PRESENTATION

TECHNICAL ENVIRONMENTAL SYSTEMS

PROFESSOR

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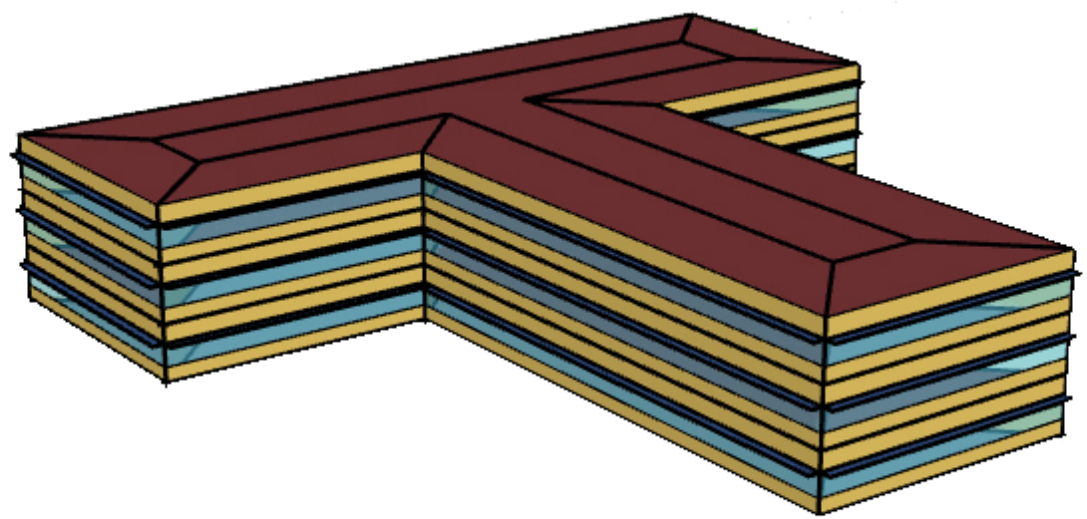


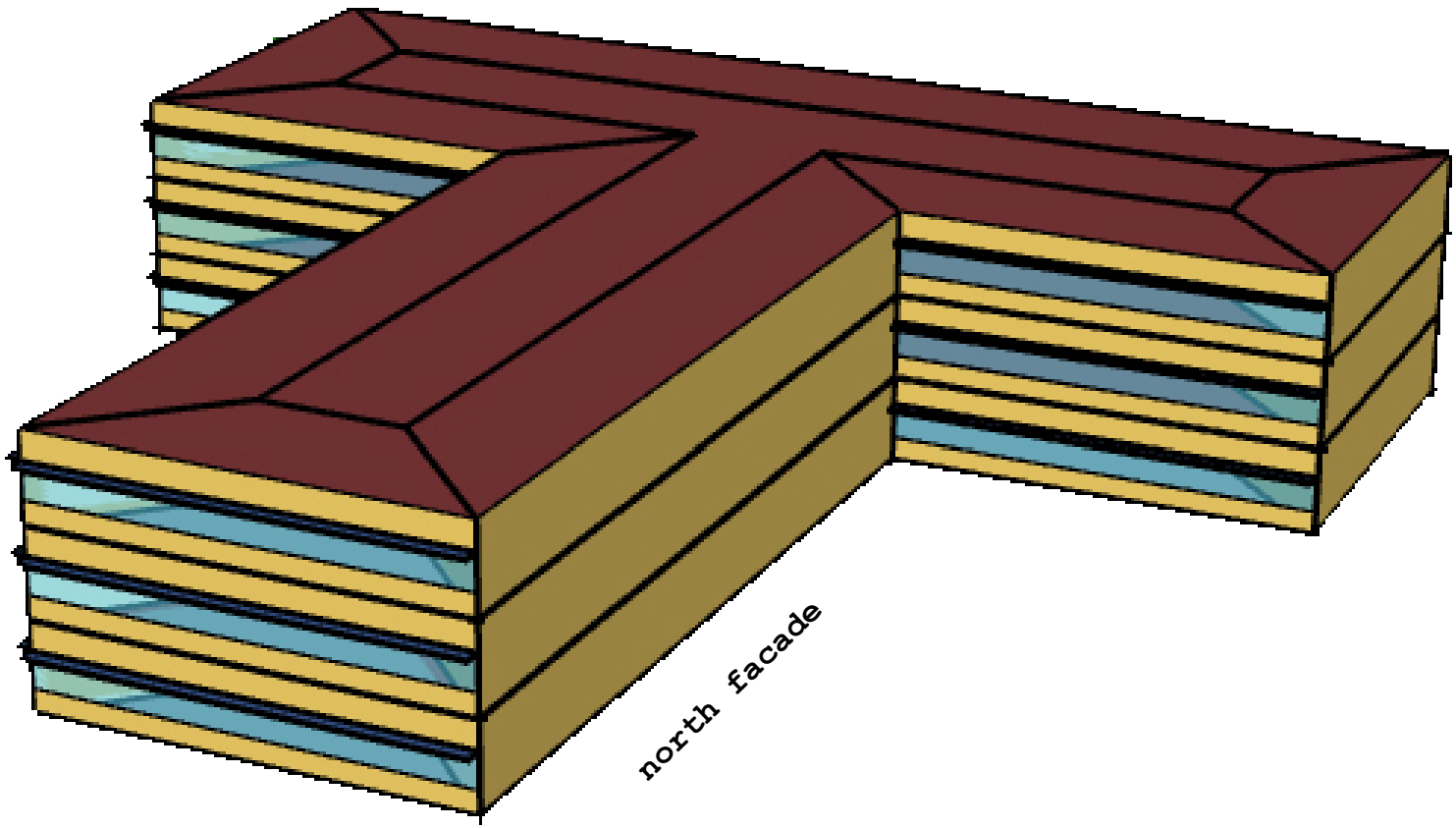
A.Y. 2019 - 2020

Master in Sustainable Architecture and Landscape Design

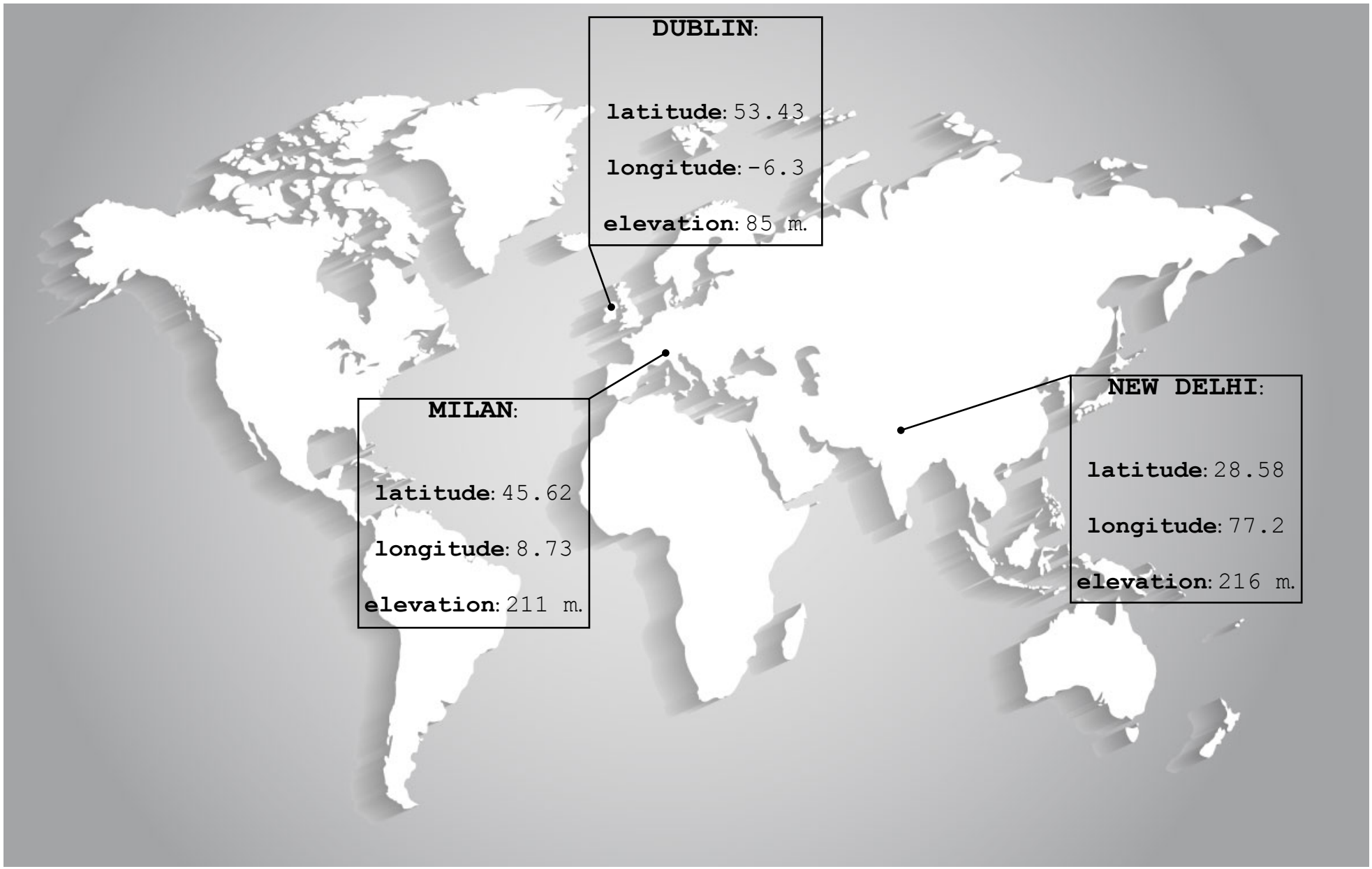
POLITECNICO
MILANO 1863

Geometry and buildings characteristics

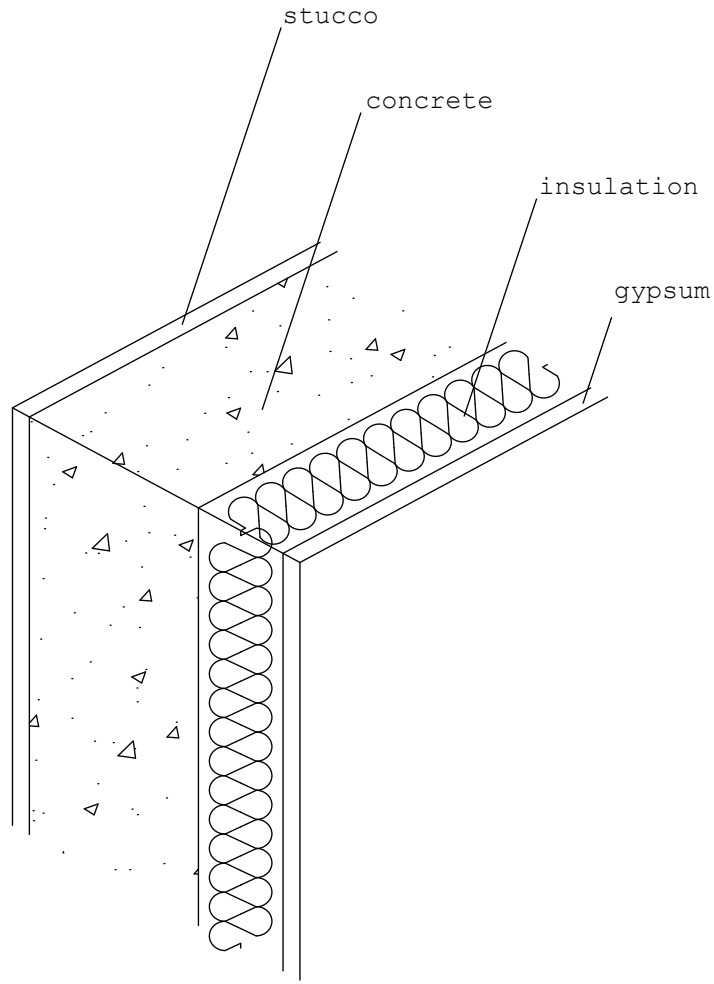
Building type: commercial / office
Total building area: 3.375 m^2 (3 floors)



Our chosen cities



Stratigraphy of the wall



Basic wall

	thickness (m)	conductivity (W/m*K)	density (kg/m^3)	specific heat (J/kg*K)	thermal absorptance	solar absorptance	visible absorptance	R-value (m^2*C/W)
1IN Stucco	0.025300	0.691800	1858.0	837	0.900000	0.920000	0.920000	0.036
8IN Concrete HW	0.203300	1.729600	2243.0	837	0.900000	0.650000	0.650000	0.12
Wall insulation (44)	0.110400	0.043200	91.0	837	0.900000	0.500000	0.500000	2.56
1/2IN Gypsum	0.012700	0.160000	784.9	830	0.900000	0.400000	0.400000	0.079

*** R_value =** thickness/conductivity *** R_total:** 2.795 (m^2*C/W)

*** U_value =** 1/R_value *** U_value:** 0.357 (W/m^2*C)

Consumption comparison of the chosen cities

	MILAN (Italy)	DUBLINO (Ireland)	NEW DELHI (India)
Average outdoor annual temperature	13.1 °C	9.7 °C	25.2 °C
Heating consumption (W)	256939.62 30/JAN	246181.75 13/FEB	184634.75 30/DEC
Cooling consumption (W)	77707.52 24/JUL	40814.87 05/JUL	193902.50 20/JUL
Electricity:			
interior lighting (W)	20249.34	20249.34	20249.34
interior equipment (W)	12748.78	12748.78	12748.78

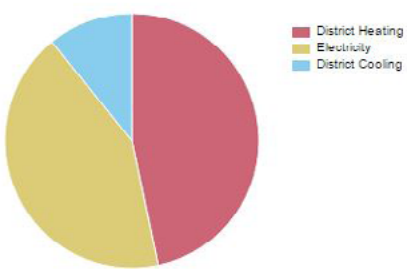
DUBLINO (than Milan)	NEW DELHI (than Milan)
Heating consumption 4.18% lower	Heating consumption 28.14% lower
Cooling consumption 47.48% lower	Cooling consumption 49.53% higher

Diagrams

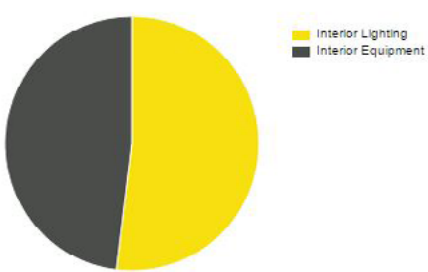
Annual Overview

Milan

Energy Use - view table

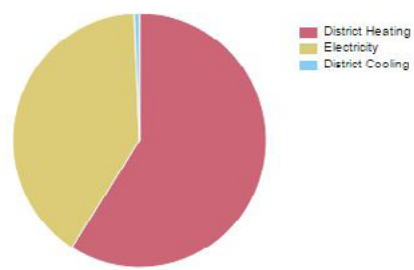


EUI - Electricity - view table

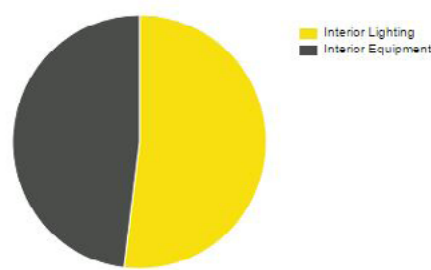


Dublin

Energy Use - view table

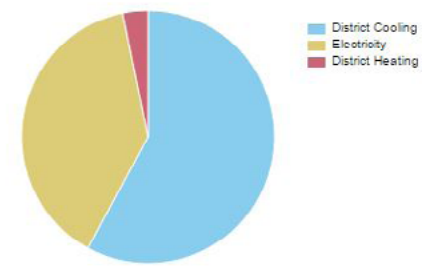


EUI - Electricity - view table

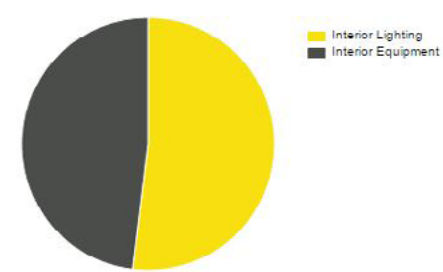


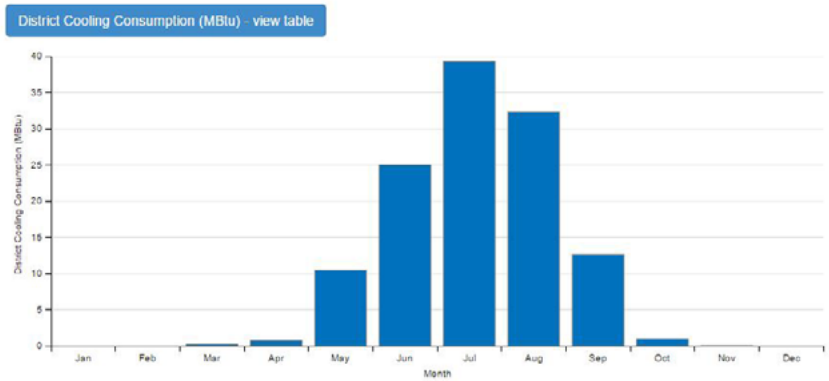
New Delhi

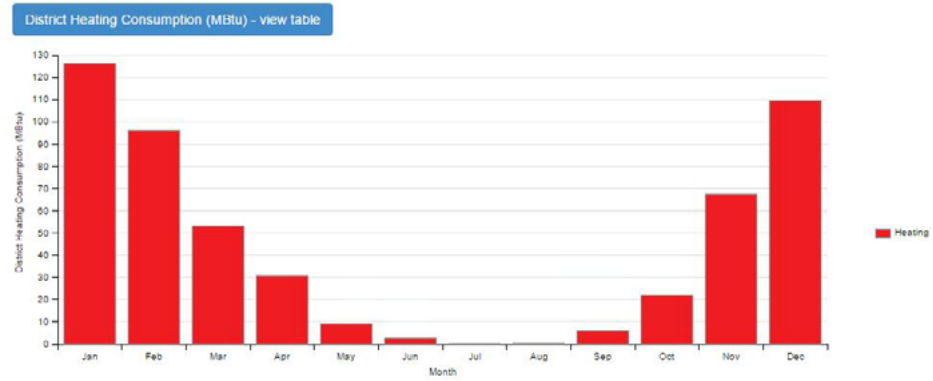
Energy Use - view table



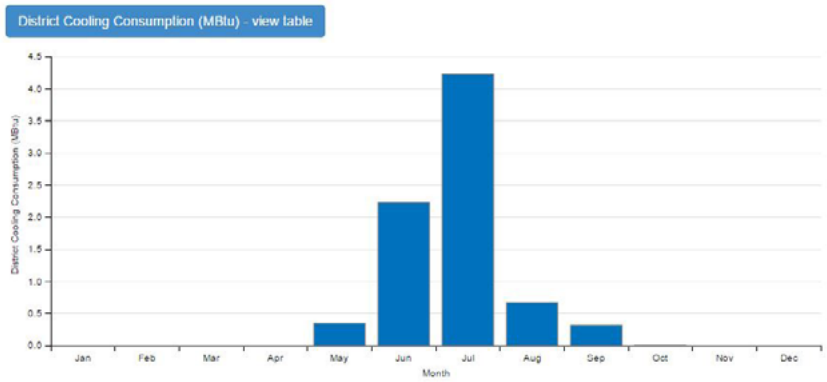
EUI - Electricity - view table

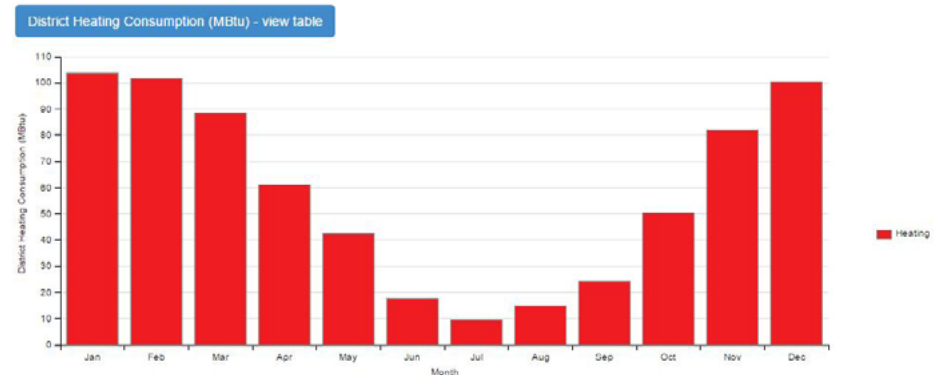




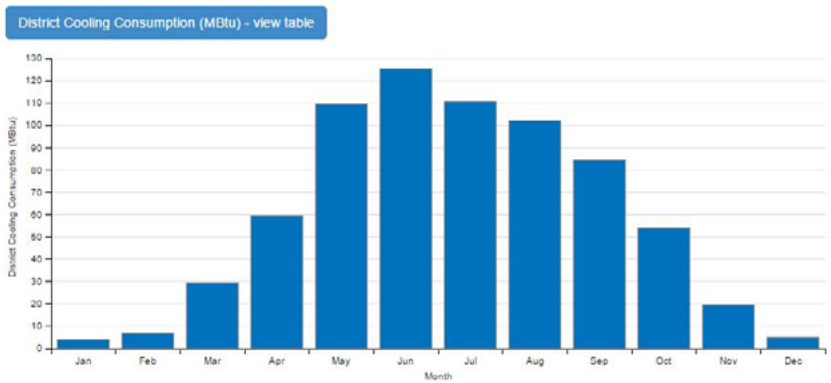


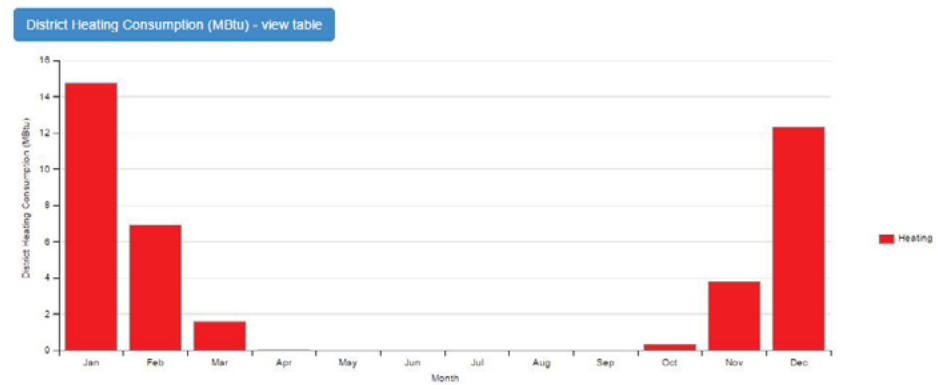
Milan





Dublin





New Delhi

Conclusions

From this simulation project it is possible to understand that the energy consumption of the same building depends on the climate zone in which it is located and on the materials that compose it (if we keep the same material for different climate zones, it is not efficient).

OpenStudio allowed us to calculate all the values with regard to the consumptions and the loads of the same building, especially useful to prevent extra-costs.
EnergyPlus allowed us to calculate the heating and cooling consumptions for the compared cities.
SketchUp allowed us to create the model building.