

Research on Environmental and Natural Resources Policy



ISTPP has formed a series of multidisciplinary teams to pursue research on controversies surrounding the environment. Projects range from the examination of the impact of policy change on perceptions and use of the environment to the role of leadership in environmental debates. The goal of this group of scholars is to provide theory and data that will contribute to human and non-human use of the environment in mutually beneficial ways.

Current Projects

Utilization of Science-based Information on Climate Change in Decision Making and the Public Policy Process, Phase I

Funder: National Oceanic and Atmospheric Administration (NOAA)

Many unresolved issues linger with regard to the human dimensions of global climate change. Of particular interest is the National Research Council's recognition that there is a need to improve methods for decision making about global climate change, in part by improving our understanding of the role of institutions and their climate change policies at all levels.

This project seeks to develop a deeper understanding of how decision makers—climate change scientists, policy makers, and individual citizens—utilize science-based information on climate change. This focus is consistent with NOAA's mission goals of: (1) Understanding climate variability and change and enhancing the ability of society to plan and respond to these factors; and (2) Serving society's needs for weather and water information and its interest in seeing this information play an important role in decision making. To serve these needs effectively, accurate data are needed on the way science-based information is defined, framed, packaged, transmitted, received and used by these groups along with the many other factors that influence decision making in this complex area. This research will focus on these issues as well as an additional set of important questions—how climate change science is actually used by decision makers.

To more sharply focus the research, we will examine two substantive areas of decision making that are subject to climate change influences: public health and economic development. The strategy and methodologies that will be used are derived from an array of well-tested and established social science methods including large-scale surveys, elite/stakeholder interviews, as well as case studies and policy content analysis.

We are using a two-pronged strategy. One set of research activities will center around the development and implementation of a series of surveys: (1) a survey of climate change scientists; (2) a survey aimed at a representative sample of decision and policy-making stakeholders, such as national, state and local decision makers who have or may have to address climate change issues that could be informed by science-based information; (3) a survey of a representative, national sample of adult, U.S. citizens, with the objective to specify knowledge levels on climate change among the general public, the way the public understands the information it possesses, and the public's assessment of climate change risks for public health and economic development. The second, but related, set of research activities will be the development and implementation of a set of case studies that will allow a more detailed examination of how information is transmitted, interpreted and used in decision and policy making.

Expected outcomes of the research include: (1) specification of knowledge levels on climate change; (2) a deeper understanding of how scientists view the information needs of the public and decision makers and how such perceptions influence scientists' communication with these groups; (3) conceptual models of effective information transmission on climate variability; (4) recommendations for improving efforts to inform and educate the public on climate change and its implications for human response and adaptation.

The research team is led by Principal Investigator and ISTPP Director, Dr. Arnold Vedlitz and two Co-Principal Investigators, Dr. Eric Lindquist (ISTPP Associate Research Scientist/political science), and Dr. Letitia T. Alston (ISTPP Associate Director/sociology). Also on the project are Drs. B. Dan Wood, Professor, Department of Political Science; Dr. Gerald R. North, Distinguished Professor and Holder of the Harold J. Haynes Endowed Chair in Geosciences, Department of Atmospheric Sciences; Sam Zahran, ISTPP Post-Doctoral Research Scientist. Other research team members from the Institute include: Meg Patterson Rogers, Nell Frazer Lindquist, Brenda Chaloupka, and Doris Newton.

Current Projects (cont.)

Utilization of Science-based Information on Climate Change in Decision Making and the Public Policy Process, Phase 2

Funder: National Oceanic and Atmospheric Administration (NOAA)

Agencies such as NOAA recognize the importance of bridging the gap between the producers and users of scientific information, and considerable effort has been made to try to encourage this. Research has already contributed to a shift in the way in which agencies engage stakeholders and transmit climate information they consider critical to decision making.

Phase II builds upon ISTPP's project *Utilization of Science-based Information on Climate Change in Decision Making and the Public Policy Process, Phase 1*. It is exploring several aspects of this vital link between science and decision making. Recommendations from this research will focus on improving information transmission and education on climate change and its probable consequences for human response and adaptation. This project is Phase Two. It will extend our inquiry into how these perceptions and means for transmission of scientific information affect, and are affected by, the various stakeholders and actors in the national public policy process. This examination will explain how scientific information on climate variability and climate change (CV/CC) is received, processed and utilized by the major participants in the public policy process, including Congress, the Executive branch, scientific advisory groups, as well as interest groups and the subset of climate scientists who have access to this level and participate in the policy debate. To this mix of national actors and policy participants, we will also include public opinions toward CV/CC science and technical information in the US and from several other nations.

The broad research questions that will be addressed in this project are: 1) What role does scientific and technical information on climate variability and climate change (CV/CC) play in the national policy community organized to address decision-making in this issue area?; 2) How is CV/CC science and technical information utilized in the strategic definition of climate problems and solutions and how does CV/CC science and technical information influence the key decision nodes (points of influence) in the climate-related policy process?; and 3) What role does CV/CC science and technical information play compared to the other systems of factors that contribute to specific policy preferences in this policy area?

Four research tasks designed to accomplish these goals. Task 1 will be an identification and assessment of the climate variability and change (CV/CC) policy community. The policy network and flow of information will be mapped from existing websites. In addition, targeted interviews and evaluation of documents will also be done. Information from Task 1 will be used in the next two tasks to design surveys for a larger sample of policy community participants, including climate scientists who are members (Task 2), and the public (Task 3). Web and existing survey data will be examined for a sample of other countries. This extensive database on CV/CC information flow and its impact on decision making will be integrated and distilled for dissemination at a workshop for approximately 80 personnel from NOAA and other relevant agencies. Topics around which data will be integrated are the image and understanding of CV/CC among decision makers, the public and members of the policy community, 2) factors that inhibit attention to and use of climate science among these groups, 3) description of the flow of information through the policy process and identification of important transmission streams and nodes of influence, and 4) recommendations for improving information flow, understanding and use of science among all groups.

The research team is led by Principal Investigator and ISTPP Director and Professor in The Bush School, Dr. Arnold Vedlitz and two Co-Principal Investigators, Dr. Eric Lindquist (ISTPP Associate Research Scientist/political science), and Dr. Letitia T. Alston (ISTPP Associate Director/sociology). Also on the project are Drs. B. Dan Wood, Professor, Department of Political Science; Dr. Gerald R. North, Distinguished Professor and Holder of the Harold J. Haynes Endowed Chair in Geosciences, Department of Atmospheric Sciences; Sammy Zahran, ISTPP Post-Doctoral Research Scientist. Other research team members from the Institute include: Meg Patterson Rogers, Nell Frazer Lindquist, Brenda Chaloupka, and Doris Newton.

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Current Projects (cont.)

Climate Change, Drought and Policymaking in the U.S. Southern Region

Funder: National Oceanic and Atmospheric Administration (NOAA)

The availability of water to meet all the current and future needs for agriculture, industry, recreation, habitat preservation and human consumption is of great concern to scientists and policy makers. Increased demands on water resources from all categories of users and possible changes in climate that could increase drought are increasingly worrying scientists and policy makers.

Identifying and examining trends, improving predictions of the availability of water in the future and improving distribution of the use of water resources to maximize its benefits to all consumers is a huge task. Scientists and policy makers must work together to obtain the best scientific predictions of climate-related water resources, forecasting information must be communicated to stakeholders in useful and compelling ways, and policy makers must receive these predictions and use them to develop strategies that mitigate the potential negative consequences of water shortages.

This study is designed to link the National Weather Service (NWS) and university scientists' models and projections of drought-significant trends and climate predictions with economic, social and policy scientists' evaluations of possible impacts and appropriate mitigating policy strategies along with information that can be used to enhance effective communication between NWS and its clients.

A research team led by the Institute for Science, Technology and Public Policy and including physical scientists, economists and policy scientists, will conduct the research. The project will aggregate and synthesize extant scientific information on climate induced drought in Texas and New Mexico, conduct targeted research on climate trends, investigate the potential roles of soot and aerosols in the drought/trend process, examine the economics of water management and allocation regimes in times of scarcity, and relate all of these findings to the decisions and decision processes of stakeholders, the public and policy makers.

This interdisciplinary research project will illustrate how scientific information on an important problem, climate induced drought, can be utilized by decision makers, water managers and the public to identify potential problem areas and evaluate policy options. The results of this study will help NWS better communicate its forecasts and other data and reports to relevant stakeholders, the public and policy makers.

The research team is led by Principal Investigator and ISTPP Director and Professor in the Bush School, Dr. Arnold Vedlitz and two Co-Principal Investigators, and Dr. Eric Lindquist (ISTPP Associate Research Scientist/political science). Also on the project are Drs. B. Dan Wood, Professor, Department of Political Science); Sammy Zahran, ISTPP Post-Doctoral Research Scientist. Other research team members from the Institute include: Meg Patterson Rogers, Nell Frazer Lindquist, Brenda Chaloupka, and Doris Newton.

Public Understanding of Air Quality Issues in Texas: Phase I, II, III, IV, & V

Funder: Texas Department of Transportation (TxDOT) & Texas Commission on Environmental Quality (TCEQ)

For 2001, the Texas Transportation Institute (TTI) and the Institute of Science, Technology and Public Policy (ISTPP) at Texas A&M University were contracted to gather baseline information which was used to develop a public awareness program on air quality issues in Texas. In order to develop a more effective campaign, TxDOT needed to learn how people in different communities across Texas think about air quality issues. TxDOT wanted to know, for example, how seriously the public perceived air quality issues, what individual citizens are willing to do to clean the air in Texas, and what organizations currently are doing or planning to do to improve air quality. To gather this information, ISTPP interviewed over 100 community leaders and decision makers in all nonattainment and near-nonattainment communities in Texas. Communities are designated by the Environmental Protection Agency (EPA) as nonattainment or near-nonattainment areas based on the local air quality. ISTPP also conducted a state-wide survey of citizens. This Phase I information formed the bases for the development of the The Drive Clean Across Texas (DCAT) campaign which was launched March 25, 2002.

ISTPP and TTI partnered again in 2003 (Phase II) and 2005 (Phase III) to conduct two follow-up surveys (T2 and T3) to assist TxDOT and TCEQ in the evaluation of the DCAT air quality campaign. Time 2 follow-up and evaluation was performed in late summer and early fall of 2003, and Time 3 follow-up and evaluation was performed in late summer and early fall of 2005.

The PI is Dr. Brian Bochner (TTI). The Phase I ISTPP research team included: Dr. Arnold Vedlitz (ISTPP Director/political science); Dr. Letitia Alston (sociology), Dr. B. Mitchell Peck (sociology); Dr. Eric Lindquist (political science); Dr. Nandita Chaudhuri (political science), Nell Frazer Lindquist; Meg Patterson Rogers; Monica Holder; Stacey Allison, Kami Jones, and Charlie Hemmeline. The Phase II ISTPP research team included: Dr. Arnold Vedlitz; Dr. Letitia Alston, and B. Mitchell Peck. The Phase III ISTPP research team included: Dr. Arnold Vedlitz; Dr. Letitia Alston, Dr. Sammy Zahran (sociology), and Belinda Bragg (political science).

Completed Projects

Use of Science in Gulf of Mexico Decision Making Involving Climate Change (update for exec. summary)

Funder: U.S. Environmental Protection Agency (U.S. EPA)

This multidisciplinary, multi-institutional research project assessed how representative stakeholder groups currently use science information about global climate change in their decision-making processes; how this varies across stakeholder groups; and what unfilled information needs these groups have. Research questions about information and stakeholder decision-making will be investigated in the context of regionally relevant topics. The study is designed to allow maximum variation across Gulf regions, and endpoints. The expected outcomes of the research are 1) data on the decision making processes and information needs of stakeholders that is generalizable across the Gulf and 2) recommendations for strategies to facilitate the use of this information in stakeholder-based decision-making, thereby improving stakeholders' ability to respond to both the opportunities and challenges presented by those changes. Three research locations representing Gulf areas that 1) are particularly vulnerable to impacts on water resources, coastal ecosystems, or coastal infrastructure from climate change and other stressors, 2) face challenges salient to local stakeholders, and 3) have existing stakeholder networks are the focus of the project. Sources of data on decision-making and information use are unstructured interviews with local stakeholders, observation of group processes, and examination of relevant documents.

The research team is led by Principal Investigator and ISTPP Director, Dr. Arnold Vedlitz and includes researchers from four universities—Texas A&M University's *Institute for Science, Technology and Public Policy* in The Bush School of Government and Public Service, the University of New Orleans' *Center for Hazards Assessment, Response and Technology*, the University of Louisiana at Lafayette's *Center for Socioeconomic Research*, and Florida A&M University's *Environmental Sciences Institute*.

Swimming Upstream: Collaborative Approaches to Watershed Management

Funder: U.S. Environmental Protection Agency (U.S. EPA)

A team of six lead authors collaborated on a book drawing largely upon lessons learned from EPA-funded *Water and Watersheds Program* projects. The book was published in May 2005 by MIT Press (ISBN 0-262-69319-4).

The interdisciplinary team of lead authors included: Drs. Paul A. Sabatier (environmental science and policy, University of California-Davis), Will Focht (political science, Oklahoma State University), Mark N. Lubell (political science, Florida State University), Marty D. Matlock (biological and agricultural engineering, University of Arkansas), Zev Trachtenberg (philosophy, Oklahoma State University) and Arnold Vedlitz (political science, ISTPP/George Bush School, Texas A&M University). Other authors include: Drs. Tarla Rai Peterson (communication, University of Utah), Charles D. Samuelson (psychology, Texas A&M University), Guy D. Whitten (political science, Texas A&M University), and Dr. Susan J. Gilbertz (geography and communication, Texas A&M University).

Completed Projects (cont.)

Development of an Urban Watershed Rehabilitation Method Using Stakeholder Feedback to Direct Investigation and Restoration

Funder: U.S. Environmental Protection Agency (U.S. EPA)—Science to Achieve Results (STAR) Water and Watersheds Program

This interdisciplinary project developed and tested a method for restoring the ecological integrity of urban watersheds that combines ecology, engineering and social sciences. The following hypotheses were tested: (1) Risk-based models developed for agricultural NPS pollution management can be applied to urban watersheds; and (2) a) Stakeholders' understanding of NPS pollution issues, b) use of systems thinking, c) ability to use scientific information about TMDLs/rehabilitation options, and d) communication competence will increase as a result of the Collaborative Learning (CL) intervention.

Baseline data on the San Antonio population were gathered through a survey of a random sample of that population. Stakeholder council members were recruited using both leads developed from the larger San Antonio survey and from face-to-face interviews with residents of the two watersheds, using a snowball sampling technique. Once councils were formed, the CL intervention used iterative input from stakeholders to guide risk-based research and restoration planning. Two integrated eco-indicators—periphyton and bluegill sunfish—were used to evaluate and communicate risk to the stakeholder groups. The effectiveness of the CL process was evaluated using both pretest and posttest surveys with council members and face-to-face interviews with council members at the conclusion of the CL process.

The project also integrated four modeling activities: A GIS-based riparian zone impact zone model, a BASINS-HSPF watershed model, an Ecophys.Fish model, and a STELLA watershed model linking watershed policy and management decisions to watershed hydrologic response. In addition, a simulation of citizen behavior was developed to integrate human behavioral models with watershed models.

Research team members included: Dr. Charles D. Samuelson, (psychology), Dr. Marty D. Matlock (biological and agricultural engineering, University of Arkansas), Dr. Tarla Rai Peterson (communication, University of Utah), Dr. Guy D. Whitten (political science); Dr. William H. Neill (wildlife and fisheries sciences), and Dr. Ann L. Kenimer (biological and agricultural engineering), Dr. Arnold Vedlitz (ISTPP/political science), Dr. Letitia T. Alston, (ISTPP/sociology), Dr. Susan J. Gilbertz (geography and communication), and Meg Patterson Rogers (ISTPP).

Summit for the Sustainability of the Gulf of Mexico Shrimp Industry

Funder: National Oceanic and Atmospheric Administration (NOAA) and the National Sea Grant Office

More information about the summit can be found at: ShrimpSummit.tamu.edu

The Gulf of Mexico shrimp fishery has traditionally been the most valuable fishery in the United States and has been a major source of foreign commerce for Mexico. Over the past 25 years, the offshore Gulf of Mexico shrimp fishery and its accompanying industry have experienced considerable changes in the management regime, the market and the regulatory measures taken in response to concerns for shrimp stocks, endangered species and fisheries habitat. The shrimp industry of the U.S. Gulf of Mexico and Mexico's east coast bordering the Gulf have long been intertwined by commonality of shrimp stocks, markets, research and regulatory regimes. As interests and issues become more entrenched, it is critical to consider the elements that will ensure sustainability of the Gulf of Mexico shrimp industry along with the communities and social fabric that it supports.

The *Summit for the Sustainability of the Gulf of Mexico Shrimp Industry* was held March 6-8, 2003 in Houston, Texas. The Institute for Science, Technology and Public Policy provided background research for the Summit through a survey that asked a sample of shrimp industry members their perceptions of key issues they face and potential solutions. ISTPP also conducted a follow-up survey of the Summit.

The Summit provided a venue for industry, regulators, researchers and conservation interest from both the United States and the Republic of Mexico to come together in a non-regulatory forum to discuss those issues of concern and attempt to provide solutions that will satisfy the needs of the managers, the health of the ecosystem, the economics of the industry and the well-being of local communities and consumers.

The research team included: Principal Investigator, Ralph Rayburn, Associate Director, Texas Sea Grant College Program; Dr. Tazim Jamal, Assistant Professor (recreation, park and tourism); Dr. Letitia T. Alston, ISTPP Associate Director (sociology); and Dr. Arnold Vedlitz, ISTPP Director (political science). Other sponsoring partners included the Sea Grant Programs in Louisiana, Mississippi/Alabama, Florida and Puerto Rico, and the Universidad Nacional Autonoma de Mexico.

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Completed Projects (cont.)

Instrument Development for Measuring Social and Cultural Frames in Environmental Conflicts

Funder: National Science Foundation (NSF)—Decision-Making & Valuation for Environmental Policy Program (DMVEP)

This project focused on how stakeholders frame or interpret the myriad of elements that comprise a protracted conflict. In particular the study examines patterns of framing across four types of categories—identity, characterization, conflict management, and power—for eight different stakeholder groups. Drawing from 156 interviews in four different types of environmental conflicts, the researchers sought to determine the framing profiles for different stakeholder groups, the themes that typify these profiles, and the similarity and differences across groups. Stakeholder groups consist of business and industry, farmers, citizen activists, elected officials, government agencies, environmentalists, media, and neutrals/mediators. The inter-university project joined researchers from Pennsylvania State and Ohio State Universities to examine data from two natural resources sites, one toxins cleanup site, and one watershed dispute.

Texas A&M University researcher team members included: Dr. Linda L. Putnam and Boris H. Brummans (Communication).

Frame Changes, Reframing, and Turning Points in Disputes: The Edwards Aquifer Case

Funder: The Hewlett Foundation

Funded in 2001 as a two-year extension of the first Inter-University Consortium on environmental framing, this project focused on the tracking the frame changes in the Edwards Aquifer conflict. It drew from the newspaper articles and case analysis of major events in the dispute to examine the turning points in the conflict as a way of understanding frame enlargements, narrowing, and abrupt shifts. Data from the 240 newspaper articles and 68 interviews was used to track shifts, discover variations from dominant frames, examine the conceptual features of these shifts, and determine the patterns of framing that lead to naming, blaming, and claiming the conflict differently. The research centers on the frame patterns among four types of frames—identity, characterization, conflict management, and intractability. The study sought to relate the frame changes to the movement of a protracted conflict to a more tractable state.

Texas A&M University researcher team members included: Dr. Linda Putnam and Rebecca Royer (communication). Other consortium members included Pennsylvania State University (Dr. Barbara Gray, organizational behavior) and Ohio State University (Dr. Roy J. Lewicki, management and human resources), among others.

Framing of Intractable Environmental Disputes: The Edwards Aquifer Case

Funder: The Hewlett Foundation

This was one of eight research studies conducted by a Hewlett-funded research consortium project, *An Inter-University Consortium on the Framing of Intractable Environmental Disputes*, headed by Dr. Barbara Gray at Pennsylvania State University. Researchers from the ISTPP's former Program on Conflict and Dispute Resolution (PCDR) examined media portrayals of the stakeholders involved in the Edwards Aquifer Dispute.

PCDR researchers interviewed over 70 stakeholders and developed a framework for understanding values that stakeholders bring to this conflict, particularly their views of the problem, their insights about the relationships among parties, and their descriptions of the historical development and interventions used in the dispute. They are particularly interested in the way that perceptions and recommendations for managing the conflict have changed through the development of the dispute.

Research team members at Texas A&M University included: Drs. Linda L. Putnam and Tarla Rai Peterson (communication).

Research on Environmental and Natural Resources Policy

Completed Projects (cont.)

Media Portrayal of Framing in the Edwards Aquifer Dispute

Funder: Interdisciplinary Research Initiatives Program—Texas A&M University

This project, conducted by researchers from the Institute's former Program on Conflict and Dispute Resolution (PCDR), focused on the way that newspapers have portrayed the stakeholders involved in the Edwards Aquifer dispute. It examined newspaper articles for a ten-year period to understand how the media has cast the conflict, how different stakeholders are represented in the articles, and how stakeholders cited in the media characterize each other. PCDR researchers also examined changes in media portrayal across time and location.

Research team members included: Drs. Linda L. Putnam (communication), Tarla Rai Peterson (communication), Charles D. Samuelson (psychology), and Ronald Kaiser (recreation, park, and tourism sciences).

Private Land Stewardship and Conservation: Partnerships for Collaborative Problem Solving

Funders: Sponsored jointly by the Institute for Science, Technology and Public Policy (ISTPP) & the Institute for Renewable Natural Resources (IRNR)

This symposium was held April 2-4, 2000 at the Presidential Conference Center at Texas A&M University in College Station, Texas. The overall purpose of this symposium was to contribute to more efficient and productive decision making and more effective approaches for encouraging, rewarding, and assisting with private land stewardship and conservation. Half of the symposium participants represented private landowners and land managers, federal and state natural resource agencies, nongovernmental organizations, trade associations, businesses, and other related groups. The other half included Texas A&M University scholars from a diverse set of disciplines ranging from the humanities to the social and natural sciences. The four sessions focused on: (1) *Goals and Measures* of successful private land stewardship and how they differ among interested parties; (2) *Status and Trends* of relevant current conservation issues; (3) governmental and nongovernmental *Approaches* designed to enhance stewardship of private lands; and (4) identification and discussion of *Research and Development* projects to pursue following the symposium. In the final session, participants selected the following research areas for further development: *communication, fragmentation, incentive models, public policy, and valuation*. The symposium was a key step in building a research and partnership agenda to address private land stewardship and conservation. The next step is already underway as teams of Texas A&M University scholars are further developing the five identified areas of research.

Ecological, Economic and Policy Alternatives for Texas Rice Agriculture

Funders: Texas Water Resources Institute (TWRI), the Texas Agricultural Program, & the Institute for Science, Technology and Public Policy

An interdisciplinary research team conducted a two-year project examining the ecological, economic and policy alternatives for Texas rice agriculture. In addition to its agricultural value, rice is linked to a surrogate wetland system that provides at least some of the ecological services that have been lost as natural wetlands have given way to residential and commercial development. The objectives of this research were (1) to develop a reliable first estimate of the environmental consequences of reduction in rice acreage, (2) to analyze economic consequences of changes in rice acreage that may occur due to the changes in the system of price supports, and (3) to critically review existing policy and explore the kinds of institutional arrangements that might be developed to encourage the preservation of the environmental amenities provided by rice farming.

The project team developed a set of recommendations for the rice industry and policy makers and also identified areas where future research is needed. On the most general level, it is recommended that producers, their representatives, and policy makers become more attuned to the multiple output nature of agriculture and the implications of this for increased income, valuable alliances with powerful interest groups whose goals also include environmental health, and for a workable strategy for sustainable agriculture.

The interdisciplinary team of researchers included: Dr. Letitia T. Alston (ISTPP/sociologist), Dr. Thomas E. Lacher (wildlife and fisheries sciences); Dr. R. Douglas Slack (wildlife and fisheries sciences); Dr. Arnold Vedlitz (ISTPP/political science), and Dr. Richard T. Woodward (agricultural economics).

Completed Projects (cont.)

Effluent Trading: A Policy Review for Texas

*Funder: Texas Commission on Environmental Quality (TCEQ)
formerly known as the Texas Natural Resource Conservation Commission (TNRCC)*

In November 1999, ISTPP completed a project entitled *Effluent Trading: A Policy Review for Texas*. This study and report were prepared at the request of and funded by the Texas Natural Resource Conservation Commission (TNRCC). The standard approach to water regulation, both in Texas and throughout the nation, has been to regulate discharges using technology-based restrictions on point-source emitters. While these regulations have been quite successful in addressing the most egregious water problems, they have major weaknesses that are driving the consideration of market-based trading. Effluent trading programs offer viable means to reduce loading of certain pollutants, and there is a growing body of experience with these programs across the country. Furthermore, U.S. EPA's support for effluent trading means that the institutional barriers to the continued development of such programs are coming down.

While there is a wide array of technical, economic, legal and regulatory, and sociopolitical alternatives, this report presents five broad policy approaches for effluent trading that might be taken by the TNRCC. Advantages and disadvantages of each approach, how each approach has been applied elsewhere in the U.S., and the implications for each approach to TNRCC are reviewed.

Research team members included: PI Dr. Arnold Vedlitz (ISTPP/political science), and Co-PIs Dr. Mark A. Fossett (sociology and the Race and Ethnic Studies Institute); Dr. Ronald Kaiser (recreation, park, and tourism sciences), Dr. Marty D. Matlock (biological and agricultural engineering, University of Arkansas), and Dr. Richard T. Woodward (agricultural economics).

Protection of Surface and Ground Water Quality by Utilizing Waste Disposal Sites on Soils that are not Prone to Oxidize Chromium to a Toxic Form

Funder: Interdisciplinary Research Initiatives Program—Texas A&M University

This multidisciplinary project looked at the interaction of chromium (Cr) from waste drilling fluids with various soils that may alter the form of Cr, resulting in a more or less hazardous Cr form. A policy analysis team conducted a literature search and stakeholder analysis to determine what is necessary to transfer this knowledge into best practice.

Researcher team members included: Drs. Joe Dixon (soil and crop science), and Arnold Vedlitz (ISTPP/political science).

Clean Water for Armand Bayou

Funder: Texas State Soil and Water Conservation Board

This project was an education and demonstration project focusing on reducing non-point source (NPS) pollution in the Armand Bayou Watershed in both rural and urban settings. Two researchers from the Institute's Program on Conflict and Dispute Resolution (PCDR) assisted with this project's watershed working group through "Collaborative Learning." This was a joint project of the Texas Agricultural Extension Service and the Texas Sea Grant Program.

The principal investigator was John Jacob, soil and crop science and extension specialist with the Texas Agricultural Extension Service. ISTPP researchers included: Dr. Charles D. Samuelson (psychology) and Dr. Tarla Rai Peterson (communication).