

Contents

1	Life Cycle and Sustainability: Concepts and Keywords	1
1.1	Architecture/Ecology/Sustainable Development	1
1.2	Design Process/Multidisciplinary Approach/Life Cycle Approach	5
1.3	Time/Service Life/Future	9
1.4	Regulations/Standards/Codes	10
1.4.1	ISO/TC 59 Buildings and Civil Engineering Works (SC14 and SC17)	10
1.4.2	CEN/TC 350 Sustainability of Construction Works	12
1.5	Integrated Design/Assessment Systems/Tools	14
1.5.1	Tools for Integrated Design	16
	References	19
2	The Environment and Economics	21
2.1	The Circular Economy	21
2.1.1	The Carrying Capacity of the Environment	23
2.2	Environmental Economics	24
2.3	Tools and Principles of the Environmental Policy	27
2.4	The Circular Approach to Design	28
	References	29
3	Life Cycle Methodologies	31
3.1	Life Cycle Assessment (LCA)	31
3.1.1	Origins, Definitions, and References	31
3.1.2	Environmental Indicators	35
3.2	Life Cycle Costing	42
3.2.1	Origins, Definitions and References	42
3.2.2	General Framework and Costs	49

3.3	Combining LCA and LCC	54
3.3.1	A Common Framework for the Building Sector.	56
	References	62
4	Defining an Innovative Design Method Based on the Life Cycle	
	Approach	65
4.1	Design with a Matrix	65
4.2	The Life Cycle Design Model (LCDM)	70
4.2.1	Basic Principles of the Life Cycle Design Model.	73
4.2.2	General Framework	76
4.2.3	The Environment and Energy Factor.	81
4.2.4	The Economic Factor.	84
4.3	€CO: Economic-Environmental Efficiency Factor	88
4.3.1	Example of How to Calculate the Efficiency Factor	90
4.4	Interpretation of the Results	93
	References	117
5	Case Studies	119
5.1	Life Cycle Design for Building Envelopes	119
5.1.1	Building Façades: VM House.	120
5.1.2	Green Roof: TEA Headquarters	128
5.2	Life Cycle Design for the Whole Building	139
5.2.1	Industrial Building Restoration: The Chavonne Warehouse	139
	References	151
6	Conclusions and Outlook	153
	References	157