Water Resources Research

EDITORIAL

10.1029/2023WR036728

Key Points:

- Opening a continuing special collection for translational research (TR) papers in the context of Water Resources Research (WRR)
- Explaining the multi-faceted nature of TR and Initiating a process to encourage and include such papers in WRR
- Aiming to facilitate a community within hydrology and water science that seeks to provide actionable knowledge for societal benefit

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Citation:

Islam, S., Illangasekare, T. H., Selker, J., & Destouni, G. (2023). Looking for theory-practice synthesis for actionable outcomes: A Continuing Special Collection for Translational Water Research. *Water Resources Research*, *59*, e2023WR036728. https://doi.org/10.1029/2023WR036728

Received 17 NOV 2023
Accepted 28 NOV 2023

Looking for Theory-Practice Synthesis for Actionable Outcomes: A Continuing Special Collection for Translational Water Research

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Abstract Translational research (TR) represents a promising systematic process for going from scientific discoveries to practical applications. Through conversations with academics, practitioners, decision-makers and users, there has emerged a broad level of water science community support for including TR in Water Resources Research (WRR) publications. Based on this, we now open a continuing special collection of TR papers in WRR. The aim is to facilitate a community within hydrology and water science that seeks to provide actionable knowledge for societal benefit across disciplines, scales and contexts, with a focus on water as a key societal resource or a risk (e.g., of floods, droughts, or as pollutant carrier). This Editorial discusses what the multi-faceted nature of TR may include in the context of WRR, why it is important to encourage TR papers in WRR, and how the opening of a continuing special collection of translational water research papers initiates a process to include such articles in the journal.

1. Introduction

There is growing recognition of the need for a systematic process of translating scientific discoveries to practical applications. While translational research (TR) initially emerged in the context of healthcare to bridge the gap between basic research and clinical practice, its principles have been extended to other areas to accelerate the translation of scientific knowledge into practical applications (Eisenhauer et al., 2021; Galli et al., 2022; Highmore et al., 2022; Passioura, 2020; Smith et al., 2021). Key steps in this process vary depending on specific discipline and context, but generally include the following: (a) discovery and knowledge creation, (b) assessment of competing frameworks, theories, and methods, (c) translation planning, (d) conversations between producers and users of knowledge, (e) communication and contextualization, (f) implementation and evaluation, and (g) adaptive learning.

TR has been hailed as a promising pursuit to make scientific discoveries useful for promoting societal good. In its ideal form, TR is the answer to achieving integrative understanding and action amid fragmentation in the theory-practice-policy-politics chain. In the context of health care, TR involves the conversion of knowledge gained from theoretical research into tangible outcomes that improve human health and well-being. In agriculture, TR is applied to facilitate the translation of scientific advancements in crop genetics, pest management, soil science, and sustainable farming practices into practical solutions for farmers. In education, TR focuses on translating research-based knowledge and evidence into effective teaching practices and policies. Educationally focused TR aims to bridge the gap between educational research and its practical implementation in classrooms to improve student outcomes, inform curriculum development, and enhance educational strategies. The fundamental principle of bridging the gap between scientific knowledge and practical application promoted by TR can be applied to various domains to drive innovation, inform decision-making, and create positive societal impact. Our conversations with a diverse group of academics, practitioners, decision-makers, and users from the water community suggest a broad level of support for including TR in water resources research (WRR) publications. Based on this, we now open a continuing special collection of TR papers in WRR, with the aim to facilitate a community within hydrology and water science that seeks to provide actionable new knowledge for societal benefit across disciplines, scales and contexts, with focus on water as a key societal resource or a risk (e.g., associated with floods or droughts, or as carrier of environmental pollutants).

Despite its widespread support as an idea, there has yet to be a consensus on what constitutes TR within the broader context of water as a resource or a risk, and in the specific context of how publication of TR contributions

can be implemented in WRR. This Editorial discusses what the multi-faceted nature of TR may include in the context of water resources research, why it is important to encourage TR types of articles in WRR, and how we can initiate the process of including TR articles in WRR.

2. Many Faces of TR in Water as an Object and Water as a Resource or a Risk

A scrutiny of the history and evolution of hydrology—broadly defined as the study of water—reveals a dichotomy. This dichotomy has been discussed as a puzzle (question-driven) science and a problem (solution-driven) science of hydrology and practice of engineering hydrology. Such a binary characterization has created tension in the broader water community. To bridge the pitfalls of such dichotomous representations, we focus here on discussing "water as an object" and "water as a resource or risk".

Water as an object is autonomous. It can be studied with the highest level of rigor applicable to natural and engineering science methods from molecular to global scales. As an object, water in its various manifestations and their scales can be studied with well-posed hypotheses, careful observations, data, and experiments to arrive at reproducible and replicable results that are place or context-independent. Water as a resource or a source of hazard and risk, on the other hand, is not autonomous. With this focus, water connects socio-economic, cultural, and political factors. Understanding and managing water as a key societal resource or a risk depends heavily on the specific context to which the analysis is applied. Consequently, it is not enough for TR articles to merely suggest that context matters; they need to show how context matters and what lessons can be learned from a particular context that can be transferred to some other (not necessarily all possible) contexts.

There is awareness that science alone will not solve major water problems of our time, nor will policy and practice operating in a vacuum without inputs from science solve these problems. Based on our conversations with several members of the water community—from physical science to social science as well as from academics to practitioners, TR articles need to advance actionable water knowledge by bridging the dichotomy of analyzing water as either a science puzzle (water as an object) or a practical problem (water as a resource or risk). The papers focusing on the former may refer to practical problems as a research motivation, but seldom take all the steps needed to provide actionable solution pathways for the problems. The TR papers need to focus on the solution pathways based on new insights gained and concepts and methods developed by the research on water as a science puzzle.

A key goal of opening a continuing special collection of TR papers in WRR is to facilitate a community within hydrology and water science that specifically seeks to provide actionable knowledge across disciplines, scales, and contexts, focusing on water as a resource or a risk for societal benefit. These papers will synthesize explicit (scientific) and tacit (contextual) water information and knowledge that is reliable, relevant, and actionable. Within the context of WRR, TR papers may, for example, address key challenges of how to: (a) integrate knowledge from various science and practice domains in framing, formulating and answering the TR questions; and (b) advance actionable knowledge by involving relevant users and producers of knowledge in proposing and (re) solving complex water problems for beneficial societal impact.

3. Topical Areas

We do not want to pre-define specific topics for the continuing special collection of TR papers in WRR. We expect these papers to cover a diversity of topics within the spectrum of translational water research. As illustrative examples, TR papers may address questions like: How can current limitations in forecasting lead time of precipitation (3–5 days) be addressed to develop a flood forecasting platform needed for effective emergency response (10–15 days) that can minimize impacts of floods so that natural hazard does not become a societal disaster? How can we address the perennial "small n problems" of water case studies to suggest and defend what aspects of a "case study" are contextually relevant and what aspects are more generalizable and why? How can we systematically integrate quantitative and qualitative methods to study water issues and capture the contextual knowledge of water management for actionable outcomes? The latter questions recognize that knowledge generated only from specific case studies may not be easily generalized or transferred to other contexts, and reflect a growing realization that traditional quantitative methods alone are not appropriate to address the dynamics of many coupled natural and human systems involving water as we cannot always quantify the societal variables with exact mathematical relationships.

4. Concluding Remarks

Water Resources Research publishes research papers on hydrology, water resources, and the social sciences of water that provide a broad understanding of the role of water in Earth's system with novel concepts, methods, or insights. The TR papers are expected to focus on emphasizing and documenting novel TR approaches to practical applications regarding water as a key societal resource or a risk. The TR papers also need to provide evidence for why and what aspects of their findings matter, and how and why they matter beyond a single place or context of application. The TR paper type can be any of the following: research articles, commentaries, technical reports with a focus on methods or data, or reviews, with content and length requirements as described in the Author Resources for AGU Publications (https://www.agu.org/Publish-with-AGU/Publish#1).

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