



Bridging the Gulf

Finding Common Ground on Environmental and
Safety Preparedness for Offshore Oil and Gas in Cuba

Bridging the Gulf

Finding Common Ground on Environmental and
Safety Preparedness for Offshore Oil and Gas in Cuba

Authors

Emily A. Peterson

Daniel J. Whittle, J.D.

Douglas N. Rader, Ph.D.

Acknowledgments

The authors of this report gratefully acknowledge the support of Dr. Jonathan Benjamin-Alvarado (University of Nebraska), Dr. Lee Hunt (International Association of Drilling Contractors), Paul Kelway (International Bird Rescue), Jorge Piñón (University of Texas at Austin), Skip Przelomski (Clean Caribbean & Americas), William K. Reilly (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling), Richard Sears (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling), Captain John Slaughter (U.S. Coast Guard), Robert Muse (Washington, DC attorney), and Dr. John W. Tunnell, Jr. (Harte Research Institute at Texas A&M University) for providing input on this report. The final report reflects the views of its authors and not necessarily that of those interviewed.

This report has been made possible thanks to the generous support of the John D. and Catherine T. MacArthur Foundation and the J.M. Kaplan Fund.

Environmental Defense Fund

Environmental Defense Fund is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

Cover photo: Vidar Løkken

©2012 Environmental Defense Fund

The complete report is available online at edf.org/oceans/cuba.

Table of contents

Executive summary	v
Background on EDF’s involvement in Cuba	1
Cuba: crown jewel of the Caribbean	2
High connectivity and shared resources with the United States	4
Cuba’s energy supply and demand: current and forecasted	5
Energy relationship with Venezuela	7
Cuba’s offshore energy sector	8
Cuba’s offshore energy resources	8
Concessions in Cuba’s EEZ	10
Risks of a spill in Cuban waters	12
Projected trajectory of a spill	12
Shared environmental resources at risk	13
Economic assets at risk	15
Oil spill preparedness and response	16
International Offshore Drilling Response Plan	19
Model international agreements on oil spill response	20
Lessons from the <i>Deepwater Horizon</i> spill	21
Environmental impacts	22
Economic costs	23
Technical and regulatory capabilities	23
Public communications	24
National Commission findings and recommendations	25
State of U.S.-Cuba environmental cooperation	26
Current collaborations	26
Constraints on collaborations	28
Path forward: policy recommendations	29
Unilateral actions	29
Bi-lateral engagement	30

Appendix A: Chronology of key events surrounding offshore energy in Cuba	33
Appendix B: National and international coordination of oil spill response plans	37
Appendix C: Organizations involved in U.S.-Cuba environmental cooperation	39
Nongovernmental organizations	39
Academic and research centers	40
Notes	42

Executive summary

U.S. policy still does not do enough to lessen the likelihood of [an oil] spill.

In May 2012, the Spanish oil company Repsol announced it had drilled a dry hole during its deepwater exploration in Cuba. After having spent roughly \$150 million on two failed wells in Cuba's waters (the first being in 2004), the company revealed it would likely exit the island and explore more profitable fields such as those in Angola and Brazil. In August 2012, Cuba's state oil company announced that the latest offshore exploration project—a well drilled by Malaysia's state-owned Petronas on Cuba's northwest coast—was also unsuccessful.

To some, the outcome of three failed wells out of three attempts in Cuban waters may suggest that the threat of a catastrophic offshore spill impacting U.S. waters and the shared ecosystems of the Gulf of Mexico is now moot. To the contrary, the issue is salient now more than ever. Cuba has an existing near-coastal oil industry on its north coast near Matanzas, a near- single-source dependency on imported petroleum from Venezuela, and has exhibited continued strong interest in developing its own offshore capacity. Several additional foreign oil companies are slated to conduct exploratory deepwater drilling in Cuba at least through 2013.

Current U.S. foreign policy on Cuba creates a conspicuous blind spot that is detrimental to the interests of both countries. The United States government enacted stricter regulations governing deepwater drilling in U.S. waters in the aftermath of the *Deepwater Horizon* oil spill, and has publicly acknowledged a need to better prepare for a potential major spill in neighboring Cuban waters of the Gulf of Mexico. Yet U.S. policy still does not do enough to lessen the likelihood of such a spill or to ensure that sufficient resources will be at the ready to respond to a spill in a timely and effective manner. Beyond their geographical proximity, Cuba



Daniel Whittle

Stretching for 750 miles, Cuba is rich in biodiversity. Much of its shoreline is undeveloped.

Cuba and the United States are tightly interconnected by ocean currents and share ecosystems.

and the United States are tightly interconnected by ocean currents and share ecosystems such that a spill in either country could have profound impacts on fisheries, tourism, and recreation in the entire region. Yet, due to longstanding U.S. economic sanctions, international operators working in Cuba are unable to turn northward to the United States to freely access equipment and expertise in the event of an oil disaster.

The purpose of this report is to present EDF's position that direct dialogue and cooperation between the United States and Cuba on environmental and safety matters associated with offshore oil and gas development is the only effective pathway to protect valuable environmental and economic interests in both countries. Cooperation now on safety and environmental preparedness surrounding offshore oil can also lay a foundation for broader constructive engagement on environmental protection and natural resources management in the future. Principally, this report addresses U.S. policy toward Cuba and makes recommendations for improving environmental and safety preparedness related to offshore oil exploration and development in Cuba. This report is not intended nor does it purport to serve as a comprehensive analysis of Cuba's domestic energy strategy, policies, laws, or regulations.

Deepwater drilling off the northern coast of Cuba and in many other areas of the Gulf of Mexico poses a potential threat to sensitive and vulnerable marine and coastal ecosystems and to coastal communities. Cuba has a sovereign right to determine whether to exploit oil and gas resources within its Exclusive Economic Zone (EEZ), in the same way other nations do, including Cuba's neighbors in the Gulf of Mexico, the United States and Mexico. Other Caribbean countries, such as the Bahamas, are also considering offshore oil and gas operations in the future. The underlying reality is that the Cuban government will continue with its drilling activities, with or without the acquiescence of U.S. policymakers.

Therefore, EDF proposes policy recommendations along two dimensions: those that the U.S. government should take unilaterally and those that require the U.S. government to engage in meaningful dialogue and cooperation with the Cuban government. In this report, we recommend the following:

Unilaterally, the United States should revise its licensing process to ensure that the resources of U.S. private companies and personnel could be deployed in a timely and comprehensive manner should an oil spill occur in Cuba.

On a bilateral level, the U.S. and Cuban governments should create a written agreement similar to existing agreements with neighbors like Mexico and Canada. Such an agreement should stipulate proactive joint planning aimed at maximizing preparedness and response to prevent or mitigate the consequences of an offshore oil spill. (This agreement would supplement any regional, multi-lateral agreement that may result from ongoing discussions described in this report.)

U.S. and Cuban government agencies should fund and facilitate collaborative research on baseline science of shared marine resources in the Western Caribbean and Gulf of Mexico. The high level of connectivity between the two countries underscores that developing baseline science is an imperative that should not wait for a disaster to occur.

These and other recommendations in this report are pragmatic and fully consistent with those put forth by the National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling. The co-chair of the commission and former U.S. Environmental Protection Agency (EPA) Administrator, William K. Reilly, concurs that environmental cooperation is as critical to U.S. interests as it is to Cuba's. "Our priority with Cuba should be to make safety and environmental response the equivalent of drug interdiction and weather exchange information, both of which we have very open, cooperative policies with the Cuban government," Reilly said.¹

Finally, we are hopeful that the Cuban government will continue to expand its promising energy efficiency and renewable energy programs, so as to minimize fossil fuel reliance and to mitigate environmental threats on the island and beyond.

Background on EDF's involvement in Cuba

Founded in 1967, Environmental Defense Fund (EDF) is a national organization dedicated to working toward innovative, cost-effective solutions to environmental problems by building on a foundation of sound economics, science and law. For over 35 years, EDF has worked in the Gulf of Mexico region to protect and restore coastal ecosystems and to rebuild the region's over-exploited fisheries. As part of our longstanding work in the region, EDF has fostered scientific and political consensus to restore the eroding wetlands of South Louisiana, essential to both fisheries and energy infrastructure critical to our nation's interests.

In collaboration with our Gulf Coast restoration partners, EDF strongly advocated for the passage of The Resources and Ecosystems Sustainability, Tourist Opportunity, and Revived Economies Gulf States Act of 2011 (RESTORE Act), which will dedicate 80 percent of the Clean Water Act penalties from BP and other parties responsible for the 2010 gulf oil disaster toward revitalizing the Gulf Coast environment and economy. In the southeastern United States, EDF has spearheaded efforts to end overfishing and to protect coastal and marine habitats that are crucial to healthy and profitable fisheries. In fact, it was our work on oceans in the southeastern United States that prompted us to explore opportunities to advance sustainable fisheries and habitat conservation programs in Cuba.

Since 2000, and pursuant to a specific license from the U.S. Department of Treasury, EDF has cooperated on a number of research and conservation projects with marine scientists, fishermen, environmental groups, and others in Cuba aimed at protecting biodiversity in Cuba and at addressing shared environmental and natural resource issues. Recognizing that nature knows no political boundaries, a principal objective of EDF's Cuba Program is to protect shared ecosystems whose ecological integrity is paramount to both countries. Specifically, EDF works to preserve coral reefs and other coastal and ocean ecosystems, to restore declining fish populations, and to safeguard migratory species such as sharks and sea turtles.

In the last several years, EDF has closely followed Cuba's plans to develop offshore energy resources. We have facilitated dialogue and promoted bi- and multi-lateral cooperation to ensure that oil exploration and production, if it proceeds, is done in an environmentally responsible and safe manner. In September 2011, for example, EDF led a fact-finding delegation to Cuba to engage in discussions with officials there about the country's capacity to regulate offshore operations and respond to the possible risks associated with deepwater drilling. Our delegation included experts from the National Commission on the *Deepwater Horizon* Oil Spill and Offshore Drilling which, in its final report to President Barack Obama, recommended the development of collective standards and regulations for drilling in the Gulf of Mexico.

Additionally, EDF has followed Cuba's plans to develop alternative clean energy sources, including wind, solar, current, ocean thermal energy, and biomass. EDF scientists have communicated with Cuban officials on potential environmental tradeoffs and on the importance of reducing threats to shared ecosystems when considering ocean energy development.



Douglas Reider

Cuba's shorelines provide essential habitat for a large variety of plant and animal species.

Cuba: crown jewel of the Caribbean

Situated at the convergence point of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea, Cuba is a biological crown jewel that boasts the largest marine biodiversity in the Caribbean. The country's expanses of mangrove forests, wetlands, seagrass meadows, and coral reefs provide critical spawning areas, feeding grounds, and shelter for a wide array of marine animals, plants, and organisms.

Its location within the Caribbean makes Cuba a prime migratory corridor and wintering site, particularly given its positioning along the Mississippi and East Atlantic flyways. Cuba provides crucial refueling habitat for 284 bird species that breed in the United States, including warblers, orioles and other song birds, shore birds and wading birds, and raptorial birds.² Cuba's network of wetlands provide extremely important habitat for waterbird species—including flamingos, ibises, cormorants, egrets, and spoonbills—that form in record concentrations not found elsewhere throughout the Caribbean.³ One of these wetlands, the Zapata Swamp on Cuba's southern coast, encompasses over a million acres and represents one of the largest protected areas in the entire Caribbean region.

The popular media has often, and mistakenly, characterized Cuba's prized natural environment as "an accidental Eden," made possible through coincidences "of geography and history."⁴ Such a perspective fails to recognize or credit the affirmative and, in many cases, progressive environmental policies and programs that Cuba has adopted over the last 20 years. In the



Noel Lopez Fernandez

Cuba has pledged to protect 25% of its insular shelf in marine parks and reserves.

In the mid-1990s, Cuban began adopting a suite of environmental laws and regulations that established environmental protection and sustainability as top policy priorities.

mid-1990s, Cuba began adopting a suite of environmental laws and regulations that established environmental protection and sustainability as top policy priorities.

Among these are strong new laws on coastal zone conservation and management and the protection of biodiversity and important natural areas. In 1996, the government set aside the Jardines de la Reina (Gardens of the Queen) as a largely no-take fishery reserve, now the largest and one of the most important marine parks in the Caribbean. The famed archipelago off Cuba's southern coast—home to thriving populations of giant grouper, sharks, sea turtles, and American crocodiles—is regarded as one of the world's most intact coral reef ecosystems.⁵ The government has now pledged to protect a full 25 percent of its insular shelf as marine parks or reserves, and appears primed to meet this objective.⁶

Despite the apparent commitment of Cuban officials to build a body of environmental laws, policies, and regulations, the country's environment is not immune to natural and manmade pressures. These threats range from global challenges — such as climate change, which is causing ocean acidification, rising seas, and intensifying storms — to more local problems, including management of liquid and solid wastes, soil erosion, deforestation, and pressure to develop pristine coastal areas for tourism and other economic sectors.

Furthermore, the extent of scientific understanding is still limited in many parts of Cuba due to inadequate financial and technical resources. While Cuban scientists themselves are industrious and world-class, scientific institutions are often under-funded and equipped with limited technology. As consequence, there is a lack of thorough baseline science on marine ecosystems in Cuba, even in the deep waters off Cuba's North Coast where exploratory drilling is currently underway.

High connectivity and shared resources with the United States

The United States has a vested interest in the health of Cuba's natural environment for an underlying reason: "location, location, location." Aligning with the principle that "nature knows no political borders," the United States shares extensive and important elements of biodiversity at large spatial scales with Cuba, Mexico, and the Bahamas, due to geographical proximity and prevailing ocean currents.

Three major linked ocean currents in the Gulf Basin—the Gulf Loop Current, Florida Current, and the Gulf Stream—create a "highway in the sea" that facilitates dispersal and exchange of diverse aquatic organisms and populations between Cuban and U.S. territorial waters. The most dominant current, the Gulf Loop, is a current of warm water from the Caribbean that travels northward from the Yucatan Straits to the Florida Straits. The Gulf Loop creates a clockwise loop along the West Florida Shelf, where it becomes the Florida Current.⁷ After traveling eastward from the Gulf of Mexico through the Florida Straits, the Florida Current shifts northward to power the Gulf Stream, which travels along the U.S. East Coast and is deflected into the North Atlantic. The Gulf Loop naturally evolves, elongating to the north nearly to the coast of Louisiana before bending back on itself, forming a central gyre, which is then pushed off into the western Gulf.

The movement of these currents underscores the level of shared resources and high connectivity between the United States and Cuba. Managing U.S. southeast fisheries "downstream" is incomplete if managers neglect to protect the key spawning and nursery grounds upstream in the Caribbean, including Cuba, that are the lifeline for important elements of the multibillion-dollar commercial and recreational fisheries in the U.S. Gulf of Mexico. Similarly, management (or mismanagement) of marine resources in the United States also impacts Cuba's economy and environment given our reciprocal relationship.

Cuba's extensive coral reefs, seagrass meadows, and mangrove forests provide vital habitat for snapper, grouper, and other reef fishes that spawn to send larvae towards the United States. The shared Gulf of Mexico also provides spawning sites and foraging habitats for migratory species that are economically valuable to U.S. fisheries, including tunas, sharks, and billfishes. Other migratory species whose population numbers are imperiled—such as the endangered Florida manatee, whale sharks (classified as 'vulnerable' by the IUCN), endangered sea turtles such as the Hawksbill, and the highly depleted Atlantic bluefin tuna—travel unimpeded between Cuban and U.S. waters.

It is also likely that the two countries share an ancient deepwater coral ecosystem that encompasses more than 25,000 square miles—ranging as far north as North Carolina—and makes up one of the world's largest known areas of healthy deep sea coral. In June 2010, the National Oceanic and Atmospheric Administration (NOAA) approved a plan to ban the use of destructive bottom-trawling fishing gear in the U.S. South Atlantic portions of this ecosystem to safeguard the reefs and the commercial fisheries that rely on them.⁸

The interdependency of our ecosystems—and the resulting economic ramifications—reinforces the notion that environmental cooperation between the United States and Cuba is an imperative.



Noel Lopez Fernandez

Endangered sea turtles and other marine life travel freely between the United States and Cuba.

Cuba's energy supply and demand: current and forecasted

In 2011, Cuba produced 55,690 barrels per day (b/d) and consumed just over 170,000 b/d, qualifying the country as a net oil importer.⁹

The island's current production capacity places it ninth among Latin American oil-producing countries, far behind top producers such as Mexico, Brazil, and Venezuela (see Table 1).¹⁰ The majority of Cuba's production occurs from onshore or near shore fields in the northern Matanzas province, yielding a heavy, sour crude oil that requires advanced refining.¹¹ Currently, Cuba's offshore production fields are accessed via horizontal drilling techniques from onshore rigs (in partnership with a Chinese company).

Expanding the country's petroleum production is largely contingent upon the discovery of new, commercially-viable and recoverable reserves. If current exploratory projects yield large commercial finds, Unión Cuba Petróleo (Cubapetroleo, or Cupet)—the island's national oil company—could potentially increase Cuba's onshore and offshore total equity production to roughly 100,000-150,000 b/d within ten years.¹² This upper limit may permit Cuba to strike a supply-demand equilibrium at current demand levels.

However, researchers from Rice University's James Baker Institute estimate that the country's oil demand could expand several fold, potentially spiking consumption up to 350,000 b/d within the next few years if Cuba adopts a decentralized economic system.¹³ For instance, further economic reforms could facilitate the expansion of the tourism sector, regarded as the driver of the country's economic growth. A rapid influx of new visitors to the island and considerable development of its physical infrastructure could lead to a substantial increase in energy demand as compared to current consumption rates. Yet, the scope and pace of the Cuban government's economic reforms remain unclear, and thus attempting to predict Cuba's future energy balance is an uncertain venture given that changes in policy could dramatically alter the country's energy demand.¹⁴

Still, the Cuban government appears committed to attracting foreign investment to develop its oil infrastructure. The island is receiving

TABLE 1
Top Latin American oil producers
(in thousand barrels per day)

	Country	2011
1	Mexico	2,959.47
2	Brazil	2,693.05
3	Venezuela	2,470.08
4	Colombia	930.86
5	Argentina	748.53
6	Ecuador	498.99
7	Peru	153.79
8	Trinidad and Tobago	135.37
9	Cuba	55.69
10	Bolivia	49.93

Source: U.S. Energy Information Administration, 2012.

The Cuban government appears committed to attracting foreign investment to develop its oil infrastructure.

The country's geographic and climactic features endow it with enormous renewable energy potential.

financial support from the Venezuelan and Chinese national oil companies to expand its Cienfuegos refinery (southeast of Havana) and to construct a new refinery at the port of Matanzas (east of Havana), with the goal of bringing total refining capacity to roughly 300,000 b/d during the upcoming years.¹⁵ In 2009, the Brazilian government also announced its decision to invest \$300 million to help finance the development of a new port in the coastal town of Mariel, located about 25 miles west of Havana.¹⁶ The Port of Mariel will feature a major container terminal as well as logistics facilities to accommodate Cuba's offshore oil and gas industry.

Beyond the Cuban government's pursuit to develop its offshore industry, it has also made impressive progress in implementing energy efficiency measures and has significant potential to expand its renewable energy sector. Energy consumption in Cuba is already at a comparatively nominal level, due in part to successful energy efficiency programs as well as enduring impacts from the early 1990s, when the Soviet Union's dissolution left the island with a diminished energy supply and prolonged blackouts.

According to data from the World Bank, Cuba's annual per capita energy consumption is 1,327 kWh, only 10 percent of U.S. per capita energy consumption.¹⁷ The country's geographic and climactic features endow it with enormous renewable energy potential. From solar and wind to ocean current and ocean thermal energy conversion, there is vast capacity to increase the island's renewable energy sector, which currently provides approximately 3.8 percent of electricity supply.¹⁸ (As comparison, renewable energy accounted for 12.7 percent of electricity generation in the United States in 2011.¹⁹) Additional research and financing are needed to facilitate the growth of renewable energy in Cuba.

Energy relationship with Venezuela

Cuban government leaders appear to be well aware of the risks associated with single-source oil dependency.

Presently, Cuba receives roughly 114,000 b/d of crude oil and refined products from Petroleos de Venezuela S.A. (PDVSA), the national oil company of Venezuela, to cover its energy deficit.²⁰ In 2000, former Cuban President Fidel Castro and Venezuelan President Hugo Chavez agreed on a framework by which PDVSA would sell crude oil and derivatives at world market prices to Cupet, in exchange for the deployment of medical, educational, cultural, and intelligence services from Cuba to Venezuela. Since the fallout of the Soviet Union's support for Cuba in the early 1990s, the relationship with Venezuela has become the backbone of the island's energy supply.

Cuban government leaders appear to be well aware of the risks associated with single-source oil dependency, as underscored by current President Raul Castro's recent visits and outreach to countries such as China, Russia, Brazil, and Angola. Given reports that Venezuela's President Chavez is currently undergoing cancer treatment—and given the fact he faces a re-election fight this fall—Cuban officials have shown escalating interest in recruiting more diversified foreign investors to explore for and produce oil in the offshore fields of the island's North Coast.

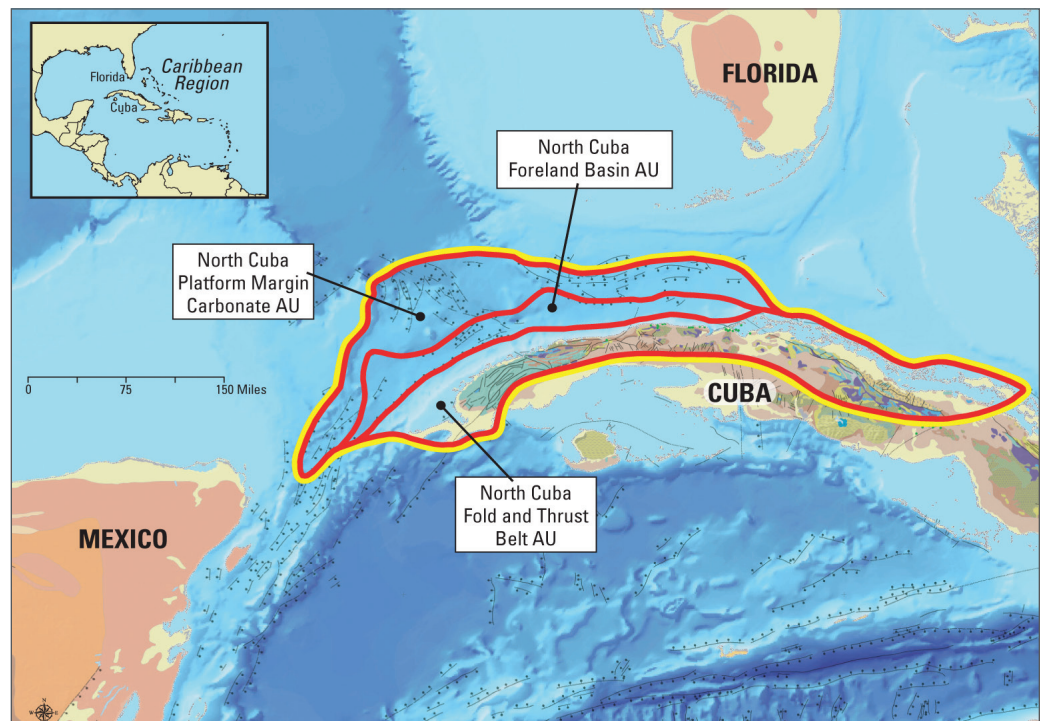
Cuba's offshore energy sector

Cuba's offshore energy resources

As Cuba seeks to develop its offshore oil resources and reduce its petroleum dependency on Venezuela, it is worth examining the magnitude of Cuba's energy resources, especially given discrepancies between U.S. and Cuban government estimates. According to the U.S. Energy Information Administration, Cuba has proven oil reserves of 0.1 billion barrels and natural gas reserves of 2.5 trillion cubic feet.²¹ The actual amount of recoverable oil and gas remains unknown, though upcoming exploratory drilling may shed more light on the possible size of the country's reserves.

In 2005, the U.S. Geological Survey (USGS) released an assessment that estimated a mean of 4.6 billion barrels of undiscovered oil, a mean of 9.8 trillion cubic feet of undiscovered natural gas, and a mean of 0.9 billion barrels of undiscovered natural gas liquids in the North Cuba Basin of Cuba (see Figure 1).

FIGURE 1
USGS assessment of undiscovered oil and gas resources of the North Cuba Basin



Source: USGS, Assessment of Undiscovered Oil and Gas Reserves of the North Cuba Basin, Cuba, 2004, (2005), available at http://pubs.usgs.gov/fs/2005/3009/pdf/fs2005_3_009.pdf

Note: The figure depicts the North Cuba Basin. The boundary of the Jurassic-Cretaceous Composite Total is outlined and encompasses the three assessment units (AU) that were defined and assessed in the USGS study.

TABLE 2
Crude oil proven reserves globally
 (in billion barrels)

	Country	2012		Country	2012
1	Saudi Arabia	267.02	15	Brazil	13.99
2	Venezuela	211.17	16	Algeria	12.20
3	Canada	173.63	17	Mexico	10.16
4	Iran	151.17	18	Angola	9.50
5	Iraq	143.10	19	India	8.94
6	Kuwait	104.00	20	Ecuador	7.21
7	United Arab Emirates	97.80	21	Azerbaijan	7.00
8	Russia	60.00	22	Oman	5.50
9	Libya	47.10	23	Norway	5.32
10	Nigeria	37.20	24	Sudan	5.00
11	Kazakhstan	30.00	25	Cuba	4.60 ^b
12	Qatar	25.38	26	Egypt	4.40
13	United States	25.20 ^a	26	Vietnam	4.40
14	China	20.35	27	Indonesia	3.89

Source: U.S. Energy Information Administration, 2012.

Proven reserves in Cuba are 0.124 BB.

^a Represents 2010 figure, latest year for which data is available.

^b Represents mean estimate of undiscovered resources, according to USGS Assessment (2005).

In contrast, Cuba's state-owned oil company, Cupet, estimates that all of Cuba's offshore basins may contain over 20 billion barrels of undiscovered oil reserves. Energy experts, however, suggest that insufficient exploratory work has been performed to confidently validate the higher-end estimate from Cuban geologists.²² As a basis of comparison, if the USGS estimate of 4.6 billion barrels of undiscovered oil were ultimately proven, it would move Cuba up the ranks alongside other top holders of proven oil reserves in Latin America, such as Ecuador (see Table 2).

There are several points worth exploring regarding the differences between the two estimates of undiscovered oil reserves and its implications for Cuba's energy future. First, neither estimate involved actual exploratory work: the USGS estimate is based on a geology-based assessment method, and Cupet has not publicly provided details on its methodology.

Secondly, the USGS estimate of 4.6 billion barrels of undiscovered oil represents a mean figure based on a conservative probability distribution. The high-end potential of the North Cuba Basin, according to the agency's assessment, could reach 9.3 billion barrels of undiscovered oil and 21.8 trillion cubic feet of undiscovered natural gas. The USGS assessment suggests that the country's low-end potential is 1.1 billion barrels of undiscovered oil and 2.0 trillion cubic feet on undiscovered natural gas. The USGS characterizes the low-end potential as a 95 percent likelihood that the calculated figures, at minimum, are undiscovered. The wide range of these figures depicts the current level of uncertainty that exists regarding the size of undiscovered oil and gas reserves in Cuba. While the mean figures are commonly cited in media reports, it is important to note that they are not absolute and represent only one value in a broad statistical distribution.

Lastly, the USGS assessment only encompassed the extent of the Jurassic-Cretaceous Composite Total Petroleum System, located off northwestern Cuba, as demarcated in Figure 1.

In contrast, Cupet’s estimate refers to the entire Cuban EEZ. Very little seismic work and exploratory drilling have been performed outside of the North Cuba Basin.

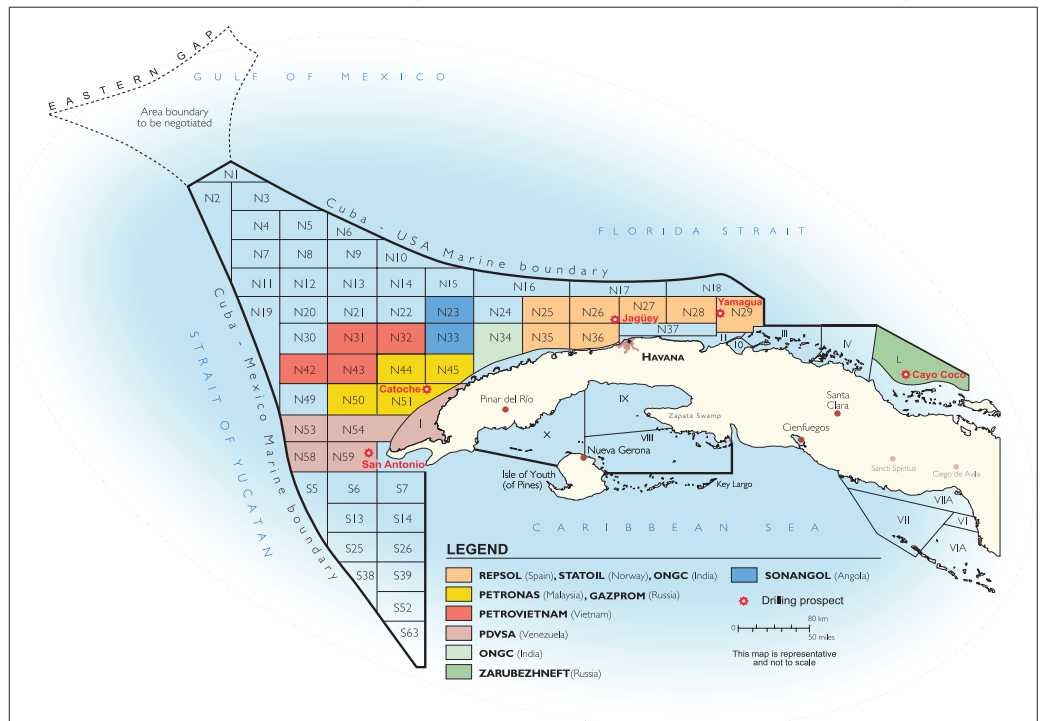
We can conclude from these points that both estimates are highly speculative given that they refer to undiscovered, rather than proven or recoverable, reserves. Current horizontal drilling, seismic data, and deepwater exploratory wells recently drilled by Repsol and Petronas indicate that oil and gas deposits are located in Cuba’s offshore fields. What is unknown is whether these reserves are recoverable, commercially viable, and could yield compelling economic returns. This implies that, until disproven, industry will retain interest in continuing to explore Cuba’s EEZ—or at minimum, study its geology and seismic data—given the possibility of recovering lucrative reserves.²³

Energy experts also note that examples from deepwater exploratory drilling around the world demonstrate that it is not atypical to drill numerous dry or commercially unviable holes in new fields before a profitable discovery is found.²⁴ Jorge Piñón, the former president of Amoco Oil Latin America and now an energy specialist at the University of Texas at Austin, explained that economic discoveries often play out over a longer time horizon. “A lot of people have been very naïve in thinking that an oil-rich Cuba was going to materialize overnight, and that is not the case,” Piñón said. “You don’t just turn the faucet on overnight.”²⁵

Concessions in Cuba’s EEZ

Cuba’s EEZ covers a 46,000-square-mile area in the Gulf of Mexico. Cupet has divided the zone into 59 exploration blocks, each of which are roughly 772 square miles with an average ocean depth of 6,500 feet.²⁶ As of June 2012, Cupet had consigned 24 of the 59 deepwater blocks in Cuba’s EEZ to ten international oil companies (see figure 2). Lease holders include private

FIGURE 2
Cuba’s offshore leasing blocks reserved for drilling



Source: Jorge R. Piñón, 2012.

Note: Map not drawn to scale.

Oil companies operating in the country have plans to drill several more deepwater exploratory wells through 2013.

companies such as Repsol (Spain) as well as state-owned companies including Gazprom (Russia) and Sonangol (Angola).

In June 2004, Spain's Repsol drilled the first exploratory well within Cuba's EEZ, in block 27, located approximately 25 miles north of Havana and 95 miles southwest of Key West.²⁷ Although Repsol spent approximately \$40 million drilling the well and ultimately discovered high-quality oil deposits, the company deemed the find commercially insufficient to support production.

In Spring 2012, Repsol drilled a second exploratory well using a deepwater, semi-submersible rig, Scarabeo-9, which was manufactured in China and does not violate U.S. law on the export of goods to Cuba.²⁸ After drilling a dry hole and spending a sum of \$150 million on Cuban explorations, Repsol's CEO, Antonio Brufau, suggested that the company would likely abandon its other planned exploratory projects in Cuba for more profitable fields, such as those in Brazil or Angola.²⁹ Experts are careful to note that Repsol's two non-commercial finds are not clear evidence of the absence of recoverable oil deposits in Cuba's EEZ.³⁰ According to Cuban officials, oil companies operating in the country have plans to drill several more deepwater exploratory wells through 2013.³¹ Following Repsol's withdrawal, Malaysian company Petronas started conducting exploratory work in partnership with Russian company Gazprom, using the Scarabeo-9 rig. Petronas' drilling operations took place at the Catoche-1 well prospect in block 51, off the northwestern coast of Cuba (see Figure 2).³²

Cubapetroleo announced in August 2012 that Petronas' exploration project yielded a non-commercial discovery: the company found oil in a compact geological formation that would prohibit oil and gas from flowing in commercially-viable quantities. Petronas transferred the Scarabeo-9 rig to the Venezuelan oil company PDVSA, which is scheduled to begin exploratory drilling off the southwest coast of Cuba shortly.

In November 2012, Russian company Zarubezhneft may begin drilling off the northeastern coast of Cuba, near the maritime border with the Bahamas. Company representatives stated they will use a Norwegian-owned rig called the Songa Mercur.^{33,34} Zarubezhneft announced that it planned to spend over \$3 billion on offshore exploration projects in Cuba by 2025.³⁵ For additional details on Cuba's oil leases and drilling projects, please see Appendix A: Chronology of Key Events Surrounding Offshore Energy in Cuba.

Risks of a spill in Cuban waters

As demonstrated by the *Deepwater Horizon* Gulf of Mexico oil disaster of 2010, the *Exxon Valdez* spill in Alaska in 1989, and Mexico's 1979 Ixtoc I well blowout, deepwater drilling is inherently risky. Even companies using the most sophisticated, cutting-edge technology with highly skilled personnel experience oil spills and accidents that threaten human lives, economies, and the environment.

In fact, the *Deepwater Horizon* accident resulted in extensive oil pollution of roughly 200 miles along the edge of the Cuban EEZ, and very nearly led to U.S.-drilled oil befouling important and valuable Cuban beaches, reefs, seagrass beds, and mangrove swamps.³⁶ The only factor that prevented an international incident was the chance timing of the central Gulf Loop Current gyre formation, which interrupted the delivery of oil down current as far as the Florida Keys.

As Cuba proceeds with plans to explore its deepwater offshore oil fields, the risk of a potential oil spill in Cuban waters impacting U.S. marine and coastal resources is similarly worrisome. Significant oil spills from exploratory wells are not without precedent: both the BP *Deepwater Horizon* and Ixtoc I spills resulted from exploratory well blowouts. Experience from past disasters highlights that oil spills do not adhere to political boundaries and that advanced planning and cross-border cooperation are pivotal for mounting a timely, coordinated response strategy.

Experience from past disasters highlights that oil spills do not adhere to political boundaries.

Projected trajectory of a spill

In assessing the potential threat to U.S. shores, many often reference that Key West, Florida is a mere 80 miles from the Jaguey prospect site where Repsol drilled in Cuba's EEZ, north of Havana, in spring 2012.³⁷ In fact, several other factors—such as the prevailing ocean current, wind direction and velocity, water temperature, and type of oil spilled — also play critical roles in determining the direction and speed of spilled oil. Thus, despite the geographic proximity of the ecologically valuable Florida Keys to the rig site in Cuba, scientists from the National Oceanic and Atmospheric Administration (NOAA) estimate that the probability of oil traveling from a potential blowout at the Repsol rig site to the Florida Keys was comparatively low.³⁸

Doug Helton, operations coordinator for the office of response and restoration at NOAA, emphasized that the dominance of ocean currents can trump distance in influencing the direction of an oil slick. “The currents are like a conveyor belt at the grocery store,” he told *The Miami Herald*.³⁹ “Oil moves at 2 to 3 percent of the wind speed. It moves at 100 percent of the current speed.” Due to the powerful Gulf Loop Current, it is more likely that oil spilled from a rig site in Cuba's EEZ could travel to the eastern shore of Florida and up the southeast Atlantic coast, in addition to threatening Cuba's North Coast, Cay Sal Banks (the third largest bank of the Bahamas), and the Bahamas proper.

In preparation for Repsol's exploration project in 2012, NOAA generated computer tracking models to assess the threat to U.S. coasts and shorelines from deepwater drilling off the coast of Cuba. NOAA selected 20 potential deepwater drilling sites from the western region of Cuba to the Bahamas. The model was run using 200 different spill scenarios based on a variety of ocean current and weather conditions. According to the agency's first study of a hypothetical spill from



Mangrove forests, coral reefs, and sea grass beds in Cuba and the United States are at risk from major oil spills in the Gulf of Mexico.

a deepwater well site offshore of Cuba, the area at highest risk of shoreline impact could be the eastern shore of Florida.⁴⁰ Areas as far north as Charleston, South Carolina could face potential shoreline risk, though the modeled scenario predicted a lower likelihood of oiling for shorelines north of the Florida border.⁴¹

While areas at risk of immediate impact appear to be those along the Straits of Florida and U.S. south Atlantic coast, scientists are careful to note that the models are far from precise, authoritative forecasts. NOAA specialists themselves emphasize that the models vary significantly based on weather data and location of the drilling site. Richard Sears, who served as chief scientific advisor on the federal commission that investigated the *Deepwater Horizon* disaster, stressed there was significant uncertainty in projecting the path of the BP oil slick in 2010, even with the combined technical expertise of federal agencies and private companies.⁴²

“There were a wide array of models surrounding the BP spill, ranging from most of the oil projected to come ashore to Louisiana, Mississippi, Alabama, and Florida—to a significant portion going out through the Straits of Florida and up the East Coast towards North Carolina,” Sears said in a personal interview. “Neither of those happened.”⁴³

Sears described the added complexity of estimating the oil’s vertical movement. “There were a lot of surprises with Macondo about where the oil went,” Sears explained, “not only in two dimensions, but also in terms of three dimensional impacts within the water column.”⁴⁴

Preparing for a potential spill in Cuba’s EEZ highlights the underlying uncertainty in predicting the trajectory of a spill, particularly with regards to possible shoreline impacts and biological threats within the water column and on the seafloor. This lack of predictability reinforces the importance of opening lines of communication and expanding U.S.-Cuban cooperation to ensure that any containment and response strategy would be implemented effectively using the most timely incident updates.

Shared environmental resources at risk

If a spill were to occur in Cuban waters, marine and coastal resources of the United States, Cuba, and the Bahamas could be placed at significant risk. Fisheries, coastal tourism, recreation, and other natural resources-based enterprises and activities in the region could experience adverse

impacts on the scale of weeks to years, or even decades. Multiple factors—including the type and amount of oil spilled, the environment in which the oil spilled, and prevailing weather and ocean current conditions—would play key factors in determining the extent and gravity of a spill's impact.⁴⁵

In Cuba, marine and coastal habitats could suffer substantial long-term harm which could degrade, in turn, entire populations and habitats downstream in the U.S. Gulf of Mexico. According to Dr. John W. Tunnell, Jr., associate director of the Harte Research Institute and an expert on the Gulf of Mexico marine environment, the primary three habitats at risk on Cuba's North Coast near the area where exploration is occurring are coral reefs, seagrass beds, and lush mangrove forests.⁴⁶ These habitats are found throughout the region, but in greatest abundance in the Archipelago Sabana-Camaguey and the Archipelago Los Colorados, where they provide breeding, nursery, and feeding habitats for commercial fish species, including grouper, snapper, and grunts.

If chemical dispersants were used as part of the clean-up effort, they could reduce impacts on fauna for which oiling per se is the greatest threat (e.g. birds) but also add additional toxicity, as well as alter the transport and ecological fate of oil constituents moving through the water column and then into the air or back towards the bottom. Dispersed oil could have greater deleterious effect on Cuba's coral reefs, which are fragile, slow-growing, and have low resilience to physical and chemical stresses.⁴⁷ Like salt marshes, coastal mangrove swamps are also difficult to clean up in the aftermath of an oil spill, and mangroves can die within a week to several months as a result of oil exposure.⁴⁸ Reduced from their formerly healthy, vibrant state, such important habitats could lose their ability to support the fisheries and marine life that depend on them.

Oil toxicity and physical contamination can also have profound effects on individual organisms. The news media often draw attention to charismatic marine life, such as dolphins and sea turtles, which are closer to shore and can experience heavy oil coating during a spill. However, less visible organisms such as surface-floating larvae, mid-depth "scattering layer" organisms, and benthic organisms—including coral reefs, but also soft-sediment communities—are equally, if not more, vulnerable. A significant spill in Cuba's waters could impact larval populations of lobster, grouper, snapper, and other reef fishes that traditionally mature in the



Noel Lopez Fernandez

Nearshore habitats along Cuba's northern coast provide breeding and nursery grounds for juvenile reef fishes.

The economic implications of a major deepwater oil spill in Cuba could be substantial, with far-reaching impacts on tourism as well as commercial and recreational fishing.

waters of the U.S. Gulf of Mexico and south Atlantic, as well as those that have key spawning grounds in the Gulf itself (including Atlantic bluefin tuna).

The ecological linkages between Cuba and the United States are brought into clear focus when considering the environmental resources that would be at stake in those two countries in the event of a spill. In the same way that Cuban officials expressed serious concern about potential impacts to Cuban waters from the BP *Deepwater Horizon* spill, Floridians are deeply worried about potential damages to their communities and natural environment. Migratory species that normally travel freely between Cuban and U.S. territory — including bluefin tuna, whale sharks, and birds along the East Coast flyaway — could suffer from oil exposure during a significant spill incident.

One problematic limitation in evaluating natural resources at risk in Cuba's waters—and the subsequent risk to the U.S. environment—is the lack of sufficient baseline scientific knowledge. Detailed geological and environmental conditions are not fully understood in many parts of the Caribbean.⁴⁹ For example, petroleum-eating microbes exist in high concentrations in the U.S. Gulf of Mexico and may help mitigate environmental damages during spills and natural seepages, although the ecological cascades unleashed by altered biomass, dissolved oxygen, and acidification patterns remain unknown. It is not known if such oil-eating bacteria also exist in substantial numbers in Cuban waters and would possibly modulate damages to natural resources there.

Economic assets at risk

The intertwined relationship between coastal economies and the local environment illustrates that the economic implications of a major deepwater spill in Cuba could be substantial, with far-reaching impacts on tourism as well as commercial and recreational fishing. In Florida, over 86.5 million tourists visited the state in 2011 and generated over \$67 billion in direct economic impact.⁵⁰ Tourism represents Florida's top industry and accounts for 23 percent of the state's sales tax revenue.⁵¹

Florida also boasts one of the most productive commercial fisheries in the country, and its recreational saltwater fishery has an economic impact of \$5.7 billion, while supporting over 54,000 jobs.⁵² As demonstrated during the *Deepwater Horizon* disaster, publicity surrounding a spill can ignite public fears and decimate tourism and seafood consumption even in areas spared of oil exposure.

An oil spill could threaten fisheries and tourism in Cuba as much as in Florida. Top tourist areas along Cuba's North Coast—including Cayo Paraiso and Cayo Levisa—are known for their pristine beaches and attractive snorkeling opportunities. Following Havana, the resort town of Varadero is the second most popular destination on the island for foreign travelers. Varadero's extensive beaches receive one million international visitors annually and could experience devastating physical and financial impacts in the event of a spill. Cayo Coco, located on the Sabana Camaguey Archipelago on the northern shore of Cuba, is another prime tourist destination also directly vulnerable to a potential spill. With its crystal waters and pristine white sand beaches, Cayo Coco is home to a host of all-inclusive luxury resorts.

In 2011, tourism attracted 2.7 million visitors and 2.5 billion in income to Cuba, which represents a 12.8 percent increase in revenue from the previous year.⁵³ Given that the tourism industry is perceived as the engine of Cuba's economic growth, the island would have much to lose if a highly-publicized oil spill impacted its shores

Oil spill preparedness and response

In the event of a spill in Cuba's EEZ, the U.S. Coast Guard would utilize the National Contingency Plan (NCP), which provides a framework on how federal, state, and local agencies would carry out a coordinated response. Under the NCP, the Coast Guard acts as the designated Federal On-Scene Coordinator and would immediately mount a whole-of-government response to combat the spill, operating within the parameters of national and international law.

In addition to the Coast Guard's work to update agency-wide contingency plans, the 7th U.S. Coast Guard District in Miami is proactively engaging state and coastal communities in Florida, as well as industry representatives, to identify gaps in equipment and human resource capacities should a spill occur.⁵⁴ For an extraterritorial spill, the Coast Guard would most likely have to direct and fund the response efforts by accessing the Oil Spill Liability Trust Fund. The purpose of the Fund is to provide financing for expenses not paid by the Responsible Party, including removal costs and damages resulting from oil spills impacting the navigable waters of the United States.⁵⁵ For a spill on the scale of the *Deepwater Horizon*, expenses would promptly surpass current congressional limits on the Fund and could require legislative change to support the response effort.

Under current U.S. law, American companies must obtain licenses and approvals from the U.S. Treasury Department and the U.S. Commerce Department in order to provide assistance in Cuba with equipment or personnel during a spill in Cuban waters. How many companies



Daniel Whittle

Important commercial fishing grounds in the United States and Cuba lie down current from oil fields in both countries.



Noel Fernández Lopez

Cuba has some of the healthiest and most abundant coral reefs in the region.

are licensed is not a public record, but many observers believe that licensed capacity is not yet sufficient to independently respond to a major spill in Cuban waters. In the case of the *Deepwater Horizon* spill, for instance, 52 contractors were involved in incident response and 7,278 contract personnel provided services at the peak of the response effort.⁵⁶ In a Senate testimony in October 2011, Paul Schuler, president of Clean Caribbean and Americas—which is one of the contractors authorized by the Department of Treasury to supply pre-approved equipment for a spill in Cuba—stated that “loosening up” the licensing process could make more U.S. companies and resources available if needed for a significant spill in Cuba.⁵⁷

Without immediate access to a full range of U.S. resources and technology, international oil companies operating in Cuba might have to rely on supplies and expertise from Europe or Asia, which could cost precious time during an event in which time is of paramount urgency.⁵⁸ Thus, there is a real need to guarantee that sufficient resources are at the ready in order to ensure response is carried out in a timely and effective manner. Estimates indicate that the fastest timeframe in which response equipment could be mobilized from U.S. sources in the Gulf of Mexico is approximately 14 days.⁵⁹ A more efficient and proactive federal licensing process might help condense this timeframe and expedite response efforts.

The Coast Guard notes that it holds general licenses from the Department of the Treasury and the Department of Commerce that would permit the agency to marshal private U.S. resources and personnel needed for mounting a full-scale response to an oil disaster that threatens the U.S. EEZ.⁶⁰

These licenses—which have not been made available for public review—apparently would allow the Coast Guard to take action in the Cuban EEZ if necessary and to bring non-licensed U.S. companies to operate under the agency’s direction in Cuban waters. While these licenses represent a positive step forward, the precise nature and scope of authority granted to the Coast Guard and to the private companies it chooses to deploy in the event of an emergency remain unclear.

It also bears emphasizing here that this general license notwithstanding, the U.S. Coast Guard and any private companies it recruits would not be authorized to enter into or operate in Cuban waters without permission from the Cuban government. Thus, as discussed below, an explicit agreement between the United States and Cuba is needed to provide this authority and to set forth the terms of any joint U.S.-Cuban oil spill response in Cuban waters.⁶¹

Political constraints still pose obstacles to more direct engagement between U.S. and Cuban authorities.

Given their broad nature, the Coast Guard's licenses would be applicable during a catastrophic spill—i.e. on the magnitude of the *Deepwater Horizon* incident—for which the limited list of pre-approved U.S. private contractors is insufficient to combat the spill and protect U.S. resources. The Coast Guard has used inter-agency tabletop exercises to coordinate broadly with contractors on general spill preparedness throughout the Western Caribbean.⁶² Although the Coast Guard holds access to a database of resources that U.S. contractors could provide in the event of an international spill, it has not specifically collaborated with licensed and non-licensed contractors to codify a communications and resource mobilization protocol for a potential spill in Cuban waters.

Notwithstanding longstanding legal and political obstacles to U.S.-Cuba cooperation, U.S. government officials have increasingly acknowledged the importance of greater international dialogue and cooperation on spill prevention, preparedness, and response and have taken important steps in that direction. Following the *Deepwater Horizon* spill, EDF, the International Association of Drilling Contractors, and BP spill federal commission co-chair William K. Reilly, called upon the Obama Administration to engage with Cuba and other Caribbean countries to develop a common framework for spill prevention and response.

Shortly thereafter, the U.S. State Department initiated unprecedented multi-lateral discussions on oil spill issues with Cuba and other nearby Caribbean countries. Several U.S. government agencies, including NOAA, the Department of Interior, and the Coast Guard are sending technical experts and other officials to these meetings, held under the auspices of the International Maritime Organization (IMO) as part of the International Convention on Oil Pollution Preparedness, Response, and Cooperation (OPRC).⁶³

The OPRC Convention recommends that signatories develop measures for handling pollution incidents, either at the national level or in concert with other countries. Three multilateral meetings on marine pollution preparedness and response have been held, and a fourth is scheduled to take place during late August 2012 in Mexico City. Countries present at the meetings thus far have included the United States, Cuba, Bahamas, Mexico, and Jamaica. (Curacao and Guyana have also attended at least one meeting.) Discussions have focused on contingency planning to identify resources and expertise needed for oil spill response planning, prevention, and coordination. The International Association of Drilling Contractors has played a key role in sponsoring these meetings and advancing the dialogue on forging a cross-border oil spill prevention and management plan.⁶⁴

Based on reports from delegates, these meetings have provided a valuable forum for government representatives to convene with their foreign counterparts and develop initial working relationships.⁶⁵ The progress made in a compact timeframe at these meetings provides strong indication that the country delegates and observers are committed to advancing spill coordination in the region. At the conclusion of the third multilateral meeting, held in Jamaica, delegates expressed support for developing a written international spill response plan and articulated their intent to advance this goal at future meetings. Given its mutual benefit to all countries involved, the progress from these meetings should be firmly institutionalized, and negotiations should feature a specific goal of producing a written agreement on spill prevention, preparedness, and response.

Senior-level officials within the U.S. government have indicated that a regional agreement should be a core objective. In a congressional hearing in November 2011, former Director of Bureau of Safety and Environmental Enforcement (BSEE), Michael Bromwich, stated that a multilateral agreement for spill prevention and response is a priority of the agency. He testified, “We believe a multilateral approach that involves all parties in the region contemplating drilling activities [Mexico, Cuba, and Bahamas] that could affect the United States is the most effective means of safeguarding our interests. We therefore intend to continue to vigorously pursue continued multilateral engagements in the Gulf of Mexico.”⁶⁶

Industry representatives also affirm that building working relationships with authorities is an essential process that takes time and requires close interactions prior to a spill.⁶⁷ The



Scientists from the U.S., Mexico and Cuba are working together to reverse the decline of shark populations in the Gulf of Mexico.

opportunity to engage in real-time exercises and drills can improve the level of preparedness and response, as they allow the involved parties to identify and pre-emptively address shortfalls and concerns. According to representatives from Clean Caribbean and Americas, practice exercises with U.S. and Cuban authorities could stem a range of challenges, relating to legal, logistical, and physical response issues.⁶⁸

The relationship building and progress being made at the IMO multilateral meetings are commendable and these negotiations should continue in earnest. Nonetheless, outside of these proceedings, political constraints still pose obstacles to more direct engagement between U.S. and Cuban authorities on other environmental and natural resource management issues of shared concern, such as fisheries, coral reef conservation, and wildlife protection. For example, U.S. government resource agencies such as the EPA, NOAA, the U.S. Fish and Wildlife Service, and BSEE are not permitted to directly communicate with their counterparts in Cuba outside of these formal settings or without the prior permission of the U.S. State Department. This impedes timely sharing of information and joint cooperation on issues of mutual interest, which could compromise the economic and environmental security of both countries.

International Offshore Drilling Response Plan

In anticipation of Repsol's exploratory drilling in Cuban waters in winter 2012, the U.S. Coast Guard promulgated the International Offshore Drilling Response Plan (IODRP), a process which involved extensive cooperation and input from federal, state, and local agencies. The plan presents a protocol for applying an offensive approach to contain an offshore spill as close as possible to the source, even in foreign waters. It outlines the range of U.S. federal agencies that may be called upon to provide assistance, including the Environmental Protection Agency, Fish and Wildlife Service, and U.S. Army Corps of Engineers. For more information on the interface between national and international response efforts, please see Appendix B: Domestic and International Coordination of Oil Spill Response Plans.

In November 2011, the U.S. Coast Guard held an inter-agency table top exercise in Miami with over 80 representatives from both government and industry to validate the plan.⁶⁹ Participants involved in the simulation responded to a fictitious international spill off the coast of

Cuba that would impact the Florida shoreline. According to Captain John Slaughter, chief of planning and force readiness for the 7th Coast Guard District, participants were working in lockstep with each other given their collective experience of responding to the *Deepwater Horizon* spill.⁷⁰

Coast Guard officials acknowledge that a potential spill originating in Cuba's EEZ could present a host of unique challenges. First, the fast-moving currents in the Florida Straits could render traditional spill response techniques less effective. For instance, mechanical cleanup of oiled coral reefs, seagrass beds, and mangrove swamps is a difficult to virtually impossible task. Secondly, the Coast Guard recognizes that a spill could introduce substantial economic impacts even without reaching U.S. shores. Lastly, there is a need for continued educational outreach to inform the public that responding to a spill in the Florida Straits would differ from the response effort implemented during *Deepwater Horizon*.

According to the IODRP and local Area Contingency Plans, financial and human resources would be channeled to protect areas of high priority, which are generally the areas with the greatest environmental sensitivity. Protecting tidal inlets would be a primary objective to prevent oil from reaching sensitive habitats like mangrove swamps and spawning grounds. Sand beaches would most likely not receive extensive boom protection due to the challenges of fast currents and the difficulties in maintaining miles upon miles of boom. However, sand beaches typically have a lower environmental sensitivity than the areas inside the tidal inlets, and there is a higher success rate for mechanically cleaning beaches. Impacted beaches would be prioritized for mechanical cleanup after oil exposure.⁷¹

The 7th Coast Guard District in Miami deserves credit for its wide public outreach to ensure that coastal residents in Florida are aware of the plan's protocol. Continuing this outreach is of critical importance, as one can easily imagine frustrated property and business owners along Florida's coast, concerned that their coastal-oriented economy would be defenseless in the event of a spill.

Model international agreements on oil spill response

Multiple precedents exist for the United States to develop bilateral response plans with neighboring countries on oil spill response: the United States holds such agreements with Mexico, Canada, and Russia. The agreement with Mexico — known as the MEXUS Plan — outlines the corresponding roles of each country for implementing a joint response during a spill threatening the waters of both countries. The MEXUS Plan was signed in 1980, after the Ixtoc well blowout impacted the south Texas coast in 1979. The United States and Mexico regularly conduct simulation exercises in an effort to build close working relationships and improve on-the-ground coordination between the involved parties.

The MEXUS Plan can serve as an important reference when considering the development of a similar agreement with Cuba, though the plan in its current form is not the ultimate aspiration. In fact, the United States and Mexico have been working to strengthen the plan in the aftermath of the *Deepwater Horizon*. A full-pronged solution requires cooperation beyond the extent of spill response, as is the case with the MEXUS Plan. Instead, a bilateral agreement with Cuba should focus on developing spill prevention and response capacity, as well as improving baseline scientific knowledge.

Lessons from the *Deepwater Horizon* spill

The *Deepwater Horizon* oil spill in the Gulf of Mexico was a watershed event and unprecedented on many levels. As the world's largest accidental marine oil spill, it released over 200 million gallons of oil into the northern Gulf of Mexico for a duration of 87 days, between April 20 and July 15, 2010.⁷² The spill dwarfed all prior accidental marine spills not only in terms of size, but also with regards to technology, supplies, and human resources required to address it.

The 2010 Gulf of Mexico spill marked the first time that a spill of national significance was declared and a National Incident Commander was named. The response effort entailed the coordination of a vast array of entities, including British Petroleum (BP) as the named Responsible Party, private contractors, civilians, and federal, state, and local agencies. Resources demanded for the response effort were numerous: 48,200 responders; 7,000 Coast Guard members; 3,200 Vessels of Opportunity (civilian boats); and 127 aircraft.⁷³

Popular public perception generally holds that we “dodged a bullet” in the aftermath of the *Deepwater Horizon* spill and experienced only short-lived impacts to coastal industries such as fisheries, tourism, shipping, and recreation. Contrary to such perspective, the verdict on the spill's impacts remains unclear. Many vulnerable ecosystem elements were damaged, some severely, though scientists are currently conducting research to measure long-term impacts. To further complicate the matter, there is a lack of baseline science to use as a measure



Noel Lopez Fernandez

Economic and ecological impacts from an oil spill in Cuban waters could be even greater than those resulting from the BP oil spill in 2010.

for understanding the ecology of many of the Gulf's mid-water and deep-sea communities in their pre-spill state.

The historic nature of the *Deepwater Horizon* incident provides a valuable playbook of lessons learned and a lens through which to evaluate potential deepwater drilling challenges in Cuba.

Environmental impacts

The *Deepwater Horizon* spill revealed perhaps more about scientific knowledge gaps rather than affirming a concrete understanding of the spill's environmental impacts. Critical shortfalls inhibiting the scientific community's grasp of the spill's true impacts include the following: little is known about oil and gas release processes occurring at such significant ocean depths; only speculative estimates can be formed about the fate and breakdown of oil and oil constituents released from the well; and there is a lack of sufficient baseline science on the conditions of many habitats and species at the time of the spill to gauge changes to the Gulf's biota.

The U.S. government is currently conducting a Natural Resource Damage Assessment to fulfill its legal duty of assessing damage to the natural resources from a human-caused disaster. The figures derived from this assessment will be used to levy fines against BP for its damages to the natural resources of the Gulf of Mexico. The scientific community is also deeply engaged in an ongoing capacity in measuring the spill's impacts. In May 2010, BP announced a pledge of \$500 million over ten years to fund scientific research on the Gulf of Mexico environment and public health. As a result, we are poised to eventually learn more from the *Deepwater Horizon* incident than any other marine spill in history.

According to Dr. John W. Tunnell, Jr.—a Gulf of Mexico specialist who prepared an expert opinion on the spill's biological effects for Kenneth Feinberg of the Gulf Coast Claims Facility—there are three areas of outstanding concern that merit close scientific monitoring going forward.⁷⁴ These areas include: a) habitat and marine life surrounding the Macondo well site; b) oyster reefs in southeast Louisiana; and c) salt marshes of the Mississippi Delta.⁷⁵

Several applications from the BP spill are directly relevant to Cuba's environment. First, understanding the spill's long-term effects on migratory species—such as bluefin tuna and whale sharks—may provide insight into how shared resources could be impacted for nations whose territorial



Scientists are continuing to study the impacts from the BP oil spill on marine ecosystems in the Gulf of Mexico.

Wildlife planning should make up a key component of contingency planning for oil spills, particularly in Cuba's case.

waters are adjacent to the site of a spill. Second, data about recovery rates of mangrove forests in the U.S. Gulf of Mexico could help guide contingency planning in Cuba. The north coast of Cuba is lined with thick expanses of mangroves, which do not lend themselves to mechanical cleanup.⁷⁶

Third, data from the Gulf of Mexico will provide important information about cascading ecological effects and the likelihood that changes in one ecosystem element could influence others. A recent study suggests that microscopic life near Alabama's coast was affected extensively by the BP spill.⁷⁷ Long-term implications could be extensive given that these organisms form the base of the food chain and support ecosystem functioning. The study's authors point to the experience of *Exxon Valdez* in Alaska, where the herring population collapsed several years after the 1989 spill in direct connection to changes at the microscopic level. Moreover, large amounts of extremely toxic and persistent chemicals were released during the *Deepwater Horizon* incident—including polycyclic aromatic hydrocarbons—which will be recycled through sedimentary and living ecosystems for years to come.

Lastly, whereas the United States marshaled equipment to rescue and treat oiled wildlife, Cuba's nascent offshore industry lacks comparable equipment and expertise to deal with such aftermath. No rehabilitation facility currently exists in Cuba to treat oiled birds, mammals, and reptiles.⁷⁸ Over 8,200 oiled birds were collected dead or alive within the spill's incident impact area along the Gulf Coast.⁷⁹ This effort required significant human resources and trained wildlife responders to rescue, and, if possible, to rehabilitate and release impacted wildlife. Wildlife planning should make up a key component of contingency planning for oil spills, particularly in Cuba's case, given its high rate of endemism and positioning as a migratory flyaway.

Economic costs

The financial ramifications of the *Deepwater Horizon* spill were on an order of magnitude not experienced in any other marine spill. The Gulf Coast Claims Facility was tasked with issuing compensation to affected individuals and businesses in a timely manner. During its 1½ years of operation, the Facility processed over one million claims and paid over \$6.2 billion to more than 220,000 individual and business claimants.⁸⁰ BP is also currently in negotiations with the Department of Justice to settle criminal and civilian penalties from the 2010 Gulf of Mexico disaster. The federal settlement could reach upwards of \$15 billion.⁸¹

In the case of a potential spill in Cuba's EEZ, it is not clear whether the Responsible Party would have similar financial largesse as BP has to mount an adequate response and clean-up effort, as well as to provide compensation for natural resource damages. The lack of commercial liability regulations for an oil spill originating from a foreign source could create additional challenges for U.S. citizens and businesses seeking compensation for spill-related damages.

Based on the Oil Pollution Act of 1990, no financial protections exist for U.S. citizens and property impacted by a spill outside of the U.S. EEZ.⁸² Consequently, if a well drilled in Cuban waters were to experience a blowout and jeopardize communities in the United States, the Responsible Party would bear no legal liability to U.S. citizens. The Oil Spill Liability Trust Fund would likely be used to fund the response effort in the United States, yet critics note that the fund would likely have insufficient capital for a large-scale spill.⁸³

Finally, and perhaps most importantly, the United States and Cuba do not have any formal agreement on how to impose liability for Cuban oil spills that affect U.S. residents, businesses, and resources. We are not aware whether this issue is being discussed in the multi-lateral meetings discussed above.

Technical and regulatory capabilities

At its crux, the *Deepwater Horizon* incident was brought about by a combination of technical failure, human negligence, lax government oversight, and a corporate culture misaligned with

“It is in our country’s national interest to negotiate now with these near neighbors [Cuba and Mexico].”

–from “Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling,” the report of the National Commission on the *BP Deepwater Horizon* Oil Spill and Offshore Drilling

public interest. The unfolding events of the spill raised several questions about technical and regulatory capacities to prevent and respond to an accident of this magnitude.

William K. Reilly, who co-chaired the presidential commission that investigated the spill, noted that it is critically important for regulators to intimately understand the industry and to subject companies to investigation if any element of incertitude arises. Despite BP’s lack of attention to process safety and its track record of shortcuts, federal regulators failed to apply heightened scrutiny to the company’s operations prior to the Macondo well blowout.⁸⁴ Even those companies commonly perceived as industry “gold standards” and receiving safety awards should not escape regulatory attention. Reilly pointed out that on the day of the Macondo well blowout, executives from the BP and Transocean management teams were on the *Deepwater Horizon* rig presenting an award to the crew for seven years of accident-free days.⁸⁵

Translating this experience to offshore drilling in Cuba, Reilly said, “Regulation could be the most difficult lesson for the Cubans because they have no history with the industry. They are genuinely working on familiarizing themselves, but they lack a background to even understand the industry’s specialized language.”^{86,87}

The Gulf oil spill also revealed that the party responsible for the disaster may be the only entity actually equipped to manage the cleanup, despite potential conflict of interest. Throughout the response effort, the U.S. government faced criticism for not exercising greater authority in directing decision-making to cap the well. In truth, the government lacked both technical authority and equipment to handle a well blowout, leaving it with only one option: to rely on BP and other industry experts.

In May 2010, Secretary of the Interior Ken Salazar indicated the U.S. government would “push them [BP] out” if the company underperformed in the cleanup.⁸⁸ In response, National Incident Commander, Coast Guard Admiral Thad Allen asked, “To push BP out of the way would raise the question of: Replace them with what?”⁸⁹ In a similar fashion, the Cuban government would rely on oil companies and contractors to an even greater extent, given the island’s lack of expertise in dealing with deepwater operations and spills.

Public communications

The *Deepwater Horizon* spill plainly illustrated that communicating the situation to the public in a timely and clear manner is equally important as physically managing the incident itself. Very early in the response effort, media and the American public had grown wary of the federal government’s decision-making. A large segment of the public felt that the government was allowing BP to play an inordinately influential role in directing containment and response activities. By the end of May 2010, polls showed that 60 percent of Americans thought the government was performing poorly in responding to the spill.⁹⁰

Challenges in public communications resulted in increased politicization of the spill: one clear manifestation was the deployment of containment boom. Although the boom was not fully effective in preventing oil from washing ashore and contaminating beaches, Gulf Coast governors and local politicians became engaged in an “arms race” to obtain miles of boom for their respective states and districts, and even to authorize large public works projects (including sand barrier building) of doubtful value and serious possible consequences.

It is not hard to imagine how a spill originating from a foreign source and impacting U.S. shorelines could further complicate the U.S. government’s efforts to convey its role to the American public. Jurisdictional law and the multitude of actors involved in responding to a spill outside of U.S. waters could easily muddle the media and public’s perception of how the government is working to protect U.S. property and interests.

This is particularly true in the case of Cuba given the embargo’s restrictions on exchanging vital U.S. equipment such as blowout preventers and capping stacks. U.S. government officials indicate the Coast Guard’s broad licenses could authorize the mobilization of equipment such



William Reilly (right), co-chair of the national oil spill commission, and Richard Sears (left), the commission's chief scientist, met with Cuban energy experts on a fact-finding mission to Havana in September 2011.

as well containment systems, yet the specific operational details of these licenses are not public record. In any case, the experience of the *Deepwater Horizon* response demonstrates that implementing a well-executed communications plan—featuring timely and accurate updates about what is known and not known—is critical to ensuring that the government maintains public trust and management of response activities.

National Commission findings and recommendations

The National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling released its final report, “Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling” in January 2011. As part of its nearly 400-page report to President Obama, the commission recommended that the United States develop joint drilling standards and a clear policy with neighbors such as Cuba and Mexico to avert and deal with future risks associated with deepwater drilling. The commission's recommendations relating to Cuba were as follows:

“Agreement on standards for operations should be part of any negotiation to define the maritime boundary between the United States, Mexico, and Cuba in the eastern Gulf of Mexico.”⁹¹

“It is in our country's national interest to negotiate now with these near neighbors [Cuba and Mexico] to agree on a common, rigorous set of standards, a system for regulatory oversight, and the same operator adherence to the effective safety culture called for in this report, along with protocols to cooperate on containment and response strategies and preparedness in case of a spill.”⁹²

The co-chair of the commission and former EPA Administrator, William K. Reilly, reaffirmed that cooperating with neighbors in the Caribbean, including Cuba, is sensible policy to protect our own natural and economic resources. In a personal interview, Reilly said, “Irrespective of our economic sanctions on Cuba, we must make an exception for matters affecting safety and environmental response, in our own interest.”⁹³

State of U.S.-Cuba environmental cooperation

The United States and Cuba have an extensive history of scientific collaboration dating back to the 1800s. Despite that the decades-old U.S. embargo has created numerous political and administrative impediments, American and Cuban scientists have shown steady commitment to researching and devising solutions to shared environmental challenges.

Current collaborations

The high connectivity and biological linkages between countries bordering the Gulf of Mexico and Western Caribbean underscore the need to leverage sound science as a tool for guiding regional conservation policy. Due to the lack of formal diplomatic relations between the United States and Cuba, U.S. academic and NGO communities have fulfilled the role of initiating and sustaining bilateral collaborations. A brief selection of scientific collaborations in Cuba includes the following:

- The **Trinational Initiative for Marine Science and Conservation in the Gulf of Mexico** and Western Caribbean, which began in 2007, is an effort to promote joint research and conservation activities with Mexico, Cuba, and the United States. The initiative has developed a long-term comprehensive plan that identifies targeted areas for priority research. (www.trinationalinitiative.org)
- The **Mote Marine Laboratory** works with students from the University of Havana to perform field research and develop conservation strategies for sharks that migrate between U.S. and Cuban waters. (www.mote.org)
- The **Sea to Shore Alliance** tracks marine wildlife in Cuba, with the goal of increasing national capacity for conservation. Using manatees as a flagship species to promote conservation, the organization is especially focused on assessing and monitoring manatee populations in Florida, Cuba, and Belize. (www.sea2shore.org)
- The **New York Botanical Garden** participates in field studies with Cuban scientists to document the island's most vulnerable plant species. (www.nybg.org)
- **The Nature Conservancy** is working to develop a network of protected areas in Cuba, Haiti, and the Dominican Republic as part of the Caribbean Biological Corridor. (www.nature.org/ourinitiatives/regions/caribbean)
- In addition to its work on protecting marine habitat and safeguarding migratory species such as sharks and sea turtles, **Environmental Defense Fund** has played an instrumental role in recent years to broker constructive dialogue on environmental concerns surrounding Cuba's burgeoning oil and gas industry. (www.edf.org/cuba)

American scientists and researchers have collaborated with their counterparts from numerous institutions in Cuba including, but not limited to, the following: the Center for Marine Research at the University of Havana; the Center for Fisheries Research in the Ministry of the Food Industry; the Institute of Oceanology in the Ministry of Science, Technology, and the Environment; the Center for Engineering and Environmental Management of Bays in the Ministry of Transportation; and the Center for Coastal Ecosystems Research.⁹⁴ The Obama Administration should be commended for enacting policies that have facilitated professional travel by Cuban scientists to the United States. In fact, since 2009 the U.S. State Department has significantly increased the number of non-immigrant visas for Cuban scientists to attend workshops and meetings in the United States. For additional details on U.S. NGOs and institutes active in this field, please see Appendix C: Organizations Involved in U.S.-Cuba Environmental Cooperation.

While diplomatic non-recognition hampers government-to-government dialogue on issues of shared environmental interest, offshore exploratory activities in Cuba's EEZ have attracted the attention of U.S. government agencies whose missions are to protect the marine and coastal resources of the United States. Though not a member of the Trilateral Initiative mentioned above, NOAA has been supportive of the NGO community's science work in Cuba and has allowed senior staff to travel to Cuba to participate in scientific and fisheries exchanges. Working within the scope of political parameters, the Coast Guard is also engaged in multi-lateral meetings convened by the IMO to plan for a potential oil spill in waters adjacent to U.S. territorial waters.

In June 2012, the Coast Guard signed a Memorandum of Understanding with the Florida Institute of Oceanography (FIO), a consortium of 27 public and private marine science institutes in the United States. The agreement specifies that marine scientists from FIO will be available to provide scientific expertise to the Coast Guard for the purposes of disaster planning and response. The need to assess baseline science prior to a manmade or natural disaster and to provide timely scientific information to the public during the unfolding of an incident was a key lesson that emerged from the *Deepwater Horizon* spill.

This MOU represents an important and positive development in that it formalizes the role of science in informing emergency planning and response. In the case of an offshore spill in Cuban



Scientists from Cuba, Mexico and the U.S. met in Cuba in November 2011 to discuss strategies for protecting coral reefs.

waters, the agreement would provide a framework for the U.S. Coast Guard to consult with FIO experts to ensure that the best scientific information is brought to bear in response activities and is conveyed in public communications. Given its emphasis on improving scientific and baseline information, this MOU might also serve as a model in the future for joint scientific research between U.S. government agencies and their counterparts in the Cuban government.

Constraints on collaborations

Substantial statutory, regulatory, and political constraints thwart the level of environmental cooperation between the United States and Cuba. The previously mentioned projects occur in the context of a highly restrictive set of U.S. laws on trade and engagement with Cuba, including the Trading with the Enemy Act of 1917 (TWEA) [12 USC §95(a)] and the Foreign Assistance Act of 1961 (FAA) [22 USC §2151].⁹⁵ Political restrictions and administrative delays also stymie the potential for increased scientific collaboration. Even organizations licensed to carry out environmental projects in Cuba face impediments that inhibit the two countries from developing solutions to shared environmental problems. Constraints stem from both the U.S. and Cuban governments, and include the following: travel and licensing restrictions; limitations on transporting research equipment to Cuba; inadequate funding; and the prohibition of bringing global positioning systems to Cuba for field research.⁹⁶

Reducing these barriers is critical to facilitating higher levels of scientific collaboration. It is within the interest of the U.S. government to exercise its full authority and relax current U.S. regulatory and administrative constraints, in order to create an opening for a higher level of scientific engagement between the United States and Cuba.

Path forward: policy recommendations

Environmental Defense Fund recognizes that any significant oil spill, irrespective of its source, would require unified cooperation between industry, private contractors, and public agencies at the federal, state, and local levels. A spill originating from a foreign source adjacent to U.S. waters would inevitably require a broad, coordinated international response.

In light of new offshore exploratory drilling activities in Cuba's EEZ, the U.S. and Cuban governments should take the following actions as soon as possible to accelerate the development of robust and coordinated spill prevention programs, contingency planning, and response protocols. Implementing these actions proactively is an imperative, since further delay could lead to an ineffective, ad-hoc response during an actual disaster.

Unilateral actions

The U.S. government should exercise the full extent of its executive authority to improve U.S. capacity to prevent, prepare for, and respond to potential oil spills that originate in Cuban waters and threaten to impact U.S. natural resources. As summarized below, this means that the U.S. government should amend licensing regulations to allow private sector companies in the United States in the event of an officially declared environmental emergency to contract



Noel Lopez Fernandez

The United States and Cuba should develop a bilateral agreement that maximizes protection for ecosystems in both countries.

with the Cuban government (and its partnering foreign oil companies) to provide prevention, spill response, and clean-up services. The general license granted to the U.S. Coast Guard, discussed above, does not obviate the need to authorize private sector U.S. companies from engaging directly in Cuban waters, as needed. We recommend that the Administration promptly undertake the following pragmatic unilateral actions:

- 1. Direct the Department of the Treasury to pre-approve new general licenses for U.S. individuals from qualified oil services and equipment companies to travel to Cuba and provide technical expertise in the event of an oil spill.** The Treasury Department should adopt two new categories of general licenses under 31 C.F.R. §515. The first should authorize travel to Cuba by designated categories of U.S. persons after a designated federal official declares that “an oil-related environmental emergency exists in Cuban marine waters.” A second general license should authorize “all transactions, including but not limited to payments, incident to the provision of equipment and services to Cuba in response to an officially declared oil-related emergency.”⁹⁷ This recommendation is consistent with regulations that allow U.S. citizens to travel to Cuba for other emergency purposes, such as to provide humanitarian relief.
- 2. Direct the Department of Commerce to pre-approve licenses for the temporary export of U.S. equipment, vessels, and technology to Cuba for use during a significant oil spill incident.** Specifically, the Department of Commerce should create a “license exception” permitting specific exports to Cuba without a license, pursuant to 15 C.F.R. §740. Supplies ranging from containment booms and chemical dispersants to capping stacks and remotely-operated vehicles (ROVs) would be necessary to facilitate well containment and spill cleanup activities. Because speed is of paramount importance in responding to oil spills, it is critical to adopt new licensing exceptions now to prevent any delays during a disaster response. Select U.S. spill-response providers, such as Clean Caribbean and Americas, have already received licenses. However, the private sector needs clear indication from the Administration now as to what items may be legally exported temporarily to Cuba in the event of an oil-related emergency in Cuba’s EEZ. The best way to do this is to expand the existing license exception category to include pre-approved specific items that may be sent to Cuba during an oil-related environmental emergency.
- 3. Lock in and strengthen favorable policies that allow for two-way scientific research and collaboration.** The Administration should continue to approve visas for Cuban scientists and environmental professionals to permit their attendance at scientific meetings and conferences in the United States. The Administration should also, as a matter of policy, continue to approve licenses for U.S. scientists and environmental professionals to travel to Cuba for the purpose of conducting scientific research and conservation projects.
- 4. Congress should recognize the authority of the Executive Branch and support the Administration in its efforts to revise policy as needed in order to protect U.S. national interests.** This report does not recommend that Congress enact specific legislation relating to this issue at this time. Congress should support Executive Branch actions to strengthen U.S. readiness for a potential Cuban oil spill and to expand dialogue and cooperation with Cuba on a full range of environmental and natural resource management issues.

Bi-lateral engagement

The U.S. and Cuban governments should strengthen their cooperation on oil spill prevention, preparedness, and response by completing the following actions:

- 1. Enter direct government-to-government negotiations to develop a bilateral environmental agreement modeled on frameworks that already exist between the United States and**



Douglas Rader

Small-scale fisheries are important to the economies of both the United States and Cuba.

neighbors such as Mexico and Canada. An agreement between the United States and Cuba should codify preventive measures, such as common drilling standards and safety protocols, in addition to detailing a response strategy that would be implemented in the event of an oil spill. For example, such an agreement could set forth guidelines, protocols, and procedures that would govern the activities of the U.S. Coast Guard (that serves as the on-site coordinator for offshore oil spills in U.S. waters) and its counterpart in the Cuban government in the event of a spill. EDF recognizes and commends the important progress being made at the multilateral discussions taking place between the United States and Caribbean countries, including Mexico, Cuba, Jamaica, and the Bahamas. A multilateral agreement on spill prevention, planning and response would represent a notable step forward for enhancing environmental safety in the region. However, EDF believes a bilateral agreement between the United States and Cuba would provide a more comprehensive and explicit framework that would allow the two countries to accelerate emergency preparedness efforts and to mitigate the likelihood of a significant offshore oil spill.

2. Prepare for a potential oil spill incident in Cuba's EEZ by conducting annual real-time, joint exercises with all applicable parties from the United States, Cuba, and other Caribbean countries that may be involved in a response effort. EDF commends the noteworthy collaboration and relationship-building already taking place between the U.S. Coast Guard and their counterparts in Caribbean countries through avenues such as the IMO meetings focused on marine pollution preparedness and response. However, representatives from both the public and private sectors require advanced cooperation in a real-life simulation to ensure a united approach during a disaster situation. As demonstrated during the *Deepwater Horizon* oil spill, a contingency plan on paper does not imply seamless execution in practice. Private contractors will need time to familiarize themselves with rig specifications, while public agencies will need to develop logistical expertise to oversee the timely transport and deployment of clean-up equipment.

3. Commit to robust information sharing on environmental issues of mutual concern as a matter of standard operating procedure. In the same manner that the U.S. government relayed information on a daily basis to Cuban officials during the *Deepwater Horizon* spill, information sharing between government agencies on the environment and natural resources

should occur on a fluid rather than an exceptional basis. This recommendation is fully consistent with precedents of the two countries sharing information in other fields, such as drug trafficking, immigration, and hurricane preparedness. Furthermore, this recommendation builds upon the progress being made at multilateral discussions, such as those held under the auspices of the IMO.

4. Facilitate collaborative research and support planning efforts such as those of the Trinational Initiative for Marine Research and Conservation in the Gulf of Mexico and Western Caribbean, which calls for joint scientific research between the U.S., Cuba, and Mexico to protect and preserve shared marine resources. EDF believes that scientific research and collaboration should also occur on the direct government-to-government level. U.S.-Cuban scientific collaborations should include a priority focus on filling knowledge gaps and improving baseline scientific knowledge in order to understand our shared ecosystems and to identify strategies for mitigating potential environmental harm.

For instance, one project on which NOAA could collaborate with Cuba's Ministry of Science, Technology, and Environment (CITMA) involves researching the movement patterns and population numbers of the goliath grouper and other severely depleted groupers, including the Nassau. It is critical to properly manage these species across their entire geographic range, yet current efforts are limited in linking the health of grouper populations in the United States to their spawning grounds upcurrent in Cuba.

5. Build upon the success of Cuba's energy efficiency programs and broaden the country's renewable energy portfolio. While it is not within the scope of this report to evaluate the technical capacity and scale-up potential of individual renewable energy technologies, EDF encourages Cuba to develop a diversified energy portfolio. This measure would not only enhance Cuba's economic security and self-sufficiency, it would also mitigate potential damage to fragile marine life and habitats, including slow-growing coral reefs and mangrove swamps, which are vulnerable to oil toxicity. It is in the interest of the United States to support Cuba's pursuit to decrease dependence on fossil fuels given the finite nature of these resources and the global urgency of transitioning to clean energy sources due to climate change.

APPENDIX A

Chronology of key events surrounding offshore energy in Cuba

2004

June: Spain's Repsol drilled the first oil well in Cuba, located 18 miles off the North Coast, in offshore block 27. The company reported a high-quality but non-commercial oil find.

2005

February: U.S. Geological Survey released "Assessment of Undiscovered Oil and Gas Resources of the North Cuba Basin, Cuba, 2004." The report estimated a mean of 4.6 billion barrels of undiscovered technically recoverable crude oil and 9.8 trillion cubic feet of undiscovered natural gas in the North Basin.

April: Venezuela increased its discounted oil shipments to Cuba from 53,000 barrels per day to 90,000 barrels per day. In a move to strengthen integration between the two countries, Venezuela's state oil company, Petroleos de Venezuela (PDVSA), opened a Havana office as the headquarters for Petrocaribe, the Caribbean branch of the company's energy operations.

2006

February: U.S. oil executives met with Cuban officials in Mexico City to obtain a deeper understanding of Cuba's offshore oil and gas potential. Citing claims that the U.S. companies were violating terms of the embargo, the U.S. government ordered the Mexico City hotel to force the Cubans to leave. The meeting resumed at another hotel in the city and represented the first private-sector oil summit between the two countries.

2007

November: A delegation of 15 Americans and 15 Cubans met in Cancún, Mexico for an inaugural meeting to discuss opportunities for increased collaboration of joint marine research and conservation between the United States, Cuba, and Mexico. The Trilateral Initiative on Marine Science and Conservation in the Gulf of Mexico and Western Caribbean met on an annual basis thereafter to formalize plans for collaboration and scientific exchange between the countries.

2008

February: Raul Castro was elected as Cuba's chief executive, President of the Council of the State, a position he had held provisionally since 2006.



Cuban and American scientists are evaluating new ways to manage troubled fish stocks.

2009

April: The Obama Administration announced the easing of restrictions on travel and remittances to Cuba.

July: Cuba signed an agreement with Russia permitting oil exploration in Cuban waters of the Gulf of Mexico.

2010

April: On April 2010, the *Deepwater Horizon* rig operated by British Petroleum (BP) exploded in the Gulf of Mexico in the U.S. EEZ, roughly 40 miles off the coast of Louisiana. Eleven workers died in the explosion. The ensuing oil spill flowed unabated for three months.

July: The Center for Democracy in the Americas led a delegation of U.S. energy and climate experts on a meeting with senior officials in Cuba. The U.S. delegation discussed energy and environmental policy, including with foreign diplomats from nations whose oil companies engaged in offshore exploration in Cuban waters.

July: After releasing an estimated 4.9 million barrels of oil according to the Flow Rate Technical Group, the Macondo Prospect wellhead was capped.

August: Representatives from the International Association of Drilling Contractors (IADC) traveled to Cuba to discuss environmental safety and hazard mitigation with Cuban officials.

September: The Macondo Prospect wellhead was officially sealed. The *Deepwater Horizon* oil disaster became the largest marine oil spill ever recorded.

September: Seventeen Cuban delegates came to Sarasota, Florida for the fourth gathering of the Tri-National Initiative on Marine Sciences and Conservation in the Gulf of Mexico and Western Caribbean (United States, Cuba, and Mexico). NOAA sent several scientists and officials to attend and participate in sessions on shark conservation. The meeting concluded with an outline for a formal action plan to address key priorities areas aimed at protecting the health of the Gulf of Mexico and Western Caribbean marine ecosystems.

2011

January: The National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling released its final report, “Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling.” The report asserted that it is in the U.S. national interest to negotiate with neighbors such as Mexico and Cuba on a set of common safety standards for deepwater drilling in the Gulf of Mexico.

May: IADC sponsored a conference in Trinidad and Tobago to gather industry experts from around the world, including Cuba, and to initiate dialogue on best safety and environmental practices for oil and gas drilling in the Gulf of Mexico. EDF and IADC representatives spoke on a panel on the need for enhanced U.S.-Cuba cooperation on environmental protection and safety.

September: EDF and IADC led a fact-finding delegation to Cuba to explore the government’s plans for growing its oil and gas industry in the Gulf of Mexico. The U.S. delegation was composed of nine experts, including William Reilly, former Administrator of the U.S. Environmental Protection Agency and co-chair of the National Commission of the *Deepwater Horizon* Oil Spill and Offshore Drilling, and Richard Sears, chief scientist of the Commission.

October: The Senate Energy and Natural Resources Committee conducted a hearing on Outer Continental Oil Spill Response Capabilities to examine U.S. response capabilities and readiness for potential oil spills in international waters.

November: The House Natural Resources Committee held a congressional hearing on “North American Offshore Energy: Mexico and Canada Boundary Treaties and New Drilling by Cuba and Bahamas.” Among those who testified, EDF Senior Attorney/Cuba Program Director Daniel Whittle discussed the need for increased environmental cooperation between the United States and Cuba.

November: The U.S. Coast Guard (USCG) sponsored an inter-agency table top exercise in Miami to practice its response plan for a fictitious international oil spill off the Florida coast.

December: A delegation of independent U.S. scientists, facilitated by the American Association for the Advancement of Science (AAAS) and the Cuban Academy of Sciences, traveled to Havana to engage in technical discussions with Cuban scientists.

2012

January: The Transportation and Infrastructure Committee Chairman held a congressional field hearing in Miami to review Cuban and Bahamian plans to drill exploratory oil wells off the Florida coast. The hearing examined the Coast Guard’s emergency response preparedness to a potential international spill.

January: With voluntary consent from Repsol, U.S. inspectors examined the Scarabeo 9 semi-submersible rig during the platform’s port of call in Trinidad and Tobago. Repsol used Scarabeo-9 to conduct exploratory drilling in Block N27 in the Florida Straits, about 90 miles from Key West, during spring 2012.

March: The USCG Seventh District in Miami publicly released its International Offshore Drilling Response Plan, an updated contingency plan that details response operations that would be employed in the event of an oil spill in international waters, including Cuba, which could impact U.S. waters and coastline.

May: Repsol announced that the first of its three planned wells in Cuban waters was a dry hole. In a May 29 press conference debuting the company’s four-year strategic plan, Repsol President, Antonio Burfau, stated that the company would likely cease its prospecting activities in Cuba.

June: Using the Scarabeo 9 platform, Malaysia's national oil company, Petronas, and Russian partner Gazprom began exploratory drilling off the western coast of Cuba and south of the Florida Strait.

June: The Russian explorer Zarubezhneft announced that it had secured the Soviet-built, Norwegian-owned drilling platform Songa Mercur for drilling operations in Cuba. The company signed a contract on the rig for 325 days, worth an estimated \$88 million for the Norwegian firm Songa Offshore. The rig's potential failure to comply with U.S. embargo restrictions could impose delays on the company's plans to commence drilling in Cuban waters during fall 2012.

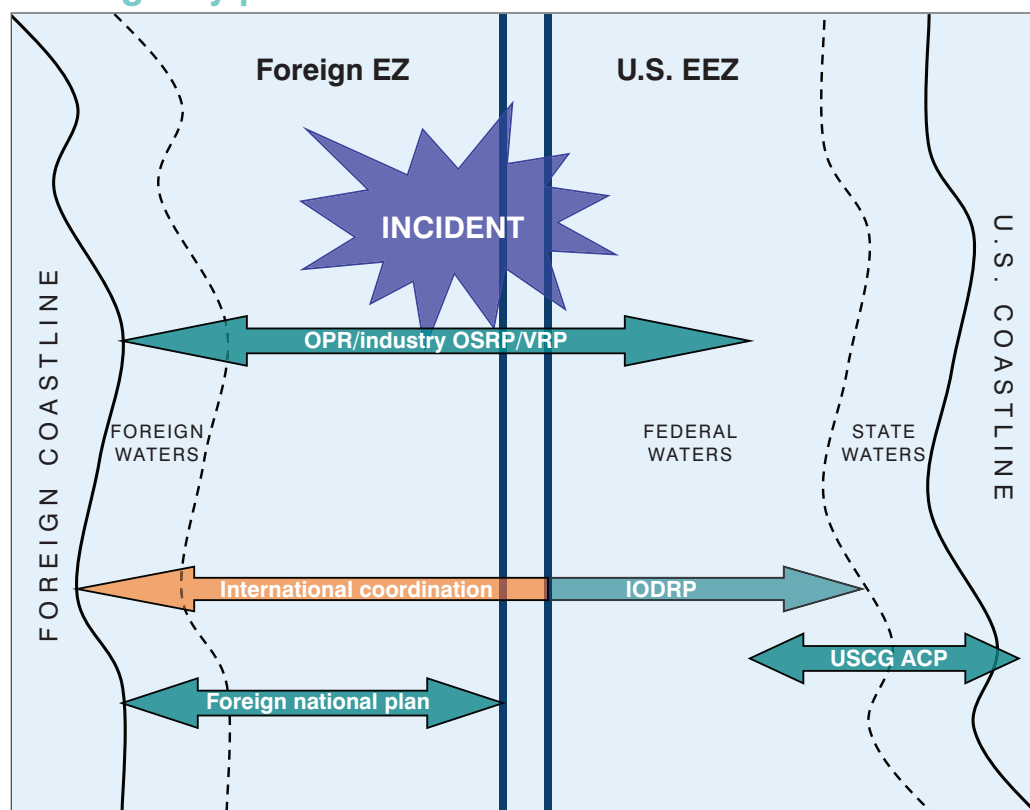
August: Cubapetroleo announced that the island's latest offshore exploration project, drilled by Petronas in partnership with Gazprom, off the northwest coast of Cuba was unsuccessful. Petronas described its discovery as non-commercial, given that it found oil in a compact geological formation that would not permit oil and gas to flow through in commercially-viable quantities. Petronas transferred the rig to Venezuelan oil company PDVSA, which will begin drilling off the southwestern coast of Cuba.

APPENDIX B

National and international coordination of oil spill response plans

FIGURE B1

Interface between national and international contingency plans



Source: Adapted from U.S. Coast Guard, "Seventh District International Offshore Drilling Response Plan (IODRP)," March 6, 2012.

TABLE B1

Table of corresponding response activities under national and international response plans

Convention on Oil Pollution, Preparedness, and Response (OPRC)/Industry-Created Oil Spill Response Plan (OSRP)/Vessel Response Plan (VRP)	International Coordination/International Offshore Drilling Response Plan (IODRP)	Foreign National Plan	USCG Area Contingency Plan (ACP)
PRIMARY ACTIVITIES			
Source control	Source control	Source control	Nearshore skimming
Salvage	Salvage	Salvage	Geographic response plan implementation
Surface/sub-surface dispersant application	In-situ burning/dispersant operations	Surface/sub-surface dispersant application	Tidal inlet protection
In-situ burning operations	Offshore skimming	In-situ burning operations	Vessel traffic decontamination
Offshore skimming	Oiled vessel monitoring/decontamination	Nearshore skimming	Shoreline cleanup
	Coordinate state response	Shoreline cleanup	Wildlife recovery
	Vessel traffic control		Coordinate county/local response
	Air traffic coordination		

Source: Adapted from U.S. Coast Guard, "Seventh District International Offshore Drilling Response Plan (IODRP)," March 6, 2012.

APPENDIX C

Organizations involved in U.S.-Cuba environmental cooperation

Nongovernmental organizations

Environmental Defense Fund (EDF) works with Cuban scientists, resource managers, fishermen, conservation groups, and environmental officials to protect coral reefs and other important ocean and coastal ecosystems, and to identify strategies for restoring declining fish populations. Operating under a specific license from the U.S. Department of the Treasury since 2000, EDF has collaborated with Cuban partners on projects to protect shared marine and coastal ecosystems in the Gulf of Mexico, Caribbean Sea, and the Atlantic Ocean. Since 2009, EDF has promoted bi-lateral and multi-lateral dialogue and cooperation on oil spill prevention and response.

American Association for the Advancement of Science (AAAS) houses the Center for Science Diplomacy, which provides a forum for scientists, policy analysts and policy-makers to share information and explore collaborative opportunities. The Center uses science diplomacy as a catalyst between societies where official relations might be limited, and to strengthen civil society interactions through partnerships in science and technology. AAAS has led multiple trips for U.S. scientists to meet with their Cuban counterparts about potential cooperation in the fields of marine and atmospheric sciences, and sustainable fisheries.

American Museum of Natural History (AMNH) has coordinated exchanges over the past 25 years for U.S. scientists to perform field work in Cuba with the objective of surveying the island's plant and animal species. Under a People-to-People license issued by the U.S. Department of the Treasury, AMNH has recently begun leading expeditions for Americans to meet with museum curators, scientists, and teachers focused on protecting Cuba's natural heritage.

Cooperation for the Development of Emerging Countries (COSPE) is an Italian-based nongovernmental organization that is partnering with the World Wildlife Fund and the Cuban Ministry of Science, Technology, and the Environment on a project called "SOS Fishing," which seeks to protect marine and coastal habitat as well as to advance sustainable use of fisheries resources in southern Cuba.

Fundación Antonio Núñez Jiménez (FANJ) is a renowned conservation and environmental education non-governmental organization in Cuba which was founded in 1994 with the core mission of promoting harmony between society and its surroundings through research, education, and environmental programs. As part of its environmental education program, the Foundation has produced a vast collection of publications and supports projects aimed at finding local solutions to environmental problems.

Global Environment Facility (GEF) was established in 1991 to promote environmental sustainable development and to provide funding for transforming projects from those with national benefits to those with global environmental benefits. The GEF is an independent organization that seeks to involve developing countries in the decision-making process and in implementation of environmental projects. The World Bank serves as the Trustee of the GEF Trust Fund and also provides administrative services. To date, GEF has provided \$50 million in grants to fund environmental work in Cuba.

New York Botanical Garden (NYBG) has conducted more than a century of plant exploration in partnership with Cuban botanists and institutions. During the course of more than two dozen expeditions, NYBG has collected over 20,000 species and performed analyses of Cuba's most vulnerable plant species. In 2010, NYBG presented the exhibition, *The Orchid Show: Cuba in Flower*, dedicated to the island's orchid varieties and other traditional plants.

The Ocean Foundation seeks to conduct a comprehensive coastal assessment of marine habitats in Cuba's territorial waters in order to advance science and inform environmental policy efforts. Through its Cuba Marine Research and Conservation Program, the Foundation is identifying and mapping important habitats to help guide the management and conservation of marine ecosystems.

The Nature Conservancy (TNC) is developing a tri-national marine action plan between the Dominican Republic, Cuba, and Haiti for the Caribbean Biological Corridor. The project aims to encourage and facilitate collaboration among the participating countries through the establishment of a network of protected areas.

The Society for the Conservation and Study of Caribbean Birds (SCSCB) is the largest single regional organization devoted to wildlife conservation in the Caribbean. Its goals are to promote the scientific study and conservation of Caribbean birds and their habitats, and to promote greater public awareness of the bird life of the region.

Sea to Shore Alliance concentrates on marine wildlife conservation in Cuba. In 2001, Sea to Shore began a long-term project to assess manatees in Cuba, given that little is known about the country's manatees, even as it boasts some of the best manatee habitat throughout all of the Caribbean. In partnership with the Wildlife Trust, University of Havana Center for Marine Research, and the Cuban Enterprise for Flora and Fauna, the Alliance has developed manatee surveys and supported conservation initiatives. Its research has explored how the Cuban manatee population is interrelated with the Florida and Antillean sub-species found elsewhere throughout the Caribbean.

Wildlife Conservation Society (WCS) works to strengthen marine ecosystem and biodiversity capacity in Cuba, particularly for that of Cuban crocodile population. Additionally, WCS promotes the conservation of the Zapata Swamp, which, at one million acres, is one of the best preserved swamps in the entire Caribbean.

World Wildlife Fund (WWF) Netherlands collaborates with the Cuban government and Cuban and international NGOs to promote the preservation of important marine habitats throughout the island.

Academic and research centers

Center for International Policy (CIP) is a nonprofit research and advocacy organization whose Cuba Project promotes bi-lateral cooperation in defending against hurricanes and safeguarding the Gulf of Mexico. The Cuba Project also advocates for relaxing travel restrictions to Cuba as a tool for deepening engagement.

Cornell Lab of Ornithology partners with Cuban education and conservation institutions to support natural resource management on the island. The Lab has led multiple expeditions to Cuba to train local students and engage the public in citizen science initiatives for monitoring birds and their habitats.

Florida International University (FIU) houses the Cuban Research Institute, whose mission is to contribute to the knowledge body of Cuban and Cuban-American issues, particularly those relating to the environment, governance, arts, and society. In 2011, Visiting Professor Dr. Jennifer Gebelein published *A Geographic Perspective of Cuban Landscapes*, which details historical changes in the Cuban landscape due to anthropogenic influences.

Florida Institute of Oceanography (FIO) is a consortium of 27 public and private marine science institutes dedicated to advancing understanding and stewardship of the coastal oceans. In June 2012, FIO signed a Memorandum of Understanding with the U.S. Coast Guard to support the agency in interpreting technical and scientific questions, and to assist the federal agency during emergency situations, including oil spills.

Harte Research Institute is an endowed research component of Texas A&M University-Corpus Christi committed to advancing the ecological and economic sustainability of the Gulf of Mexico ecosystem. The Institute was an early advocate for building relationships between the United States, Mexico, and Cuba to foster scientific understanding of the Gulf and to promote appropriate use of its resources. The Institute has hosted workshops and disseminated its own research to further its objective of integrating science and policy in the Gulf of Mexico region. It recently completed a multiyear research study of Cuba's Gulf of Mexico coast—*Proyecto Costa Noroccidental* (Project of the Northwest Coast)—in conjunction with The Ocean Foundation, Ocean Conservancy, and University of Havana's Center for Marine Research.

Mote Marine Laboratory is an independent marine research institute that seeks to promote marine and environmental science through applied research, education, and public outreach. In Cuba, Mote conducts research on important marine habitats and species, including sharks, dolphins, whales, sea turtles, and dolphins.

Social Science Research Council established the Working Group on Cuba in 1997 in partnership with the American Council of Learned Society and the Academy of Sciences in Havana. To advance its goal of strengthening scholarly relations between Cuba and the United States, the program has provided support for: researchers to travel to and from Cuba, translation of research by Cuban scholars, and the development and maintenance of reference materials for Cuban scholarly access.

The Alabama-Cuba Initiative at the University of Alabama was initiated in 2002 to forge academic and scientific exchanges between the university and its peers in Cuba. Operating under an academic travel license issued by the U.S. Department of the Treasury, the Alabama-Cuba Initiative has permitted over 150 faculty members and students at the graduate and undergraduate levels to perform research in Cuba. Over 45 disciplines and departments at the University have participated in the initiative to date.

Notes

- 1 Interview with William K. Reilly, co-chair, National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling, phone, July 19, 2012.
- 2 Brian M. Boom, Ph.D., "Biodiversity without Borders: The Case for Enhanced Environmental Cooperation between the Republic of Cuba and the United States of America," New York Botanical Garden, 2011.
- 3 Susana Aguilar Mugica, "Important Bird Areas in the Caribbean: Cuba," Centro Nacional de Areas Protegidas, 2008, <http://www.birdlife.org/datazone/userfiles/file/IBAs/CaribCntryPDFs/cuba.pdf>
- 4 Cornelia Dean, "Conserving Cuba, After the Embargo," *New York Times*, December 25, 2007, <http://www.nytimes.com/2007/12/25/science/25cuba.html?pagewanted=all>
- 5 Nick Miroff, "Scientists Work to Protect Cuba's Unspoiled Reefs," NPR, December 8, 2009, <http://www.npr.org/templates/story/story.php?storyId=121177851>
- 6 Saleem Ali, "Greening Diplomacy with Cuba," *National Geographic News Watch*, June 16, 2012, <http://newswatch.nationalgeographic.com/2012/06/16/greening-diplomacy-with-cuba/>
- 7 Debbie Payton, "Testimony on Offshore Drilling and the Bahamas: The U.S. Coast Guard's Oil Spill Readiness and Response Planning," U.S. House Committee on Transportation and Infrastructure, January 30, 2012.
- 8 Environmental Defense Fund, "Annual Report 2009," http://www.edf.org/sites/default/files/10667_EDF_AR09_Oceans.pdf.
- 9 U.S. Energy Information Administration, "Country Analysis Brief: Cuba," 2012, <http://205.254.135.7/countries/country-data.cfm?fips=CU>
- 10 *Ibid.*
- 11 Neelesh Nerurkar and Mark P. Sullivan, "Cuba's Offshore Oil Development: Background and U.S. Policy Considerations," Congressional Research Service, November 28, 2011.
- 12 Jorge Piñón, "Temper Cuba's high expectations: Avoid 'oil curse'," *Progreso Weekly*, February 1, 2012, http://progreso-weekly.com/2/index.php?option=com_content&view=article&id=3031:temper-cubas-high-expectations-avoid-oil-curse&catid=34:our-pulse-florida&Itemid=53
- 13 Amy Myers Jaffe and Ron Soligo, "Energy in Cuba," Cuba Policy Foundation, 2002, <http://www.ascecuba.org/publications/proceedings/volume12/pdfs/soligo.pdf>
- 14 Victoria Burnett, "Cuba Hits Wall in 2-Year Push to Expand Private Sector," *New York Times*, July 17, 2012, <http://www.nytimes.com/2012/07/17/world/americas/economists-question-cubas-commitment-to-privatizing-businesses.html?pagewanted=all>
- 15 Nerurkar and Sullivan, *supra* note 11.
- 16 *Ibid.*
- 17 The World Bank, "World Development Indicators," 2012, http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?cid=GPD_28
- 18 Andrea Rodriguez, "Solar, wind energy a missed opportunity for Cuba." Associated Press, July 5, 2012, <http://www.chron.com/news/article/Solar-wind-energy-a-missed-opportunity-for-Cuba-3685763.php>
- 19 U.S. Energy Information Administration, "FAQ: How much U.S. energy consumption and electricity generation comes from renewable sources?", 2012, <http://www.eia.gov/tools/faqs/faq.cfm?id=92&t=4>
- 20 Nerurkar and Sullivan, *supra* note 11.
- 21 U.S. Energy Information Administration, "International Energy Statistics," 2012, <http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=5&pid=57&aid=6&cid=regions&syid=2011&eyid=2012&unit=BB>
- 22 Jorge R. Piñón and Jonathan Benjamin-Alvarado, "Extracting Cuba's Oil and Gas: Challenges and Opportunities. In *Cuba's Energy Future: Strategic Approaches to Cooperation*, edited by Jonathan Benjamin-Alvarado, The Brookings Institution: Washington, D.C., 2010.
- 23 *Ibid.*
- 24 Interview with Richard Sears, National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling, phone, June 7, 2012.
- 25 Peter Orsi, "Second Cuban offshore well also a bust," *Associated Press*, August 6, 2012, http://hosted.ap.org/dynamic/stories/C/CB_CUBA_OIL?SITE=AP&SECTION=HOME&TEMPLATE=DEFAULT&CTIME=2012-08-06-13-26-13
- 26 Jorge R. Piñón and Jonathan Benjamin-Alvarado, *supra* note 22.
- 27 *Ibid.*

- 28 The Scarabeo-9 rig was constructed with less than 10 percent of its parts manufactured in the U.S., meaning companies employing the rig do not violate the Helms-Burton Act. At the time of this writing, it is the only rig in the world to meet this specification.
- 29 Raphael Minder, "Repsol to Sell Assets and Spend More on Exploration," *New York Times*, May 29, 2012, <http://www.nytimes.com/2012/05/30/business/global/repsol-to-sell-assets-and-spend-more-on-exploration.html>
- 30 Interview with Jorge Piñón, University of Texas at Austin, phone, June 5, 2012.
- 31 Nerurkar and Sullivan, *supra* note 11.
- 32 "Petronas, PDVSA Searcher for Oil in Offshore Cuba," *Offshore Energy Today*, June 7, 2012, <http://www.offshoreenergytoday.com/petronas-pdvsa-searching-for-oil-offshore-cuba/>
- 33 At the time of this writing, it was suggested that the Songa Mercur rig may be in violation of the U.S. embargo, a development which could create further delays in commencing drilling operations. (See Sebastião Martins, "Russian drilling in Cuba delayed by Embargo," *Oil and Gas Technology*, July 19, 2012, <http://oilandgastechology.net/upstream/russian-drilling-cuba-delayed-us-embargo>)
- 34 Nick Miroff, "Russian for Cuba's Oil," *Global Post*, June 28, 2012, <http://mobile.globalpost.com/dispatch/news/regions/americas/cuba/120627/russia-oil-rig-drill-cuban-oil-zarubezhneft-songa-mercur>
- 35 Alexander Bratersky, "Castro Reaches out to Putin with Visit," *The Moscow Times*, July 12, 2012, <http://www.themoscowtimes.com/news/article/analysis-castro-reaches-out-to-putin-with-russia-visit/462071.html>
- 36 NOAA, "Fishery Closure Boundary as of 6 PM Eastern Time 02 June 2010," June 2, 2010, http://sero.nmfs.noaa.gov/sf/deepwater_horizon/BP_OilSpill_FisheryClosureMap_060210.pdf
- 37 David Goodhue, "Oil Rig Arrives off Havana," *Miami Herald*, January 23, 2012, <http://www.miamiherald.com/2012/01/23/2603419/oil-rig-arrives-off-havana-drilling.html>
- 38 Cammy Clark, "Exploratory Drilling Off Cuba Renews Oil Spill Fear Factor in the Keys," *Miami Herald*, April 22, 2012, http://www.miamiherald.com/2012/04/22/2762927_p2/exploratory-drilling-off-cuba.html#storylink=cpy
- 39 *Ibid.*
- 40 Debbie Payton, *supra* note 7.
- 41 *Ibid.*
- 42 Interview with Richard Sears, *supra* note 24.
- 43 *Ibid.*
- 44 *Ibid.*
- 45 Interview with John W. Tunnell, Jr., Ph. D., Harte Research Institute at Texas A&M University, phone, June 7, 2012.
- 46 *Ibid.*
- 47 E. Peters, N. Gassman, J. Firman, R. Richmond, and E. Power, "Ecotoxicology of Tropical Marine Ecosystems," *Environmental Toxicology and Chemistry* 16 (1): 12-40, 1997.
- 48 NOAA, "Oil Spills in Mangroves: Planning and Considerations," Reprinted July 2010, http://response.restoration.noaa.gov/sites/default/files/Oil_Spill_Mangrove.pdf
- 49 Interview with John W. Tunnell, Jr., Ph. D., *supra* note 45.
- 50 Office of Governor Rick Scott, "Florida Governor Applauds Florida's Tourism Marketing," press release, <http://www.flgov.com/2012/06/22/governor-scott-applauds-floridas-tourism-marketing/>
- 51 *Ibid.*
- 52 Florida Fish and Wildlife Conservation Commission, "Value of Florida's Saltwater Fishery," 2011, <http://myfwc.com/conservation/value/saltwater-fishing/>
- 53 "Cuba says tourism up 12.8 percent in 2011," Associated Press, August 9, 2012, <http://www.businessweek.com/ap/2012-08-09/cuba-says-tourism-income-up-12-dot-8-percent-in-2011>
- 54 Rear Admiral William Baumgartner, U.S. Coast Guard, "Testimony on Offshore Drilling in Cuba and the Bahamas and Coast Guard's Oil Spill Readiness and Response Planning," House Committee on Transportation and Infrastructure, January 30, 2012.
- 55 U.S. Coast Guard, "Oil Spill Liability Trust Fund Funding for Oil Spills," January 2006, http://www.uscg.mil/npsc/docs/PDFs/OSLTF_Funding_for_Oil_Spills.pdf
- 56 Marine Spill Response Corporation, "Deepwater Horizon Response," 2011.
- 57 Paul Schuler, Clean Caribbean and Americas, "Testimony before Senate Committee on Energy and Natural Resources," October 18, 2011.
- 58 During the opening of the third regional OPRC Forum held in April 2012, Christopher Cargill, Chairman of the Petroleum Corporation of Jamaica, maintained that Jamaica and other Caribbean countries lack equipment and resources to respond to spills on the magnitude of the *Deepwater Horizon* incident. (See REMPEITC-Caribe, "Activity Report," May 27, 2012.)
- 59 Captain John Slaughter, U.S. Coast Guard, email communication to author, August 11, 2012.
- 60 Baumgartner, *supra* note 54.
- 61 For more on this issue, see Robert L. Muse, "The Case for Proactive U.S. Regulatory Action to Deal with an Oil-Related Environmental Emergency in Cuban Waters" at *Oil Drilling Off Cuba's North Coast: Must the U.S. Do More to Forestall the Impact of a Major Spill?* Center for International Policy, May 10, 2012.
- 62 Interview with Captain John Slaughter, U.S. Coast Guard, phone, August 1, 2012.

- 63 Detailed activity reports from each meeting are publicly available online at:
- a) Meeting in Bahamas (December 2011): http://cep.unep.org/racrempeitc/activities/activities-2010_2011/oprc-seminar-off-shore-exploration-bahamas/Activity%20Report%20OPRC%20Seminar%20Bahamas%20Dec%202011%20Final.pdf
 - b) Meeting in Curacao (January/February 2012): <http://cep.unep.org/racrempeitc/activities/activities-2012/oprc-seminar-off-shore-exploration-curacao-january-2012/Activity%20Report%20OPRC%20Workshop%20Curacao%20Jan%202012%20Final.pdf>
 - c) Meeting in Jamaica (April 2012) <http://cep.unep.org/racrempeitc/activities/activities-2012/oprc-seminar-off-shore-exploration-jamaica-april-2012/Final%20Activity%20Report%203rd%20OPRC%20Workshop%20Kingston-%20Jamaica%20April%202012.pdf>
- 64 Organizers have asked Environmental Defense Fund to co-sponsor the fourth multi-lateral meeting focused on spill prevention and response held in Mexico City on August 29-31, 2012.
- 65 IMO Activity Report, *supra* note 63.
- 66 Michael Bromwich, Bureau of Safety and Environmental Enforcement, "Testimony on North American Offshore Energy: Mexico and Canada Boundary Treaties and New Drilling by Cuba and the Bahamas," House Natural Resources Committee, November 2, 2011.
- 67 Skip Przelomski, Clean Caribbean & Americas, email to the author, July 24, 2012.
- 68 *Ibid.*
- 69 Interview with Captain John Slaughter, U.S. Coast Guard, phone, June 8, 2012.
- 70 *Ibid.*
- 71 *Ibid.*
- 72 John W. Tunnell, Jr. "An expert opinion of when the Gulf of Mexico will return to pre-spill harvest status following the BP *Deepwater Horizon* MC 252 oil spill," prepared for Kenneth R. Feinberg, Gulf Coast Claims Facility, January 31, 2011.
- 73 Bob Pond, "BP *Deepwater Horizon* Oil Spill Incident Specific Preparedness Review: Major Findings and Recommendations," 2011, U.S. Coast Guard.
- 74 Interview with John W. Tunnell, Jr., Ph. D., *supra* note 45.
- 75 A recent groundbreaking study found compelling evidence that deep-water coral near the Macondo well experienced significant stress due to oil exposure. The study suggests that the spill killed at least some slow-growing coral and may have threatened deep-sea ecosystems. See White et al., 2012, "Impact of the *Deepwater Horizon* oil spill on a deep-water coral community in the Gulf of Mexico." PNAS, www.pnas.org/cgi/doi/10.1073/pnas.1118029109
- 76 Interview with John W. Tunnell, Jr., Ph. D., *supra* note 45.
- 77 HM Bik, KM Halanych, J Sharma, WK Thomas, 2012, "Dramatic Shifts in Benthic Microbial Eukaryote Communities following the *Deepwater Horizon* Oil Spill," PLoS ONE 7(6): e38550. doi:10.1371/journal.pone.0038550
- 78 Sea Alarm, "Country Wildlife Response Profiles: Cuba," May 14, 2012.
- 79 U.S. Fish & Wildlife Service, "*Deepwater Horizon* Response Consolidated Fish and Wildlife Collection Report," April 11, 2011, <http://www.fws.gov/home/dhoilspill/pdfs/ConsolidatedWildlifeTable042011.pdf>
- 80 BDO USA LLP, "Independent Evaluation of the Gulf Coast Claims Facility: Executive Summary," April 19, 2012 <http://www.justice.gov/iso/opa/resources/697201241917226179477.pdf>
- 81 Aditya Venkatesan, "BP hoping for \$15 billion settlement with DoJ," Reuters, June 8, 2012, http://articles.chicagotribune.com/2012-06-08/business/sns-rt-us-bp-settlementbre85800k-20120608_1_drilling-partners-spill-settlement-deepwater-horizon
- 82 Captain Melissa Bert and Blake Clayton, "Addressing the Risk of a Cuban Oil Spill," Council on Foreign Affairs, 2011, <http://www.cfr.org/cuba/addressing-risk-cuban-oil-spill/p27515>
- 83 *Ibid.*
- 84 National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling, "Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling," January 2011.
- 85 Ben Casselmen, "Gulf Rig Owner Had Rising Tally of Accidents," *Wall Street Journal*, May 10, 2010, <http://online.wsj.com/article/SB10001424052748704307804575234471807539054.html>
- 86 Reilly noted that Cuba has recently sent approximately 200 of its engineers to other countries, including Brazil, Canada, and Norway for courses and workshops relating to deepwater drilling technology, workplace safety, and industry regulations.
- 87 Interview with William K. Reilly, *supra* note 1.
- 88 Karen Tumulty and Steven Mufson, "Obama administration conflicted about relying on BP to stop gulf oil spill," *Washington Post*, May 25, 2010, <http://www.washingtonpost.com/wp-dyn/content/article/2010/05/24/AR2010052404071.html>
- 89 *Ibid.*
- 90 Mimi Hall, et al., "Is oil spill becoming Obama's Katrina?" *USA Today*, May 27, 2010, http://www.usatoday.com/news/washington/2010-05-27-Spill-poll_N.htm
- 91 National Commission on the BP *Deepwater Horizon* Oil Spill and Offshore Drilling, *supra* note 84.
- 92 *Ibid.*
- 93 Interview with William K. Reilly, *supra* note 1.
- 94 G., Machlis, T.A. Frankovich, P.M. Alcolado, E. García-Machado, A. Caridad Hernández-Zanuy, R.E. Hueter, N. Knowlton, E. Perera, and J.W. Tunnell Jr., 2012. "Ocean policy—US-Cuba scientific collaboration: Emerging issues and opportunities in marine and related environmental sciences." *Oceanography* 25(2):227–231, <http://dx.doi.org/10.5670/oceanog.2012.63>

- 95 According to Section 5(b) of the Trading with the Enemy Act of 1917, the President of the United States may enforce an embargo during wartime or during “any other period of national emergency.” In 1961, the U.S. Congress passed the Foreign Assistance Act of 1961 (FAA), which imposed an economic embargo on Cuba during the reign of Cuban President Fidel Castro and authorized the U.S. President to enforce a total embargo on Cuba. In 1962, U.S. President John F. Kennedy issued a full prohibition on trade with Cuba through Proclamation 3447, referred to as “Embargo on All Trade with Cuba.” In 1996, the U.S. Congress passed the Cuban Liberation and Democracy Solidarity Act, also known as the Helms-Burton Act, which reinforced the U.S. embargo on Cuba. This legislation mandates that the U.S. President is no longer permitted to lift the embargo on Cuba unless a democratic transition government, as defined by the U.S. Congress in 22 USC §6065, is instated in Cuba.
- 96 For an enumerated list of obstacles to enhanced Cuba-U.S. cooperation on environmental affairs, please see: Brian M. Boom, Ph.D., “Biodiversity without Borders: The Case for Enhanced Environmental Cooperation between the Republic of Cuba and the United States of America,” New York Botanical Garden, 2011. Also see, Robert L. Muse, “The Case for Proactive U.S. Regulatory Action to Deal with an Oil-Related Environmental Emergency in Cuban Waters” at *Oil Drilling off Cuba’s North Coast: Must the U.S. Do More to Forestall the Impact of a Major Spill?* Center for International Policy, May 10, 2012.
- 97 Robert L. Muse, “The Case for Proactive U.S. Regulatory Action to Deal with an Oil-Related Environmental Emergency in Cuban Waters” at *Oil Drilling off Cuba’s North Coast: Must the U.S. Do More to Forestall the Impact of a Major Spill?* Center for International Policy, May 10, 2012.



National Headquarters

257 Park Avenue South
New York, NY 10010
T 212 505 2100
F 212 505 2375

Austin, TX

301 Congress Avenue
Austin, TX 78701
T 512 478 5161
F 512 478 8140

Bentonville, AR

1116 South Walton Boulevard
Bentonville, AR 72712
T 479 845 3816
F 479 845 3815

Boston, MA

18 Tremont Street
Boston, MA 02108
T 617 723 2996
F 617 723 2999

Boulder, CO

2060 Broadway
Boulder, CO 80302
T 303 440 4901
F 303 440 8052

Raleigh, NC

4000 Westchase Boulevard
Raleigh, NC 27607
T 919 881 2601
F 919 881 2607

Sacramento, CA

1107 9th Street
Sacramento, CA 95814
T 916 492 7070
F 916 441 3142

San Francisco, CA

123 Mission Street
San Francisco, CA 94105
T 415 293 6050
F 415 293 6051

Washington, DC

1875 Connecticut Avenue, NW
Washington, DC 20009
T 202 387 3500
F 202 234 6049

Beijing, China

East C-501
No. 28 East Andingmen Street
100007 Beijing, China
T +86 106 409 7088
F +86 106 409 7097

La Paz, Mexico

Revolución No. 345
E/5 de Mayo y Constitución
Col. Centro, CP 23000
La Paz, Baja California Sur, Mexico
T +52 612 123 2029