



Kelly Knee – Director of Coastal Hazards Services| Engineer | Data Management Specialist

B.S. Environmental Engineering –Tufts University

M.S. Water Resources Engineering – Tufts University

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Areas of Expertise:

Ms. Knee is an engineer and data management specialist with RPS ASA and currently directs the coastal hazards group. She has a broad engineering and scientific background but has specialized in coastal flooding issues for almost 15 years. Over her 11 years at ASA she has completed numerous coastal flooding and mapping related projects for both engineering and educational purposes. Her visualizations of coastal flooding have gained national attention and her coastal risk analyses have been used for both educational and engineering purposes. She has performed coastal risk assessments, including sea level rise, storm surge, wave, seiche, rainfall, and tsunami effects, for many major industrial facilities including nuclear power stations, LNG plants, and onshore coastal wind farms. In addition to her focus on coastal issues, Ms. Knee has also has more than 11 years of experience in GIS, modeling, software development, ocean observing, and data management and communication (DMAC). She currently manages numerous complex data management, distribution, and visualization projects for NOAA, the USACE, and NROC. Prior to joining ASA in 2004 she used a Fulbright Fellowship to study the impacts of sea level rise and storm surge flooding in the country of Mauritius by integrating GIS and systems engineering models.

Experience Includes:

RPS ASA

2004 - Present

Coastal Hazards Assessment

- Manager of Nuclear Power Plant Flood Hazard Re-Evaluations (analysis and modelling of storm wind, surge, seiche, waves, sea level rise, and tsunamis) for a number of nuclear power plants around the coastal United States. Design and modeling of worst case potential storm conditions, in accordance with NRC regulations. Determination and consideration of combined effects impacts.
- Development of high resolution inundation impact predictions, based on sea level rise and storm surge estimates, for the Dubai Municipality Operational Forecasting System, an operational model system for the Arabian Gulf and UAE that provides daily forecasts from meteorology, hydrodynamic, and wave models.
- Manager of and lead modeller for a climate change vulnerability assessment and adaptation planning study for water quality infrastructure in New Bedford, Fairhaven and Acushnet.
- Design of interactive web-based tools for communicating inundation risk (from storm surge and sea level rise) to the public
- Designed and managed the development and implementation of a variety of kiosks for visualization of climate change impacts. The kiosks were designed to educate the public about potential inundation due to storm surge and sea level rise and are hosted in science museums around the east coast.
- Performed sea level rise and storm surge impacts analyses for critical facilities around the town of Hull, MA. Designed and created three dimensional visualizations and animations of the impacts of future storm scenarios using a combination of open source and ESRI technologies.
- Extreme value/statistical analysis of metrological/oceanographic data
- Generate design-storm conditions, including winds, waves, surge, seiche, and rainfall, for coastal industrial facilities
- Simulation and visualization of sea level rise and storm surge flooding for a variety of clients using a custom ArcGIS/Google Earth tool to easily visualize and animate potential flooding in a given area based on the local topography.
- Design and execution of custom web-based tools for visualizing risk analysis results

Numerical Modeling

- Manager of numerous hydrodynamic modelling studies including two FVCOM studies of coastal mangrove areas in Abu Dhabi.
- Coordinated implementation of the Arabian Gulf Operational Forecasting System, which provides three day forecasts of weather, hydrodynamics (currents and water level), and waves for the entire Gulf. Integrated model results into an inundation prediction system for the Dubai Municipality Coastal Zone Management Section.



- Developed ArcGIS extension for determination of tidal boundary conditions for input into hydrodynamic models.
- Coastal risk analyses for shoreline facilities including assessment of sea level rise, surge, seiche, and wave run-up using a combination of statistical engineering and modeling techniques.
- Execute pipeline breach impact assessments by modeling the fate and transport of oil spills pipeline using ASA's OILMAPLand system.
- Oil spill modeling in support of contingency planning and risk assessment for a series of proposed oil developments around the world using ASA's stochastic OILMAP model to assess the potential impacts of the spills and define worst-case scenarios for further trajectory and fate modeling.

Data Management and GIS

- Coordination and management of the Northeast Ocean Data Portal, which provides maps and data for ocean planning in the northeast, responsibilities include data management, development of web services, and design and implementation of data driven websites and portals.
- Managed the design, development, and implementation of the Abu Dhabi Coastal Resources Atlas and Environmental Vulnerability Index, a multiyear project to classify the marine and coastal habitats of Abu Dhabi, assess their vulnerability to stressors such as sea level rise, and leverage the resultant data in both web-based and desktop marine spatial planning applications.
- Manager of the USACE Field Research Facility Data Integration Framework, an initiative to archive 34 years of field data and provide web-based data services and applications for accessing, analysing and visualizing the data
- Coordination of cyber-infrastructure development for the NOAA Coastal and Ocean Modeling Testbed, allowing modelers to upload data to a common interface for comparison among models and with observations.
- Coordination of coastal structure inventory generation, acquisition of license documents, and database development for Massachusetts Office of Coastal Zone Management Coastal Structures Mapping and Analysis project.
- Manager of the Great Lakes and Mid-Atlantic Regional Association Observing Systems Data Management and Communication initiatives. Coordinate back-end services architecture and ingestion of various meteorological and oceanographic model and observation data streams. Implement web-based portals to facilitate communication of data with project stakeholder and the public.
- Manager and developer of the NOAA Environmental Data Connector (EDC) an open source interface for facilitating connections to environmental data web services from a variety of common analysis software packages (ArcGIS, Matlab, R, Excel).
- Designed and managed the development and implementation of the NOAA AIS Data Handler. The AIS Data Handler was designed to help coastal managers better understand vessel traffic patterns by streamlining the acquisition, loading, filtering, display and analysis of AIS data.
- Managed the design, development, and implementation of the American Samoa Landuse Planning Web Portal, which allows users assess potential permitting violations easily. The portal was designed to be configurable and extensible and allows system administrators to easily make updates or implement additional portals.
- Design and implementation of custom ArcGIS tools for coastal flooding, site screening, ecological impacts assessment, , pipeline spill management, bathymetry data integration, and water quality modeling.
- Extensive GIS data acquisition and integration at regional, national, and international scales in support of a variety of modeling projects including inputs for water quality, coastal inundation, pipeline spill, and site assessment models. Designed custom bathymetry blending system, integrating GIS and MATLAB, to merge disparate bathymetry datasets into a single high-resolution dataset with consistent horizontal and vertical datums and units

Fulbright Fellowship – Republic of Mauritius

2003

- Implemented time-series analysis and GIS/systems modeling to assess physical and economic impacts of sea level rise and storm surge flooding.
- Equated physical and economic stresses with environmental and social impacts.
- Implemented extensive field program to survey and map coastal land-use and coastal protection structures. Compiled nationwide GIS database of shore-types, land-uses, and coastal protection structures.
- Designed feasible adaptation strategies and performed cost-benefit analyses

Tufts University – Research Assistant

2001 - 2003

- Developed GIS model of sea level rise impacts for the coastal zone of metro Boston.
- Utilized historic data to predict future flooding scenarios using bootstrapping techniques and Monte Carlo simulation.
- Developed simulation model of storm-surge flooding impacts under various adaptation scenarios.



- Evaluated structural and non-structural methods of coastal protection.
- Employed regression techniques to model long-term erosion rates.

Publications:

Howlett, E., D.P. Snowden, R.P. Signell, D. Wilson, and K.Knee, 2014. Data Management Update for the Integrated Ocean Observing System, Proceedings of MTS Oceans, Halifax, Canada. September, 2014.

Kirshen, P. and K. Knee and M. Ruth, 2008. Climate change and coastal flooding in Metro Boston: impacts and adaptation strategies, Climatic Change, Vol. 90, No. 4, October 2008, p. 453-473.

Knee, K. and E. Comerma, 2008. The COASTMAP Inundation Module: A Framework for Modeling Coastal Flooding, Proceedings of the Hydrotechnique Society of France New Approaches of Coastal Risks Conference, Paris, France. January 30-31, 2008.

Knee, K. and C. Galagan, 2008. Coastal risk analysis: combined effects of storm surge and rainfall, Proceedings of the 5th American Water Resources Association Conference on GIS and Water Resources, San Mateo, CA. March 17-19, 2008.

Knee, K., S. Sontag, K. Wilcox, E. Yassuda, G. Clauzet, P. Anid, H. Mahaba, and E. Howlett, 2012. Development and Implementation of an Operational Forecasting System for the Dubai Coastal Zone, Proceedings of MTS Oceans, Hampton Roads, Virginia. September, 2012.

Yohe, G., Knee, K. and Kirshen, P., "On the Economics of Coastal Adaptation Solutions in an Uncertain World", Climatic Change, 2011.