### New Science adv

#### US commitment to science is in question globally – expanding leadership is critical Science Diplomacy which solves a laundry list of scenarios

**Federoff, 8** - professor @ Penn State, National Medal of Science Recipient, Master @ Syracuse University, PhD @ Rockefeller University, National Science Board, Science and Technology Adviser to Sec. of State (Nina V., Statement before Congress, “Making Science Diplomacy More Effective”, 4-2-11, http://www.gpo.gov/fdsys/pkg/CHRG-110hhrg41470/html/CHRG-110hhrg41470.htm)  
Chairman Baird, Ranking Member Ehlers, and distinguished members of the Subcommittee, thank you for this opportunity to discuss science diplomacy at the U.S. Department of State. The U.S. is recognized globally for its leadership in science and technology. Our scientific strength is both a tool of ``soft power''--part of our strategic diplomatic arsenal--and a basis for creating partnerships with countries as they move beyond basic economic and social development. Science diplomacy is a central element of the Secretary's transformational diplomacy initiative, because science and technology are essential to achieving stability and strengthening failed and fragile states. S&T advances have immediate and enormous influence on national and global economies, and thus on the international relations between societies. Nation states, nongovernmental organizations, and multinational corporations are largely shaped by their expertise in and access to intellectual and physical capital in science, technology, and engineering. Even as S&T advances of our modern era provide opportunities for economic prosperity, some also challenge the relative position of countries in the world order, and influence our social institutions and principles. America must remain at the forefront of this new world by maintaining its technological edge, and leading the way internationally through science diplomacy and engagement. The Public Diplomacy Role of Science Science by its nature facilitates diplomacy because it strengthens political relationships, embodies powerful ideals, and creates opportunities for all. The global scientific community embraces principles Americans cherish: transparency, meritocracy, accountability, the objective evaluation of evidence, and broad and frequently democratic participation. Science is inherently democratic, respecting evidence and truth above all. Science is also a common global language, able to bridge deep political and religious divides. Scientists share a common language. Scientific interactions serve to keep open lines of communication and cultural understanding. As scientists everywhere have a common evidentiary external reference system, members of ideologically divergent societies can use the common language of science to cooperatively address both domestic and the increasingly trans-national and global problems confronting ~~human~~ity in the 21st century. There is a growing recognition that science and technology will increasingly drive the successful economies of the 21st century. Science and technology provide an immeasurable benefit to the U.S. by bringing scientists and students here, especially from developing countries, where they see democracy in action, make friends in the international scientific community, become familiar with American technology, and contribute to the U.S. and global economy. For example, in 2005, over 50 percent of physical science and engineering graduate students and postdoctoral researchers trained in the U.S. have been foreign nationals. Moreover, many foreign-born scientists who were educated and have worked in the U.S. eventually progress in their careers to hold influential positions in ministries and institutions both in this country and in their home countries. They also contribute to U.S. scientific and technologic development: According to the National Science Board's 2008 Science and Engineering Indicators, 47 percent of full-time doctoral science and engineering faculty in U.S. research institutions were foreign-born. Finally, some types of science--particularly those that address the grand challenges in science and technology--are inherently international in scope and collaborative by necessity. The ITER Project, an international fusion research and development collaboration, is a product of the thaw in superpower relations between Soviet President Mikhail Gorbachev and U.S. President Ronald Reagan. This reactor will harness the power of nuclear fusion as a possible new and viable energy source by bringing a star to Earth. ITER serves as a symbol of international scientific cooperation among key scientific leaders in the developed and developing world--Japan, Korea, China, E.U., India, Russia, and United States--representing 70 percent of the world's current population. The recent elimination of funding for FY08 U.S. contributions to the ITER project comes at an inopportune time as the Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project had entered into force only on October 2007. The elimination of the promised U.S. contribution drew our allies to question our commitment and credibility in international cooperative ventures. More problematically, it jeopardizes a platform for reaffirming U.S. relations with key states. It should be noted that even at the height of the cold war, the United States used science diplomacy as a means to maintain communications and avoid misunderstanding between the world's two nuclear powers--the Soviet Union and the United States. In a complex multi-polar world, relations are more challenging, the threats perhaps greater, and the need for engagement more paramount. Using Science Diplomacy to Achieve National Security Objectives The welfare and stability of countries and regions in many parts of the globe require a concerted effort by the developed world to address the causal factors that render countries fragile and cause states to fail. Countries that are unable to defend their people against starvation, or fail to provide economic opportunity, are susceptible to extremist ideologies, autocratic rule, and abuses of ~~human~~ rights. As well, the world faces common threats, among them climate change, energy and water shortages, public health emergencies, environmental degradation, poverty, food insecurity, and religious extremism. These threats can undermine the national security of the United States, both directly and indirectly. Many are blind to political boundaries, becoming regional or global threats. The United States has no monopoly on knowledge in a globalizing world and the scientific challenges facing ~~human~~kind are enormous. Addressing these common challenges demands common solutions and necessitates scientific cooperation, common standards, and common goals. We must increasingly harness the power of American ingenuity in science and technology through strong partnerships with the science community in both academia and the private sector, in the U.S. and abroad among our allies, to advance U.S. interests in foreign policy.

#### Thats an impact filter

The Royal Society, 10 – a Fellowship of more than 1400 outstanding individuals from all areas of science, mathematics, engineering and medicine, who form a global scientific network of the highest calibre. The Fellowship is supported by over 130 permanent staff with responsibility for the day-to-day management of the Society and its activities. (January, 2010, “New frontiers in science diplomacy”)  
Cooperation on the scientific aspects of sensitive issues may sometimes be the only way to initiate a wider political dialogue. The soft power of science, and the universality of scientific methods, can be used to diffuse tensions even in ‘hard power’ scenarios, such as those relating to traditional military threats. For example, technologies to verify nuclear arms control agreements were a rare focus of joint working between the US and USSR during the Cold War. Lessons from the Cold War are once again highly pertinent. In the run-up to the May 2010 Review Conference of the Nuclear Non-Proliferation Treaty (NPT), nuclear disarmament is firmly back on the international agenda. However, the timescale for disarmament is long, as illustrated by the history of negotiations over the Chemical Weapons Convention. After the Geneva Convention banned the use of chemical weapons in 1925, negotiations for a treaty banning their production and stockpiling did not start until the 1980s, and the convention entered into force only in 1997. Even now, stockpiles of chemical weapons in the US and Russia have yet to be destroyed. So focusing in 2010 on the challenges of the final stages of a nuclear disarmament process may be premature. A more practical next step could be to establish the scientific requirements for the verification regime necessary to support future stages of negotiation (Pregenzer 2008). In 2008, the Norwegian Minister of Foreign Affairs suggested that a high-level Intergovernmental Panel on Nuclear Disarmament could be established (based on the model of the Intergovernmental Panel on Climate Change). This panel could begin by identifying the scientific and technical aspects of disarmament, and then set out a research agenda necessary to achieve them. International cooperation would be essential, both between nuclear and non-nuclear weapon states, as all would need to have confidence that reductions are taking place. The recent initiative between the UK and Norwegian governments on disarmament verifi cation sets a precedent here, and could be expanded to include additional States (VERTIC 2009). However, security threats now extend beyond the military domain, with environmental security attracting particular attention (Abbott C, Rogers P & Sloboda S 2007). Essential resources, such as freshwater, cultivable land, crop yields and fish stocks, are likely to become scarcer in many parts of the world, increasing the risk of competition over resources within and between states (UNEP 2009). This could intensify as previously inaccessible regions, such as the Arctic Ocean, open up as a consequence of climate change and ice melt. Substantial parts of the world also risk being left uninhabitable by rising sea levels, reduced freshwater availability or declining agricultural capacity. Many of the regions that are vulnerable to the impacts of these multiple stresses are already the locus of existing instability and conflict (see Figure 2). 5 Conclusions The main conclusions to emerge from the discussions at the Royal Society/AAAS meeting were as follows: 5.1 The three dimensions of science diplomacy The concept of science diplomacy is gaining increasing currency in the US, UK, Japan and elsewhere. It is still a fluid concept, but can usefully be applied to the role of science, technology and innovation in three related areas: • informing foreign policy objectives with scientific advice (science in diplomacy); • facilitating international science cooperation (diplomacy for science); • using science cooperation to improve international relations between countries (science for diplomacy). 5.2 Science and universal values Scientific values of rationality, transparency and universality are the same the world over. They can help to underpin good governance and build trust between nations. Science provides a non-ideological environment for the participation and free exchange of ideas between people, regardless of cultural, national or religious backgrounds. 5.3 The soft power of science Science is a source of what Joseph Nye terms ‘soft power’ (Nye 2004). The scientific community often works beyond national boundaries on problems of common interest, so is well placed to support emerging forms of diplomacy that require non-traditional alliances of nations, sectors and non-governmental organisations. If aligned with wider foreign policy goals, these channels of scientific exchange can contribute to coalition building and conflict resolution. Cooperation on the scientific aspects of sensitive issues—such as nuclear nonproliferation—can sometimes provide an effective route to other forms of political dialogue. Similarly the potential of science as an arena for building trust and understanding between countries is gaining traction, particularly in the Middle East and wider Islamic world (see Case study 1). 5.4 Motivations for science diplomacy Science diplomacy seeks to strengthen the symbiosis between the interests and motivations of the scientific and foreign policy communities. For the former, international cooperation is often driven by a desire to access the best people, research facilities or new sources of funding. For the latter, science offers useful networks and channels of communication that can be used to support wider policy goals. Foreign ministries should place greater emphasis on science within their strategies, and draw more extensively on scientific advice in the formation and delivery of policy objectives. In the UK, the appointment of Professor David Clary FRS as the Chief Scientific Adviser at the Foreign and Commonwealth Office creates an important opportunity to integrate science across FCO priorities, and develop stronger linkages with science-related policies in other government departments. Mechanisms to help achieve this could include: • ensuring messages about the value of science are promulgated throughout foreign ministries and embassies, including to all Heads of Mission; • incorporating science policy training into induction courses and training for foreign ministry staff, and specialist diplomatic training for dedicated science officers; • involving more scientists in foreign ministries to advise at senior and strategic levels; • encouraging the recruitment of science graduates as part of the general intake to the foreign service; • encouraging secondments and pairing between diplomats and scientists; • encouraging independent scientific bodies to provide science policy briefi ngs for foreign ministry and embassy staff.

#### Scenario 1 is the atmosphere

#### Specifically Cuban science cooperation is key to effective Atmospheric Science

**Lempinen, 12** – Researcher at the American Association for the Advancement of Science, Public Information Officer at The World Academy of Sciences, cites the best nuclear author person ever Mr. Robock (Edward W., “Oceans, Weather, Health—U.S. Researchers Explore Potential Collaboration with Cuban Colleagues” *American Association for the Advancement of Science,* 1 May 2012 http://www.aaas.org/news/releases/2012/0501cuba.shtml)ahayes

Atmospheric research is another area where Cuba and the United States share tangible common interests. Hurricanes and other storms go over Cuba en route to the United States. Clues gained from atmospheric conditions over the Caribbean can give insights—and perhaps early warning—about tornados in Oklahoma and Arkansas, or storms in Chicago and New York. It is an area of particular interest for Turekian, an atmospheric geochemist. “There is no doubt that real atmospheric science involving Cuba—measurements, understanding of atmospheric conditions—is important not only for better understanding of transport of African dust, but also for getting a handle on how atmospheric conditions and dynamics affect the Gulf of Mexico and the southeastern United States,” he said. “Given that tornadoes are driven by really complicated dynamics that involve large amounts of warm air coming up through the Gulf and interacting with cold fronts, any data we can gain can mean lives saved.... But you can’t hope to understand things like storms as they affect the Southeast Coast of the United States without having better joint cooperation between scientists in the U.S. and Cuba, and without research, instruments, and calibration to measure dynamics that affect us both.” Still, both Turekian and Robock suggested that official mistrust and the trade embargo combine to make such collaboration on climate research difficult, if not impossible. Robock, in an interview, outlined efforts by the National Center for Atmospheric Research in Boulder to install global positioning system devices in the central Cuban city of Camaguey. The GPS devices receive signals from satellites; microwave signals are affected by transmission through the atmosphere, a]nd depending on the density of the atmosphere, that allows for insights on weather and climate change. There are nearly 100 such devices in the Caribbean, Robock explained, but Cuba, though one of the largest land masses in the Caribbean, hosts none of them. “Basic weather data are already shared by all the countries of the world,” he said. “But taking specific measurements there with the GPS would be useful to Cubans and to the larger community. It gives you better information about the state of the atmosphere—temperature, humidity, soil moisture. That’s what you need to start a weather forecast model.” But the Cuban military is wary of the GPS devices, and the nation has not approved the installation. At the same time, the U.S. embargo of Cuba makes it impossible for Cuban scientists to come to the United States for even a week-long course in how to use a computer climate model. “Scientists from both countries want to work together,” Robock said. “We’ll do the best we can... but there are significant limitations.” “From the scientific standpoint,” Turekian added, “this is about the ability to go to a place to make measurements so that we can better understand hurricanes and other conditions that affect the Caribbean and the southeastern United States. To do that, we need relationships and protocols so that Americans and the Cubans together can benefit from measurements in Cuba.” Marine Science Coral reefs in much of the Caribbean have sustained significant damage from ~~human~~ activity—over-fishing, climate change, oil spills, and other pollution. But off of Cuba’s coasts, says marine scientist Nancy Knowlton, the reefs have been less exposed to development, and they’re in better health. Knowlton is the Sant Chair for Marine Science at Smithsonian Institution and senior scientist emeritus at Smithsonian Tropical Research Institute. She’s worked in fields of marine biodiversity and ecology; coral reefs are her specialty. Save for a cruise that stopped in Guantanamo, she’d never been to Cuba, but on her visit in December, she was deeply impressed with opportunities for research in the Cuban reefs and by the marine science already underway there. “There are amazing habitats, much less impacted by people than most places in Caribbean, in terms of over-fishing and that sort of thing,” she said. “And there’s a large community of marine biologists there, many with shared interest in biodiversity and conservation.” For Knowlton, the Cuban reefs are like “a window in time,” allowing researchers a view of what healthy reefs looked like in an era past. “They give you a baseline as to what a healthy fish community should look like,” she explained. And that gives greater insight into other Caribbean reefs where damage is more pronounced. “So there are a lot of things to learn from Cuban marine scientists,” she said. “And there are a lot of reasons for Cubans to come here, or for Cubans to come and work at the Smithsonian. There’s a huge potential for interchange because there are so many shared interests.” Small Steps, Significant Potential Those shared interests appear to extend across many fields. Carney, whose parents were born in Cuba, met in December with Cuban counterparts who study and help shape government science and technology policy. “From my own perspective in talking to their scientists, I was struck by some of the similarities between our communities,” Carney said. The Cubans “face challenges in policy decisions regarding research priorities, and how to balance between basic research and applied research. They provide universal health care, and so life science research is a bit more targeted, a bit more applied. But looking forward, you want to balance the applied portion with the basic research. “It’s interesting that we’re both faced with similar issues, even though our systems are different.” Scientists from both countries are aware, of course, of the considerable obstacles that stand in the way of full collaboration. Visas and the U.S. embargo are obvious problems. But where scientists in a wealthy nation like the United States take digital and Internet resources for granted, bandwidth in Cuba can be so limited that it’s difficult or impossible to exchange data. Given those constraints, the immediate prospects for full, constructive engagement between science communities are slender at best. And yet Robock, Carney, and others said the visits have made clear that working with Cuban scientists is easier than it might appear. “Any academic can go to Cuba and spend money without restriction,” Robock explained. “You need a license from the U.S. Treasury Department to spend money, but as a researcher, you are subject to the existing general license. So many more Americans could go to Cuba and start doing science with them—but they don’t know that they can.” One of the ideas to emerge from the discussions, Carney said, was a Web resource page that would provide such practical information to both scientific communities. These may be small steps, but they have a significant value in helping to build the foundation for collaboration among researchers in Cuba and the United States. Though the formal relationship between the two nations has long been strained, the scientists are betting on better times ahead, even if they don’t know exactly when. “While it’s been the same for 50 years, it will change—political relationships always do,” said Turekian. “Whenever that relationship changes, you want to be in place where you have the groundwork laid and relationships built so you can take advantage of areas where science cooperation can actually contribute to both countries.” In the meantime, efforts will continue, building on the collegiality that visitors to the island have shared with their hosts. “Everyone who was there was a pretty good science diplomat,” said Knowlton. “There was no uneasiness—there was a lot of curiosity on both sides to meet people and find out what people are doing.... Everyone was going out of their way to be gracious. That’s important—you have to be willing to listen as well as to talk. It was lovely. I’d really like to go back.” Added Agre: “Non-governmental science and AAAS have a tremendously important role to play. More than ever, science is a way for us to break barriers between adversaries. It’s a constructive way for the world to move ahead.” Pastrana, too, sounded an ambitious note for the future. “Any hurdle that comes in the way of international exchange in science is limiting its capacity to be of help for increasing the resilience of this world’s environments,” he said. “Only the knowledge, technologies, and products that come from scientific developments could provide the tools for societies to be able to continue ~~human~~ development in harmony with the only planet that sustains them so far, which has been abused for the last half-century far beyond its capacity to cope with such abuse. “Let us be in favor of scientists and their open communication everywhere. In this way, they would be able to contribute to the sustainability of ~~human~~ societies on planet Earth.”

#### Expanding atmospheric science is critical to solve ozone depletion – the brink is now

**NOAA** National Oceanic and Atmospheric Administration **2013** Stratospheric Ozone Layer Depletion and Recovery http://www.esrl.noaa.gov/research/themes/o3/ ajh

In each year beginning in the early 1980s the stratospheric ozone layer over Antarctica has thinned dramatically and abnormally during springtime. Smaller decreases in stratospheric ozone amounts also have been observed over this same period in most other regions of the stratosphere. Subsequent study by scientists, including those from NOAA, revealed that the decline in ozone was attributable to accumulation of certain ~~human~~-made chemicals in the atmosphere. NOAA's role as a steward of the atmospheric environment has enabled it to play a central role in enhancing our understanding of the ozone layer and ozone layer depletion, and in gauging the effectiveness of measures taken to restore the ozone layer to its original strength. NOAA is charged to track the amount of ozone in the stratosphere (referred to here as the "thickness" of the stratospheric ozone layer, and the atmospheric burden of ozone-depleting compounds and their alternatives. NOAA additionally provides fundamental studies of the atmosphere and atmospheric processes to further our understanding of stratospheric ozone depletion and of the potential for recovery the ozone layer. Mass fraction of submicron particles found in different areas of the world.Source: Scientific Assessment of Ozone Depletion: 2002, World Meteorological Organization, Global Ozone Research and Monitoring Project, Report No. 47 Antarctic "ozone hole". Total ozone values are shown for high southern latitudes as measured by a satellite instrument. The dark regions over the Antarctic continent show the severe ozone depletion now found in every spring. Minimum values of total ozone inside the ozone hole are close to 100 Dobson units (DU) compared with normal springtime values of about 300 DU [...]. In late spring or early summer (November- December) the ozone hole disappears as ozone-depleted air is displaced and diluted by ozone-rich air from outside the ozone hole. What is the Stratospheric Ozone Layer and Ozone Layer Depletion? Most ozone is found in a layer more than 10 kilometers (6 miles) above the Earth. This stratospheric ozone layer prevents the Sun's harmful, high-energy radiation from reaching Earth's surface. Ozone in the stratosphere is constantly being created and destroyed by the action of light and photochemistry. The thickness of the ozone layer depends upon the balance of many different processes. The accumulation of chlorofluorocarbons and other ozone-depleting gases in the atmosphere as a result of ~~human~~ activities have altered this balance so that the ozone layer has become depleted. The depletion has been dramatic over certain regions of the globe since the 1980s, such as above Antarctica during September- October, but is less severe in other regions. Why is it important? While ozone is only a very small part of the atmosphere (<0.001%), it plays a critical role in preventing high-energy solar radiation from reaching Earth's surface. The ozone layer acts as a shield for the planet that prevents dangerous radiation from reaching the biosphere, where ~~human~~s, plants, and animals reside. The small amount of this high energy, ultraviolet radiation that normally reaches Earth's surface is responsible for sunburn, skin cancer, cataracts, and damage to genetic material. The depletion of ozone in the ozone layer results in increased amounts of this damaging radiation reaching Earth's surface and an increased occurrence of these problems in ~~human~~s and other living beings. Stratospheric Ozone Background Information 20 Questions and Answers About Ozone What do we know about ozone depletion and recovery? The stratospheric ozone layer has become substantially depleted throughout much of the globe since the 1980s because of enhanced ~~human~~ production and use of ozone- depleting chemicals, such as chlorofluorocarbons, halons, and others, during the 20th century. UV radiation increases in areas where the ozone layer has thinned. Ozone-depleting chemicals include those that contain chlorine or bromine and that are not easily removed from the atmosphere by chemical degradation or dissolution in clouds and rain. Atmospheric observations of these chemicals during the latter part of the 20th century showed dramatic increases that could be directly traced to the amounts produced by ~~human~~s. By 1980, the amounts of chlorine and bromine from these chemicals soon far surpassed the smaller amounts of atmospheric chlorine and bromine arising from natural processes. The abnormally high quantities of atmospheric chlorine and bromine began altering the balance of ozone in the stratosphere so as to dramatically thin the ozone layer. Since the 1980s the most severe ozone layer depletion has been regularly observed over Antarctica during spring, when ozone levels drop by over 95% and UV radiation reaching Earth's surface increases substantially. Less intense depletion of ozone occurs above the Arctic and in mid-latitudes of both hemispheres. Global total ozone changes.Source: Scientific Assessment of Ozone Depletion: 2002, World Meteorological Organization, Global Ozone Research and Monitoring Project, Report No. 47 Global total ozone changes. Global total ozone values decreased by an average of a few percent in the last two decades, as measured by satellite instruments. In the top panel, global ozone changes are compared with average global ozone found in the period of 1964 to 1980. Between 1980 and 2000, the largest decreases occurred following the volcanic eruption of Mt. Pinatubo in 1991. In the 1997 to 2001 period global ozone was reduced by about 3% from the 1964- 1980 average. In the bottom panel, ozone changes between 1980 and 2000 are compared for different latitudes. The largest decreases have occurred at the highest latitudes in both hemispheres because of the large winter/spring depletion in polar regions. The losses in the Southern Hemisphere are greater than those in the Northern Hemisphere because of the greater losses that occur each year in the Antarctic stratosphere. Long-term changes in the tropics are much smaller because reactive halogen gases are not abundant in the tropical lower stratosphere. As a result of the discovery of ozone depletion and the scientific advances that delineated its causes, efforts to reduce the production, and ultimately the atmospheric concentrations, of ozone-depleting chemicals were begun in the late 1980s through the ratification of the Montreal Protocol on Substances that Deplete the Ozone Layer by many countries across the globe. This international Protocol and its subsequent revisions and amendments have resulted in a turnaround in the atmospheric abundance of most ozone-depleting chemicals. While atmospheric levels of ozone-depleting chemicals were rapidly increasing before the Protocol was ratified, emissions of nearly all of these chemicals have declined substantially and atmospheric levels of most of these gases have decreased in the intervening 2 decades. Measurements show that depletion of the ozone layer steadily worsened during the 1980s and most of the 1990s, but more recently as atmospheric amounts of chlorine and bromine have stabilized, a further worsening of ozone depletion appears to have been avoided. In the mid-latitude stratosphere, for example, the decreases in the ozone layer seen in the 1980s and 1990s have not continued. Continued declines in ozone-depleting gases are expected to allow for a recovery of the ozone layer, but not until the middle of the 21st century. The long time scale for this recovery arises because ozone depleting gases such as chlorofluorocarbons are only removed from the atmosphere by natural processes at very slow rates. Halogen source gas changes.Source: Scientific Assessment of Ozone Depletion: 2002, World Meteorological Organization, Global Ozone Research and Monitoring Project, Report No. 47 Halogen source gas changes. The rise in effective stratospheric chlorine values in the 20th century has slowed and reversed in the last decade (top panel). Effective chlorine values combine the measured or projected abundances of chlorine-containing gases with those of brominecontaining gases in a way that properly accounts for the greater effectiveness of bromine in depleting stratospheric ozone. As effective chlorine decreases in the 21st century, the potential for ozone depletion from halogen gases will also decrease. The decrease in effective chlorine values is a result of reductions in individual halogen source gas emissions. The emissions decreased because of the Montreal Protocol, which restricts production and consumption of manufactured halogen gases. The changes in the atmospheric abundance of individual gases are shown in the lower panels using a combination of direct atmospheric measurements, estimates of historical abundance, and future projections of abundance. The increases of CFCs, along with those of CCl4 and CH3CCl3, have either slowed significantly or reversed in the last decade. HCFCs, which are being used as CFC substitutes, will continue to increase in the coming decades. Some halon abundances will also grow in the future while current halon reserves are being depleted. Smaller relative decreases are expected for CH3Br in response to restrictions because it has substantial natural sources. CH3Cl has large natural sources and is not regulated under the Montreal Protocol. Contributions to International Efforts United Nations Environment Programme Scientific Assessment of Ozone Depletion International Panel on Climate Change (IPCC) World Meteorological Organization Global Atmospheric Watch (WMO/GAW) What don't we know? Progress continues on reducing atmospheric amounts of chlorine and bromine so as to allow for the recovery of the ozone layer. Continued declines in emissions of chlorine and bromine gases are necessary for a full recovery of the ozone layer- but will occur only with strict adherence to the restrictions outlined in the fully revised and amended Protocol. Furthermore, future levels of bromine and chlorine depend upon natural processes removing these gases from the atmosphere as they have in the past, despite changes in atmospheric temperatures, circulation, etc. Hence, there exists uncertainty in how the levels of bromine and chlorine will change in the future. If by 2050 bromine and chlorine returned to the levels present in 1980 and every other aspect of the atmospheric environment were unchanged, we would expect a full recovery of the ozone layer. Other aspects (temperature, winds, etc.) of the atmospheric environment and chemicals other than halocarbons can also influence the ozone layer. Changes in these features have been observed and will undoubtedly continue to change in the future. Because the interactions between ozone, temperature, mixing rates, water vapor (and other chemicals) are complex and multi-faceted, accurate predictions of the future ozone layer's health in the face of predicted or unexpected changes are difficult. Changes in ozone depletion may also affect climate change, and many of the chemicals involved in ozone depletion and their substitutes also can influence climate. These interactions at this time are very uncertain. Efforts are currently underway to explore the range of potential future atmospheric conditions and how they might influence the health of the ozone layer. What is NOAA's role? NOAA is responsible for monitoring the stratospheric ozone layer and ozone-depleting gases and it plays a large role in making the fundamental measurements of other atmospheric variables (water vapor, nitrous oxide, aerosols, etc.) that influence the ozone layer. NOAA scientists are leading efforts in assessing alternative chemicals for possible use as replacements to ozone depleting gases through laboratory study. NOAA is also responsible for synthesizing this information to allow for a comprehensive picture of the ozone layer, its changes, and how it might change in the future. As a result of these activities, NOAA has led the effort to guide the recovery of the ozone layer, to ensure the recovery proceeds as expected, and to note areas or action that might allow a faster recovery or hinder recovery. Measurements of ozone-depleting gases provide a means by which adherence to international protocols can be assessed. Measurements of ozone allow one to discern if the policy actions are having their desired effect. Studies of potential climate change effects (e.g., changes in temperature, circulation, or the abundance of other chemicals) allow for much less ambiguity in accurately attributing any observed changes in the ozone layer to their appropriate cause. These NOAA activities constitute a large part of the global scientific effort to understand stratospheric ozone depletion and recovery. NOAA's scientists not only are involved in maintaining a large portion of the world air sampling and measurement network, but also provide the calibration necessary for an integrated network and serve on several advisory groups and expert committees for assuring quality control, improving understanding, and identifying future needs. Only through careful management and interpretation of accurate, high-resolution measurements can we manage our environmental resources efficiently and effectively. What will we need to know in the future? Ozone depletion is still at its peak-ozone levels in many regions of the global are as low as they have ever been. Indications of a recovery are beginning to be seen, though we've got a long way to go before the problem can be regarded as solved. Continued monitoring and process studies of ozone and ozone-depleting gases are required if we hope to be able to discern if the ozone layer is recovering as expected, or whether additional actions are necessary to ensure the recovery of the ozone layer. Continued scientific advances in understanding processes and their simulation in atmospheric models are needed to understand how secondary influences will affect ozone. This is particularly important as the burdens of Cl and Br diminish. These include the influences of a changing climate, altered air mixing and transport rates, energy exchange, and changes in the composition of the atmosphere (e.g., water vapor, methane, nitrous oxide, aerosols, etc.), all of which can influence stratospheric ozone. Only through additional study and incorporation in improved models will we accurately predict how the interplay of the multitude of factors affecting stratospheric ozone layer will respond to declines in chlorine and bromine. What are the benefits for society of NOAA's activities? NOAA's activities are focused on ensuring a recovery of the ozone layer so that it once again provides protection to all life from the Sun's harmful UV radiation. These activities can guarantee that the efforts heal the ozone layer stay on course and do not become sidetracked by unknown and unforeseen events or occurrences. Through its meticulous monitoring of the atmospheric composition and scientific expertise in understanding processes and modeling, as well as the search for CFC alternatives, NOAA provides much of the global scientific foundation for understanding the ozone layer and its changes.

#### New developments trump recovery – prefer our ev

Sharon **Begley** writer at the Smithsonian mag, cites Jim Anderson an atmospheric science researcher, phd, at Harvard, and Kerry Emanuel, an atmospheric scientist at MIT, “The Ozone Problem is Back – And Worse Than Ever” **2013**

The rest of the world may have thought the ozone problem had been solved, but Anderson wasn’t so sure. He persisted in his high-altitude research forays. ER-2 flights from Bangor, Maine, in 1992, found “extremely high ClO over the United States,” he recalls. In 2000, flights from Sweden showed that “the arctic was beginning to emulate” the “massive ozone loss” over Antarctica, as he put it. (The Sweden mission was slightly delayed when a Russian general, who was scheduled to fly in a DC-8 chase plane with Anderson as the spy plane flew over Russia, vanished briefly. Anderson thought he had been going to the head, but the general was taking forever. It turned out he was conferring by phone with officials in the Kremlin, telling them one last time that the U-2 they’d soon notice in Russia’s skies was doing science, not espionage, and to please not shoot it down.) Those discoveries should have served as a wake-up call that, for all the good the Montreal Protocol did, ozone loss was not a thing of the past. “But NASA [which had funded much of Anderson’s work] said we’re declaring victory against ozone loss and going after climate change by studying clouds,” he says. Among the many unknowns about how climate will change in a world warmed by a blanket of greenhouse gases—mostly carbon dioxide from burning fossil fuels—is whether clouds will slow or accelerate global warming. Anderson decided to tackle one piece of that puzzle: the formation of cirrus clouds. Clouds, of course, are made of water vapor. On summertime flights to measure water vapor starting in 2001, Anderson’s team kept getting “deadly boring” results, the same 4.5 to 5 parts per million of water in the stratosphere. In 2005 and 2007, however, flights over Florida and then Oklahoma found “to our shock and surprise,” Anderson says, that thunderstorms were injecting water molecules as high as 12 miles into the stratosphere, reaching the ozone layer. It wasn’t a rare event, either: About half the flights found the high-altitude water. As Anderson and his colleagues wrote with the usual academic understatement in Science last summer, “What proved surprising is the remarkable altitude to which large concentrations of water vapor are observed to penetrate.” “I went to NASA and said we have a big problem here,” says Anderson. Go away, the agency told him; we’ve moved on, now that the world had solved the ozone problem by phasing out CFC production. Anderson persisted (again) and began writing more and more insistent letters up the NASA chain of command. He finally got a sympathetic hearing from Ken Jucks, manager for the agency’s Upper Atmosphere Research Program. Together, they wrested enough financial support for Anderson to keep his team together and analyze what the raw data from the flights were trying to tell him. What happens is that the strong thunderstorms—those about 30 miles across—create powerful updrafts, essentially gaseous elevators that carry warm, humid air miles into the atmosphere. Usually, the gaseous elevator stops short of the stratosphere. But if a storm is strong enough, the updraft can blast through the boundary between the lower atmosphere and the stratosphere, reaching the latter and spreading 60 miles or more in all directions and remaining there for days. The concentration of water in the stratosphere more than triples. The more water, the more ozone loss, through a sequence that begins with the fact that as the air rises, it cools. (To test this, put your hand against the window of an airplane the next time you fly.) The water vapor condenses out as liquid water, much as the steam from your shower turns liquid when it hits a cold bathroom mirror. Condensation releases heat. That raises the temperature of the surrounding air, which contains CFCs left over from the days before they were banned. The heat alters CFC molecules in such a way as to make them more reactive; specifically, sunlight breaks apart the chlorine molecules in CFCs, producing ClO, the same free radical whose detection by Anderson’s team provided the final proof that CFCs destroy ozone over Antarctica. That free radical, Anderson’s latest work showed, is also—thanks to powerful thunderstorms—chomping its way through the ozone layer over the U.S. As a result, ozone is depleted 100 times faster in an area affected by thunderstorms than in an area that is not. About 13 to 21 percent of the ozone is destroyed after four days, with losses of 4 to 6 percent over the next few days. All told, 25 to 30 percent of the ozone over a 60- by 60-mile area could be destroyed, with the effect persisting for weeks. Sunlight eventually replenishes the molecule, converting ordinary oxygen into it; one big remaining question is whether ozone destruction or replenishment will come out ahead. The region the storm-tossed water reaches, 9 to 12 miles up, contains about 20 percent of the ozone column in the summer over the U.S. “The system reacts much more quickly than we expected,” says Anderson. “We don’t know how long that lasts, but it may be many days or weeks.” If the intensity and frequency of powerful summertime thunderstorms increased as a result of climate change, he and his colleagues wrote, then “decreases in ozone and associated increases in UV dosage would also be irreversible”—at least until there are no more manmade chlorine or other ozone-eating chemicals in the atmosphere. In 80 years or so, CFCs from the air conditioner in your 1965 Mustang, the spray cans that were part of your morning grooming and every other source will have finally dissipated, eliminating the threat to ozone. Accordingly, that means we’ll have to hang on for another eight decades with possibly more people dying from skin cancer and more crops wilting under the intense UV rays. To be sure, the idea of ozone-killing storms is not a slam-dunk at this point. The weakest link in the chain of evidence is whether climate change is indeed bringing more powerful and more frequent thunderstorms. “We haven’t a clue whether that’s happening,” says MIT’s Emanuel, “but Jim’s work shows that we better pay attention to the connection” between climate change and thunderstorms. Anderson acknowledges the uncertainty—“we can’t write down a precise equation between carbon dioxide and storms”—but is convinced the link is there, partly because rising levels of greenhouse gases have already been accompanied by weird rainfall patterns: Since the late 1950s, the percentage of rainfall coming in deluges has increased some 70 percent in the Northeast and 30 percent in the Midwest, for instance. Climate scientist James Hansen believes Anderson is right: “What we call ‘moist convection’ will penetrate higher into the atmosphere as the climate becomes warmer,” he says. Anderson’s work brings the science of ozone loss full circle. Years before some scientists suspected that chlorine from CFCs attacked strato­spheric ozone, others warned that supersonic aircraft such as the now-retired Concorde could deplete the ozone layer because its exhaust left water molecules in the stratosphere. Jim Anderson showed that something much more common—the thunderstorms that characterize American summers as reliably as watermelon and hot dogs—can provide the ozone-destroying water. “We thought we’d solved the problem of ozone depletion,” says Anderson, “but we haven’t. If anything, it could be made much worse than we thought by climate change.”

#### Independently that results in extinction

FES, 9 [“The Ozone Layer”, 2-17-09, http://festiveearth.com/index27739.pdf?option=com\_content&do\_pdf=1&id=96]

The ozone layer is essential for ~~human~~ life.  It is able to absorb much harmful ultraviolet radiation, preventing penetration to the earths surface.  Ultraviolet radiation (UV) is defined as radiation with wavelengths between 290-320 nanometers, which are harmful to life because this radiation can enter cells and destroy the deoxyribonucleic acid (DNA) of many life forms on planet earth.  In a sense, the ozone layer can be thought of as a UV filter or our planets built in sunscreen (Geocities.com, 1998).  Without the ozone layer, UV radiation would not be filtered as it reached the surface of the earth.  If this happened, cancer would break out and all of the living civilizations, and all species on earth would be in jeopardy. Thus, the ozone layer essentially allows life, as we know it, to exist.

#### Specifically it kills phytoplankton

Charles **Welch** Ozone Hole Consequence, cites, Dr Patrick Neale, of the Smithsonian Environmental Research Center , researcher at Ozone Hole Inc, received an award from UN environmental protection division, pretty cool **2013** <http://www.theozonehole.com/consequences.htm> ajh

The Southern Ocean is one of the world's most productive marine ecosystems, home to huge numbers of penguins, seals, and bottom plants, and a major supplier of nutrients carried to other parts of the world by undersea currents. Little is known about the effect of UV-B on marine life, particularly the microscopic algae called phytoplankton that form the foundation of the undersea food chain. These tiny plants capture the sun's energy through photosynthesis, providing food for microscopic animals. phytoplankton images They are eaten by krill, which sustain the Antarctic's abundant seals, penguins, and baleen whales. Antarctic Krill Photo Courtesy of http://www.ecoscope.com Less phytoplankton means less food for these animals to eat. It is estimated that a 16 % ozone depletion could result in further losses in Phytoplankton, which would lead to a loss of about 7 million tons of fish per year. With the ~~human~~ food supply already strained due to demands of an ever-increasing population, small reductions resulting from UV damage may be disastrous to many people, especially the poor and indigenous people. UV Rays enter the ~~human~~ body Researchers say it's clear that UV-B harms Antarctic microbes. Dr Patrick Neale, of the Smithsonian Environmental Research Center, has predicted that phytoplankton photosynthesis declines by as much as 8.5 per cent under the worst conditions. DNA It also damages the DNA of marine bacteria and the larvae of starfish and urchins, they say. And it even alters ocean chemistry, creating potentially dangerous substances in the water itself. "This refers to the fact that UV radiation is involved in a number of photochemical reactions in seawater (including the hydrolysis/splitting of water molecules) that produce radicals (hydroxyl, peroxide, superoxide, etc.). These radicals are very reactive and can cause biological damage by oxidizing biological molecules. It's really dramatic what the changes in ozone levels will do to rates of DNA damage and inhibited development," says biologist Deneb Karentz of the University of San Francisco. "If you have a 30 per cent decline in ozone, that doesn't mean a 30 per cent decline in a given biological process - it could be a lot more than that". Experts predict that an estimated 10 % reduction in the ozone layer will result in a 25 % increase in non-melanoma skin cancer rates for temperate latitudes by the year 2050.

#### Extinction

Magda **Fahsi** Ph.D., Mint Press Europe correspondent and investigative reporter, cites Chris Bowler, PhD, director of research at the National Centre for Scientific Research January 3, **2013** “The Fabulous History Of Plankton And Why Our Survival Depends On It” <http://www.mintpressnews.com/the-fabulous-history-of-plankton-and-why-our-survival-depends-on-it/44732/> ajh

Take a drop of ocean water. Just a simple drop of water, you may think? You’d be wrong. That tiny drop is actually full of life. When one thinks about marine life, one has often in mind fish or whales or dolphins … but these only represent 2 percent of the oceans’ living organisms. The other 98 percent is made up of micro-organisms of all kinds whose generic name is plankton. Now, you may remember that, as a child, you were taught that plankton is a whale’s favorite meal. Forget about the whales. Plankton is much more than that; it is about life on Earth itself. First, because without them, we as ~~human~~ beings would not be here; and second, because without them, we’d probably disappear. So we’d better be aware of what happens to them, including what we do to them. This is the reason why a French schooner called Tara spent two and a half years from September 2009 to March 2012 sailing around the globe: to provide scientists with more information on the current status of this invisible world that populates the oceans. It represented 938 days of sailing in total, 62,000 miles travelled, 32 countries visited and 126 scientists from different nationalities and all kind of disciplines – genomics, biology, oceanography, biophysics, genetics, biogeochemistry and biogeography – taking turns on board to collect more than 30,000 samples of plankton. Chris Bowler is one of the scientific coordinators of the Tara Oceans expedition who spent some time on board the Tara. A British scientist, currently director of research at the National Centre for Scientific Research (CNRS) in France, he devotes his life to studying marine micro-organisms. When he speaks about them, it feels as if he were opening a door right in front of you to an entirely new world. He knows how to explain in a vivid and lively manner why plankton is vital for the survival of ~~human~~ beings on Earth. He takes you to the most fascinating journey of micro-organisms to illustrate the vital role they have played in the past and will continue to play for our future. “Plankton has done incredible things in the past,” he starts. “These tiny living organisms, when they die, sediment at the bottom of the oceans. With time, the accumulated sediments generate different kinds of rocks like limestone, chalk and opal. We now find rock structures all over the world composed of billions of these microscopic organisms, such as the white cliffs of Dover in England, or the Sisquoc formation in Lompoc, Santa Barbara. Most of northern Europe is actually of planktonic origin.” Incidentally, this is also how fossil fuels like oil were formed: through the sedimentation over millions and millions of years of dead micro-organisms to the ocean floor. Not only that: “Plankton also generated the air we breathe,” Bowler goes on. “Through photosynthesis, these micro-organisms took the carbon dioxide (CO2) from the atmosphere and learned how to fix it. This is how oxygen was originally generated on Earth. And this is what permitted the emergence of more complex forms of life, like animals and ~~human~~s.” In other words, without oxygen-producing plankton, ~~human~~s would never have seen the light of day. Tiny, but important But what exactly are these microorganisms? “Well,” Bowler explains, “there are different sorts. First, we have what we call the protists, mainly the phytoplankton, if you want. There are up to 10 million of them in every liter of seawater. Then we have the metazoans, like the zooplankton, which graze on the protists. We also have bacteria – up to 1 billion/liter – and viruses – up to 10 billion/liter. These viruses are not dangerous for ~~human~~ beings, only for the phytoplankton and the zooplankton. They have an important regulatory role because they maintain the turnover in the system. Nature does not tolerate excess, it likes equilibrium between species. This means that as soon as one species becomes dominant, nature finds a way to eliminate it.” The only exception to that rule of nature is … man. Although it is obvious that man has become largely dominant on Earth and has done huge damages to other species and to life on Earth itself, nature has not managed to keep up and has not – yet? – found a way to eliminate him. But “through our pollution, our destruction of the environment and our burning of fossil fuels, we are busy with it ourselves,” Bowler comments. “For despite the huge insult men have done to Earth, most life will go on regardless, one way or another. The species that is most at risk is us. So what we are actually busy doing is killing ourselves.” Today, marine micro-organisms still play two vital roles for the survival of ~~human~~ beings. First, and this is probably the most obvious one, they are at the base of the food chain. They provide food to the fish which we eat. Second, they still generate half of the oxygen on the planet, removing CO2 from the atmosphere in the process. We know why this is so important: Carbon dioxide, being a greenhouse gas, is contributing to the global warming of the Earth. Hence the importance of reducing its presence in the atmosphere. “That forests are the first lung of our planet is well-known; what is much less known is that oceans constitute the second. It is like an invisible forest in the oceans,” says Bowler. How does plankton do that? “Micro-organisms suck in the CO2 from the air and create organic carbon to grow and proliferate,” Bowler explains. “And when they die, some of them sink to the bottom of the oceans, taking this carbon dioxide with them. This is what is called the carbon pump and it is one important way of taking CO2 out of the atmosphere. And the bigger these micro-organisms are, the easier and the faster they sink to the bottom. In other words, the heavier they are, the more effective they are in taking CO2 down to the ocean depths.” This means that if pollution or other ~~human~~ activities lead to the extinction of the big guys and they are replaced by a lot of smaller ones, these will be less effective in taking the carbon dioxide down to the bottom of the ocean. And so global warming may accelerate as a consequence. The Tara taking some samples from the ocean. (Photo S. Bollet - Tara Expeditions) Changes in these unique ecosystems could therefore have enormous consequences for life on our planet. And this is why the work done by the Tara Oceans expedition is so important.

#### Scenario 2 is marine science

#### Cuba represents a huge data gap in marine science – the plan resolves that

EDF 13 (February 2013; “Improving Environmental ¶ Science in Cuba for Healthy Marine Ecosystems”; Environmental Defense Fund; <http://www.edf.org/sites/default/files/improvingEnvironmentalScienceInCubaForHealthyMarineEcosystems.pdf>; KDUB)

Conclusions and what’s next¶ some have called Cuba the black hole of marine science, because there is still so much to learn ¶ about Cuba’s abundant and diverse marine and coastal areas. Cuba has world-class marine ¶ scientists yet, over the last two decades, field research has been limited because of insufficient ¶ funding and constraints on scientific collaboration resulting from the lack of diplomatic ¶ relations between the United States and Cuba. Fortunately, over the last few years, that has ¶ changed thanks in large part to policies in both countries that open up new opportunities. since ¶ 2009, for example, scientists from Cuba and the united states have initiated new collaborative ¶ projects (in both the us and Cuba) on a range of issues, including fisheries science and ¶ management, marine protected areas, endangered species, sea level rise, and climate change..

#### Specifically US and Cuban marine cooperation is key to coral reef conservation

**Lempinen, 12** – Researcher at the American Association for the Advancement of Science, Public Information Officer at The World Academy of Sciences, cites the best nuclear author person ever Mr. Robock (Edward W., “Oceans, Weather, Health—U.S. Researchers Explore Potential Collaboration with Cuban Colleagues” *American Association for the Advancement of Science,* 1 May 2012 http://www.aaas.org/news/releases/2012/0501cuba.shtml)ahayes

Coral reefs in much of the Caribbean have sustained significant damage from human activity—over-fishing, climate change, oil spills, and other pollution. But off of Cuba’s coasts, says marine scientist Nancy Knowlton, the reefs have been less exposed to development, and they’re in better health.¶ Knowlton is the Sant Chair for Marine Science at Smithsonian Institution and senior scientist emeritus at Smithsonian Tropical Research Institute. She’s worked in fields of marine biodiversity and ecology; coral reefs are her specialty. Save for a cruise that stopped in Guantanamo, she’d never been to Cuba, but on her visit in December, she was deeply impressed with opportunities for research in the Cuban reefs and by the marine science already underway there.¶ “There are amazing habitats, much less impacted by people than most places in Caribbean, in terms of over-fishing and that sort of thing,” she said. “And there’s a large community of marine biologists there, many with shared interest in biodiversity and conservation.”¶ For Knowlton, the Cuban reefs are like “a window in time,” allowing researchers a view of what healthy reefs looked like in an era past. “They give you a baseline as to what a healthy fish community should look like,” she explained. And that gives greater insight into other Caribbean reefs where damage is more pronounced.¶ “So there are a lot of things to learn from Cuban marine scientists,” she said. “And there are a lot of reasons for Cubans to come here, or for Cubans to come and work at the Smithsonian. There’s a huge potential for interchange because there are so many shared interests.”

#### Extinction – new marine research is key

Hoegh-Guldberg et al 7 (O. Hoegh-Guldberg,1\* P. J. Mumby,2 A. J. Hooten,3 R. S. Steneck,4 P. Greenfield,5 E. Gomez,6¶ C. D. Harvell,7 P. F. Sale,8 A. J. Edwards,9 K. Caldeira,10 N. Knowlton,11 C. M. Eakin,12¶ R. Iglesias-Prieto,13 N. Muthiga,14 R. H. Bradbury,15 A. Dubi,16 M. E. Hatziolos17; “Coral Reefs Under Rapid Climate¶ Change and Ocean Acidification”; Science, published by the American Association for the Advancement of Science; peer reviewed journal; 2007; google scholar; KDUB)

Socioeconomic Impacts of Coral Reef Decline¶ The scenarios presented here are likely to have serious¶ consequences for subsistence-dependent societies,¶ as well as on wider regional economies¶ through their impact on coastal protection, fisheries,¶ and tourism. These consequences become¶ successively worse as [CO2]atm increases, and unmanageable¶ for [CO2]atm above 500 ppm.¶ Although reefs with large communities of coral¶ reef-related organisms persist under CRS-A and¶ CRS-B, they become nonfunctional under CRS-C,¶ as will the reef services that currently underpin¶ human welfare. Climate change is likely to fundamentally¶ alter the attractiveness of coral reefs to¶ tourists (compare Fig. 5, A and C), which is an¶ important consideration for the many low-income¶ coastal countries and developing small island states¶ lying within coral reef regions. Under-resourced¶ and developing countries have the lowest capacity¶ to respond to climate change, but many have¶ tourism as their sole income earner and thus are at¶ risk economically if their coral reefs deteriorate¶ (40). For instance, tourism is a major foreign exchange¶ earner in the Caribbean basin and in some¶ countries accounts for up to half of the gross domestic¶ product (40). Coral reefs in the United¶ States and Australia may supply smaller components¶ of the total economy, but still generate considerable¶ income (many billions of U.S. $ per year)¶ from reef visitors that are increasingly responsive¶ to the quality of reefs (41).¶ Reef rugosity is an important element for the¶ productivity of all reef-based fisheries, whether subsistence,¶ industrial, or to supply the aquarium trade.¶ The density of reef fish (32) is likely to decrease as¶ a result of increasing postsettlement mortality arising¶ from a lack of hiding places and appropriate¶ food for newly settled juveniles (42). Regardless of¶ future climate-change influences, the total landing¶ of coral reef fisheries is already 64% higher than can be sustained, with an extra 156,000 km2 of¶ coral reef estimated as being needed to support¶ anticipated population growth by 2050 (43). For¶ example, in Asia alone coral reefs provide about¶ one-quarter of the annual total fish catch and food¶ to about 1 billion people (43). Climate-change impacts¶ on available habitat will only exacerbate already¶ overstretched fisheries resources.¶ The role of reefs in coastal protection against¶ storms (44) has been highlighted in analyses of¶ exposed and reef-protected coastlines (45, 46). We¶ do not yet have estimates for how fast reef barriers¶ will disappear (47), but we can anticipate that¶ decreasing rates of reef accretion, increasing rates of¶ bioerosion, rising sea levels, and intensifying storms¶ may combine to jeopardize a wide range of coastal¶ barriers. People, infrastructure, and lagoon and estuarine¶ ecosystems, including mangroves, seagrass¶ meadows, and salt marshes, will become increasingly¶ vulnerable to growing wave and storm impacts.¶ Observations of increasingly intense tropical¶ hurricanes and cyclones in all oceans (48) suggest¶ that losses of beach sand from coastal zones are¶ likely to increase (49). Further losses may occur¶ from reduced sand production, formed in many¶ cases by coral reefs, as a consequence of ocean¶ acidification and thermal stress on calcareous algae¶ and other sand producers. Beaches are also under¶ threat of erosion from rising sea levels. The combination¶ of these factors will lead to less stable¶ beaches and impacts on other organisms, such as¶ turtles and sea birds that depend on beach habitats¶ for reproduction, as well as leading to economic¶ impacts on tourism and coastal fishing communities.¶ Opportunities for Management Intervention¶ The inherent inertia of the atmosphere and of our¶ attempts to mitigate CO2 emissions suggest that¶ reef managers and coastal resource policies must¶ first reduce the influence of local stressors such as¶ declining water quality, coastal pollution, and overexploitation¶ of key functional groups such as herbivores¶ (4). These types of action are most likely to¶ assist coral reefs through the decades of stress that¶ inevitably face them. There may be opportunities¶ for using coral restoration to reduce the risk that¶ reefs will shift into a non–coral-dominated state¶ (Fig. 3); however, the efficacy of coral restoration¶ methods to increase rugosity and coral cover remains¶ unclear, and further evaluation of methods is¶ badly needed. With respect to the latter, there is a¶ mismatch between the feasible scale of restoration¶ (hectares) and that of the extent of degradation¶ (many thousands of km2). Nevertheless, new techniques¶ for the mass culture of corals from fragments¶ and spat may assist local restoration or the¶ culture of resistant varieties of key organisms (44).¶ At the 100- to 1000-km scale of coral reefs,¶ one of the most practical interventions is to facilitate¶ grazing by fish and invertebrate herbivores.¶ This is likely to play an important role in situations¶ like that of the Caribbean where densities of one¶ important herbivore, the sea urchin Diadema¶ antillarum, were decimated by disease in the early¶ 1980s (50). Clearly, the improved management of¶ reef fish, especially grazers such as parrotfish,¶ would be expected to result in an improved ability¶ of coral reefs to bounce back from disturbances (51),¶ as long as other factors such as water quality are not¶ limiting. Unfortunately, with the exception of marine¶ reserves, there is negligible explicit management¶ of herbivores in most countries, but this could be¶ improved by setting catch limits (52). Diversification¶ of the herbivore guild to include modest densities¶ of invertebrates like sea urchins will also¶ enhance the resilience of coral reef ecosystems.¶ Conclusion¶ It is sobering to think that we have used the lower¶ range of IPCC scenarios in our analysis yet still¶ envisage serious if not devastating ramifications for¶ coral reefs. Emission pathways that include higher¶ [CO2]atm (600 to 1000 ppm) and global temperatures¶ of 3° to 6°C defy consideration as credible¶ alternatives. Equally important is the fact that IPCC¶ scenarios are likely to be cautious given scientific¶ reticence and the inherently conservative nature of¶ consensus seeking within the IPCC process (53).¶ Consequently, contemplating policies that result in¶ [CO2]atm above 500 ppm appears extremely risky¶ for coral reefs and the tens of millions of people¶ who depend on them directly, even under the most¶ optimistic circumstances.

### A2 squo solves

### afteA2 “say no”

#### Cuba would say yes

EDWARD P. DJEREJIAN, 2011, Founding director of the James A. Baker III Institute for Public Policy at Rice University, is a former U.S. ambassador to Syria and to Israel; Lane is a senior fellow in science and technology policy at the Baker Institute as well as the Malcolm Gillis University Professor and a professor of physics and astronomy at Rice University; Matthews is a fellow in science and technology policy at the Baker Institute and a lecturer for the Wiess School of Natural Sciences at Rice University. “Science, diplomacy and international collaboration”  
http://www.chron.com/opinion/outlook/article/Science-diplomacy-and-international-collaboration-1683250.php

The recent dramatic events taking place in the broader Middle East pose major challenges for the United States, making it all the more important that the Obama administration craft policies that respond to the dynamics of change in the region. One often-neglected but powerful diplomatic tool is known as "science diplomacy," the sharing of scientific information and establishing scientific collaborations with nations in which the United States has limited political relations. Polls show that American scientific research is widely respected throughout the world, even in nations whose citizens do not, overall, have a positive opinion of the United States. For instance, a 2004 Zogby poll showed that only 11 percent of Moroccans have a positive view of the United States, but 90 percent had a favorable view of U.S. science. Of 43 countries surveyed, U.S. science exceeded the general favorability of the United States by an average of 23 points. For this reason, it is often possible to establish constructive discussions and cooperative scientific efforts, especially ones that relate to food, water, health, energy and other human needs, when other channels of communication are closed.

### 2ac politicization

#### The state is key for science and science diplomacy funding

National Research Council 12 The National Research Council (NRC) is the working arm of the United States National Academies, which produces reports that shape policies, inform public opinion, and advance the pursuit of science, engineering, and medicine. (“U.S. and International Perspectives on Global Science Policy and Science” [pg.28]—2012 <http://www.nap.edu/openbook.php?record_id=13300&page=33> KW)

Hernan Chaimovich also suggested that science diplomacy is done by the state, and while science can be a tool for diplomacy, it is part of a government’s policy. According to him, the problem we are facing today is the relationship between a government’s policy and the agencies that are effectively engaged with scientific cooperation, including the private sector. As an example, he reffered to the stagnant budget of NSF’s international division over the past few years, which appears to be mainly due to policy issues. Several participants underlined the importance of funding. Daniel Goroff of the Sloan Foundation stated that science and scientific knowledge are a public good, which by definition is nonexcludable and nonrival, meaning that no one can be excluded from it , and its “consumption” by one individual does not reduce its availability to another individual. Most people expect it to be free, but in fact, it does have a cost. Therefore, it takes collective will and organization to make science happen.

#### Government-controlled science diplomacy solves – allows cooperation which bolsters soft power – multiple existential threats in the status quo means it’s try or die

Sackett 10

[Penny Sackett, Former Chief Scientist for Australia, former Program Director at the NSF, PhD in theoretical physics, the Director of the Australian National University (ANU) Research School of Astronomy and Astrophysics and Mount Stromlo and Siding Spring Observatories (2002 – 07), August 10, 2010, “Science diplomacy: Collaboration for solutions,” <http://www.chiefscientist.gov.au/2010/08/science-diplomacy-collaboration-for-solutions/>] WD

Now turn your attention to today’s reality. Almost 7 billion people inhabit the planet and this number increases at an average of a little over one per cent per year. That’s about 2 more mouths to feed every second. Do these 7 billion people have an impact on the planet? Yes. An irreversible impact? Probably. Taken together this huge number of people has managed to change the face of the Earth and threaten the very systems that support them. We are now embarked on a trajectory that, if unchecked, will certainly have detrimental impacts on our way of life and to natural ecosystems. Some of these are irreversible, including the extinction of many species. But returning to that single individual, surely two things are true. A single person could not have caused all of this, nor can a single person solve all the associated problems. The message here is that the human-induced global problems that confront us cannot be solved by any one individual, group, agency or nation. It will take a large collective effort to change the course that we are on; nothing less will suffice. Our planet is facing several mammoth challenges: to its atmosphere, to its resources, to its inhabitants. Wicked problems such as climate change, over-population, disease, and food, water and energy security require concerted efforts and worldwide collaboration to find and implement effective, ethical and sustainable solutions. These are no longer solely scientific and technical matters. Solutions must be viable in the larger context of the global economy, global unrest and global inequality. Common understandings and commitment to action are required between individuals, within communities and across international networks. Science can play a special role in international relations. Its participants share a common language that transcends mother tongue and borders. For centuries scientists have corresponded and collaborated on international scales in order to arrive at a better and common understanding of the natural and human world. Values integral to science such as transparency, vigorous inquiry and informed debate also support effective international relation practices. Furthermore, given the long-established global trade of scientific information and results, many important international links are already in place at a scientific level. These links can lead to coalition-building, trust and cooperation on sensitive scientific issues which, when supported at a political level, can provide a ‘soft politics’ route to other policy dialogues. That is, if nations are already working together on global science issues, they may be more likely to be open to collaboration on other global issues such as trade and security.

#### Goal-based science diplomacy is good – facilitates smart power which comparatively outweighs other international frameworks

Edwards 11

[Austen O. Edwards, Georgia Institute of Technology, The Fellows Review 2011, “Conscience sans Science: Staging Science Diplomacy for the 21st Century,” <http://www.thepresidency.org/storage/Fellows2011/Edwards_Austen-_Final_Paper.pdf>,] WD

As evident in the typology previously discussed, the range of international science cooperation activities can also be understood by their primary goal. Flink and Schreiterer’s extensive discussion on a goals-based typology suggests that scientific cooperation across borders is sought simply in pursuit of “(a) access to researchers, research findings, and research facilities, natural resources and capital; (b) promotion of a country’s achievements in R&D; or (c) influence on other countries’ public opinion, decision-makers, and political or economic leaders.” The AAAS reinforces and corroborates these delineations by describing how science diplomacy can be conducted by the United States as a way to foster a developing country’s capacity to translate S&T into economic growth or to increase international understanding of US values and business practices. In particular, key proponents of the latter argue that science diplomacy can be utilized to inject the often instable and irrational international community with the norms and values of scientific research such as rational deliberation, universalism, and the acknowledgement of better data despite who is putting forth the argument [Turekian et. al, 2009]. Other foreign policy experts have also suggested that this field of study opens the door for a large number of differing organizational actors (beyond governmental agencies) to perform science diplomacy and maintain communication and cooperation links with the citizens of other countries despite the present temperature of official relations [Pickering et. al, 2010]. Both the governmental and non-governmental approaches, however, focus on science diplomacy’s us as tool to build stronger civil relationships abroad. Joseph Nye’s seminal book Soft Power and Public Diplomacy shines further light on to this framework and its potential to attract the sympathy, talents, capital, and political support of foreign populations to improve both a nation’s leverage and international standing. By creating linkages independent of the political process, science diplomacy therefore can potentially build relationships that seem to rise above national constraints to create a metanetwork of independent, decentralized diplomatic actors. After all, as Flink and Shreiterer state, “With cultural and political tensions mounting all over the world, conventional diplomacy, military power, and political or economic coercion have lost their former grip in IR” [Flink et. al, 2010]. The Obama-Clinton doctrine has attempted since 2008 to accommodate the emerging theories of soft power within the conventional concepts of international realist thought. This shift in the tone and posture of US foreign policy to one of ‘smart power’ provides an opportunity to analyze and reevaluate the tools brought to bear on the world stage. As then-Senator Hillary Clinton said in her 2009 confirmation hearing, smart power uses “the full range of tools at our disposal – diplomatic, economic, military, legal, and cultural – picking the right tool, or combination of tools, for each situation.” However, these attempts to reframe American diplomacy in a new conceptual framework as a logical extension of international liberal thought, including theories of science diplomacy, risks a number of tradeoffs and consequences in terms of reasonable expectations for these strategies.

### Nuke war cards

#### Nuclear war doesn’t cause extinction – prefer models

**Seitz 6 -** former associate of the John M. Olin Institute for Strategic Studies at Harvard University’s Center for International Affairs (Russell, “The' Nuclear Winter ' Meltdown Photoshopping the Apocalypse”, <http://adamant.typepad.com/seitz/2006/12/preherein_honor.html>)//AM

All that remains of Sagan's Big Chill are curves such as this , but history is full of prophets of doom who fail to deliver, not all are without honor in their own land. The 1983 'Nuclear Winter " papers inScience were so politicized that even the eminently liberal President of The Council for a Liveable World called "The worst example ofthe misrepesentation of science to the public in my memory." Among the authors was Stanford President Donald Kennedy. Today he edits Science , the nation's major arbiter of climate science--and policy.¶ Below, a case illustrating the mid-range of the ~.7 to ~1.6 degree C maximum cooling the 2006 studies suggest is superimposed in color on the Blackly Apocalyptic predictions published in Science Vol. 222, 1983 . They're worth comparing, because the range of soot concentrations in the new models overlaps with cases assumed to have dire climatic consequences in the widely publicized 1983 scenarios --"Apocalyptic predictions require, to be taken seriously,higher standards of evidence than do assertions on other matters where the stakes are not as great." wrote Sagan in Foreign Affairs , Winter 1983 -84. But that "evidence" was never forthcoming.'Nuclear Winter' never existed outside of a computer except as [air-brushed animation](http://www.atomicarchive.com/Movies/Movie6.shtml) commissioned by the a PR firm - Porter Novelli Inc. Yet Sagan predicted "the extinction of the ~~human~~ species " as temperatures plummeted 35 degrees C and the world froze in the aftermath of a nuclear holocaust. Last year, Sagan's cohort tried to reanimate the ghost in a machine anti-nuclear activists invoked in the depths of the Cold War, by re-running equally arbitrary scenarios on a modern interactive Global Circulation Model. But the Cold War is history in more ways than one. It is a credit to post-modern computer climate simulations that [they do not reproduce the apocalyptic results](http://www.copernicus.org/EGU/acp/acpd/6/11817/acpd-6-11817_p.pdf) of what Sagan oxymoronically termed "a sophisticated one dimensional model." The subzero 'baseline case' has melted down into a tepid 1.3 degrees of average cooling- [grey skies do not a Ragnarok make](http://whyfiles.org/shorties/222nuclear/images/BCabsoptdaily.gif) . What remains is just not the stuff that End of the World myths are made of.¶ It is hard to exaggerate how seriously " nuclear winter "was once taken by policy analysts who ought to have known better. Many were taken aback by the sheer force of Sagan's rhetoric Remarkably, Science's news coverage of the new results fails to graphically compare them with the old ones Editor Kennedy and other recent executives of the American Association for the Advancement of Science, once proudly co-authored and helped to publicize.¶ You can't say they didn't try to reproduce this Cold War icon. Once again, soot from ¶ imaginary software materializes in midair by the megaton , flying higher than Mount Everest . This is not physics, but a crude exercise in ' garbage in, gospel out' parameter forcing designed to maximize and extend the cooling an aeosol can generate, by sparing it from realistic attrition by rainout in the lower atmosphere. Despite decades of progress in modeling atmospheric chemistry , there is none in this computer simulation, and ignoring photochemistry further extends its impact. Fortunately , the history of science is as hard to erase as it is easy to ignore. Their past mastery of semantic agression cannot spare the authors of "Nuclear Winter Lite " direct comparison of their new results and their old.¶ Dark smoke clouds in the lower atmosphere don't last long enough to spread across the globe. Cloud droplets and rainfall remove them. rapidly washing them out of the sky in a matter of days to weeks- not long enough to sustain a global pall. Real world weather brings down particles much as soot is scrubbed out of power plant smoke by the water sprays in smoke stack scrubbers Robock acknowledges this- not even a single degree of cooling results when soot is released at lower elevations in he models . The workaround is to inject the imaginary aerosol at truly Himalayan elevations - pressure altitudes of 300 millibar and higher , where the computer model's vertical transport function modules pass it off to their even higher neighbors in the stratosphere , where it does not rain and particles linger.. The new studies like the old suffer from the disconnect between a desire to paint the sky black and the vicissitudes of natural history. As with many exercise in worst case models both at invoke rare phenomena as commonplace, claiming it prudent to assume the worst.

#### International pressures force an inevitable change in Cuba policy

Suver 4/24/12 (Roman, research associate at the Council on Hemispheric Affairs, Looking back on the Cuba distraction at Cartagena and the Failure of the US Latin America Policy”, [www.coha.org/looking-back-on-the-cuba-distraction-at-cartagena-and-the-failure-of-the-u-s-latin-america-policy/](http://www.coha.org/looking-back-on-the-cuba-distraction-at-cartagena-and-the-failure-of-the-u-s-latin-america-policy/); KDUB)

This pronouncement and the U.S.’ opposition to Cuba’s future involvement in OAS-related hemispheric gatherings effectively acted as a unilateral veto, as Canada was the only other summit attendee to oppose Cuba’s reintegration, though Prime Minister Stephen Harper reportedly considered supporting the majority position on Cuba’s unconditional readmittance. This stubborn and clearly ideologically-based U.S. move served to do nothing but further alienate the U.S. from the region at a time when it is actively attempting to build both economic and political alliances. Furthermore, by exacerbating the divide between traditional U.S. pan-American policy and the Latin American position through his comments, Obama ensured that the topic of Cuba would continue to dominate the discussion throughout the summit, instead of allowing for a unified hemispheric discourse on other important and pressing regional matters to command media attention. Not surprisingly, amidst the polarizing environment in Cartagena, the Sixth Summit of the Americas concluded without a joint declaration on the agenda’s subjects, further accentuating the dysfunctional nature of current hemispheric politics.¶ Ahead of the Summit, Ecuador’s President, Rafael Correa, wrote a letter to the summit’s host, Colombian President Juan Manuel Santos, in which he declared his intention to boycott the meeting in protest of Cuba’s ongoing exile. He further pledged that Ecuador would boycott any future gatherings that excluded Cuba as long as he remains in office, and urged fellow ALBA members to do the same. While it appeared last week that no other nation would take similar steps, Nicaraguan President Daniel Ortega abstained from attending at the last minute, boycotting the event on the same grounds as Correa, despite his government’s presence in Cartagena.¶ There had been speculation prior to the meeting that some Latin American countries, especially those with memberships in ALBA, would decline to join Ecuador in boycotting the event in hopes that the U.S. would soften its position on Cuba during the weekend’s meeting, making a gesture that could worsen trade relations with the U.S. unnecessary. However, after Obama’s steadfast reiteration of the U.S.’ stance, all eight ALBA members moved swiftly to decry the Cuban situation, vowing to boycott all subsequent Summits of the Americas if Cuba is not granted unconditional participation. Perhaps not so surprisingly, this same sentiment was echoed by some of South America’s most influential nations, including Mercosur members Argentina, Brazil, Paraguay, and Uruguay.¶ The increasingly vocal and adamant calls for Cuba’s inclusion by Latin America, and the growing number of provocative comments being made by Latin American leaders about ending North American hegemony in the region, are ominous signs for the abiding strength of the U.S.’ influence in the region. With the prospect of the majority of the next Summit’s attendees boycotting the event under the current status quo, the future of the OAS and North American participation in Latin American affairs appears noticeably bleak. There are already a number of regional organizations which exclude the U.S. and Canada, CELAC and UNASUR among them, and their increasing relevance to international cooperation in the Americas does not bode well for North America. If the U.S. continues to persistently adhere to its current stance on Cuba through to the 2015 Seventh Summit of the Americas in Panama, there is a distinct possibility that the OAS could lose all legitimacy as well as its influence as exasperated Latin American countries refuse to participate. This could lead to both a rethinking of U.S. policy towards Cuba, and greater cooperation and concessions by the U.S., pursuant to a more unified and egalitarian Western Hemisphere dynamic. Conversely, if the U.S. continues its archaic and neo-imperialistic stance, bodies like CELAC would stand to gain considerable influence, and could perhaps even replace the OAS as the hemisphere’s primary pan-American body and standard-bearer for regional cooperation.¶ In either scenario, the inescapable reality becomes quite clear; no matter how U.S. policy towards Latin America evolves in the near future, the U.S.’ longstanding and powerful influence in Central and South America is beginning to wane. Newly developing export markets and swift economic growth in Latin America are bolstering the region’s ability to function independently of more developed powers like the U.S., and the more the region continues to develop, the stronger its thirst for self-determinism will become. As Central and South America continue to modernize in their quest to join the ranks of developed world powers, the U.S. will continue to watch its previously formidable regional will diminish. The more Washington is willing to proactively amend its foreign policy towards Latin America to promote a more respectful and reciprocal partnership arrangement, the better its prospects will become in forging long-term amicable alliances and beneficial economic partnerships with a rapidly upsurging region.

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#### WM

Haass and O’Sullivan 2k– American diplomat, president of the Council on Foreign Relations, Director of Policy Planning for the Department of State, advisor to Colin Powell, US Coordinator for the Future of Afghanistan / former deputy national security advisor on Iraq and Afghanistan, Jeane Kirkpatrick Professor of Practice of International Affairs and senior fellow at Harvard University’s John F. Kennedy School of Government Belfer Center for Science and International Affairs, and adjunct senior fellow at the Council on Foreign Relations (Richard N. and Meghan L., “f Engagement: Alternatives to Punitive Policies”, Brooking Institute, 2000; < http://www.brookings.edu/~/media/research/files/articles/2000/6/summer%20haass/2000survival.pdf>)//Beddow

Many different types of engagement strategies exist, depending on who is engaged, the kind of incentives employed and the sorts of objectives pursued. Engagement may be conditional when it entails a negotiated series of exchanges, such as where the US extends positive inducements for changes undertaken by the target country. Or engagement may be unconditional if it offers modifications in US policy towards a country without the explicit expectation that a reciprocal act will follow. Generally, conditional engagement is geared towards a government; unconditional engagement works with a country’s civil society or private sector in the hopes of promoting forces that will eventually facilitate cooperation. Architects of engagement strategies can choose from a wide variety of incentives. Economic engagement might offer tangible incentives such as export credits, investment insurance or promotion, access to technology, loans and economic aid. 3 Other equally useful economic incentives involve the removal of penalties such as trade embargoes, investment bans or high tariffs, which have impeded economic relations between the United States and the target country. Facilitated entry into the economic global arena and the institutions that govern it rank among the most potent incentives in today’s global market. Similarly, political engagement can involve the lure of diplomatic recognition, access to regional or international institutions, the scheduling of summits between leaders – or the termination of these benefits. Military engagement could involve the extension of international military educational training in order both to strengthen respect for civilian authority and human rights among a country’s armed forces and, more feasibly, to establish relationships between Americans and young foreign military officers. While these areas of engagement are likely to involve working with state institutions, cultural or civil-society engagement entails building people-to-people contacts. Funding non- governmental organisations, facilitating the flow of remittances and promoting the exchange of students, tourists and other non-governmental people between countries are just some of the possible incentives used in the form of engagement.

#### Counter interpretation economic engagement is influencing the political behavior of a state through economic means

**Resnik, 1** – Assistant Professor of Political Science at Yeshiva University (Evan, Journal of International Affairs, “Defining Engagement” v54, n2, political science complete)

A REFINED DEFINITION OF ENGAGEMENT In order to establish a more effective framework for dealing with unsavory regimes, I propose that we define engagement as the attempt to influence the political behavior of a target state through the comprehensive establishment and enhancement of contacts with that state across multiple issue-areas (i.e. diplomatic, military, economic, cultural). The following is a brief list of the specific forms that such contacts might include: DIPLOMATIC CONTACTS Extension of diplomatic recognition; normalization of diplomatic relations Promotion of target-state membership in international institutions and regimes Summit meetings and other visits by the head of state and other senior government officials of sender state to target state and vice-versa MILITARY CONTACTS Visits of senior military officials of the sender state to the target state and vice versa Arms transfers Military aid and cooperation Military exchange and training programs Confidence and security- measures Intelligence sharing ECONOMIC CONTACTS Trade agreements and promotion Foreign economic and humanitarian aid in the form of loans and/or grants CULTURAL CONTACTS Cultural treaties Inauguration of travel and tourism links Sport, artistic and academic exchanges(n25) Engagement is an iterated process in which the sender and target state develop a relationship of increasing interdependence, culminating in the endpoint of "normalized relations" characterized by a high level of interactions across multiple domains. Engagement is a quintessential exchange relationship: the target state wants the prestige and material resources that would accrue to it from increased contacts with the sender state, while the sender state seeks to modify the domestic and/or foreign policy behavior of the target state. This deductive logic could adopt a number of different forms or strategies when deployed in practice.(n26) For instance, individual contacts can be established by the sender state at either a low or a high level of conditionality.(n27) Additionally, the sender state can achieve its objectives using engagement through any one of the following causal processes: by directly modifying the behavior of the target regime; by manipulating or reinforcing the target states' domestic balance of political power between competing factions that advocate divergent policies; or by shifting preferences at the grassroots level in the hope that this will precipitate political change from below within the target state.This definition implies that three necessary conditions must hold for engagement to constitute an effective foreign policy instrument. First, the overall magnitude of contacts between the sender and target states must initially be low. If two states are already bound by dense contacts in multiple domains (i.e., are already in a highly interdependent relationship), engagement loses its impact as an effective policy tool. Hence, one could not reasonably invoke the possibility of the US engaging Canada or Japan in order to effect a change in either country's political behavior. Second, the material or prestige needs of the target state must be significant, as engagement derives its power from the promise that it can fulfill those needs. The greater the needs of the target state, the more amenable to engagement it is likely to be. For example, North Korea's receptivity to engagement by the US dramatically increased in the wake of the demise of its chief patron, the Soviet Union, and the near-total collapse of its national economy.(n28) Third, the target state must perceive the engager and the international order it represents as a potential source of the material or prestige resources it desires. This means that autarkic, revolutionary and unlimited regimes which eschew the norms and institutions of the prevailing order, such as Stalin's Soviet Union or Hitler's Germany, will not be seduced by the potential benefits of engagement. This reformulated conceptualization avoids the pitfalls of prevailing scholarly conceptions of engagement. It considers the policy as a set of means rather than ends, does not delimit the types of states that can either engage or be engaged, explicitly encompasses contacts in multiple issue-areas, allows for the existence of multiple objectives in any given instance of engagement and, as will be shown below, permits the elucidation of multiple types of positive sanctions.

#### Plan is economic means – promotes trade and investment

State Department (“Science and Technology Cooperation”, http://www.state.gov/e/oes/stc/)

Thirty U.S. S&T Agreements worldwide establish bilateral frameworks to facilitate the exchange of scientific results, provide for protection and allocation of intellectual property rights and benefit sharing, facilitate access for researchers, address taxation issues, and respond to the complex set of issues associated with economic development, domestic security and regional stability. S&T cooperation supports the establishment of science-based industries, encourages investment in national science infrastructure, education and the application of scientific standards, promotes international trade and dialogue on issues of direct import to global security, such as protection of the environment and management of natural resources. S&T collaboration assists USG agencies to establish partnerships with counterpart institutions abroad. These relationships enable them to fulfill their individual responsibilities by providing all parties with access to new resources, materials, information, and research. High priority areas include such areas as agricultural and industrial biotechnology research (including research on microorganisms, plant and animal genetic materials, both aquatic and terrestrial), health sciences, marine research, natural products chemistry, environment and energy research.

#### Reasonability – competing interpretations is infinitely regressive – they’ll always move the goal post

**CICEP, 13** (The Commission on Innovation, Competitiveness and Economic Prosperity (CICEP) is a working group of the Association of Public and Land-grant Universities (APLU). Through regular workshops and meetings, the Commission works on building tools, resources, and standards of practice that universities can use to make the most effective contributions to innovation and economic growth, and to communicate their value in these areas. Members of CICEP include representatives from APLU institution's offices of: academic affairs; research and graduate administration; public and governmental affairs; business and engineering departments; outreach and economic development; technology transfer; and entrepreneurship programs; <http://www.aplu.org/document.doc?id=4431>) KD

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A university conducts its economic development work in a geographic footprint. Sometimes we refer to this geographic footprint as community or region, or we modify it with words like local, state, national, or international to help clarify the geographic area being served. This document will use the word ‘community’ to define the geographic area being served, recognizing that the service area specified for or assumed by the institution (i.e., the city, county, region, state(s), nation, or world) varies by institution and by the specific program or economic development activity. Similarly, the term “economic engagement” has various interpretations across the higher education community. Its use in this tool is meant to help guide campus conversations, not prescribe a particular view of how an institution defines its contributions to its community.

### 2ac cir – notre dame

#### The plan’s popular

**DeWeerd, 1** – writer in seatte, cites Nick Smith, a republican rep from MI, (Sarah, “Embargoing Science: US Policy toward Cuba and Scientific Collaboration” 2001)ahayes

These relatively streamlined procedures have been in place since 1999, when the Clinton administration announced a new policy to expand people-to-people contacts-such as scientific exchanges-between the United States and Cuba. Scientific collaboration between the two countries continues to enjoy broad bipartisan support in Washington. Rep. Nick Smith (R-MI), who visited Cuba in April as part of a delegation organized by the American Association for the Advancement of Science, says that scientific collaboration is "one area that's reasonable" for contact with Cuba. "There are some things we can learn from them, and certainly many things they can learn from the scientific effort in this country."

#### Won’t pass

Bolton 10/29 (Alex Bolton - 10/29/13; “Ted Cruz looms large over comprehensive immigration reform”; The Hill; <http://thehill.com/homenews/senate/188422-ted-cruz-looms-large-over-comprehensive-immigration-reform>; KDUB)

Sen. Ted Cruz (R-Texas) has shaped the view of Republican leaders on immigration reform, and his sway with grassroots conservatives will make passing comprehensive legislation significantly more difficult.¶ Cruz scored a victory in the battle for the hearts and minds of his party over the weekend when Sen. Marco Rubio (R-Fla.) backed away from the Senate’s overhaul of immigration laws.¶ GOP leaders, after President Obama’s reelection last year, sounded more open to moving broad legislation on immigration, but their interest in doing so has waned as Cruz’s power has grown.¶ “There are going to be a lot of Republicans who don’t want to be on the other side of Ted Cruz,” said Rosemary Jenks, director of government relations at NumbersUSA, a group that advocates for reduced immigration flows.¶ Cruz told Rubio and other Senate Republican colleagues earlier this year that a bill including a pathway to citizenship for an estimated 11 million illegal immigrants could not pass Congress and suggested removing the controversial provision.¶ Cruz has yet to decide what strategy he will pursue in the weeks ahead as Obama and Democrats try to ramp up pressure on the House to pass immigration reform.¶ “He’ll definitely be engaged,” a Senate GOP aide said.¶ Cruz’s influential stands against funding the Affordable Care Act and passing comprehensive immigration reform have made him a hero among conservative activists in Iowa, which hosts the first contest in the GOP presidential primary election.¶ “If the caucuses were held today, he would lap the field,” Steve Deace, a nationally syndicated radio host based in Iowa, told The Hill last week.¶ Deace said “Rubio is a nonstarter here” because of his partnership with Sen. Charles Schumer (D-N.Y.) and John McCain (R-Ariz.) to pass the Senate immigration bill.¶ Cruz spent the weekend in Iowa with Rep. Steve King (R-Iowa), the most outspoken critic of comprehensive immigration reform in the lower chamber. It’s a potentially fruitful relationship for both lawmakers.¶ Cruz, who has become an influential voice among House Tea Party conservatives, can help cement opposition to merging the broad Senate package with one of the narrower House bills that could pass there this fall. ¶ King does not want any immigration reform proposal to pass, fearing that one of the House piecemeal bills could later be used as vehicle to move the 1,200-page Senate bill.¶ King’s support could be crucial in the 2016 Iowa caucuses if Cruz decides to launch a bid for the White House.¶ Cruz pointedly clashed with Schumer, the chief Democratic sponsor of the Senate bill, and McCain on the need to pass a comprehensive bill in April.¶ “Any attempt to say in the House that you will not have a path to citizenship, will be a nonstarter,” Schumer warned reporters at a breakfast sponsored by The Christian Science Monitor. “I say that unequivocally. It will not pass the Senate.” ¶ “There’s no way of getting this job done without giving people a path to citizenship,” McCain told reporters.¶ At a Judiciary Committee hearing a few days earlier, Cruz warned a comprehensive bill could not pass¶ “I think if instead the bill includes elements that are deeply divisive — and I would note that I don’t think there is any issue in this entire debate that is more divisive than a path to citizenship for those who are here illegally — in my view, any bill that insists upon that jeopardizes the likelihood of passing any immigration reform bill,” Cruz said.¶ Conservative strategists say Cruz’s aggressive push to defund ObamaCare, which resulted in a 16-day government shutdown, has slammed the door on the Senate bill.¶ “The defund fight has affirmatively closed door on passing amnesty because it soured the relationship between the White House and Republicans,” a conservative strategist said.¶ Cruz’s popularity among Tea Party voters soared during the shutdown. A recent Pew poll showed he had a 74 percent favorable rating among Tea Party Republicans.¶ Conservatives warn that if GOP leaders attempt to negotiate a comprehensive reform bill with Senate Democrats, they would risk another intraparty blowup.¶ “They have no credibility to push through something so unpopular with the base,” the conservative strategist said.¶ Rubio, a likely 2016 presidential candidate, tempered his support for the Senate bill over the weekend.¶ “An ‘all or nothing’ strategy on immigration reform would result in nothing,” Alex Conant, Rubio’s spokesman, said Monday.¶ “What is keeping us from progress on a series of immigration issues on which there is strong consensus is the fear that a conference committee on a limited bill will be used to negotiate a comprehensive one. We should take that option off the table so that we can begin to move on the things we agree on,” he added.

#### Forcing controversial fights key to Obama’s agenda- try or die for the link turn

Dickerson 13 (John, Slate, Go for the Throat!, 1/18 www.slate.com/articles/news\_and\_politics/politics/2013/01/barack\_obama\_s\_second\_inaugural\_address\_the\_president\_should\_declare\_war.single.html)

On Monday, President Obama will preside over the grand reopening of his administration. It would be altogether fitting if he stepped to the microphone, looked down the mall, and let out a sigh: so many people expecting so much from a government that appears capable of so little. A second inaugural suggests new beginnings, but this one is being bookended by dead-end debates. Gridlock over the fiscal cliff preceded it and gridlock over the debt limit, sequester, and budget will follow. After the election, the same people are in power in all the branches of government and they don't get along. There's no indication that the president's clashes with House Republicans will end soon. Inaugural speeches are supposed to be huge and stirring. Presidents haul our heroes onstage, from George Washington to Martin Luther King Jr. George W. Bush brought the Liberty Bell. They use history to make greatness and achievements seem like something you can just take down from the shelf. Americans are not stuck in the rut of the day. But this might be too much for Obama’s second inaugural address: After the last four years, how do you call the nation and its elected representatives to common action while standing on the steps of a building where collective action goes to die? That bipartisan bag of tricks has been tried and it didn’t work. People don’t believe it. Congress' approval rating is 14 percent, the lowest in history. In a December Gallup poll, 77 percent of those asked said the way Washington works is doing “serious harm” to the country. The challenge for President Obama’s speech is the challenge of his second term: how to be great when the environment stinks. Enhancing the president’s legacy requires something more than simply the clever application of predictable stratagems. Washington’s partisan rancor, the size of the problems facing government, and the limited amount of time before Obama is a lame duck all point to a single conclusion: The president who came into office speaking in lofty terms about bipartisanship and cooperation can only cement his legacy if he destroys the GOP. If he wants to transform American politics, he must go for the throat. President Obama could, of course, resign himself to tending to the achievements of his first term. He'd make sure health care reform is implemented, nurse the economy back to health, and put the military on a new footing after two wars. But he's more ambitious than that. He ran for president as a one-term senator with no executive experience. In his first term, he pushed for the biggest overhaul of health care possible because, as he told his aides, he wanted to make history. He may already have made it. There's no question that he is already a president of consequence. But there's no sign he's content to ride out the second half of the game in the Barcalounger. He is approaching gun control, climate change, and immigration with wide and excited eyes. He's not going for caretaker. How should the president proceed then, if he wants to be bold? The Barack Obama of the first administration might have approached the task by finding some Republicans to deal with and then start agreeing to some of their demands in hope that he would win some of their votes. It's the traditional approach. Perhaps he could add a good deal more schmoozing with lawmakers, too. That's the old way. He has abandoned that. He doesn't think it will work and he doesn't have the time. As Obama explained in his last press conference, he thinks the Republicans are dead set on opposing him. They cannot be unchained by schmoozing. Even if Obama were wrong about Republican intransigence, other constraints will limit the chance for cooperation. Republican lawmakers worried about primary challenges in 2014 are not going to be willing partners. He probably has at most 18 months before people start dropping the lame-duck label in close proximity to his name. Obama’s only remaining option is to pulverize. Whether he succeeds in passing legislation or not, given his ambitions, his goal should be to delegitimize his opponents. Through a series of clarifying fights over controversial issues, he can force Republicans to either side with their coalition's most extreme elements or cause a rift in the party that will leave it, at least temporarily, in disarray.

#### Piecemeal passage is more likely

Foley 10/29 (Elise Foley, reporter; Huffington Post; 10/29/2013; “Conservatives Pushing Immigration Reform Say Piecemeal Approach Gains Steam”; <http://www.huffingtonpost.com/2013/10/29/immigration-reform-conservatives_n_4175758.html>; KDUB)

House Republican leaders have rejected a comprehensive approach, saying they will instead vote on individual pieces of legislation. Though some immigration-related bills have been approved by House committees, they haven't gone to the floor for a vote.¶ Other bills are being drafted, but haven't been released, such as one led by Majority Leader Eric Cantor (R-Va.) and Judiciary Committee Chairman Bob Goodlatte (R-Va.) to give legal status to undocumented young people. Rep. Darrell Issa (R-Calif.) reportedly plans to introduce a bill that would allow undocumented immigrants to stay in the U.S. temporarily while they seek long-term solutions. It's unclear if such a measure could win support, given Republican opposition to so-called "amnesty" and Democratic reluctance to support something without a path to citizenship.¶ House Democrats have introduced a bill of their own and won support from nearly all of their own caucus and two Republicans: Reps. Jeff Denham (R-Calif.) and Ileana Ros-Lehtinen (R-Fla.). The Democratic bill is a combination of the Senate-passed comprehensive reform legislation -- which includes a path to citizenship for undocumented immigrants -- and a separate border security measure approved by the House Homeland Security Committee. The House Democrat-led bill won't get a vote, according to GOP leadership.¶ Based on what he heard from House members, Bailey said he doesn't think a path to citizenship "is going to happen." But Democrats, he said, may be realizing they're better off taking what they can get now and pushing for expanded reforms later.

#### Capital isn’t key to immigration reform

Hirsh ’13 (Michael Hirsh is chief correspondent for National Journal. He also contributes to 2012 Decoded. Hirsh previously served as the senior editor and national economics correspondent for Newsweek, based in its Washington bureau. He was also Newsweek’s Washington web editor and authored a weekly column for Newsweek.com. (“There’s No Such Thing as Political Capital”, National Journal, 2/7/2013, <http://www.nationaljournal.com/magazine/there-s-no-such-thing-as-political-capital-20130207>)

Meanwhile, the Republican members of the Senate’s so-called Gang of Eight are pushing hard for a new spirit of compromise on immigration reform, a sharp change after an election year in which the GOP standard-bearer declared he would make life so miserable for the 11 million illegal immigrants in the U.S. that they would “self-deport.” But this turnaround has very little to do with Obama’s personal influence—his political mandate, as it were. It has almost entirely to do with just two numbers: 71 and 27. That’s 71 percent for Obama, 27 percent for Mitt Romney, the breakdown of the Hispanic vote in the 2012 presidential election. Obama drove home his advantage by giving a speech on immigration reform on Jan. 29 at a Hispanic-dominated high school in Nevada, a swing state he won by a surprising 8 percentage points in November. But the movement on immigration has mainly come out of the Republican Party’s recent introspection, and the realization by its more thoughtful members, such as Sen. Marco Rubio of Florida and Gov. Bobby Jindal of Louisiana, that without such a shift the party may be facing demographic death in a country where the 2010 census showed, for the first time, that white births have fallen into the minority. It’s got nothing to do with Obama’s political capital or, indeed, Obama at all.

#### **XO solves**

The Hill 2-16 (“Dems: Obama can act unilaterally on immigration reform”

http://thehill.com/blogs/regwatch/administration/283583-dems-recognize-that-obama-can-act-unilaterally-on-immigration-reform#ixzz2LEvg4R5R)

President Obama can – and will – take steps on immigration reform in the event Congress doesn't reach a comprehensive deal this year, according to several House Democratic leaders. While the Democrats are hoping Congress will preclude any executive action by enacting reforms legislatively, they say the administration has the tools to move unilaterally if the bipartisan talks on Capitol Hill break down. Furthermore, they say, Obama stands poised to use them. "I don't think the president will be hands off on immigration for any moment in time," Rep. Xavier Becerra (D-Calif.), the head of the House Democratic Caucus, told reporters this week. "He's ready to move forward if we're not." Rep. Joseph Crowley (N.Y.), vice chairman of the Democratic Caucus, echoed that message, saying Obama is "not just beating the drum," for immigration reform, "he's actually the drum major." "There are limitations as to what he can do with executive order," Crowley said Wednesday, "but he did say that if Congress continued to fail to act that he would take steps and measures to enact common-sense executive orders to move this country forward." Rep. Raul Grijalva (D-Ariz.), who heads the Congressional Progressive Caucus, said there are "plenty" of executive steps Obama could take if Congress fails to pass a reform package. "The huge one," Grijalva said, is "the waiving of deportation" in order to keep families together. "Four million of the undocumented [immigrants] are people who overstayed their visas to stay with family," he said Friday. "So that would be, I think, an area in which … there's a great deal of executive authority that he could deal with." The administration could also waive visa caps, Grijalva said, to ensure that industries like agriculture have ample access to low-skilled labor. "Everybody's for getting the smart and the talented in, but there's also a labor flow issue," he said. To be sure, Obama and congressional Democrats would prefer the reforms to come through Congress – both because that route would solidify the changes into law and because it would require bipartisan buy-in. Still, House Republicans have been loath to accept one of the central elements of Obama's strategy: A pathway to citizenship for the estimated 11-12 million undocumented people currently living in the country – a move which many conservatives deem "amnesty." Indeed, when the House Judiciary Committee met earlier this month on immigration reform, much of the discussion focused on whether there is some middle ground between citizenship and mass deportation. “If we can find a solution that is … short of a pathway to citizenship, but better than just kicking 12 million people out, why is that not a good solution?” Rep. Raul Labrador (R-Idaho) asked during the hearing. Obama on Tuesday spent a good portion of his State of the Union address urging Congress to send him a comprehensive immigration reform bill this year. Central to that package, he said, should be provisions for "strong border security," for "establishing a responsible pathway to earned citizenship" and for "fixing the legal immigration system to cut waiting periods and attract the highly-skilled entrepreneurs and engineers that will help create jobs and grow our economy." "We know what needs to be done," Obama said. "So let’s get this done." Becerra said he and other immigration reformers have had two meetings with the White House on immigration this month, one with the executive team working on the issue and, more recently, with Obama himself. Becerra said administration officials "essentially" know what reforms they want – "and they have communicated that to both House and Senate members, bipartisanly" – but they also want Congress to take the lead. "They're giving Congress a chance to work its will to move this," Becerra said. "But … I don't think he's going to wait too long. "If you were to ask him would he be prepared to submit a bill if Congress isn't ready … he would tell you, I have no doubt, 'I can do it in a heartbeat,'" Becerra added. "The president will move forward where he can if Congress doesn't act."

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