

# S. Julio Friedmann

## Position/Department/Division/Institution/Organization

Senior Research Scholar  
Center for Global Energy Policy  
Columbia Univ.

## Country

USA

## Career history

Senior Research Scholar (2018-pres) Center for Global Energy Policy, Columbia Univ.  
CEO and President, (2017-pres) Carbon Wrangler, LLC  
Chief Scientist, (2020-pres) Carbon Direct  
Distinguished Associate (2017-2020) Energy Futures Initiative  
Senior Advisor for Energy Innovation (2016-pres) Lawrence Livermore Natl. Laboratory  
Principal Deputy Asst. Secretary (2014-2016) Office of Fossil Energy (FE), U.S. DOE  
Deputy Asst. Secretary for Clean Coal and Carbon Management (2013-2014), U.S. DOE  
Chief Energy Technologist (2011-2013) Lawrence Livermore Natl. Lab, Livermore, CA  
Director, Carbon Management Program (2003 – 2011) LLNL, Livermore, CA  
Assistant Research Scientist (2001-2004) University of Maryland, College Park  
Sr. Research Geol. (1998-2000) ExxonMobil Upstream Research Co., Houston  
Research Geologist (1996-1998) Exxon Production Research Co., Houston

## Awards/Publications

**Greenman Award (IEA):** Significant contributions for CO<sub>2</sub> removal, storage, and utilization (2016)

**Friedmann, S.J., Agrawal, M., Bhardwaj, 2021, Evaluating Net-Zero Hubs in the United States: A Case Study in Houston, Center on Global Energy Policy report,**  
<https://www.energypolicy.columbia.edu/research/report/evaluating-net-zero-industrial-hubs-united-states-case-study-houston>

Bhardwaj, A.A., McCormick, C., **Friedmann, S.J., 2021, Opportunities and limits of CO<sub>2</sub> recycling in a circular carbon economy: techno-economics, critical infrastructure needs, and policy priorities, Center on Global Energy Policy report:**  
<https://www.energypolicy.columbia.edu/research/report/opportunities-and-limits-co2-recycling-circular-carbon-economy-techno-economics-critical>

Fan, Z., and **Friedmann**, S.J., 2021, Low-Carbon Production of Iron & Steel: Technology Options, Economic Assessment, and Policy, Joule, 5, 1-31, April, <https://doi.org/10.1016/j.joule.2021.02.018>

**Co-lead**, Biomass Carbon Removal and Storage Roadmap, Innovation for a Cool Earth Forum, Dec. 2020, <https://www.icef-forum.org/roadmap/>

**Friedmann**, S.J., Fan, Z., Ochu, E.R., Byrum, Z.S., Bhardwaj, A.A., Sheerazi, H.A., 2020, Levelized Cost of Carbon Abatement: A new methodology for a net-zero emissions world, Center on Global Energy Policy Report:

Sivaram, V., Hart, D., Cunliff, C., **Friedmann**, S.J. & Sandalow, D., 2020 (in press), Launching a National Energy Innovation Mission: *A Strategy for Tripling Federal Investment in Clean Energy Technologies Over Five Years*, Center on Global Energy Policy Report: 65 p.

**Friedmann**, S.J., Ochu, E.R., and Brown, J., 2020, Capturing Investment: Policy Design for CCUS Financing and Deployment in the U.S. Power Sector, Center on Global Energy Policy Report: 57 p.  
<https://energypolicy.columbia.edu/research/report/capturing-investment-policy-design-finance-ccus-projects-us-power-sector>

**Co-lead**, Industrial Heat Decarbonization Roadmap, Innovation for a Cool Earth Forum, Dec. 2019, <https://www.icef-forum.org/roadmap/>

**Friedmann**, S.J., Fan Z., Tang K. 2019, Low-Carbon Heat Solutions for Heavy Industry: Sources, Options, and Costs Today, Center for Global Energy Policy Report: 100 p.  
<https://energypolicy.columbia.edu/research/report/low-carbon-heat-solutions-heavy-industry-sources-options-and-costs-today>

**Friedmann**, S.J., 2019, Congressional Testimony, House Energy and Commerce Committee, Hearing on Industrial Decarbonization.  
<https://docs.house.gov/meetings/IF/IF18/20190918/109943/HHRG-116-IF18-Wstate-FriedmannJ-20190918.pdf>

**Friedmann**, S.J., 2019, Engineered CO<sub>2</sub> removal, climate restoration, and humility, *Frontiers in Climate*, July 26 2019, <https://doi.org/10.3389/fclim.2019.00003>

Gordon K. & **Friedmann**, S.J. 2018, Climate Change is a Chronic Condition, <https://www.foreignaffairs.com/articles/united-states/2018-09-18/climate-change-chronic-condition>

**Co-lead**, Direct Air Capture of Carbon Dioxide, Roadmap, Innovation for a Cool Earth Forum, Dec. 2018, [https://www.icef-forum.org/pdf2018/roadmap/ICEF2018\\_DAC\\_Roadmap\\_20181210.pdf](https://www.icef-forum.org/pdf2018/roadmap/ICEF2018_DAC_Roadmap_20181210.pdf)

**Lead Author**, Advancing Large-Scale Carbon Management: Expansion of the 45Q Tax Credit, Policy Paper, Energy Future Initiative, May 2018, [https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5b0604f30e2e7287abb8f3c1/1527121150675/45Q\\_EFI\\_5.23.18.pdf](https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5b0604f30e2e7287abb8f3c1/1527121150675/45Q_EFI_5.23.18.pdf)

**Co-lead**, Building a New Carbon Economy: An Innovation Plan, New Carbon Economy Consortium, Sept. 2018, <https://carbon180.org/s/ccro2innovationplanFNL-3wkx.pdf>

**Friedmann**, S.J., 2019, Congressional Testimony, Senate Committee on Energy and Natural Resources, Enhancing the Future of CCUS, <https://www.energy.senate.gov/public/index.cfm/2019/5/full-committee-hearing-to-examine-ccus-and-to-receive-testimony-on-legislation>

**Friedmann**, SJ, 2018, Congressional Testimony, Senate Environment & Public Works Committee The USE IT Act and CCUS Deployment [https://www.epw.senate.gov/public/\\_cache/files/6/8/68543b44-27ad-4a98-b03b-0101e9c66543/B5CEB3DDBCD44E586388A553B4C2918B.04.11.2018-friedman-testimony.pdf](https://www.epw.senate.gov/public/_cache/files/6/8/68543b44-27ad-4a98-b03b-0101e9c66543/B5CEB3DDBCD44E586388A553B4C2918B.04.11.2018-friedman-testimony.pdf)

**Friedmann**, SJ, 2017, Congressional Testimony, Senate Environment and Public Works Committee, EXPANDING AND ACCELERATING THE DEPLOYMENT AND USE OF CARBON CAPTURE, UTILIZATION, AND SEQUESTRATION, <https://www.gpo.gov/fdsys/pkg/CHRG-115shrg27318/pdf/CHRG-115shrg27318.pdf>

**Co-Chair**, Chapter 7 (Carbon removal), UN Environmental Program Emissions Gap Report, Nov. 2017 [https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR\\_2017.pdf](https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR_2017.pdf)

**Co-Lead**, Carbon Dioxide Utilization Roadmap 2.0, Innovation for a Cool Earth Forum, Oct. 2017 [https://www.icef-forum.org/platform/upload/CO2U\\_Roadmap\\_ICEF2017.pdf](https://www.icef-forum.org/platform/upload/CO2U_Roadmap_ICEF2017.pdf)

**Friedmann**, SJ and Cohen, A, 2013, Shale Gas will Change the US, not the Climate, *Financial Times*, Jan. 10<sup>th</sup>, 2013

Jones D, McVey T, **Friedmann** SJ, 2012, Location-Specific Techno-economic evaluation of a Novel Amine Technology, *Energy Procedia*, Elsevier, 8 p.

**Friedmann**, SJ, 2012, Shaping California's Smart Grid: Employing the best computer technology, *EnergyBiz Magazine*, Jan/Feb, <http://www.energybiz.com/magazine/article/251061/shaping-california-s-smart-grid>

Buscheck TA, Sun Y, Chen M, Hao Y, Wolery T, Bourcier W, Court B, Celia MA, **Friedmann** SJ, Aines RD, 2012, Active CO<sub>2</sub> reservoir management for carbon storage: Analysis of operational strategies to relieve pressure buildup and improve injectivity, *Intl. J. of Greenhouse Gas Control* v.6

Chiaromonte L, Zoback MA, **Friedmann** SJ, Stamp V, 2012, 3D Stochastic Reservoir Model and Fluid Flow Simulation of the Fractured Tensleep Formation for a CO<sub>2</sub>-EOR Pilot, SPE Conf. on Carbon Management Tech, CMTC-151480

**Friedmann** SJ, 2011, Carbon Capture and GreenTechnology: Environmentalism's Step Forward and Two Steps Back, *Foreign Affairs* (Online), <http://www.foreignaffairs.com/articles/68256/s-julio-friedmann/carbon-capture-and-green-technology>

## **Areas of expertise**

Carbon Capture and Storage (CCS)

Direct Air Capture (DAC) and other CO<sub>2</sub> removal (CDR)

Carbon-to-value (CO<sub>2</sub> Use)

Industrial decarbonization

Hydrogen production and use

Advanced power cycles and energy conversion

Shale gas and tight hydrocarbon science, technology development and practice

Asian energy systems, conversion, and networks

Geology and geophysics (emphasis on stratigraphy and geomechanics)