

Keith L. Kline

Distinguished Scientist, Environmental Sciences Division
Oak Ridge National Laboratory (ORNL)
Just Transition Coordinator, DOE Net Zero World
Phone: 865-574-4230, Email: klinekl@ornl.gov
Website: <https://www.ornl.gov/staff-profile/keith-l-kline>

Overview: Keith lived and worked with partners in developing nations for 24 years to improve livelihoods while conserving forests and biodiversity under US Agency for International Development programs supporting renewable energy options, disaster relief and reconstruction, community-based forest concessions, land tenure, and conflict resolution. Keith is affiliated with ORNL since 1990, working to improve approaches to assess the sustainability of energy, agricultural, and forestry systems. Since returning to the U.S. in 2008, he has contributed to over 100 publications and public presentations related to engaging stakeholders in more sustainable management of natural resources.

Keith currently supports DOE leadership of the [Biofuture](#) Clean Energy Ministerial to develop and apply best practices for sustainability governance, coordinates efforts to integrate justice issues for [Net Zero World](#) (involving nine US Agencies and ten DOE laboratories) while advancing emission reduction strategies around the world, and serves as an expert for the US Technical Advisory Group to the ISO Technical Committee developing international standards for [Net Zero](#) and a [Circular Economy](#). Keith serves as an Adjunct Professor in the [Department of Biosystems Engineering & Soil Science](#) in the Institute of Agriculture, and advisor to the [Bredesen Center](#) for Interdisciplinary Research and Graduate Education and International Research Networks on Food-Energy-Water, at the University of Tennessee, Knoxville.

Degrees:

M.Ed., International Education Program, Framingham State College, Mass., 2000
B.S., Energy & Environment, School of Natural Resources, University of Michigan, 1979

Professional Experience

2018-present, [Distinguished Scientist](#), Oak Ridge National Laboratory (ORNL), Environmental Science Division. Keith leads just transition work for the USG multi-agency Net Zero World initiative and serves as Principal Investigator (PI) for multiple DOE-funded projects at ORNL.

1990-2018, ORNL scientist serving on intermittent assignments funded by the [US Agency for International Development \(USAID\)](#) focused on improved management of forests, agricultural landscapes, water, and biodiversity.

2007-2009, [Advisor](#) to USAID Southern Africa Environmental Programs (under participating agency service agreement) for the Okavango River Basin Project, and Research Staff, Environmental Sciences Division, ORNL.

- 2004-06, Regional Natural Resources Program Officer; U.S. Agency for International Development (USAID), Regional Center for Southern Africa, based in Gaborone, Botswana, and working throughout Southern Africa Development Community (SADC) on regional planning to promote international parks and improved management of limited freshwater resources.
- 2001-04, Research Staff, supporting Federal Energy Management Program, combined heat-power systems, alternative financing for energy efficiency and renewable energy technologies; Engineering Science and Technology Division, ORNL.
- 1990-2000, Team Leader, USAID Environmental Strategic Objective, Guatemala (on loan from ORNL under a Participating Agency Service Agreement, DOE-USAID).
- 1984-1990, Project Manager, USAID Energy & Environmental Programs, in the Regional Office for Central American Programs (ROCAP) leading the Maya Biosphere Project (Guatemala) and renewable technology transfer with the Central American Research Institute for Industry & Technology; and environmentally sound disaster recovery and reconstruction following the 1983 extreme weather events associated with El Nino (USAID Peru).
- 1980-1984: Appropriate Technology Advisor for Rural Development; US Peace Corps, USAID, and National Energy Institute of Ecuador.

Selected Synergistic Activities and Appointments

- 2009-present, US liaison and technical collaborator with the International Energy Agency [Bioenergy Inter-task](#) and [Sustainable Supply Task](#)
- 2010-present, Expert and technical advisor for International Organization for Standardization (ISO) on ISO [TC-323 Circular Economy](#) (current). Expert and Lead for International Editing Committee, [ISO 13065, Sustainability Criteria for Bioenergy](#) (2010-15)
- 2012-present, contributor to American Society for Testing and Materials (ASTM) International [Committee E48](#) on Bioenergy and Industrial Chemicals from Biomass and [Committee E-60 Sustainability](#)
- 2019-23, Science Advisor, NSF-funded UTK International Research Network on “Transdisciplinary Nodes for Food-Energy-Water”
- 2021-present, organize and facilitate global stakeholder outreach and engagement for the Clean Energy Ministerial Biofuture Initiative on sustainability and serve as liaison with other stakeholders and other organizations
- 2009-11, advisor serving by invitation of California Air Resource Board (CARB) on the Land-Use Change Expert Work Group for the Low-Carbon Fuel Standard
- Periodic invitations to serve as Chair for international conferences and sessions including [Coordinating Research Council](#) on Life-Cycle Assessment (2021, 2019, 2017); AIChE Institute for Sustainability [2019 Conference](#); Institute for Food Policy Research workshop on [food security and bioenergy](#) (2016)
- Ongoing: Reviewer for IPCC Assessment Report chapters and scientific journals e.g.: Proceedings National Academy of Sciences (US PNAS); Frontiers in Ecology and the Environment; GCB-Bioenergy; Energy; Sustainability and Society; and others.

Examples of publications:

- CBES (Center for BioEnergy Sustainability, Oak Ridge National Laboratory). 2009. Land-Use Change and Bioenergy: Report from the 2009 workshop, ORNL/CBES-001, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy and Oak Ridge National Laboratory, Center for Bioenergy Sustainability. <http://www.ornl.gov/sci/besd/cbes.shtml>.
- Cowie AL, Berndes G, Bentsen NS, Brandao M, Cherubini F, Egnell G, George B, Gustavsson L, Manewinkel M, Harris ZM, Johnsson F, Junginger M, Kline KL, ...Woods J, Ximenes FA. 2021. Applying a science-based systems perspective to dispel misconceptions about climate effects of forest bioenergy. Research Review in *GCB-Bioenergy* <https://doi.org/10.1111/gcbb.12844>
- Dale B, Anderson J, Brown R, Csonka S, Dale VH, Herwick G, Jackson R, Jordan N, Kaffka S, Kline K, Lynd L, Malmstrom C, Ong R, Richard T, Taylor C, Wang M. 2014. Take a Closer Look: Biofuels Can Support Environmental, Economic and Social Goals. *Environmental Science & Technology* 48(13): 7200-7203
- Dale VH, KL Kline. 2013. Modeling for integrating science and management. Pages 209-240 In D.G. Brown, D. T. Robinson, N. H. F. French, and B.C. Reed (editors), **Land Use and the Carbon Cycle: Advances in Integrated Science, Management, and Policy**, Cambridge University Press.
- Dale VH, KL Kline. 2013. Issues in using landscape indicators to assess land changes. *Ecological Indicators* 28:91-99 <http://dx.doi.org/10.1016/j.ecolind.2012.10.007>
- Dale VH, K. Kline, J. Wiens, and J. Fargione. 2010. Biofuels: Implications for Land Use and Biodiversity. *Ecological Society of America*. <http://esa.org/biofuelsreports/>.
- Dale VH, R Efroymsen, and K Kline. 2010. Using a Broad-scale Perspective to Address Changes in Land, Climate, and Energy. The Climate-Energy Nexus: Proceedings of the 2009 China-US Joint Research for Ecosystem and Environmental Change, pages 52-55, published by the Institute for a Secure and Sustainable Environment, University of Tennessee.
- Dale VH, KL Kline, LL Wright, RD Perlack, M Downing, RL Graham. 2011. Interactions among bioenergy feedstock choices, landscape dynamics and land use. *Ecological Applications* 21(4):1039-1054.
- Dale VH, Efroymsen RA and Kline KL. 2011. The land use – climate change – energy nexus. *Landscape Ecology* 26(6):755-773.
- Dale VH, RA Efroymsen, KL Kline, MH Langholtz, PN Leiby, GA Oladosu... and R Hilliard. 2013. Indicators for assessing socioeconomic sustainability of bioenergy systems: A short list of practical measures. *Ecological Indicators* 26:87-102 <http://dx.doi.org/10.1016/j.ecolind.2012.10.014>
- Dale VH, Kline KL, Kaffka SR, Langeveld JWA. 2013. A landscape perspective on sustainability of agricultural systems. *Landscape Ecology* 28:1111-1123
- Dale VH, Kline KL, Perla D, Lucier A. 2013. Communicating about bioenergy sustainability. *Environmental Management* 51(2):279-290. DOI: 10.1007/s00267-012-0014-4.
- Dale VH, Parish ES and Kline KL. 2014. Risks to global biodiversity from fossil-fuel production exceed those from biofuel production. *Biofuels, Bioproducts and Biorefining* 9(2):177-189.
- Dale VH, RA Efroymsen, KL Kline, and M Davitt. (2015) A framework for selecting indicators of bioenergy sustainability. *Biofuels, Bioproducts & Biorefining* 9(4): 435-446. DOI: 10.1002/bbb.1562

- Dale VH, Kline KL, MA Buford, TA Volk, CT Smith, I Stupak. 2016. Incorporating bioenergy into sustainable landscape designs. *Renewable & Sustainable Energy Reviews* 56:1158-1171. <http://authors.elsevier.com/sd/article/S1364032115014215>
- Dale VH, Kline KL, Richard TL, Karlen DL, Belden WW. 2018. Bridging biofuel sustainability indicators and ecosystem services through stakeholder engagement. *Biomass and Bioenergy* 114: 143-156. <https://doi.org/10.1016/j.biombioe.2017.09.016>
- Dale VH, Kline KL, Parish ES, Eichler SE. 2019. Engaging stakeholders to assess landscape sustainability. *Landscape Ecology*. DOI: 10.1007/s10980-019-00848-1. June 2019, Volume 34, Issue 6, pp 1199–1218. <http://link.springer.com/article/10.1007/s10980-019-00848-1>
- Dale VH, Kline KL, Lopez-Ridaura S, Eichler SE, Ortiz-Monasterio I, Ramirez LF . 2020. Towards more sustainable agricultural landscapes: Lessons from Northwestern Mexico and the Western Highlands of Guatemala. *Futures* 24:2164 Special Issue 'Health, Climate Change, and Poverty' doi: 10.1016/j.futures.2020.102647 <https://europepmc.org/article/med/33082598>
- Dale VH, Kline KL. 2022. Effects on the Sustainable Development Goals of Wood Pellet Production in the Southeastern United States. *World Biomass 2021-2022*, pages 45-49. <http://www.dcm-productions.co.uk>
- Davis M, Alves BJR, Karlen D, Kline KL, Galdos M, Abulebdeh D. 2018. Review of Soil Organic Carbon Measurement Protocols: A U.S. and Brazil Comparison and Recommendation. *Sustainability* 10(1)53; doi:10.3390/su10010053 <http://www.mdpi.com/2071-1050/10/1/53>
- Dimitriou I, Kline KL, Berndes G et al. (November 2015) Chapter 5, Lignocellulosic crop supply chains in Mobilizing Sustainable Bioenergy Supply Chains - Inter-Task Project Synthesis Report (editor: C.T. (Tat) Smith) <http://www.ieabioenergy.com/publications/mobilizing-sustainable-bioenergy-supply-chains/> (180 pgs).
- Dimitriou I, Berndes G, Englund O, Brown M, Busch G, Dale V, Devlin G, English B, Goss K, Jackson S, Kline KL, McDonnell K, McGrath J, Mola-Yudego B, Murphy F, Negri MC, Parish ES, Ssegane H, Tyler D. 2019. Lignocellulosic Crops in Agricultural Landscapes: Production systems for biomass and other environmental benefits – examples, incentives, and barrier. *IEA Bioenergy*. <https://www.ieabioenergy.com/wp-content/uploads/2019/01/TR2018-05.pdf>
- Dubois O, Kline KL, et al. (2022). Assessing Energy's Interlinkages with other SDGs, Chapter 3 Interlinkages with Sustainable Use of Land (SDG 15). A Policy Brief prepared for the High-Level Political Forum of the United Nations, New York, NY (July 2022) https://sdgs.un.org/sites/default/files/2022-06/2022-UN_SDG7_Brief-060122.pdf
- Efroymsen RA, Dale VH, Bielicki J, McBride A, Smith R, Parish E, Schweizer P, Kline KL, Shaw D. 2013. Environmental indicators of biofuel sustainability: What about context? *Environmental Management* 51(2):291-306. DOI: 10.1007/s00267-012-9983-6 <https://link.springer.com/article/10.1007/s00267-012-9907-5>
- Efroymsen RA, Kline KL, Angelsen A, Verburg PH, Dale VH, Langeveld JW, McBride A. 2016. A causal analysis framework for land-use change and the potential role of bioenergy. *Land Use Policy* 59:516-527
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- Eichler SE, Kline KL, Ortiz-Monasterio I, López-Ridaaura S, Dale VH. (2020). Rapid appraisal of landscape sustainability indicators for Yaqui Valley, Mexico. *Environmental and Sustainability Indicators* 6: 100029. <https://doi.org/10.1016/j.indic.2020.100029>
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- Hecht AD, D Shaw, R Bruins, V Dale, K Kline, A Chen. 2009. Good policy follows good science: Using criteria and indicators for assessing sustainable biofuels production. *Ecotoxicology* 18(1)1-4.
- Hoekman K, Scott D and Kline KL. 2019. Summary of the NBB Sustainability and Land Use Change Workshop held September 26-27, 2018, in St. Louis, MO. Available at Center for *BioEnergy Sustainability* publications website <http://www.ornl.gov/sci/ees/cbes/>
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- Kang S, Wang D, Nichols JA, Schuchart J, Kline KL, et al. 2015. Development of mpi_EPIC Model for Global Agroecosystem Modeling. *Computers and Electronics in Agriculture* 111, 48–54.
- Kanter DR, Musumba M, Wood SLR, Palm C, Antle J, Dale VH, Havlik P, Kline KL, et al. 2018. Evaluating agricultural trade-offs in the age of sustainable development. *Agricultural Systems* 163:73-88.
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- Kline KL, Dale VH, Lee R, Leiby P. 2009. In Defense of Biofuels, Done Right. *Issues in Science and Technology* 25(3): 75-84. <http://www.issues.org/25.3/kline.html>
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- Kline KL, Mayer AL, Martinelli FS, Medeiros R, Oliveira COF, Sparovek G, Walter A, Venier L. 2015. Bioenergy and biodiversity: Key lessons from the Pan America Region. *Environmental Management* [56:1377-1396](#).
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- Kline KL, Davis M, Dunn J, Eaton L, Efroymsen RA. 2017. "Land Allocation and Management: Understanding Land-Use Change (LUC) Implications under BT16 Scenarios" in U.S.

Department of Energy 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Vol 2: Environmental Sustainability Effects of Select Scenarios from Volume 1. RA Efroymsen, MH Langholtz, KE Johnson, and BJ Stokes (Eds.), [ORNL/TM-2016/727](https://www.osti.gov/osti-pub/1338837). Oak Ridge National Laboratory, Oak Ridge, TN. 640p. [doi 10.2172/1338837](https://doi.org/10.2172/1338837)

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- Kline KL, Ramirez LF, Sum C, Lopez-Riadura S, Dale VH. 2020. Enhancements to agriculture in Guatemala can reduce migration pressure. *Nature-Sustainability* 3(2), 74-76. doi.org/10.1038/s41893-020-0473-1. <https://rdcu.be/b08LL>
- Kline KL, Dale VH, Rose E, Tonn B. 2021. Effects of Production of Woody Pellets in the Southeastern United States on the Sustainable Development Goals. *Sustainability* 13(2), 821; <https://doi.org/10.3390/su13020821>
- Kline KL, Dale VH, Rose E. 2021. Resilience lessons from the southeast US wood-pellet biomass supply chain response to the Covid-19 pandemic. *Frontiers in Forests and Global Change*. DOI: 10.3389/ffgc.2021.674138
- Kline KL and Dale VH. 2022. Role of sustainable biomass markets in forest conservation. *World Biomass 2022-2023* (trade journal available here: <https://dcm-productions.co.uk/world-biomass-2022-2023/>)
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- Oladosu GA and Kline KL. (2013) “A dynamic simulation of the ILUC effects of biofuel use in the USA.” *Energy Policy*. 61(C): 1127-1139
- Oladosu GA, Kline KL, Langeveld JA (2021) Structural break and causal analyses of U.S. Corn use for ethanol and other corn market variables. *Agriculture* 11(3), 267 –
- Parish ES, RA Efroymsen, VH Dale, KL Kline, AC McBride, T Johnson, MR Hilliard, HI Jager, JM Bielicki. 2013. Comparing scales of environmental effects from gasoline and ethanol production. *Environmental Management* 51(2): 307-338.
- Parish ES, Dale VH, Kline KL Abt RC. 2017. Reference scenarios for evaluating wood pellet production in the Southeastern United States. WIREs Energy and Environment. e259. [doi: 10.1002/wene.259](https://doi.org/10.1002/wene.259). <http://onlinelibrary.wiley.com/doi/10.1002/wene.259/epdf>
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- Parish ES, Karlen DL, Kline KL, Comer K, Beldon W. 2023. Identifying Opportunities to Improve Social and Environmental Benefits by Comparing Scenarios for Agricultural Land Management at Landscape Scales. *Sustainability* 15, <https://doi.org/10.3390/su151310051>.
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