

Book Review

Selin, Henrik, and Noelle Eckley Selin. 2020. *Mercury Stories: Understanding Sustainability Through a Volatile Element*. Cambridge, MA: MIT Press.

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In *Mercury Stories*, Henrik Selin and Noelle Eckley Selin introduce and apply their original systems theory, a human–technical–environmental (HTE) framework coupled with an illustrative matrix approach, to an issue of sustainability: the mercury system. The underlying idea of the system perspective is that “a system is a connection of individual components that together produce results unobtainable by the components alone” (19). It is important to examine social, technological, and environmental factors and their interactions together to truly understand the sustainability system. This book urges social and natural scientists and engineers to broaden analytical scopes in their own fields, while analytically and empirically connecting with the field of sustainability science.

The authors frame four research questions: What are the main components of systems relevant to sustainability? In what ways do the components of these systems interact? How can actors intervene in these systems to change their effects? What insights can be drawn from analyzing these systems? In addressing these questions, they apply the HTE framework to different aspects of the mercury issue: pollution and management, human health, the atmosphere, products and processes, artisanal small-scale gold mining, and mercury.

They first identify and classify five system components of sustainability: material (human, technical, and environmental components) and nonmaterial (institutional and knowledge components). Then, via their matrix, they identify how the three material components interact with each other within the context of the two nonmaterial components, which provides multiple interaction pathways. Interaction pathways are documented by remarkably in-depth studies on mercury, which incorporate evidence from history and social and environmental sciences. For example, in commerce, through usage in products, industrial processes, and artisanal small-scale gold mining, mercury is emitted and released into the environment (an interaction between technical and environmental components). Under specific ecosystem conditions, discharged mercury is converted to methylmercury, which is much more toxic than elemental mercury and adversely affects living organisms, including humans (an interaction between environmental components).

Third, the authors identify interventions targeted toward influencing respective system interactions across components. These are performed by multiple actors at various scales. At the international level, the Minamata Convention on Mercury, a multilateral environmental agreement, specifies a set of legal mandates that cover the entire life cycle of mercury. It addresses almost all aspects of the interaction pathways identified in their empirical analysis and is designed to fit both the socioeconomic and environmental dimensions of the mercury issue. At another level, national and local governments, for example, adopt laws and regulations to protect workers from mercury exposure and regulate mercury use in products and processes. Additionally, industries deploy pollution-control devices or design mercury-free products. Furthermore, international nonstate standard-setting bodies formulate rules about mercury usage for certification.

The empirical assessments illustrate that most pathways involve interactions among all three material components, although they vary in their scope (the number of interactions), complexity (e.g., linear, multifactor causality, or feedback), and temporal and spatial scales. Accordingly, the authors maintain that the system approach allows better sustainability analysis because it can better account for dynamics in an integrated way, capturing system-wide variability and changes over temporal and spatial scales. From a governance perspective, polycentric governance structures are more appropriate than traditional top-down governance because the former can concurrently address different aspects of complex issues in separate places.

Given the richness and comprehensiveness of this book, it is difficult to identify weaknesses. Nonetheless, one limitation is a scarce discussion on how scholars can accommodate interdisciplinary perspectives in their own fields, especially with a gap in analytical focus between the two. Social scientists may face this gap in treating institutional components, defined as “social structures outlining rules, norms, and shared expectations that define acceptable or legitimate behavior” (22). In the HTE framework, institutional components serve merely as a context in which technological, environmental, and human components interact. However, from the social scientist’s perspective, institutional components themselves interact with other components: political and economic institutions embedded in a society shape technological progress and human behaviors and even influence interventions. Political scientists typically ask how institutions shape human behavior by providing incentives through micro-level analytical lenses. For instance, it is likely that various economic institutions (e.g., patent law or government subsidies) helped technological development of mercury alternatives in industrialized countries, which facilitated the negotiation of the Minamata Convention. Likewise, political institutions empowering civil society organizations may have promoted the rise of social movement against mercury pollution and accelerated mercury regulations at both national and local levels. The macro-oriented HTE framework, which marginalizes the role of institutions, may prevent political scientists from

delivering a sophisticated analysis of these institutions. This may leave important institutional aspects of the sustainability system unexplored. How can scholars overcome this dilemma? Can they modify the HTE framework by bringing institutional components into its center? More discussion on these questions will guide scholars studying sustainability systems on how to bridge different fields in practice.

This innovative work unquestionably sheds new light on a wide range of sustainability studies, including studies on environmental politics, by illuminating the importance of an interdisciplinary approach through in-depth and empirically grounded analysis of the mercury issue.