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Gregory A. Keoleian

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I. Education

Ph.D. (Chemical Engineering) †	1982 - 1987	University of Michigan
M.S.E. (Chemical Engineering)††	1981 - 1982	University of Michigan
B.S. Chemistry	1975 - 1980	University of Michigan
B.S.E. (Chemical Engineering) †††	1975 – 1980	University of Michigan

† Dissertation title: "Elucidation of Mechanisms and Evaluation of Multicomponent Sorption Models for 2,2',4,4'-Tetrachlorobiphenyl, Humic Substances, and Natural Sorbent Systems."

†† Industrial Chemical Safety: interdisciplinary program with the Environmental and Industrial Health Department, School of Public Health.

††† Biochemical engineering specialization.

II. Professional Appointments

2022 -	Co-Director, MI Hydrogen, Office of the Vice President for Research
2011-	Peter M. Wege Professor of Sustainable Systems, University of Michigan
2009 -	Professor, University of Michigan, School for Environment and Sustainability
	Professor, University of Michigan, Civil and Environmental Engineering
2003 - 2009	Assoc. Professor, University of Michigan, School of Natural Resources & Environment
1999 -	Co-Director, Director (2011- 2023) Center for Sustainable Systems based at the University of Michigan: Primary mission is to organize and lead interdisciplinary research and education on the application and development of life cycle based models and sustainability metrics.
1998 - 2003	Associate Research Scientist, University of Michigan, School of Natural Resources and Environment: Research topics include life cycle assessment, life cycle design, industrial ecology, sustainability modeling and metrics.
1998 - 2001	Associate Research Scientist, University of Michigan, College of Engineering, Institute for Environmental Science and Engineering Technology: Developed environmental sustainability undergraduate education program.

1992 - 1998 Assistant Research Scientist, University of Michigan, School of Natural Resources and Environment: Research topics included life cycle assessment, life cycle design, pollution prevention and industrial ecology.

1991 - 1999 Co-founder and Manager, National Pollution Prevention Center for Higher Education based at the University of Michigan: Established through a competitive grant by the US Environmental Protection Agency. Primary mission was to develop and disseminate pollution prevention educational resources to colleges and universities.. Other program activities included internships, professional education, conferences and workshops, and life cycle design research.

1991-1993 Research Fellow, University of Michigan Transportation Research Institute, Office for the Study of Automotive Transportation: Investigated life cycle resource management of automotive plastics. .Member of an interdepartmental consortium (material science, chemical engineering, natural resources, economics, and policy)

1989-1991 Research Fellow, University of Michigan, School of Natural Resources: Modeled the total life-cycle of a product (raw material procurement, manufacture, consumer use, resource recovery, disposal) for comprehensive resource management and environmental impact and risk minimization.

1988 Lecturer and Postdoctoral Research Fellow, University of Michigan, Chemical

(winter term) Engineering Department: Organized an Environmental Seminar (ChE 895) for doctoral students; lectured and arranged speakers from industry and government regulatory agencies.

1985-1987 Research Assistant, University of Michigan, Chemical Engineering Department: Investigated mechanisms for the multicomponent sorption of 2,2',4,4'-tetrachlorobiphenyl with humic acid and natural sorbents, including Lake Michigan sediment.

1983-1984 Teaching Assistant, University of Michigan, Chemical Engineering Department: Instructed undergraduate students in Chemical Engineering Unit Operations I Laboratory (ChE 360).

1980-1981 Research Assistant, Wayne State University, Department of Anatomy: Investigated the protein chemistry of dystrophic skeletal muscle. Isolated, purified and characterized muscle proteins using high voltage paper chromatography, ion exchange and gel filtration chromatography, polyacrylamide gel electrophoresis and amino acid sequencing.

1979 Laboratory Technician, Camp Dresser & McKee, Environmental Consultants:

(summer) Conducted bomb calorimetric measurements of sludge filter cake from primary treatment at the Detroit Sewage Treatment Plant.

III. Funded Research

1. Principal Investigators: G.A. Keoleian and J.W. Bulkley
   Title: *Optimization of Resource Recovery Strategies. I. Model Development*
   Sponsor: Office of Vice President for Research/School of Natural Resources, University of Michigan
   Project Duration: February – September, 1989
   Award: $10,000

2. Principal Investigators: G.A. Keoleian, J.W. Bulkley and R. De Young
   Title: *Research and Documentation for Transfer of Waste Reduction Technologies*
   Sponsor: Michigan Department of Natural Resources, Solid Waste Alternative Program
   Project Duration: May 1990 – June 1991
   Award: $50,000

3. Principal Investigators: G.A. Keoleian and J.W. Bulkley
   Title: *Product Life Cycle Design for Environmental Impact Mitigation and Health Risk Reduction*
   Sponsor: U.S. EPA, Risk Reduction Engineering Laboratory, Cincinnati, OH
   Project Duration: February 1991– July 1994
   Award: $203,395

4. Principal Investigators: M.S. Flynn, B.C. Smith and G.A. Keoleian
   Title: *Plastic Recycling in Automobiles*
   Sponsor: Society of Plastic Industries
   Project Duration: January 1991 – December 1993.
   Award: $70,000

5. Principal Investigators: J.W. Bulkley and G.A. Keoleian
   Title: *EPA Pollution Prevention Center for Curriculum Development and Dissemination*
   Sponsor: U.S. EPA, Office of Toxic Substances
   Project Duration: October 1, 1991 – September 30, 1994.
   Award: $320,000

6. Principal Investigators: G.A. Keoleian and J.W. Bulkley
   Title: *Interdisciplinary Research and Education on Industrial Ecology*
   Sponsor: AT&T Foundation Industrial Ecology Faculty Fellowship Program
   Project Duration: November 10, 1993 – 1995 (two one-year competitive grants).
   Award: $100,000

7. Principal Investigator: G.A. Keoleian
   Title: *Flat Panel Displays: Environmental Assessment and Improvement*
   Sponsor: Optical Imaging Systems/Center for Display Technology and Manufacturing
   Project Duration: July 1994 – December 1994
   Award: $7360

8. Principal Investigators: J.W. Bulkley and G.A. Keoleian
   Title: *National Pollution Prevention Center for Higher Education*
   Sponsor: U.S. EPA, Pollution Prevention Division and Office of Administrator
   Project Duration: October 1, 1994 – September 30, 1996.
   Award: $500,000

9. Principal Investigators: J.W. Bulkley and G.A. Keoleian
   Title: *National Pollution Prevention Center for Higher Education*
   Sponsor: 3M Foundation
   Project Duration: May 1994 – April 1997.
   Award: $240,000

10. Principal Investigators: G.A. Keoleian and J.W. Bulkley
    Title: *Cleaner Products through Life Cycle Design*
    Sponsor: U.S. EPA, National Risk Management Research Laboratory, Cincinnati, OH
    Project Duration: October 6, 1994 – April 30, 1999
    Award: $450,000

11. Principal Investigator: G.A. Keoleian
    Title: *Pollution Prevention Curriculum Development in Chemistry*
    Sponsor: New Jersey Institute of Technology
    Project Duration: October 1, 1994 – June 30, 1995

Award: $12,500

12. Principal Investigator: G.A. Keoleian
Title: *Life Cycle Inventory of a Generic Vehicle*
Sponsor: U.S. Automotive Materials Partnership, U.S. Consortium for Automotive Research (USCAR) and Ecobalance
Project Duration: May 1996 – August 1998
Award (1st): $90,008 (5/17/96 – 12/31/97); Award (2nd): $36,600 (5/17/96 – 8/31/98)

13. Principal Investigators: J.W. Bulkley and G.A. Keoleian
Title: *National Pollution Prevention Center for Higher Education*
Sponsor: Mott Foundation
Project Duration: October 1, 1996 – September 30, 1999
Award: $225,000

14. Principal Investigators: G.A. Keoleian, M.R. Moore, D.L. Mazmanian, and M. Navvab
Title: *Life Cycle Design of Building Integrated Photovoltaics Systems*
Sponsor: NSF/Lucent Technologies
Project Duration: October 1997 – September 1999
Award: $100,000

15. Principal Investigators: J.W. Bulkley and G.A. Keoleian
Title: *Faculty Workshops on Sustainability*
Sponsor: U.S. EPA, Region V
Project Duration: October 1997 – September 1999
Award: $50,998

16. Principal Investigator: G.A. Keoleian
Title: *Environmental Science Grant*
Sponsor: DuPont
Project Duration: 1997/98
Award: $20,000

17. Principal Investigator: G.A. Keoleian
Title: *Environmental Science Grant*
Sponsor: DuPont
Project Duration: 1998/99
Award: $20,000

18. Principal Investigator: G.A. Keoleian
Title: *Environmental Science Grant*
Sponsor: DuPont
Project Duration: 1999/2000
Award: $10,000

19. Principal Investigators: G.A. Keoleian, J.Bean, J.W. Bulkley, M.H. Ross
Title: *Life Cycle Optimization of Vehicle Replacement*
Sponsor: National Science Foundation, Technology for a Sustainable Environment
Project Duration: May 1, 2000 – April 31, 2004.
Award: $444,138

20. Principal Investigator: G.A. Keoleian
    Title: *Life Cycle Modeling and Improvement of the Stonyfield Farm Product Delivery System*
    Sponsor: Stonyfield Farms/Polytainer
    System Studied: Yogurt Packaging (Product Delivery System)
    Project Duration: May 1, 2000 – April 31, 2001
    Award (1st): $20,000; Award (2nd): $12,000

21. Principal Investigator: G.A. Keoleian
    Title: *Application and Refinement of BEES for Enhancing Building Life Cycle Assessments*
    Sponsor: National Institute of Standards and Technology
    Project Duration: September 25, 2000 – September 24, 2001
    Award: $20,000

22. Principal Investigators: M.C. Heller and G.A. Keoleian
    Title: *Life Cycle Assessment of a Willow Agriculture and Biomass Energy Conversion System*
    Sponsor: U.S. Department of Agriculture
    Project Duration: October 1, 2000 – September 30, 2003
    Award: $90,000

23. Principal Investigator: G.A. Keoleian
    Title: *Integration of Lifecycle and Macroeconomic Analysis*
    Sponsor: Argonne National Laboratories
    Project Duration: January 1, 2001 – August 31, 2001; August 15, 2002 – August 14, 2003
    Awards: $20,000 and $24,900

24. Principal Investigators: G.A. Keoleian, J.W. Bulkley, T. Gladwin, W. Pradt Lougee, M.S. Bonn
    Title: *Life Cycle Assessment of E-Publishing and Digital Libraries: Linking Industrial Ecology, Research and Education*
    Sponsor: AT&T Industrial Ecology Fellowship Program
    Project Duration: January 1, 2001 – December 31, 2001
    Award: $25,000

25. Principal Investigator: G.A. Keoleian
    Title: *Critical Evaluation of LEED™ Rating System Credit Distribution Using Life Cycle Assessment*
    Sponsor: National Institute of Standards and Technology
    Project Duration: January 4, 2002 – September 30, 2002
    Award: $30,000

26. Principal Investigators: G.A. Keoleian, J.W. Bulkley, T. Gladwin, W. Pradt Lougee, M.S. Bonn
    Title: *Life Cycle Assessment of E-Publishing and Digital Libraries: Scholarly Books and E-Book Reading Devices*
    Sponsor: AT&T Industrial Ecology Fellowship Program
    Project Duration: January 1, 2002 – December 31, 2002
    Award: $25,000

27. Principal Investigator: G.A. Keoleian
    Title: *Ultra Light Steel Auto Body (ULSAB) Advanced Vehicle Concept LCI Study*
    Sponsor: International Iron and Steel Institute
    Project Duration: April 18, 2002 – May 31, 2003
    Award: $33,580

28. Principal Investigator: G.A. Keoleian
    Title: *LCI National Database Project*
    Sponsor: Ford
    Award: $20,000

29. Principal Investigators: G.A. Keoleian, V. Li, R. Robertson, S. Batterman, S. Kesler, M. Moore
    Title: *Sustainable Infrastructure Materials and Systems: Integration of microstructure tailoring and life cycle analysis of engineered cementitious composites (ECC)*
    Sponsor: National Science Foundation, MUSES (Materials Use: Science, Engineering, and Society), Biocomplexity Program
    Project Duration: September 1, 2002 – August 31, 2003
    Amount: $110,000

30. Principal Investigator: G.A. Keoleian
    Title: *A Practical Application for Measuring the Sustainability of Ben & Jerry's Dairy Suppliers*
    Sponsor: Ben & Jerry's Homemade
    Project Duration: March 2003 to March 2004
    Amount: $20,000

31. Principal Investigators: J. Schwank, A. Atreya, G.A. Keoleian
    Title: *Technology Assessment and Evaluation for the NextEnergy Zone Microgrid System*
    Sponsor: Next Energy
    Project Duration: July 1, 2003 to June 30, 2004
    Amount: $110,000

32. Principal Investigators: L.T. Thompson, G.A. Keoleian J. Schwank
    Title: *Curriculum Development for a Master of Science Degree in Alternative Energy Technology*
    Sponsor: Next Energy
    Project Duration: July 1, 2003 to June 30, 2004
    Amount: $125,475

33. Principal Investigators: G.A. Keoleian, V. Li, S. Batterman, J. Bulkley, G. Helfand, S. Kesler, R. Robertson
    Title: *Sustainable Concrete Infrastructure Materials and Systems: Developing an Integrated Life Cycle Design Framework*
    Sponsor: National Science Foundation, MUSES (Materials Use: Science, Engineering, and Society), Biocomplexity Program
    Project Duration: September 1, 2003 – August 31, 2009
    Amount: $1,670,000

34. Principal Investigators: G.A. Keoleian, F.B. Talbot
    Title: *Aveda's Product Distribution System: A Strategic Assessment of Greenhouse Gas Emissions and Energy Consumption*
    Sponsor: Aveda Corporation
    Project Duration: May 1, 2004 – April 30, 2005
    Amount: $30,000

35. Principal Investigator: G.A. Keoleian
    Title: *State of Michigan Greenhouse Gas Inventory*
    Sponsor: Energy Foundation, DTE Energy Foundation, State of Michigan, Education Foundation of America
    Project Duration: May 1, 2004 – April 31, 2005

Amount: $32,500

36. Principal Investigator: G.A. Keoleian
Title*: Large Scale Solar Photovoltaic Demonstration Project at the University of Michigan*
Sponsor: Wege Foundation, United Solar, Ballard, University of Michigan
Duration: May 1, 2004 – April 31, 2005
Amount: $275,000

37. Principal Investigators: H. Giles, T. Buresh, E. Dueweke, G. Keoleian, F. Lara, P. Papalambros, S. Skerlos,
Title*: Technological Innovations in an Industrially Designed and Manufactured Modular Housing Concept for Low Energy, Prefabricated, Low-Rise, Monocoque, Volumetric Housing Units for Low Income*
Sponsor: National Science Foundation
Duration: September 1, 2005 – August 31, 2008
Amount: $300,000

38. Principal Investigators: G.A. Keoleian, T.P. Lyon, D.G. Brown, J.W. Bulkley, W.S. Currie, T.N. Gladwin, A.J. Hoffman, M.R. Moore, B.G. Rabe, S.J. Skerlos, J.M. Wondolleck
Title*: Alcoa Foundations Conservation and Sustainability Fellowship Program: Enabling Technology for a Sustainable Energy Future Through Interdisciplinary Research and Training*
Sponsor: Alcoa Foundation
Duration: July 29, 2005 – April 30, 2010
Amount: $995,765

39. Principal Investigator: G.A. Keoleian
Title*: Michigan at the Climate Crossroads: Strategies for Guiding the State in a Carbon Constrained World*
Sponsor: National Environmental Trust, Energy Foundation
Duration: October 13, 2005 – February 28, 2007
Amount: $146,500

40. Principal Investigator: G.A. Keoleian
Title*: Life Cycle Modeling and Improvement of United Technologies PureCell™ 200 Power System*
Sponsor: United Technologies Corporation
Duration: January 1, 2006 – June 30, 2006
Amount: $4,740

41. Principal Investigator: G.A. Keoleian
Title*: Life Cycle Assessment for Enhancing Product Environmental Performance at Steelcase*
Sponsor: Steelcase, Inc.
Duration: January 16, 2006 – August 16, 2006
Amount: $30,000

42. Principal Investigators: P. Papalombros, G.Keoleian, F. Feiberg, R. Gonzalez, J. Anderson, S. Skerlos,
Title*: Ford Block M Project*
Sponsor: Ford Motor Company.
Duration: May 1, 2006 – August 31, 2008
Amount: $625,000

43. Principal Investigators: S. Skerlos, G.A. Keoleian, W. McManus, P. Papalambros (University of Michigan); J. Winebrake, J.S. Hawker, S. Rothenberg (RIT); M. DeLucchi, T. Lipman (UC Berkeley), S.

Garcia (Northeastern U.)
Title: *Implications of Greenhouse Gas Policy Instruments on Material Flows: A Life Cycle Approach Integrating Engineering, Public Policy and Market Behavior*
Sponsor: National Science Foundation, MUSES (Materials Use: Science, Engineering, and Society), Biocomplexity Program
Project Duration: September 1, 2006 – August 31, 2011
Amount: $2,000,000

44. Principal Investigators: G.A. Keoleian, M. Lepech
Title*: Integration of LCA Elements into Early-Stage Product Development at Steelcase (Wizards)*
Sponsor: Steelcase
Duration: December 1, 2006 to May 31, 2008
Amount: $50,000

45. Principal Investigator: G.A. Keoleian
Title*: Further Analysis of Energy Security from Clean Energy*
Sponsor: Argonne National Laboratories
Duration: January 1, 2007 – May 31, 2007
Amount: $14,500

46. Principal Investigators: J. Diana, A. Briones, J. Bulkley, G. Keoleian. L. Raskin, S. Skerlos
Title*: Development of Sustainable Shrimp Aquaculture*
Sponsor: Graham Environmental Sustainability Institute
Duration: January 1, 2007 – December 31, 2008
Amount: $198,316

47. Principal Investigators: D. Callaway, M. Fowlie, G.A. Keoleian, T.P. Lyon, M. Moore, S. Skerlos
Title*: Integrating Resource Assessment, Economics and Public Policy to Optimize Renewable Electricity Generation*
Sponsor: Michigan Memorial Phoenix Energy Institute
Duration: February 1, 2007 – May 31, 2009
Amount: $199,683

48. Principal Investigator: G.A. Keoleian
Title*: Charting the Course for Sustainability at Aurora Organic Dairy – Phase 1 Energy and Carbon Footprint Analysis; Phase 2 – Life Cycle Based Sustainability Indicators and Assessment, Phase 3 – Developing a prototype corporate sustainability report for Aurora Organic Dairy*
Sponsor: Aurora Organic Dairy
Duration: December 1, 2007 – April 30, 2011
Amount: $370,493

49. Principal Investigators: G.A. Keoleian and Michael Lepech
Title*: Integration of LCA (Life Cyle Assessment) Elements into Early-Stage Product Development at Steelcase*
Sponsor: Steelcase, Inc.
Duration: December 1, 2006 – May 31, 2008
Amount: $50,000

50. Principal Investigators: G.A. Keoleian and Michael Lepech
Title*: Development of Steelcase Wood Products Manufacturing Division Environmental Performance*
Sponsor: Steelcase, Inc.
Duration: September 1, 2007 – April 30, 2008

Amount: $50,000

51. Principal Investigators: G.A. Keoleian and L. Kostyniuk
Title*: Matching Vehicle and Fleet Capacities with Household Transportation Needs: Evaluating the Potential to Reduce Fuel Consumption and Greenhouse Gas Emissions*
Sponsor: Office of the Vice President for Research, University of Michigan
Duration: January 1, 2008 – December 31, 2009
Amount: $100,000

52. Principal Investigator: G.A. Keoleian
Title*: Renewable Energy Strategies for BHP Billiton*
Sponsor: BHP Billiton
Duration: July 1, 2007 – December 31, 2008
Amount: $14,583

53. Principal Investigators: J. Stein, Mechanical Engineering; Co-PIs: Z. Filipi; G. Keoleian; H. Peng; M. Crow; Participating Investigators: D. Callaway; H. Fathy; C. Simon; J. Sullivan; J. Sun
Title*: A Multi-Scale Design and Control Framework for Dynamically Coupled Sustainable and Resilient Infrastructures, with Application to Vehicle-to-Grid Integration*
Sponsor: NSF Resilient and Sustainable Infrastructure (RESIN) Program
Duration: September 15, 2008 – September 14, 2013
Amount: $2,000,000 (CSS budget = $381,048)

54. Principal Investigators: G. Was, MMPEI; CoPIs: D. Callaway; H. Fathy; I. Hiskens; G. Keoleian; J. Lee; T. Lyon; C. Mi; J. Sullivan; Z. Filipi
Title*: DTE Energy- MPSC PHEV Pilot Project*
Sponsor: Michigan Public Service Commission
Duration: September 1, 2008 – July 31, 2010
Amount: $2,204,076 (CSS budget = $656,988)

55. Principal Investigator: G. Keoleian
Title: *Life Cycle Optimization for Residential Air Conditioning Replacement*
Sponsor: Energy Foundation
Duration: December 1, 2008 – November 30, 2009
Amount: $55,000

56. Principal Investigators: P. Savage, G. Keoleian, A. Matzger, S. Linic, N. Lin, N. Love, H. Wang
Title: *The Science and Engineering of Microalgae Hydrothermal Processing*
Sponsor: NSF EFRI-HyBi
Duration: September 1, 2009 – August 31, 2013
Amount: $1,998,152

57. Principal Investigators: O. Jolliet, G. Keoleian,
Title: *US Fluid Milk beyond Carbon LCA Study*
Sponsor: Dairy Management Inc. (DMI)
Duration: February 1, 2010 – April 30, 2012
Amount: $600,000

58. Principal Investigators: L. Raskin, J. Diana, G. Keoleian
Title: *Improving the Environmental Sustainability of Shrimp Aquaculture Systems through Microbial Resource Management*
Sponsor: NSF

Duration: March 15, 2010 – February 28, 2013
Amount: $ 310,053

59. Principal Investigators: H. Peng (Center Director), J. Ni (Deputy) Thrust Leaders: G. Keoleian, D. Manley, I. Hiskens, Ian, A. Violi, G. Rizzoni, D. Siegel, K. Saitou
Title: *Clean Energy Research Center, Clean Vehicles Consortium*
Sponsor: DOE
Duration: October 1, 2010 - August 31, 2016
Amount: $29,797,185

60. Principal Investigators: G. Keoleian, S. Miller
Title: *Update Material Production Modules: GREET 2Model*
Sponsor: Argonne National Lab
Duration: March 15, 2010 – September 30, 2011
Amount: $100,000

61. Principal Investigators: J. Kelly, M.R. Moore, G.A. Keoleian, S. Adlerstein-Gonzalez
Title: *Advancing Offshore Wind Power Siting through Multi-criteria Assessment Integration*
Sponsor: NSF
Duration: 9/1/2012 – 8/31/2016
Amount: $299,933

62. Principal Investigators: L. Thompson, M.S. Sanford, R.F. Savinell, G.A. Keoleian
Title: *Non-Aqueous Redox Flow Battery Chemistries for Sustainable Energy Storage*
Sponsor: NSF Sustainable Energy Pathways
Duration: 9/15/2012 to 8/31/2017
Amount: $1,750,000

63. Principal Investigators: G.A. Keoleian, C. Kim, T. Wallington, E. Lee, D. Mielewski
Title: *Sustainable Materials Selection Tool: Life Cycle Assessment of Natural Fibers For Auto Applications*
Sponsor: Ford Motor Company
Duration: 1/1/2013-12/31/2014
Amount: $96,690

64. Principal Investigators: O. Jolliet, G.A. Keoleian, M.C. Heller, V. Fulgoni, III
Title: *Nutritional benefits and environmental performance of dairy products*
Sponsor: Dairy Research Institute
Duration: 6/1/2013 - 2/28/2014
Amount: $135,000

65. Principal Investigators: J. Stein, J. Levine, I. Hiskens, G.A. Keoleian, S. Parthasarathy, O. Wu, J. Kelly
Title: *Sustainable Transportation for a 3rd Century: An Interdisciplinary Approach to Addressing the Last Mile Problem for Enhanced Accessibility*
Sponsor: University of Michigan Global Challenges for a Third Century program
Duration: 7/1/2013 to 6/30/2014
Amount: $299,878

66. Principal Investigators: G.A. Keoleian, J. Stein, L. Kostyniuk, T. Ersal, R. DeKleine
Title: *"Road Map of Autonomous Vehicle Deployment Priorities in Ann Arbor: Travel Demand, Vehicle Design and Sustainability Performance"*
Sponsor: University of Michigan Mobility Transformation Center

Duration: 5/1/2014 to 4/30/2016
Amount: $100,000

67. Principal Investigators: G.A. Keoleian, M.C. Heller,
Title: *"Life Cycle Assessment of Food Packaging and Waste"*
Sponsor: Dow Chemical Company
Duration: 7/1/2014- 12/31/2015
Amount: $100,000

68. Principal Investigators: G.A. Keoleian, M.C. Heller, S.E. Selke
Title: *"Optimizing the Environmental Performance of Food Product-Package Systems: A life Cycle Assessment of the Trade-offs Between Packaging Design and Food Waste"*
Sponsor: Center for Packaging Innovation and Sustainability (Michigan State University)
Duration: 8/1/2014 - 7/31/2017
Amount: $239,107

69. Principal Investigators: A. Taub, M. Collette, M. Banu, N. Vlahopoulos, J. Allison, G.A. Keoleian, R. Kapuscinski
Title: *"University of Michigan's Technical Management of ALMMII (American Lightweight Materials Manufacturing Innovation Institute)"*
Sponsor: Department of the Navy
Duration: 2/21/2014 - 2/21/2019
Amount: $2,178,713 (initial UM award; total Institute budget $148 million)

70. Principal Investigators: D. Rose, L. Bazzano, M.C. Heller, P. Hutchison, G.A. Keoleian
Title: *"Linking Health and Environmental Outcomes to Dietary Behaviours in the United States"*
Sponsor: Wellcome Trust, Tulane University (UM subcontract)
Duration: 10/1/2015 to 8/31/2017
Amount: $89,566 (UM subcontract)

71. Principal Investigators: M.C. Heller, G.A. Keoleian
Title: *"Category-Level Product Environmental Footprints of Foods"*
Sponsor: Oregon Department of Environmental Quality
Duration: 12/01/2015 - 9/30/2016
Amount: $74,537

72. Principal Investigators: G.A. Keoleian, J. Sullivan, G. Lewis
Title: *"LIFT Core Life Cycle Assessment"*
Sponsor: American Lightweight Materials Manufacturing Innovation Institute
Duration: 6/01/2016 - 2/1/2019
Amount: $674,184

73. Principal Investigators: G. Keoleian
Title: Life Cycle Analyses of Different Fuel Options for United Airlines' Baggage Tractors and Belt Loaders
Sponsor: United Airlines
Duration: May 1, 2016 - April 30, 2017
Amount: $10,000

74. Principal Investigators: G.A. Keoleian, R. DeKleine, T. Wallington
Title: *Evaluating the Sustainability and Environmental Benefits of Autonomous Vehicles*
Sponsor: Ford Motor Company

Duration: 1/1/2017-12/31/2018
Amount: $215,795

75. Principal Investigators: G. Keoleian
Title: CERC-CVC (*Clean Energy Research Center, Clean Vehicles Consortium)* 2.0 Thrust Area: Systems Assessment and Best Practices
Sponsor: DOE
Duration: January 6, 2017 - September 30, 2017
Amount: $45,000

76. Principal Investigators: M. Heller, G. Keoleian
Title: A Comprehensive Comparison of Plant-Based and Animal-Based Protein Sources: Beyond Meat's Beyond Burger Life Cycle Assessment
Sponsor: Savage River Inc.
Duration: February 1, 2017 - January 31, 2018
Amount: $76,668

77. Principal Investigators: S. Skerlos, G. Keoleian, N. Love
Title: Comparative Life Cycle Assessment of Urine Derived Fertilizer
Sponsor: Water Environment & Reuse Foundation (WE&RF)
Duration: October 31, 2017 – June 30, 2018
Amount: $50,000

78. Principal Investigators: G. Keoleian, M. Xu
Title: Travel Behavior Changes and Sustainability Implications of CAV Fleet Deployment
Sponsor: Ford Motor Company
Duration: July 1, 2018 – December 31, 2019
Amount: $150,000

79. Principal Investigators: G. Keoleian, M. Arbabzadeh, G. Lewis
Title: Green Principles for Responsible Battery Management in Mobile Applications
Sponsor: Responsible Battery Coalition
Duration: May 1, 2018 - Aug 31, 2018
Amount: $50,000

80. Principal Investigators: G. Keoleian
Title: Whirlpool Masters Thesis Project
Sponsor: Whirlpool Corporation
Duration: May 1, 2018 - Aug 31, 2019
Amount: $20,999

81. Principal Investigators: G. Keoleian
Title: Life Cycle Assessment of Automated Vehicle Sensors
Sponsor: Ford Motor Company
Duration: May 1, 2017 – April 30, 2018
Amount: $15,000

82. Principal Investigators: M. Heller, G. Keoleian, L. Hoey
Title: Navigating Local and Sustainable Foods
Sponsor: Graham Catalyst
Duration: January 1, 2018 – April 30, 2019
Amount: $9,950

83. Principal Investigators: G. Keoleian
Title: Life Cycle Assessment of Weight Reduction Scenarios for TARDEC
Sponsor: American Lightweight Materials Manufacturing Innovation Institute
Duration: July 26, 2018 – February 1, 2019
Amount: $102,955

84. Principal Investigators: G. Keoleian
Title: SEAS Master's Project 2018-19 Ford Motor Company
Sponsor: Ford Motor Company
Duration: December 1, 2017 – June 30, 2019
Amount: $5,000

85. Principal Investigators: G. Keoleian
Title: Sustainable Systems Internship Program
Sponsor: Wege Foundation
Duration: May 1, 2018 – April 30, 2021
Amount: $48,000

86. Principal Investigators: G. Keoleian
Title: CERC-CVC (*Clean Energy Research Center, Clean Vehicles Consortium)* 2.0 Thrust Area: LCA of Connected and Automated Vehicles
Sponsor: DOE Argonne National Lab
Duration: October 1, 2017 - December 31, 2019
Amount: $116,647

87. Principal Investigators: I. Easton, G. Keoleian
Title: Thermal Modification of Blue Stained, Fire Salvaged Timber
Sponsor: USDA Wood Education and Resource Center (WERC)
Duration: June 1, 2018 – August 20, 2023
Amount: $81,998

88. Principal Investigators: G. Keoleian
Title: Analysis for the Supply Chain of Major Automotive Materials
Sponsor: DOE Argonne National Lab
Duration: September 18, 2018 – September 12, 2019
Amount: $81,998

89. Principal Investigators: G. Keoleian, M. Arbabzadeh, G. Lewis
Title: Strategies to Limit Degradation and Maximize Battery Service
Sponsor: Responsible Battery Coalition
Duration: February 1, 2019 - December 31, 2019
Amount: $148,859

90. Principal Investigators: G. Keoleian
Title: Amazon Long Haul Trucking Energy Systems Analysis
Sponsor: Amazon.com, Inc.
Duration: February 1, 2019 - December 31, 2019
Amount: $21,496

91. Principal Investigators: G. Keoleian, S. Miller
Title: Morgan Stanley Plastics Waste Reduction Research and Fellowship

Sponsor: Morgan Stanley Services Group, Inc.
Duration: April 15, 2019 - June 30, 2022
Amount: $360,000

92. Principal Investigators: V. Sick, M. Banu, J. Fay, G. Keoleian, N. Kotov, V. Li, S. Miller, A. Taub, R. Yang
Title: The Global Co2 Initiative: Transforming a Liability into an Opportunity
Sponsor: Michigan Engineering Blue Sky Initiative
Duration: September 1, 2018 – August 31, 2021
Amount: $2,500,000

93. Principal Investigators: K. Velikov, M. del Campo, G. Keoleian, G. Lewis, B. Meenu
Title: Design Ecologies of Glass
Sponsor: Guardian Glass, LLC
Duration: 5/1/2019 - 8/31/2020
Amount: $18,614 (CSS budget)

94. Principal Investigators: G. Keoleian
Title: Sustainability Assessment of Automated Urban Delivery Systems
Sponsor: Ford Motor Company
Duration: 1/1/2020 - 12/31/2021
Amount: $199,430

95. Principal Investigators: G. Keoleian
Title: CERC-CVC (*Clean Energy Research Center, Clean Vehicles Consortium)* 2.0 Thrust Area: Automobile Circular Economy Framework, Metrics, and Application
Sponsor: DOE Argonne National Lab
Duration: January 1, 2020 - December 31, 2020
Amount: $58,439

96. Principal Investigators: G. Keoleian, M. Craig, P. Vaishnav, G. Lewis
Title: *Guidance for Decarbonization and Sustainable Operation of Battery Systems in Electrified Delivery Vehicles*
Sponsor: Responsible Battery Coalition
Duration: June 1, 2020 - June 30, 2021
Amount: $150,000

97. Principal Investigators: M. Heller, G. Keoleian
Title: *Life Cycle Assessment of a High-Protein Ramen*
Sponsor: Borealis Foods
Duration: January 1, 2021 - December 31, 2021
Amount: $94,522

98. Principal Investigators: G. Keoleian, P. Vaishnav
Title: *Sustainability of electrified light-duty trucks*
Sponsor: Ford Motor Company
Duration: January 1, 2021 - December 31, 2022
Amount: $210,000

99. Principal Investigators: G. Keoleian, D. Cooper
Title: *Iron Castings Life Cycle Analysis*
Sponsors: American Foundrymen's Society and Ductile Iron Society

Duration: January 1, 2021 - December 31, 2022
Amount: $100,000

100. Principal Investigators: D. Cooper, J. Allison, G. Keoleian
Title: *Material and Vehicle design for High-Value Recycling*
Sponsor: Sustainable Manufacturing Innovation Alliance Corp. (SMIA)
Duration: January 1, 2022 - December 31, 2023
Amount: $471,814

101. Principal Investigators: G. Lewis, G. Keoleian,
Title: *Life cycle carbon footprint analysis and improvement strategies for US maple syrup production*
Sponsor: US Department of Agriculture. (USDA)
Duration: Sep 30, 2022-Sep 29, 2025
Amount: $500,000

102. Principal Investigators: T. Allen, G. Keoleian
Title: MI Hydrogen (https://research.umich.edu/mi-hydrogen/)
Sponsor: University of Michigan Office of the Vice President for Research
Duration: December 1, 2022 - November 31, 2025
Amount: $1,500,000

103. Principal Investigators: G. Keoleian
Title: Planning a Hydrogen Ecosystem for the State of Michigan: Demand Analysis and Carbon Reduction Potential
Sponsor: University of Michigan School for Environment and Sustainability (Theme Award)
Duration: November 1, 2022 - July 31, 2024
Amount: $80,000

104. Principal Investigators: G. Keoleian
Title: *Life Cycle Assessment of Fuel Cell and Battery Electric Medium/Heavy Vehicles*
Sponsor: Ford Motor Company
Duration: June 1, 2023 – May 31, 2025
Amount: $199,999.54

105. Principal Investigators: G. Keoleian
Title: *Comparative Life Cycle GHG Emissions Analysis of PHEVs and BEVs for Light Duty Truck Applications*
Sponsor: University of Michigan Electric Vehicle Center
Duration: September 1, 2023 - August 31, 2024
Amount: $100,000

106. Principal Investigators: G. Keoleian, S. Kesler, J. Newell, P. Vaishnav
Title: *Life cycle assessment of EV battery materials*
Sponsor: Ford Motor Company
Duration: May 1, 2024 - April 30, 2026
Amount: $199,843

107. Principal Investigators: G. Keoleian
Title: *Framework for Sustainable Battery Management*
Sponsor: Responsible Battery Coalition
Duration: October 1, 2024 - September 30, 2025
Amount: $106,949

108. Principal Investigators: T. McKenney, G. Keoleian
Title: *Michigan Maritime Strategy*
Sponsor: State of Michigan, Department of Environment, Great Lakes, and Energy
Duration: October 1, 2024 - September 30, 2025
Amount: $199,993

109. Principal Investigators: G. Keoleian
Title: *Hydrogen Ecosystem Planning in Southeast Michigan*
Sponsor: Electric Power Research Institute
Duration: May 1, 2025 – April 30, 2026
Amount: $46,600

IV. Publications

Journal Articles

Wallington, T. J., M. Woody, G. M. Lewis, G.A. Keoleian, E.J. Adler, J. R. R. A. Martins, M.D. Collette, "Hydrogen as a sustainable transportation fuel", *Renewable and Sustainable Energy Reviews* (2025) 217: 115725, https://doi.org/10.1016/j.rser.2025.115725

Zhu, Y., G.A. Keoleian, D.R. Cooper, "The role of hydrogen in decarbonizing U.S. industry: A review", *Renewable and Sustainable Energy Reviews* (2025) 214: 115392. https://doi.org/10.1016/j.rser.2025.115392

Christian H., G. Keoleian, R. Rasool, "Scaling up reusable container systems through city-wide centralized collection and washing", *Resources, Conservation and Recycling* (2025) Volume 215. Published online Feb 1. https://doi.org/10.1016/j.resconrec.2025.108154

Checkoway, S.M. G.M. Lewis, and G.A. Keoleian, "Carbon and Energy Footprinting across Archetypes for U.S. Maple Syrup Production", *Environmental Science & Technology* (2024) 58(49): 21499–21509. https://doi.org/10.1021/acs.est.4c03067

Wallington, T. J., M. Woody, G. M. Lewis, G.A. Keoleian, E.J. Adler, J. R. R. A. Martins, M.D. Collette, "Green hydrogen pathways, energy efficiencies, and intensities for ground, air, and marine transportation" *Joule* (2024) 8(8): 2190-2207. https://doi.org/10.1016/j.joule.2024.07.012

Woody, M., S. Stolper, P. Vaishnav, G.A. Keoleian, "Vehicle scrappage policies for transportation decarbonization" *Environ. Research: Energy* (2024) 1(3): 033002. https://doi.org/10.1088/2753-3751/ad63aa

Ravikumar, D., G.A. Keoleian, J. Walzberg, G. Heath, M.C. Heller, "Advancing environmental assessment of the circular economy: Challenges and opportunities" *Resources, Conservation & Recycling Advances* (2024) 21: 200203, https://doi.org/10.1016/j.rcradv.2024.200203.

Woody, M., S.A. Adderly, R.Bohra, G.A.Keoleian "Electric and gasoline vehicle total cost of ownership across US cities. *Journal of Industrial Ecology*, (2024) 28(2): 194-215. https://doi.org/10.1111/jiec.13463

Liu, L., G. Keoleian, G. Lewis. "Life cycle cost analysis of LED retrofit and luminaire replacements for four-foot T8 troffers. *Lighting Research & Technology*." (2023) 1-18. https://doi.org/10.1177/14771535231207810

Zhu, Y., G.A. Keoleian, and D.R. Cooper. "Ductile Iron Energy Use and Greenhouse Gas Emissions: Excel-Based Parametric Model Development and Application." *American Foundry Society Transactions* 2023 (23-014).

Woody, M., Keoleian, G.A. & Vaishnav, P. "Decarbonization potential of electrifying 50% of U.S. light-duty vehicle sales by 2030". *Nat Commun* (2023) 14, 7077. https://doi.org/10.1038/s41467-023-42893-0

Vega-Perkins, J., J.P. Newell, G.A. Keoleian. "Mapping electric vehicle impacts: greenhouse gas emissions, fuel costs, and energy justice in the United States." *Environmental Research Letters*, (2023)18, 014027 https://doi.org/10.1088/1748-9326/aca4e6

Hitt, C., J. Douglas, and G.A. Keoleian. "Parametric life cycle assessment modeling of reusable and single-use restaurant food container systems." *Resources, Conservation and Recycling*, (2023) 190, 106862 https://doi.org/10.1016/j.resconrec.2022.106862

Zhu, Y., G.A. Keoleian, D.R. Cooper. A parametric life cycle assessment model for ductile cast iron components. *Resources, Conservation and Recycling*, (2023) 189: 106729, doi.org/10.1016/j.resconrec.2022.106729

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Kemp, N.J., Luyao Li, G.A. Keoleian, H.C. Kim, T.J. Wallington, and R. De Kleine. 2022. Carbon Footprint of Alternative Grocery Shopping and Transportation Options from Retail Distribution Centers to Customer. *Environmental Sciences and Technology*, (2022) 56(16): 11798–11806. https://doi.org/10.1021/acs.est.2c02050.

Lewis, G.M., I. Eastin and G.A. Keoleian. (2022). Life Cycle Carbon Accounting of Thermally Modified Wood in the US Inland Northwest. ACS Sustainable Chemistry & Engineering (2022) 10 (31): 10252–10259. https://doi.org/10.1021/acssuschemeng.2c02023

He, X., Kim, H., Ma, R., Wallington, T., G.A. Keoleian, R. De Kleine, S. Zhang, Y. Wu, "Energy Consumption Simulation for Connected and Automated Vehicles: Eco-driving Benefits versus Automation Loads," *SAE Intl. J CAV* (2023) 6(1), https://doi.org/10.4271/12-06-01-0002.

Dong, Y, S.A. Miller, and G.A. Keoleian. "Estimating the greenhouse gas emissions of cold chain infrastructure in China from 2021 to 2060." *Sustainable Production and Consumption*, 31, 546-556.

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Ravikumar, D., G.A. Keoleian, S.A. Miller, and V. Sick, "Assessing the Relative Climate Impact of Carbon Utilization for Concrete, Chemical, and Mineral Production" *Environmental Science & Technology* (2021) 55, 17, 12019–12031, DOI: 10.1021/acs.est.1c01109.

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U.S."*Proceedings of the 6th International Conference on LCA in the Agri-Food Sector*, Zurich, November 12–14, 2008.

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Li, V. C., S. Qian, H. Zhang and G. A. Keoleian, "Sustainable infrastructure with durable fibre concrete material", Keynote paper *for Congress 2008 - Concrete: Construction's Sustainable Option,* Dundee Scotland 8-10 July 2008.

Kim, H-J., C. McMillan, G. Keoleian, S.J. Skerlos, "Model of Cost and Mass for Compact Sized Lightweight Automobiles using Aluminum & High Strength Steel", *Proceedings of the 2008 IEEE International Symposium on Electronics and the Environment*, San Francisco, USA, May 19th-21st (DOI: 10.1109/ISEE.2008.4562897) p. 1-6.

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Zhang, H., G.A. Keoleian, and M.D. Lepech, "An integrated life cycle assessment and life cycle analysis model for pavement overlay systems" in *Life-Cycle Civil Engineering*, F. Biondini and D.M. Frangopol, Eds., Proceedings of the First International Symposium of the International Association for Life Cycle Civil Engineering, Varenna, Lake Como, Italy, June 11-14, 2008, pp. 907-912.

Keoleian, G., A. Kendall, M. Lepech and V. Li. "Guiding the design and application of new materials for enhancing sustainability performance: Framework and infrastructure application" *Mater. Res. Soc. Symp. Proc.*, Materials Research Society (2006) Vol. 895, 0895-G06-01.1-01.13.

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M. Lepech and V.C. Li and G.A. Keoleian, "Sustainable Infrastructure Material Design" in Advances in Life-Cycle Cost Analysis and Design of Civil Infrastructure Systems A.S. Nowak, DM. Frangopol (ed.) Proceedings of the 4th International Workshop on Life-Cycle Costs Analysis and Design of Civil Infrastructure Systems, Cocoa Beach, Florida, May 8-11, 2005, p. 83-90.

Spitzley, D.V., D.E. Grande, H.C. Kim, G.A. Keoleian "Life Cycle Economics and Replacement Optimization for a Generic U.S. Family Sedan" SAE Technical Paper Series 2005-01-1553, SAE International, Warrendale, PA, 1-8.

Keoleian, G.A. and. Heller, M.C. "Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System" *Proceedings of the 4th International Conference on: Life Cycle Assessment in the Agri-Food Sector*, Bygholm,, Denmark, October 6-8, 2003. Niels Halberg (ed.) Danish Institute of Agricultural Sciences (DIAS) report, Animal Husbandry no. 61, October 2004, p. 190-198.

V.C. Li, M. Lepech, S. Wang, M. Weimann, G. Keoleian "Development of Green Engineered Cementitious Composites for Sustainable Infrastructure Systems" *Proceedings of the International Workshop on Sustainable Development & Concrete Technology* Beijing, China, May 20-21, 2004., Center for Transportation Research and Education, Iowa State University. p. 181-191.

Smith, V.M., G.A. Keoleian, R.L. Williams, S.T. Chubbs. "Life Cycle Inventory Study of the UltraLight Steel Auto Body - Advanced Vehicle Concepts Vehicle Product System." *Proceedings of the 2003 International Body Engineering Conference*. Society of Automotive Engineers of Japan (JSAE): Chiba, Japan JSAE 20037117; SAE 2003-01-2838.

Kozak, G. and G.A. Keoleian, "Printed Scholarly Books and E-Book Reading Devices: A Comparative Life Cycle Assessment of Two Book Options." *Proceedings of IEEE International Symposium on Electronics and Environment,* Boston, 19-22 May 2003: 291-296.

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Gard, D.L. and G.A. Keoleian, "A Life Cycle Energy Comparison of Two Journal Collections: Electronic and Traditional." *Proceedings of IEEE International Symposium on Electronics and Environment,* San Francisco, 6-9 May 2002: 49-52.

Heller, M., G. Keoleian, M. Mann, T. Volk "Life Cycle Assessment of a Willow Agriculture and Biomass Energy Conversion System: Methodology and Preliminary Results" *Proceedings of the 5th International Biomass Conference of the Americas,* December 17-21, 2001. (abstract issued as a CD-ROM; conference cancelled due to 9/11)

Vernon, M.K., L.N. Garvin, N. S. Henry, G.A. Keoleian "Community Materials Flow Analysis: A Case Study of Ann Arbor, Michigan" *Third International Workshop on Environmental Systems Analysis and Management*, Vienna, Austria, September 21-23, 2001, The Institute for Water Quality and Wastes Management, TU Vienna: pp. 25-30.

Kim, H.C., G.A. Keoleian, S. Spatari, and J.W. Bulkley "Optimizing Vehicle Life Using Life Cycle Energy Analysis and Dynamic Replacement Modeling" *Proceedings of the 2000 Total Life Cycle Conference, P-353*, SAE International, Warrendale, PA, (2000) Paper No. 2000-01-1499: 241-250.

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Keoleian, G.A. and J.S. McDaniel, "Life Cycle Assessment and Design of Instrument Panels: A Common Sense Approach" SAE Technical Paper Series 970695, Reprinted from: *Design for Environmentally Safe Automotive Products and Processes (SP-1263)*. SAE International, Warrendale, PA, 1997: 75-86.

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Kar, K. and G.A. Keoleian, "Application of Life Cycle Design to an Intake Manifold." SAE Technical Paper Series 960410, SAE International, Warrendale, PA, 1996: 1-16.

Keoleian, G.A. "Life Cycle Design Criteria for Engine Oil Filters: AlliedSignal Case Study." SAE Technical Paper Series 951849, Reprinted from: *Proceedings of the 1995 Total Life Cycle Conference*, Vienna, Austria, October 16-19, 1995: 109-119.

Koch, J. and G.A. Keoleian "Evaluating Environmental Performance: A Case Study in the Flat-Panel Display Industry." *Proceedings of IEEE International Symposium on Electronics and Environment,* Orlando, 6-8 May 1995: 158-165.

Keoleian, G.A., W.J. Glantschnig, and W. McCann. "Life Cycle Design: AT&T Demonstration Project." *Proceedings of IEEE International Symposium on Electronics and the Environment,* San Francisco, 2-4 May 1994: 135A-135H.

Other Technical Reports

Heller, M. and G.A. Keoleian. (2021) "Chef Woo High-Protein Ramen Noodle Life Cycle Assessment: A Detailed Comparison with Animal-Based Protein Sources." CSS Report to Borealis Foods Inc., University of Michigan: Ann Arbor 1-43.

Keoleian, G., G. Lewis, N. Kemp, N. Hua, S. Hilton. (2021) Carbon Accounting Modeling Project: A Report Developed for and Supported by the U-M President's Commission on Carbon Neutrality, Michigan Publishing, 83 pages, https://doi.org/10.3998/mpub.12245679

Heller, M., G. Keoleian, and D. Rose. (2020) "Implications of Future US Diet Scenarios on Greenhouse Gas Emissions." CSS Report, University of Michigan: Ann Arbor 1-24.

Hua, N., G.A. Keoleian, and G.M. Lewis. (2019) "Regional-level analysis for the material flows and process energy demands of aluminum and steel in the American automotive industry." CSS Report, University of Michigan: Ann Arbor 1-122.

Hilton, Stephen, Bowen Zhou, Glen T. Daigger, Gregory Keoleian, Nancy Love, and Steven Skerlos. (2018) "Life Cycle Assessment of Urine Diversion Wastewater Treatment: Results and Software Tool." Water Research Foundation (WRF) project number STAR-Na1R14/4899, 1-83

Heller, Martin C. and Gregory A. Keoleian. (2018) "Beyond Meat's Beyond Burger Life Cycle Assessment: A detailed comparison between a plant-based and an animal-based protein source." CSS Report, University of Michigan: Ann Arbor 1-38.

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Spitzley, D.V., T. Gruhl, D. Grande, J. Bean and G.A. Keoleian. *Automotive Life Cycle Economics and Replacement Intervals* Center for Sustainable Systems, Report No. CSS04-01, University of Michigan, Ann Arbor, Michigan, January 7, 2004. 46 pp.

Spitzley, D.V. and G.A. Keoleian *Life Cycle Environmental And Economic Assessment Of Willow Biomass Electricity: A Comparison With Other Renewable And Non-Renewable Sources* Center for Sustainable Systems, Report No. CSS04-05, University of Michigan, Ann Arbor, Michigan, March 25, 2004.72 pp.

Scheuer, C.W. and G.A. Keoleian *Evaluation of LEED Using Life Cycle Assessment Methods* NIST GCR 02-836 National Institute of Standards and Technology, September 2002, 157 pages.

Smith, V.M. and G. Keoleian *Evaluation of Alternative Closure Options for Stonyfield Farm Product Delivery Systems*, Center for Sustainable Systems, Report No. CSS02-02, University of Michigan, Ann Arbor, Michigan, May 1, 2002.

Staudinger, J. and G.A. Keoleian *Management of End-of-Life Vehicles (ELVs) in the US.* Center for Sustainable Systems, Report No. CSS01-01 University of Michigan, Ann Arbor, Michigan, March, 2001, 67 pp.

Heller, M.C. and G.A. Keoleian *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System* Center for Sustainable Systems, University of Michigan: Ann Arbor, Report No. 2000-4 December, 2000.

Lewis, G.McD., G.A. Keoleian, M.R. Moore, D.L. Mazmanian, and M. Navvab, *PV-BILD: A Life Cycle Environmental and Economic Assessment Tool for Building-Integrated Photovoltaic Installations.* Project Report for National Science Foundation / Lucent Technologies Industrial Ecology Grant BES-9727268, December 20, 1999.

Keoleian, G.A., et. al., "Waste Reduction in Furniture Manufacture: Case Study Report of Steelcase Inc.," Office of Waste Reduction Services, State of Michigan Departments of Natural Resources and Commerce, April 1991, 32 pages.

Keoleian, G.A., et. al., "Waste Reduction in Food Retail: Case Study Report of the People's Food Co-op," Office of Waste Reduction Services, State of Michigan Departments of Natural Resources and Commerce, April 1991, 39 pages.

Keoleian, G.A., et. al., "Waste Reduction in the Hospital Sector: Case Study Report of McPherson Hospital," Office of Waste Reduction Services, State of Michigan Departments of Natural Resources and Commerce, April 1991, 29 pages.

Keoleian, G.A., et. al., "Waste Reduction in Children's Day Care: Case Study Report of Gretchen's," Office of Waste Reduction Services, State of Michigan Departments of Natural Resources and Commerce, April 1991, 27 pages.

Keoleian, G.A., et. al., "Waste Reduction in Department Store Retail: Case Study Report of Hudson's," Office of Waste Reduction Services, State of Michigan Departments of Natural Resources and Commerce, April 1991, 28 pages.

Keoleian, G.A, et. al., "Waste Reduction Case Studies: Final Project Report," Office of Waste Reduction Services, State of Michigan Departments of Natural Resources and Commerce, April 1991, 45 pages.

V. Invited Presentations at International and National Conferences and Workshops (partial list)

“Life cycle analysis of Battery Electric Vehicles: Decarbonizing light duty vehicles” Americas Mobility of the Future, Monterrey Mexico - Jun 7, 2023.

“Circular Economy for the Automobile Framework, Metrics, Strategies and Insights” U.S.-China Clean Energy Research Center-Clean Vehicle Consortium 2020-2021 Annual Meeting, March 15, 2021.

“Circular Economy of the Automobile: Framework, Metrics, Strategies and Insights” NIST Circular Economy Workshop, January 27, 2020.

“Lightweight Innovations for Tomorrow (LIFT): Fuel saving potentials for heavy-duty vehicles, trains, ships, and aircraft” Material Trends in Transport Workshop, International Energy Agency, Paris, March 8, 2018.

“Drivers for sustainable systems: mobility, buildings, and food.” First Annual Trottier Symposium on Sustainable Engineering, Energy and Design, McGill University, Montreal, March 18, 2014.

“The Material Energy Nexus and Design Decisions for Product Life Cycle Sustainability” Material Research Society Fall Meeting, Symposium G: Materials as Tools for Sustainability, Boston, November 25-30, 2012.

“Life Cycle Models For Engineering Sustainable Buildings, Transportation, and Infrastructure Systems” *Engineering Sustainability 2011: Innovation and the Triple Bottom Line* University of Pittsburgh/Carnegie Mellow University, Pittsburgh, PA. April 10-12, 2011.

“Life Cycle Optimization Methods for Enhancing the Sustainability of Design and Policy Decisions” *First International Congress on Sustainability Science and Engineering*, AIChE Institute for Sustainability, August 9-12, 2009 Cincinnati.

“Life Cycle Modeling of Photovoltaics and Biomass Energy Systems” *ESF-NSF Workshop on the applications of Adaptive Structures and Materials to Sustainable Energy and the Built Environment* Pizay, France, October 15-17, 2008.

"Life Cycle Models and Metrics: the Sustainability Compass for Energy Systems, Products, & Technology" Energy Symposium, University of Michigan, February 14, 2007.

"Life Cycle Models and Metrics: the Sustainability Compass for Energy Systems, Products, & Technology" Wrigley Lecture, Arizona State University, February 1, 2007.

"Enabling Technology for a Sustainable Energy Future" Alcoa Foundation's Conservation and Sustainability Program Advancing Sustainability Conference, Brussels, November 29 – December 3, 2006.

"Life Cycle Models for Enhancing Building Sustainability" *Ecologies of Construction Symposium*, MIT, Boston, MA. April 2006.

"Copper Life Cycle Management & Sustainability" *Global Market Trends Conference* Copper Development Association, Chicago, September 28, 2005.

"Guiding the design and application of new materials for enhancing sustainability performance: Framework and infrastructure application" *Mater. Res. Soc. Fall Meeting Symp. G Life-Cycle Analysis Tools for "Green" Materials and Process Selection* Boston, MA. November 30 – December 2, 2005.

"Life cycle model for evaluating the sustainability of concrete infrastructure systems." *International Conference on Structural Safety and Reliability (ICOSSAR) 2005 Proceedings.* Rome, Italy 2005.

"Life –Cycle Cost Model for Evaluating the Sustainability of Bridge Decks" *4th International Workshop on Life-Cycle Costs Analysis and Design of Civil Infrastructure Systems*, Cocoa Beach, Florida, May 8-11, 2005.

Keoleian, G.A., Life Cycle Modeling and Metrics for Guiding Progress Towards Sustainability 6th International Conference on EcoBalance – Tsukuba, Japan, Oct 23 – 27, 2004.

"Environmentally Benign Manufacturing, Industrial Ecology and Pollution Prevention" Keynote at EPA and NSF Technology for Sustainable Environment (TSE) Grantees Meeting, Washington D.C., May 17-19, 2004.

Keoleian, G.A. and. Heller, M.C. Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System *Proceedings of the 4th International Conference on: Life Cycle Assessment in the Agri-Food Sector*, Horsens, Denmark, October 6-8, 2003.

"Industrial Ecology" Mauritius Environmental Resource Management and Industrial Development (MERMAID) 2001 Workshop, University of Mauritius and Mauritius Research Council, Reduit, Mauritius, June 25-29, 2001.

"Sustainable Systems: Framework and Application" Global Seminar: Global Sustainability Environment and Food Systems, Cornell University, keynote at Regional Meeting, Chicago, Illinois, June 1, 2001.

"Application of LCA in Life Cycle Design: Two Demonstration Projects" Helsinki Symposium on Industrial Ecology and Material Flows, University of Jyväskylä, Finland, August 30 – September 3, 2000.

"Life Cycle Assessment: Capabilities and Limitations for Enhancing Product Design and Management Decisions" International Workshop on Environmental Systems Analysis and Management, Royal Institute of Technology in Sweden, Stockholm, 23-24 October 1998.

"LCI Modeling Challenges and Solutions for a Complex Product System: A Mid-Sized Automobile" 1998 SAE Total Life Cycle Conference, Graz, Austria, December 1, 1998.

Keoleian, G. "Life Cycle Design of Air Intake Manifolds," SAE Detroit Section Composites Technology Update: Lecture Series, Southfield, Michigan, March 19, 1998.

"Improvement of Photovoltaic Modules Using Life-Cycle Energy Analysis," LCA Workshop, co-sponsored by the National Renewable Energy Laboratory and the Federal Energy Technology Center, San Francisco, Novermber 13, 1997.

"Life Cycle Design Framework and Case Studies." Chalmers Industriteknik, Goteborg, Sweden, 18 September, 1996.

"Life Cycle Design." *National Academy of Engineers International Conference on Industrial Ecology*, Irvine, California, 9-13 May, 1994.

"Incorporating Pollution Prevention into Higher Education Curricula" *Pollution Prevention Seminar, Association of Environmental Engineering Professors*, at Water Environment Federation Annual Meeting, Chicago October 18, 1994.

"Incorporating Pollution Prevention into the Chemistry Curriculum: New Challenges and Opportunities," *American Chemical Society National Meeting, Division of Environmental Chemistry Symposium,* Washington D.C. August 21, 1994

Annual Critical Review Presentation - "Sustainable Development by Design: Review of Life Cycle Design and Related Approaches." *Annual Meeting Air and Waste Management Association* June 19-24, 1994, Cincinnati.

"Life Cycle Analysis and Product Development." Expert Seminar on *Life Cycle Assessment and its Applications*, UNEP, Leiden University, Netherlands, June 10-12, 1993.

"The Application of Life Cycle Analysis to Design." *ASTM Third Symposium on Environmental Toxicology and Risk Assessment*, Atlanta, April 27, 1993.

"Pollution Prevention in Higher Education: A National Perspective," *American Society of Engineering Education*, Toledo, June 23, 1992.

"Product Life Cycle Design Methodology," *American Society of Mechanical Engineers, National Design Engineering Conference*, Chicago, April 8, 1991.

"Product Life Cycle Design Methodology," *Engineering Society of Detroit, Environmentally Conscious Engineering Design*, Detroit, April 16, 1991.

"Modeling the Life Cycle of a Product for Comprehensive Waste Minimization Planning," *National Recycling Congress*, October 1989.

VI. Teaching Experience and Other Educational Activities

Current Courses

2001 - *Sustainable Energy Systems* (NRE 574/ Physics 419/ Public Policy 519/ Residential College

Natural Science RCNSCI 419/599 ESENG)

1994 - 2024 *Industrial Ecology: Theory and Practice* (NRE 501) Winter Terms 1994, 1995; *Industrial Ecology* (NRE 557/CEE 586) 1997 - present; cross listed as CEE 586 in 1998; industrial ecology field component (one credit option) added in 1998.

Courses Taught

2006/2012/2013 *Integrated Problem Solving/Environmental Assessment* (NRE 580): Michigan Renewable Energy Module/ Sustainable Systems/Offshore Wind Energy Siting Module with Jarod Kelly

1998 - 2000 *Energy Demand* (Physics 419, NRE 574, Public Policy 519, Residential College Natural Science (RCNSCI 419) and Energy Engineering (ME 499))

1989 - Invited lecturer for: *Ecological Issues* NR 301, *Behavior and Environment* NR 306/501, *Environmental Studies* 320, *Biology* 100, *Energy Demand* 419 (NR 574), *Chemical Engineering Waste Management* (CHE 447), *Chemical Engineering Design* (CHE 486*), Mechanical Engineering Design* (ME 450), *Material Engineering Design and Manufacturing* (MSE 480), *Technology and Society* (Engineering 451), *Transportation and Society* (Urban Planning 670), *Construction Materials* (NRE 591), *Hazardous Waste* (EIH), *Eco-Industrial Parks* (NRE 791-098). *CEMP Seminar* (BA 742), *Global Environmental Impact of Technology* (AOSS 300), *Experimental Course* (Arch 509), *Junior Honors Seminar* (NRE 399), *Introduction to Engineering* (Eng 100), *How to Save the Planet* (Law 771), *Sustainable Energy Development in South America* (CEE 490), *Promising Research Paths for Sustainability: Cutting Edge Perspectives from the Natural and Social Sciences* (ESPP 891 – Michigan State University)

1988 Lecturer, Chemical Engineering doctoral seminar on *Environmental Management* (ChE 895)

1983 - 84 Teaching Assistant, *Chemical Engineering Unit Operations Laboratory* (ChE 360), three semesters.

Post-Graduate and Graduate Students Supervised (as Chair or Co-Chair)

Postdoctoral Research

Dr. Krishnendu Kar	1994 – 1996	Life Cycle Design
Dr. Martin Heller	1999 – 2002	Life Cycle Assessment of Biomass Energy Systems
Dr. Hyung Chul Kim	2004	Life Cycle Optimization of Vehicle Replacement
Dr. Sergio Pacca	2004 – 2005	Life Cycle Energy Modeling
Dr. Amit Kapur	2004 – 2006	Sustainable Concrete Infrastructure
Dr. Geoffrey Lewis	2006 – 2008	Alcoa Foundation Conservation and Sustainability Fellow
Dr. Hilary Grimes Casey	2006 – 2008	Alcoa Foundation Conservation and Sustainability Fellow
Dr. Michael Lepech	2006 – 2008	Sustainable Systems
Dr. Jarod Kelly	2008 – 2010	Alcoa Foundation Conservation and Sustainability Fellow
Dwarak Ravikumar	2018 -- 2020	LCA of CO2 Utilization Technologies
Xiaoyi He	2018 -- 2020	Travel Behavior of Connected and Autonomous Vehicles
Maryam Arbabzadeh	2019 -- 2019	Strategies to Limit Battery Degradation

Doctoral Research

Anna Bjorklund	1998 – 1999	Visiting PhD student from the Royal Institute of Technology in Sweden
Troels Keldman	1995	Visiting PhD student from the Technical University of Denmark
Hyung Chul Kim	2000 – 2003	Shaping Sustainable Fleet Vehicle Conversion Policies Based

		on Life Cycle Optimization and Risk Analysis
Marc Melaina	2002 – 2005	Initiating Hydrogen Infrastructures: Key Dynamics, Challenges and Rewards in the Transition to a Hydrogen Economy
Alissa Kendall	2004 – 2007	Concrete Infrastructure Sustainability: Life Cycle Metrics, Materials Design, and Optimized Distribution of Cement Production
Andres Clarens	2004 – 2008	Carbon Dioxide Based Metal Working Fluids
Deepak Sivaraman	2004 – 2009	Photovoltaic Technology
Han Zhang	2005 – 2009	Sustainable Pavement Asset Management Based on Life Cycle Models and Optimization Methods
Kevin Bolon	2006 – 2011	Assessing Energy Use in Household Travel: A Consideration of Vehicle Capability Constraints and Multi-day Activity Patterns
Colin McMillan	2006 – 2011	Automotive Greenhouse Gas Policy and Materials Flow
Andrew Winkelman	2007 – 2011	Impact of Climate Change Policies on Energy Use in Niger, West Africa
Liang Tsai	2009 – 2013	An Integrated Assessment of Offshore Wind Farm Siting: A Case Study in the Great Lakes of Michigan
Nolan Orfield	2010 – 2013	Life Cycle Design and Assessment of an Algal Biofuel that is Sustainable, Scalable, and Salable
Anne Marie Lewis	2011– 2013	The Potential of Lightweight Materials and Advance Engines to Reduce Life Cycle Energy and Greenhouse Gas Emissions for ICVs and EVs Using Design Harmonization Techniques
Maryam Arbabzadeh	2013 – 2018	Green Principles, Parametric Analysis, and Optimization for Guiding Environmental and Economic Performance of Grid-Scale Energy Storage Systems
Kevin Bi	2015 – 2018	Life Cycle Analysis and Optimization of Wireless Charging Technology to Enhance Sustainability of Electric and Autonomous Vehicle Fleets
Lixi Liu	2015 – 2020	Improving Building Sustainability: Lighting Life Cycle Optimization and Management, and HVAC Demand Response
Maxwell Woody	2022 – 2025	Decarbonizing Road Transportation: Energy, Emissions, Cost, and Policy Drivers for Battery Electric and Hydrogen Fuel Cell Vehicles
Spencer Checkoway	2024 –	Topic: Hydrogen Ecosystem Planning and Optimization

<u>Master's Thesis</u>

Holly Lynch	1995	A Chemical Engineer's Guide to Environmental Law and Policy
Jonathan Koch	1996	Evaluating Environmental Performance: A Case Study in the Flat-Panel Display Industry
Jeffrey McDaniel	1997	Application of Life Cycle Assessment and Design Tools to Instrument Panels (Analysis for US EPA Common Sense Initiative Pilot Project)
Hyung Chul Kim	2000	Optimizing Vehicle Life Using Life Cycle Energy Analysis and Dynamic Replacement Modeling
David Gard	2001	Comparative Life Cycle Assessment of E-Publishing and Digital Libraries with Traditional Print Collections
Greg Kozak	2003	Printed Scholarly Books and E-book Reading Devices: A Comparative Life Cycle Assessment of Two Book Options
Sharada Gundala	2003	LEED Energy Performance Modeling and Evaluation of the S.T. Dana Building Renovations

Richard Chandler	2004	Life-Cycle Cost Model for Evaluating the Sustainability of Bridge Decks: A Comparison of Conventional Concrete Joints and Engineered Cementitious Composite Link Slabs
Scott Baron	2004	Developing Power Business Plan: Empowering the Bottom of the Pyramid
Yuhta Horie	2004	Life Cycle Assessment of Refrigerator Replacement
Alissa Kendall	2004	Dynamic Life Cycle Assessment Tool for Comparing Bridge Deck Designs
Bernhard Dietz	2005	Life Cycle Assessment of Office Furniture Products
Richard Bole	2006	Life-Cycle Optimization of Residential Clothes Washer Replacement
Peter Arbuckle	2007	
Arthur Wai-Cheung Chan	2007	Economic and Environmental Evaluations of Life-Cycle Cost Analysis Practices: A Case Study of Michigan DOT Pavement Projects
Malavika Tripathi	2007	Life-Cycle Energy and Emissions for Municipal Water and Wastewater Services: Case-Studies of Treatment Plants in US
Carolyn Conway	2008	Steelcase Green Product Development: An Early Stage Life Cycle Analysis Tool and Methodology
Robb DeKleine	2009	Life Cycle Optimization of Residential Air Conditioner Replacement
Thomas Stephens	2010	An Agent-Based Model of Energy Demand and Emissions from Plug-In Hybrid Electric Vehicle Use
Michael Buday	2011	Measuring irradiance, temperature and angle of incidence effects on photovoltaic modules in Auburn Hills, Michigan
Shoshannah Lenski	2011	Life Cycle Environmental and Economic Impacts of 'Cash for Clunkers'
Sonika Choudhary	2012	Life Cycle Comparative Analysis of Bioenergy Pathways: Cellulosic Ethanol vs Biomass Electricity (Ming Xu co-advisor)
Nathan MacPherson	2013	Fuel Economy and Greenhouse Gas Emissions Labeling and Standards for Plug-In Electric Vehicles from a Life Cycle Perspective
Joseph Colett	2013	Impacts of Geographic Variation on Aluminum Lightweighted Plug-in Hybrid Electric Vehicle Greenhouse Gas Emissions
Claire Boland	2014	Life Cycle Energy and Greenhouse Gas Emissions of Natural Fiber Composites for Automotive Applications: Impacts of Renewable Material Content and Lightweighting
Brandon Marshall	2014	Environmental assessment of plug-in hybrid electric vehicles using naturalistic drive cycles and vehicle travel patterns: A Michigan case study
Kevin Bi	2015	Plug-in vs. Wireless Charging: Life Cycle Energy and Greenhouse Gas Emission Analysis of an Electric Bus System
Amy Chiang	2015	Investment Cost and View Damage Cost of Siting an Offshore Wind Farm: A Spatial Analysis of Lake Michigan

Nicole Ryan	2016	Comparative assessment of models and methods to calculate grid electricity emissions
Dominic Bednar	2016	The Intersection of Energy and Justice: Exploring the Spatial, Racial and Socioeconomic Patterns of Residential Heating Affordability, Consumption and Efficiency in Wayne County, Michigan
Robert Meyer	2017	Regional scale characterization and assessment of water use and competition impacts for U.S. food crops
Jim Gawron	2019	Evaluating the Potential Environmental Impacts of Connected and Automated Vehicles
Gabriela Porras	2019	Life Cycle Comparison of Manual and Machine Dishwashing in Households
Stephen Hilton	2020	Life-Cycle Assessment of Urine Diversion and Conversion to Fertilizer Products
Nate Hua	2020	Regional-level analysis for the material flows and process energy demands of aluminum and steel in the American automotive industry
Nicholas Kemp	2020	Life Cycle Greenhouse Gas Impacts of a Connected and Automated SUV and Van
Michael London	2020	Cradle-to-Gate Life Cycle Assessment of Multi-Jet Fusion 3D Printing
Maxwell Woody	2020	Strategies to limit degradation and maximize Li-ion battery service lifetime - critical review and guidance for stakeholders
Luyao Li	2021	Life cycle greenhouse gas emissions for last-mile parcel delivery by automated vehicles and robots
Jesse Vega-Perkins	2022	Mapping Electric Vehicle Impacts: Greenhouse Gas Emissions, Fuel Costs, and Energy Justice in the United States
Spencer Checkoway	2024	Life cycle carbon footprint analysis and improvement strategies for US maple syrup production
Elizabeth Smith	2024	Greenhouse Gas Reductions Driven by Vehicle Choice and Use Patterns
Sarah Gorman	2025	U.S. Graphite Sourcing for Electric Vehicle Battery Applications
Antara Green	2025	Vehicle Price Depreciation: An Empirical Study on Used EVs vs ICEVs in the United States

<u>Master's Project</u>

Catie Blackler Richard Denbow William Levine Kathy Nemsick Ruth Polk	1995	A Comparative Analysis of Perc Dry Cleaning and an Alternative Wet Cleaning Process
Sabrina Spatari (Chemical Engineering)	1997	Sustainable Materials
Steve Blanchard Peter Reppe	1998	Life Cycle Analysis of a Residential Home in Michigan
Tertia Speiser	1999	Ecotourism in North America Applied: Implications for the Irwin Lounge
Natalie Henry Garvin Lewis Melissa Vernon	2000	Community Material Flow Analysis: City of Ann Arbor Case Study

Amy Cotter Dahlia Chazan	2001	The Causes and Consequences of Land Conversion in Washtenaw County
Dov Brachfeld Tad Dritz Shinsuke Kodama Alan Phipps Elyse Steiner	2001	Life Cycle Modeling and Improvement of the Stonyfield Delivery System
Samatha Conrad Sandra Rodriguez Matt Roman Elizabeth Terry	2002	Sustainability Assessment and Reporting for the University of Michigan Campus
Carey Bylin Ruchi Misra Mindy Murch Wendy Rigterink	2004	A Practical Application for Measuring the Sustainability of Ben & Jerry's Dairy Suppliers
Nathan Arbitman Tony Baptista Ted Ekkers Jon Forrester Heather Kirshman	2005	Aveda's Product Distribution System: A Strategic Assessment of Greenhouse Gas Emissions and Energy Consumption
Asako Yamamoto Colin McMillan Pierre Bull	2005	Conducting a Baseline Greenhouse Gas Inventory for Michigan
Ed Chao Marshall Chase Kris Jadd	2006	An Economic Analysis of the DTE Energy Hydrogen Technology Park
Dimitri Shanin	2006	Protocol and Preliminary Greenhouse Gas (GHG) Emissions Inventory Steelcase, Inc.
Michael Edison Kate Elliott Bernie Fischlowitz-Roberts Rachel Permut Sarah Popp	2007	Michigan at a Climate Crossroads: Strategies for Guiding the State in a Carbon-Constrained World
Peter Bailey Oracha Chotimongkol Shinji Isono	2007	Demand Analysis and Optimization of Renewable Energy Sustainable Rural Electrification of Mbanayili, Ghana
Anthony Gross Ali Moazed Priyanka Bandyopadhyay Jeffrey LeBrun Michael Hartley	2008	Renewable Energy for BHP Billiton: Framework and Application to BHP Billiton's Global Assets
Doyoon Kim	2008	Preliminary Life Cycle Analysis of Modular and Conventional Housing in Benton Harbor, MI
Sarah Cashman Keri Dick Derek Przybylo	2009	Life Cycle Energy and Carbon Footprint Analysis for Aurora Organic Dairy
William Walter Amy Kolodzy Jennifer Gough Blake Marshall Richard (Dan)Wilson	2010	Phase II: Energy, Greenhouse Gas, Nutrient Use, Water Use, and Solid Waste Generation Life Cycle Assessment
Brian Katzman	2010	Dynamic Pricing Tariffs for DTE's Residential Electricity

Arie Jongejan Mark Michelin Thomas Leahy		Customers
Pablo Medina Paul Gruber	2010	Global Lithium Availability: A Constraint for Electric Vehicles
Jason MacDonald Camere, Aaron Caroline de Monasterio Allison Schafer	2010	Environmental Impacts of Plug-in Hybrid Electric Vehicles
Christina Bosch Lisa Ingmarsson Jamie Mikkelsen Arthur Peterson	2011	Supply Chain Greenhouse Gas Management Strategy for Ford Motor Company (co-advised with John Sullivan)
Rosemary Lapka Neesha Modi Lauren Start David Weinglass	2011	Aurora Organic Dairy Phase III: Corporate Sustainability Report (co-advised with Scott Noesen)
Tim Dobson Kellie Donajkowski Andrew Heairet Betsy Riley Caitlin Sadler Tirumulai Tejas Yuan Zhang	2013	Bringing Renewable Energy to Camp Michigania: An Assessment and Educational Plan for Implementing Renewable Energy Strategies
Liting Cui Andrew Eilbert Hongda Jiang Weina Wang	2013	From Home Energy Audit to Retrofit and Beyond
Jill Carlson Jenny Cooper Marie Donahue Max Neale Anis Ragland	2014	City of Detroit Greenhouse Gas Inventory: An Analysis of Citywide and Municipal Emissions for 2011 and 2012 (Preliminary Report)
Luis Cecco Yiyao Chen Jeremy Good Kuan-Ho Lai, Ekaterina Loshakova Eric Weinberg	2015	Renewable Energy Community Plan Northport Energy Action Task Force
Brittany Anstead Ashley Green Katherine Gregory Henrik Mader Brian Rassel Oluwafemi Sawyerr Puneeth M Venkatarama Reddy	2015	Improving Energy Sustainability for the LTBB Reservation
John Dooley Whitney Johnson Divyesh Kumar Benjamin Kunstman Kristin Steiner Brittany Szczepanik	2016	Doubling Energy Efficiency at the University of Michigan by 2030

Joshua Silverblatt Denise Miller Lu Chen Montana Krukowski Ryan Leclerc Xiajun Zhang	2016	Meijer Sustainability Plan and 2014 Environmental Footprint Report
Reema Abi-Akar Gabriel Jones Yi Tang	2017	Opportunities for Sustainable Materials Management and Zero Waste in Detroit
Rees Blanchard	2017	Property Assessed Clean Energy (PACE) Renewable Energy Program Plan and Pilot Project
Kit Price	2017	Preliminary Comparative Lifecycle Analysis of Low Sulfur Diesel, Compressed natural gas, and Electric Baggage Tractors for United Airlines
Chun Yin Anson Chang Xiaodan Zhou Geoffrey Murray	2018	Meijer Renewable Energy Strategy
Laura Aguilar Esteva Akshat Kasliwal Michael Kinzler	2019	Scope 3 Emissions Assessment and Circular Economy Protocol Development at Ford Motor Company
Leona Liu Abhijeet Walchale	2019	100% Renewable Energy Plan for Leelanau County, MI
Elizabeth Ballor Xinxin Cao Lisa Dinon Gautham Karthikeyan Haowen Zhou	2020	Sustainability Assessment and Design Recommendations for the Meijer Store of Tomorrow
Connie Chow Dengfeng Qin Ruimin Yang	2021	A Tool for Evaluating the Sustainability of Plastic Waste Reduction Innovations
Shannon Blair Renhui (Lola) Chen Stephanie Hefelfinger Heeseung Kim Catherine Mullin Erin Seguin	2021	Greenhouse Gas Inventory and Corporate Climate Strategy for Ocean Spray Cranberries, Inc.
Yixuan Feng Xiao Guo Jinhu Li Mingyu Wang	2022	Assessing a Post-COVID World: Impacts of Travel Demand and Remote Work on Sustainability
Jacob Namovich Anna Ostrander	2022	UM Scope 3 Purchased Goods & Services Emissions Footprinting
Jillian Brown Erika Kinninger Nick Rojas Swathy Vidyadharan Nazli Yazdizadeh	2023	Meijer Scope 3 Carbon Accounting Framework and Inventory
Brooke Alsterlind Patrick Killian Sara Murphy Shagun Parekh Stephen Lipshaw	2024	State of Michigan Hydrogen Demand Analysis: Current (2022), Near-term (2030), and Long-term (2050)

Yaqi Zhang Jean Poll Alva Araujo Abhishek Gupta Cyan Lee Nicholas Nonnenmacher Pete Schultz Loren Steinberg Hollie Wilburn	2025	Emerging Green Hydrogen Applications in India's Power Sector

Engineering Sustainable Systems Dual Degree Program http://ess.umich.edu/
Developer and Co-Director (with S. Skerlos) of the 54 credit hour MS/MSE dual degree program between the College of Engineering and the School of Natural Resources and Environment, with specializations in sustainable energy systems, sustainable design and manufacturing and sustainable water resources. Rackham Graduate School, University of Michigan (2007 to present)

Program in the Environment
Faculty Associate (2004 -)

Graduate Certificate Program in Industrial Ecology http://industrialecology.umich.edu/
Developer and Co-Director (with J.W. Bulkley) of the 16 credit hour specialization in industrial ecology. Rackham Graduate School, University of Michigan (1999 to present)

NASA Summer High School Apprenticeship Research Program (SHARP)/Summer Apprenticeship Program (SAP)
Mentor (1999 to 2001) in conjunction with the Minority Engineering Program Office, College of Engineering, University of Michigan

Pollution Prevention and Sustainable Systems Internship Program
Mentor and Project Director (with J.W. Bulkley) for National Pollution Prevention Center (1992 to 1999) and Center for Sustainable Systems (1999 to present) Internship Programs. Provided 79 undergraduate and graduate student internship positions (paid) within the public and private sectors between 1992 – 2008.

Pollution Prevention/ Sustainability Curriculum Development and Dissemination
Principal Investigator and Project Director with J.W. Bulkley (1991 to present). Educational resource compendia were developed for the following disciplines: accounting, agriculture, architecture, business law, chemical engineering, chemistry, coastal zone management, corporate strategy, environmental engineering, environmental studies, finance, industrial ecology, industrial engineering & operations research, marketing, operations management, and strategic environmental management. Compendia offer faculty a broad set of resources for integrating pollution prevention/sustainability into courses. Resources include case studies, problem sets, course syllabi, and multimedia aids (videos, slide shows, and CD-ROM interactive software).

Center for Sustainable Systems Sustainability Factsheets http://css.snre.umich.edu/factsheets
In 2001 launched this factsheet series that cover topics including energy, water, food, waste, buildings, materials, and transportation systems. Each factsheet presents important patterns of use, life cycle impacts and sustainable solutions. They are designed to inform policymakers, business professionals, students and teachers. The factsheets are peer-reviewed and updated annually.

Continuing Education Experience
Design for Environment (DFE): Fundamentals for Sustainable Development, Engineering Continuing Education, College of Engineering, University of Michigan, June 27-29, 1994.
Design for Environment (DFE), AT&T Bell Labs, Murray Hill, New Jersey, November 17, 1994.

Design for Environment (DFE), U.S. Post Office, Washington D.C. February 22, 1995.
Design for Environment (DFE): Fundamentals for Sustainable Development, Engineering Continuing Education, College of Engineering, University of Michigan, June 19-21, 1995.
Design for Environment (DFE): Fundamentals for Sustainable Development, Engineering Continuing Education, College of Engineering, University of Michigan, June 24-26, 1996.
Sustainable Product Systems: Life Cycle Tools and Applications, Center for Professional Development, College of Engineering, University of Michigan, June 24-26, 1998.
Tutorial on *the Theory and Application of Tools for Environmental Product Design*, International Symposium on Electronics & the Environment, sponsored by Institute of Electrical and Electronics Engineers, Danvers, MA, May 11, 1999.
Energy Engineering course offered to General Motors' students using videotape delay (with M.H. Ross and J. Barker); Center for Professional Development, College of Engineering, University of Michigan, Fall semester, 1999.

VII. Professional Service

Committees and Panels (partial list):

2025 -	Member, Hydrogen Infrastructure Action Team, Michigan Council on Future Mobility and Electrification (CFME)
2022 - 2024	Member, National Science Foundation, Directorate for Engineering Advisory Committee
2021	Testimony written and oral given for hearing of the Congressional Committee on Science, Space, and Technology, "Plastic Waste Reduction and Recycling Research: Moving from Staggering Statistics to Sustainable Systems."
2019 - 2021	Member, University of Michigan President's Commission on Carbon Neutrality
2017-	Member, Science Advisory Board, Responsible Battery Coalition
2011-12	Committee Member, Planning Committee Workshop on Exploring the True Costs of Food, Institute of Medicine.
2010	Peer Reviewer, Oregon Department of Environmental Quality A Life Cycle Approach to Prioritizing Methods of Preventing Waste from the Residential Construction Sector in the State of Oregon
2010	Peer Reviewer, *USPS Product and Service Carbon Allocation and Offsetting Study*
2008-2009	Peer Reviewer, *Life Cycle Assessment of GHG Emission Reductions from the Use of Dow Building Solutions Thermal Insulation,* Dow Chemical.
2007	Peer Reviewer, *A Methodology for Life Cycle Greenhouse Gas Emission Assessments of Automotive Materials The Example of Mild Steel, Advanced High Strength Steel and Aluminum in Body in White Applications* International Iron and Steel Institute
2005-2006	Member, *Michigan Energy Research Council,* University of Michigan
2004-2005	Member, *Michigan Memorial Phoenix Project Executive Committee*, University of Michigan
2003-2005	Member, *President's Environmental Task Force*, University of Michigan
2003-2004	Peer Reviewer, *Life Cycle Inventory of Packaging Options for Shipment of Retail Mail-Order Soft Goods,* Oregon Department of Environmental Quality and U.S. EPA.
2003-2005	Member, *Aquinas College Sustainable Business Advisory Committee*
2002	Peer Reviewer, *IISI Worldwide LCI Database for Steel Industry Products,* project of the International Iron and Steel Institute.
2001- 2003	Member, Project Advisory Committee and Critical Review Team, US LCI Database Project, National Renewable Energy Lab
2001	Member, Environmental Excellence in Transportation Award Committee, Society of Automotive Engineers
2000	Peer Review Chair *Life Cycle Assessment of Copper Tube and CPVC Pipe for the Supply of Potable Water in Residential Structures*, International Copper Association, Ltd.

1999 - 2000	Peer Reviewer, *Application of Life Cycle Management to Evaluate Integrated Waste Management Strategies* project of the U.S. Environmental Protection Agency, Research Triangle Institute, North Carolina State University and University of Wisconsin.
1998 - 2001	Member, Alliance for Environmental Systems Analysis and Management (Royal Institute of Technology, Sweden; Swiss Federal Institute of Technology; Technical University of Vienna; University of California, Berkeley; University of Michigan.)
1998 - 1999	Member, National Advisory Council, Vinyl Institute.
1996 - 1999	Member, Curriculum Committee, Institute for Environmental Science, Engineering and Technology.
1996 - 1999	Member, Advisory Board, Society of Environmental Toxicology and Chemistry, Life Cycle Assessment Committee.
1995	Peer Reviewer, *SEMATECH S70 Design for Environment, Safety and Health (DFESH)* project.
1994 - 1996	Member, Life Cycle Management/Supplier Partnership Project Team, Common Sense Initiative, Automotive Manufacturing Sector, U.S. Environmental Protection Agency.
1993	Panelist, *Environmental Consciousness: A Strategic Competitiveness Issue for the Electronics and Computer Industry*, Microelectronics and Computer Technology Corp., Washington, D.C.
1993 - 1994	Peer Reviewer, *Resource and Environmental Profile Analysis of Product and Packaging for four Granular Detergent Formulations* for Proctor and Gamble Company.
1992 - 1993	Peer Reviewer, *Resource and Environmental Profile Analysis of Hard Surface Cleaners and Mix-Your-Own Cleaning Systems* for Proctor and Gamble Company.
1991-1993	Member, Pollution Prevention Subcommittee of the U.S. EPA National Advisory Council for Environmental Policy and Technology (NACEPT).
1991, 1992	Panelist, Ecodesign International Expert Workshop in Delft, Netherlands, 28 February – 1 March, 1991 and Copenhagen, 1 - 2 June, 1992.
1990-1994	Peer Reviewer, U.S. EPA Life Cycle Analysis Methodology project.
1990	Panel Member, U.S. EPA Risk Reduction Engineering Laboratory, Pollution Prevention Research Planning Session, Clean Products Group.
1989	Member, City of Ann Arbor Solid Waste Task Force (University Representative), summer.

Manuscripts Reviewed for:
Journal of Cleaner Production, Journal of Industrial Ecology, Clean Products and Processes, Environmental Science and Technology, Journal of Engineering Education, Progress in Photovoltaics, Journal of Engineering for Gas Turbines and Power (American Society of Mechanical Engineers), The Science of the Total Environment, National Renewable Energy Laboratory; Journal of Ecological Economics; International Journal of Life Cycle Assessment, Energy & Buildings; Journal of Infrastructure Systems; Integrated Environmental Assessment and Management; Resource Conservation and Recycling; Transportation Research Part E:Logistics and Transportation Review

Editorial Board: *Journal of Industrial Ecology* (Member 1997 – ; Managing Board Member 2011-2012)

Professional Affiliations
National Science Foundation Engineering Directorate Advisory Committee (2022 -)
International Society for Industrial Ecology, Member and President (two year term: 2011-2012; President Elect 2009-2010; Immediate Past President 2013-2014)
American Chemical Society (Environmental Science Division), Member
International Association for Life Cycle Civil Engineering, Member
Society of Automotive Engineers (SAE), and the Institute of Electronics and Electrical Engineers (IEEE), Active participant in international meetings

Conferences and Workshops Organized

State of Michigan Hydrogen Workshop: Building Foundations for a Hydrogen Economy, University of Michigan, Ann Arbor, May 13, 2024.
Hydrogen Roadmap for the State of Michigan Workshop, University of Michigan, Ann Arbor, May 20, 2022.
Michigan at a Climate Crossroads: Strategies for Guiding the State in a Carbon Constrained World, University of Michigan, Ann Arbor, Forum I January 31, 2006; Forum II October 25, 2006.
2007 AAAS Annual Meeting, New Models for Materials Use, Biocomplexity and Sustainability Symposium, February 19, 2007, San Francisco
International Society for Industrial Ecology 2003 Conference (Co-Chair)
Peter M. Wege Sustainability Lecture Series (2001 -)
Life Cycle Approach to Sustainable Agriculture Indicators, Feb. 26-27, 1999
National Sustainable Buildings Workshop, October 8-9, 1999
Environmental Assessment and Reporting for College/University Campuses: Oct. 8, 1999; May 16, 2000
International Workshop on Environmental Systems Analysis, Nov. 19-20, 1999
Fuel Cells for Motor Vehicle Applications Seminar Series, Fall 1998 – Winter 1999
Industrial Ecology of the Automobile Seminar Series, Fall 1994 – Fall 1995

VIII. Honors and Awards

2024 Best Paper Award American Foundry Society Technical Council (Cast Iron Division) (Xongxian Zhu, Gregory Keoleian, Daniel Cooper, "Ductile Iron Energy Use and Greenhouse Gas Emissions: Excel-Based Parametric Model Development and Application" *(23-014))*
Reuters Hot List World's Top 1000 Climate Scientists, 2021
Environmental Research Letters Best Articles of 2018 (Heller, Martin C., Amelia Willits-Smith, Robert Meyer, Gregory A. Keoleian and Donald Rose. (2018) "Greenhouse gas emissions and energy use associated with production of individual self-selected US diets." *Environmental Research Letters* 13(4):1-11)
Environmental Science and Technology Runner up Best Paper Environmental Policy in 2018 (James H. Gawron, Gregory A. Keoleian, Robert D. De Kleine, Timothy J. Wallington, and Hyung Chul Kim. Life Cycle Assessment of Connected and Automated Vehicles: Sensing and Computing Subsystem and Vehicle Level Effects).
Energy and Buildings Best Research Paper Award for 1998-2007 (Schuer, C., G.A. Keoleian, P. Reppe "Life cycle energy and environmental performance of a new university building: modeling challenges and design implications")
Journal of Industrial Ecology Best Paper Prize (Heller, M.C., and G.A. Keoleian, "Greenhouse Gas Emission Estimates of U.S. Dietary Choices and Food Loss." *Journal of Industrial Ecology* (2015) 19(3): 391–401) announced in 2017.
Rackham Master's Mentoring Award, Rackham Graduate School, University of Michigan, 2015
Presented "Life Cycle Models and Metrics: the Sustainability Compass for Energy Systems, Products, & Technology" Wrigley Sustainability Lecture, Arizona State University, February 1, 2007.
US EPA P3 Award (2006): People, Prosperity and the Planet Student Design Competition for Sustainability (Faculty co-Advisor)
Materials Research Society Fall Meeting (2005) Best Paper for Symposium G Life-Cycle Analysis Tools for "Green" Materials and Process Selection
AT&T Industrial Ecology Faculty Fellow (2002- 2003)
AT&T Industrial Ecology Faculty Fellow (2001- 2002)
1999 Arch T. Colwell Merit Award (recognizes authors of outstanding papers presented at SAE meetings): 1 of 14 selected from over 2160 papers published by SAE in 1999.
Selected to present the Annual Critical Review Paper at the Annual Meeting of Air and Waste Management Association, 19-24 June 1994, Cincinnati.
AT&T Industrial Ecology Faculty Fellow (1993-1995)

Jessie Smith Noyes Foundation Internship in the Chemodynamics of Toxic Substances Control (1986 - 1987).
Amoco Foundation Fellowship (Fall 1985)
National Institute of Occupational Safety and Health (NIOSH) Traineeship in Industrial Chemical Safety (1981- 1983).
Sigma Xi, Tau Beta Pi