POLITECNICO
MILANO 1863

Technical Environmental Systems
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ENERGETIC SIMULATION OF A BUILDING IN DIFFERENT LOCATIONS

ABU DHABI
WINNIPEG
SYDNEY

Introduction

Computer modelling and simulation of the energy consumption of a building is extremely important for designers and developers.

The goal is to be able to achive a sustainable and efficient design by reducing the energy consumption of the building. To do this we have to understand the conditions of the building and to run an analysist against utility bills.

The model and the simulations has been made in Sketchup, OpenStudio and Energy Plus.

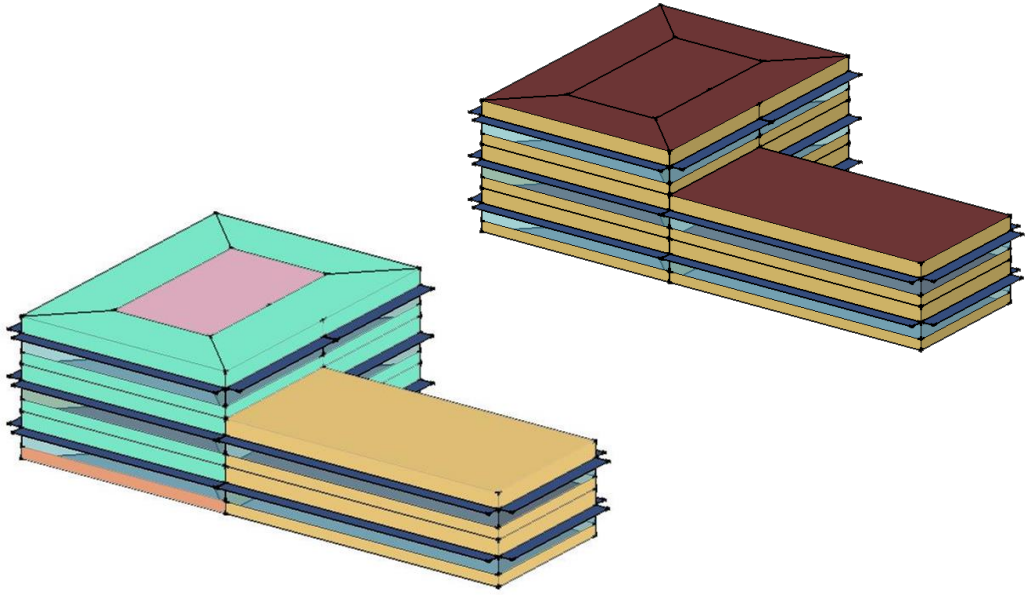
Energy Plus provides an integrated simulation for accurate temperature and comfort prediction. The simulation was performed in several locations in order to compare the different values between diverse climates.

The input data were building constructional records and local climate data.

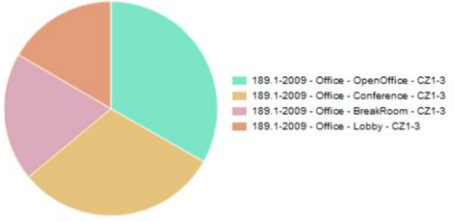
Three Different thermal zones were taken into consideration in order to achieve a more accurate analysis:

Abu Dhabi, Winnipeg and Sydney are different in latitude and climatic factors.

BUILDING CHARACTERISTICS / WEATHER CHARACTERISTICS



Space Type Breakdown - view table



Building Area

	Area [m2]
Total Building Area	1300.00
Net Conditioned Building Area	1300.00
Unconditioned Building Area	0.00

Abu Dhabi

	Value
Weather File	ABU DHABI - ARE IWEC Data WMO#=412170
Latitude	24.43
Longitude	54.65
Elevation	89 (ft)
Time Zone	4.00
North Axis Angle	0.00
ASHRAE Climate Zone	

Winnipeg

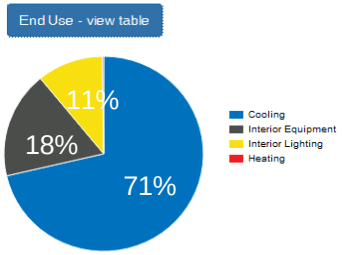
	Value
Weather File	Winnipeg Int'l MB CAN WYEC2-B-14996 WMO#=718520
Latitude	49.90
Longitude	-97.2
Elevation	784 (ft)
Time Zone	-6.0
North Axis Angle	0.00
ASHRAE Climate Zone	

Sydney

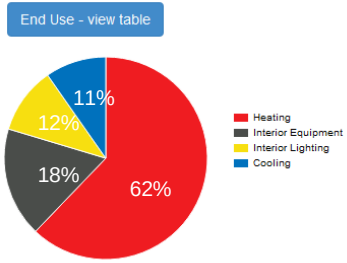
	Value
Weather File	Sydney NSW AUS RMY WMO#=947680
Latitude	-33.9
Longitude	151.20
Elevation	131 (ft)
Time Zone	10.00
North Axis Angle	0.00
ASHRAE Climate Zone	

ANNUAL OVERVIEW

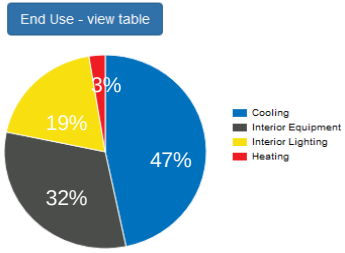
Abu Dhabi

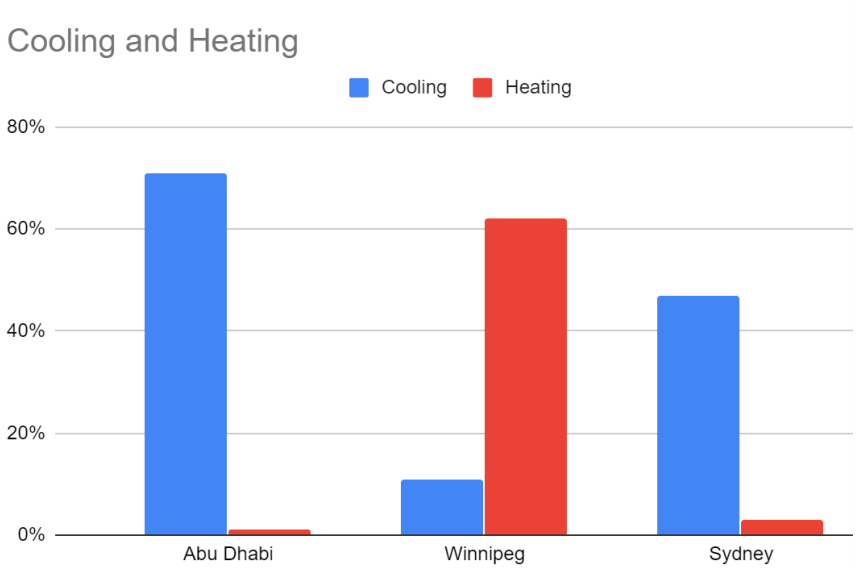


Winnipeg



Sydney

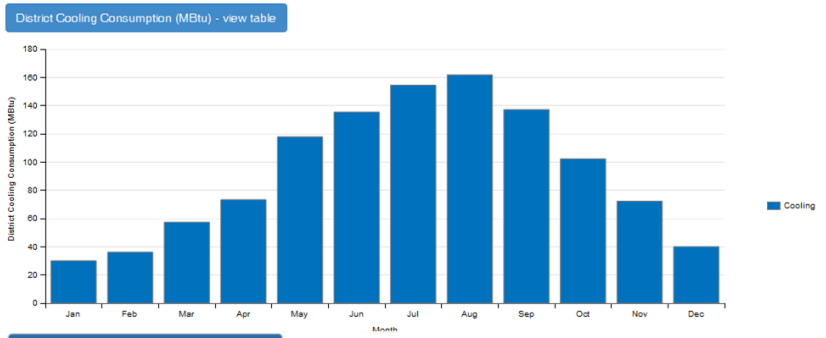


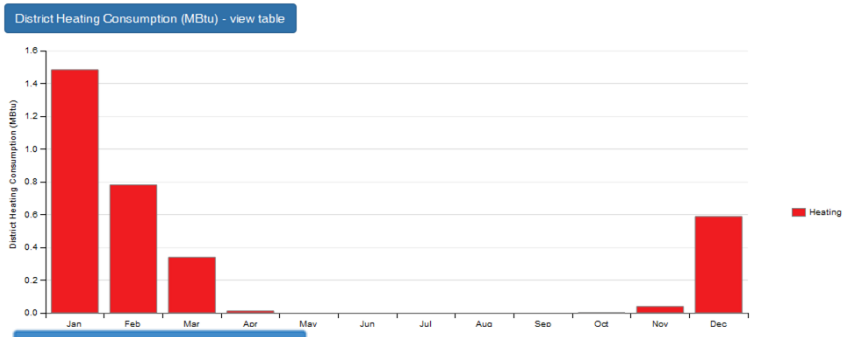


	Abu Dhabi	Winnipeg	Sydney
District Cooling (GJ)	1180.26	161.89	432.55
District Heating (GJ)	3.42	1037.31	24.48

MONTHLY OVERVIEW

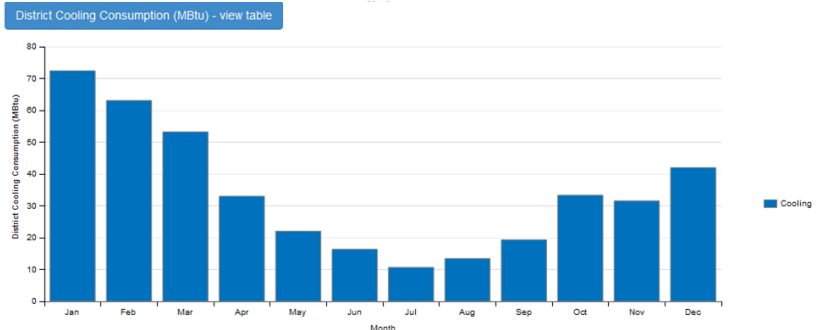
Abu Dhabi

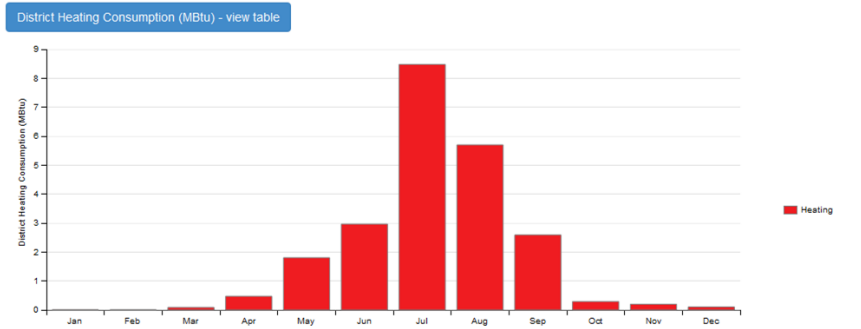




Winnipeg

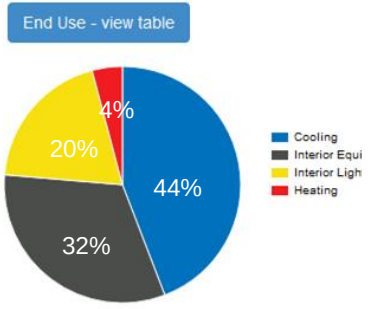
Sydney

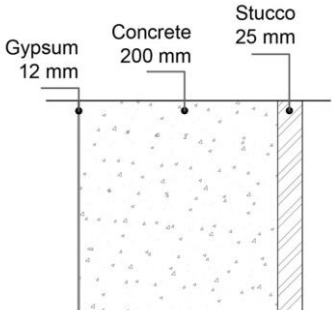




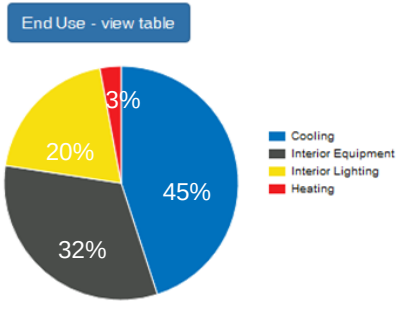
ANNUAL OVERVIEW OF EACH WALL IN SYDNEY

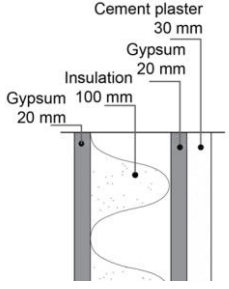
Wall 1



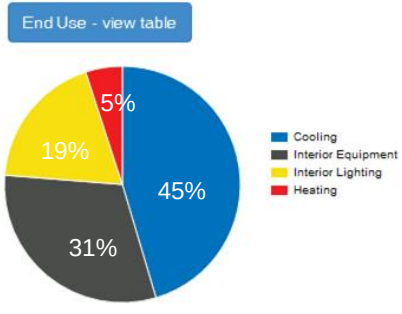


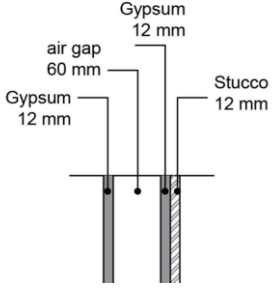
Wall 2

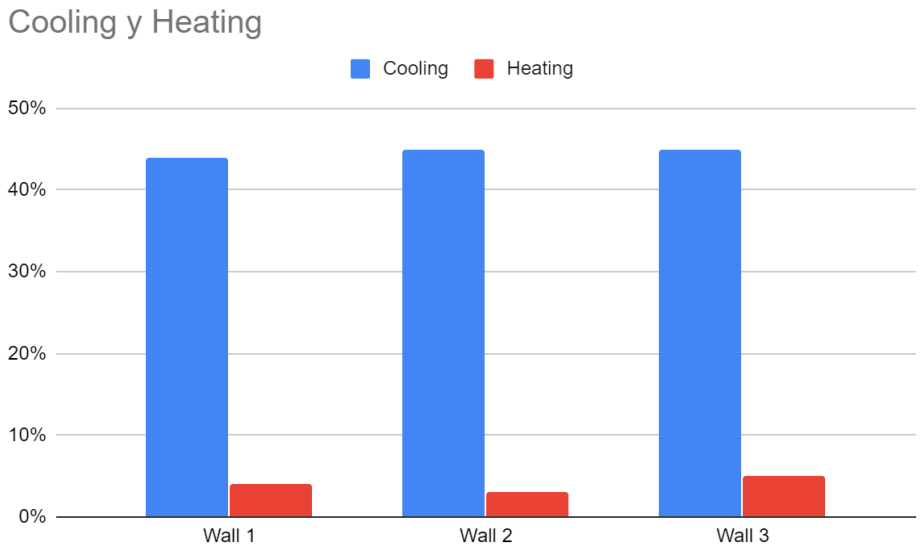




Wall 3





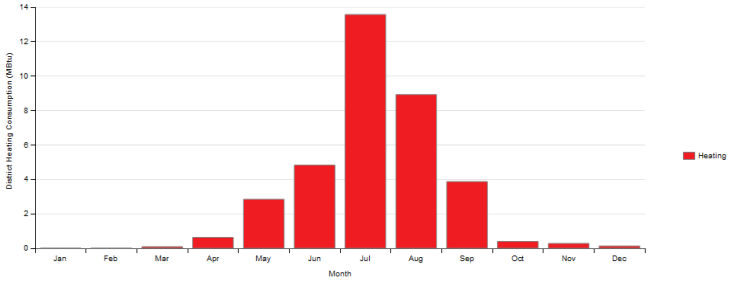


	Wall 1	Wall 2	Wall 3
District Cooling (GJ)	401.52	406.07	430.25
District Heating (GJ)	37.54	26.27	47.53

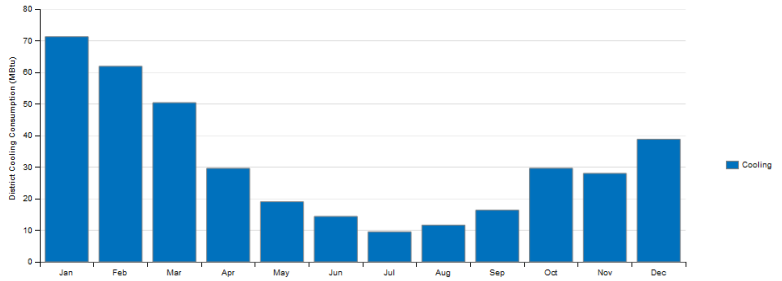
MONTHLY OVERVIEW

Wall 1

District Heating Consumption (MBtu) - view table

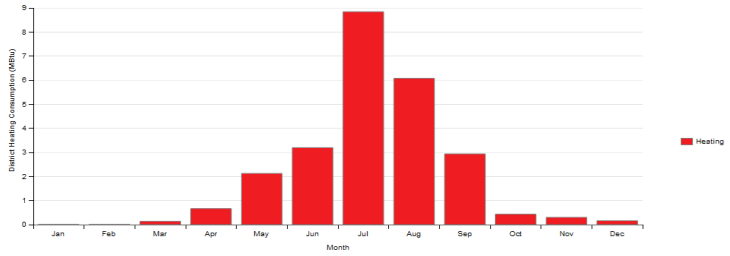


District Cooling Consumption (MBtu) - view table

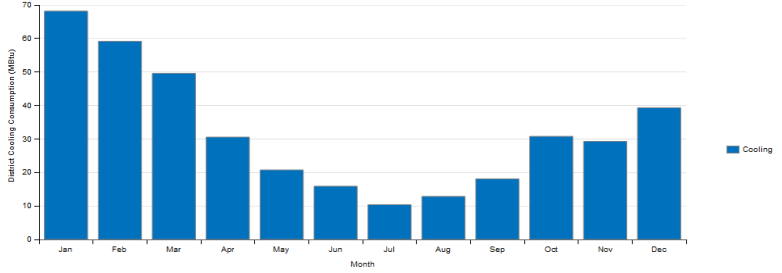


Wall 2

District Heating Consumption (MBtu) - view table

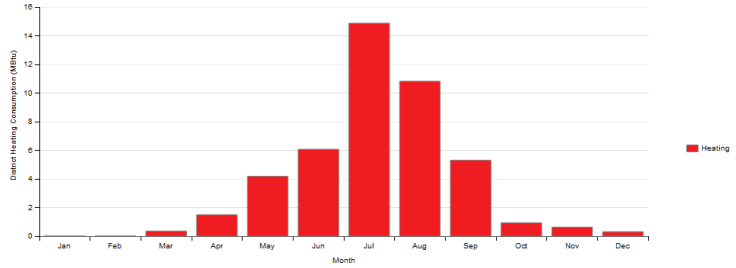


District Cooling Consumption (MBtu) - view table

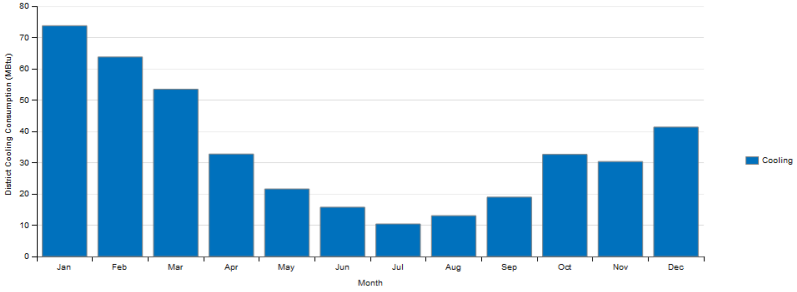


Wall 3

District Heating Consumption (MBtu) - view table



District Cooling Consumption (MBtu) - view table



CONCLUSION – U-FACTOR VALUES

Wall Type	U-factor with film (EnergyPlus)(W/m2-K)	U-factor (Manual)(W/m2-K)
Wall 1	2.610	2.50
Wall 2	0.366	0.248
Wall 3	2.551	2.3

Wall 1 -- 2.620/2.50 = 1%
Wall 2 -- 0.366/0.248 = 1.5%
Wall 3 -- 2.551/2.3 = 1%

Total net area=530.38m2

Wall Type	Overall U-factor with film (EnergyPlus)	Overall U-factor (Manual)
Wall 1	1384.29	1325.95
Wall 2	194.12	131.53
Wall 3	1352.99	1219.87

As the U- factor of the Wall 2 is lesser than Wall 1 and Wall 3, Wall 2 is the best wall system to be used in sydney as the heat transfer is lesser in this case.