



# Brunswick Centre

57, London, WC1N 1BS

University of Westminster

Faculty of Architecture and Built Environment

Architecture and Environmental Design MSc

Semester 1 - Evaluation of Built Environment Module:

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# 1. Overview



Fig. 1 United Kingdom

- Located in the southeast part of **Bloomsbury**, a suburban upmarket residential area of London.
- Largely part of the **borough of Camden** (with only a small part lying within the City of Westminster), it is generally **regarded** as a **Central London district**.
- Close to Russell Square Underground Station.
- Close to a **several points of interest**, such as the British Museum, the British Library, the campus of University College London, The School of Oriental and African Studies (SOAS) and numerous historic homes, parks, and buildings.

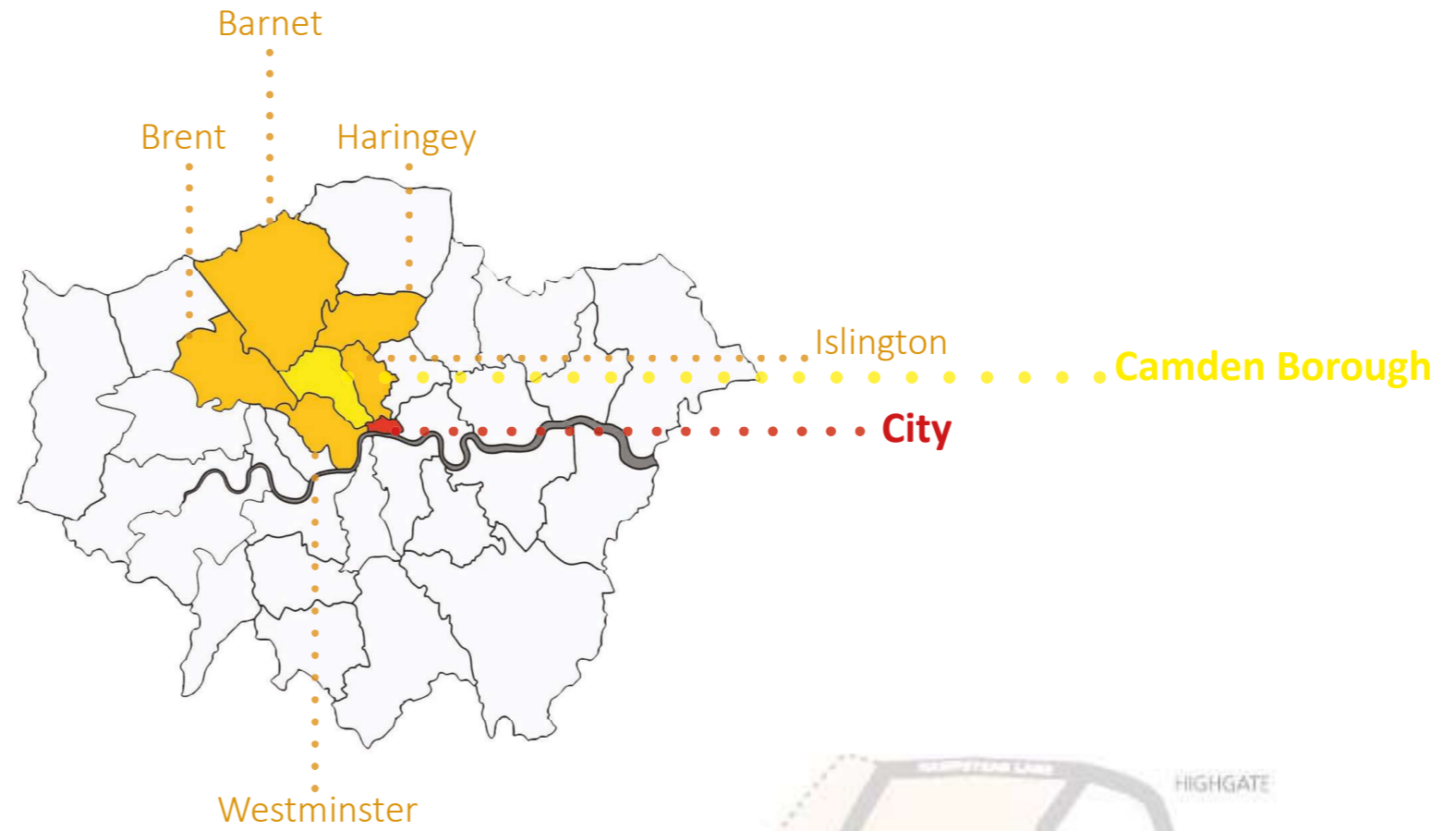


Fig. 2 London Map

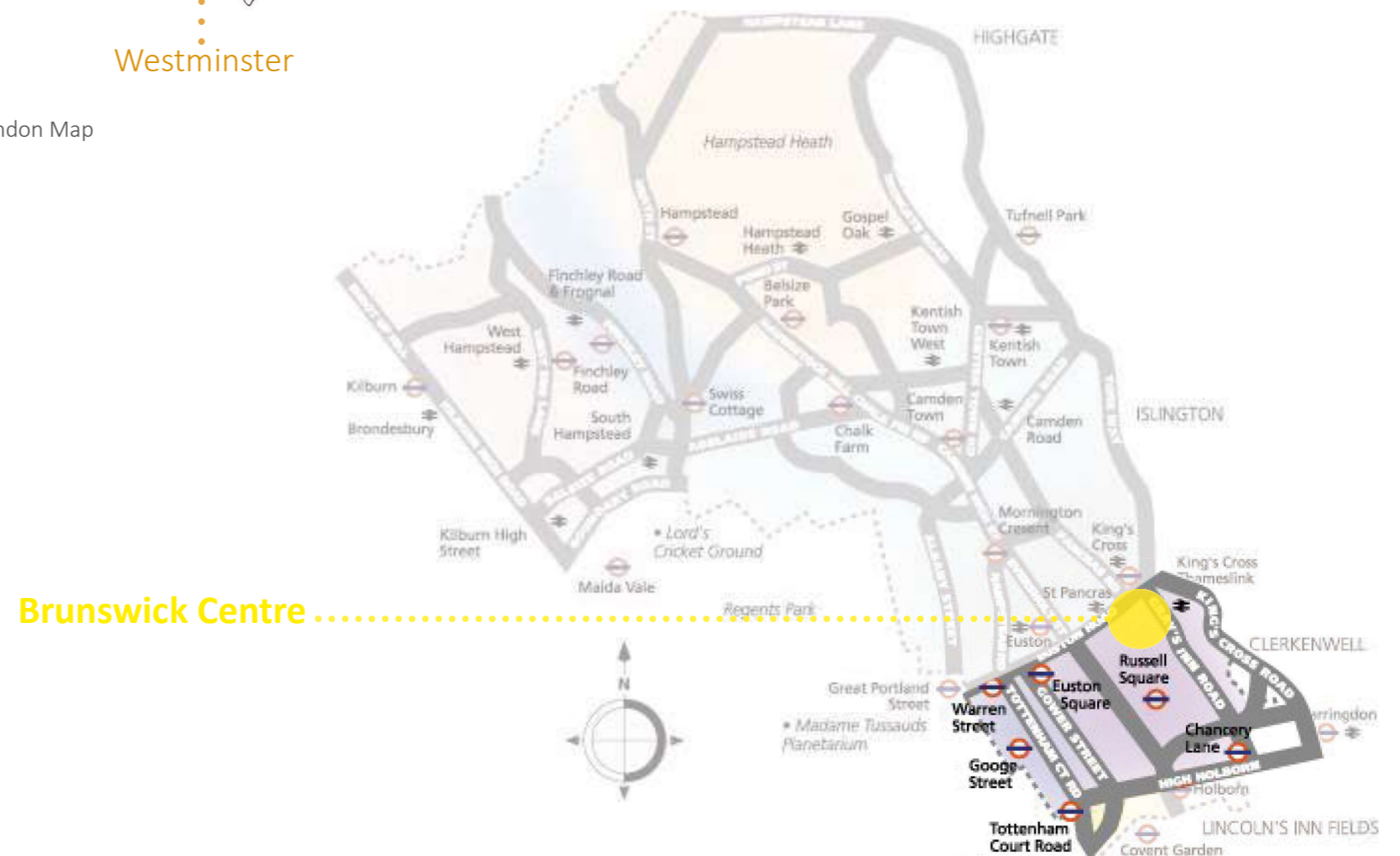


Fig. 3 Bloomsbury area in Camden Borough (Source: www.thecamdenstore.co.uk)

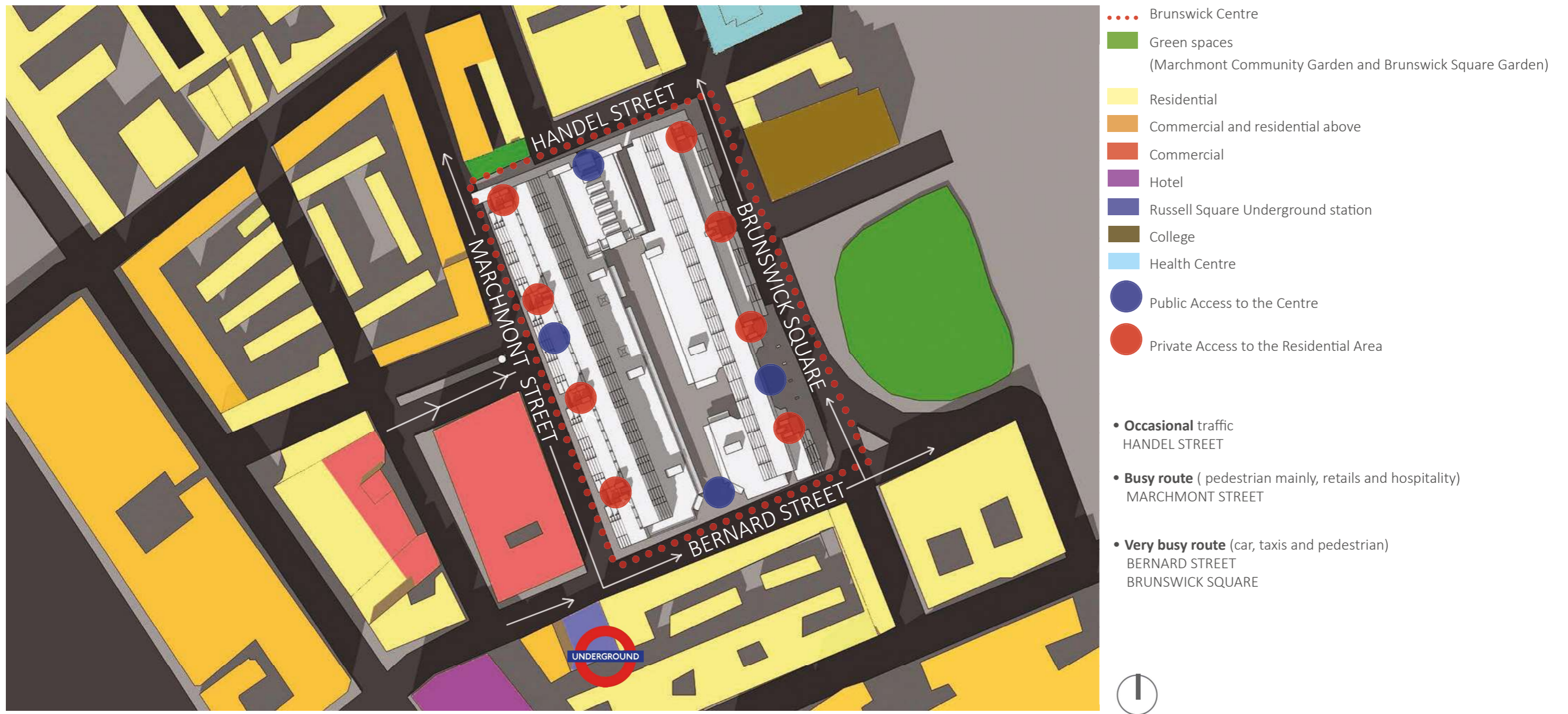


Fig. 4 Urban context

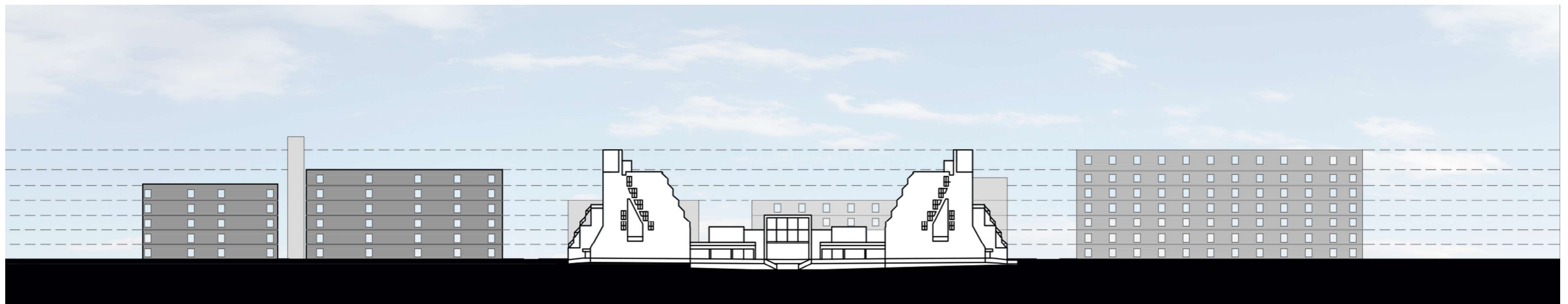


Fig. 5 South elevation (Scale 1:1000)

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Fig. 6 North side  
(Marchmont Garden view)



Fig. 7 West side



Fig. 8 South West side  
(Russel Square Underground Station view )



Fig. 9 South East side



Fig. 10 Original structure in the plaza place



Fig. 11 Plaza originally



Fig. 12 Plaza view from the South West terrace



Fig. 13 Plaza at present

1959 - 1965

1965 - 1990

1990 - PRESENT

- 1959 - Marchmont properties **commissioned** Patrick Hodgkinson and Leslie Martin to design the scheme on the property owned by Founding Hospital.
- 1964 - Design is **presented** to the client, Marchmont properties and it is financed by Robert Mc Alpine's building firm.
- 1965 - The **range of flats** was reduced from 16 to 3.
- 1968 - The **construction began**. Mc Alpine was the engineering consultants.
- 1970 - The architect, Patrick Hodgkinson was forced out by the engineering consultants.
- 1972 - The Brunswick Centre **opened** for the first time.
- 1990 - The project council **rejected lots of proposals** that have been given.
- 2002 - The **permission of refurbishment** was finally given.
- 2003 - Levitt Bernstein and Associates **started the refurbishment**.
- 2006 - **Refurbishment completed**.
- 2011 - Marchmont Community Garden opening (North side of Brunswick Centre).
- **PRESENT**

- Brunswick is a great piece of **postwar housing modernist architecture**.
- 
- The **plaza was repaved in 2006** in granite-alternating polishes and semi-polished paving creating a chequer-board pattern and a new series of water features by Susanna Heron, seatings and raised planters were designed (Fig. xx).
- Opening of several branches of **high street chain stores** and **restaurants** after the refurbishment.
- The concrete was repaired and the **blocks were painted** in their originally-planned cream colour in 2006.
- The **refurbishment changed** the **microclimate** of the plaza making it a comfortable space.
- Double glazing were installed in the sloping area

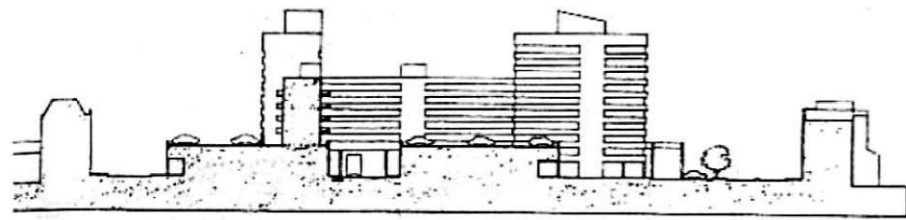


Fig. 14 Development of concept from discrete elements

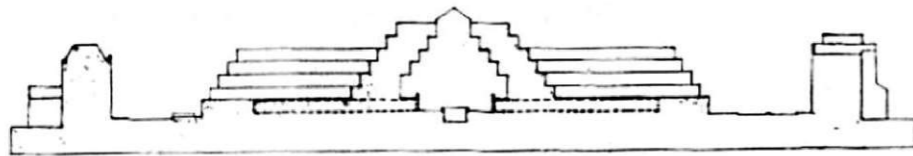


Fig. 15 The later shift to the concept of a single "megastructure"

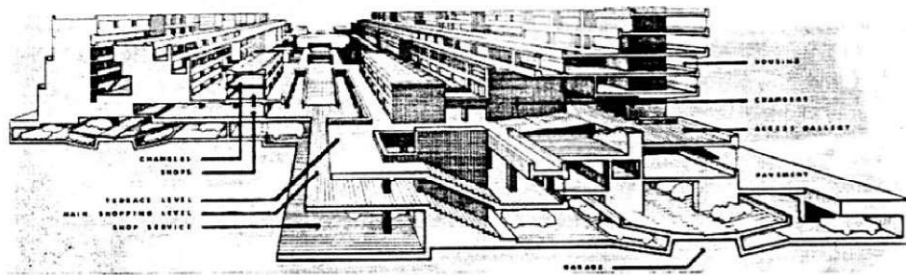


Fig. 16 Revised design to provide more public space and less integration of the shops and housing

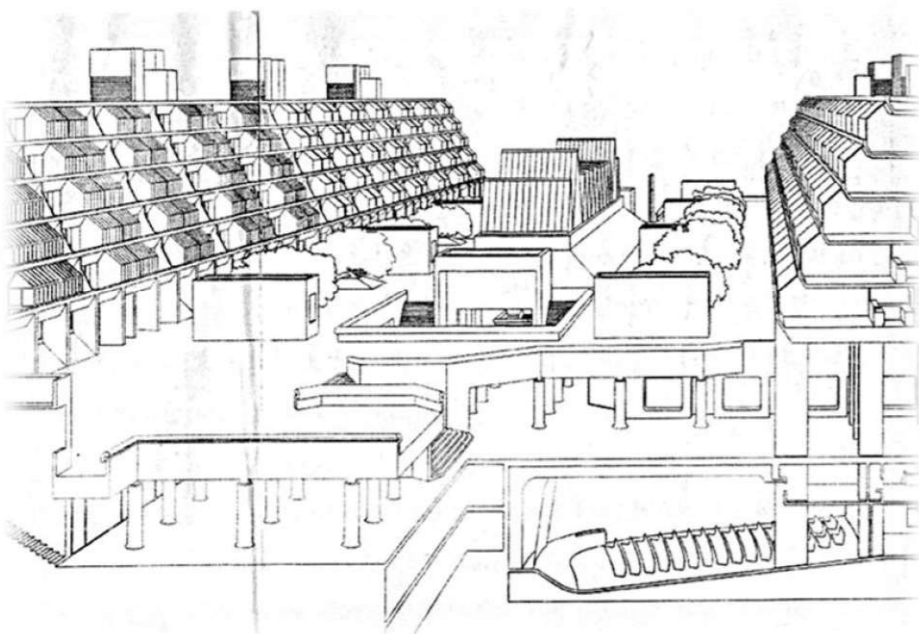


Fig. 17 Brunswick Centre perspective as proposed and partially built, 1972

- **Stepped back structure** to break the monotony of the dense residential area and provide views looking out into the open plaza.

- The **initial proposal** was to extend the building till Travestock place but because the neighboring area belonged to the military it was not possible to get acquisition of the land and hence only two thirds of the project was sanctioned.

- Between 1960 and 1963, Patrick Hodgkinson's designs whilst working with Sir Leslie Martin, show a **transition from a mixed height "piecemeal" development** of offices and housing with retail units built in between to something approaching the building we see today.

- His thinking later moved on to the ideas of the **"superblock"**. P. H. redesigned the site as a "spine" with housing clustered around a shopping precinct which he considered "two closely integrated". This later shaped into a design, with housing along the edges of the site and commercial and retail functions at the centre.

- But the **initial outline** from the developers side was **disordered**. He then adopted a **common structural bay** with regular service nodes and simplified the layout of the public space, the terrace area over the shops was to be simple, tree lined avenue separated from the arcaded street below.

- Around the time a **lots of modifications** were also made in the **housing units** with each block being split and units being changed from double to single. It was originally intended that there be a much more diverse mix of property types allowing larger family units.

- The flats had open terraces in the earlier designs but were now modified to have these **enclosed "winter - garden"** with a second glazed screen to the main living space. Although both conceptually and physically this is a simple change, the effect is fundamental to the appearance of the Brunswick Centre.

- Due to the high risk involved, Marchmont properties did not want to proceed with the project. In 1956 Camden council collaborated with the architect and agreed to **lease all the housing**.

- **This new criteria to be met changed the design drastically.** The **winter - garden lost their key function** as the glazed partition between the winter garden and the interior of the house was removed. The **sizes of the units were reduced** to suit housing for the elderly. Due to this the **number of floors were reduced by one on both sides**.

- Originally, the **two large stepped wings** flanking the open plaza, were connected to each other by **three bridges** above the shopping arcade. For security reasons they are been removed leaving the two wings as two separate buildings. Shops were brought forward removing the covered walkways provided by the colonnades.

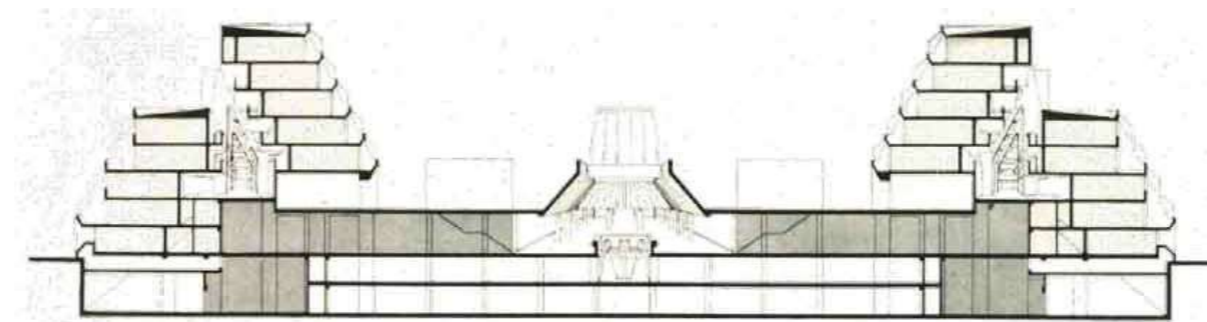


Fig. 18 Plaza initial Design

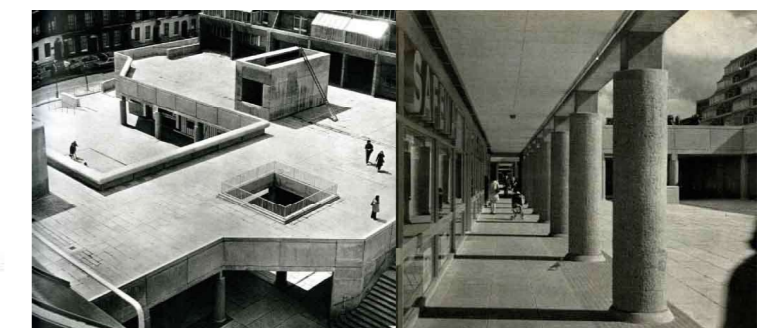


Fig. 19 Plaza before the refurbishment completed in 2006

Design revolves around the **concept of low rise-high density**, with an **open plaza**, to relate housing to shops and provide a nucleus for future development.

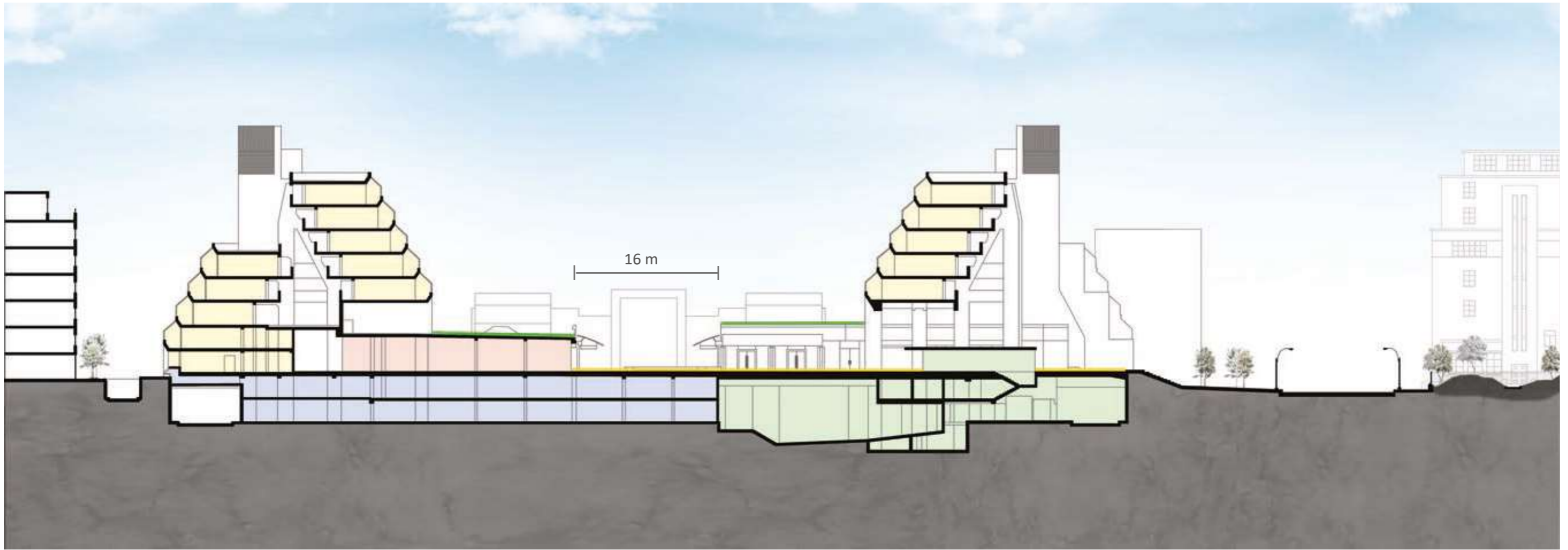


Fig. 20 Actual section through the plaza

Parking Space
  Cinema
  Residential Space
  Retail
  Plaza Level
  Terraced Level

**Building layout:**

- **Plaza** acts as a spine of the site, linking the two sides together. It is lined with retail spaces on either sides of the central pedestrian walkway
- **Terraces** run around the inner court at the first floor level
- **Housing** is formed in two blocks running the length of the site

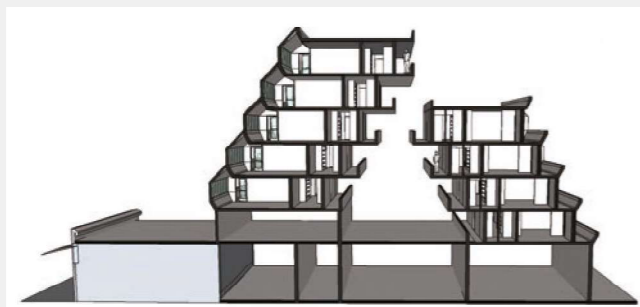


Fig. 21 Stepped back building arrangement

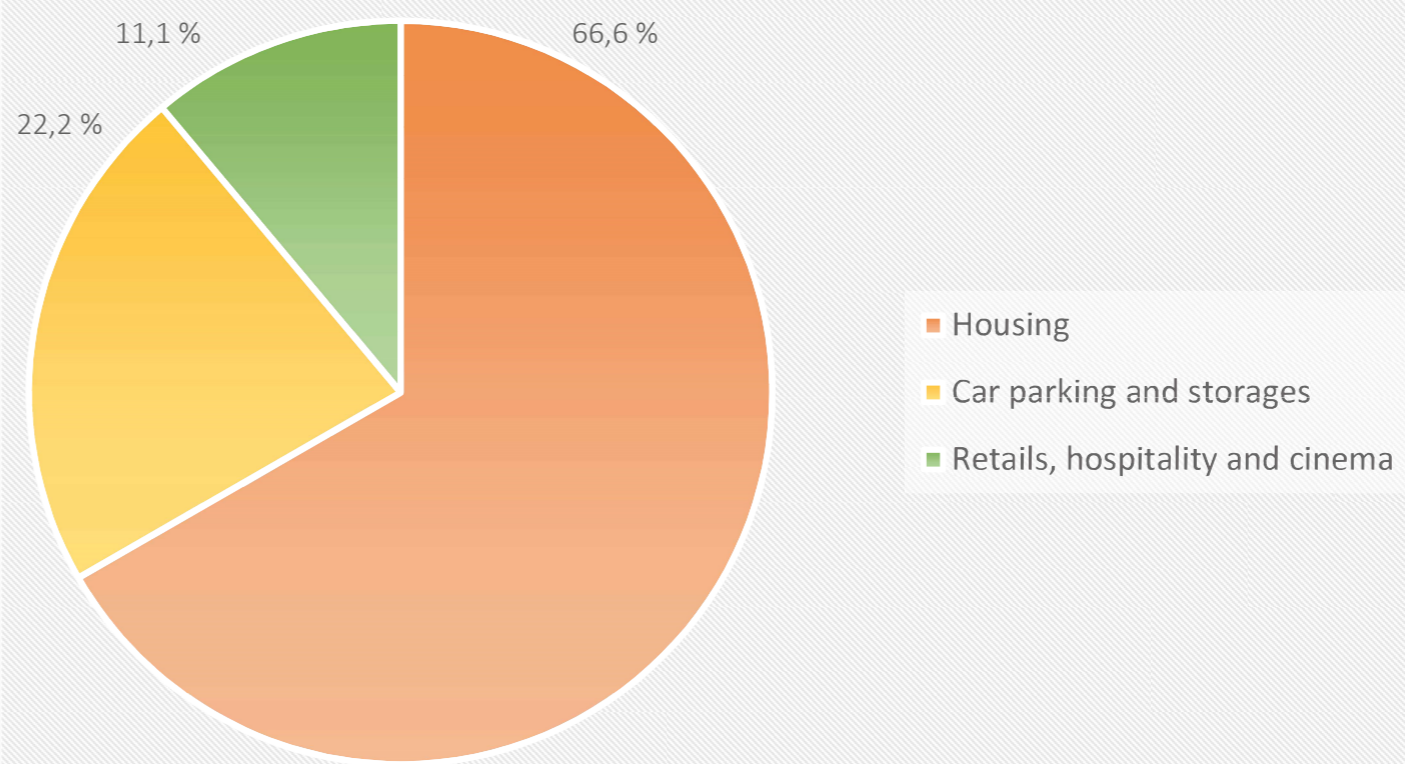


Fig. 22 Building organisation graph (%)

**Building organisation:**

- **Overall** development is **9 floors**
- **2 underground floors:** car parking, retail storage and loading bays
- **Entrance level:** retail units, hospitality and a cinema
- **6 Upper floors:** housing

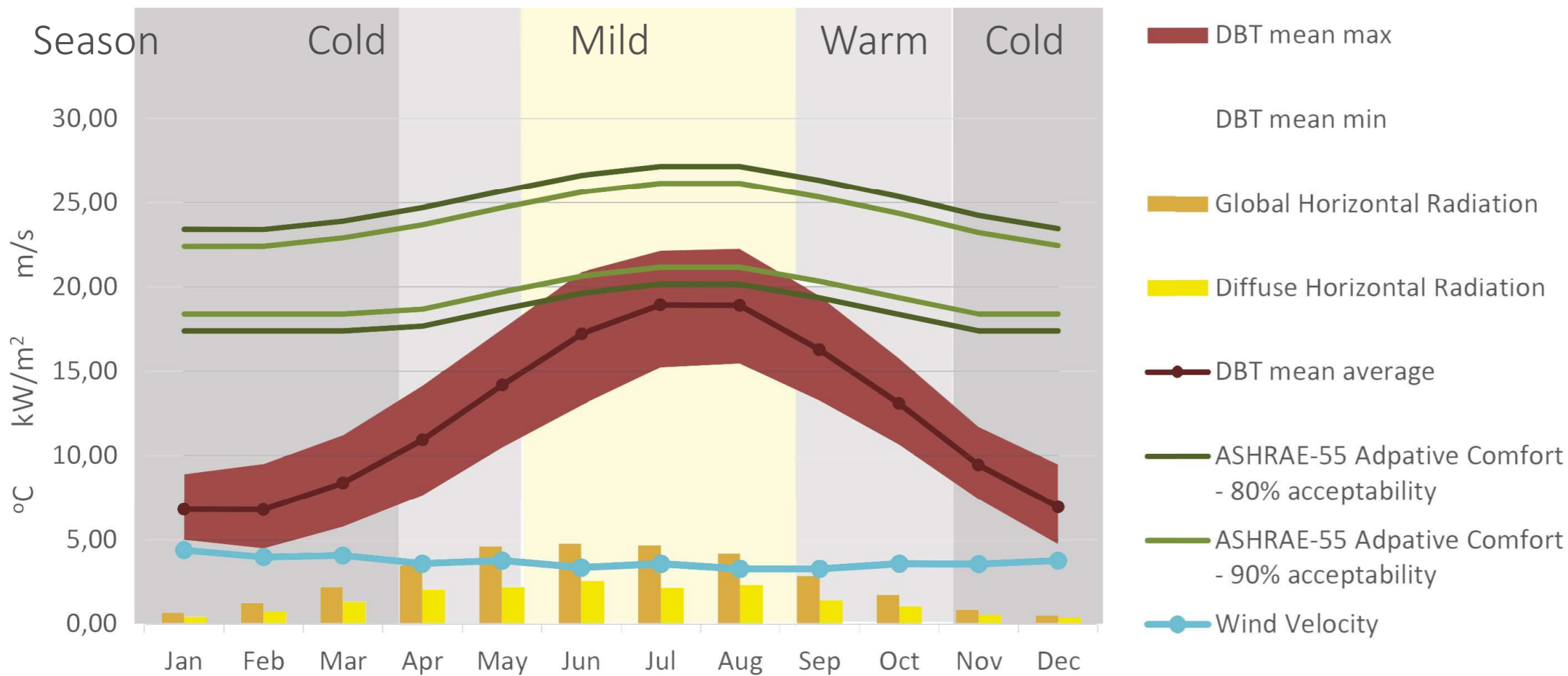


Fig. 21 Monthly Average London Climate Parameters (Source: Meteonorm)

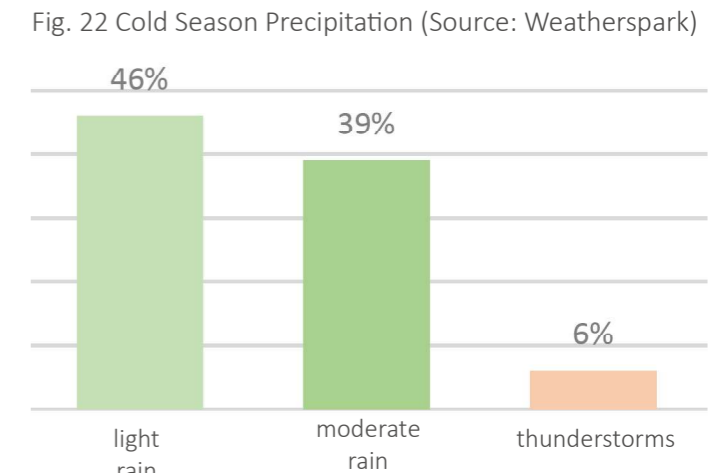
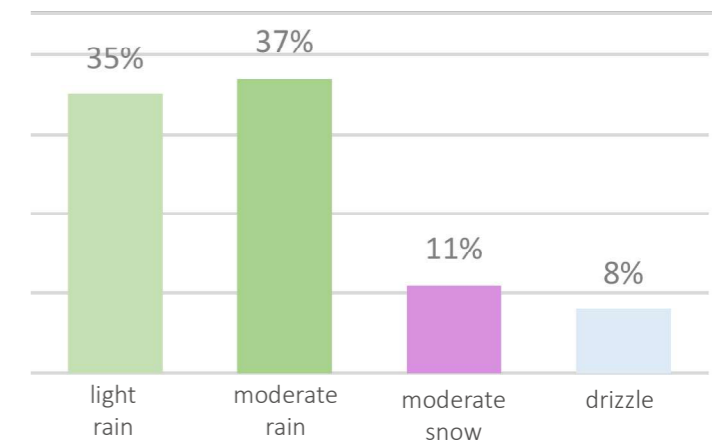


Fig. 23 Warm Season Precipitation (Source: Weatherspark)

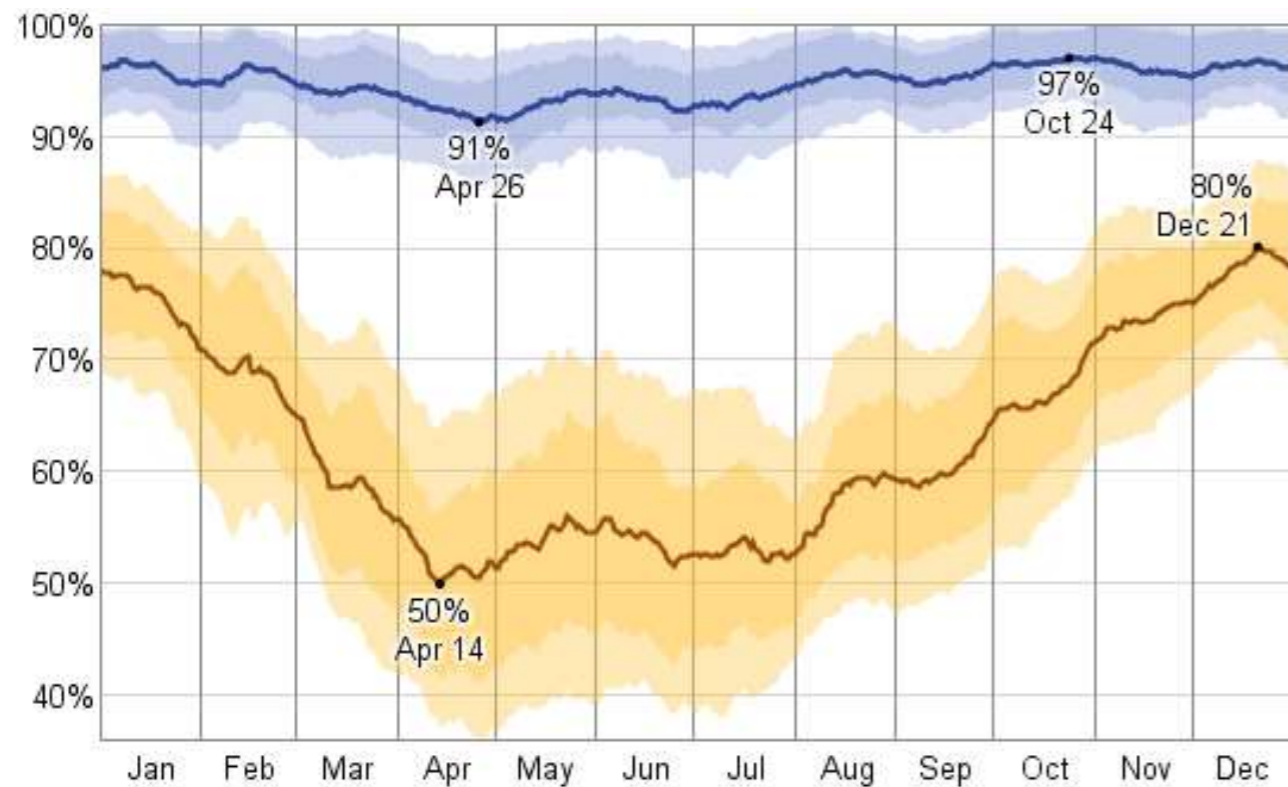


Fig. 24 Monthly Average Relative Humidity (%) (Source: Weatherspark.com)

The air is driest around April 14, at which time the relative humidity drops below 56% (mildly humid); it is most humid around October 24, exceeding 95% (very humid). The average daily high (blue) and low (brown) relative humidity with percentile bands.

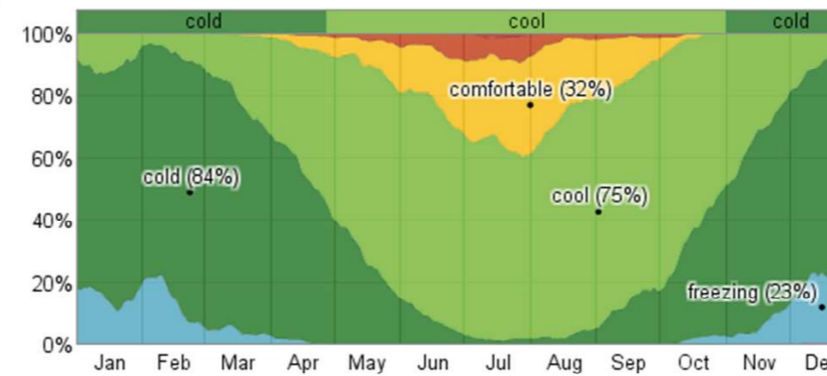


Fig. 25 Fraction of time spent in various temperature bands (Source: Weatherspark.com)

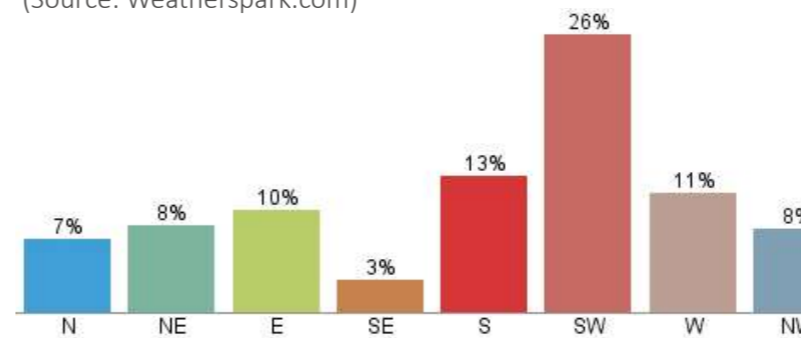


Fig. 26 Wind direction over the entire year (Source: Weatherspark.com)

**Climate definition:**

- **Cfb** type climate by Köppen climate classification: **warm temperate, fully humid, warm summer.**
- 3 Seasons: **cold** (cool and little temperature variation, rare temperature under 0°C), **mild, warm** (mean max temperature around 23 °C, rare temperature over 25 °C).
- Precipitations rate: **54%** average chance that precipitation will be observed at some point during a given day in the **warm** season. It is most often **light rain (46%)**, moderate rain (39%), and thunderstorms (8%). During the **cold** season, **60%** average chance that precipitation will be observed at some point during a given day. It is most often **moderate rain (37%)**, light rain (35%), moderate snow (11%), and drizzle (8%).
- Higher **Solar Radiation** between May and September.
- **Relative humidity** typically ranges from **50%** (comfortable) to **97%** (very humid), rarely dropping below 36% (comfortable) and reaching as high as 100% (very humid).
- The **main wind direction** of London is the **south-west** with a wind speed of **0 to 7m/s** throughout the year (**Light/Moderate**).

# 2. Outdoor studies:

☀️ 21 °C- 16° C (Weather station)

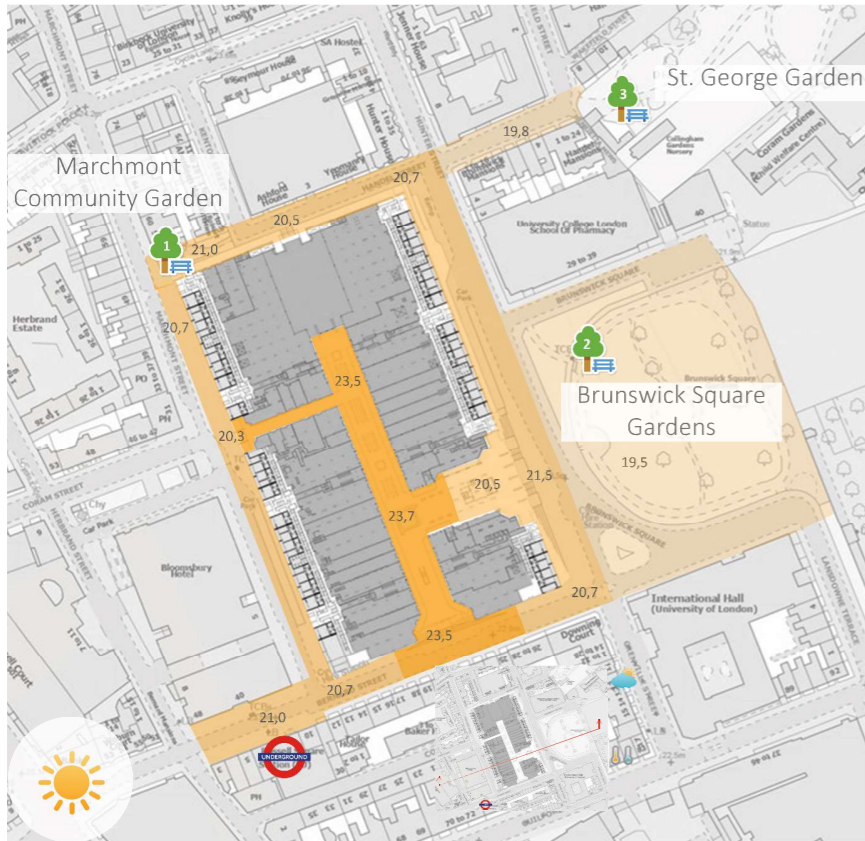


Fig. 27 Outdoor Air Temperature **Sunny Day**- 5<sup>th</sup> October 2016 (°C)

☁️ 21 °C- 12° C (Weather station)

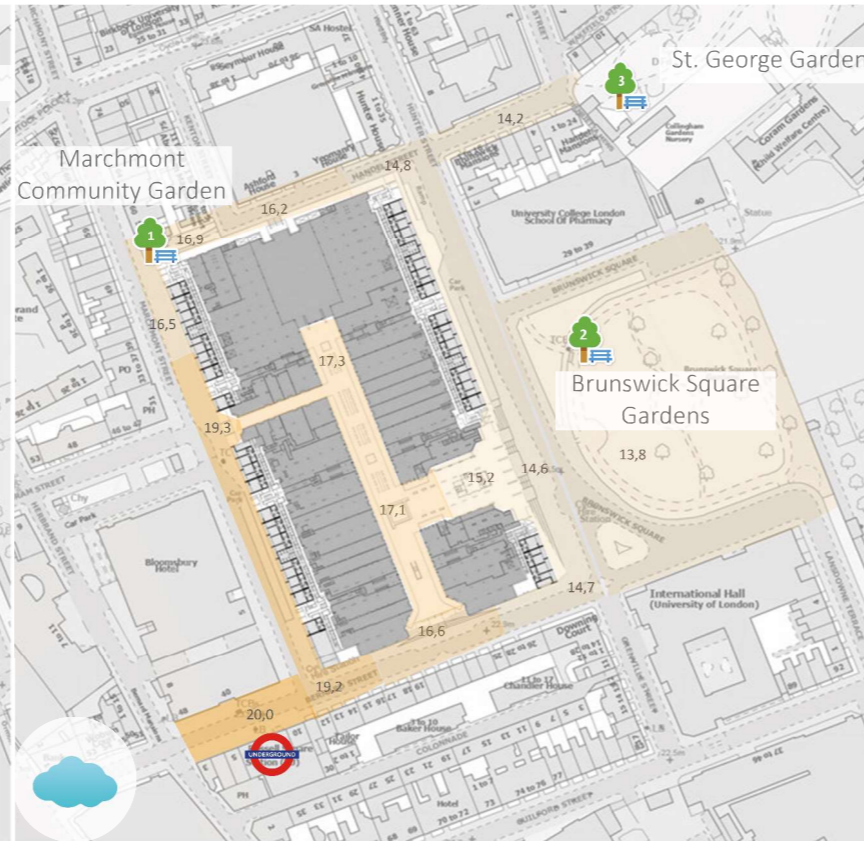
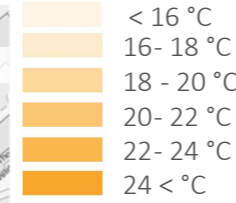


Fig. 28 Outdoor Air Temperature **Cloudy Day**- 6<sup>th</sup> October 2016 (°C)



🕒 14.30- 15.00 pm

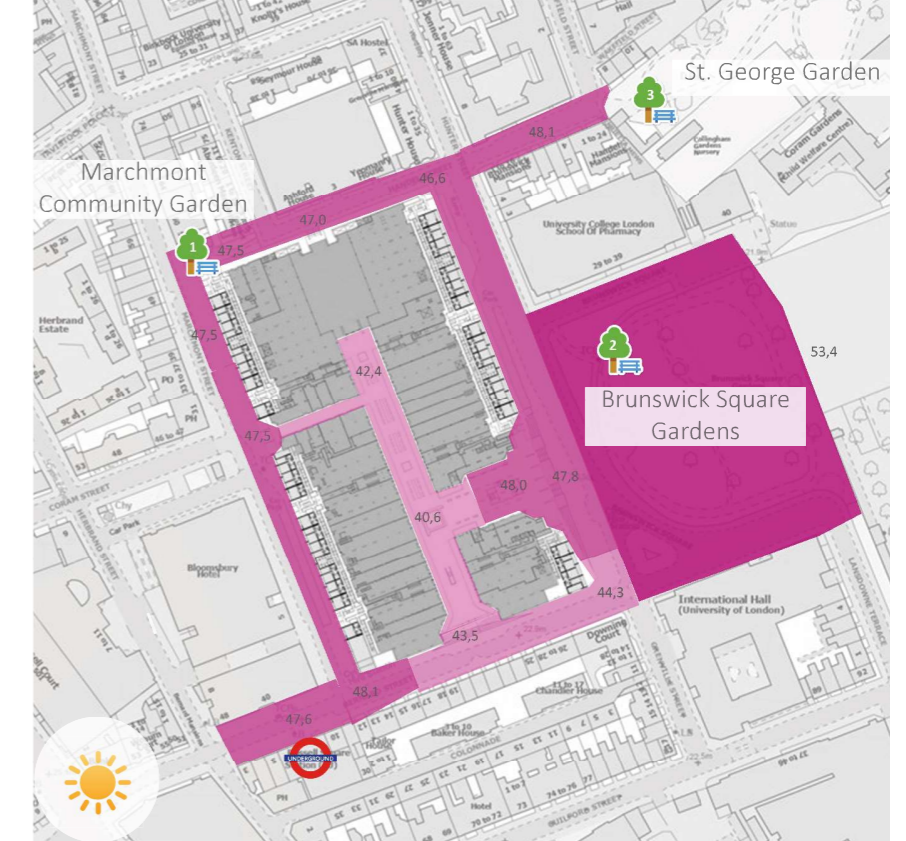
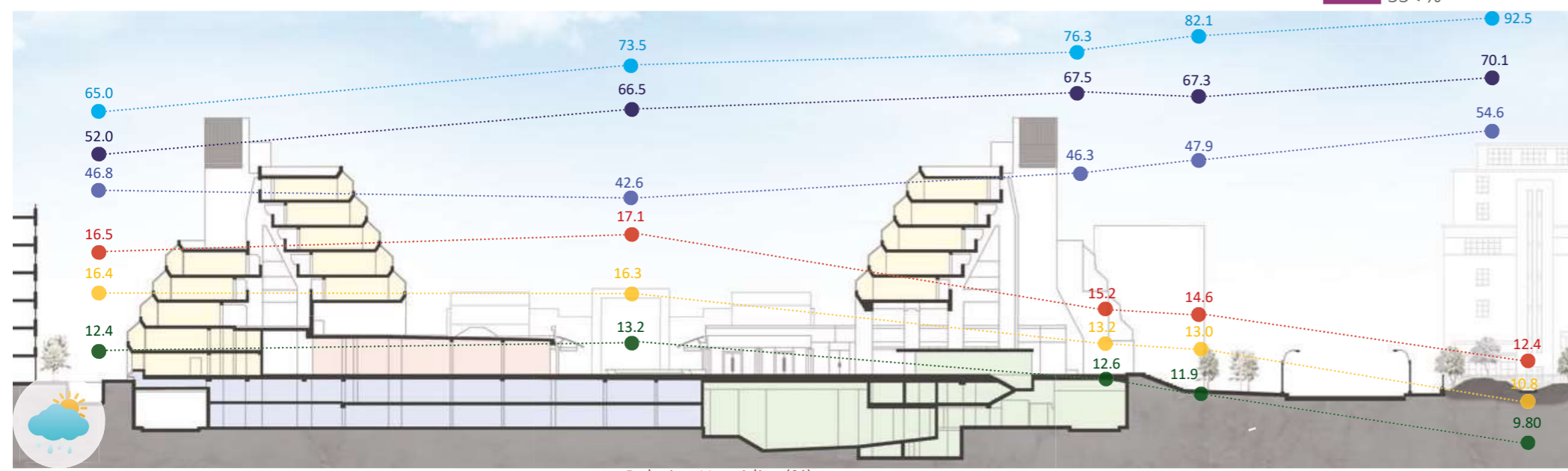
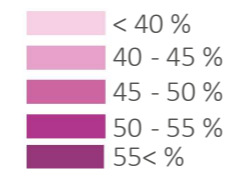


Fig. 29 Outdoor Relative Humidity **Sunny Day**- 5<sup>th</sup> October 2016 (%)



Air Temperature (°C)      Relative Humidity (%)      ☀️ 16.6 °C- 11° C (Weather station)

● Morning Spot (9.00-10.00 am)      ● Evening Spot (19.00-20.00 pm)

● Afternoon Spot (14.00-15.00 pm)      ● Afternoon Spot (14.00-15.00 pm)

Fig. 31 Outdoor Daily Variance Temperature-Relative Humidity **Unsettle Weather Day** - 13<sup>th</sup> October 2016

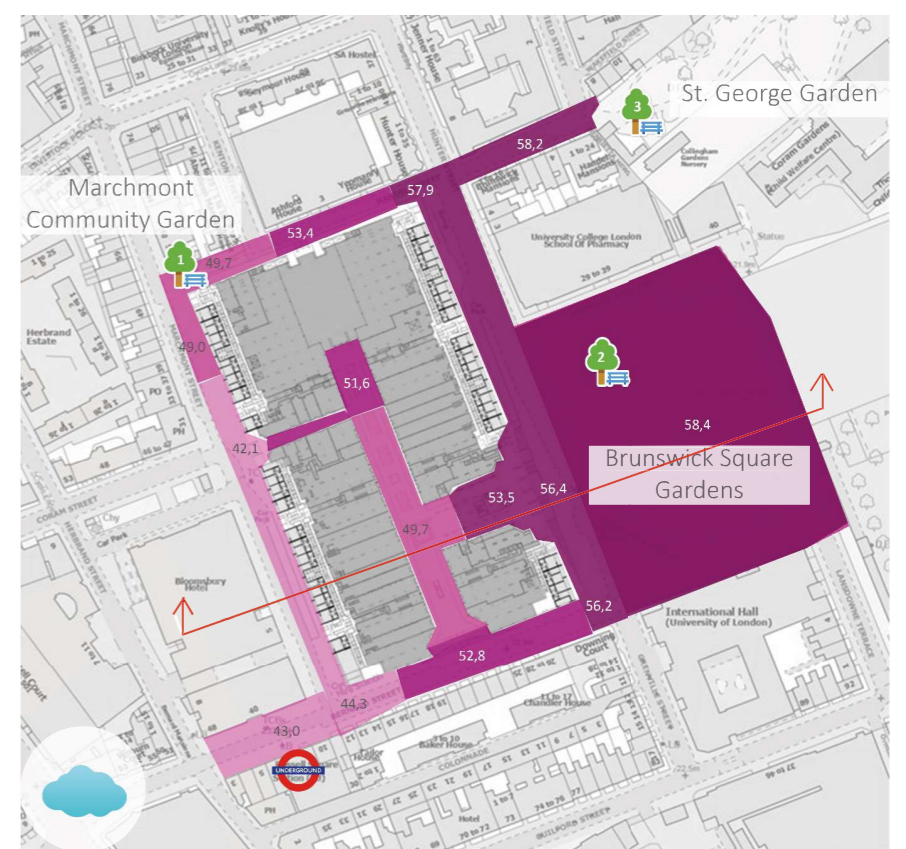


Fig. 30 Outdoor Relative Humidity **Cloudy Day**- 6<sup>th</sup> October 2016 (%)



🌡️ 21 °C- 16° C (Weather station)

🌡️ 21 °C- 12° C (Weather station)

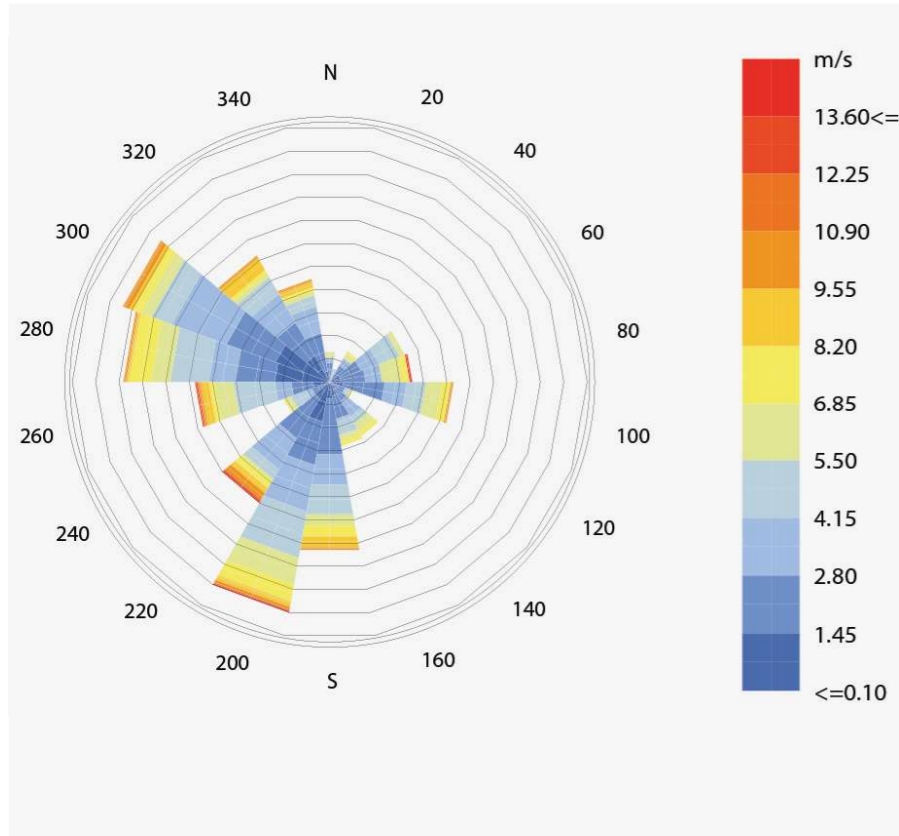


Fig. 34 Wind rose October (m/s) (Source: Rhino- Ladybug)

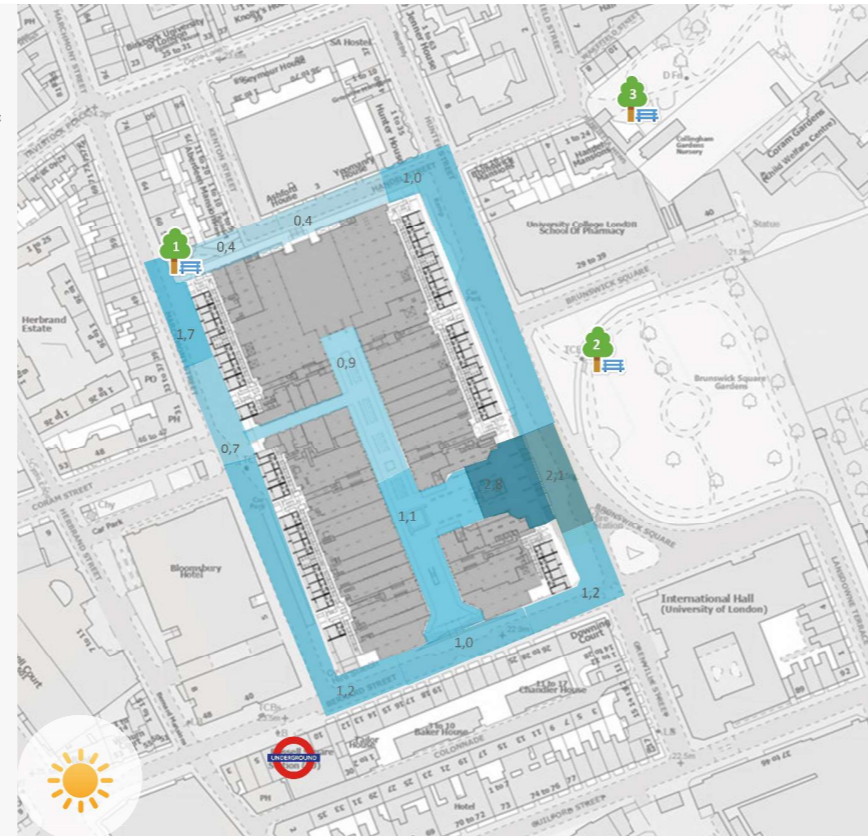
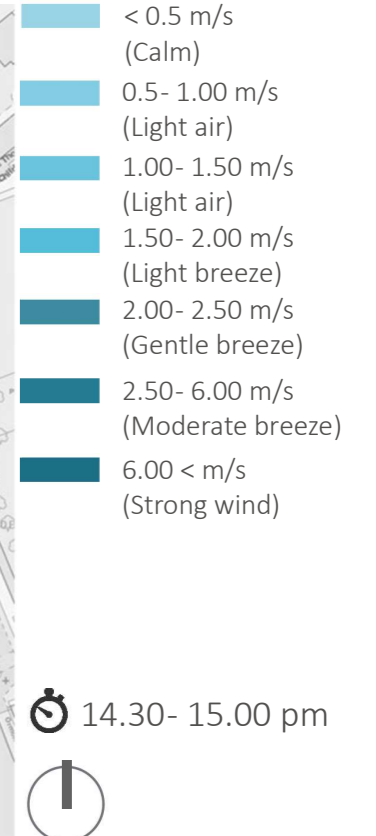


Fig. 32 Air Velocity **Sunny Day**- 5<sup>th</sup> October 2016 (m/s)



Fig. 33 Air Velocity **Cloudy Day**- 6<sup>th</sup> October 2016 (m/s)



🕒 14.30- 15.00 pm  
📍

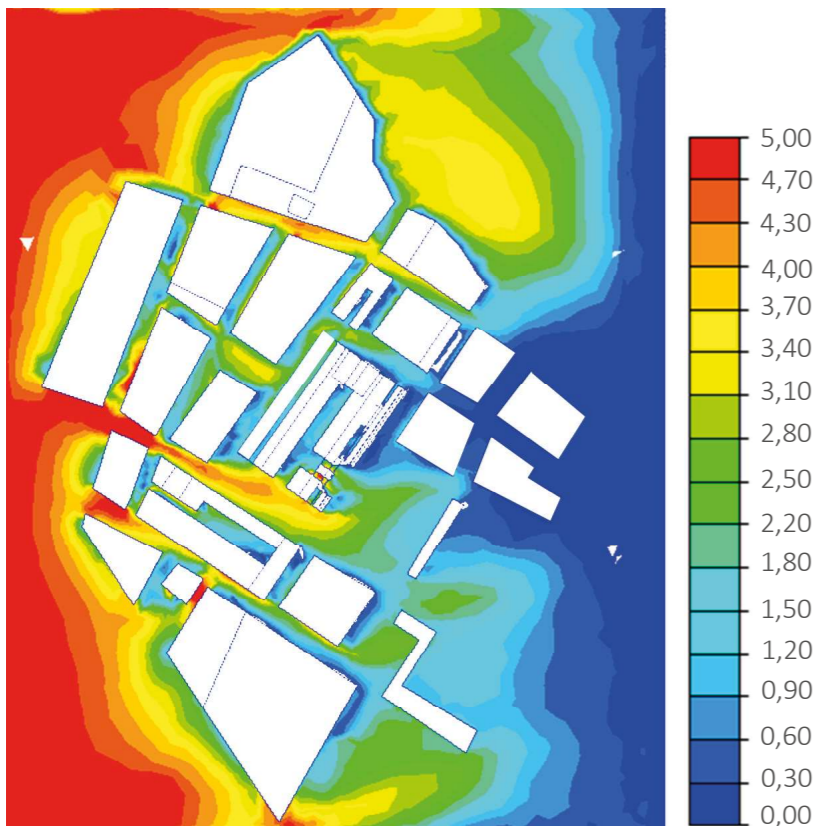


Fig. 34 Air Velocity Flow October (m/s)- South/West Direction (Source: CFD)

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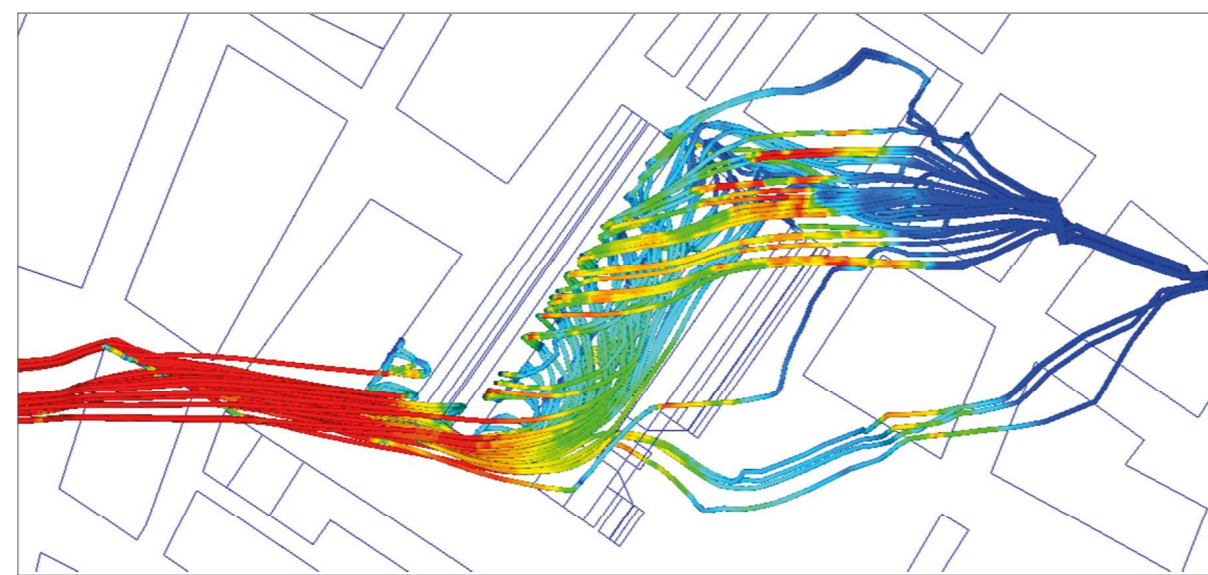


Fig. 35 In between particles Air Velocity Flow October (m/s) (Source: CFD)

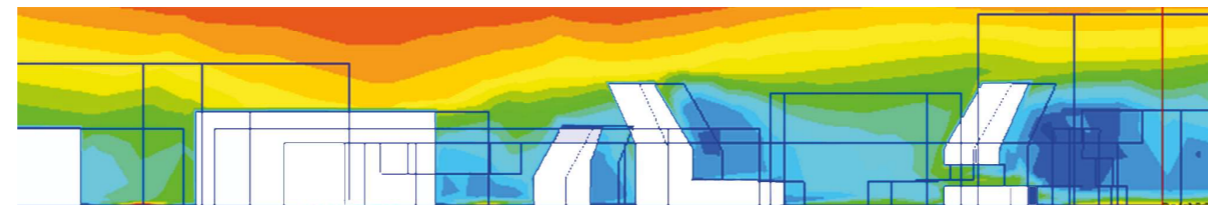
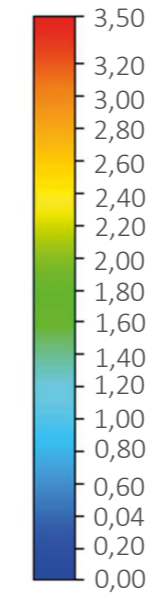


Fig. 35 Air Velocity Flow section (m/s) (Source: CFD)

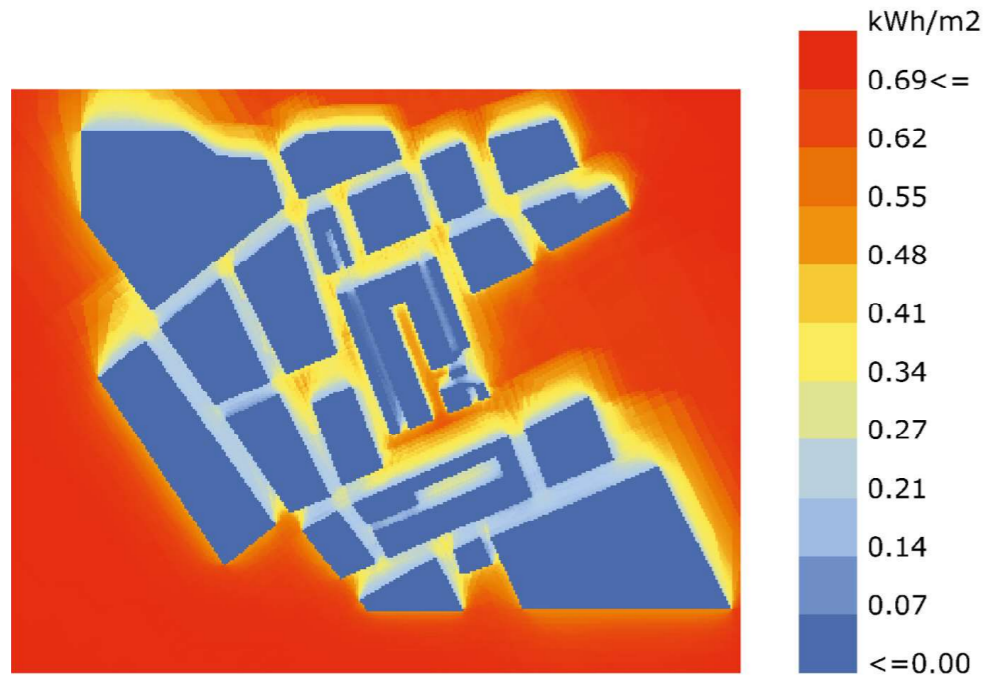


**Wind definition:**

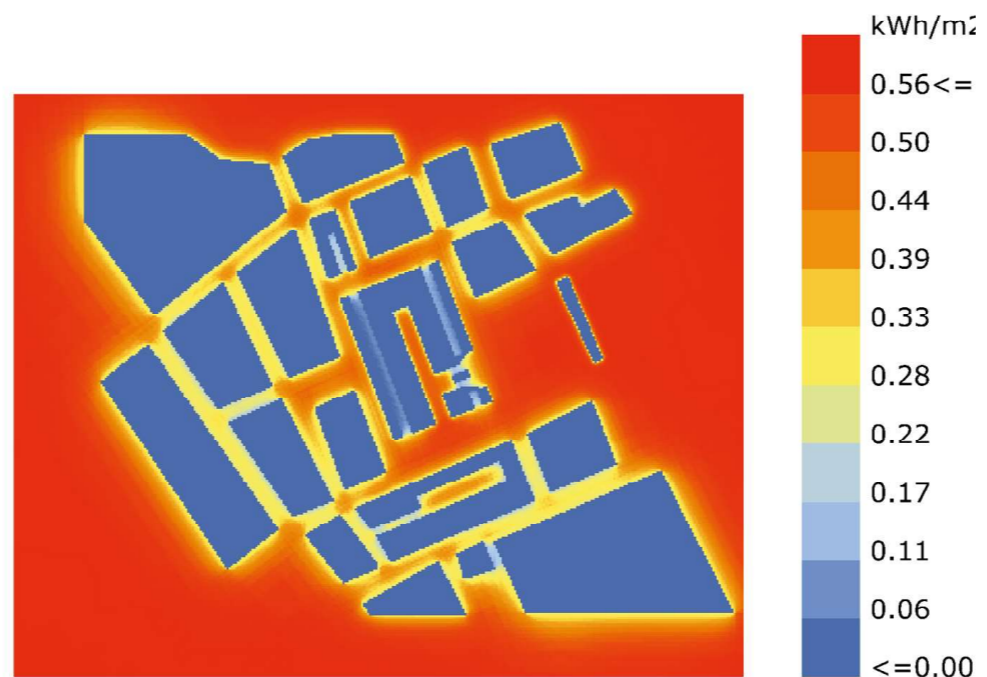
- **Air Velocity Range (CFD):** 0,00- 3,50 m/s)
- Brunswick Centre has a linear built mass which shields the plaza from the **prevailing West and South-West winds**, maintaining the plaza air flow between 0,00 and 1,50 m/s (Light breeze)
- CFD simulation confirmed that the plaza is mainly exposed to a comfortable air flow over the year, technically defined as calm and light air
- Due to the light breeze plaza will be nicely ventilated during the warm season
- During the cold season plaza is protected from the building masses and consequently comfort in the plaza will not be affected from strong and cold air



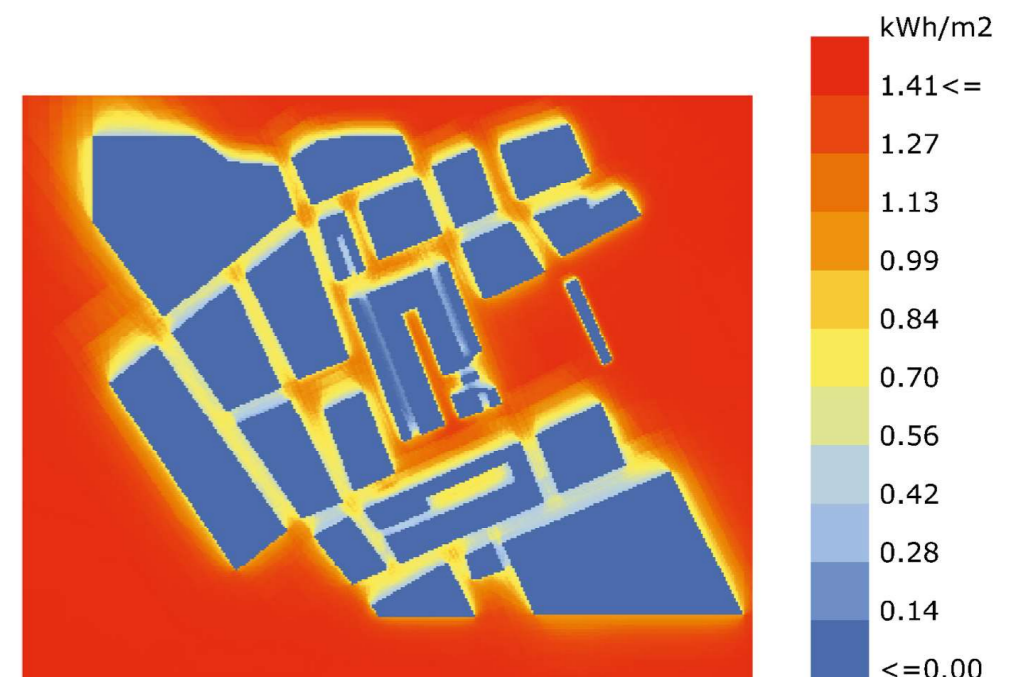
# SOLAR RADIATION ANALYSIS



Radiation Analysis  
London\_Weather\_C\_  
1 JAN 9:00 - 1 JAN 15:00



Radiation Analysis  
London\_Weather\_C\_  
1 JUL 9:00 - 1 JUL 15:00



Radiation Analysis  
London\_Weather\_C\_  
15 OCT 9:00 - 15 OCT 15:00

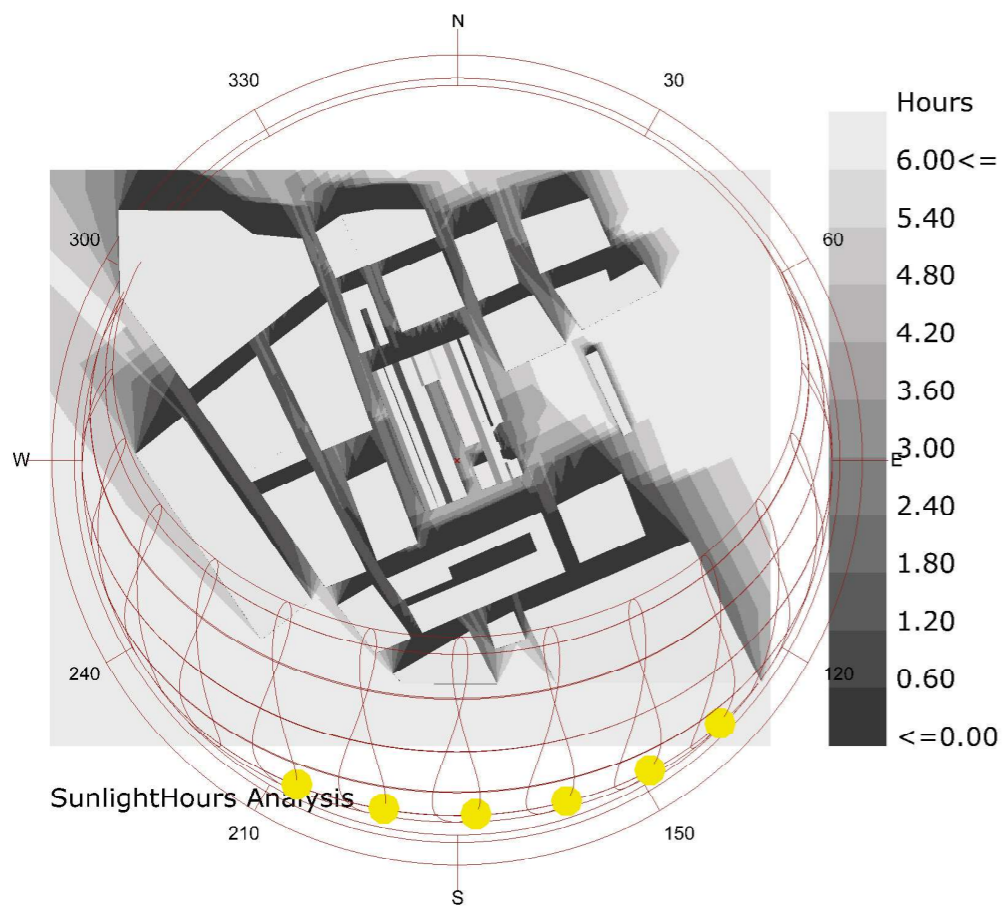


Fig. 36 Sunlight hours analysis January (Source: Rhino- Ladibug)  
Latitude: 51.517

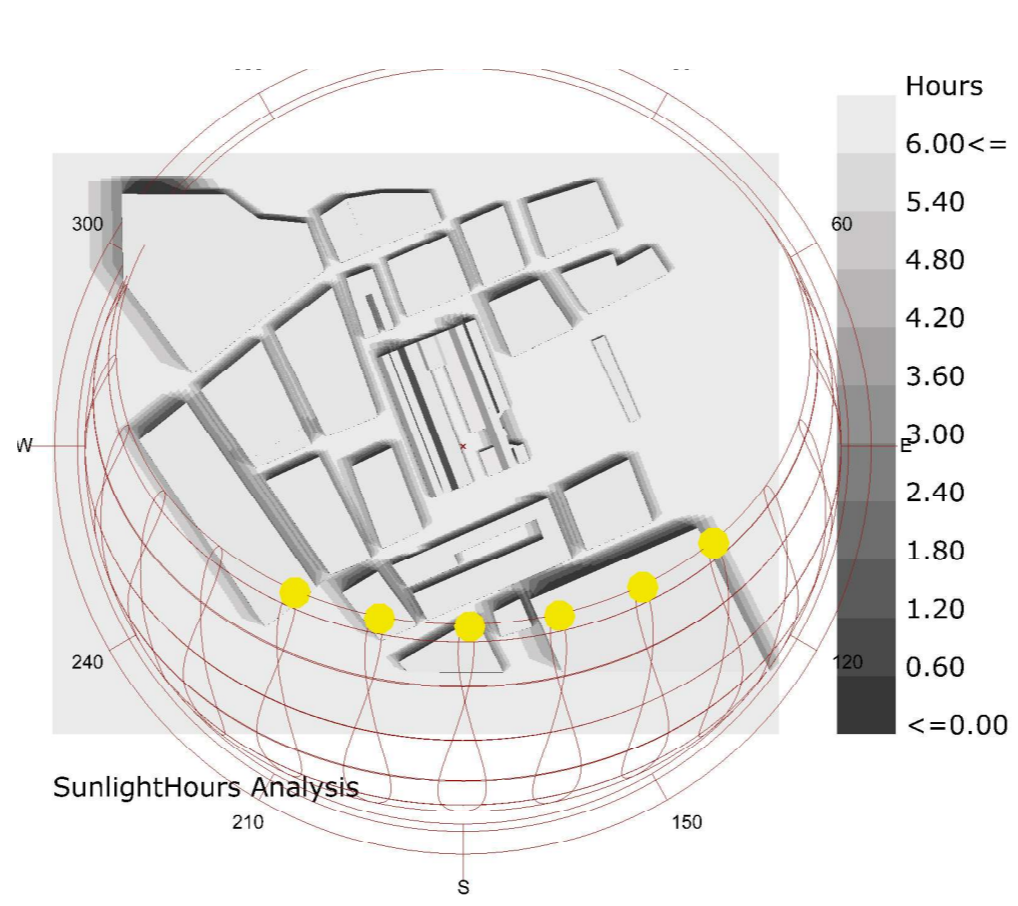


Fig. 37 Sunlight hours analysis June (Source: Rhino- Ladibug)  
Latitude: 51.517

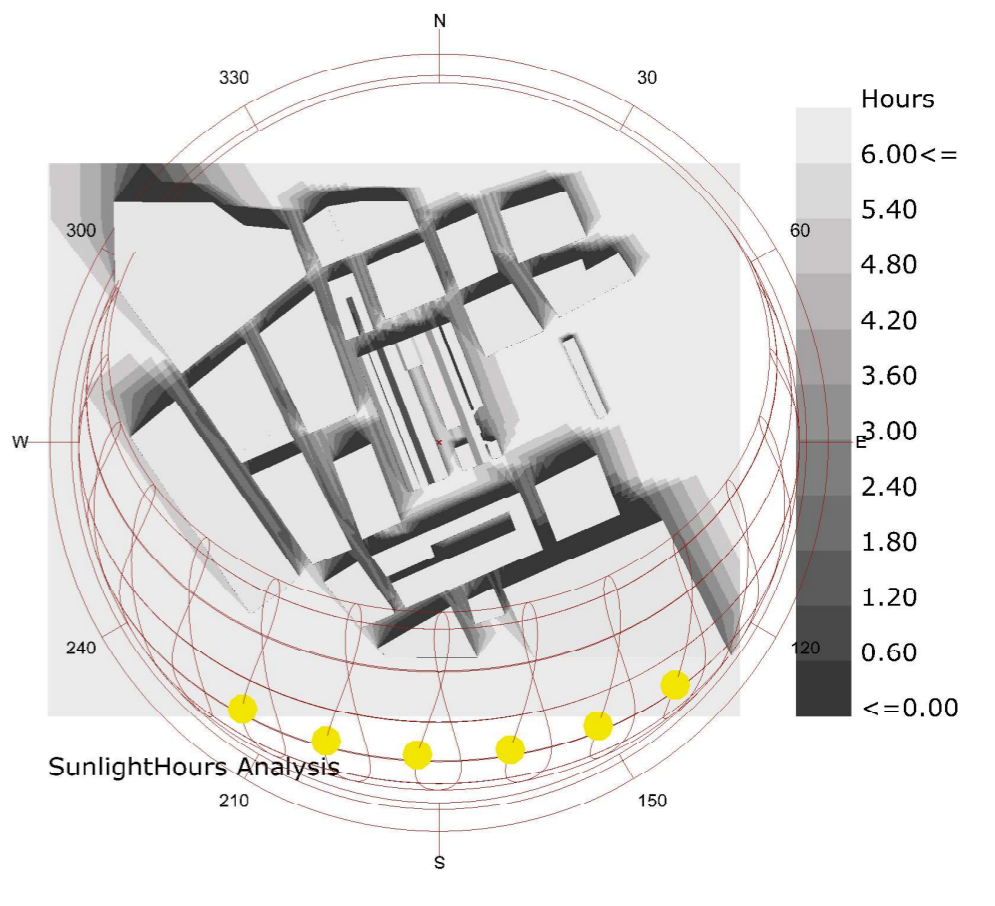
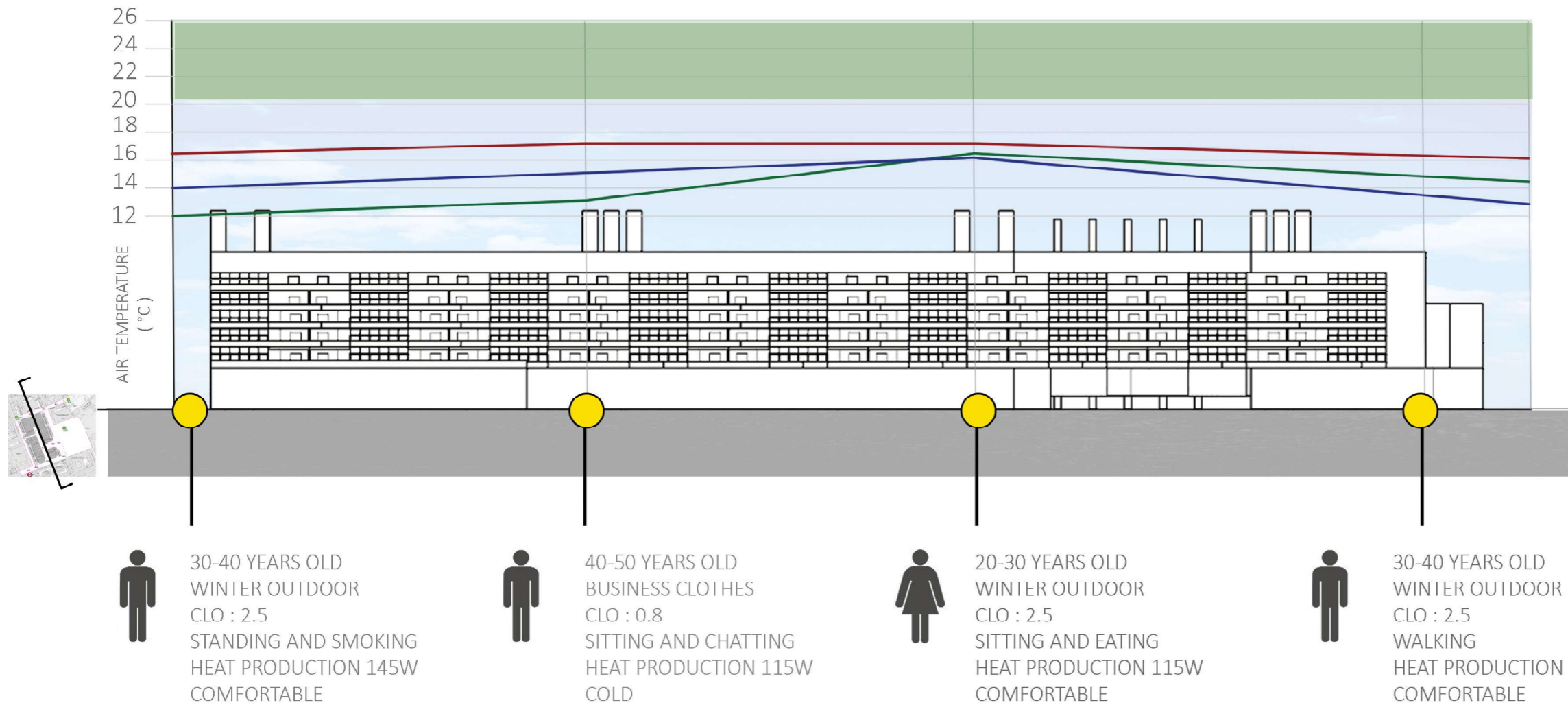


Fig. 38 Sunlight hours analysis October (Source: Rhino- Ladibug)  
Latitude: 51.517





### Comfort zone

The average temperature in Brunswick Plaza was below 20 degrees, which means that the area needs to be exposed by direct sunlight or sun radiation in order to make the temperature warmer. However, the measurement was held in a cloudy and raining day, 6th of October 2016.

### Relative Humidity

The relative humidity has to be below 80% and to achieve the comfort zone, it has to be between 30 to 65%. Brunswick Centre has the relative humidity between 40 to 55%, which means this area is comfortable enough for the relative humidity measurement.

- Comfort Zone (Temperature)
- Air Temperature- morning
- Air Temperature- afternoon
- Air Temperature- evening



Fig. 38 Central seating facing north



Fig. 38 Cafe seating near waterbody area



Fig. 38 Sidewalk outside the main building



- < 40 %
- 40 - 45 %
- 45 - 50 %
- 50 - 55 %
- 55 < %

Fig. 29/30 Outdoor Relative Humidity **Sunny/Cloudy Day**- 5<sup>th</sup> October 2016/ 6<sup>th</sup> October 2016 (%)

UTCI	Stress Level	Season/ Data	TMRT/DBT	RH	AIR V.
above +46	extreme heat stress	cold	5 °C min	70 % av.	1,5 m/s max
+38 to +46	very strong heat stress	mild	14 °C av.	55 % av.	1,5 m/s max
		warm	24 °C max	50 % av.	1,5 m/s max
+32 to +38	strong heat stress				
+26 to +32	moderate heat stress				
+9 to +26	no thermal stress				
+9 to +0	slight cold stress				
+0 to -13	moderate cold stress				
-13 to -27	strong cold stress				
-27 to -40	very strong cold stress				
below -40	extreme cold stress				

UTCI +23,1	Warm season (July)
UTCI +12,8	Mild season (April)
UTCI +3,6	Cold season (January)

Fig. 38 UTCI Assessment for plaza (Source: UTCI.org)

### 3. Indoor studies:

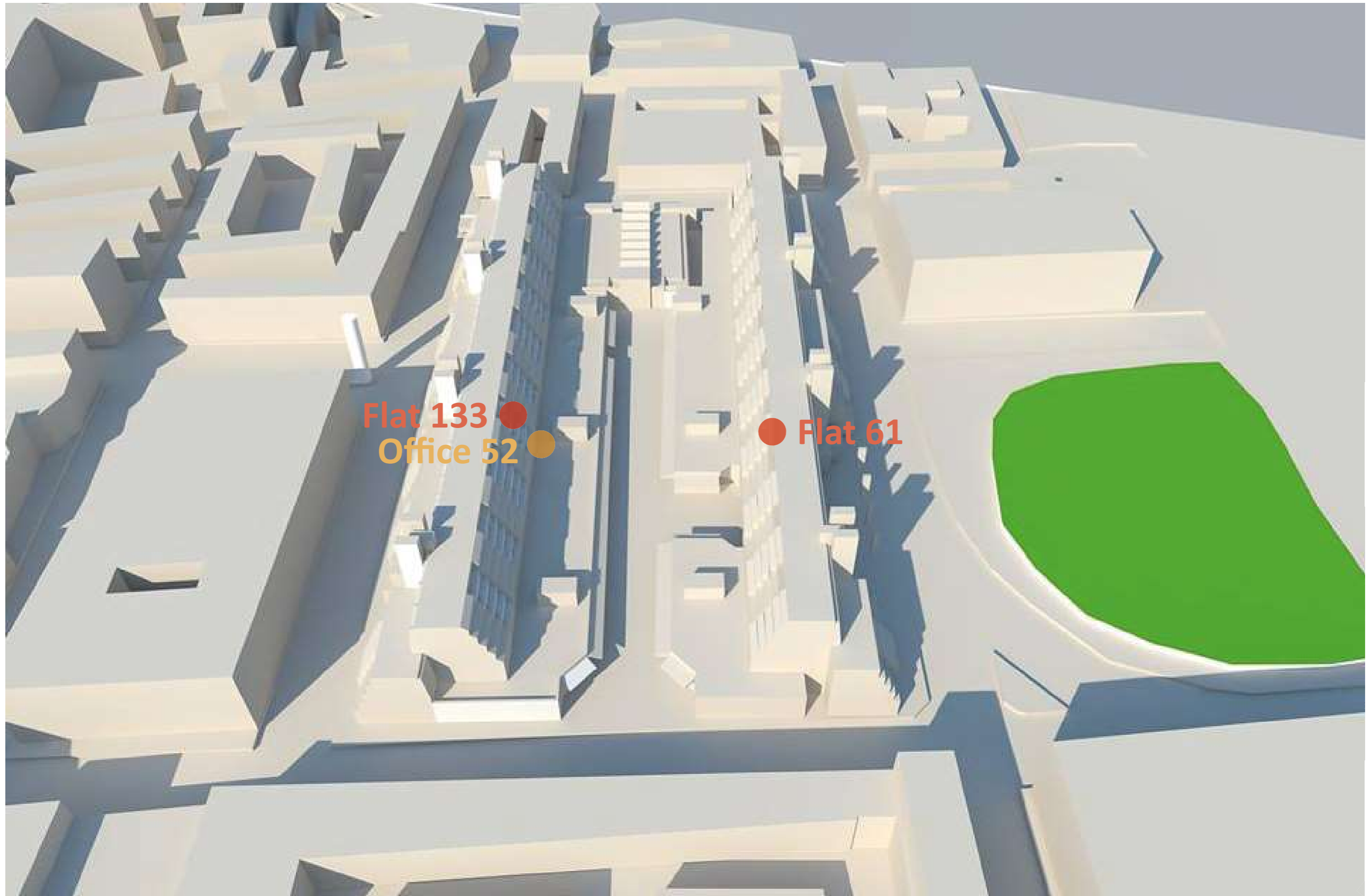
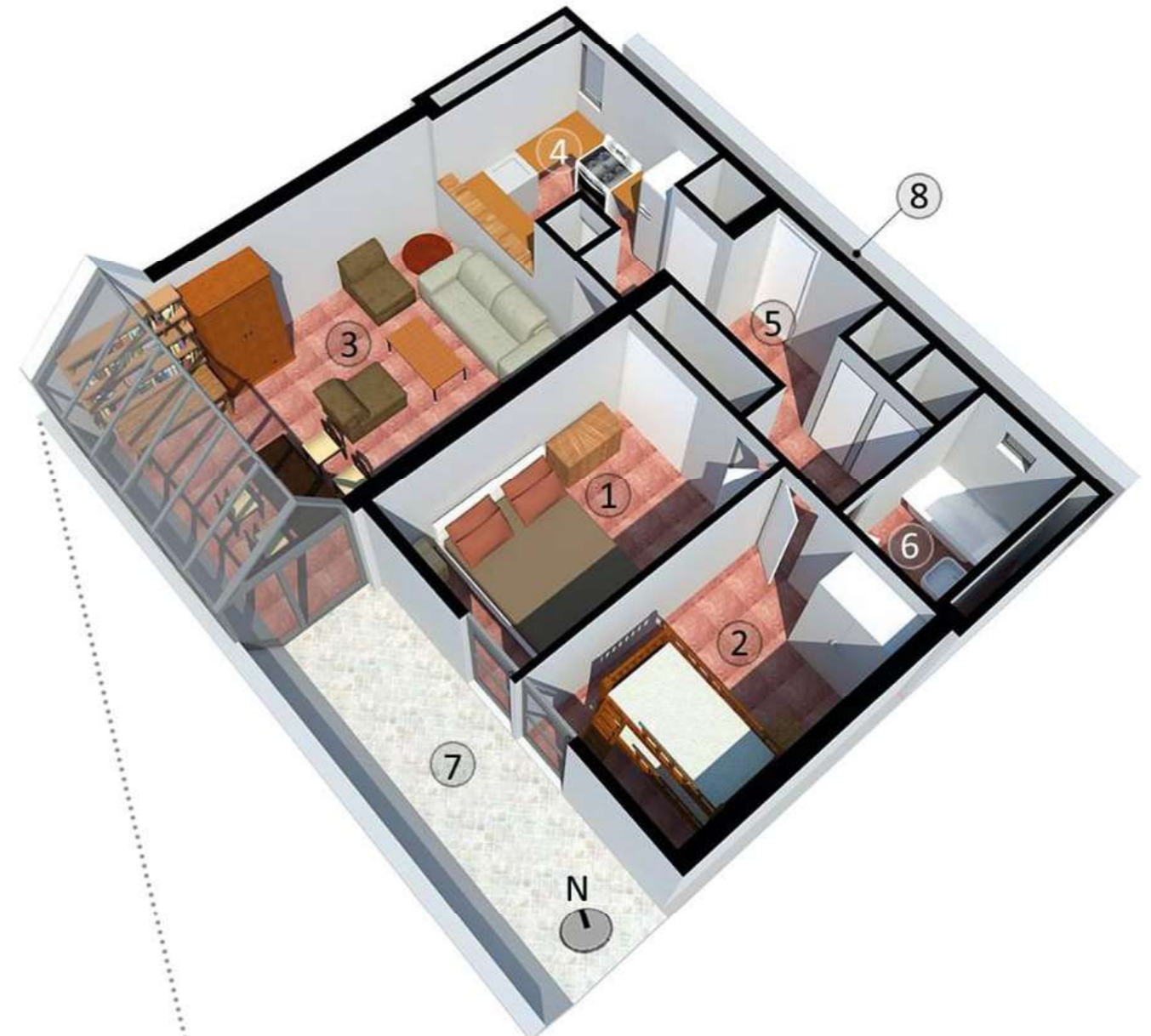


Fig. 8 Case studies location

Flat 133

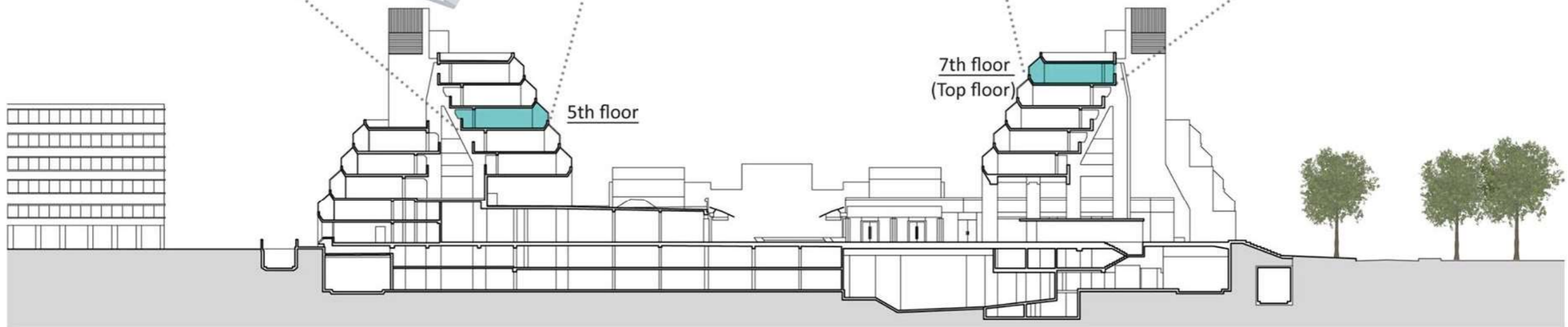


Flat 61



Legend

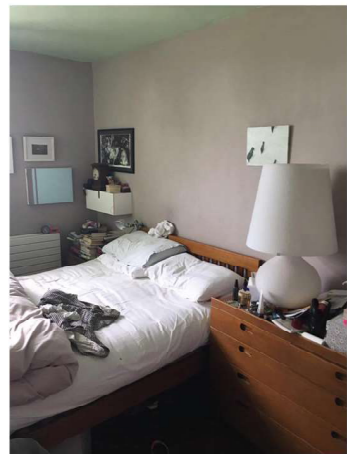
- 1. bed room-1
- 2. bed room-2
- 3. living room
- 4. kitchen
- 5. entrance
- 6. bathroom
- 7. balcony
- 8. corridor



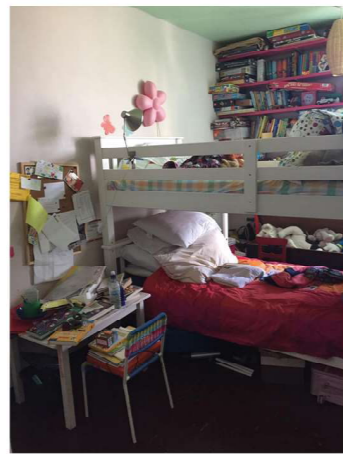
# FLOOR PLANS AND DATA LOGGERS

## FLAT 61 - MARCELLA FRISANI

The location of dataloggers are in bedroom, living room, and balcony. Basically, our group wants to measure and compare the difference between indoor and outdoor temperatures in a week time. However, there is a heater that is located in the bedroom, and we have an assumption that the temperature in the bedroom at night would be higher than the temperature in the living room.



BEDROOM



KIDS BEDROOM



BATHROOM



LIVING ROOM






CONSERVATORY AREA



## FLAT 133 - STUART TAPPIN

The location of dataloggers are in bedroom and in the kitchen. Basically, the reason that we put the datalogger in the bedroom is because there is a heater that is located next to the window, which we assume that it will make the temperature inside bedroom more warmer.

### Legend

-  Lighting
-  Heater
-  Data Loggers



BEDROOM



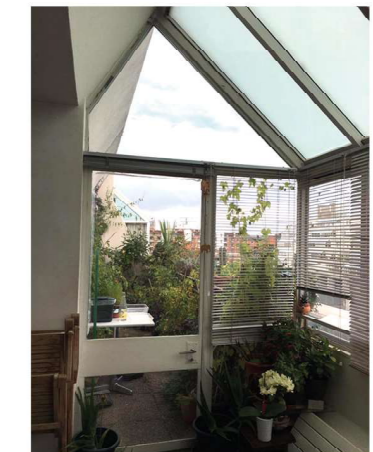
READING ROOM



BATHROOM



KITCHEN



CONSERVATORY AREA

# OCCUPANCY PATTERNS

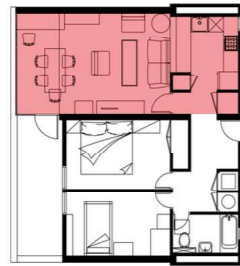
## Flat 61

Name: Gerard Mclean and Marcella Frisani

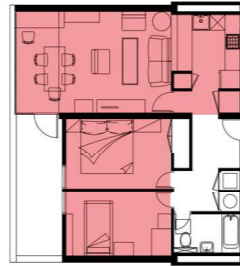
The family begins their activities at 7 am, the husband who is an architect works until quite late, the wife who is a researcher works from home, and their 9 years old daughter spends most of the time in school during the day.



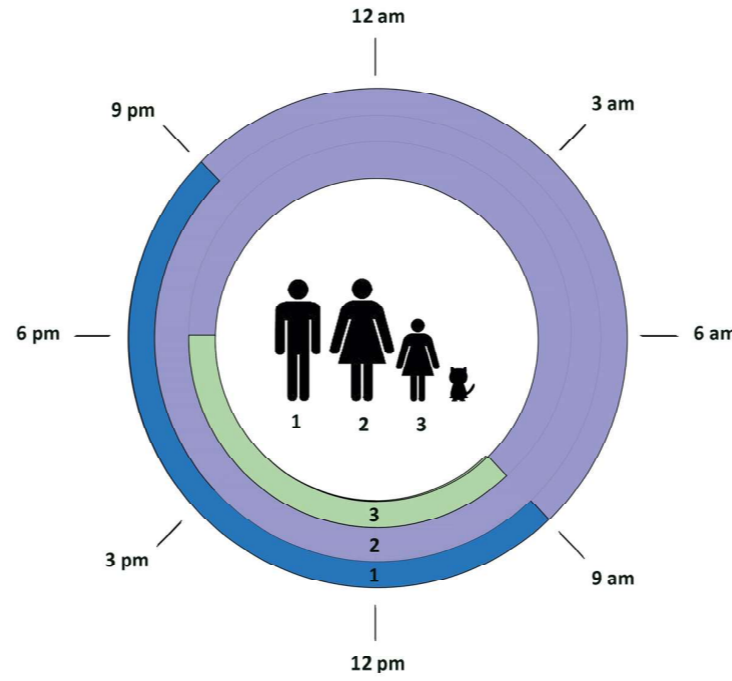
MORNING



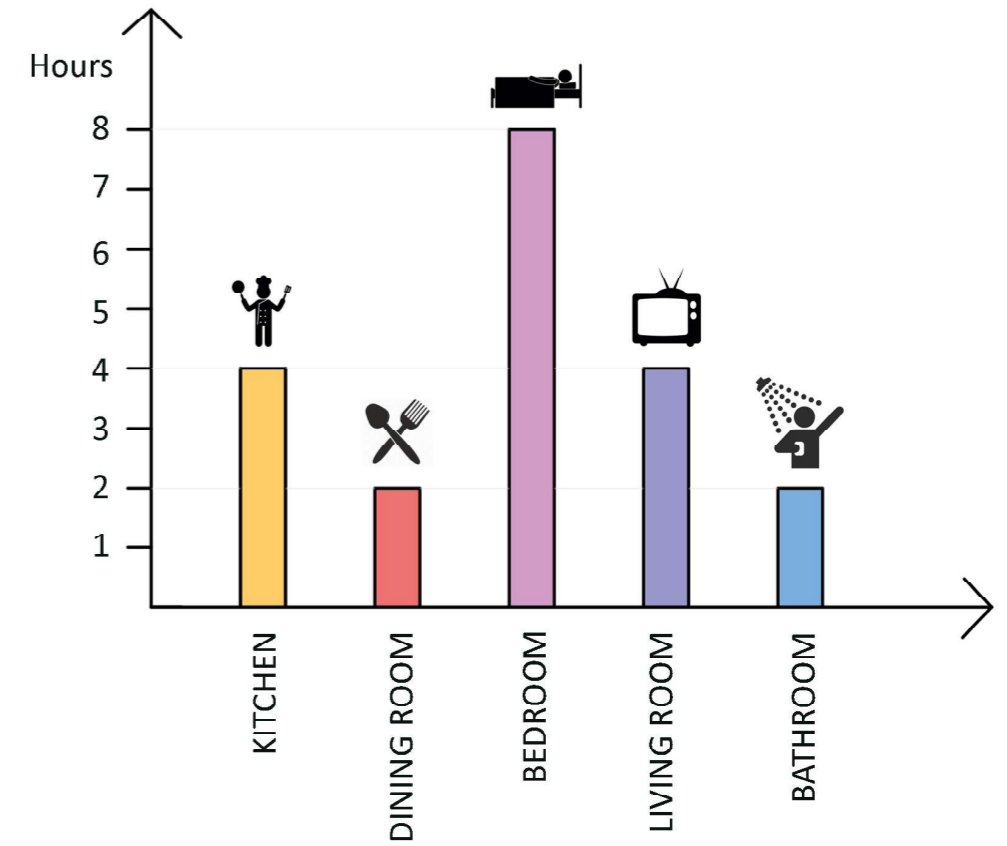
AFTERNOON



EVENING/NIGHT



- ALL OCCUPANTS' ACTIVITIES INSIDE THE HOUSE
- HUSBAND'S ACTIVITIES OUTSIDE THE HOUSE
- WIFE'S ACTIVITIES INSIDE THE HOUSE
- KID'S ACTIVITIES OUTSIDE THE HOUSE



## Flat 133

Name: Stuart Tappin and Angela Wong

They begin their activities at 7am and leave the house at 9am to the office and they come back home to eat during lunch time and go back home again at 7pm.



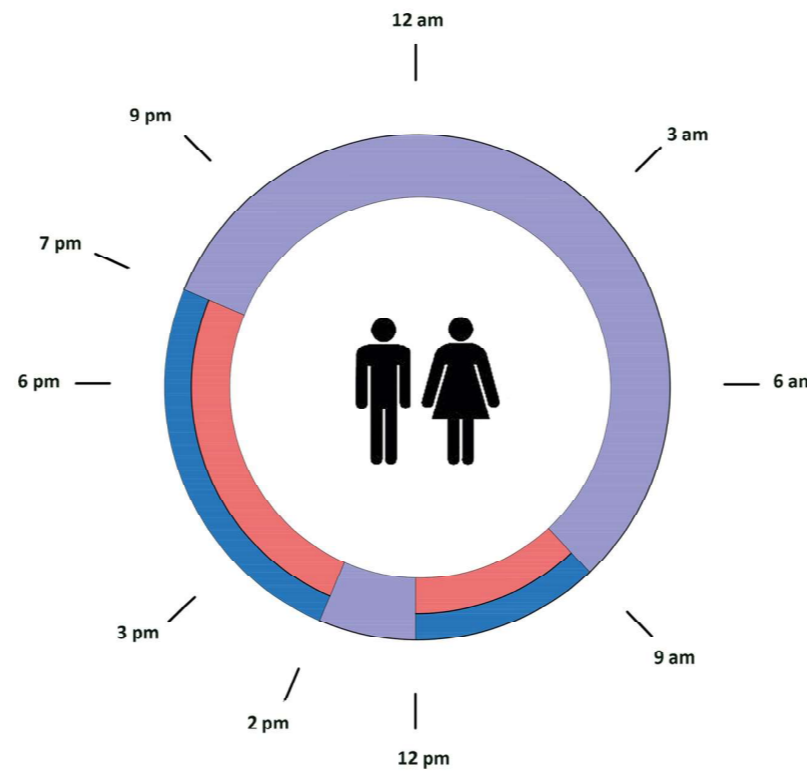
MORNING



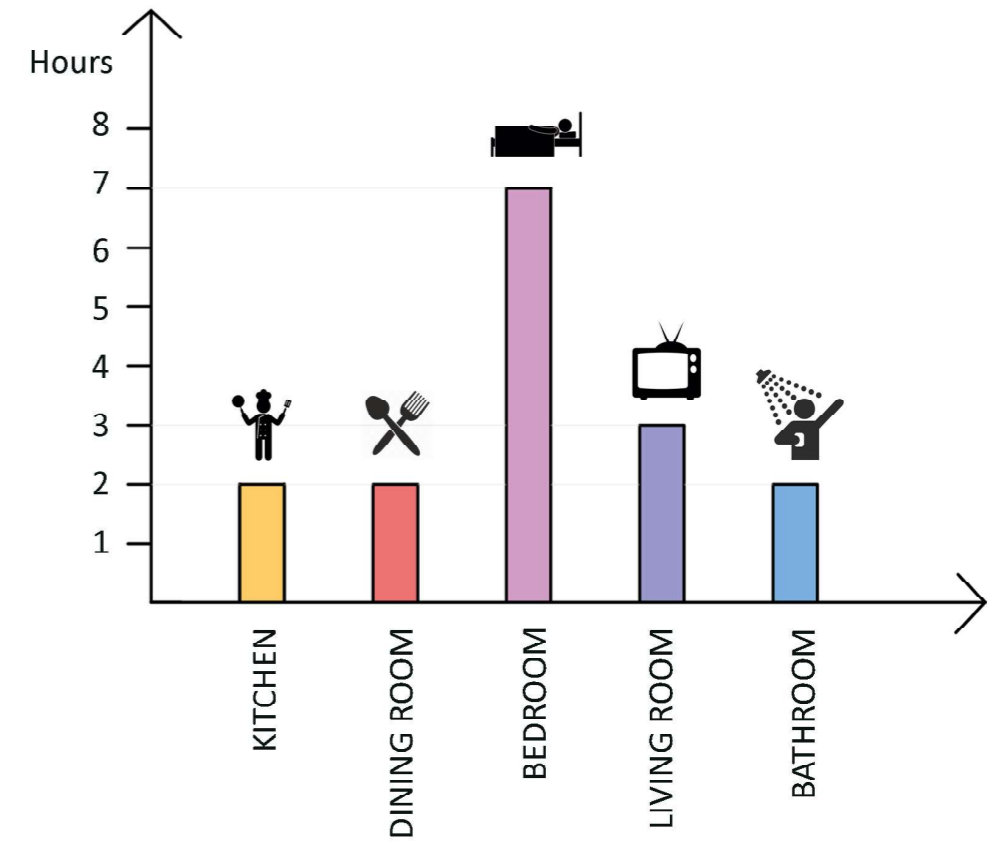
AFTERNOON



EVENING/NIGHT



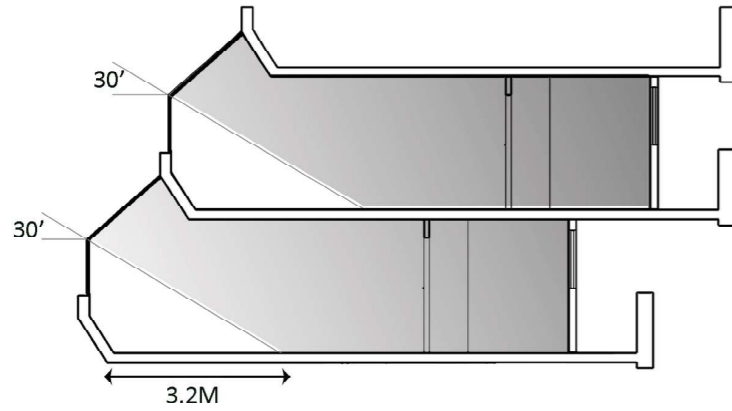
- ALL OCCUPANTS' ACTIVITIES INSIDE THE HOUSE
- ANGELA ACTIVITIES OUTSIDE THE HOUSE
- STUART ACTIVITIES OUTSIDE THE HOUSE



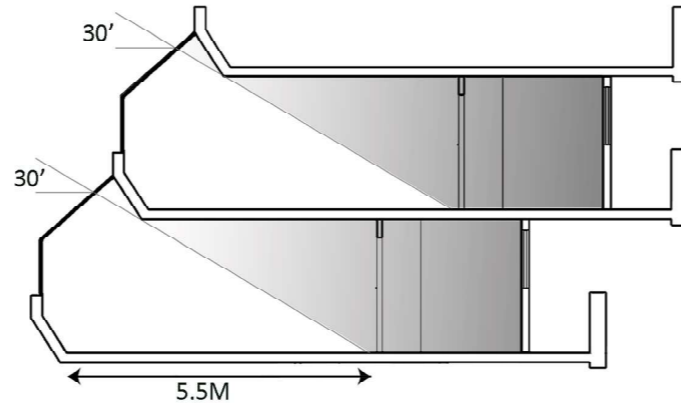
# INCIDENT SOLAR RADIATION

**Daylight penetration** distance is almost two times the height of the upper edge of the window in the living room. However, the kitchen that is located next to the living room receives very low solar penetration even though there is no wall between the kitchen and living room, because of the distance of the kitchen from the windows in conservatory area is more than 6 meters.

## DAYLIGHT PENETRATION



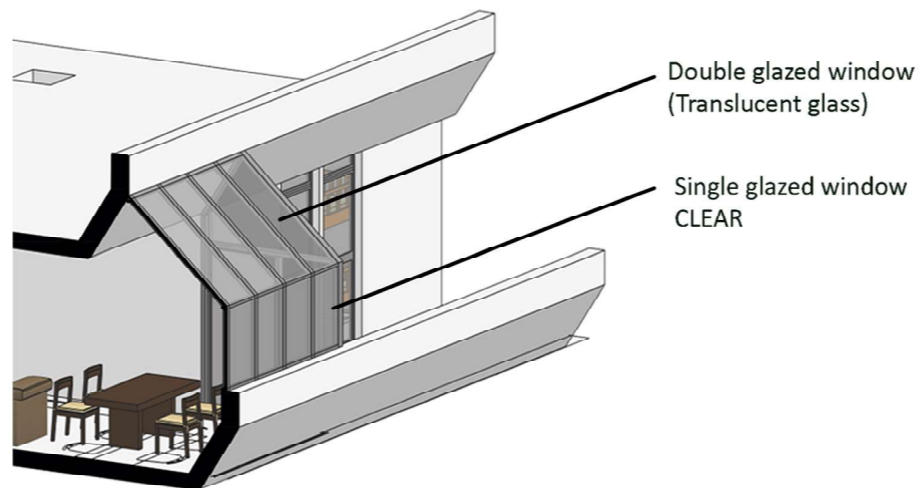
THE CURRENT SCENARIO



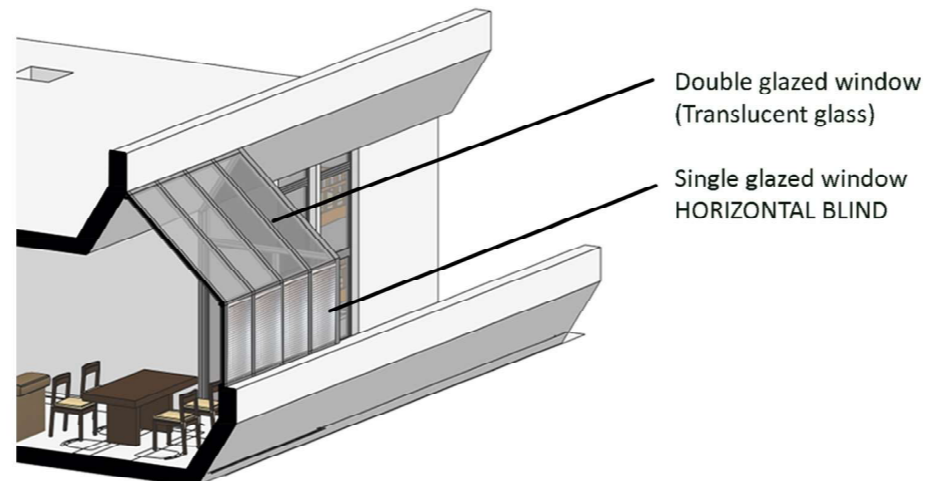
OPENING THE INCLINED GLAZING



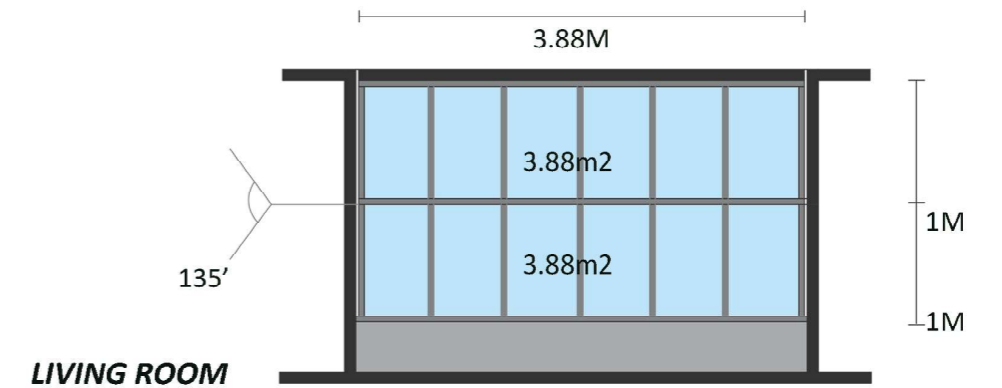
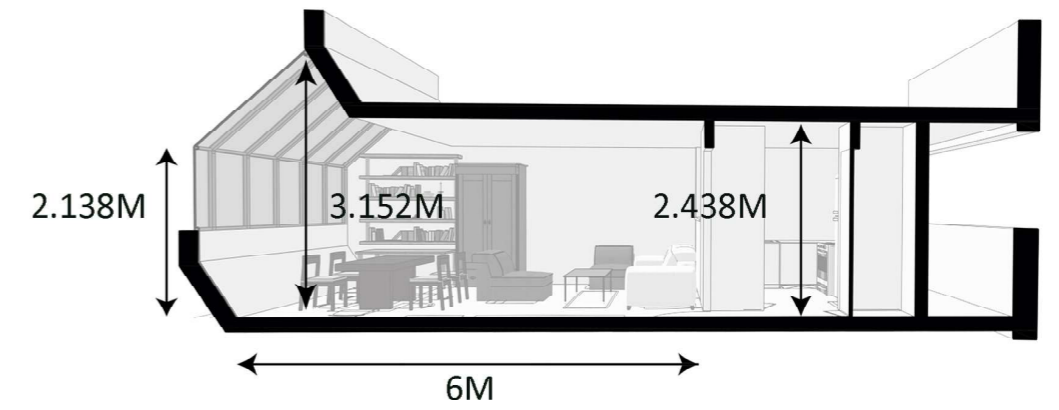
FLAT 61



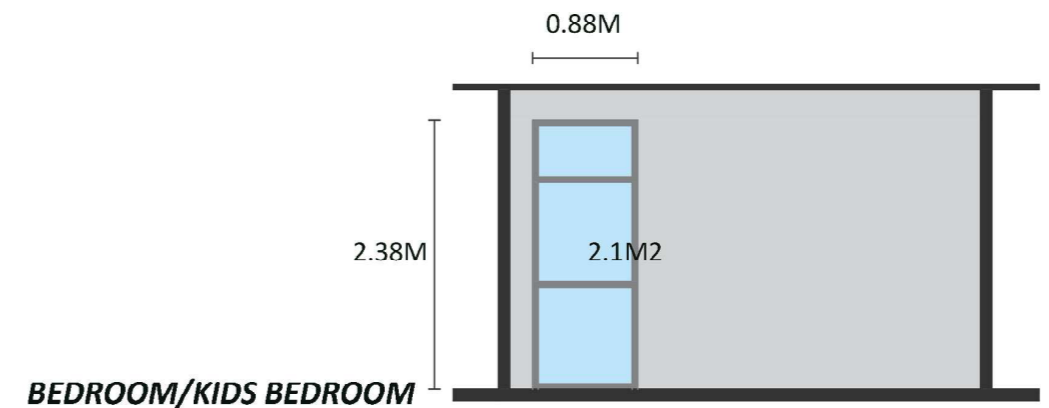
FLAT 133



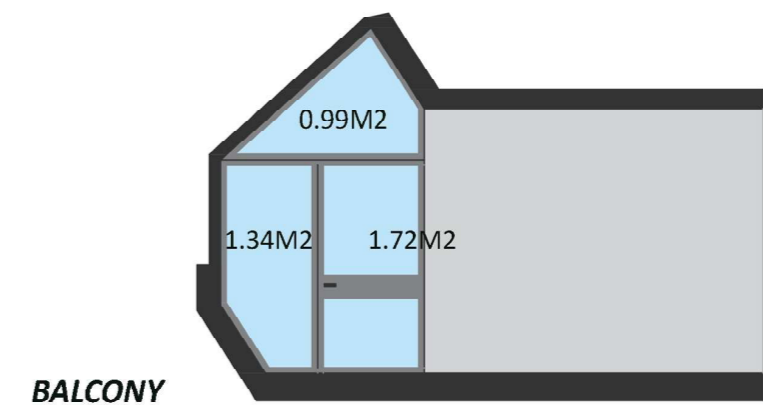
## ROOM SIZE



LIVING ROOM



BEDROOM/KIDS BEDROOM



BALCONY

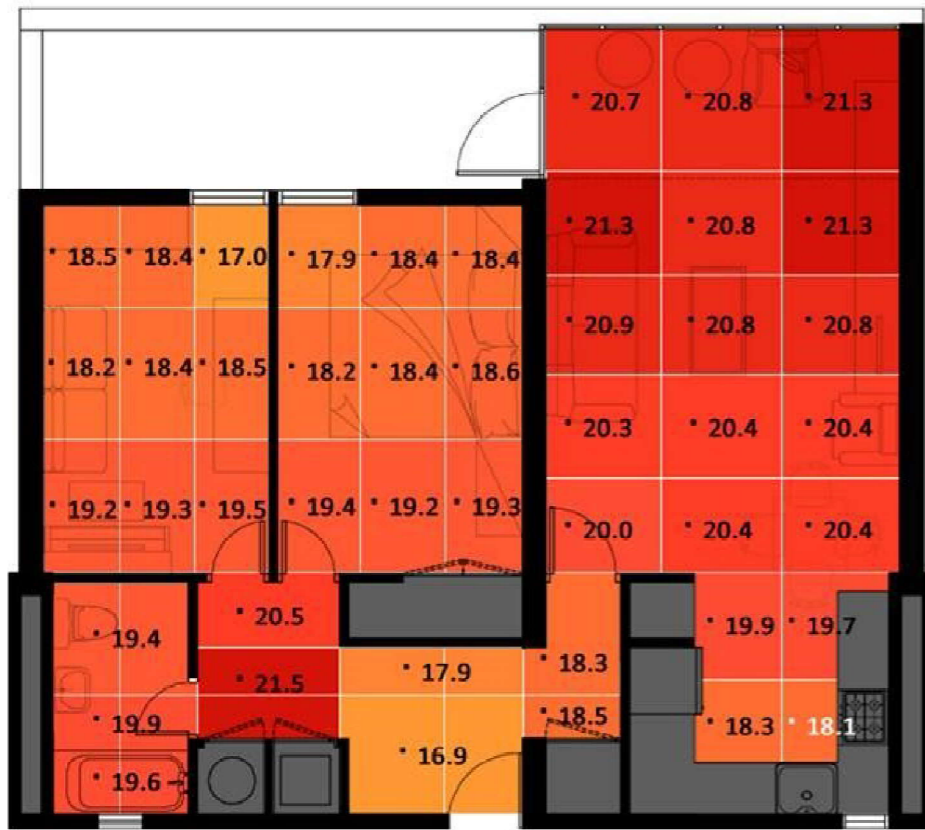


## Spot measurements of the flat 133

- 14 Oct 2016 12am - 1pm  
- Light Cloud

- Weather station data  
① Temperature : 13 °C  
② Humidity : 68%

TEMPERATURE MEASUREMENT(°C)



0M 1M 3M 6M



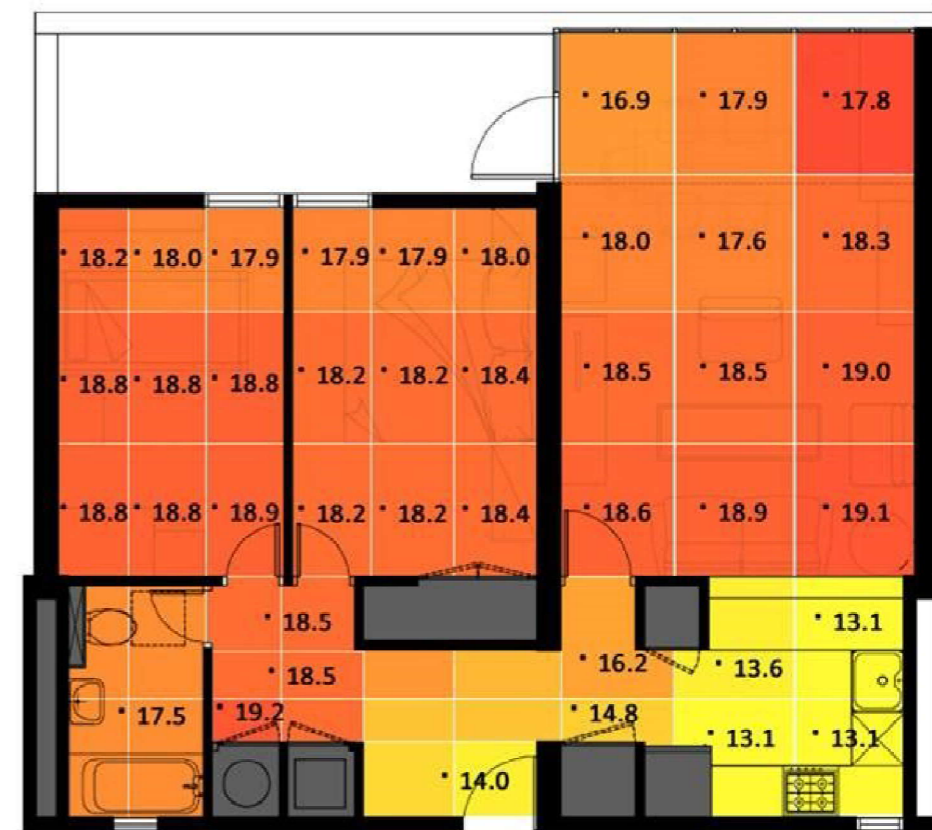
The spot measurements indicate that the highest temperature is adjacent windows in the living room. This result is due living room was exposed by the sun in the morning with fully glazed wall facing North east so its temperature raised to over 20 dgrees. On the other hand, entrance has the lowest temperature in the flat because of two reasons, one is the heat leak from entrance door and another reason is that it is not exposed to the sun yet.

## Spot measurements of the flat 61

- 13 Oct 2016 10am - 12pm  
- Light rain in the morning  
- Light cloud

- Weather station data  
① Temperature : 10 °C  
② Humidity : 81%

TEMPERATURE MEASUREMENT(°C)



0M 1M 3M 6M



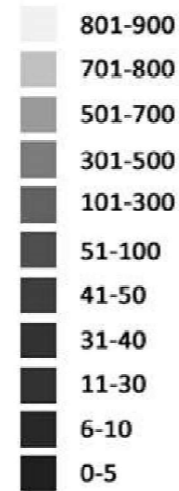
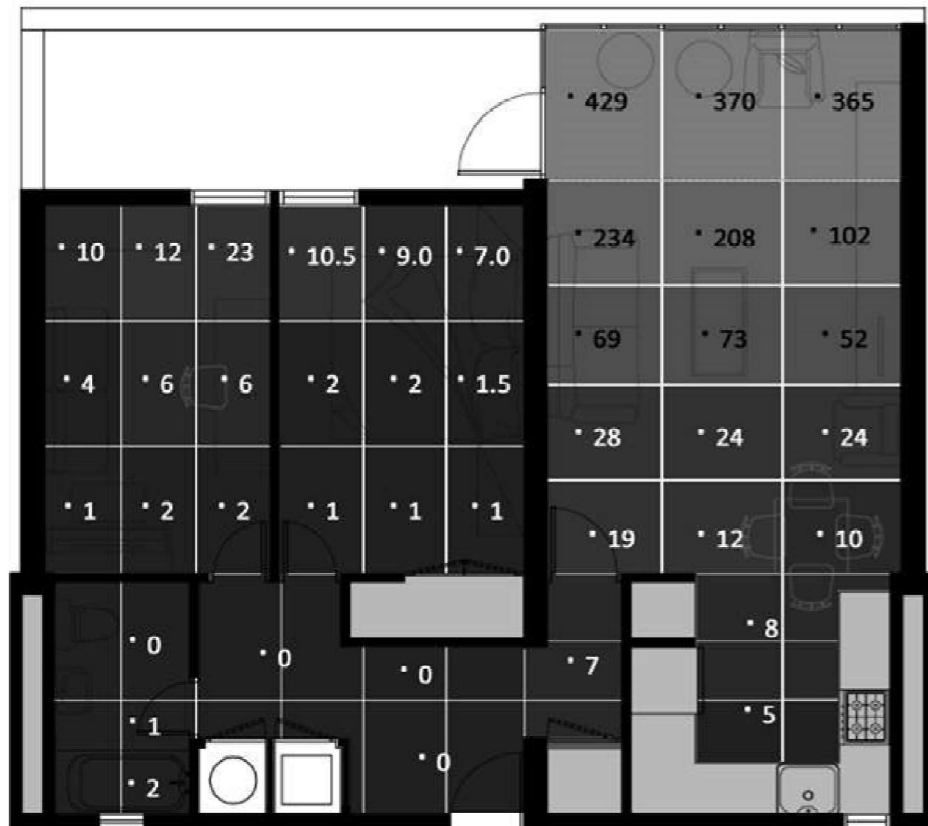
The spot measurements indicates the highest temperatures in the living room around kitchen. This result is due living room was exposed to the sun with fully glazed wall to south west so its temperature raised to around 20 dgree and at the same time, the door of living room was opend to ventilate then the temperature adjacent to window in living room decreased.

# Spot measurements of the flat 133

- 14 Oct 2016 12am - 1pm  
- Light Cloud

- Weather station data  
① Temperature : 13 °C  
② Humidity : 68%

## ILLUMINANCE MEASUREMENT



The living room and two bedrooms are facing to south west. Especially, living room is fully glaze so its illuminance is relatively higher than the others. Also, kitchen is partly opened to the living room to have day light. On the other hand, bath room is quite bright peculiarity although it is facing to the north east. This is because the flat is located in top floor so that it could have skylight.

# Spot measurements of the flat 61

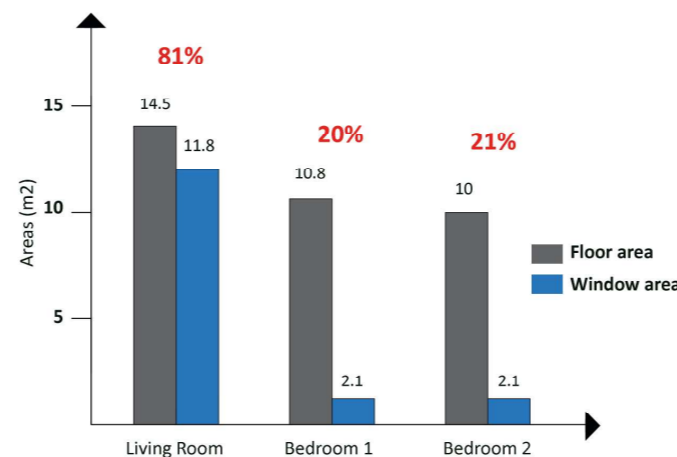
- 13 Oct 2016 10am - 12pm  
- Light rain in the morning  
- Light cloud

- Weather station data  
① Temperature : 10 °C  
② Humidity : 81%

## ILLUMINANCE MEASUREMENT



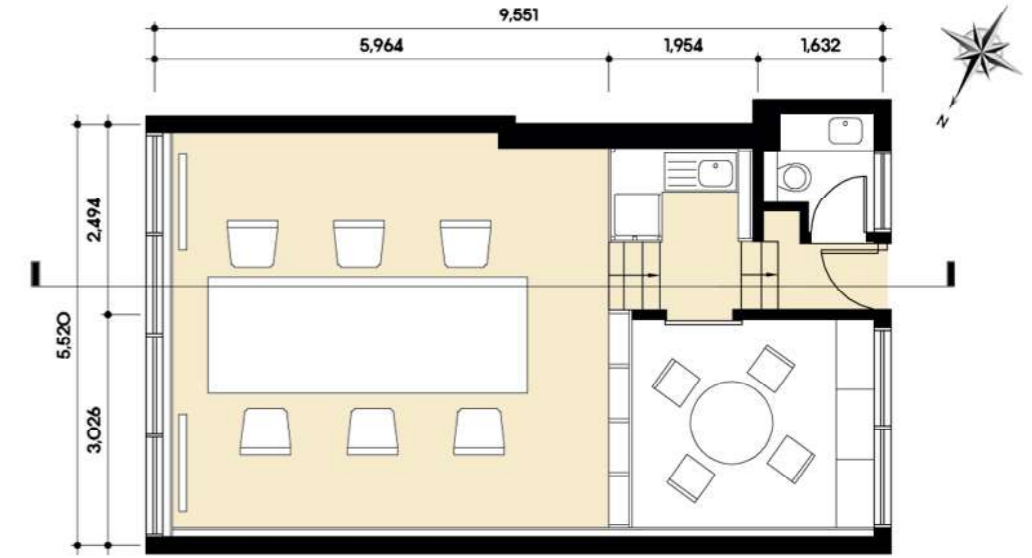
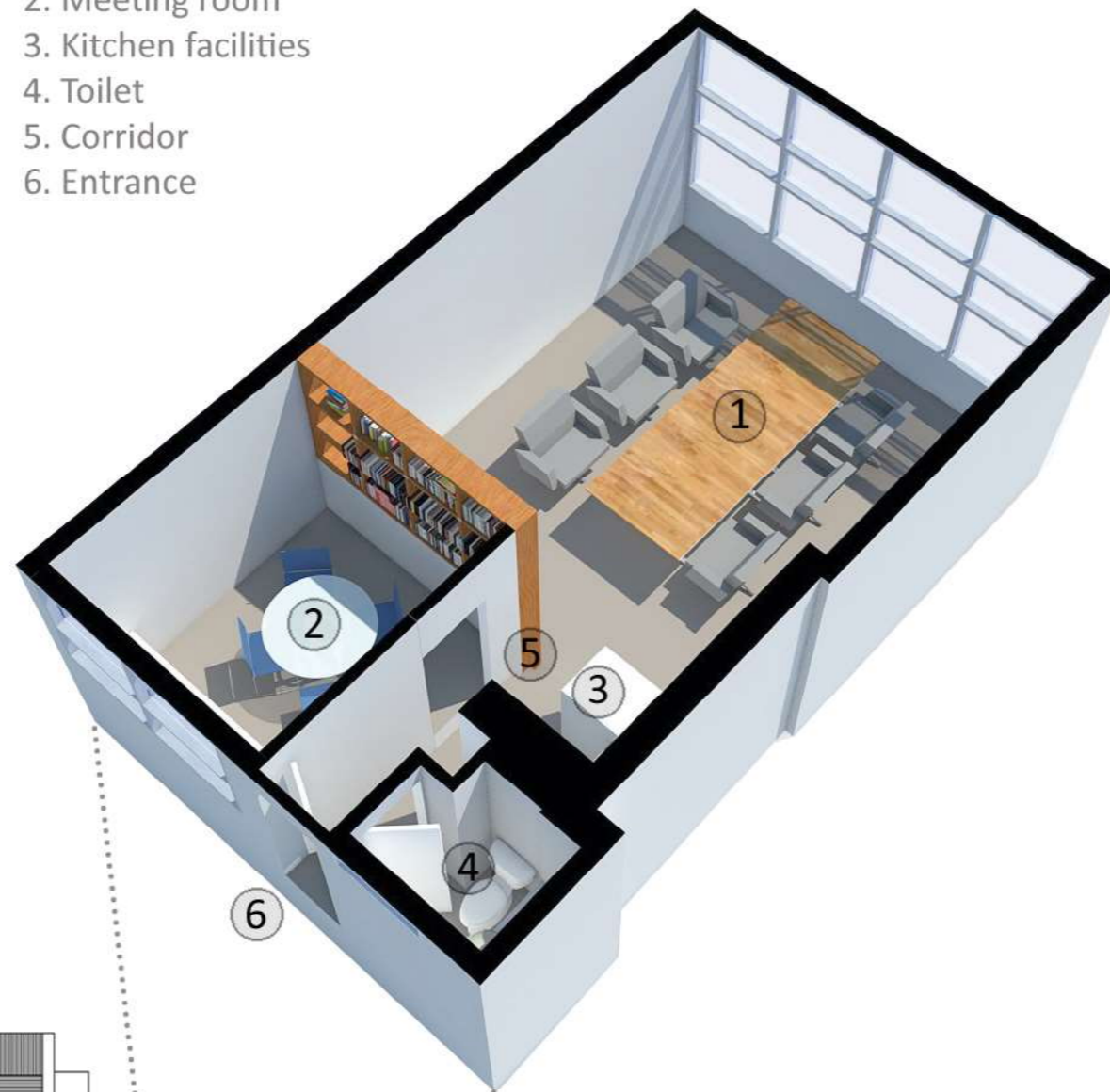
The living room and two bedrooms are facing to North east. Especially, living room is fully glaze so its illuminance is relatively higher than the others. Also, kitchen is open planed to the living room to have day light. On the other hand, two bedrooms, bath room and hall way are quite dark compare with flat 133. Apart from living room and kitchen, flat 133 has less day light than flat 61, which means it has more energy loads to make it bright.



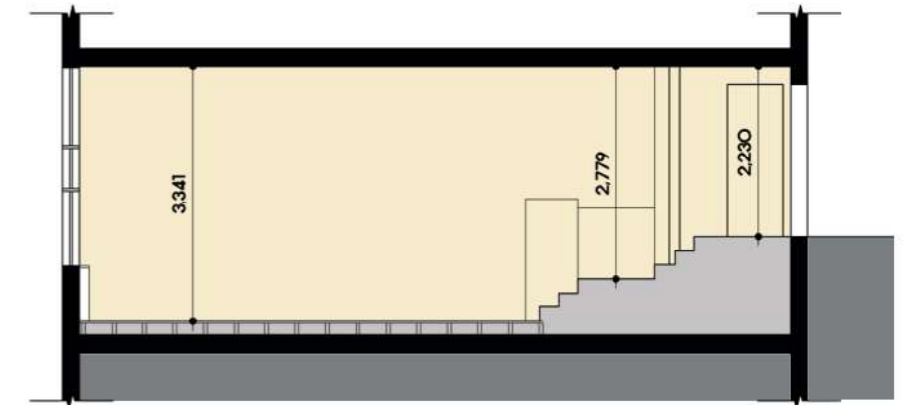


### Legend

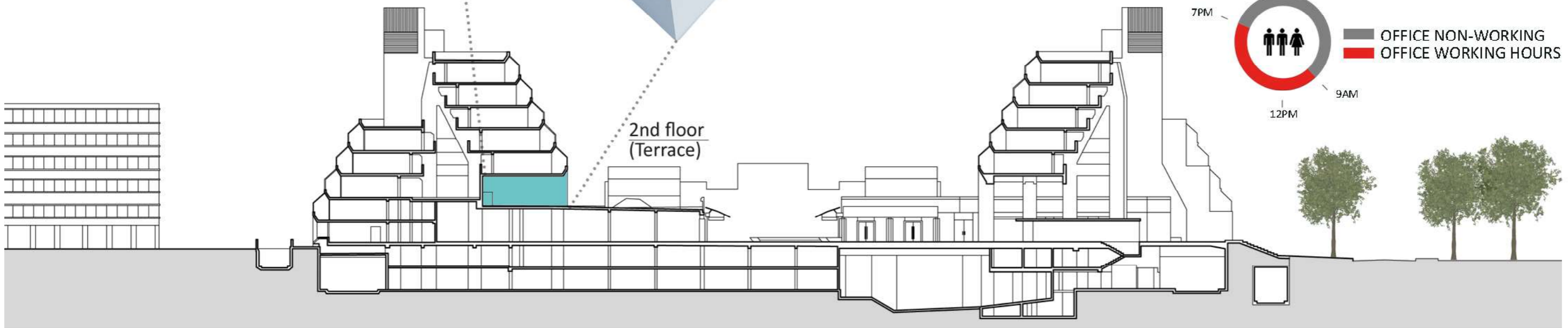
- 1. Office
- 2. Meeting room
- 3. Kitchen facilities
- 4. Toilet
- 5. Corridor
- 6. Entrance



Floor plan



Section plan

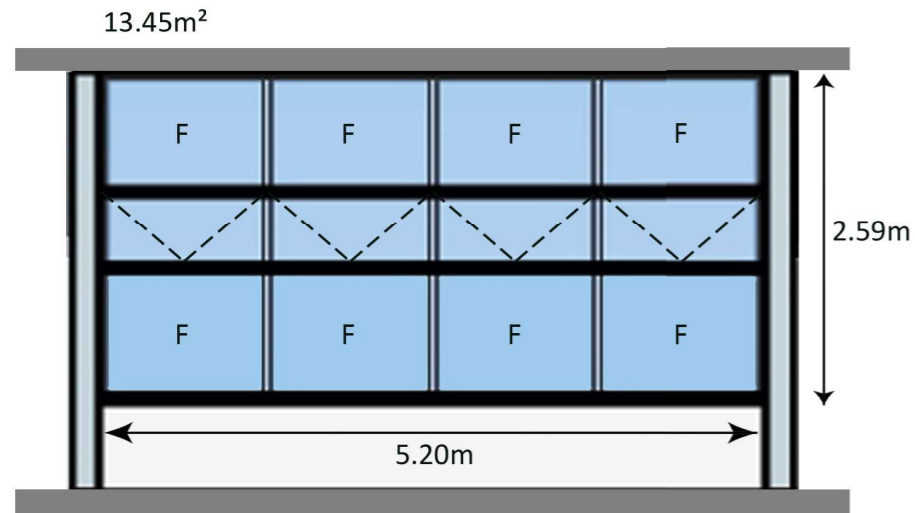


# INCIDENT SOLAR RADIATION

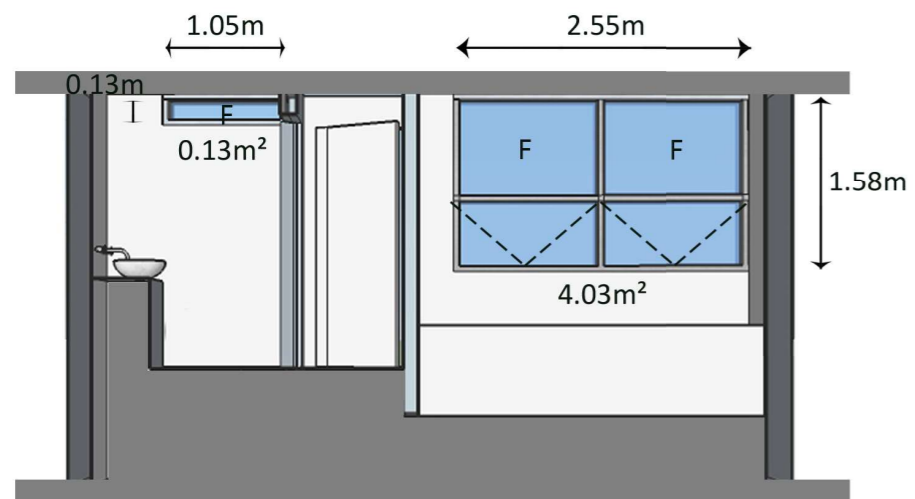
**Daylight penetration distance** is about two times the height of the upper edge of the window in the office. However, the meeting room and the toilet receive low solar penetration due to their location: facing the interior of the building.

## WINDOW SIZES

The office is composed by single glazed windows. In the main part of the office, there are horizontal blinds, whilst curtain is used in the meeting room.

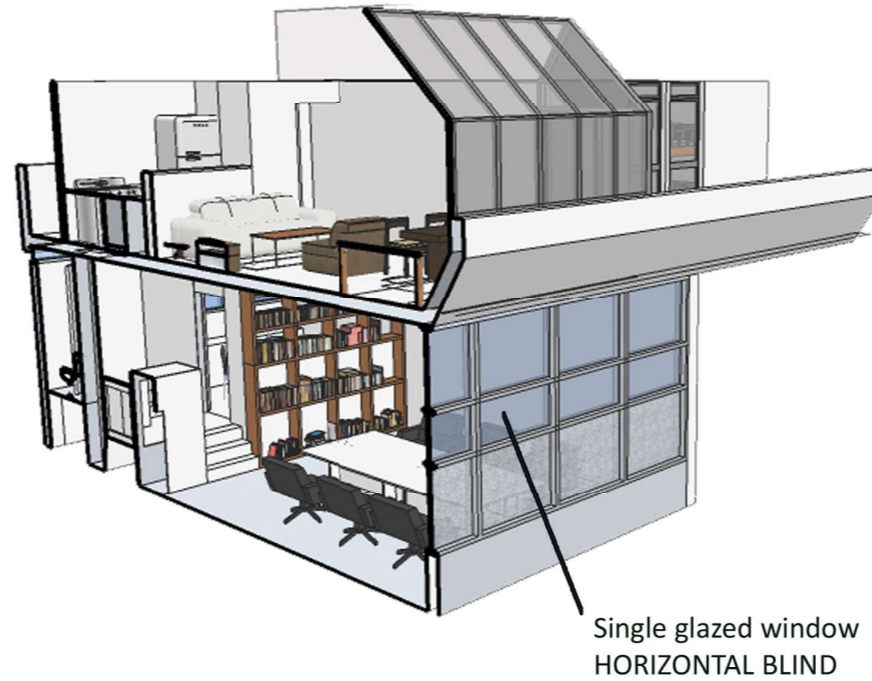


OFFICE



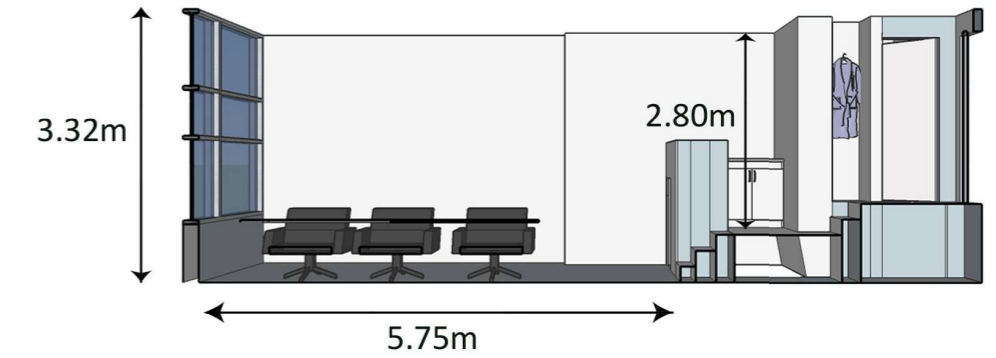
TOILET

MEETING ROOM

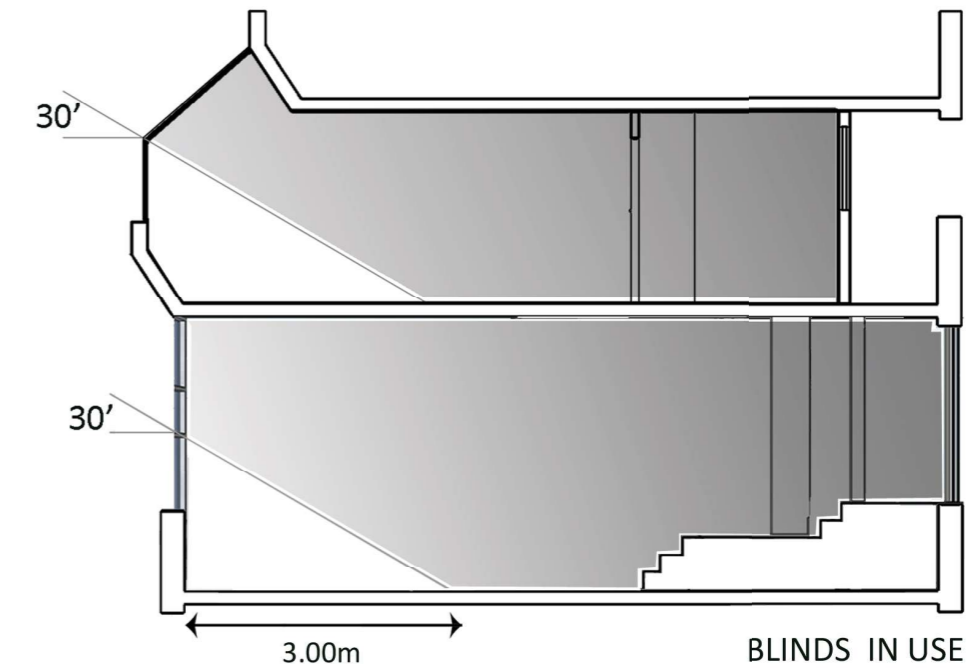
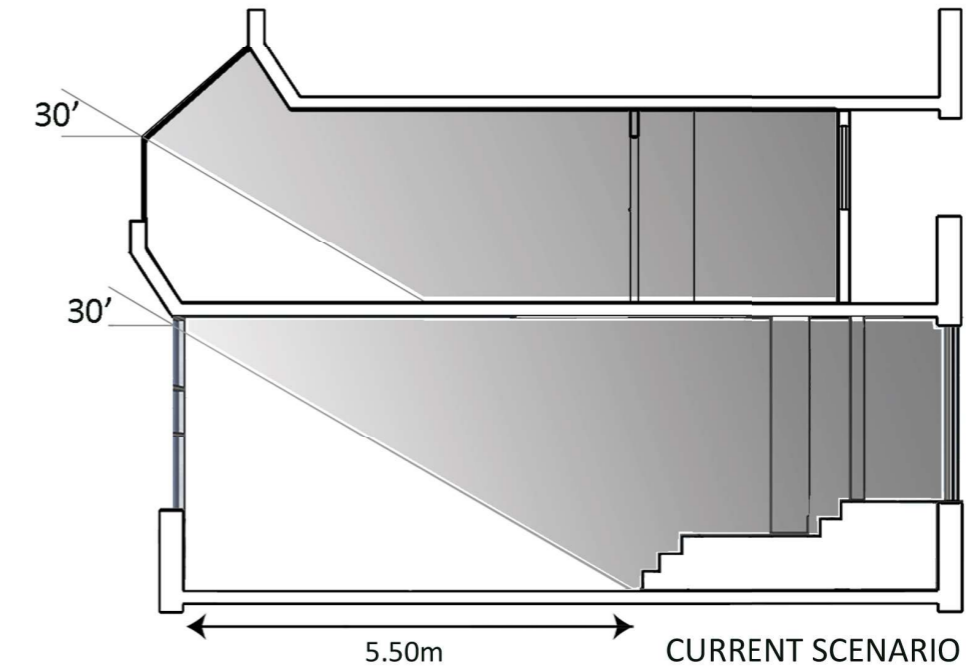


OFFICE 52

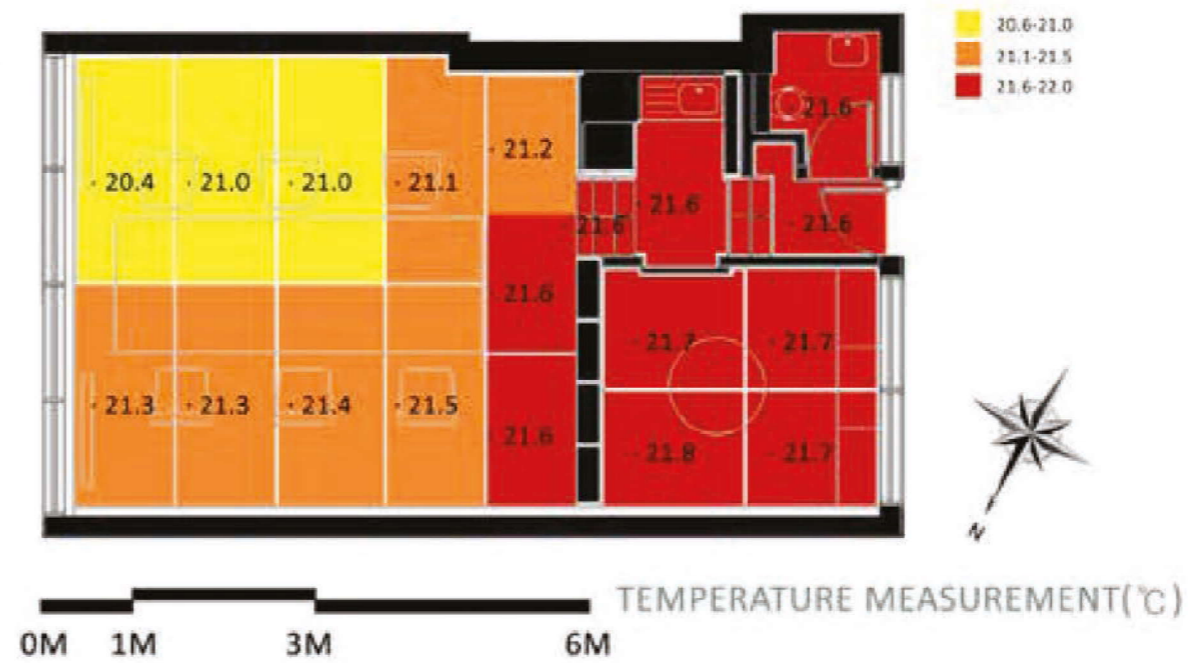
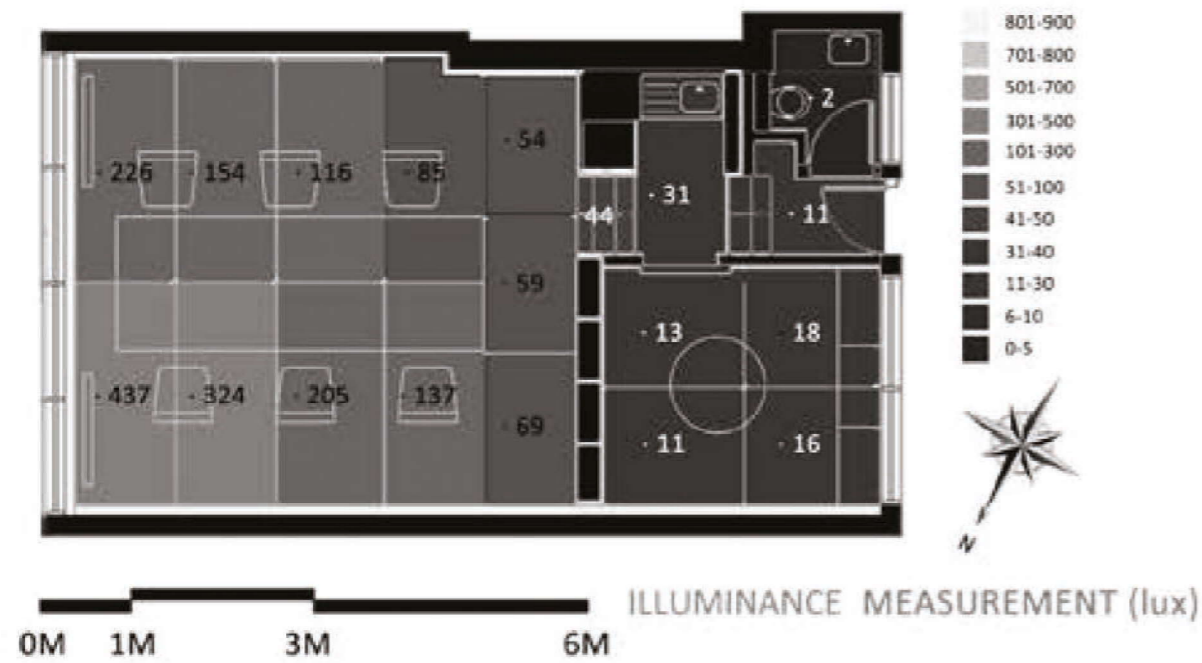
## OFFICE SIZE



## DAYLIGHT PENETRATION



# ILLUMINANCE & TEMPERATURE

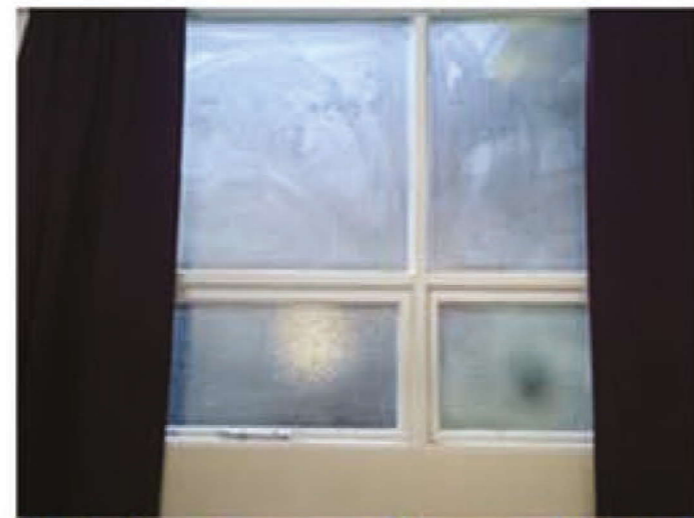
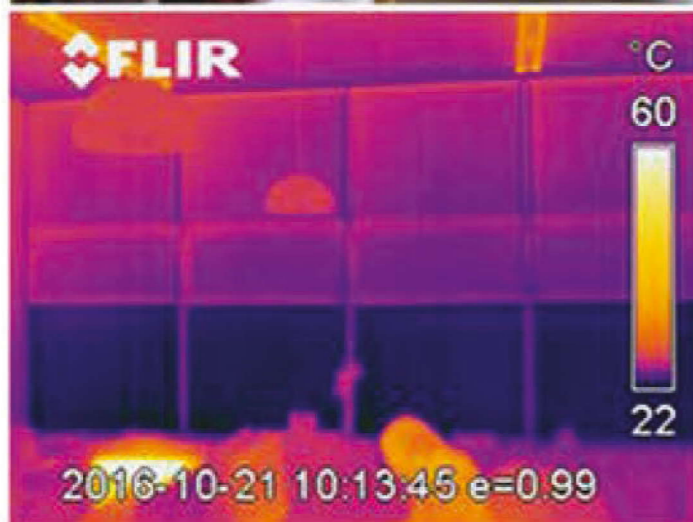
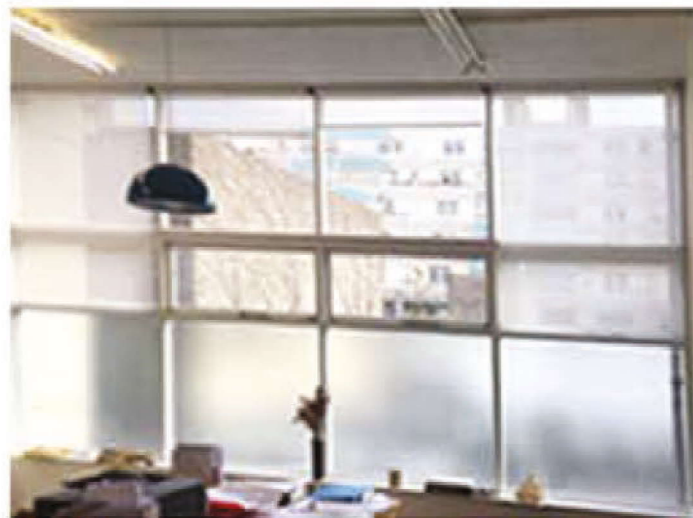


Spot measurements

- 14 Oct 2016 11am - 12pm  
- Light cloud

Weather station data

- ① Temperature : 13 °C
- ② Humidity : 68%



- The flat 61 was supposed to have the worse performance than the flat 133 because it is facing to south west.

- However, the measurements show that the flat 133 has a worse performance. We believe that it happened for the following reasons:

- the time of measurements were different

- the temperature in the flat kept by the heaters were different in the two flats

- the door facing the balcony in flat 61 was opened at the time of the measurement

- Also, comparing the personal residents perceptions obtained during the interviews we can say:

- both flats are bright, but flat 61 is very bright, especially during lunch time

- both flats have quiet hot temperature in summer time

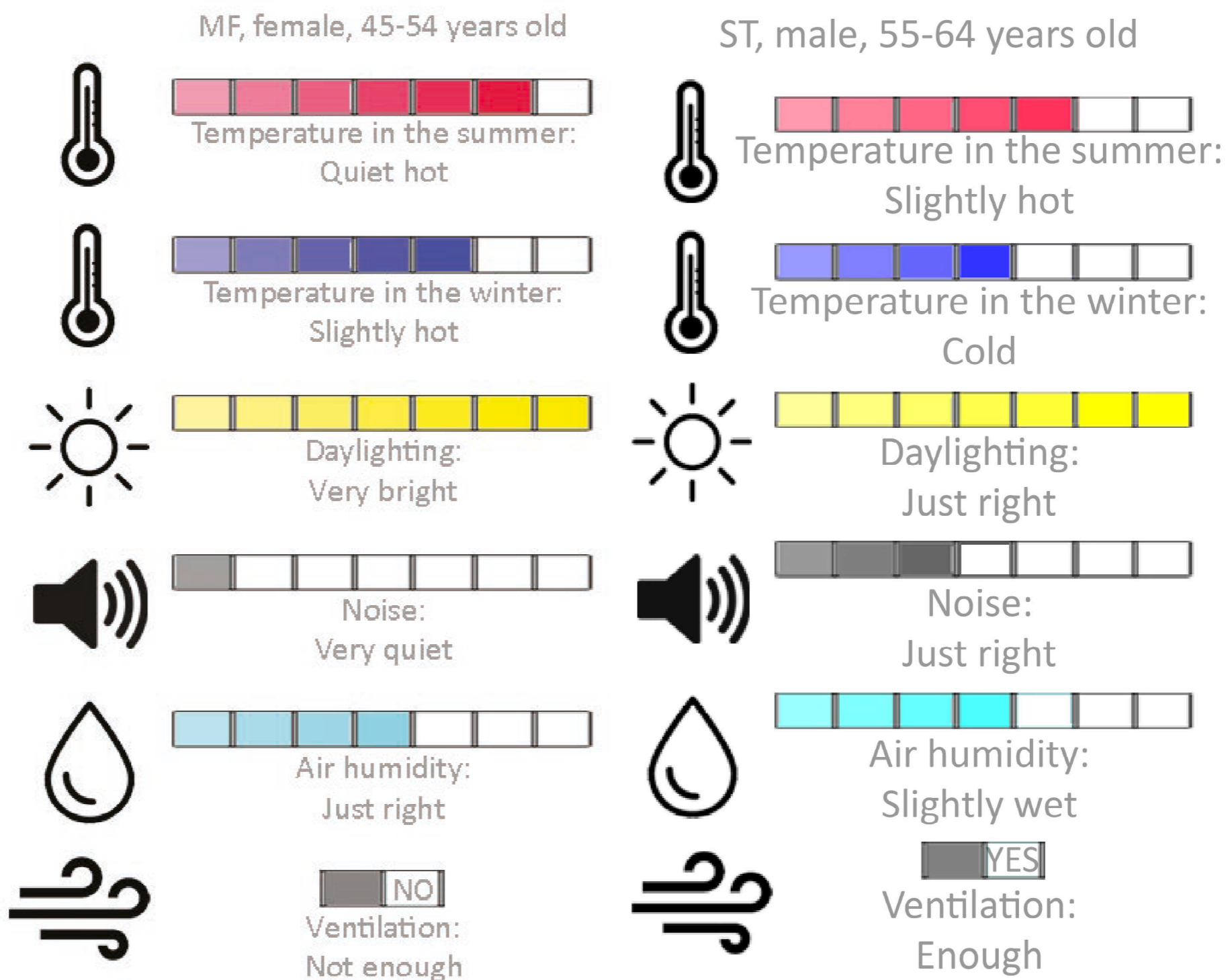
- flat 133 has cold temperature in winter time while flat 61 is slightly hot

- flat 133 has enough ventilation while flat 61 has not



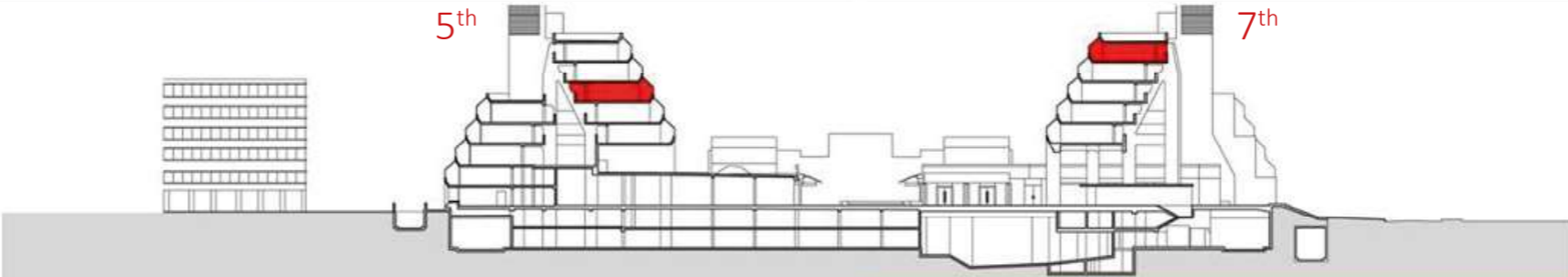
# Interview outcome

## 61, O'Donnell Court

## 133, Founding Court



# Recapitulation

	Flat 133	Flat 61
Orientation	 <p>North east facing</p>	 <p>South west facing</p>
Location		
Mean illuminance	0 ~ 429 lux	10 ~ 866 lux
Mean Temperature	19.4 °c	17.5 °c
Satisfaction	1 2 3 4 5 <b>6</b> 7	1 2 3 <b>4</b> 5 6 7
Recommendation	Install Insulation on walls	Install Insulation on walls and ceiling, Tinted window film