

MEGHNA BABBAR-SEBENS

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EDUCATION

Doctor of Philosophy in Environmental Engineering in Civil Engineering, 2006
University of Illinois at Urbana-Champaign, Urbana, IL, USA

Certificate of Computational Science and Engineering, 2006
University of Illinois at Urbana-Champaign, Urbana, IL, USA

Master of Science in Environmental Engineering in Civil Engineering, 2002
University of Illinois at Urbana-Champaign, Urbana, IL, USA

Bachelor of Engineering (with Honors) in Pulp and Paper Engineering, 2000
Indian Institute of Technology (IIT), Roorkee, INDIA

ACADEMIC AND PROFESSIONAL APPOINTMENTS

2012- current School of Civil and Construction Engineering, Oregon State University, USA
Assistant Professor

2008-2012 Department of Earth Sciences, Indiana University Purdue University Indianapolis (IUPUI), USA
Assistant Professor

2006 - 2008 Department of Biological and Agricultural Engineering, Texas A&M University, USA
Postdoctoral Research Associate

2000-2006 Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, USA
Graduate Research Assistant

2003 BP (former British Petroleum), USA
Consultant

RESEARCH INTERESTS

Dr. Babbar-Sebens' research interests lie in the area of Water Resources and Environmental Systems Analysis. Her research program develops and employs multiple hydroinformatics approaches (for example, computational environmental and socio-economic models, multi-objective optimization, interactive optimization, evolutionary computing, multi-agent models, Markov decision processes, neural networks, human-computer interaction, high performance

computing, etc.) to (a) improve the understanding of higher-order human-environment interactions (such as emerging behaviors and dynamic relationships) in water-based systems, and (b) support human-computer collaboration for integrated, adaptive, and sustainable management of complex water-based systems.

TEACHING INTERESTS

Dr. Babbar-Sebens' teaching interests include water resources systems analysis, optimization techniques, water quality modeling, watershed hydrology, machine learning methods for engineering design, water resources planning and management, numerical methods, hydroinformatics, groundwater hydrology, stochastic hydrology, hydraulic engineering, groundwater modeling, water resources engineering, environmental risk assessment, and other related areas.

PEER-REVIEWED PUBLICATIONS

1. Bruder, S., **M. Babbar-Sebens**, L.P. Tedesco, and E. Soyeux, "Use of fuzzy logic models for prediction of taste and odor compounds in algal-bloom affected inland water bodies," *Journal of Environmental Engineering*, 2012 (*in review*)
2. **Babbar-Sebens, M.**, R.C. Barr, L.P. Tedesco, and M. Anderson, "Spatial identification and optimization of upland wetlands in agricultural watersheds," *Ecological Engineering*, 2012 (*in press*).
3. Gallege, L.S., A.J. Phadke, R.R. Raje, and **M. Babbar-Sebens**, "Cloud Service Selection from Earth Science Domain," *International Journal of Computers and Their Applications*, 2012 (*in press*).
4. Singh, V.B., S. Mukhopadhyay, and **M. Babbar-Sebens**, "Decentralized Pursuit Learning Automata in Batch Mode," *Proceedings of the 6th International Conference on Soft Computing and Intelligent Systems, The 13th International Symposium on Advanced Intelligent Systems*, Nov.20 - 24, Kobe, Japan, 2012.
5. Gamble, A., and **M. Babbar-Sebens**, "On the use of multivariate statistical methods for combining in-stream monitoring data and spatial analysis to characterize water quality conditions in the White River basin, Indiana, U.S.A.," *Environmental Monitoring and Assessment*, Volume 184, Number 2, Pages 845-875, 2012.
6. **Babbar-Sebens, M.**, and B.S. Minsker, "Interactive genetic algorithm with mixed initiative interaction for multi-criteria ground water monitoring design," *Applied Soft Computing*, Volume 12, Issue 1, Pages 182-195, 2012.
7. Tilak, O., **M. Babbar-Sebens**, and S. Mukhopadhyay, "Decentralized and partially decentralized reinforcement learning for designing a distributed wetland system in watersheds," *Proceedings of the IEEE Systems, Man, and Cybernetics (SMC) Conference*, Anchorage, Alaska, Oct 9-12, pp. 271-276, ISBN 978-1-4577-0652-3, 2011.
8. **Babbar-Sebens, M.**, and B.S. Minsker, "Case-based micro interactive genetic algorithm (CBMIGA) for interactive learning: Methodology and application to groundwater monitoring design," *Environmental Modelling and Software*, 25, pp. 1176-1187, 2010.
9. **Babbar-Sebens, M.**, and S. Mukhopadhyay, "Reinforcement Learning for Human-Machine Collaborative Optimization: Application in Ground Water Monitoring,"

- Proceedings of the IEEE Systems, Man, and Cybernetics (SMC) Conference, pp. 3563 – 3568, 2009.
10. Deepti, R. Karthikeyan, and **M. Babbar-Sebens**, "Predicting the fate and transport of E. coli in two Texas River Basins," *Journal of the American Water Resources Association*, Vol. 45, No. 4, pp. 928-944, 2009.
 11. **Babbar-Sebens, M.**, and R. Karthikeyan, "Consideration of sample size for estimating contaminant load reductions using load duration curves," *Journal of Hydrology*, Volume 372, Issues 1-4, Pages 118-123, 2009.
 12. Teague, A., R. Karthikeyan, **M. Babbar-Sebens**, R. Srinivasan, and R. Persyn, "Spatially Explicit Load Enrichment Calculation Tool to Identify E. coli Sources in Watersheds." *Transactions of ASABE*, 52(4), pp. 1109-1120, 2009.
 13. **Babbar-Sebens, M.**, and B. S. Minsker, "Standard Interactive Genetic Algorithm (SIGA): A Comprehensive Optimization Framework for Long-Term Ground Water Monitoring Design," *J. of Water Resources Planning and Management*, 134(6), pp. 538-547, 2008.
 14. **Babbar, M.**, and B. S. Minsker, "Groundwater Remediation Design Using Multiscale Genetic Algorithms," *J. of Water Resources Planning and Management*, 132(5), pp. 341-350, 2006.
 15. **Babbar, M.**, A. Lakshmikantha and D.E. Goldberg. "A Modified NSGA-II to Solve Noisy Multiobjective Problems," in James Foster (editors), 2003 Genetic and Evolutionary Computation Conference. Late-Breaking Papers, pp. 21--27, AAAI, Chicago, Illinois, USA, July 2003.
 16. **Babbar, M.**, and B. S. Minsker. "A Multiscale Master-Slave Parallel Genetic Algorithm with Application to Groundwater Remediation Design", W. L. Langdon, E. Cantu-Paz, K. Mathias, R. Roy, D. Davis, R. Poli, K. Balakrishnan, V. Honavar, G. Rudolph, J. Wegener, L. Bull, M. A. Potter, A. C. Shultz, J. F. Miller, E. Burke, and N. Jonoska, editors. 2002. Proceedings of the Genetic and Evolutionary Computation Conference, GECCO'2002. New York, Morgan Kaufmann Publishers, 2002.

CONFERENCE PRESENTATIONS AND PROCEEDINGS

1. Minsker, B.S., A. Singh, and **M. Babbar-Sebens**, "Handling model uncertainty: The importance of human knowledge," American Geophysical Union (AGU) Fall Meeting, San Francisco, California, December 3-7, 2012.
2. Piemonti, A.D., **M. Babbar-Sebens**, and E.J. Luzar, "Effect of land tenure and stakeholders attitudes on optimization of conservation practices in agricultural watersheds," American Geophysical Union (AGU) Fall Meeting, San Francisco, California, December 3-7, 2012.
3. Samuels, A., and **M. Babbar-Sebens**, "Field Scale Optimization for Long-Term Sustainability of Best Management Practices in Watersheds," American Geophysical Union (AGU) Fall Meeting, San Francisco, California, December 3-7, 2012.
4. Piemonti, A.D., **M. Babbar-Sebens**, E.J. Luzar, "Effect of social attitudes on the spatial optimization of distributed best management practices to improve upland runoff storage in Eagle Creek watershed, IN," *American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute 's (EWRI) World Environmental & Water Resources Congress* in Albuquerque, NM, May 20-24, 2012.

5. Piemonti, A.D., **M. Babbar-Sebens**, E.J. Luzar, "A socioeconomic framework for incorporating stakeholder preferences in the optimization of distributed best management practices," *XIX International Conference on Computational Methods in Water Resources*, Urbana-Champaign, IL, June 17 – 21, 2012.
6. Bruder, S., **M. Babbar-Sebens**, and S. Xie, "Framework for Prediction of Spatial-Temporal Distribution of Algal Metabolites in Algal-Bloom Affected Water Bodies," *American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute 's (EWRI) World Environmental & Water Resources Congress* in Palm Springs, CA, May 22-26, 2011.
7. Xie, S., **M. Babbar-Sebens**, and S. Bruder, "Remote Sensing Data Assimilation in Water Quality Numerical Models for Simulation of Algal Bloom Dynamics," *American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute 's (EWRI) World Environmental & Water Resources Congress* in Palm Springs, CA, May 22-26, 2011.
8. Li, L. and **M. Babbar-Sebens**, "Remote Sensing of Global Warming-Affected Inland Water Quality," NASA Biodiversity and Ecological Forecasting Team Meeting, Washington, DC, May 17-19, 2010.
9. Gamble, A., and **M. Babbar-Sebens** , "Combining Multivariate Statistics and GIS to Characterize Water Quality Conditions in the White River," Central Indiana Water Resources Partnership Science Meeting, Indianapolis, IN, May 10th 2010.
10. **Babbar-Sebens**, M., S. Xie, and S. Bruder, "Development of Eagle Creek Reservoir Water Quality Model based on Environmental Fluid Dynamics Code," Central Indiana Water Resources Partnership Science Meeting, Indianapolis, IN, May 10th 2010.
11. Gamble, A., and **M. Babbar-Sebens**, "Combining Spatial Analysis and Multivariate Statistical Methods to Characterize Watershed Water Quality Conditions," Proceedings of the American Water Resources Association Specialty Conference GIS and Water Resources VI in Orlando, FL March 29-31, 2010.
12. Tedesco, L.P., R.C. Barr, **M. Babbar-Sebens**, "Responding to Climate and Land Use Changes: Multi-Objective Optimization for Wetland Restoration Site Selection," Indiana Association of Soil and Water Conservation Districts Annual Conference. January 12-14, Indianapolis, IN, 2010.
13. **Babbar-Sebens**, M., Barr, R.C., Tedesco, L.P., " Multiobjective Optimization for Wetland Restoration Site Selection - Eagle Creek Watershed, Indiana, USA", *Proceedings of the American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute 's (EWRI) 3rd developing nations conference: India 2010 - An International Perspective on Current & Future State of Water Resources & the Environment* , Chennai, India, January 5-7, 2010.
14. Anderson, M., **Babbar-Sebens**, M., Lobligeois, F., Rampnoux, N., Soyeux, E., and Tedesco, L., "Combining a conceptual hydrologic model (SWAT) and a hydrodynamic model (Telemac 3D) to simulate reservoir dynamics in Eagle Creek Reservoir, Indiana, 5th International SWAT Conference, Boulder, Colorado, August 5-7, 2009.
15. Barr, R., Bender, A., **Babbar-Sebens**, M., Tedesco, L.P., "Reevaluating Indiana's Flood Management Strategies: Lessons from the Mississippi River Floods of 1993" , 30th Annual Symposium "Floods of 2008, Status of Flood Plain Management, and Management to Protect Levees and Dams in Indiana.

16. **Babbar-Sebens, M.**, Minsker, B.S., "Interactive Genetic Algorithm with Mixed Initiative Interaction for Water Resources Optimization," Proceedings of the 8th International Conference on Hydroinformatics, Concepción, Chile, 2009.
17. Teague, A., **M. Babbar-Sebens**, R. Karthikeyan, R. Srinivasan, J. Jacobs, M. McFarland, N. Dictson, and D. Boellstorff. "Spatially Explicit Load Enrichment Calculation Tool (SELECT) and Cluster Analysis for Identification of E. coli Sources in Plum Creek Watershed, TX," ASABE International Conference, Minneapolis MN, 2007.
18. **Babbar-Sebens, M.**, R. Karthikeyan, and R. Srinivasan, "Development of an Extensive Fate and Transport Model for Pathogens in Watersheds," American Society of Agricultural and Biological Engineers (ASABE), Fourth Conference on Watershed Management to Meet Water Quality Standards and Emerging TMDL, San Antonio, TX, 2007.
19. Teague, A., **M. Babbar-Sebens**, R. Karthikeyan, and R. Srinivasan, J. Jacobs, M. McFarland, N. Dictson, and D. Boellstorff, "Spatially Explicit Load Enrichment Calculation Tool (SELECT) and Load Duration Curves for Identification of E. coli Sources in Plum Creek Watershed, TX," American Society of Agricultural and Biological Engineers (ASABE), Fourth Conference on Watershed Management to Meet Water Quality Standards and Emerging TMDL, San Antonio, TX, 2007.
20. **Babbar-Sebens, M.**, and B. S. Minsker, "Interactive Genetic Algorithm - An Adaptive and Interactive Decision Support Framework for Design of Optimal Groundwater Monitoring Plans," American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, 2006.
21. **Babbar, M.**, and B. S. Minsker, "A Collaborative Interactive Genetic Algorithm Framework for Mixed-Initiative Interaction with Human and Simulated Experts: A Case Study in Long-Term Groundwater Monitoring Design," American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2005 & Related Symposia, Omaha, NE, 2006.
22. **Babbar, M.**, and B. S. Minsker, "Long-Term Groundwater Monitoring Optimization: Facing the Real World Challenges," Midwest Ground Water Conference, Urbana, IL, 2005
23. **Babbar, M.**, B. S. Minsker, and H. Takagi, "Expert Knowledge in Long-Term Groundwater Monitoring Optimization Process: The Interactive Genetic Algorithm Perspective," American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2005 & Related Symposia, Anchorage, AK, 2005.
24. **Babbar, M.**, B. S. Minsker, and H. Takagi, "Interactive Genetic Algorithm Framework for Long-Term Groundwater Monitoring Design," American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2004 & Related Symposia, Salt Lake City, UT, 2004.
25. Sinha, E., B. S. Minsker, and **M. Babbar**, "Multiscale Island Injection Genetic Algorithm for Ground Water Remediation," American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2004 & Related Symposia, Salt Lake City, UT, 2004.
26. **Babbar, M.**, and B. S. Minsker. "Multiscale Strategies for Solving Water Resources Management Problems with Genetic Algorithms", American Society of Civil Engineers

- (ASCE) Environmental & Water Resources Institute (EWRI) World Water & Environmental Resources Congress 2003 & Related Symposia, Philadelphia, PA, 2003.
27. **Babbar, M.**, A. Lakshmikantha and D.E. Goldberg. "A Modified NSGA-II to Solve Noisy Multiobjective Problems," in James Foster (editors), 2003 Genetic and Evolutionary Computation Conference. Late-Breaking Papers, pp. 21--27, AAAI, Chicago, Illinois, USA, July 2003.
 28. **Babbar, M.**, and B. S. Minsker. "A Multiscale Master-Slave Parallel Genetic Algorithm with Application to Groundwater Remediation Design", W. L. Langdon, E. Cantu-Paz, K. Mathias, R. Roy, D. Davis, R. Poli, K. Balakrishnan, V. Honavar, G. Rudolph, J. Wegener, L. Bull, M. A. Potter, A. C. Shultz, J. F. Miller, E. Burke, and N. Jonoska, editors. 2002. Proceedings of the Genetic and Evolutionary Computation Conference, GECCO'2002. New York, Morgan Kaufmann Publishers, 2002.
 29. **Babbar, M.**, B. S. Minsker, and D. Goldberg. "A Multiscale Island Injection Genetic Algorithm for Optimal Groundwater Remediation Design", American Society of Civil Engineers (ASCE) Environmental & Water Resources Institute (EWRI) 2002 Water Resources Planning & Management Conference, Roanoke, VA, 2002.

GRANTS AND FELLOWSHIPS

1. Indiana USDA-NRCS CREP Wetlands Site Identification Project
United States Department of Agriculture - Natural Resources Conservation Service
Meghna Babbar-Sebens (PI)
10/11-9/12 \$79,982 (\$39,991 grant dollars)
2. Algae, Taste and odor, and Algal Toxin Monitoring Program for Indianapolis Drinking Water Reservoirs
Citizens Energy Group
Meghna Babbar-Sebens (PI)
10/11-9/12 \$150,000
3. Spatial Interactive Optimization for Restoration of Upland Storage in Watersheds: Community Participation in the Design of Distributed Practices and Alternatives
National Science Foundation, Environment, Society and the Economy program
Meghna Babbar-Sebens (PI) and Snehasis Mukhopadhyay (co-PI)
10/10-10/13 \$410,000
4. Remote Sensing of Global Warming-Affected Inland Water Quality: Challenge, Opportunity and Solution
National Aeronautics and Space Administration
Lin Li (Principal Investigator), Meghna Babbar-Sebens (Co-Investigator), Lenore Tedesco (Collaborator)
03/10-03/11 \$72,524
5. Towards the Development of a Decision Support System for Managing Eutrophication and Human Health Impacts in Central Indiana Reservoirs
Central Indiana Water Resources Partnership

Meghna Babbar-Sebens (PI)
01/10-12/12 \$107,980

6. Eagle Creek Watershed Implementation Project
EPA 319 Grant Program/ Indiana Department of Environmental Management
L.P. Tedesco (PI), and Meghna Babbar-Sebens (co-PI)
10/09 – 9/12 \$655,375 (\$393,225 grant dollars)
7. A Model to Identify Constructed Wetland Sites to Maximize Nitrate Reduction and Flood Mitigation.
Indiana State Department of Agriculture
Lenore Tedesco (PI) and Meghna Babbar-Sebens (co-PI)
1/09-1/10 \$38,000
8. Sustaining Water Resources: Environmental Impacts of Chemical Loadings and Transport during Floods
Indiana University - Bloomington – IUPUI Intercampus Collaboration in Environmental Research
Co-PI with L. Tedesco and P.A. Jacinthe (IUPUI)
K. Clay, S. Hall, H. Reynolds, and T. Royer (IU-Bloomington)
1/09 – 6/10 \$50,333
9. Performance Analysis of Selected Mitigation Systems Used to Attenuate Diffuse Pollution Occurring during Baseflow and High Flow Events from Agricultural Fields (Aquisafe 2)
KompetenzZentrum Wasser Berlin
L. Tedesco (PI), Meghna Babbar-Sebens (co-PI) and P.A. Jacinthe (co-PI)
1/09-12/12 \$216,200

PROFESSIONAL ORGANIZATIONS

IEEE Systems, Man and Cybernetics Society

ASCE, American Society of Civil Engineers, Member of the Environmental & Water Resources Institute.

SRA, Society for Risk Analysis.

AGU, American Geophysical Union, Member of Hydrology Section.

AAUW, American Association of University Women

ISGEC, International Society for Genetic and Evolutionary Computation.

HONORS, RECOGNITION, AND AWARDS

- Outstanding Reviewer Award, Journal of Hydrologic Engineering, American Society of Civil Engineers, 2012.
- Nominated for Jaguar Academic Advising Association's IUPUI Advisor of the Year Award, 2011.
- National Ground Water Association recognition for outstanding review of a paper in the journal *Groundwater*, 2009.
- Smt. Kaushalya Arya Award: Outstanding woman student in B.E. / B.Arch. final year, IIT (Roorkee), India, 2000.

- Birla Institute of Scientific Research Medal, India, 2000.
- Thomason Award: Outstanding academic performance in College of Engineering, IIT (Roorkee), India, 2000.
- Sirpur Paper Mills Medal: Outstanding performance in Design courses, IIT (Roorkee), India, 2000.

SERVICE

PROFESSIONAL

PEER-REVIEWING FOR JOURNALS AND PROCEEDINGS (year (# of reviews))

1. Groundwater (2008(1))
2. Journal of Contaminant Hydrology (2008(1), 2009(1))
3. Journal of Hydroinformatics (2009(1), 2010(1), 2011(2))
4. Journal of Hydrologic Engineering (2009(1), 2010(4), 2011(8), 2012(2))
5. Journal of Hydrology (2009(1))
6. Journal of Computing in Civil Engineering (2011(4), 2012(1))
7. Advances in Water Resources (2006(1))
8. Journal of Water Resources Planning and Management (2007(1), 2008(1), 2009(2), 2011(1), 2012(2))
9. Environmental Monitoring and Assessment (2011(3), 2012(1))
10. Transport in Porous Media (2006(1))
11. Journal of Geoscience Education (2008(1))
12. IEEE Systems, Man, and Cybernetics Conference (2010(3), 2011(5))
13. IEEE Congress on Evolutionary Computation (2010(1), 2011(3))
14. GECCO (Proceedings of the Genetic and Evolutionary Computation Conference), AAAI, USA (2003(1))
15. ASCE EWRI's World Environmental & Water Resources Congress (2010(3))

PEER-REVIEWING FOR PROPOSALS (year (# of reviews))

1. National Science Foundation, Environmental Engineering program (2012)
2. Purdue Research Foundation's Summer Faculty Grants and Research Grants (2010 (11))
3. IUPUI Signature Center pre-proposal review (2011(2))
4. IUPUI E.C. Moore Symposium (2010 (8))
5. Smithsonian Institution and Indo-US Science & Technology Forum (2010 (1))

CONFERENCE ORGANIZATION

1. Sub-track chair for ASCE EWRI's World Environmental & Water Resources Congress, 2011.
2. Technical Committee on Soft Computing: IEEE Systems, Man, and Cybernetics Conference, 2010.
3. Session moderator: ASCE EWRI's 3rd developing nations conference: India 2010.

COMMITTEES

1. Member of ASCE EWRI's Environmental and Water Resources Systems committee.

2. Member of IEEE Systems, Man and Cybernetics Society's Technical Committee on Soft Computing (2009 onwards).
3. Member of IEEE Systems, Man and Cybernetics Society's Human-Computer Interface Technical Committee (2009 onwards).

OTHER PROFESSIONAL ACTIVITIES

INVITED RESEARCH SEMINARS

1. "Protecting the environment with a Systems Analysis view", Cutting edge lecture series, Indiana University Purdue University Indianapolis, IN, April 2010.
2. "Optimization for Management of Contaminated Water Resources" at Department of Agricultural and Biological Engineering at Purdue University, West Lafayette, IN, April 2009.
3. "Navigating Your Career in Academia" at Department of Agricultural and Biological Engineering at Purdue University, West Lafayette, IN, April 2009.
4. "Computational Modeling and Decision Making for Management of Contaminated Water Resources" at Department of Computer Science, IUPUI, Indianapolis, IN, Aug 2008.