

# Curriculum Vitae

## **Sean Turner, EngD**

Water Resources / Hydropower Engineer  
Water Resource Science and Engineering Group  
Environmental Sciences Division

### **Oak Ridge National Laboratory**

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## **Education**

EngD (Engineering Doctorate) in Water Resources Planning, **Cranfield University**, UK (2010 – 2014)

MSc in Hydrology and Climate Change, **Newcastle University**, UK (2009 – 2010) *Distinction*

BSc in Engineering, **University of Glasgow**, UK (2004 – 2008) *First Class Hons*

## **Employment Record**

### **Oak Ridge National Laboratory**

Hydropower & Water Resources Engineer 2023 – present

### **McKinsey & Company**

Research Science Specialist 2022 – 2023

### **Pacific Northwest National Laboratory**

Earth Systems Scientist (L3) 2020 – 2022

Earth Systems Scientist (L2) 2018 – 2020

Postdoc @ Joint Global Change Research Institute (JGCRI) 2016 – 2018

### **Singapore University of Technology and Design**

Postdoc @ SUTD-MIT International Design Centre 2014 – 2016

Teaching Assistant, Water Resources Modeling 2015

Teaching Assistant, Power Systems Modeling 2016

### **United Utilities PLC (Warrington, UK)**

Research Engineer 2011 – 2014

### **CSIRO (Melbourne, Australia)**

Intern Researcher 2013

### **AEA Technology (Glasgow, UK)**

Technical Consultant 2008 – 2009

## Honors and Awards

- \* 2022 *Editor's Highlight* and Top 25 most read paper – Nature Communications
- \* 2022 *Top 25 most read paper* – Nature Communications
- \* 2021 *Best Research Paper of the year* – PNNL Earth System Sciences Division
- \* 2018 *Best Reviewer* – Journal of Water Resources Planning and Management
- \* 2017 *Editor's Highlight* – Hydrology and Earth System Sciences
- \* 2011 *Top Performing Research Engineer* – STREAM Industrial Doctorate Centre
- \* 2010 *Best Overall Performance* – Newcastle University
- \* 2008 *Best Project in Civil Engineering Hydraulics* – University of Glasgow
- \* 2008 *Dean's List* – University of Glasgow

## Media Engagement

2022-10-18 *Grist*. <https://grist.org/drought/will-western-hydropower-survive-drought/>

2022-09-20 *WPTO Press Release*. <https://www.energy.gov/eere/water/articles/study-finds-hydropower-provides-reliable-electricity-even-during-historic>

2022-09-13 *E&E News*. <https://www.eenews.net/articles/what-the-western-drought-reveals-about-hydropower/>

2022-08-17 *Vox*. <https://www.vox.com/science-and-health/23308281/colorado-river-western-drought-satellite-hoover-dam-mead-powell>

2022-08-16 *Vox*. <https://www.vox.com/23292669/drought-2022-power-energy-grid-lake-mead-climate-heat-hoover-dam>

2022-04-27 *PNNL Press Release*. <https://www.pnnl.gov/news-media/watershed-moment-key-findings-about-potential-drinking-water-contamination>

2021-10-07 *Inside Climate News*. <https://insideclimatenews.org/news/07102021/inside-clean-energy-drought-hydroelectric-power/>

## Publications

### Refereed Journal Publications

[39] Abeshu, G.W., Tian, F., Wild, T., Zhao, M., **Turner, S.W.**, Chowdhury, A.K., Vernon, C.R., Hu, H., Zhuang, Y., Hejazi, M. and Li, H.Y., 2023. Enhancing the representation of water management in global hydrological models. *Geoscientific Model Development*, 16(18), pp.5449-5472.

[38] Kanyako, F., Lamontagne, J., Baker, E., **Turner, S.W.** and Wild, T., 2023. Seasonality and trade in hydro-heavy electricity markets: A case study with the West Africa Power Pool (WAPP). *Applied Energy*, 329, p.120214.

- [37] **Turner, S.W.**, Voisin, N. and Nelson, K., 2022. Revised monthly energy generation estimates for 1,500 hydroelectric power plants in the United States. *Scientific Data*, 9(1), p.675.
- [36] Magee, T.M., **Turner, S.W.**, Clement, M.A., Oikonomou, K., Zagona, E.A. and Voisin, N., 2022. Evaluating power grid model hydropower feasibility with a river operations model. *Environmental Research Letters*, 17(8), p.084035.
- [35] Cohen, S.M., Dyreson, A., **Turner, S.W.**, Tidwell, V., Voisin, N. and Miara, A., 2022. A multi-model framework for assessing long-and short-term climate influences on the electric grid. *Applied Energy*, 317, p.119193.
- [34] Dyreson, A., Devineni, N., **Turner, S.W.**, De Silva M, T., Miara, A., Voisin, N., Cohen, S. and Macknick, J., 2022. The role of regional connections in planning for future power system operations under climate extremes. *Earth's Future*, 10(6), p.e2021EF002554.
- [33] **Turner, S.W.** and Voisin, N., 2022. Simulation of hydropower at subcontinental to global scales: a state-of-the-art review. *Environmental Research Letters*.
- [32] Steyaert, J.C., Condon, L.E., **Turner, S.W.** and Voisin, N., 2022. ResOpsUS, a dataset of historical reservoir operations in the contiguous United States. *Scientific Data*, 9(1), p.34.
- [31] **Turner, S.W.**, Rice, J.S., Nelson, K.D., Vernon, C.R., McManamay, R., Dickson, K. and Marston, L., 2021. Comparison of potential drinking water source contamination across one hundred US cities. *Nature Communications*, 12(1), p.7254.
- [30] **Turner, S.W.**, Steyaert, J.C., Condon, L. and Voisin, N., 2021. Water storage and release policies for all large reservoirs of conterminous United States. *Journal of Hydrology*, 603, p.126843.
- [29] **Turner, S.W.**, Nelson, K., Voisin, N., Tidwell, V., Miara, A., Dyreson, A., Cohen, S., Mantena, D., Jin, J., Warnken, P. and Kao, S.C., 2021. A multi-reservoir model for projecting drought impacts on thermoelectric disruption risk across the Texas power grid. *Energy*, 231, p.120892.
- [28] Galelli, S., Nguyen, H.T., **Turner, S.W.** and Buckley, B.M., 2021. Time to use dendrohydrological data in water resources management?. *Journal of Water Resources Planning and Management*, 147(8), p.01821001.
- [27] **Turner, S.W.** and Jeffrey, P.J., 2021. A simple drought risk analysis procedure to supplement water resources management planning in England and Wales. *Water and Environment Journal*, 35(1), pp.417-424.
- [26] Nelson, K.D., **Turner, S.W.**, Vernon, C.R. and Rice, J.S., 2021. gamut: A geospatial R package to analyze multisectoral urban teleconnections. *Journal of Open Source Software*, 6(66), p.3383.
- [25] Thurber, T., Vernon, C., Sun, N., **Turner, S.W.**, Yoon, J. and Voisin, N., 2021. mosartwmpy: A Python implementation of the MOSART-WM coupled hydrologic routing and water management model. *Journal of Open Source Software*, 6(PNNL-SA-161232).
- [24] Nguyen, H.T., **Turner, S.W.**, Buckley, B.M. and Galelli, S., 2020. Coherent streamflow variability in monsoon Asia over the past eight centuries—Links to oceanic drivers. *Water Resources Research*, 56(12), p.e2020WR027883.

- [23] Voisin, N., Dyreson, A., Fu, T., O'Connell, M., **Turner, S.W.**, Zhou, T. and Macknick, J., 2020. Impact of climate change on water availability and its propagation through the Western US power grid. *Applied Energy*, 276, p.115467.
- [22] **Turner, S.W.**, Doering, K. and Voisin, N., 2020. Data-driven reservoir simulation in a large-scale hydrological and water resource model. *Water Resources Research*, 56(10), p.e2020WR027902.
- [21] **Turner, S.W.**, Xu, W. and Voisin, N., 2020. Inferred inflow forecast horizons guiding reservoir release decisions across the United States. *Hydrology and Earth System Sciences*, 24(3), pp.1275-1291.
- [20] Graham, N.T., Hejazi, M.I., Chen, M., Davies, E.G., Edmonds, J.A., Kim, S.H., **Turner, S.W.**, Li, X., Vernon, C.R., Calvin, K. and Miralles-Wilhelm, F., 2020. Humans drive future water scarcity changes across all Shared Socioeconomic Pathways. *Environmental Research Letters*, 15(1), p.014007.
- [19] **Turner, S.W.**, Hejazi, M., Calvin, K., Kyle, P. and Kim, S., 2019. A pathway of global food supply adaptation in a world with increasingly constrained groundwater. *Science of the Total Environment*, 673, pp.165-176.
- [18] Arango-Aramburo, S., **Turner, S.W.**, Daenzer, K., Ríos-Ocampo, J.P., Hejazi, M.I., Kober, T., Álvarez-Espinosa, A.C., Romero-Otalora, G.D. and van der Zwaan, B., 2019. Climate impacts on hydropower in Colombia: A multi-model assessment of power sector adaptation pathways. *Energy Policy*, 128, pp.179-188.
- [17] Santos Da Silva, S.R., Miralles-Wilhelm, F., Muñoz-Castillo, R., Clarke, L.E., Braun, C.J., Delgado, A., Edmonds, J.A., Hejazi, M., Horing, J., Horowitz, R., **Turner, S.W.**, Kyle, P., et al., 2019. The Paris pledges and the energy-water-land nexus in Latin America: Exploring implications of greenhouse gas emission reductions. *PloS one*, 14(4), p.e0215013.
- [16] **Turner, S.W.**, Hejazi, M., Yonkofski, C., Kim, S.H. and Kyle, P., 2019. Influence of groundwater extraction costs and resource depletion limits on simulated global nonrenewable water withdrawals over the twenty-first century. *Earth's Future*, 7(2), pp.123-135.
- [15] **Turner, S.W.**, Voisin, N., Fazio, J., Hua, D. and Jourabchi, M., 2019. Compound climate events transform electrical power shortfall risk in the Pacific Northwest. *Nature Communications*, 10(1), p.8.
- [14] Bond-Lamberty, B., Dorheim, K., Cui, R., Horowitz, R., Snyder, A., Calvin, K., Feng, L., Hoesly, R., Horing, J., Kyle, G.P., Link, R., **Turner, S.W.**, et al., 2019. gcamdata: An R package for preparation, synthesis, and tracking of input data for the GCAM integrated human-earth systems model. *Journal of Open Research Software*, 7(1).
- [13] Vernon, C.R., Hejazi, M.I., **Turner, S.W.**, Liu, Y., Braun, C.J., Li, X. and Link, R.P., 2019. A global hydrologic framework to accelerate scientific discovery. *Journal of Open Research Software*, 7(1).
- [12] Lucena, A.F., Hejazi, M., Vasquez-Arroyo, E., **Turner, S.W.**, Köberle, A.C., Daenzer, K., Rochedo, P.R., Kober, T., Cai, Y., Beach, R.H. and Gernaat, D., 2018. Interactions between climate change mitigation and adaptation: the case of hydropower in Brazil. *Energy*, 164, pp.1161-1177.
- [11] Cui, R.Y., Calvin, K., Clarke, L., Hejazi, M., Kim, S., Kyle, P., Patel, P., **Turner, S.W.**, and Wise, M., 2018. Regional responses to future, demand-driven water scarcity. *Environmental Research Letters*, 13(9), p.094006.

- [10] **Turner, S.W.**, Hejazi, M., Kim, S.H., Clarke, L. and Edmonds, J., 2017. Climate impacts on hydropower and consequences for global electricity supply investment needs. *Energy*, 141, pp.2081-2090.
- [9] **Turner, S.W.**, Bennett, J.C., Robertson, D.E. and Galelli, S., 2017. Complex relationship between seasonal streamflow forecast skill and value in reservoir operations. *Hydrology and Earth System Sciences*, 21(9), pp.4841-4859.
- [8] **Turner, S.W.**, Ng, J.Y. and Galelli, S., 2017. Examining global electricity supply vulnerability to climate change using a high-fidelity hydropower dam model. *Science of the Total Environment*, 590, pp.663-675.
- [7] Ng, J.Y., **Turner, S.W.** and Galelli, S., 2017. Influence of El Niño Southern Oscillation on global hydropower production. *Environmental Research Letters*, 12(3), p.034010.
- [6] Ekström, M., Grose, M., Heady, C., **Turner, S.W.** and Teng, J., 2016. The method of producing climate change datasets impacts the resulting policy guidance and chance of mal-adaptation. *Climate Services*, 4, pp.13-29.
- [5] **Turner, S.W.** and Galelli, S., 2016. Regime-shifting streamflow processes: Implications for water supply reservoir operations. *Water Resources Research*, 52(5), pp.3984-4002.
- [4] **Turner, S.W.** and Galelli, S., 2016. Water supply sensitivity to climate change: An R package for implementing reservoir storage analysis in global and regional impact studies. *Environmental Modelling & Software*, 76, pp.13-19.
- [3] **Turner, S.W.**, Blackwell, R.J., Smith, M.A. and Jeffrey, P.J., 2016. Risk-based water resources planning in England and Wales: challenges in execution and implementation. *Urban Water Journal*, 13(2), pp.182-197.
- [2] **Turner, S.W.** and Jeffrey, P.J., 2015. Industry views on water resources planning methods—prospects for change in England and Wales. *Water and Environment Journal*, 29(2), pp.161-168.
- [1] **Turner, S.W.**, Marlow, D., Ekström, M., Rhodes, B.G., Kularathna, U. and Jeffrey, P.J., 2014. Linking climate projections to performance: A yield-based decision scaling assessment of a large urban water resources system. *Water Resources Research*, 50(4), pp.3553-3567.

### Technical Reports

- [4] **Turner, S.W.**, Voisin, N., Nelson, K.D. and Tidwell, V.C., 2022. Drought impacts on hydroelectric power generation in the Western United States (No. PNNL-33212). Pacific Northwest National Lab. (PNNL), Richland, WA (United States).
- [3] Cohen, S., Miara, A., Tidwell, V., **Turner, S.W.**, Voisin, N. and Dyreson, A., 2022. Water and Climate Impacts on ERCOT Long-Term Systems Assessment (No. NREL/TP-6A20-79581). National Renewable Energy Lab.(NREL), Golden, CO (United States).
- [2] Somani, A., Voisin, N., Tipireddy, R., **Turner, S.W.**, Veselka, T.D., Ploussard, Q., Koritarov, V., Mosier, T., Mohanpurkar, M., Ingram, M. and Signore, S., 2021. Hydropower value study: Current status and future opportunities (p. 47). Technical Report PNNL-29226. Hydrowires. Richland, WA: Pacific Northwest National Lab.
- [1] Santos Da Silva, S.R., McJeon, H.C., Miralles-Wilhelm, F., Muñoz Castillo, R., Clarke, L., Delgado, A., Edmonds, J.A., Hejazi, M., Horing, J., Horowitz, R., Kyle, P., **Turner, S.W.**, et al., 2018. Energy-

water-land nexus in Latin America and the Caribbean: A perspective from the Paris agreement climate mitigation pledges (No. IDB-WP-901). IDB Working Paper Series.

### Software contributions

- [5] capratTX Capacity at Risk Analysis Tool for Texas <https://github.com/pnnl/capratTX>
- [4] starfit Storage Targets and Release Function Inference Tool. <https://github.com/IMMM-SFA/starfit>
- [3] hydrofixr Water model post-processing tool for creating hydropower inputs to power system models. <https://github.com/pnnl/hydrofixr>
- [2] gamut. Geospatial Analytics for Multisectoral Urban Teleconnections. <https://github.com/IMMM-SFA/gamut>
- [1] reservoir. Tools for analysis, design, and operation of water supply reservoir storages <https://cran.r-project.org/web/packages/reservoir/index.html>

### Data contributions

- [9] **Turner, S.W.**, Voisin, N., Nelson, K., & Bracken, C. (2023). RectifHyd (1.2.1) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.10011017>
- [8] **Turner, S.W.**, Nelson, K., & Vernon, C. (2022). Turner et al., 2021, urban water supply contributions and GAMUT output data (0.0.1) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.5813878>
- [7] **Turner, S.W.** (2021). Formatted inputs for hydrofixr (0.0.1) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.5773123>
- [6] **Turner, S.W.**, Nelson, K., Vernon, C., & Rice, J. (2021). Point and Nonpoint Proportion of Potentially Contaminated Supply (PPCS) for 116 United States cities (1.0) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.5602059>
- [5] **Turner, S.W.**, Voisin, N., Steyaert, J. C., & Condon, L. (2021). ISTARF-CONUS (0.0.1) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.4602277>
- [4] Jennie Steyaert, Laura Condon, **Sean Turner**, & Nathalie Voisin. (2021). ResOpsUS (Version 2) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.6612040>
- [3] Nelson, K., **Turner, S.W.**, Voisin, N., & Kao, S.-C. (2020). ERCOT Reservoir Watershed Delineations and Inflow Scenarios (1.1.0) [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.4273147>
- [2] **Sean W D Turner**, Kenji Doering, & Nathalie Voisin. (2020). IMMM-SFA/Turner\_et\_al\_2020\_WRR: CRB reservoir simulations [Data set]. In Water Resources Research (v1.0.0). Zenodo. <https://doi.org/10.5281/zenodo.3983584>
- [1] Ben Bond-Lamberty, abigailsnyder, kdorheim, russellhz, rynecui, Aaron S., Leyang Feng, kvcalvin, Praliti Patel, cwroney, Robert Link, Cary Lynch, **Sean W D Turner**, jhoring, Corinne Hartin, rhoesly, pkyle, Haewon, Steve Smith, ... mihejazi. (2018). JGCRI/gcamdata: GCAM Data System Version 1.0 (v1.0). Zenodo. <https://doi.org/10.5281/zenodo.1249932>

## **Service**

### **Proposal review**

National Academies of Sciences, Engineering, and Medicine. U.S. - Egypt Science and Technology (S&T) Joint Fund, Cycle 21. September 2022.

Swiss National Science Foundation. Climate Change and Swiss Hydropower: National and Local Impacts and Adaptation Options. July 2019.

### **Program evaluation**

DoE Office of Science. Award DE-FG02-94ER61937 (\$2.1M). June 2019.

DoE. U.S. China Clean Energy Research Center, Water-Energy Technologies (CERC-WET). November 2018.

### **Peer review**

Nature, Nature Climate Change, Science, Nature Scientific Data, Water Resources Research, Journal of Hydrology, Journal of Water Resources Planning and Management, Environmental Research Letters, Advances in Water Resources, Hydrology and Earth System Sciences.

### **Special Issue editor**

Hydrology and Earth System Sciences. Representation of water infrastructures in large-scale hydrological and Earth system models. April 2022 – March 2023.

### **Conference session chair**

Session chair, AGU Fall Meeting, Washington, DC, USA, 11th – 15th Dec 2018, Session H23F: The Future of Coupled Water–Energy Systems Confronting Global Change.

Session chair, AGU Fall Meeting, New Orleans, USA, 10th – 15th Dec 2017, Session H41Q: Modeling basin storage and human interventions to the water cycle across scales.

Session co-convenor, 13th Annual Meeting of the Asia Oceania Geosciences Society, Beijing, 31st July – 5th Aug 2016. Session: Ensemble Hydro-Meteorological Forecasting.

Session leader, MODSIM 2015, Gold Coast, Australia, 29th Nov – 4th Dec 2015, Session L.15: Water resources management informed by hydroclimatic forecasts