Approved by the Regents
May 20, 2021

PROMOTION RECOMMENDATION
The University of Michigan
School for Environment and Sustainability

Shelie Miller, associate professor of environment and sustainability, with tenure, School for Environment and Sustainability, and associate professor of civil and environmental engineering, without tenure, College of Engineering, is recommended for promotion to professor of environment and sustainability, with tenure, School for Environment and Sustainability, and professor of civil and environmental engineering, without tenure, College of Engineering.

Academic Degrees:

Ph.D.	2006	University of Illinois at Chicago, Civil and Materials Engineering
M.E.	2001	Clarkson University, Civil and Environmental Engineering
B.S.	2000	Denison University, Chemistry

Professional Record:

2018 – present	Director, Program in the Environment
2016 – present	Jonathan W. Bulkley Collegiate Professor in Sustainable Systems
2013 – present	Associate Professor, with tenure, School for Environment and Sustainability (SEAS), University of Michigan, Associate Professor, without tenure, Department of Civil and Environmental Engineering, College of Engineering, University of Michigan
2010-2013	Assistant Professor, School of Natural Resources and Environment (SNRE), University of Michigan, Assistant Professor, Department of Civil and Environmental Engineering, College of Engineering, University of Michigan
2006-2010	Assistant Professor, Department of Environmental Engineering and Earth Sciences, Clemson University
2001-2006	Doctoral Resident, Environmental Health and Safety, Alcoa, Inc.

Summary of Evaluation:

Teaching: Professor Miller's teaching of both graduate and undergraduate courses is exemplary. Her standard portfolio, as described at the beginning of the report, includes two undergraduate courses and one graduate course. Her course evaluation metrics consistently exceed the median numbers for the university. In particular, the evaluations for "Dr. Miller is an excellent teacher" are impressive, falling in the 4.5 to 5.0 range for the courses (where 5.0 is a perfect score). Professor Miller brings creativity, passion, preparation, and commitment to her teaching responsibilities. Since 2013, Professor Miller's students have nominated her four times for the SEAS Outstanding Teacher Award and one time for the undergraduate Golden Apple Award.

Professor Miller has mentored a significant number of graduate students. Since her last promotion, she has graduated five Ph.D. students and three master's students, in addition to serving as faculty advisor for eight group master's projects. She currently advises two Ph.D. students, two master's students, and one master's project, and she co-advises one post-doctoral fellow.

Research: Professor Miller's research spans fields of industrial ecology, sustainable engineering, and life cycle analysis. She has demonstrated substantial productivity and scholarship in two major thrusts: (1) developing frameworks and quantitative tools to assess environmental impacts of new technology, and (2) understanding how patterns of technology adoption could lead to different environmental outcomes. Professor Miller's applied research within these thrusts has focused on four topics: the development of the cold chain (temperature-controlled food supply chains) in developing economies, the food-energy-water nexus, carbon capture and utilization, and emerging trends in agriculture/biofuels. She has made important scholarly contributions that often integrate across her basic and applied research.

Professor Miller has established a strong record of scholarship and research productivity; her publications appear in highly rated journals, including the top journals in the fields of environmental engineering and industrial ecology. Her peer-reviewed publications include 48 journal articles, two book chapters, and four conference proceedings. Of these, 35 journal articles were published since her last promotion. Of her papers, she is first author of seven, and Professor Miller, one of her students, or one of her post-doctoral fellows is first author on all but two papers. In addition, Professor Miller has seven submitted journal manuscripts at various stages in the review process.

Professor Miller is a nationally and internationally recognized leader in the fields of industrial ecology and sustainable engineering. She has received several major honors that reflect her recognition in her field. Professor Miller is a 2009 recipient of a Presidential Early Career Award for Scientists and Engineers. She also received an NSF CAREER Award for 2009-2013. She was selected as a Kavli Frontiers Fellow in 2013 (National Academy of Sciences) and a Jefferson Science Fellow in 2016 (National Academies of Science, Engineering, and Medicine). Since her last promotion, Professor Miller has delivered 12 invited lectures and seven presentations at national and international conferences, including presentations to the National Academy of Sciences, Kavli Frontiers of Science Symposium; National Academies of Sciences, Engineering, and Medicine, Jefferson Science Fellows Distinguished Lecture Series; USAID, Global Development Lab; Industrial Ecology Gordon Research Conference; and Argonne National Laboratory, Systems Science Center. She has been an invited speaker at many leading universities.

Professor Miller's various government appointments reflect her exceptional reputation. These include serving on the Federal Biomass Research and Development Technical Advisory Committee (appointed by the US Secretaries of Energy and Agriculture) and participating in a number of high-level programmatic reviews for the DOE Bioenergy Technologies Office and Advanced Manufacturing Office. She has served on review panels for NSF, DOE, USDA, EPA, G8 Research Councils, SunGrant, and Ellen MacArthur Foundation New Plastics Economy Initiative. Her work has gained significant media attention, thereby indicating its broader societal relevance and impact. She has provided commentary for *TIME*, NPR, *Forbes*, *The Guardian*, *Christian Science Monitor*, *Popular Science*, *Wired*, *Grist*, and *Consumer Affairs*. She has made appearances on CSPAN, NPR, and the Canadian Broadcasting Channel.

Professor Miller has a continuous record of grant funding in support of her scholarship. She is credited with over $1 million in external funding over her academic career, with the vast

majority from NSF awards. Overall, she received over $2.8 million in total external grant awards, including four awards as the PI and eight awards as a co-PI. During her years as an associate professor, she received over $1.1 million in total grant awards.

At the university, Professor Miller has received several significant awards supporting her environmental assessment of emerging technologies. She was a member of the REFRESCH project team ($3 million over 2014-2017), which was one of four projects selected for Global Challenges funding under the university's Third Century Initiative. She also is a member of the Global CO2 Initiative team ($2.5 million over 2018-2021), which was one of four projects selected under the UM College of Engineering's Blue Sky Initiative.

Recent and Significant Publications:

Miller SA, Keoleian GA. Framework for analyzing transformative technologies in life cycle assessment, *Environmental Science & Technology*, 2015, 49(5): 3067-3075. (Cited 64 times as of mid-January 2021)

Heard BR, Miller SA. Potential changes in greenhouse gas emissions from refrigerated supply chain introduction in a developing food system, *Environmental Science & Technology*, 2019, 53(1): 251-260.

Miller SA et al., Exploring adoption price effects on life cycle inventory results, *Int. J. Life Cycle Assessment*, 2020, 25(6), 1078-1087.

Miller SA. Five misperceptions surrounding the environmental impacts of single-use plastic, *Environmental Science & Technology*, 2020, 54 (22): 14143-51.

Heard BR*, Bandekar M*, Vassar B*, Miller SA. Comparison of life cycle environmental impacts from meal kits and grocery store meals, *Resources, Conservation, and Recycling*, 2019, 147: 189-200.

Bergerson J, Brandt A, Cresko J, Carbajales-Dale M, MacLean HL, Matthews HS, McCoy S, McMannus M, Miller SA, Morrow III W, Posen ID, Seager T, Skone T, Sleep S. Life cycle assessment of emerging technologies: Evaluation techniques at different stages of market and technical maturity, *Journal of Industrial Ecology*, 2020, 24(1): 11-25.

Service: Professor Miller's service record includes numerous significant appointments in professional societies, federal committees, university committees and administrative posts, and SEAS committees. She serves on the Federal Biomass Research and Development Technical Advisory Committee, beginning in 2015, and she has served on grant review panels for NSF, DOE, USDA, and EPA. At the university, Professor Miller is currently chairing the President's Public Engagement Award Selection Committee, co-chaired the Program in the Environment faculty transition committee, and served as the director of the Graduate Certificate Program in Sustainability. She was elected her to serve three two-year terms on the SEAS Executive Committee.

External Reviewers:

Reviewer A: "My summary view of Shelie Miller's scholarship is that she is innovative and meticulous (usually we get one or the other). This represents a coherent body of work that has had an international impact and changed LCA practice. … Miller has performed a substantial amount of university service… She has also performed national service with prestigious fellowships and placement in federal government roles and National Academy committees. She

has done much for her discipline as a reviewer of manuscripts at journals. This generosity is good to see in a candidate for promotion and suggests that she will remain a good citizen of the university."

Reviewer B: "I have a very positive impression of Professor Miller's research. In my opinion, she is a thoughtful and serious researcher and deep thinker who is exploring new directions to meet important challenges in the area of Industrial Ecology and Life Cycle Assessment (LCA). Her work tends to be of high quality and is focused on extending LCA to deal with emerging technologies and on studying the effects of technology adoption on the environment."

Reviewer C: "There is always a trade-off between quality and quantity, and I feel Shelie has the right balance. …her 42 journal papers have made an impact in the field of sustainable engineering. This is due to the high quality of her papers – her research is always thoughtfully designed, carefully conducted, and well organized and communicated through appropriate peer-reviewed journals. Her productivity has also ramped up recently, so her impact is likely to grow."

Reviewer D: "The impact of Professor Miller's work as measured by citations is good and growing. … Through both her research and professional service contributions Professor Miller has earned national and international visibility. There is every indication that her record and reputation will grow even more in the years ahead."

Reviewer E: "…it is obvious that Professor Miller has worked hard as a teacher at UM, and in service to the university community. These are essential tasks at a university, but are often not given the credit that they merit. She is to be commended for her work in this regard."

Reviewer F: "Professor Miller's published works are of high caliber overall and have frequently shown up as course readings in my graduate level life cycle assessment class and my advanced industrial ecology course. … Professor Miller seems to be at the leading edge of answering the persistent questions that either have not been previously answered, or those that are messy enough that answers are hard to find. … Professor Miller is counted among the top five or so with respect to research in the field. Her great success with NSF is particularly notable, winning not just research grants, but the most competitive among them. She has received a number of prestigious fellowships as well."

Reviewer G: "In summary, Professor Shelie Miller has compiled an impressive array of accomplishments. Her research activities are innovative and of high quality. She is securing external research funding to support her research program. She is mentoring graduate students to the completion of their degrees at a commendable rate. She is an inspiring and outstanding teacher in the classroom. Her record of scholarship is very strong… She is a fantastic citizen of the University of Michigan, and is providing substantial leadership as Director of the PitE."

Reviewer H: "…is the leading scholar for analysis of the life cycle impact of nitrogen fertilizers; her work sets the standard and is a robust source for methodology. …Dr. Miller's work has high and enduring impact, substantially greater than might be surmised from a quick glance at google

scholar. …Dr. Miller has a thriving research program, and has developed the field of environmental life cycle assessment in ways that will stand the test of time."

Reviewer I: "Dr. Miller's rigorous work fills a timely and crucial space in the Environmental community. Through her scholarship and leadership, Dr. Miller has raised the level of science at the intersection of technology assessment and sustainability bringing much needed attention and credibility to the topics. …She is clearly a national – and international – leader in her areas of expertise. … Dr. Miller has intentionally and selectively chosen to use her time to have an impact at the highest-levels of international dialogue and engage on the policy implications of her work. For this, she should be commended and serves as an example to other faculty in the environmental fields about being generous with time and energy."

Summary of Recommendation: Professor Miller has established an upward trajectory in scholarly achievement; a record of excellence in teaching and mentoring; and a robust set of elected and appointed leadership positions in important service roles both on- and off-campus. She has become a nationally and internationally recognized leader for her expertise in life cycle assessment of emerging technology. We enthusiastically recommend Shelie Miller for promotion to professor of environment and sustainability, with tenure, School for Environment and Sustainability, and professor of civil and environmental engineering, without tenure, College of Engineering.

Jonathan T. Overpeck
Samuel A. Graham Dean
School for Environment and Sustainability

Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2021