

Contents

Volume 1

Part I Scientific Evidences of Climate Change and Societal Issues	1
Introduction to Climate Change Mitigation	3
Maximilian Lackner, Wei-Yin Chen, and Toshio Suzuki	
Loss and Damage Associated with Climate Change Impacts	17
Linta M. Mathew and Sonia Akter	
Paleoclimate Changes and Significance of Present Global Warming	47
Asadullah Kazi	
Life Cycle Assessment of Greenhouse Gas Emissions	61
L. Reijnders	
Some Economics of International Climate Policy	93
Karen Pittel, Dirk Rübelke, Martin Altemeyer-Bartscher, and Sebastian Otte	
Ethics and Environmental Policy	127
David J. Rutherford and Eric Thomas Weber	
Mass Media Roles in Climate Change Mitigation	167
Kristen Alley Swain	
Economics for a Sustainable Planet	221
Arif S. Malik	
Emissions Trading	257
Roger Raufer, Paula Coussy, Carla Freeman, and Sudha Iyer	

Carbon Markets: Linking the International Emission Trading Under the United Nations Framework Convention on Climate Change (UNFCCC) and the European Union Emission Trading Scheme (EU ETS)	313
Itziar Martínez de Alegría, Gonzalo Molina, and Belén del Río	
European Union (EU) Strategy to Face the Climate Change Challenge in the Framework of the International Commitments	341
Itziar Martínez de Alegría, María-Azucena Vicente-Molina, and Cristian Moore	
Implications of Climate Change for the Petrochemical Industry: Mitigation Measures and Feedstock Transitions	383
Simon J. Bennett and Holly A. Page	
Venture Capital Investment and Trend in Clean Technologies	427
John C. P. Huang	
Analysis of the Co-benefits of Climate Change Mitigation	477
Douglas Crawford-Brown	
The Role of Aviation in Climate Change Mitigation	489
Katsuya Hihara	
Part II Impact of Climate Change and Adaptation	525
Carbon Liability	527
Yoshihiro Fujii	
Climate Change and Carbon Sequestration in Forest Ecosystems	555
Dafeng Hui, Qi Deng, Hanqin Tian, and Yiqi Luo	
Impact of Climate Change on Biodiversity	595
David H. Reed	
Sea-Level Rise and Hazardous Storms: Impact Assessment on Coasts and Estuaries	621
Yan Ding	
Projected Impacts of Climatic Changes on Cisco Oxythermal Habitat in Minnesota Lakes and Management Strategies	657
Xing Fang, Heinz G. Stefan, Liping Jiang, Peter C. Jacobson, and Donald L. Pereira	
Impact of Climate Change on Crop Production	723
Gamal El Afandi	

Volume 2

Climate Change Impacts, Vulnerability, and Adaptation in East Africa (EA) and South America (SA)	749
Anne Nyatichi Omambia, Ceven Shemsanga, and Ivonne Andrea Sanchez Hernandez	
Statistics in Climate Variability, Dry Spells, and Implications for Local Livelihoods in Semiarid Regions of Tanzania: The Way Forward	801
Ceven Shemsanga, A. N. N. Muzuka, L. Martz, H. Komakech, and Anne Nyatichi Omambia	
Climate Change Adaptation, Mitigation, and the Attainment of Food Security in the Sudano-Sahelian Belt of Nigeria	849
Aishetu Abdulkadir	
Understanding Climate Change Adaptation Needs and Practices of Households in Southeast Asia: Lessons from Five Years of Research	863
Herminia A. Francisco and Noor Aini Zakaria	
Impact of Climate Change, Adaptation, and Potential Mitigation to Vietnam Agriculture	899
Trinh Van Mai and Jenny Lovell	
Potential Impacts of the Growth of a Mega City in Southeast Asia: A Case Study on the City of Dhaka, Bangladesh	925
A. K. M. Azad Hossain and Greg Easson	
Potential of Solid Waste and Agricultural Biomass as Energy Source and Effect on Environment in Pakistan	953
S. R. Samo, K. C. Mukwana, and A. A. Sohu	
The Advanced Recycling Technology for Realizing Urban Mines Contributing to Climate Change Mitigation	1007
Tatsuya Oki and Toshio Suzuki	
An Introductory Course on Climate Change	1037
Wei-Yin Chen	
Reducing Personal Mobility for Climate Change Mitigation	1071
Patrick Moriarty and Damon Honnery	
Nontechnical Aspects of Household Energy Reductions	1107
Patrick Moriarty and Damon Honnery	

Bringing Global Climate Change Education to Middle School Classrooms: An Example from Alabama	1127
Ming-Kuo Lee, Chandana Mitra, Amy Thomas, Tyaunnaka Lucy, Elizabeth Hickman, Jennifer Cox, and Chris Rodger	
Climate Change: Outreaching to School Students and Teachers	1149
Dudley E. Shallcross, Timothy G. Harrison, Alison C. Rivett, and Jauyah Tuah	
Geoengineering for Climate Stabilization	1201
Maximilian Lackner	
Social Efficiency in Energy Conservation	1235
Patrick Moriarty and Damon Honnery	
Measuring Household Vulnerability to Climate Change	1251
Sofie Waage Skjeflo	
Fracking	1265
Qingmin Meng	
Transport Through Porous Media: Case Studies of CO₂ Sequestration, CO₂-Oxygen Reaction in Oxy-Combustion, and Oxygen Transport in Membrane at High Temperatures	1279
Aishuang Xiang	
Part III Climate Change Mitigation: Energy Conversation, Efficiency, and Sustainable Energies	1307
Energy Efficiency: Comparison of Different Systems and Technologies	1309
Maximilian Lackner	
Fuel Efficiency in Transportation Systems	1385
Maximilian Lackner, John M. Seiner, and Wei-Yin Chen	
Thermal Insulation for Energy Conservation	1413
David W. Yarbrough	
Thermal Energy Storage and Transport	1433
Satoshi Hirano	
Smart Grid	1465
Dawood Al Abri, Arif S. Malik, Mohammed Albadi, Yassine Charabi, and Nasser Hosseinzadeh	
Concentrated Solar Thermal Power	1503
Anjaneyulu Krothapalli and Brenton Greska	

Volume 3

Harvesting Solar Energy Using Inexpensive and Benign Materials	1537
Susannah Lee, Melissa Vandiver, Balasubramanian Viswanathan, and Vaidyanathan (Ravi) Subramanian	
Greenhouse Gas Emission Reduction Using Advanced Heat Integration Techniques	1581
Kailiang Zheng, Helen H. Lou, and Yinlun Huang	
Modern Power Plant Control for Energy Conservation, Efficiency Increase, and Financial Benefit	1631
Pal Szentannai	
Mobile and Area Sources of Greenhouse Gases and Abatement Strategies	1657
Waheed Uddin	
Biomass as Feedstock	1723
Debalina Sengupta	
Biochemical Conversion of Biomass to Fuels	1777
Swetha Mahalaxmi and Clint Williford	
Thermal Conversion of Biomass	1813
Zhongyang Luo and Jingsong Zhou	
Chemicals from Biomass	1855
Debalina Sengupta and Ralph W. Pike	
Hydrodeoxygenation (HDO) of Bio-Oil Model Compounds with Synthesis Gas Using a Water Gas Shift Catalyst with a Mo/Co/K Catalyst	1903
Rangana Wijayapala, Akila G. Karunanayake, Damion Proctor, Fei Yu, Charles U. Pittman, and Todd E. Mlsna	
Biochar from Biomass: A Strategy for Carbon Dioxide Sequestration, Soil Amendment, Power Generation, and CO₂ Utilization	1937
Vanisree Mulabagal, David A. Baah, Nosa O. Egiebor, and Wei-Yin Chen	
Wind Energy	1975
Manfred Lenzen and Olivier Baboulet	
Wave Power: Climate Change Mitigation and Adaptation	2007
Gregorio Iglesias and Javier Abanades	
Geothermal Energy	2057
Hirofumi Muraoka	

Hydropower	2085
Jingsheng Jia, Petras Punys, and Jing Ma	
Nuclear Energy and Environmental Impact	2133
K. S. Raja, B. Pesic, and M. Misra	
Part IV Climate Change Mitigation: Advanced Carbon Conversion Sciences and Technologies	2195
Reducing Greenhouse Gas Emissions with CO₂ Capture and Geological Storage	2197
J. Marcelo Ketzer, Rodrigo S. Iglesias, and Sandra Einloft	
Chemical Absorption	2239
Mengxiang Fang and Dechen Zhu	
CO₂ Capture Using Solid Sorbents	2349
Yao Shi, Qing Liu, and Yi He	
Volume 4	
CO₂ Capture by Membrane	2405
Teruhiko Kai and Shuhong Duan	
CO₂ Geological Storage	2433
Masao Sorai, Xing Lei, Yuji Nishi, Tsuneo Ishido, and Shinsuke Nakao	
Conversion of CO₂ to Value Added Chemicals: Opportunities and Challenges	2487
Arun S. Agarwal, Edward Rode, Narasi Sridhar, and Davion Hill	
Oxy-Fuel Firing Technology for Power Generation	2527
Edward John (Ben) Anthony	
Gasification Technology	2557
Lawrence J. Shadle, Ronald W. Breault, and James Bennett	
Conversion of Syngas to Fuels and Chemicals	2629
Steven S. C. Chuang and Long Zhang	
Chemical Looping Combustion	2647
Edward John (Ben) Anthony	
High Temperature Oxygen Separation Using Dense Ceramic Membranes	2681
Jaka Sunarso, Kun Zhang, and Shaomin Liu	

Part V Climate Change Mitigation: Advanced Technologies	2707
Photocatalytic Water Splitting and Carbon Dioxide Reduction	2709
Nathan I. Hammer, Sarah Sutton, Jared Delcamp, and Jacob D. Graham	
Simultaneous CO₂ and H₂S Sequestration by Electrocatalytic Conversion for Chemical Feedstock Synthesis	2757
Nosa O. Egiebor and Jonathan Mbah	
Power-to-Gas	2775
Michael Sterner	
Reduction of Greenhouse Gas Emissions by Catalytic Processes	2827
Gabriele Centi and Siglinda Perathoner	
Integrated Systems to Reduce Global Warming	2881
Preben Maegaard and Anna Krenz	
Thermoacoustics	2967
Matthew E. Poese	
Hydrogen Production	2995
Qinhui Wang	
Low-Temperature Fuel Cell Technology for Green Energy	3039
Scott A. Gold	
Solid Oxide Fuel Cells	3087
Nigel M. Sammes, Kevin Galloway, Mustafa F. Serincan, Toshio Suzuki, Toshiaki Yamaguchi, Masanobu Awano, and Whitney Colella	
Molten Carbonate Fuel Cells	3113
Takao Watanabe	
Fusion Energy	3139
Hiroshi Yamada	
3rd-Generation Biofuels: Bacteria and Algae as Sustainable Producers and Converters	3173
Maximilian Lackner	
Biopolymers	3211
Maximilian Lackner	
Glossary	3231
Maximilian Lackner	
Index	3297