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Groundwater models can be powerful tools for managing groundwater resources, optimizing their use, mitigating risks, and provide decision-makers with forecasts of different management actions. To fulfill this purpose, it is generally advocated that a model should quantify the uncertainty associated with the outcomes it aims to assess, the rationale being that decisions made without an understanding of the uncertainty risk causing more harm than good. We review the use of groundwater models for characterization and decision support in Sweden between 2010 and 2023, with our analysis reflecting key academic advances and the current state-of-the-art in the field. To establish a link between education and practical outcome, we also evaluate the syllabi of water-related STEM courses in Swedish higher education institutions to determine the presence and scope of groundwater modelling education. Our findings highlight a significant gap between academic advancements in groundwater modelling and their practical application in Sweden's industry over two decades. It also reveals that uncertainty quantification is rarely undertaken, and that groundwater modelling remain a low priority in higher education. Based on these findings, we propose recommendations for decision-makers, the industrial sector, and educational institutions. These recommendations include adopting state-of-the-art practices through a blended learning approach, utilizing both industry-standard, open-source modelling and learning software.