IMPROVEMENT OF HUMAN THERMAL COMFORT IN BUILT ENVIRONMENT USING BIM SIMULATION METHODS

case study in Alexandria, Egypt.

By: Omnia Kassab

co-author: **Ali Fouad Bakr**

co-author: **Zeyad El-Sayad**

Keywords

Built Environment

Building Regulation

Thermal Comfort

Energy Efficiency

BIM

DIFFERENT STREET EXPERIENCES

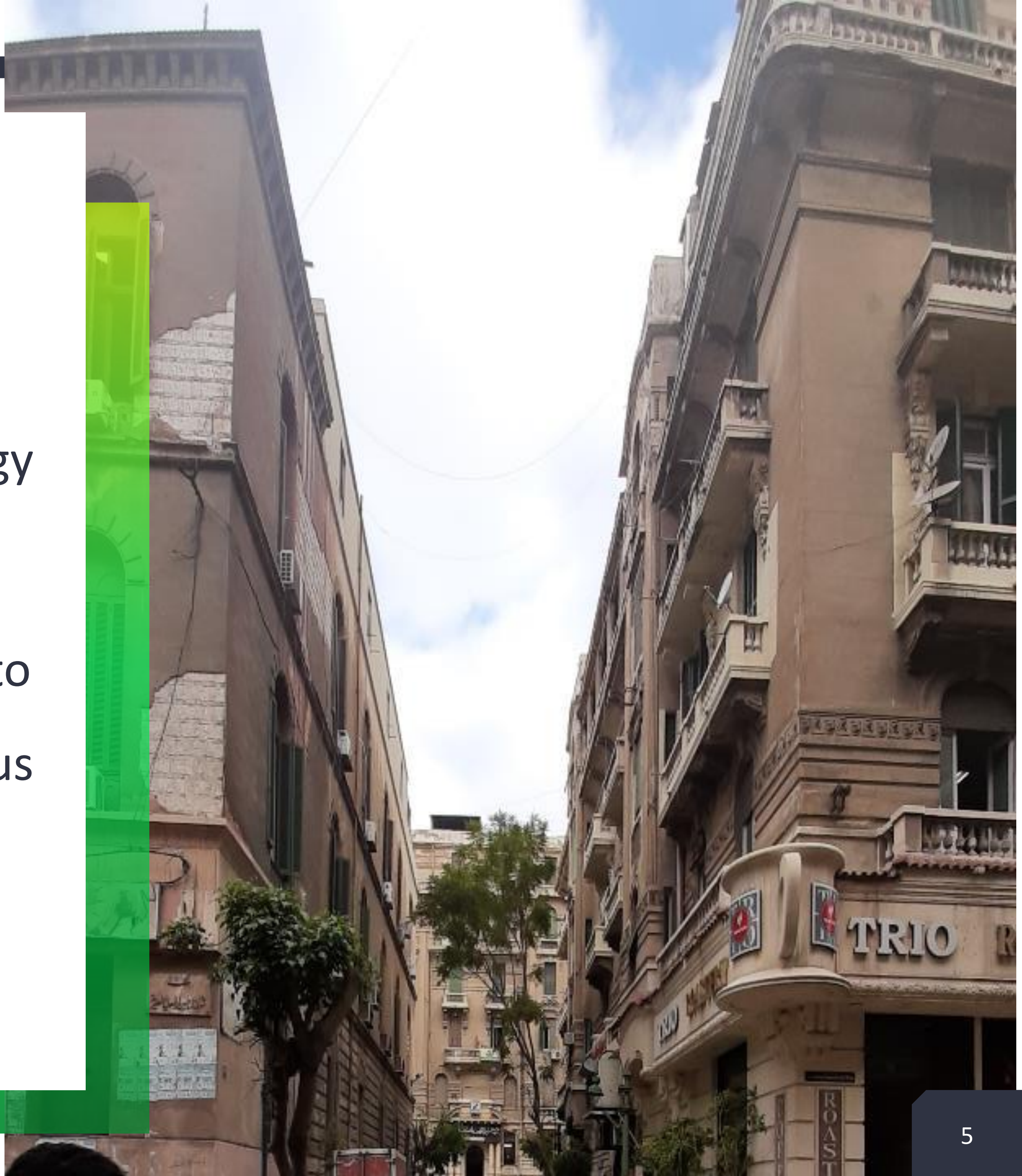
Summer

DIFFERENT STREET EXPERIENCES

Winter

RESEARCH PROBLEM

- Building Regulations do not consider either human thermal comfort or energy consumption in the built environment.
- Building codes that were not sensitive to the built environment as the codes focus on the buildings themselves not the surroundings.

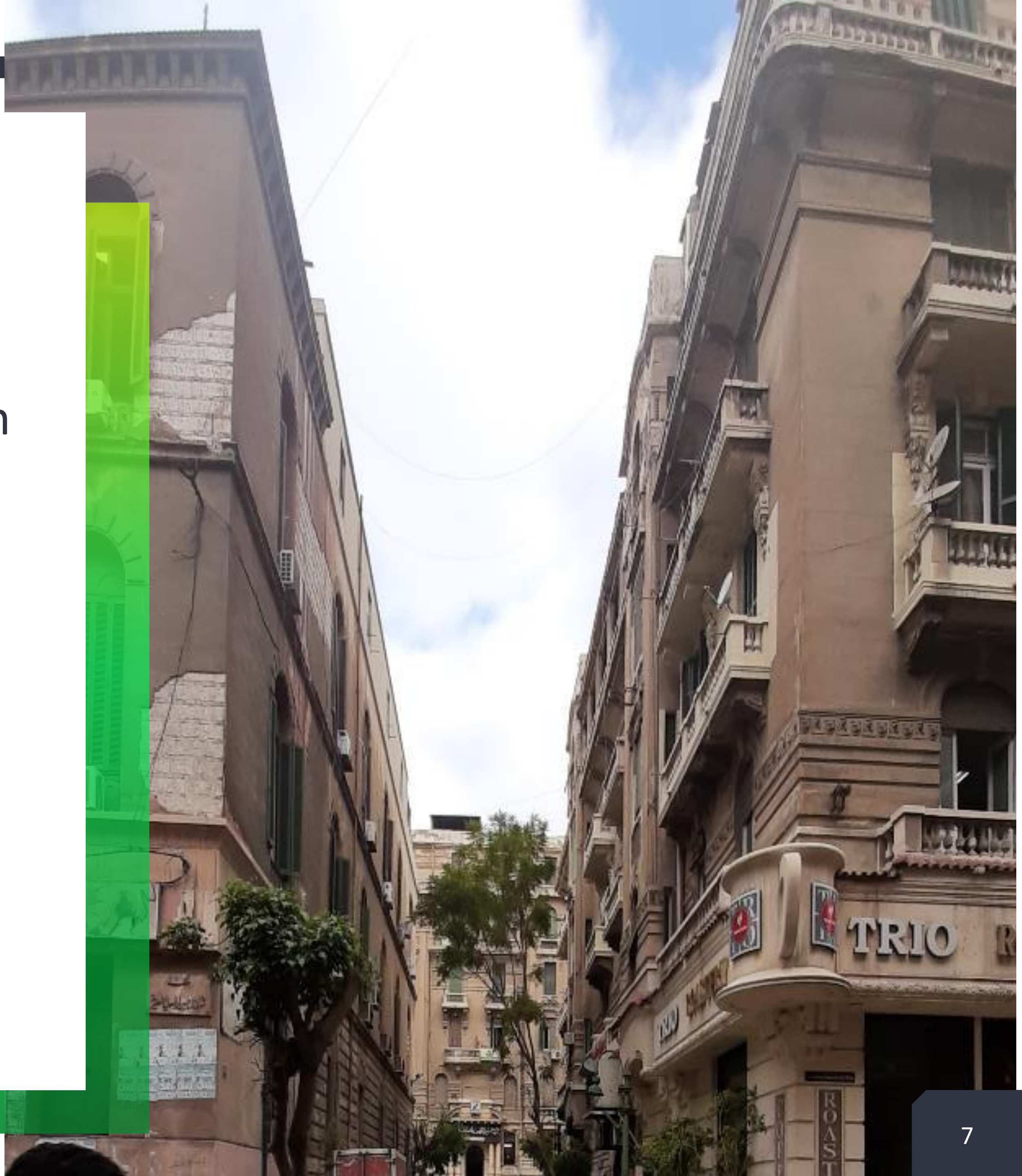


RESEARCH AIM & OBJECTIVES

- This research aims to solve the problems of thermal comfort and energy consumption in the built environment.
- Also, to comprehend the broad influence of climate change on the thermal comfort of our built environment.
- It is an attempt to achieve a better-built environment and healthy cities.

RESEARCH HYPOTHESIS

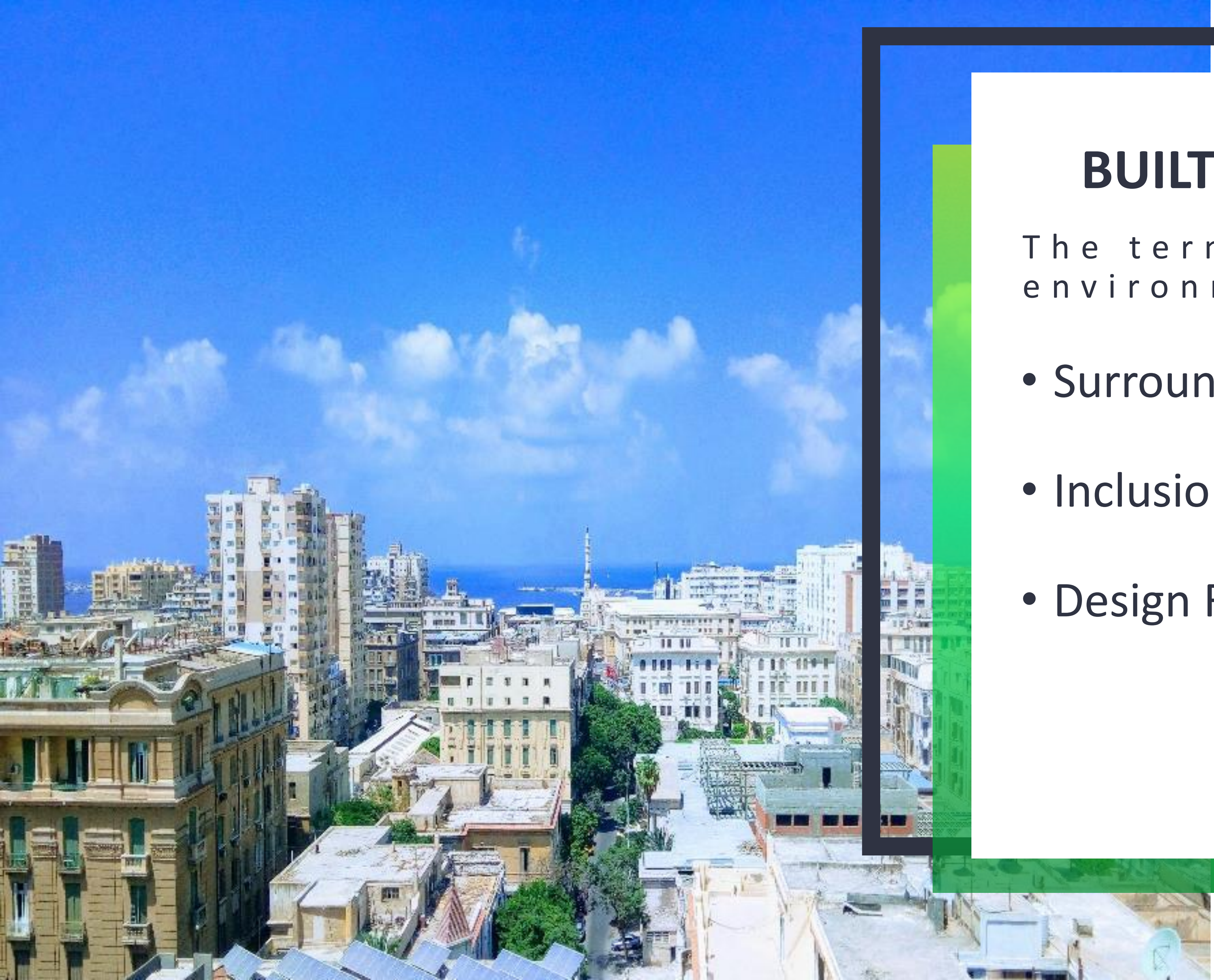
- Building codes Vs built environment
- Simulation methods to optimal solution



RESEARCH STRUCTURE

Main Points

- Built Environment
- Building Regulation
- BIM



BUILT ENVIRONMENT

The term ‘built environment’ refers to

- Surroundings
- Inclusions
- Design Reasons

BUILDING REGULATIONS

- What
- Why
- How

BIM

Building information model

- Virtually Vs physically
- Simulation
- Analysis

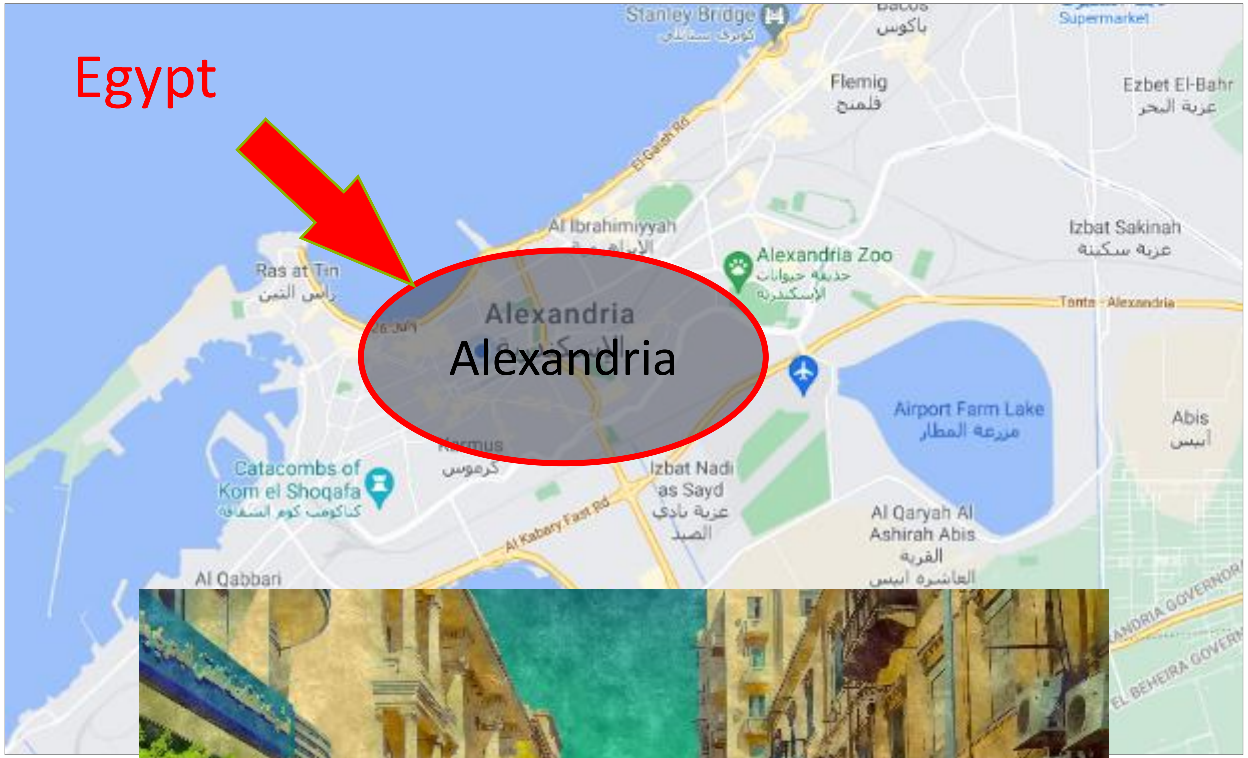
CASE STUDY

Main Points

DESCRIPTION

Details & Components

- It 's located in the most famous and oldest city street ever.
- Mainly Residential buildings.
- It still retains its Florentine buildings, which date back to two centuries.
- Building's Heights between 24 – 32 meter.

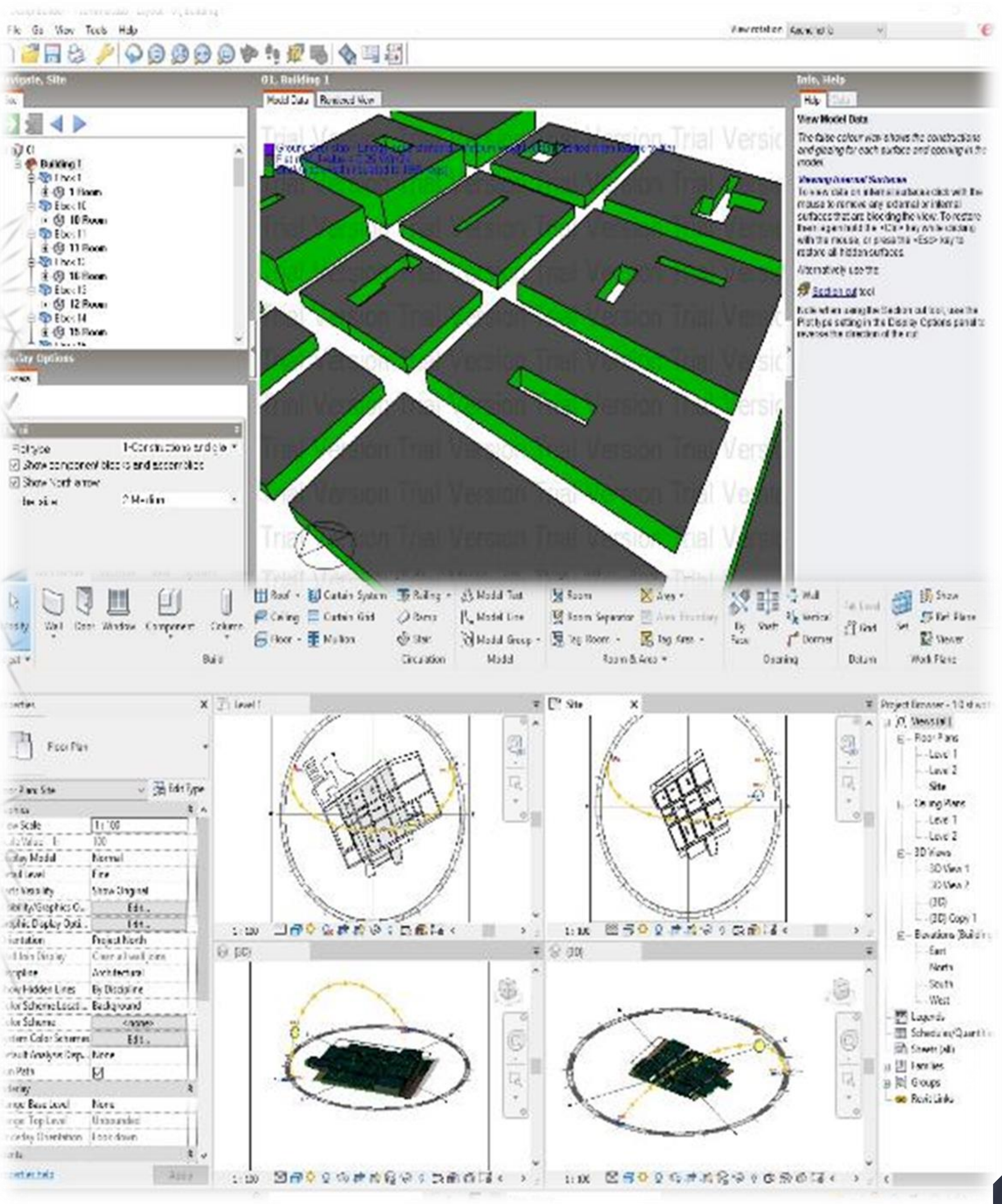


METHODOLOGY

Analytical Comparison

Steps:

1. Survey
2. Draw & build a model
3. Parameters Determination
4. Run Simulation
5. Compare Results



SIMULATION DATA

Explore & Study details

- Each case will study the sun moving from sunrise to sunset.
- June 21st is the representative day of the summer.
- December 21st is the representative day of the winter.
- Shade and shadows was observed in areas of the street and on the facades.

PARAMETERS

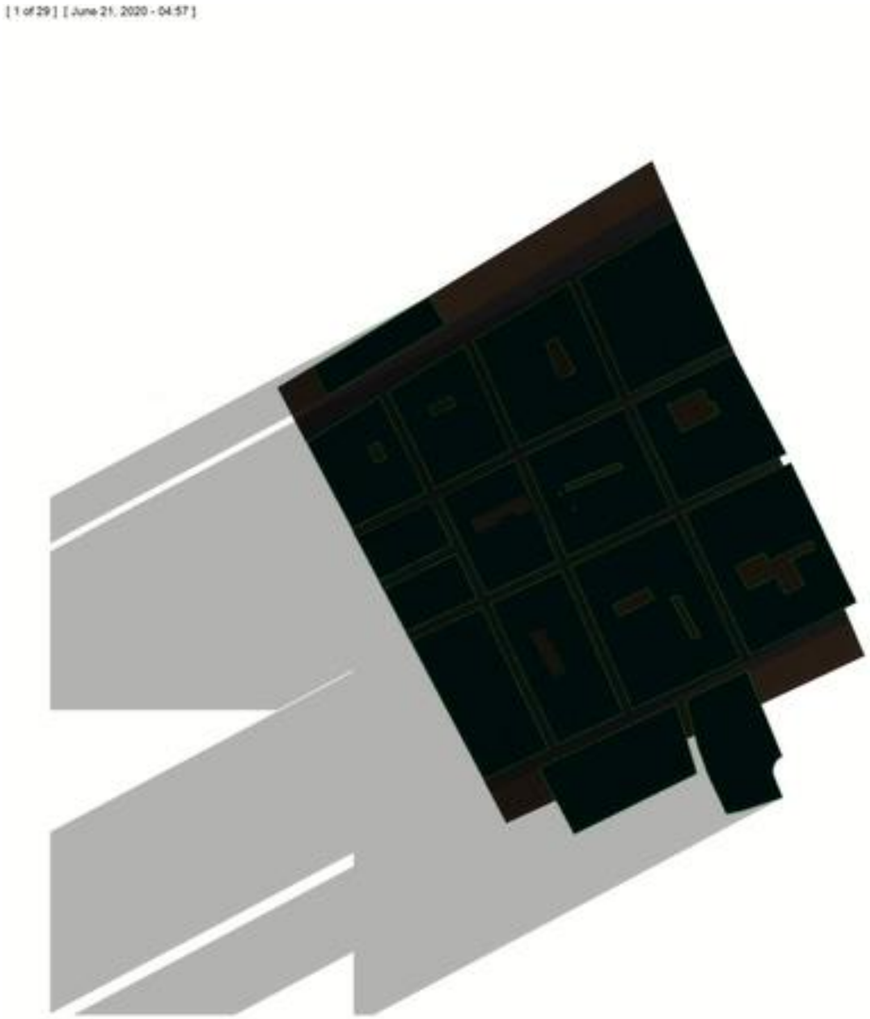
Case I	Case II
Height = 1.5 x Width Setback = 0 m	Height = Width Setback = 2.5 m

SUMMER

Study Simulation

SHADE & SHADOW COMPARISON

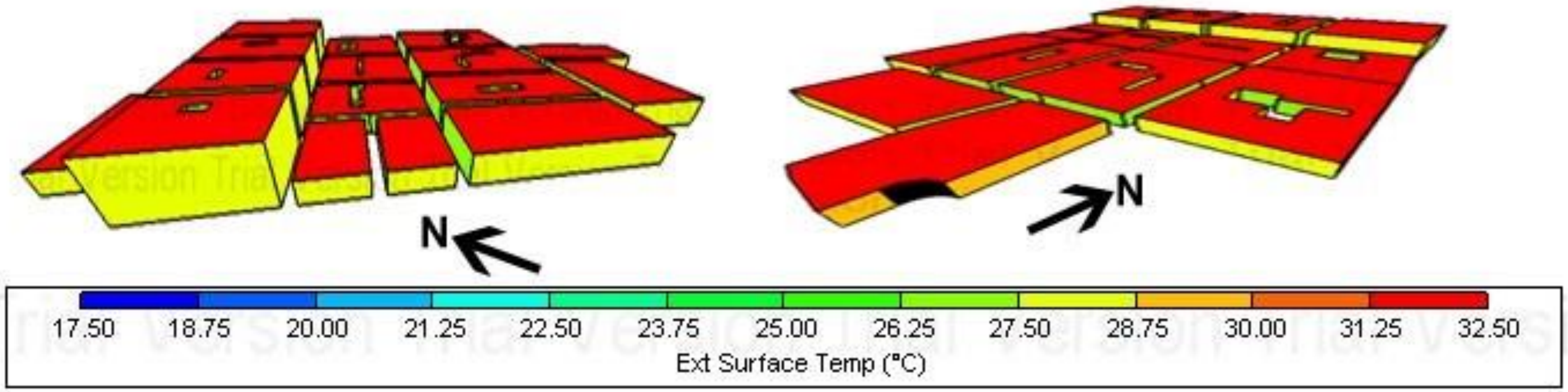
Case I



Case II

EXTERIOR SURFACE TEMPERATURE (°C)

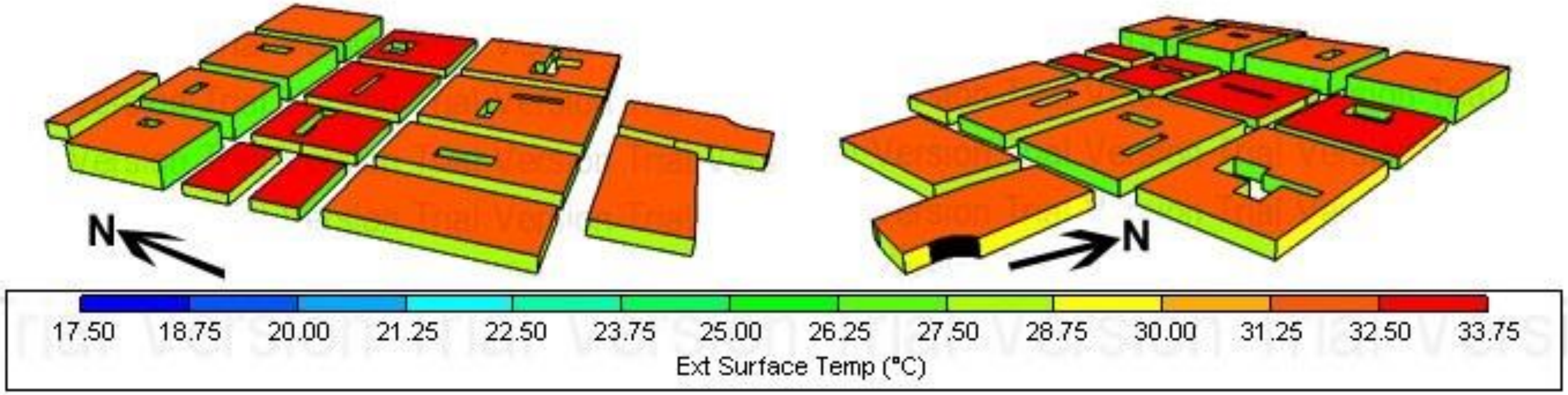
Case I



(South / West) Facades

(North / East) Facades

Case II



(South / West) Facades

(North / East) Facades

SUMMER RESULTS COMPARISON

	Case I	Case II
Exterior surface temperature values for each façade (°C)		
Roofs	(31 - 33) °C	(29 – 31) °C
South	(25 - 28) °C	(23 - 25) °C
West	(27 - 29) °C	(22.5 – 26.5) °C
East	(25 - 27) °C	(25 - 27) °C
Solar Incident Values for each façade (KWh/m^2)		
Roofs	(65 – 75) KWh/m^2	(60 -70) KWh/m^2
South	(25 - 35) KWh/m^2	(15 - 30) KWh/m^2
West	(40 - 50) KWh/m^2	(30 - 45) KWh/m^2
East	(30 - 40) KWh/m^2	(20 -35) KWh/m^2

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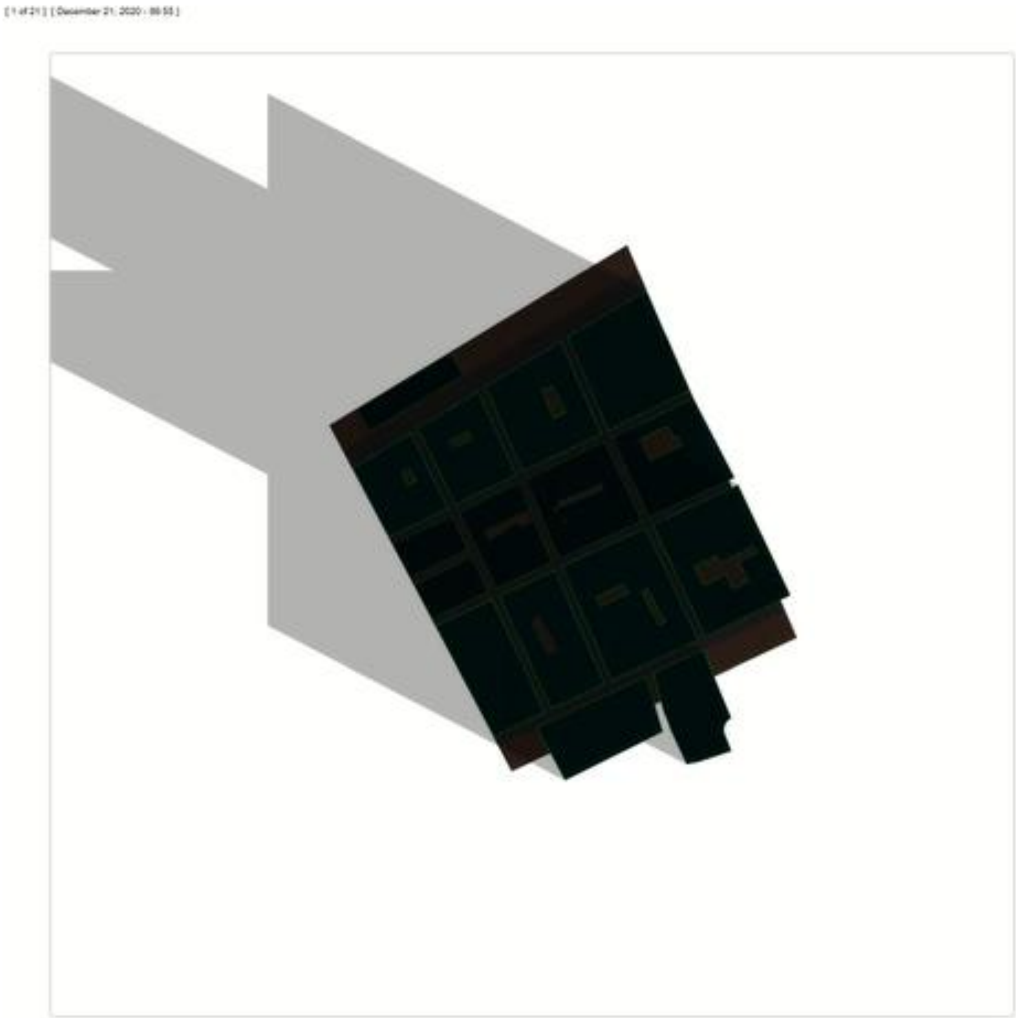
WINTER

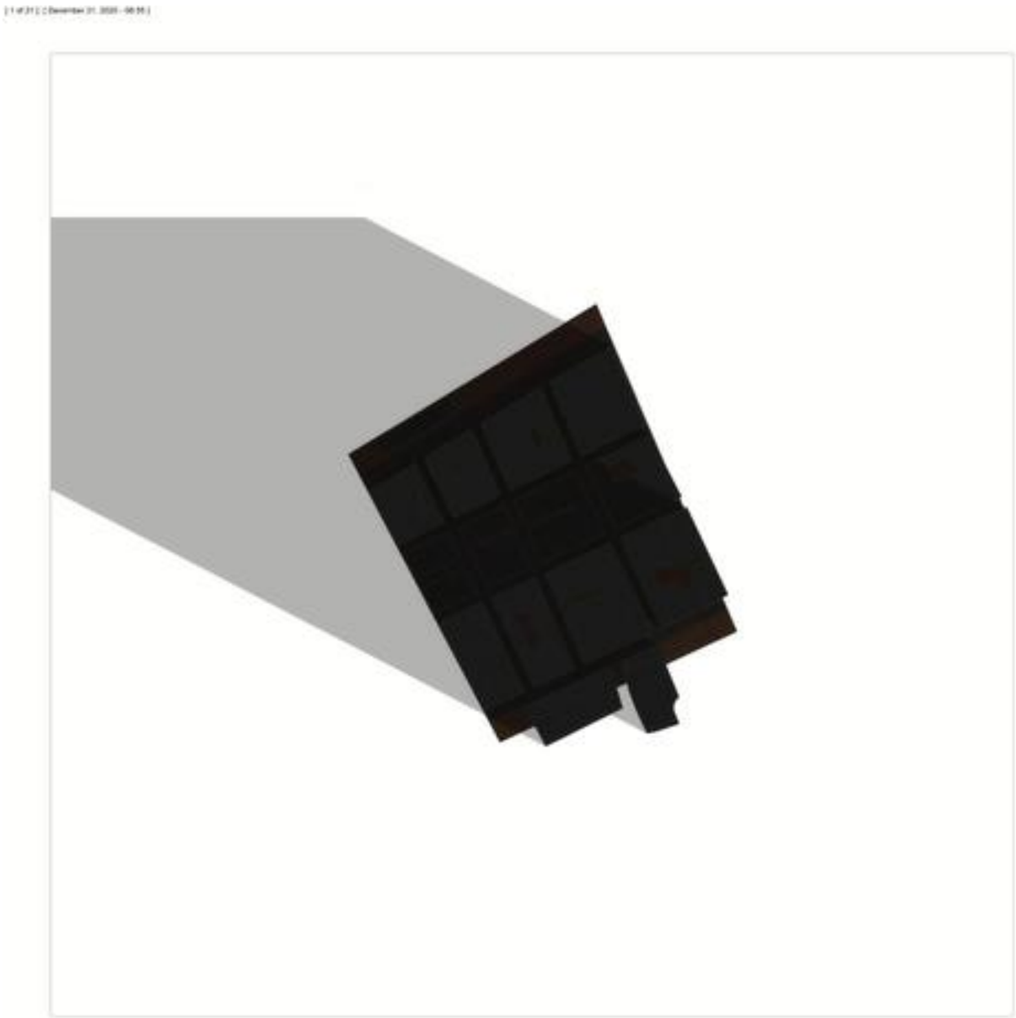
Study Simulation

SHADE & SHADOW COMPARISON

Case I

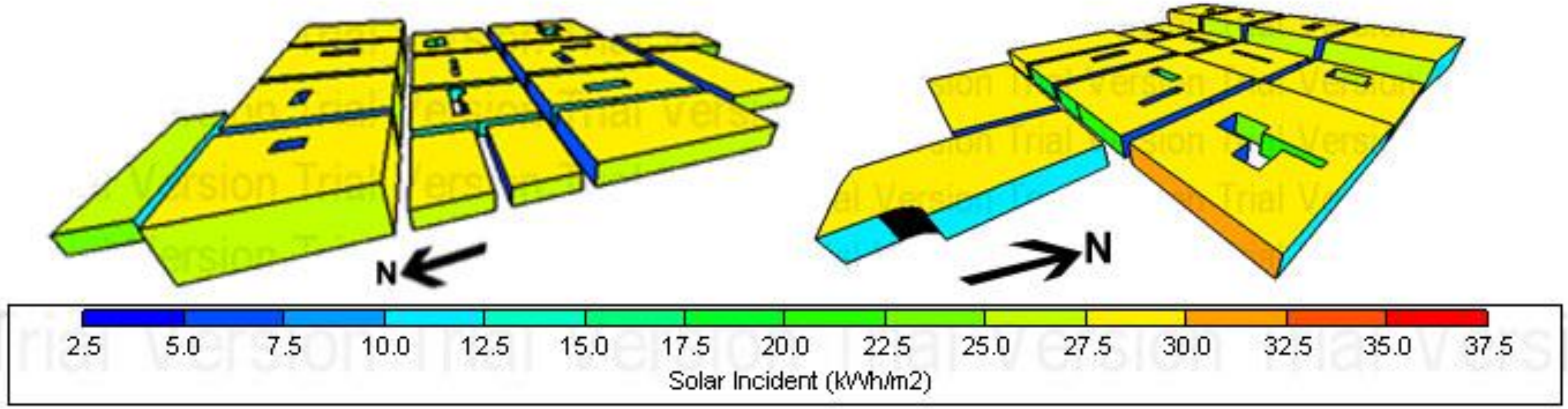


Case II



SOLAR INCIDENT (KW/M2)

Case I



(South / West) Façade

(North / East) Façade

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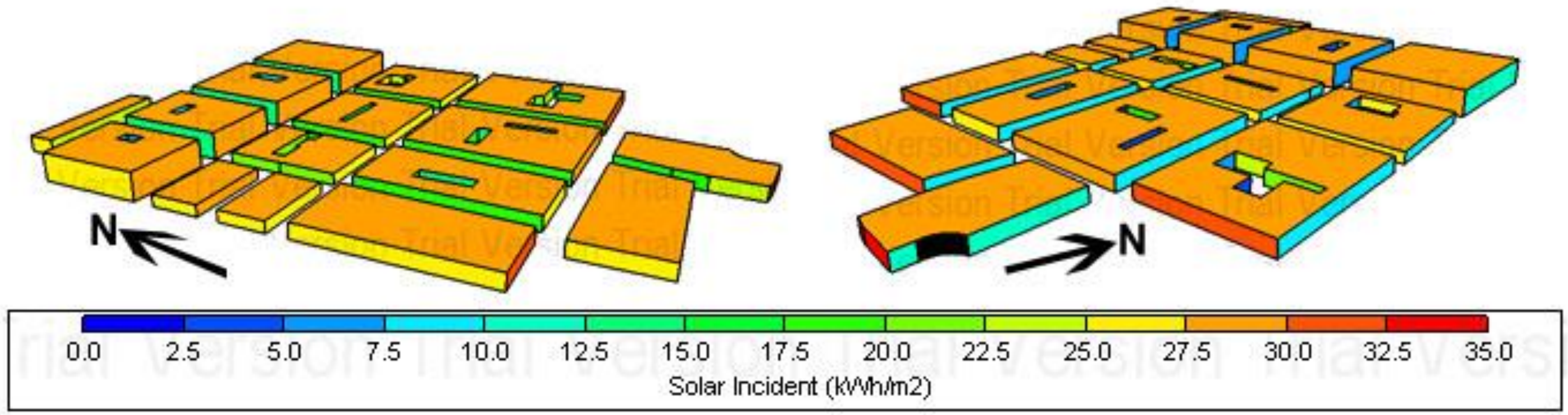

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(North / East) Façade

WINTER RESULTS COMPARISON

	Case I	Case II
Exterior surface temperature values for each façade (°C) as shown in fig. 9&15		
Roofs	(15 - 16) °C	(17 – 18.5) °C
South	(18 – 19.5) °C	(18.5 – 20.5) °C
West	(16.5 - 18) °C	(17.5 - 19) °C
East	(14.5 - 16) °C	(16 - 17) °C
Solar Incident Values for each façade (KWh/m2) as shown in fig. 10&16		
Roofs	(25 - 30) KWh/m^2	(27.5 - 30) KWh/m^2
South	(17.5 - 25) KWh/m^2	(22.5 - 35) KWh/m^2
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Conclusion

- Building Regulations
- Built environment.
- Thermal comfort.
- Architects, designers, constructors and stakeholders
- New technology
- Building Information Modelling

ANY QUESTIONS!

THANK YOU