



The Digital Transformation

Exploring Data Science Careers in the Water Sector

By Miriam Hacker, PhD, The Water Research Foundation; Prabhushankar Chandrasekeran, PE, Arcadis; Rylee Rubino, EIT, Metro Water Recovery; and Shirley Ben-Dak, PMP, The Smart Water Networks Forum (SWAN Forum)

The use of advanced technologies and data to improve decision-making is the basis of the emerging topic area, Intelligent Water Systems (Nakamura et al. 2017). The Water Environment Federation (WEF) and The Water Research Foundation (WRF) partnered together with water professionals to identify a variety of aspects needed for a shift to intelligent water systems (Nakamura et al. 2017, p. 5–6):

- Data prioritization
- Data governance
- Data capture
- Data validation
- Data processing, storage and access
- Data integration
- Data analytics
- Business intelligence and business support
- Knowledge sharing
- Performance reporting and visualization

These aspects are important because they show the emerging skillsets required for the water sector to fully realize this digital transformation. Research is being done to better understand how utilities are integrating artificial intelligence and machine learning into their day-to-day operations



advancing the science of water®

(WRF 5189), as well as understanding what this means for existing water professionals and potentially interested candidates that have the necessary data science skills (WRF 5178). A recent webcast highlighted this ongoing discussion through the experience of three water professionals from the private, public, and non-profit sector. This article summarizes key take-aways from this panel session for individuals with an interest in data science careers in the water sector.



Data Science Careers in the Water Sector

There are a number of definitions and interpretations for what data science embodies, but generally speaking, it is “an interdisciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured and unstructured data” (Crabtree and Nehme 2023.)

What Is ‘Data Science’ from the Water Perspective?

Rylee Rubino, a Data Analytics Engineer with Metro Water Recovery, started in conventional engineering roles before exploring data visualization projects through the utility; this led to a dedicated position in data analytics. For Rubino, data science takes two major roles, including visualizations and calculation management. **“Visualizations are very important for operations and for the executive leadership team for seeing trends in the data and for understanding how to propose budgets in the future. Calc management is also super important to ensure that calculations in the utility’s databases are performing correctly and not stalling out,”** shares Rubino.

Prabhu Chandrasekeran was also introduced to data science in the water sector through consulting with utilities in the DC area to assist them with their consent decree. As North America’s VP Intelligent Water National Practice Leader for Arcadis and Principal Investigator for two of WRF’s



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Rylee Rubino, Data Analytics Engineer, Metro Water Recovery

major projects with intelligent water systems (WRF 5178, 5189), Chandrasekeran shared his journey through starting with building Excel models and expanding to better understand other programs and platforms that can handle large amounts of information. As he put it, data science is “using data, automation to create more efficient operations. How to improve decision-making in a quicker faster way? That can come from data.”

Shirley Ben-Dak, Senior Advisor for the Smart Water Networks Forum (SWAN Forum), brings a unique perspective, coming from outside of engineering and representing the nonprofit sector. Her experience started in the broader public sector and working in international development; she was drawn to the ability of data-driven decision-making. Water presents an opportunity to be involved with an impact-driven mission, and data still plays a major role. “Looking at data in how SWAN functions as an organization,” Ben-Dak explains, “is being able to better understand our metrics or key performance indicators (KPIs). What’s driving performance on the marketing side of things and business development? How to make sure our members really see that value that we’re providing them?”



Career Pathways into Data Science in Water

A common misconception is that you need to be an engineer to work in the water sector. While this might be true for more technical roles on the design and operations side of the industry, there are also many opportunities across organizations that benefit from other disciplines. Rather than thinking about one career path to water, the panelists provided an alternative way to see the sector: You have domain knowledge, which might be a specific discipline or field of study, but then you also have fundamental skillsets in data science. An individual might start on one end of either side of this bridge, but there’s the possibility to crossover to the other; positions that use data science draw from both sides of this bridge. Figure 1



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Prabhu Chandrasekeran,
VP Intelligent Water National
Practice Leader,
Arcadis

shows examples of different domains of knowledge where data science can be applied.

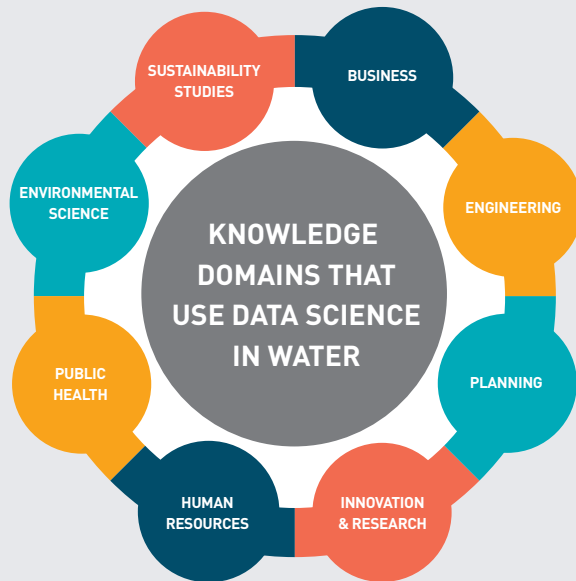


Figure 1. Examples of domains of knowledge across the water sector where data science is applicable.

A job title might not explicitly incorporate the term 'data science' in it, but that doesn't mean that it's not a possibility. Panelists and participants shared examples of key terms that one can look for when searching for positions. For example, if you are looking for data-related positions, you might want to look for terms like 'data analysis,' 'data transformation,' or 'data visualization.' In other cases, it could be helpful to look for positions that specify the programming languages or platforms you have experience with using.

Beyond domain knowledge, translational skillsets are another key aspect to data science careers. These skills include character traits like problem solving, curiosity, open-mindedness to learn different things, ability to work with other people, and ability to pick up new information quickly.

Insights from Water Professionals

Several questions came in during the panel discussion, and the major ones are answered below.

Data Science Roles and Skills

What work experience is needed for a data scientist in the water sector?

There are a variety of pathways to working in the water sector and different types of experience that can help land a role. In some cases, for those with a background in engineering or technical domains of knowledge, it might look like starting in an entry role then finding lateral movement within an organization. Internships and fellowships can be a great way to explore

Rather than thinking of a single career path to water, an alternative approach is to attain domain knowledge in a specific discipline or field and also acquire a fundamental skillset in data science.



various topics and areas and are offered across private companies and public sectors, including the federal government (e.g., ORISE fellowships or AAAS fellowship programs, which are available within various federal agencies).

Is formal programming experience necessary for transitioning from engineering to data science in the water sector?

It depends on the role you are looking at, but here some common skill-sets that are used include: Microsoft Excel, Microsoft SQL, programming languages like R or Python, Power BI, and ArcGIS.

What are common job titles explicitly for data science in the water sector?

Examples include data scientist, data engineer, data analyst, data architect, management analyst, systems analyst, big data engineer, and GIS analyst.

Is a Professional Engineer (PE) certification necessary for transitioning to a data engineer role?

Not necessarily. If you are looking to work in a larger role in an organization, like a utility, you might need to have the engineering background. However, there are other opportunities, like in the business side of operations.

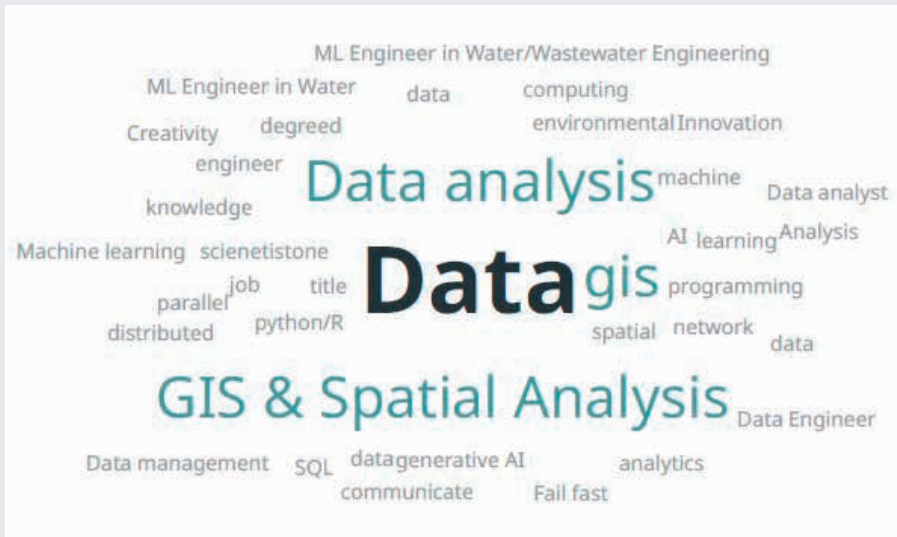


Figure 2. Examples of key search terms that panel participants use when looking for data science roles in the water sector.

Transitioning to Data Science

What skills and certifications are needed to move from water engineering to data science in water?

There isn't necessarily a specific certification that would help for transitioning to data science, but having some portfolio of work or experience in working with data science can help with moving into a more data-centric role. Conversely, you might already have the data science skills, but it might be helpful to get a certification in environmental science or a technical domain of knowledge to have better context for the water sector.

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What are some ways to get started or strengthen your data science skills?

- Take a course or certification program. It might be worth exploring platforms like [Coursera](#).
- Free online courses for programming languages or data science; a quick Google search can provide you with a number of options to explore.
- In some cases, it might make sense to complete a formal degree in data science, however, the panelists expressed that this isn't necessary for transitioning, and it really has to be a personal decision.

Are there mentoring schemes or support available for water data science professionals?

One option is the [Rising Smart Water Professionals \(RiSWP\)](#) offered through the Smart Water Networks Forum (SWAN Forum). Other informal opportunities for mentorship might look like joining a water association like American Water Works Association (AWWA), the Water Environment



Federation (WEF), or the International Water Association (IWA). All these associations have subgroups focused on specific topics like intelligent water systems or digital transformation. Involvement can help build your experience in the topic and help connect you with other like-minded individuals that can provide informal mentorship. Connections play a large role in any sector. For people who are new to data science and/or the water sector, one indirect way to get more involved might be to follow or connect with people on LinkedIn who have roles or produce content similar to your interests.

Where Can People Look for Data Science Jobs?

- [Work for Water](#), co-hosted by AWWA and WEF
- [Josh's Water Jobs](#)
- [Water Tech Jobs](#) by Imagine H2O

RELATED RESOURCES

WEBCAST: Exploring Data Science Careers in the Water Sector

Preparing the Water Sector to Embrace Technology: Skillsets and Enterprise Management Approaches for the Digital Age (5178)

PI: Prabhu Chandrasekeran, Arcadis

Quantifying the Impact of Artificial Intelligence/Machine Learning-Based Approaches to Utility Performance (5189)

PI: Prabhu Chandrasekeran, Arcadis



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Ways to Stay Engaged with Intelligent Water Systems Content

- 1 Stay up to date on research related to [Intelligent Water Systems](#) at WRF.
- 2 Get involved with [Rising Smart Water Professionals](#) (RiSWP) through the Smart Water Network (SWAN) Forum.
- 3 Join the [Intelligent Water Technology Community](#) through the Water Environment Federation (WEF).
- 4 Participate in the [Intelligent Water Systems Challenge](#), co-hosted annually by WRF and WEF.
- 5 Explore [America's Datahub Consortium](#), co-sponsored by the National Science Foundation (NSF) and National Center for Science and Engineering Statistics (NCSES).

REFERENCES & RESOURCES

Nakamura, B., C. Williams, and E. Belia. 2017. "Intelligent Water Systems: The Path to a Smart Utility," Water Environment Federation, WSEC-2016-WP-002, 2017.

Crabtree, M. and A. Nehme. 2023. "What is Data Science? Definition, Examples, Tools & More." Accessed: Sep. 05, 2024.

MEET THE PANELISTS



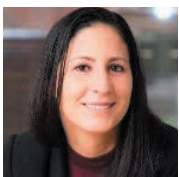
Rylee Rubino, EIT, Metro Water Recovery

Rylee is a data analytics engineer at Metro Water Recovery in Denver, CO. At Metro, Rylee creates visualizations of process data to inform decision making, and creates tools for engineering calculations, data transformation, and data management. Rylee has been with Metro for about 18 months, starting as a temporary engineer in applied research, and then moving to her current roll in data analytics. Prior to joining Metro, Rylee spent five years as a design engineer for a manufacturer in the stormwater sector.



Prabhushankar Chandrasekeran, PE, Arcadis

Prabhu is the Intelligent Water National Practice Leader for Arcadis North America. Prabhu brings 20 years of engineering and consulting experience in water industry and specializing in utility management consulting for digital transformation. His background includes digital maturity assessment, digital strategy and planning, business process optimization, strategic planning, organizational effectiveness, smart water networks, Sensors and Industrial Internet of Things (IIoT) application, situational awareness, operations optimization.



Shirley Ben-Dak, PMP, Smart Water Networks Forum (SWAN Forum)

Shirley serves as the Senior Advisor of the SWAN Forum, the leading global hub for the smart water sector. Since 2016, she has helped lead innovation and strategic activities, supporting SWAN's regional and international expansion. Shirley has developed five-year strategic plans, established new smart water frameworks, curated unique workshops and programming elements, led global innovation sessions, and managed strategic research projects. A certified PMP, she serves as the CEO and Founder of Bird Eye Consulting, an impact-driven project management firm working with public, private and non-profit clients across water, smart cities, digital transformation, and sustainability.