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EDUCATION

- DPhil Geography and Environment – January 2018
  University of Oxford, United Kingdom
  Dissertation Title: Negotiated Risk Management of Transboundary Rivers
- MSc Water Science, Management and Policy – September 2013
  University of Oxford, United Kingdom – Graduation with Distinction
  Dissertation Title: Distributing Costs and Benefits through Dam Operations: A Case Study of the Grand Ethiopian Renaissance Dam
- MSc Civil/Water Resource Engineering – May 2000
  University of Colorado, Cumulative GPA: 3.94 – Graduation with Honors
  Dissertation Title: A Methodology for Rapid Water Quality Assessment in Developing Countries: A Case Study of China's Yellow River
- BSc Civil/Environmental Engineering – December 1997
  University of Colorado, Cumulative GPA: 3.80 – Graduation with Honors

PROFESSIONAL EXPERIENCE

Environmental Change Institute – University of Oxford **(**http://www.eci.ox.ac.uk/)
October 2013 to Present
DPhil, Post-Doctoral Researcher

- Oxford Martin School Research Fellow - Transboundary Resource Management Programme: Explore the nexus of water-energy-food systems through multi-track dialogue in the Nile and Jordan River basins to reach regional Millennium Development Goals.
- Eastern Nile Coordinated Reservoir Operations: Expanded and applied the Eastern Nile RiverWare Model to analyze potential coordinated management strategies among water uses within Ethiopia, Sudan, South Sudan, and Egypt. This work focuses on incremental cooperative strategies of short term-filling and long-term operations of Grand Ethiopian Renaissance Dam (GERD) using Multi-Objective Evolutionary Algorithms (MOEAs).
- Eastern Nile RiverWare Model Training: Conducted 7 training sessions on the RiverWare software and model at Cairo University, Egypt; University of Khartoum, Sudan; Addis Ababa University, Ethiopia; National Water Research Center of the Ministry of Water Resources and Irrigation, Egypt; Eastern Nile Technical Regional Office, Ethiopia, and Dams Implementation Unit of the Ministry of Water Resources, Irrigation and Electricity, Sudan. Trainees included staff from governmental ministries, dam operators, academic staff, students, and professional consultants.
- Eastern Nile Cooperative Management Project: Ongoing dissemination and training of MOEA techniques for coordinated development and negotiation support. The final objective is to develop recommendations for data-sharing among Nile Basin countries. Support won through a post-doctoral grant from the Global Challenges Research Fund of the Engineering and Physical Sciences Research Council (EPSRC).
- Water Security and Sustainable Growth: This project, funded by the OECD and Global Water Partnership (GWP), examined the four elements of water security – droughts, flooding, water for health, and water for the environment – and explored the linkages to economic growth. My primary contributions to this multi-institutional effort was the analysis of global flood impacts and environmental requirements, compilation and aggregation of all four elements, and examining historical pathways to water security in contested river basins.
- Water Diplomacy Workshop: Guest lecturer (2015-2017) in workshops to demonstrate principles and practices of the water diplomacy framework. My unique contribution included the uses of hydro-policy water resource models to facilitate transboundary negotiations.
- Basin-wide Stochastic Hydrology: Developed a new technique to generate multi-site synthetic hydrologic sequences based on a simulated annealing technique for risk-based analysis of water management and future

development. Incorporation of potential climate change effects is a primary application for this research. The case study is the Nile River.

Water Balance Consulting **(**http://waterbalance.org)
June 2010 to Present
Principal

River Basin Analysis and Stakeholder Support

- Nile Basin Initiative – Eastern Nile RiverWare Model: Designed and supported a stakeholder-driven RiverWare model of water management in the Eastern Nile Region. Working with stakeholders from Ethiopia, Sudan, South Sudan and Egypt, this long-range planning model simulates the reservoir operations and river management across the region. This model provides a common platform for institutions to analyze the basin-wide impacts of river development and a forum to explore strategies for cooperative management.
- U.S. Bureau of Reclamation – Bi-National Negotiations with Mexico for Colorado River Shortage Sharing: The focus of this work was to amend the bi-national treaty between the United States and Mexico to reduce consumptive water use during extended drought conditions, allocate water during surplus conditions, establish a transboundary water banking mechanism, and introduce a test flow to restore the Colorado River Delta. My role was to facilitate the negotiations between the two countries by developing cooperative management strategies, analyze proposals through hydro-policy models, and provide technical concept translation between stakeholders. The successful outcome was Minute 319 of the treaty, signed into law on November 20th, 2012. http://ibwc.state.gov/Files/Minutes/Minute_319.pdf
- Environmental Defense Fund – Colorado River Policy Analysis: Provided technical support and policy analysis for a coalition of non-governmental organizations including Environmental Defense Fund, The Nature Conservancy, Trout Unlimited and Western Resource Advocates. I provided modeling expertise for the analysis of existing and proposed water management policies, implementation of improved reservoir operation guidelines, and evaluation of the impacts of climate change scenarios using the Colorado River Simulation System (CRSS). The alternatives were successfully incorporated into the Colorado River Basin Supply and Demand Study by the U.S. Bureau of Reclamation, released on December 12, 2012. http://www.usbr.gov/lc/region/programs/crbstudy.html
- Tarrant Regional Water District – Policy Development: Developed alternative water management policies for the Fort Worth Texas area under potential climate change scenarios and improved forecasting capabilities. Policies were evaluated to improve system efficiency by reducing pumping costs, evaporation losses, and reservoir spills while minimizing shortages to water users and maximizing strategic in-stream flows and maintaining reservoir elevations.

Stakeholder Support and Education

- American Museum of Natural History – Center for Biodiversity and Conservation Education: Co-author of an interactive teaching tool for understanding the complexities of the Colorado River. Components include six modules: geographic, hydrologic, economic, climate change, water conservation, and native ecosystems which interact with a central reservoir simulation to evaluate trade-offs of different scenarios. http://ncep.amnh.org/colorado_simulation/

Kennedy School of Government – Harvard University **(**https://www.hks.harvard.edu/)
January 2017 to July 2017
Doctoral Research Fellowship in Sustainability Science

Economic Modeling for Climate-Energy Policy - Project of the People Programme (Marie Curie Actions)

- Transboundary River Models on the Science-Policy Interface: Evaluation of the historical and potential use of water resource management models to facilitate negotiations in complex multi-stakeholder river basins. The study examines recent agreements in two drought-prone regions including the Colorado River in the United States and Mexico and the Murray-Darling River Basin in Australia.

Hydrosphere Resource Consultants – AMEC Earth and Environmental
Jan. 2005 to May 2010
Water Resource Engineer

River Basin Analysis and Stakeholder Support

- State of Colorado – Colorado River Water Availability Study: Conducted a basin-wide stochastic analysis of the impacts of climate change on the Colorado River Basin to determine the future amount of water available to the State. This work included the representation of a historical interstate compact agreement within a modeling framework and an analysis of the impacts of this agreement during future drought conditions.
- U.S. Bureau of Reclamation – Model Development and Support: Provided technical assistance for the development and enhancement of the CRSS modeling tool. Examples of work include the implementation of paleo-reconstructed hydrologic scenarios, simulation of reservoir operations during extreme drought events and evaluating potential management strategies.
- Windy Gap Firming EIS: Developed the analysis tools to conduct an impact evaluation of development in the Fraser River Basin and provided an expansion of the three-lakes water quality model for the Windy Gap Firming Environmental Impact Statement. The work included enhancement of a Q2K water quality model for the Upper Colorado River to assess potential water quality concerns from the project.
- Lower Colorado River Lower Colorado River Authority (Texas) – Daily Operations Model Development: Collaborated with dam managers to develop three models for the LCRA River Operation Center including: 1) a daily release model based on multi-objective water rights allocation, 2) a river routing model to evaluate flooding potential from hydropower releases, and 3) a post-accounting model to evaluate and charge water delivered to LCRA customers. These three models are currently used to help LCRA staff operate and manage six reservoirs on the Colorado River System.
- Lower Colorado River Authority (Texas) – Planning Model Development: Provided hydrologic policy modeling expertise with RiverWare to simulate existing models and management criteria in a water rights model for long-term planning. This project emphasized modeling of prior appropriations allocation and the evaluation of impacts of future development on those water rights.

Stakeholder Support and Education

- Colorado River Upper Basin Water User Coalition: Provided support for a coalition of upper basin water users during interstate negotiations for the Colorado River Interim Guidelines for Lower Basin Shortages EIS. Consultation included analysis of proposals set forth by stakeholders through implementation and simulation of these potential policies within the CRSS modeling tool.
- Unites States of Mexico: Conducted a five day stakeholder training session of the RiverWare software at the National Water Commission of Mexico (CONAGUA). Participants included staff from CONAGUA, Mexico Technical Water Institute (IMTA), University of Zacatecas, and the International Boundary and Water Commission (Mexico water managers).

Infrastructure Design and Development

- Eagle River Water and Sanitation District: Conducted a hydrologic and hydraulic analysis of flood flows for a dam design and rehabilitation using HEC-HMS and HEC-RAS modeling tools, and coordinated the construction design for a new spillway and rehabilitation of the outlet.
- Eagle River Water and Sanitation District: Designed and installed various hydraulic structures for accurate flow measurements and installed automated flow and reservoir volume data collection systems to improve water resource management practices.
- City of Northglenn: Conducted a preliminary design study for a stream flow monitoring station on Big Dry Creek. This project included providing numerous alternatives ranging from temporary to permanent structures in a highly erosive region.

- City of Boulder Flow Monitoring Station: Designed, implemented and operated a flow measurement station for Elmer's Two Mile Creek including an automated data collection system on behalf of the City of Boulder. The data was used to determine annual baseflow and storm flow runoff contributions.
- Piceance Basin Lateral Pipeline Scour Analysis: Conducted a channel scour analysis for three stream crossings of the Piceance Basin Natural Gas Liquids (NGL) pipeline to determine proper burial depth to avoid damage of the pipeline due to long-term degradation and localized storm event scour.

Peace Corps - Dominican Republic and Haiti
Sept. 2002 to Nov. 2004
Water and Sanitation Engineer

Infrastructure Design and Development

- Designed and directed the construction of two rural water systems in the Dominican Republic that provide potable water to 850 individuals. An emphasis was on the facilitation of local water committees to manage community participation and logistics, secure external funding, develop a sustainable financing program for operation and maintenance, negotiating a watershed conservation plan and developing disaster mitigation strategies. Construction management included oversight of the pipeline route selection, hydraulic design, labor management and quality control of construction practices. The projects emphasized the inclusion and empowerment of women throughout the planning and construction process.
- Provided technical consultation for the development of a potable water system in Tiroli, Haiti to provide water to approximately 3,500 individuals. This project required working closely with local NGO's and community members while serving in an advisory role for hydraulic design, route selection, materials procurement and quality control.
- Implemented a bio-sand water filter project for point-of-use removal of waterborne pathogens for 80 households.
- Implemented a fuel-efficient cook stove project for 23 households.

Stakeholder Support and Education

- Designed and implemented a community-wide sanitation education project including household peer-education of hygiene practices and latrine improvements. Outreach included 180 households.
- Provided technical and organizational advice for 4 malfunctioning water systems throughout the Dominican Republic and assisted in the revival of ineffective water committees.
- Solicited and managed all project funding from multiple donor agencies including the Embassy of Canada, USAID, local governments, private donors and community contributions.

Center for Advanced Decision Support for Water and Environmental Systems – University of Colorado
Jan. 2000 to Aug. 2002
Professional Research Assistant/Hydrologic Modeling

River Basin Analysis

- Worked with Reclamation to implement and analyze the impacts of alternative polices on reservoir levels for the Colorado River Interim Surplus Criteria, Secretarial Implementation Agreement and Multi-Species Conservation Programs for the Colorado River system. The policies analyzed focused on the impacts of reoperation of reservoirs to reduce consumptive use by California and transfers from agricultural to municipal users.
- Collaborated with The Nature Conservancy and U.S. Fish and Wildlife Service to analyze alternatives for restructuring the Flaming Gorge Dam operation to improve peak flood flow timing and habitat conditions for endangered species.
- Collaborated with Environmental Defense Fund and U.S. Bureau of Reclamation to develop operational management proposals for the restoration of the Colorado River Delta and evaluate impacts on stakeholders throughout the basin.

Stakeholder Support and Education

- Developed the Graphical Policy Analysis Tools (GPAT) for analyzing results of the CRSS model and allowing greater stakeholder involvement. This outreach included participating in numerous stakeholder meetings to present modeling results from ongoing Environmental Impact studies and to explore stakeholder suggestions and concerns through refinement of proposed management alternatives.

Institute for Arctic and Alpine Research (INSTAAR) – University of Colorado
Jan. 2001 to Aug. 2002
Professional Research Assistant/Hydrologist/Database Manager

Data Collection and Analysis

- Conducted fieldwork at the Long Term Ecological Research (LTER) Station of Dry Valleys, Antarctica. The work included logistics coordination, water collection and laboratory analysis, flow measurements and land surveying to map and analyze remote seasonal streams.
- Conducted fieldwork at the Long Term Ecological Research (LTER) Station Toolik Lake, Alaska. The work included logistic coordination, hydrologic measurements, water quality sampling and laboratory analysis.
- Managed, archived and posted incoming data and publications from all field researchers as the team database manager and web-master.

International Institute for Applied Systems Analysis (IIASA) – Laxenburg, Austria
Sept. to Dec. 2000 and June to Sept. 1999
Research Fellow

River Basin Analysis

- Developed a GIS/Visual Basic model of basin-scale surface water pollution in China based on socio-economic conditions to study the impacts of various climate change scenarios and management/mitigation policies. Modeling included overland accumulation of biochemical and nitrogenous oxygen demand and in-stream modeling of pollution fate and transport.
- Awarded the Mikhalevich Scholarship for innovative research approaches to assist policy decisions.

Department of Civil, Environmental and Architectural Engineering – University of Colorado
Jan. 1994 to June 1999
Lab Instructor/Teaching Assistant/Student Research Assistant

- Designed and co-instructed a new laboratory course in GIS applications in water resources.
- Teaching Assistant for courses in engineering hydrology, hydraulic engineering, engineering economics and land surveying.
- Used various GIS tools to study the variations in hydrologic properties across watershed and continental scales.

TEACHING AND SUPERVISION EXPERIENCE

- Climate Change Impacts and Adaptations (Oxford), Transboundary River Management (Oxford), GIS applications in Water Resources (Colorado) and Land Surveying (Colorado). I have lectured on various issues of water science, management and negotiations at the Harvard University, Massachusetts Institute of Technology, University of Colorado, University of Oxford, University of Khartoum, Addis Ababa University and Cairo University.
- Co-supervised 5 MSc students (University of Oxford and TH Koln)

ACTIVITIES AND CERTIFICATIONS

- Professional Engineer – Registered in the State of Colorado, PE-43389
- Associate Editor - *Water International* - International Water Resources Association

- Reviewer - Journal of Water Resources Planning and Management, Environmental Software and Modelling, Journal of Hydrology: Regional Studies, Journal of Contemporary African Studies
- Mountain Rescue Association, Incident Command System (IS100, IS200, IS300, IS700, IS800)

LANGUAGE SKILLS

- Native Fluency in English
- Written and Conversational Fluency in Spanish (ACTFL Advanced Mid)

COMPUTER SKILLS / MODELS

WINDOWS, UNIX, Excel, Microsoft Word, Access, Quicksurf , Matlab, Visual Basic, ArcGIS, ArcView, MAPINFO, IDRISI, AutoCAD, Surfer, EPANET, HEC1, HEC-RAS, HEC-HMS, HEC-DSS, SWMM, WARMF, WEAP, RiverWare

PUBLICATIONS

Journal Articles

Wheeler, K., Jeuland, M. A., Hall, J.W., Zagona, E. and Whittington, D. Understanding and Managing New Risks on the Nile with the Grand Ethiopian Renaissance Dam, *Nature Communications,* **in review**.

Wheeler, K., Simpson, M., Borgomeo, E. and Hall, J. W. A multi-site non-parametric method for hydrologic scenario generation in the Eastern Nile Basin, *Journal of Hydrology*, **in review**.

Basheer, M., **Wheeler, K.**, Harou, J., Elagib, N., Zagona, E., Abdo, G., Etichia, M. When filling new large controversial dams one should not forget engineering realities, *One Earth*, **in review**

Wheeler, K., Caplan, R. (2020), How Natural Resource (Mis-)management in the Nile River Basin May Threaten Stability, *Georgetown Journal of International Affairs, online only* https://gjia.georgetown.edu/2020/05/20/natural-resource-mis-management-in-nile-river-basin-may-threaten-stability/

Wheeler, K., Hall, J. W., Abdo, G. M., Dadson, S. J., Kasprzyk, J. R., Smith, R., & Zagona, E. A. (2018). Exploring Cooperative Transboundary River Management Strategies for the Eastern Nile Basin. *Water Resources Research, 54*(11), 9224-9254. doi:doi:10.1029/2017WR022149

Wheeler, K., Robinson, C. J., & Bark, R. H. (2018). Modelling to bridge many boundaries: the Colorado and Murray-Darling River basins. *Regional Environmental Change, 18*(6), 1607-1619. doi:10.1007/s10113-018-1304-z

Basheer, M., **Wheeler, K.,** Ribbe, L., Majdalawi, M., Abdo, G., & Zagona, E. A. (2018). Quantifying and evaluating the impacts of cooperation in transboundary river basins on the Water-Energy-Food nexus: The Blue Nile Basin. *Science of The Total Environment, 630*, 1309-1323. doi:https://doi.org/10.1016/j.scitotenv.2018.02.249

Wheeler, K., Basheer, M., Mekonnen, Z. T., Eltoum, S. O., Mersha, A., Abdo, G. M., Zagona, E. A., Hall, J. W., & Dadson, S. J. (2016). Cooperative filling approaches for the Grand Ethiopian Renaissance Dam. *Water International, 41*(4), 611-634. doi:10.1080/02508060.2016.1177698
(Awarded Best Paper of the Year for 2016 and all-time most downloaded paper)

Grafton, R. Q., McLindin, M., Hussey, K., Wyrwoll, P., Wichelns, D., Ringler, C., Garrick, D., Pittock, J., Wheeler, S., Orr, S., Matthews, N., Ansink, E., Aureli, A., Connell, D., De Stefano, L., Dowsley, K., Farolfi, S., Hall, J., Katic, P., Lankford, B., Leckie, H., McCartney, M., Pohlner, H., Ratna, N., Rubarenzya, M. H., Sai Raman, S. N., **Wheeler, K.,** & Williams, J. (2016). Responding to Global Challenges in Food, Energy, Environment and Water: Risks and Options Assessment for Decision-Making. *Asia & the Pacific Policy Studies, 3*(2), 275-299. doi:doi:10.1002/app5.128

Wheeler, K.G., Pitt, J., Magee, T. M., & Luecke, D. F. (2007). Alternatives for restoring the Colorado river delta. *Natural Resources Journal, 47*, 917. doi:http://www.jstor.org/stable/24889540

Book Chapters

Wheeler, K. (2019). Transboundary Governance of the Colorado River. In E. Choudhury & S. Islam (eds.), *Complexity of Transboundary Water Conflicts: Enabling Conditions for Negotiating Contingent Resolutions*. London: Antham Press.

Wheeler K. (2018) Managing risks while filling the Grand Ethiopian Renaissance Dam. In: Yihdego Z, Rieu-Clarke A, Cascão AE (eds.), *The Grand Ethiopian Renaissance Dam and the Nile Basin: Implications for Transboundary Water Cooperation*. Abingdon: Routledge.

Other Relevant Publications and Proceedings

Wheeler, K, Rosenberg D. Schmidt J. 2019. *Water Resource Modeling of the Colorado River: Present and Future Strategies, Center for Colorado River Studies*, Quinney College of Natural Resources, Utah State University.

Wheeler, K., 2018. *Negotiated Risk of Transboundary Rivers*, D.Phil. Thesis School of Geography and Environment, University of Oxford, United Kingdom.

Wheeler, K., 2013. *Distributing Costs and Benefits through Dam Operations: A Case Study of the Grand Ethiopian Renaissance Dam*, MSc Thesis. Thesis School of Geography and Environment, University of Oxford, United Kingdom.

Wheeler, K., Setzer, S. 2012. Eastern Nile RiverWare Planning Model Final Report, October 2012, Eastern Nile Regional Technical Office, Addis Ababa, Ethiopia

Wheeler, K., Magee, T., Fulp T., and Zagona, E. 2002. Alternative Policies on the Colorado River. In: *Natural Resources Law Center: Allocating and Managing Water for a Sustainable Future: Lessons From Around the World*. Boulder, CO 11-14 June 2002.

Wheeler, K. 2000. *A Methodology for Rapid Water Quality Assessment in Developing Countries: A Case Study of China's Yellow River*, MSc Thesis. Thesis Civil Environmental and Architectural Engineering, University of Colorado, Boulder CO.

Wheeler, K., Strzepek, K., 2000. A Method for Rapid Water Quality Assessment in Developing Countries, In: *4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4): Problems, Prospects and Research Needs.* Banff, Alberta, Canada 2-8 September 2000.

ACADEMIC GRANTS

2019-2022 Oxford Martin School - PDRA - £994,975
2018-2019 GIZ and the German Federal Foreign Office - Principal Investigator - €146,685
2018-2019 Catena Foundation - Co-investigator - $60,000
2017 EPSRC Global Challenge Research Fund Institutional Sponsorship - £29,609
2017 Economic Modeling for Climate-Energy Policy - €12,600

AWARDS

Best paper award for papers published in IWRA's journal Water International in 2016 for "Cooperative filling approaches for the Grand Ethiopian Renaissance Dam" (2016).

Best dissertation in 2013 – MSc in Water Science, Management and Policy, University of Oxford, School of Geography and Environment