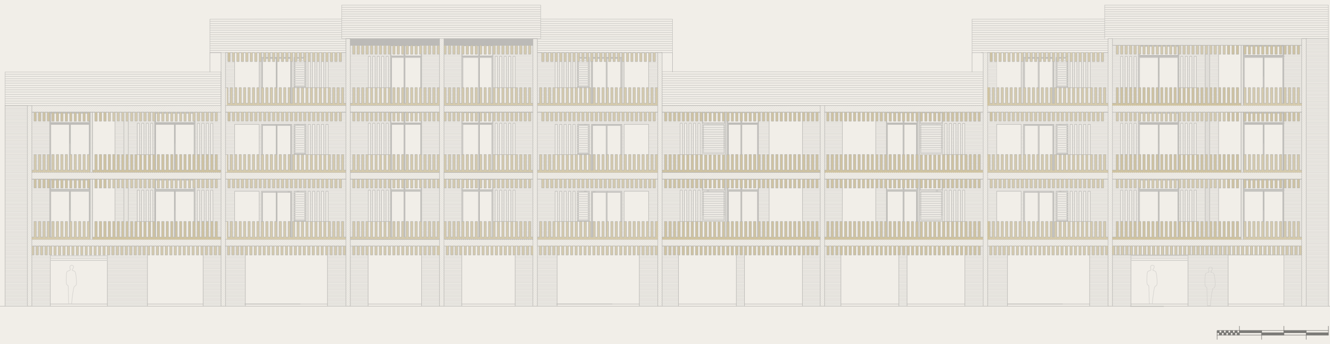
The Journal of SUSTAINABLE BUILDING DESIGNS

ISSUE NO. 4

Affordable Housing



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FOR A BETTER URBAN FUTURE

The Journal of Sustainable Building Design

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The Journal of

SUSTAINABLE BUILDING DESIGN

Affordable housing

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Contents

1

Introduction

Buildings have a strong potential to impact positively or negatively two important elements of everyday life: our environment and energy bills. Their contribution to climate change mitigation on greenhouse gas emission and higher or lower energy bills are directly related to the way buildings are designed in relation to the local climate and site-specific characteristics.

This journal calls for change in the way we build. It promotes creative ways to produce buildings which achieve optimum conditions for their inhabitants whilst making minimum demands on fossil-based energy. The first step in creating comfort and thermal delight in buildings is to understand the relationship between the local climate and our need for shelter. Buildings should vary with climate and thus with location.

The design of energy efficient buildings and homes depends on, solar path and solar radiation, rainfall, humidity, prevailing wind, and ambient temperature of a particular place among others. Design parameters of buildings and homes, therefore, vary with different climatic zones. Therefore, to achieve sustainable housing, it is important to build conssidering the prevailing climatic conditions.

Poor climatic design of buildings, all too often seen in 'modern' architecture, causes many buildings to overheat, even in temperate or cold climates where such problems were never faced before the advent of modern architecture. The influence of the sun should be understood and respected by designers of passive solar buildings in which the sun's free energy is used for natural lighting, heating and drying out but will not interfere with the occupants' comfort. Well-designed buildings with environmentally friendly solutions use less energy. They require lower maintenance compared to ordinary buildings and are more comfortable spaces to live in.

Designing an energy efficient built environment involves minimising the wastage of energy resources while maximising the use of passive design options and renewable energy sources. The green building (or sustainable building) is a result of a holistic approach. It is designed, constructed, and operated in an environmentally responsible way; it is resource efficient (land, water, energy, material, waste) throughout the building's life-cycle.

This journal acts as a guideline in providing applicable passive design principles for different climatic conditions that should be taken into consideration when designing in the different climates. These include:

- Site analysis
- Building orientation
- Natural ventilation
- Day lighting
- Solar shading
- Building materials
- Window sizes
- Window location
- Location of building services

Whereas sustainable buildings are directly related to local climate and site conditions, this journal is not intended to provide generic templates replicable in any part of the East African region. It aims to discuss examples and guide the user on how best to explore local climatic conditions.

Designing an energy efficient built environment involves minimising the wastage of energy resources while maximising the use of passive design options and renewable energy sources.

2 Site Planning

Sustainable site planning begins with the assessment of the building site in terms of its capability to provide natural lighting and ventilation, sun shading but also access to services and facilities.

Microclimate

The microclimate of a certain site is affected by the following factors: landform, urban forms and external space, vegetation, water bodies, street width and orientation.

Urban forms and external space

The urban form cannot change the regional climate but can moderate the microclimate and improve the conditions for the buildings and their inhabitants.

The influence of the climate on the external space of traditional settlements can be well illustrated by the following examples:

1. Settlements for hot, dry climates are characterized by optimal protection against solar radiation by mutual shading, which leads to compact settlements, narrow streets and small squares which are shaded by tall vegetation;

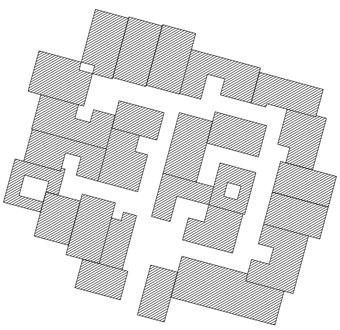
2. Settlements for warm humid areas are laid out to make maximum use of the prevailing breeze. Buildings are scattered, vegetation is arranged to provide maximum shade without hindering natural ventilation.

Urban Patterns

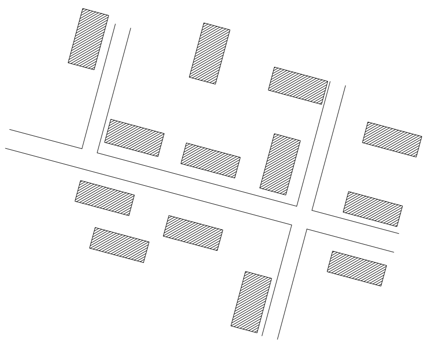
Balanced urban patterns of streets and blocks can be oriented and sized to integrate concerns for light, sun and shade according to local climate characteristics.

Solar radiation control:
Streets orientation and layout has a significant effect on the microclimate around buildings and on the access to sun and wind.
A cardinal orientation will generally cast more shadow on buildings facing north-south streets than a rotated organization, and thus do a better job at shading buildings. In contrast, rotated orientations provide more shade on the streets for more time

Figure 1: Urban density according to climate



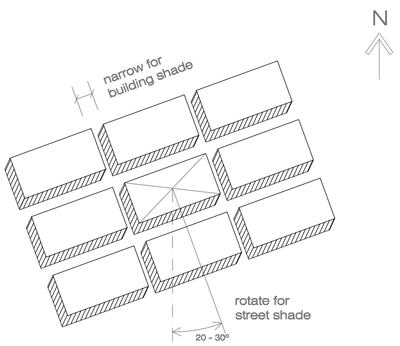
Hot and arid:
Dense urban settlements with narrow streets provide solar protection



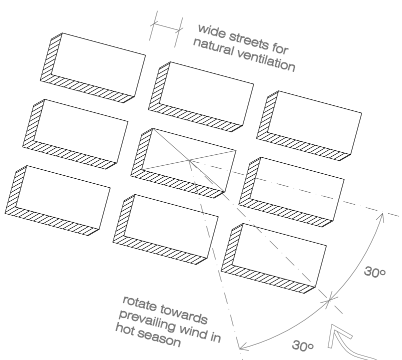
Hot and humid:
Wide streets and space between buildings maximizes natural ventilation

Hot-arid climate
1st priority: Summer shade
2nd priority: Summer wind; winter sun
•Narrow N/S streets for shade.
•Rotate from cardinal to increase street shading.
•Space e/W streets for solar access, if needed. Elongate blocks E/W.

Figure 2: Recommended urban patterns in different climates



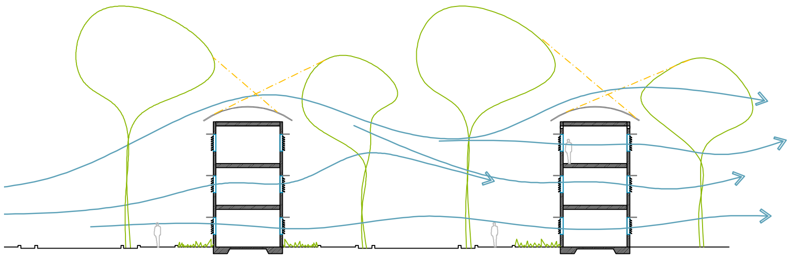
Hot and arid climate



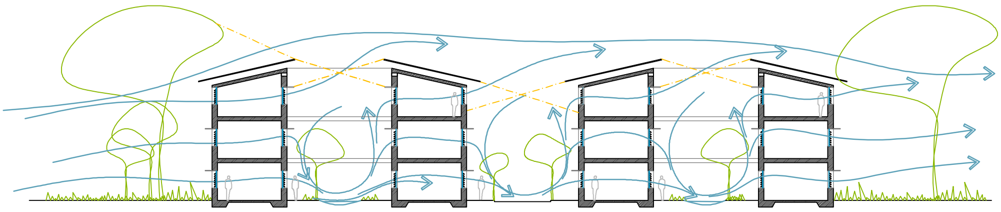
Hot and humid climate

Hot-humid climate
1st priority: Summer wind
2nd priority: Summer shade; winter sun
•Orient streets 20°-30° oblique to summer wind.
•Modify orientation by rotating from cardinal to increase street shading.
•Space e/W streets for solar access, if needed. Elongate blocks E/W.
•Wide streets for wind flow.

Figure 3: Site planning for sunshading and natural ventilation



Hot and humid climate.



Hot and arid climate.

Wind effects
In hot humid climates, loose urban patterns should be preferred in order to maximise cooling breezes.
Breezy streets oriented to the prevailing wind maximize wind movement in urban environments and increase the access of buildings to cross ventilation.
To maximize cross ventilation access and air movement in streets, orient primary avenues at an angle of approximately of buildings to 20°-30° either direction from the line of the prevailing summer breeze.
Dispersed buildings with continuous and wide open spaces preserve each building's access to breezes. Howeve, for a compact development, this is not possible, so buildings should not be in a raw but in a discontinuous pattern. When cooling is the priority, windbreaks should be avoided. The unique exception is in relation to dry hot climates where windbreaks provide important dust and sand protection.

Water effects
Organizations of interwoven buildings and water can be used to reduce the ambient air temperature.
In hot-arid climates, water evaporation can cool air temperature.

Green edges
In hot arid and semi-arid climates, green edges of irrigated vegetation can be formed to cool incoming breezes. Planted areas can be as much as 5-8°C cooler than built-up areas due to a combination of evaporation and transpiration, reflection, shading and storage of cold.

Overhead shades
A layer of overhead shades can protect outdoor space buildings from the high sun.
In many hot climates, both humid and arid, groups of buildings may be linked by shading pedestrian streets or pedestrians may be protected by arcades at the edge of streets and open spaces.

With the aim of reducing the energy demand of individual buildings, low energy urban design combines analysis of shading, wind and natural illumination for optimising shape, orientation and distances between buildings, in order to control solar radiation and ventilation.

3

Case Studies

Appropriate building materials can dramatically affect indoor conditions by controlling indoor temperature and humidity

Affordable housing

CLIMATIC ZONE 1: Hot and Humid climate

Climatic Zone 1: Hot and Humid climate

Location	Dar es Salaam, Tanzania
Latitude	6°48'S
Longitude	39°17'E
Altitude	53 m above sea level
Temperature	Min average temp 21.9°C; Max average temp 29.6°C
Annual Rainfall	Average 1,100 mm
Humidity	Average relative humidity is 79%
Prevalent Wind Direction	Southerly monsoon winds (April - October) and Northerly monsoon winds (November - March) prevailing winds

Figure 5: DAR ES SALAAM (Hours of Sunshine / Temperature)

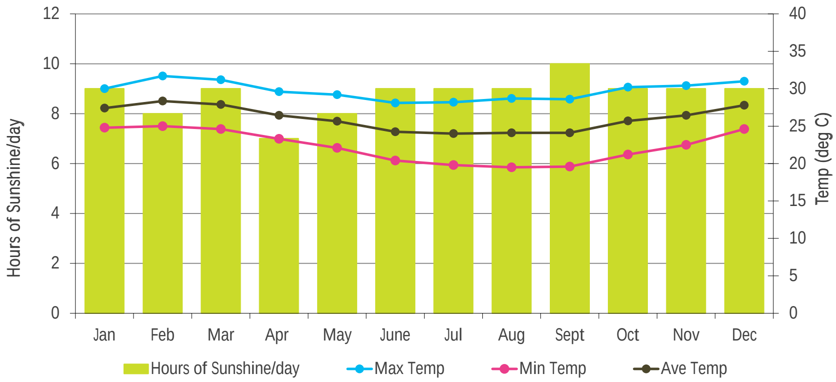


Figure 6: DAR ES SALAAM (Relative Humidity / Rainfall)

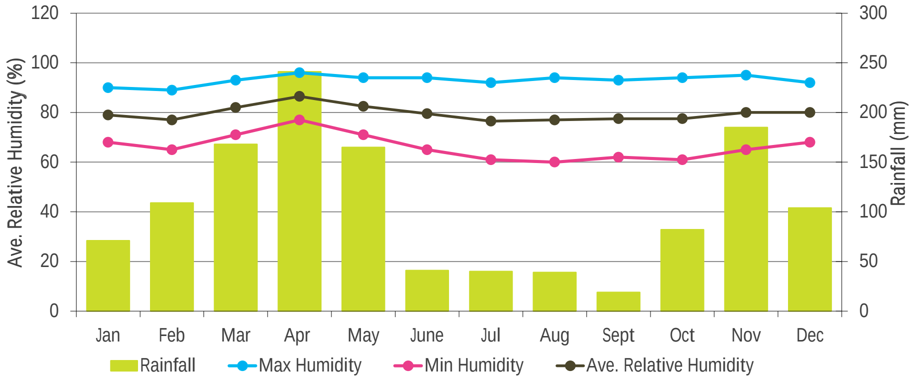


Figure 7: Prevailing wind direction

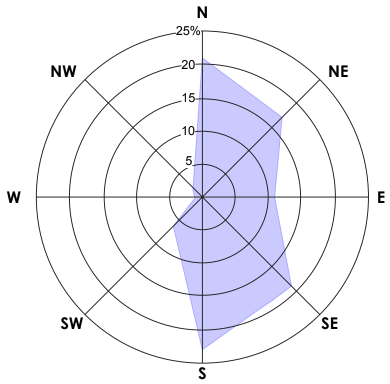


Figure 8: Sun path Diagram for Latitude 6° South

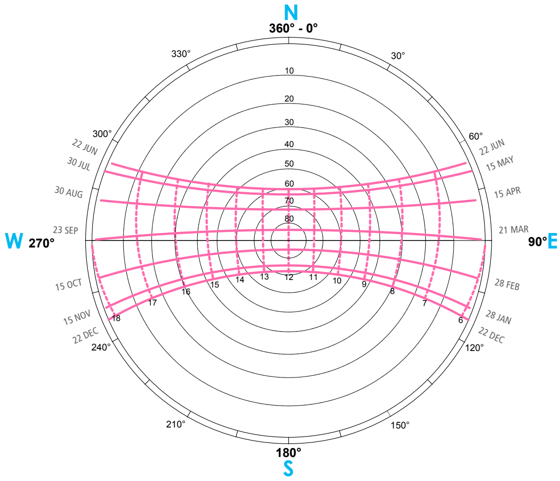
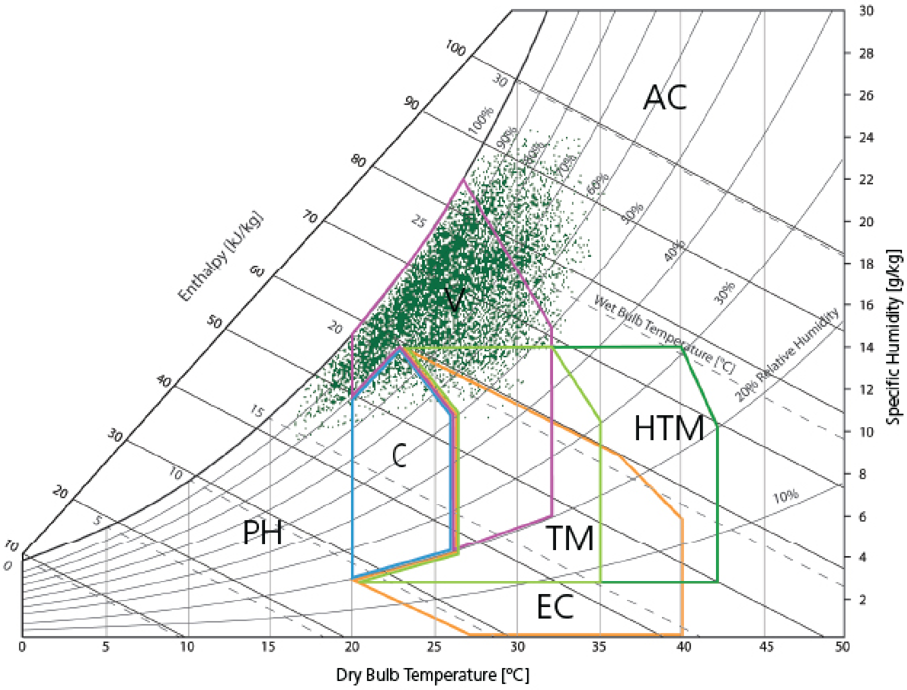
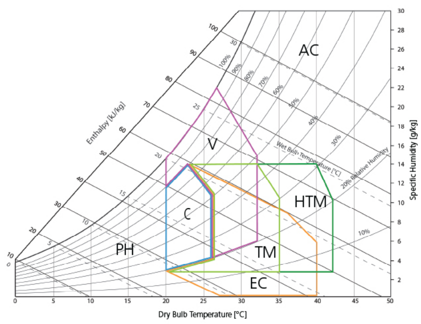


Figure 9: Bioclimatic Chart





LEGEND

C	Comfort Zone
V	Ventilation
TM	Thermal Mass
HTM	High Thermal Mass
EC	Evaporative Cooling
PH	Passive Heating
H	Artificial Heating
AC	Air Conditioning

INTERPRETATION

- Both day and night temperatures in this zone, as well as the humidity levels, are high throughout the year. With this combination there are few days inside the comfort zone (C), thus passive ventilation is essential throughout the year.
- Cross ventilation strategies should be adopted to improve the indoor thermal comfort.
- The prime design objective for this zone is to provide free air movement through the house while preventing internal surface temperatures from rising above the outdoor temperatures protecting all the facades from solar radiation.
- Buildings in this zone should be lightweight with minimum possible thermal storage capabilities.
- The maximum temperatures from January to March are outside the ventilation area. Airconditioning may be necessary to provide comfortable indoor conditions by cooling the air during high day temperatures.
- Open buildings (not compact) are preferred to enhance ventilation.

CLIMATIC ZONE 1:
Hot and Humid climate

CASE STUDY 1

Affordable housing

Figure 10: Site Plan

Location of appropriate vegetation can improve thermal comfort inside the building. Tall trees protect the North and South facades from solar radiation whilst allowing natural ventilation

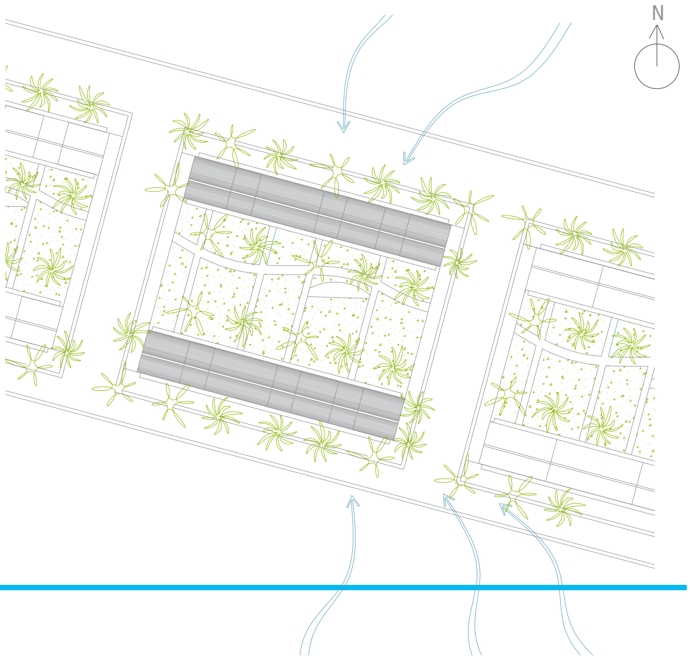


Figure 11:Typical Floor Plan

Natural ventilation has major priority in a hot and humid climate, thus openings have to be strategicaly designed and located

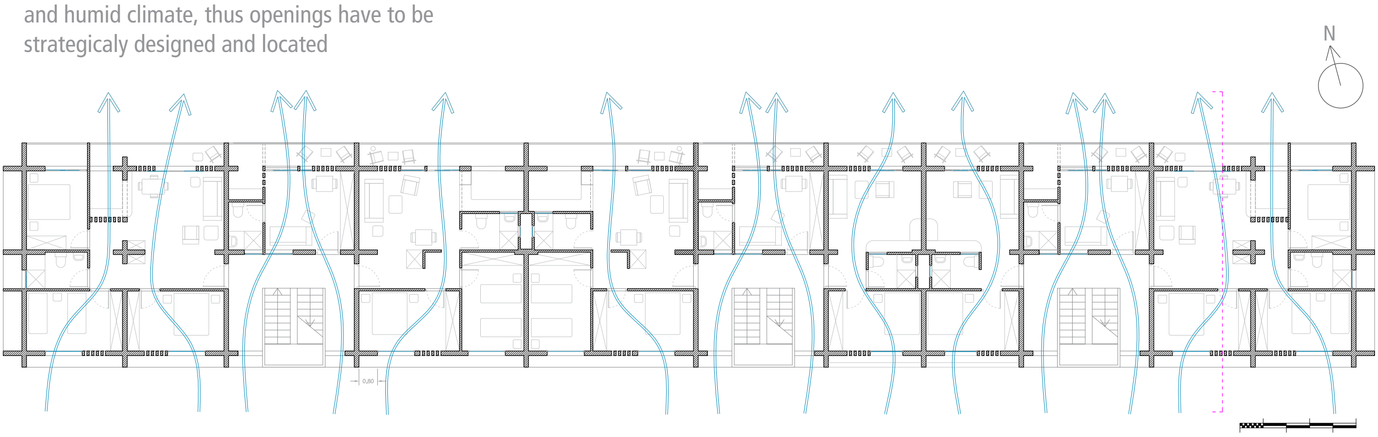


Figure 12: North Elevation

Figure 13: West Elevation

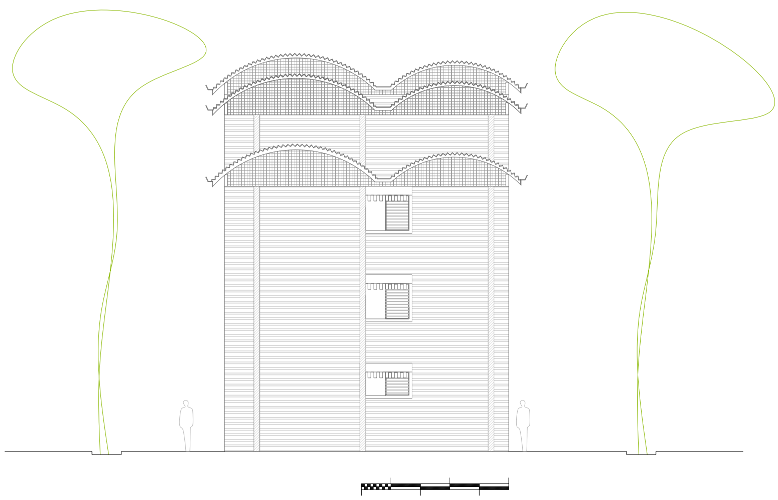


Figure 14: Section

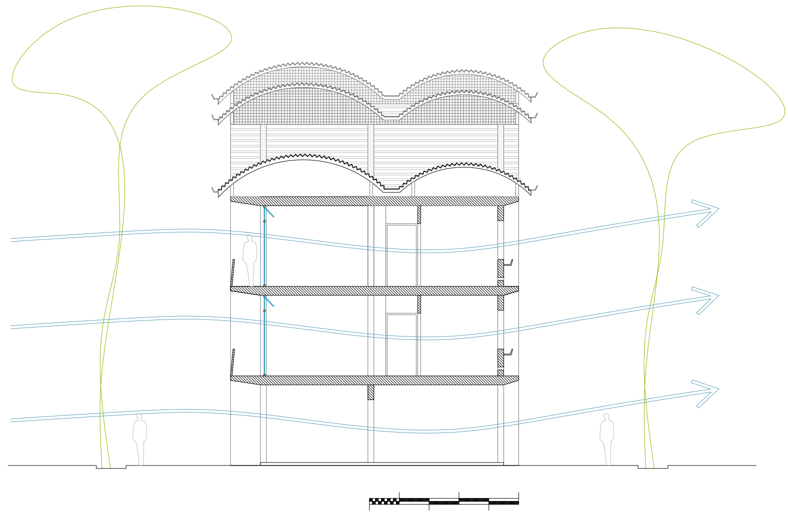
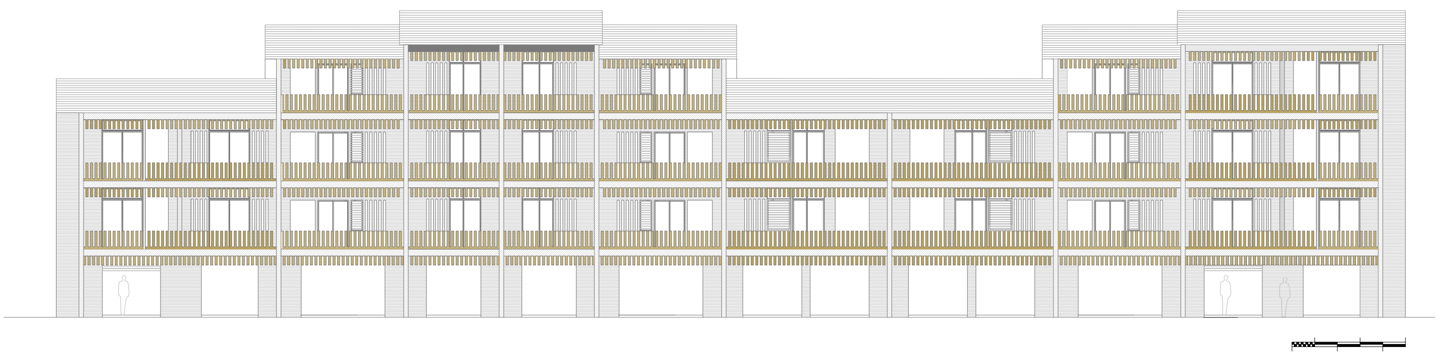


Figure 15: South Elevation



DESIGN RESPONSES

1 **Orientation** - The major façades of the apartment block are facing the North-South direction.

2 **Ventilation** - To provide cross ventilation, louvred windows have been provided in all rooms. In order to maximize ventilation, the windows have been located in different axes all the space and permanent ventilation vents have been provided at all openings at different heights. In addition, the roof is permanently ventilated through an open-air chamber. The open plan of the living space decreases resistance to air flow thus creates flow paths through the house further aiding in cross ventilation.

3 **Daylighting** - Provision of large windows in the major spaces ensures that the rooms are adequately lit naturally during the day.

4 **Sun shading** - Windows on the North and South facing façades have been provided with deep balconies and solar devices to generate mid-day shade, particularly in the southern facade where the sun heats during the hottest season. Major windows have been avoided on the western and eastern facing walls, using these locations for bathrooms. Most of the apartments are not exposed to the east and west and are thus are protected from the morning and afternoon solar radiation.

5 **Building materials** - Lightweight walls and roof with external reflective surfaces have been used to allow internal heat to quickly dissipate to the outside and to reflect unwanted solar radiation.

CASE STUDY 2

Affordable housing

CLIMATIC ZONE 2:
Hot semi-arid / Savannah climate

Climatic Zone 2: Hot semi-arid / Savannah climate

Location	Makindu, Kenya
Latitude	2°28’S
Longitude	37°83’E
Altitude	1000 m above sea level
Temperature	Min average temp 16.1°C; Max average temp 28.3 °C
Annual Rainfall	Average 641 mm
Humidity	Average relative humidity is recorded at 68%
Prevalent Wind Direction	East Prevailing winds

Figure 16: MAKINDU (Hours of Sunshine / Temperature)

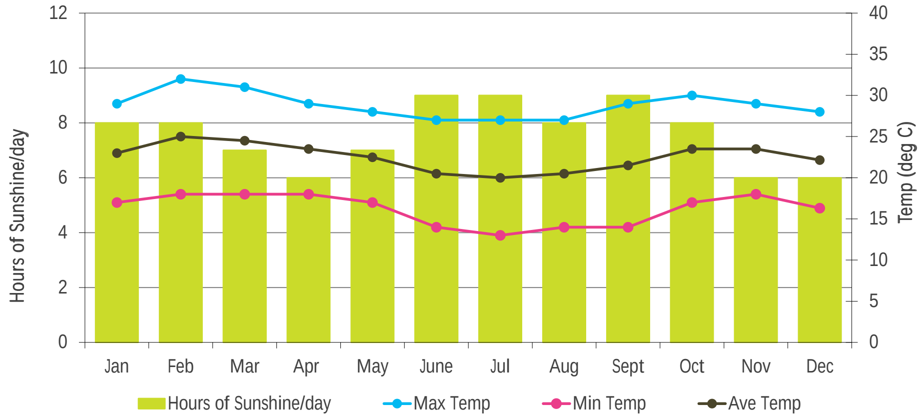


Figure 17: MAKINDU (Relative Humidity / Rainfall)

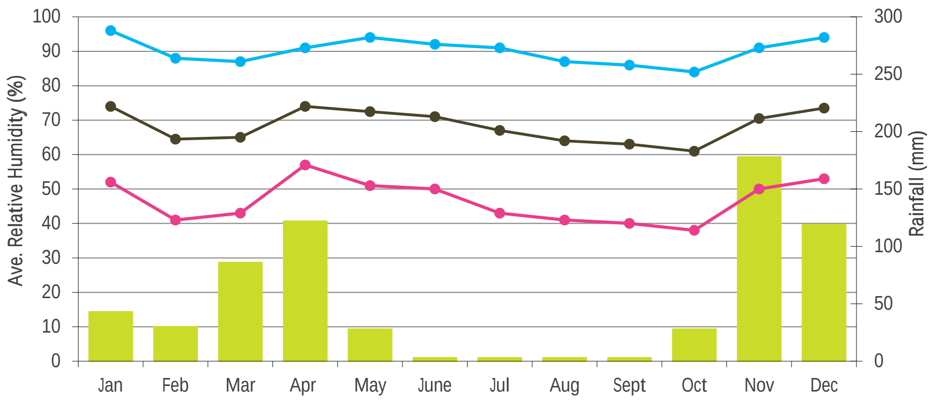


Figure 18: Prevailing Wind Analysis

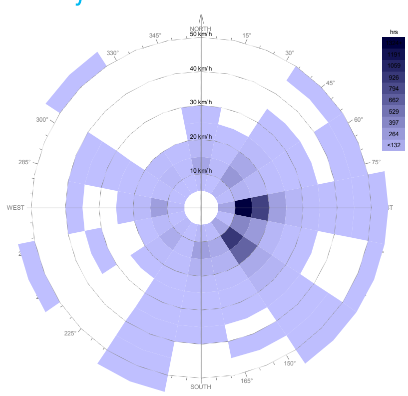


Figure 19: Sun path Diagram for Latitude 2° S

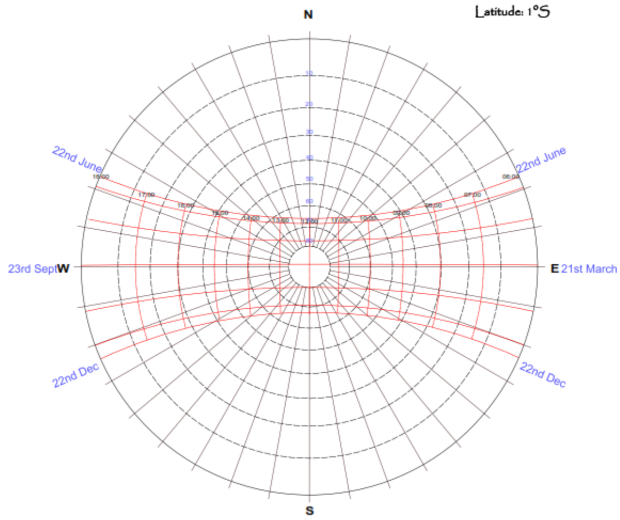
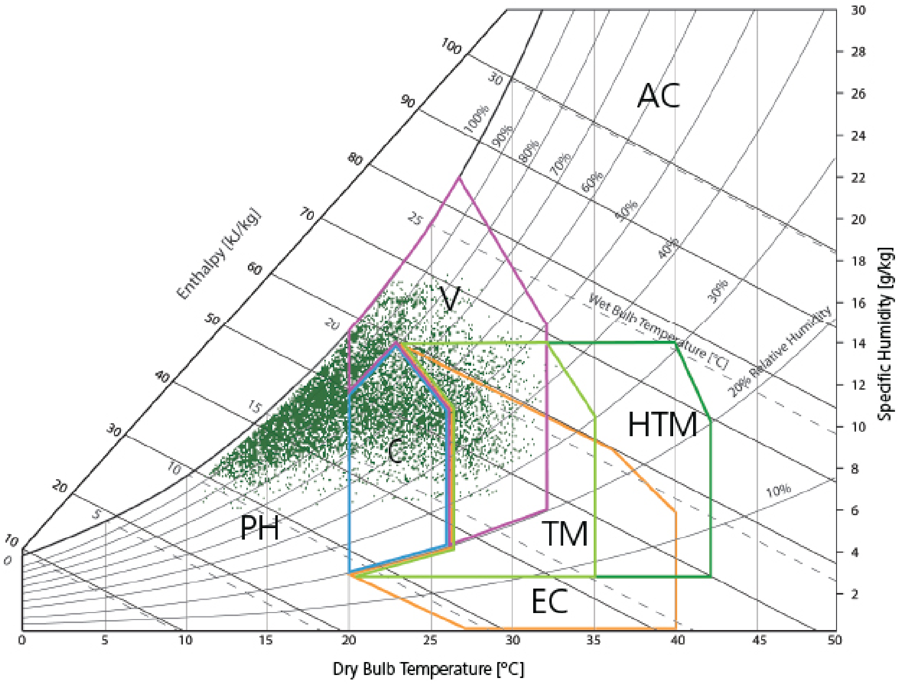
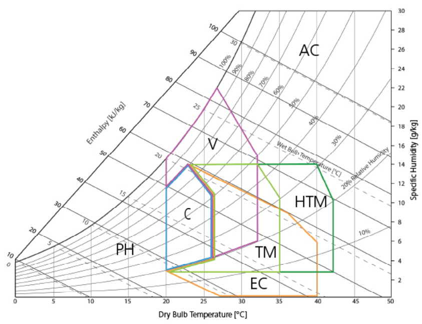


Figure 20: Bioclimatic Chart





LEGEND

C	Comfort Zone
V	Ventilation
TM	Thermal Mass
HTM	High Thermal Mass
EC	Evaporative Cooling
PH	Passive Heating
AH	Artificial Heating
AC	Air Conditioning

INTERPRETATION

- Both temperature and humidity levels fall within the comfort zone for most periods of the year.
- Natural ventilation (night ventilation), high thermal mass and solar shading are the most effective passive design strategies for improving thermal comfort.
- Medium or heavy weight walls are preferable in this zone since they are subjected to greater heating by day and faster cooling at night.
- Passive heating through thermal mass assisted with ventilation is an appropriate way to maintain thermal comfort inside the building.
- Compact buildings are suitable for the type of climate to reduce the facade exposed to solar radiation, thus solar heat gains.
- Buildings should be oriented with the long axis running east-west to provide effective shading.

CLIMATIC ZONE 2:
Hot semi-arid / Savannah climate

CASE STUDY 2

Affordable housing

Figure 21: Site Plan

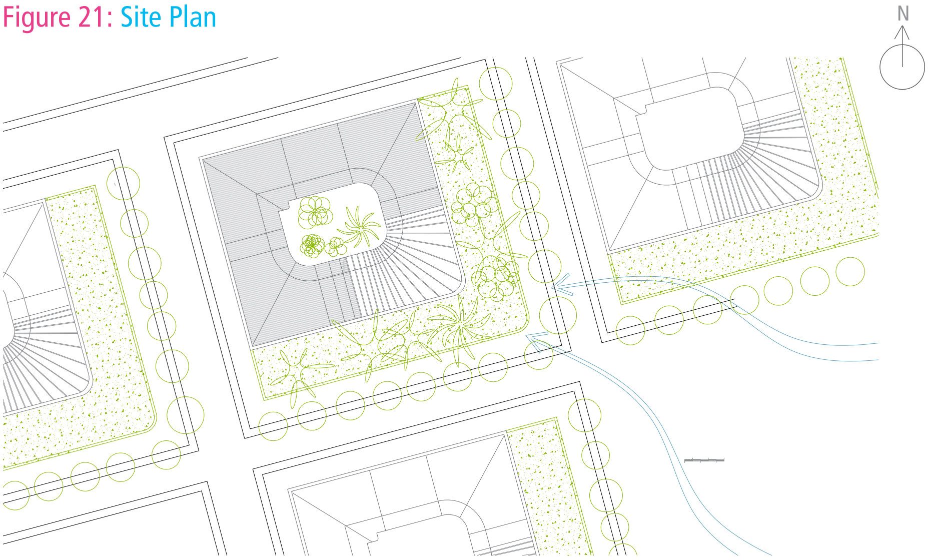


Figure 22: Typical Floor Plan

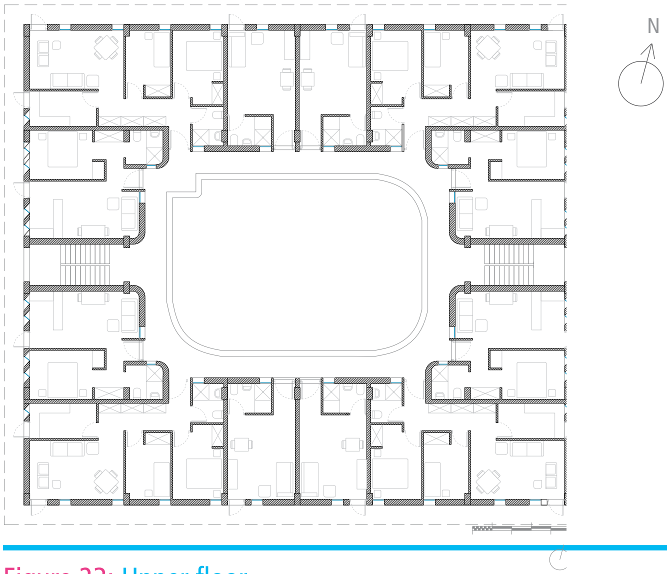


Figure 23: Upper floor

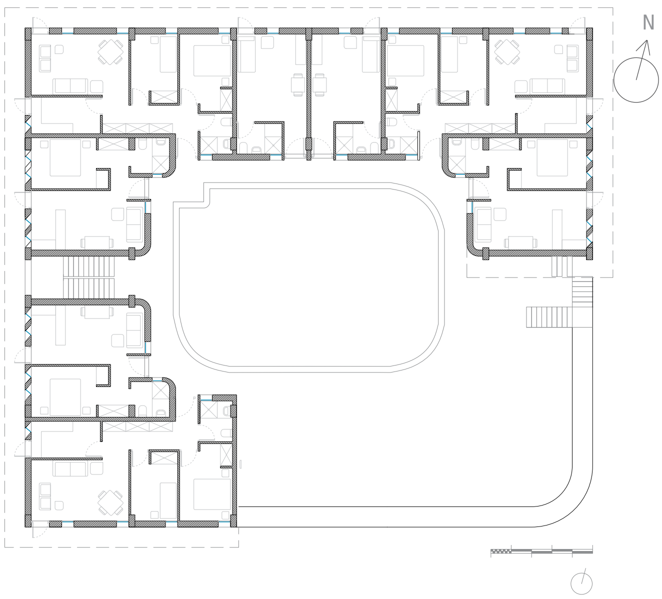
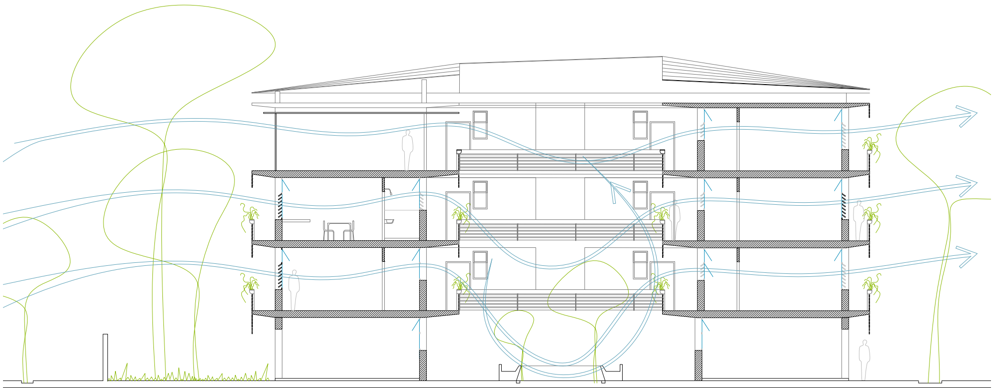


Figure 24: North Elevation

Figure 25: West Elevation

Figure 26: Section X-X showing cross ventilation



DESIGN RESPONSES

1 **Orientation** - The building's major axis is optimally oriented along the east-west axis.

2 **Ventilation** - All the rooms are entirely naturally ventilated through the windows and the permanent ventilation provided at the roof level through a ventilated roof. The patio with vegetation and the vegetation along the South and East facades (following the prevailing winds) provide natural cooling at night. The staircase external walling is made of hollow concrete vent blocks which guarantee optimum ventilation and natural lighting.

3 **Daylighting** - All the rooms are naturally lit during the day by the provision of windows. The patio provides natural lighting to the interior rooms. Light colours are used indoors in order to enhance natural lighting

4 **Sun shading** - North and south-facing windows are protected from the high mid-day sun by the provision of balconies, horizontal louvres on a vertical plane at the windows and roof overhangs (at the top level). Balconies on the four facades are protected with vertical sun shading elements to avoid unwanted solar gains by the low morning and afternoon sun during the hot months.

- Windows on the east and west facing are oriented towards the north and south in orther to minimize solar gains and prevent direct solar radiation.

-Balconies on the four facades are protected by vertical sun shading elements to avoid unwanted solar gains by the low morning and afternoon sun during the hot months.

5 **Building materials** - High thermal mass walls of stabilized soil blocks are used in the building as they store heat and regulate indoor temperatures both in hot and cold seasons.

Affordable housing

CLIMATIC ZONE 3:
Hot arid climate

Climatic Zone 3: Hot arid climate

Location	Lodwar, Kenya
Latitude	3°12’N
Longitude	35°62’E
Altitude	515 m above sea level
Temperature	Min av. temp 23°C; Max av. temp 36°C
Annual Rainfall	Average 415 mm
Humidity	Average relative humidity is 48%
Prevalent Wind Direction	South-East prevailing winds

Figure 27: LODWAR (Hours of Sunshine / Temperature)

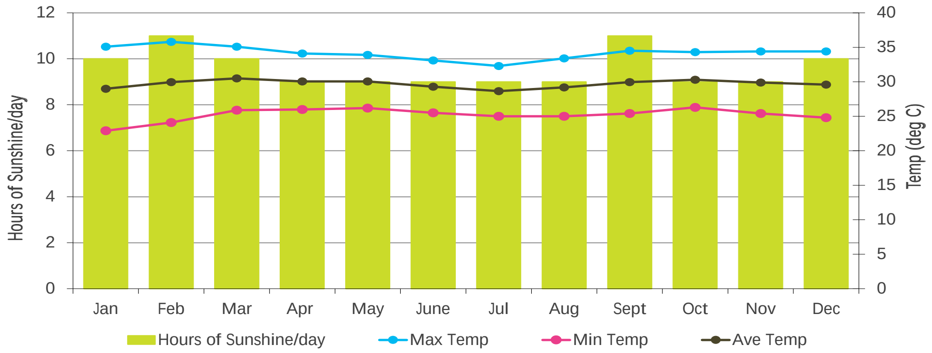


Figure 28: LODWAR (Relative Humidity / Rainfall)

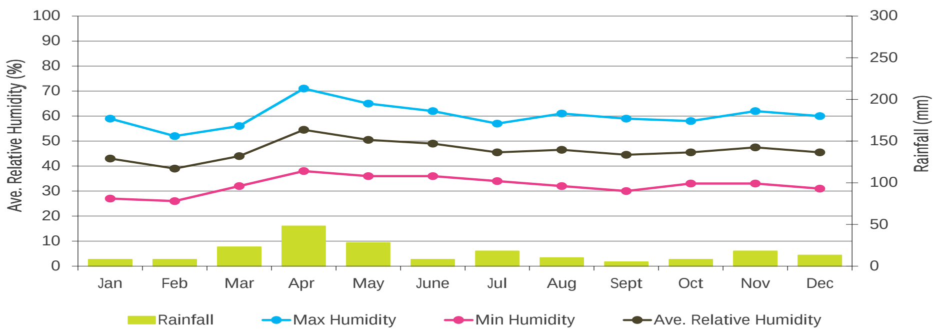


Figure 29: Prevailing Wind Analysis

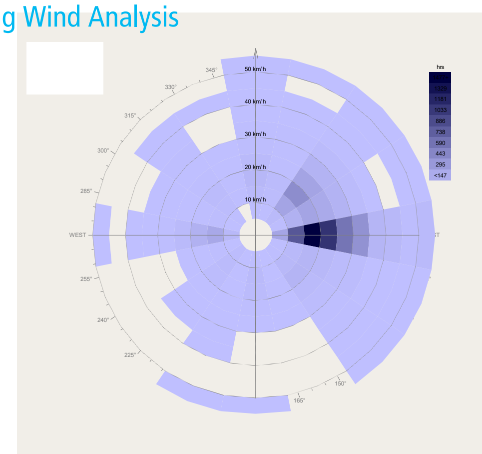


Figure 30: Sun path Diagram for Latitude 3° North

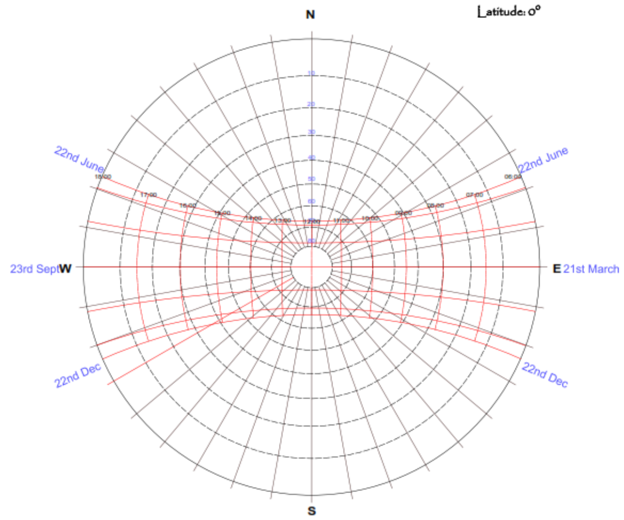
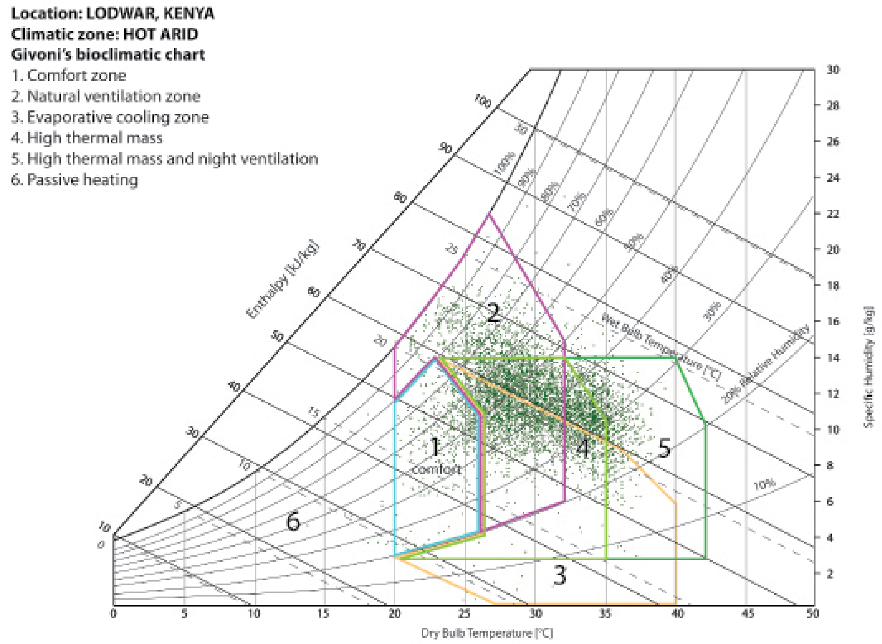
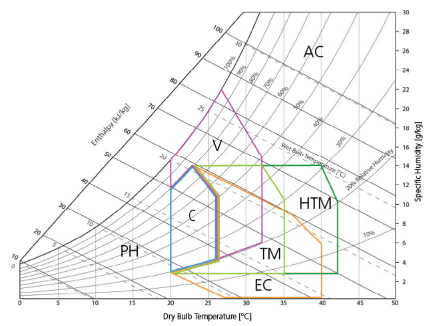


Figure 31: Bioclimatic Chart





LEGEND

C	Comfort Zone
V	Ventilation
TM	Thermal Mass
HTM	High Thermal Mass
EC	Evaporative Cooling
PH	Passive Heating
AH	Artificial Heating
AC	Air Conditioning

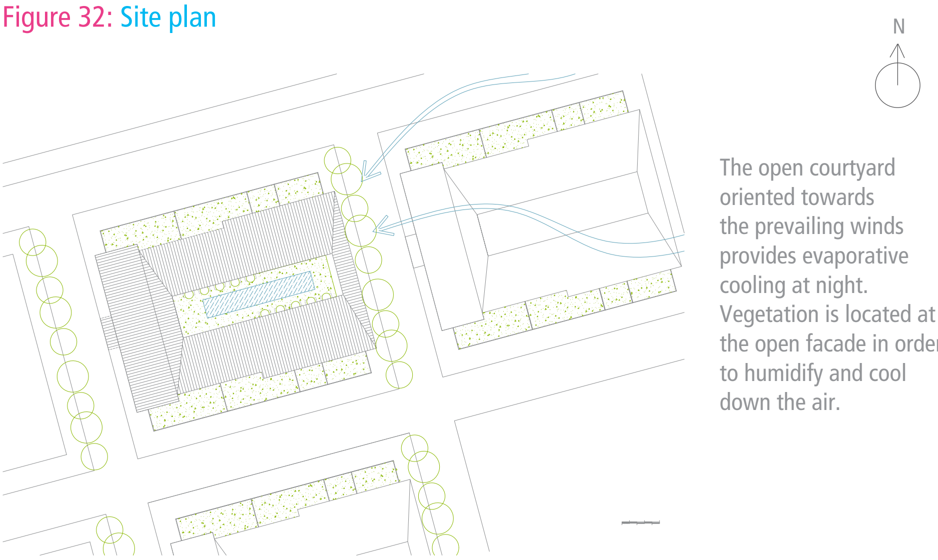
INTERPRETATION

- Days in this zone are invariably hot. High daytime temperatures are accompanied by moderate to low humidity levels.
- Due to the high daily temperature variation or diurnal range, it is best to keep heat out during the day and ventilate during the night i.e. night ventilation.
- Natural ventilation (night ventilation), high thermal mass, solar shading and evaporative cooling are the most effective passive design strategies for improving thermal comfort.
- The maximum temperatures in some months are outside the high thermal mass area, thus additional air conditioning means may be required to provide adequate thermal comfort indoors during the day.
- High thermal mass for walls and roofs prevents overheating during daytime while natural ventilation combined with evaporative cooling relieves heat delivered by the heavy structures at night.
- Buildings should be compact and oriented with the long axis running East-West to provide effective sun shading.

CLIMATIC ZONE 3:
Hot arid climate

Affordable housing

Figure 32: Site plan

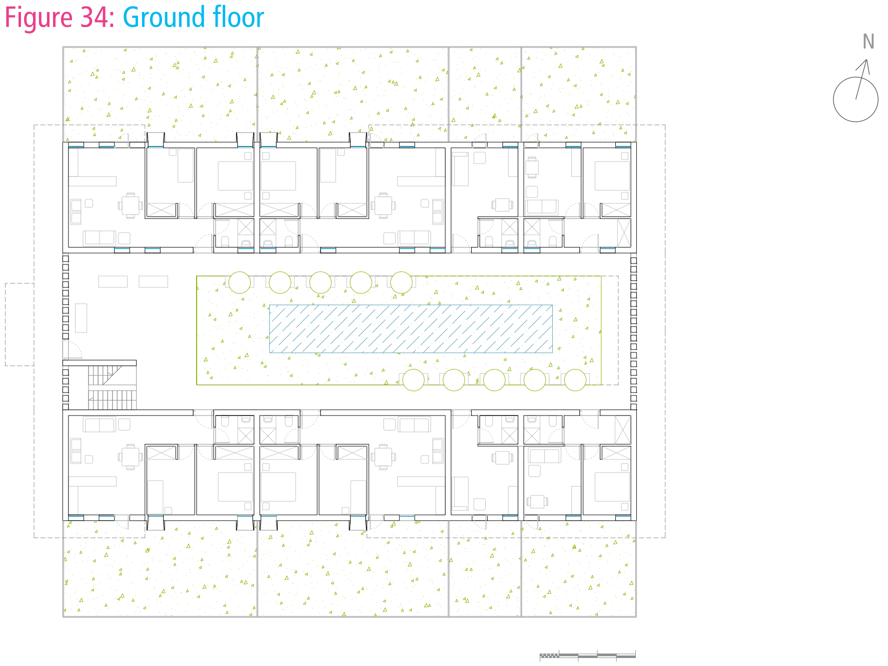


The open courtyard oriented towards the prevailing winds provides evaporative cooling at night. Vegetation is located at the open facade in order to humidify and cool down the air.

Figure 33: Typical floor plan

Figure 34: Ground floor

A water body and vegetation inside the courtyard enhance natural evaporative cooling at night. Vegetation cover at the ground floor level around the building avoids overheating of the floor thus heat reflection.



DESIGN RESPONSES

1 Orientation - This apartment block is elongated along the east-west axis and shortened on the north-south with the main openings along these facades. This orientation coupled with the compact design and courtyard ensures heat gain is minimized.

2 Ventilation - The open courtyard has been oriented to protect against solar overheating but capturing the prevailing winds. Natural cooling is provided through the vegetation and water body in the courtyard and around the building, strategically oriented towards the prevailing winds. Openings in the external and internal facade of the building provide cross ventilation and natural cooling at night.

- Openings in the east and west facades are restricted to the bathrooms, the rest of the walls on these facades are predominantly solid. - The roof space is adequately ventilated via an open-air chamber that avoids the overheating of the slab in the upper floor.

3 Daylighting - The east-west orientation of this block exposes the major openings to the north-south direction thus maximizing on daylight and at the same time minimizing on the heat gain. The courtyard provides natural lighting. Small vertical windows provide natural lighting and minimize solar heat gains.

4 Sun shading - Walls and openings on the north-south facing facades are shaded by a long balcony that surrounds the building. Landscaping through indigenous vegetation creates cooling through evapotranspiration

5 Building materials - Materials with high thermal mass like thick soil blocks walls are recommended. They absorb heat during the day and release it during the night when the temperature is lower, resulting in comfortable temperatures without the need for supplementary cooling. - Light coloured finishes have been used to reflect unwanted solar radiation.

Figure 35: South Elevation

Figure 36: West Elevation

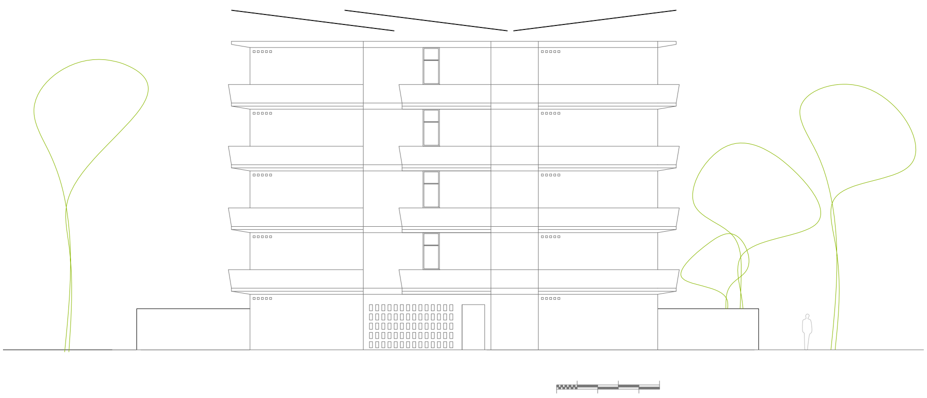
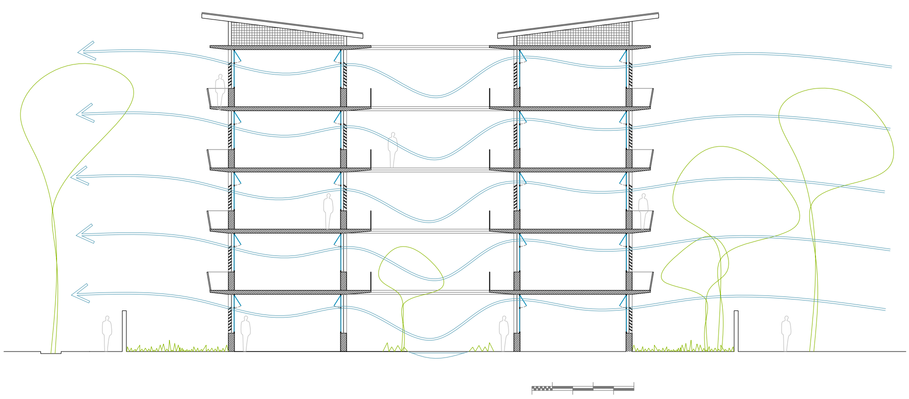


Figure 37: Section X-X showing cross ventilation

The cantilever provides a long balcony that surounds the building whilst providing sunshading



Affordable housing

CLIMATIC ZONE 4: Upper Highland climate

Climatic Zone 4: Highland climate

Location	Kigali, Rwanda
Latitude	1°57'S
Longitude	30°04'E
Altitude	1490 m above sea level
Temperature	Min av. temp 15.7 °C; Max av. temp 26.9°C
Annual Rainfall	Average 1,095 mm
Humidity	Average relative humidity is 68.1%
Prevalent Wind Direction	Predominantly South and North East prevailing winds

Figure 38: KIGALI (Hours of Sunshine / Temperature)

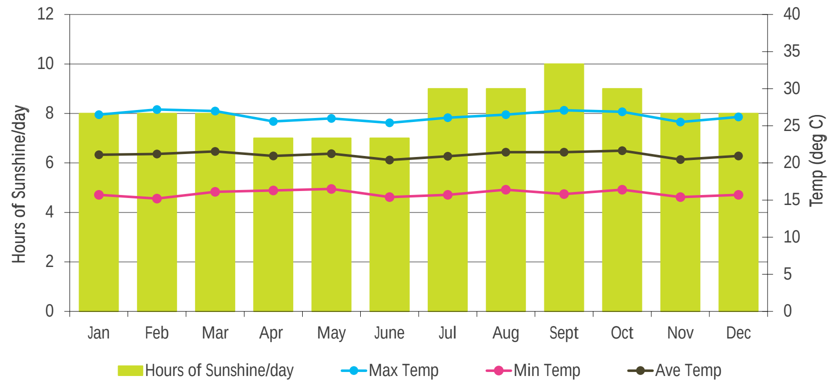


Figure 39: KIGALI (Relative Humidity / Rainfall)

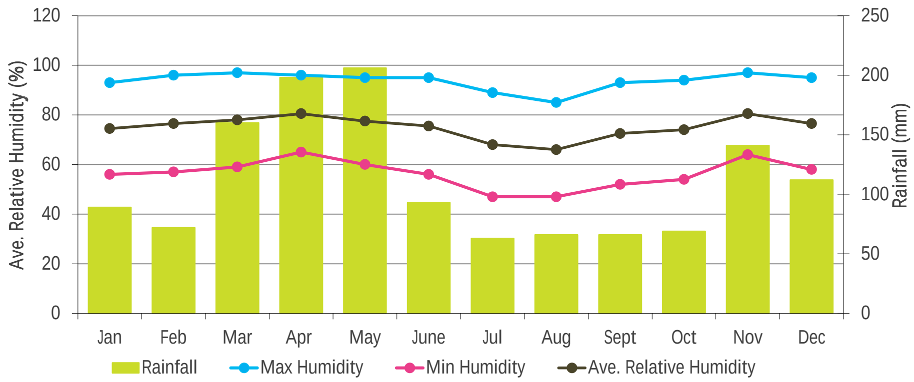


Figure 40: Prevailing wind direction

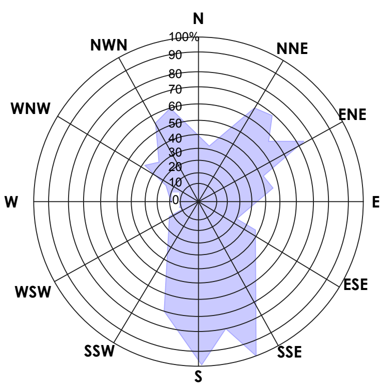


Figure 41: Sun path Diagram for Latitude 1° South

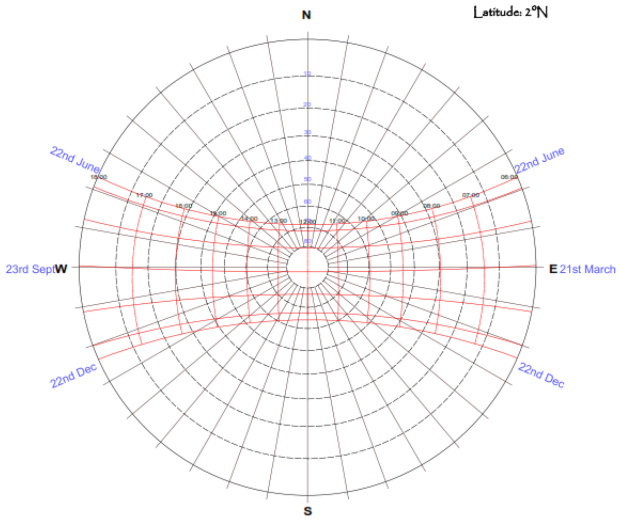
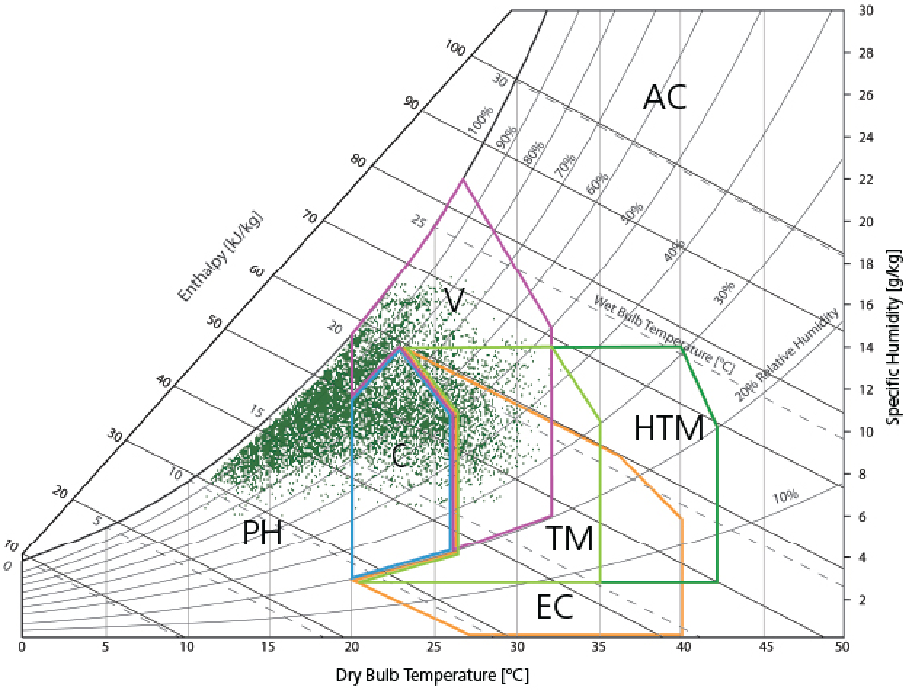
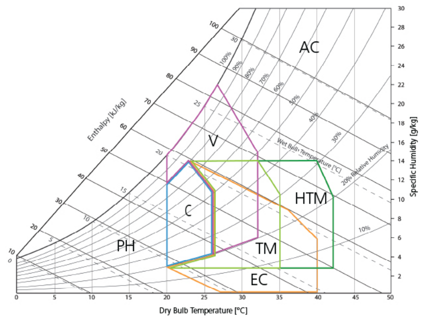


Figure 42: Bioclimatic Chart





C	Comfort Zone
V	Ventilation
TM	Thermal Mass
HTM	High Thermal Mass
EC	Evaporative Cooling
PH	Passive Heating
AH	Artificial Heating
AC	Air Conditioning

INTERPRETATION

- This zone has its mean temperatures falling within the comfort zone. However, its maximum temperatures rise above the upper limits while the minimum temperatures drop below the lower limits throughout the year.
- Passive heating and medium thermal mass are the most effective design strategies for improving on the thermal comfort.
- Due to low temperatures, some passive heating (e.g. by sunshine) is welcome during the cool period of the year.
- Natural ventilation is important for indoor comfort. Nevertheless, air temperature rarely exceeds the upper limit of the comfort zone
- Thick walled structures are recommended in order to limit the heat admitted to interiors during hours of strong sunshine and to store some of the day's heat so it may be re-emitted to interiors during the cold nights.
- Buildings should be oriented with the long axis running East-West to minimise exposure to the sun as it moves from sunrise to sunset.

CLIMATIC ZONE 4:
Upper Highland climate

Affordable housing

Figure 43: Site plan

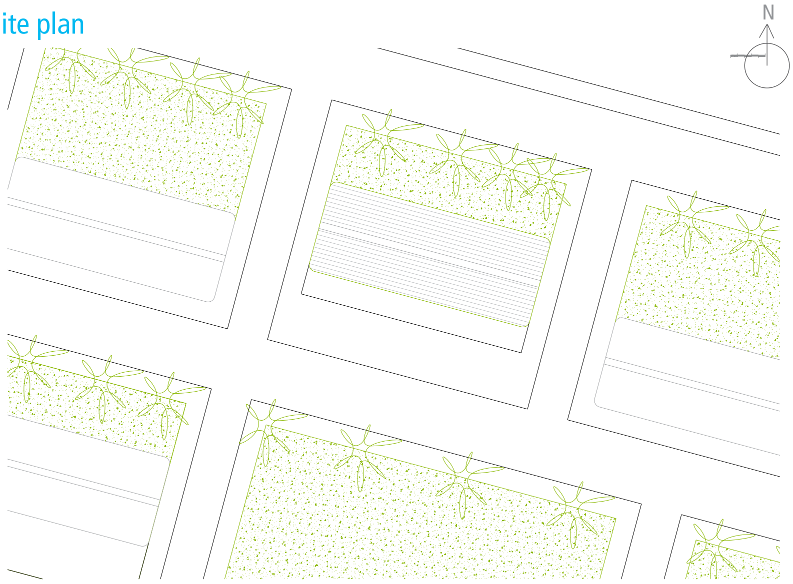


Figure 44: Typical Floor plan

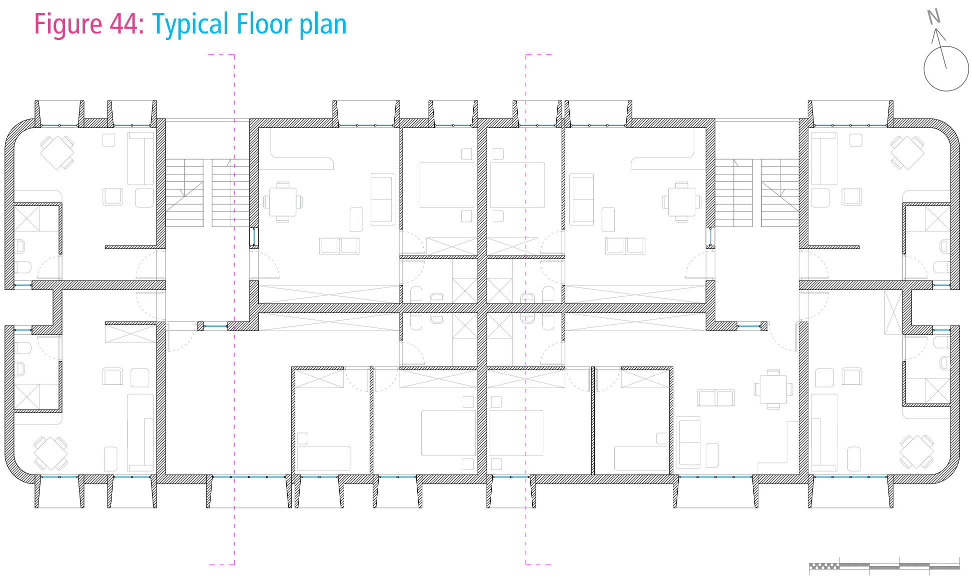


Figure 45: Ground floor

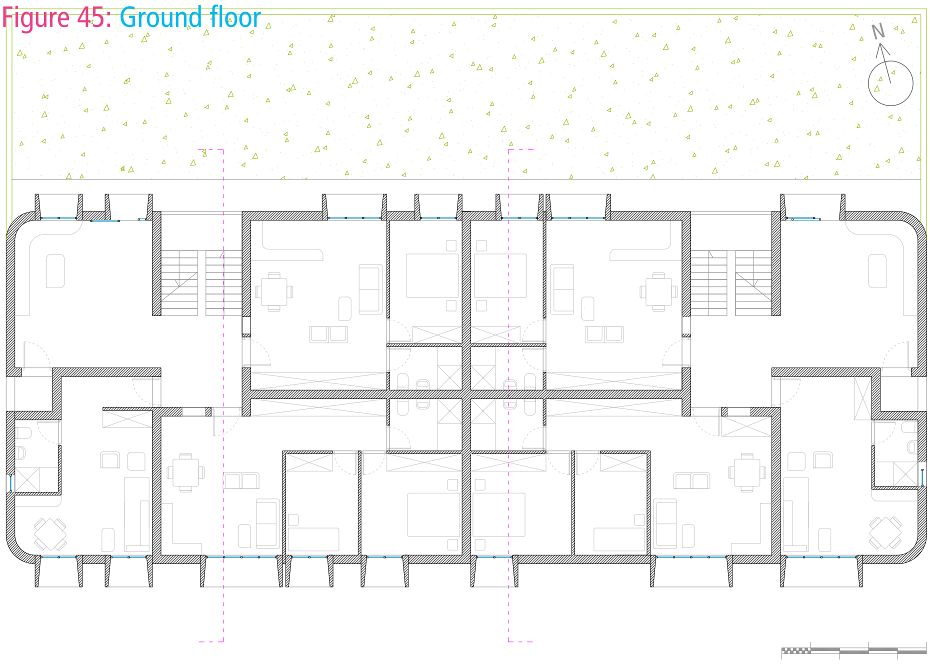


Figure 46: South Elevation

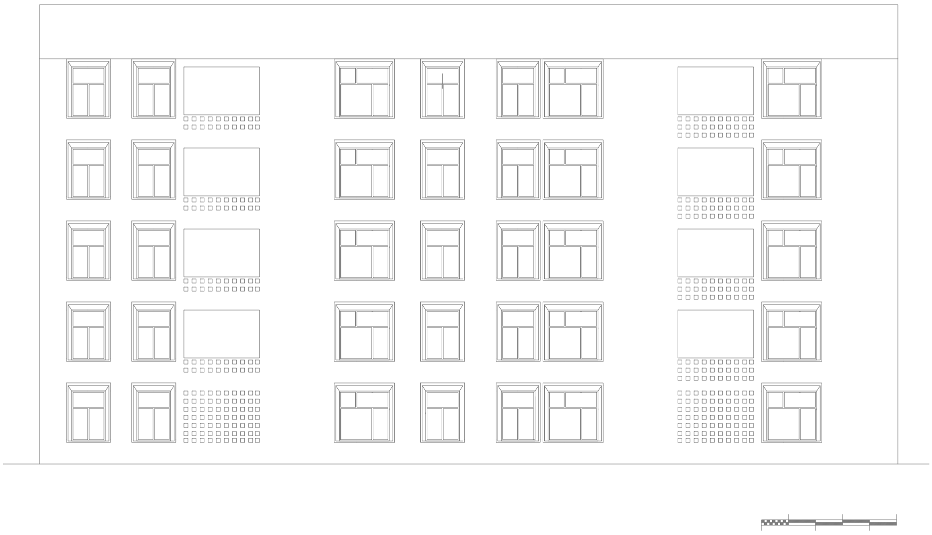


Figure 47: West Elevation

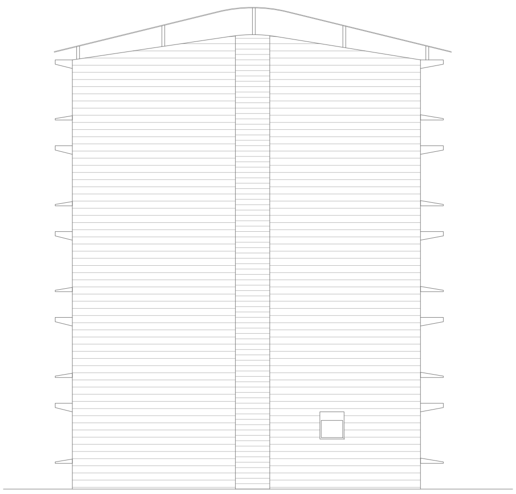
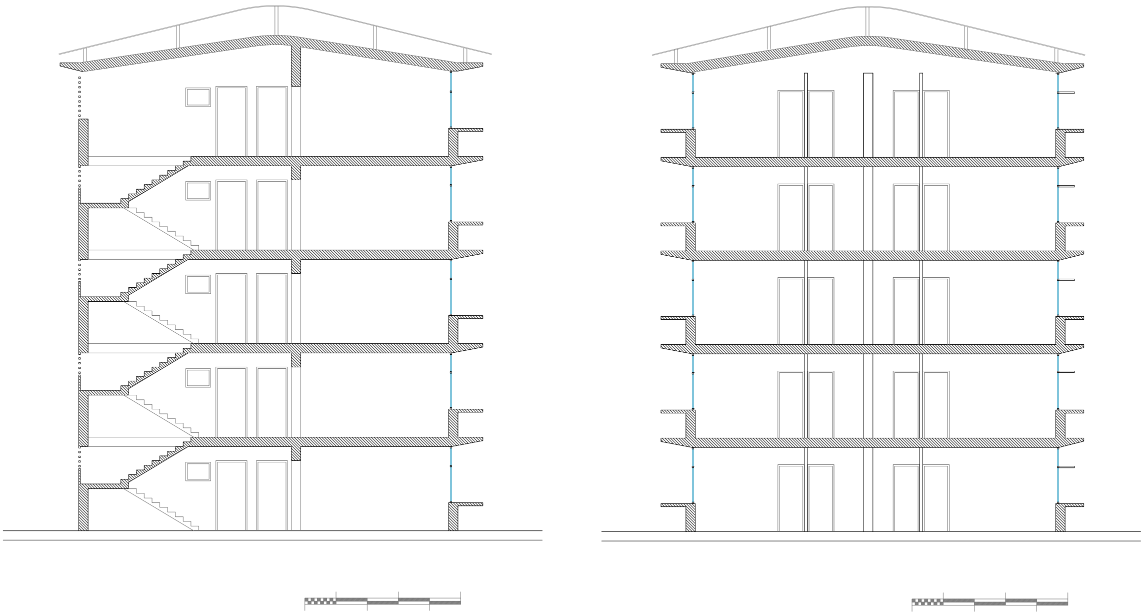


Figure 48: Section X-X



DESIGN RESPONSES

1 **Orientation** - This apartment block is correctly oriented with its major façade facing the North-South direction.

2 **Ventilation** - To achieve natural ventilation, the block has been provided with windows in all rooms. Permanent ventilation in the roof avoids overheating of the upper floors in the hot season. All the windows have an independent opening in the upper part in order to allow release of hot air whilst preventing the entry of hot air in the hotter season.

3 **Daylighting** - All windows in all the rooms meet the minimum required area - 20 per cent of elevation area - for the provision of natural day lighting.

4 **Sun shading** - Majority of the windows are on the North and South facing façades. They have been provided with overhangs and fins of 600 mm and 800 mm deep respectively to generate mid-day shade to the rooms, but allowing solar heat gains in the cold season for passive heating.

5 **Building materials** - Natural stone has been used for the building envelope to store the sun’s heat and release it back into the building at night during the cold months. During the hot season, this material absorbs excess heat during the day therefore lowering the internal temperature.

CLIMATIC ZONE 5:
Lake region climate

CASE STUDY 5

Affordable housing

Climatic Zone 5: Lake region climate

Location	Kampala, Uganda
Latitude	0°19'N
Longitude	32°34'E
Altitude	1140 m above sea level
Temperature	Min average temp 17.7°C; Max average temp 27.8°C
Annual Rainfall	Average 1,369 mm
Humidity	Average relative humidity is 68.1%
Prevailing Wind Direction	Predominantly South prevailing winds

Figure 49: KAMPALA (Hours of Sunshine / Temperature)

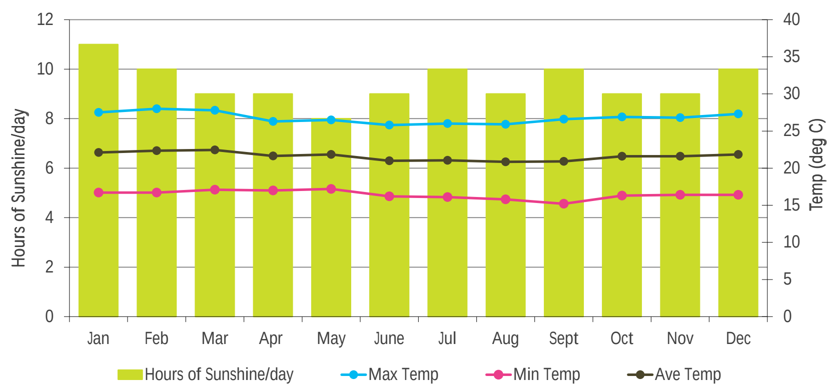


Figure 50: KAMPALA (Relative Humidity / Rainfall)

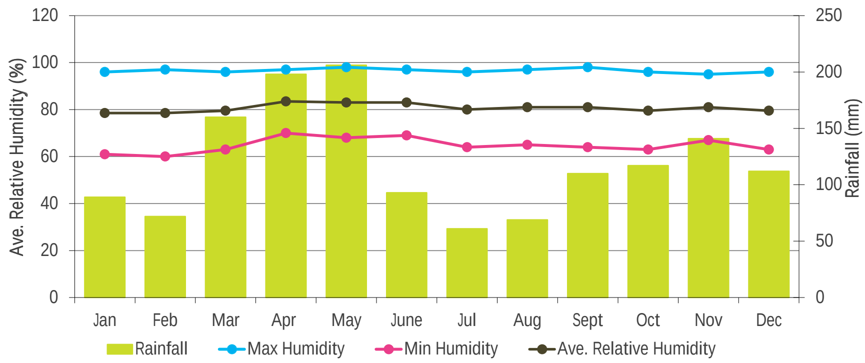


Figure 51: Prevailing wind direction

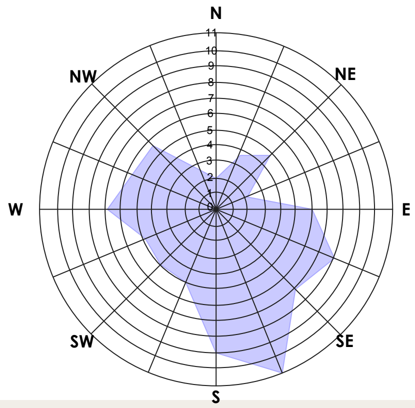


Figure 52: Sun path Diagram for Latitude 0° North

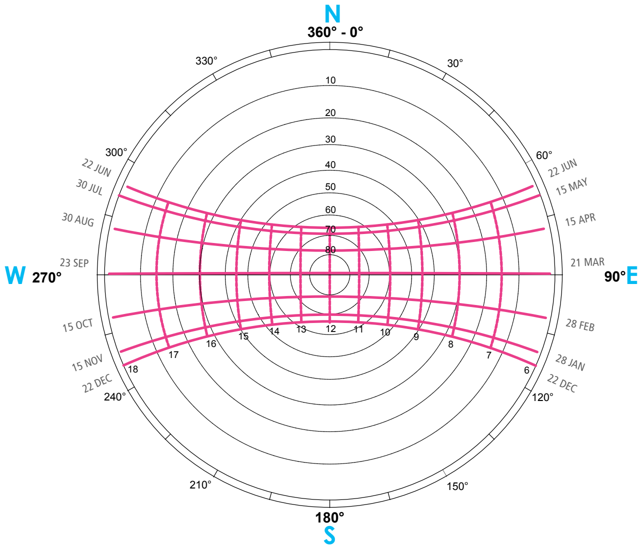
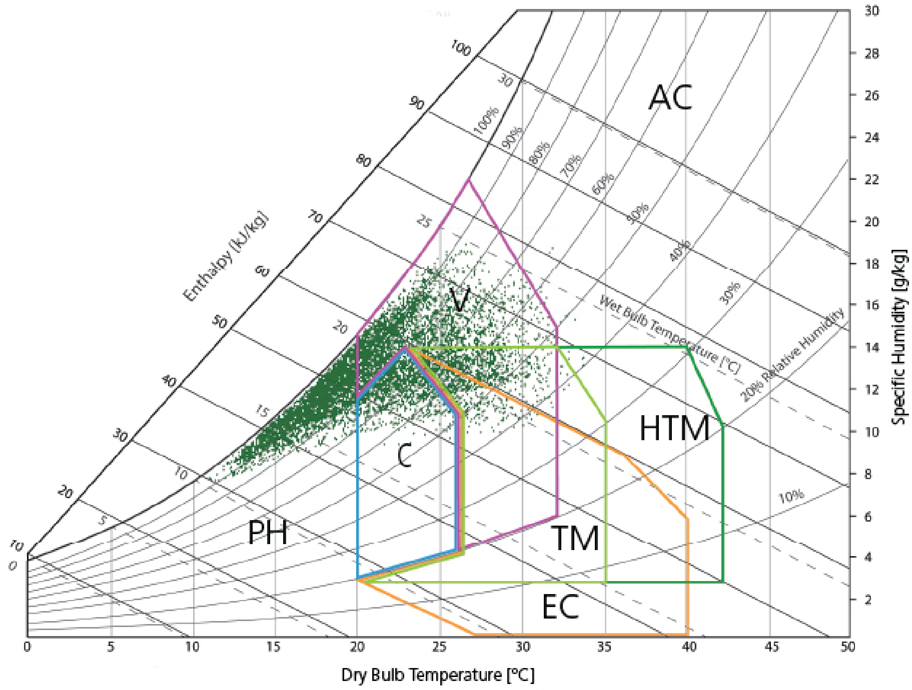
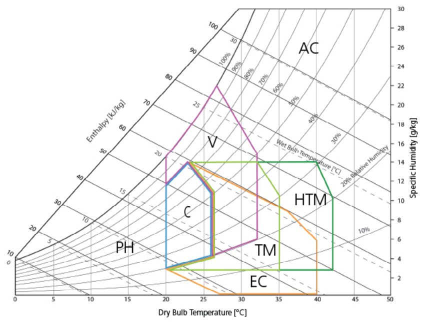


Figure 53: Bioclimatic Chart





LEGEND

C	Comfort Zone
V	Ventilation
TM	Thermal Mass
HTM	High Thermal Mass
EC	Evaporative Cooling
PH	Passive Heating
AH	Artificial Heating
AC	Air Conditioning

INTERPRETATION

- This zone experiences high daytime temperatures and low nighttime temperatures for some periods of the year.
- Natural ventilation, passive heating through thermal mass during the day, and solar shading are the most effective strategies for improving thermal comfort.
- The most critical climatic requirements of buildings in this zone are the needs for cool indoor spaces during the high day temperatures and, warm interiors during the night. High thermal mass walls are therefore recommended to even out the indoor temperatures.
- Cross ventilation should be achieved in all habitable rooms by having openings on both external and internal walls and by having permanent openings that admit air but not direct sunlight to interiors.
- Buildings should be oriented with the long axis running east-west.
- All window openings should be fully sun shaded throughout the daytime.

CLIMATIC ZONE 5:
Lake region climate

CASE STUDY 5

Affordable housing

Figure 54: Site plan

Figure 55: Typical floor plan

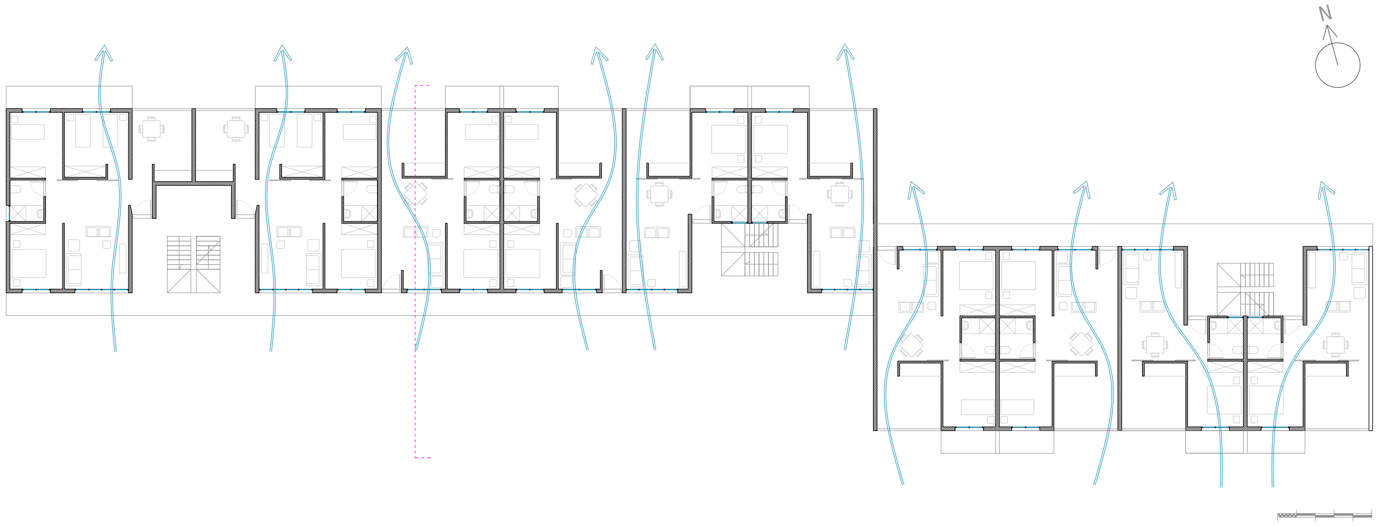


Figure 56: North Elevation

Figure 57: ...

Figure 58: East Elevation

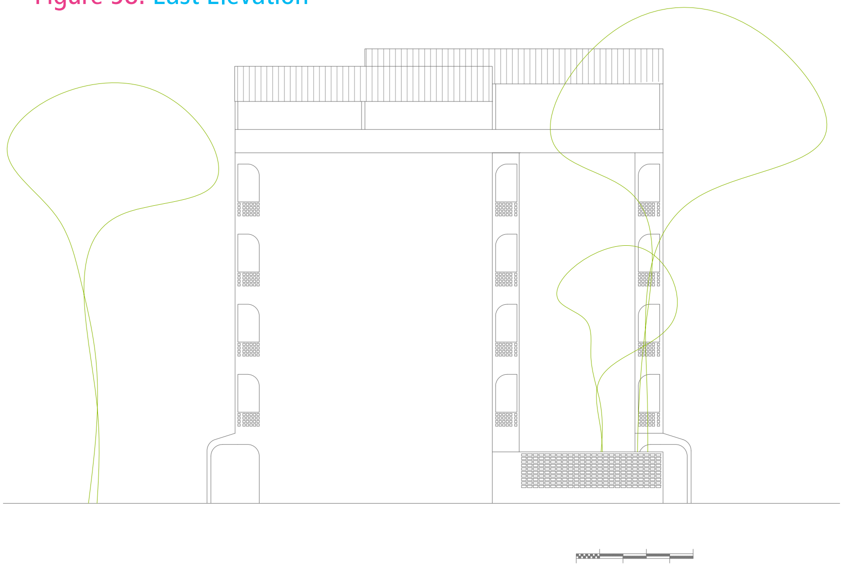
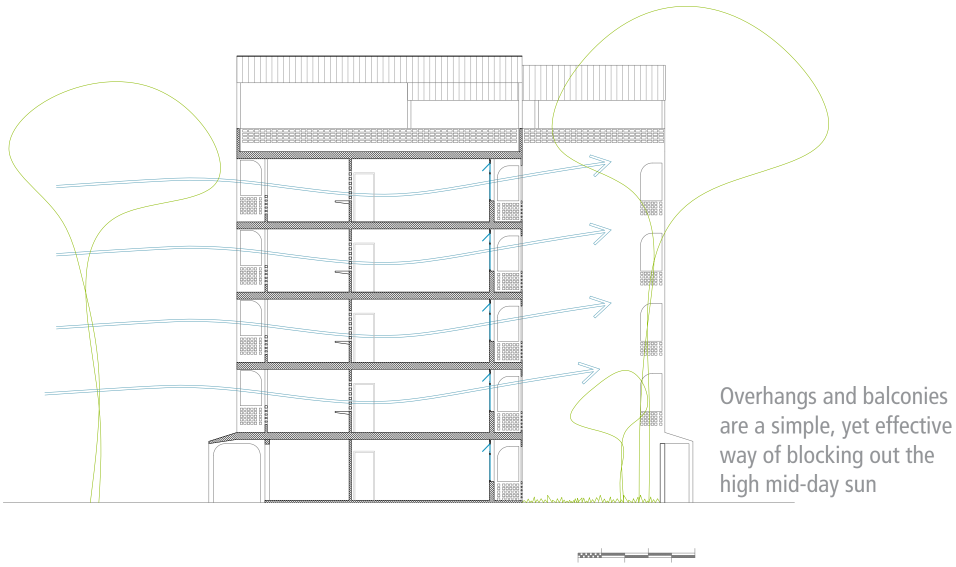


Figure 59: Section X-X showing cross ventilation



DESIGN RESPONSES

1 Orientation - The block is optimally oriented along the East-West axis with the major opening facing North - South directions. The longitudinal shape of the building ensures that minimal surface area is exposed to the East and West sun.

2 Ventilation - All apartments have openings in the north and south facade, ensuring good cross ventilation. The terrace at the roof level allows to ventilate the upper slab whilst protecting it from the direct solar radiation and overheating.

- The open plan living, dining and kitchen design is part of the block's natural ventilation through cross ventilation to get rid of the heat during the hot seasons. The balconies have been provided with openings to allow ventilation at all levels.

3 Daylighting - Natural light is allowed to penetrate all the rooms through the windows provided thus preventing the use of artificial lighting during the day.

4 Sun shading - The balconies, slab and roof overhangs (600 mm deep) have been incorporated to cut out unwanted direct solar radiation from the mid-day sun on the north and south facing façades.

- Windows have been minimized on the East and West facing façades to reduce solar gains from the low morning and afternoon sun respectively.

5 Building materials - Local stone is used as a major construction material for the building envelope. This material provides thermal mass for reduction of diurnal swings in temperatures.

- Light coloured roofing clay tiles have been used to reflect heat during the hot months.

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The project **Promoting Energy Efficiency in Buildings in East Africa** is an initiative of UN-Habitat in collaboration with the United Nations Environment Programme (UNEP), the Global Environment Facility (GEF) and the governments of Kenya, Tanzania, Uganda, Rwanda and Burundi.

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