**Jhih-Shyang Shih**

October 2020

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| **Education** | Post-Doc., Engineering and Public Policy, Carnegie Mellon UniversityPh.D., System Analysis and Economics for Public Decision Making, Johns Hopkins UniversityM.S., Environmental Systems, National Cheng-Kung UniversityB.S., Environmental Engineering, National Cheng-Kung University | 1991-19951985-19901981-19831977-1981 |
| **Research** **Experience** | Fellow, Resources for the FutureConsultant, Resources for the FutureAAAS-EPA Fellow, US EPAResearch Associate, Department of Engineering and Public Policy, Carnegie Mellon UniversityConsultant, Argonne National Laboratory | 1998-present1995-199719951991-19951995 |
| **Teaching****Experience** | Instructor, Mathematical Foundation for Public Decision Making, Part-Time Programs in Engineering and Applied Science, Whiting School of Engineering, The Johns Hopkins University | 1997 |
| **Honors and Awards** | Assistant Editor, International Journal of Society Systems ScienceRFF New Frontiers Fund AwardAWWA Small Systems Division Best Paper AwardWho's Who in Science and Engineering, 4th-EdDirector, Oversea Chinese Environmental Engineering and Scientist AssociationAmerican Association for the Advancement of Science (AAAS)/EPA FellowJi-Dian Liang FellowshipJunior Scientist Traveling Award, NATO Advanced Study InstituteResearch Assistant Fellowship, The Johns Hopkins UniversityTuition Fellowship, The Johns Hopkins UniversityChairman of Chinese Graduate Student Association, The Johns Hopkins UniversityGraduate Scholarship, National Cheng-Kung University | 2007-present2012200719981997-19981995199419931987-19901985-199019861981-1983 |
| **Invited****Reviewer** | *Agricultural and Resource Economics Review, American Association for the Advancement of Science, American Journal of Agricultural Economics, Annals of Regional Science, Automatica, Energy Economics, Energy Policy,* Environment and Development Economics, *Environmental Science and Technology,* Growth and Change, International Transactions in Operational Research, Journal of the Air and Waste Management Association, *Journal of Environmental Economics and Management, Journal of Hazardous Materials, Journal of Policy Analysis and Management, Land Economics, Municipal Engineer, Science of the Total Environment, Socio-Economic Planning Sciences, Utility Policy*, *Water Resource Management*, Argonne National Laboratory, Swarthmore College Honors Program examiner (Operations Research and Environmental Systems Engineering), U.S. Environmental Protection Agency (EPA), World Resource Institute. |
| **Certification****Skills****Referred Publications** | SAS certified base programmer for SAS 9ESRI certifications for ArcGIS Desktop I and IIEcoMod School certification for Practical General Equilibrium Modeling with GAMS. 2019.**Software:** GAMS, SAS, Stata, R, ArcGIS, Matlab, Analytica, IMPLAN, BenMAP, SPARROW,  BASIN, ISCST3, SAS Enterprise Guide.**Coding:** FORTRAN, BASIC, Python, C.**Languages:** English, Mandarin ChineseShih, Jhih-Shyang, Charles Driscoll, Dallas Burtraw, Huizhong Shen, Richard Smith, Amelia Keyes, Kathy Lambert, Yilin Chen, Armstead G. Russell. “Energy Policy and Water Quality: An Integrated Air and Water Quality Modeling Approach.” Submitted.Chen, Yilin, Huizhong Shen, Jennifer Kaiser, Yongtao Hu, Shannon L Capps, Shunliu Zhao, Amir Hakami, Jhih-Shyang Shih, Gertrude K Pavur, Matthew D Turner, Daven K Henze, Jaroslav Resler, Athanasios Nenes, Sergey L Napelenok, Jesse O Bash, Kathleen M Fahey, Gregory R Carmichael, Tianfeng Chai, Lieven Clarisse, Pierre-François Coheur, Martin Van Damme, Armistead G Russell. “High-resolution Hybrid Inversion of IASI Ammonia Columns to Constrain U.S. Ammonia Emissions Using the CMAQ Adjoint Model.” *Atmospheric Chemistry and Physics Discussions*, <https://doi.org/10.5194/acp-2020-523>, in review, 2020.Chen, Yilin, Huizhong Shen, Jhih-Shyang Shih, Armistead G. Russell, Shuai Shao, Yountao Hu, Mehmet Odman, Athanasios Nenes, Gertrude Pavur, Yufei Zou, Zhihong Chen, Richard Smith, Dallas Burtraw, Charles Driscoll. 2020. “Greater contribution from agricultural sources to future reactive nitrogen deposition in the United States.” ***Earth’s Future***, accepted.Shen, Huizhong, Yilin Chen, Yufei Li, Armistead G Russell, Yongtao Hu, Lucas RF Henneman, Mehmet Talât Odman, Jhih-Shyang Shih, Dallas Burtraw, Shuai Shao, Haofei Yu, Momei Qin, Zhihong Chen, Abiola S Lawal, Gertrude K Pavur, Marilyn A Brown, Charles T Driscoll. (2019). “Relaxing Energy Policies Coupled with Climate Change Will Significantly Undermine Efforts to Attain US Ozone Standards.” *One Earth*, 1(2), pp. 229-239.<https://doi.org/10.1016/j.oneear.2019.09.006>Linn, Joshua and Jhih-Shyang Shih. (2019). “Do Lower Electricity Storage Costs Reduce Greenhouse Gas Emissions?” ***Journal of Environmental Economics and Management,*** 96, pp. 130-158.<https://www.sciencedirect.com/science/article/pii/S0095069617304400?via%3Dihub>Lucija Muehlenbachs, Elaine Swiedler, Ziyan Chu, Jhih-Shyang Shih, and Alan Krupnick (2019). “Should solid waste from shale gas development be regulated as hazardous waste?” ***Energy Policy***, Vol. 129. Pp. 1020-1033. <https://doi.org/10.1016/j.enpol.2019.02.016> Ho, Jacqueline S., Jhih-Shyang Shih, Lucija A. Muehlenbachs, Clayton Munnings, and Alan J. Krupnick. (2018). “Managing Environmental Liability: An Evaluation of Bonding Requirements for Oil and Gas Wells in the United States.” ***Environmental Science & Technology***, 52 (7), pp. 3908-3916. **doi:**10.1021/acs.est.7b06609.<https://pubs.acs.org/doi/10.1021/acs.est.7b06609> Yang, Qichun, Xuesong Zhang, Xingya Xu, Ghassem R. Asrar, Richard A. Smith, Jhih-Shyang Shih, and Shuiwang Duan (2016). “Spatial Pattern and Environmental Controls of Particulate Organic Carbon in Surface Waters in the Conterminous United States.” ***Science of the Total Environment***, Vol. 554, pp. 266-275. doi:10.1016/j.scitotenv.2016.02.164. <http://www.sciencedirect.com/science/article/pii/S0048969716303758> Shih, Jhih-Shyang, James E. Saiers, Shimon C. Anisfeld, Ziyan Chu, Lucija A. Muehlenbachs, and Sheila M. Olmstead (2015). “Characterization and Analysis of Liquid Waste from Marcellus Shale Gas Development.” ***Environmental Science & Technology***, Vol. *49, No.* 16, pp. 9557–9565. **doi:** 10.1021/acs.est.5b01780. <http://pubs.acs.org/doi/abs/10.1021/acs.est.5b01780> Li, Shanjun, Han Kyul Yoo, Molly Macauley, Karen L. 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Morgenstern, and Jhih-Shyang Shih (2011). “The Performance of Industrial Sector Voluntary Climate Programs: Climate Wise and 1605(b).” ***Energy Policy,*** Vol. 39: Iss. 12, pp 7907-7916. doi:10.1016/j.enpol.2011.09.040.<http://www.sciencedirect.com/science/article/pii/S0301421511007294> Macauley, Molly, Joe Maher, and Jhih-Shyang Shih (2010). “From Science to Applications: Determinants of Diffusion in the Use of Earth Observations.” ***Journal of Terrestrial Observation*:** Vol. 2: Iss. 1, Article 4.<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1064&context=jto> Shih, Jhih-Shyang, Dallas Burtraw, Karen L. 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Pizer and Kenneth **Gillingham (2006). “**Economies of Scale in Community Water Systems,” ***Journal of American Water Work Association***, September, Vol. 98, No. 9, pp 100-108. (2007 AWWA Small Systems Division Best Paper Award)<http://www.awwa.org/publications/journal-awwa/abstract/articleid/15520.aspx> Morgenstern, Richard D., Mun S. Ho, Jhih-Shyang Shih, Xuehua Zhang (2004). “The Near-Term Impacts of Carbon Mitigation Policies on Manufacturing Industries,” ***Energy Policy***, November. Vol. 32, No. 16, pp. 1825-1841. doi:10.1016/S0301-4215(03)00171-X.<http://www.sciencedirect.com/science/article/pii/S030142150300171X> Macauley, Molly K., Karen L. 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"The Cost of Environmental Protection,"***The Review of Economics and Statistics***, 83(4): 732-738.doi:10.1162/003465301753237812.<http://www.mitpressjournals.org/doi/abs/10.1162/003465301753237812#.V2CbrdkrKM8> Shih, Jhih-Shyang, Garrick E. Louis and Karen Palmer (2001). "Recycling" in Encyclopedia of Global Change: Environmental Change and Human Society, Goudie A.S. Ed., Oxford University Press, March.[https://global.oup.com/academic/product/encyclopedia-of-global-change-9780195108255?cc=us&lang=en&#](https://global.oup.com/academic/product/encyclopedia-of-global-change-9780195108255?cc=us&lang=en&) Morgenstern, Richard D., Jhih-Shyang Shih and Stuart Sessions (2000). "Comparative Risk Assessment: An International Comparison of Methodologies and Results," ***Journal of Hazardous Materials***, 78, 19-39. doi:10.1016/S0304-3894(00)00215-6.<http://www.sciencedirect.com/science/article/pii/S0304389400002156> Shih, Jhih-Shyang, Armistead G. Russell and Gregory J. McRae (1998). 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"Water Supply Operations during Drought: A Continuous Hedging Rule," ***Journal of Water Resources Planning and Management*, ASCE**, 120(5), 613-629.[http://ascelibrary.org/doi/abs/10.1061/(ASCE)0733-9496(1994)120:5(613)](http://ascelibrary.org/doi/abs/10.1061/%28ASCE%290733-9496%281994%29120%3A5%28613%29)  |
| **BOOK PUBLICATIONS** | Bergamaschi, Brian A., Richard A. Smith, Michael J. Sauer, Jhih-Shyang Shih and Lei Ji. “Terrestrial Fluxes of Nutrients and Sediment to Coastal Waters and Their Effects on Coastal Carbon Storage in the Eastern United States**.”** In Baseline and projected future carbon storage and greenhouse-gas fluxes in ecosystems of the eastern United States. Zhu, Zhiliang, and Reed, Bradley, eds. Professional Paper 1804, 204 p. 2014. U.S. Geological Survey. Reston, VA. <http://dx.doi.org/10.3133/pp1804>. Shih, Jhih-Shyang, Sheila Olmstead, Ziyan Chu, Alan Krupnick, Lucija Muehlenbachs, James Saiers, and Shimon Anisfeld. Wastewater Characteristics from Marcellus Shale Gas Development in Pennsylvania. In Alan Krupnick, editor, *Managing the Risks of Shale Gas: Key Findings and Further Research*, pages 8-9. Resources for the Future, Washington, DC 2013.Bergamaschi, Brian A., Richard A. Smith, Michael J. Sauer, and Jhih-Shyang Shih. “Terrestrial Fluxes of Sediments and Nutrients to Pacific Coastal Waters and Their Effects on Coastal Carbon Storage Rates.” In Baseline and Projected Future Carbon Storage and Greenhouse-Gas Fluxes in Ecosystems of the Western United States. Zhiliang Zhu and B.C. Reed, eds. Professional Paper 1797. November, 2012. U.S. Geological Survey. Reston, VA. <http://pubs.usgs.gov/pp/1797/>Shih, Jhih-Shyang, Winston Harrington, William Pizer, and Kenneth Gillingham. “Economies of Scale in Community Water Systems.” In The Business of Water: A Concise Overview of Challenges and Opportunities in the Water Market. Steve Maxwell, Editor. January, 2008. American Water Works Association. Denver, CO.Morgenstern, Richard D., William A. Pizer, Jhih-Shyang Shih. “Evaluating Voluntary U.S. Climate Programs: The Case of Climate Wise.” In the Reality Check: The Nature and Performance of Voluntary Environmental Programs in the United States, Europe, and Japan. Morgenstern and Pizer, Editors. February, 2007. Resources for the Future, Washington DC.Blackman, Allen, Steven Newbold, Jhih-Shyang Shih, David Evans, Joseph Cook and Michael Batz. “Benefits and Costs of Controlling Small Firm Pollution: Informal Brickmaking in Ciudad Juárez, Mexico.” In the Small Firms and the Environment in Developing Countries: Collective Impacts, Collective Action. Allen Blackman, Editor. February, 2006. Resources for the Future, Washington DC.Krupnick, Alan and Jhih-Shyang Shih, A New Approach to Air Quality Management, in New Approaches on Energy and the Environment: Policy Advice for the President, Morgenstern and Portney Ed., November 2004. Resources for the Future, Washington DC. |
| **RESOURCES****RFF BLOG****RFF REPORT** | Jhih-Shyang Shih and Karen Palmer. Could Blockchain Technology Improve Water, Wastewater, and Solid Waste Management in the Oil and Gas Industry? March 22, 2019. <https://www.resourcesmag.org/archives/could-blockchain-technology-improve-water-wastewater-and-solid-waste-management-oil-and-gas-industry/>Macauley, Molly K., Karen L. Palmer, Jhih-Shyang Shih, Sarah Cline, and Heather Holsinger. “The Environment and the Information Age,” *Resources*, Fall 2001, Issue 145, 6-9. Shanjun Li, Han Kyul Yoo, Jhih-Shyang Shih. “Renewable Energy from Landfills,” *Resources*, 2015, Issue 188, 18-19. <http://www.rff.org/RFF/Documents/RFF-Resources-188_Featurette-LiYooShih.pdf> Lucija Muehlenbachs, Jhih-Shyang Shih, and Alan Krupnick. Is Shale Drilling Waste Toxic? Comments on EPA’s Recent Report. Resources for the Future. Common Resources. May 2, 2019.<https://www.resourcesmag.org/common-resources/is-shale-drilling-waste-toxic-comments-on-epas-recent-report/> Jhih-Shyang Shih and Dallas Burtraw. California’s New Legislation on Short-Lived Climate Pollutants. Resources for the Future. November 11, 2016.<http://www.rff.org/blog/2016/california-s-new-legislation-short-lived-climate-pollutants> Jhih-Shyang Shih. Resources Magazine: Renewable Energy from Landfills. Resources for the Future. January 28, 2015.<http://www.rff.org/blog/2015/resources-magazine-renewable-energy-landfills> Molly K. Macauley, Karen L. Palmer and Jhih-Shyang Shih. Assessing Landfill Gas-to-Energy Adoption Policies. July 9, 2014.<http://www.rff.org/blog/2014/assessing-landfill-gas-energy-adoption-policies> Jaqueline Ho, Alan Krupnick, Katrina McLaughlin, Clayton Munnings, and Jhih-Shyang Shih. Plugging the Gaps in Inactive Well Policy: Summary of Key Findings. Resources for the Future Report. May 2016. <http://www.rff.org/files/document/file/RFF-Rpt-PluggingInactiveWells_ExecutiveSummary_0.pdf> Jaqueline Ho, Alan Krupnick, Katrina McLaughlin, Clayton Munnings, and Jhih-Shyang Shih. Plugging the Gaps in Inactive Well Policy. Resources for the Future Report. May 2016. <http://www.rff.org/files/document/file/RFF-Rpt-PluggingInactiveWells.pdf> Shimon Anisfeld, Ziyan Chu, Hal Gordon, Madeline Gottlieb, Alan J. Krupnick, Lucija Anna Muehlenbachs, Sheila M. Olmstead, Nathan Richardson, James Saiers, Jhih-Shyang Shih, Juha V. Siikamäki, Elisheba Beia Spiller, Chris Timmins, Hannah Wiseman. Managing the Risks of Shale Gas: Key Findings and Further Research. Resources for the Future Report. May 2013. <http://www.rff.org/Publications/Pages/PublicationDetails.aspx?PublicationID=22216> Dallas Burtraw, Carolyn Fischer, Clayton Munnings, Karen L. Palmer, Anthony Paul, Nathan Richardson, Jhih-Shyang Shih, Roberton C. Williams III. Comments to the US Environmental Protection Agency on Its Proposed Clean Power Plan. Resources for the Future Report. December 2014. <http://www.rff.org/RFF/Documents/RFF-Rpt-CPPComments.pdf>  |
| **CONFERENCE PROCEEDINGS** | Shih, Jhih-Shyang, Dallas Burtraw, Karen Palmer and Juha Siikamaki. “Valuation of Air Emissions from Livestock Operations and Options for Policy.” Proceedings of Workshop on Agricultural Air Quality: State of the Science, June 5-8, 2006. Potomac, Maryland. Ed. Viney P. Aneja, William H. Schlesinger, Raymond Knighton, Greg Jennings, Dev Niyogi, Wendell Gilliam, and Clifford S. Duke. Raleigh: North Carolina State University, 2006.Shih, Jhih-Shyang, Michelle S. Bergin, Alan J. Krupnick, and Armistead G. Russell. “Source-Receptor Matrices and Cost-Benefit Analysis With Meteorological Variability for Ambient Ozone and Fine Particulates: Development and Demonstration of an Integrated Model and Framework,” *Proceeding of Air & Waste Management Association Annual Conference*, June 22-26, 2003, San Diego, CA.Shih, Jhih-Shyang and H. Christopher Frey. "Coal Blending Optimization Under Uncertainty," Tenth Annual International Pittsburgh Coal Conference, September 1993, Pittsburgh, Pennsylvania, p. 1110-1115.Shih, Jhih-Shyang and Charles S. ReVelle. "Water Supply Operations during Drought," Proceeding of Water Forum '92, August 1992, Baltimore, Maryland, p. 310-315. |
| **DISCUSSION PAPERS** | Shih, Jhih-Shyang, Elaine Swiedler, and Alan J. Krupnick. “A Model for Shale Gas Wastewater Management.” RFF Discussion Paper 16-44. October 17, 2016.<http://www.rff.org/research/publications/model-shale-gas-wastewater-management> Linn, Joshua and Jhih-Shyang Shih. “[Does Electricity Storage Innovation Reduce Greenhouse Gas Emissions?](http://www.rff.org/research/publications/does-electricity-storage-innovation-reduce-greenhouse-gas-emissions)” RFF Discussion Paper 16-37. September 2016.<http://www.rff.org/files/document/file/RFF-DP-16-37.pdf> Li, Shanjun, Han Kyul Yoo, Jhih-Shyang Shih, Karen L. Palmer, Molly K. Macauley. “Assessing the Role of Renewable Energy Policies in Landfill Gas Energy Projects.” RFF Discussion Paper 14-17. July 2014. <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-14-17.pdf> Li, Shanjun, Han Kyul Yoo, Molly Macauley, Karen L. Palmer and Jhih-Shyang Shih. “Assessing the Role of Renewable Energy Policies in Landfill Gas to Energy Projects.” (May 2, 2014).<http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2432374> Olmstead, Sheila, Lucija Muechlenbachs, Jhih-Shyang Shih, Ziyan Chu, and Alan Krupnick. “Shale Gas Development Impacts on Surface Water Quality in Pennsylvania.” RFF Discussion Paper. August 2012.Shih, Jhih-Shyang, Richard B. Alexander, Richard A. Smith, Elizabeth W. Boyer, Gregory E. Schwarz, and Susie Chung. (2011) “An initial SPARROW model of land use and in-stream controls on total organic carbon in streams of the conterminous United States.” U.S. Geological Survey Open-File Report 2010–1276, 22 p. <http://pubs.usgs.gov/of/2010/1276/> Macauley, Molly K. and [Jhih-Shyang Shih](http://www.rff.org/Researchers/Pages/ResearchersBio.aspx?ResearcherID=62). “[Assessing Investment in Future Landsat Instruments: The Example of Forest Carbon Offsets](http://www.rff.org/RFF/Documents/RFF-DP-10-14.pdf).” RFF Discussion Paper 10-14. March 2010.<http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-10-14.pdf> Ho, Mun, Richard D. Morgenstern, Jhih-Shyang Shih. “Impact of Carbon Price Policies on U.S. Industry.” RFF Discussion Paper 08-37. December 2008.<http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-08-37.pdf> Pizer, William A., Richard D. Morgenstern, Jhih-Shyang Shih. “Evaluating Voluntary Climate Programs in the United States.” RFF Discussion Paper 08-13. July 2008.<http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-08-13-REV.pdf> Macauley, Molly K. and Jhih-Shyang Shih. “A Cost-Index Approach to Valuing Investment In Far Into The Future Environmental Technology.” RFF Discussion Paper 07-29. June 2007.<http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-07-29.pdf> Shih, Jhih-Shyang, Dallas Burtraw, Karen Palmer and Juha Siikamaki. “Air Emissions of Ammonia and Methane from Livestock Operations: Valuation and Policy Options.” RFF Discussion Paper 06-11. March 2006.<http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-06-11.pdf> Palmer, Karen L., Dallas Burtraw, and Jhih-Shyang Shih. “Reducing Emissions from the Electricity Sector: The Costs and Benefits Nationwide and for the Empire State.” RFF Discussion Paper 05-23. June 2005. <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-05-23.pdf> Shih, Jhih-Shyang, Michelle S. Bergin, Armistead G. 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