

Contents

Tables	xv
Figures	xvii
Preface	xxi
Foreword by Pamela Lippe	xxv
Reinventing Green Building: A Call to Action	xxix

PART I: THE GREEN BUILDING MOVEMENT

1 The Technological Challenge:	
The Age of Algorithms and Big Data	3
The Great Convergence: Real Estate, IT, Energy and Sustainability	7
The Age of Algorithms	9
Bringing Green Building Certification into the Age of Big Data	10
A Smorgasbord from the Internet of Things	11
Summary	15
2 The Future of Green Building: Top Ten Megatrends	17
Megatrend #1: Green Building Certification's Growth Rate Is Flat in the United States	18
Megatrend #2: Energy Efficiency Leads the Way	19
Megatrend #3: Zero Net Energy Buildings Are on the Rise	20
Megatrend #4: Competition Among Rating Systems Will Increase	21
Megatrend #5: A Sharper Focus on Existing Buildings Will Emerge	22
Megatrend #6: Cloud Computing and Big Data Analytics Will Provide Much Needed Direction	22

Megatrend #7: Cities and States Will Demand Building Performance Disclosure	23
Megatrend #8: Debate over Healthy Building Materials Will Become Even More Vexatious	24
Megatrend #9: Solar Power Will Finally Break Through	25
Megatrend #10: Expect a Heightened Emphasis on Water Conservation	27
Summary	27
3 The Green Building Movement: A Brief History	29
BREEAM	32
LEED	35
Green Globes	38
Living Building Challenge (LBC)	40
National Green Building Standard (NGBS)	42
Comparing Three Leading US Green Building Rating Systems	43
Summary	43
4 The US Green Building Movement Today	45
LEED Data Sources	46
LEED in the United States since 2005	49
LEED Projects in 2014	52
The US Construction Market	52
International	54
Summary	57
5 The (Business) Case for Green Building	59
Carbon Reduction in Green Building	59
The Business Case for Commercial Projects	61
The Business Case for Green Homes	67
Employees—The Elephant in the Room	68
Summary	70

PART II: GREEN BUILDING HITS THE WALL

6	Successes: Positive Impacts of LEED and Other Rating Systems	73
	Defining Green	73
	Integrated Design	75
	Professional Education	76
	Better Energy Performance	77
	Building Commissioning	77
	Better Products	78
	Occupant Comfort and Satisfaction	80
	Government Policy	80
	Commercial Successes	80
	The LEED “Ecosystem”	83
	Summary	85
7	Failures: LEED’s Limited Appeal	87
	LEED Fatigue	88
	Designed to LEED	90
	LEED Has Not Transformed the Built Environment	91
	LEED’s Real Appeal Is Quite Limited	93
	LEED’s Customer Experience Is Questionable	95
	Summary	96
8	LEED Fails to Transform the Marketplace	97
	Overall LEED Project Trends	97
	The US Commercial Buildings Market	99
	Large Commercial and Corporate Offices	101
	Smaller Office Buildings	101
	Public Sector	101
	Education	102
	Retail	104
	Healthcare	107
	Existing Buildings	108
	Commercial Interiors	109
	Residential	110
	Summary	112

9 Forensics: Why Green Building Has Hit the Wall	113
It's Too Hard to Get Certified	115
Documentation Is Cumbersome	116
Arbitrary and Capricious Rulings	117
It Costs Too Much	119
It Takes Too Long	120
There's No Longer Much PR Value	121
Idealists Designed LEED; Realists Rule the Market	122
LEED Is Too Rigid	124
Certified vs. "Certifiable"	125
Summary	126
10 Green Building Certification Costs Too Much	129
Does Green Building Cost More?	129
Rethinking Cost and Value	130
What I Learned as a Management Consultant	131
What Should Green Building Certification Cost?	132
The "LEED Tax"	133
Lessons from Other Economic Sectors	134
Summary	135
PART III: LOOKING FOR SOLUTIONS	
11 LEEDv4: Can It Succeed?	139
What Is LEEDv4 Supposed to Do?	140
The LEED Delivery Model Is Still Wrong	142
LEEDv4—New Construction Adds to the Problem	142
LEEDv4 Will Likely Cost Even More	144
LEEDv4—"Operations and Maintenance" Doesn't Meet Building Owners' Needs	145
The Bottom Line—LEEDv4 Is a Bug Looking for a Windshield	145
12 Current Alternatives Won't Solve the Problem	147
Energy Star	149
Green Globes	150
Living Building Challenge	152
BREEAM	156

Green + Productive Workplace	157
Property Efficiency Scorecard	159
Summary	161
13 Is Certification Really Necessary?	163
Reducing Energy Use in Buildings	164
Regulation	164
Incentives	166
Policy	166
Education and Transparency	167
Ultimately the Customer Decides	168
Summary	168
14 Focus on Carbon and Leverage New Technology	171
Begin with the End in Mind—Architecture 2030	171
Begin with the End in Mind—Zero Net Energy Buildings	172
Zero Net Energy Retrofits	174
Zero Net Energy Homes	174
Moving Beyond LEED, Green Globes and BREEAM— Cutting Carbon Emissions	175
Intelligent Buildings	177
The LEED Dynamic Plaque	180
Incorporating Green Building Data on Cloud-based Platforms	181
How Data Platforms Can Help Create New Green Building Rating Systems	182
Cloud-based Energy Management at the Microsoft Campus	183
Rekindling the Green Building Revolution	187
PART IV: THE FUTURE OF GREEN BUILDING	
15 Reinventing Green Building	191
An Analogy—Painting vs. Sculpture	191
Designing a Disruptive Innovation	192
Smart	194
Simple	194
Sustainable	196

Design on the EDGE	198
Focus on Continuous Improvement	198
Reaching Beyond the “1 Percent”	200
Conclusion: A New Green Building Manifesto	201
16 Green Building Futures	203
Five Scenarios	204
Scenario 1: Business as Usual	207
Scenario 2: Reform—LEED Adopts a New Format and Delivery Model	208
Scenario 3: KPIs and Internet 3.0	211
Scenario 4: Zero Net Carbon	212
Scenario 5: Reward Continuous Improvement	213
Scenario Review	214
Conclusion: Reinventing Green Building	215

EPILOGUE: THE FUTURE OF GREEN BUILDING TECHNOLOGY

Green Building Technology to 2020 <i>by Timothy C. Mack</i>	219
Changing Materials	219
New Building Air Quality Technologies	221
Reducing GHG Emissions	221
Changing Green Building Materials Markets	223
Green Cement: Low-Carbon Outcomes from Traditional Systems	224
Ceramics Used with Cement in Green Buildings	225
Summary	226
Appendix: 2015 LEED Projects Update	227
Bibliography	233
Glossary	235
Interviews	237
Acknowledgments	239
Endnotes	241
Index	267
About the Author	276