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research paper

An evaluation of the framework for national marine environmental policies in Cuba

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ABSTRACT.—A slow rate of economic development and a national commitment to sustainable development has enabled Cuba to maintain some of the best preserved marine ecosystems in the Caribbean region. Still, important environmental threats persist, at the same time that changes in the rate and magnitude of marine environmental impacts are occurring because of increased globalization, new relations between Cuba and the United States, and efforts to reform Cuba's economic model. Since Cuba lacks an explicit overarching national ocean policy, marine conservation is implemented through a combination of policy instruments. We evaluated nine major policy instruments to understand whether and how they create conditions for sustainable use and conservation of marine resources. Our evaluation is based on five key attributes identified in the literature: attention to multiple levels of ecological organization, operation at multiple spatial scales, coordination of interacting uses, adoption of precautionary and adaptive approaches, and establishment of a sound scientific basis for management. Although our evaluation suggests that Cuba's marine environmental–policy framework is relatively strong, with individual policies scoring on average 68% of the maximum for the five key attributes, we found a marked bias toward terrestrial ecosystems and issues. We also found that too little attention is paid to the inclusion of precautionary and adaptive approaches, which received a score of 22%, a significant deficiency in the face of ongoing ecological and socioeconomic changes. Cuba should develop a forward-looking national ocean policy that integrates existing and future laws and policies, as current limitations in the policy framework could undermine the country's ability to achieve its sustainability and environmental protection goals as economic development pressures grow.

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Cuba is home to some of the best preserved marine environments in the Caribbean Sea (Kritzer et al. 2014). The combination of a slow rate of economic development along with a national commitment to sustainable development has hindered significant degradation of many marine ecosystems. Still, a number of important environmental threats exist, and some are growing (e.g., illegal fishing, invasive species, and poaching of some protected species; Table 1, see also Kritzer et al. 2014). Moreover, increasing globalization, changing relations between Cuba and the United States, and ongoing efforts to reform Cuba's economic model make it likely that the rate and magnitude of environmental impact is poised to change. Consequently, beginning in the mid-1990s, Cuba has been assembling a multifaceted marine environmental policy framework consisting of laws, regulations, policy and management guidelines, and other instruments.

Cuba lacks an explicit overarching national ocean policy. Instead, marine conservation is provided through a series of legal and policy instruments developed by ministries with jurisdiction over different economic sectors and activities. Policies dealing with land-based pollution, freshwater management, fisheries and aquaculture, tourism, oil and energy production, and shipping play an important role in the national environmental agenda. The National Environmental Strategy, National Goals on Biodiversity, and the strategic plan for the National Protected Areas System are the cornerstones of Cuba's national environmental policy architecture (CITMA 2011). Perhaps the most important policies that specifically address marine conservation are decree laws on protected areas, coastal management, and fisheries management. Despite the importance of these and other policy instruments addressing marine environmental issues, no evaluation has been conducted to date of the extent to which these policies facilitate the sustainable use and conservation of Cuba's marine resources, either individually or collectively.

It is difficult to evaluate the merits and effectiveness of a marine environmental policy framework because of the lack of reliable indicators across a range of human uses and ecosystem services (Butchart et al. 2010). A notable exception is guidance on the key objectives and attributes that should shape implementation of marine protected areas (MPAs; e.g., Spalding et al. 2013). MPAs are certainly an important tool in the marine conservation toolbox, but they do not sufficiently address conditions and impacts beyond their borders, and additional management strategies are needed (Kritzer et al. 2014). Therefore, policy attributes and performance indicators are needed across a broader range of instruments, uses, and impacts to more fully evaluate Cuba's national approach to marine environmental management. Here, we conduct an evaluation of the major national policy instruments shaping management of the marine environment in Cuba according to five key attributes identified in the literature. Our objective was to determine whether the national environmental policy framework in Cuba creates objectives and guidelines, provides authority, and sets priorities for sustainable use and conservation of marine resources. We did not focus on policies below the national scale (i.e., provincial or municipal) or multinational policy frameworks to which Cuba is a party, although we discuss the relationship between national policy and both larger and smaller scales of governance. We did not aim to conduct a thorough evaluation of the effectiveness with which the policies are implemented in practice because of an absence of necessary information, but we do conduct a preliminary evaluation of implementation and enforcement of fisheries and MPA policies, for which more information is available than other uses,

Table 1. Main threats to marine conservation in Cuba.

Threats	References
Pollution from land-based sources	CITMA 2011
Reduction of freshwater flow and watershed deforestation	Baisre and Arboleya 2006
Illegal clearing of mangrove and mangrove mortality	Rodríguez et al. 2006, CNAP 2013
Unsustainable fishing practices	Baisre 2000, this issue; Claro et al. 2001, Baisre et al. 2003, Puga et al. this issue
Invasive species	Chevalier et al. 2008, CNAP 2013
Poaching of endangered species	Forneiro et al. 2015, Álvarez y Forneiro 2015
Unsustainable coastal/marine tourism practices	Caballero and Perera 2015
Pollution from marine-based sources	Caballero and Perera 2015
Climate change	Cambers et al. 2008, Azanza-Ricardo et al. 2013

such as tourism and energy. We consider one illustrative case study of the implementation of national policy in more depth to underscore the strengths and deficiencies identified in the policy framework. Finally, we offer recommendations for improving Cuba's marine policy framework to best prepare the nation for future social, economic, and environmental challenges.

Methods

We reviewed literature on marine ecology and the practice and performance of marine environmental policy, and selected five key attributes that promote sustainable use and conservation (Table 2). Like most countries, Cuba does not have a single comprehensive policy instrument governing conservation, planning, management, and sustainable use of marine resources. However, we identified nine national policy instruments that are relevant to the management of the marine environment. To decide on the relevance of instruments, we took into account their direct or potential role in effecting, shaping, or implementing the national marine conservation policy, including strategy documents and legal instruments. We then evaluated the content of the selected instruments in light of the five key attributes. The nine policy instruments that we evaluated and a brief description of each are as follows (listed chronologically; a more detailed description of the instruments, their hierarchical relationships, and links to the original sources is presented in Online Appendix 1):

1. Decree Law 164/1994 (DL164)—Establishes the authority to implement harvest controls in marine fisheries, as well as the adoption of Zones Under Special Regime of Use and Protection (ZBREUP), a spatial tool for fisheries management that was the precursor of MPAs (Consejo de Estado 1996).
2. Law 81/1997 (L81)—Establishes the general legal framework for environmental protection, conservation of nature, and sustainable use of resources (Asamblea Nacional del Poder Popular 1997).
3. Decree Law 200/1999 (DL200)—Expands upon Law 81/1997 by defining critical environmental violations more explicitly and the enforcement and punitive measures applicable to such violations (Consejo de Estado 1999a).

4. Decree Law 201/1999 (DL201)—Establishes the National System of Protected Areas (*Sistema Nacional de* Áreas *Protegidas,* or SNAP) as an integrated network spanning marine, coastal, freshwater, and terrestrial ecosystems, as well as the management categories, objectives, and processes for designation (Consejo de Estado 1999b).
5. Decree Law 212/2000 (DL212)—Focuses on integrated management of uses in the coastal zone, including mandatory setbacks and processes for coordination and mitigation (Consejo de Estado 2000).
6. National Environmental Strategy 2011–2015 (NES)—Establishes the primary overarching framework for Cuba, founded upon the principles set forth in Law 81/1997, setting high-level environmental objectives and providing coordination among social and economic sectors (CITMA 2011).
7. SNAP Plan 2014–2020 (SNAP Plan)—Establishes targets and timelines for development of the SNAP, building on Decree Law 201/1999, and provides guidelines for the creation of individual protected areas within the network and for the management of the 120 protected areas, including 62 MPAs, currently in place (Centro Nacional de Áreas Protegidas 2013).
8. National Strategic Development Plan 2017–2030 (NSDP)—A product of the 7th Congress of the Cuban Communist Party (PCC, after its Spanish name, *Partido Comunista de Cuba*) in 2016, charts major new directions in all areas of public policy, including the environment (Séptimo Congreso del PCC 2016).
9. National Goals on Biodiversity 2016–2020 (NGB)—Sets objectives and actions for conservation of biodiversity, defines the major bioregions within which conservation strategies should be developed, and identifies the primary human uses that threaten biodiversity (CITMA 2017).

We first evaluated the extent to which these policy instruments explicitly address issues relevant to marine environmental management or, conversely, exhibited bias toward nonmarine issues. To do so, we searched the documents for the frequency of nine keywords that could show specific focus on marine issues (marine/maritime, ocean, mangrove, coral reef, sea grass, fish/fishing/fisheries, sea turtle, lobster, manatee) and nine that could show focus on terrestrial issues (land, terrestrial, forest, soil, mountain/mountainous, agricultural, hutia, almiqui, bird). We also counted the number of articles, objectives, and actions devoted to either, or both, terrestrial and marine issues. In the case of the NSDP we only assessed the Guiding Principles and specific objectives related to natural resources, as it is an instrument of very wide scope.

For each policy instrument, we then determined a score for each of the five key attributes, reflecting the extent to which the policy instrument embodies the attribute. A score of 2 indicates that the policy explicitly or otherwise clearly and strongly conveys the attribute. A score of 1 indicates that, although the attribute is not a central component of the policy, certain elements of the policy (mandates, tools, processes, etc.) create opportunities to achieve the attribute in practice. A score of 0 indicates that the attribute is not contained within the policy, nor does it create clear channels to achieve the attribute. We considered including negative scores for policies that actively worked in opposition to a given attribute, but we did not find this to be the case for any.

Table 2. Five important attributes of a marine environmental policy framework. References provided are illustrative, but not exhaustive.

Attribute	Description and rationale	References
(A) Addresses multiple levels of ecological organization	Ecosystem status is determined by the functional contributions across the community of species; community composition is maintained by viable populations of constituent species; management should therefore address attributes at the population, community and ecosystem levels, including the supporting habitats and connectivity	Leslie and McLeod 2007, Foley et al. 2010
(B) Operates at multiple spatial scales	Processes operating at large scales (e.g., watersheds and ocean basins) can affect and homogenize outcomes at nested sites; changes at key sites (e.g., spawning aggregations and nursery habitats) can have effects over much larger areas; interactions among nested scales necessitates explicit attention to each	Kritzer and Sale 2004, Kritzer and Liu 2013
(C) Coordinates management of multiple interacting human uses	Failure to account for trade-offs among uses can lead to inaccurate expectations about the costs and benefits of decisions made with respect to each use and contribute to inequitable distribution of benefits, marginalization, and other unwanted socio-economic outcomes	FAO 2003, Pikitch et al. 2004, Arkema et al. 2006, Murawski 2007, Leslie and McLeod 2007
(D) Adopts precautionary and adaptive management approaches	Uncertainty is generally high in diverse and spatially complex systems in the developing tropics, where capacity is limited; this uncertainty necessitates precaution and ability to respond quickly and adaptively to new understanding; monitoring needed to implement adaptive management can address the uncertainties and risks underlying precautionary approaches	UNCED 1992, CBD 1995, Ellis 2003
(E) Establishes a sound scientific basis for management	Optimizing benefits across a range of ecosystem services in complex systems requires explicit consideration of uncertainty, risk, interactions, and trade-offs; a diminished role for science can lead to decisions based on politics and power, risking lost value, and to ecological and socio-economic instability	Cash et al. 2003, Pullin and Steward 2006, Sullivan et al. 2006, Fleishman et al. 2011, Cook et al. 2013

The NSDP is an especially high-level policy instrument that, unlike the other policy instruments we evaluate, spans all aspects of Cuban law, politics, society, and economy. At the time of publication, this plan is still undergoing public review and is not yet finalized. Given its scope, influence, and the infrequency with which it is revised, however, we include it within our evaluation. Furthermore, we identify and discuss in more detail several of the specific elements of the draft plan that have especially important implications for marine environmental policy in Cuba. As the legal framework is changing, we also include Decree Law 331/2015 in the discussion, which, despite not considered key for the assessment, has an important potential role in the implementation of the policies examined.

Finally, we conducted a preliminary exploration of the implementation and enforcement of national policy, focusing on two important marine conservation topics worldwide: MPAs and fisheries. We reviewed provisions in legal instruments regarding MPA and fisheries enforcement, as well as experiences and information conveyed through peer-reviewed papers, gray literature, and conference sessions and presentations. Additionally, we develop a more in-depth case study of the "SOS Pesca" project, a collaboration among government agencies, local communities, and international NGOs aimed at integrating and improving fisheries, protected areas, and quality of life.

Results

Biases in Policy Focus.—Only three policy instruments (DL164, DL200, and DL2012) have a vocabulary that reflects a marine focus, with 3.7–16.7 times more marine-related keywords than terrestrial ones. However, we found that the policy instruments overall have an average of 1.25 times more articles, objectives, and actions devoted to terrestrial issues. This bias is much stronger if DL164 is excluded, as it is the only policy specifically devoted to marine issues. The SNAP Plan has goals, targets, priorities, and actions focused on marine conservation issues, but a stronger emphasis on terrestrial issues. Despite these findings, most of the articles in the four instruments that have very broad scope (NSDP, L81, DL200, and DL201) are unspecific and could be applied comparably to both marine and terrestrial issues.

Performance Relative to Key Attributes.—The marine environmental policy framework in Cuba generally scored well against the five key attributes we selected (Table 3). In particular, L81, DL201, and the SNAP Plan all received 80% or more of the maximum total score. Of particularly importance, L81, which creates the general legal framework for environmental protection, scored in this top group, and the NSDP and the NGB, which are also overarching instruments, each received 70% of the maximum score. In contrast, four of the policy instruments, DL164, DL200, DL212, and the NES, scored lower, with only 40%–60% of the maximum. Absence of content that mandates or promotes precautionary approaches was a consistent deficiency among these low-scoring instruments. Other gaps, such as consideration of multiple spatial scales, multiple levels of ecological organization, coordinated management of impacts, or scientific-based approaches, were unique to one or a few policy instruments. On average, the nine policy instruments received a score of 68%.

The management of marine resources in Cuba is achieved not by any single instrument, but by a combination of many. Prospects for success will depend on the extent

Table 3. Evaluation of marine policy instruments in Cuba according to five key attributes promoting sustainability. See text for description of policy instruments, attributes, and scores. See Table 2 for descriptions of policy attributes.

	Policy attributes					
Policy instruments	(A) Levels of ecological organization	(B) Multi-scale	(C) Coordinated management of impacts	(D) Precautionary and adaptive	(E) Science-based	Policy score (% max)
Decree Law 164/1994 on Fishery Regulations	2	0	2	0	2	6 (60.0%)
Law 81/1997 on the Environment	2	1	2	1	2	8 (80.0%)
Decree Law 200/1999 on Environmental Contraventions	2	2	0	0	0	4 (40.0%)
Decree Law 201/1999 on the Protected Areas System	2	1	2	1	2	8 (80.0%)
Decree Law 212/2000 on Coastal Zone Management	0	2	2	0	2	6 (60.0%)
National Environmental Strategy 2015	1	1	2	0	2	6 (60.0%)
SNAP Plan 2014–2020	2	2	2	1	2	9 (90.0%)
National Strategic Development Plan 2017–2030	2	2	1	0	2	7 (70.0%)
National Goals on Biodiversity 2016–2020	2	2	1	1	1	7 (70.0%)
Attribute score (% max)	15 (83.3%)	13 (72.2%)	14 (77.8%)	4 (22.2%)	15 (83.3%)	61 (67.8%)

to which the collective framework embodies these key attributes. From this perspective, the framework performs rather well. Marine environmental policy in Cuba provides a strong role for science and multiple scales of ecological organization, with these attributes receiving 83.3% of the maximum score. Furthermore, marine environmental policies in Cuba contain a high degree of coordination among different user groups (77.8%) and reflect attention to multiple spatial scales (72.2%). A notable exception to the general strength of the attributes of Cuba's marine environmental policy framework, however, is too little inclusion of precautionary and adaptive approaches, which received only 22.2%. More information on the identified strengths and deficiencies of the nine policy instruments can be found in Online Appendix 2.

Implications of the National Strategic Development Plan for Marine Issues.—The draft NSDP proposes a number of general policy directions that could have important implications for conservation and sustainable use of marine resources (Table 4). Whether any of these policy directions affect marine ecosystems and industries positively or negatively will depend upon how the details develop and how each is implemented. In general, policy proposals to develop existing or new uses can risk greater degradation and conflict, but they can also present new sources of funding, expertise, and ideas for more effective management. Proposals to spread decision-making authority and involve more users can improve coordination and incorporation of different ideas and perspectives, but it can also increase conflict and the general complexity of processes.

Enforcement and Policy Implementation.—Provisions for enforcement of marine environmental regulations related to MPAs and fisheries are provided mainly by DL164 and DL200. Decree Law 164 creates the National Fisheries Inspections System, to be carried out by the National Office for Fishing Inspection (ONIP, after its Spanish name, *Oficina Nacional de Inspección Pesquera*) under Agreement 2994/1996 of the Executive Committee of the Council of Ministers (CECM 1996). Decree Law 200 establishes a broad National Environmental Inspection System with a small network of inspectors throughout the country. Recently, the Border Troops of the Ministry of the Interior (TGF, after its Spanish name, *Tropas Guarda Fronteras*) have been granted authority for protecting Cuban marine resources (CNAP 2013).

The ONIP created conditions for enforcement of fishing regulations with around 200 inspectors (Baisre 2004) and substantially contributed to the reduction of illegal fishing and to the control of recreational fishers though fishing licenses (Claro 2009). Nonetheless, ONIP operations at sea have been less than those carried out in land because of limited resources, although the office seizes thousands of meters of illegal nets and hundreds of kilograms of illegal fishing products every year, and fines or prosecutes hundreds of offenders (ONIP 2015). A growing number of fishing regulations have been issued, although most are input controls aimed at recovery of species presumed to be already depleted.

Cuba has developed an extensive MPA system covering a large portion of the most important ecosystems of the Cuban shelf (CNAP 2013; Perera et al. this issue). However, management effectiveness varies widely across this network, with logistical limitations (e.g., remoteness of some sites), limited staff and high turnover of trained personnel, and low enforcement capacity (e.g., small number of officers, lack of sufficient equipment and materials, and limited maintenance budgets) being among the main barriers to more effective enforcement in MPAs (Azanza-Ricardo et

Table 4. Summary of policies being considered following the 7th Congress of the Cuban Communist Party that could influence marine conservation in Cuba.

Policies	Potential benefits	Potential risk
Opening to foreign investment	Additional sources of funding, expertise, and other resources for research, monitoring, and implementation of innovative solutions	Strong economic pressures for rapid and unsustainable development of infrastructure and the magnitude of potentially harmful uses
Encouraging small/ medium private sector businesses and cooperatives	Devolving and sharing decision-making responsibilities to alleviate strain on national entities; new market opportunities to increase profitability of fishermen	Rapid increase in demand for seafood to supply growing number of private restaurants; new stakeholders to involve in decision-making
Promoting rapid growth of tourism	Opportunities for nature-based tourism, building upon conservation ethic in home countries of visitors and experience elsewhere; additional revenue for research, monitoring, and management; support for protected areas	Alteration of beaches, mangroves, and other coastal habitats to accommodate hotels and other facilities; rapid increase in demand for seafood; careless behavior by visitors with adverse effects on habitats and wildlife
Promoting exploration, production, and processing of oil and gas	Reduced dependence on foreign sources and lower carbon footprint for delivery; additional revenue for research, monitoring, and management	Oil spills and other contamination in marine and coastal areas; displacement of marine habitats; increased maritime traffic
Encouraging an increase of fisheries to supply tourism and to increase revenues	Increased investment in sustainable management; empowerment of fishers to take on research, monitoring, and management responsibilities; decreased dependence on unsustainable foreign sources of seafood	Depletion of fish stocks, with consequences for ecosystem health and assets for tourism industry
Ensuring wise use and conservation of natural resources	Provides an overarching objective for marine conservation; promotes new tools such as marine spatial planning	Differing interpretations can introduce uncertainties in management process
Stimulating citizen participation, transparency, public scrutiny and accountability	Opportunity for wider public participation in marine planning and management, with more ideas and greater buy-in	More complex decision-making processes with more users and competing interests
Decentralization of management and bureaucracy reduction	Opportunity for more efficient and responsive management and new ideas	Greater need for already limited capacity; greater potential for corruption

al. 2015). In light of these deficiencies, MPA managers rely mostly on other enforcement bodies such as the National Office of State Inspection (previously ONIP) and TGF (CNAP 2013). To improve MPA enforcement and make better use of limited resources, CNAP has promoted coordinated enforcement among park rangers, the National Office of State Inspection, and TGF.

Discussion

Cuba established its first environmental law in 1981 (Asamblea Nacional del Poder Popular 1981). After the 1992 United Nations Conference on Environment and Development (UNCED 1992), popularly known as the "Rio Earth Summit," the Cuban government engaged in a process of strengthening its environmental policy, legal, and organizational framework. Our evaluation suggests that during the evolution of its environmental policy, Cuba achieved some success in assembling a strong framework for marine policy, with some areas (such as mechanisms for implementing marine spatial planning, adaptive management, and precautionary approach) in need of improvement. Cuba's law on protected areas and resulting national protected areas plan exhibit many important attributes of good policy, as do its overarching environmental law and the recent national strategic plan, although some deficiencies need to be addressed. The National Environmental Strategy, for example, does not clearly target marine species and ecosystems, nor does it prioritize any marine environmental issues. Similarly, the National Strategic Development Plan does not provide specific tools or mandates to coordinate management of interacting human uses, such as marine-spatial-planning processes. Both instruments need to include precautionary approaches explicitly.

We identified greater deficiencies in several policy instruments, particularly the decree law on environmental contraventions. It may be reason for concern that the primary vehicle for enforcement mechanisms scored so low, although perhaps the narrow scope of this particular instrument prevented the inclusion of some of the principles, which instead had to be incorporated into overarching instruments (e.g., L81). Furthermore, changes in the Cuban and global economies prompting the emergence of new actors, opportunities, and technologies will likely result in new uses of and threats to natural resources in Cuba. In particular, plans for energy development in Cuba are proceeding at a rapid pace, and changing relations with the United States have the potential to rapidly expand tourism, agriculture, and other sectors. These changes might test Cuba's environmental legal system in new ways, which could reveal some unforeseen consequences of having a decree law on environmental enforcement that does not reflect many of the key policy attributes directly.

Several other policy instruments that received lower scores, specifically the decree law on fisheries and the National Environmental Stategy, are being updated and amended, which presents an opportunity to improve their attributes. Cuba's decree law on fisheries needs stronger provisions for harvest controls and recovery of depleted resources, and the environmental strategy and biodiversity plan currently have a disproportionately strong focus on terrestrial systems that should be counterbalanced by further emphasis on the marine environment.

The deficiencies in individual policy instruments notwithstanding, the overall marine environmental policy framework in Cuba reflects many of the key attributes well. Given that the Cuban government is highly centralized and founded upon a

philosophy of shared public ownership of natural resources, it is perhaps not surprising that the nation's policies promote coordinated management of different impacts. Science is likely given prominence in public policy because of Cuba's national commitment to education and scientific development. In turn, the strong role of science has likely helped promote the country's attention to multiple levels of ecological organization and spatial scales.

Of course, not all of the attributes are reflected well in the policy framework. It is especially a cause for concern that the attribute least embodied in the Cuban marine policy framework is the inclusion of precautionary and adaptive approaches. The challenges ahead lie not only in coordinating the management of different marine resources, but also in understanding the interactions among terrestrial, freshwater, and marine systems (Galford et al. this issue). Dams, for example, have been constructed on nearly every river in Cuba for flood control, hydroelectric power, and water supply, but with little consideration of potential impacts on marine systems (Baisre and Arboleya 2006).

Our evaluation considered nine of the most important policy instruments governing use of marine resources in Cuba but did not consider all relevant policies or regulations. It is possible that other instruments will improve upon the identified deficiencies in the framework, but it is also possible that they will present competing objectives or create conditions that could hinder the effectiveness of those considered here. For instance, the recently issued Decree Law 331/2015 made an important contribution by requiring different legal entities to establish priority management areas with stronger regulations under the concept of zones with special regulations. These zones are intended to protect areas with high environmental or historical value (including protected areas, fishing zones, coastal zones, watersheds, and monuments), importance for economic development, or national defense/security interest as identified by the relevant legal entity (Consejo de Estado 2015). Its effectiveness, however, remains to be seen as the implementation process progresses. On the one hand, implied changes in some well-established procedures and instruments might be cause for concern. On the other hand, the government is trying to make its organizational structure and performance more compact and efficient, which could have benefits. In some cases, this structure could involve merging of different agencies and expanding their scope. In doing so, the policy risks losing focus on marine issues, which could require additional adjustments to ensure effective implementation of marine-related policies and enforcement of the legal framework.

The effectiveness of Cuba's national policy framework can be enhanced by the obligations of international environmental agreements to which Cuba is a party. Cuba has ratified several conventions aimed at the protection of marine ecosystems or biodiversity in general, including the Convention on the Law of the Sea, Convention on Biological Diversity, Convention on Migratory Species, Convention on International Trade of Endangered Species, Cartagena Convention on the Caribbean Sea, Protocol Concerning Specially Protected Areas and Wildlife within the Cartagena Convention, and Agreement on Port State Measures to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing. Development of these complex international agreements requires considerable investment of high-level expertise, funding, and political capital. In return, they have the potential to enhance positive outcomes nationally and globally by shaping national policy and strengthening its implementation. Whether these outcomes have been achieved for Cuba, and

whether the investment made in developing these conventions has been worthwhile, requires further research and assessment. An evaluation of the role of international agreements in shaping national policy, as well as social, economic, and ecological outcomes, is also needed.

The merits of national and international policy instruments are clearly important in achieving desired outcomes, but good policy does not necessarily result in good implementation. Rather, implementation success is determined by an additional set of conditions, including funding, technical capacity, leadership, cohesion, education, and institutions (formal and informal; government, social, and private). These factors determine whether the right tools are considered in the implementation process and if they are applied in developing creative solutions. They can also help participants engage in good faith and with respect, influence the quality of scientific information, and determine the degree of compliance with regulations. The limited data available to perform an analysis of multifaceted and large-scale policy instruments and their objectives, as well as the many complex factors that lie between high-level policy and implementation on the ground, narrowed our evaluation to the key attributes of national policy instruments. Our preliminary findings regarding enforcement and implementation of the MPA system and fisheries regulations, based on a review of the scarce materials publicly available, revealed that resource limitations hinder more effective marine conservation at a national scale, despite the rather robust policy framework in place.

The size of the enforcement force of ONIP, for example, which was recently merged with other inspectors to create the ONIE (National Office of State Inspection of the Ministry of Food, or MINAL), will likely be insufficient to watch over almost 70,000 km^2 of marine shelf and >5000 km of coastline due to limited mobility and a broad mission. With an expansive MPA system and basic infrastructure in place, some improvement could be attained through better coordination and by empowering MPA rangers with some enforcement capacity. Because the objective of good policy is to produce tangible benefits, a more comprehensive analysis linking policy, implementation factors, and outcomes would be worthwhile. Initial steps have been taken in this direction in the coastal zone management arena by González (2015) and Gerhartz-Abraham et al. (2016).

SOS Pesca Project: an Example of Implementation

In the absence of a comprehensive evaluation of implementation success, a recent case study in Cuba provides a compelling example of how a diverse partnership can integrate the objectives and mechanisms of multiple policy instruments to coordinate interests and decision-making among different stakeholders to balance conservation, fisheries, and other ecosystem services toward greater social, economic, and environmental outcomes. The SOS Pesca[1] project was a four-year initiative, from 2012 to 2016, that aimed to improve fisheries sustainability, environmental conservation, and quality of life in two communities in south-central Cuba, Playa Florida and Guayabal, while bringing together stakeholders at multiple scales resulting in local, regional, and national achievements. State and private commercial fishers from

[1] The SOS Pesca project was principally funded by the European Union and coordinated by Cuba's National Center for Protected Areas and the Italian NGO COSPE Onlus with major support from Cuba's Ministry of Food (MINAL), Environmental Defense Fund, and the World Wildlife Fund-NL

Playa Florida and Guayabal operate in the waters of the Gulf of Ana María and Gulf of Guacanayabo, where the fishing grounds extend from the coast out to Cuba's largest MPA, the Jardines de la Reina National Park. The region produces around 40% of Cuba's finfish catch, is home to highly valuable shrimp and lobster fisheries, and encompasses some of the best-preserved coral reef ecosystems in the Caribbean region, attracting international tourism (Puga et al. this issue).

The implementation and results of the project illustrate how the important policy attributes facilitate on-the-ground action where multiple uses of marine resources interact. A major strategy of SOS Pesca was to integrate diverse user-groups in the decision-making processes for fisheries and MPA management, an attribute strongly supported by the majority of policy instruments we examined. Fishers, fishing families, local government representatives, scientists, fishery managers, and protected-area managers collaborated in capacity-building activities and exchanges on science, policy, and management. Together, they established two new coastal protected areas by jointly conducting baseline ecological monitoring and developing management plans that include spatial zoning, furthering the objectives of DL 201 and the SNAP Plan.

In addition to protected-area planning, the project also established an improved scientific basis for fisheries management through the first assessment of the vulnerability of fish populations to overfishing in each of Cuba's four regional fishing zones (Puga et al. this issue). This participatory assessment used available data and local ecological knowledge to determine the most vulnerable species; fisheries officials are now using the results to prioritize monitoring and stock assessments. The scientific basis for management was also strengthened on a site-specific scale through evaluations of the potential development of a blue crab (*Callinectes* sp.) fishery near Playa Florida and Guayabal. These scientific efforts, and others, are contributing to the development of the first regional finfish management plan for the southeast coast and a National Plan of Action of Shark Conservation and Management, both in alignment with DL 164.

One of the less tangible or measurable outcomes of the SOS Pesca project is the positive experience of diverse stakeholders in participating in marine science and decision-making related to fisheries, conservation, and coastal livelihoods, resulting in greater stakeholder buy-in for management reforms. This engaged group of stakeholders seems to be more prepared to fulfill some of the marine policies being considered after the 7th Congress of the PCC through participatory science and co-management strategies. Their participation will likely benefit marine environmental conservation and coastal communities. This case study illustrates the relationships between national policy and local governance. Importantly, the success of SOS Pesca can be attributed to factors external to national policy, particularly the commitment of several international NGOs and a multiyear funding source that supported capacity-building programs, scientific monitoring, and marine stakeholder meetings. It might not be possible to sustain this progress without future funding. Sustainable financing, in addition to other factors, such as capacity for monitoring and enforcement, complement a strong policy framework, which are an essential set of conditions to ensure a successful replication of the SOS Pesca model in other parts of Cuba.

Concluding Remarks

There remains a much stronger policy focus on terrestrial ecosystems over those in the sea, even though the marine waters of Cuba's exclusive economic zone (EEZ) represents almost 76% of its overall territory and the country's extensive and diverse marine and coastal ecosystems provides a range of ecosystem services. This imbalance is likely a consequence of the predominance of human activity on land and the many istruments that have provisions applicable to both on land and sea. Regardless, the Cuban government, with full participation from civil society, should take steps now to identify gaps in marine environmental policy and to adopt new measures to address them. New policy instruments should fully embrace the precautionary approach and provide for adaptive management strategies that are flexible enough to address as yet unforeseen circumstances. Ideally, Cuba should begin the process of developing a forward-looking, comprehensive national ocean policy that integrates existing and future laws affecting coastal and marine environments. Evolving this framework, developing the conditions for effective implementation, and strengthening the connections between international and national policies are critical next steps.

Cuba is a developing but determined nation; it takes seriously the responsibility of managing its rich natural resources for both national and global benefit, including conservation and economic prosperity. As the nation works toward these aspirations, economic factors, geopolitics, technological innovations, and the state of the natural environment are all in flux. Sound national policy architecture is necessary to ensure effective governmental responses to these changes. Our evaluation suggests that Cuba's national marine environmental policy framework is relatively broad and strong, but the framework also has weaknesses and gaps that could undermine the country's ability to achieve its environmmental and sustainability goals as development pressures grow.

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