Environmental Information: A Road Map to the Future

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About This Report and the *State of the Nation's Ecosystems 2008*
Based on more than ten years of work on environmental monitoring and indicators, *Environmental Information: A Road Map to the Future* provides recommendations for improving the availability of the environmental information needed to manage our nation's natural resources. It is a companion to *The State of the Nation's Ecosystems 2008: Measuring the Lands, Waters, and Living Resources of the United States. The State of the Nation's Ecosystems 2008* is available from Island Press (www.islandpress.org) For more information, see www.heinzcenter.org/ecosystems

The *State of the Nation's Ecosystems* reports are produced by The Heinz Center with the cooperation of hundreds of collaborators from businesses, environmental organizations, universities, and federal, state, and local government agencies. The 2008 report offers decision makers and the public high-quality, nonpartisan information on the condition and use of our lands, waters, and living resources. It also illustrates how the environment is changing, serving as a tool to help shape policy choices and manage natural resources.

Scientifically grounded and with data drawn largely from federal agency data collection programs, *The State of the Nation's Ecosystems 2008* is the most comprehensive collection of information available about the condition of the nation's ecosystems.

About The Heinz Center
At the crossroads of science and environmental policy, The Heinz Center brings leaders together from business, government, academia, and environmental groups to brainstorm solutions that are both scientifically and economically sound. Founded in 1995 in honor of Senator H. John Heinz III, the Center's guiding philosophy is that only by working together can we solve today's environmental challenges and leave the world a better place for generations to come.

About the Paper
Pritned on Accent Opaque 80, White, Smooth. This paper was made within the largest conservation area in the lower 48 states – the Adirondack Park of northern New York. The 6 million acre park is a mosaic of public and private ownership, protected wilderness, historic communities, working forests and International Paper's Ticonderoga mill. It is also home to purple crowberry, tamarack, pitcher plant, bear, moose, pine marten, spruce grouse, loon, peregrine falcon, northern harrier, and bald eagle. The trees come from forests that have been managed responsibly for more than 110 years and are harvested according to the principles of the Sustainable Forestry Initiative® and the Forest Stewardship Council®, third-party certification standards ensuring the continual planting, growing and harvesting of trees while protecting wildlife, plants, soil and water quality.

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Environmental Information: A Road Map to the Future

The Challenge

The United States is facing unprecedented environmental changes, but decision makers do not have the information they need to understand and respond to these changes in a timely fashion. Current environmental stresses, exacerbated by a changing climate, will produce more rapid and less predictable environmental change, requiring managers to respond quickly and creatively,[1] but funding limitations and a fragmented system limit the ability of the nation's environmental monitoring and reporting infrastructure to meet current and future needs.

Despite growing environmental challenges facing the United States, the current system of collection and delivery of information about environmental trends is ***unable to meet current and future needs of decision makers.***

At the national level, there is ***no established set of indicators to serve as benchmarks for judging the nation's progress*** on key environmental matters. The United States has an official suite of indicators for the economy—the environment needs one, too.

Responsibility for the collection, analysis, and dissemination of the data needed for key policy and decision making is fragmented, resulting in a profusion of ***insufficiently coordinated federal, state, local, and nongovernmental efforts.***

The bottom line: Without leadership from Congress, the executive branch, and states, decision makers will continue to struggle to obtain information, crucial decisions will be poorly informed and thus poorly crafted, and information for accountability purposes will not be available.

The Solution

Formally establish a set of national environmental indicators and an open and transparent process for selecting and refining these indicators.

Use this process to ***drive improvements in environmental monitoring by federal, state, local, and nongovernmental parties,*** by carefully aligning monitoring activities so that they meet key decision needs.

Who Should Lead the Way?

- ***Congress*** should authorize a set of national environmental indicators, as the capstone of a more strategically managed system of monitoring and reporting.
- ***The executive branch*** should create public–private, federal–state forums to involve key decision makers, and should plan, budget, and prioritize investments for building a national system.
- ***States*** should act on the realization that multistate, regional, and national trend-tracking can provide powerful input to many of their decisions.
- Both the ***federal government and states*** should increase the resources devoted to information collection and integration.

What Is the Time Frame?

Work should begin immediately. Climate change is already modifying the nation's environment, and the information that managers and policymakers need to deal with these growing challenges is not now available.[2] This urgency demands a corresponding rigor and efficiency in conceiving, designing, and implementing a new environmental information system that builds on the monitoring, reporting, and research infrastructure currently in place. The time to act is now.

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CHAPTER 1

The United States Needs a 21st Century Environmental Information System

The nation's economic policy community is served by a well-functioning information system that uses well-established indicators to produce precise snapshots of overall economic trends. The underlying data depict in detail how these trends are affecting particular regions, states, and demographic groups. Those charged with making policy for nation's environment deserve no less.

Until the Heinz Center launched *The State of the Nation's Ecosystems* report series, the environment had no equivalent of the commonly reported and universally accepted national economic indicators. National environmental indicators help policymakers understand the scope of environmental problems, and whether they are becoming more serious or not—*Is water quality improving? Are more species at risk of extinction?* This allows policymakers to focus on solutions to these problems, rather than on whether the problems exist in the first place and helps clarify whether public and private expenditures to manage the environment are effectively meeting their goals.

National Indicators Can "Anchor" Broader Improvements

National indicators provide the "big picture" crucial to national debate and policymaking on the environment. They should also play an important role in improving the information available to decision makers at all geographic scales and levels of government.

Although the specifics differ, environmental managers in federal, state, and local governments and their nongovernmental counterparts face many of the same challenges. At the top of the list are ensuring high-quality water and food supplies, protecting homes and habitats, and sustaining our economy's natural resource base.

National indicators should speak to these common concerns. Just as important, however, environmental data collection should be planned so that it both supplies data for national indicators and informs managers at all levels of government and geography. Federal, state, local, tribal, and both private and nongovernmental stakeholders should be directly involved in selecting the indicators and identifying needed data improvements. This multisector involvement ensures that the indicators will be broadly accepted as useful and unbiased, and the programs that provide the data can be effectively managed.

And yet, the United States has no established infrastructure for selecting, refining, and reporting a set of national environmental indicators, and it cannot even provide the data needed to describe many of the features reported by such indicators.

Identifying the Root of the Problem

The United States already invests in gathering and delivering environmental information.[3] But these programs merely provide a starting point for the more effective environmental information system needed today.[4] The current environmental monitoring and reporting programs were developed to meet the many needs of federal, state, and local governments, as well as those of nongovernmental and private groups. *A strategic design and sufficient coordination are sorely lacking.*

As a result, the information produced by these programs suffers from important gaps. Data are collected for some places and some resources, but not others. Data collected by different agencies and levels of government often cannot be used together. This makes it difficult to track trends that cross agency or state boundaries, such as water quality or species status in adjacent states, or to understand national trends. Without an overall strategy for what information is needed and by whom, data collection needs will continue to be met in a piecemeal fashion, or not met at all.

Devising such a strategy will not be easy. The diversity of entities collecting environmental information makes coordination of monitoring and reporting difficult. Further, the diversity of policy and political perspectives makes the selection of indicators complex because these indicators should broadly reflect what society thinks is "important" to track. The Heinz Center's development of the *State of the Nation's Ecosystems* reports proves that dialogue among very different parties can result in agreement on a set of key indicators. This type of dialogue must continue. It must also be coupled with cooperation among data providers and users at all levels to ensure that improvements provide maximum shared benefits.

Without such engagement, political support—and thus funding and resources—will not materialize for strategic improvements, and individual entities will continue to fight isolated battles to expand or maintain their systems.

Understanding Water Use

Increasing water demand, shifting precipitation patterns and complex management jurisdictions amplify the need for consistent water use data to assess whether conservation and water use policies are working, as well as to project future demand. According to data compiled by the U.S. Geological Survey[5], total withdrawals from surface water and groundwater increased by 46% nationally from 1960 to 2000. However, the accuracy of underlying data sources varies from state to state, and some categories of water use are not consistently reported—for example, wastewater treatment and hydroelectricity estimates are not required reporting elements and are not provided by every state.

Building a 21st Century System

An effective environmental information system is one that provides the information its users need. More specifically, it should

- Produce high-level, broad views of important environmental conditions and trends
- Provide the necessary detail on specific issues so that managers can act
- Support assessments of cause and effect, including performance measurement

No less important, users must have confidence that the selection and presentation of data are unbiased—that is, the system does not advance a specific policy agenda. Finally, the data and indicators provided by the system must reflect current scientific and technical knowledge.

Achieving these goals requires attention to the architecture of the system—who needs to be involved in decisions for the system to meet its goals, how different elements are linked to one another, and how to balance the need for top-down strategic guidance with the need for bottom-up tailoring to meet specific needs. It also requires a serious and sustained commitment to increasing the amount and improving the quality of environmental information available and to making these data "fit together" better to describe important environmental changes. Finally, adequate resources are needed.

STRATEGIC DESIGN —THE ARCHITECTURE OF A NEW SYSTEM

- The nation should have a firmly established set of national environmental indicators that form the basis for a periodic report to the nation on key trends.
- These indicators should be selected to reflect multiple views—from federal, state, tribal, and local government, as well as nongovernmental, private sector, and academic interests—on what information is needed to understand environmental change, manage it, and evaluate the effectiveness of management.
- Changes to monitoring programs for reporting national indicators should be linked to assessment of the information needs of decision makers at other levels of government and geography.

The State of the Nation's Ecosystems reports are a solid foundation for a national indicator set. Both the model by which they were developed—broad multistakeholder engagement—and the specific ecological indicators themselves are sound. However, there are important environmental topics, such as energy extraction and use, that are not reported[6]; the needed *environmental* indicators would cover this broader set of issues. More importantly, the reports have been funded by a series of discretionary public and private grants, and face an uncertain future in the coming transition to a new administration (and such uncertainty would arise in *every* such transition). Finally, while the reports identify needed data, there are only informal means to include these needs in monitoring programs and budgets.

Another obstacle is that there is no venue for identifying high-priority data collection needs across multiple agencies within the federal government or between federal and state governments. As it stands, individual proposals for expansion or reduction of monitoring activities

are considered in isolation. It is simply not reasonable to plan and implement a series of programs independently of one another, without a strategic view—and then hope that the whole thing magically fits together and meets the needs of multiple users. To succeed, such coordination will depend on a mandate and—much like the selection of indicators themselves—the effective involvement of multiple levels of government and appropriate nongovernmental and private stakeholders.

IMPROVEMENTS IN DATA QUANTITY AND QUALITY

Key challenges in ensuring the availability of useful data to decision makers are:

- Ensuring that the most important environmental features and trends are being adequately tracked through ongoing monitoring
- Resolving inconsistencies in the methods used to collect and analyze data, so that data are used more effectively

Both the 2002 and 2008 *State of the Nation's Ecosystems* reports noted approximately 40 percent of the indicators selected could not be reported, largely because of data limitations. While there was improvement in data availability between the two report, crucial information on trends in groundwater resources, non-native species, carbon storage, key habitat types, and other vital ecological phenomena could still not be described. The Heinz Center's work with State Wildlife Action Plans has identified the lack of information about wildlife species as a critical limitation to the implementation of these congressionally mandated plans. Such examples abound.

Measuring Carbon in Ecosystems

Ecosystems can trap and store carbon from the atmosphere, but monitoring of carbon storage is incomplete for many U.S. ecosystems. Policymakers and land managers need credible baselines and ongoing monitoring of carbon storage in terrestrial and aquatic ecosystems in order to track the effects of carbon trading programs, the expansion of biofuels production into marginal lands, and changing environmental conditions.

Data are collected in some places but not others; monitoring and reporting methods differ and change over time, frustrating the long-term tracking of trends; baseline data are collected, but no ongoing monitoring is conducted; and some monitoring is not detailed enough to provide the kind of information needed for important decisions. Many federal, state, and other entities collect environmental data. This is vital, as no single entity has the resources, mandate, or expertise to do it all, but inconsistent or incomparable data, among other problems, are often the result. Addressing the gaps caused by the current patchwork of efforts will provide significantly better data for decision makers and the public.

CREATING CAPACITY

An effective system for meeting the nation's environmental information needs will depend on

- Sufficient financial and personnel resources
- Institutional stability
- Appropriate incentives for participation and collaboration

It is well known among environmental professionals that information collection and related activities are among the lowest priorities when it comes to budgets and other resources. The chronic underinvestment in gathering and delivering information necessary for good decision making should be reversed.

It is unrealistic to assume that gaps in current information collection can be met by redirecting resources from current monitoring activities—existing data programs have important uses and many users. In addition, resources are required to combine data from different systems and to implement many of crucial tasks needed for a truly well-functioning national environmental information system. Largest among these are convening the many relevant partners to establish priorities for indicators and monitoring data and the regular production of synthesized reports from multiple data sources. Compared to spending on environmental protection and management activities overall—activities that depend on timely, credible, reliable information—these investments will be small.

Tracking Forest Pests

Warmer temperatures expand the range of insects and disease-carrying organisms that can have potentially devastating effects on U.S. forests. According to data collected by the US Forest Service, forest acreage with insect-induced mortality is increasing, but data are not available to track trends in forests damaged by disease outbreaks.

Progress toward the kinds of improvements outlined here requires long-term commitment—the changes will be incremental and will require consideration of the needs, resources, and technical perspectives of many different parties. To protect against short-term shifts in priorities and to ensure that environmental information delivery continues over time, institutional stability is imperative.

Finally, measures to increase consistency across monitoring and reporting programs are often not undertaken or are assigned low priority. Because these measures come with real costs—in dollars, staff time, and management attention—they may be viewed as either not advancing an agency's central mission or as frustrating its ability to meet its statutory mandates and satisfy its core constituencies. Providing individuals and institutions with signals about the importance of moving toward more integrated—and thus more useful—information systems, and positive incentives for doing so, is crucial.

CHAPTER 2

An Agenda for the Future

Who will design and implement the national environmental information system recommended here? Key roles must go to multiple congressional authorizing and appropriations committees, a wide range of the federal departments and agencies dealing with science, management, and regulation, all states and territories (which themselves often have multiple executive and legislative entities), the academic community, and the for-profit and not-for-profit communities, which also have multiple parties, capabilities, and interests.

Each of these parties can and should contribute; none should dominate. This requires a high level of trust and communication, and recognition of the full range of national, regional, state, and local information needs. It requires acknowledgement of resource limitations, but also a willingness to provide additional resources and to implement firm, well-supported decisions because the nation cannot effectively meet the environmental challenges of the 21st century with our current fragmented information system.

What follows is a description of the areas in which urgent action is needed by Congress, the executive branch, and states to launch the system described here. These actions are not mutually exclusive; they are in fact complementary.

Congress Should

- **Establish a national system of periodically reported environmental and natural resource indicators.**
- Create a public–private governance structure to oversee the selection of indicators and the development and implementation of reporting mechanisms.
- Mandate and facilitate the use of indicators from the national system to report on and evaluate major federal programs to the maximum extent practicable.
- Provide for periodic review of the status of the system, including its scientific credibility, unbiased nature, and relevance to users' needs.
- Ensure, through annual oversight, that the executive branch is effectively advancing implementation of the system.
- Minimize barriers that emerge from multiple committee jurisdictions for authorizing and appropriating resources for the nation's environmental monitoring and reporting infrastructure.

ADVANTAGES OF CONGRESSIONAL ACTION

By authorizing the periodic reporting of a set of national environmental and natural resource indicators and incorporating them into decision making, Congress can provide the stability that is often missing from administrative actions, even though those actions can achieve many of the same ends.

PUBLIC–PRIVATE GOVERNANCE

How an indicator system is managed is crucial to its acceptance and thus its survival. A public–private structure, not dominated by any single level of government or other interest, has the greatest potential to achieve the level of engagement and trust necessary for progress in this arena. A public–private body chartered by Congress, and including representation from the federal, state, private, nongovernmental, and academic sectors, would design the national indicators and provide the vision and strategic guidance for implementing the system so that it effectively meets multiple needs.

KEY GOALS AND FUNCTIONS

Congressional chartering of a new governance body would provide stability over time. Properly constituted, it would provide representation from multiple levels of government and other key societal sectors, assuring all participants of a strong voice in key decisions—crucial to gaining trust and acceptance. Additionally, congressional charter and oversight would clearly signal the importance of a robust environmental information system.

Although it may be relatively small, the governance body would undertake the following important strategic functions:

- Identifying high-priority topics for tracking, leading ultimately to the selection of national indicators
- Preparing a periodic report on trends in these key indicators that is as informative as possible about the nature of these trends but that studiously avoids "taking sides" or making policy recommendations
- Providing a focus for discussions about enabling consistent indicator reporting, while also meeting the needs of other decision makers (note that this report also recommends immediate actions by the executive branch to begin this process; see the section on executive branch actions below)

There are important constitutional and legal issues that arise from such a recommendation. Federal (and state) prerogatives over funding and other resource allocation decisions must be respected. Given their significant resources, federal and state entities will have the primary responsibility for any necessary changes.* Thus, a careful distinction must be drawn between the *design* of an indicator set—identification of the topics and desired indicators—and its *implementation*. The congressionally chartered public–private governance body would, essentially, recommend the design of a national system of indicators and attendant modifications to monitoring and data programs, but federal and state officials must have final say over allocating resources to implement these recommendations.

*The contributions of nongovernmental, private, and academic partners will likely be smaller, especially in the short term, but should be maximized nonetheless.

A good-faith, by-agreement strategy, based on planning that addresses key needs, is a sound and realistic approach that can accommodate the diversity of users and data providers, each operating within their independent spheres of action.

CONGRESSIONAL INVOLVEMENT

Congress should maximize the use of national indicators as integral components of its ongoing oversight and reauthorization of environmental and natural resource legislation. Where strong legislative or program indicators exist, they should be considered for use in the national system.

Congress should oversee the executive branch's implementation of improvements to the system and should commission periodic reviews by outside experts, perhaps every five years, to ensure that the system is achieving goals related to the unbiased nature, scientific credibility, and user relevance of the output. A joint report to Congress by the Government Accountability Office and the National Academies represents one option for such reviews. Congress should provide the resources needed to implement the improvements to the nation's information infrastructure.

Finally, the components of the nation's environmental monitoring and reporting infrastructure are overseen and funded by a large number of congressional committees. This fragmentation of responsibility—not limited to environmental issues, nor easily resolved—hinders integrated management of these components as a larger whole. Creative solutions, such as joint or special committees or other procedural strategies, are likely the best approach to addressing this problem.

The Federal Executive Branch Should

- **Take immediate steps to begin design and implementation of a system of national indicators**. In doing so, it should:
- Create formal interagency processes for establishing federal plans and priorities for selecting indicators and collecting information. The Office of Management and Budget (OMB) should be an integral part of these processes, which should be linked to budget decisions and implementation.
- Create public–private, federal–state forums for discussing high-priority national indicators and data needs for other levels of government and geography.
- Place higher priority on activities that make it possible for data from multiple programs to be used together. In addition to assuring needed funding, it is important that agency managers— especially senior managers who set agency priorities—signal their recognition of the value of this work, take into account in performance evaluations and job categorization, and the like.

MOVING FORWARD IMMEDIATELY

Executive branch action is needed to complement, not preempt, congressional action. It is crucial that momentum be maintained for the many initiatives currently under way within and in partnership with the federal government. Efforts such as The Heinz Center's *State of the Nation's Ecosystems* reports, the Environmental Protection Agency's *Report on the*

Environment, activities within the Council on Environmental Quality (CEQ) and the Office of Science and Technology Policy (OSTP),[†] and design work for the National Water Quality Monitoring Network have laid important groundwork that need not conflict with eventual congressional action.

The two areas in which federal action can contribute most at this time are increased interagency coordination, or "getting the federal house in order," and initiation of forums for external dialogue among the many parties whose support and concerted action are required.

INTERAGENCY COORDINATION: Both CEQ and OSTP are considering steps to improve the internal coordination and management of environmental information activities. CEQ has led an interagency working group exploring institutional strategies for producing a system of national indicators. OSTP is developing an "earth observations information policy" that would begin to provide cross-program prioritization for maintaining and investing in monitoring and related activities. These important initiatives should be continued and expanded. They foster cross-agency work but also include "top down" strategic direction necessary to creating a coherent whole, not simply an array of independent parts. Because each program has supporters and users, change may not come easy—CEQ, OSTP, and OMB should ensure that implementation is adequately funded and that real progress is achieved.

FORUMS FOR EXTERNAL DIALOGUE: Executive branch action should build on the many instances in which federal, state, local, tribal, nongovernmental, private, and other entities have worked together to identify indicators and data needs. Both the substantive recommendations and the networks of engaged and trusting parties are a strong foundation for discussions about the nature of indicators and data needs at national to local management-oriented scales.

Action can begin immediately to identify the information needs that must be met for major management challenges and that will undoubtedly be part of the national indicator systems. These include water quantity and quality, air quality, land use and land cover change, and the status of both native and non-native species. These discussions should address both national indicators and data needs for other levels of government and geography—and explicitly identify high-priority needs, potential costs, and likely implementation responsibilities. At the same time, parallel discussions, based on The Heinz Center's national *ecological* indicator work, should work to identify what additional measures are needed to round out a broader *environmental* set.

The treatment of these dialogues under the Federal Advisory Committee Act (FACA) must be thoroughly considered. The discussions envisioned here have substantial characteristics of joint decision making rather than simply provision of advice to the federal government because many actions would be taken by nonfederal parties. Congressional action to clarify the ability of federal officials to engage in these dialogues within a clear legal structure will help, but the executive branch should move forward, under FACA or other modes, nonetheless.

[†] Both offices are within the Executive Office of the President.

Both Congress and the Executive Branch Should

- **Place higher priority on providing resources to expand the capacity of the nation to observe and report on environmental change.** This should include consideration of short-duration transition funding to accomplish the important tasks related to reconciling different monitoring programs and strategies, as well as general increases in funding for information activities.

EXPANDED FEDERAL FUNDING

As reports by The Heinz Center and the Government Accountability Office have noted,[7] the nation's environmental observation and information infrastructure has significant gaps and weaknesses; these will become more problematic as climate change continues.

Greater federal funding should be devoted to collecting, analyzing, and delivering information on environment change. (See the next section for recommendations on state funding.) Such funding should be linked to an effective process for establishing broadly shared priorities, as described above.

Congressional action may provide an impetus and potential mechanism for increased funding. Reauthorization of the 1990 Global Change Research Act may include mandates for indicators of climate-driven environmental change and could result in establishment of a National Climate Service. One legislative proposal for a "cap and trade" system to reduce greenhouse gas emissions and to auction allowances specifies that a portion of the proceeds be used to foster adaptation to a changing climate.[8] Adequate information is a prerequisite to guiding and evaluating such large and crucial investments.

SHORT-TERM TRANSITION FUNDING

Cost is a significant barrier to ensuring the consistency and comparability of data from multiple monitoring and reporting systems. Congress and the administration should consider dedicated, limited-term funding to support the difficult work that must be undertaken at the federal, state, and other levels to make the transition from the current fragmented system to one that is significantly more coherent. Such costs would have to be met for a limited period to support the modification of programs and the creation of "cross-walking" tools or other information strategies to facilitate comparison and aggregation of unlike data. Such funding would reap important benefits.

Individual States (and Groups of States) Should

- Aggressively seek opportunities for alignment of information programs on a regional or national basis.
- Expand state funding for information activities, including efforts to align with other states and federal agencies.
- Participate actively in the federal and Congressionally-authorized activities described here.

States are fundamental partners in monitoring, reporting on, and managing the nation's environment. The recommendations in this report are intended to ensure that states are afforded a significant voice in designing enhancements to the nation's environmental information infrastructure, in a way that respects their sovereign status.

SEEKING CONSISTENCY

States should expand activities with neighboring states, regional groupings, or groups with specific management concerns (such as migratory or invasive species). Federal agencies should participate in and support such activities to the maximum extent feasible. Commendably, 14 northeastern states have agreed to work together through the Northeastern Association of Fish and Wildlife Agencies to provide some of the crucial information needed by each state to implement its State Wildlife Action Plans.

INCREASING FUNDING

State budgets often face severe constraints. However, as with the federal budget, it is crucial that information collection and delivery be accorded higher priority than has been the case over recent decades.

PARTICIPATING IN NATIONAL DIALOGUES

Finally, states are crucial partners in the many dialogues that will be required, and in the many enhancements in monitoring and reporting that may be required. It is essential that states (and state-based organizations[§]) participate as fully as resources allow.

[§] For example, the Association of Fish and Wildlife Agencies, the Environmental Council of the States, and the National Association of State Foresters.

CHAPTER 3

The Time Is Now

The economic indicators we rely so heavily on today were developed in a time of significant national economic stress. The combination of the Depression and World War II provided an important impetus for the creation and refinement of indicators that provided a large-scale view of the performance of the national economy.

The United States, and indeed the world, faces a comparable set of powerful environmental stresses. Growing population, increasing energy costs, stresses on agricultural production, and a host of other factors are now being joined by climate change. Some changes may be positive, but many are predicted to be negative and to both exacerbate existing problems and introduce new stresses.

Responding to these changes in an efficient and effective manner requires information that meets the needs of decision makers and the public. The environment and the stresses on it are complex and interconnected. There are many parties involved in environmental management. Continuing reliance upon the existing set of underfunded and inadequately coordinated suite of monitoring and reporting programs to provide the information needed to meet these challenges is not a viable strategy.

The steps to be taken to build a national environmental information system are neither drastic nor overly costly. Serious and sustained commitment is required, and the time is now.

Notes and References

1. U.S. Climate Change Science Program. 2008. Scientific Assessment of the Effects of Global Change on the United States, A Report of the Committee on Environment and Natural Resources National Science and Technology Council. Washington, DC.
2. U.S. Government Accountability Office. 2007. Climate Change: Agencies Should Develop Guidance for Addressing the Effects on Federal Land and Water Resources. GAO-07-863. U.S. Government Accountability Office, Washington, DC. Also, participants in a recent series of meetings convened by The Heinz Center discussed in detail a wide range of information gaps for responding to climate change. For example, the need to improve linkages between remote sensing and field observations, develop more robust data sources for predictive models, and enhance standardization of data collection protocols were emphasized.
3. The most commonly cited estimate of federal environmental monitoring and related activities dates from 1996, when the National Science and Technology Council's interagency Committee on Environment and Natural Resources calculated that these expenditures run about $600 million a year. These costs do not include expenditures by state, local, or regional governments, by the regulated private sector, or by other nongovernmental entities.
4. Recognition of the need for improvements in the nation's environmental information infrastructure is neither new nor limited to the United States. A host of high-level government and outside reviews have consistently called for improvements in the information used for environmental decision making. The Council on Environmental Quality's first annual report to Congress (1970) concluded that the efforts of that time did "not provide the type of information or coverage necessary to evaluate the condition of the Nation's environment or to chart changes in its quality and trace their causes" (p. 237).

   The federal interagency process that resulted in the Heinz Center's State of the Nation's Ecosystems project was motivated by a desire to improve the efficiency of the nation's environmental monitoring infrastructure. The National Environmental Monitoring Initiative was coordinated by the National Science and Technology Council's Committee on Environment and Natural Resources, an interagency group managed by the White House Office of Science and Technology Policy. This process culminated in a major conference in 1996 (see Executive Office of the President, National Science and Technology Council, Committee on Environment and Natural Resources, National Environmental Monitoring and Research Workshop Proceedings, February 25, 1997).

   The Government Accountability Office has reported on issues ranging from the need for a high-level system of national indicators to the shortcomings or fragility of specific information collection and delivery programs. See for example, Water Quality: Key EPA and State Decisions Limited by Inconsistent and Incomplete Data, GAO/RCED-00-54 (2000); Informing Our Nation: Improving How to Understand and Assess the USA's Position and Progress, GAO-05-1 (2004); and Environmental Information: Status of Federal Data Programs That Support Ecological Indicators, GAO-5-376 (2005).

   Federal climate change legislation is likely to increase the demand for more strategically managed and readily available information, either explicitly, as in proposal to reauthorize the Global Change Research Act or to create a National Climate Service, or implicitly, if resources and/or mandates for planning for adapaation activities is included in "cap and trade" legislation, as it was in the current Congress. The National Academy of Sciences (National Research Council, Committee to Evaluate Indicators for Monitoring Aquatic and Terrestrial Environments, Ecological Indicators for the Nation, 2000) and the National Academy of Public Administration (Setting Priorities, Getting Results: A New Direction for the Environmental Protection Agency, 1995) have also recognized for more strategically managed information. Internationally, the Organisation for Economic Co-operation and Development (OECD) is planning a third world forum on national indicator systems, and many countries are pursuing their own national indicator systems.
5. See The State of the Nation's Ecosystems 2008; Chapter 6. Fresh Waters, Water Withdrawals
6. The State of the Nation's Ecosystems reports focus on the condition and use of U.S. ecosystems. Issues that might cause changes in ecosystems—such as energy extraction or other—were not reported directly. Rather, they were assumed to be reflected in the condition of ecosystems. Topics were selected for "use" reporting based on whether the use directly involved ecological processes—production of food and fiber and withdrawal of water, for example. Activities not included within this ambit include shipping and manufacturing.
7. See the Heinz Center report Filling the Gaps: Priority Data Needs and Key Management Challenges for National Reporting on Ecosystem Condition (2006), and the GAO reports cited earlier.
8. Senate 2191, 110th Congress.

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