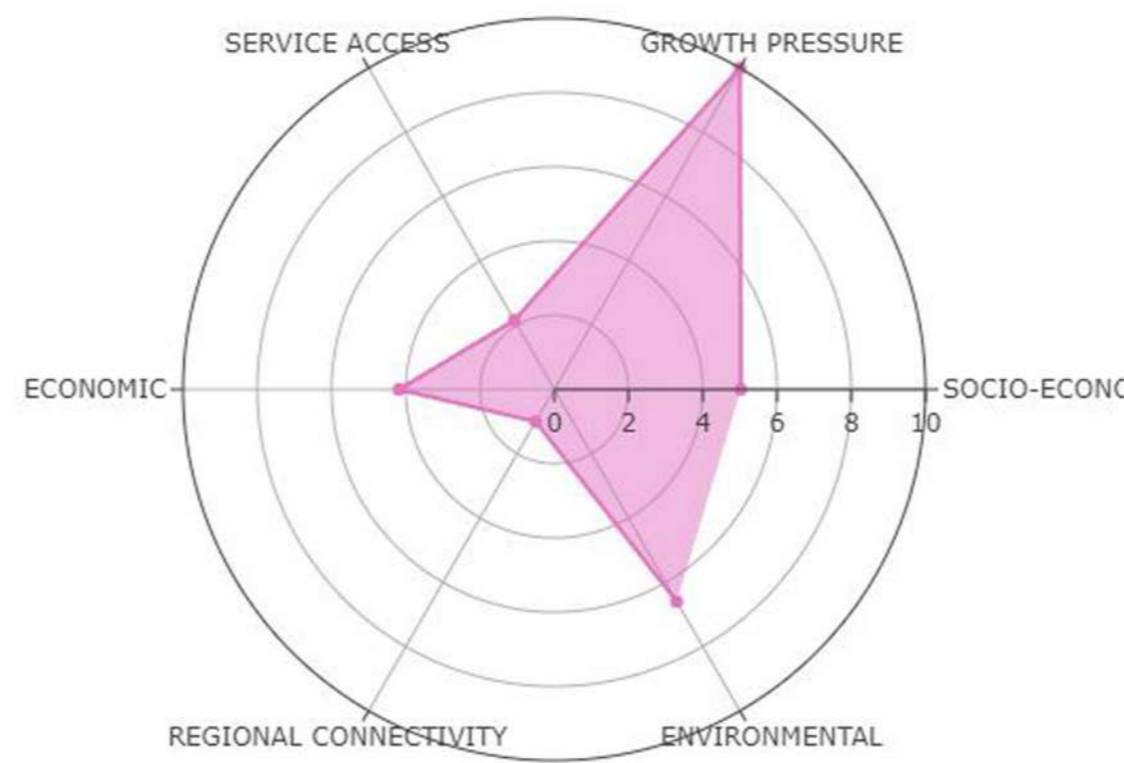
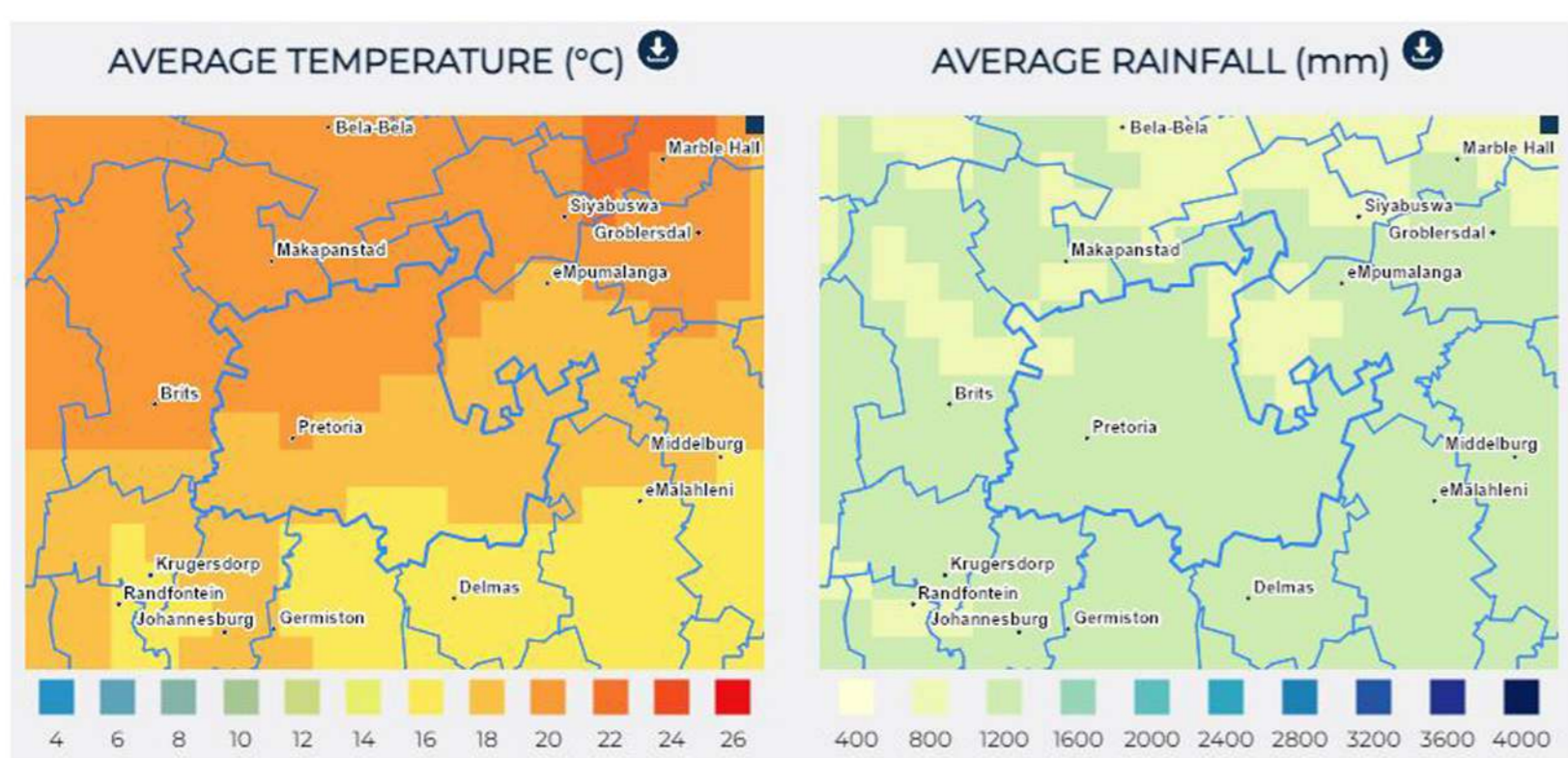
Cwb – Temperate, Dry Winter, Warm Summer (Centurion/Johannesburg Present Classification)

The coldest month has a temperature greater than $-3\text{ }^{\circ}\text{C}$ but less than $+18\text{ }^{\circ}\text{C}$. The wettest month precipitation in summer is more than ten times that of the driest month precipitation in winter, while the wettest month precipitation in winter is less. The warmest month has a temperature of less than $+22\text{ }^{\circ}\text{C}$, while at least four months have temperatures of more than or equal to $+10\text{ }^{\circ}\text{C}$ (Chen & Chen, 2013).

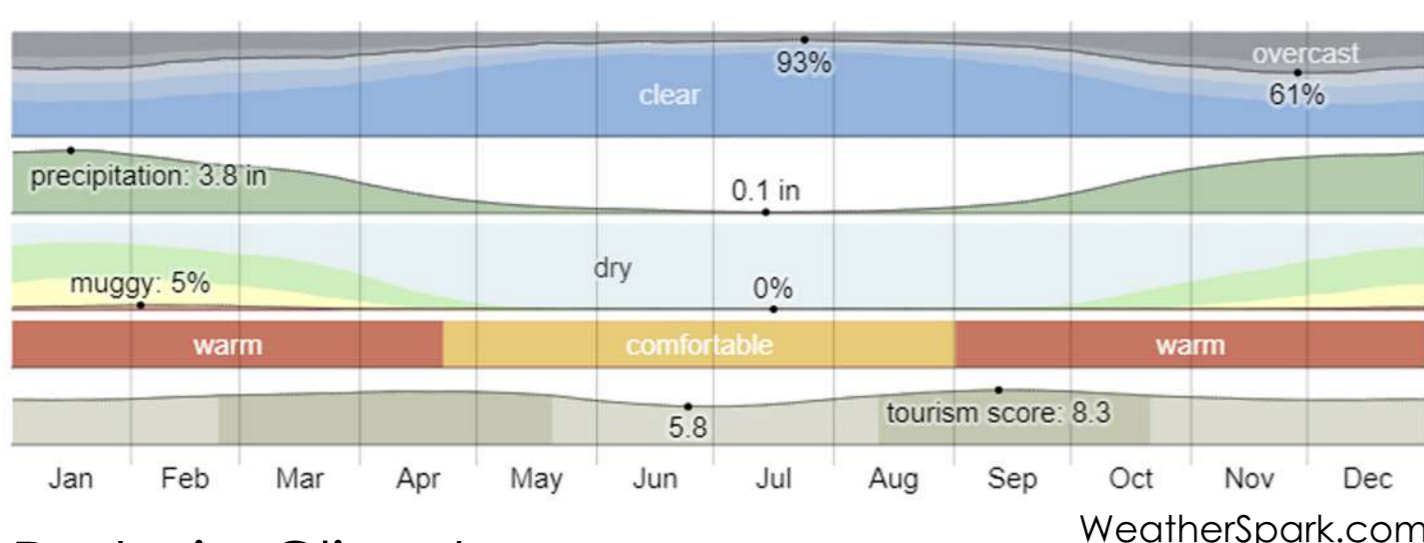


Köppen-Geiger Climate Classification map for South Africa (1980-2016) (Beck, et al., 2018).

BASELINE

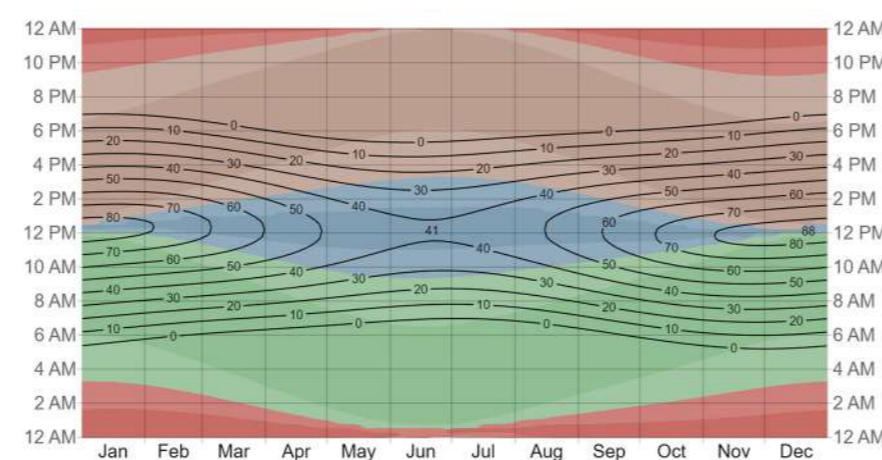


- Tropical, rainforest (Af)
- Tropical, monsoon (Am)
- Tropical, savannah (Aw)
- Arid, desert, hot (BWh)
- Arid, desert, cold (BWk)
- Arid, steppe, hot (BSh)
- Arid, steppe, cold (BSk)
- Temperate, dry summer, hot summer (Csa)
- Temperate, dry summer, warm summer (Csb)
- Temperate, dry winter, hot summer (Cwa)
- Temperate, dry winter, warm summer (Cwb)
- Temperate, dry winter, cold summer (Cwc)
- Temperate, no dry season, hot summer (Cfa)
- Temperate, no dry season, warm summer (Cfb)
- Temperate, no dry season, cold summer (Cfc)
- Cold, dry winter, cold summer (Dwc)
- Cold, no dry season, cold summer (Dfc)
- Polar, tundra (ET)

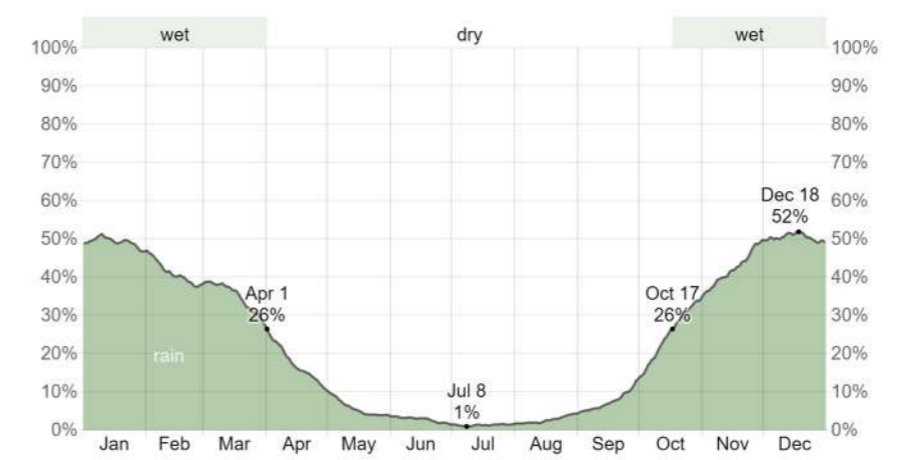


Pretoria Climate

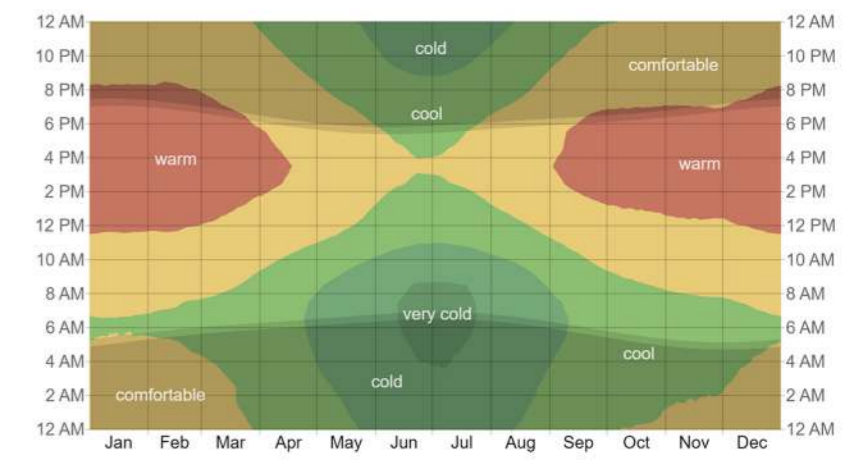
WeatherSpark.com



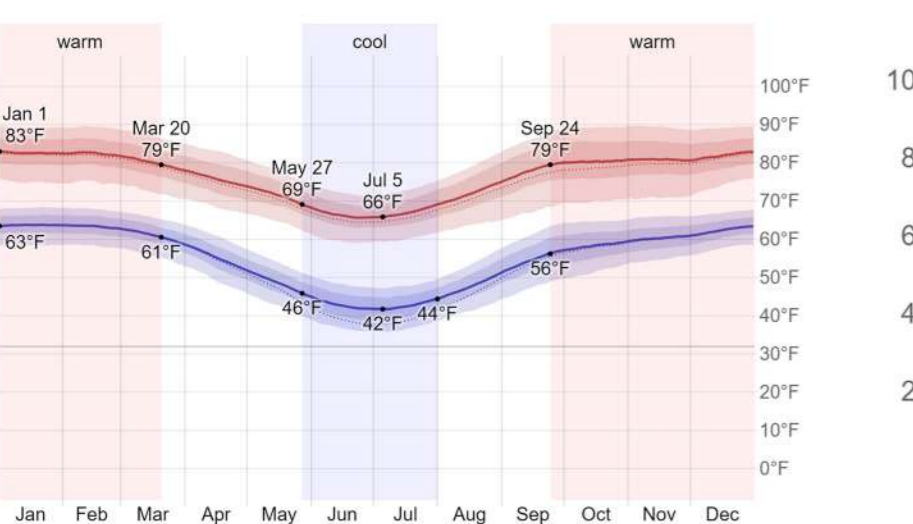
Solar Elevation and Azimuth



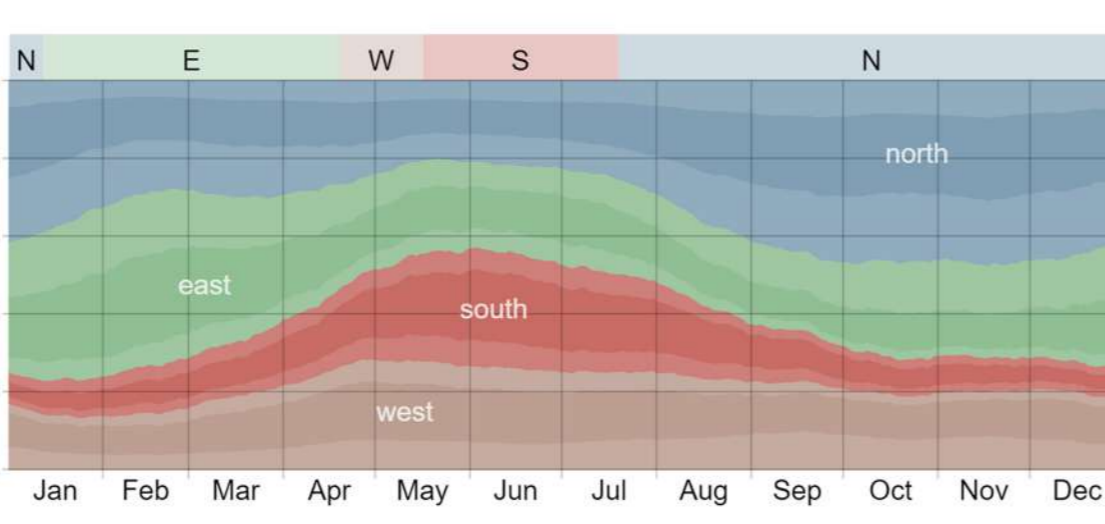
Daily chance of precipitation



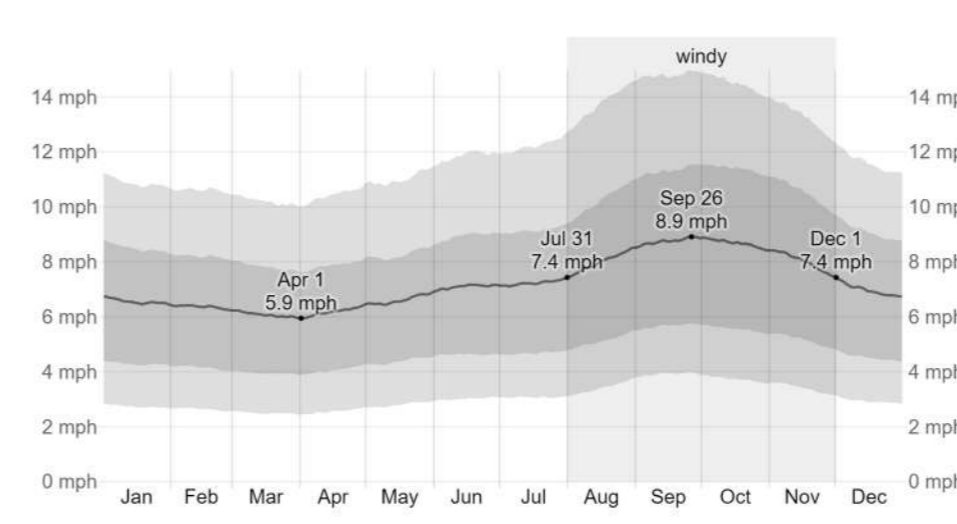
Average Hourly Temperature



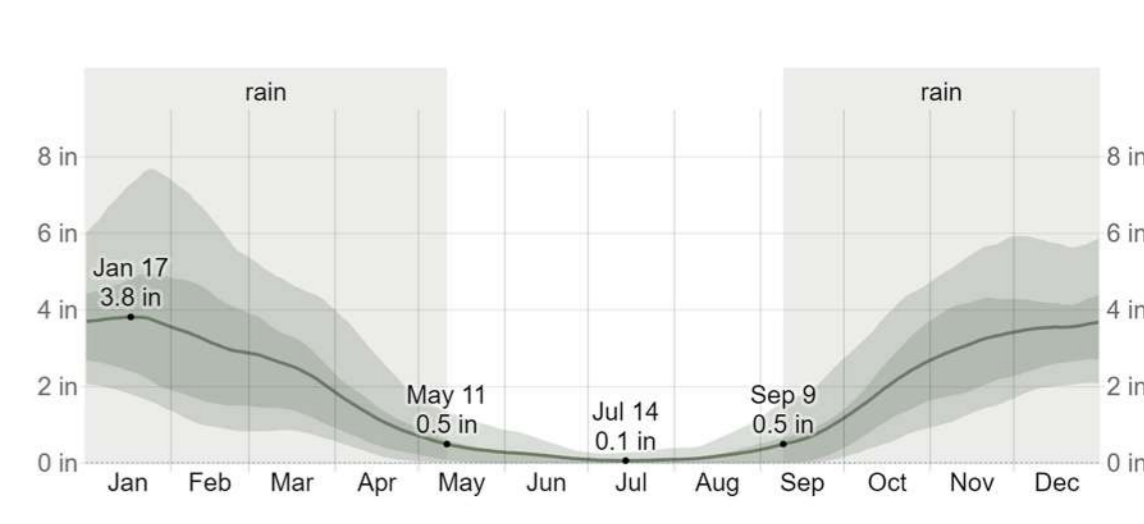
Pretoria Average Temperature



Wind Direction

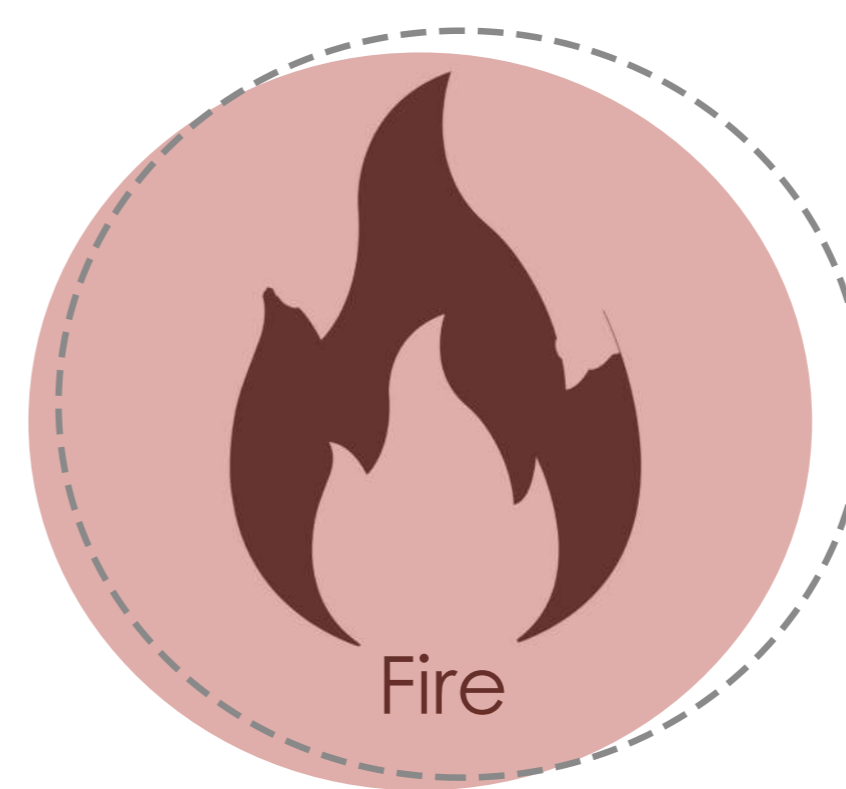
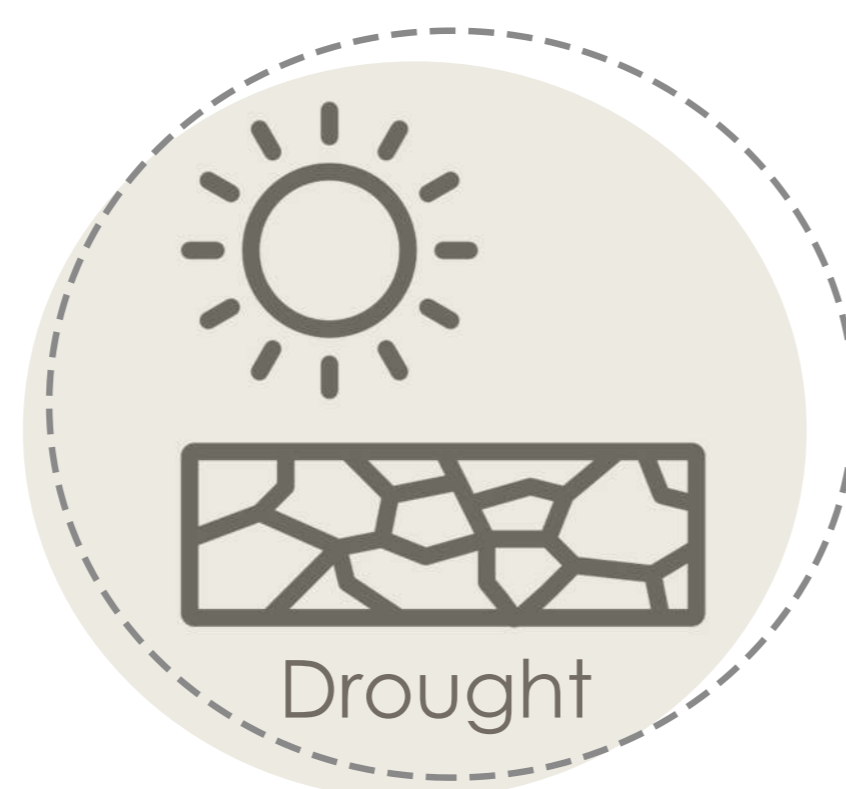


Average Wind Speed



Average Monthly Rainfall

HAZARDS



FUTURE CLIMATE SCENARIO

BSh Climate Classification

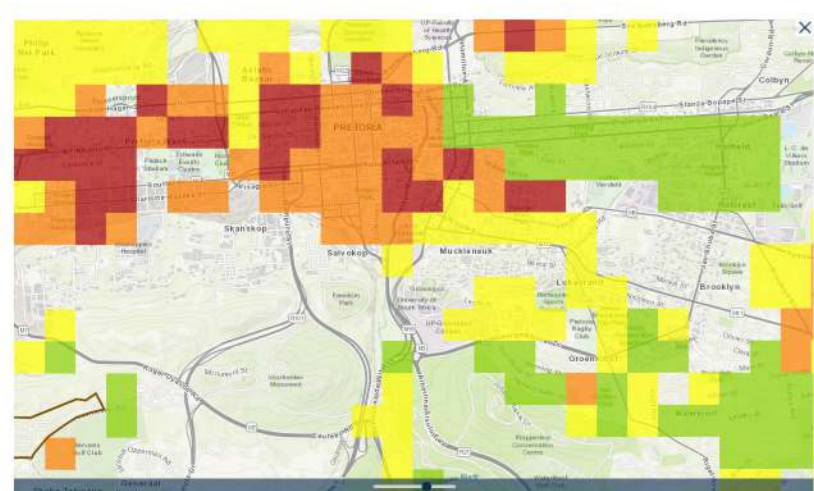
BSh – Arid, Steppe, Hot (Tshwane Future Classification)
 Total annual precipitation is greater than 5 times the dryness threshold. The dryness threshold is stated in millimetres and is proportional to the annual mean temperature (Tann) in degrees Celsius. It is determined as follows: if at least two-thirds of the annual precipitation falls during the winter, the dryness threshold is 2Tann; if at least two-thirds of the annual precipitation falls during the summer, the dryness threshold is 2Tann + 28; otherwise, the dryness threshold is 2Tann + 14. The annual mean temperature is more than or equal to +18 degrees Celsius (Chen & Chen, 2013). The annual mean temperature of less than +22 °C, while at least four months have temperatures of more than or equal to +10 °C (Chen & Chen, 2013).



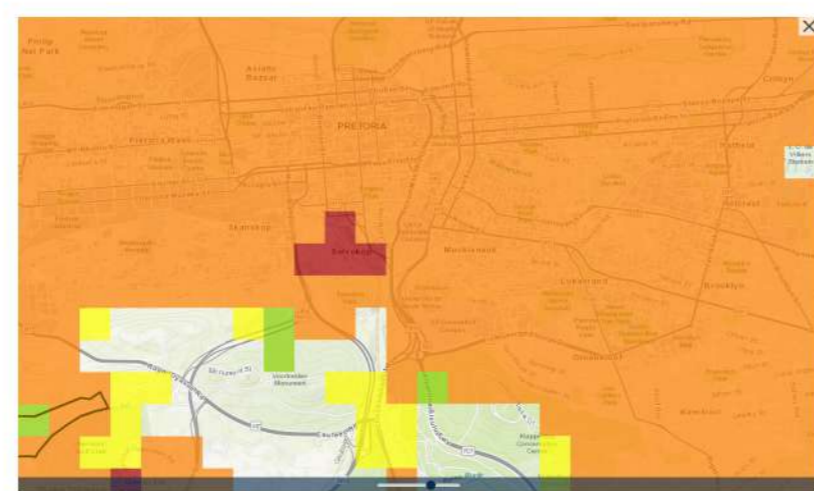
- Tropical, rainforest (Af)
- Tropical, monsoon (Am)
- Tropical, savannah (Aw)
- Arid, desert, hot (BWh)
- Arid, desert, cold (BWk)
- Arid, steppe, hot (BSh)
- Arid, steppe, cold (BSk)
- Temperate, dry summer, hot summer (Csa)
- Temperate, dry summer, warm summer (Csb)
- Temperate, dry winter, hot summer (Cwa)
- Temperate, dry winter, warm summer (Cwb)
- Temperate, dry winter, cold summer (Cwc)
- Temperate, no dry season, hot summer (Cfa)
- Temperate, no dry season, warm summer (Cfb)
- Temperate, no dry season, cold summer (Cfc)
- Cold, dry winter, cold summer (Dwc)
- Cold, no dry season, cold summer (Dfc)
- Polar, tundra (ET)

BASELINE

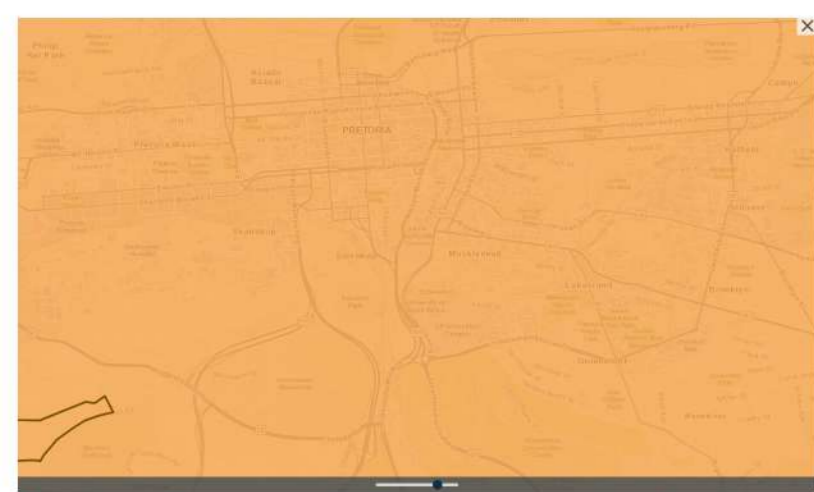
2050



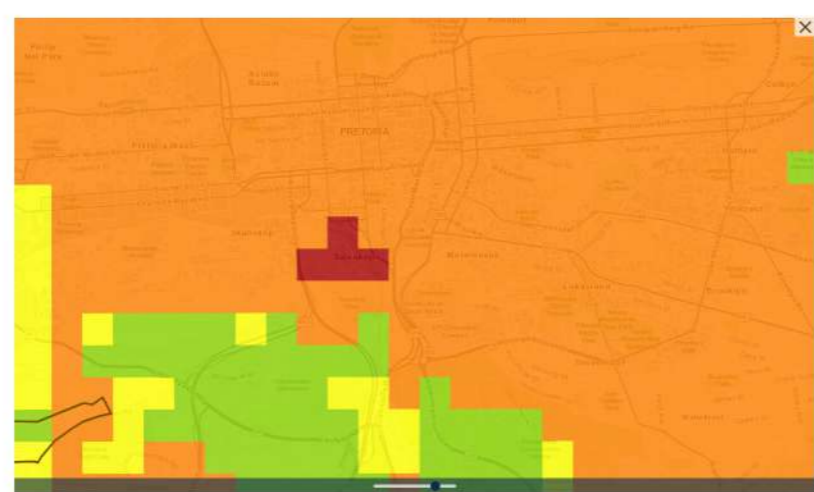
CURRENT COMBINED FLOOR HAZARD



PROJECTED INCREASE IN FLOODING



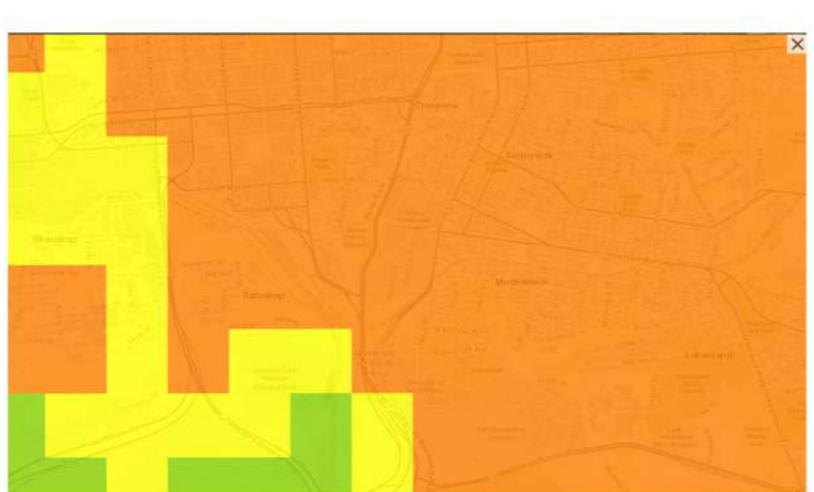
SPEI DROUGHT INDEX



PROJECTED INCREASE IN DROUGHT



EXTREME HEAT HAZARD



PROJECTED INCREASE IN EXTREME HEAT



FIRE HAZARD

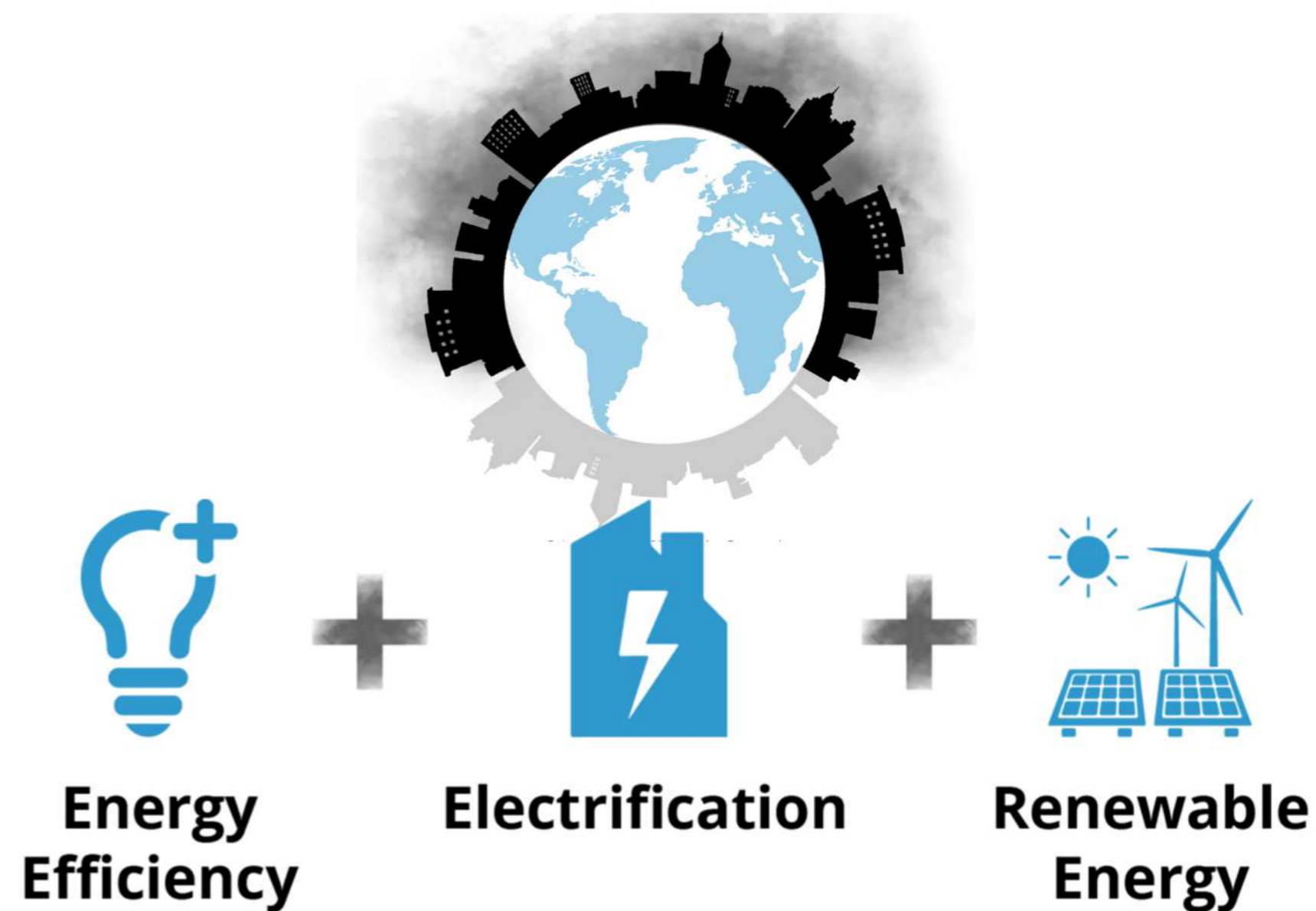


PROJECTED INCREASE IN FIRE

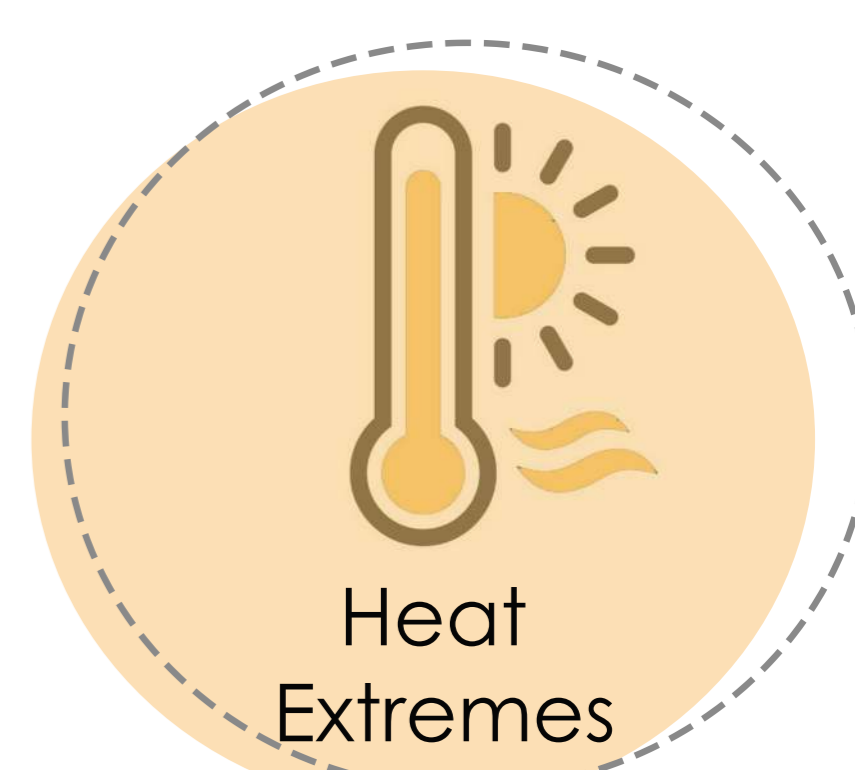
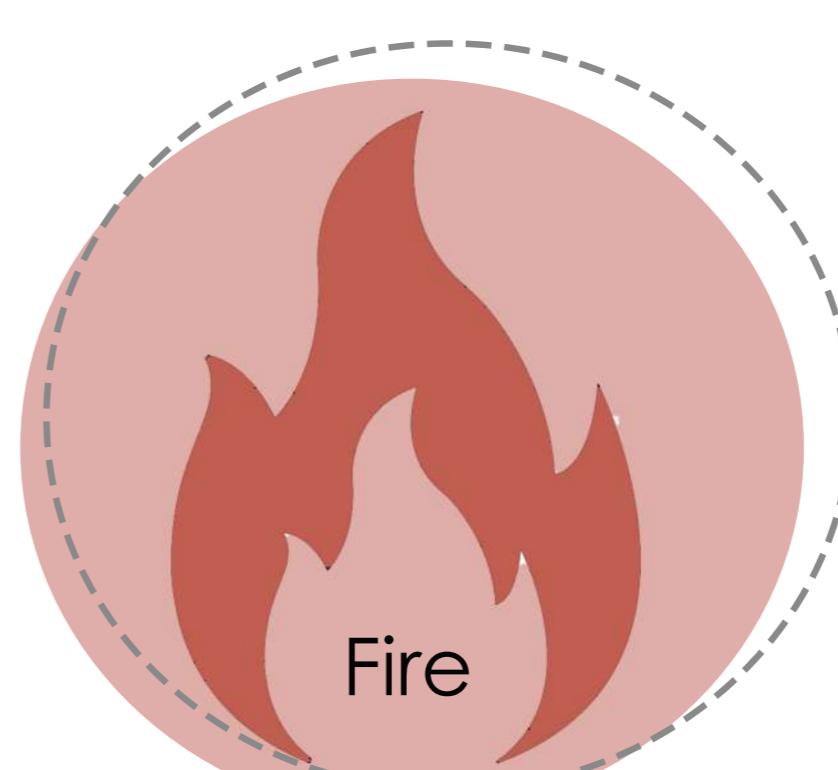
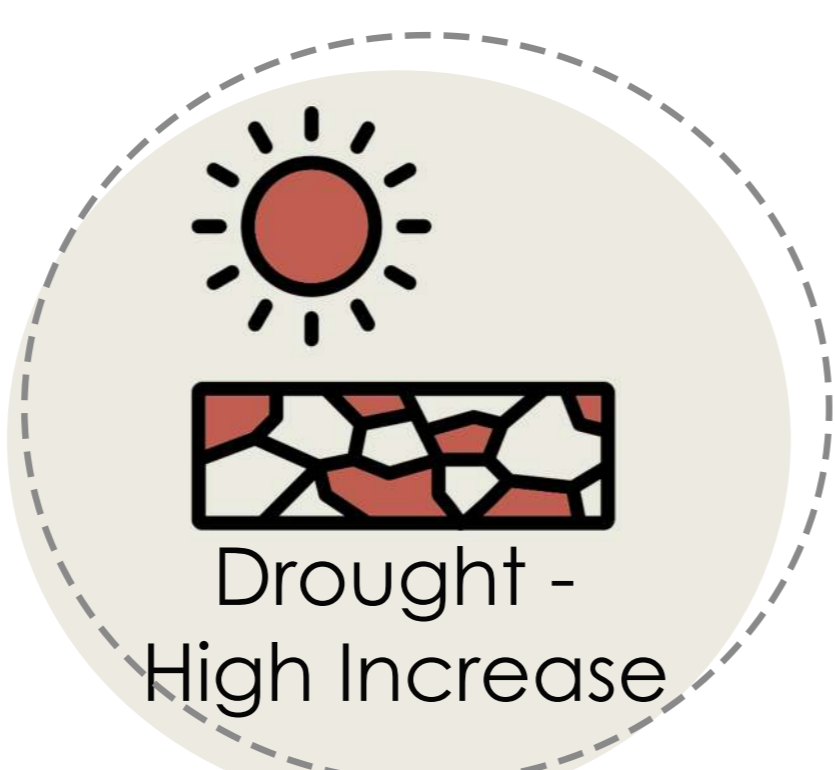
● Average Rainfall & Extreme Rainfall Days will increase slightly, with a big increase in very hot days.

● Projected Changes in annual average temperature
 RCP 4.5: 2.23°C — 2.81°C
 RCP 8.5: 2.72°C — 3.16°C

● Projected Changes in annual average temperature
 RCP 4.5: 2.23°C — 2.81°C
 RCP 8.5: 2.72°C — 3.16°C



HAZARDS



SITE ANALYSIS

Pretoria, Gauteng



Huis Potgieter, UNISA Sunnyside Campus



EXISTING



SITE ANALYSIS



S -Gateway
-Area (Surface water)
-Existing building

W -Campus (Gated community)
-Derelict condition
-History

O -Wetland
-Existing building footprint
-Access to building

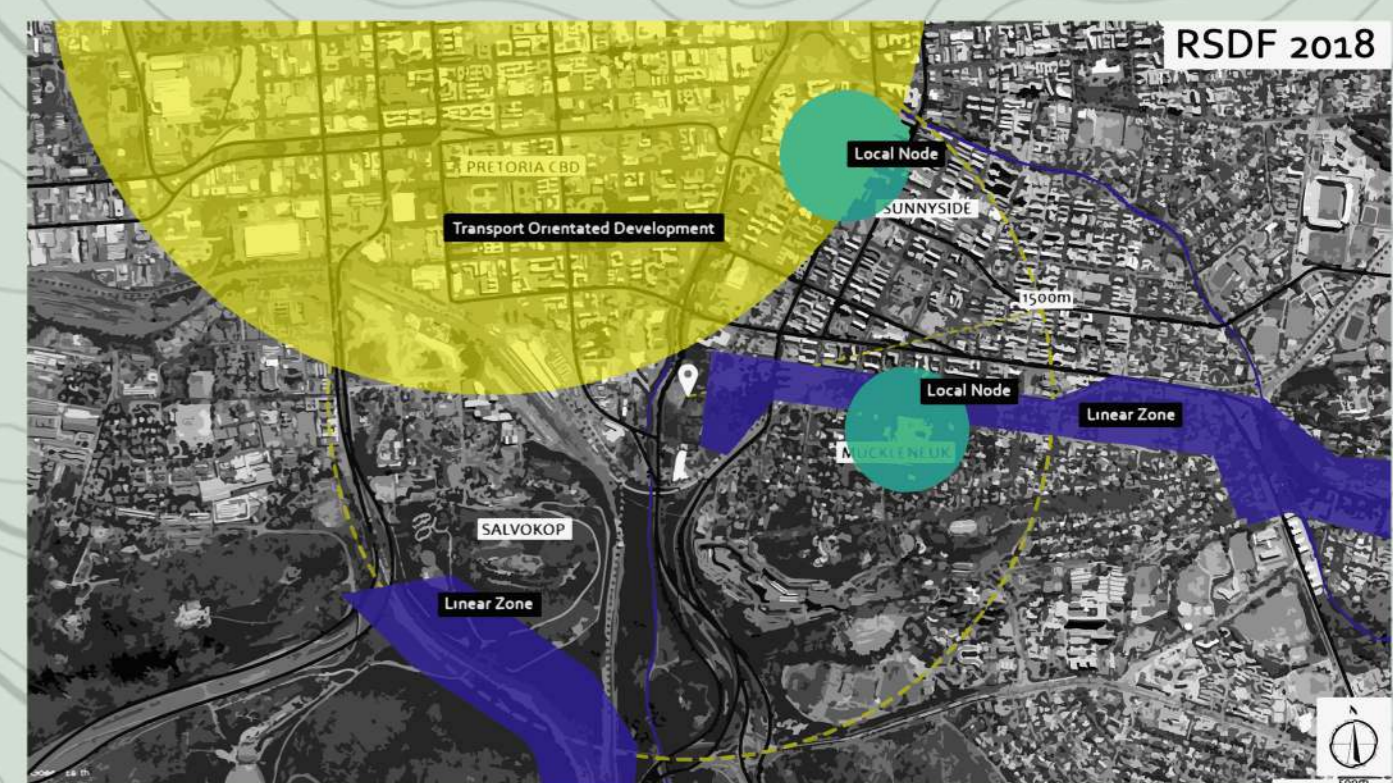
T -Climate (flood lines)
-Demolishing



Locality



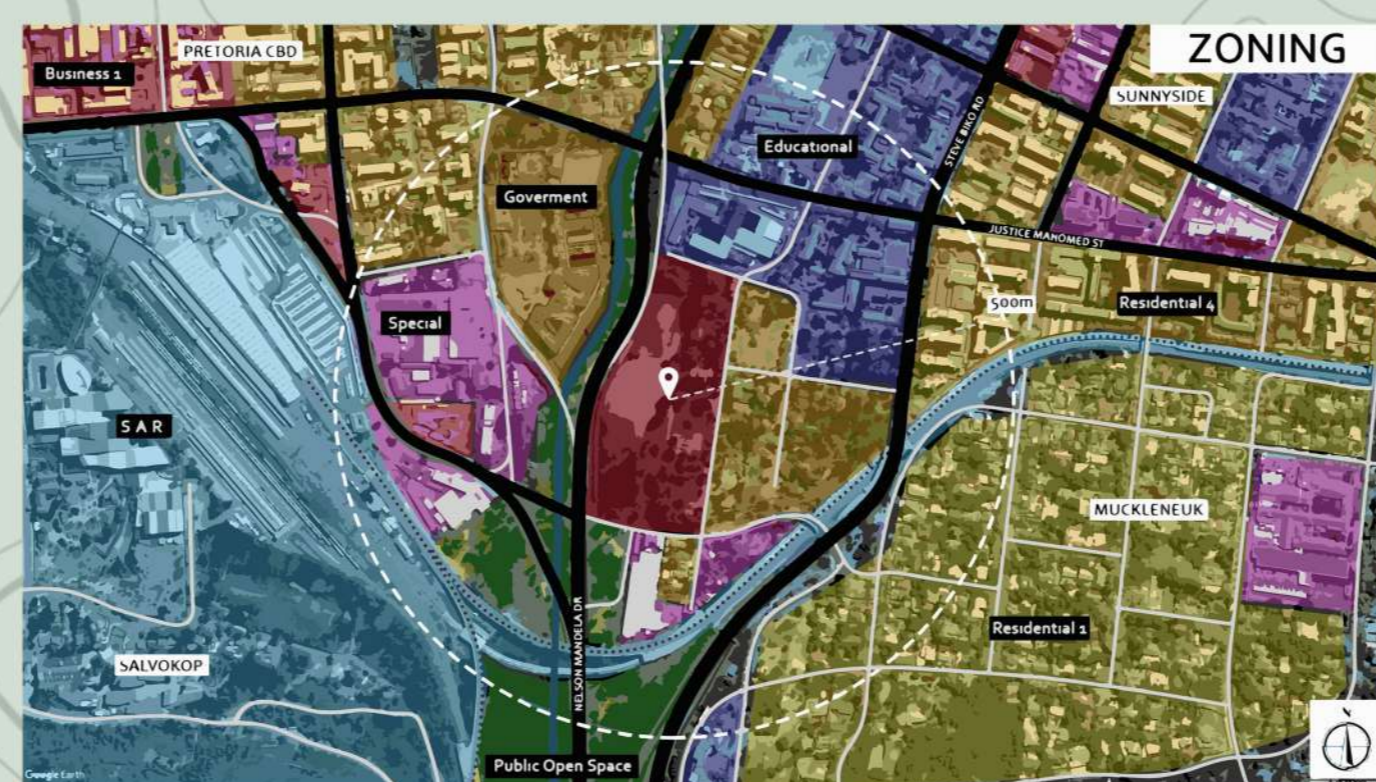
Nodes



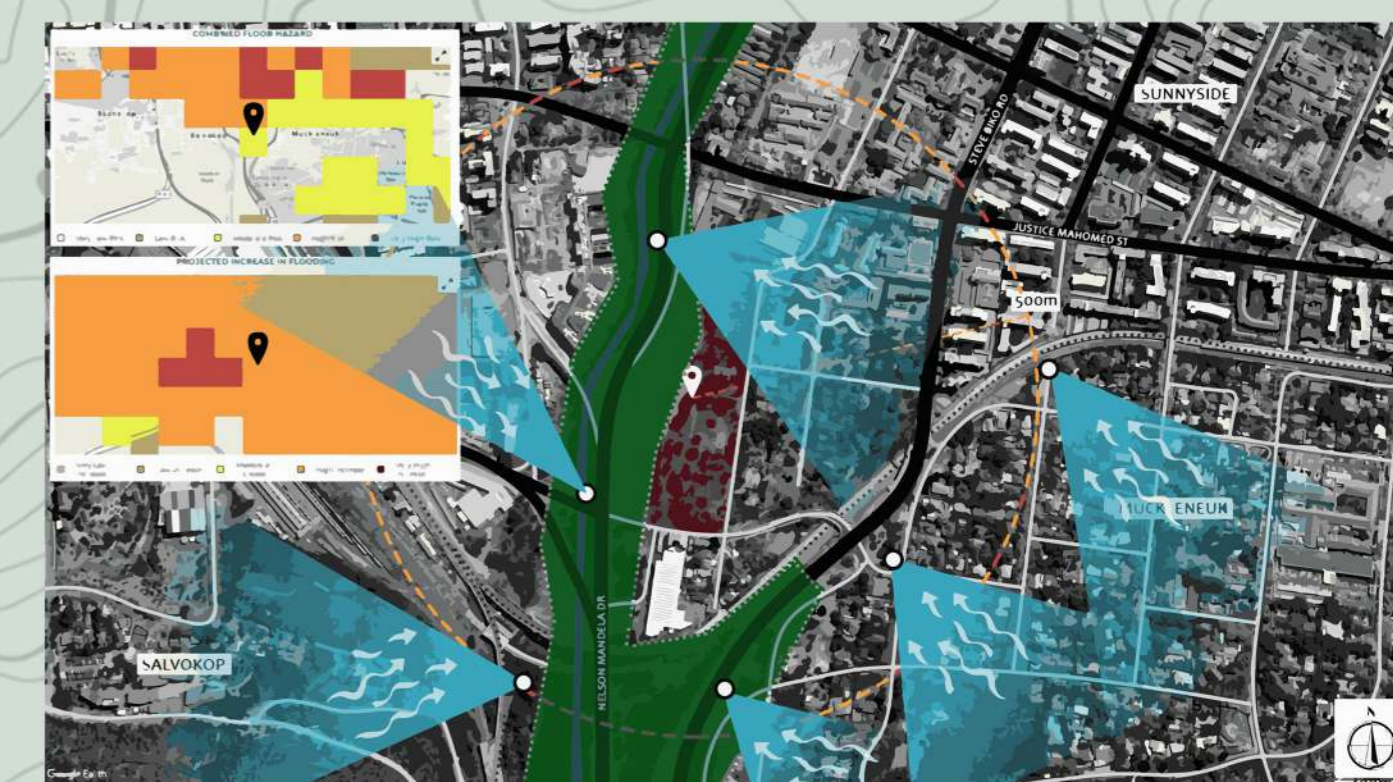
RSDF 2018



Immediate Context



Zoning



Floor Line & Surface Water Runoff



Site



Proposed Urban Strategy

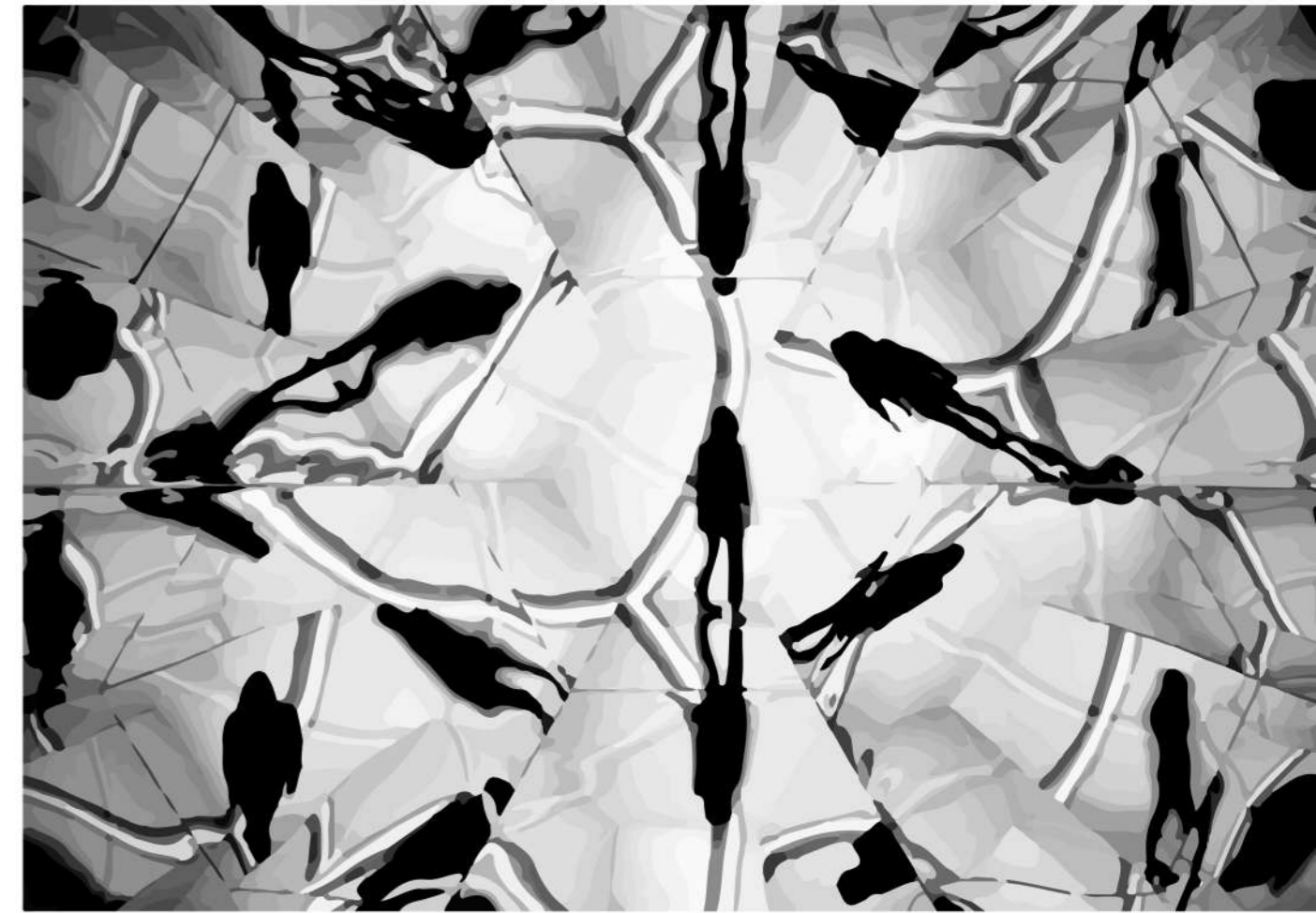
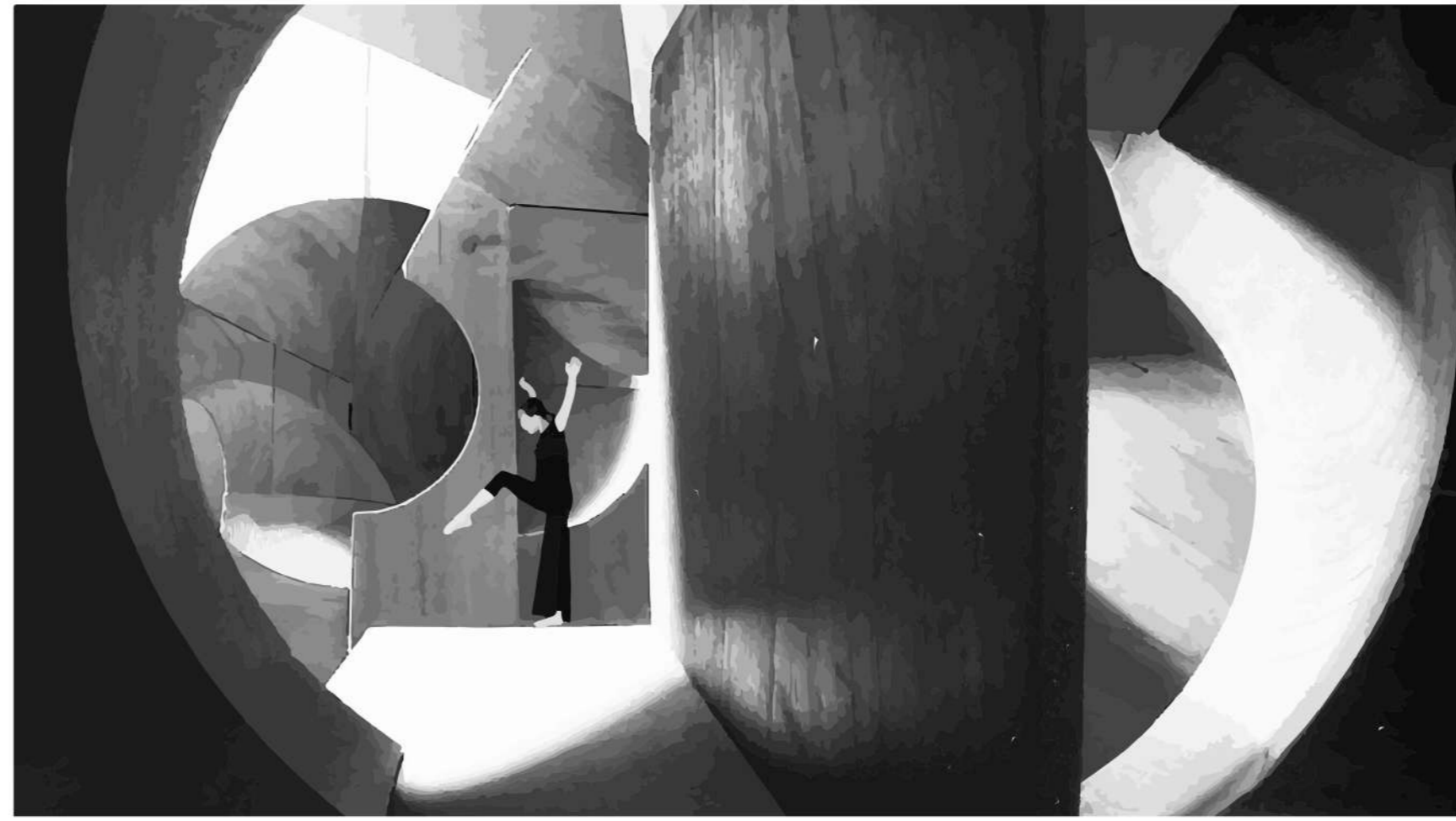
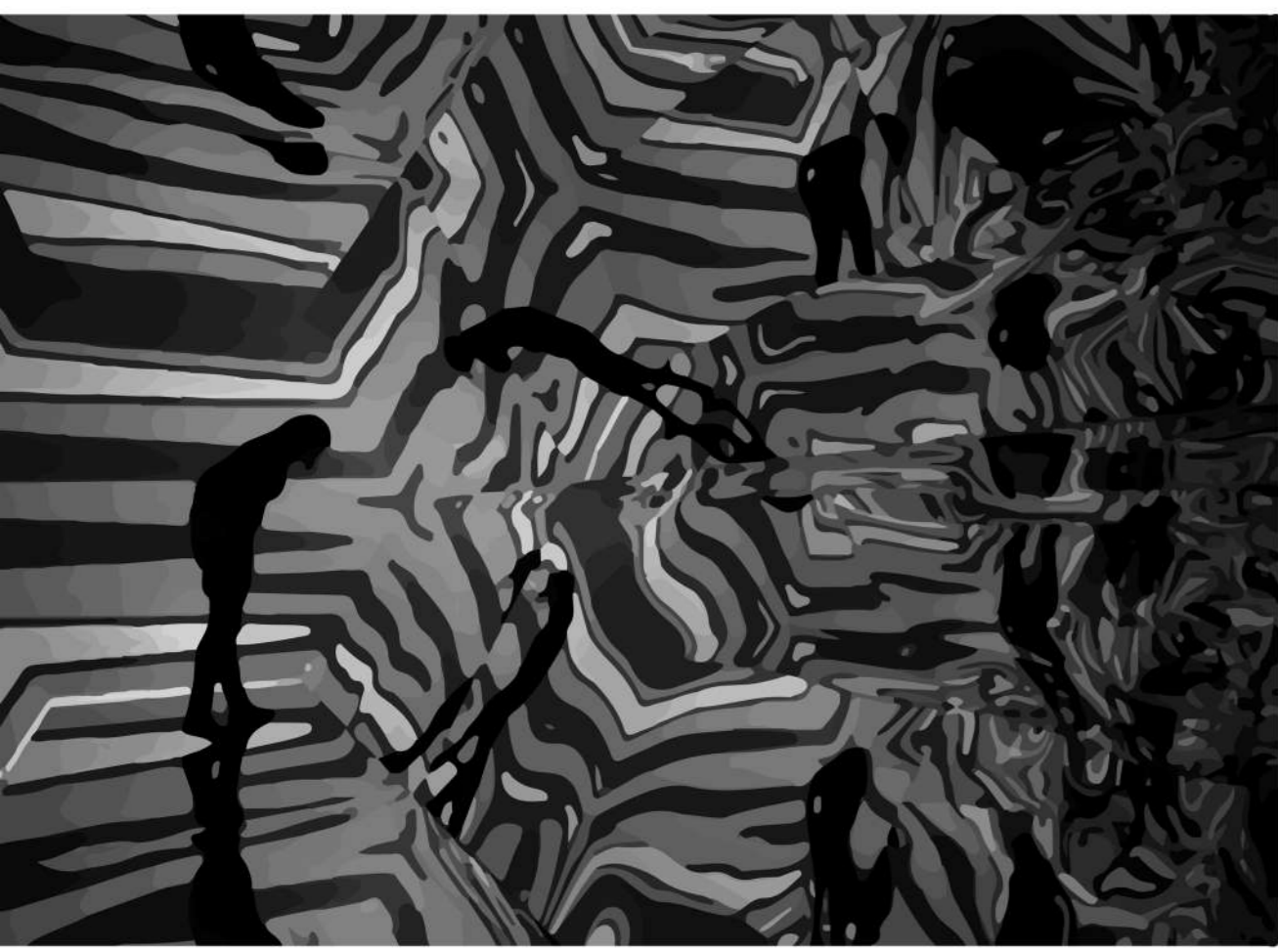


Aerial View

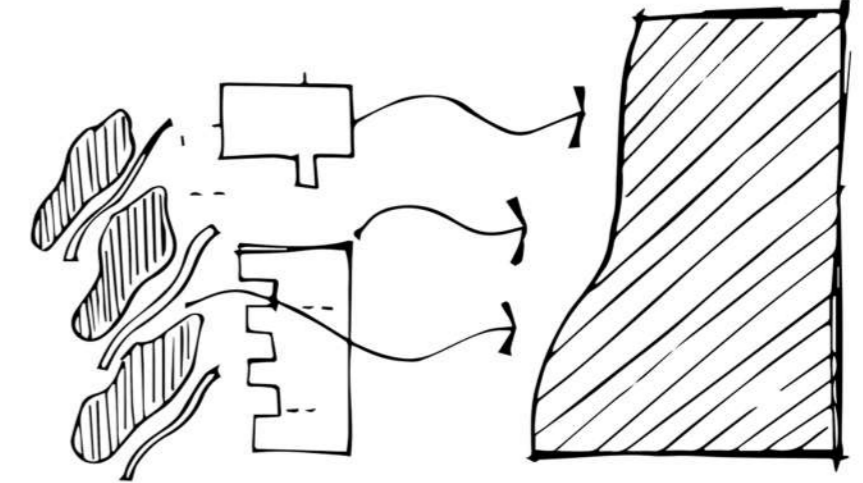
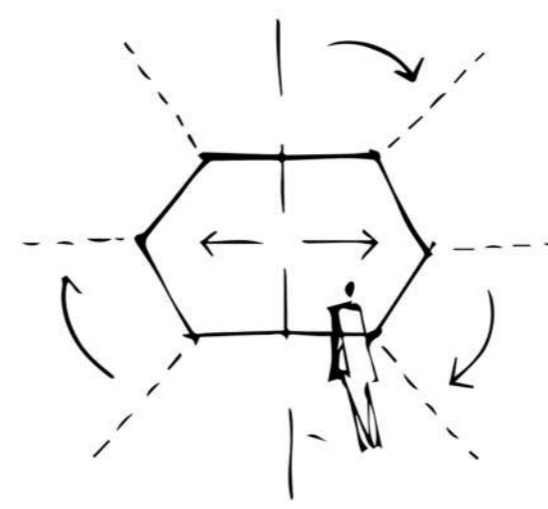
CONCEPTS

Theoretical Framework & Informants

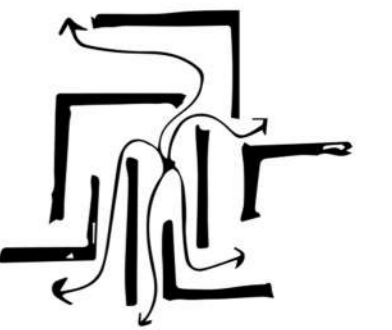
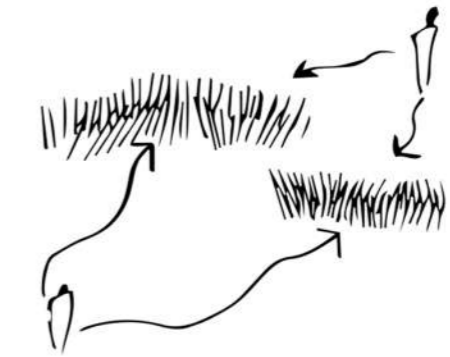
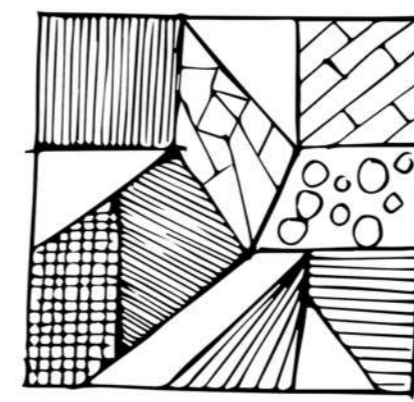
kaleidoscope



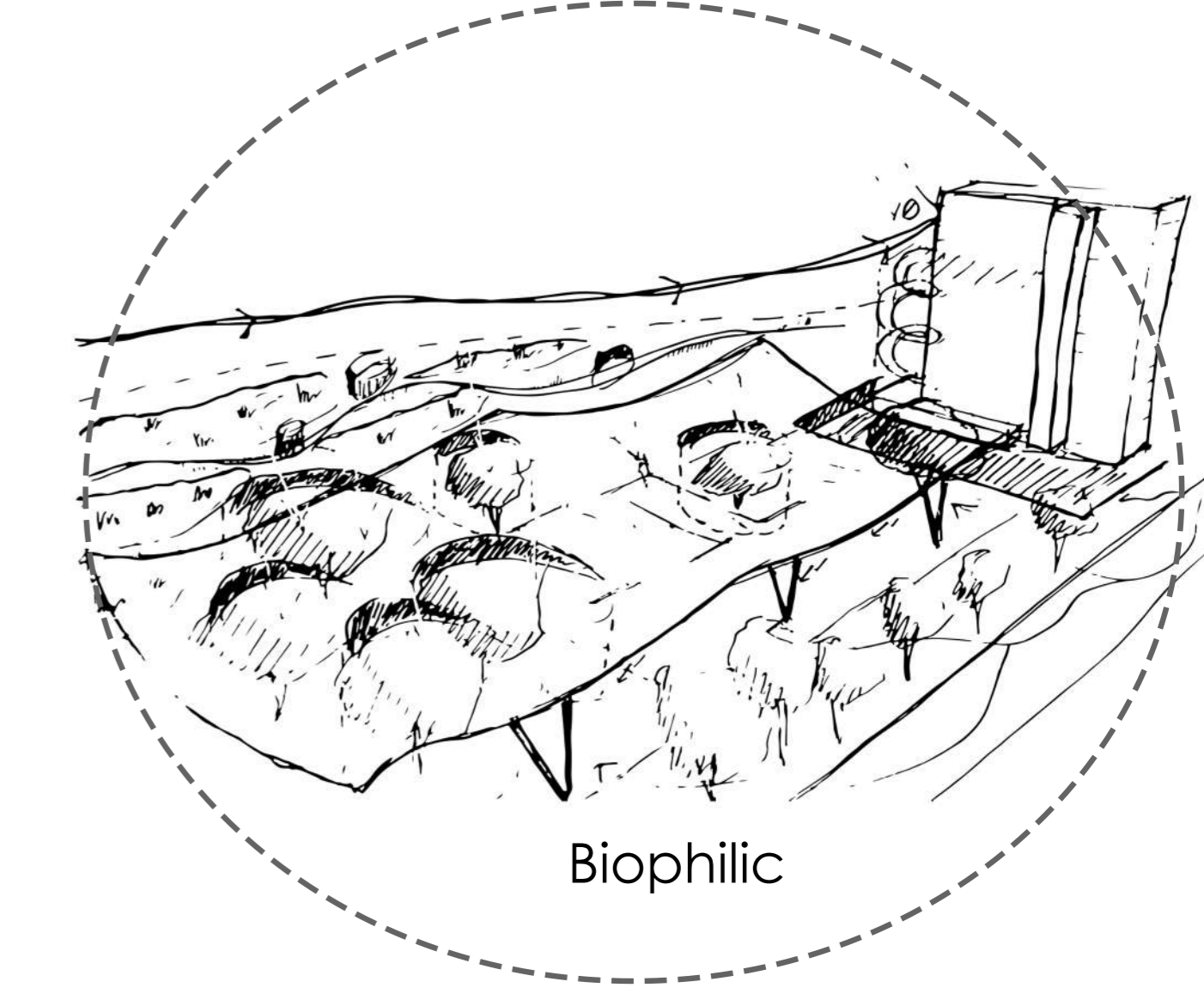
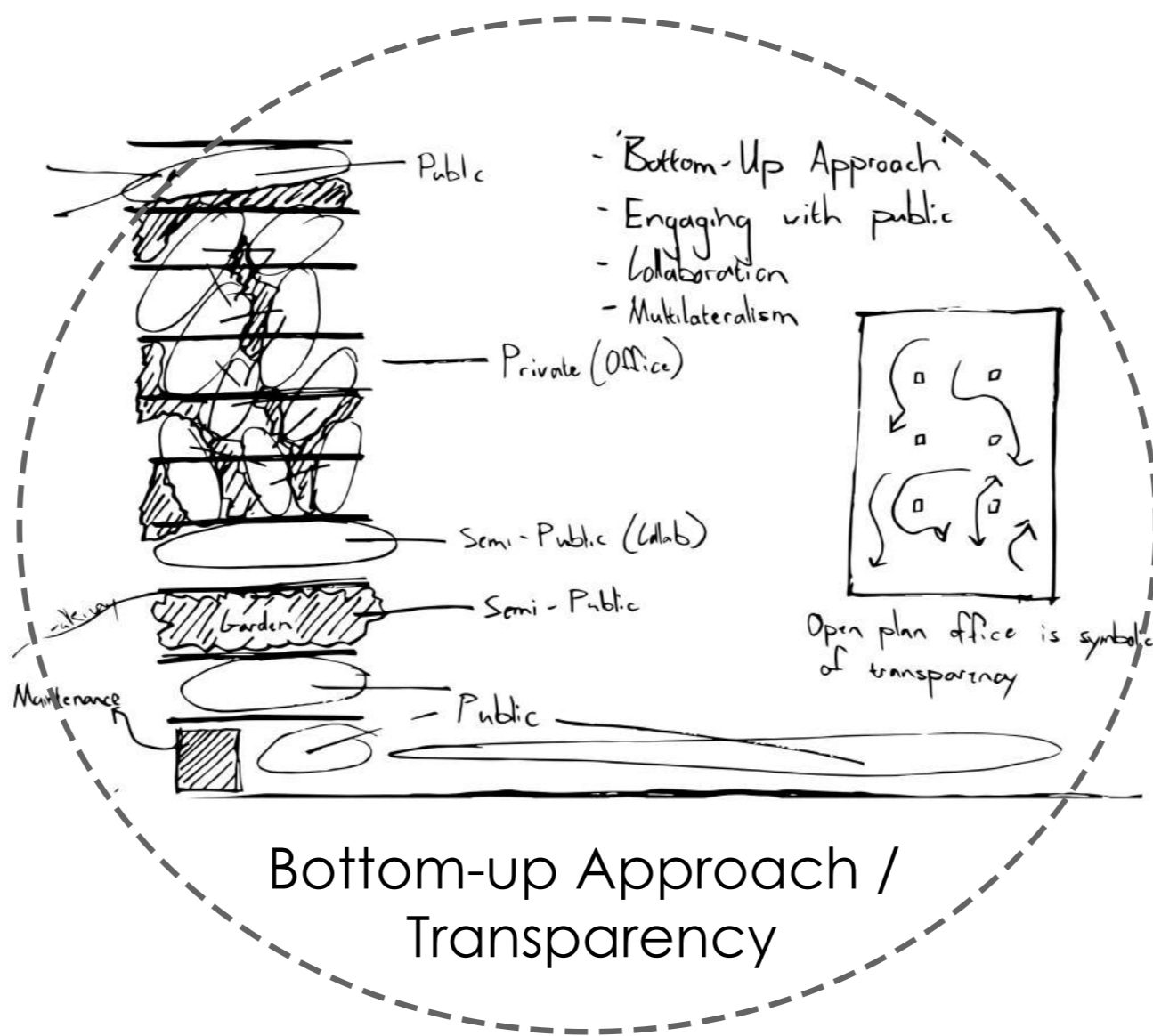
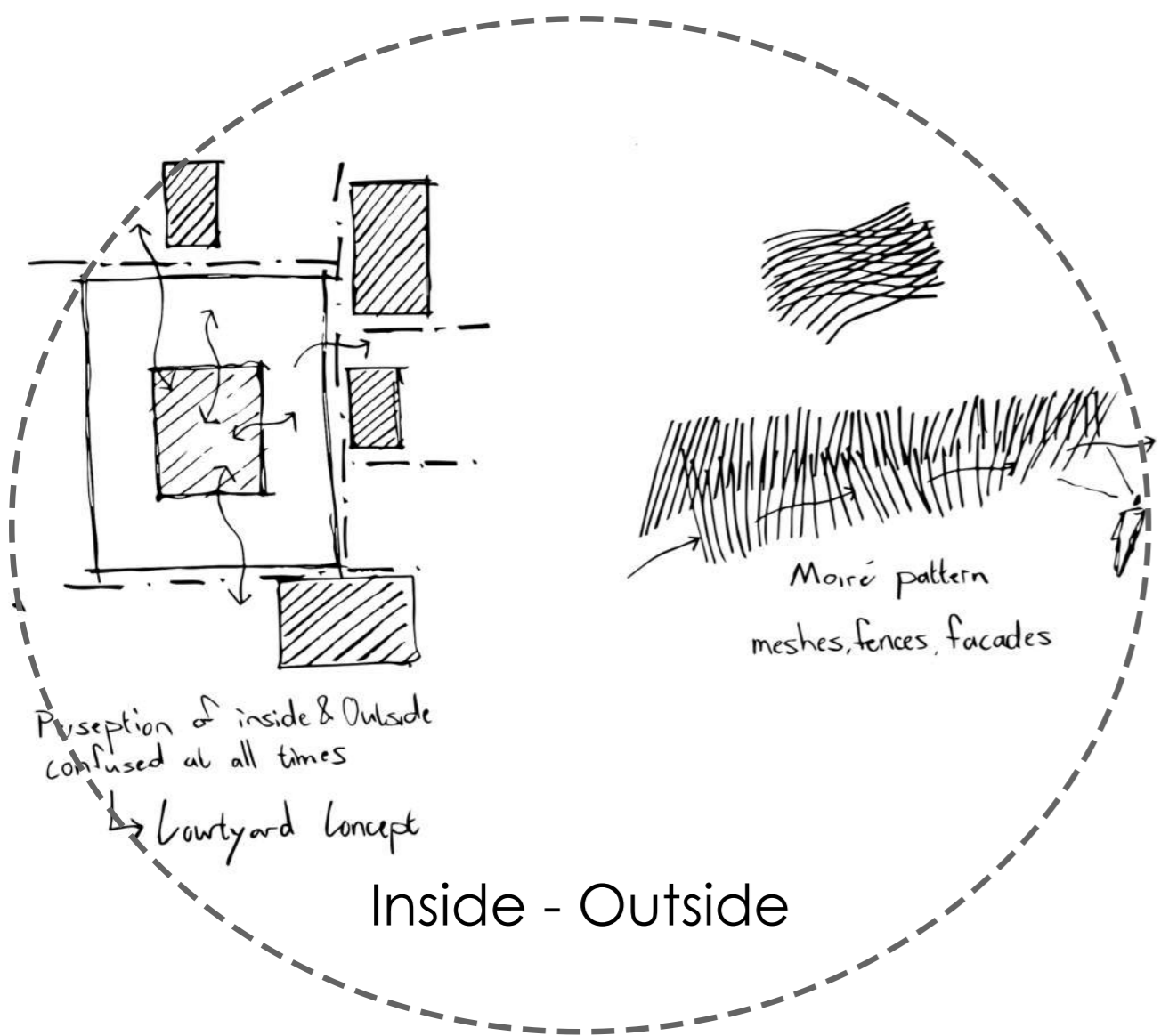
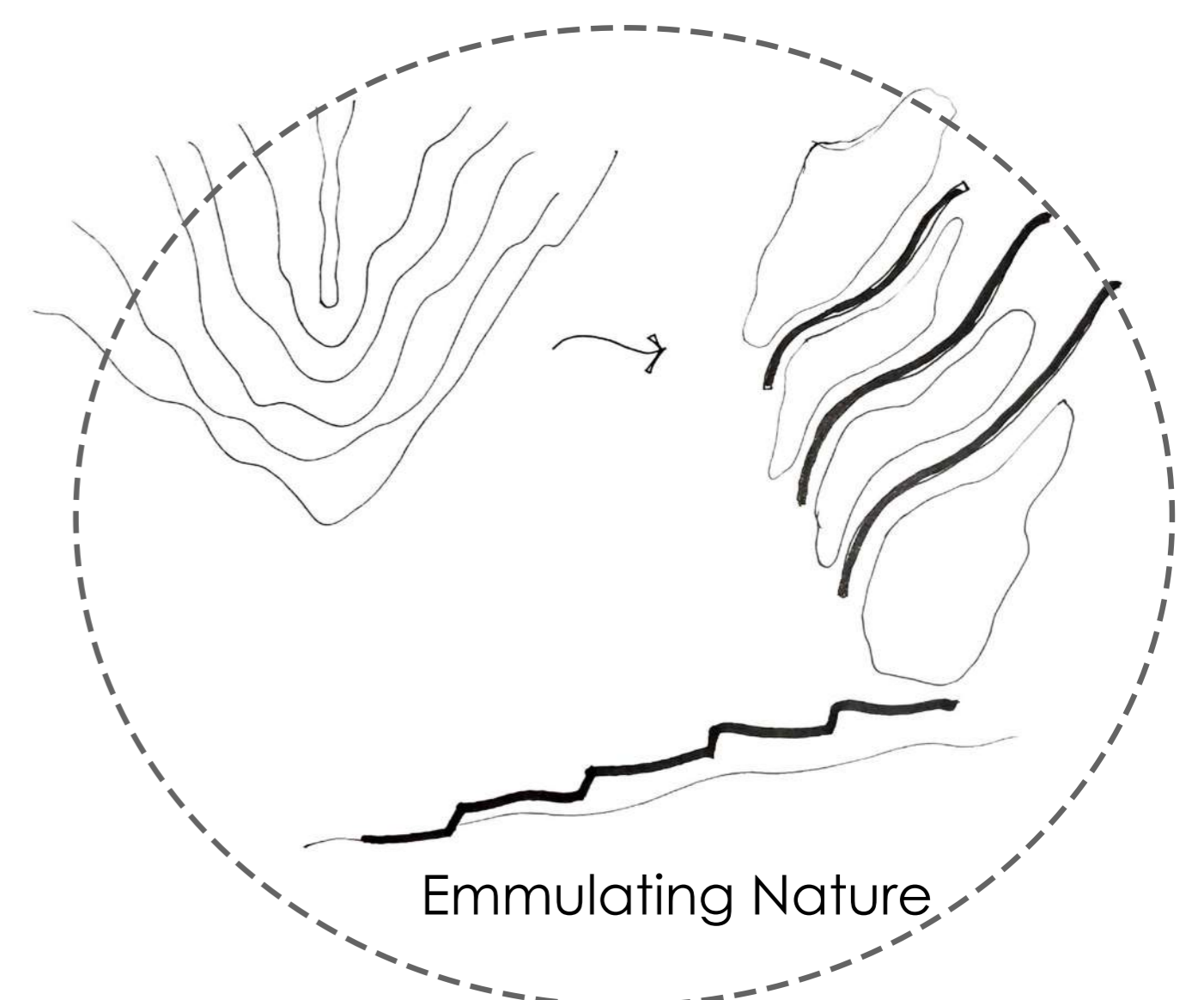
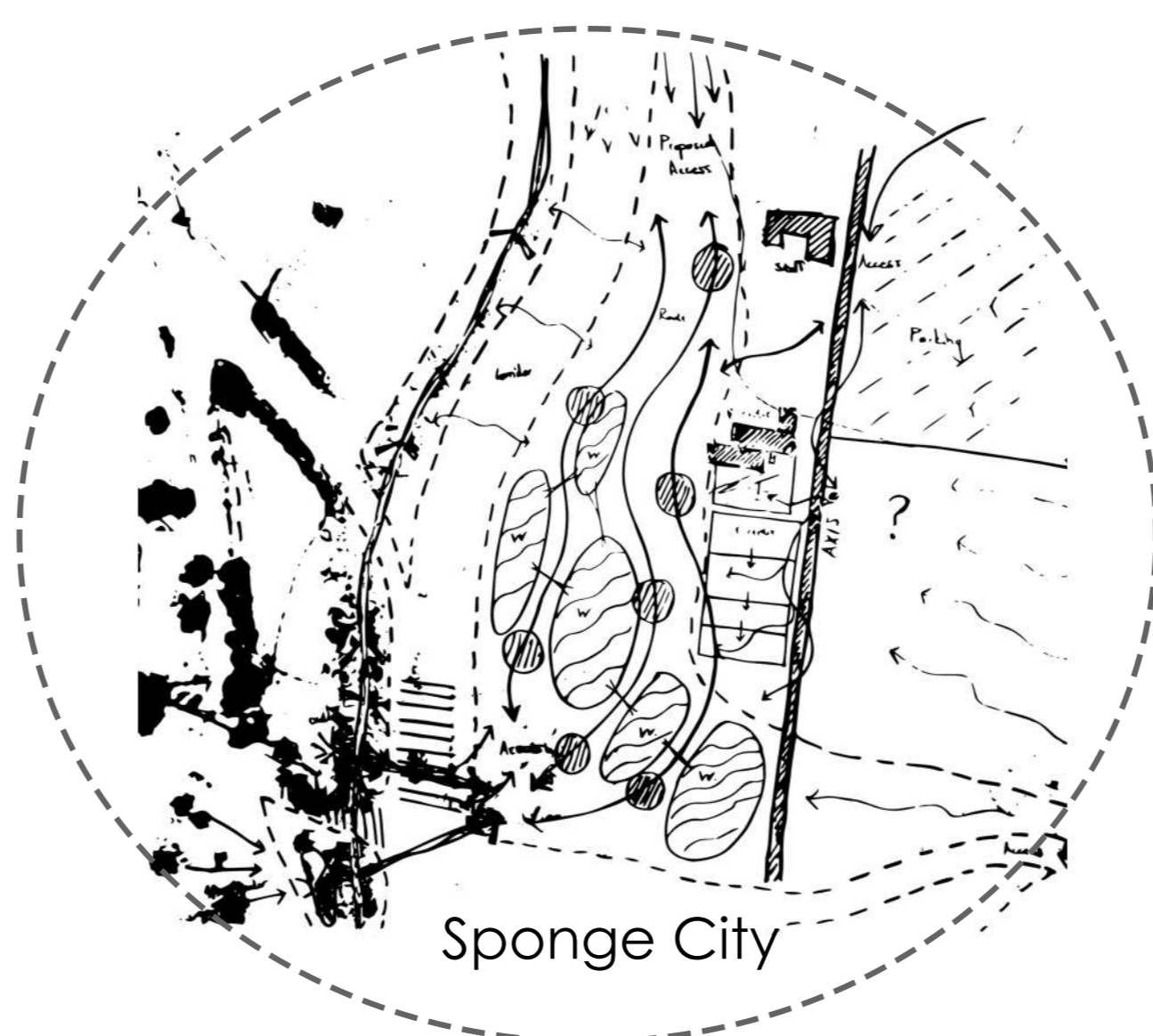
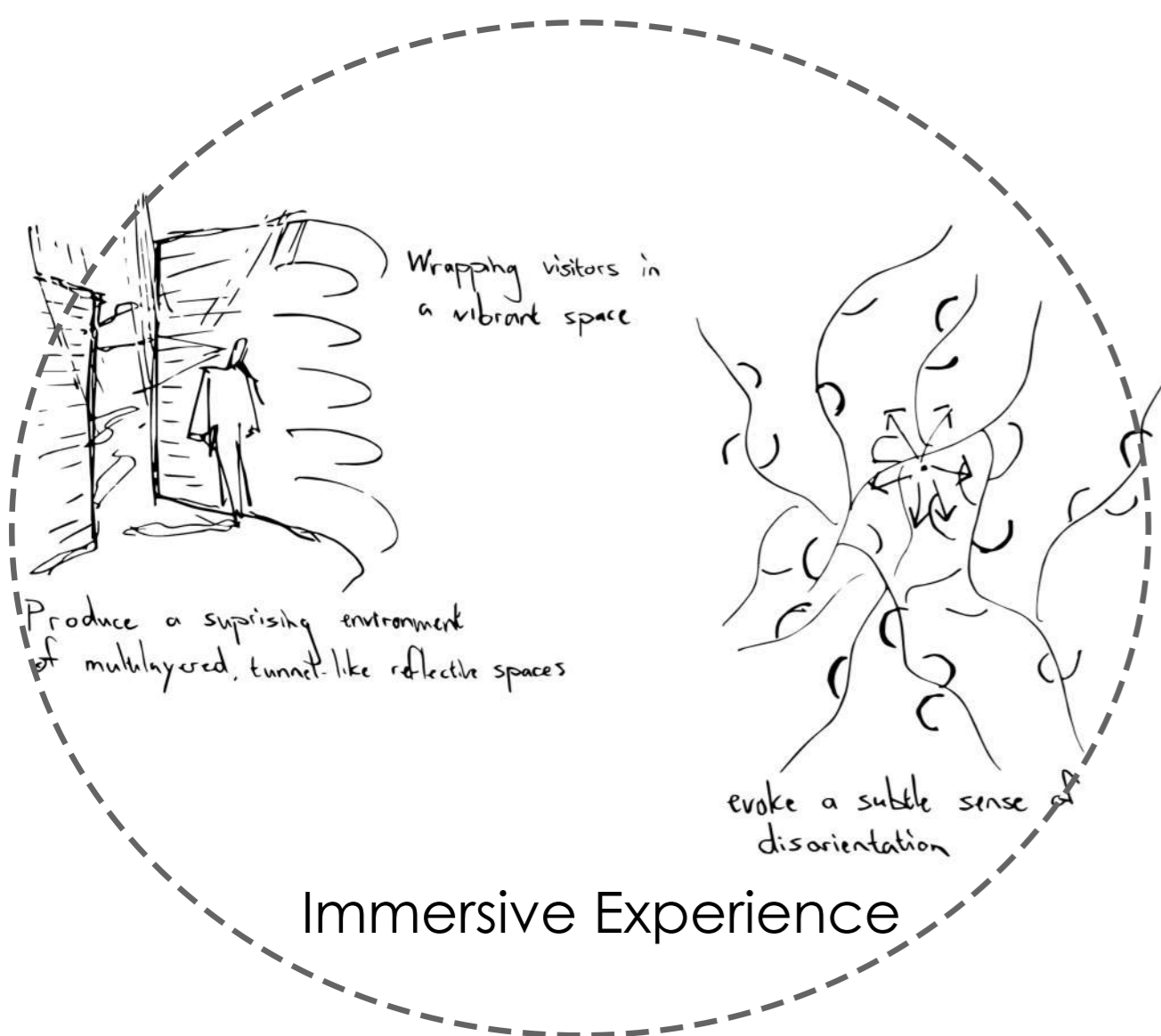
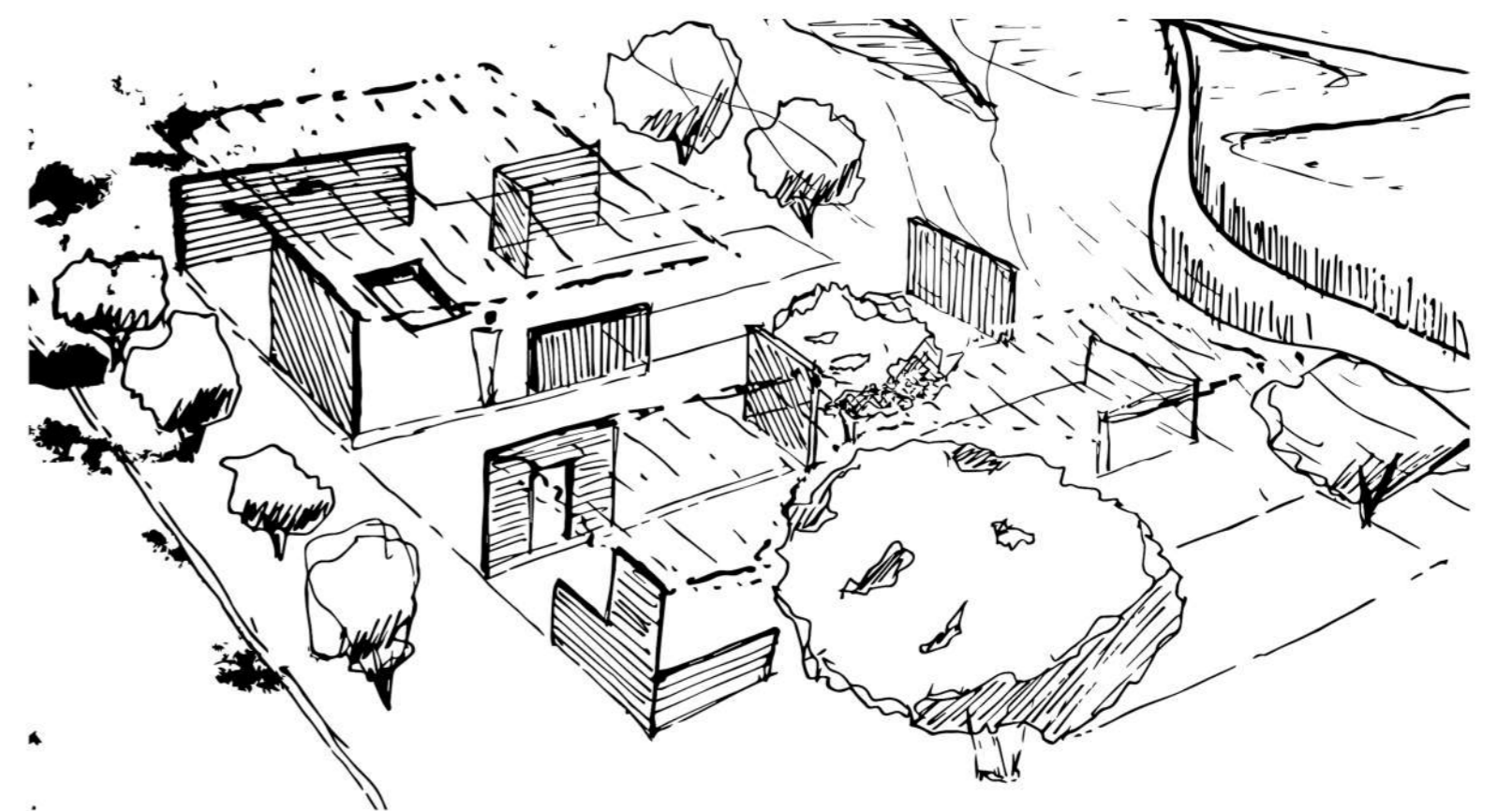
The project's core concept is symbolized by a kaleidoscope, representing change, balance, and harmony. The dynamic symmetry of the pattern reflects its transformative nature, constantly shifting, integrating past, present, and future elements. Its multilayered and holistic attributes convey a circular system, creating a unique and dynamic visual experience.



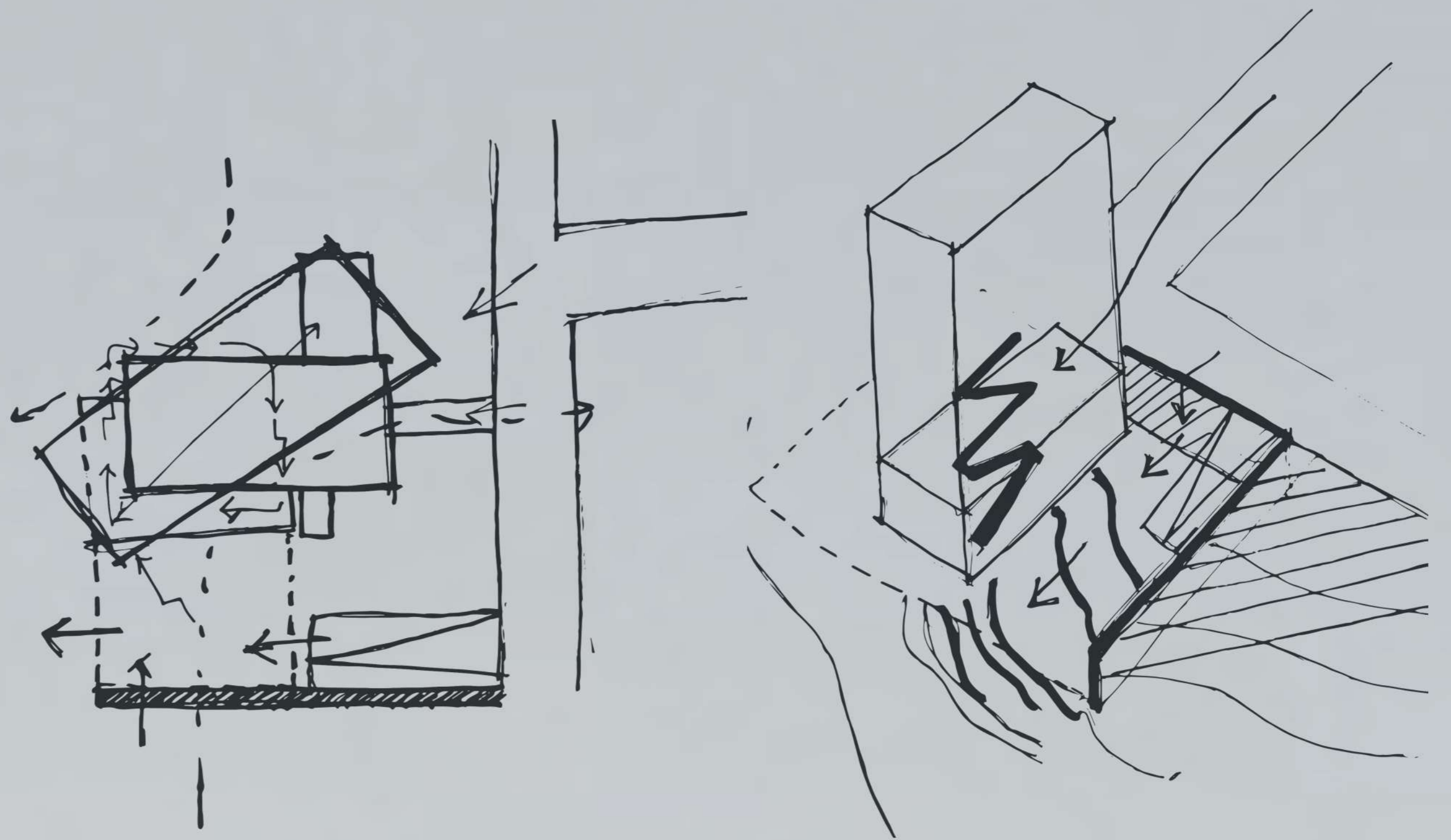
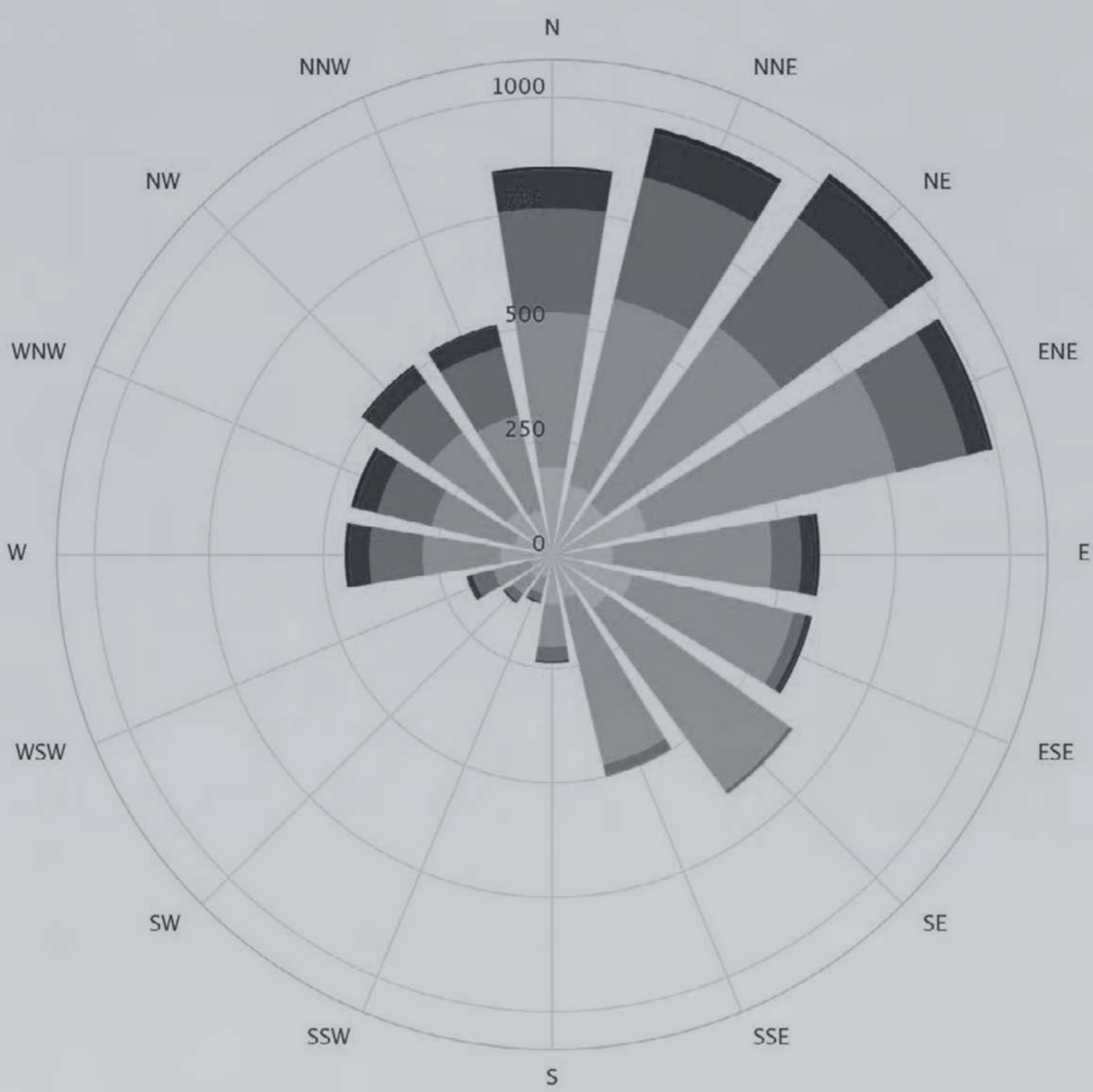
The interplay of materials, angles, and shapes within the project results in a complex interaction of light, color, and shades. As visitors move around and through the site, the alignment of various elements shifts, causing new colors and tones to emerge, akin to a moiré pattern. This immersive and dynamic approach aims to evoke a subtle sense of disorientation, enveloping visitors in a vibrant and captivating space.



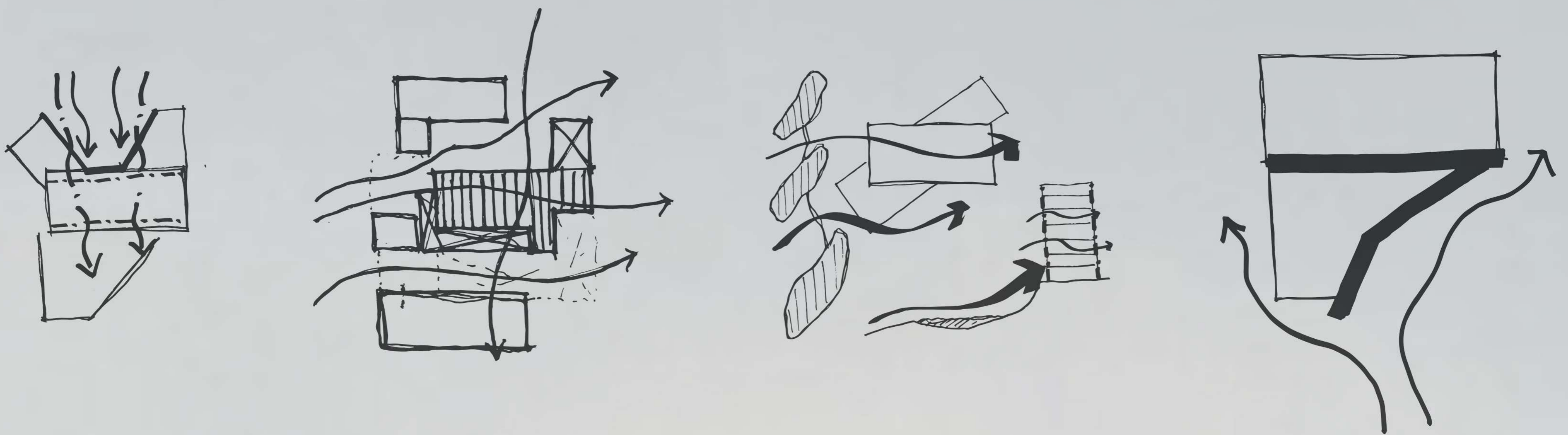
The project is designed to be in constant dialogue with its ever-changing natural surroundings. The site's natural condition, characterized by its variability, serves as a source of inspiration for architectural elements that adapt and respond to these natural forces.



DESIGN INFORMANTS

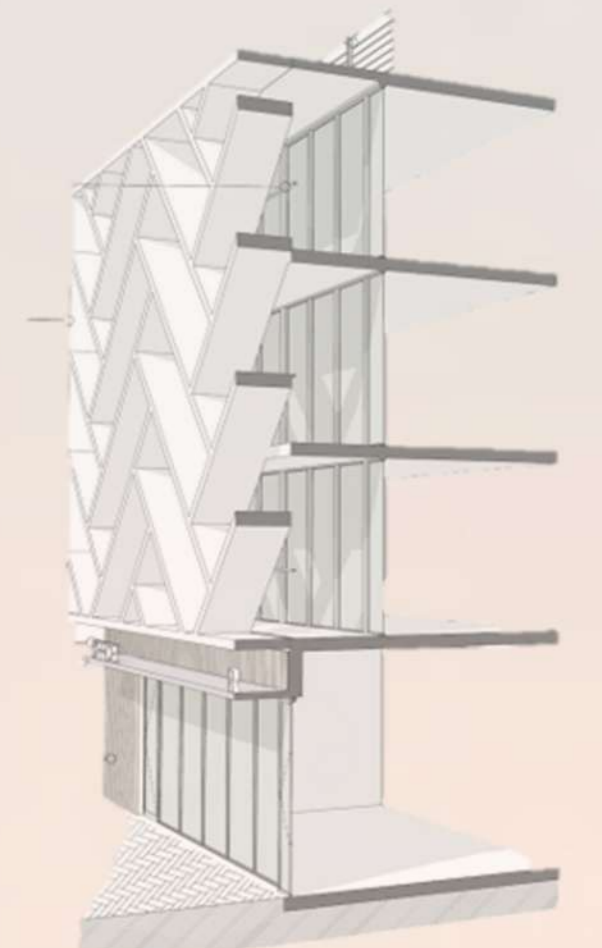
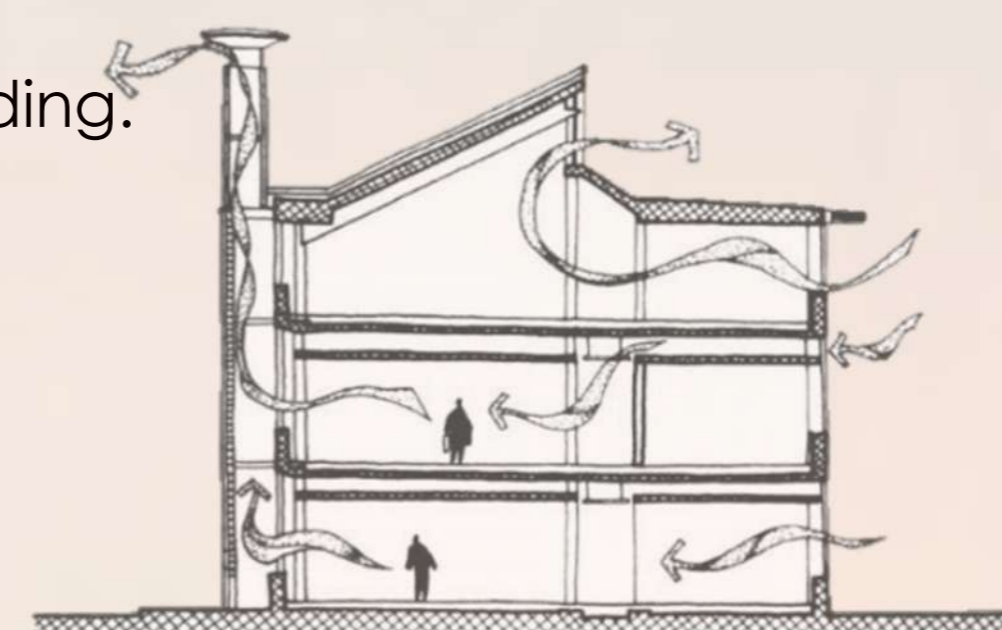
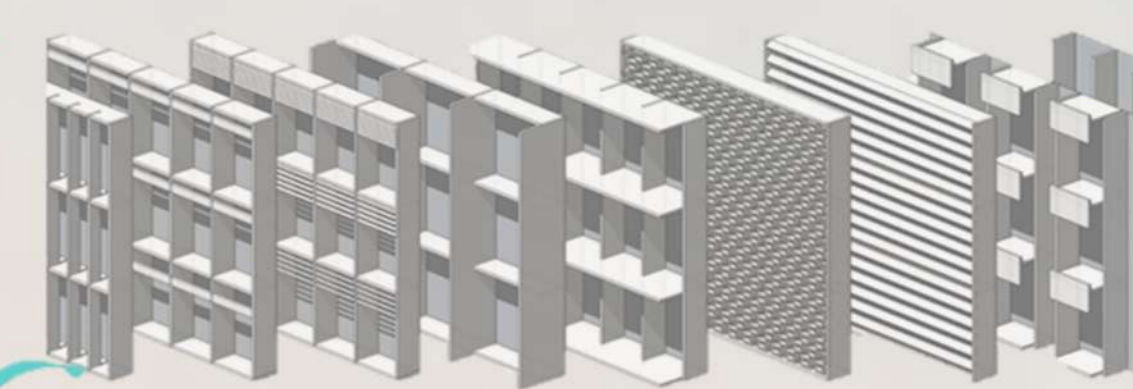
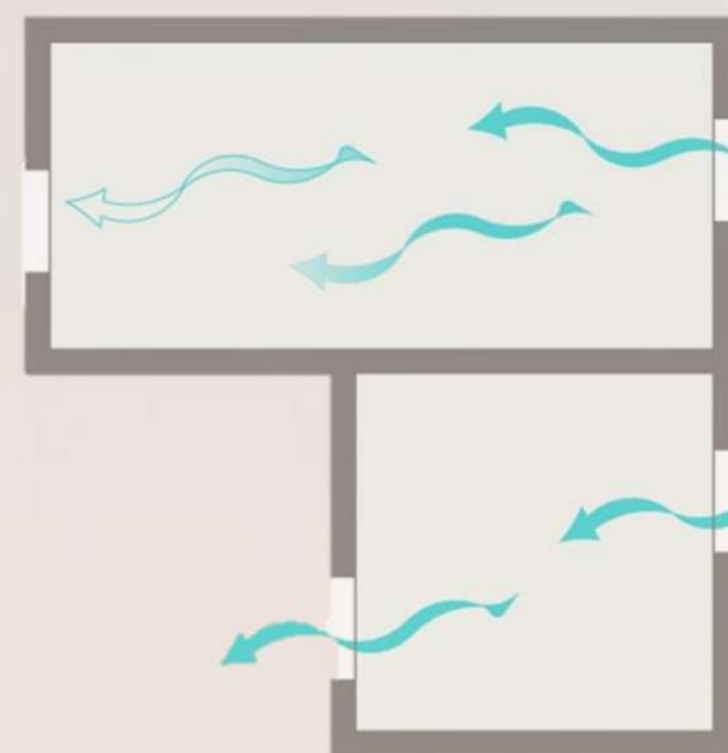
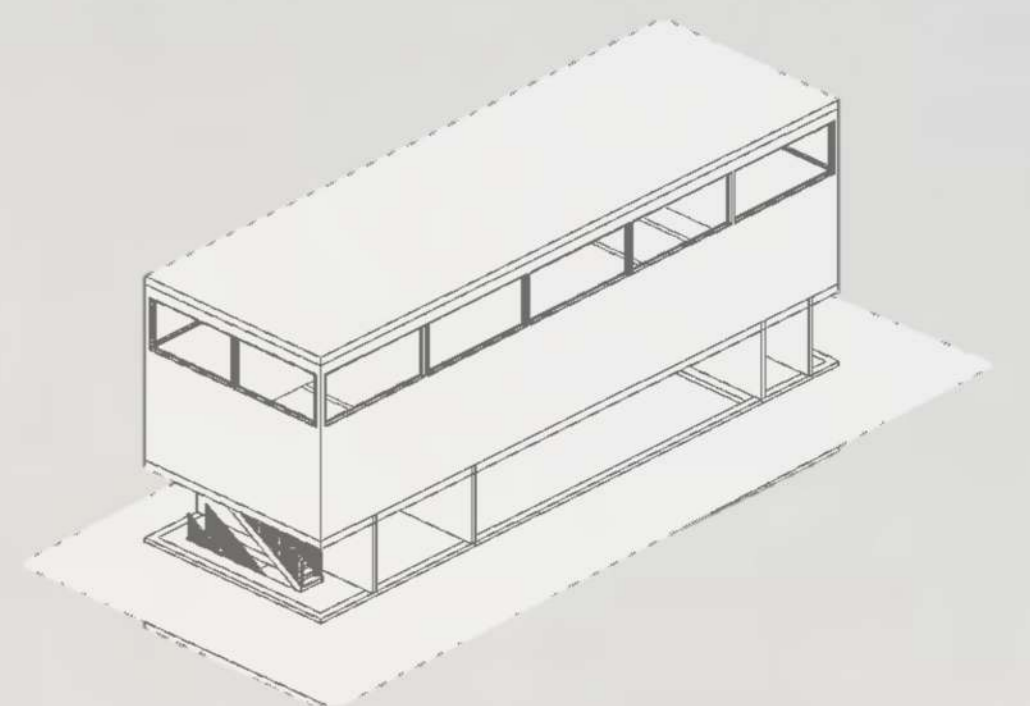


Wind Direction Informing the shape



PASSIVE STRATEGIES

- Mechanical Air Movement Equipment
- Openable Clerestory windows to provide convective air current
- Openings that can be completely opened enable cross ventilation.
- Stack ventilation to induce natural air flow and extract hot air
- Louvered intake provides a turbulent loop for air circulation.
- Planting and/or green space in proximity to buildings.
- Screen / brise soleil or perforated wall that provides shades
- Thermal mass acts as an insulator to regulate interior cooling retention.
- Courtyard enhances air flow and minimises internal temperature of the building.
- Evaporative cooling reduces internal temperature.



CLIENT, USER & ARCHETYPES



- Department of Environmental Sciences
- Department of Geography



office worker



pedestrian



volunteer



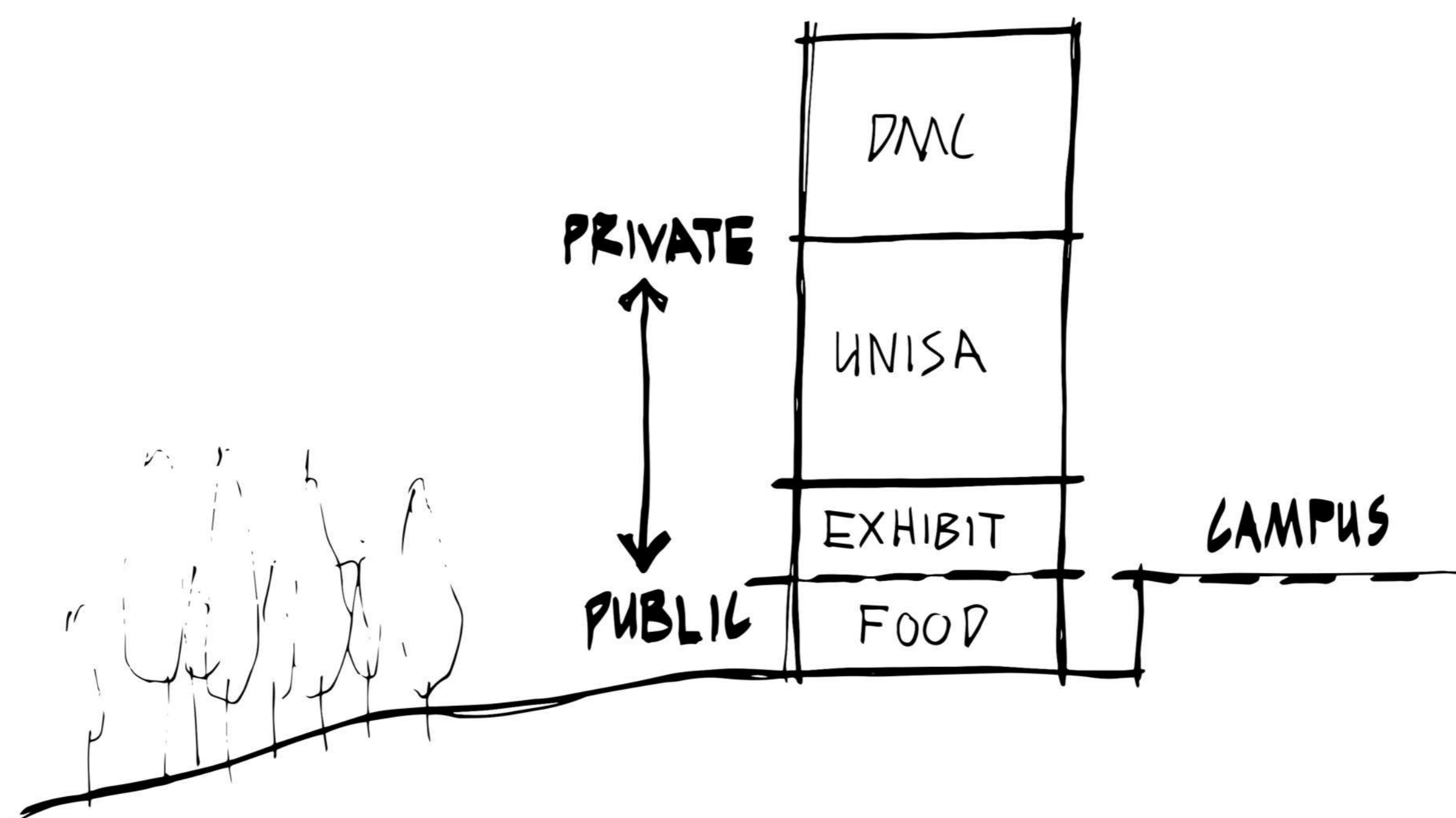
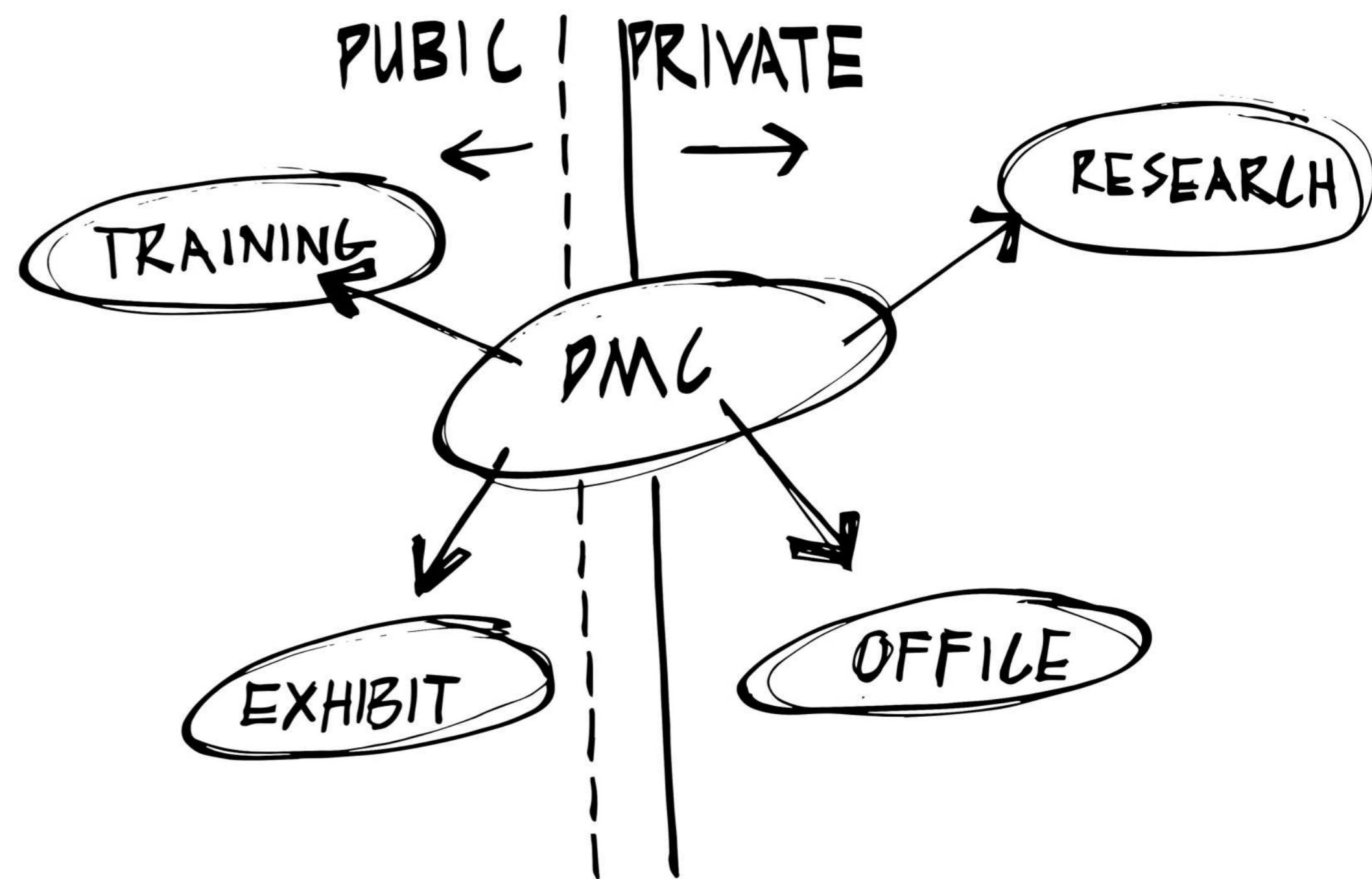
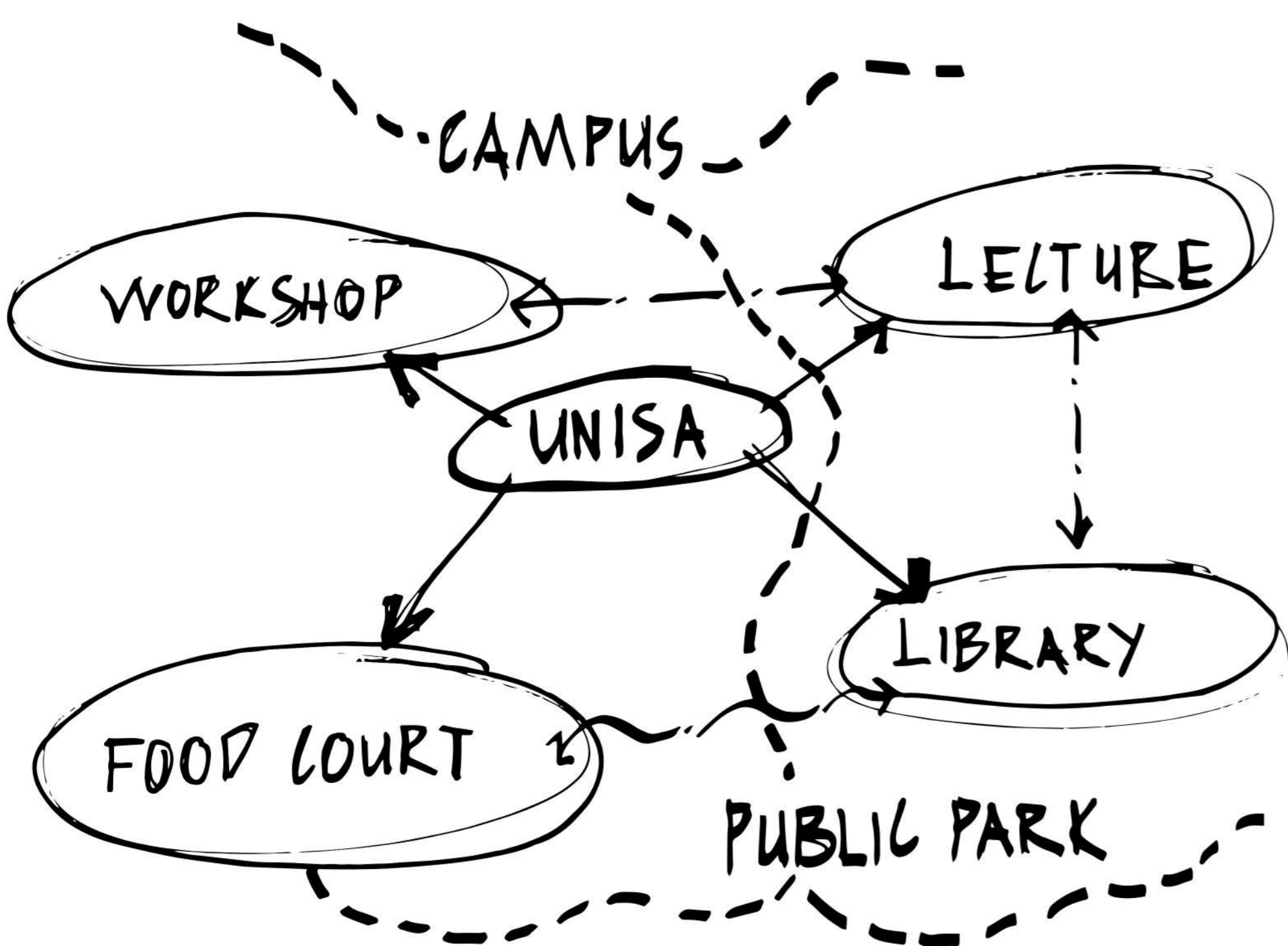
researcher



student & scholar



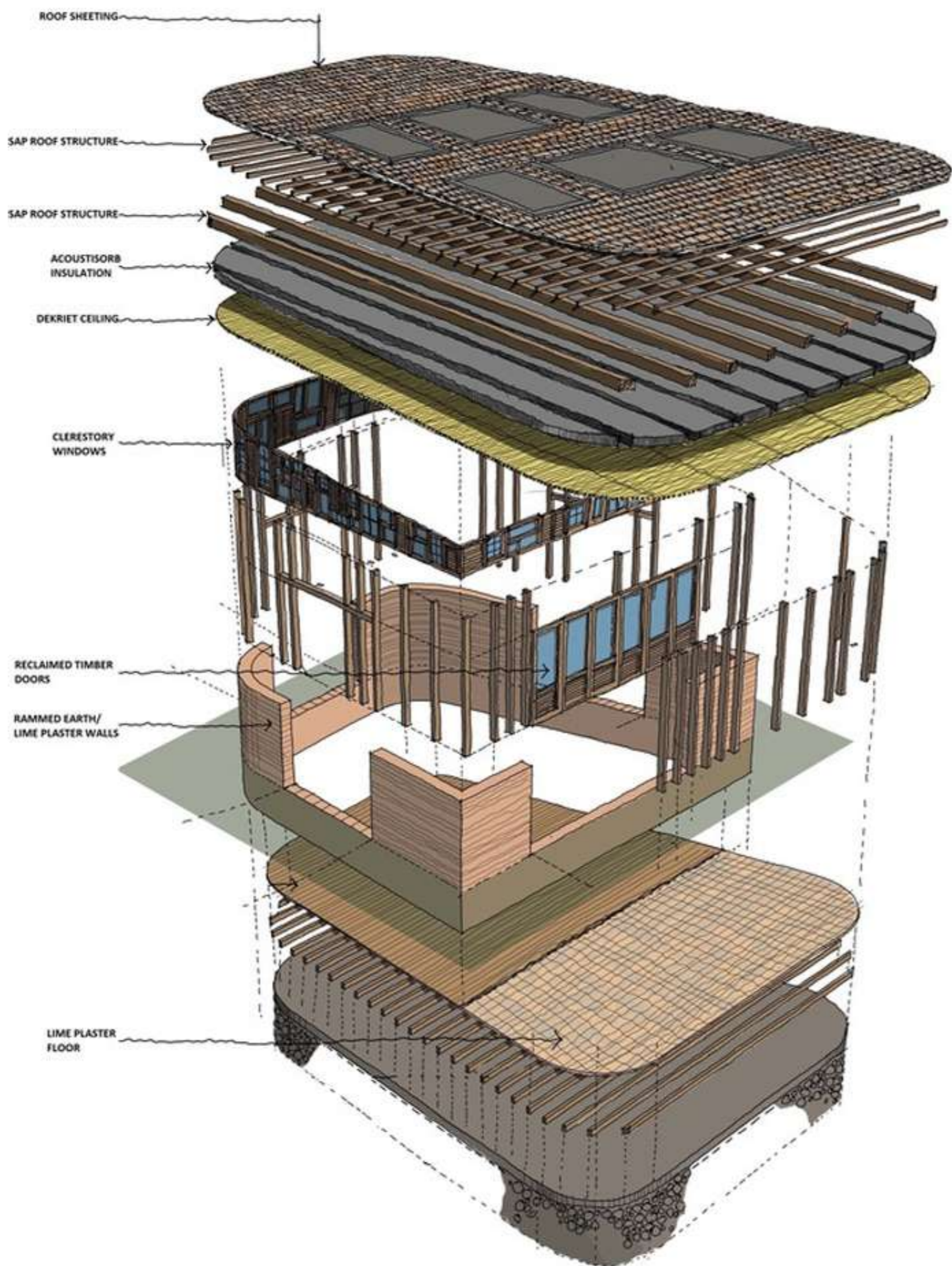
tourist



PRECEDENTS



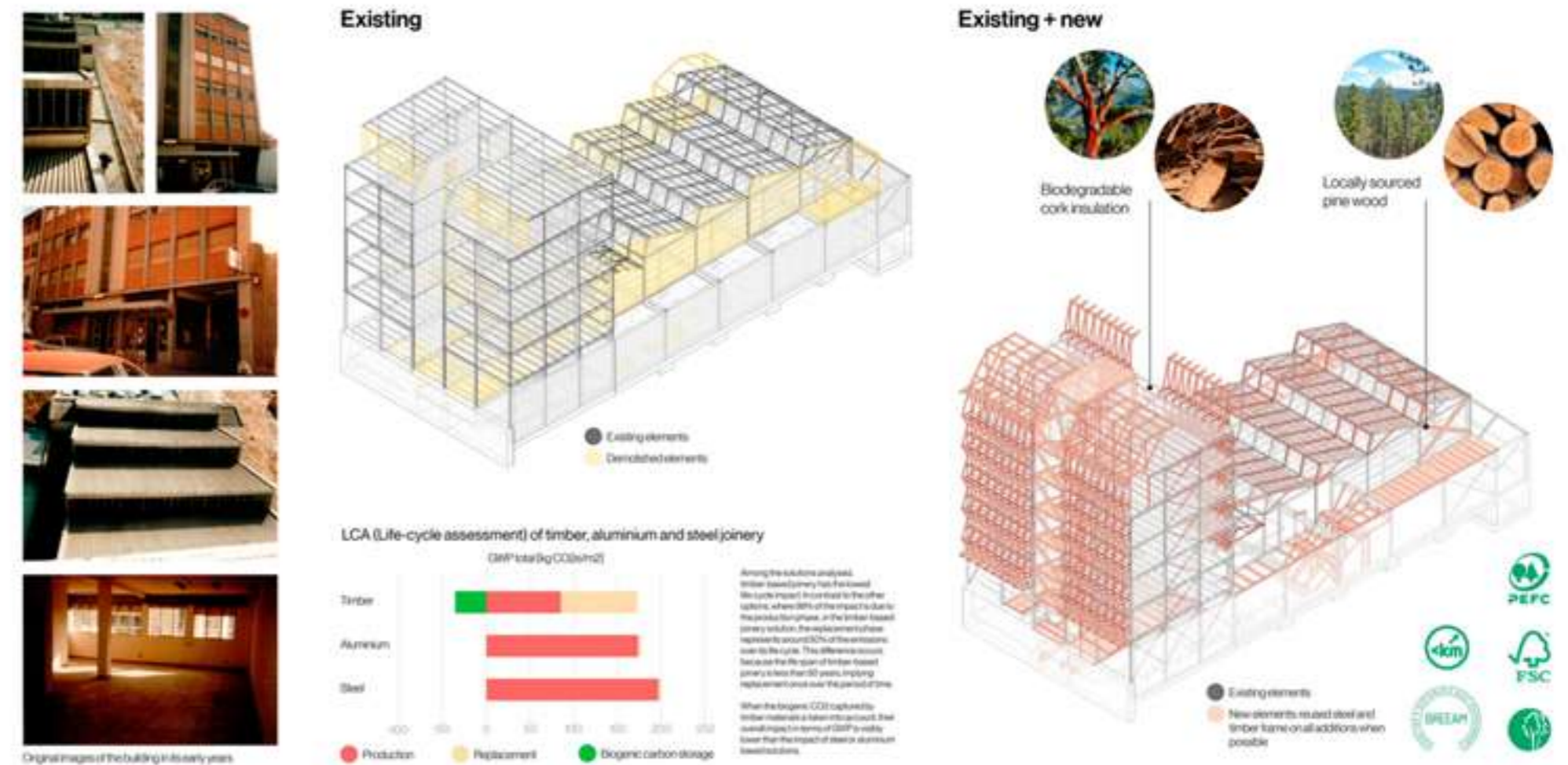
Green School South Africa
 GASS Architecture Studios
 Year: 2021
 Location: Paarl, South Africa



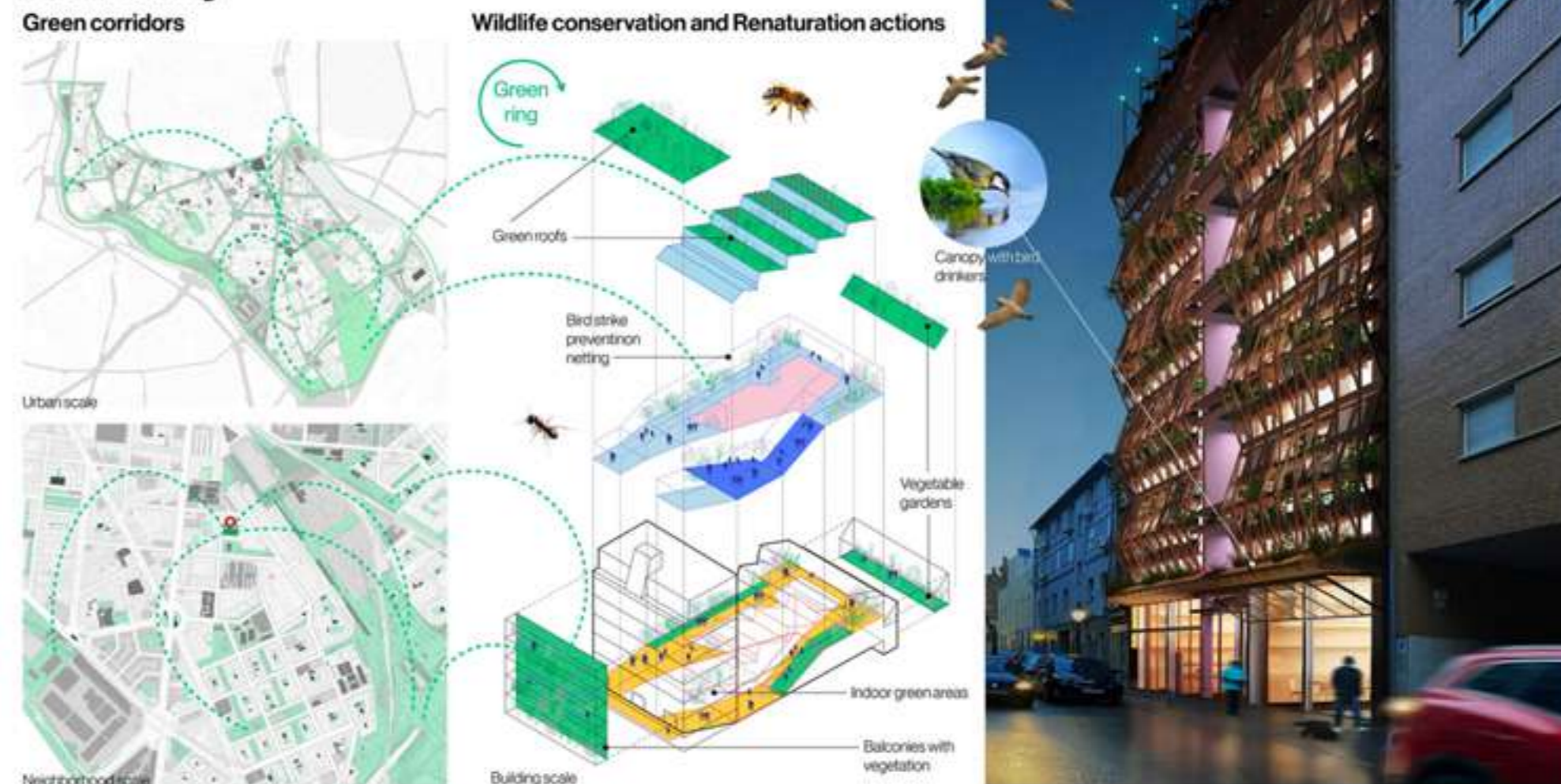
Composition of Knowledge House
 Husos & Elii, Ultrazul
 Year: 2022
 Location: Madrid, Spain



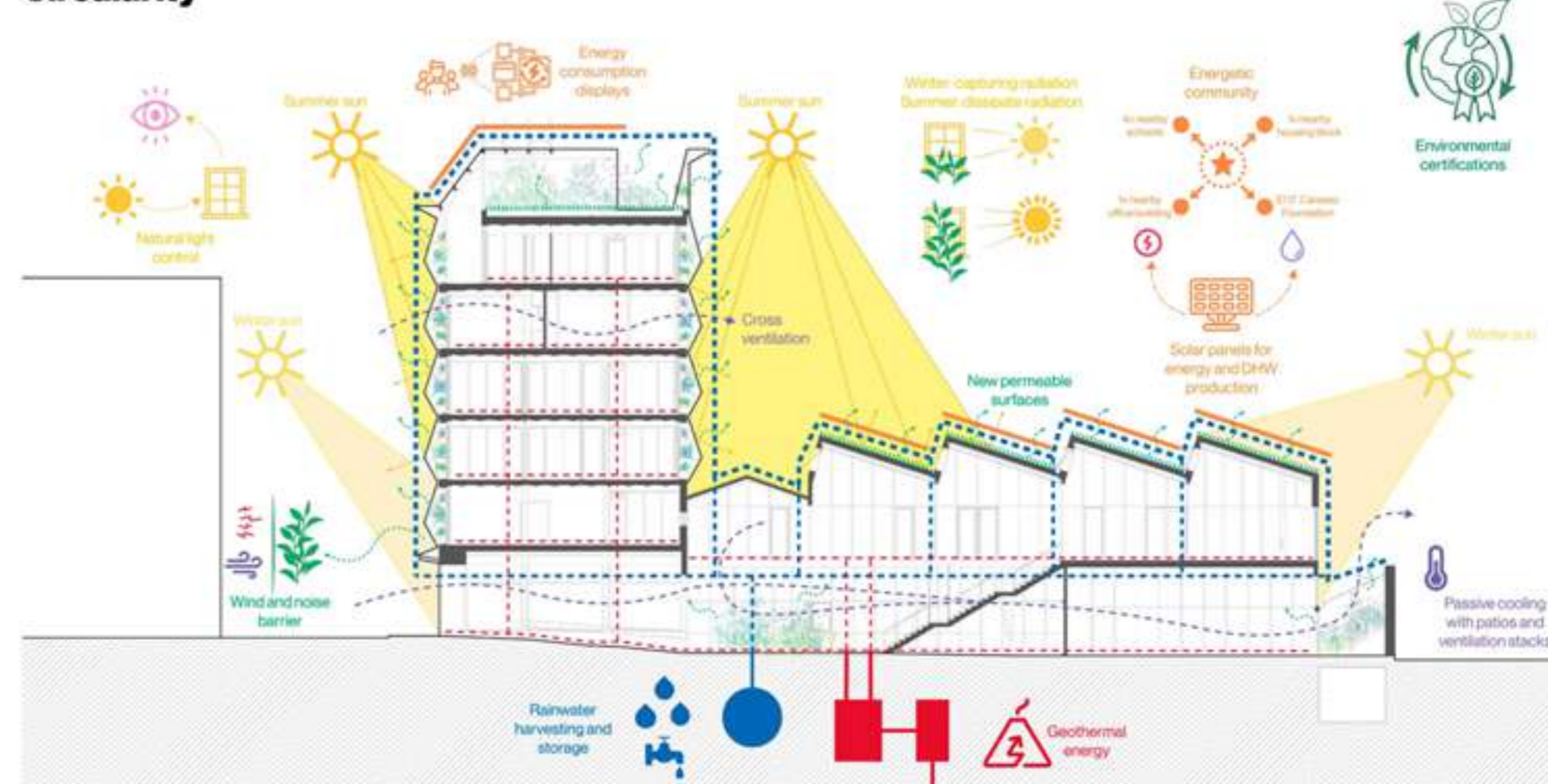
Re-Use + Bio Materials



Biodiversity



Circularity



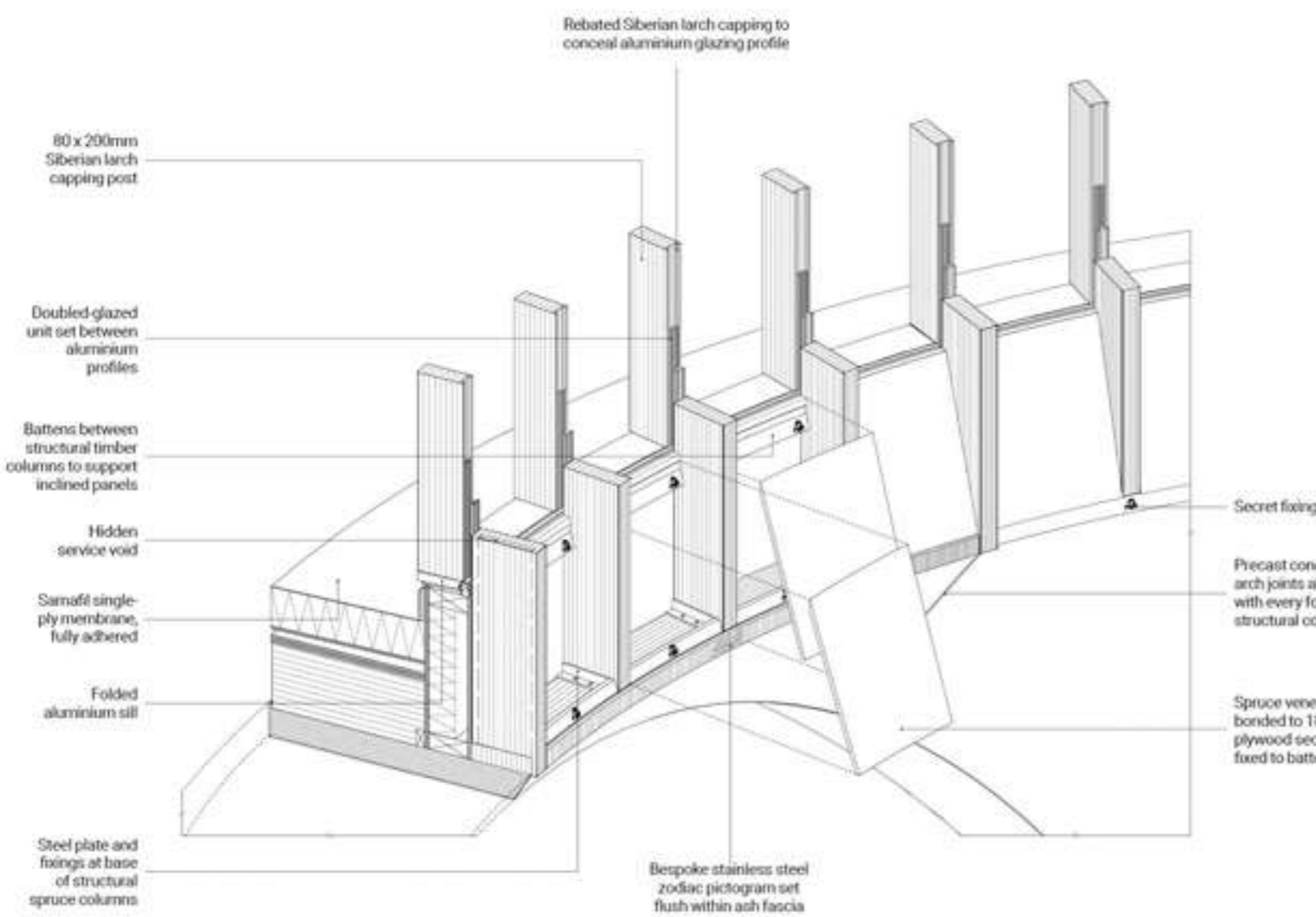
PRECEDENTS



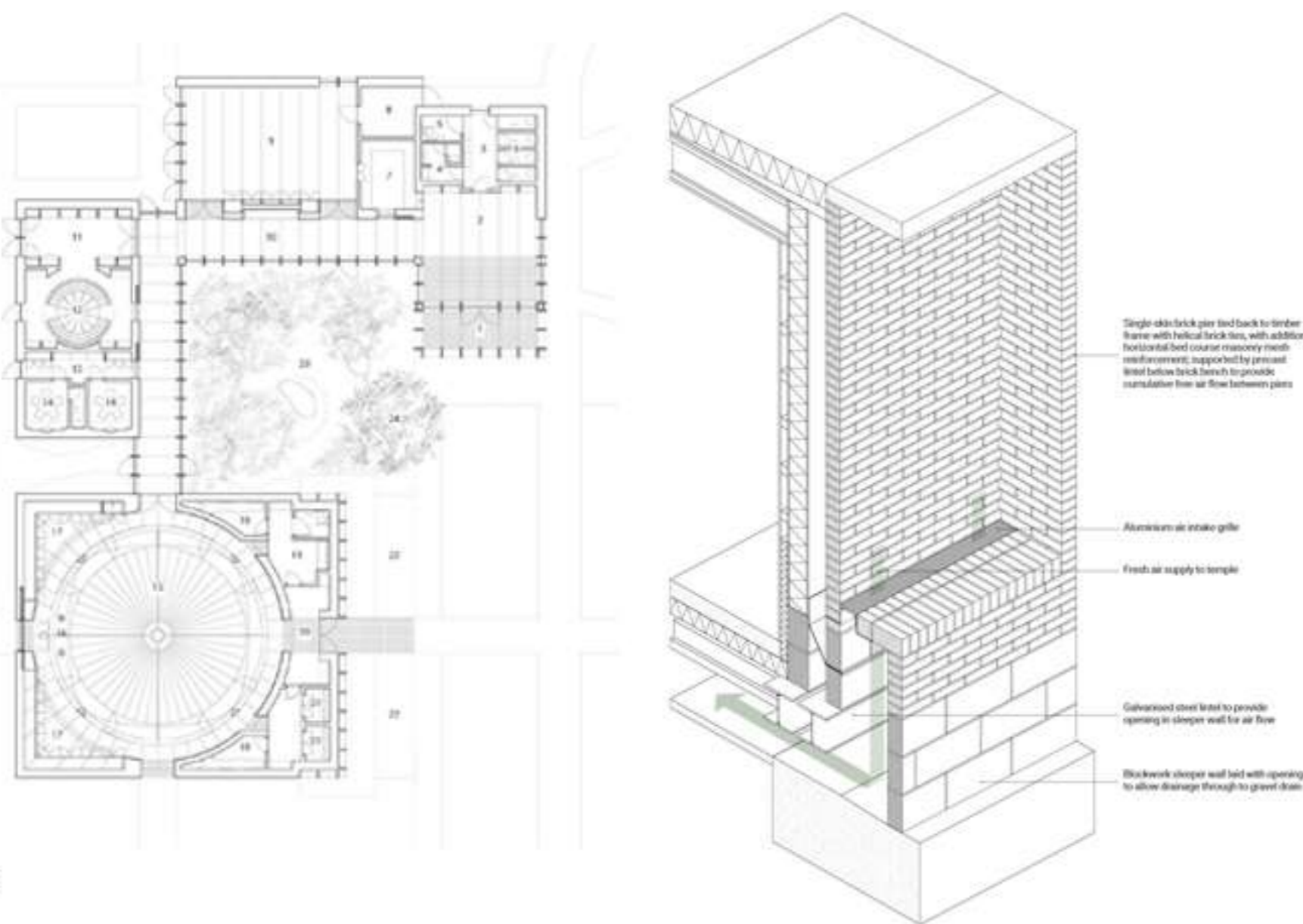
Temple Complex
James Gorst Architects
Year: 2023
Location: United Kingdom



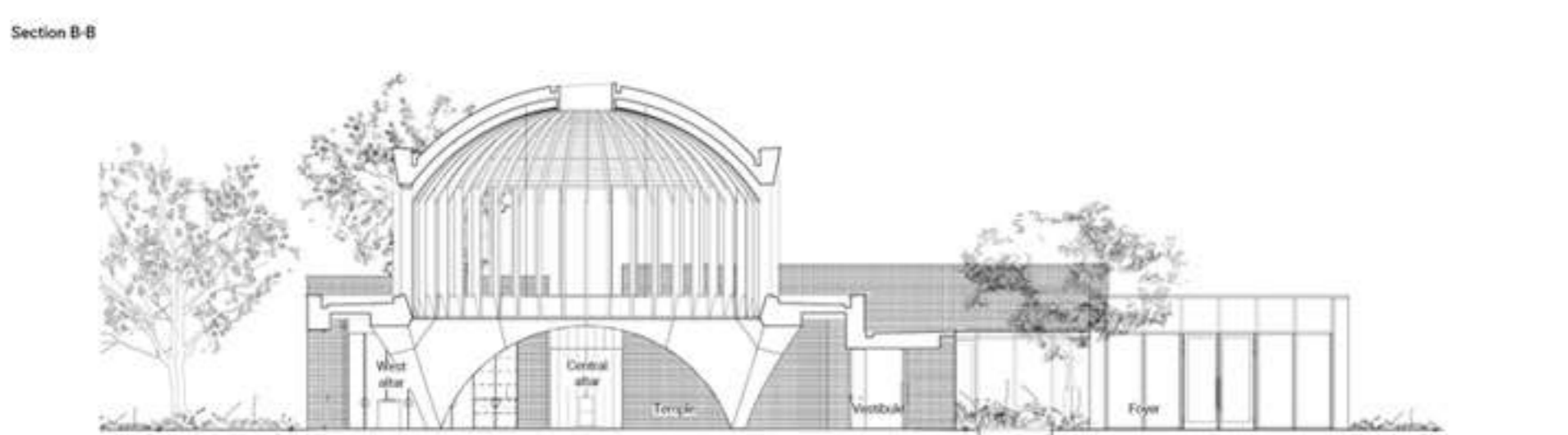
Isometric sectional lantern detail



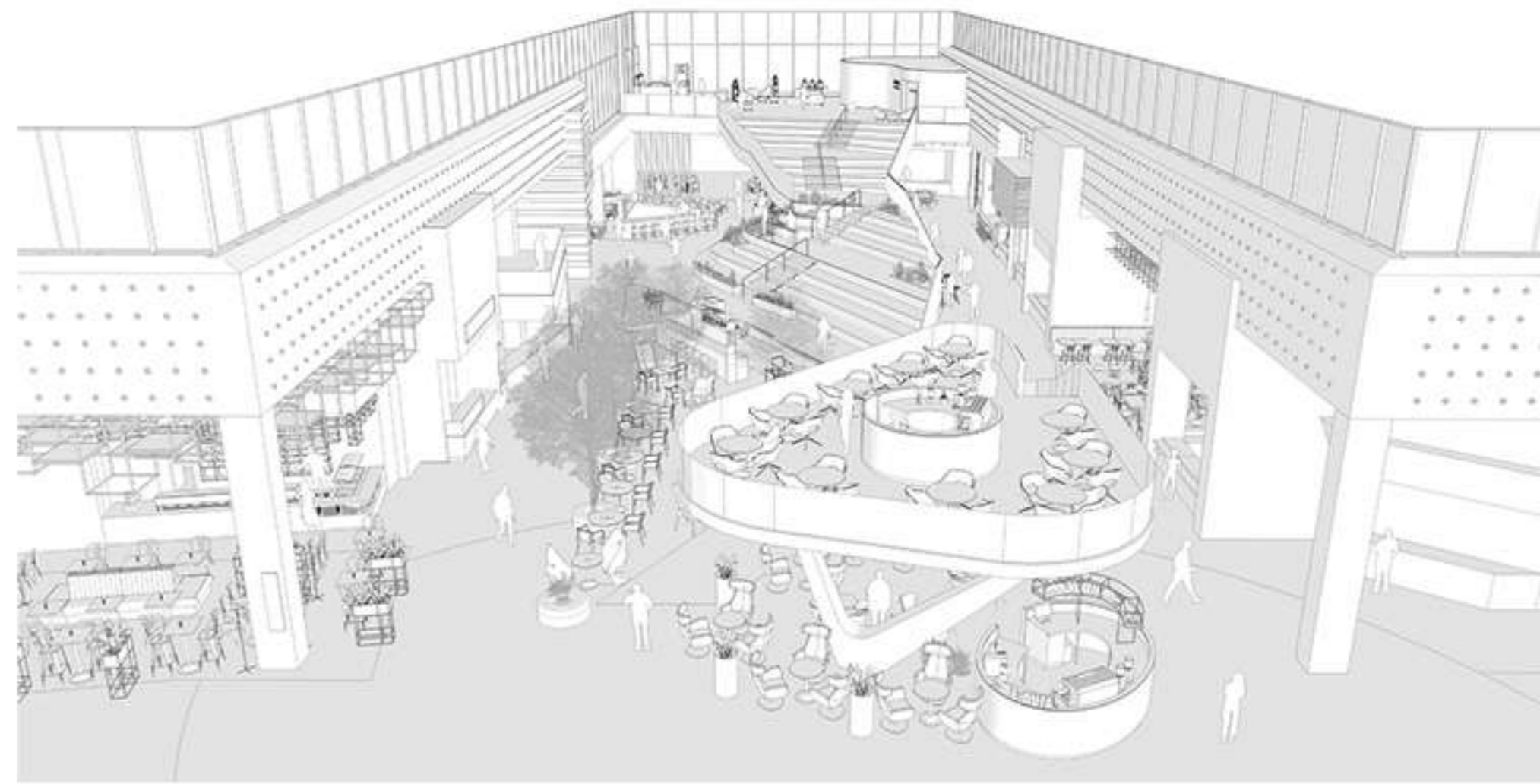
Sub-floor ventilation detail



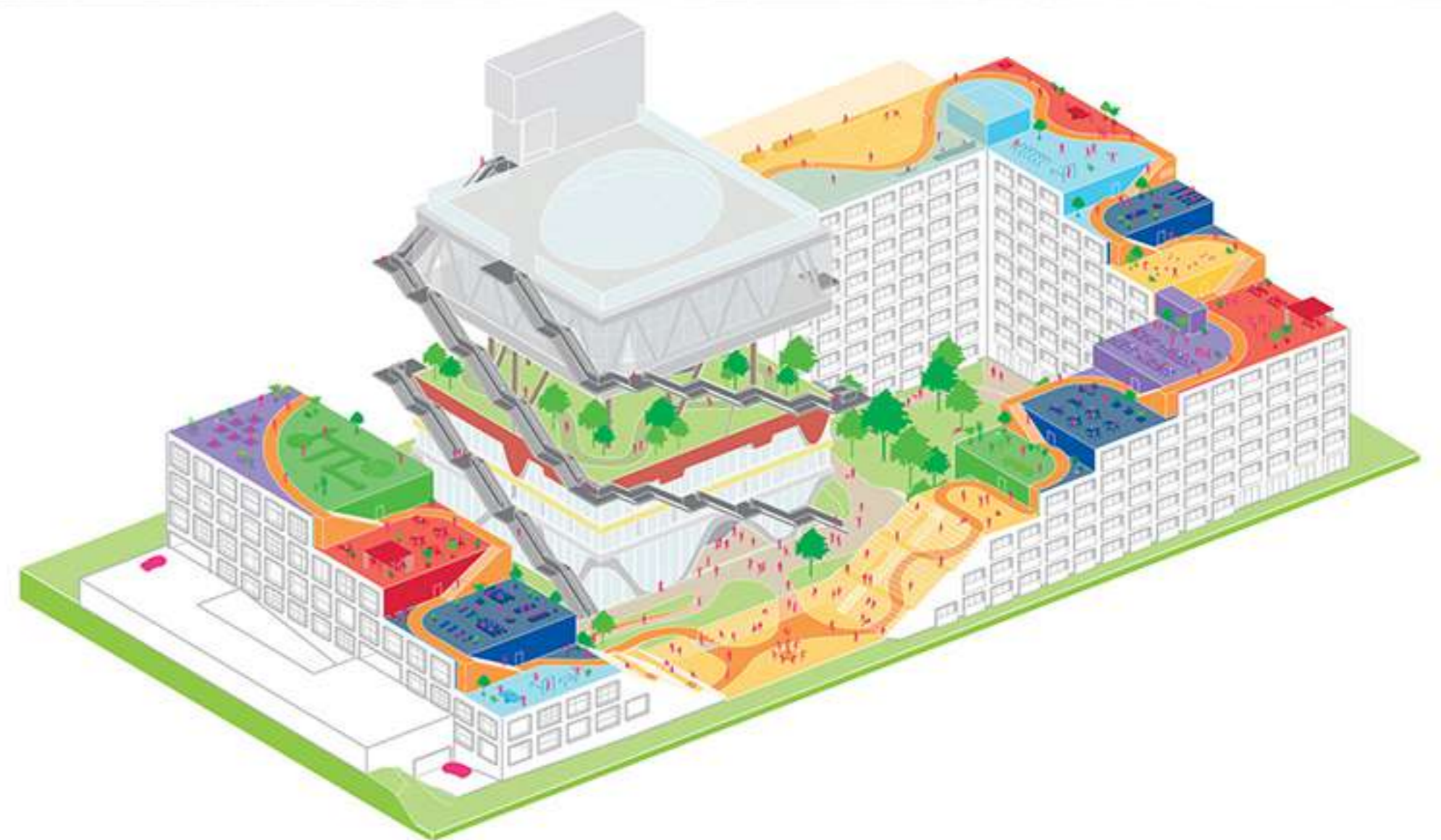
Sections



Gastro Passage Foodcourt
Suchanek Architectural Office
Year: 2018
Location: Bratislava, Slovakia



Co-Working Complex
MVRDV
a



PRECEDENTS



Van Gogh Immersive Expo

Year: 2017
Location: London, United Kingdom



PLANTING PALETTE



ASPARAGUS VIRGATUS * PLECTRANTHUS ECKLONII * PLECTRANTHUS MADAGASCARIENSIS * ZANTEDESCHIA AETHIOPICA * MACKAYA BELLA * ASPARAGUS DENSIFLORUS



PORTULACARIA AFRA * ASPARAGUS DENSIFLORUS SP MEYERSII



PLECTRANTHUS CILIATUS * MAYTENUS UNDATA * ASPARAGUS VIRGATUS * CHLOROPHYTUM BOWKERII * CASSINOPSIS ILICIFOLIA



PLECTRANTHUS CILIATUS * ASPARAGUS DENSIFLORUS MEYERSII * ZANTEDESCHIA AETHIOPICA

CLIMATE RESPONSE & ADAPTATION STRATEGIES

