

## MARIAN R. CHERTOW

Associate Professor of Industrial Environmental Management  
Yale School of Forestry & Environmental Studies  
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### UNIVERSITY APPOINTMENTS

- 1990-present Yale University, School of Forestry & Environmental Studies (F&ES)  
Associate Professor, Industrial Environmental Management 2011-present - tenured  
Associate Professor with term (2007-2011); Assistant Professor (2002-2007).  
Director, Industrial Environmental Management Program, 1991-present  
Director, Program on Solid Waste Policy, 1990-present  
Chair and Founder, Corporate Environmental Leadership Seminar 1992-2002
- 2009-present Yale University, School of Management, Associate Professor (courtesy appointment)
- 2001-present National University of Singapore, School of Design and Environment  
Visiting Associate Professor for MSc in Environmental Management Programme
- 1995-1999 Yale University, Center for Environmental Law and Policy  
Director, Environmental Reform: The Next Generation Project, a multi-year collaboration  
between Yale Law School and F&ES to look back at the first 25 years of U.S. environmental  
policy and look ahead to consider the next 25 years
- 1989-1990 Yale University, Institution for Social and Policy Studies, Visiting Fellow

### PROFESSIONAL EXPERIENCE

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- 1988-1989 The United States Conference of Mayors, Senior Fellow
- 1986-1988 Connecticut Resources Recovery Authority  
President of \$1 billion state bonding authority for environmental infrastructure
- 1983-1986 Town of Windsor, Connecticut, Assistant Town Manager, Asst. to Town Manager
- 1981-1983 City and County of San Francisco, California, Financial Manager, Solid Waste  
Management Program and Assistant to the Chief Administrative Officer
- 1978-1979 Resource Recovery Systems, Inc. Essex, Connecticut  
Director of Marketing and Development for materials recycling firm

### EDUCATION

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- 2000 PhD, Environmental Studies, Yale University  
Thesis: *Accelerating the Commercialization of Environmental Technology in the US*
- 1981 MPPM - Public and Private Management, Yale School of Management
- 1978 BA, *magna cum laude*, Barnard College, Columbia University

## **CURRENT RESEARCH INTERESTS**

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- Industrial Ecology and Energy: Networks of inter-firm resource exchange (industrial symbiosis)  
Multi-scale waste and materials management  
Industrial ecology in developing countries-especially India & China
- Business and Environment: Economic and environmental benefits of business co-location
- Urban Systems and Waste: Comparative studies of material & energy flows (urban metabolism)  
Sustainable and low-carbon cities
- Environmental Technology: Interface of environmental and technology policy

## **PUBLICATIONS**

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### ***Books***

Singh, S., J., Haberl, H., **Chertow, M.**, Mirtl, M., and Schmid, M., eds. *Long Term Socio-Ecological Research: Studies in Society-Nature Interactions Across Spatial and Temporal Scales*. Springer. 2013. More than 25,000 chapter downloads.

**Chertow, M.**, and Esty, D., eds. *Thinking Ecologically: The Next Generation of Environmental Policy*, New Haven: Yale University Press. 1997; Chinese Translation 2004. 8000 copies sold.

**Chertow, M.**, and Portlock, M. eds. *Developing Industrial Ecosystems: Approaches, Cases, and Tools*, New Haven: Yale School of Forestry & Environmental Studies Publication Series, Bulletin No. 106, 2001.

### ***Peer-Reviewed Publications or Accepted and In Press***

Powell, J. T., **M. Chertow**, D. C. Esty. Where is global waste management heading? An analysis of solid waste sector commitments from nationally-determined contributions. *Waste Management*, 80, 137-143, 2018.

Makov, T., T. Fishman, **M. Chertow**, V. Blass. What Affects the Secondhand Value of Smartphones: Evidence from eBay. *Journal of Industrial Ecology*, 2018. doi:[10.1111/jiec.12806](https://doi.org/10.1111/jiec.12806), 8-25-2018.

Chavez, A., C. Kennedy, B. Chen, **M. Chertow**, T. Baynes, S. Chen, X. Bai. Understanding, Implementing, and Tracking Urban Metabolism is Key to Urban Futures. Chapter in *The Urban Planet: Knowledge Towards Sustainable Cities*, 68. Cambridge University Press, 2018.

**Chertow, M.**, R. Lifset, T. Yang. "Industrial Ecology." In *Oxford Bibliographies in Ecology*. Ed. David Gibson. New York: Oxford University Press, 3-28- 2018.

van Ewijk, S., J-Y Park, **M. Chertow**. Quantifying the system-wide recovery potential of waste in the global paper life cycle. *Resources, Conservation and Recycling*, 134, 48-60, 2018.

Powell, J. and **M. Chertow**. Quantity, Components, and Value of Waste Materials in the United States. *Journal of Industrial Ecology*, DOI: 10.1111/jiec.12752, 3-30-2018.

Jiang, D., W-Q Chen, W. Liu, **M. Chertow**. Inter-Sector Bisphenol A (BPA) Flows in the 2012 Chinese Economy. *Environmental Science and Technology*, 51 (15), 8654-8662, 2017.

Ramaswami, A., K.K. Tong, A. Fang, R. Lal, A. Nagpure, Yang Li, Huajun Yu, D. Jiang, A. Russell, L. Shi, **M. Chertow**, Y. Wang, S. Wang. Urban -Sector Actions for Carbon Mitigation with Local Health Co-Benefits in China. *Nature Climate Change*. 7 (10), 736-742, 2017.

Zhu, J. and **M. Chertow**. Authoritarian but responsive: Local regulation of industrial energy efficiency in Jiangsu, China. *Regulation & Governance*. DOI: 10.1111/rego.12172, 2017.

Shi, L. and **M. Chertow**. Organizational Boundary Change in Industrial Symbiosis: Revisiting the Guitang Group in China. *Sustainability* 9 (1085), 2017.

Boons, F., **M. Chertow**; J. Park; W. Spekkink; H. Shi. Industrial Symbiosis Dynamics and the Problem of Equivalence: Proposal for a Comparative Framework. *Journal of Industrial Ecology*, 21(4), 938-952, 2017.

Pearce, J.B.B. and **M. Chertow**. Scenarios for achieving absolute reductions in phosphorus consumption in Singapore. *Journal of Cleaner Production*. 140, 1587-1601, 2017.

Zhu, J. and **M. Chertow**. Business Strategy under Institutional Constraints: Evidence from China's Energy Efficiency Regulations. *Ecological Economics*. 135, 10-21, 2017.

Guo, Y., J. Tian, **M. Chertow**, L. Chen. Exploring Greenhouse Gas-mitigation Strategies in Chinese Eco-Industrial Parks by Targeting Energy Infrastructure Stocks. *Journal of Industrial Ecology*. DOI: 10.1111/jiec.12542/ JIEC12542, 2017.

Powell, J.T., J. Pons, **M. Chertow**. Waste Informatics: Establishing Characteristics of Contemporary U.S. Landfill Quantities and Practices. *Environmental Science & Technology*, 50 (20), 10877-10884 016. 2016.

Guo, Y., J. Tian, **M. Chertow**, L. Chen. Greenhouse Gas Mitigation in Chinese Eco-Industrial Parks by Targeting Energy Infrastructure: A Vintage Stock Model. *Environmental Science & Technology*. 50 (20): 11403–11413, 2016.

**Chertow, M.**, J. Zhu, and V. Moye. Positive Externalities in the Urban Boundary: the Case of Industrial Symbiosis. Chapter in *Handbook on Urbanization and Global Environmental Change*. K. Seto, W. Solecki, and C. Griffith, eds. Routledge International Handbooks, 2016.

Zhu, J. and **Chertow, M.** Greening Industrial Production through Waste Recovery: ‘Comprehensive Utilization of Resources’ in China. *Environmental Science & Technology*. 50 (5):2175–2182, 2016.

**Chertow, M.** and J. Y. Park. Scholarship and Practice in Industrial Symbiosis: 1989-2014. Chapter 5 in *Taking Stock of Industrial Ecology*. R. Clift and A. Druckman, eds. Springer DOI 10.1007/978-3-319-20571-7, 2016.

Flores, B., J. Zhu, Li Xiao, **M Chertow**. Modeled Distribution of Industrial Solid Wastes in Qinhuangdao, China to Assess Reuse Opportunities. Elsevier: *Procedia Environmental Sciences*, 2015.

- Mannino, M., E. Ninka, M. Turvani, **M. Chertow**. The Decline of Eco-industrial Development in Porto Marghera, Italy. *Journal of Cleaner Production*.100, 286-296, 2015.
- Ramaswami, A., A. Russell, **M. Chertow**; R. Hollander, S. Tripathi, Shi Lei, S. Cui, A. Nagpure. International, Interdisciplinary Education on Sustainable Infrastructure and Sustainable Cities: Key Concepts and Skills. *The Bridge: National Academy of Engineering*. 44(3):5-21 Fall 2014.
- Short, S, N. Bocken, C. Barlow, **M. Chertow**. From Refining Sugar to Growing Tomatoes: Industrial Ecology and Business Model Evolution. *Journal of Industrial Ecology*. 18(5): 603-618, 2014.
- Park, J. and **M. Chertow**, Establishing and Testing the “Reuse Potential” Indicator for Managing Wastes as Resources, *Journal of Environmental Management*, 137:45-53, 2014.
- Eckelman, M. and **M. Chertow**, Life Cycle Energy and Environmental Benefits of a U.S. Industrial Symbiosis, *International Journal of Life Cycle Assessment*, 18:1524-1532, 2013.
- Chertow, M.**, W. Ashton, E. Fugate, The Intimacy of Human-Nature Interactions on Islands. In: S. Singh, et al, eds., *Long Term Socio-Ecological Research: Studies in Society-Nature Interactions Across Spatial and Temporal Scales*. Springer, 2013.
- Ramaswami, A, A. Chavez, and **M. Chertow**, Carbon Footprinting of Cities and Implications for Analysis of Urban Material and Energy Flows, *Journal of Industrial Ecology*, 16(5):783-785, 2012.
- Desai, A., N. Nassar, **M. Chertow**, American Seams: An Exploration of Hybrid Fast Fashion and Domestic Manufacturing Models in Relocalized Apparel Production, *Journal of Corporate Citizenship*, Issue 45, Spring 2012.
- Chertow, M.**, J. Ehrenfeld, Organizing Self-Organizing Systems: Toward a Theory of Industrial Symbiosis, *Journal of Industrial Ecology*, 16(1), 13-27, 2012.
- Chertow, M.**, E. Choi, and K. Lee. The material consumption of Singapore’s economy: an industrial ecology approach. In: V. Savage and L.H. Lye, eds., *Environment and Climate Change in Asia: Ecological Footprints and Green Prospects*. Pearson: Prentice Hall, 2011.
- Chertow, M.**, Y. Miyata, Assessing Collective Firm Behavior: Comparing Industrial Symbiosis with Possible Alternatives for Individual Companies in Oahu, Hawaii, *Business Strategy and the Environment*, 20(4), 266–280, 2011.
- Chertow, M.**, J.Y. Park, Reusing Non-hazardous Industrial Waste Across Business Clusters, In: T. Letcher, D. Vallerio, eds., *Waste: A Handbook for Management*. Elsevier, 2011.
- Eckelman, M., R. Ramaswamy, M. Shenoy, **M. Chertow**, Applying Industrial Ecology Tools to Demand-Side Water Management in Bangalore, India, *Asian Journal of Water, Environment and Pollution*, 7(4):71-79, 2010.
- Bain, A., M. Shenoy, W. Ashton, **M. Chertow**, Industrial Symbiosis and Waste Recovery in an Indian Industrial Area, *Resources, Conservation and Recycling*, 54(12), 1278-1287, 2010.

Shi, H., **M. Chertow**, Y. Song. Developing Country Experience with Eco-Industrial Parks: A Case Study of the Tianjin Economic-Technological Development Area in China, *Journal of Cleaner Production*, 18(3), 191-199, 2010.

**Chertow, M.**, W. Ashton, The Social Embeddedness of Industrial Symbiosis Linkages in Puerto Rican Industrial Regions, In: F.A. Boons, J. Howard-Grenville, eds., *The Social Embeddedness of Industrial Ecology*. Edward Elgar Publishers, Cheltenham, U.K., pp. 128-151, 2009.

Eckelman, M., **M. Chertow**, Using Material Flow Analysis to Illuminate Long-Term Waste Management Solutions in Oahu, HI, USA, *Journal of Industrial Ecology*, 13(5), 758-774, 2009.

Johnson, J, **M. Chertow**, Climate Stabilization Wedges in Action: A Systems Approach to Energy Sustainability for Hawaii Island, *Environmental Science & Technology*, 43(7), 2234–2240, 2009.

**Chertow, M.**, Dynamics of Geographically Based Industrial Ecosystems, In: M. Ruth, B. Davidsdottir, eds., *The Dynamics of Regions and Networks in Industrial Ecosystems*, Edward Elgar Publishers, Cheltenham, U.K., 6-30, 2009.

Eckelman, M., **M. Chertow**, Quantifying Life Cycle Environmental Benefits from the Reuse of Industrial Materials in Pennsylvania, *Environmental Science & Technology*, 43(7), 2550-2556, 2009.

**Chertow, M.**, Municipal Solid Waste: Building Stronger Connections to Jobs and the Economy, In: J. Dernbach, ed., *Agenda for a Sustainable America*, The Environmental Law Institute, Island Press, 2008.

**Chertow, M.**, Industrial Ecology in a Developing Context, In: C. Clini, I. Musu, M. Gullino, eds., *Sustainable Development and Environmental Management*, Springer, 2008.

**Chertow, M.**, W. Ashton, J. Espinosa, Industrial Symbiosis in Puerto Rico: Environmentally Related Agglomeration Economies, *Regional Studies*, 42(10), 1299-1312, 2008.

**Chertow, M.**, Industrial Symbiosis, In: Cleveland, C. J., ed., *Encyclopedia of Earth* [online]. Available from: <http://www.eoearth.org>, October 2007.

**Chertow, M.**, Uncovering Industrial Symbiosis, *Journal of Industrial Ecology*, 11(1), 11-30, 2007.

**Chertow, M.**, D.L. Lombardi, Quantifying Economic and Environmental Benefits of Co-located Firms, *Environmental Science & Technology*, 39(17), 6535 –6541, 2005.

Deschenes, P.J., **M. Chertow**, An Island Approach to Industrial Ecology, *Journal of Environmental Planning and Management*, 47(2), 201-217, 2004.

**Chertow, M.**, Industrial Symbiosis, In: Cleveland, C. J., ed., *Encyclopedia of Energy*, Elsevier, 2004.

**Chertow, M.**, Evaluating the Success of Eco-Industrial Development, In: E. Cohen-Rosenthal, J. Musnikow, eds., *Eco-Industrial Strategies: Unleashing Synergy between Economic Development and the Environment*, Greenleaf Publishing, 258-268, 2003.

**Chertow, M.**, Pursuing Sustainable Solid Waste Management, *The Environmental Law Reporter*, 32(7), 10812-10821, 2002.

Ehrenfeld, J., **M. Chertow**, Industrial Symbiosis: the Legacy of Kalundborg, *In: Ayers, R., L. Ayres eds., Handbook of Industrial Ecology*, Edward Elgar Publishers, 334-350, 2002.

**Chertow, M.**, The IPAT Equation and its Variants: Changing Views of Technology and Environmental Impact, *Journal of Industrial Ecology*, 4(4): 13-29, 2001. Selected for inclusion in four-volume reference set: *International Environmental Politics*, Ronald Mitchell, ed., Sage Publications, October 2008.

**Chertow, M.**, Industrial Symbiosis: Literature and Taxonomy, *Annual Review of Energy and Environment*, 25, 313-337, 2000.

**Chertow, M.**, The Eco-Industrial Park Model Reconsidered, *Journal of Industrial Ecology*, 2(3), 8-10, 1999.

**Chertow, M.**, Waste, Industrial Ecology, and Sustainability, *Social Research*, Vol. 65(1), 31-53, 1998.

Powers, C., **M. Chertow**, Industrial Ecology: Overcoming Policy Fragmentation, *In: Chertow, M., D. Esty, eds., Thinking Ecologically: The Next Generation of Environmental Policy*, Yale University Press, 19-36, 1997.

**Chertow, M.**, Environmental Pollution, *World Book Encyclopedia*, 10 page feature article, 1993-2006.

Lifset, R., **M. Chertow**, Changing the Waste Makers, *The American Prospect*, 83-88, Fall 1990.

**Chertow, M.** Garbage Solutions: A Public Official's Guide to Recycling and Alternative Solid Waste Management Technologies. The United States Conference of Mayors, 74pp. 1989.

#### **Conference Papers, Proceedings, Reports, Blogs, and Other Publications**

Mangan, A. and **M. Chertow**. Materials Management as Carbon Reduction Strategy. US Business Council for Sustainable Development, Blog Post. December 5, 2014. <http://usbcsd.org/2014/12/05/materials-management-as-carbon-reduction-strategy/>

**Chertow, M.** and J.Y. Park. Industrial Ecology and Greening Architecture, *KIRA: Korea Institute of Registered Architects*, November, 2014.

**Chertow, M.** Gains in Plain Sight: The Common Sense of Cooperative Resource Management, *Huffington Post*, May 16, 2012.

**Chertow, M.** Conserving Resources: The Case for Industrial Symbiosis in India. *Energy Manager: a quarterly magazine of the Society of Energy Engineers and Managers, India*, 2010.

Ashton, W. **M. Chertow**, M. Shenoy. Industrial Ecology – Developing Systemic Solutions to Climate Change and Other Environmental Challenges in Indian Industry, *Sustainability Tomorrow: Confederation of Indian Industries*, 4(4), 48-55, 2009.

**Chertow, M.** The Ecology of Recycling, *UN Chronicle*, Vol. XLVI (3-4), 56-59, 2009.

Eckelman, M., **M. Chertow**. Linking Waste and Material Flows on the Island of Oahu, Hawaii: The Search for Sustainable Solutions. Sponsored by the Hawai'i Community Foundation. New Haven: Yale School of Forestry & Environmental Studies, Report Number 21. 2009.

- Chertow, M.** Resource Productivity and Material Flows: A View of Asian Circular Economies. *Proceedings of the Sustainability: Resources Circulation and Low Carbon Society Conference*, Osaka: Osaka University Research Institute for Sustainability Science (RISS). 2009.
- Johnson, J., **M. Chertow.** A Systems Approach to Energy Sustainability in Hawai'i County. *Proceedings of the 42<sup>nd</sup> Annual Hawaii International Conference on System Sciences*, Oahu, HI. 2009.
- Ashton, W., **M. Chertow.** *Puerto Rico's Industrial Legacy: Finding a Path to Sustainability*. Final Report of the Puerto Rico: An Island of Sustainability Project 2001-2008. New Haven: Yale School of Forestry and Environmental Studies. 2008.
- Chertow, M., W. Ashton.** *Aligning Firm Competitiveness with Regional Sustainability*. New Haven: United Technologies Corporation. 2007.
- Chertow, M.** *Industrial Ecology in Asia: Barriers and Opportunities*. Manila: Asian Development Bank. 2007.
- Chertow, M.** Planning Eco-Industrial Parks: The Record So Far. *Proceedings of the 3rd International Conference on Circular Economy*, Tianjin, China. 2006.
- Chertow, M.** and D.R. Lombardi, Economic and Environmental Impacts from Industrial Symbiosis Exchanges: Guayama, Puerto Rico, *Rensselaer Working Papers in Economics* RPI, Econ. Dept. Available from, <http://www.economics.rpi.edu/workingpapers/rpi0407.pdf>, 2004. 217 downloads.
- Chertow, M., W. Ashton, R. Kuppalli.** *The Industrial Symbiosis Research Symposium at Yale: Advancing the Study of Industry and Environment*. New Haven: Yale School of Forestry & Environmental Studies. Report Number 3, 2004.
- Chertow, M., W. Ashton, J. Espinosa and J. Guarnaccia.** *Sustainable Industrial Development Model for Puerto Rico*. Washington, DC: Final Report EDA Project No. 01-79-07795, 53pp. 2004.
- Chertow, M.,** Differentiating Industrial Complexes and Industrial Symbiosis. Economic Development and Industrial Symbiosis: Results from Puerto Rico. *Proceedings of the Association of American Geographers 2004 Annual Meeting*, March 15-17, Philadelphia. 2004.
- Chertow, M.,** Industrial Symbiosis: Building a Framework for Economic Development Planning. *Proceedings of the Fifth International Conference on EcoBalance*, Tsukuba, Japan. 2002.
- Chertow, M.** The 'Gap' in Commercializing Environmental Technology. *American Association for the Advancement of Science Annual Meeting*, San Francisco. 2001.
- Chertow, M.** Industrial Symbiosis: A Multi-Firm Approach to Sustainability. *Greening of Industry Network Conference*, November 15, Chapel Hill: University of North Carolina. 1999.
- Chertow, M.,** Industrial Ecology at Yale. *Conference Proceedings of the Third Industrial Ecology Seminar and Workshop*, October 15-16. Trondheim: Norwegian Academy of Technological Sciences. 1998.

**Chertow, M.**, D. Esty, The Next Generation of Environmental Policy, *Issues in Science and Technology*, Fall 1997.

**Chertow, M.**, CalRecovery, Inc, Waste Prevention in New York City: Analysis and Strategy, *New York City Solid Waste Management Plan*. 1992.

### **Congressional Testimony**

U.S. House of Representatives Committee Hearing on the DeLauro-Lowey Water Pollution Control and Estuary Restoration Financing Act, **Testimony of Marian R. Chertow** before the Subcommittee on Water Resources of the Committee on Public Works and Transportation, Oct. 13, 1992.

U.S. House of Representatives Hearing on Municipal Waste Recycling, **Testimony of Marian R. Chertow**, before the Subcommittee on Transportation and Hazardous Materials, Energy and Commerce Committee, Washington D.C. July 12, 1989.

U.S. Senate Testimony, **Statement of Marian R. Chertow**, President, Connecticut Resources Recovery Authority, before the Subcommittee on Hazardous Waste and Toxic Substances of the Committee on Environment and Public Works, Washington, D.C., December 3, 1987.

### **RESEARCH FUNDING: GRANTS AND CONTRACTS**

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| 2019-2020 | MacMillan Center Faculty Research Grants – Principal Investigator. “Small State Self-Determination to Achieve Social and Economic Stability: Rwanda and Local Industrial Development.” \$18,000.   |
| 2018-2019 | Sloan Foundation and the Environmental Law Institute – Principal Investigator. Energy and Environmental Impacts of the Digital Economy Grant. \$35,000.  |
| 2017-2020 | U.S. National Science Foundation – Principal Investigator. “Reusing Non-Hazardous Industrial Waste in the U.S.: A Geo-Specific Estimate of Quantities and Benefits.” \$300,000   |
| 2011-2018 | Pratt&Whitney, Self-directed environmental research, Principal Investigator,\$25,000.  |
| 2016-2018 | Environmental Research and Education Foundation, Principal Investigator, "Making up for Lost Time (and Space): Quantifying Non-hazardous Industrial Waste Output and Beneficial Use Opportunities in the US." \$150,000.   |
| 2013-2017 | Ellen MacArthur Foundation, Principal Investigator, Schmidt-MacArthur Fellowship on Circular Economy. \$44,600 (Year 1); \$44,600 (Year 2); \$32,000 (Year 3)  |
| 2014-2016 | Sobotka Research Fund. Principal Investigator. The Power of Information: Bringing to Scale an Industrial Symbiosis Database to Address Market Inefficiency in Resource Reuse among Industrial Firms. \$14,000  |
| 2012-2018 | U.S. National Science Foundation – Co-principal Investigator, PIRE Award. Developing Low-Carbon Cities in the USA, China & India Through Inter-Disciplinary Integration Across Engineering, Environmental Sciences, Social Sciences & Public Health. Total grant – \$4.45 million; Chertow/Yale portion - \$712,535. |



- 2012-2015 U.S. National Science Foundation –SEES Fellow/Post-doctoral Mentor. Re-localization and Sustainability - Linking Industrial and Political Ecology on Molokai and the Big Island, Hawaii. PI: Anjali Gupta, \$382,944.
- 2011-2015 U.S. National Science Foundation – Co-principal Investigator, RCN Award,. Sustainable Cities - People, Infrastructures and the Energy-Climate-Water Nexus, \$750,000.
- 2010-2011 The Japan Foundation, Center for Global Partnership. “Island Industrial Ecology and Sustainability.” Principal Investigator, \$60,000.
- 2009-2013 U.S. National Science Foundation – ULTRA-Ex Award. “Human-Nature Interactions in an Urbanized Island Setting: Hilo and Kailua-Kona, Hawai‘i as Model Socio-Ecological Systems.” Principal Investigator, \$145,416.
- 2009-2013 Ministry of National Development, Singapore with National University of Singapore, “Planning and Development for Sustainable High Density Living: Urban Metabolism Studies.” Yale Principal Investigator, \$300,000.
- 2009-2010 Woodrow Wilson International Center for Scholars, The Smithsonian Institution, “Clean Slate Project.” Principal Investigator, \$15,000.
- 2009 Great Wall Enterprises, Beijing, China. “Circular Economy Plan for Tianjin Economic-Technological Development Area.” Principal Investigator, \$20,000.
- 2008-2015 Pratt & Whitney, Self-directed environmental research, Principal Investigator, \$200,000.
- 2008-2011 Rice Family Foundation Asia Environmental Fund, “Industrial Ecology in Developing Countries.” Principal Investigator, \$200,000.
- 2008-2009 Hawai‘i Community Foundation, “Waste and Material Flows on Oahu: An Industrial Ecology Approach.” Principal Investigator, \$87,720.
- 2007 Contract award from United Technologies Corporation, “Firm Competitiveness and Regional Sustainability.” \$9,000.
- 2007-2009 Private donor support for start-up of the “Program on Industrial Ecology in Developing Countries.” \$140,000.
- 2007 Yale McMillan Center for International and Area Studies Faculty Research Grant for "Spontaneity and Central Planning: Organizing Industry in China," \$5,000.
- 2006 Yale Hixon Center for Urban Ecology Award (with H. Shi) “Patterns of Household Water and Electricity Consumption and their Underlying Determining Factors in Beijing,” \$4,800.
- 2005 The Kohala Center, to support industrial ecology field research Spring 2006 for eight researchers in Hawaii, (with A. Grubler and T. Graedel). \$18,000.

- 2004-2005 National Science Foundation Education Grant, supplemental to “Multilevel Cycles, Models, and Scenarios for Iron Alloying Elements” for Puerto Rico project. \$29,921.
- 2004 State Environmental Protection Administration, China. Award for 12-day environmental executive training program for director generals. Principal Investigator, (with D. Esty). \$180,350
- 2001-2006 Henry Luce Foundation, “Collaborative Industrial Ecology in Asia.” Co-principal investigator, \$1.2 million.
- 2003 Support for Industrial Symbiosis Research Symposium, Coca-Cola World Fund \$5000 and Windmar Associates, \$5,000.
- 2002-2004 US Economic Development Administration with Luis Munoz Marin Foundation, Project # 01-79-07795. “Sustainable Industrial Development Model for Puerto Rico.” Co-principal investigator, \$75,600.
- 2002 Banco Popular, “Puerto Rico: An Island of Sustainability.” Principal Investigator, \$25,000.
- 2001 Luis Munoz Marin Foundation. “Puerto Rico: An Island of Sustainability.” Principal Investigator, \$50,000.
- 1995-1999 Environmental Reform: The Next Generation Project. Director of project that raised \$750,000 total including the following: Avina Foundation, Geraldine R. Dodge Foundation, GE Fund, German Marshall Fund, The Energy Foundation, Hughes Foundation, the Kendall Foundation, and the McKnight Foundation.
- 1991-1993 Principal investigator for project with the US Marine Corps on Recycling Planning at Quantico, Virginia, Twenty-Nine Palms, California, and Okinawa, Japan. \$30,000.

## **AWARDS AND RECOGNITION**

- 2018 Selected for Board of Directors of Terracycle U.S. Inc.
- 2016-2017 Selected by the National Academies for Committee to Review EPA’s Science to Achieve Results” Research Grants Program.
- 2015 Selected by US EPA as the representative of the U.S. at the launch of the G7 Alliance for Resource Efficiency in Berlin, Germany as speaker (Sept 30-Oct 2) and at the G7 Workshop on Industrial Symbiosis in Birmingham, U.K. as speaker (October 29-30)
- 2013-2014 President of the International Society of Industrial Ecology (elected to two-year term)
- 2014 Distinguished Visitors Program-Corona Chair, Universidad de los Andes School of Management, Bogota, Colombia
- 2014 Honoree, The Connecticut Women’s Hall of Fame
- 2012-2013 Selected as Public Voices Fellow, Yale University and Women’s Faculty Forum
- 2011- Present Alliance for Research on Corporate Sustainability (ARCS) Board of Directors

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|---------------|---|
| 2010-2012     | Appointed by US EPA Administrator to the National Advisory Council for Environmental Policy & Technology (NACEPT)                         |
| 2010- Present | Appointed by Ingersoll Rand to the company's External Advisory Council for the <i>Center for Energy Efficiency &amp; Sustainability</i> . |
| 2009-2012     | Appointed by Duke Energy Chairman and CEO to the company's Energy and Environment Thought Leaders Council                                 |
| 2008-2011     | Elected to the Council of the International Society for Industrial Ecology  |
| 2000-2007     | Appointed by Speaker of the Connecticut House to the Founding Advisory Board of the Connecticut Clean Energy Fund                         |
| 2000          | Connecticut's Distinguished Environmental Fellow, Briarwood College   |
| 2000          | The Clyde O. Fisher Award, Connecticut Bar Association, Environmental Law Sect.   |
| 1999-2000     | Teresa Heinz Scholar for Environmental Research   |
| 1997          | Environmental Merit Award. U.S. Environmental Protection Agency – Region 1  |
| 1993-2000     | Appointed by Governor to the Connecticut Council for Environmental Quality  |
| 1981-83       | Presidential Management Intern  |
| 1980-1981     | HEW Fellowship (tuition plus stipend), Yale SOM   |

## SELECTED PRESENTATIONS

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### **Representative Presentations (2009-2018). Full list of presentations available on request.**

“Historical Contributions of Industrial Ecology & Industrial Symbiosis to Green Transformations.” The 15<sup>th</sup> Annual Industrial Symbiosis Research Symposium, Tecnológico de Costa Rica (TEC), October 30, 2018.

“Food and Industrial Symbiosis: Scales of Circularity.” The International Conference on Circular Economy for Agri-Food Resource Management, Seoul National University, Korea June 13-15, 2018.

“International Experience with Eco-Industrial Parks & Industrial Symbiosis: Emergence, Development and Outcomes. Tsinghua University, China - International Forum on Sustainable Solutions for New Era of Ecological Civilization. December 18, 2017.

“Carbon Neutral Landscapes: Building Strategies in a Model Socio-Ecological System.” University of Hawaii. November 20, 2017.

“Small Islands and Resource Use.” Workshop on Sustaining Small Islands in the Context of Global Environmental Change. Waterloo University, Ontario, Canada, October 24, 2017.

“Developing Low-Carbon and Sustainable Cities in the US, China, and India.” Workshop on Waste Management, Waste Reuse and Industrial Symbiosis in Indian Cities, Bangalore, India, May 9, 2017.

“Industrial Ecology: Closing the Loop.” Sustainability Across Disciplines Conference, Concordia University, Montreal, Canada, March 17, 2017.

“Industrial Symbiosis Dynamics and the Problem of Equivalence.” Strategic Management and Public Policy: George Washington University, February 17, 2017.

“Emergence and Development of Industrial Symbiosis: Inter-firm Resource Sharing Across the Globe.” Erb Institute, University of Michigan, October 21, 2016.

“Industry Trends – How Will Cities Plan for the Future?” Deloitte Global Think Tank, New Haven, CT, June 29, 2016.

Plenary Session “Improving Industrial Systems: The Contribution of Industrial Ecology to Innovation in the Business Sector. Gordon Research Conference on Industrial Ecology, Stowe, VT June 19, 2016.

Plenary Session “Industrial Symbiosis and Materials Management: Physical Resource Sharing Among Proximate Firms.” The Minerals Metals and Materials Society (TMS), Nashville, Tenn, Feb. 16, 2016

“Comparative Analysis in Industrial Symbiosis: Local to Global,” G7 Alliance for Resource Efficiency, Workshop on Industrial Symbiosis, Birmingham, UK, October 29, 2015

“Promoting Resource Efficiency: Contextualizing Research and Innovation,” at launch of G7 Alliance for Resource Efficiency, Berlin, Germany, October 2, 2015.

“Industrial Symbiosis Dynamics: Empirical Studies of Three Different Dynamic Types,” International Society for Industrial Ecology, University of Surrey, July 8, 2015.

“Creating Shared Value” and “Industrial Ecology and Business Strategy,” World Business Council for Sustainable Development, GNAM Week, Geneva, Switzerland, March 17-18, 2015.

“Environment and Economy from Bangkok to Bali,” “The Oil Palm Industry in Indonesia and Malaysia,” “The Miracle of Modern Singapore.” Yale Educational Travel - Southeast Asia, February 4-17, 2015.

“China: Where Planetary Boundaries Meet Unprecedented Economic Growth.” Yale Center Beijing Opening Conference, Beijing, China, October 27, 2014.

“Environment, Sustainability, and Competitive Advantage,” SOM Reunion Lecture, October 18, 2014.

“Industrial Ecology, Industrial Symbiosis, and Opportunities for Urban Intervention.” NSF PIRE – Sustainable & Low Carbon Cities Summer School, Tsinghua University, Beijing, China July 10, 2014.

“Integrating Industrial Ecology and Applied Sustainability with Resilience Thinking,” Resilience 2014, Montpellier, France May 7, 2014.

“Powers of Ten: Industrial Symbiosis and Urban Agglomeration,” Yale School of Architecture, February 19, 2014.

“Organizing Self-Organizing Systems: Material, Energy, and Industrial Ecology. Universidad de los Andes School of Management, Bogota, Colombia, February 7, 2014.

“Two Decades of Industrial Ecology: Growing an Interdisciplinary Environmental Field.” Seoul National University, Seoul, Korea, July 1, 2013.

“Historical Material Flows in Hawaii over 200 Years: A Theory of Material Succession.” 7<sup>th</sup> Conference of the International Society for Industrial Ecology, Ulsan, Korea, June 28, 2013.

“Yale, New England, and the Founding of Modern Hawai’i.” Yale Alumni Reunions, May 24, 2013.

“Industrial Symbiosis and Urban Agglomeration,” Harvard Graduate School of Design, Cambridge, MA February 20, 2013.

US Congress - Briefing on Electronic Waste with American Chemical Society, February 13, 2013.

<http://portal.acs.org/portal/acs/PublicWebSite/policy/acsonthehill/briefings/ewaste/index.ht>

“Two Decades of Industrial Ecology: From Oxymoron to Interdisciplinary Field,” State University of New York, College of Environmental Science & Forestry, December 10, 2012.

“Industrial Ecology, ISIE, and the Competition for Resources.” Tsinghua University – ISIE-Asia Pacific, Beijing, October 21, 2012.

“Industrial Symbiosis: Planning vs Self Organization?” 9th Annual Industrial Symbiosis Research Symposium, TEDA Industrial Park – Tianjin, China, October 19, 2012.

“Setting the Stage: Outlook on Sustainability of Resources.” UBS Q Series® Inflection Points: Toward Sustainability Conference, Bloomberg Center, New York, NY, October 3, 2012.

“New Solutions to Waste Management” and “Shaping the Circular Economy.” World Economic Forum, Tianjin, China September 11-12, 2012.

“Comparing Socio-Ecological Change over 200 Years in Two Urban Systems in Hawai’i.” The American Association of Geographers, New York, NY. Symposium 11 – The Ultra-Ex Network. February 25, 2012. Also delivered at the Kohala Center, Hawai’i Island, Hawai’i, May 2, 2012.

“Designing Sustainable Products and Processes. Soundwaters – Stamford, Connecticut Jan. 26, 2012.

“Industrial Symbiosis: Resource Sharing across Business Clusters,” University of Tel Aviv, Israel, Dec. 28, 2011.

“Industrial Ecology in Asia: Why Waste Waste?” National University of Singapore, Dec 15, 2011.

“Material Flows and Land Use Change in Two Urban Areas of Hawai’i Island,” Ecological Society of America, Austin, Texas, August 10, 2011.

“A Behavioral Economics View of Industrial Symbiosis.” International Society of Industrial Ecology. Berkeley, California, June 9, 2011.

“China, Rare Earth Elements, and the Quest for Resources.” Yale – China Social Science Seminar, February 21, 2011.

“Multi-level Material Flows in a City-State: Implications for Policy and Planning.” International Society of Industrial Ecology - Asia Pacific Meeting, Tokyo, Japan, November 7, 2010.

“Approaching Modern China.” Association of Yale Alumni, Hosted by Tsinghua University, Department of Environmental Science and Engineering, Beijing, China, July 20, 2010.

“Upcycling, Waste, and Industrial Ecology.” Singularity University, NASA-Ames Research Center, Moffett Field, California, June 23, 2010.

“Collective Environmental Advantage: Toward a Theory of Industrial Symbiosis.” Alliance for Research on Corporate Sustainability (ARCS), Harvard Business School, May 14, 2010.

“Industrial Symbiosis: A Global Review of Research and Progress.” Linköping University, Sweden, April 28, 2010.

“Industrial Symbiosis: Collective Action for Sustainable Material and Energy Use.” Academy of Management Annual Meeting All Academy Workshop: Toward a Research Agenda for Industrial Symbiosis in Organizational Studies. Chicago, August 9, 2009.

“The 20th Birthday of Industrial Ecology: Insights from the Study of Material and Energy Flows.” Fellows Lecture, Pratt & Whitney, July 29, 2009.

“Resource Productivity and Material Flows: A View of Asian Circular Economies.” Osaka University Research Institute for Sustainability Science (RISS), July 22, 2009.

“Billions and Billions: Sustainable Management of Non-Hazardous Industrial Waste.” International Society for Industrial Ecology, Lisbon, Portugal, June 22, 2009.

“A Systematic Methodology for Eco-industrial Development.” American Planning Association National Conference, Minneapolis, Minnesota, April 29, 2009.

“Asian Economic Power and Environment,” Yale Redpath Seminar on the Future of Asia, San Francisco, California, March 21, 2009.

“Urban Metabolism and the City.” Workshop on Sustainable High Density Cities, National University of Singapore, School of Design and Environment, Singapore, February 23, 2009.

### **Selected Academic Conference Presentations**

- 2018 The Int’l Conference on Circular Economy for Agri-Food Resource Management, Seoul, Korea
- 2018 15<sup>th</sup> Annual Industrial Symbiosis Research Symposium, Cartago, Costa Rica
- 2017 International Society for Industrial Ecology, Chicago, Illinois, USA
- 2016 ISIE Americas, Bogota, Colombia
- 2016 13th Annual Industrial Symbiosis Research Symposium, Tianjin, China
- 2015 International Society for Industrial Ecology, Surrey, U.K.
- 2015 11<sup>th</sup> Annual Industrial Symbiosis Research Symposium, Lausanne, Switzerland
- 2014 Resilience 2014, Montpellier, France  
International Society of Ecological Economics
- 2013 International Society for Industrial Ecology, Ulsan, Korea
- 2012 Association of American Geographers, New York, NY  
9<sup>th</sup> Annual Industrial Symbiosis Research Symposium, Tianjin, China
- 2011 International Society for Industrial Ecology, Berkeley, CA  
Ecological Society of America

- Urban India Conference, Mysore, India
- 2010 Alliance for Research on Corporate Sustainability, Harvard Business School  
International Society for Industrial Ecology – Asia Pacific
- 2009 Sustainability: Resources Circulation and Low Carbon Society, Osaka University Research  
Institute for Sustainability Science, Japan  
International Society of Industrial Ecology, Lisbon, Portugal  
Academy of Management Annual Meeting, Chicago
- 2008 5<sup>th</sup> Annual Industrial Symbiosis Research Symposium, Devens, Massachusetts
- 2007 International Society of Industrial Ecology, Toronto, Canada
- 2006 Gordon Research Conference on Industrial Ecology, Oxford, U.K.  
Expert Meeting, Toyo University, Center for Regional Industrial Symbiosis, Japan  
3rd International Conference on Circular Economy, Tianjin, China
- 2005 International Society for Industrial Ecology, Stockholm, Sweden
- 2004 The Industrial Symbiosis Research Symposium at Yale: Advancing the Study of  
Industry and Environment, New Haven  
Association of American Geographers 2004 Annual Meeting, Philadelphia
- 2003 NSF Sponsored Symposium on Sustainable Industrial Development, University of  
Southern California, Los Angeles  
International Society of Industrial Ecology, University of Michigan, Ann Arbor
- 2002 Gordon Research Conference on Industrial Ecology, Holderness, New Hampshire  
Fifth International Conference on EcoBalance, Tsukuba, Japan
- 2001 Between Invention and Innovation: Mapping the Funding for Early Stage, Technology Based  
Innovation. Kennedy School of Government, Harvard University, Cambridge  
International Society for Industrial Ecology, Leiden, The Netherlands  
American Association for the Advancement of Science (AAAS) Annual Meeting,  
San Francisco
- 1999 Greening of Industry Network Conference, UNC-Chapel Hill  
3<sup>rd</sup> Industrial Ecology Seminar and Workshop, Norwegian Academy of Technological  
Sciences, Trondheim, Norway
- 1998 Linking Industrial Ecology to Public Policy. NSF-sponsored Workshop, White House Conference  
Center, Washington DC

**University Seminars and Symposia Presentations**

*International Universities*

TU Delft, The Netherlands  
Tsinghua University, Beijing, China  
Nanjing University, Nanjing, China  
Central Party School, Beijing, China (group visiting New Haven)  
Linköping University, Sweden  
Osaka University, Japan  
TERI University School of Advanced Studies, India  
Lund University, Sweden  
University of Tel Aviv, Israel  
National University of Singapore

Seoul National University, Korea  
University of the Andes, Bogota, Colombia  
Concordia University, Montreal, Canada  
Waterloo University, Ontario, Canada  
Tecnológico de Costa Rica (TEC)

*American Universities*

MIT(3); Carnegie Mellon University; Cornell University; Harvard (3), RPI (3); University of North Carolina at Chapel Hill; University of Tulsa School of Law; Pace University; University of Minnesota; Washington State University; University of Southern Maine; Rice University; Dartmouth College; University of Puerto Rico (3); University of Hawaii, State University of New York, College of Environmental Science & Forestry; University of Michigan, George Washington University

***Selected Presentations to Practitioner Groups***

- 2018 Air & Waste Management Association
- 2018 National Council for Science and the Environment (NCSE)
- 2017 Yale Sustainability Leadership Forum  
All-China Youth Federation.
- 2016 US Business Council for Sustainable Development  
GE – Fairfield, CT  
Tata North America
- 2015 World Business Council for Sustainable Development
- 2013 US Congress – Briefing with American Chemical Society
- 2012 UBS Bank  
World Economic Forum  
Soundwaters
- 2010 Singularity University  
Environment and Sustainable Development Leadership Program (for Chinese public officials)
- 2009 American Planning Association  
Pratt & Whitney
- 2008 Executive Environmental Sustainability Forum, Tuck School of Business  
Young Presidents' Organization  
United Nations Environment Programme - North American Workshop on Sustainable Consumption and Production  
State of Karnataka Pollution Control Board, Bangalore, India
- 2007 International Symposium on Circular Economy, Chinese Ministry of Information Industry, Beijing, China  
China Development Forum, Tianjin, China  
Asian Development Bank, Manila, Philippines
- 2006 Canadian Pollution Prevention Roundtable  
The Kohala Center, Hawaii Island  
Kawasaki International Business Forum, Japan
- 2005 Brown Forman Company, Louisville, Kentucky  
Byproducts Beneficial Use Summit, US Environmental Protection Agency  
North Dakota Department of Commerce  
Yale-BP Seminar on Urbanization



- 2004 Puerto Rico Manufacturers Association Board of Directors
- 2003 Jepsen & Jessen EHS Group, Malaysia
- 2000 The Brookings Institution Seminar on Science and Technology Policy
- 1999 National Research Summit on Environmental Management Systems  
US Environmental Protection Agency
- 1998 New York Academy of Sciences  
Enron Corporation  
White House Regional Conference - Implementing an Action Plan for a Sustainable  
New England  
Environmental Protection Agency Region 10
- 1997 AT&T Bell Labs  
United Nations Development Programme Manila, Philippines
- 1996 Environmental Law Institute Board of Directors Retreat  
General Electric EHS Managers
- 1989 The Chautauqua Institution, Chautauqua, New York

**SYNERGISTIC PROFESSIONAL AND SCIENTIFIC MEETINGS**

***Industrial Symbiosis Research Symposium* – Founder and co-convener**

- 2004 Hosted by Yale School of Forestry & Environmental Studies, January 7-9.
- 2005 Sponsored by the Nordic Council of Ministers and hosted by Lund Univ., Roskilde Univ. & the Norwegian Univ. of Science and Technology, Stockholm, June 11.
- 2006 Hosted by National Industrial Symbiosis Programme, Birmingham, UK, August 5-6.
- 2007 Hosted by Dalhousie University at University of Toronto, June 11.
- 2008 Hosted by Devens Enterprise Commission, Devens, Mass. August 15-17.
- 2009 Hosted by Industrial Symbiosis Institute, Kalundborg, Denmark, June 18-20.
- 2010 Hosted by Tsinghua Univ., Chinese Academy of Science, Ulsan Univ., Korea, & the National Institute for Environmental Studies in Japan; Kawasaki, Japan, November 5-6.
- 2011 Hosted by Yale University, San Francisco, California, June 5-6.
- 2012 Hosted by Tianjin Economic and Technological Development Area (TEDA), October 19-20.
- 2013 Hosted by Ulsan University, Korea, June 23-24.
- 2014 Hosted by Australian Industrial Ecology, November 25.
- 2015 Hosted by Lausanne University, Switzerland, July 5-6.
- 2016 Hosted by Devens Enterprise Commission, Devens, Mass. June 17-18.
- 2017 Hosted by Illinois Institute of Technology, Chicago, Ill. June 24.
- 2018 Hosted by Tecnológico de Costa Rica (TEC), Cartago, Costa Rica, Oct 30-31.

***Additional Meetings* – Invited participant, moderator, section leader**

- 2017 Resources Optimization Initiative, Bangalore, India
- 2016 ICLEI South Asia, Delhi.
- 2015 Yale Symposium on Chinese Overseas Investment & its Envi. and Social Impacts, April
- 2014 Gordon Research Conference on Industrial Ecology, June

- 2014 How Do Leaders Advance Sustainability in Complex Organizations? Yale Insights Moderator  
 2013 Rio+20 to 2015: A New Architecture for a Sustainable New World – Cities Panel Moderator  
 2011 Association of Chinese Students and Scholars at Yale, April 23-24, 2011.  
 2010 Urban Metabolism Workshop, MIT School of Architecture, January 13-14.  
 2009 Individual Consumption and Systemic Social Transformation, Sustainable Consumption Research and Action Network (SCORAI), Clark University, October 15-17.  
 2008 Corporate Environmental Indicator Workshop, Yale Center for Environmental Law & Policy, December 9-10.  
 2005 Yale Conference on Climate Change: From Science to Action, Aspen, Colorado October 6-8.  
 2003 Economic and Social Research Council, Oxford University, “Democratic Governance of Technological Change in an Era of Globalization,” Lisbon, Portugal, February 23-25.  
 1999 National Town Meeting for a Sustainable America, Detroit, Michigan, May 2-5.  
 1998 BP’s Washington Environmental Forum, Washington, D.C., July 13.  
 1995 White House Conference on Environmental Technology, Washington D.C., December.

**TEACHING**

***Yale Graduate Teaching***

|                  |                |  |
|------------------|----------------|--|
| 2017, 2018       | FES            | Waste and Materials Management: Fundamentals and Frontiers                           |
| 2014             | FES            | Advanced Industrial Ecology Seminar: Dynamics of Industrial Symbiosis (with J. Park) |
| 2011, 2013, 2014 | FES            | Field Experience in Industrial Operations (1 cr)                                     |
| 2013             | FES            | Seminar on Interdisciplinarity in Environmental Research (with C. Gupta)             |
| 2012             |                | FES/MGT Seminar on Energy Industries and Technologies                                |
| (with W. Ellis)  |                |  |
| 2010, 2011       | FES/MGT*       | Seminar on Business Strategy and Industrial Ecology                                  |
| 2009             | FES/MGT/ENVE** | Greening Business Operations (with T. Graedel)                                       |
| 2008             | FES            | Seminar on Industrial Ecology in Developing Countries                                |
| 2007             | FES/MGT/ENVE   | Greening Business Operations (with J. Zimmerman)                                     |
| 2006             | FES            | Seminar on Industrial Ecology and the Circular Economy in China                      |
| 2004             | FES            | Greening the Industrial Facility   |
| 2003             | FES/ENAS***    | Seminar on the Environmental Aspects of Emerging Technologies                        |
| 2000-present     | FES/MGT        | Corporate Environmental Management and Strategy                                      |
| 1997-present     | FES/ENAS       | Industrial Ecology (with T. Graedel)   |
| 1993-2007        | FES/MGT        | Business Concepts for Environmental Managers (with W. Ellis/M. Burke/other staff)    |
| 1995             | FES/LAW/MGT    | Environmental Policy: the Next Generation Seminar (with D. Esty)                     |

|           |     |  |
|-----------|-----|--|
| 1990-1995 | FES | Multiple Aspects of Solid Waste Management (with W. Smith) |
| 1992      | FES | Seminar on Society and Natural Resources (with W. Burch)   |

\* SOM

\*\* Environmental Engineering

\*\*\* Engineering and Applied Science

### **Teaching-Related Field Study**

Since its founding F&ES has been dedicated to field work. The Industrial Environmental Management Program, in turn, has actively organized class field work and projects to support the teaching program. Over 200 industrial ecology students have completed field study projects in New Haven, East Coast states, and beyond, including approximately 150 students visiting Puerto Rico or Hawaii over 10 years of study in these two venues. Greening Business Operations had four company field visits per semester and Corporate Environmental Management and Strategy has had one-two visits per year. A one-credit course offered in 2011, 2013, and 2014 has been dedicated to field visits. These have included industrial plants that have produced: electricity from waste and hydrogen fuel cells, helicopters, jet engines, packaging, powdered metals, pharmaceuticals, ultrasonics, food, office supply distribution, and many others.

### **Guest Lectures in Yale Undergraduate and Graduate Courses**

Advanced Studio, Yale Architecture School; Introduction to Environmental Studies; Environmental Politics; Environmental Aspects of the Technological Society; Designing the Eco-City; Science and Politics of the Environment; Creating Science Narratives for Solutions; Seminar on Multi-Scale Industrial Ecology; Qualitative Research Methods; Introduction to Environmental Engineering; Ecological Urbanism: New Approaches to Urban Ecology and City Planning; Natural Development: Toward Creation of a Code; Yale College Urban Studies Colloquium; Building Science Networks for Climate Solutions.

### **Executive Education**

|               |   |
|---------------|---|
| 2016- present | Yale Sustainability Leadership Forum, Yale Sustainability Accelerator   |
| 2015-2016     | Yale Sustainability Accelerator   |
| 2014-present  | Faculty, Yale Executive MBA – Sustainability  |
| 2010-2011     | Faculty, Environment and Sustainable Development Leadership Program (for Chinese public officials) summer program in New Haven.   |
| 2006-2008     | Faculty, The Energy Research Institute (TERI) School of Advanced Studies (New Delhi, India) summer program in New Haven.  |
| 2004          | Organized and chaired 12-day Executive Course for Chinese State Environmental Protection Administration (SEPA) Director Generals with Professor Daniel Esty at Yale.  |
| 2004          | Co-organized a workshop on the teaching of industrial ecology in Beijing at Tsinghua University attended by 50 professors from 35 Chinese universities with funding from the Henry Luce Foundation. This workshop led to the creation of a listserv among the professors and the initiation of numerous new courses in industrial ecology in China. |
| 1992-2002     | Initiated and co-chaired The Corporate Environmental Leadership Seminar at Yale School of Forestry & Environmental Studies, a 2-week training course for global environmental executives.   |

### **Teaching External to Yale University**

|      |  |
|------|--|
| 2016 | PIRE Winter School, China and India, 3-week course, January<br>Doctoral Defense, Erasmus University, The Netherlands |
|------|--|

- 2015 Doctoral Defense, TU Delft, The Netherlands
- 2014 PIRE Summer School, Tsinghua University, 5 week course, July
- 2013 PIRE Summer School, IIT Kanpur, 6 week course, Kanpur, India, June
- 2012 Instructor, INSEAD, short course: Environmental Management in a Global Economy, June.
- 2010 Faculty, Singularity University, Upcycling Program, NASA-Ames Campus, California, June-August.
- 2010 Visitor to Linköping University, Sweden, to assist with planning world's first doctoral program in Industrial Symbiosis, April.
- 2005, 2006 Faculty, Environmental Management Executive Programme for Singapore Ministry of Environment and Water Resources, August, 2005 and September 2006.
- 2004, 2005 Faculty, Advanced Training Program on Environmental Management and Sustainable Development, Venice International University, Nov, 2004, June and July 2005.
- 2003 Opponent for defense of doctoral dissertation, International Institute for Industrial Environmental Economics at Lund University, Sweden, September 19.
- 2001-present Visiting Assoc. Professor. "Business and Environment," National Univ. of Singapore.
- 2002 Faculty, Short course on "Industrial Environmental Management," Sustainable Development Leadership Program, Aetna School of Management, Shanghai Jiao Tong University, Shanghai, China, May 5-11.
- 2000 Faculty, Sustainable Development Leadership Program – Nanjing, China.

Industrial Ecology Training Sessions: United Nations Development Programme; Intertec; US Environmental Protection Agency; National Recycling Coalition; Brown Forman Company; Connecticut Department of Environmental Protection, Tata North America

#### ACADEMIC ADVISING

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##### ***Completed Doctoral Dissertations – Doctoral Advisor and Committee Chair***

**Jon Powell, May 2018.** "Enabling and Enhancing Sustainable Materials Management through Waste Informatics." E&AS

**Gabriel Grant, December 2017.** "A Self-determined Pursuit of Personal, Organizational, and Planetary Flourishing."

**Bin Bin Jiang Pearce, March 2015.** "Phosphorus Cycles in Urban Systems and Implications for Sustainable Urban Resource Management." Post-doctoral fellow at Swiss Federal Institute of Technology Zurich (ETH Zurich)

**Joo Young Park, October 2012.** "Wastes as Resources: The Case of Coal Combustion By-products in the United States." *Assistant Professor, School of Management, University of the Andes, Bogota, Colombia.*

**Shi Han, October 2009.** "Industrial Symbiosis from the Perspectives of Transaction Cost Economics and Institutional Theory." *Assistant Professor, City University, Hong Kong*

**Weslyne Ashton, March 2008** "Coordinated Resource Management in Regional Industrial Ecosystems." *Associate Professor, Stewart School of Business, Illinois Institute of Technology*

##### ***Completed Doctoral Dissertations – Doctoral Committee and/or Reader***

**Timothy Terway, April 2018.** "Sustained in Signs With(out) Context and Ourselves: Expert Environmental Knowledge and 'Social-Ecological Systems'" *Reader.*

**Yitian Wang, August 2013.** "The Emergence of Domestic Carbon Trading in China: Institutional Development and International Influences." *Doctoral Committee and Reader. Assistant Professor, Fudan University, China*

**Angel Hsu, April 2013.** “Advancing Data-Driven Environmental Decision-Making and Governance in China.” *Reader, Accepted position as Assistant Professor, Yale-NUS, Singapore*

**Jennifer Baka, August 2012.** Biofuels and Marginal Lands: An Interdisciplinary Examination of Jatropha Biodiesel Promotion in Tamil Nadu, India *Doctoral Committee and Reader. Assistant Professor, London School of Economics, now at Penn State University*

**Matthew Eckelman, December 2009.** “Production and Costs, Recycling and Loss: Modeling Energy and Environmental Impacts of Global Material Systems” *Doctoral Committee and Reader. Assistant Professor, Northeastern University.*

**Anastasia O’Rourke, March 2009.** “The Emergence of Cleantech: Essays in Venture Capital Investments, Funds and Frames” *Doctoral Committee and Reader Consultant with Industrial Economics*

**Tao Wang, November 2007.** “Forging the Anthropogenic Iron Cycle” *Doctoral Committee and Reader*

**Ermelinda Harper, March 2007** “Multi-Level Approach to Historical Material Flow Analysis: Tungsten as a Case Study” *Doctoral Committee and Reader*

**Robert Klee, March 2005.** “Material Flow Analysis of Industrial Systems in Antarctica” *Reader, currently serving as Commissioner, Connecticut Department of Energy and Environmental Protection*

**Current Chair or Member of Doctoral Committee**

| <i>Name</i>   | <i>Affiliation</i> | <i>Chair/Advisor</i> | <i>Expected Graduation</i> |
|---|--------------------|----------------------|----------------------------|
| Tamar Makov   | F&ES               | Marian Chertow       | 2018-2019                  |
| Matthew Gordon  | F&ES               | Marian Chertow       | 2021- 2022                 |
| State University of New York, College of Environmental Science & Forestry – Steven Balogh, PhD 2013 |                    |                      |                            |
| MIT Engineering Systems Division – Jonathan Krones, PhD 2016  |                    |                      |                            |
| PhD Student Visitor – Stijn van Eijk, University College, London, 2016.                             |                    |                      |                            |

**Post Doctoral Scholars**

|         |   |
|---------|---|
| 2018    | Xiao Li, Tsinghua University – NSF funded projects – PIRE and NHIW grants             |
| 2016-18 | Jonathan Krones, MIT – EREF funded project – industrial processes and waste           |
| 2013-16 | Junming Zhu, Univ. of Maryland – NSF funded PIRE project – low carbon cities          |
| 2012-15 | Clare Gupta, Univ. of California – Berkeley – NSF funded SEES Fellow                  |
| 2012-14 | Joo Young Park, Yale University – Resource-based vs. waste-based paradigm             |
| 2012-13 | Jennifer Baka, Yale University, Interdisciplinary studies                             |
| 2008    | Megha Shenoy, Indian Institute of Science, Industrial ecology in developing countries |
| 2006    | Ilda Mannino, Venice International University, Industrial symbiosis in Porto Marghera |
| 2005    | Zengwei Yuan, Nankai University, Comparing industrial symbiosis in US and China       |
| 2004-05 | Rachel Lombardi, Yale School of Engineering, Industrial environmental management      |

**Supervision of Masters Projects/Independent Study**

|           |   |
|-----------|---|
| 2016-2017 | Evaluating the Greenhouse Gas Impacts of Public Transit: A Life Cycle Assessment of NYC Transit Options (Michael Cox MEdSc 2017)  |
| 2015-2016 | (on sabbatical spring) Comparing Design Results of the European Passivhaus Standard with the Climate-Specific PHIUS+ 2015: Passive House Standard – North America (Stephanie Johns MEdSc 2016). |
| 2014-2015 | Desalination financial model (Michael Warrady, MEM/MBA 2017), Input-Output analysis for industrial symbiosis (Brendan Edgerton MEM/MBA 2015)  |

- 2013-2014 Stranded Assets: an analysis of Bloomberg's carbon risk valuation tool (Tyler Van Leeuwen, SOM); Sustainable apparel production (Annie Barry YC 2014).
- 2012-2013 (on sabbatical spring) Industrial Symbiosis Potential: A Case Study at Qinhuangdao City in China (Rui He, MEdSc); Social-environmental monitoring framework (SEMF) for Small Island Tourist Economies (SITE): Case Studies in Lana'i (USA), St John (USVI) & Fernando de Noronha's (Brazil)
- 2011-2012 Industrial Symbiosis in the Chinese Solar Industry (.Zhouwei Diao, MEdSc); By-Product Exchanges in the Suzhou Industrial Park (Ran Tao, MEM); Advancing Sustainable Apparel Production in the US (Anuj Desai, MEM); Hawaii Energy Sustainability Projects: Bryant Cannon – Hawai'i Island Energy Sustainability Plan: Legal and Regulatory Context; Christina Dietrich - Case Studies and Best Practices; Erin Gill – Hawai'i Island: Energy Sustainability Decision Framework; Brian Kauffman - Passenger Vehicle Transportation
- 2010-2011 "Building Deconstruction in New Haven, Connecticut: A Systems Dynamics Analysis and Policy Tool" (Thomas Chase, MEdSc); "Reframing Energy Efficiency Policies to Better Reduce Absolute Energy Consumption: A Case Study of Refrigerators" (Alyssa Go, MEdSc); "Tree Water: Case Study on Green Entrepreneurship" Casey Pickett, MEM/MBA
- 2009-2010 Recycling in Singapore's construction industry (Huijia Phua MEM); Industrial symbiosis in Chile's mining industry (Aislinn Affinito MEM); Carbon free desalinization of water (JF Thye MEM/MBA); State of waste-to-energy technologies (Adrian Horotan MEM); Linking industrial symbiosis with landscape ecology (Mona Yang MEM); Historical trends and forecasting of energy efficiency (Alyssa Go MEM); Material recovery opportunities in Hawaii (Francisco Espinoza MEM); Analysis of Point of Use/Point of Entry water treatment market (Catherine Manzo MEM/MBA)
- 2008-2009 (on sabbatical) Quantification of by-product reuse and industrial symbiosis in India (Ariana Bain MEM); International best practices in eco-industrial development (Fengyuan Wang MEM); Improving industrial waste reuse and recycling in Pennsylvania (Tara Parthasarathy MEM)
- 2007-2008 Industrial symbiosis database research (Michael Davies MEM); Energy service companies (Eric Roberts MEM/MBA); Responsible purchasing guide for carpet sector (Colleen Sullivan MEM); Uncovering industrial symbiosis in Pennsylvania (Jamie Spivey MEM); Uncovering industrial symbiosis in Delaware (Korinti Recalde MEM); Performance data for water company operations (Tingting Quan MEM); Valuing environmental amenities in large scale development (Christopher Clement MEM/MBA); Policy analysis of micro grid options in Hawaii (Dan Leistra MEM/MBA); Are green purchases a complement or substitute to charity? (Duncan Cheung 5-Year Program); Environmental impacts of surface coal mining (Edan Rotenberg MEM/ JD YLS); Long-term investments in wastewater treatment (Koichi Kurisu MBA); Lifecycle assessment of ceramic vs. biodegradable plates (Mita Broca TERI)
- 2006-2007 Commercialization strategies for rural cookstoves (Amanda Cowan MEM); Opportunities for the use of biofuel pellets in India (Dawn Lippert MEM); Power generation and pollution scenarios in Hong Kong (Matt Malone MEM); Lifecycle assessment of recycling vs. disposal of plastics (Sarah Percy MEM)

- 2005-2006 Quantifying the benefits of industrial symbiosis in Hawaii (Yuko Miyata MEM);  
Development of the aquaculture industry in New Haven (Konstantine Drakonakis MEM)
- 2004-2005 (on sabbatical). Voluntary PC recycling in Thailand (Chikako Fujita MEM)
- 2003-2004 Quantification of industrial symbiosis benefits in the rum industry (Suzette Carty, MEM);  
Climate change and the insurance industry (Elizabeth Martin MEM); Industrial parks in  
Tongzhou District, Beijing (Xue Wang MEM)
- 2002-2003 Elements of corporate environmental strategy (Andrew Winston MEM); Dataset of former  
US military properties with residual risk (Martha Walters MEM); Corporate practices  
and urban development (Veda Truesdale MEM); Aral Sea environmental and political  
history (Alexander Gritsinin MEM); Participation in eco-industrial networks in  
pharmaceutical manufacturing (Weslyne Ashton MEd)
- 2001-2002 Study of the development of fuel cells (Marni Rapoport MEM/SOM); Climate change  
action plan for City of New Haven (Madeleine Weil MEM); Industrial ecology of  
packaging foam (Kensuke Fuse MEM)
- 2000-2001 Industrial ecology and public policy (Curtis Robinhold MEM/SOM); Business plan for a  
new national park (Heather Cabrera MEM); Solid waste management in Bhutan (Karma  
Kunzang Chhimi MEM); Redefining the environmental industry (Mari Morikawa MEM);  
On-site study of BP's emissions trading program (Michael Terrell MEM).

## **UNIVERSITY SERVICE**

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### ***F&ES Committees***

Masters Admissions Committee; Doctoral Admissions Committee; Doctoral Program Committee; Centennial Capital Campaign Committee; Gender Committee; Student Affairs Committee; Faculty Development Committee; Facility Siting and Design Committee; Environmental Stewardship Committee (Chair for 2 years); Diversity Committee; Strategic Planning Committees, Masters Program Committee.

### ***Other F&ES Service***

Coordinator of the Memorandum of Understanding (MOU) and programs with the National University of Singapore since 2001, Faculty Search Committees; Manager for Moore Foundation Grant for final two years 2014-2016; Manage grant from Ellen MacArthur Foundation, U.K. to support a student fellowship – 5 years, Co-lead Specialization on Business and Environment.

### ***Service to Other Professional Schools and Programs at Yale***

**School of Management:** Secondary faculty appointment at SOM. Active involvement with the jointly sponsored Center for Business and Environment at Yale since its start-up in 2007. Teach in Executive MBA in Sustainability beginning 2014 - teaching E-MBA course Corporate Environmental Management & Strategy.

**Law School:** From 1995-1999, Director of a joint program between the Law School and F&ES called “Environmental Reform: the Next Generation Project” with Professor Dan Esty. Involved convening multiple sessions with policy experts at Yale, production of a book, and a 10 city tour to present findings to academic, civic and business groups. For 2015, 2017 appointed YLS Professor (Adjunct).

**Yale Institute for Biospheric Studies (YIBS) and Yale Climate and Energy Institute (YCEI):**

Presenter and participant. Accompanied faculty from YIBS for environmental conference in Djibouti, Africa 2015.

**Institution for Social and Policy Studies:** Social Science Workshop on Contemporary China. Presenter and participant.

***Other Service to Yale***

**Office of International Affairs:** Contributed to committees within the Secretary's Office concerning Framework 2.0 for the Internationalization of Yale and to several meetings on Singapore and China initiatives. Attended sessions with Presidents of Chinese universities, Indian Parliamentarians, and the Indian Minister of Education. 2017-2018 serve on university-wide committee on the implementation of a Pay-as-You-Throw waste management program within Yale. **President's Council on International Activities:** Presentation on industrial ecology; group discussion with India section on future direction.

***Other Recent Presentations for Yale***

AYA Reunion Lectures 2009-2013. Faculty leader for AYA trips 2008, 2010, 2015, 2016, 2017. 2018. Yale Redpath Seminar on The Future of Asia 2009, Yale Club of Cleveland Annual Meeting 2008.

**SELECTED MEDIA**

- 2018 *National Public Radio, NBC, Voice of America, Sage Press, Waterbury Republican* – interviews about the Chinese import ban on waste.
- 2017 *Corporate Knights* – “Industrial Symbiosis” by L. Childress, Fall Issue.
- 2017 *The Hill* – “Trump has a great opportunity to save our environment”–multiple authors. Jan 23
- 2016 *The Hartford Courant*–“State, Hartford Pondering Future of Trash-To-Energy Plant”April 25
- 2013 *FuturArc* –The Voice of Green Architecture in Asia. Interview with Marian Chertow. July-August 2013/Volume 31.
- 2012 *International Innovation*. Yale Center for Industrial Ecology and Int'l Society for Industrial Ecology – Four Presidents.
- 2010 *SWE* – Magazine of the Society of Women Engineers, “Industrial Ecology: Moving beyond Traditional Engineering Borders.”
- 2009 New Hampshire Public Radio Interview. Available from: <http://www.nhpr.org/node/26421>
- 2007 Yale F&ES Podcast: Why Waste Waste? (20,000 downloads). Available from: <http://environment.yale.edu/multimedia/video-playlist/>
- 2005 *Environmental Science and Technology* news section– “Quantifying Industrial Symbiosis”
- 1999 *Science*: “Turning Engineers into Resource Accountants”
- 1998 On-line Forum leader for the *American Scientist* on “Is Combustion of Plastics Desirable?”

Additional mentions in: *Fortune, Wall Street Journal, New York Times, Big Island Chronicle, Puerto Rico Business, Huffington Post* and *New Haven Register*.

Articles or reviews about *Thinking Ecologically: The Next Generation of Environmental Policy* appeared in more than 30 journals and media including *Issues in Science and Technology, Ecology, The Environmental Forum, The Economist, The Futurist, Fordham Environmental Law Journal, Journal of Environment and Development* and *the Journal of Economic Literature*.

**PROFESSIONAL SERVICE**

***Selected Peer-Review Service***

Academy of Management Review

Current Opinion in Environmental Sustainability



Academy of Management Journal  
Harvard Business School Press  
John Wiley  
Journal of Environmental Management  
Journal of Industrial Ecology  
Springer  
Yale University Press

Frontiers of Environmental Science and Engineering in China  
Journal of Business Strategy and Environment  
Journal of Cleaner Production  
Columbia University Press  
Nature Sustainability  
UN International Resource Panel Report

National Science Foundation Proposal Review Panel – Engineering Sustainability  
National Science Foundation Committee of Visitors – Bioengineering and Environmental Systems  
Swiss National Science Foundation  
Vienna Science and Technology Fund

**Professional and Advisory Boards**

2015-2016 Co-Chair and Advisor to first ISIE Americas Meeting – Bogota, Colombia May 2016  
2015-2016 Immediate Past President, The International Society for Industrial Ecology  
2013-2014 President, The International Society for Industrial Ecology; Incoming President, 2011-2012,  
2012-2013 Advisory Board, Governor’s Task Force on Recycling Modernization, Connecticut  
2012-Present International Science Board for MAB Reserve in Samothraki, Greece  
2010-2012 Advisory Board Member, Int’l Society of Industrial Ecology Asia-Pacific Meeting  
2008-2011 Senior Scientific Advisor, Iron Ventures  
2007-2013 Advisory Board, Soltage, Inc.- solar energy start-up  
2005-2007 Co-Chair of the Nominating Committee, International Society of Industrial Ecology  
2005-2007 Chair, Awards Committee and Member, Technical Committee, 2007 International Society of  
Industrial Ecology Conference  
2003-2009 Board of Directors, Chair, Research Committee, Eco-Industrial Development Council  
2002 Organizing Committee, Gordon Research Conference on Frontiers of US Science  
& Technology Policy, New London, Connecticut  
2000-2006 Advisory Board, Clearwater Technologies, Inc.  
1996-present Editorial Board, *Journal of Industrial Ecology*  
1995-2003 Advisory Council, Alliance for Environmental Innovation, A Project of the Pew  
Memorial Trust and Environmental Defense  
1989-2011 Board of Directors, Tax-Exempt Proceeds Fund  
1989-2011 Editorial Board, *BioCycle* Magazine

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