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Introduction

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This issue of *Maine Policy Review* is devoted to the Sustainability Solutions Initiative (SSI). This endeavor, funded by the National Science Foundation, is a unique large-scale effort that brings together faculty from campuses throughout the state to work with stakeholders on sustainability issues through the lens of sustainability science. Sustainability is key to Maine's future. Sustainability science aims to balance ecological, economic, social, and cultural needs to preserve the planet for future generations. At its core, sustainability science is about aligning research with the needs of communities to ensure that science can inform decision making and lead to more sustainable practices.

The depth of resources across Maine's campuses for addressing these issues is great. For example, more than one-third of the faculty at the University of Maine is involved in research related to the environment and sustainability, and many of the faculty at campuses throughout the state are focusing their efforts on sustainability. In the past, the efforts have too often been scattered and disconnected, but SSI is working to change this, at the confluence of ecological, social, and economic science.

This initiative is a unique and important experiment in many ways. Few other states have brought all of their campuses together, and few states have made bringing stakeholders and researchers together a centerpiece of research. It is also highly unusual for disciplines to work together on common problems, or for people working on different problems to look for the shared underlying themes. Moreover, university faculty are used to examining problems in isolation from citizens and policymakers rather than on searching for solutions and developing policies together with citizens and policymakers.

SSI is also very much focused on place. Each investigation occurs at a certain place: in Fort Kent or on the shores of the Belgrade Lakes; the tidal zones of Washington County or the verdant forests near Unity College. Although work must be situated in a context, findings and solutions must also be generalizable to the state, the nation, and internationally. Articles in this issue address how to extend insights more generally without losing the deeply placed-based nature of the analysis and findings, and how these generalizations might allow us to predict future landscape change or conditions. SSI emphasizes scaling up: How can the lessons learned in individual settings be brought to larger arenas? If certain findings emerge in individual municipalities, how can they be useful for counties or the entire state?

As the titles of the articles suggest, SSI is built around projects that focus broadly on issues of water, forestry, and climate and energy. Individual projects are the basic building blocks: What can be learned from individual tidal power projects in easternmost Maine? What are the implications if individual rural areas in northernmost Maine move to greater reliance on biofuels? If the emerald ash borer will decimate trees essential to Wabanaki basketmaking, what steps should be taken?

Yet, SSI is not just about individual projects, it is also about bringing the building blocks together to understand cross-cutting issues. The paramount challenges involve finding ways (1) to engage stakeholders throughout the process of developing and continually reevaluating solutions; and (2) developing common languages and shared methods for conducting this work. Many of the articles in the issue highlight the joint challenges and rewards of this kind of research. For example, what can we learn about sustainability by comparing the approaches to the woolly agelgid and emerald ash borer insect pests (Ranco, Arnett et al.)? What can we learn by comparing energy approaches from the biofuels (Johnston and Cardenas) and tidal power (Johnson and Zydlewski) projects? What can we learn by analyzing lessons from projects in forestry versus projects on urbanization (Waring)? SSI is about finding the commonalities. The water article (Peckenham et al.) reflects this search for commonalities in its presentation of a guided tour of the commonalities of various water-related projects.

SSI is also a complex endeavor with many goals. Change is being pursued on many different fronts. Readers might well be daunted by the range of efforts

covered in this issue. To make it easier to sort through and make sense of the wealth of SSI activities, goals, and endeavors, we have introduced an innovative "top 10" list format. These lists represent the actual input and insights of students, faculty, and stakeholders who are conducting this work. Throughout the issue, you will see seven top-10 lists such as "Top 10 Ways That SSI Is Not Science as Usual," "Top 10 Ways SSI Will Make a Difference for Maine in the Policy Arena," and "Top 10 Ways SSI Will Make a Difference for Workforce Development." Our hope is that readers will find the lists to be useful guides and will share them with others. The lists may be particularly helpful for stakeholders and policymakers as they look to bring together multiple strategies and solutions from a range of disciplines.

Students are central to SSI. Throughout this issue we have included "student spotlights" to illustrate student work and involvement. Each spotlight features a student from one of the SSI campuses. The students represent many different disciplines, many different programs, and many different institutions of higher education in Maine. Students at all levels (high school, undergraduate, and graduate) are involved. Some are midcareer professionals completing their Ph.D. programs. Others are in their first years as undergraduates. These accounts highlight SSI's emphasis on mentoring and empowering Maine's next generation and on workforce development. Many of the students grew up in Maine and hope to use what they are learning to make a difference in the state.

Information use is also key to this effort. SSI is working to streamline data use and access among Maine's higher education institutions and communities. The question of how stakeholders, partnerships, and others collect, manage, and use information has become a central focus. For example, an important strand of work concerns the development and use of decision-support tools. One article (Waring's "Wicked Tools") focuses specifically on modeling tools to predict the causes and consequences of specific land-, water-, and energy-use decisions. The development of these decision-support tools will be critical to resource managers and policymakers when they face difficult decisions for stewarding Maine's environment, workforce, economy, and way of life. Concerns with information issues emerge in other articles. The articles on history (Lichter and Ames; Fleming and Love), for example, reflect the importance of drawing on the diverse perspectives of groups that have had varying experiences with a particular place, across wide scales of space and cultural memory. By finding inventive ways to tap views of a place across generations, it becomes possible to extend the length of time considered for sustainability issues.

SSI is focused on Maine. The intent is to find new ways to do research that will be helpful to Maine's future: preparing a workforce, solving interrelated sustainability problems, and finding robust solutions. This cutting-edge approach to research also puts Maine on the national and international map. The Margaret Chase Smith Essay by Senator George Mitchell captures the importance of this work to Maine, as seen through the lens of one of Maine's native sons and an iconic international figure in politics and peace-brokering/conflict mediation. Also, as noted by international sustainability leader Robert Kates in his interview, what is learned in Maine through SSI has international significance and implications well beyond Maine. Places around the world are struggling with these same interconnected problems, yet few of them have developed such an integrated and aggressive place-based approach to trying to address these issues. SSI's strategies are producing widespread interest throughout the world, and the lessons learned here are being carefully scrutinized for possible application elsewhere.

This special issue of *Maine Policy Review* is designed with policymakers as a key audience in mind. What is reported here is intended to assist policymakers with the challenging decisions they face. Our goal is to show how scientific information can make it possible to

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address sustainability questions in integrated, transformative ways. Questions addressed here include:

- What workforce-development issues are raised by sustainability questions (Renault et al.)?
- If Maine is to safeguard its environment while pursuing workforce development, what will be the role of science, technology, engineering and math (STEM) education (Keller)?
- How do sustainability issues link to economic development (Noblet et al.)?
- How do we foster continual dialogue, communication, and information transfer between researchers and policymakers (Hall et al.)?

Ultimately, our intent is to show how university-based research can be increasingly helpful to policymakers by recognizing potentially conflicting research goals and focusing on practical solutions.

Finally, taken together, the articles in this issue offer insights into the many lessons that SSI participants are learning about how to incorporate insights from different disciplines and collaborate across institutions, how to bring historical insights into scientific endeavors, and how to involve stakeholders in the co-production of knowledge and engage students in these urgent problems. Although SSI focuses on Maine, we hope that the insights gained here will be helpful elsewhere.

Linda Silka directs the Margaret Chase Smith Policy Center and is a professor in the University of Maine School of Economics. Her research focuses on building partnerships among diverse groups. In the Sustainability Solutions Initiative, Silka co-leads the knowledge-to-action work, assists in developing grant-writing capacity, and teaches graduate courses in stakeholder-researcher partnerships.

Bridie McGreavy is a doctoral student in the Department of Communication and Journalism and a research fellow in the Sustainability Solutions Initiative at the University of Maine. As a member of SSI's Knowledge-to-Action Collaborative, her research focuses on communication and collaboration within sustainability science.

Brittany Cline is a Ph.D. student in the Department of Wildlife Ecology at the University of Maine and a graduate fellow with the Sustainability Solutions Initiative (SSI). She is a member of an interdisciplinary research group investigating the fauna of vernal pools as a case study for protecting natural resources at municipal scales in Maine.

Laura Lindenfeld is an associate professor in the Department of Communication and Journalism and the Margaret Chase Smith Policy Center at the University of Maine. She co-leads the SSI Knowledge-to-Action Collaborative.

Top 10 Questions We Are Trying to Answer with SSI

How do people, landscapes, and technologies affect one another?

How do we balance ecological, economic, and social needs to support Maine's future?

How can we manage the natural environment for human benefit in ways that leave ample resources for future generations?

What research do different types of decision makers need to address their pressing concerns, and can modeling and visualization be used as tools in planning for a more sustainable future?

How do we prepare our workforce with the skills to address sustainability issues and meet future STEM (science, technology, engineering, and math) industry demands?

How do we create better linkages between the production of knowledge and motivating action toward solutions?

In what ways does interdisciplinary, collaborative research improve decision making?

What strategies and structures encourage universities and colleges and communities to work together to develop short- and long-term solutions?

How do we transform a state's higher education network into a collaborative infrastructure and foster a culture of engaged research?

How can we reach a more comprehensive understanding of the interactions in social-ecological systems for making decisions while allowing for potential sources of scientific uncertainty?

"Top 10" lists provide a synthesis of common themes, methods, strategies and outcomes within SSI and reflect the collective input of more than 30 SSI faculty and students.