Stanford



Edgar Virgüez

Research Engineer, Woods Institute

Curriculum Vitae available Online Resume available Online

Bio

BIO

Edgar Virgüez is Director of Research at the Stanford Woods Institute for the Environment and Managing Director of the Interdisciplinary Energy Systems Research Group at the Stanford Doerr School of Sustainability. He brings more than 20 years of experience spanning energy and environmental research, engineering, international development, and scientific leadership. His work bridges rigorous scholarship and institutional strategy, building collaborations that connect science with real-world decision-making.

Dr. Virgüez develops data-driven models to inform energy system planning, evaluate environmental and economic impacts, and guide infrastructure investment and technology deployment toward reliable, low-carbon energy systems. He has authored and co-authored more than 50 scholarly publications and research outputs cited over 1,200 times, including work in Energy & Environmental Science, Nature Cities, PNAS, and Science. He serves on the Editorial Board of Environmental Research: Energy, where he was one of seven inaugural Executive Editorial Board members, and received IOP Publishing's 2026 Editorial Excellence Award for outstanding intellectual leadership and sustained excellence in peer review and editorial stewardship.

Before taking on his current role at the Stanford Woods Institute, Dr. Virgüez served as Managing Director of the $23 million EARNEST Consortium at Stanford, overseeing a U.S. Department of Energy-funded collaboration spanning 21 universities, national laboratories, and research organizations focused on the future of the U.S. electricity system. He has also led successful interdisciplinary proposals and partnerships supported by universities, foundations, government, and industry.

Prior to joining Stanford, he was a Research Fellow at Carnegie Science and Deputy Group Leader in Ken Caldeira's research group, helping lead a portfolio at the intersection of energy, climate, and decarbonization. His professional experience also encompasses projects for universities, governments, and international development organizations, including the World Bank and Inter-American Development Bank.

Dr. Virgüez serves as an Expert Advisor to The Earthshot Prize, assessing climate solutions for innovation, impact, and scalability. He has also provided expert review and advice to Schmidt Sciences and the International Energy Agency on research proposals and technical reports focused on energy systems and decarbonization.

His contributions to scholarship, leadership, and education have been recognized through 22 competitive honors, including the American Geophysical Union's 2025 Science for Solutions Award, Duke University's 2021 Graduate School Dean's Award for Excellence in Teaching, and the Association

of American Colleges and Universities' 2020 K. Patricia Cross Future Leader Award. As an educator, he has taught 17 courses, reaching nearly 600 students, while mentoring students and early-career researchers.

Dr. Virgüez previously served on Duke University's Board of Trustees, the university's highest governing body, and currently serves on the Nicholas School of the Environment Board of Visitors and Dean's Cabinet, as well as Duke's Climate Commitment Campaign Board.

He earned a Ph.D. in Environmental Sciences and Policy and an M.A. in Environment from Duke University, as well as an M.Sc. in Environmental Engineering and dual B.Sc. degrees in Chemical and Environmental Engineering from Universidad de los Andes. His education has been supported by more than $795,000 in competitive scholarships and fellowships.

Across scholarship, education, and institutional leadership, his work is guided by a common purpose: advancing rigorous science, building enduring collaborations, and strengthening institutions to translate knowledge into impact at scale.

ACADEMIC APPOINTMENTS

- Research Engineer, Woods Institute

ADMINISTRATIVE APPOINTMENTS

- Director of Research, Stanford Woods Institute for the Environment, (2026- present)
- Managing Director, Interdisciplinary Energy Systems Research Group, (2025- present)
- Equitable Accessible Reliable Nationwide Energy System Transition (EARNEST) Consortium, Stanford University, (2025-2026)

HONORS AND AWARDS

- Editorial Excellence Award - Environment and Energy, Institute of Physics (IOP) Publishing (2026)
- Science for Solutions Award, American Geophysical Union (AGU) (2025)
- Best Student Paper Award (Energy and Environment Specialty Group), American Association of Geographers (2022)
- U.S. Carbon Program Leadership Award, U.S. Carbon Cycle Science Program & North American Carbon Program (2022)
- LatinX Awards: Excellence in Activism Award, Duke University (2022)
- Dean's Award for Excellence in Teaching (<0.1% of Duke University's Ph.D. students), Duke University Graduate School (2021)
- Forever Duke Student Leadership Award (<0.5% of Duke University Class of 2021), Duke University & Duke Alumni Association. (2021)
- Chron15: 15 leaders, pioneers, and icons at Duke University, Duke University Chronicle (2021)
- International Awards Program: Graduate/Professional Academic Wizard of the Year, Duke University International House (2021)
- Advancing Diversity and Inclusion Award (Energy and Environment Specialty Group), American Association of Geographers (2021)
- K. Patricia Cross Future Leader Award, Association of American Colleges and Universities (2020)
- Australia Awards International Fellow, Australia's Department of Economic Development, Jobs, Transport and Resources (2015)
- Procter & Gamble's Prestige Award, Procter & Gamble (P&G) Colombia (2008)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Board of Visitors, Duke University Nicholas School of the Environment (2026 - present)
- Editorial Board Member, Environmental Research: Energy (2023 - present)
- Expert Advisory Panel, Earthshot Prize (2024 - present)
- Trustee (Board Member), Duke University (2022 - 2025)
- Future Leaders Society Advisory Committee, American Association of Colleges and Universities (2022 - 2023)

PROFESSIONAL EDUCATION

- Ph.D., Duke University , Environmental Sciences and Policy (2022)
- Certificate, Duke University , College Teaching (2022)
- M.A., Duke University , Energy & Environment (2018)
- Certificate, Duke University , Geospatial Analysis (2018)
- M.Sc., Universidad de los Andes , Environmental Engineering (2010)
- B.Sc., Universidad de los Andes , Chemical Engineering & Environmental Engineering (double major) (2009)

SERVICE, VOLUNTEER, AND COMMUNITY WORK

- Nicholas School of the Environment Board of Visitors (3/26/2026)
- Board of Trustees (July 1, 2022 - 6/30/2025)
- Executive Editorial Board Member (June 1, 2023)
- Expert Advisory Panel (February 1, 2024)

LINKS

- LinkedIn Profile: https://www.linkedin.com/in/edgarvirguez/
- Personal Site: https://sites.duke.edu/edgarvirguez/

Publications

PUBLICATIONS

- **The effect of land costs on the economic and sustainability performance of solar photovoltaics in China.** *Proceedings of the National Academy of Sciences of the United States of America*
  Chen, S., Lu, X., Hao, J., Virgüez, E., Caldeira, K., Davis, S. J.
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- **Planning reliable wind- and solar-based electricity systems** *ADVANCES IN APPLIED ENERGY*
  Ruggles, T. H., Virguez, E., Reich, N., Dowling, J., Bloomfield, H., Antonini, E. G. A., Davis, S. J., Lewis, N. S., Caldeira, K.
  2024; 15
- **Copy-and-paste fixes can’t decarbonize Global South cities** *Nature Cities*
  Virguez, E.
  2024; 1 (8): 492-493
- **How I balanced my Ph.D. research with opening doors for others** *Science*
  Virguez, E.
  2022; 662: 376
- **High-resolution data shows China's wind and solar energy resources are enough to support a 2050 decarbonized electricity system** *APPLIED ENERGY*
  Li, M., Virguez, E., Shan, R., Tian, J., Gao, S., Patino-Echeverri, D.
  2022; 306
- **Utility-scale photovoltaics and storage: Decarbonizing and reducing greenhouse gases abatement costs** *APPLIED ENERGY*
  Virguez, E., Wang, X., Patino-Echeverri, D.
  2021; 282
- **Techno-economic optimization of hydrogen refueling infrastructure for corridor-based heavy-duty freight** *ENVIRONMENTAL RESEARCH-ENERGY*
  Lara, E., Lopez, O., Sierra, R., Virguez, E.
  2026; 3 (4)

- **The green resource trap: economic instability and the subordination of decarbonization in South America** *ENVIRONMENTAL RESEARCH-ENERGY*
  Leon, L., Sanchez-Silva, M., Virguez, E.
  2026; 3 (4)
- **Cost-effective approaches to maintaining resource adequacy in wind and solar electricity systems over decades of weather variability** *ENVIRONMENTAL RESEARCH-ENERGY*
  Reich, N. D., Ruggles, T. H., Virguez, E., Dowling, J. A., Caldeira, K., Lewis, N. S.
  2026; 3 (3)
- **Variability of technology learning rates** *ADVANCES IN APPLIED ENERGY*
  Carlino, A., Wongel, A., Duan, L., Virguez, E., Davis, S. J., Edwards, M. R., Caldeira, K.
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- **Economic development, air conditioning and adaptation to warming** *ENVIRONMENTAL RESEARCH LETTERS*
  Wongel, A., Freese, L. M., Virguez, E., Davis, S. J., Caldeira, K.
  2025; 20 (12)
- **Renewable energy quality trilemma and coincident wind and solar droughts** *COMMUNICATIONS EARTH & ENVIRONMENT*
  Li, M., Ma, Q., Shan, R., Abdulla, A., Virguez, E., Gao, S., Patino-Echeverri, D.
  2024; 5 (1)
- **Disproportionate energy disruptions afflicted rural Hispanic households during winter storm Uri** *ENVIRONMENTAL RESEARCH: ENERGY*
  Kumar, A., Ruggles, T. H., Virguez, E.
  2024; 1 (3)
- **Oahu as a case study for island electricity systems relying on wind and solar generation instead of imported petroleum fuels** *APPLIED ENERGY*
  Covelli, D., Virgueez, E., Caldeira, K., Lewis, N. S.
  2024; 375
- **Copy-and-paste fixes can't decarbonize Global South cities** *NATURE CITIES*
  Virguez, E.
  2024; 1 (8): 492-493
- **The Influence of Regional Geophysical Resource Variability on the Value of Single- and Multistorage Technology Portfolios.** *Environmental science & technology*
  Li, A. X., Virguez, E., Dowling, J. A., Wongel, A., Covelli, D., Ruggles, T. H., Reich, N., Lewis, N. S., Caldeira, K.
  2024
- **Preventing bad behavior in academia.** *Science (New York, N.Y.)*
  da Cruz Albino, R., Brimble, M. A., Zdenek, C., Vandenbroeck, K., Masud, S., Zhang, X., Cosentino, M., Gupta, A., Abdul-Ghani, R., Gerarduzzi, C., Jackson, P., Oomen, R., Servais, et al
  2024; 385 (6704): 22-24
- **The climate sciences need representation from the Global South** *ONE EARTH*
  Virguz, E., Leon, L., Freese, L. M.
  2024; 7 (3): 370-373
- **Identification of reliable locations for wind power generation through a global analysis of wind droughts** *COMMUNICATIONS EARTH & ENVIRONMENT*
  Antonini, E. G. A., Virguez, E., Ashfaq, S., Duan, L., Ruggles, T. H., Caldeira, K.
  2024; 5 (1)
- **The role of dispatchability in China's power system decarbonization** *ENERGY & ENVIRONMENTAL SCIENCE*
  Li, M., Shan, R., Abdulla, A., Virguez, E., Gao, S.
  2024; 17 (6): 2193-2205
- **Changing outdated expectations.** *Science (New York, N.Y.)*
  Singh, G., Teng, D., Turki, H., Bouchard, L., Chen, Y., Chugh, M., Wen, J., Chen, E. Y., Bezerra, P., Wu, L., Huang, J., Wen, Q., Hartzell, et al

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- **Reframing international students' success: Institutional responsibility for international student wellbeing and belongingness** *Supporting College Students of Immigrant Origin: New Insights from Research, Policy, and Practice*
  Suresh, M., Wagnon, J., Hall, T., Campos, R., Wakio, S., Virguez, E., Sperling, J.
  Cambridge University Press.2024; 1: 332-351
- **Opportunities and constraints of hydrogen energy storage systems** *Environmental Research: Energy*
  Dowling, J., Ruggles, T., Virguez, E., et al
  2024; 1 (3)
- **Disproportionate energy disruptions afflicted rural Hispanic households during winter storm Uri** *Environmental Research: Energy*
  Kumar, A., Ruggles, T., Virguez, E.
  2024
- **Low-carbon transition pathways of power systems for Guangdong-Hongkong-Macau region in China** *ENERGY & ENVIRONMENTAL SCIENCE*
  Liu, Z., Li, M., Virguez, E., Xie, X.
  2024; 17 (1): 307-322
- **Move up or move over: mapping opportunities for climate adaptation in Pakistan's Indus plains** *ENVIRONMENTAL RESEARCH LETTERS*
  Schmitt, R. J. P., Virguez, E., Ashfaq, S., Caldeira, K.
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- **NextGen Voices: Historic introductions.** *Science (New York, N.Y.)*
  Bismuth, K., Sharma, V., Powell, J. R., Tang, H., Cao, B., Huang, J., Patel, R. J., Bezerra, P., Zhang, X., Wen, Q., Oda, F. S., Verstiuk, O., Khan, et al
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- **AI in search of human help** *SCIENCE*
  Heim, A., Bharani, T., Konstantinides, N., Powell, J., Srivastava, S., Cao, X., Agarwal, D., Waiho, K., Lin, T., Virgueez, E., Strielkowski, W., Uzonyi, A.
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- **The Effect of Down-Cascade Re-Regulation on Alleviating the Flow Regime Alteration Induced by an Up-Cascade Reservoir** *WATER*
  Wang, Y., Wang, X., Virguez, E., Zheng, K., Hu, T., Mei, Y., Wang, H.
  2023; 15 (12)
- **The future of scientific societies.** *Science (New York, N.Y.)*
  da Silva, C. F., Virguez, E., Eker, S., Zdenek, C. N., Bergh, C., Gerarduzzi, C., Ge, Y., Klinger, M., Allareddy, V., Hoots, E., Henriquez, T., Waiho, K., D'Ippoliti, et al
  2023; 380 (6640): 30-32
- **Guiding the deployment of electric vehicles in the developing world** *ENVIRONMENTAL RESEARCH LETTERS*
  Dioha, M. O., Lukuyu, J., Virguez, E., Caldeira, K.
  2022; 17 (7)
- **What I promised my mother.** *Science (New York, N.Y.)*
  Virguez, E.
  2022; 376 (6593): 662
- **Integrating wind and photovoltaic power with dual hydro-reservoir systems** *ENERGY CONVERSION AND MANAGEMENT*
  Wang, X., Virguez, E., Mei, Y., Yao, H., Patino-Echeverri, D.
  2022; 257
- **Energy storage reduces costs and emissions even without large penetration of renewable energy: The case of China Southern Power Grid** *ENERGY POLICY*
  Li, M., Shan, R., Virguez, E., Patino-Echeverri, D., Gao, S., Ma, H.
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- **Graduate student perspectives on transforming academia** *CONSERVATION SCIENCE AND PRACTICE*
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- **Embracing the value of cultural wealth from underrepresented groups** *Teaching Gradually: Practical Pedagogy and Classroom Strategies for Graduate Students by Graduate Student*
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- **Clustering and dispatching hydro, wind, and photovoltaic power resources with multiobjective optimization of power generation fluctuations: A case study in southwestern China** *ENERGY*
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- **Integrating wind, photovoltaic, and large hydropower during the reservoir refilling period** *ENERGY CONVERSION AND MANAGEMENT*
  Wang, X., Virguez, E., Kern, J., Chen, L., Mei, Y., Patino-Echeverri, D., Wang, H.
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- **Abating carbon emissions by means of utility-scale photovoltaics and storage: The Duke Energy Progress/Carolinas case study** *Cigre Conference*
  Virguez, E., Patino-Echeverri, D.
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- **Uncertainty of greenhouse gas emission models: A case in Colombias transport sector**
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- **Influence of driving patterns on vehicle emissions: A case study for Latin American cities** *TRANSPORTATION RESEARCH PART D-TRANSPORT AND ENVIRONMENT*
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- **On the assessment of marginal life saving costs for risk acceptance criteria** *STRUCTURAL SAFETY*
  Fischer, K., Virguez, E., Sanchez-Silva, M., Faber, M. H.
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- **Defining guidelines for the application of the marginal life saving costs principle for risk regulation**
  Fischer, K., Virguez-Rodriguez, E., Sanchez-Silva, M., Faber, M. H.
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  CRC PRESS-TAYLOR & FRANCIS GROUP.2011: 444-451

- **Supporting decisions on global health and life safety investments**
  Faber, M. H., Virguez-Rodriguez, E.
  edited by Faber, M. H., Kohler, J., Nishijima, K.
  CRC PRESS-TAYLOR & FRANCIS GROUP.2011: 434-443