

A REPORT OF THE CSIS  
PROJECT ON GLOBAL WATER POLICY

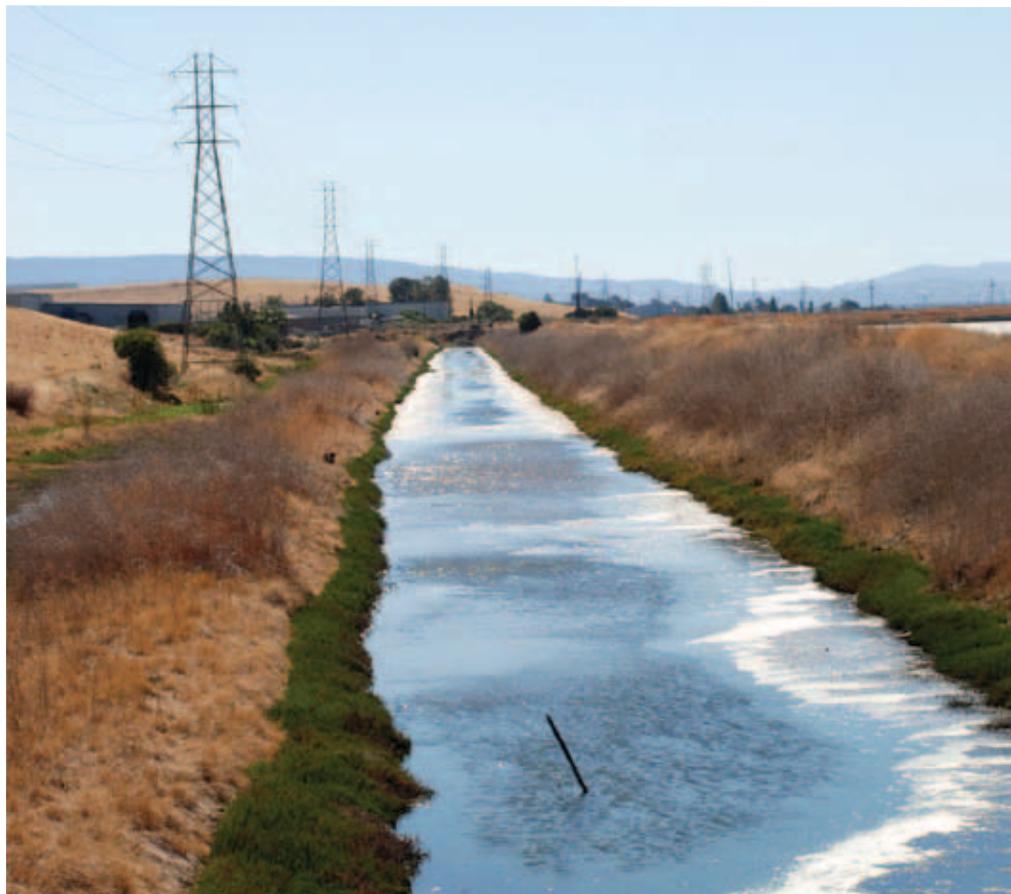
# Bridging Knowledge Gaps in Water Management

INTEGRATING APPROACHES TO FOOD, WATER, ENERGY,  
AND THE ENVIRONMENT

*Authors*

Katherine E. Bliss  
Katryn F. Bowe

May 2011



A REPORT OF THE CSIS  
PROJECT ON GLOBAL WATER POLICY

# Bridging Knowledge Gaps in Water Management

INTEGRATING APPROACHES TO FOOD, WATER, ENERGY,  
AND THE ENVIRONMENT

*Authors*

Katherine E. Bliss

Katryn F. Bowe

May 2011

## About CSIS

In an era of ever-changing global opportunities and challenges, the Center for Strategic and International Studies (CSIS) provides strategic insights and practical policy solutions to decisionmakers. CSIS conducts research and analysis and develops policy initiatives that look into the future and anticipate change.

Founded by David M. Abshire and Admiral Arleigh Burke at the height of the Cold War, CSIS was dedicated to the simple but urgent goal of finding ways for America to survive as a nation and prosper as a people. Since 1962, CSIS has grown to become one of the world's preeminent public policy institutions.

Today, CSIS is a bipartisan, nonprofit organization headquartered in Washington, DC. More than 220 full-time staff and a large network of affiliated scholars focus their expertise on defense and security; on the world's regions and the unique challenges inherent to them; and on the issues that know no boundary in an increasingly connected world.

Former U.S. senator Sam Nunn became chairman of the CSIS Board of Trustees in 1999, and John J. Hamre has led CSIS as its president and chief executive officer since 2000.

CSIS does not take specific policy positions; accordingly, all views expressed herein should be understood to be solely those of the author(s).

Photo credit: An inland waterway stretches off into the distance © iStockphoto.com/  
Craig Scoffone.

© 2011 by the Center for Strategic and International Studies. All rights reserved.

ISBN 978-0-89206-646-9

Center for Strategic and International Studies  
1800 K Street, NW, Washington, DC 20006  
Tel: (202) 887-0200  
Fax: (202) 775-3199  
Web: [www.csis.org](http://www.csis.org)



# CONTENTS

Introduction	1
I. Knowledge Management for Decisionmaking	2
II. Decisionmaking in the Context of Change and Uncertainty	3
III. Cross-Sectoral Collaboration: Bureaucracies, Funding, and Competition	5
IV. Political, Institutional, and Regulatory Processes	7
Appendix: Workshop Agenda	9
About the Authors	10





# BRIDGING KNOWLEDGE GAPS IN WATER MANAGEMENT

INTEGRATING APPROACHES TO FOOD, WATER,  
ENERGY, AND THE ENVIRONMENT

*Katherine E. Bliss and Katryn F. Bowe*

## Introduction

On October 27, 2010, the Center for Strategic and International Studies (CSIS) and the federal Subcommittee on Water Availability and Quality (SWAQ) cohosted a participatory workshop on domestic and international water issues entitled “Bridging Knowledge Gaps in Water Management.” The event convened federal agency experts and influential thinkers from academia, nonprofit organizations, and local communities to share insights across sectors and develop practical, actionable recommendations regarding the management of and access to food, water, and energy both domestically and abroad.

A keynote address, two expert panels, and a break-out session structured the day’s discussion. David Zetland, senior water economist at Wageningen University in the Netherlands, delivered the keynote address. In his remarks, Zetland critiqued the political process through which water and other resources are managed in the United States. His speech set the stage for a rigorous assessment of the challenges in conserving and using water resources efficiently. The first panel focused on identifying research and education gaps that pertain to water, as it relates to food, energy, and the environment. Allan Hoffman of the U.S. Department of Energy moderated the session, which featured speakers Piet Klop of World Resources Institute (WRI), David Reed of World Wildlife Fund (WWF), and Ed Link of the University of Maryland. On the second panel, representatives of the energy industry, academia, and think tanks shared their perspectives on bridging the knowledge gaps identified during the first session. Katherine Bliss of CSIS moderated the second panel, which included Reagan Waskom of Colorado State University, Kirsten Thorne of Chevron, and Paul Faeth of CNA.

Following the keynote address and two morning panels, 50 to 60 workshop participants engaged in break-out sessions to develop recommendations regarding research needs, ways to promote multi-

---

CSIS is grateful to the Subcommittee on Water Availability and Quality (SWAQ) and to the U.S. Department of Agriculture’s National Institute for Food and Agriculture; the U.S. Department of Energy, the U.S. Army Corps of Engineers, and the Colorado State University’s Colorado Water Institute for their support of and contributions to the conference.

sectoral collaboration, and how to improve federal regulatory processes related to water. Four broad questions structured the roundtable discussions: Beyond financial restraints, what barriers do you face in your line of work (related to water)? In your opinion, what is hindering cross-sectoral collaboration with respect to water management? What has worked well in improving cooperation across sectors? What actions would you recommend the U.S. government undertake to help remove these barriers? During the workshop's final session, the groups shared their findings with all participants.

The attached summary and recommendations are organized around four key themes that emerged in the context of the day's discussion: knowledge management for decisionmaking; decisionmaking in a context of risk and uncertainty; interagency and inter-sectoral collaboration; and the relevance of political and regulatory processes to water, energy, food, and agriculture.

*The recommendations in this report are not attributed to individual participants and do not necessarily reflect the consensus of those who attended the conference on October 27, 2010.*

## I. Knowledge Management for Decisionmaking

The importance of obtaining and disseminating high-quality water-related data was a central theme in the panel discussions and during the break-out sessions. Participants and speakers emphasized that in the United States, and overseas, the quality of data regarding water resources and management is so poor that it can be difficult to rely on it in determining accurate baselines, making projections, and setting targets in implementing water-related projects. One representative of a private-sector firm observed that his organization required five full years of data on its water consumption before managers felt confident in the quality of their figures.

Participants also decried the lack of sufficient data on local issues. They noted that the paucity of information regarding local water management processes, especially as they connect to more global structures and complex relationships, greatly impedes their work.

### Recommendations

- Given that water issues are inherently local, local-level water data should be made available to decisionmakers, whether they are working at the local, state, or national levels.
- The U.S. government, nonprofit organizations, and the private sector should jointly support research to provide information about the following domestic water issues:
  - groundwater quantity, quality, and recharge rates;
  - the difference between water rights of agricultural producers and the water they use;
  - return flows of water diverted for agriculture;
  - the appropriate quality of reclaimed water for various uses, such as irrigation in urban areas;

- the impact of regulations, including water quality, agricultural, and industrial regulations, on water quality;
- the levels of pharmaceuticals in water sources and the long-term consequences;
- a comparison of tap water costs across the United States;
- the condition of U.S. levees (although \$375 billion has been invested in levees, most levees within the United States are not mapped and their condition is unknown).
- Efforts should be undertaken to support research and development to expand the capacity of modeling software to capture resource management complexities, which current products are not able to do.
- Researchers should strive to present scientific and economic data and analyses in ways that are easily understood by resource agencies and decisionmakers, including those in Congress, to facilitate its utilization in funding and regulatory processes.
- The interagency process should commit to making information about agency activities regarding water management more transparent. It should address the significant barriers to knowledge sharing between federal science agencies and resource agencies, including political or security sensitivities that inhibit sharing data.
- A common, simplified language to improve knowledge sharing among U.S. government agencies and different disciplines should be used. The U.S. government should make the information on water that it collects available to researchers in the nongovernmental sector, including those working in academia, think tanks, and industry.
- The U.S. government should provide incentives to agencies and private organizations to educate the public on water management issues through traditional media, social networking, and grassroots engagement. These efforts should include outreach to all generations and lifestyles to ensure the citizenry understand and influence policy in an informed manner.

## II. Decisionmaking in the Context of Change and Uncertainty

The challenge of decisionmaking in the context of uncertainty with respect to climate change and water demand was a second theme of the conference. Speakers noted that the past will not serve as an accurate guide for the future, given the rapidity and magnitude of these changes. These include rainfall patterns, the frequency and severity of extreme weather events, the strength of infrastructure, and the ability of water systems to meet the demands that a growing population places upon them. Already, water systems are experiencing the impact of climate change. In some places, a changed climate is rendering recently built infrastructure obsolete. Extreme weather events are more frequent and more severe than in recent history. According to one speaker, floods that had previously occurred on a 50-year cycle are now occurring every 20 years. In the Sierra

Nevada Mountains in California, floods on a scale previously determined to occur every 100 years are now regularly happening twice a decade.

Because the past no longer serves as an accurate model for the future, decisionmakers must be more aggressive in taking change into account as they develop resource-related policies and actions. Despite the rapidity and scale of these water-relevant changes, institutions largely operate on the assumption of fixed climatic conditions and therefore use incomplete data. There was general agreement that current institutions and decisionmaking processes in the United States do not incorporate change in a robust manner. Data is often outdated. For example, a contract on water management and allocations in the Colorado River Basin is based on data collected in the early 1900s, when there was greater abundance of water. This assumption of available water became the legal foundation for allocation across the basin, and has led to the urbanization and development processes that currently characterize the region. Managing risk is made more complicated by the degree of uncertainty and inadequate information that characterizes water systems in a changing climate. Considerable uncertainty surrounds predictions of the frequency of extreme weather events, such as hurricanes, droughts, and floods. The 100-year flood line has traditionally been viewed with confidence, guiding insurance rates, housing values, and the cost-benefit equations that underpin infrastructure investments. But in a situation of climate uncertainty, such assumptions may be misleading and lead to poor planning in the long term.

## Recommendations

- The decision horizon should be modified to accommodate long-term planning, while ensuring an ability to respond to short-term challenges. Risk planning, rather than static planning, should guide the approach. Programs and policies should be built, and decisions made, to take into account the possibilities of uncertainty, risk, and inadequate information.
- Research should be undertaken to identify vulnerabilities to extreme events—not just the likelihood of extreme weather events occurring—in order to guide how to make these areas more resilient to increasingly common extreme weather events. Analysis to determine how to best allocate limited resources to reach this goal must be carried out, as well.
- Decisionmaking regarding water resources in the context of change and uncertainty should more accurately value the consequences of various courses of action. Knowing the value of policy outcomes can be crucial for decisionmakers as they consider policy choices. For example, what are the consequences of building a new wastewater treatment plant, tightening regulations on drinking water quality, or reinforcing levees? Measuring the impact of extreme weather events, and of the services ecosystems provide, are also critical tasks to inform planning with respect to changing climate and water conditions.
- A broad range of externalities and multiplier effects must be included in efforts to assign costs and value to natural resource management processes. For example, quantifying the damage of a flood should include the social and cultural losses, and the recovery cost of rebuilding neighborhoods, not just the direct damages that built infrastructure has suffered.

- The value of ecosystem services should be more adequately incorporated into planning processes. Although this need is increasingly acknowledged, there is a long way to go before a reliable method for valuing ecosystem services is developed. The Bureau of Reclamation's San Joaquin River Restoration Program in California serves as a cautionary tale. The project drastically reduced the river's flows. The courts demanded that the government overturn this project, and the bureau is now spending much more money in trying to recover the salmon run that was lost when the river went dry. Had this demand for and value of environmental water been considered in the cost-benefit assessment, it is unlikely the project, as originally designed, would have moved forward.

### III. Cross-Sectoral Collaboration: Bureaucracies, Funding, and Competition

The limited ability of U.S. government agencies to collaborate across sectors on resource issues was a third theme of the workshop. One challenge is that the U.S. government agencies charged with managing water resources do not always understand other agencies' authorities, obligations, priorities, and funding streams when it comes to water. High personnel turnover is partially to blame. Consistency is often not a strong suit of the interagency process; indeed, the watershed management policies of the U.S. Forest Service, the U.S. Army Corps of Engineers, and the U.S. Bureau of Land Management contrast in important ways, thanks to differences in agency mandates and responsibilities. For example, the Army Corps of Engineers works at the watershed level to reduce the risk of flood damage in critical regions, while the Bureau of Land Management focuses on protecting and improving water quality and ecosystem sustainability in the areas under its control. The Forest Service is tasked with ensuring the security and quality of water resources for domestic use, as well as agriculture, industry, and energy production.

Yet, even if all agencies were to seek cross-sectoral approaches to resource management, the structure of interagency collaboration would severely constrain their ability to do so. There is no formal structure to "cross pollinate" between agencies (and at times, between organizations within the same agency). Moreover, collaborative processes are routinely limited by bureaucracy and red tape.

The way agencies and projects are funded perpetuates the difficulty of collaboration. Models exist on how to work between departments, agencies, and disciplines, but they take time and resources to implement. When funding does not support collaborative exchanges, then agencies' approaches will be similarly fragmented. Legislation that governs funding and the agencies' work flows can further box people into a narrow stream of expertise and mandate that they employ a "siloed" approach.

Competition also impedes collaboration. At times, the funding streams for U.S. government agencies not only fail to nourish collaboration, but they implicitly discourage it. Entities that compete against one another for funding (such as the Department of Energy's National Laboratories) may fear that sharing best practices and information will limit their own chances at

obtaining federal funds. Competition for professional rewards and recognition has the same effect, particularly when there are no channels to reward collaboration beyond their organization. Organizational “turf battles” thus spring up often within the U.S. government, as well as within other sectors.

## Recommendations

- Develop positive incentives to encourage collaboration, rewarding successful and productive collaboration in particular. Scientists working within the U.S. government, for example, should be credited for their work in interagency groups so that they are not inclined to publish only within their agency. Realigning the reward system could take the form of greater recognition and professional advancement.
- Link federal research funding to sharing information across bureaucratic divides, to improving communication, and to implementing programs through partnerships. Flexible funding streams that can be pooled (and done so easily) would also be helpful. Such shared resources could ease the competitive and anticollaborative nature that permeates work on resource issues.
- Create interdisciplinary opportunities within the U.S. government to facilitate discussion regarding natural resource management, especially water.
- Identify new methods of facilitating collaboration and setting common goals across agencies and organizations, perhaps making use of new technologies and communications tools.

Although much of the discussion on challenges to cross-sectoral collaboration focused on U.S. government processes, participants observed that the same recommendations also apply to academia, nongovernmental organizations, and (to a lesser extent) corporations. Workshop participants emphasized that partnerships are crucial, and they stressed that more work should be undertaken to strengthen partnerships among multiple sectors (including corporations and academia) to include a broad array of stakeholders and experts in decisionmaking.

Beyond the public sector, competition can be detrimental for water resource management processes. The private sector’s focus on creating profits, for example, can serve to discourage sharing best practices and technology. The energy industry and agriculture firms compete politically when it comes to water quantity. It has been relatively easy for them to find common ground in improving water quality, but water quantity issues are not as easily conducive to pursuing mutual interests. Firms working in these sectors harbor strong political perceptions of which industry is “winning” the competition for water access, and it is frequently assumed that not all can win in this scenario.

In academia, there is considerable potential and reason to increase cross-disciplinary collaboration. Higher education plays a crucial role in training the next generation to work at the intersection of water and other sectors, and it must help students preparing for careers as water professionals to think critically and broadly.

However, academic departments sometimes hesitate to think about water in an interdisciplinary manner. They face many of the same constraints implementing and incentivizing such collaboration: barriers in institutional structures, lack of rewards for collaborative work, entrenched practices of working within silos, and inflexible funding streams.

Institutions of higher education are increasingly aware of the need to educate across disciplines, and there are some promising examples of interdisciplinary training and research. One university held a university-wide competition to foster innovation and discovery on several topics, including renewable energy. Students who work with others from different academic disciplines remarked that it spurred creativity and learning.

### **Recommendation**

- Leaders in higher education should find ways to strengthen communication on resource management issues between departments within schools and between schools within universities. Funding public universities to work in this manner would enable them to foster collaboration between departments and beyond the university walls.

## **IV. Political, Institutional, and Regulatory Processes**

Agreeing that political processes in the United States generally do not favor a comprehensive and integrated approach to water and resource issues, workshop participants stressed the importance of understanding the extent to which water and resource management decisions are linked to politics and urged that they be separated to the greatest extent possible.

The political dynamic is detrimental, some participants observed, because politicians are elected officials. Sensitive to the needs of their direct constituents, politicians often prioritize short-term wins and policy fixes at the expense of addressing longer-range, complex issues. Decisionmakers also tend to be risk averse (in the interest of sustaining their careers). Given the complexity, unforeseen consequences, and uncertainty that are inherent in water resource decisions, they may be inclined to steer away from the difficult decisions.

### **Recommendations**

- De-link politics from research and project funding decisions. This would reduce the extent to which federal agency activities and research are influenced by ever-changing political priorities and would instill confidence that researchers can undertake long-term scientific or other research without interruptions in funding.
- Transboundary governance on water issues can pose challenges, so increased federal guidelines on managing water across state lines could be helpful. Even though water should be managed locally, the federal government should send clear signals and expectations (through funding and institutional communications) to states and localities.

- The U.S. government should continue to exercise caution in determining how and when to regulate water and other resources at the federal, state, or municipal level. On the one hand, water issues are extremely local, and relevant regulations should be made on the most local scale possible. On the other hand, federal regulations on water issues (e.g., Clean Water Act, Safe Drinking Water Act) play a significant role.
- In setting standards, the U.S. government should emphasize performance-based standards for industry and strive to ensure that the private sector feels that it is on a level playing field compared to other industries. The government should also strive for consistency. Currently, the issues of water quality and water quantity are governed very differently, which creates confusion and difficulty for the private sector and other actors.

Finally, several participants suggested that water prices should be market driven, rather than politically driven. However, it should be stressed that the workshop participants did not reach consensus on this issue. Some participants pointed out that when prices are determined by a central political authority rather than by individual consumers, it can be difficult to predict how much of the product people will use. A market does not require an institution or person to decide how others should value water; people can thus send signals (through prices and by indicating what they are willing to pay) regarding how they want to allocate water, at what volume, and for which uses. In a market-driven scheme, people may be more inclined to allocate water to activities they believe to be most productive. In such a scenario, some argued, the role of subsidies would be diminished, as consumers would understand the true price of extracting, purifying, and transporting water and therefore use water more sparingly.

# Appendix: Workshop Agenda

## **Bridging Knowledge Gaps in Water Management**

*Part of the Global Resource Future Series: Integrating Approaches to Food, Water, Energy, and the Environment*

CSIS, Washington, D.C., October 27, 2010

- |                  |   |
|------------------|---|
| 8:30–8:45 a.m.   | <b>Welcome Remarks</b><br>Johanna Nesseth, Vice President, CSIS; and Michael O’Neill, National Program Leader, U.S. Department of Agriculture   |
| 8:45–9:30 a.m.   | <b>Keynote Address</b><br>David Zetland, author of <i>The End of Abundance</i>  |
| 9:30–10:45 a.m.  | <b>Panel 1: Knowledge Gaps in Research and Education</b><br>Moderator: Allan Hoffman, Senior Analyst, U.S. Department of Energy<br>Piet Klop, Senior Fellow, World Resources Institute<br>David Reed, Senior Vice President for Policy, World Wildlife Fund<br>Ed Link, Senior Research Engineer, Department of Civil and Environmental Engineering, University of Maryland |
| 10:45–11:00 a.m. | Coffee break  |
| 11:00–12:15 p.m. | <b>Panel 2: Integrated Multi-Sectoral Solutions to Bridging Knowledge Gaps</b><br>Moderator: Katherine Bliss, Director, Project on Global Water Policy, CSIS<br>Reagan Waskom, Director, Colorado Water Institute, Colorado State University<br>Kirsten Thorne, Senior Policy Adviser, Chevron<br>Paul Faeth, Senior Fellow, CNA  |
| 12:15–1:30 p.m.  | Lunch and break-out sessions  |
| 1:30–1:50 p.m.   | Conclusions from break-out sessions   |
| 1:50–2:00 p.m.   | <b>Closing Remarks</b><br>Katherine Bliss, Director, Project on Global Water Policy, CSIS; and James Dobrowolski, National Program Leader, U.S. Department of Agriculture   |

## About the Authors

**Katherine E. Bliss** is director of the CSIS Project on Global Water Policy and deputy director and senior fellow with the CSIS Global Health Policy Center. She is also a senior fellow with the CSIS Americas Program. Before joining CSIS, she was a foreign affairs officer at the U.S. Department of State, where she led work on environmental health for the Bureau of Oceans, Environment, and Science, focusing on water, sanitation, and hygiene; indoor air pollution; and climate change adaptation challenges in developing countries. In 2006, she received the bureau's Superior Honor Award for her work on environmental health, as well as avian and pandemic influenza preparedness. As a 2003–2004 Council on Foreign Relations international affairs fellow, Bliss served as a member of the State Department's Policy Planning Staff, covering issues related to global health, international women's issues, Mexico, and the Summit of the Americas. Previously, she served on the faculty at the University of Massachusetts at Amherst, where she held tenure and was associate professor. She is currently an adjunct associate professor at Georgetown University and teaches courses in the Edmund A. Walsh School of Foreign Service.

Bliss received her Ph.D. from the University of Chicago and was a David E. Bell fellow at the Harvard School of Public Health's Center for Population and Development Studies. She received her A.B. magna cum laude and her A.M. from Harvard University and studied at the Colegio de México in Mexico City.

**Katryn F. Bowe** was a research assistant for the CSIS Project on Global Water Policy. Prior to joining CSIS in September 2009, she served as a research assistant at Water Advocates, the first U.S.-based organization dedicated to increasing U.S. support for worldwide access to safe drinking water and adequate sanitation. Bowe is currently enrolled at the Johns Hopkins School of Advanced and International Studies, where she will be an M.A. candidate in September 2011. She graduated from the University of Pennsylvania in 2008, where she studied health policy and economic philosophy, concentrating on international development. While a student there, she conducted field research on water and sanitation projects in rural Cameroon with the Philadelphia Global Water Initiative and interned in the health department of the microfinance organization Pro Mujer in Puno, Peru, in 2006. More recently, she cofounded the Young Professionals in Water Network, a group of Washington-based young professionals interested in freshwater and sanitation issues.





**CSIS** | CENTER FOR STRATEGIC &  
INTERNATIONAL STUDIES

1800 K Street, NW | Washington, DC 20006  
Tel: (202) 887-0200 | Fax: (202) 775-3199  
E-mail: [books@csis.org](mailto:books@csis.org) | Web: [www.csis.org](http://www.csis.org)

