

Barbara J Ward

Environmental Engineer, M.S.

Languages: English – native speaker, German – B2

SHORT PROFILE

- Research on dewatering and resource recovery from faecal sludge, excreta, and wastewater
 - Working experience in Zambia, Senegal, Kenya, Tanzania, Ghana, Rwanda, Uganda, and Haiti
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EDUCATION

Dec 2017 – present	PhD Candidate Environmental Engineering ETH Zurich , Zurich, Switzerland Thesis: Settling and Dewatering of Faecal Sludge: Building Fundamental Models for Improved Global Sanitation Advisor: Eberhard Morgenroth Supervisor: Linda Strande
2013	MSE Environmental Engineering Graduate Certificate, Engineering for Developing Communities University of Colorado Boulder , Boulder, Colorado, USA Thesis: Carbonized feces from the Sol-Char Toilet for use as a solid fuel Adviser: Lupita Montoya
2009	BS Chemical Engineering North Carolina State University , Raleigh, North Carolina, USA

EXPERIENCE

Dec 2017 - present	PhD Researcher studying faecal sludge dewatering and settling Management of Excreta, Wastewater, and Sludge Research Group Sandec – Department of Sanitation, Water, and Solid Waste for Development Eawag – Swiss Federal Institute of Aquatic Science and Technology Dübendorf, Switzerland
April 2016 – Nov 2017	Project Manager for Water Hub @ NEST faecal sludge dewatering research Management of Excreta, Wastewater, and Sludge Research Group Sandec – Department of Sanitation, Water, and Solid Waste for Development Eawag – Swiss Federal Institute of Aquatic Science and Technology Dübendorf, Switzerland
Oct 2014 – Feb 2016	Project Manager for Renewable Solarthermal Hydrogen project Department of Chemical and Biological Engineering University of Colorado Boulder Boulder, Colorado, USA

- Jan 2014 – Oct 2014 **Professional Research Assistant** for B&MGF Reinvent the Toilet Sol-Char Toilet
Department of Environmental Engineering
University of Colorado Boulder
Boulder, Colorado, USA
- Aug 2013 – Dec 2013 **Research Assistant** for Faecal Sludge to Biodiesel project
Pivot Works, Ltd. (formerly Waste Enterprisers)
Kumasi, Ghana
- Aug 2011 – Dec 2013 **Graduate Student**, Environmental Engineering Master's Program
University of Colorado Boulder
Boulder, Colorado, USA
Completed coursework in Wastewater Treatment, Microbiology, Process Engineering, Interfacial & Colloidal Thermodynamics, Air Quality Management, Life-Cycle Analysis, WASH, and Sustainable Community Development. Received certificate in *Engineering for Developing Communities* program.
- June 2013 – Aug 2013 **Master's Intern**, assessment of local organic waste streams for biofuels use
NEGES Foundation
Léogâne, Haiti
- Sept 2011 – June 2013 **Project Manager**, High efficiency cookstoves project
Engineers Without Borders USA, University of Colorado Boulder
Mugonero, Rwanda and Boulder, Colorado, USA
- Jan 2010 – June 2011 **Research Assistant**, Algae biofuels project
Department of Chemical and Biological Engineering
University of Colorado Boulder
Boulder, Colorado, USA
- Aug 2008 – Aug 2009 **Undergraduate Research Assistant**, Biodiesel from waste grease project
Department of Chemical and Biomolecular Engineering
North Carolina State University
Raleigh, North Carolina, USA
- May 2008 – July 2008 **Undergraduate Research Assistant**, Direct methanol fuel cell project
Fraunhofer Institute for Solar Energy Systems ISE
Freiburg, Germany
- Sept 2007 – May 2008 **Undergraduate Research Assistant**, North Carolina biofuels policy
NC Clean Energy Technology Center
North Carolina State University
Raleigh, North Carolina, USA

SCIENTIFIC PUBLICATIONS

Authored Book Chapters

Ward, B.J., Strande, L. (2019) Chapter 5.2 Conditioning. Englund & Strande (Eds.), *Faecal Sludge Management: Highlights and Exercises*, 151-162. Dübendorf, Switzerland: Eawag. ISBN: 978-3-906484-70-9.

Refereed Journal Articles

1. Ward, B.J., Traber, J., Gueye, A., Diop, B., Morgenroth, E., Strande, L. (submitted) Evaluation of conceptual model and predictors of faecal sludge dewatering performance in Senegal and Tanzania. *Water Research*, 167, 115101.
2. Andriessen, N., Ward, B.J., Strande, L. (2019). To char or not to char? Review of technologies to produce solid fuels for resource recovery from faecal sludge. *Journal of Water, Sanitation and Hygiene for Development*, 9 (2), 210-224.

- Penn, R., Ward, B.J., Strande, L., Maurer, M. (2018). Review of synthetic human faeces and faecal sludge for sanitation and wastewater research. *Water Research*, 132, 222-240.
- Hafford, L.M., Ward, B.J., Weimer, A.W., Linden, K. (2018). Fecal sludge as a fuel: characterization, cofire limits, and evaluation of quality improvement measures. *Water Science and Technology*, 78(12), 2437-2448.
- Strande, L., Schoebitz, L., Bischoff, F., Ddiba, D., Okello, F., Englund, M., Ward, B.J., Niwagaba, C. (2018). Methods to reliably estimate faecal sludge quantities and qualities for the design of treatment technologies and management solutions. *Journal of environmental management*, 223, 898-907.
- Ward, B.J., Yacob, T.W., Montoya, L.D. (2014). Evaluation of solid fuel char briquettes from human waste. *Environmental science & technology*, 48(16), 9852-9858.
- Al-Shankiti, I.A., Ehrhart, B.D., Ward, B.J., Bayon, A., Wallace, M.A., Bader, R., Kreider, P., Weimer, A.W. (2019). Particle design and oxidation kinetics of iron-manganese oxide redox materials for thermochemical energy storage. *Solar Energy*, 183, 17-29.
- Ehrhart, B.D., Ward, B.J., Richardson, B.M., Anseth, K.S., Weimer, A.W. (2018). Partial flocculation for spray drying of spherical mixed metal oxide particles. *Journal of the American Ceramic Society*, 101(10), 4452-4457.
- Muhich, C.L., Ehrhart, B.D., Al-Shankiti, I., Ward, B.J., Musgrave, C.B., Weimer, A.W. (2016). A review and perspective of efficient hydrogen generation via solar thermal water splitting. *Wiley Interdisciplinary Reviews: Energy and Environment*, 5(3), 261-287.

Refereed Conference Papers

- Ward, B.J., Gold, M., Turyasiima, D., Studer, F., Getkate, W., Maiteki, J.M., Niwagaba, C.B., Strande, L. SEEK (Sludge to Energy Enterprises in Kampala): Co-processing faecal sludge for fuel production. *40th WEDC International Conference*, Loughborough, UK, Paper and Podium Presentation, 2017.
- Hafford, L.M., Ward, B.J., Weimer, A.W., Linden, K. Fecal sludge as a fuel: Characterization, co-fire limits, and two methods to improve its quality. *IWA Specialist Conference on Sludge Management: SludgeTech*, London, UK, Paper and Podium Presentation, 2017.
- Etter, B., Wittmer, A., Ward, B.J., Udert, K.M., Strande, L., T.A. Larsen, E. Morgenroth. Water Hub @ NEST: A Living Lab to Test Innovative Wastewater Treatment Solutions. *IWA Small Water and Wastewater Systems & Specialized Conference on Resources-Oriented Sanitation*, Athens, Greece, Paper and Podium presentation, 2016.

CONFERENCE PRESENTATIONS AND PROCEEDINGS

Invited Talks

- Ward, B.J., Strande, L. Determining predictors of faecal sludge quantities, qualities, and dewatering performance. Sanergy Speaker Series. Nairobi, Kenya. 8 July, 2019.
- Ward, B.J., Strande, L. End use and resource recovery from faecal sludge – focusing on solid fuels. *Beyond development aid: Sanitation financing & revenue models in reuse (human) waste*. Organized by Institute of Fiscal Studies (IFS), UK & WASTE, Netherlands. The Hague, Netherlands, 15 May, 2017.

Presentations and Proceedings

- Ward, B.J., Sam S.B., Morgenroth, E., Strande, L. Progress in Faecal Sludge Dewatering: Evaluating a conceptual model and predictors of dewatering performance. *Faecal Sludge Management – FSM5*, Cape Town, South Africa. Podium Presentation, 2019.
- Ward, B.J., Sam, S.B., Morgenroth, E., Strande, L. Water Hub @ NEST: Faecal Sludge Dewatering for Resource Recovery. *Eawag Symposium*, Duebendorf, Switzerland, Podium Presentation, 2018. First place, best presentation.
- Ward, B.J., Morgenroth, E., Strande, L. Water Hub @ NEST: Faecal Sludge Dewatering for Resource Recovery. *Eawag Symposium*, Duebendorf, Switzerland, Poster and Flash Presentation, 2017. First place, best presentation.
- Ward, B.J., Gold, M., Morgenroth, E., Kimwaga, R., Strande, L. Faecal Sludge Dewatering: New Research Facilities for a Multi Directional Approach. *Faecal Sludge Management – FSM4*, Chennai, India. Podium Presentation, 2017.
- Fisher, R., Yacob, T.W., Mahoney, R.B., Ward, B.J., Linden, K.G., Weimer, A.W. Distributed Activation Energy Model for Solar-Driven Pyrolysis of Untreated Human Feces, *American Institute of Chemical Engineers (AIChE) 14th Annual Meeting*, Atlanta, Georgia USA. Podium Presentation, 2014.
- Ward, B.J., Montoya, L.D. Investigating energy sources from solar-biochar toilet, *Association of Environmental Engineering & Science Professors 50th Anniversary Conference*, Golden, Colorado USA. Podium Presentation, 2013.

Sandec News Articles

1. Ward, B.J., Sam, S., Gueye, A., Diop, B., Morgenroth, E., Strande, L. Predicting faecal sludge dewatering performance for improved treatment, 2019.
2. Ward, B.J., Sam, S., Andriessen, N., Morgenroth, E., Strande, L. Research Priorities and Progress in Faecal Sludge Dewatering, 2018.
3. Ward, B.J., Morgenroth, E., Strande, L. Dewatering Characterisation of Synthetic Faecal Sludge, 2017.

Teaching and Knowledge Dissemination

1. Workshop co-facilitator and trainer. Faecal sludge Q&Q Kickoff Workshop, Climate-Friendly Sanitation Lusaka Project. Lusaka, Zambia, July 2019.
2. Workshop facilitator and presenter. Moisture content: Solving the Achilles heel of faecal sludge treatment and processing options. Cape Town, South Africa, February 2019.
3. Workshop presenter. Workshop on sustainable sanitation – Global & local partnerships, experiences and way ahead. Cape Town, South Africa, February 2019.
4. Workshop presenter. Characterization and quantification of faecal sludge. Cape Town, South Africa, February 2019.
5. Guest lecturer for Water supply, sanitation and waste infrastructure and services in developing countries ETHZ course, April 2018.
6. Guest lecturer for Sanitary engineering in developing countries EPFL course Env 402, October 2017.
7. Presentations and workshop. City-wide Sanitation Advocacy and Planning: Tools for FSM Diagnostics and Project Planning. Loughborough, UK, July 2017.
8. Presentations and workshop. Citywide Inclusive Sanitation for Bank Operations – Strategic Knowledge and Learning Event. Durban, South Africa, December 2016.
9. Presentations and workshop. Introduction to Faecal Sludge Management workshop. Dar es Salaam, Tanzania, November 2016.
10. Guest lecturer for Sanitary engineering in developing countries EPFL course Env 402, December 2016.
11. Guest lecturer for Water, Sanitation and Hygiene, University of Colorado Boulder course CVEN 5969, September 2015.
12. Guest lecturer for Water, Sanitation and Hygiene, University of Colorado Boulder course CVEN 5969, September 2014.

SUMMER SCHOOLS AND COURSES

10th Summer School in Environmental Systems Analysis, Eawag	2018
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AWARDS & HONORS

Sawaris Foundation E4D Doctoral Fellowship	2018 - 2021
Best Student Presentation 2018 Eawag Symposium	2018
Outstanding Reviewer for Environmental Science: Water Research & Technology	2017
Best Student Presentation 2017 Eawag Symposium	2017
Colorado Engineering Excellence Fund support for master's thesis research	2011 - 2012
Park Scholarship, 4-year full academic scholarship to North Carolina State University	2005-2009
Semifinalist level at MIT Ignite Clean Energy Competition with trap grease to biodiesel business plan	2009

PROFESSIONAL MEMBERSHIPS

IWA Specialist Group in Non-Sewered Sanitation

International Water Association (IWA)

American Water Works Association (AWWA)

Sustainable Sanitation Alliance (SuSanA)

REVIEWER ACTIVITIES

Journal of Water, Sanitation & Hygiene for Development	2019
Fuel	2019
Sustainable Environment Research	2019
Water South Africa	2018
Environmental Science: Water Research & Technology	2017
Water Research	2017

STUDENTS SUPERVISED

Kapanda Kapanda, MS thesis, University of Zambia	2019 - 2021
Thomas Howard, BS Internship, Johns Hopkins University	2018
Michael Reinisch, MS Internship, University of Colorado Boulder	2017