# CONTENTS

Foreword viii
Introduction ix
Origins x
Language xii
Numbers xiv

#### **ENERGY**

Wind Turbines 2 Microgrids 5 Geothermal 6 Solar Farms 8 Rooftop Solar 10 Wave and Tidal 12 Concentrated Solar 14 Biomass 16 Nuclear 18 Cogeneration 22 Micro Wind 23 Alexander von Humboldt 24 Methane Digesters 26 In-Stream Hydro 27 Waste-to-Energy 28 Grid Flexibility 30 Energy Storage (Utilities) 32 Energy Storage (Distributed) 34 Solar Water 36

# FOOD

Plant-Rich Diet 38 Farmland Restoration 41 Reduced Food Waste 42 Clean Cookstoves 44 Multistrata Agroforestry 46 Improved Rice Cultivation 48 Silvopasture 50 Why Bother? 52 Regenerative Agriculture 54 Nutrient Management 56 Tree Intercropping 58 Conservation Agriculture 60 Composting 62 Biochar 64 Tropical Staple Trees 66 Farmland Irrigation 68 The Hidden Half of Nature 70 Managed Grazing 72

#### **WOMEN AND GIRLS**

Women Smallholders 76 Family Planning 78 Educating Girls 80

#### **BUILDINGS AND CITIES**

Net Zero Buildings 84
Walkable Cities 86
Bike Infrastructure 88
Green Roofs 90
LED Lighting 92
Heat Pumps 94
Smart Glass 96
Smart Thermostats 98
District Heating 99
Landfill Methane 100
Insulation 101
Retrofitting 102
Water Distribution 104
Building Automation 106

## LAND USE

Forest Protection 108
Coastal Wetlands 112
Tropical Forests 114
Bamboo 117
The Man Who Stopped the Desert 118
Perennial Biomass 121
Peatlands 122
Indigenous Peoples'
Land Management 124
Temperate Forests 128
The Hidden Life of Trees 130

#### **TRANSPORT**

Afforestation 132

Mass Transit 136
High-Speed Rail 138
Ships 140
Electric Vehicles 142
Ridesharing 144
Electric Bikes 146
Cars 148
Airplanes 150
Trucks 152
Telepresence 154
Trains 156

#### **MATERIALS**

Household Recycling 158
Industrial Recycling 160
Alternative Cement 162
Refrigeration 164
Recycled Paper 166
Bioplastic 168
Water Saving—Home 170

## **COMING ATTRACTIONS**

Repopulating the Mammoth Steppe 172 Pasture Cropping 175 Enhanced Weathering of Minerals 176 Marine Permaculture 178 Intensive Silvopasture 181 Artificial Leaf 182 Autonomous Vehicles 184 Solid-State Wave Energy 187 Living Buildings 188 On Care for Our Common Home 190 Direct Air Capture 192 Hydrogen-Boron Fusion 194 Smart Highways 196 Hyperloop 198 Microbial Farming 200 Industrial Hemp 202 Perennial Crops 203 A Cow Walks onto a Beach 204 Ocean Farming 206 Smart Grids 209 Building with Wood 210 Reciprocity 212

An Opening 216
Methodology 218
What Do the Numbers Tell Us? 220
Summary of Solutions by:
Overall Ranking 222
Summary by Sector 224
Drawdown Fellows 226
Drawdown Advisors 228
Acknowledgments 234
Index 235
Photograph Credits 240