

LEADING LARGE TRANSDISCIPLINARY PROJECTS ADDRESSING SOCIAL-ECOLOGICAL SYSTEMS: *A Primer for Project Directors*



TABLE OF CONTENTS

INTRODUCTION TO THE PRIMER 3

1. QUALITIES AND SKILLS OF A HIGH FUNCTIONING DIRECTOR 5

2. MOLDING YOUR TEAM 11

3. CREATING A CULTURE OF COLLABORATION IN SOCIAL-ECOLOGICAL PROJECTS..... 17

4. ENABLING PARTICIPANT SUCCESS..... 28

5. SUPPORT FOR THE NEXT GENERATION OF RESEARCHERS..... 34

6. HIGH PERFORMANCE TEAMS 41

7. PROJECT DESIGN AND MANAGEMENT 46

8. PARTNERS AND STAKEHOLDER RELATIONSHIPS 54

9. INSTITUTIONAL RESOURCES AND SUPPORT 60

CONCLUSION 66

Eigenbrode, S. D., T. Martin, L. Wright Morton, J. Colletti, P. Goodwin, R. Gustafson, D. Hawthorne, A. Johnson, J. T. Klein, L. Mercado, S. Pearl, T. Richard, and M. Wolcott. 2017. Leading large transdisciplinary projects addressing social-ecological systems: A primer for project directors.

Edited by Emily Smudde.

<https://nifa.usda.gov/leading-transdisciplinary-projects>

Cover Photo, Credit: Barb McBreen

Front Row: Sanford Eigenbrode, University of Idaho; Tim Martin, University of Florida; Lois Wright Morton, Iowa State University.

Middle Row: Leida Mercado, The Tropical Agricultural Research and Higher Education Center, Turrialba Costa Rica; Stephanie Pearl, USDA-National Institute of Food and Agriculture (NIFA) and AAAS Fellow; Julie Thompson Klein, Wayne State University.

Top Row: Anna Johnson, Center for Rural Affairs; Peter Goodwin, University of Idaho; Rick Gustafson, University of Washington; David Hawthorn, University of Maryland and SESYNC; Michael Wolcott, Washington State University; Joe Colletti, Iowa State University; Michael Bowers, National Institute of Food and Agriculture (NIFA); Tom Richard, Pennsylvania State University.



Lois Wright Morton, Director of the USDA-NIFA sponsored Coordinated Agricultural Project, 'Sustainable Corn' welcomes farmers and their crop advisors to the project's Resilient Agriculture Conference. Credit: Lynn Laws

INTRODUCTION TO THE PRIMER

The Challenge Addressed

The imperative to address issues pertaining to large social-ecological systems (SES) through appropriately scaled, well integrated, transdisciplinary efforts is now widely recognized (NSF 2015). Biological, physical, social, and economic elements of these systems are intricately interrelated (Tilman et al. 2002) and scientific endeavors are expanding beyond traditional disciplinary sciences to encompass multi-disciplinary approaches to build new system-level knowledge. Funding agencies around the world are investing in very large coordinated projects to better understand the complexity and diversity of human-natural systems and the intended and unintended consequences of human actions. Prominent among these projects are the USDA National Institute of Food and Agriculture (NIFA)-sponsored Coordinated Agricultural Projects (CAP) addressing issues such as renewable fuel production, climate change and agriculture, and food security (<https://nifa.usda.gov/program/agriculture-and-food-research-initiative-afri>). Funding for a single CAP has ranged from \$4M to \$40M and a single project can have upwards of 100 investigators with many more technical support persons and students. For agricultural research, this scale of individual project is unprecedented. The NIFA CAP projects are not unique. Similar large-scale efforts include Engineering Research Centers and Science and Technologies Centers supported by the National Science Foundation (NSF), some of which target SES challenges. Other large SES projects with funding equivalents of multiple millions of U.S. dollars and dozens of investigators are underway with funding from USAID, the Swiss Program for Swiss Programme for Research on Global Issues for Development (<http://www.r4d.ch>), Norway (e.g. the Mesoamerican Agroenvironmental Program), and other public and private institutions.

- Large SES projects typically address *wicked problems*, i.e. those involving complex systems with incomplete or apparently contradictory knowledge, stakeholders with divergent positions, and large economic or social consequences. These projects often encompass management challenges associated with natural-resource-based provisioning of food, energy, shelter and other ecosystem services. Such problems require research and action that involve teams of physical, natural, and social scientists crossing disciplinary boundaries (interdisciplinary) and deeply engage stakeholders to define problems and find effective solutions, (i.e. transdisciplinary, Wickson et al. 2006). Successful efforts draw on specialized knowledge, interests, and skills of all participants. They are designed to be dynamic and responsive to changing conditions and they must integrate knowledge creation, education, and outreach.
- The challenges of interdisciplinary and transdisciplinary research and the methods and skills required are well recognized and have spawned a growing literature. Key references include the Oxford Handbook of Interdisciplinarity (Frodeman et al. 2017) and volumes published by the National Academy Press (2004, 2014). The field of “team science” has been formalized and supports coordinated scholarly and applied effort (Science of Team Science or SciTS, <http://www.scienceofteams.org>). This primer addresses three gaps in the SciTS literature pertaining specifically to directing very large SES projects. First, these projects present unique challenges because of the sheer number of participants, interactions, and activities that must be managed to achieve a large number of interrelated objectives. Second, the types of collaborations required simultaneously within the project can be diverse, including those that might be considered disciplinary, multi-disciplinary, interdisciplinary or transdisciplinary; and entail dynamic relationships which change throughout the project life cycle. Third, much of the literature on team science emphasizes principles over the operational issues, such as the routine activities, day-to-day decisions, and leadership responsibilities that confront directors of large SES projects. Approaches to these issues are often discovered “in the saddle” by project directors. The team science literature often is inadequate to prepare directors for the surprises and intensity of effort required to keep a team functioning smoothly and effectively. This primer deals with these gaps by drawing on the experience of its authors, successful directors of large SES projects.

Purpose, Genesis, and Structure of this Primer

This primer is intended to reduce the steepness of the learning curve for new directors of large SES projects and to provide insights and inspiration as directors seek to lead and enable their team to become high functioning. It is designed to complement the literature on interdisciplinary practice by providing pragmatic guidance concerning the details of leading a large project. The language and tone throughout is informal. We have often adopted the second person reflecting our intention to provide collegial and supportive advice from practicing directors to others. The primer is an outcome of a workshop held at and supported by the NSF-funded National Socio-Environmental Synthesis Center (SESYNC) at its headquarters in Annapolis, MD in June 2016. Twelve participants who were intimately involved in directing large SES projects at the time of the workshop identified over 112 common and unique aspects of directing large collaborative projects. Then participants rated each item on importance and grouped them into similarity piles which resulted in nine thematic areas. These themes form the framework of the primer, and are presented as sections:

1. Qualities and Skills of a High Functioning Director;
2. Molding the Team;
3. Creating a Culture of Collaboration in SES Projects;
4. Enabling Participant Success;
5. Support for a Next Generation of Researchers;
6. High Performance Teams;
7. Project Design and Management;
8. Partner and Stakeholder Relationships;
9. Institutional Resources and Support.

Each section includes principles and practical advice related to its theme and is organized using four phases of project life cycle: proposal development (*Proposal*); initiating the project (*Getting Started*); executing the project (*Performing*); completing the effort (*Finishing Strong*). A short list of *Take Away Messages* sums each section's key points. The primer concludes with a synopsis of the themes that occur repeatedly throughout the primer. References cited and links to additional resources are limited to those we consider most useful to you. Short biographies of the primer authors are provided, along with video clips which offer advice to other directors from our own experiences.

Using this Primer

- Read the primer systematically front to back or skip to sections that are most relevant to your own current needs. The advice here reflects the experiences and perspectives of many successful project directors; experience built on vision and high hopes, mistakes, false starts, and dead ends. Each project is unique, and authors acknowledge no one director has all the answers. The authors of this primer wish you much success and intend this primer as a useful, accessible, and pragmatic guide.



Launch meeting for Woody Invasive Weeds in East Africa, Nairobi Kenya. Credit: Anonymous

References Cited

- Tilman, D. K. G. Cassman, P. A. Matson, R. Naylor, and S. Polasky. 2002. Agricultural sustainability and intensive production practices. *Nature* 418:671-677.
- Frodeman, R., J.T. Klein, and R. Pacheco, editors. 2017. *The Oxford Handbook of Interdisciplinarity*, 2nd Ed. Oxford University Press, Oxford
- NSF 2015b. *America's Future: Environmental Research and Education for a Thriving Century. A Report by the NSF Advisory Committee for Environmental Research and Education.* 48 pp. Available at: www.nsf.gov/geo/ere/ereweb/advisory.cfm
- Wickson, F., A. L. Carew, and A. W. Russell. 2006. Transdisciplinary research: characteristics, quandaries and quality. *Futures* 38:1046-1059.
- National Academy of Sciences: Committee on Facilitating Interdisciplinary Research and the Committee on Science Engineering and Public Policy. 2005. *Facilitating interdisciplinary research.* The National Academies Press, Washington, DC.
- National Research Council of the National Academies. 2014. *Convergence: Facilitating transdisciplinary integration of life sciences, physical sciences, engineering, and beyond.* The National Academies Press, Washington, D.C.