The widely quoted statement of a Trump advisor that NASA's Earth Science Division should be eliminated has heightened fears that the new administration will undermine or ignore science. (Image credit: NASA."

There has understandably been a great deal of hand wringing in the environmental policy world since the US presidential election, including on this site (see, for example, Sean's post here, Dan's here, and Ann's here). There are so many hands to be wrung, however, that we're nowhere near through them all.

One topic that has not yet gotten much coverage is the potential for a new administration to do mischief to the federal government's production and use of scientific information. It has certainly been noted that the incoming administration seems remarkably untethered to any notion that objective facts matter, or to any understanding of the facts about, say, climate

change. The Washington Post recently published a piece noting that thousands of scientists had signed on to an open letter urging the Trump team and the incoming Congress to "adhere to high standards of scientific integrity and independence." (Peter Frumhoff of The Union of Concerned Scientists, which spearheaded the letter and has long been a key proponent of scientific integrity in government, provides a bit more context on the letter.)

Both the letter and the Post article conflate at least two distinct issues and neither provides much background on the law that governs scientific integrity at federal agencies.

The issues I think we should separate for analytical purposes are (1) research funding and (2) regulatory use of science.

The funding issue is undeniably important. The federal government has long been a major source of funding for all manner of science and social science research. And there's good reason to fear that the combination of Trump in the Oval Office and the Republican party in charge of both houses of Congress threatens to strongly politicize the grant funding process. Congress has been wrangling with the Obama administration for years about whether NSF should be allowed to fund social science; Lamar Smith, Chair of the House Committee on Science, Space, and Technology, has repeatedly ridiculed individual federal grants for research he deems insufficiently important; and funding for research on human embryonic stem cells hinges on the fate of an Obama executive order.

For those of us interested in the regulatory landscape and the implementation of federal environmental laws, however, funding for basic research is of secondary importance to the problem of regulatory scientific integrity, which encompasses how information is produced, collected, interpreted, and used by federal regulatory agencies.

Regulatory scientific integrity has come to be perceived as a partisan issue. The presidential administration of George W. Bush was sharply criticized for "manipulat[ing] the process through which science enters into its decisions," and Barack Obama (a self-professed science geek) came into office promising to "restore science to its rightful place."

Pretty much no one, including Donald Trump, is publicly opposed to scientific integrity. One of the 20 questions posed to each of the campaigns by ScienceDebate.org was:

> "Evidence from science is the surest basis for fair and just public policy, but that is predicated on the integrity of that evidence and of the scientific process used to produce it, which must be both transparent and free from political bias and pressure. How will you foster a culture of scientific transparency and accountability in

> government, while protecting scientists and federal agencies from political interference in their work?"

Trump's answer was short, but did at least nod in the expected direction:

> Science is science and facts are facts. My administration will ensure that there will be total transparency and accountability without political bias. The American people deserve this and I will make sure this is the culture of my administration.

The Trump campaign's tenuous relationship with facts makes it hard to take much comfort from that soothing statement, however. It's hardly reassuring that Bob Walker, described as a senior Trump adviser (but not apparently on the transition team) has been widely quoted as describing NASA's highly regarded climate science work as "heavily politicized," and calling for zeroing out funding for its Earth Science division. In the face of such apparent disregard for the consensus views of the relevant scientific community, it will be important to watch how the new administration structures science advice and regulatory implementation.

It's worth noting that charges that the executive branch has ignored or manipulated science go back at least a hundred years, and that even the Obama administration has not been immune to them. Tough policy decisions always implicate important, and often implicate competing, values. Temptations to shade, selectively interpret, or hide scientific information that pushes in politically challenging directions are therefore endemic to the policy process.

It's very difficult to police such behavior from outside. Congress can, and often does, mandate that agencies consult the best available scientific information, but its hard to be sure that information is given appropriate weight. Whistleblowers can help expose shortfalls, but face daunting challenges. The best way to protect regulatory scientific integrity is to set up internal structures, within agencies and in the White House, that set up a strong culture of scientific integrity that helps counter the temptations as they arise. Those structural decisions tend to fly under the radar of public view, but they'll be important indicators of the reality (or not) of the new administration's commitment to scientific integrity.

The keystone decisions, which will set the tone for use of science in the administration, will be the choice of a presidential science advisor and the definition of that person's role. In 1976, after Nixon had eliminated the science advisor position, Congress mandated

> "an advisory mechanism within the Executive Office of the President so that the Chief

> Executive may have available independent, expert judgment and assistance on policy matters which require accurate assessments of the complex scientific and technological features involved."

Absent Congressional intervention, therefore, the new president must have an Office of Science and Technology Policy. The head of that office also typically serves as the presidential science advisor. But there's no assurance that the office will be filled early, that it will be adequately resourced, that the next head of OSTP will have strong scientific credentials, or that he or she will play the high-profile role that Obama's OSTP Director, John Holdren, has enjoyed.

Neil Lane, OSTP Director under Bill Clinton, and colleagues at Rice University have issued an excellent set of recommendations for science advice in the next administration. One of the most important suggestions is that "a nationally respected scientist or engineer" should be identified early to fill the role of OSTP Director and presidential science advisor, and should be consulted as senior science and technology positions are filled, in the White House and federal agencies. Science advice seems like an afterthought in the Trump transition work, but whether or not the team quickly identifies a science advisor, it should follow the Obama administration's lead and draw on scientifically qualified candidates for key positions like NOAA Administrator.

Obama's legacy should make another important step easier for the Trump administration. The G.W. Bush administration was rocked by scandals over unjustified silencing of agency scientists, both in the course of regulatory decisions (remember Julie MacDonald at Interior?) and with respect to politically controversial topics like climate science (remember when James Hansen was still at NASA?). Shortly after he took office, Obama responded by personally instructing his executive branch that

> "The public must be able to trust the science and scientific process informing public policy decisions. Political officials should not suppress or alter scientific or technological findings and conclusions. If scientific and technological information is developed and used by the Federal Government, it should ordinarily be made available to the public. To the extent permitted by law, there should be transparency in the preparation, identification, and use of scientific and technological information in policymaking. The selection of scientists and technology professionals for positions in the executive branch should be based on their scientific and technological knowledge, credentials, experience, and integrity."

Obama delegated the task of "ensuring the highest level of integrity in all aspects of the

executive branch's involvement with scientific and technological processes" to Holdren and OSTP. In turn, Holdren directed all agencies to establish policies that would "ensure a culture of scientific integrity"; "strengthen the actual and perceived credibility of Government research"; "facilitate the free flow of scientific and technological information"; and "establish principles for conveying scientific and technological information to the public." The Department of Interior was the first agency to establish a scientific integrity policy, together with a process to review allegations of scientific misconduct. Many other agencies have followed suit.

The Trump administration could reassure critics and quiet concerns about its willingness to adhere to the norms of scientific inquiry and interpretation by endorsing the Obama memo and committing to abide by the scientific integrity policies already in place at federal agencies.

If it renounces or ignores those policies, persistent oversight by citizen activists and science advocacy groups will be important. The Data Quality Act, which emerged in 2001 as a Congressional reaction to perceived regulatory "overreach" in the Clinton administration, provides one set of tools. Most public interest groups have viewed the Act primarily as a way for regulated industries to harass government scientists and delay needed decisions, but some environmental groups have used it successfully, for example to contest the inadequate protection of the Florida panther. That sort of strategy might look even more attractive if a Trump administration appears to be running roughshod over science. Organizations like Public Employees for Environmental Responsibility, which helps civil servants anonymously report scientific or other agency misconduct, may also assume increased importance.

In the world of agency scientific integrity, the public should only trust if it can verify. If the Trump administration genuinely intends to "ensure that there will be total transparency and accountability without political bias," the tools it needs are already in place. It should use them.