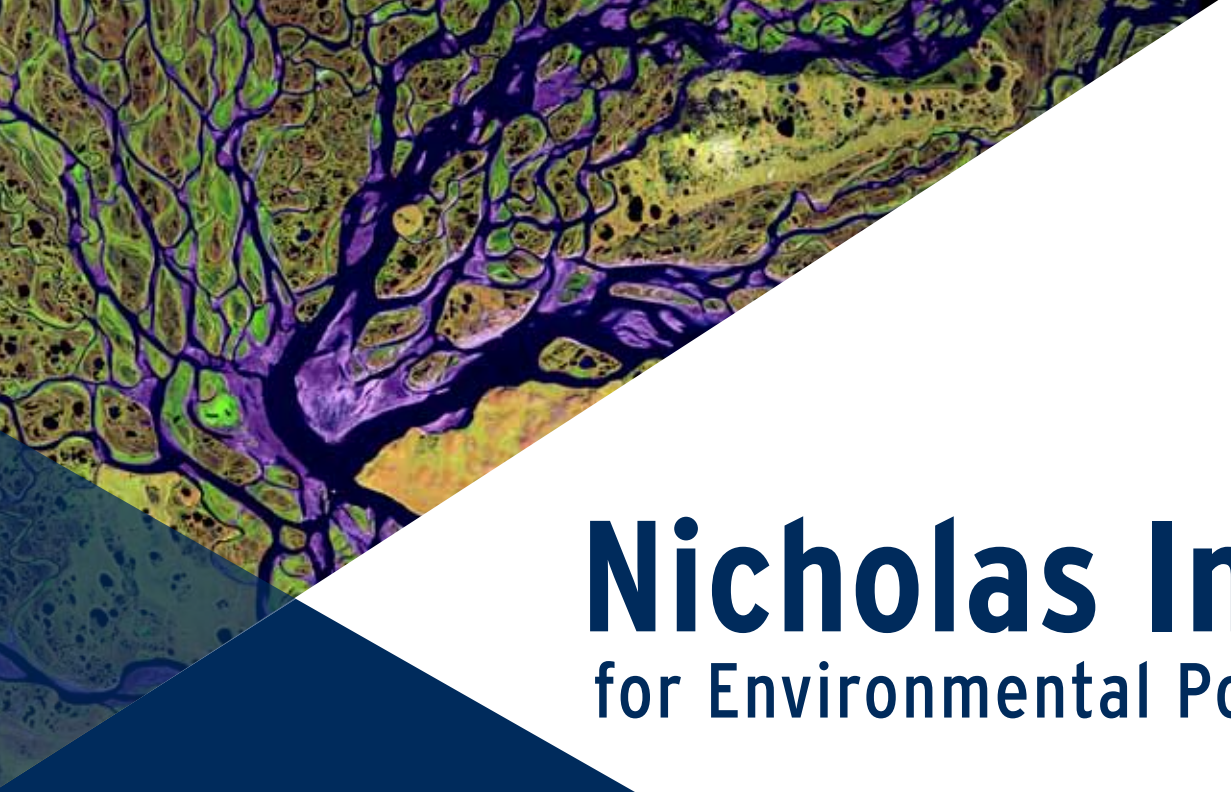


Nicholas Institute

for Environmental Policy Solutions

Duke University

2014 Annual Report

Contents

4 Climate and Energy Program

5 Ecosystem Services Program

6 Environmental Economics Program

7 State Policy Program

8 [FEATURE]
Shaping Policy Making:
Interactive Games, Online Courses,
and a Guidebook Help Decision Makers
Weigh Choices

14 Ocean and Coastal Policy Program

15 Water Policy Program

16 Selected Publications

17 Financial Information

18 Nicholas Institute Leadership

19 Fiscal Year 2014 Board of Advisors
Q&A with Diana Propper de Callejon

About

Established at Duke University in 2005, the Nicholas Institute for Environmental Policy Solutions helps decision makers create timely, effective, and economically practical solutions to the world's critical environmental challenges. The Nicholas Institute mobilizes objective, rigorous research to confront the climate crisis, clarify the economics of limiting carbon pollution, harness emerging environmental markets, put the value of nature's benefits on the balance sheet, develop adaptive water management approaches, and identify other strategies to attain community resilience.

Director's Message

At the heart of the Nicholas Institute for Environmental Policy Solutions' mission is one clear objective: shaping policy making by educating organizations and decision makers about their choices. Our ability to bring close-to-the-ground decision makers together to grapple with policy issues is a reason so many looked to us to better understand their options in FY 2014.

We've raised our profile as a home for peer learning through several efforts. Building on already-solid initiatives such as the Fisheries Leadership & Sustainability Forum—which brings regional fisheries management council members together at least twice a year to share information about and pressing solutions to fisheries management problems—we launched a series of workshops and webinars for energy and environmental regulators in the southeastern United States. Timed near the release of the U.S. Environmental Protection Agency's proposed Clean Power Plan, these events helped participants assess the cost, reliability, and risk management tradeoffs of policy choices during this period of great uncertainty and fundamental transition in the power sector.

Our feature story focuses on three other peer-learning efforts in which we are bringing a wide range of experts and interests together to discuss issues with the aid of unbiased evaluations of policy risks and rewards. The Energy Risk Lab, the Conservation Economics Initiative, and the *Federal Resource Management and Ecosystem Services Guidebook* are offering tools for improved decision making, thereby effecting positive change now and potentially decades into the future. They are just some of the ways we are continuing to make our mark as an environmental policy leader.

— Tim Profeta

Climate and Energy Program

The Climate and Energy Program focuses on meeting the energy needs of a growing global population while protecting the environment, particularly from the threat of global climate change. The program's projects use interdisciplinary resources to weigh tradeoffs, illuminate associated trends, and assess how policies can work together to advance optimal solutions.

Informing the New Climate Policy Debate. In the last five years the climate policy landscape has shifted dramatically.

"We went from a focus on federal cap-and-trade legislation using economy-wide targets to sector-by-sector efforts to tackle carbon emissions," said Climate and Energy Program director Jonas Monast. "Add in fundamental economic and technological changes in the energy sector, the current focus of regulatory action, and you can see how important objective analysis and constructive stakeholder relationships are to figuring out our best climate change strategy."

Once new federal legislation became a non-starter, said Monast, the Climate and Energy Program quickly pivoted to analysis of implementation of carbon dioxide (CO_2) emissions control under section 111(d) of the Clean Air Act (CAA). It has since used legal analysis, economic modeling, and stakeholder engagement to explore cost-effective and legally viable regulatory design options—work that made the Nicholas Institute a go-to authority on the subject during the period leading up to the U.S. Environmental Protection Agency's (EPA) announcements of proposed CO_2 emissions guidelines for new and existing power plants.

The Climate and Energy Program has been exploring ways to limit power sector CO_2 emissions under the CAA since 2009, when it began hosting meetings and workshops for federal and state officials, power sector representatives, and environmental advocates to consider regulatory options in a neutral forum. These public and private meetings have informed the regulatory process and have helped prepare states to respond to the EPA's proposed emissions targets.

They also have allowed Nicholas Institute staff to monitor evolving issues and to produce analyses to advance policy discussions. This work is premised on the importance of near-term activity under the CAA in shaping long-term policy—in particular, on how today's policy choices may limit or create path dependency for future policies. "The Nicholas Institute is focusing on the role of the CAA in the broader energy policy matrix," said Monast. "We think an important contribution to the climate policy debate is to continue studying comprehensive strategies for deploying innovative energy technologies through combinations of regulatory mandates and standards and tax policy."

The Nicholas Institute's relationships with state regulators and its CAA expertise position it to advance three critical aspects of the U.S. effort to control CO_2 emissions: engaging a diversity of regulators and other stakeholders, identifying cost-effective options that reduce CO_2 emissions while also addressing other energy sector challenges, and informing next steps for the climate policy debate.

These efforts were supported by Bank of America, the Energy Foundation, the Merck Family Fund, and the Z. Smith Reynolds Foundation.

The Nicholas Institute launches the Southeast Energy and Environmental Leadership Forum, a workshop series for utility commissioners and environmental regulators to explore challenges facing the electricity sector and multi-benefit strategies for reducing carbon dioxide emissions and other sector risks.

Lydia Olander is selected to be a reviewer of the Intergovernmental Panel on Biodiversity and Ecosystem Services guide to ecosystem services policy support tools and methodologies.

Ecosystem Services Program

The Ecosystem Services Program ensures that the environment can sustain future generations by helping public and private decision makers value the benefits and processes natural ecosystems supply for humankind's well-being and prosperity. The program provides information and assessment frameworks that support development of public and private policies, economic incentives, and environmental markets to maintain and enhance ecosystem services—such as the purification of air and regeneration of soil fertility—that maintain life on Earth.

Managing Agricultural Nitrogen Impacts. Carbon emissions dominate the headlines, but our nitrogen footprint is an equally large problem. Nitrogen loss from agricultural land is one of the biggest sources of coastal and inland water pollution, a source of the most abundant ozone-destroying gas in the stratosphere, and a source of one of the most potent greenhouse gases.

"Given the effects of nitrogen in the environment, you'd think efforts to reduce nitrogen losses would be well-informed by the science," said Ecosystem Services Program director Lydia Olander, "but dig into the problem and you'll find significant knowledge gaps."

Olander said she and her colleagues, researchers Alison Eagle, Emily Bernhardt, and Jim Heffernan, expect that filling these gaps will provide an opportunity to significantly improve not only farmers' fertilizer strategies but also emerging nitrogen management efforts such as water quality trading, use of a Farm Bill cost-sharing scheme for treating wetlands polluted by nitrogen, protocols in the California carbon market for reducing nitrous oxide, and sustainability targets for reducing farms' contribution to Walmart's greenhouse gas footprint.

"A targeted research effort focused on a holistic assessment of nitrogen losses across soils, climates, cropping systems, and filtering systems could relatively quickly and cheaply help us identify the best opportunities for reducing these losses and fill critical knowledge gaps," Olander said. That's the objective of the program's Project N. It will advance our ability to predict nitrogen loss pathways and have implications for how we reduce the impacts of nitrogen losses not only in U.S. agriculture but also in food production systems around the world.

To lay the groundwork, the Project N team has undertaken a meta-analysis of the nitrogen management literature to determine the impact of 4R nutrient management—Right rate, Right timing, Right placement, and Right source—on total nitrogen losses relative to yields from corn-based cropping systems in North America. This analysis will begin answering critical questions, in particular, which 4R management practice(s) can have the largest impact on nitrogen use efficiency and which can make the biggest difference in reducing nitrogen losses to the environment while maintaining or improving crop yield.

"Perhaps the most significant result will be a clearer picture of the critical research needed to expand our understanding of how best to manage nitrogen," said Eagle. "In an ideal world, all the fertilizer added to crops would be used by crops—no wasted money, no excess nitrogen."

These efforts were supported by the 4R Research Fund of the Foundation for Agronomic Research.

The Nicholas Institute organizes and chairs a side event with the German Marshall Fund of the United States at the UN Climate Change Conference, the world's largest climate conference. The event in Warsaw, Poland, explored technological and regulatory innovations supporting the transition to low-carbon economies in Europe and the United States.

The Nicholas Institute is among the first entities at Duke to participate in the university-wide Bass Connections program, which partners faculty and students on energy-focused research.

Environmental Economics Program

The Environmental Economics Program employs sophisticated models and rigorous analytics to advance incentive-based solutions to environmental problems. Signature projects support the crafting of market-oriented policies to reduce greenhouse gases, to avoid tropical deforestation and the loss of coastal and marine ecosystems, to assess the effects of renewable energy subsidies, and to explore pricing mechanisms for guiding the stewardship of natural resources.

Taking the Long View of Today's Energy Choices. As legislators, regulators, utility operators, and electricity generators were debating how the U.S. Environmental Protection Agency's (EPA) proposed regulation of carbon emissions from new and existing power plants would affect the U.S. electricity sector, researchers at the Nicholas Institute were putting the finishing touches on a tool to look at a set of much longer-term and more widely spread impacts. They were attuned to the much less publicized fact that the entire U.S. energy sector will turn over in the next 40 to 50 years, an adjustment that with proper planning could represent a big opportunity to redesign electricity production technologies and to craft policies that meet energy needs while cost-effectively reducing emissions.

The Dynamic Integrated Economy/Energy/Emissions Model (DIEM) is the Nicholas Institute's newest instrument for taking a long and broad view of today's technology and policy choices. A macroeconomic simulation model of the global economy with a focus on U.S. energy and a detailed representation of regional electricity systems, DIEM allows researchers to evaluate economic and environmental impacts at regional, national, and global scales.

DIEM's launch is one milestone in a multi-year strategy to examine international emissions trends and the transformation of the U.S. energy industry. The goal is to integrate a thorough understanding of the pace and patterns of economic development and related energy demands into climate policy strategies.

"Our research evaluates many interacting forces that are affecting energy investment," said senior research economist Martin Ross. "We're using DIEM to assess how power plant aging, new energy sources, and technology innovations will alter the nation's energy infrastructure."

A modeling analysis of U.S. and global emissions scenarios will highlight expected trends in emissions, energy production, consumption, and prices as well as assess technology options and their impacts under potential greenhouse gas mitigation scenarios. A deeper dive into these scenarios could include an examination of how global discoveries and trade in natural gas might affect emissions mitigation.

"One of the questions we're trying to answer," said Environmental Economics Program director Brian Murray, "is what if EPA regulation of electric power plant carbon emissions turns out to be inadequate to address future mitigation goals? We modeled the long-term consequences of some key near-term regulatory design choices and found that they create significant legacy effects. It may be the case that key policy choices entail one set of tradeoffs if proposed EPA rules are viewed as relatively permanent and final and another set of tradeoffs if the rules are viewed as an interim solution."

These efforts were supported by Bank of America, Duke Energy, and the Energy Foundation.

Brian Murray is selected as a Fulbright Visiting Research Chair in Environment and Economy at the University of Ottawa, where he will reside during the 2015 spring semester.

Amy Pickle is elected to serve a one-year term as vice chair of the North Carolina Mining and Energy Commission.

State Policy Program

The State Policy Program works with local, state, and regional decision makers to design policies and practices to protect valuable resources and build environmentally and economically sustainable communities. The program tracks political, economic, and social forces shaping environmental issues and builds on existing legal and regulatory frameworks to design and implement innovative policy solutions in the areas of urban sustainability, water resources, energy, and climate change adaptation.

Accounting for Green Infrastructure. America's water infrastructure is being stressed as never before. "Water and wastewater utilities are grappling with climate change, water scarcity, and decaying facilities," said State Policy Program director Amy Pickle. "Good investment decisions hinge on bringing green infrastructure into their accounting systems."

Many utilities recognize the value of "green" infrastructure such as nearby forests and rain gardens for or improving water quality and hedging against risk, but they don't know how to reflect that value in decision making. "By developing new approaches for green infrastructure accounting," said Pickle, "we aim to help water utilities weigh the benefits of green versus gray infrastructure."

With its partner organization, Earth Economics, State Policy Program staff developed two frameworks and engaged three utilities to pilot test them.

Under the conventional balance sheet framework, utilities report natural assets in a format similar to a financial statement. On a balance sheet (analogous to statement of net assets), they break down natural assets by accounting unit (rain garden, forest, reservoir, and so on). On a statement of changes (analogous to a statement of revenues, expenses, and changes in net assets), they report physical inflows and outflows of resources that affect the stocks of natural assets.

Under the ecosystem services framework, utilities record green infrastructure assets and the ecosystem services each asset provides. Dollar values can be linked to each service to provide financially based accounting in addition to an accounting of ecosystem services, such as water filtration and climate regulation.

A post-pilot test survey revealed that the testers had adopted a hybrid framework reflecting the information they regularly collect. "The utilities' accounting departments favored the balance sheet framework because it most closely resembles their required financial asset reporting, but managers favored the ecosystem services framework because it provides a more comprehensive accounting of green infrastructure," said Pickle. "Ease of green infrastructure accounting depends on whether a utility is already tracking environmental metrics—something it may not do unless required. A regulatory driver will likely be the most important factor in widespread implementation of green infrastructure."

State Policy Program staff are now exploring how communities can use green infrastructure to adapt to climate change by crafting model ordinances, such as for habitat protection, and by assessing equitable distribution of ecosystem services.

These efforts were supported by the North Carolina Forest Service and the Water Environment Research Foundation.

The Nicholas Institute participates in a U.S. State Department side event focused on land use at the United Nations Framework Convention on Climate Change 40th session of the Subsidiary Body for Scientific and Technological Advice in Bonn, Germany.

As a member of the North Carolina Mining and Energy Commission, Amy Pickle drafts the state's first proposed rules for hydraulic fracturing.

Shaping Policy Making:

Interactive Games, Online Courses, and a Guidebook Help Decision Makers Weigh Choices

In a room on the top floor of a major metropolitan building, decisions are being made that could change the U.S. energy landscape. Traders feverishly wave white paddles, offering up wind power and solar energy credits that will allow electric utilities to meet North Carolina's Renewable Energy and Energy Efficiency Portfolio Standard. Or maybe comply with the U.S. Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS) or carbon emissions regulation.

Though much of the action could be real, it isn't. State regulators are using little more than play money and spreadsheets capable of some game-altering simulations to figure out how to deal with a host of challenges facing the electricity sector.

This Energy Risk Lab for North Carolina regulators, presented by Duke University's Nicholas Institute for Environmental Policy Solutions and the National Association of Regulatory Utility Commissioners, is another instrument for policy makers to better predict behavior that will affect the nation's energy future.

Like so many of the Nicholas Institute's events, the tools used are sophisticated and the conversations they initiate are transformative. Without the Nicholas Institute, and the long history of trust it's built among decision makers, many of these conversations would otherwise never occur.

This trust has brought together public sector and private sector decision makers who may not regularly talk to one another—but need to. Putting the critical decision makers at one table and providing them with practical ideas and unbiased evaluations of policy risks and rewards on pressing environmental topics has allowed the Nicholas Institute to shape policy making in all corners of the world.

In its nine years, the Nicholas Institute has advised California on design aspects of the country's first cap-and-trade program, produced the first estimates of global carbon dioxide emissions from the destruction of coastal and marine ecosystems, and made recommendations to the North Carolina General Assembly for water supply and ecological flow planning that later became law.

Three projects in FY 2014 had or are poised to have similarly significant impacts. Their approaches to informing debate and prompting change are often as unique as the problems they address.

> **"The Nicholas Institute is dedicated to providing information tailored to decision makers' needs without requiring anything in return. It's that dedication and decision makers' willingness to go through our process that helps us to shape policy making."**
>
> — David Hoppock, Nicholas Institute

In the case of the National Ecosystem Services Partnership (NESP), a Nicholas Institute initiative, the key to change is giving federal decision makers tools for evaluating ecosystem services, thereby allowing them to more fully understand how people are affected by natural resource planning and management decisions.

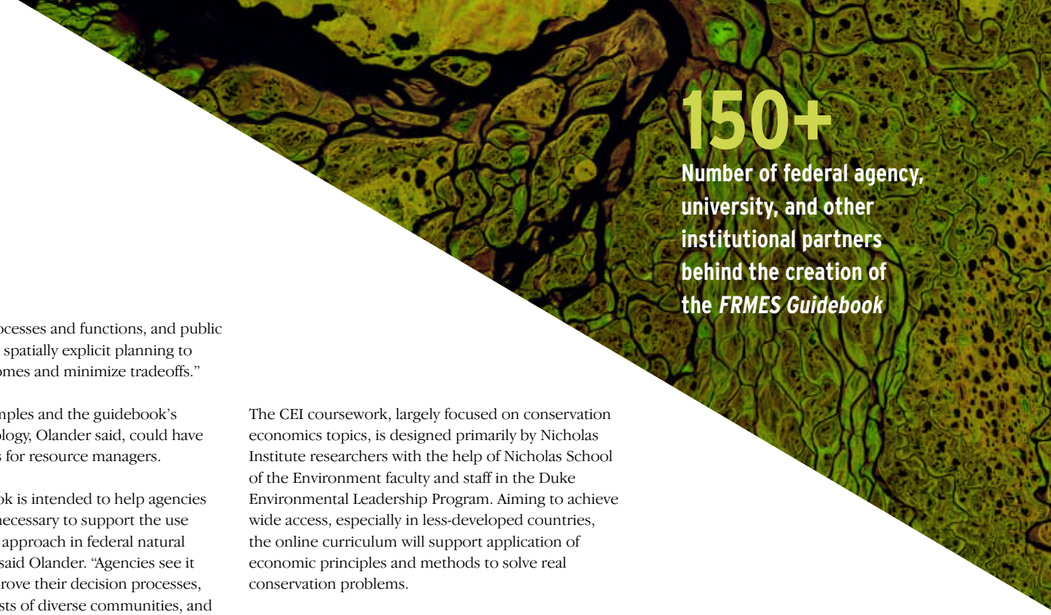
In December 2014, NESP will launch the *Federal Resource Management and Ecosystem Services Guidebook* to help agencies reflect ecosystem services concepts in their planning and management efforts. As an example, a water resource manager focused on reducing flood risk might use the guidebook to consider how improving the water retention capacity of a flood plain rather than building a levee could enhance services such as fishing, birding, recreation, and water quality. And, perhaps this could even provide highly valued but often overlooked nonuse benefits like preserving healthy wetland ecosystems as habitat for migratory birds and for the enjoyment of future generations.

"The guidebook is an online tool for resource managers to give them a basic understanding of ecosystem services," said Lydia Olander, who directs both the NESP and the Ecosystem Services Program at the Nicholas Institute. "It explains why ecosystem services can be a useful concept for management decisions, provides examples of how this concept is being applied across federal agencies, and describes an analytic framework for management decisions."

More than 150 agency, university, non-governmental organization, and think tank representatives were engaged in the guidebook's development. Federal agency partners also provided 13 on-the-ground examples that showcase the initial benefits and challenges of applying an ecosystem services management approach.

The U.S. Forest Service is taking an ecosystem services approach to management of the 10,000-acre Soda Fork Creek drainage in the upper South Santiam River in Linn County, Oregon. That approach has garnered community support for management driven not solely by timber objectives but also informed by goals for recreation, wildlife habitat, cultural values, and watershed functions.

"Forest Service staff began their assessment with an understanding of the inherent capacity of the landscape and aimed to sustain a range of ecosystem services appropriate to that landscape, rather than driving the planning process with single-resource objectives," writes agency example author Nikola Smith, an ecologist and ecosystem services specialist with the Pacific Northwest Region of the Forest Service. "This interdisciplinary approach highlighted connections among landscape structures, ecological processes and functions, and public benefits, and it informed spatially explicit planning to enhance beneficial outcomes and minimize tradeoffs."



150+

Number of federal agency, university, and other institutional partners behind the creation of the *FRMES Guidebook*

Use of these agency examples and the guidebook's framework and methodology, Olander said, could have several potential benefits for resource managers.

"Ultimately, the guidebook is intended to help agencies build the infrastructure necessary to support the use of an ecosystem services approach in federal natural resource management," said Olander. "Agencies see it as an opportunity to improve their decision processes, better balance the interests of diverse communities, and possibly increase efficiency and develop new partnerships in resource management."

The key to educating decision makers that are shaping policy is making information accessible.

From Durham, North Carolina, two Nicholas Institute researchers are partnering on the Conservation Economic Initiative (CEI) with the Conservation Strategy Fund. Through the initiative, they will develop courses and training materials for conservation professionals as well as provide experiential learning for master's degree students from Duke and other universities working in developing countries.

The CEI coursework, largely focused on conservation economics topics, is designed primarily by Nicholas Institute researchers with the help of Nicholas School of the Environment faculty and staff in the Duke Environmental Leadership Program. Aiming to achieve wide access, especially in less-developed countries, the online curriculum will support application of economic principles and methods to solve real conservation problems.

In winter 2014, the first 10-week course on coastal conservation economics debuts. Interactive online and recorded lectures, webinars, and role-playing scenarios will walk students through common problems and their possible solutions.

"Economics is an important tool for conservation, but many professionals lack access to formal training," said Brian Murray, project co-lead and director of the Environmental Economics Program at the Nicholas Institute. "They realize that conservation needs to align with economic incentives in order to be sustained, but they may not know how to design incentive-compatible programs. We are aiming to reach these professionals with

conceptually sound, practical methods that allow them to succeed in conserving valuable resources."

One novel aspect of the initiative is its connection of master's degree students with decision makers facing conservation challenges that economics can help remedy. These decision makers can request the students to perform fieldwork addressing these challenges.

In Ecuador, three Duke students are attempting to put a value on mangrove ecosystem services such as storm surge amelioration and carbon sequestration. What's innovative about the work is that the students are comparing the results of multiple valuation models for the same location and services, said Aaron Bruner, senior economist with the Conservation Strategy Fund.

What the local and national government are getting from this work, Bruner said, is "a sense of what the different models offer them in situations in which they need to understand ecosystem services values but don't have time for a primary study."

In the case of the Energy Risk Lab, the education strategy is getting the right people in the room to promote conversation and learning.

In 2013, the Nicholas Institute partnered with the National Association of Regulatory Utility Commissioners to make technical improvements in a scenario-based role-playing game that guides federal and state regulators and utility officials through a series of situations involving the EPA's proposed Clean Power Plan and MATS—and potential challenges such as suddenly high natural gas prices or an accident that forces the shutdown of nuclear plants. In the game, policy makers and other decision makers work alongside one another to make billion-dollar decisions that they may one day face in real life.

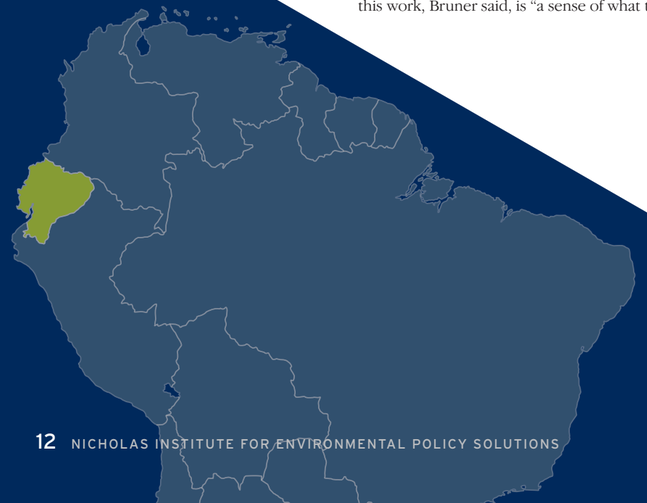
"When you're playing with monopoly money, you're taking yourself out of your state's political constraints," said David Hoppock, Nicholas Institute senior policy associate and Energy Risk Lab co-developer. "Through the game, regulators and utility officials from one state are partnered in planning with their counterparts in another state. That helps them think about risk in a different way."

Participants say they benefit from the opportunity to face a challenge while working with perspectives different from their own—particularly if it forces them to think about a much longer-term horizon than they normally would contemplate in decision making. For Glenn Sappie, an economist with the North Carolina Department of Environment and Natural Resources Division of Air Quality, participating in the risk lab made him realize you can have a plan that one day no longer applies to the world you're operating in.

"The sequencing of decision making was really brought out in this workshop—that you commit to a decision in one stage and it has implications for many periods beyond," Sappie said, noting that you have to be ready to adapt no matter what's thrown at you.

Educating decision makers about their choices through timely, objective analysis and opportunities for constructive stakeholder engagement has raised the Nicholas Institute's profile as a policy expert and trusted convener. Simply put, "the Nicholas Institute is dedicated to providing information tailored to decision makers' needs without requiring anything in return," according to Hoppock. "It's that dedication and decision makers' willingness to go through our process that helps us to shape policy making."

These efforts were supported by the Gordon and Betty Moore Foundation, the U.S. Department of Agriculture's Office of Environmental Markets, the Z. Smith Reynolds Foundation, the U.S. Department of Energy, and the National Association of Regulatory Utility Commissioners.



Watch video of the Energy Risk Lab
bit.ly/1IrIVNC

Ocean and Coastal Policy Program

The Ocean and Coastal Policy Program seeks ways to better manage marine resources, particularly the ecosystem services they provide, for the benefit of humankind. Program projects operate in the space between science and policy and facilitate the appropriate science to guide management decisions about the ocean.

Managing Sustainable Fisheries in a Changing Environment. From the rich fishing grounds of the North Pacific to small-scale reef fisheries of the Caribbean, U.S. federal fisheries span a wide diversity of marine ecosystems. This network of eight regional fishery management councils is tasked with managing sustainable fisheries in the public trust. The Fisheries Leadership & Sustainability Forum, a partnership that includes the Nicholas Institute, the Center for Ocean Solutions, the Environmental Defense Fund, and the Stanford Woods Institute for the Environment, supports this effort by providing decision makers with policy-neutral opportunities to share ideas, challenges, and solutions across regions.

In March 2014, the Fisheries Forum helped to develop and facilitate a workshop to examine the management implications of climate change on East Coast marine fisheries. Fishermen, scientists, and managers have begun to witness changes in the geographic distribution and productivity of economically important species. Hosted by the Mid-Atlantic Fishery Management Council, the East Coast Climate Change and Fisheries Governance workshop convened more than 70 fishery managers in Washington, D.C., for a collaborative and unprecedented discussion about climate-ready fisheries management.

"Fishery managers are the experts when it comes to anticipating how climate change will test our existing fisheries management framework," said John Henderschedt, executive director of the Fisheries Forum. "This meeting was an opportunity to examine how climate change may demand greater collaboration and coordination between management partners, especially as fisheries shift across jurisdictions."

Fisheries Forum staff designed and facilitated a series of discussions to help participants build a shared frame of reference and to begin identifying potential solutions and next steps. As a policy-neutral convener, the Fisheries Forum does not advocate for specific solutions, but it does help empower fishery managers to tackle challenging issues.

"No one can predict exactly what climate-related challenges we'll be facing 5, 10, and 20 years down the road," said Chris Moore, executive director of the Mid-Atlantic Fishery Management Council. "However, this workshop was an important first step in opening lines of communication with our management partners so that we can begin developing a strategic response to climate change."

These efforts were supported by a collaboration of private foundations.

As part of the Embassy of the United States Jakarta-Indonesia U.S. Speaker and Specialist Program, Linwood Pendleton meets with Indonesian people across Java, Kalimantan, Sumatera, and Sulawesi to share perspectives on coastal conservation.

The Nicholas Institute launches the first meeting—on emerging issues in deep sea policy—in its Washington Forum series.

Water Policy Program

The Water Policy Program focuses on the long-term viability of water quantity and quality, both with regard to water infrastructure and to basic water needs for society and ecosystems. Program projects address adaptive water management in the face of climate change, opportunities and threats that emerging technologies pose for water supplies, and the intersection of federal and state governments in water resource management.

Bringing Technology, Policy, and Finance Innovators to the Table. In June, California entered its sixth month of severe drought. Amid bitter battles over water allocations and yet another early start to the state's fire season, residents learned they could face $500-a-day fines for overwatering lawns and other water misuses. Water shortages were literally hitting home.

The challenge of U.S. water resource management continues to grow in the face of increasing demands on fresh water resources, declining budgets, aging infrastructure, and adverse effects from more frequent extreme weather events. To push momentum for transformative change in the water sector, the Nicholas Institute partnered with the Aspen Institute's Energy and Environment Program to convene a forum for cross-sector, forward-thinking dialogue.

The first Aspen-Nicholas Water Forum, in Aspen, Colorado, brought together a select group of executives, entrepreneurs, policy makers, and thought leaders for a rich discussion on the convergence of technology, policy, and finance solutions needed to protect and properly manage the nation's water resources. The conversation focused on water's perceived value, investment mechanisms, emerging technologies, and resilience.

"Our overall objective was to host an open dialogue with visionaries engaged in U.S. water issues to determine what steps need to be taken to diverge from our current trajectory, which will likely lead to an unsustainable water future," said Martin Doyle, Water Policy Program director. Among several priorities that emerged were helping the public and decision makers understand that water availability cannot be taken for granted and enabling technological innovation that can bring about a secure water future.

"Historically, in this country, water has been viewed as a limitless and (nearly) free resource," said policy associate Courtney Harrison. "Changing that mindset is priority one. Equally important is figuring out how to get the kinds of innovations implemented by the forum's utility representatives to trickle down to the 50,000 water utilities not at the table. We need much wider adoption of practices such as integrated data management, wastewater nutrient and energy capture, and coordinated water and land use planning. That will be a challenge for small water utilities. That's where the creative financing and policy making ideas shared by forum participants can play a role."

One of the forum's accomplishments was bringing together water sector representatives who've never been at the same table. A second forum in 2015 will build on their conversations.

These efforts were supported by Water Asset Management, American Water, Duke Energy, GE, Goldman Sachs, Intel, the Cynthia and George Mitchell Foundation, and the National Renewable Energy Laboratory.

At the Bureau of Reclamation's Technical Services Center, Martin Doyle teaches a two-day course covering the implications of new guidelines for federal water projects, reservoir sedimentation, and ecosystem processes in degraded rivers and streams.

Linwood Pendleton accepts a joint Nicholas Institute-University of West Brittany appointment.

Selected Publications

Reports

Biogas in the United States: An Assessment of Market Potential in a Carbon-Constrained Future

Deep Sea Minerals and the Green Economy

Greenhouse Gas Mitigation Opportunities in California Agriculture: Science and Economics Summary

Designing CO_2 Performance Standards for a Transitioning Electricity Sector: A Multi-Benefits Framework

Refining Models for Quantifying the Water Quality Benefits of Improved Animal Management for Use in Water Quality Trading

Promoting Innovative and Clean Energy Technology Deployment in Conjunction with GHG Regulation of Stationary Sources under Section 111 of the Clean Air Act

Journal Articles

Ecology: Protect the Deep Sea
Nature

Determining Benefits and Costs for Future Generations
Science

The Effect of Non-Fluoride Factors on Risk of Dental Fluorosis: Evidence from Rural Populations of the Main Ethiopian Rift
Science of the Total Environment

Incorporating Ecosystem Services in Marine Planning: The Role of Valuation
Marine Policy

Climate and Direct Human Contributions to Change in Mean Annual Streamflow in the South Atlantic, USA
Water Resources Research

Carbon Market Lessons and Global Policy Outlook
Science

Reducing Greenhouse Gas Emissions and Adapting Agricultural Management for Climate Change in Developing Countries: Providing the Basis for Action
Global Change Biology

New Source Review and Coal Plant Efficiency Gains: How New and Forthcoming Air Regulations Affect Outcomes
Energy Policy

Economics of Forest Carbon Sequestration as a Climate Change Mitigation Strategy
Encyclopedia of Energy

Characterization of Drought in the South Atlantic, United States
Journal of the American Water Resources Association

Considering "Coastal Carbon" in Existing U.S. Federal Statutes and Policies
Coastal Management

How Effective Are U.S. Renewable Energy Subsidies in Cutting Greenhouse Gases?
American Economic Review: Papers and Proceedings

Working Papers

Assessing the Risk of Utility Investments in a Least-Cost Planning Framework

East Coast Forum Summary: Habitat Considerations

An Initial Assessment of the Economics, Carbon Scores, and Market Impacts of Selected Woody Feedstock Systems

Beyond Carbon Dioxide: Capturing Air Quality Benefits with State 111(d) Plans

Policy Briefs

The Clean Air Act and Power Sector Carbon Standards: Basics of Section 111(d)

Enabling Conditions and Outstanding Challenges in Marine Protection and Management

The EPA's Proposed Guidelines for Regulating Carbon Dioxide Emissions from Existing Power Plants

Regulating Greenhouse Gases Sector by Sector under the Clean Air Act: How Well Does the Electric-Generating Unit Experience Translate to Petroleum Refineries?

nicholasinstitute.duke.edu/publications

Fiscal Year 2014 Operating Funds

Percentages	
University (core):	44.3
Gifts	13
Grants	42.7

Of the 13.0% allotted in gifts, 4.9% was attributable to individuals and 8.1%, to foundations. Foundations provided 30.6% of grant funding; government grants, 6.3%; and corporations, 5.8%.

Nicholas Institute Leadership

Tim Profeta
Director
Nicholas Institute

Larry Shirley
Director
Operations and Planning

Emerson Beyer
Associate Director
Corporate and Foundation Relations

Martin Doyle
Director
Water Policy Program

John Henderschedt
Executive Director
Fisheries Leadership & Sustainability Forum

Sheri Matthews
Administrative and Business Manager
Nicholas Institute

Jonas Monast
Director
Climate and Energy Program

Brian Murray
Director
Environmental Economics Program

Lydia Olander
Director
Ecosystem Services Program

Linwood Pendleton
Director
Ocean and Coastal Policy Program

Amy Pickle
Director
State Policy Program

Fiscal Year 2014 Board of Advisors

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Senior Advisor
TPG Capital and Former Administrator of the U.S. EPA

Frances Beinecke
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Natural Resources Defense Council

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Dean
Sanford School of Public Policy, Duke University

William Chameides (Ex Officio)
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Disque Deane Jr.
Chief Investment Officer and Co-Portfolio Manager
Water Asset Management LLC

Kristina Johnson
CEO
Enduring Hydro

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Director
Boston Scientific Corporation, Xerox Corporation, and Time Warner Cable

Peter M. "Pete" Nicholas
Co-Founder and Chairman
Boston Scientific Corporation

Edward Norton
Senior Advisor
TPG Capital

Diana Propper de Callejon
Managing Director
Cranemere

Cornelia Quennet-Thielen
Deputy Secretary of State
Federal Ministry for Education and Research, Federal Republic of Germany

Diane Regas
Senior Vice President for Programs
Environmental Defense Fund

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Co-Founder and Director
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Samuel F. Moredecai Professor of Law and Nicholas Institute Professor of Environmental Policy
Duke University

Joseph A. Stanislaw
Founder
The JAStanislaw Group LLC

Mark Tercek
President and CEO
The Nature Conservancy

Douglas Wheeler
Partner
Hogan Lovells US LLP

Q&A with Diana Propper de Callejon

Diana Propper de Callejon [1984 BA Political Science] is managing director at the global investment company Cranemere Inc., where she is responsible for building the firm's sustainability platform. Previously, she spent 10 years as general partner at Expansion Capital, investing in clean tech and sustainable businesses. She serves on the board of Echoing Green, an organization that supports social entrepreneurs, and has served on the Nicholas Institute Board of Advisors since 2011.

What led you to work at the intersection of finance and the environment?
I realized that the problems were so large that neither the nonprofit sector nor government had the resources to properly address them. In terms of the world's environmental resources, the private sector is integral to managing and often controlling how these resources are managed. That was what led me to go to Harvard Business School, where I started studying how to turn environmental and social problems into opportunities. My career since then has been focused on building businesses and making investments in companies that drive financial returns from the environmental and social value they create.

What advice do you have for aspiring environmental and sustainability leaders?
Today, everything is global, and everything is being affected by technology in one way or another, so you have to be fluent in a lot of different "languages." If you work in an NGO, you also have to know what's going on in business, finance, and government. You need networks and knowledge that transcend the specific sector you work in. Always be committed to learning.

What attracted you to the Nicholas Institute Board of Advisors?
What first attracted me was the opportunity to come back to Duke, where I had such a positive experience [as an undergraduate] and where I believe that the Nicholas Institute is engaging the next generation of leadership, whether that's students or policy makers or business leaders. We need to educate future leaders in terms of practical solutions—that is critical to me.

Learn More

nicholasinstitute.duke.edu/articles/qa-diana-propper-de-callejon

Duke
NICHOLAS INSTITUTE
FOR ENVIRONMENTAL POLICY SOLUTIONS

P.O. Box 90335
Duke University
Durham, North Carolina 27708

1201 New York Avenue NW
Suite 1110
Washington, D.C. 20005

135 Duke Marine Lab Road
Beaufort, North Carolina 28516

General Inquiries: 919.613.8709
Development: 919.613.7473
Media: 919.613.3652
E-mail: nicholasinstitute@duke.edu
Website: www.nicholasinstitute.duke.edu

Authors: Erin McKenzie, Melissa Edeburn, and Jamar Negron

Cover Photo: Satellite image of the Lena Delta Wildlife Reserve in Russia. Courtesy of the U.S. Department of Interior, U.S. Geological Survey.