

**UNIVERSITY OF LIECHTENSTEIN**

**TOWERS            FOR            2020**

**MASTER THESIS**

**MASTERS OF SUSTAINABLE DESIGN 2011**

**PROFESSOR:**  
**DIETRICH SCHWARZ**

**ASSISTANT:**  
**ROBERT MAIR**

**STUDENT:**  
**AHMED EL BABLY**

## **TABLE OF CONTENT.**

<b>1. Introduction</b>	6,7
<b>2. What is the solar decathlon competition ?</b>	8,9
2.1. Practicing the solar decathlon competition.	10,11
2.2. U-value calculation	12,13
2.3. The relation between the shape and sustainability performance.	14,15
2.4. Window study	16,17,18,19
2.5. Insulation study	20,21
<b>3. Theories</b>	
<b>3.1. Footprint theory</b>	22,23,24,25
3.1.1. Personal footprint analysis	26,27
3.1.2. Rhine valley footprint analysis	28,29,30
3.1.3. Conclusion and key world	31
<b>3.2. Theory of sky scrapers.</b>	
3.2.1. Sky scrapers in Manhattan.	34
3.2.2. The city of congestion	35
3.2.3. The theory of the Utopian city	36,37
<b>4. Bregenz</b>	
4.1. Short Brief about Bregenz	40,41
4.2. Site map and site analysis	42,43
<b>5. Project practice 1</b>	
5.1. Key words and the architecture approach	44,45,46,47
5.2. Ventilation and structure concept	48,49
5.3. Criticism	50,51
<b>6. The relation between the shapes and sustainability performance</b>	
6.1. Squared base shape	52,53
6.2. Rectangular base shape	54,55
6.3. Circular base shape	56,57
6.4. Triangular base shape	58,59
6.5. Perimeter comparison	60,61
6.6. Heat demand comparison	62,63
6.7. Embodied energy.	64,65
6.8. Conclusion	66
6.9 New experiment	67,68,69
<b>7. Case studies.</b>	
7.1. Unite d'habitation	70,71
7.2. Robin hood housing project	72,73
<b>8. Bregenz old city and the Urban qualities</b>	74,75,76,77

<b>9. Project practice 2</b>	
9.1 Mixed use and diversity	82,83
9.2 walkability	84
9.3 Connectivity	85,86,87
9.4 Mixed housing and Increased density	88,89
9.5 Traditional neighbourhood structure	90-99
9.6 Unite heating demand calculation	100-103
9.7 Whole building heating demand	104,105
9.8 Final presentation criticism	106,107
<b>10. Reference page</b>	108
<b>11. Declaration</b>	110