

# SETH B.C. SHONKOFF, PhD, MPH

## EDUCATION

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- University of California, Berkeley** *September 2006 – May 2012 – Berkeley, CA*  
PhD, Environmental Science, Policy and Management
- University of California, Berkeley** *September 2007 – May 2008 – Berkeley, CA*  
MPH, School of Public Health, Epidemiology
- Skidmore College** *September 1999-May 2003 – Saratoga Springs, NY*  
BA, Environmental Studies

## WORK AND RESEARCH EXPERIENCE

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- Executive Director, PSE Healthy Energy** *December 2012 – Present*  
*Oakland, CA; Ithaca, NY; New York City, NY*
- Built an energy science and policy research institute focused on bringing scientific transparency to energy policy with a focus on oil and gas development, power generation, and energy transitions.
  - Increased staff from two to ten and increased budget by more than 500% over five years.
  - Published more than 35 peer-reviewed papers, reports and book chapters.
  - Led environmental public health research on multiple state and foundation funded multi-institution scientific studies on oil and gas production.
  - Service on multiple science-policy advisory boards.
- Visiting Scholar, Dept. Environmental Science, Policy and Mgmt., UC Berkeley** *May 2012 – Present*  
*Berkeley, CA*
- Environmental public health and climate science and policy; public health, water, air and climate dimensions of oil and gas development and renewable energy transitions.
- Affiliate, Energy Technologies Area, Lawrence Berkeley National Laboratory** *July 2014 – Present*  
*Berkeley, CA*
- Environmental and public health dimensions of fossil fuel and hydrocarbon development.
- Independent Consultant** *January 2012 – Present*
- Analysis and expert testimony on environmental, public health, energy, and climate science and policy issues.
  - Development of data-driven strategies for effective foundation and philanthropic work.
- Affiliated Faculty Member, Berkeley Food Institute, UC Berkeley** *August 2014 – Present*  
*Berkeley, CA*
- Contributing Author, IPCC, UC Berkeley** *April 2011 – April 2014*  
*Berkeley, CA*
- Contributing Author, “Human Health” chapter of Working Group II, AR 5 report for the Intergovernmental Panel on Climate Change (IPCC).
- Climate & Health Graduate Student Researcher, UC Berkeley** *May 2008 – May 2012*  
*Berkeley, CA*

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- Conducted environmental public health and equity research focused on climate change mitigation, air quality and appropriate technology assessments (*with Professors Kirk R. Smith, PhD, MPH & Rachel Morello-Frosch, PhD, MPH*).

**Program Associate**, Berkeley Air Monitoring Group  
Berkeley, CA

February 2010 – December 2010

- Managed local staff and executed household energy monitoring and evaluation programs in Ghana and Mali; built international partnerships; assessment of climate forcing emissions, technology adoption, energy efficiency, health, and development dimensions of household energy projects in developing countries.

**Health Policy Analyst**, San Francisco Department of Public Health  
San Francisco, CA

May 2007 – September 2007

- Conducted epidemiologic research; tested patients for HIV and other STIs (*with Jeffrey Klausner, MD, MPH*).

**Molecular Epidemiology Graduate Student Researcher**, UC Berkeley  
Berkeley, CA

September 2007 – May 2008

- Investigated risk factors for rheumatic fever in children from northeastern Brazil and Oakland, CA (*with Professor Lee Riley, MD, MPH*).

**Environmental Analyst**, San Francisco Estuary Institute  
Oakland, CA

September 2003 – June 2006

- Managed projects; collected and analyzed ecological, geomorphological, and aquatic field data; co-authored science and policy reports for state agencies and peer-reviewed journals.

## SELECTED PUBLICATIONS AND REPORTS

### ***PEER-REVIEWED JOURNAL PUBLICATIONS***

1. Hill LA, Czolowski E, DiGiulio DC, **Shonkoff SBC**. (2019). Temporal and Spatial Trends of Oil and Gas Waste Disposal in Pennsylvania, 1991 – 2017. *Science of the Total Environment*. Available at: <https://www.sciencedirect.com/science/article/pii/S0048969719314913>
2. Garcia-Gonzales D, **Shonkoff SBC**, Hays J, Jerrett M. (2019). Hazardous Air Pollutants Associated with Upstream Oil and Natural Gas Development: A Critical Synthesis of Current Peer-Reviewed Literature. *Annual Reviews of Public Health*. 40:283-304. Available at: <https://www.annualreviews.org/doi/full/10.1146/annurev-publhealth-040218-043715>
3. DiGiulio DC and **Shonkoff SBC**. (*In Preparation*). Risk of drinking water contamination from legacy disposal of oil and gas wastewater in percolation pits in the Rocky Mountain West.
4. DiGiulio DC, **Shonkoff SBC**, Jackson RB. (2018). The Need to Protect Fresh and Brackish Groundwater Resources During Unconventional Oil and Gas Development. *Current Opinion in Environmental Science & Health*. 3:1-7. Available at: <https://authors.elsevier.com/c/1Wf1I8nIePIe~Z>
5. Czolowski E, Santoro RL, Srebotnjak T, **Shonkoff SBC**. (2017). Towards Consistent Methodology to Quantify Populations in Proximity to Oil and Gas Development: A National Spatial Analysis and Review. *Environmental Health Perspectives*. Available at: <https://ehp.niehs.nih.gov/EHP1535>

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6. DiGiulio D, **Shonkoff SBC**. (2017). Is Reuse of Produced Water Safe? First, Let's Find out What's in It. August 2017. *EM Magazine, a copyrighted publication of the Air & Waste Management Association*.
7. Stringfellow WT, Camarillo MK, Domen JK, **Shonkoff SBC**. (2017). Comparison of Chemical-Use Between Hydraulic Fracturing, Acidizing, and Routine Oil and Gas Development. *PLoS ONE*. 12(4): e0175344. Available at: <https://doi.org/10.1371/journal.pone.0175344>
8. **Shonkoff SBC**, Hays J, Hill LA, Krieger E, Hughes D, Hosang N, Law A. (2016). Trump: Renewables for Self-Sufficiency. *Nature*. 540:341. Available at: <http://www.nature.com/nature/journal/v540/n7633/pdf/540341b.pdf>
9. Hays J, McCawley M, **Shonkoff SBC**. (2016). Public Health Implications of Environmental Noise Associated with Unconventional Oil and Gas Development. *Science of The Total Environment*. Available at: <http://www.sciencedirect.com/science/article/pii/S0048969716325724>.
10. Krieger E, Casey J, **Shonkoff SBC**. (2016). A framework for siting and dispatch of emerging energy resources to realize environmental and health benefits: Case study on peaker power plant displacement. *Energy Policy*. 96:302-313. Available at: <http://www.sciencedirect.com/science/article/pii/S0301421516302798>
11. Hays J, **Shonkoff SBC**. (2016). Toward an Understanding of the Environmental and Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of the Peer-Reviewed Scientific Literature, 2009-2015. *PLoS ONE*. 11(4): e0154164. Available at: <https://doi.org/10.1371/journal.pone.0154164>
12. Hays J, Finkel M, Depledge M, Law A, **Shonkoff SBC**. (2015). Considerations for the development of shale gas in the United Kingdom. *Science of The Total Environment*. 512-513: 36-42. Available at: <http://www.sciencedirect.com/science/article/pii/S0048969715000078>
13. Ingraffea A, Wells M, Santoro R, **Shonkoff SBC**. (2014). Assessment and Risk Analysis of Casing and Cement Impairment in Oil and Gas Wells in Pennsylvania: 2000-2012. *Proceedings of the National Academy of Science*. 111 (30): 10955-10960. Available at: <http://www.pnas.org/content/111/30/10955.abstract>
14. **Shonkoff SB**, Hays J, Finkel, MF. (2014). The Public Health Dimensions of Shale Gas Development. *Environmental Health Perspectives*. 122 (8): 787-795. <http://dx.doi.org/10.1289/ehp.1307866>
15. Law A, Hays J, **Shonkoff SB**, Finkel, ML. (2014). Re: Public Health England's reply to Editorial on its Draft Report on Shale Gas Extraction. *BMJ*. 348:g3280.
16. Law A, Hays J, **Shonkoff SB**, Finkel, ML. (2014). Public Health England's Draft Report on Shale Gas Extraction: Mistaking Best Practices for Actual Practices. *BMJ*. 348:g2728.
17. **Shonkoff SB**. (2013). Shale gas and Tight Oil Development: Look Before We Leap. *Global Energy Affairs*. Available at: <http://globalenergyinitiative.org/insights/103-shale-gas-tight-oil-development.html>
18. **Shonkoff SB**, Morello-Frosch R, Pastor M, Sadd J. (2011). Environmental Health and Equity Implications of Climate Change and Mitigation Policies in California: A Review of the Literature. *Climatic Change*. Volume 109. Supp. 1. Available at: <https://link.springer.com/article/10.1007/s10584-011-0310-7>

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19. Smith KR, Jerrett M, Anderson HR, Burnett RT, Stone V, Derwent R, Atkinson RW, Cohen A, **Shonkoff SB**, Krewski D, Pope CA, 3rd, Thun MJ, Thurston G. (2009). Public Health Benefits of Strategies to Reduce Greenhouse-Gas Emissions: Health Implications of Short-Lived Greenhouse Pollutants. *The Lancet*. 374(9707): 2091-2103. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/19942276>
20. **Shonkoff SB**, Morello-Frosch R, Pastor M, Sadd J. (2009). Minding the Climate Gap: Implications of Environmental Health Inequities for Mitigation Policies in California. *Environmental Justice* 2(4): 173-177. Available at: <https://www.liebertpub.com/doi/abs/10.1089/env.2009.0030>
21. Spencer DF, Ksander GG, Donovan MJ, Liow PS, Chan WK, Greenfield BK, **Shonkoff SB**, Andrew S. (2006). Evaluation of Water Hyacinth Survival and Growth in the Sacramento Delta, California, Following Cutting. *The Journal of Plant Management*. 44: 50-60. Available at: <http://www.apms.org/japm/vol44/v44p50.pdf>

## PEER-REVIEWED TECHNICAL REPORTS

1. **Shonkoff SBC**, Hill LL, Domen JK. (*In Press*). California Produced Water Quality: Implications for Human Health and the Environment. In: *A Preliminary Evaluation of Data Collected Pursuant to California Senate Bill 1281, An Independent Review of Scientific and Technical Information*. **California Council on Science and Technology**. Sacramento, CA.
2. DiGiulio D and **Shonkoff SBC**. (*In Press*). Impact to Groundwater Resources from Disposal of Produced Water into Unlined Produced Water Ponds in the San Joaquin Valley. In: *A Preliminary Evaluation of Data Collected Pursuant to California Senate Bill 1281: an Independent Review of Scientific and Technical Information*. **California Council on Science and Technology**. Sacramento, CA.
3. DiGiulio D, Hill LA, **Shonkoff SBC**. (2019). Evaluation of the Draft EPA Report “Study of Oil and Gas Extraction Wastewater Management Under the Clean Water Act (EPA- 821-R19-001), May 2019”. *PSE Healthy Energy*. Oakland, CA
4. Lindsey B, Feinstein I, **Shonkoff SBC**, Hill LA, Mace AJ, Brady SE. (2018). An Assessment of Oil and Gas Water Cycle Reporting in California. In: *A Preliminary Evaluation of Data Collected Pursuant to California Senate Bill 1281: an Independent Review of Scientific and Technical Information*. **California Council on Science and Technology**. Sacramento, CA. July 2018.
5. **Shonkoff SBC**, Hill LL, Czolowski ED, Prasad K, Hammond SK, McKone TE. (2017). Human health hazards, risks, and impacts associated with underground natural gas storage in California. In: Long-Term Viability of Underground Gas Storage in California. In: *Long-Term Viability of Underground Natural Gas Storage in California*. **California Council on Science and Technology**, Sacramento, CA. Available at: <http://ccst.us/publications/2018/Chapter%201/Chapter%201%20v2%20Section%201-4.pdf>
6. **Shonkoff SBC**, Domen JK, Stringfellow WT. (2016). Hazard Assessment of Chemical Additives Used in Oil Fields that Reuse Produced Water for Agricultural Irrigation, Livestock Watering, and Groundwater Recharge in the San Joaquin Valley of California: Preliminary Results. *PSE Healthy Energy*. September 2016. Available at: <https://www.psehealthyenergy.org/our-work/publications/archive/hazard-assessment-of-chemical-additives-used-in-oil-fields-that-reuse-produced-water-for-agricultural-irrigation-2/>

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7. Krieger E, McPhail A, Millstein D, Shehabi A, Czolowski E, Hays J, Casey J, **Shonkoff SBC**. (2016). The Clean Power Plan in Pennsylvania: Analyzing power generation for health and equity. *PSE Healthy Energy*. July 2016. Available at: <https://www.psehealthyenergy.org/our-work/publications/archive/our-air-health-and-equity-impacts-of-pennsylvanias-power-plants/>
8. Krieger E, McPhail A, Millstein D, Shehabi A, Czolowski E, Hays J, Casey J, **Shonkoff SBC**. (2016). The Clean Power Plan in Ohio: Analyzing power generation for health and equity. July 2016. *PSE Healthy Energy*. Available at: <https://www.psehealthyenergy.org/our-work/publications/archive/our-air-health-and-equity-impacts-of-ohios-power-plants/>
9. (In alphabetical order) Crane, CM, English P, Heller J, Kirsch J, Kuiper H, Kyle AD, Ostro B, Rudolph L, **Shonkoff SBC**. (2016). An Assessment of the Health and Safety Implications of Coal Transport through Oakland: Public Health Advisory Panel on Coal. Oakland, CA June 14, 2016. Available at: <http://www2.oaklandnet.com/w/oak059227>.
10. Garcia-Gonzales DA, **Shonkoff SBC**. (2016). Hazardous Air Pollutants from Oil and Gas Development in the United States: A Systematic Review of the Peer-Reviewed Literature from 2012-2015. *A Report Submitted to the United States Environmental Protection Agency*. March 2016. *PSE Healthy Energy*, Oakland, CA.
11. **Shonkoff SBC**, Maddalena RL, Hays J, Stringfellow W, Wettstein ZS, Harrison, R, Sandelin W, McKone, TE. (2015). Potential Impacts of Well Stimulation on Human Health in California. In: *An Independent Scientific Assessment of Well Stimulation in California*. **California Council on Science and Technology**, Sacramento, CA. Available at: <http://ccst.us/publications/2015/vol-II-chapter-6.pdf>
12. **Shonkoff SBC**, Jordan P, Brandt A, Ferrar K, Maddalena RL, Greenfield BK, Jerrett, M, Heberger M, McKone TE. (2015). Public Health Risks Associated with Current Oil and Gas Development in The Los Angeles Basin. In: *An Independent Scientific Assessment of Well Stimulation in California*. **California Council on Science and Technology**, Sacramento, CA. pp. 213-266. Available at: <http://ccst.us/publications/2015/vol-III-chapter-4.pdf>
13. **Shonkoff SBC**, Gautier D. (2015). A Case Study of the Petroleum Geological Potential and Potential Public Health Risks Associated with Hydraulic Fracturing and Oil and Gas Development in The Los Angeles Basin. In: *An Independent Scientific Assessment of Well Stimulation in California*. **California Council on Science and Technology**, Sacramento, CA. pp. 200-266. Available at: <http://ccst.us/publications/2015/vol-III-chapter-4.pdf>.
14. Smith KR, *et al.* (**Shonkoff SB** contributing author). (2013). Chapter 11. Human Health: Impacts, Adaptation, and Co-Benefits, Intergovernmental Panel on Climate Change (IPCC), Assessment Report 5 (AR5). [https://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap11\\_FINAL.pdf](https://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap11_FINAL.pdf)
15. Jerrett M, Su JG, Ortega Hinojosa OM, Kontgis C, **Shonkoff SB**, Yuen T, Seto E, Jesdale, B, Morello-Frosch R. (2012). Mapping Climate Change Exposures, Vulnerabilities and Adaptation to Public Health Risks in the San Francisco Bay and Fresno Regions. A Report for The **California Energy Commission**. July 2012. Available at: <http://www.energy.ca.gov/2012publications/CEC-500-2012-041/CEC-500-2012-041.pdf>.
16. Morello-Frosch R, Pastor M, Sadd J, **Shonkoff SB**. (2009). The Climate Gap: Inequalities in How Climate Change Hurts Americans & How to Close the Gap. The Program for Environmental and Regional Equity (PERE). **University of Southern California**. Available at: <http://dornsife.usc.edu/per/publications/>

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17. **Shonkoff SB**, Morello-Frosch R, Pastor M, Sadd J. (2009). Environmental Health and Equity Impacts from Climate Change and Mitigation Policies in California: A Review of the Literature." In: *Cal-EPA Climate Action Team* Report. Available at: <http://www.climatechange.ca.gov/publicationscatindex.html>
18. Greenfield BK, Jahn A, Grenier JL, **Shonkoff SB**, Sandheinrich M. (2006). Mercury in Biosentinel Fish in San Francisco Bay: First Year Project Report: A report of the Regional Monitoring Program Exposure and Effects Pilot Study. **San Francisco Estuary Institute; River Studies Center, University of Wisconsin.**
19. Greenfield BK, David N, Siemering GS, McNabb TP, Spencer DF, Ksander GG, Donovan MJ, Liow PS, Chan WK, **Shonkoff SB**, Andrews SP, Andrews JC, Rajan M, Howard V, Sytsma M, Earnshaw S, Anderson LWJ. (2005). Aquatic Pesticide Monitoring Program Non-Chemical Alternatives Year 3 Final Report. APMP Technical Report: **San Francisco Estuary Institute** Contribution 390. Oakland, CA.
20. Pearce S, McKee L, **Shonkoff SB**. (2005). Pinole Creek Watershed Sediment Source Assessment. Oakland, California. **San Francisco Estuary Institute** Contribution 316.
21. Greenfield BK, Wittner E, David N, **Shonkoff SB**, Davis JA. (2004). Monitoring Trace Organic Contamination in Delta Fish: Current Data and Future Steps. A report to the Central Valley Regional Water Quality Control Board. **San Francisco Estuary Institute** Contribution 99. Oakland CA.
22. Hayworth J, David N, **Shonkoff SB**. (2004). Phase 2 (2003) Bioassessment of Waterbodies Treated with Aquatic Pesticides. **San Francisco Estuary Institute** Contribution 117. Oakland, CA.
23. Pearce SA, McKee LJ, **Shonkoff SB**. (2004). San Pedro Creek Watershed Sediment Source Analysis, Volume III: Tributary sediment source assessment. A report prepared for the City of Pacifica, California. **San Francisco Estuary Institute** Contribution 87. Oakland, CA.

## CONFERENCE ABSTRACTS

1. DiGiulio D, **Shonkoff SBC**, Jackson RB. 2019. The Need for a Uniform Conservative Definition of Protected Groundwater During Oil and Gas Development. *National Groundwater Association Conference on Groundwater and Oil and Gas Development: Improved Management Practices for Groundwater Protection and Water Supply*. March 04 - 05, 2019, San Antonio, Texas. Available at: <https://ngwa.confex.com/ngwa/gogd19/webprogram/Paper12466.html>.
2. Srebotnjak T, **Shonkoff SB**, Czerwinski E. Quantifying Populations in Proximity to Oil and Gas Development: A National Spatial Analysis and Review. *Conference on Statistical Practice 2018*, Portland, OR.
3. **Shonkoff SB**, Stringfellow W, Domen J, Camarillo MK. From 'Fracking' to Oil and Gas Development: Chemical Constituents and Potential Implications for the Beneficial Reuse of Produced Water. *American Chemical Society Annual Meeting*, San Diego, CA – March 16, 2016
4. **Shonkoff SB. Environmental and Public Health Impacts of Shale Oil and Gas Development**, *Public Interest Environmental Law Conference (PIELC)*, University of Oregon School of Law – March 2, 2013

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5. **Shonkoff SB.** Where Global Meets Local: Climate Change Mitigation Strategies and Population Health Co-Benefits. *Global Health: Breaking Borders and Boundaries Conference*, UC Davis – April 9, 2011.
6. **Shonkoff SB.** Climate Change and Health: Direct and Indirect Health Effects. *Global Health: Breaking Borders and Boundaries Conference*, UC Davis– April 9, 2011.
7. **Shonkoff SB,** Chafe Z, Smith KR. 2010. Addressing Inconsistencies in Black Carbon Literature. Poster presented at the *American Geophysical Union*. Session Title: Black Carbon's Role in Global to Local Air Quality and Climate Change. San Francisco, CA. December 15, 2010.

## OPINIONS AND OTHER MEDIA PUBLISHED

1. Hays J, **Shonkoff SBC.** April 19, 2017. Published in: *Sierra Magazine*, “It’s Time to March for Science: This Saturday’s March will Defend the Role of Science in a Democracy”. Available at: <http://www.sierraclub.org/sierra/green-life/it-s-time-march-for-science>
2. Krieger E, **Shonkoff SBC.** August 26, 2015. Published in: *The Hill*, “Strong EPA Methane Rule Required To Fully Realize Clean Power Plan Benefits.” Available at: <http://thehill.com/blogs/congress-blog/energy-environment/251903-strong-epa-methane-rule-required-to-fully-realize#>.
3. **Shonkoff SB.** July 7, 2013, Published in: *Pittsburg Post Gazette*. Letter to the editor: “Shale cherry-picking.” Available at: <http://www.post-gazette.com/opinion/letters/2013/07/07/Shale-cherry-picking/stories/201307070171>

## EXPERT COMMITTEES SERVED

1. **Member, Technical Advisory Group,** Methane Monitoring Project, Imperial County and Eastern Coachella Valley, CA. *April 2019 - Present*
2. **Expert Committee Member,** Senate Bill 83 Independent Review Panel for the California Department of Conservation’s Underground Injection Control (UIC) Program, California Environmental Protection Agency and California Natural Resources Agency. *February 2018 – Present*
  - Appointed by the Secretary of the California Environmental Protection Agency and the Secretary of the California Natural Resources Agency.
  - To evaluate the handling of the Underground Injection Control (UIC) program by the California Division of Oil, Gas and Geothermal Resources.
3. **Expert Committee Member,** Food Safety Expert Panel on Oil Field Produced Water for Agricultural Irrigation, California Central Valley Regional Water Quality Control Board *October 2015 – Present*
  - Appointed by the Central Valley Regional Water Quality Control Board in California.
  - Provided public health and oil and gas technical expertise and guidance on the issue of the use of oil field produced water for agricultural irrigation.
4. **Peer-Reviewer,** RFA National Priorities: Oil and Gas Development in the Appalachian Basin, United States Environmental Protection Agency *January – February 2017*

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- Provided public health and oil and gas technical expertise to assess academic proposals for a \$2 million award.
5. **Expert Panel Member**, Public Health Advisory Panel on Coal in Oakland  
*March 2015 – July 2015*
    - Provided environmental public health expertise and scientific guidance on the issue of coal transport, handling, processing, and export.
  6. **Member of the Steering Committee**, California Council on Science and Technology Study of Well Stimulation Technologies in California, Senate Bill 4 (SB 4) Study *June 2014 – July 2015*
    - Provided public health and oil and gas development expertise and guidance to report authors at Lawrence Berkeley National Laboratory, The Pacific Institute, and Stanford University.
  7. **Member of the Steering Committee**, United States Climate-Health Alliance.  
*January 2015 – Present*
    - Provided climate and public health expertise to the organization; engage public health experts in discussing the interplay between climate change and public health.
  8. **Member of the Steering Committee**, California Council on Science and Technology Study of Well Stimulation Technologies in California, Bureau of Land Management *March 2013 – July 2014*
    - Provided public health and oil and gas development expertise and guidance to report authors; peer review of analysis and writing.

## HONORS AND AWARDS

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1. **Pioneer Under 40 in Environmental Public Health**; Collaborative on Health and the Environment (CHE) *July 2017*
2. **Emerging Leader, The Claneil Foundation**; \$270,000 award *2014 – 2017*
3. **Outstanding Graduate Student Instructor Award**, UC Berkeley *Spring 2012*

## SELECTED CONSULTANCIES AND PROJECTS

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1. **California Air Resources Board** *January 2019 – Present*  
Retained as a consultant to evaluate oil and gas and well stimulation (e.g., hydraulic fracturing) and air quality data reported to CARB and write a report focused on our findings.
2. **Office Petroleum and Natural Gas Administration and Safety (OPNGAS), Board of Public Works, City of Los Angeles, CA** *January 2019 – Present*  
Retained as a consultant to execute two projects: (1) conduct a review of the peer-reviewed literature on oil and gas development and human health; and (2) conduct a toxicological assessment of chemical use at oil and gas well pads and in oil and gas wells in the Los Angeles Basin. These reports are part of a larger report managed by the OPNGAS and other agencies in the City of Los Angeles, CA.
3. **California Council on Science and Technology** *March 2018- Present*  
Retained as a consultant to advise on and co-author technical and policy analyses of produced water quality issues associated with upstream oil and gas development in the State of California.



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4. **California Council on Science and Technology** *January 2017– January 2018*  
Performed a human health hazard and risk assessment of underground gas storage facilities in California, legislated by the State of California and funded by the California Public Utilities Commission.
5. **Private Law Firm** *January 2017*  
Assessment of Marcellus shale region air quality data and public health studies
6. **Carnegie Endowment for International Peace, Washington, DC** *June 2016*  
Produced a report on the human health dimensions of shorter-lived climate pollutants and discussed findings on a panel
7. **California Council on Science and Technology** *January 2014 – July 2015*  
Led the research and policy recommendations on the independent scientific study on hydraulic fracturing and well stimulation, legislated under Senate Bill 4 (Pavley) and funded by the California Natural Resources Agency
8. **Private Foundation:** *Spring 2012*  
Retained as a consultant to conduct a geospatial and regulatory analysis of socioeconomic and environmental trends in the siting of oil and gas development in California and the Northeast
9. **Private Foundation** *January – March 2012*  
Retained as a consultant to conduct a review of the literature on the public health dimensions of shale gas development along with guidance for philanthropic opportunities.
10. **Private Foundation** *Winter 2012*  
Retained as a consultant to evaluate appropriate human health technologies for low-resource hospital and healthcare settings in Africa

## UNIVERSITY TEACHING EXPERIENCE

1. **Environmental Science Senior Research Seminar;** UC Berkeley *Fall 2010 – Spring 2012*
2. **Sociology of Natural Resources;** UC Berkeley *Fall 2009*
3. **Environmental Health and Development;** UC Berkeley *Fall 2008*

## BOARDS SERVED

**Board Member,** Planning and Conservation League

*Sept 2016 – February 2019; Sacramento, CA*

**Board Member (ex-officio),** PSE Healthy Energy

*Dec 2012 – Present; Oakland, California*

## CONFERENCES ORGANIZED

1. **Symposium on the Public Health Dimensions of Oil and Gas Development: Tools, Strategies, and Collaboration,** Occidental College, Los Angeles, CA *Jan 2016*
2. **Fracking and Health Symposium: Community-Based Monitoring,** George Washington University, Washington, D.C. *October 2014*

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3. **Fracking and Health Research Workshop**, London School of Hygiene and Tropical Medicine (LSHTM), London, UK November 15, 2013

## **SELECTED INVITED LECTURES, BRIEFINGS AND TESTIMONY**

1. **Reuse of Oil and Gas Wastewater for Agricultural Irrigation: Health and Environmental Considerations for the USEPA Water Reuse Action Plan**
  - Invited briefing to the United States Environmental Protection Agency. Washington, DC – June 21, 2019.
2. **Reuse of Oil and Gas Wastewater for Agricultural Irrigation: Health and Environmental Considerations**
  - Invited lecture to the *Sustainable Agriculture and Food Systems Funders* Annual Convening. Pittsburgh, PA – June 18, 2019.
3. **Reasons to maintain a definition of protected groundwater equivalent to an USDW during well stimulation and oil and gas development in California**
  - Invited briefing to the *California State Water Resources Control Board* at the Staff Workshop Review of Model Criteria for Groundwater Monitoring in Areas of Oil and Gas Well Stimulation Definition of “Protected Water” pursuant to Senate Bill 4. Sacramento, CA – May 10, 2019
4. **Peaker Power Plants and Public Health**
  - Invited lecture at *Replacing Peaker Plants with Batteries and Renewables* workshop convened by the Clean Energy Group, The Meridian Institute and PSE Healthy Energy. Sausalito, CA – May 7, 2019
5. **Human Health Hazards, Risks, and Impacts Associated with Underground Gas Storage in California**
  - Invited Briefing to *California Public Utilities Commission (CPUC)*. Los Angeles, CA – August 28, 2018
6. **Oil and Gas Wastewater Reuse in California: Considerations, Risks and Data Gaps**
  - Invited Briefing to the Energy Extraction Webinar, *United States Environmental Protection Agency (USEPA)*. – July 19, 2018
7. **Human Health Hazards, Risks, and Impacts Associated with Underground Gas Storage in California**
  - Invited Briefing to *United States Government Accountability Office (GAO)*. California Council on Science and Technology Office, Sacramento, CA– July 17, 2018
8. **Oil and Gas Wastewater Reuse in California: Considerations and Risks**
  - Award acceptance talk for the Pioneers in Environmental Public Health Under 40 Award. San Francisco, CA. – May 31, 2018
9. **Considerations For The Management of Oil And Gas Produced Water For Reuse**
  - Invited briefing to the *Office of Science and Technology (OST) of the United States Environmental Protection Agency (USEPA)*. EPA Region 8 Office, Denver Colorado. – May 21, 2018

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10. **Water Use and Impacts in California Oil and Gas Production: Findings and Recommendations from SB 4 Report and Select Updates**
  - Invited briefing to the *California Council on Science and Technology Steering Committee on California Senate Bill 1281 evaluation* – May 9, 2018
11. **Emerging Environmental Health Research on Oil and Gas Development in California**
  - Invited lecture to the *Earth Health Course, School of Pharmacy, University of California, San Francisco* – May 2, 2018.
12. **Emerging Environmental Health Research on Oil and Gas Development in California**
  - Invited lecture to the *Environmental Health and Development Course, School of Public Health and the Department of Environmental Science, Policy and Management, University of California, Berkeley.*
13. **Health Hazards, Risks, and Impacts Associated with Underground Gas Storage in California**
  - Invited webinar lecture to California nurses, convened by *Alliance of Nurses for a Healthy Environment* – January 26, 2018.
14. **Continuing Medical Education: Oil and Gas Development in California**
  - Invited webinar lecture to California nurses, convened by *Alliance of Nurses for a Healthy Environment* – January 12, 2018.
15. **Emerging Science and Policy: California Oil Production**
  - Invited lecture to *The Environmental Public Health Seminar, School of Public Health, Touro University, Vallejo, CA* – November 1, 2017.
16. **Environmental Health and Climate Policy: California Oil Production**
  - Invited lecture to *The Environmental and Occupational Medicine Seminar, School of Public Health, UC Berkeley* October 25, 2017.
17. **Oil and Gas Development in Los Angeles: Public Health and Chemical Use Hazards**
  - Invited talk and panel participation at the *Climate Action Team Meeting convened jointly by the California Department of Public Health and the California Air Resources Board, California Environmental Protection Agency, Sacramento, CA* – May 23, 2017.
18. **Oil and Gas Development in Los Angeles: Public Health and Chemical Use Hazards**
  - Invited lecture to *Physicians for Social Responsibility-Los Angeles, Los Angeles, CA* – May 18, 2017.
19. **Environmental Public Health Dimensions of Oil and Gas Development in California: Science and Policy**
  - Invited lecture to *The California Conference of Local Health Officers (CCLHO), Sacramento, CA* – April 21, 2017.
20. **Public Health Risk Factors of Oil and Gas Development**
  - Invited lecture to *Environmental Health and Development course, UC Berkeley, Berkeley, CA* – April 4, 2017.
21. **The Public Health Dimensions of Oil and Gas Development in the Los Angeles Basin, California**
  - Invited briefing to the *Los Angeles County Department of Public Health and the South Coast Air Quality Management District, The California Endowment, Los Angeles, CA* – February 7, 2017.

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22. **Oil and Gas Development and Wastewater: Considerations for Agriculture, Livestock and Aquifers**
  - Invited lecture to the *Sustainable Agriculture and Food Systems Funders (SAFSF) Annual Meeting*, Sacramento, CA – December 12, 2016.
23. **Chemical Additives Used in Oil Fields that Reuse Produced Water for Irrigation, Livestock Watering and Aquifer Recharge**
  - Invited lecture to the *Oil and Gas Muster, Environmental Protection Agency Region 8*, Colorado Department of Public Health and the Environment, and other state and federal agencies. Denver, CO – December 6, 2016.
24. **The Aliso Canyon Blowout: What Happened and Lessons for the Future**
  - Invited lecture to the *Unnatural Disasters and Environmental Health Colloquium, Center for Occupational and Environmental Health*, University of California, Los Angeles – November 4, 2016.
25. **The Public Health Dimensions of Unconventional Oil and Gas Development: Lessons for Latin America**
  - Keynote speaker at the *Universidad Nacional Autonoma de Mexico (UNAM) International Colloquium on the Exploitation of unconventional fossil fuels in the United States and Canada: lessons for Latin America* – October 13-14, 2016.
26. **Considerations for the Reuse of Oilfield Wastewater for Agriculture, Livestock, and Aquifer Recharge**
  - Invited lecture to the *Environmental Engineering Seminar Series*, UC Berkeley – August 16, 2016.
27. **Environmental Public Health and Equity Dimensions of the Clean Power Plan**
  - Invited lecture to *The Environmental Justice Advisory Committee, Pennsylvania Department of Environmental Protection*. Harrisburg, PA. – August 10, 2016.
28. **The Climate Change Mitigation-Air Quality-Human Health Nexus: Opportunities and Considerations**
  - Invited lecture to *The Carnegie Endowment for International Peace panel on “Climate, Air Pollution, and Public Health – Revisiting the Energy Innovation Agenda”*. Washington, DC. – June 7, 2016.
29. **The Effects of Oil and Gas on California’s Communities**
  - Invited lecture and panelist, Sacramento, CA – April 18, 2016.
30. **The Water-Energy-Public Health Nexus: The Case of California Oil and Gas**
  - Invited lecture to the *Environmental Health and Development Course*, UC Berkeley, Berkeley, CA – April 5, 2016.
31. **Chemical Hazards and Risks of Beneficial Reuse of Oil Field Produced Water**
  - Presented research at the *American Chemical Society Annual Meeting*, San Diego, CA – March 16, 2016.
32. **Water Quality and Public Health Risk Factors of Oil and Gas Development in California – An Update**
  - Invited Lecture to the *San Francisco Estuary Institute*, Richmond, CA – March 9, 2016.

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33. **Public Health and Climate Risk Factors of Oil and Gas Development**
  - Keynote lecture for *The Oil and Gas Citizen Monitoring Symposium*, Occidental College, Los Angeles, CA – January 21, 2016.
34. **Air Pollution Monitoring of Oil and Gas Development in the United States (Panel Moderator)**
  - Moderated panel at the *Oil and Gas Citizen Monitoring Symposium*, Occidental College, Los Angeles, CA – January 21, 2016.
35. **Public Health Considerations for Health Care Professionals**
  - Invited lecture for the *Occupational and Environmental Medicine Grand Rounds*, UC San Francisco, San Francisco, CA – January 12, 2016.
36. **Public Health Findings from the Senate Bill 4 Independent Scientific Study**
  - Invited lecture for the *Touro University School of Public Health*, Vallejo, CA – November 19, 2015.
37. **Updates on Findings from Public Health Science: Oil and Gas Development**
  - Invited Lecture and panelist for the *Health and Environmental Funders Network Annual Meeting*, Baltimore, MD – November 16, 2015.
38. **Climate and Public Health Findings from The Senate Bill 4 Independent Scientific Study**
  - Invited lecture to the *Masters of Public Health Core Seminar*, UC Berkeley. Berkeley, CA – November 9, 2015.
39. **Public Health Risk Factors Associated with Well Stimulation in California**
  - Invited briefing to the *Interagency Workgroup on Well Stimulation (Convened by Governor Brown's office)*. Sacramento, CA – July, 2015.
40. **The Public Health Dimensions of “Fracking” (and Other Oil and Gas Development) In California**
  - Invited lecture to the to the *American Lung Association in California*. Sacramento, CA – February 6, 2015.
41. **The Environmental Public Health Dimensions of Shale Oil and Gas Development in the USA**
  - Keynote talk at the *University of Calgary*. Calgary, Canada – January 30, 2015.
42. **Oil and Gas Development and Agriculture in CA**
  - Invited panelist for the *UC Berkeley Food Institute*. Berkeley, CA – September 22, 2014
43. **Fracking (and Oil and Gas Development) in California**
  - Invited lecture and panelist for a public audience, *the San Francisco Public Library*. San Francisco, CA – July 23, 2014.
44. **Environmental Policy Will Never Be the Same after “Fracking”**
  - Invited lecture in *ESPM 175: Resources and Environmental Policy course*, UC Berkeley. Berkeley, CA – April 15, 2014.

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45. **The Environmental Public Health and Climate Dimensions of Oil and Gas Development Enabled by Well Stimulation in the USA**
  - Invited lecture in *ESPM 167: Environmental Health and Development course*, UC Berkeley. Berkeley, CA – April 8, 2014.
46. **Fracking and Environmental Equity**
  - Invited lecture and panelist at the *Center for Race, Poverty, and Environment (CRPE)* luncheon. San Francisco, CA – March 6, 2014.
47. **Oil and Gas Development: Climate, public health, Air and Water. What Do We Know?**
  - Invited lecture for to the *San Ramon Valley Democrats quarterly meeting*. Danville, CA – February 27, 2014.
48. **The Public Health and Climate Dimensions of Shale Gas Development in the USA**
  - Invited lecture and convener: *Fracking and Health: Research Workshop*. The London School of Hygiene and Tropical Medicine (LSHTM), London, UK – November 15, 2013.
49. **You Don't Get What You Expect, You Get What You Inspect: Methane, Energy Intensity, and Climate Dimensions of Shale Development**
  - Invited lecture at the *Physicians for Social Responsibility Health Professionals Series*. Washington, DC – October 31, 2013.
50. **You Don't Get What You Expect, You Get What You Inspect: Public Health, Climate Science, and Shale Development**
  - Invited talk at the *Health and Environmental Funders Network (HEFN)*, Washington, DC – October 31, 2013.
51. **What Does the Science Say? Shale Gas and Tight Oil Development**
  - Presented to the *Environmental Policy Graduate Seminar, UC Berkeley School of City and Regional Planning*, Berkeley, CA – October 15, 2013.
52. **Shale Gas and Tight Oil Development in California: Public Health and Climate Considerations**
  - Presented to the *California Department of Conservation* and the *Department of Gas and Geothermal Resources*, Sacramento, CA – May 1, 2013.
53. **Air Pollution, Water Quality, and Climate Change: The Case of Shale Gas and Tight Oil Development**
  - Invited lecture to the *Global Public Health Core* course, UC Berkeley – April 24, 2013.
54. **Fracking in the News: Modern Energy Policy Analysis**
  - Presented to the *Energy and Resources Group*, UC Berkeley – April 23, 2013.
55. **Is Shale Gas a Sound Transition Fuel?**
  - Invited lecture to the *Climate and Health Course*, School of Public Health, UC Berkeley – April 18, 2013.
56. **The Public Health and Climate Dimensions of Shale (Tight) Oil and Gas Development**
  - Invited lecture to the *Environmental Health and Development* course, School of Public Health & The Dept. of Environmental Science, Policy, and Management, UC Berkeley – April 9, 2013.
57. **The Scientific Understanding of Shale (Tight) Oil and Gas Development: Implications for Policy in the US**

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- Invited lecture to *the Environmental Policy, Administration and Law course*, UC Berkeley – March 12, 2013.
- 58. Environmental and Public Health Impacts of Shale Oil and Gas Development**
    - Presented at the *Public Interest Environmental Law Conference (PIELC)*, University of Oregon School of Law – March 2, 2013.
  - 59. Public Health Dimensions of Hydraulic Fracturing**
    - Invited talk at the *Environmental Health Sciences Doctoral Seminar, School of Public Health*, UC Berkeley – February 25, 2013.
  - 60. The Public Health Dimensions of High Volume Horizontal Hydraulic Fracturing**
    - Invited talk at the *Bay Area Climate Funders Meeting on Natural Gas*, San Francisco, CA – October 25, 2012.
  - 61. Fracking with Our Air? The Health Concerns of Hydraulic Fracturing**
    - Presented to the *Department of Environmental Science, Policy and Management*, UC Berkeley – May 5, 2012.
  - 62. Identifying the Public Health Concerns of Hydraulic Fracturing: What We Know and How to Fill the Gaps**
    - Presented to *The Schmidt Family Foundation/ 11<sup>th</sup> Hour Project*, Palo Alto, CA – March 22, 2012.
  - 63. Climate Change and Human Health: Impacts and Opportunities**
    - Presented to *San Francisco State University*, San Francisco, CA – June 21, 2011.
  - 64. The Philosophy of Science**
    - Presented to the *Department of Environmental Science, Policy and Management*, UC Berkeley – Sept. 27, 2011.
  - 65. Where Global Meets Local: Climate Change Mitigation Strategies and Population Health Co-Benefits**
    - Presented at the *Global Health: Breaking Borders and Boundaries* Conference, UC Davis – April 9, 2011.
  - 66. Climate Change and Health: Direct and Indirect Health Effects**
    - Presented at the *Global Health: Breaking Borders and Boundaries* Conference, UC Davis– April 9, 2011.
  - 67. Inconsistencies in Black Carbon Measurement: Implications for Climate and Health Policy Development**
    - Presented to the *Energy and Resources Group Climate Lab*, UC Berkeley – February 17, 2011.
  - 68. Climate Change and Environmental Health Co-Benefits**
    - Presented to the *Department of Environmental Studies*, Skidmore College, Saratoga Springs, NY – Feb 17, 2011.
  - 69. Interview and Survey Instrument Development and Study Design Workshop**
    - Presented to the *Department of Environmental Sciences*, UC Berkeley – November 15, 2010.
  - 70. Quantitative Analysis for Survey Data**
    - Presented to the *Department of Environmental Sciences*, UC Berkeley – January 15, 2011.

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## PEER REVIEW SERVICE

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1. National Science Foundation
2. Proceedings of the National Academy of Science
3. Science of the Total Environment
4. PLoS ONE
5. Environmental Health Perspectives
6. Environmental Toxicology
7. United States Environmental Protection Agency
8. Journal of Exposure Analysis and Environmental Epidemiology

## ORGANIZATIONAL MEMBERSHIP

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1. **Member**, American Chemical Society *2016 - Present*
2. **Member**, American Public Health Association *2015 - Present*
3. **Co-Founder & Director**, Berkeley Rural Energy Group *January 2010 - May 2012*
  - o Directed a network of more than 40 NGO, private sector, and university experts in the San Francisco Bay Area, CA in activities, meetings, and projects focused on innovative solutions to rural energy and health access.
4. **Advisor**, The Center for Public Health and Climate Change, PHI *March 2010 – Present*
5. **Member**, American Geophysical Union *September 2006 – Present*

## OTHER RELEVANT EXPERIENCE AND SKILLS

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**Languages Spoken:** English (fluent), Spanish (conversant)

**International Work Experience:** Ghana, Mali, Brazil, Costa Rica, Guatemala, Nicaragua, Ecuador, Mexico, and The United Kingdom.