Omar Ibne Abdul Aziz

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RESEARCH INTERESTS

Ecological engineering, sustainable engineering and infrastructure, ecohydrology, ecohydraulics, biogeochemical modeling, watershed hydrology, river hydraulics, sediment transport, environmental management, water resources management, hydrologic modeling, stochastic hydrology, ecofluid dynamics, hydrologic ecosystem services, multiscale analysis, nonlinear dynamics, self-organization and criticality in biogeochemical processes.

Water quality modeling, aquatic food web and ecosystem modeling, modeling fate and transport of pollutants, stream/river and wetland restoration, total maximum daily load (TMDL) and stream health.

Climate impacts on water resources and ecosystems, climate change and land use interactions, hydroclimatology, hydrometeorology, land-atmospheric interactions, remote sensing, GIS applications.

TEACHING INTERESTS

Graduate level: Ecohydrology, ecological engineering, geospatial approaches in hydrology, environmental hydraulics, modeling of water quality and aquatic environment, environmental mass transport, ecofluid dynamics, water resources management, stochastic hydrology, advanced methods in hydrology, hydrologic modeling, watershed drainage and management, parameter estimation in hydrology, river and wetland restoration, environmental fluid mechanics, engineering risk and reliability, statistics in engineering, hydroclimatology, hydrometeorology, atmospheric boundary layers, etc.

Undergraduate level: Hydrologic design and analysis, watershed engineering, open channel hydraulics, irrigation and flood control, fluid mechanics, ecological engineering, ecohydrology, stochastic hydrology, probability and statistics, project planning and management, environmental engineering, etc.

EDUCATION

Ph.D. Civil Engineering, University of Minnesota, Twin Cities, U.S.A.
Saint Anthony Falls Laboratory, Minneapolis, MN, May 2008. GPA: 3.88/4.00.

Thesis: *Ecohydrology of Unit River Ecosystems: Scaling and Critical Responses of Stream Health Indicators to the Environmental Drivers.*

Committee: Efi Foufoula-Georgiou (chair), Heinz G. Stefan, Bruce N. Wilson (co-advisor), and John S. Gulliver (co-advisor).

M.A.Sc. Civil Engineering, University of Waterloo, Ontario, Canada.
October 2004. Advisor: Donald H. Burn. GPA: 89%.

Thesis: *Climate Change Impacts on the Hydrological Regime in the Mackenzie River Basin.*

B.Sc. Engg. Civil Engineering, Bangladesh University of Engineering and Technology, Dhaka.
April 2002. Degree awarded with the highest *HONORS*. GPA: 3.80/4.00.

Thesis: *Risk Assessment and Economic Evaluation of Health Hazards Resulting from Environmental Pollutions.*

AWARDS

- University of Minnesota Doctoral Dissertation Fellowship 2007-08.
  The most prestigious fellowship awarded to the outstanding Ph.D. candidates through competition among departments.
- Sommerfeld Fellowship 2004-05, University of Minnesota.
  Awarded by the Department of Civil Engineering to the most qualified graduate students.
- Tsai Award 2007-08, Saint Anthony Falls Laboratory, University of Minnesota.
- Sommerfeld Travel Grant 2007-08, University of Minnesota.
- Award of Travel Grant 2006-07 from Civil Engineering at the University of Minnesota.
- University of Waterloo Faculty of Engineering Scholarship 2004.
- University of Waterloo Graduate Scholarship 2004.
- University of Waterloo Millennium Graduate Student Bursary 2003.
- University of Waterloo International Graduate Student Award 2003-04.
- Dean Listed, and University Merit Scholarship during all semesters of undergraduate studies at the Bangladesh University of Engineering and Technology.

EMPLOYMENT AND RESEARCH EXPERIENCE

1. Univ. of Washington, Seattle Joint Institute for the Study of the Atmosphere and Ocean, and School of Aquatic and Fisheries Sciences

Group: Climate Impacts & Dynamics.

Project: Responses of Pacific salmon to climate change: Importance of evolutionary versus plastic responses and mechanisms that limit geographic range.

Sponsor: National Center for Ecological Analysis and Synthesis, Univ. of California, Santa Barbara.

Research Associate (July 2008 – present). Worked with mechanistic as well as statistical models to project future stream temperature in the Pacific Rim by incorporating potential climate change scenarios reported by the Inter Governmental Panel for Climate Change (IPCC). The projected stream temperature and flow data, as well as sea surface temperature data from history (NOAA ersst data) and global models (GCMs), are being analyzed and interpreted to assess the probable climate impacts on the aquatic ecology in the Pacific Rim. Potential geographic range changes of Pacific salmon are also mapped in ArcGIS 9.3.

2. Univ. of Minnesota Dept. of Civil Eng. jointly with the Dept. of Bioproducts and Biosystems Eng.

Advisors: Bruce N. Wilson and John S. Gulliver

Research Assistant (June 2005 – December 2007). Conducted research in the emerging discipline of ecohydrology and ecological engineering that integrates concepts of ecological sciences with those of civil and environmental engineering to solve environmental problems through analyzing the cycling of water within the context of ecosystem productivity. The specific objectives were to realistically model river food web and develop a scaling algorithm for the hydrologic and water quality variables of stream health assessment. Prepared doctoral dissertation that required the use of concepts and evolving tools in this area. Worked on modeling of water quality and aquatic environments relating to the total maximum daily load (TMDL) research of stream health and wrote several scientific papers.

3. Univ. of Waterloo Dept. of Civil Eng.

Advisor: Donald H. Burn

Research Assistant (January 2003 – August 2004). Explored climate change impacts on the hydrological and meteorological regimes in the Mackenzie River Basin of Canada. Also evaluated the implication and appropriateness of a physically based distributed hydrological model named WATFLOOD in generating hydroclimatological data for climatic trend analysis. Worked in the Canadian version of the international project, Global Energy and Water-cycle Experiment (GEWEX).

4. Dalhousie Univ., Canada Dept. of Civil Eng.

Advisor: Rafiqul Islam.

Research Assistant (September – December 2002). Worked on the potential effects of non-revenue water, which is generally defined as the water lost from distribution networks through leaky and broken pipes, on roadway pavement. Also investigated possible solutions to the critical problem of sand production during the operation of oil and gas wells in petroleum industry.

5. Bangladesh Univ. of Eng. and Tech. Dept. of Civil Eng.

Advisor: M. Ashraf Ali.

Undergraduate Researcher (January – December 2001). Based on ambient concentrations of groundwater pollutants (e.g., arsenic) and air pollutants (e.g., particulate matter), census data, and epidemiological studies, a quantification of health risks was developed for different cities of Bangladesh. Potential economic losses due to these environmental pollutions were also estimated.

TEACHING EXPERIENCE

- **Univ. of Minnesota Dept. of Civil Eng.**
  Hydrologic Design. Teaching Assistant (September – December 2006).
  Responsible for teaching recitation components of class. Assisted students individually with homework or lab material they found difficult to understand. Updated and revised existing lab assignments. Prepared solutions to the labs and graded lab assignments.

- **Univ. of Waterloo Dept. of Civil Eng**.
  Probability and Statistics. Teaching Assistant (January – April 2004).

Responsible for teaching recitation components of class. Assisted students individually with homework or lab material they found difficult to understand. Graded homework assignments.

- **Dalhousie Univ., Canada Dept. of Civil Eng.**
  Transportation Systems. Teaching Assistant (September – December 2002).
  Responsible for grading homework assignments.

PUBLICATIONS

- **Abdul-Aziz, O.I.**, Wilson, B.N. and Gulliver, J. S. (2008). "Development and evaluations of a two-zone food web model for stream and river ecosystems." *in review*.

- **Abdul-Aziz, O.I.**, Wilson, B.N. and Gulliver, J. S. (2007). "An extended stochastic harmonic analysis (ESHA) algorithm: Application for dissolved oxygen." *Water Resources Research*, 43(8): W08417, doi: 10.1029/2006WR005530.

- **Abdul-Aziz, O.I.**, Wilson, B.N. and Gulliver, J. S. (2007). "Calibration and validation of an empirical dissolved oxygen model." *Journal of Environmental Engineering,* 133(7): 698-710.

- **Abdul-Aziz, O.I**. and Burn, D. H. (2006). "Trends and variability in the hydrological regime of the Mackenzie River basin." *Journal of Hydrology,* 319(1-4): 282-294.

- Burn, D. H., **Abdul-Aziz, O.I.** and Pietroniro, A. (2004). "Trends in hydrological variables for two watersheds in the Mackenzie River basin." *Canadian Water Resources Journal*, 29(4): 283-298.

JOURNAL ARTICLES UNDER PREPARATION

- **Abdul-Aziz** et al. (2009). "Impacts of potential climate change on the ocean habitat range of Pacific salmon." Expected to submit to *Ecology* or *Climate Change.*

- **Abdul-Aziz** et al. (2009). "Dynamics of stream and ocean temperature in the Pacific Rim: Implications for ecology and management." Expected to submit to *Science* or *Nature.*

- **Abdul-Aziz** et al. (2009). "Non-dimensional formulation of a stream temperature model: Scope of parameter robustness and grouping." Expected to submit to the *Journal of Environmental Engineering.*

- **Abdul-Aziz, O.I.,** Wilson, B.N. and Gulliver, J. S. (2009). "A non-dimensional ecohydrological food web model for stream and river ecosystems." Expected to submit to *Water Resources Research.*

- **Abdul-Aziz, O.I.,** Wilson, B.N. and Gulliver, J. S. (2009). "Scope of appropriate food web models as useful tools in ecohydrology and ecological engineering." Expected to submit to the *Journal of Ecohydrology* or *Journal of Ecological Engineering*.

PRESENTATIONS AND CONFERENCE PROCEEDINGS

- **Abdul-Aziz** et al. (2008). "Future stream temperature projections for the US Pacific Northwest: Potential implications for salmon habitat." Presented at the *AGU Fall Meeting,* San Francisco, California, December 15-19.

- **Abdul-Aziz, O.I.,** Wilson, B.N. and Gulliver, J. S. (2008). "Food web models for stream ecosystems." *Proc., World Environmental & Water Resources Congress 2008,* Honolulu, Hawaii, May 12-16.

- **Abdul-Aziz, O.I.,** Wilson, B.N. and Gulliver, J. S. (2007). "Ecohydrological modeling of food webs in stream ecosystems." Presented at the *AGU Fall Meeting,* San Francisco, California, December 10-14.

- **Abdul-Aziz, O.I.,** Wilson, B.N. and Gulliver, J. S. (2007). "Comparative parameterization of dissolved oxygen by an extended stochastic harmonic analysis (ESHA) algorithm." *Proc., World Environmental & Water Resources Congress 2007,* Tampa, Florida, May 15-19.

- **Abdul-Aziz, O.I.,** and Wilson, B.N. (2006). "Dissolved oxygen (DO) interpolation and extrapolation." Presented at the *14th National Nonpoint Source Monitoring Workshop: Measuring Project and Program Effectiveness,* Minneapolis, Minnesota, September 24-28.

- **Abdul-Aziz, O.I.** (2004). "Climate change impacts and flood risk analysis in the Mackenzie River basin: A modeling based comparative study considering and not considering trends in hydrologic variable." *Proc., 6th International Conference on Hydroinformatics,* Singapore, June 21-24.

- Burn, D. H., **Abdul-Aziz, O.I.** and Pietroniro, A. (2004). "Trends in hydrological variables for two watersheds in the Mackenzie River basin." Water and Climate Change: Knowledge for Better Adaptation, *Proc., 57th Canadian Water Resources Association Annual Congress,* Montréal, Qc, June 16-18.

- **Aziz, O.I.A.** (2004). "Developing control rules in operating single reservoir system: Use of micro-genetic algorithm." *Proc., 2nd BSME-ASME International Conference on Thermal Engineering*, Dhaka, Bangladesh, January 2-4.

ACTIVITIES

- FE License, to appear in Fall 2009.

- Invited member of the **'Reader Advisory Panel'** of **NATURE**

- **Reviewer:** Water Resources Research (AGU), Water Research (Elsevier), Ecological Modelling (Elsevier), 2008-present.

- **Member:** American Geophysical Union, 2007 – present; American Society of Civil Engineers, 2006 – present; Ecological Society of America, 2007 – present.

- **Organizer:** Fall 2006 and Fall 2007 seminar series at the Saint Anthony Falls Laboratory. Responsible for planning, inviting and communicating with the external as well as the local speakers, and maintaining the seminar schedules.

REFERENCES

Dr. Bruce N. Wilson (Ph.D. advisor)
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Dr. John S. Gulliver (Ph.D. Advisor)
Joseph T. & Rose S. Ling Professor
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ADDITIONAL REFERENCES

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Distinguished McKnight University Professor
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University of Minnesota, Twin Cities
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Dr. Heinz G. Stefan (Ph.D. Committee member)
James L. Record Professor
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