

CHAPTER 6

Addressing Environmental Degradation

I. EXECUTIVE SUMMARY

Cuba has many natural assets and challenges. The natural environment has suffered degradation as a result of the harmful policies stemming from a Soviet-style economic system. Cuba faces degraded soil, old and decaying water and sanitation infrastructure, wildlife habitat destruction, and salt water intrusion into its fresh water supplies. It also lacks an independent non-governmental organization (NGO) sector that can advocate on behalf of environment and natural resources and serve as a mechanism to raise public awareness and bring new ideas and issues to the attention of policy makers for action.

Among Cuba's assets are a rich biodiversity, mineral reserves, relatively low levels of industrialization, elements of an environmental framework law, an educated population, and highly trained experts and scientists. These assets could serve as a foundation for sustainable development in a free Cuba. Only a Cuban government prepared to meet the environmental challenges of accelerated growth will be in a position to provide long-term benefits to the Cuban people.

The poor environmental protection policies that have been in effect are evident in the quality of land, water, air, and natural habitats that exist on the island today.

Land and Soils: Like many of its Caribbean neighbors, Cuba faces deforestation and over-cultivation of the land, compaction of soils due to the use of heavy farm machinery, and strip mining. These practices have resulted in salinity in soils and heavy erosion of the land.

Water: Agricultural runoff from heavily treated fields has contributed to the degradation of surface water streams, in addition to the untreated wastewater from cities, sugar mills and other food-processing plants, and nickel mining operations. Irrigation practices have resulted in low groundwater levels, causing significant salt-water intrusion in fresh water and salinity in coastal soils. Low river flows due to dam construction have in turn caused lower re-charge of aquifers and further salinity in the streams.

Habitat/Biodiversity: Wildlife habitat has been affected by water quality in freshwater streams, which is in turn affected by runoff from agricultural practices, erosion due to deforestation, and sedimentation of freshwater streams. The

introduction of non-native species has also had a significant impact on their ecological health. The construction of hotels and tourism infrastructure projects has affected fragile ecosystems.

Air: Air emissions from industry and transportation cause significant health problems. Stationary sources of emissions (electric power plants, petroleum refineries, cement plants, nickel plants, and other old industries) emit large amounts of sulfur dioxide and particulate matter. Although, compared to other countries, there is a low density of vehicles per capita in Cuba, the vehicles are old and require pollution controls and maintenance.

U.S. cooperation and technical assistance can help a free Cuba address the short- and long-term needs it will face in a post-Castro era. As an immediate step, the U.S. Government can help a transition government conduct a rapid assessment of equipment needs to ensure that drinking water systems are operational and chemicals needed to treat the water are made available. For medium- and long-term actions, a wide range of cooperation and assistance possibilities exist, such as training to build Cuba's environmental governance capabilities; cooperative activities related to marine science and fisheries management; developing coral reef management tools; identifying and developing control strategies for high-priority stationary sources of air pollution; and providing on-site technical assistance to Cuban park staff to develop and maintain park infrastructure and provide visitor services. All cooperation and assistance options seek to build on existing capacity. Implementation of the recommendations assumes availability of adequate funding.

It is important to select a few key areas where there can be a short-term success as well as work on medium- and long-term capacity building efforts. Generating and providing quality environmental information to the public will be a cornerstone for engaging a free Cuban people in environmental and natural resources management. The international community is already engaged in environmental and natural resource management issues.

II. INTRODUCTION

Cuba has a rich storehouse of biodiversity and minerals on this island of barely 45,000 square miles. On a per hectare basis, compared to the U.S. plus Canada, it has 12 times more mammal species, 29 times as many amphibian and

reptile species, 39 times more bird species, and 27 times as many vascular plant species.¹ Compared to its Caribbean neighbors, it has a high number of native species compared to non-native species. It also contains some of the healthiest coral reef ecosystems and largest intact coastal habitats in the Caribbean. It has a large percentage of the world's proven nickel reserves, which it exports along with cobalt, and it also has iron, copper, manganese, magnesium, chromium, silver and gold deposits.

However, Cuba's tropical forests, soils, and maritime areas have suffered degradation as a result of the harmful policies stemming from a Soviet-style economic system. The Castro government has failed to protect and preserve Cuba's environment. There have been mistakes and shortcomings due mainly to insufficient environmental awareness, knowledge and education, the lack of a higher management demand, limited introduction and generalization of scientific and technological achievements, the still insufficient incorporation of the environmental dimension in the policies, development plans and programs, and the absence of an integrative and coherent judicial system.²

An important factor in the quality of the environment in Cuba is the poor economic situation that exists on the island. Those who depend on the land and its resources for mere survival (i.e., food, housing, heating fuel, and a source of income) will frequently over-exploit it. This kind of poverty, which provokes the destruction of the natural resources, has been witnessed in other areas of the world. Any program aimed at conserving Cuba's natural resources must take into consideration the poverty and associated behavior of its citizens, and the need to provide alternative income opportunities that do not conflict with the objectives of conservation.

The environmental problems will require medium- and long-term strategies and many years of infrastructure development and implementation of programs to reverse and restore the years of misuse. But Cuba has many potential advantages that could help it to overcome these obstacles. In addition to its natural resources, the country boasts 10 percent of the total scientists in Latin America.³ Many of these are knowledgeable of

¹ Maldonado, Argelio, "Cuba's Environment: Today and Tomorrow--An Action Plan", quoting Dr. Michael Smith of Conservation International, p3

² Oliver A. Houck, *Environmental Law in Cuba*, 16.1 J. Land Use & Env'tl. L. Fall 2000,

³ Argelio Maldonado, conference call, February 17, 2004

environmental matters, but lack the tools (e.g., well-equipped labs, computers, and communications technologies) to be most effective in their fields. In addition, Cuba has a functioning environmental ministry that has monitored environmental commitments, maintains a list of environmental impact assessments, and has sponsored legislation that incorporates international environmental standards and testing protocols into programs of waste remediation and/or recycling of wastes.

As with other nations, economics plays a large role in the implementation of environmental programs. To ensure that there are resources to address all of its environmental problems, a free Cuba should consider having a permanent nationwide market-based system for financing environmental infrastructure projects. This system, which can be capitalized by donor grants, should be large enough to ensure the construction of drinking water treatment plants, wastewater treatment plants, biodiversity initiatives, and other environmental priorities on a sustainable basis. The Castro regime's inadequate funding and lack of independent oversight have prevented Cuba from maintaining effective enforcement of existing laws and accepted international environmental practices.

Many years of neglect by the Castro regime of Cuba's environment present many challenges to be overcome in a free Cuba. The island's rich natural resources can be an asset in a future economic strategy where, most likely, tourism will play a predominant role. In this new market economy, Cuba will also be challenged to preserve its existing environment. An adequate regulatory structure, together with a strong public and industry outreach, should be part of any effort aimed at recovering and preserving Cuba's diverse habitats and unique species, while also addressing its poverty. The situation in Cuba presents an opportunity to do things differently.

III. IMMEDIATE ACTIONS

A. Drinking Water and Wastewater

Please see the IMMEDIATE ACTIONS section of Chapter 5, MODERNIZING INFRASTRUCTURE, for a discussion of this topic.

IV. MEDIUM- and LONG-TERM ACTIONS

A. Environmental Quality and Protection

1. Environmental Governance

i. Legal Structure

a. Status

Cuba's first steps in the environmental arena date back to 1930, when the country declared its first national park, followed in later years with designations of refuges and natural areas.⁴ In 1959, the revolutionary government passed the Law of Agrarian Reform; its chapter on Conservation of Forests and Soils of the Law of the Agrarian Reform placed these reserves under management regimes.⁵ In 1976, Cuba established the Commission for the Protection of the Environment and the Conservation of Natural Resources (COMARNA), centralizing all agencies with environmental responsibilities. Although COMARNA was all-inclusive, it lacked independent authority, so its activities achieved little program results.⁶ In order to assist COMARNA, Cuba followed other Latin American countries' environmental advancements, and in 1981 it adopted Law 33. Although hailed to be a law ahead of its time, Law 33 produced few, if any, results, given COMARNA's ineffective implementation mechanism. In 1990, the country adopted Decree-Law 118, establishing a new Ministry of Science, Technology, and the Environment (*Ministerio de Ciencia, Tecnología y Medio Ambiente* [CITMA]) and allocating environmental responsibilities among more than eight separate Ministries.

CITMA came to life in 1994 with a mandate to steer and control the implementation of environmental policy, the rational use of natural resources, and sustainable development.⁷ CITMA was authorized to settle environmental issues and disagreements among agencies or to pass them on to a higher authority, the Council of State, which is headed by Fidel Castro. CITMA's internal responsibilities were organized into two primary branches under a Deputy Minister

⁴ Oliver A. Houck, *Environmental Law in Cuba*, 16.1 J. Land Use & Envtl. L. Fall 2000, at 14 (2000).

⁵ *Id.*

⁷ *Id.*

⁷ Houck, at 19, quoting Agreement No. 2823 of the Executive Committee of the Council of Ministries of November 28, 1994.

for the Environment. The first branch is the Environmental Agency (*Agencia de Medio Ambiente*),⁸ comprised of several scientific institutes and a center for natural areas and a Center for Environmental Regulation and Inspection - *Centro de Inspección y Control Ambiental*, which houses the regulatory and enforcement power of the Ministry. The second branch is the Environmental Policy Directorate, which is charged with developing initiatives. In addition, CITMA also has an Institute of Ecology and Systematics (*Instituto de Ecología y Sistemática*) as well as other institutes (oceanography) and centers (natural areas) that have additional capabilities for implementing integrated coastal management.

In July 1997, Cuba enacted Law 81, entitled The Law of the Environment (*Ley del Medio Ambiente*).⁹ Law 81 is a comprehensive framework law with “14 titles and 163 articles that embrace air, water, waste, noise, toxic substances, historic preservation, biological diversity, national parks, forests, wildlife refuges, coastal management, education, research and technology, environmental impact assessment and planning, inspection, enforcement, and penalty regimes.”¹⁰ Law 81 provided CITMA with new tools for environmental management and control: First, it gave status of law to the environmental impact review process; second, it established an environmental license required for activities under the purview of other agencies, including tourist development, mining, land use planning, and licenses for foreign investment.

Law 81 required CITMA to develop a system of environmental inspections and enforcement, and a schedule of penalties for environmental violations.¹¹ CITMA is allowed to enlist the help of NGOs to assist in these inspections. If irregularities are discovered, CITMA has the power to issue compliance orders, set deadlines for achieving compliance, suspend licenses (temporarily or permanently), order waste removal, and refer violations for criminal prosecution.¹² Facilities are required to submit requested information and must grant access to project sites.

⁹ *Id.* At 20.

⁹ Houck at 23. Decree-Law 118 replaced Law No. 33, the Law for the Protection of the Environment and Natural Resources (1981) *Ley de Protección del Medio Ambiente y los Recursos Naturales*.

¹⁰ *Id.* at 24.

¹¹ *Id.* at 57, citing Law 81 art. 39 and Second Interim Provision.

¹² *Id.* at 57.

Law 81, Article 71 confers on CITMA, the Attorney General, or any other person or entity that has “personally suffered” damage the right to claim both money damages and restoration for environmental harm.¹³ However, Article 71 also provides that only CITMA and the Attorney General may act in defense of the social interest in environmental protection.¹⁴

The Cuban Code of Civil Procedure provides for judicial review of actions that are final and when administrative remedies have been exhausted. And, although the Code exempts certain subjects from judicial review, environmental issues are not.

b. Needs

It is unclear how effectively the existing environmental laws are being implemented in Cuba.¹⁵ Given the U.S. Government’s experience in other countries, it is very likely that the Castro regime lacks the political will and the means to effectively enforce its environmental laws. Other issues that need to be defined in a free Cuba are the issues of the standing of private individuals in claims of environmental harm, devolution of government authority, and adequate public participation in environmental decision-making.

c. U.S. Actions

The courses mentioned below have been offered by the U.S. Government to other countries in the region to enhance their capacity to develop and enforce effective environmental laws and requirements.

RECOMMENDATION:

- *The U.S. Government should be prepared to offer to a free Cuba a number of courses to help strengthen the legal framework and compliance and improve the development and implementation of environmental law:*

¹³ *Id.* at 77.

¹⁴ *Id.* at 77, *citing* Law 81, Art. 71.

¹⁵ Sergio Diaz-Briquets and Jorge Perez Lopez. “Socialism and Environmental Disruption: Implications for Cuba” p. 162 *citing* Stanley Kabala, “Environment and Development in a New Europe” Occasional Paper No. 3, Middlebury, Vermont, Genomics Institute. p. 10.

- *The Elements of Effective Legal Regimes for Environmental Protection focuses on the basic elements of effective legal frameworks and institutions for addressing pollution. It addresses both traditional means, such as regulations and permit systems, as well as newer approaches including pollution prevention, market-based incentives, and public-private partnerships. It covers a variety of themes, including sustainable development, human health protection, public participation, market-based tools, and public right-to-know, and examines the role of legislative and administrative institutions at the federal and sub-federal level.*
- *The Principles of Environmental Enforcement provides a framework for designing effective environmental compliance strategies and enforcement programs; improving the enforceability of compliance programs; promoting more effective cooperation and implementation among ministries, and other public and private sector groups; introducing a broad range of tools and authorities for enforcement responses; and introducing negotiation techniques to resolve violations.*
- *Conducting Environmental Compliance Inspections is designed to introduce inspectors to the main aspects of the environmental compliance inspection process, and the role of the inspector in motivating compliance in any international setting. Topics include planning and conducting the inspection, evidence collection, sampling, reporting the results, and the role of the inspector in the enforcement process.*
- *Environmental Criminal Investigations Training is designed for police officers and teaches how to recognize environmental crime and how to provide an initial response, while ensuring the personal safety of all involved. It also seeks to improve the relationship between the police and environmental compliance personnel. The course was developed, and is given, under the auspices of Interpol. It covers pollution crimes and illegal trafficking of endangered species. The course can be tailored to adapt to the particular demands and issues for the region in which it is taught.*

ii. Environmental Impact Assessments

a. Status¹⁶

Following the adoption of Law 81 in Cuba, an environmental impact assessment/analysis (EIA, or analysis) must be obtained for the proposed project, in order to obtain a CITMA license to move forward with it. CITMA's regulations list the classes of projects that require EIAs, as well as an analysis of all phases of a particular proposal to which prospective and on-going government policies and programs must be applied.¹⁷ Resolution 77/99 requires that alternatives to the proposed projects, including the location of the projects, be identified in applications for CITMA licenses.¹⁸

Before granting a license, CITMA must take into account the interests and concerns of the general public and, more specifically, those in the project area.¹⁹ In order to comply with this requirement, license applications must document the public information used and consultations made with the local authorities and the public by the applicant. However, this is the extent of public participation. There are no provisions for public participation or comment on EIAs, nor is there any recourse for the public to appeal the absence of an analysis, a defective analysis, or a licensing decision. However, if a license is denied, applicants can appeal the decision with CITMA.

Despite what appears on paper, the Castro regime subordinates environmental concerns to its economic survival strategy. Economic development projects, which are approved by the top echelons of the Castro regime, move forward based largely on political and economic calculations of what benefits the regime, and not necessarily on a project's environmental impact.

¹⁶ All information contained in this subchapter is derived from Oliver A. Houck, *Environmental Law in Cuba*, 16.1 J. Land Use & Envtl. L. Fall 2000, (2000).

¹⁷ Houck at 28, referring to Regulations of the Environmental Impact Evaluation Process, CITMA Resolution No. 77/99 (July 28, 1999), 48 *Gaceta Oficial de la Republica de Cuba* 778 (Aug. 6, 1999).

¹⁸ Because many of the mission agencies that are required to conduct EIAs for their projects do not have the necessary expertise to conduct such analyses, Cuba relies largely on a system of consultants to comply with its EIA process. CITMA has a list of pre-screened and approved outside consultants for this purpose. Consultants are paid directly by the agencies requiring the analysis, not by CITMA.

¹⁹ *Id.* at 37.

b. Needs/Problems

Given that the agencies requiring EIAs are also responsible for paying the consultants hired to conduct the analysis, agencies have leverage to employ only consultants who will grant favorable reviews to their projects. As a result, the current Cuban consultant system finds itself in a situation where one central consulting firm is cornering the bulk of the environmental impact assessment work in the country.²⁰

The lack of public participation, therefore, needs to be addressed in Cuba's EIA process. Linked to this issue is the fact that all projects in Cuba are subject to a process called "micro-localization," a zoning review and authorization system managed by the Planning Ministry that also does not include a public participation component.²¹ Under Resolution 77/99, a "micro-localization" approval must be obtained before an application can be submitted for an environmental license. This requirement in turn "fixes the location of activities that can have considerable impact, such as hotels, roads, and mining operations," making the central issue of environmental reviews the location of the project.²² Thus, the lack of public involvement and the timing for the micro-localization approval and the environmental review are issues that need to be addressed.

Lastly, although Cuba's Law of Foreign Investment requires that foreign investment be made in the context of sustainable development and executed with care for the protection of the environment and the rational use of natural resources²³ environmental concerns often bump up against economic pressures and it is unclear how much power, if any, CITMA has, if any, over foreign investment decisions.

c. U.S. Actions

EIAs serve as a valuable management tool. The U. S. Government has extensive experience in this area and should be prepared to offer capacity building assistance to a free Cuba through its Environmental Impact Assessment for

²⁰ *Id.* at 33.

²¹ *Id.* at 29.

²² *Id.*

²³ *Id.* at 30, quoting Ley 77, *Ley Para La Inversion Extranjera* [Law 77, Foreign Investment Law], reprinted in *La Economía Cubana: Reformas Estructurales y Desempeño en Los Noventa* (1997).

Reviewers Course. This course is not only targeted at an audience with different skill levels, but focuses on the use of environmental impact assessment review in any institutional setting and set of roles. It covers the general approach, along with the tools and techniques, for conducting objective, unbiased reviews and for ensuring widespread participation in the decision-making process.

2. Water Quality

i. Ambient Water Quality

Surface and groundwater in Cuba are severely polluted by runoff from heavily treated fields with fertilizers, pesticides, and herbicides, as well as by the discharge of untreated effluents from cities and industries such as sugar mills, sugar by-products, food processing plants, mining operations, etc.²⁴ Socialist Cuba's fixation with irrigation resulted in very high rates of extraction of groundwater causing groundwater levels to drop, salt-water intrusion, and increase salinity of the soils near the coasts. In addition, an extensive dam construction program reduced the river flows and limited the natural recharge of aquifers, increasing the salt-water encroachment, especially in *Ciego de Avila* Province. The insufficient levels of wastewater treatment and the lack of sewer pipelines have caused a degradation of the water quality.

Most of the rivers have been dammed to catch the runoff waters for irrigation and water supply. At the present time, volume of storage water is huge in these numerous reservoirs, but there is no specific data available. The damming of nearly all the major rivers has reduced the flow in the river channels and exacerbated the salt-water intrusion along the coastal areas.

²⁴ Díaz-Briquets, Sergio and Jorge Pérez-López, Conquering Nature: The Environmental Legacy of Socialism in Cuba. Pittsburgh: University of Pittsburgh Press, 2000; and, López Vigil, María, "Cuba Campaign: Twenty Issues for a Green Agenda," Global Exchange, 5 October 2001. <http://www.globalexchange.org/campaigns/cuba/sustainable/lopez100501.html> (23 January 2003)

ii. Land-based sources of pollution

a. Status

Cuba discharges large amounts of wastes to the Wider Caribbean, particularly from along its northeastern coast. Data compiled by the U.N. Environment Programme (UNEP)/Caribbean Environment Programme²⁵ show high waste loads from domestic (municipal) and industrial sources. For domestic (municipal) pollution loads, Cuba contributed approximately 12 percent of the Biochemical Oxygen Demand (BOD) (63,147 tons/year) and 12 percent of the total suspended solids (TSS) (54,292 tons/year) introduced into the Wider Caribbean Basin; of Cuba's total loading, 85 percent of BOD and 93.5 percent of TSS originated from its northeastern coast. The available data indicate little or no treatment of municipal wastewater. Waste loads from Cuba's industrial sources were relatively lower, totaling 5 percent of contributions to the Wider Caribbean Region. Almost two-thirds of Cuba's industrial BOD loadings came from sugar/molasses and rum industries.

According to available sources, Havana Bay is severely polluted. A 1997 study conducted by the Center for Environmental Engineering and Management of Bays and Coasts (*Centro de Ingeniería y Manejo Ambiental de Bahías y Costas*)²⁶ found that the main pollutants in Havana Bay are high levels of nutrients, solids, oil and grease, heavy metals, and bacteria.

Oil pollution is considered the most serious marine environmental problem despite a decrease since 1981. Reported values are higher than the CARIPOL²⁷ standards. The average hydrocarbons in surface waters of Havana Bay decreased from an average of 3.35 mg/l in the 1981-85 period to 0.69 mg/l in 1996. The average hydrocarbons in the sediments of Havana Bay decreased from 3,948 ug/g in 1986 to 994 ug/g in 1996. Also highly contaminated with oil and grease is the Santiago del Estero Bay (0.31 mg/l in water and 864 ug/l in sediments), North

²⁵ UNEP Caribbean Environment Programme, Regional Overview of Land-Based Sources of Pollution in the Wider Caribbean Region, Technical Report No. 33, 1994, pp. 28-32.

²⁶ UNEP Caribbean Environment Programme, Assessment of Land-Based Sources and Activities Affecting the Marine, Coastal and Associated Freshwater Environment in the Wider Caribbean Region, UNEP Regional Seas Reports and Studies #172, 1999, pp. 57-59.

²⁷ Marine Pollution Monitoring Programme in the Caribbean (a UNEP program)

Coast of Havana City (0.23 mg/l in water and 327 ug/l in sediments), Matanzas Bay (<0.05 mg/l in water and 175 ug/l in sediments), Nipe Bay (104 ug/l in sediments), and the Varadero-Cardenas Coastal Area (78 ug/l in sediments). The study found that the majority of the sewage was discharged into Havana Bay without any treatment, which accounted for the high level of ammonia nitrogen, nitrate, nitrites, phosphorus, and fecal coliform. The bay experienced eutrophication²⁸ due to the high concentration of nutrients. The amount of suspended solids also increased from 160 mg/l in 1986 to about 220 mg/l in 1996. Heavy metals from domestic and industrial sources (with the exception of iron, lead, and zinc) also increased from 1994 to 1996, posing a serious risk to human health and living marine organisms.²⁹

b. U.S. Actions

RECOMMENDATIONS:

- *The U.S. Government can assist in developing and conducting assessments of the impacts of point and non-point sources of pollution. The U.S. manages a National Status and Trends Program, which conducts long-term contaminant monitoring at more than 350 estuarine and coastal sites to determine the impacts of contaminant exposure and changes in coastal habitats on the distribution and abundance of living marine resources.*
- *The U.S. Government can also contribute expertise in the use of chemical, biomolecular, microbiological, and histological research to describe, evaluate, and predict the significant factors related to point and non-point sources of pollution.*

iii. Drinking Water and Wastewater

a. Status

Please see the MEDIUM- & LONG-TERM ACTIONS section of Chapter 5, MODERNIZING INFRASTRUCTURE, for a discussion of this topic.

²⁸ A process of oxygen depletion that diminishes fish populations.

²⁹ *Id.* at 57-59

b. U.S. Actions

The U.S. Government has limited technical expertise for addressing primary infrastructure issues, as states and local agencies, with the help of private sector engineering consulting firms, have primary responsibility in the U.S. The U.S. Government does have experience in bringing together small ad hoc teams of experts from around the country to act as consultants to other countries on a limited basis. This type of team is most likely not appropriate for a full scale assessment and potential rebuilding of a nation's infrastructure; however, the following actions are recommended:

RECOMMENDATIONS:

- *U.S. Government agencies can provide a free Cuba with a significant amount of capacity building expertise. Capacity building includes, but is not limited to, development of monitoring programs, review and assessment of water quality data (drinking water, effluent discharge, ambient water quality), long-term development of laws and regulations, development of pre-treatment programs (control of industrial discharges into public waste water systems), etc.*
- *The U.S. Government could help a free Cuba develop a water and wastewater plan similar to the one being done along the California/Tijuana, Mexico border. The Plan would assess current potable water resources and needs, future potable water needs, current wastewater infrastructure resources and needs, and future wastewater needs.*
- *The overall project objective would be to develop a living document that presents an integrated strategy for water and sanitation services (including infrastructure) for Cuba. This will allow the local, international, and U.S. agencies to collaborate in meeting the needs of public health, quality of life, and environmental protection for present and future generations.*
- *The U.S. Government could also provide assistance on lab improvement and treatment optimization if requested by a transition government. A significant consideration here is whether there exists an administrative structure and potential for binding requirements on the water suppliers in Cuba to value and maintain improvements over time in these areas. If the appropriate*

institutional infrastructure and political support are not present, long-term sustainability is unlikely. Hence, it is important to collaborate and empower local officials to carry out meaningful improvements.

- *Long-term infrastructure financing is critical for lasting water and wastewater capital improvements. A free Cuba faces or could face problems similar to those of the Pacific Islanders. The U.S. Government has vast experience and is investigating innovative financing schemes that could promote financing for long-term capital improvements.*

iv. Coral Reefs³⁰

a. Status

Cuba contains some of the healthiest coral reef ecosystems and largest intact coastal habitats in the Caribbean. This situation stems from a combination of minimal coastal development on the north and south coasts and the location of many of its reefs, which are generally beyond the influence of land-based sources of pollution. It has the largest and most diverse shelf habitats in the insular Caribbean. In terms of reef fish, Cuban populations have higher biomass, species richness, and average size than many other countries in the region, but these parameters were declining in the 1980s and 1990s due to over-fishing, especially groupers, snappers, conch, and lobster.

b. Current and Emerging Threats

Overall, some scientists have rated over 70 percent of Cuba's reefs to be threatened, with nearly 40 percent at high threat. The analysis identified over-fishing as the predominant threat to Cuba's reefs, but the coral reef fishery today is probably in better condition than other Caribbean countries.³¹ The use of non-selective fishing gears, the indiscriminate use of set nets during spawning

³⁰ Clive Wilkinson (ed), *Status of Coral Reefs of the World: 2002*, Australian Institute of Marine Science, 2002; Reefbase Country Overview (Search for Cuba): http://www.reefbase.org/resources/res_overview.asp; and Reefs at Risk: Caribbean, 2004. in press.

³¹ "Status of coral reefs of the world: 2002 (Wilkinson, C., ed). Australian Institute of Marine Science, Townsville, Australia. p Linton, D. *et al.* 2002. Status of coral reefs in the northern Caribbean and Atlantic node of the GCRMN. *In* .285

aggregations, and limited enforcement in the early 1970s led to extensive over-fishing of several key commercial species.³² About one-fifth of reefs are threatened by watershed-based sources of pollution, and relatively few reefs (less than 5 percent) are threatened by coastal development or marine-based sources. Sedimentation and coastal development threats are low, mainly due to the fact that many reefs are offshore and outside the influence of land-based sources of pollution³³ and because tourism, a prevalent impact on many reefs in the Caribbean, is relatively undeveloped in Cuba. Remote reefs (e.g., around the southern archipelagos) are in very good condition, but signs of decline are evident near large population centers such as Havana, characterized by low coral cover, overgrowth by algae, and disease outbreaks.³⁴

An existing initiative to create a national system of Marine Protected Areas (MPAs) by 2008 is key to helping preserve marine biodiversity. However, implementation of a national MPA system should be complemented by other forms of ocean and coastal governance, such as sustainable fisheries and integrated coastal management to control threats at an ecosystem scale.

From 1994-2000, tourism increased an average of 20 percent annually. Even with no change in U.S. travel restrictions, the Cuban Ministry of Tourism predicts international tourism will rise about 10 percent per year. Most of this tourism growth will occur in the coastal areas. A normalization of investment and travel restrictions is likely to transform, if not overwhelm, Cuban policy processes currently in place to manage growth. Cuban planning officials predict that total tourist arrivals could increase to between 5 and 10 million if the embargo is lifted or significantly eased.

³² Claro, R., K.C. Lindeman & L.R. Parenti. 2001. Ecology of Marine Fishes of Cuba. Smithsonian Institution Press, Washington DC USA. p. 219

³³ Linton, D. *et al.* 2002. Status of coral reefs in the northern Caribbean and Atlantic node of the GCRMN. *In* "Status of coral reefs of the world: 2002 (Wilkinson, C., ed). Australian Institute of Marine Science, Townsville, Australia. p.281

³⁴ Linton, D. *et al.* 2002. Status of coral reefs in the northern Caribbean and Atlantic node of the GCRMN. *In* "Status of coral reefs of the world: 2002 (Wilkinson, C., ed). Australian Institute of Marine Science, Townsville, Australia. p.281

c. Need for Assistance

The likely dramatic expansion of tourism and coastal development will intensify the need for infrastructure and services, as well as add new pressures for fisheries. Cuba has an institutional framework for environmental management in the national environmental strategy of Law No. 81, but this may need to be reassessed in the context of rapid coastal development. Coastal management tools such as land use planning, project siting, environmental impact assessments, and licensing may also need to be reassessed to enhance their contribution to integrated coastal management. The agencies involved in coastal and marine monitoring and management will need to be strengthened to meet the challenges ahead.

d. U.S. Actions

RECOMMENDATIONS:

- *If requested by a transition government, a variety of U.S. agencies that provide international development and technical assistance in integrated coastal management and improved sectoral management could be involved in a comprehensive assistance program that could cost \$3-\$5 million a year for five years.*
- *The U.S. Government can assist transition government coral reef managers with a number of tools necessary to effectively manage coral reef ecosystems. These tools include mapping of benthic habitats of coral reef ecosystems and assessing the associated reef fish and their essential fish habitat.*
- *The U.S. Government should also be prepared to provide assistance and guidance on sampling and analyzing associated sediments, and on conducting research on oxidative stress and small heat shock proteins used to predict coral bleaching events. Such tools are useful in determining the overall health status of coral reef ecosystems.*

The U.S. Coral Health and Monitoring Program provides services and information sources for researchers and the public in order to help improve and sustain coral reef health. The Coral Reef Early Warning System (CREWS) network monitors and links long-term meteorological and oceanographic

conditions to the health of coral reefs. CREWS is comprised of unique moored sampling stations that acquire a suite of meteorological and oceanographic measurements and transmit the data via satellite to the Nation Oceanic and Atmospheric Administration. The data are processed with a suite of expert systems that determine whether data are within a reasonable range and whether certain environmental conditions are conducive to specific marine behavioral events (e.g., coral bleaching). The CREWS system has been successful in modeling and alerting resource managers to coral bleaching conditions in the Florida Keys and the Great Barrier Reef. The U.S. Government plans to expand this alerting capability to other coral reef areas, as well as better refine and enhance its alerting capabilities beyond coral bleaching.³⁵

RECOMMENDATION:

- *Once a transition in Cuba is underway, the U.S. Government should be prepared to help Cuba become eligible for participation in the Coral Reef Conservation Fund, a competitive small grants program carried out by the U.S. Government in association with the National Fish and Wildlife Foundation. The Fund provides grants for projects that build public-private partnerships to reduce and prevent degradation of coral reefs and associated habitats. Program categories include management, monitoring, research, and conservation. The focus areas for the fund include U.S. state and territorial waters, freely associated states, and Caribbean or Mesoamerican coral reef ecosystems. The U.S. could use this program as a mechanism to help fund partnership coral reef conservation projects with a free Cuba.*

Established in 1994, the International Coral Reef Initiative (ICRI) is a partnership among nations and organizations seeking to implement international conventions and agreements for the benefit of coral reefs and related ecosystems. The U.S. Coral Reef Initiative (USCRI) was launched in 1996 as a platform for U.S. support for domestic and international coral conservation efforts. The goal of the USCRI is to strengthen and fill the gaps in existing efforts to conserve and manage coral reefs and related ecosystems (sea grass beds and mangrove forests) in U.S. waters in a sustainable manner. This experience, along with participation

³⁵ Daniel J. Whittle, Kenyon C. Lindeman, James T.B. Tripp, "International Tourism and Protection of Cuba's Coastal and Marine Environments," *Tulane Law Journal*, vol 16, pg 533.

by other U.S. Government agencies and departments, will be invaluable in assessing, monitoring, and protecting the coral reefs of a free Cuba.

The U.S. Government is developing a framework document on coral reef protection. This document will consider protection of coral reefs from a watershed management perspective, and will offer resource managers a bottom-up concept of management. The intent is not to manage corals reefs in isolation, but to include them as part of a comprehensive integrated coastal zone management plan. This approach will improve protection of near-shore reefs by incorporating them into the planning processes of their associated watersheds.

RECOMMENDATION:

- *The U.S. Government should offer to share its coral reef framework document with a transition government. This guidance is predominantly based on laws governing water resources in the United States, but could serve as a template for increased protection for Cuba's coral reef system if a transition government seeks assistance in this area.*

v. Integrated Coastal Resource Management

a. Status

Cuba, as a large island nation with 3,735 km of coastline including many smaller islands, would benefit from the development and implementation of an integrated coastal management program in order to deal with future development and environmental degradation issues in a more comprehensive way. Given its coastal resource base of beaches, coral reefs, mangrove forests, and waterways, etc., it is likely that coastal tourism (developments and activities conducted upon land immediately adjacent to the shoreline, coastal wetlands, estuaries and tidal waters, and associated marine waters) could quickly become Cuba's leading industry. Massive hotel development, attractions to accommodate the expected increase in tourism, and associated domestic growth will also migrate to the shoreline to support the industry. The scenario is not an unfamiliar one. Experience around the world and in the United States has shown that development must meet certain environmental, social, and economic standards or significant damage can occur to the resources that attract tourists and visitors, resulting in

costly fixes, if and when possible. Only a Cuban government prepared to meet the environmental challenges of accelerated growth will be in a position to provide long-term benefits to the Cuban people.

b. U.S. Actions

RECOMMENDATION:

- *To assist a free Cuba in developing an integrated coastal resource management program, the U.S. government could provide technical assistance to develop and conduct a National Coastal Assessment Program. At its completion, this program will assess the ecological “health” of the marine and estuarine resources of Cuba, provide data to suggest cause(s) of reduced health, and provide an ecological baseline to develop, target, and assess the effectiveness of environmental management activities into the future.*

This effort could be timely with regard to both the availability of validated monitoring and assessment technologies and the need for scientific data to manage natural resources that are critically important to Cuba’s national economy. Coordination with, and transfer of, monitoring and assessment technologies from the U.S. National Coastal Assessment Program, a component of the Environmental Monitoring and Assessment Program (EMAP), will help ensure that a National Coastal Assessment Program in Cuba is successful and is based on the most current monitoring and assessment technologies. The efficiency and effectiveness of this proposed program will be greatly enhanced by transfer of technology developed at considerable cost by the National Coastal Assessment Program.

RECOMMENDATIONS:

- *A complete monitoring and assessment program template is available, from sampling designs and protocols to data management and statistical analysis; a report format is even available that presents complex monitoring data into a form that is useful to decision makers. Assistance activities could:*
 - *transfer monitoring and assessment technologies developed in the United States;*

- *build capacity through training and assistance from U.S. Government scientists so Cuba can continue coastal monitoring and assessment activities with little or no external assistance; and*
- *plan and implement monitoring and assessment programs for additional natural resources in Cuba such as seagrasses, wetlands, and corals.*
- *With more than 30 years of experience in implementing the U.S. Coastal Zone Management Act, the U.S. Government, using appropriate resources to include expertise from U.S. Gulf States and Island Territories who have faced similar problems, could provide a free Cuba with significant technical assistance to be more prepared to meet the inevitable growth that will take place. Such assistance, if requested, could include:*
 - *an interagency needs assessment of coastal stressors and Cuban management capabilities, the result of which will be the development of a technical assistance framework; and*
 - *the development of an exchange program of technical assistance and training, based on needs identified in the technical assistance framework.*
- *The U.S. Government could also provide technical legal assistance on marine issues, such as: marine resource conservation and management, ports and shipping, marine protected areas, integrated coastal zone management, pollution prevention and natural resource restoration, mitigation of land-based sources of marine pollution, and implementation of international agreements relating to marine activities.*

3. Land Management

As with many areas, assessments will be an important first step as a new free Cuban government focuses on addressing issues related to land and other natural resources. Such assessments should identify and prioritize land resource needs and identify Cuban expertise in conservation, land management, resource management, and other areas. Additionally, consideration should be given to establishing an interdisciplinary team for problem identification/solution based on levels of complexity. Finally, while there is good basic soils information available, more

detailed information should prove useful to other agricultural and domestic uses.

i. Solid Waste Management

a. Status³⁶

As in the majority of Latin American and Caribbean countries, in Cuba the operation and administration of solid waste management is at the municipal level while the norms, planning, oversight, and evaluation are centralized at the national level.

In 1991, Havana produced 1,100 tons/day of municipal solid waste, the equivalent of 0.7 kg/day/person. This figure is below the LAC average of 0.97 kg/day/person for cities of two million people or more. The municipal solid waste collection coverage rate was 80 percent. Most of this waste went to one of two landfills; some went to specialized plants to produce pig feed. Cuba does not recover methane generated at these landfills.

At the national level, Cuba has national policies related to hospital waste management. The IDB reports that the 50,293 beds at medical facilities across the country generated 11,014.2 tons/year of hazardous medical waste. Management of these wastes is based on their hazard classification: clinical materials and “sharps,” pathogenic, or common.

ii. U.S. Actions

RECOMMENDATIONS:

- *In the area of solid wastes, if requested by a transition government, U.S. Government experts could meet with Cuban scientists and environmental experts to provide technical assistance in the form of literature as well as direct consultation assistance in diverse areas, such as:*

³⁶ Banco Interamericano de Desarrollo y la Organización Panamericana de Salud. “Diagnóstico de la Situación de Manejo de Residuos Sólidos Municipales en América Latina y El Caribe.” Report No. ENV.97-107. Washington, DC, July 1997.

- *Contaminant-specific Environmental Technologies currently employed in the U.S. (and other countries around the world);*
- *Treatment & Control of Solid Wastes (including containment technologies such as land fill liners or thermal treatments);*
- *Pollution and Management of Scrap Tires;*
- *Medical Waste Tracking;*
- *Municipal Solid Waste Source Reduction;*
- *Soil Washing (chemical and metals removal);*
- *Management of Watersheds and Freshwater Ecology;*
- *Erosion control and water management associated with solid waste landfill situations; and*
- *Planning, design, installation, and operation of methane gas recovery systems at existing solid waste landfill sites. The methane gas can be used as an energy conservation measure to reduce fossil fuel dependence by replacing petroleum imports.*

ii. Toxic and Hazardous Waste Management

a. Status

The Pan-American Health Organization (PAHO) estimated that Cuban industries now annually produce just over 26 million tons of hazardous wastes or 2.37 million tons/person: 530,000 tons of hazardous sludge; 24,960,000 tons of hazardous liquids; and, 570,000 tons of hazardous solids.³⁷

³⁷ Id. pp 118-119.

b. U.S. Actions

RECOMMENDATIONS:

- *Contingent on a formal assessment of Cuban training needs, the U.S. Government should be prepared to offer training in areas such as:*
 - *Air Monitoring for Hazardous Materials;*
 - *Emergency Response to Hazardous Materials Incidents;*
 - *Field Analytical Technologies for Volatile Organic Compounds (VOCs) in Groundwater;*
 - *Field Based Analytical Methods for Explosive Compounds;*
 - *Unexploded Ordinance (UXO) Basic Training;*
 - *Pesticide Produce Enforcement; and*
 - *Waste Treatment, Transportation, & Disposal.*
- *The U.S. Government can also provide on-line training to Cuban environmental audiences through the Internet. Currently, these hazardous waste seminars have been conducted in 100 cities in 45 countries around the world. Of particular note is a course currently offered in Spanish that provides access to information about technologies used in soil and groundwater clean-up.*
- *The U.S. Government can provide technical and hands-on assistance through training and information sharing concerning the reclamation of former industrial areas to municipalities for public or private productive use through the U.S. Brownfields Program. This program assists public and private organizations to prevent, assess, safely clean up, and sustainably reclaim these sites.*
- *The U.S. Government can provide direct hands-on technical assistance to a free Cuba in specific subject matter areas of solid or hazardous waste or*

groundwater contamination through one-on-one consultations between Cuban scientists and technicians and U.S. Government experts. Subjects of these consultations can include:

- *Detection and disposal of PCBs that can be addressed by U.S. Government scientists and disposal experts.*
- *Mining Wastes (particularly Nickel) that can also be addressed by U.S. Government experts.*
- *If requested, the U.S. Government can provide technical advice and hands-on assistance for the remediation of Cuban military bases and facilities; for example, oil spills and chemical wastes reclamation at current and former military vehicular depot sites; analyses and remediation of unexploded ordinances at weapons testing ranges; and pharmaceutical approaches to hazardous substance inventories tracking and disposal practices.*

iii. Mining Operations/Reclamation

a. Status

While a free Cuba's economic development will include mining, U.S. Government assistance programs must be cognizant that mining facilities or land currently being mined were expropriated from American citizens in 1959.

Cuba has 37 percent, or 800 million tons, of the world's proven reserves of nickel, plus cobalt and chromium. There are 2.2 billion tons of probable nickel reserves in Holguin with lesser reserves elsewhere. Nickel and cobalt account for about 90 percent of Cuban mineral exports. Other mining activity includes iron, copper, manganese, chromium, silver, and gold. Cuba has two recent mining ventures with Canadian mining companies: KRW is investing in gold exploration and Newport Exploration Ltd. has acquired a 50 percent interest in the high grade Mantua Copper Project located in western Cuba.

Cuba's oil deposits are scarce and yield high sulfur residues that corrode rigs and refineries. Few foreign investors have been willing to produce crude oil in Cuba. Nevertheless, production increased to 15 million barrels of oil and 566

million cubic meters (20 billion cubic feet) of natural gas by 1999. The oil and gas help meet the energy demand in Cuba's thermal power plants as well as the energy needed to produce cement and asphalt.

b. U.S. Actions

RECOMMENDATION:

- *The U.S. Government could provide design and maintenance assistance of conservation measures necessary for reclamation of surface mining activity. It could also provide technical assistance in erosion control, water management and related engineering.*

iv. Soil Erosion, Sedimentation, and Compaction

a. Status

Desertification has now reached over six billion hectares worldwide, affects one billion people, and is on the rise. Cuba is not exempt from this problem. In an interview with the Cuban press, the former president of the Castro regime's Environmental Agency was quoted as saying that, based on Ministry of Agriculture data, "approximately 76 percent of the country's potential agricultural land has some level of damage: erosion, salinity, or compression." This situation has led the Cuban government to list soil loss and damage as its main environmental problem. The type and extent of soil damage varies by province: desertification levels seem most pronounced in the eastern provinces, salinization is critical in Guantanamo, and wind and rain erosion have caused the most damage in the Pinar del Rio coastal plains. Mineral extraction contributes to soil loss and compaction, particularly in areas where soil has been removed for strip mining. Some 40 tons of land per hectare end up in the sea or the rivers, contaminating the water.³⁸

Implementation of urban gardening and organic production practices following the collapse of the Soviet bloc may have reduced the degree of soil

³⁸ "Desertification: Cuba's Main Environmental Problem," Granma International/On-Line Edition. Havana, Cuba, March 6, 2003.

erosion taking place in Cuba. Additionally, the loss of imported Soviet bloc fuel reduced tractor use in Cuban agriculture, thereby reducing soil compaction on some lands.

b. U.S. Actions

RECOMMENDATION:

- *Based on available information, the U.S. Government could provide assistance in all facets of soil erosion, sedimentation, soil compaction, and related conservation practices. Tropical data is not readily available; therefore, good climate and soils information would foster the best use of other expertise. Examples of activities to improve soils information of benefit to a free Cuba include: Conduct an assessment of soil conditions, soil sampling, soil classification, soil interpretation, establish a soil database, determine sedimentation rates, address sedimentation in priority areas, determine the extent of soil compaction and identify conservation priorities that decrease compacted soil layers to provide a healthy environment for plant growth.*

v. Agricultural Practices

With a change in political systems, the aim of improving agricultural practices and crops systems will be to avoid soil erosion, sedimentation, and compaction while improving nutrient content and loss of soil to the sea, and avoiding adverse public health and environmental effects from use of agricultural chemicals.

vi. Irrigation from Surface and Groundwater

a. Status

Water scarcity continues to be a major problem in Cuba. With the loss of subsidized fuel supplies in the early 1990s, the number of crops and the amount of cropland under intensive irrigation has shrunk drastically.

b. U.S. Actions

RECOMMENDATION:

- *With a transition government in Cuba, there may be opportunities to provide expertise in the form of information, design, and application based on available soils information. Also, assistance to transfer and adapt irrigation technology to tropical agriculture might be warranted. Assistance could also be provided to apply irrigation models to existing conditions.*

vii. Chemicals Application Practices

a. Status

The agricultural model followed by Cuba until the mid 1980s was very chemicals-intensive with a high reliance on pesticides. Environmental pollution from chemicals has probably fallen as applications of chemicals have dropped substantially over the last decade.

b. U.S. Actions

RECOMMENDATION:

- *The U.S. Government should be prepared to provide assistance and information on agricultural chemical management with the goal of protecting surface and subsurface waters, which can be modeled and predicted with adequate soils information*

viii. Open Field Burning of Sugar Cane

With the Cuban sugar industry shrinking over the last decade, open field burning of sugar cane may not be as large a problem as it once was.

RECOMMENDATION:

- *The U.S. Government could provide information on the advantages/disadvantages of burning versus non-burning.*

ix. Research and Technology Transfer

Research and technology transfer activities could be useful in many ways, including biological control of plant disease and insect attack, tropical agriculture, watershed management, water management for irrigation and water quality improvement, and animal health.

4. AIR QUALITY

i. Status³⁹

Although Cuba's air quality monitoring network (*Sistema Nacional de Vigilancia Atmosférica*) had serious problems during the last decade due to lack of equipment, Cuba reported a tendency for a general increase in the average concentration of oxidized gas compounds during 1986 and 1998. Most of the emissions identified were derived from industrial and agricultural sources.

In the localities of Moa, Mariel, Nuevitas, Nicaro, Santa Cruz del Norte, and parts of Havana City, the ambient air quality monitoring is seriously deficient.

During the years 1989 to 1995, the acid rain was observed to increase. Since 1996, the acid rains have apparently decreased; however, this fact cannot be scientifically confirmed due to the deterioration of their monitoring system. Acid rain deposition maps show greater values in the coastal areas of Mariel-Varadero, Santa Clara, Cienfuegos, Nuevitas, and the mining zone to the north of Holguín. The estimated reductions of SO₂ and NO_x emissions needed to attain acid rain levels close to those of nature vary between 30 percent and 80-100 percent for those areas affected by the acid rain.

In the past decade, Cuba took several actions to resolve air pollution problems, including:

- Law No 81 of 1997 which has a chapter on the atmosphere and establishes responsibilities related to these technological processes of air pollution and

³⁹ Centro de Información, Gestión y Educación Ambiental, "Panorama Ambiental de Cuba 2000," 2001, pp.50-52.

technology transfer on gases and particulate emissions which affect the ozone layer and cause climatic changes;

- development of maps that forecast the estimated elevations of sea levels and their effects on human settlement, natural resources, and short-, medium-, and long-range effects;
- promotion of renewable energy sources to replace fossil fuels, such as biomass, solar, wind, and hydroelectric; and
- development of technical norms or standards related to air quality.

Stationary and mobile sources of pollution are highly dependent on petroleum as a source of energy. Cuba's infrastructure (e.g., oil refineries, electric power generating stations) is old and, according to available data, generally lacks modern emission controls. In addition, the economy is populated with a variety of industrial sources dominated by sugar and other food processing plants and mining/smelting operations (e.g., nickel). Gasoline sold in Cuba contains lead and has a high sulfur content.⁴⁰

ii. Needs

In many cases, the assistance necessary to address air pollution issues would require investments of tens of millions, if not hundreds of millions of dollars, when one considers the cost of retrofitting oil refineries and electric power plants with modern pollution control equipment. A transition government will need to consider the relative merits and costs of restoring and retrofitting old and poorly managed facilities. In some cases, it might make more economic sense to shut down an existing facility and build a new facility.

iii. U.S. Actions

Because of the integrative nature of air pollution with human activity, any strategies developed to address air quality issues would need to be integrated with those of other activities, including transportation planning, infrastructure

⁴⁰ Argelio Maldonado, conference call, February 17, 2004.

upgrading/replacement, and overall economic growth projections. For example, an air quality management process to address “stationary sources” in a free Cuba would require working with the country on specifications for new vehicles, assuming that with the economic liberalization there would be an influx of them.

a. Stationary Sources of Pollution

RECOMMENDATIONS:

- *The first level of support the U.S. Government should be prepared to provide would be to assess the air quality and the capacity of the Cuban environmental professionals to address air quality issues. To assess air quality, the U.S. Government could examine the available data and information on ambient air and emission sources. This would include a review of: the nature of the existing monitoring network; the extent and quality of air quality data (including emission or source inventories); the extent and quality of public health, economic and research data; the industrial source categories; and pollutants of primary and secondary concern.*
- *To assess local capacity, the U.S. Government could help a transition government examine: the viability of existing statutory or regulatory authorities; the experience and educational level of current staff; the existing staffing levels; the availability of financial resources; the roles and responsibilities of national program staff, local government staff and capabilities in academia, industry, and research institutions; and the technical resources at the disposal of air quality staff (e.g., hardware, software).*

This initial assessment could include working with Cuba to identify some high priority stationary sources for purposes of developing control strategies.

RECOMMENDATIONS:

- *Once an initial assessment is complete, the U.S. Government could help a transition government identify any gaps in data needed to make a preliminary determination regarding the quality of Cuban air. If additional data is needed, the U.S. Government could initiate the work necessary to fill those data gaps. For example, if no inventory exists of current sources, a preliminary emission inventory could be conducted. If the monitoring network was inadequate to*

determine air quality, temporary monitoring or modeling could be conducted to assist a free Cuba to identify priority problems. The goal would be to develop an adequate data set and facilitate an understanding of key air quality concerns. With that information, a free Cuba could develop strategic programs to address priority concerns.

- *While acquiring the necessary data, the U.S. Government could identify priority training and capacity building activities based on the initial assessment of Cuban staff. The U.S. Government, in conjunction with local academic institutions, could develop Cuba-specific training courses on topics such as air quality management, monitoring, and emission inventory development. The ideal would be to institute a train-the-trainer system designed to provide an on-going in-country knowledge base to support air quality management activities. Again, the goal is to build the capacity of the Cuban staff to implement a strategic air quality management program.*
- *Based on the priorities identified by the transition government, the U.S. Government would work to provide technical assistance and build staff capacity to become self-sustaining. Again, depending on the areas of need, this phase could focus on training or on-going program development assistance. Also, given the experience of many developing countries, there is a good sense of preventative measures available to mitigate the air quality problems that inevitably come with rapid economic expansion.*
- *The U.S. Government should be prepared to look for public-private partnerships and partnerships with cities — with the objective of identifying U.S. expertise that could help a free Cuba reduce pollution, such as landfill methane recovery or industrial energy efficiency, and develop policies for “responsible investment.”*

b. Mobile Sources of Pollution

Since mobile and stationary sources are the primary contributors to outdoor air pollution, the assessment steps contained under “stationary sources” would incorporate a mobile source component (e.g., assessing the contribution of mobile sources to air pollution).

RECOMMENDATION:

- *In looking at vehicle pollution, there is a vehicles component (e.g., what kind of pollution controls are contained on the vehicle) and a fuels component (the quality of the fuel used to power the vehicle). The U.S. Government could assist a transition government in assessing their situation and help develop mitigation options, recognizing economic limitations. In cases where accurate data do not exist (as is likely the case in Cuba), there exist simplified versions of models that can be used with default recommendations in place of hard data.*

The Cuban vehicle population includes a large number of old vehicles that do not have modern pollution control devices on them (e.g., catalytic converters). The vehicles are also using fuel that probably has a relatively high sulfur content and contains lead.

RECOMMENDATION:

- *From a public health perspective, the U.S. Government could assist a free Cuba in devising a strategy for a phasing out lead in gasoline. This phase-out could present some transition problems, since Cuba has so many older cars that were made prior to the phase out of lead in gasoline and the introduction of catalytic converters.*

c. Indoor Air

RECOMMENDATION:

- *The U.S. Government has a great deal of recognized expertise in developing voluntary programs. A training course that has been developed for this purpose, Leadership and Voluntary Campaign Implementation, provides groups in other countries with the skills needed to establish their own voluntary programs. This class has been offered overseas in China, Latvia, Poland, Viet Nam, India, and Thailand. A second project that should be made available to a free Cuba is the Partnership for Clean Indoor Air that looks at the use of biomass fuels for indoor cooking and heating. This is an international effort aimed at the estimated 2 million women and children who are most at risk from these practices. The Central American Commission for Environment and*

Development is one of the project partners.

All major Indoor Air outreach materials are also available in Spanish so they could be used immediately.

5. OTHER ENVIRONMENTAL ISSUES

i. “Hotspot” Areas

a. Status

The U.S. Government has received reports of areas where levels of industrial contamination may be especially high. These areas include Moa nickel plants, areas around power plants, and petroleum refineries.

Cuba and the United States are signatories, but not yet parties, to the Stockholm Convention on Persistent Organic Pollutants (POPs), which enters into force on May 17, 2004. The Convention seeks to prohibit production, use and/or release of 12 POPs that can travel globally, including polychlorinated biphenyls (PCBs). Cuba has potentially significant PCB releases that can adversely affect the United States. At a United Nations Workshop on POPs in 2000, the Cuban environment agency estimated Cuba has 250 tons of PCBs, but they recognized this may be an underestimate. Workshop participants toured a transformer repair shop and saw actual drums of PCB-containing oil. In 2000, an Arctic Monitoring and Assessment Program report on “PCBs in the Russian Federation: Inventory and Proposals for Priority Remedial Actions” found that during the period from 1981 to 1989, Russia exported 39.5 metric tons of PCBs to certain countries, including Cuba.

b. U.S. Actions

RECOMMENDATIONS:

- *The U.S. Government should be prepared to provide assistance and information on the characterization and prioritization of contaminated sites and media-specific environmental technologies. The U.S. Government has a list of training courses that are taught to regional program managers (RPMs) and on-*

scene-coordinators (OSCs), as well as representatives from States and the U.S. military, which can be re-worked or adapted for Cuban audiences. These training courses range from simple 'primer courses' (e.g., that address fundamental principles of site assessments and hazardous waste investigative and management practices) to highly complex technical courses that are pollutant-specific in nature, such as those that address detection and disposal of PCBs.

- *If requested, the U.S. Government could also help a free Cuba establish a sound PCB management program by helping Cuba to identify PCB-containing equipment, evaluate management and destruction alternatives, and conduct a pilot demonstration program. The U.S. would work in collaboration with relevant international organizations, such as the United Nations, and partner with countries, such as the Russian Federation, to implement this program.*

ii. Human Health Impacts Due to Environmental Degradation

RECOMMENDATIONS:

As a democratic Cuba expands its environmental protection program, it will be important to develop methods and capacity to assess risk and monitor human health impacts due to environmental degradation. Some specific options that the U.S. Government might be able to offer a free Cuba are:

- *assess the relationship between health outcomes in children and repeated pesticide exposures via multiple sources and pathways;*
- *build human capacity by producing competent graduates on the concepts and methods of risk assessment and communication;*
- *develop bi-national environmental health workshops, and a full graduate training program in collaboration with local universities and other institutions;*
- *conduct training on epidemiology, GIS, public health, entomology, and toxicology;*
- *develop a baseline indicator suite to serve as an assessment tool for program*

effectiveness;

- *develop indicators to link environmental and human health data;*
- *develop outcome measures to better assess the improvements in human health that may accompany improvements in environmental quality; and*
- *train and use local health workers to visit local residents and provide assessments on focus issues, provide education and information, and evaluate the effectiveness of their strategies.*

iii. Laboratories

RECOMMENDATIONS:

- *Laboratory capacity is critical for monitoring environmental conditions and program effectiveness. The U.S. Government should be prepared to assist free Cuban health and environment ministries in upgrading their capabilities by sharing information on and providing training in:*
 - *current approaches to laboratory quality management;*
 - *current analytical protocols and methods for monitoring the environment (air, water, waste, soil) and assessing potential impacts of contamination on public health (e.g. pesticide residues in food monitoring);*
 - *fate and transport models for assessing the impacts of pollutant sources;*
 - *the advantages and disadvantages of various approaches to contaminated site assessment and contamination remediation;*
 - *cataloging, assessing, and protecting water resources;*
 - *upgrading Cuba's drinking water and waste water treatment infrastructure;*
 - *solid and hazardous waste management;*

- *specialized laboratory methods for waterborne pathogens and chemicals; and*
- *waterborne disease surveillance and control.*

iv. Oil and Chemical Spills/Emergency Response

a. Status

The wider Caribbean is a major oil producing area.⁴¹ Most of the oil produced within the Wider Caribbean region is shipped within the region, and since the United States is the major oil consumer in the region, the result is a series of intricate network distribution routes, several of which affect Cuba. In addition, the United States imports oil from outside the region, the majority of which is delivered to the Gulf Coast States via passage through the Old Bahamas Channel and the Florida Straits.

Cuba faces risks from oil and hazardous materials releases in the marine environment primarily from small to medium spills related to oil transfer and industrial processes and the much larger spill related threats from cargo and tanker vessel collisions or allisions that result in the loss of petroleum cargos and/or bunker fuels.

The majority of smaller spills have occurred during loading and unloading operations at terminals. Groundings and collisions account for most of the larger incidents. While Cuba has avoided significant spills and has seen spill volumes much smaller than elsewhere in the region, it is not without some spill incidents. The Princess Anne Marie spilled 5,700 tons of crude at Cabo Corrientes in 1980. The majority of this dispersed at sea. Cienfuegos appears to have had the largest number of spills within this relatively clean history, with the Aida spilling approximately 2 tons of heavy fuel oil in 1992; a second vessel, the Mare Princess, spilling 30 tons of intermediate fuel oil a year later; and the Stavanger Oak spilling approximately 10 tons of diesel oil in the same year. The Aida and Mare Princess spills were cleaned up with mechanical containment and recovery techniques and manual shoreline cleaning using Cuban national resources. The Stavanger Oak

⁴¹ Mexico and Venezuela rank 4th and 8th in refining systems in the world. Regional oil platforms, primarily in the Gulf of Mexico number some 143 platforms including some on the Saba Bank, near St. Croix and Anguilla.

spill dispersed naturally. However, all these spills led to large claims for fisheries damage.

Castro regime budget allocation decisions have resulted in deterioration in spill response training and the purchase and maintenance of pre-positioned equipment for spill response. While the nation continues to maintain some focus on this capability as witnessed in its participation in international and regional forums on the subject, and while engineering and scientific education that is applicable to spill response and recovery is among the highest in the region, actual response infrastructure is old or lacking due to the regime's budgetary and purchasing decisions. The result is an able spill response work force with detailed planning and with appropriate governmental structures but with under-capitalized equipment due to lack of a commitment by the Castro regime to dedicate/allocate the necessary economic resources.

Cuba is a party to a number of regional conventions and protocols under which marine environmental protection issues, programs, and standards are addressed. For example, Cuba acceded to the Cartagena Convention, which focuses on the protection of the marine environment of the wider Caribbean region. Under this Convention the parties work to prevent, reduce, and control pollution in the Convention area and to ensure sound environmental management, using for this purpose the best practicable means at their disposal and in accordance with local capabilities. The parties also agree to endeavor to harmonize their response policies and cooperate with the competent international, regional, and subregional organizations for their effective implementation. Cuba is also a party to the Oil Spills Protocol and SPAW Protocol (Specially Protected Areas and Wildlife), two of the three protocols to the Cartagena Convention. As well, Cuba hosts one of two Regional Activity Centers for Land-based Sources of Marine Pollution created under the UNEP Caribbean Environment Programme, even though it has yet to sign or accede to the third protocol to the Cartagena Convention, the LBS Protocol.

Specifically, the convention requires, *inter alia*, that parties take all appropriate measures to prevent, reduce, and control pollution caused by discharges from ships and to ensure the effective implementation of the applicable international rules and standards established by the competent international organization such as the International Maritime Organization. The United States is also party to this Convention, the Oil Spills and SPAW Protocols, and signatory to

the LBS Protocol.

This effort extends to pollution from point and non-point sources, on shore, on the water, in the air, and on the seabed. For example, the parties must work toward measures to prevent, reduce and control pollution caused by dumping of wastes and other matter at sea from ships, aircraft or manmade structures at sea, and to ensure the effective implementation of the applicable international rules and standards. In addition, the parties have focused on measures to prevent, reduce, and control pollution caused by coastal disposal or by discharges emanating from rivers, estuaries, coastal establishments, outfall structures, or any other sources on their territories. This has also included measures to prevent, reduce, and control pollution resulting directly or indirectly from exploration and exploitation of the seabed and its subsoil and discharges into the atmosphere such as air pollution from vessels.

Cuba has designated special protected areas to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened, or endangered species. This work has complemented their work with the International Maritime Organization under MARPOL 73/78 to designate Particularly Sensitive Sea Areas where no dumping by vessels is permitted. Cuba had the Sabana-Camaguey Peninsula so designated by the International Maritime Organization, the second such area in the world after the Australian Great Barrier Reef. Under the Cartagena Convention, the United States has a clear opportunity to support Cuban national spill response efforts. This is based on the Convention requirement that all parties, including the United States, are required to co-operate in taking all necessary measures to respond to pollution emergencies in the wider Caribbean, whatever the cause of such emergencies, and to control, reduce, or eliminate the pollution threat. When a Contracting Party becomes aware of cases or is in imminent danger of being polluted or has been polluted, it must immediately notify other States likely to be affected by such pollution, as well as competent international organizations (e.g., International Maritime Organization). Cooperative response support by all signatories to the Convention is expected from this notification.

b. U.S. Actions

Cuba has acceded to the International Convention for the Prevention of

Pollution from Ships (MARPOL 73/78) administered under the auspices of the International Maritime Organization. This convention has six annexes of which Cuba has acceded to three, related to prevention of pollution by oil, control of pollution by noxious liquid substances in bulk, and prevention of pollution by garbage from ships. Cuba has not acceded to annexes addressing harmful substances carried by sea in package form, pollution by sewage from ships, and air pollution from ships. It would be highly desirable to encourage ascension to these additional annexes both in terms of support to Cuban marine environmental protection and in terms of providing support to an international regime that the United States has long supported.⁴²

RECOMMENDATIONS:

- *The U.S. Government can encourage ratification and be prepared to help a free Cuba in the implementation of international conventions and annexes related to:*
 - *Land-based Sources of Marine Pollution. Cuba has yet to sign or accede to the LBS Protocol to the Cartagena Convention, which requires countries to adopt high standards for the control and processing of sewage, agricultural run-off, and industrial effluents; and*
 - *Prevention of Pollution from Ships. Cuba has acceded to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) administered under the auspices of the International Maritime Organization. This convention has six annexes of which Cuba has acceded to three, related to prevention of pollution by oil, control of pollution by noxious liquid substances in bulk, and prevention of pollution by garbage from ships. Cuba has not acceded to annexes addressing harmful substances carried by sea in package form, pollution by sewage from ships, and air pollution from ships. It would be highly desirable to encourage ascension to these additional annexes both in terms of support to Cuban marine environmental protection and in terms of providing support to an international regime that the United States has long supported.*⁴³

⁴² The United States has not acceded to some of these annexes.

⁴³ The United States has not acceded to some of these annexes.

All analysis would indicate that the greatest immediate focus should be along the northern coast of Cuba and related to tanker transit traffic. Substantial spills in the Florida Straits would flow northward by virtue of some currents and winds. While this effect is general and could be modified by season, weather, and other factors, it raises the prospect of a threat to the United States, specifically the Florida Keys and southeastern Florida peninsula, as well as the Turks and Caicos and the Bahamas, should a spill occur in the Old Bahamas Channel.

RECOMMENDATIONS:

- *Develop operational agreement for oil spill response: To address this issue it is imperative that three actions be taken as quickly as possible for large spills affecting the waters of two or more nations or spills on one nation's waters that migrate by virtue of winds and currents into the waters of two or more nations.*
 - *Establish a concrete and predefined notification process with a transition Cuban government. Such a process should include agreement regarding frequencies for communication, authorities responsible for initiation and receipt of notification, and information to be communicated (e.g., latitude, longitude, product, vessel type, master, registry, etc.).*
 - *Reach agreement on any joint response protocols. This would address the appropriate use of mechanical recovery, dispersant application and in situ burning based on the specific spill response variables to be encountered in this area.*
 - *Reach agreement on mutually cooperative command and control processes in a joint spill response. Agreement should be sought, though it is rarely reached initially, on a common command and control regime for organizing mutual response forces. The United States applies the Incident Command System, now accepted by Mexico, the British Virgin Islands, and Panama.*

⁴⁴ With regard to probability, the greatest emphasis must be placed on high frequency and high volume spills such as would be found in tanker traffic transiting near the Cuban coast rather than transfer operations in harbors and bays. With regard to the consequence of releases, the greatest emphasis must be placed on damage to sensitive environments or ecological zones. Currently, the most sensitive ecological zone noted by international convention as well as national interest is the Sabana-Camaguey peninsula now designated as a Particularly Sensitive Sea Area by IMO and located along the Old Bahamas Channel and Florida Straits. In addition, Cuba has signed an exploratory agreement with PETROBRAS for oil production work along the northern coast.

However, no common international standard or convention exists for these systems and many nations continue to adhere to their own unique national structures making integration of response forces difficult and, therefore, pre-planning imperative.

- *Develop mutual aid agreement: On a longer term basis there is a need to develop mutual aid agreements on spill response. Both nations are parties to the Cartagena Convention and its Protocol Concerning Cooperation in Combating Oil Spills in the Wider Caribbean Region. That Protocol at Article 6 requires parties to render assistance, within its capabilities, in responding to oil spill incidents and for each party, subject to its laws and regulations, to facilitate the movement into, through and out of its territory of technical personnel, equipment, and material necessary for responding to an oil spill incident.*

B. Natural, Cultural, and Historical Resources

Cuba currently:

- has ratified 25 international environmental treaties, including: Ramsar, the Convention on Biological Diversity, Convention on International Trade in Endangered Species, World Heritage and Cartagena Convention's Protocol on Specially Protected Areas and Wildlife;⁴⁵
- has internationally designated sites of significance, including six Ramsar wetlands sites, six Biosphere Reserves, and seven World Heritage Sites;
- is required by Article 27 of its current Constitution to protect the natural environment; and
- boasts significant amount of biological diversity within its small landmass:
- Per hectare, it has 27 times more plant species than the U.S. and Canada;⁴⁶

⁴⁵ Falcoff, Mark. Cuba the Morning After. AEI Press, Washington DC 2003, p145.

⁴⁶ Maldonado, Argelio, "Cuba's Environment: Today and Tomorrow--An Action Plan", quoting Dr. Michael Smith of Conservation International, p3.

- One percent of the world’s plants grow only in Cuba;⁴⁷ and
- Cuba’s coral reefs are among the best developed in the Caribbean Basin, although experts suggest that 70 percent of Cuba’s reefs are threatened, with nearly 40 percent at high threat. It has the largest and most diverse shelf habitats in the insular Caribbean (barrier and patch reefs, islands, mangrove forests, and extensive sea grass beds.)
- has an ambitious insular plan for terrestrial and marine areas.⁴⁸

Despite the fact that Cuba has ratified major international environmental treaties, established environmental institutes, and passed substantial environmental laws; the Cuban natural resources continue to decline, and its rich biodiversity continues to be endangered. The management of resources, whether natural, cultural, or historical, is subservient to the political interests of the Castro regime and a decision-making process specifically founded on sustaining itself, not promoting a greater respect for these resources.

1. Parks and Protected Areas, Forests, and Marine Protected Areas

i. Parks and Protected Areas

a. Status

Cuba has designated 80 protected areas of national significance and 183 of local significance. These lands cover about 12 percent of the island. If this much land was actually protected it would be a major environmental achievement, but according to a recent World Bank analysis its management has been sub-optimal⁴⁹. Declaring an area “protected” does not necessarily result in protection — Cuba has many “paper parks,” where there is no staff, no management plan, and no identified park boundaries. The inadequate management of its parks and protected areas undercuts its international environmental reputation and poses a serious threat to its valuable storehouse of biodiversity.

⁴⁷World Bank, “Cuba- Strengthening the National System of Protected Areas Project Documents”, April 2002, p46

⁴⁸ Cuba’s National Protected Areas System Plan, 2003—2008.

⁴⁹ World Bank, p53.

Protected areas are strongly affected by tourism, and vice versa. During the last decade, the Cuban government has promoted mass tourism in order to increase hard currency reserves. From 1994-2000, tourism increased an average of 20 percent *annually*.⁵⁰ In 1999, tourism generated \$1.7 billion and currently represents 21 percent of the GNP.⁵¹ Current Cuban government policy continues to promote a high growth rate for tourism, often in partnership with multi-national hotel chains. Among the documented environmental impacts from hotels and the roads which service them are: lagoons cut off from the sea by roads; polluted coral reefs, beaches, and waters; habitat destruction; disruption of critical wildlife behavioral patterns; propagation of introduced species; filled wetlands, with negative impact on fisheries; beach, and sand dune erosion, etc.⁵²

The infrastructure at most parks cannot adequately support tourists. Only 33 parks of national importance have any ability to handle visitors, but carrying capacity is far exceeded, given the infrastructure at hand. There are few visitor interpretation centers, restrooms, signs, trails, bridges, wastewater systems, or parking lots. Maintenance and communications equipment, if present at all, are woefully inadequate. Many parks are not staffed.

In 2002, the World Bank initiated a \$13.4 million, three-year project to strengthen management of the National System of Protected Areas, focusing on four national parks as demonstration sites.⁵³ Much more will need to be done in the remaining parks to improve management and infrastructure.

ii. Governance Structure

Administration and funding of protected areas is awkwardly divided among several Cuban ministries. Theoretically, protected areas are managed by the Ministry of Science, Technology and the Environment by the National Center of Protected Areas (CNAP), which was created in 1995 to oversee and manage a National System of Protected Areas. However, several agencies that had protected area responsibilities before 1995 continue to manage some of the protected areas, including the National Flora and Fauna Protection Corporation under the Ministry

⁵⁰Falcoff, p144.

⁵¹World Bank, p47 and p109.

⁵² Falcoff p144, World Bank, p109.

⁵³ World Bank, p1.

of Agriculture that manages 53 of the largest and most established protected areas. The Ministry of Fisheries oversees management of the marine protected areas. Enforcing rules and regulations is the responsibility of another government agency, the Forest Guard under the Ministry of Interior.⁵⁴ Only 20 professionals work in the national headquarters of CNAP.⁵⁵ According to a recent World Bank report, CNAP is so little known or understood among its peers that the tourism industry has been giving its own names to unpublicized national parks, calling the Zapata Swamp the “*Parque Natural Montemar*” thus raising the frustration level of tourists, tour operators, and scientists.

There are virtually no local or nationally based independent NGOs active in protected area system management, although foreign NGOs have had success in specific parks.

iii. Needs for Assistance

Little attention has been paid to developing nature-based tourism in Cuba or to collaborative research on genetic resources. If developed carefully, they could provide conservation-compatible livelihoods and contribute towards financing park management and infrastructure development.

Given that a newly democratic Cuba would have many demands for limited government funds, Cuba may want to consider doing what South Africa or some Latin American countries are doing to fund their park systems. South Africa is covering 100 percent of expenses from gate fees, charging a low fee for residents and a high fee for foreigners. Some Latin American countries are “contracting-out” the management of some parks to NGOs, who in return collect gate fees and charitable donations from foreign NGOs. Both of these options would be helpful if the IMF were to impose limits on the number of government employees.

Lessons learned over the last 40 years of park protection in developing countries have focused on the importance of local people benefiting from the tourism to their nearby parks, such as becoming tour guides, sharing in admission or hunting fees, establishing small hotels and restaurants to service park visitors,

⁵⁴ World Bank, p48

⁵⁵ World Bank, p52.

etc.

iv. U.S. Actions

RECOMMENDATIONS:

- *The U.S. Government should be prepared to offer technical assistance and training to a free Cuba to improve its parks and develop ecologically sustainable infrastructure and uses. This can be done by training the Cuban employees or their contractors in many of the park management principles used by the United States. There are over 2000 employees working with Cuba's national parks, and 1000 Forest Guards working in enforcement; however, they are not evenly distributed, as nearly 30 percent work at only three protected areas⁵⁶.*
- *For the medium- and long-term, if requested, the U.S. Government can provide three types of assistance: 1) Train Cuban park managers in best practices for park management in a variety of settings at U.S. parks similar to their own; 2) Provide a Spanish-language training manual for protected area managers, which can be used in connection with training courses conducted in the U.S. or in Cuba; and, 3) Provide on-site technical assistance to Cuban parks staff to develop and maintain park infrastructure and provide visitor services. Other assistance can include mentoring opportunities in the U.S. protected areas and creating Sister Parks between U.S. and Cuban parks.*
- *Listed below are three existing training modules, which could be provided to a transition government:*
 - *Training in Planning, Design, and Maintenance of Park Infrastructure. Methods for acquiring long-term, stable financial support; Designing and constructing visitor facilities, such as entry points, kiosks, visitor centers, hiking trails, and campsites; Development of protected area communications systems; Prescribed fire and wildfire management and suppression; Linking biological inventories and monitoring to protected area management; Legal surveys to define and mark protected area boundaries; and road*

⁵⁶World Bank, p51.

construction practices.

- *Enhancing the Visitor Experience. Public outreach and education programs and visitor information services (including producing protected area visitor brochures and environmental education publications); Monitoring protected area visitor satisfaction); Establishing and managing concession operations; Visitor public relations; Interpretive signs and exhibits; and Development of protected area interpretive programs and facilities, including campfire talks and ranger-guided nature hikes;*
- *Park Management and Basic Ranger Skills. Fee collection methods and fee structure design; Budget planning and administration; Managing and supervising personnel; Preparation of park operating plans; Incident management; Facility maintenance inspections; Radio communications management; Navigation by map and compass; Safety training (visitor, vehicle, workplace); Search and rescue operations, Field patrol techniques; Record keeping and reporting; and Equipment and supplies planning and maintenance.*

RECOMMENDATIONS:

- *The most immediate need is to improve the management of Cuban national parks, and to build the capacity of their park employees. Once park management is improved, and plans developed, it would be appropriate to identify infrastructure and visitor services needs and associated costs. U.S. Government assistance would cost approximately \$60,000 for two weeks of U.S. site visits, \$50,000 per two-week training session, and \$30,000 per two-week technical assistance visit. With appropriate levels of funding, approximately 12 courses/technical assistance visits a year could be offered for several years.*

ii. Forests

a. U.S. Actions

RECOMMENDATIONS:

- *The U.S. Government promotes sustainable forest management and biodiversity conservation worldwide in collaboration with partners in the field, adding value to their projects on the ground. In partnership with international institutions and non-governmental organizations, the U.S. Government could provide assistance to a free Cuba in a number of technical areas including:*
 - *Watershed/Habitat Management: Through initiatives such as the White Water to Blue Water Initiative, the U.S. Government could assist a transition government in the application of scientific and management expertise to promote watershed protection and ecosystem restoration. Focus areas of a program could include migratory species, particularly birds. Activities could include the restoration of degraded ecosystems and mitigation strategies to maintain biodiversity and other environmental benefits.*
 - *In addition, the U.S. Government collaborates with the University of Wisconsin–Stevens Point to offer an International Seminar on Watershed Management. The seminar engages participants on critical global and regional watershed management issues, emphasizing innovative approaches to accomplishing work across a wide range of biophysical and socioeconomic settings. Participants from relevant government agencies and/or NGOs in Cuba could benefit from the seminar and informal exchange of information and experiences with colleagues from around the world.*
 - *Improved Forest Management: The U.S. Government could work with a free Cuba to promote forest conservation through the development of improved forest planning and management, with an emphasis on reduced-impact harvesting and forest policy options and attention to biodiversity conservation and criteria and indicators for sustainable forest management.*
 - *Relevant to this technical area is the International Seminar on Forest and*

Natural Resources Administration and Management. For the past 17 years, this seminar has convened land managers from all over the world to explore and discuss the complexities of sustainable natural resource management. Participants from relevant government agencies and/or NGOs in Cuba could benefit from the seminar and informal exchange of information and experiences with colleagues from around the world.

- *Use satellite imagery to assess the status of forest and other resources. Assess the current situation of Cuba's land cover, soil quality, etc., and create a baseline for future analysis.*
- *Ecotourism/Recreation: The U.S. Government hosts several million visitors each year on its 156 National Forests — developing unparalleled skills in the design and delivery of infrastructure and interpretive materials for visitors. The U.S. Government should be prepared to provide assistance to Cuba in such areas as ecotourism planning and development of interpretive materials.*
- *Wildlife Management: Conservation of Cuba's biological diversity is in part dependent on the ability to conserve in the context of managed forests and ecosystems. The U.S. Government can work with partners in a free Cuba to address the management of individual species as well as habitat management with long term land management plans and other tools.*
- *Policy: In this technical area, the U.S. Government, if requested, could assist a transition government in bilateral policy development on a wide range of issues: ecotourism planning, including recreation concession management; models of law governing forest management; codes of practice including criteria and indicators for sustainability; chain of custody and illegal logging.*
- *Wood Technology: The U.S. Government has expertise in wood processing technologies that minimize waste and increase economic efficiency. It can engage with partners in a free Cuba to develop strategies to meet wood product demand more efficiently with less impact on the environment.*
- *Road Engineering: If requested, the U.S. Government can assist a free Cuba*

in design of forest roads that protect fragile environments and minimize costs. Skills include access planning, route location, road survey and design methods, erosion control, contract administration and maintenance strategies.

- *Fire Management and Ecology: The U.S. Government should be prepared to assist Cuba in prevention, planning, and suppression of wildland fire. It can also provide assistance to partners in a free Cuba to assess the influence of fire on forest ecosystems and to incorporate fire mitigation strategies into existing forest management systems. Specific topics for training and technical assistance include the role of fire in topic ecosystems, fire regimes and fire threat, the integrated fire management approach, and community-based fire management, education & fire prevention programs.*

iii. Marine Protected Areas

a. Status

There are 21 legally declared Marine Protected Areas (MPAs) and 13 very important ones in the final approval process of the Inter-ministerial Council's Executive Committee (ICEC) as of 2003. The 2003-2008 Plan of the National System of Protected Areas (NSPA) contains 108 proposed MPAs (25 percent of the insular platform), 49 of which are considered of national significance and because they occupy 10.07 percent of the platform.

The approved MPAs and the ones in the process of being approved total 34 areas that cover 10.73 percent of the platform. These areas also represent 64.16 percent of the total proposed extension of the Marine Protected Area System. The Jardines de la Reina National Park (NP), Cienaga Wetlands (possibly the two most important MPA's in Cuba), Punta Frances NP, Guanahacabibes NP, Los Caimanes NP, the Cayos Lanzanillo-Pajonal-Fragoso Wildlife Refuge (WR), Cayos Las Picuas-Cayos del Cristo WR, Rio Máximo WF, and Delta del Cauto Ecological Reserve are especially important because of their size and value.

The marine areas of the above sites currently receive minimal management support due to a lack of resources from the Castro government, but some are supported by international projects. This support allows for personnel for basic

protection and public use control. However, the sites lack adequate resources for marine patrols, research, and monitoring.

The great majority of the remaining proposed areas are still essentially “paper parks” in which there is little or no effective authority or enforcement. For many, including the six mostly marine areas that are far from the coast, the boundaries and management objectives are not well defined.

A type of protected area special classification that can be correlated with the IUCN Category IV is the category of Special Regions of Sustainable Development (SRSD) that includes extensive areas of high economic and conservation interest. This type of protected area includes the two largest systems of keys in Cuba: Sabana-Camaguey and Canarreos Archipelagos, and Zapata Wetlands, the largest wetland in the Caribbean and a site approved as an SRSD by Law 197 of 23 January 1995.

b. Governance Structure

The two principal current legal instruments for establishing the protected areas system are: Law 81 on Environment (1997), which defines the National Protected Area System (NPAS) as a marine-terrestrial integrated system and defines its basic principles and objectives; and the NPAS Decree 201 (December 1999). Decree 201 is the principal legal instrument of the NPAS. It defines different categories (valid for both land and ocean), administrative mechanisms, mechanisms for proposals, and participative planning and approving system of protected areas, etc.

A “representative gap” analysis of the MPA National System was completed in May 2003. This analysis was developed by the Institute of Oceanology and the Cuban National Center for Protected Areas, with support of the World Wildlife Fund-Canada and Environmental Defense (USA), and with wide participation from scientific institutions and protected areas managers.

The 2003-2008 National Protected Areas System (NPAS) Plan defines the following goals for the national MPA system:

- Represent at least 15 percent of the Cuban platform.

- Represent at least 25 percent the total coral reef area.
- Represent at least 25 percent of each sub-type of wetlands, for each wetland region.

During the MPAs national system gap analysis, the general goals have been classified in the following specific goals:

- Protect representative areas and important sites of Cuba's coastal/marine landscapes and biodiversity.
- Contribute the enhancement of sustainable fisheries.
- Represent the most important geographic features of Cuba's coastal and marine zone, including the associated historic and cultural values.

On the administrative side, the Coordinating Council of the National System of Protected Areas (NSPA) is in the process of beginning its work. This managing council directed by the National Center of Protected Areas (NCPA) includes the six most important decision-making institutions of the Cuban NSPA: NCPA, Fishing Regulations Office, State Forest Service, Ranger Corps, National Enterprise for Flora and Fauna Protection, and Environmental Management (Office). Planning and approval of the areas occur through participatory processes that include state (national) institutions, local government and communities, and relevant social groups (e.g. Fishers). This process uses different methods like formal and informal meetings, negotiation rounds, planning and conflict resolutions workshops, public awareness, education, and consultancies.

c. Needs for Assistance

The proposed substantial expansion of the national system of MPAs will require substantial financial and personnel resources for an already under-funded and under-resourced system. Needs identified in the protected areas section above apply for all protected areas in the national system, terrestrial, and aquatic.

For example, there is a serious need to establish a diversified national financing portfolio for the national protected area system. Cuban agencies currently have the authority to impose user fees (adequate concession and vendor fees, hotel/bed taxes, entrance fees), which could be applied to conservation purposes. However, these specific types of user fees for environmental protection are not widely used in Cuba.

The expansion of the MPA system requires that new attention be placed on capacity building/management effectiveness at existing sites, as well as the suite of scientific, assessment, and management skills necessary for designing and implementing new sites. Moreover, since the greatest threat to marine and coastal protected areas and marine biodiversity generally may well come from human activities outside park boundaries — i.e., fisheries and pollution — and anticipated dramatic tourism expansion, substantial technical assistance should be provided in the area of integrated coastal area management.

d. U.S. Actions

RECOMMENDATIONS:

- *The U.S. Government should be prepared to offer technical assistance and training to a free Cuba to improve its parks and develop coastal infrastructure that will not damage its environment. This can be done by training Cuban employees or their contractors in many of the park management principles and integrated coastal management utilized in the U.S. at Federal and State levels.*
- *The U.S. Government should be prepared to offer a range of opportunities for capacity building including:*
 - *Study tours at U.S. marine sanctuary and estuarine reserve sites;*
 - *Training programs at the National MPA Center on enhancing management effectiveness, managing visitor impacts, and other topics;*
 - *Legal and policy technical assistance; and*
 - *Training programs on tools for integrated coastal area management (e.g.,*

GIS).

iv. Invasive Species

a. Status

Like other islands, Cuba has major invasive species problems, which are resulting in negative environmental impacts. However, because of its semi-isolation in recent decades from international trade, Cuba has a relatively high number of native species compared to non-native species when compared to most other islands.⁵⁷

The World Conservation Union (IUCN) has “A Draft List of Species Reported Alien to the Caribbean.” This draft lists 22 species of invasive species of concern in Cuba.⁵⁸ In addition, the U.S. Geological Survey was able to identify 14 species of introduced fish that have established in Cuba. Because of the unique endemic fish found in Cuba (e.g., four species of blind cusk eels and livebearers in the family Poeciliidae) these non-native establishments are a concern to conservation biologists.⁵⁹

Specific invasive plant species of current importance in Cuba are Australian Pines, which are causing damage to beaches west of Havana; *Leuceana Leucocephala* from Central America; and Marabu from Africa. These plants spread rapidly and compete with native vegetation, displacing it, and creating large tracts of single species forests, which are of diminished value to native wildlife. Invasive animals include the Indian Mongoose, pigs, black rats, cats, and dogs, which are serious predators to native animals when they are near protected areas.⁶⁰

Due to a lack of comprehensive information on species in Cuba, both native and invasive, there may be other major problems that are unknown at this time.

⁵⁷ Vitousek, P.M., et.al, 1996 “Biological invasions as global environmental change”, *American Scientist* 84:4468-478. Vitousek, P.M., et.al, 1997, “Introduced species: A significant component of human-caused global change”, *New Zealand Journal of Ecology* 21(1), pp1-16.

⁵⁸ IUCN, “Draft List of Species Reported Alien to the Caribbean”, 2004, pp2-7.

⁵⁹ Jim Williams, Research Biologist, Florida Integrated Science Center for Aquatic Resource Studies, Gainesville, Florida, in phone conversation 2/17/04.

⁶⁰ World Bank, p49.

b. U.S. Actions

RECOMMENDATIONS:

- *The U.S. National Invasive Species Council should stand ready to coordinate invasive species assistance to a free Cuba. Good opportunities exist both from an environmental focus and from an economic focus.*
- *On the environmental side, it is important that the U.S. Government is prepared to provide stronger support to mechanisms for identification and management of invasive species in Cuba. The Caribbean section of the joint Global Invasive Species Programme (GISP), Scientific Committee on Problems of the Environment (SCOPE), The World Conservation Union (IUCN) and Diveasitas already have developed a website and mechanism dedicated to the invasive species of Cuba. In addition, U.S. birding organizations are studying invasive species in Cuba. In a free Cuba, these types of organizations could be instrumental in addressing Cuba's invasive species problems. Increasing the communication between government and academic scientists working on invasive species would also provide much needed benefits.*
- *On the economic side, Cuba's sanitary and phytosanitary infrastructure needs to be strengthened as international trade in agricultural goods is developed. In order to safeguard the biosecurity of Cuba's natural and agricultural resources, invasive plant and animal pests and pathogens in Cuba must be surveyed, and expertise in risk analysis needs to be developed, under the umbrella of international trade standards in animal and plant protection.*
- *If requested, The U.S. Government could assist in the identification and control of invasive species. Additionally, with increased movement of people and goods there will be concerns about invasive species from Cuba introduced into the United States. Much work will be necessary to survey the island for potentially invasive species to the United States. This base-line data will be a prerequisite to developing and establishing market access importation conditions for agricultural related commodities that may serve as vectors for spreading invasive species to the United States through trade.*

2. Wildlife and Fisheries Management

i. Birds

a. Current State

Cuba has 350 species of birds, 39 times more than the United States and Canada on a per hectare basis.⁶¹ It also has the world's smallest bird, the Bee Hummingbird, just bigger than a grasshopper.⁶² It is an important refuge for migrating birds in the winter, harboring the largest Caribbean populations of many species. Cuba is the southernmost range of many migratory birds.

Habitat alteration has been and continues to be the fundamental threat to Cuba's birds. In a few cases, over-exploitation of birds by local communities has exacerbated this problem. This includes activities such as massive collections of eggs and young waterfowl; subsistence hunting; and indiscriminate killings for superstitious beliefs.⁶³ The social institution of "*resolver*" (stealing from the government), has led to selling endangered species such as colorful parrots for profit.⁶⁴ Without local citizens benefiting from preservation of biodiversity, the threat of poaching will remain a problem. Other problems include logging, charcoal production, and slash-and-burn agriculture, which destroy dry forest. In the swamp areas, the threats come from dry-season burning, draining, and introduced predators such as mongooses and rats.

Cuba has established several research and scientific institutions, which have made contributions to the understanding of their bird life. The *Ojito de Agua* reserve was designated to protect the habitat of the Ivory-billed Woodpecker, but no monitoring or management of the area has taken place and the bird is nearly extinct. Of the 20 species considered threatened in Cuba, only 10 have been studied in enough detail to allow for the preparation of management plans for their protection. Cuba cites the recovery of the Rose-throated Parrot population from 100 nesting pairs in 1979 to approximately 400 pairs in 2000 as an example of where adequate data and management combined to bring this successful result on

⁶¹ Birdlife International, Birdlife's Online World Bird Database, 2003

⁶² Raffaele, Herbert, et al, *A Guide to the Birds of the West Indies*, Princeton University Press, Princeton, New Jersey, 1998 p.25

⁶³ Id.

⁶⁴ Maldonado, p4.

the Isle of Youth. Similar studies are underway for the Sandhill Crane, Cuban Parakeet, and the Cuban Kite, which are being used as “flagships” to promote conservation of the entire habitats in which they live.⁶⁵

b. Needs for Assistance

Given that 25 species, representing seven percent of Cuba’s rich species of birds, can only be found in Cuba,⁶⁶ there is good reason to expect that once U.S. citizens can legally travel to Cuba that it will be a popular destination for American bird watchers. In 1995, over 54 million Americans took part in some bird watching — a 157 percent increase from 1983. Eighteen million of these birdwatchers take trips away from home to see birds. Florida estimates that in 2000 they had almost four million participants in wildlife viewing, generating \$1.8 billion in retail sales and 52,410 jobs.⁶⁷ Cuba’s protected areas and bird habitat are not yet ready to receive a large influx of visitors.

c. U.S. Actions

RECOMMENDATION:

- *The highest priority for protection of domestic and migratory birds in Cuba is increased financial support for necessary scientific studies and for managing habitat. Another priority is to increase environmental education and community participation in conservation plans for bird preservation. Infrastructure improvements are needed in areas where bird watching is to be encouraged. This would include bird watching towers, well designed roads and trails, visitor information services, and concessions services such as environmentally sensitive hotels and restaurants, along with the other needs described above in the “Parks and Protected Areas” section. The U.S. Government can provide training and technical assistance to a free Cuba in these areas, if requested by a transition government.*

⁶⁵ Raffaele, p25.

⁶⁶ Birdlife International

⁶⁷ Lynch, Tim and Julie Harrington, “The Economic Impacts of the 2nd Annual Florida Panhandle Birding and Wildflower Festival, 2003. p9.

ii. Fisheries

a. Status

Cuba has devoted considerable energy to education in the marine sciences. This investment is evident in the high quality of its marine science.

Cooperative Fisheries Management in the Caribbean: Forums for voluntary international cooperation in the field of fisheries have existed for many years in the western Atlantic and Caribbean, e.g., the Western Central Atlantic Fisheries Commission. However, many of the coastal states in the region have experienced similar management problems for such species as Queen conch, spiny lobster, and various reef fish. Therefore, there is growing interest in developing a regional fishery management organization with binding authority to establish fishery management measures in the wider Caribbean. National Oceanic and Atmospheric Administration Fisheries is actively engaged in this development, including through the White Water to Blue Water Initiative. Because a free Cuba would be an important participant in such an organization, and has significant expertise in this subject, we should be prepared to work with a free Cuba directly as well as through the Caribbean Fishery Management Council to encourage participation.

Existing International Living Marine Resource Conservation Agreements: The commercial fishing sector in Cuba has experienced two major upswings and downswings in the last 50 years. Fishing activity is currently at a relatively low point due to lack of capital, aging fishing vessels, and depressed economic conditions. However, available catch information shows appreciable harvests of highly migratory fish stocks managed or under the management competence of the International Commission for the Conservation of Atlantic Tuna (ICCAT), including skipjack and blackfin tuna, swordfish, white and blue marlin, and sailfish. Cuba is not currently a member of ICCAT, but inasmuch as all of these species are high value and some are subject to the need for strict ICCAT conservation regimes, it would not be a surprise for there to be increased Cuban fishing pressure on these stocks once economic conditions improve. Cuba was a member of ICCAT from 1975-1991. It should be encouraged to rejoin ICCAT.

Similarly, Cuban catch statistics consistently show appreciable directed harvests of sea turtles from undifferentiated species, but all of which are

endangered. This is problematic from every conservation perspective. The Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) was established “to promote the protection, conservation, and recovery of sea turtle populations and of the habitats on which they depend, based on the best available scientific evidence, taking into account the environmental, sociological, and cultural characteristics of the Parties.” A free Cuba should be encouraged to join the IAC.

Endangered Species Protection: An effort by Cuba in 2000 to export \$4 million worth of “in inventory” endangered hawksbill sea turtle shells to Japan, and capture 500 hawksbills on an annual basis was thwarted at the 12th Convention of the Parties of the Convention on International Trade in Wild Flora and Fauna (CITES), held in Nairobi, Kenya.⁶⁸ Cuba argued that its hawksbill sea turtle population was healthy due to conservation efforts; however, others argued that hawksbill turtles found in Cuban waters actually migrate from 11 other Caribbean countries to feed in Cuba for part of the year. Transition to a free market approach by a free Cuba could re-invigorate efforts to profit from trade in endangered sea turtle parts, as well as reef fish for the aquarium trade and stony corals for trade in carvings, jewelry, artwork, and live specimens.

b. Needs

Cuba does not appear to need U.S. expertise as much as it does the resources to use its expertise effectively. Outreach efforts should establish and build on information exchanges and the provision of materials, especially equipment. The U.S. Government, directly as well as through the Caribbean Fishery Management Council, should be prepared to explore such possibilities with a free Cuba within funding constraints.

⁶⁸ Cuba is a party to CITES.

c. U.S. Actions

RECOMMENDATIONS:

- *The U.S. Government should be prepared to work with a free Cuba toward the objective of Cuba joining ICCAT and the IAC when doing so becomes appropriate.*
- *The United States should encourage a free Cuba to re-examine its relationship and commitments under CITES, and incorporate CITES into other cooperative Caribbean fisheries management organizations, as described in this document.*
- *The U.S. Government has the capacity to work with a free Cuba in fisheries management to conduct laboratory and field research on estuarine processes, nearshore and ocean ecosystems' biological productivity, the dynamics of coastal and reef fishery resources, the linkages between biological and physical oceanographic processes and fish population distribution, abundance and dynamics, the location and extent of essential fish habitat, and the effects of human influences on resource productivity. Such information provides fisheries managers with information needed to sustain and enhance recreational and commercial fishing.*
- *The U.S. Government should be prepared to help a free Cuba develop and manage its recreational fishing potential. U.S. recreational fishermen and groups will be interested in accessing these waters and availing themselves of port-based support facilities in Cuba. The U.S. Government, directly as well as through the Caribbean Regional Fishery Management Council, could work with a free Cuba to explore such possibilities when doing so becomes appropriate.*

V. ENGAGING & EMPOWERING THE CUBAN PEOPLE

Engagement with a free Cuba will be necessary for successful development and implementation of programs to protect the environment and management natural resources.

RECOMMENDATIONS:

- *To assist a post-Castro Cuba with this process, the U.S. Government should be prepared to provide assistance to:*
 - *Develop policies and procedures to promote transparency and public participation. The public should have access to relevant information and the opportunity to participate in a meaningful way in the development and implementation of environmental law and policy. Tools that promote this participation include notices and opportunities to comment on proposed regulations and other implementation instruments, advisory boards with citizen representation to advise on policy, and involvement of citizens in monitoring of the environment and natural resources.*
 - *Unleash the power of information. Providing well-developed public outreach materials for citizens, which they can use to take action to ensure a healthy environment, is an important element to any U.S. Government effort. Voluntary actions based upon self-interest can be some of the most powerful motivators to achieve environmental results. Information is also vital to communities and organizations so that local programs and approaches are developed with a shared understanding. This information can include such things as simple brochures on indoor air quality, web-based tools for use by specialists, and posters on prevention of pesticide poisonings.*
 - *Enhance all levels of collaboration. A well-developed cooperative program needs to incorporate key stakeholders from the private sector, medical/public health community, academia, NGOs and others. The core of voluntary programs is cooperation and collaboration to achieve a common goal; the range and variety of partners varies depending upon the topic. For example, working with programs like Tools for Schools will require a different set of partners than an environmental tobacco smoke program such as Take the Pledge to Keep Your Home and Car Smoke Free.*
 - *Prioritize the problems. Targeting specific environmental quality issues to achieve major public health and environmental benefits is an important step. It can assist in development of coalitions and provide a basis for outreach materials. The process of prioritization may be based on highly technical*

scientific evidence of risk (such as the radon program) or vulnerable populations (e.g., children who suffer from asthma).

VI. CONSULTING & COORDINATION WITH THE INTERNATIONAL COMMUNITY

Cuba has signed 25 international environmental agreements and participates actively in many multilateral organizations that work on environmental protection and natural resources management, including the U.N. Environment Program, Pan American Health Organization, Food and Agriculture Organization, and the Global Environment Facility.

RECOMMENDATIONS:

- *At this time, Cuba is not a member of and does not receive loans or credits from the World Bank, the Inter-American Development Bank or the Caribbean Development Bank. While mobilization of private investment, including from local capital markets, will most likely be the long-term financing source for Cuba's sustainable development, multilateral development banks can play a key role in helping to improve environmental governance, democratizing decision-making and making it more transparent, and creating a climate favorable for private investment. The U.S. Government could help a post-Castro Cuba access the public international financial community (e.g., the IDB's Multilateral Investment Fund and the World Bank initiatives on infrastructure and municipal governance) in order to create sustainable finance systems for environmental protection and natural resources management.*
- *The U.S. Government should be prepared to provide assistance to a post-Castro government to create conditions favorable to the provision or modernization of environmental services, democratizing environmental decisions making, and upgrading conventional production processes, thereby stimulating indigenous investment and attracting foreign investment in these areas. Sectors of interest in this connection would include water and wastewater infrastructure, solar energy and energy efficient technologies for rural and urban applications, waste reduction and waste management technologies, biodiversity conservation, and "green" tourism. In several of such sectors, upgraded monitoring and measurement technologies are likely to be needed as well.*

- *The international environmental NGO community will be key partners for assistance to a post-Castro Cuba. Currently, there is a very limited presence of international NGOs in Cuba and these organizations have had some small-scale success. A democratic Cuba will likely create a climate where the work of these organizations can flourish.*

- *Environmental NGOs have tremendous technical and policy expertise on a wide variety of topics — such as protected areas management, public participation, and debt-for-nature swaps. This expertise along with any additional financial resources that they can bring can be leveraged in support of U.S. assistance efforts. The U.S. Government should be prepared to coordinate with these groups and may want to consider establishing an advisory committee to facilitate this process.*