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INTERNATIONAL CENTER FOR RESEARCH ON WOMEN

A Platform for Action

For the **Sustainable Management** Of **Mangroves** in the **Gulf of Fonseca**

Centro de Estudios Ambientales y Sociales para el Desarrollo Sostenible (CEASDES)

Comité para la Defensa y el Desarrollo de la Flora y la Fauna del Golfo de Fonseca (CODDEFFAGOLF)

International Center for Research on Women (ICRW)

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*The English name for CEASDES is the Center for Environmental and Social Studies on Sustainable Development, and for CODDEFFAGOLF is the Committee for the Defense of the Flora and Fauna of the Gulf of Fonseca.

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Introduction

This document presents a platform for action for the sustainable management of the mangroves in the Gulf of Fonseca in Honduras and El Salvador. Pollution, deforestation, and inappropriate land uses put enormous pressures on the coastal ecosystem and have contributed to the loss and degradation of a unique and valuable environmental asset. The mangroves are the spawning grounds for some of the regions most important fisheries and provide habitat to a number of endangered species. The livelihoods of many are intimately connected to the health of the mangrove ecosystem. Concern about the mangroves and for those who depend upon them inspired this document. This platform for action represents more than eight years of collaborative activities with community groups, researchers, non-governmental, private sector, and governmental agencies to explore the causes and consequences of environmental degradation in the mangroves. The recommendations presented here provide guidelines for a process that must be set in motion if these unique resources are to be preserved. It is essential that policies and programs are devised that can meet development goals and guarantee the health and well being of the ecosystem. Without such efforts, the mangroves will disappear and the wealth of resources that they secure will be lost.

Few areas illustrate the interaction between population pressure, resource consumption, and environmental degradation more acutely than coastal ecosystems. Highly fragile and rich in resources, mangrove coastal ecosystems are valuable for the raw materials they provide and the biodiversity they secure (Barbier 1992). The indigenous plant and animal life in the mangroves depend on the delicate balance of fresh and tidal waters. Mangroves provide drainage and filtration, stabilize shorelines that protect the coastline and the surrounding farmland, and offer natural windbreaks as well as fresh water conduits (Martínez 1991; Hamilton and Snedaker 1984). They also serve as a prime source of fish, shrimp and other crustaceans, fuelwood, and timber for surrounding communities and the broader population. The diversity of this ecosystem supports a wide range of individuals and groups with competing interests. This competition can create tension among a variety of

stakeholders, including governments, conservationists, aquaculturists, salt producers, and local communities.

The tension between resource consumption and conservation is highlighted in conflicts over access rights to the mangroves. The formal access rights to these resources lie largely in the hands of the state. Throughout the world, coastal land and estuaries, and the rights to their resources, are concentrated in the hands of sovereign governments that provide concessions for economic activities to a variety of groups and individuals for aquaculture and salt production. Despite these formal rights structures, many customary and indigenous access rights systems have evolved around coastal ecosystems. While the land may belong to the state, much of it has been subject to *de facto* management by coastal populations themselves. Far away from national capitals, local populations exercise ownership rights over the lands their families have inhabited for generations. Similarly, while access rights may be allocated by the state, usufruct rights[1] are often informal and largely determined by customary or indigenous systems that define entitlement to those resources (Bailey 1988; Madrigal 1999; Wynter 1990).

In the absence of population pressure upon these resources, both the informal and formal systems can operate harmoniously. When in-migration and population growth combine with rising poverty rates to increase the use of and dependency upon the common property, these entitlement systems may come into conflict (Foy and Daly 1988). What is formally state-owned property has effectively degenerated into an open access resource, where violators are seldom prosecuted and those with power and influence may circumvent laws and statutes. This is particularly the case where formal access rights give priority to economic activities that take substantial portions of land and resources out of the control of the state and local communities, concentrating subsistence demands on smaller and smaller tracts of land (Rubio 1997; Stanley 1999, 1996a, 1996b). As the number of concessions for aquaculture have increased in the Gulf of Fonseca, so too has conflict over the mangroves and the resources that they secure (Stanley 1999, 1996a, 1996b).

The conflict between converting mangrove to aquaculture activities and the subsistence demands of coastal populations is a clear example of the collision of customary and formal state access rights systems. Aquaculture is a growth industry in the developing world (Stanley1999; DeWalt et al. 1996; Bailey 1988; FUSADES 1988; Mendola and Guier 1989; Marroquín 1992). The cultivation of fish and shrimp in tanks or excavated ponds yields high returns and commands much-needed foreign exchange (FUSADES 1990, 1988). Consequently, there are state and private enterprise incentives to convert the mangroves to aquaculture. Yet the location of these aquaculture tanks and ponds in the mangrove wetlands has deforested valuable woodland, concentrated environmental dependence on the few

[1] Usufruct rights are those that allow the individual or group the right to enjoy the profits and advantages of use of property belonging to the state or to another individual as long as that property is not damaged or altered.

remaining stands, and, in some circumstances, has caused irreversible ecosystem damage to both estuarine and offshore fisheries (De Walt et al. 1996; Stanley 1996a, 1996b; Pauly and Ingles 1986; Paredes et al. 1991; Ulloa and Bernal 1980).[2]

The conflict of access rights and different patterns of extraction and consumption becomes more acute when resources are overused or brought to the point of exhaustion. The pressures of internal migration toward the coast in many developing countries combined with widespread rural poverty can increase dependence upon the resource base in already contested ecosystems.[3] Poverty often increases the demand for natural resources to supplement household incomes. Poverty also shortens the horizon over which decisions are made, limits choices, reduces investment in technologies that mitigate degradation, and can accelerate unsustainable resource use (Jagannathan 1989; Barbier 1988).

In response to these concerns about coastal resource management, in 1998 the International Center for Research on Women (ICRW) undertook a series of research and advocacy activities in collaboration with the Center for Environmental and Social Studies on Sustainable Development (CEASDES) in El Salvador, and the Committee for the Defense of the Flora and Fauna of the Gulf of Fonseca (CODDEFFAGOLF) in Honduras. The three organizations explored the interconnection between population, consumption, and environmental degradation in the mangrove ecosystems of the Gulf of Fonseca in Central America.[4] Particular attention was paid to gender-specific factors that describe how men and women may be differently poor and differently dependent on the resource base (Rodda 1991; Shiva 1988). The three-year project, which began in January 1998, was funded by a grant from the John D. and Catherine T. MacArthur Foundation and built on earlier research supported by the British Overseas Development Administration and the United States Agency for International Development.

By comparing the sites in El Salvador and Honduras, researchers hoped to identify interventions to relieve pressure on the resource base and to provide alternative mangrove management options that respond to the interests of all stakeholders. The platform for action presented here is the result of more than eight years of collaborative research and advocacy activities in the region that have brought together a variety of governmental, non-governmental, community, and private sector organizations. The platform for sustainable mangrove management outlined in this document was developed in concert with these organizations and is the outgrowth of a series of regional conferences and colloquia that have taken place over the last three years, culminating in the March 2000 regional conference held in San Salvador.[5]

[2] It is important to note that shrimp aquaculture need not cause irreversible damage to the mangrove ecosystem. The ponds do not need to be located within the confines of the mangroves and larvae do not have to be culled from the estuaries. Effective regulation and enforcement can ensure that the environmental costs of shrimp aquaculture are minimized (Corrales 1998).

[3] The poor are not the only actors responsible for mangrove deforestation. The competition to clear the mangroves is acute reflecting the diverse interests of salt producers, aquaculturists, loggers, and ranch owners to expand their activities and draw more land into production.

[4] El Salvador and Honduras were selected for this study because of the availability of existing data and the interest that national non-governmental and private sector organizations showed in the project. We hope to expand the research to include Nicaragua in the future.

[5] The colloquia were a series of fora convened in the region to present and exchange ideas about sustainable mangrove management. Community groups, researchers, private sector representatives, public servants and activists were brought together to exchange ideas and comment on the research findings. These colloquia took place in El Salvador and Honduras over the last 3 years.

Six key findings and their respective recommendations are presented in the platform for action.

- Of primary importance is the need to harmonize diverse stakeholder concerns and find shared interests that can be built upon to achieve environmentally sustainable mangrove management. One clear directive that emerged from the consultations and research findings is that the governments should form multi-sectoral commissions with representatives of all primary stakeholders. These commissions should work collaboratively to develop an operational definition of sustainable mangrove management that will guide policy.
- Attempts to change resource use and promote sustainable mangrove management must also confront the development needs of those communities that depend on these resources for their livelihood and survival needs. Measures must be implemented to alleviate poverty and reduce environmental dependence.
- Successful policy initiatives to promote sustainable resource use should also take account of the gender of resource users in the community and the nature of their relationship to the resource base. Men and women have different roles and responsibilities as caregivers and providers. As a result, men and women have a very different relationship to the resource base. Men fish primarily in the open waters offshore, whereas women fish and gather shellfish in the estuaries. Although both women and men gather fuelwood, women do so more frequently and gather smaller amounts than do men. Understanding how men and women use the ecosystem, the particular types of resources that they gather and harvest, and the incentives they face to use, conserve or transform resources is vital if there is to be sustainable resource use in the mangroves.
- There is a real need to strengthen those institutions that define the rules and regulations governing the extraction and use of the mangroves at the national and local level. This requires the effective and full participation of communities and local actors as well as public and private sector institutions. The research findings drew attention to significant deficiencies in existing legislation and in the design and operation of policy. The recommendations highlight the need for concrete directives that establish parameters for the management of coastal resources and the use and conservation of the mangroves.
- The mangroves in the Gulf of Fonseca are a shared resource that cross national boundaries. Efforts must be made to promote national and international collaboration in the pursuit of sustainable resource management for the entire Gulf area. A regional forum should be constituted with the purpose of developing and implementing coordinated regulations to ensure the sustainable use and management of these coastal resources.
- Finally, data need to be collected on key biological and human-environment indicators that will guide policy and set parameters for sustainable resource use. There is a dearth of data on the current status of the mangroves: their coverage, density, age structure, and growth patterns. Similarly, almost no data exist on fuelwood and timber requirements, siltation, pollution and chemical runoff into rivers and waterbodies that drain into the mangroves. What data exist are scattered and inconclusive and do not provide sufficient detail for the development of parameters to guide the sustainable extraction of mangrove resources.

The Platform for Action

Action 1: Harmonize Resource Use among Different Interest Groups

There are multiple stakeholders with diverse interests in the use and transformation of the mangrove ecosystem in the Gulf of Fonseca. Although these stakeholders may compete for the ecosystem goods and services there is also potential to harmonize their interests in order to secure the sustainable management of the ecosystem.

A diverse group of stakeholders in the Gulf of Fonseca depends on the mangrove ecosystem (PROGOLFO 1999). Coastal communities and artisanal fishers rely on the mangroves to provide a breeding ground and nursery for a variety of fish, mollusks, and crustacea that are caught in the estuaries and the open sea. The offshore industrial fisheries depend on the health of the mangrove ecosystem to ensure that the shrimp harvest is abundant. Aquaculturists also hold interests in the mangroves because these ecosystems provide the shrimp larvae that they require to supplement laboratory varieties and stock the ponds and tanks where the shrimp will be cultivated. Farmers and livestock producers depend upon the buffer zones, windbreaks, and filtration services provided by the mangroves to prevent salt-water intrusion and protect their investments from damage by hurricanes or flooding.

Previous research estimating the "total economic value" of a mangrove ecosystem in part of the Gulf of Fonseca in El Salvador developed a cost-benefit analysis to compare the sustainable management of the forest with alternative use scenarios (Gammage 1997). Three different management strategies were considered: partial conversion to semi-intensive shrimp farming and salt production; the do-nothing strategy of deforestation, land clearance, and degradation; and the sustainable management option (see table 1 on next page).

- The partial conversion strategy projects the current trend in mangrove conversion for shrimp cultivation and considers the economic and environmental costs of this alternative land use. Converting the mangrove forest to aquaculture implies an immediate reduction in the extent of the mangroves.[6] The net benefits of forest clearance for aquaculture include the net revenues from clearance logging and the projected production of cultivated shrimp, valued at current market prices.
- The "do-nothing" strategy reflects current rates of extraction of timber for commercial and subsistence use which have resulted in an average annual deforestation rate of 24 hectares per year over the period 1974 to 1989. The main causes of deforestation can be traced back to unsustainable timber extraction,

[6] Although aquaculture ponds need not be located in areas that were formerly mangrove forest, this has historically been the case for mangrove conversion to aquaculture in El Salvador.

Table 1. The Net Present Value of the Different Scenarios until 2050 at Current Market Prices (thousands of 1992 colones)[a]

El Tamarindo, El Salvador	Net Present Value
Current Management Strategy:	
Local Fuelwood and Timber Benefits[b]	17,552
Local Artisanal Shrimp and Fish Benefits[c]	718,608
National Industrial Shrimp Benefits from Offshore Fisheries	859,236
Local Rustic Salt and Shrimp Benefits[d]	3,275
Total	**1,598,671**
Partial Mangrove Conversion:	
National Clearance Logging Benefits	55,445
Local Fuelwood and Timber Benefits	10,010
Local Artisanal Shrimp and Fish Benefits	700,981
National Industrial Shrimp Benefits from Offshore Fisheries	724,514
National Shrimp Aquaculture	105,721
Total	**1,596,671**
Sustainable Management Option:[e]	
Local Fuelwood and Timber Benefits	23,809
Local Artisanal Shrimp and Fish Benefits	761,652
National Industrial Shrimp Benefits from Offshore Fisheries	1,444,080
Local Rustic Salt and Shrimp Benefits	3,275
Total	**2,232,816**

[a] The net benefits derived from the extraction of mangrove resources are classified according to the location of the individual, community or private sector interests that receive them. Clearly a shift from the current management strategy to the sustainable management strategy benefits the local community as well as national interests by maximizing the rents available for fuelwood and timber, artisanal shrimp and fish, and industrial shrimp from offshore fisheries.

[b] The population that depends directly on the mangroves was approximately 16,500 in 1999 growing at 2.3 percent per year. The costs and benefits were calculated assuming that all timber needs would be met, and that fuelwood consumption would be determined by the remainder.

[c] All fisheries' benefits are net of primary producer costs, that is direct and indirect fishing costs: labor, capital, maintenance, and petroleum. All capital goods are amortized over the lifespan of those goods and discounted at the cost of borrowing for these firms.

[d] In both the current and sustainable management scenario, rustic salt and shrimp production is assumed to operate until receipts no longer cover the costs of variable production.

[e] The sustainable management option maximizes the net present value of all benefits extracted.
Note: $1 = 8.7 colones in 1994. The real discount rate applied is 7.08 percent.

Source: Gammage 1997

increasing fuelwood demands on a declining forest stock, and conversion of mangroves to shrimp farming and salt production. The principal economic benefits of the current management strategy are net commercial revenues from timber, rustic shrimp, and salt production, and imputed values for subsistence use for construction and fuelwood.[7]

- Sustainable management was defined by the community to be the sustainable extraction of resources from the mangroves for the benefit of the surrounding communities ensuring that the coverage and density of the mangroves were maintained and that the biodiversity of the ecosystem was preserved. Maintaining the ecosystem intact allows all preservation benefits to be captured, including herbal medicines and pharmaceuticals, other forest products (honey, fruits, herbs, spices, hides, and skins), protection of aquatic and marine life, barrier protection, and the potential for tourism development.

The primary goal of the cost-benefit analysis was to provide indicators of how benefits from natural resource use might be maximized and the rational management of the mangroves secured. A variety of different valuation techniques were used to assess the contribution of different products and services of the mangrove ecosystem. As can be seen in table 1, the sustainable management strategy enables more timber and fisheries benefits to be captured than do the other management options. Both the current management strategy and the partial conversion strategy yield fewer benefits than the sustainable management strategy.

The industrial fishers gain the most out of shifting to a sustainable management strategy; they are able to extract almost twice the benefits that they obtain under the present management strategy. Artisanal shrimp benefits are also maximized under the sustainable management scenario. The sustainable consumption of timber and fuelwood by the local population also yields more value than the current pattern of extraction which increases pressure on the ecosystem without maximizing net benefits.

[7] Rustic salt and shrimp production describes low intensity shrimp cultivation practices with little or no capital and machinery. During the wet season the excavated ponds are flooded with estuary water and used for shrimp production. Shrimp larvae are captured in the wild and transferred to the hatchery pools where they await maturation. During the dry season the excavated areas are given over to salt production, tarpaulins are spread over the bottom of the pools, and estuary water is left to evaporate producing salt, a process which takes up to three weeks. The salt is then cleaned, refined, and bagged by hand.

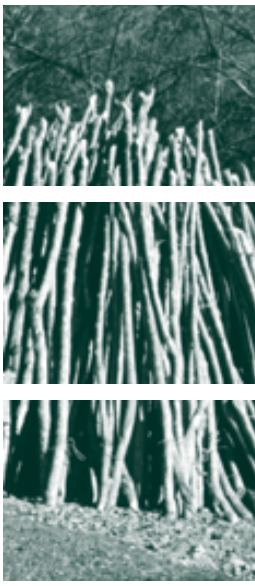
This means that there is tremendous opportunity to build alliances among the potential beneficiaries and to work toward applying a definition of sustainable mangrove management that respects sovereignty and includes all parties in the design and application of such a strategy.

The loss of mangrove cover clearly imposes costs upon all of these stakeholders denying them ecosystem goods and services and reducing the ability of the ecosystem to support a diverse range of livelihood and economic activities (Ibarra Turcios et al. 2000; Gammage 1997) (table 2 illustrates this by charting the losses associated with Hurricane Mitch). The fact that these different stakeholders can benefit from the sustainable management of the mangroves gives a clear precedent for change. In Honduras, shared concern about the ecosystem has prompted aquaculturists, environmentalists, and community members to come together to explore how they might better protect the ecosystem and harvest its resources sustainably (see box on this page on creative solutions). Three steps are needed for more rational and socially optimal mangrove management to emerge: first, the definition of sustainable management by a broad coalition of stakeholders; second, the redefinition of property rights consistent with the definition of sustainable management; and, third, the creation of institutions or modification of existing ones to enable the sustainable management plans to be operationalized and implemented.

Next Steps

Bring stakeholders together. A broad coalition of stakeholders should be brought together to form a multi-sectoral commission in each country that includes the primary stakeholders in the mangrove ecosystem and the institutions that assign access rights or enforce compliance:

- ministries of agriculture and environment, the judiciary, navy, and police
- local and municipal governments
- non-governmental organizations
- academic and research institutions
- agriculturists and livestock owners
- aquaculturists
- salt producers
- harbor authorities
- industrial fishing interests
- artisanal fishers
- community and grass roots organizations
- men and women from the local communities



A Creative Solution Involving Many Stakeholders

The recently approved "Proposal for Protected Areas in the Gulf of Fonseca (AAPP)" is an example of a collaborative effort to bring multiple stakeholders together to define and implement a creative mangrove management strategy in Honduras. CODDEFFAGOLF and the Honduran Forestry Ministry (COHDEFOR) began work to define an appropriate management strategy for multiple use wetland areas in the Gulf of Fonseca. Later, CODDEFFAGOLF gained the support of the National Association of Aquaculturists (ANDAH), an organization representing industrial shrimp aquaculturists whose interests have traditionally been at odds with CODDEFFAGOLF and the local communities. On January 20, 2000, The Honduran government finally approved this concerted effort through Decree #5-99-E, which united diverse interest groups. The AAPP will cover a surface area of 107,000 hectares, and include islands, mangrove, estuaries, and wetlands. It will consist of a national marine park, two multiple use areas, and eight management zones dedicated to the fragile habitat and species (www.morazan.tripod.com/cgolf/acuerdo.htm).

It will be a true challenge to implement this management plan effectively, but the initial results appear promising. The role of local and state actors in verifying adherence to the agreement will prove to be critical. International and local proponents of conservation policies must be equally inclusive of local economic and social development needs, and existing communal arrangements. Furthermore, governments and NGOs must inform communities how the AAPP will influence their present use and management of coastal resources. An open and participatory forum must be established where communities can voice their concerns, and where diverse stakeholders can continue discussing how best to harmonize their interests, given the AAPP procedures and continued pressure on the ecosystem.

☑ **Define sustainable management in each country.** An operational definition of sustainable mangrove management needs to be developed for both Honduras and El Salvador. Although this definition should take account of international and regional agreements about natural resource use, it should also respond to national priorities and respect the sovereignty of each country. The multi-sectoral commissions should develop a definition of sustainable management of the mangroves that is consensus driven and reflects the interests and concerns of all constituent members. The sustainable management plan should define whether the mangroves are to be used for extractive purposes and how much degradation will be tolerated. The commissions should reach consensus on whether and at what rate the extraction of fuelwood and timber should continue. Similar choices need to be made about the extent of conversion to alternative uses such as salt production and aquaculture that will be contemplated in the national plans. Particular effort should be made to ensure that the communities have voice in this process and that the needs and concerns of women are adequately reflected in national plans. This commission should establish clear guidelines and parameters for the use and transformation of the mangrove ecosystem that can be monitored and enforced.

Table 2. Hurricane Mitch

Hurricane Mitch provides a stark example of the risk associated with the gradual degradation and loss of environmental goods and services. The barrier protection afforded by coastal forests such as mangroves and the importance of forest cover in critical watersheds cannot be underplayed. The denuded hillsides and mountains and interrupted drainage have exacerbated surface water flow. Torrential rains and poor infrastructure coupled with high rates of poverty that left many populations in precarious living circumstances conspired to bring about an unacceptable loss of life. The financial and economic costs of the devastation were extremely high. Yet this extreme example of environmental vulnerability highlights the importance of the rational and sustainable use of environmental resources. If the provision of ecosystem goods and services are compromised, households and enterprises are affected directly through the loss of livelihoods. Environmental degradation, civil conflict, and the increasing marginalization of the rural economy have left few options for the majority of the rural inhabitants of Central America. Where environmental degradation contributes to the further loss of livelihoods in the region this has prompted significant out-migration, with the migrants typically leaving in search of economic opportunity in the United States and Canada. In the wake of Hurricane Mitch estimated migration rates have risen dramatically (OXFAM 1999a, b, c, d).

Summary of the Impact of Hurricane Mitch in Central America

	Guatemala	Honduras	El Salvador	Nicaragua
Loss of Life	268	5,657	240	3,045
Numbers Missing	121	8,058	19	970
Loss or damage to Housing [a]	60,000	180,000	10,372	144,500
Coastal Population Affected (loss of housing, livelihoods, harvests and livestock)	49,795[b]	100,476	37,885	163,737
Loss of Agricultural Production	$258 million	$1.7 billion	$95 million	$140.5 million
Loss of Aquaculture Production (harvests, larvae, ponds and machinery)	$2.6 million	$35.2 million	$0.7 million	$16.7 million

[a] Damage to housing includes all dwellings destroyed or partially destroyed. These figures are estimates from a combination of sources that tallied the total number of houses reported destroyed or damaged and the population made homeless for longer than one month.

[b] Estimated 10 percent of the population of the coastal municipalities of the departments of Escuintla and Santa Rosa.

All conversions assume exchange rates of 13.54 Lempiras, 8.7 Colones, 7.8 Quetzales and 10.6 Córdobas to US$1 at the close of December 1998.

Source: Honduran Government, January 1999; OXFAM 1999a, 1999b; Enríquez Villacorta 1999; CEPAL 1999a, 1999b, 1999c, 1999d; Inter American Development Bank Economic and Social Database 2000

Action 2: Alleviate Poverty to Reduce Environmental Degradation

Poverty and prices affect the choices that individuals and households make about the use and management of natural resources. Poor households may rely disproportionately on the environment to provide fuelwood and timber for energy and shelter as well as wildlife flora and fauna for food and livelihood security.

Poor households are often disproportionately dependent on natural resources to supplement unstable and insufficient incomes. These households do not have sufficient access to productive resources or alternative sources of income and turn to "unpriced" or free environmental goods to meet their immediate needs.

The complex relationship between poverty and the use of fuelwood was apparent in both sets of country findings. In El Salvador, results demonstrated that being poor increases the likelihood that a household uses and consumes environmental goods. According to national household surveys, the poorest inhabitants live in rural areas. In 1995, almost 60 percent of rural households lived below the poverty line, compared with 41 percent of urban households (Gammage 2000). It was estimated that 87 percent of rural households used fuelwood as a primary source of domestic energy for cooking, compared with 29 percent of urban households (Gammage 2000). Further analyses using national household survey data for 1995 revealed significant differences between the demand for fuelwood by region and income. Poor households were almost six times more likely to consume fuelwood than non-poor households. Controlling for poverty, households located in former conflict zones in El Salvador were almost three times more likely to consume fuelwood. Not only are households in former conflict zones more likely to be poor, but they lack critical infrastructure linking them to markets or enabling them to purchase alternatives to fuelwood energy. Consequently, these households face fewer opportunities to substitute other forms of domestic energy for fuelwood.

Table 3 illustrates how poverty shapes resource consumption in the two countries. Poor and extremely poor households typically consume more fuelwood in total than non-poor households in El Salvador and Honduras. Yet, in El Salvador, poor and extremely poor households may consume less fuelwood per capita than non-poor households. This is because of the relative scarcity of fuelwood in El Salvador. Although poor and extremely poor households are larger, they may often be more time constrained and, therefore, invest less time in fuelwood gathering than households that are non-poor or have less cash to purchase fuelwood. As forest supplies dwindle in El Salvador, these households must cut back their consumption. Furthermore, it is likely that poor and extremely poor households eat meals of lower volume and nutritional content and cook less frequently or maintain their stoves lit for shorter periods of time (Benitez and Machado 2000; Gammage, Benítez, and Machado 1999).[8]

[8] Extremely poor households typically have higher economic and demographic dependency ratios , there are fewer income earners and fewer members who can dedicate their time to gathering fuelwood among the many subsistence tasks that they engage in. On average, these households spend less on food and consume fewer calories (Benítez and Machado 2000).

Table 3. Per Capita Fuelwood Consumption, El Salvador [a]

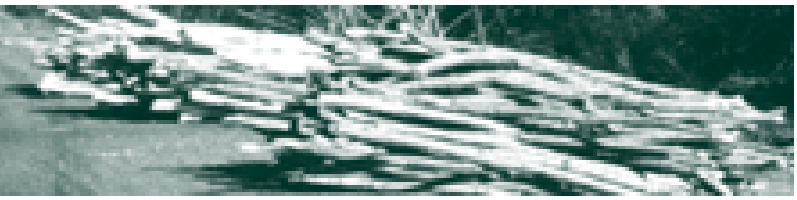
	1993		1997	
Household Characteristics	**Per Capita Fuelwood Consumption; Lbs per capita per week**	**Total Amount of Fuelwood Consumed Each Week; Lbs per household per week**	**Per Capita Fuelwood Consumption; Lbs per capita per week**	**Total Amount of Fuelwood Consumed Each Week; Lbs per household per week**
Non-Poor Households	27.23	71.02	28.22	92.80
Poor Households[b]	18.55	86.31	21.65	84.88
Extremely Poor Households	15.68	90.72	19.26	88.49
With gas cooker	15.54	63.41	21.27	58.00
Without gas cooker	31.78	98.57	26.93	91.95
With Remittances	14.21	51.09	29.91	85.21
Without Remittances	25.48	87.53	24.49	95.38
Female-Maintained Households	26.93	50.69	35.85	80.50
Male-Maintained Households	24.43	81.92	23.65	94.72
Total	22.82	78.56	26.79	91.07[c]

[a] Domestic consumption only.

[b] The poverty line is defined using the minimum cost of a basket of basic goods. This corresponds to 72.48 colones per person per week in 1993 and 84.18 colones per person per week in 1997. The extreme poverty line is half of the poverty line. Exchange rates ar $1 = 8.7 colones in 1993 and $1 = 8.8 colones in 1997.

[c] There has been a precipitous drop in real household and per capita income between 1993 and 1997. The increase in fuelwood consumption over this period is in part attributed to this loss of real income and the consequent increase in environmental dependency (Benítez and Machado 2000; Gammage, Benítez, and Machado 1999).

Source: CEASDES Household Survey data El Tamarindo 1993, 1997



The case study data for both countries revealed that out-migration is a consistent strategy to meet household subsistence needs in the face of declining rural employment and rising poverty. Households with family members that have migrated to the United States receive dollar remittances that supplement their income. Remittances cushion these households against poverty and enable them to purchase gas propane stoves and reduce the extent to which they use fuelwood. Remittance income fluctuates over time and is not necessarily predictable. Most households that receive remittances do continue to use fuelwood although the volume of fuelwood consumed is reduced.[9]

As a result of out-migration, there are often more female-headed and female-maintained households.[10] These households appear to be particularly dependent on fuelwood. This may be because their income fluctuates dramatically over time or because their earnings are consistently less than those of male-maintained households (see table 6). To meet their subsistence needs or to provide

[9] This is not the case for El Salvador in 1997. The decline of real income in the community between 1993 and 1997 has affected the purchasing power of all households. Even households that receive remittances must survive on cash earnings while they are waiting for the next installment of dollars. Consequently, the use of propane gas stoves has decreased throughout the community.

[10] Female-maintained households are those where women earn more than 50 percent of total household income.

income, these households rely disproportionately on gathered fuelwood for domestic and productive activities.

The pronounced difference in fuelwood consumption between urban and rural areas in El Salvador mirrors the lack of access to cheap and effective alternative sources of energy (Current and Juarez 1992). In urban areas—where markets are more accessible, roads are largely paved, and electricity is more readily available to the urban poor—fewer households rely on fuelwood as their sole source of domestic energy. Alternative sources of fuel are easier to find and purchase in the cities; as a result, the use of electric and gas stoves is more widespread in urban areas. Access to these basic goods and services can diminish fuelwood consumption and dependency on other environmental resources. Conversely, rural areas tend to be poorer and more remote. Rural communities often lack those basic goods and services ensured through better market access; consequently rural inhabitants depend much more on local natural resources.

The Honduras research revealed a similar relationship between poverty and fuelwood demand in the Gulf of Fonseca. Ninety-five percent of all households surveyed used fuelwood, and 76 percent of these households lived below the poverty line (Aburto and Durón 2000; Aguilar and Campos 1999) (see tables 4 and 5). In contrast to the Salvadoran findings, extremely poor households in Honduras consume more fuelwood per capita than poor households. This is likely to be because fuelwood is still relatively abundant in these communities and the cost of gathering or purchasing fuelwood in terms of time invested or income expended is less. Fishing and agricultural households in the mangrove communities in Honduras were disproportionately the poorest; these households also had the highest demand for fuelwood. It is likely that both sets of households lack the ability to purchase gas stoves and depend primarily on fuelwood for domestic energy. Furthermore, fishing households use fuelwood to smoke and cook fish for domestic consumption or sale.

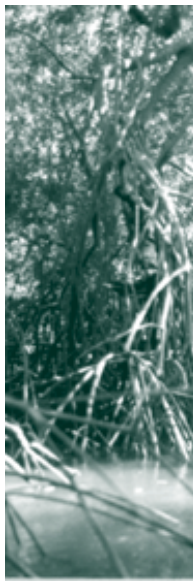


Table 4. Per Capita Fuelwood Consumption, Honduras[a]

Household Characteristics	Per Capita Fuelwood Consumption[b] Lbs per capita per week	Total Fuelwood Consumption Lbs per household per week
Non-Poor Households	24.08	77.49
Poor Households	26.69	150.43
Extremely Poor Households	27.00	129.16
With gas cooker	16.70	72.94
Without gas cooker	26.71	132.20
With Remittances	22.51	100.29
Without Remittances	28.76	148.91
Female Maintained	29.64	107.89
Total	26.24	129.16

[a] Domestic consumption only.

[b] Woodfuel consumption measured in logs, one log weighs 1.52 lbs

Table 5. Poverty and Resource Use in Honduras in 1998

	Percent of Households that Use Each Resource	Percent of These Households that are Poor[a]
Wild Animals	1.3	67
Aquatic Resources	33.0	97
Timber	0.4	100
Fuelwood	95.2	76

[a] Poverty line is 122.75 Lempiras per person per week, $1 = 13.5 Lempiras

Source: Aburto and Durón (2000)

Table 6. Ratio of Average Female to Male Income in Urban Areas by Years of Schooling, 1997[a]

Country	0-3	4-6	7-9	10-12	13+	Total
El Salvador	80	73	85	92	71	88
Honduras	60	69	76	76	59	77

[a] Income differential reported for wage earners only

Source: CEPAL 1999c

As both the actual consumption figures and the projected estimates of fuelwood demand in the regions surveyed demonstrate, there will be increasing pressure on the mangrove forests and surrounding wooded areas (Gammage 2000; Benítez and Machado 2000).[11] Targeted and complex strategies are needed to reduce the unsustainable extraction of fuelwood and other forest products destined for household consumption and markets. Particularly, these measures will need to alleviate poverty through a series of policy actions and incentives that encourage land intensification and land investments that are not environmentally damaging and that give equal weight to economic development and environmental sustainability.

Next Steps

☑ **Establish buffer zones for fuelwood extraction and promote agroforestry.** Poor households need secure access to common areas where they can legally extract fuelwood resources. Governments can support these initiatives by providing communities with multi-purpose tree seedlings—seedlings that do not require labor intensive cultivation, are fast-growing, and yield short- to medium-term returns. However, communities need to be allowed to define their own sets of regulations, restrictions, and enforcement policies for these common areas ensuring that the management and extraction of resources responds to their needs and concerns.

This recommendation builds upon the "Regional Treaty for the Management and Conservation of Natural Forestry Ecosystems and for the Development of Forest Lots," signed in 1993 by six Central American nations in support of participatory reforestation programs, which prioritize meeting household demands.[12] The second chapter of the treaty states:

> *"Focus national and regional reforestation programs on the recuperation of degraded marginal lands optimally used for forestry.These programs should encourage multiple use forestry by different land users; promote the use of native species; and employ local participation in the planning, implemention and distribution of resources. These programs should also prioritize fuelwood and forest products for domestic consumption in the communities"*
>
> (Convenio Regional Para el Manejo y Conservación de los Ecosistemas Naturales Forestales y el Desarrollo de Plantaciones Forestales 1993)

[11] Fuelwood and timber demands on the mangroves in Honduras and El Salvador are increasingly being concentrated on smaller areas of mangrove forest as much of the forest is converted to other uses. It is the concentration of this pressure on smaller and smaller tracts of forest that results in rapid deforestation. The use of mangrove wood for fuelwood, timber and salt ovens, is generally less-harmful use than clearing mangroves for shrimp or salt ponds. The pond construction often results in irreversible land use change, whereas selective logging for fuelwood and timber can be undertaken in such a way as not to cause irreversible damage to the ecosystem.

[12] The six signatories included Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panamá.

The agreement emphasizes the multiple benefits from reforestation. Reforestation can provide fuelwood resources for households, improve land quality, as well as provide multiple products such as fruit, nuts, medicines, and bark, which may be used to diversify income and meet subsistence needs. The treaty adds that cohesive partnerships between governments and local communities are needed throughout the program phases, so program objectives are not dissonant with the communities most pressing needs.

☑ **Extend micro-credit services to women and poor households**. The poor have limited opportunities to diversify their source of income or increase earnings. Micro-credit has been effective in addressing this gap through the disbursement of small group and individual non-collateral loans. Remittances sent back from family members working in the United States may prove to be a fruitful source of community capital. The challenge is to provide access to formal banking services and provide loans where the repayment schedules are tailored to the productive activity undertaken. Both agricultural and fishing households have benefited from micro-credit initiatives increasing the opportunities to upgrade and transform traditional economic activities and improve the processing and commercialization of their products. These initiatives may be particularly important for women and female-maintained households enabling them to diversify their income-earning activities and relieve environmental dependence.

☑ **Subsidize fuel-efficient stoves**. Fuel-efficient stoves can reduce fuelwood consumption. Governments and development agencies should provide cash vouchers for the purchase of materials to make improved woodfuel stoves or should subsidize the use of gas propane stoves. This will enable many more households to change their resource use, alleviating pressure on the environment.

☑ **Pave roads as a means to link markets, increase employment, and promote access to goods and services for rural poor.** Roads can contribute to poverty reduction and help minimize dependency on local natural resources. Roads can provide greater access to off-farm and better-paid employment or to markets. Higher and more stable incomes mean greater surplus that can be invested in improving food security, purchasing household improvements, such as gas stoves, as well as in land intensification practices.

Roads can ensure the availability of other goods and services essential to the welfare of the rural poor, and the sustainable management of local resources. Reducing transport costs can mean lower input prices for agricultural and aquaculture production, which in turn leads to higher margins on the sale of produce. Furthermore, lower prices for commercial household goods, such as gas stoves and gas propane, may stimulate an increase in the use of substitutes for mangrove fuelwood.

Action 3. Bring Women and Communities into Decisionmaking

Where communities have been unable to participate in decisions about mangrove management, women have been doubly excluded from decisionmaking. Efforts should be made to ensure the full participation of the community in decisions about the design and operation of sustainable management strategies and, in particular, to include women in this process.

Women form the largest single dispossessed population in the world. Few women have titled access to land, or sufficient access to physical and financial capital. In most continents and across most rural subsistence activities women have fewer and less formalized access rights to all environmental goods and services capital (Meinzen-Dick et al. 1997; Agarwal 1994). This has meant that women disproportionately depend upon common property to meet and supplement household requirements for fuel, water, grazing, and shelter. Differential access to and dependence upon these environmental goods and services characterizes women's relationship to common property, and shapes their responsibilities and investment strategies toward the environment.

The findings from the studies in El Salvador and Honduras highlight the importance of women's contributions to the local economy and to the household as fisher-persons, farmers, and fuelwood gatherers. The results also underscore the relative disadvantage that women face entering the labor market, earning wages, and securing the resources necessary to provide for themselves and their families (see table 6). In El Salvador, women earn less than 40 percent of what men earn in fishing activities and less than 70 percent of what men earn in petty trade and micro-enterprise activities (Benítez and Machado 2000). Similarly, in rural Honduras, women earn, on average, half of men's wages (Aburto and Durón 2000). A significant proportion of the households in the mangrove communities are female-headed or maintained by women's income. In El Salvador, more than a quarter of all households are headed by a woman or rely primarily on women's income to meet the needs of all household members. In Honduras almost 20 percent of all households are female-headed or female-maintained. In both El Salvador and Honduras, these households are disproportionately poorer than male-headed and male-maintained households in the same communities.[13]

To date, mangrove management plans have largely failed to document how women use and manage the resources available to them in the mangroves. Women rely on the fish they catch in the mangrove waters (see table 7). While men fish primarily in the open seas, the majority of women fish in mangrove estuaries and at the shoreline, catching a range of fresh-water and marine fish, crustaceans, and mollusks. Women gather shellfish and crabs in the estuaries, providing essential nutrients and proteins to supplement the family diet of corns and beans. Women are also involved in cleaning and processing the artisanal catch from offshore fisheries. They prepare and dry fish for sale in local and regional markets, as well as clean and pack shrimp to be exported.

[13] Many female-headed and female-maintained households receive dollar remittances from family members living in the United States. Remittances provide much-needed cash income and subsidize consumption expenditures lifting some of these households out of poverty. Despite the widespread receipt of remittances, female-headed and female-maintained households are disproportionately poorer in rural areas of Honduras and El Salvador (Gammage 2000; Aburto and Duron 2000; Gammage 1998).

Table 7. Gender and Biodiversity

Resource[a]	Wet and Dry Season 1994		Wet and Dry Season 1999	
	Men	Women	Men	Women
Fish	Anguila	Anguila	Anguila	
	Babosa		Babosa	
	Bagre	Bagre	Bagre	Bagre
	Cola de bagre	Cola de bagre	Cola de bagre	
	Corvina		Corvina	
	Gavilán	Gavilán	Gavilán	
	Macarela		Macarela	
	Pancha	Pancha	Pancha	Pancha
	Pargo		Pargo	
	Pinchada		Pinchada	
	Robalo		Robalo	
	Ruco		Ruco	
	Tiburón	Tiburón (estero)	Tiburón	
Crustaceans, Mollusks and other Invertebrates		Almejas		Almejas
				Mionas
	Camarón blanco	Camarón blanco	Camarón blanco	
	Camarón cola verde		Camarón cola verde	
	Camarón rojo	Camarón rojo	Camarón rojo	
	Chacalín	Chacalín	Chacalín	Chacalín
		Caracol		Caracol
		Concha		Concha
		Curil		Curil
	Jaiba	Jaiba	Jaiba	
	Langosta		Langosta	
	Langostino		Langostino	
		Mejillón		Mejillón
	Ostras		Ostras	
	Ostiones			Ostiones
		Punche		Punche
Fuelwood and Timber	Aceituno	Aceituno	Aceituno	
	Botoncillo			Botoncillo
	Madera dulce	Madera dulce	Madera dulce	Madera dulce
	Mangle rojo	Mangle rojo	Mangle rojo	Mangle rojo
	Mangle seco	Mangle seco		Mangle seco
		Mangollano		Mangollano
				Estopa de coco
		Palma de coco		Palma de coco
Fruits, Herbs and Spices		Albahaca		Albahaca
		Caulote		
		Chipilín		Chipilín
	Coco	Coco	Coco	Coco
	Copinol	Copinol		
	Eucalipto	Eucalipto		Eucalipto
	Hojas de carao			
	Jiote			
		Limón		Limón
	Mango	Mango	Mango	
		Marañón	Marañón	Marañón
	Naranja	Naranja		Naranja
		Nance		Nance
	Orégano	Orégano		Orégano
		Quina		Quina
		Ruda		
		Sábila		Sábila
		Tamarindo		Tamarindo
		Yerba buena		Yerba buena

[a]None of these species are listed as endangered or threatened.

Source: Participatory Rural Appraisals, Cantón y Caserío El Tamarindo, (Gammage 1997; Gammage, Benítez, and Machado 1999).

Since women's roles in the local fishing industry are less visible, their access rights are more likely to go unrecognized and not to be incorporated into decisions about the management of the resource base. For example, in El Tamarindo, El Salvador, community leaders imposed an informal ban on estuary fishing activities in the early 1990s in response to pressure from the Ministry of Agriculture and the fisheries directorate, CENDEPESCA, who were concerned about the overfishing of juvenile shrimp and other aquatic fauna in the estuary. Women were not brought into the decision-making process as the ban was being discussed. Since women fish primarily in the estuary for subsistence purposes, their access rights were undermined and a vital source of household protein and income was lost or restricted.

A better resolution to the concern about overfishing in the estuary would have been to identify which of the species were most threatened and to explore different means of reducing pressure on the estuary breeding grounds.[14] The principal concern is shrimp production and the primary cause of loss of juveniles is from agricultural runoff and from the operation of rustic shrimp ponds. Regulation could have been more effectively directed toward those activities that increase pressure on the ecosystem in a targeted fashion, rather than precluding all subsistence fishing in the estuary. It is important to note that none of the species harvested by women in the estuary listed in table 7 are reported as being endangered.

Clearly, women's interests in the mangroves must be explicitly incorporated into any management plans in order to ensure that policy recommendations for changes in mangrove management are truly inclusive. The failure to include women's representatives in the decision-making process and to take a full account of women's activities in the mangroves will result in policies that marginalize the interests of women and subordinate them to groups with greater voice and power. Furthermore, this exclusion is likely to lead to the criminalization of women's activities without necessarily altering these activities.

☑ **Revise existing laws to ensure that women have a right to hold fee simple title on land.** Fee simple titles confer the right to sell or to convey by will or transfer to the tenant's heir a plot of land held by an individual upon the death of that individual. Almost all land in Honduras and El Salvador is held in fee simple title. In 1993, in Honduras, modifications were introduced to the existing agrarian reform code enabling women to hold fee simple land title. Previously, land title under the reform initiative had generally been given to men by allocating land to the head of household under the assumption that this will benefit the entire household. Between 1975, when agrarian reform began in Honduras, and 1993 less than four percent of all beneficiaries under the agrarian reform law were women (Fundación Arias 1998). Similarly in El Salvador, despite three phases of agrarian reform, less than five percent of all beneficiaries were women (IMU 1999; Deere and Leon 1998).

Allowing women to be the beneficiaries of land transferred under the agrarian reform initiatives gives women direct control over land resources. Providing access to land in joint title that recognizes the rights of dual-heads as well as single-heads of households ensures that women also have access to an asset that can be held or transferred and used as collateral to obtain credit. Where women are land-owners, their roles as land-managers will also be recognized. Without this recognition, women will continue to be marginalized; their land rights will be ignored and their gathering activities will be concentrated upon common property and open access resources.

[14] A variety of measures are available—from permits to seasonal bans.

Build local capacity for resource management. To effectively apply environmental legislation, national governments need to invest in building local capacity for resource management, without dismissing existing institutional and organizational agreements. Women need to be drawn into this process. Governments need to specifically target the following sets of actions:

- Heighten awareness of national environmental legislation, including local governments' responsibilities in managing forestry resources. Information about national legislation should be disseminated to both men and women, using popular education formats, radio, and television.
- Promote the organization of community resource management groups, which can work with local and national governments to define regulations, restrictions, and enforcement strategies.
- Set gender targets and quotas to ensure that women are actively included in the community representation and their use rights are considered when designing and implementing community level management plans.

Build and/or strengthen local capacity to interpret data through practical and user-friendly methods. This process will include developing participatory land quality indicator tools that draw upon the data and findings generated by the multisectoral commissions. The purpose is to enhance local mangrove management practices and ensure the full participation of regional and local governments, community resource management organizations, and local land users. Local stakeholders can be trained and information should be disseminated at the grass roots level to support democratic processes that influence resource management, policy enforcement, and property rights allocation.

Increase community access to technical assistance programs. Technical assistance programs can be used to introduce appropriate technology, to change behaviors, and alleviate local resource dependency. Appropriate technologies can be used to increase food security, diversify household income, and provide more sustainable methods for resource use.

Technical assistance programs can complement coastal and resource users' knowledge of sustainable practices, incorporating and disseminating indigenous knowledge about alternative and sustainable methods of catching fish, or providing guidance on the use of integrated pest management systems and reducing the reliance on chemical inputs. Such programs should be developed with the communities and respond to their needs and priorities.

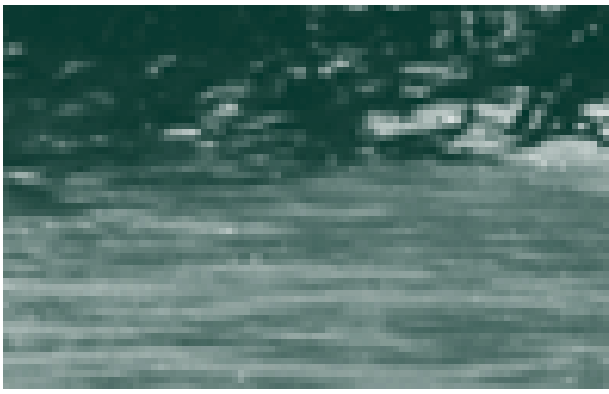
All technology transfer programs should consider the gender of the beneficiaries and particularly how gender shapes resource use. Channeling technology directly to women can be extremely worthwhile. It can change their resource dependency, relieve their need for additional household labor, and increase the efficiency of their reproductive and productive tasks. However, where women are to be the beneficiaries of technology transfer, they should be brought actively into that process. Previous endeavors to introduce solar cookers, solar driers, and food storage technologies to enable women to decrease their dependency

on fuelwood and household labor and overcome seasonal fluctuations in agricultural produce have failed (Nathan 1997; Cecelski 1984). They have failed largely because women were not encouraged to participate in the problem-identification or solution-generation phase (Gammage, Benítez, and Machado 2000). The result has been, in many cases, the application of a technology that was neither appropriate nor effective; a technology that worsened the production relations and was quickly abandoned (Anderson 1991).

These concerns are not insurmountable and many projects have successfully promoted the adoption of improved fuelwood and charcoal stoves. Projects that are participatory and focus on minimizing time-burdens, alleviating bottlenecks in household production, and accommodating the timing and sequencing of existing household tasks have achieved high rates of adoption and use (Gammage et al. 1999; Dutta 1997). Programs to promote improved fuelwood and fuel-efficient stoves should also be accompanied by efforts to manage the remaining forests effectively, plant fast-growing species that can meet local domestic energy requirements, improve existing charcoal carbonization techniques, and introduce alternatives such as the production of carbonized briquettes.

Action 4: Strengthen Institutions and Define Appropriate Rules and Regulations

The existing regulatory and institutional framework is weak, fragmented, and obsolete, and inhibits the design and implementation of sustainable mangrove management practices that respond to the development needs of coastal populations. The opportunity exists to modify government institutions by strengthening local participation in processes to define appropriate management policies, refine the existing legislation, and regulate and enforce effective mangrove management.



The mangroves are protected under forestry legislation and international treaties signed by all Central American nations. The General Directorate of Renewable Resources (DGRNR) of El Salvador, the Honduran Ministry of Forestry Development (COHDEFOR), and the Honduran Ministry of Natural Resources and the Environment (SERNA) have the ability to authorize, control, and regulate access to and the use of forest products and services. It is clear that poorly defined property rights and the lack of an institutional framework that harmonizes the competing interests of diverse stakeholders exacerbates pressures on the remaining mangrove stands, and contributes to the degradation of the ecosystem in El Salvador and Honduras. Opportunities exist in El Salvador and Honduras to redefine property rights and to harmonize competing interests to secure the sustainable management of the ecosystem and preserve livelihoods and habitats. It is vital that efforts are undertaken to strengthen those administrative bodies that oversee the management of the mangroves in both of these countries, and to provide financial support for extension and technology transfer.

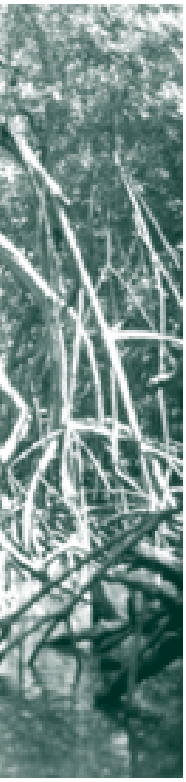
The current environmental laws and regulatory bodies in both countries potentially provide a normative framework for multiple stakeholders to participate actively and democratically in the design and implementation of strategies to reduce environmental degradation. However, further support should be given to the Ministries of Environment and Agriculture in Honduras and El Salvador to ensure that these laws and regulations can be successfully implemented and the appropriate local and national institutions strengthened to support sustainable and decentralized mangrove management.[15]

The implementation of structural adjustment measures have placed considerable pressure on public sector budgets and restricted the ability of governments to deliver services, monitor infractions, and enforce legislation. Increasingly, there is a dissonance between the laws and policies that are on the books and the institutional capacity to enforce these laws or uphold these policies. It is clear in examining those rules and regulations governing the use and transformation of environmental goods and services that there

[15] The increased role of municipal governments in environmental management provides evidence how this process has evolved in Honduras, particularly in the aftermath of Hurricane Mitch. Since 1998, municipalities have participated actively in land rehabilitation efforts, as donor agencies and national governments recognized their potential in mobilizing local resources and services (www.hurricane.info.usaid.gov/stockmun.htm). Additionally, the Honduran Environmental Development Program (PRODESAMH) is supporting a project on environmental management at the municipal level. Thus far, the program has conducted 35 pilot projects in various municipalities throughout the country. The Pan-American Health Organization is also helping organize the municipalities' environmental units to enhance local capacity. In El Salvador, the Municipalities in Action Program supported by USAID has strengthened local capacity for environmental management in various coastal municipalities, including Puerto de la Union.

is a real need for participation and partnership between different government agencies, the private sector, and civil society actors to redefine practices and establish effective, democratic, and transparent institutions that can administer and regulate sustainable management practices (Benítez and Machado 2000).

Opportunity exists in Honduras to draw on existing legislation and modify institutional arrangements to implement sustainable management. According to the Honduran Environment Law, municipalities, community groups, and non-governmental organizations should be drawn actively into forestry management in collaboration with COHDEFOR. This law emphasizes that forestry resources should be managed to ensure effective biodiversity protection and enforce sustainable extraction, taking into account the multiple use of natural resources in terms of their economic, ecological, and social values to a variety of stakeholders. The law states that the exploitation of marine and coastal resources should be guided by technical parameters that determine the rational and sustainable use of these resources. To fulfill these requirements, the Ministry of Natural Resources will establish closed seasons for fishing, put restrictions on the collection of certain species, and define criteria for target population stocks and growth rates for a variety of endangered marine and coastal ecosystem species (Vega et al. 1994).

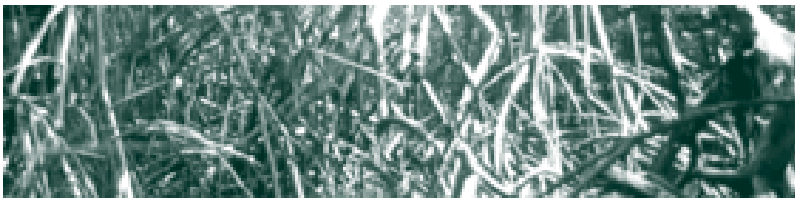


In El Salvador, passage of the recent Environment Law has led to conflicting mandates and resulted in the revision of legislation in such a way that it fails to address the current pressures on the mangrove ecosystem. The Forestry and Fauna Service, a division under the DGRNR and a sub-directorate of the Ministry of Agriculture, has held the mandate to administer mangrove forests in accordance with the terms laid down in the Forestry Law since 1973. The Forestry Service performs its work under precarious conditions, having experienced a significant reduction in funds available for investment and operations, a factor that has undermined its ability to review, uphold, and enforce the law. The advent of the new Environment Law in 1998 passes the normative and regulatory responsibility for protected areas to the Ministry of the Environment and Natural Resources (MARN). However, the division of responsibilities and separation of normative roles of each of these institutions is still not clearly defined. In the case of the mangroves, this new Environment Law requires that MARN implement agreements with the municipalities and other competent local authorities to establish parameters for the protection of natural resources in the coastal marine zone, developing an integrated management regime. The planning process and its execution, as it is defined in the Environment Law, requires the participation of all institutional actors and other interested sectors.

In El Salvador, the mangroves are defined in the current law as "ecological reserves in which no alteration will be allowed,"[16] because they are considered to be highly fragile and vulnerable ecosystems. Unfortunately, the concept of an "ecological reserve" is not adequately defined in the law and no guidelines have been set for how such a reserve can be managed. Furthermore, the rigidity of a mandate that does not permit "any alteration" is inconsistent with the national and local reality, where coastal populations depend on environmental goods and services for their livelihoods. Such a mandate is impractical, as its application will only result in the criminalization of activities and practices that are unlikely to change in the absence of measures to relieve

[16] Ley de Ambiente, Artículo 74. Decreto No. 233, Diario Oficial Tomo 339, No. 79, del 4 de mayo de 1998. San Salvador.

environmental dependence and channel resources to these coastal populations, or to modify and regulate upstream activities that undermine the health of the mangrove ecosystem



Further revision of the legislation and the regulatory framework will be required in El Salvador and Honduras to produce a workable definition of sustainable mangrove management that incorporates the competing uses and pressures to which the mangrove ecosystem is subject. Resources will also need to be dedicated to strengthening local institutions to ensure their full and active participation in this process.

The revision of the legislative and regulatory framework should not only focus on governmental structures and functions, emphasis also needs to be placed on the participation of local and community institutions. At the local level, community and municipal organizations lack the capacity to balance the twin goals of community development and environmental management. Enhancing local management capacity is critical for the promotion of more decentralized sustainable management practices.[17]

Next Steps

Review existing property and access rights. One of the primary tasks of the multi-sectoral commissions is to review the allocation and current distribution of *de facto* and *de jure* property rights and concessions to the mangroves in each country. This review should take account of the economic, social, and cultural value of the ecosystem to the stakeholders and recognize the array of *de facto*, *de jure,* and customary use rights currently exercised by all stakeholders.[18] The gender of resource users should be taken into account and the full profile of resource use in the mangroves should be explored. The final decision about the assignation of property, access, and use rights to the mangroves should be consistent with the definition of sustainable management to be determined by the sustainability commissions. Where trade-offs occur between different activities, decisions will have to be taken about which activity will be prioritized. These decisions should be informed by the Cost Benefit Analyses required by the sustainability commissions. Concrete actions that need to be undertaken in both El Salvador and Honduras are:

- Determine the appropriate property rights regime for biological and genetic resources in addition to establishing the nature of ownership and access to mangrove, wetlands and fisheries resources that recognize customary rights to use of natural resources at the local level;
- Define rules and procedures for access to natural resources in accordance with the national environmental laws; and
- Establish the normative and administrative procedures for community participation.

[17] An example of the important role that municipal governments can play is provided by the Verification and Control Commission in Honduras that has been operating through CODDEFFAGOLF since 1993. The Commission is made up of elected officials from the Municipalities of Valle and Choluteca, national police and local staff from the fishing directorate in the Ministry of Agriculture. The Commission reviews all new concessions and undertakes spot-checks on existing aquaculture activities to ensure that they are in compliance with the laws concerning effluent discharge, the purchase of larvae and the collection of wild larvae. Where infractions are observed and documented, they are reported to those national bodies responsible for enforcing the existing environmental legislation.

[18] *De facto* rights are those that are exercised without necessarily being enshrined or protected by legal statutes. *De jure* rights are legally recognized rights that have been ratified by legal bodies. Customary rights are similar to de facto rights, but these derive from cultural norms and dictates that communities have upheld for generations. Customary rights are sanctioned in community lore and are governed by strong codes of conduct.

Undertake an institutional capacity audit. The existing institutions in each country have been unable to monitor and enforce agreements about mangrove management. The multisectoral commissions should review the existing institutions and make recommendations about how these may be decentralized to ensure the effective monitoring and enforcement of sustainable management plans. The commissions should explicitly consider the gender of resource users and the ability of existing institutions to represent the needs and concerns of women in the communities and as resource-users.

Develop and implement national policies and strategies on biodiversity and on the sustainable use of coastal marine resources. Currently there are no national policies that link biodiversity to habitats. What national legislation exists focuses almost exclusively on habitats without establishing parameters for the preservation or conservation of species or recognizing the interdependence of species.

There is a real need for policies and strategies to be defined to regulate the use and transformation of natural resources in the following areas:

- Biodiversity management
- Integrated coastal zone management[19]
- Fisheries and aquaculture
- Conservation of protected coastal areas

Create and/or strengthen the institutional base for mangrove management at the national and local levels. The participation of communities, local governments, and non-governmental and community organizations should be the cornerstone of all strategies to promote equitable and sustainable development. There is an urgent need to strengthen local and national institutional capacities, and promote the active participation of women in the design and application of community resource management plans in order to ensure their equitable access to and control over these resources. This can be achieved by granting communal use concessions, based on sound ecological principles, that demonstrate a commitment to gender equality among beneficiaries and in the profile of access to environmental resources.

The sustainable community management of natural resources requires resources, training, and organizational inputs. Trainers will need to be identified to facilitate broader community fora that explore social and gender equity concerns about access to and control over the resources in rural and fishing communities. Resources should be allocated to:

- Support participatory processes to prepare and adopt community strategies for the sustainable use of natural resources in the coastal reaches of the Gulf of Fonseca;
- Strengthen initiatives to integrate and coordinate local actions through the Association of Mayors of the Gulf of Fonseca, an initiative established under the PROGOLFO project; and
- Identify, systematize, and share the initiatives on local and communal resource management, which are being undertaken in the region.

[19] Refer to Post and Lundin 1996.

Action 5: Foster International Collaboration

The Gulf of Fonseca is a shared ecosystem with its perimeter in parts of El Salvador, Honduras, and Nicaragua. Policy designed in each country to secure the sustainable management of the ecosystem should take account of the interests of each of these countries and the citizens that the governments of these countries represent. The shared benefits from ecosystem maintenance and improvement also imply shared costs from degradation. This is particularly important for the fish and shrimp larvae secured by this shared ecosystem.

A variety of mechanisms and accords exist that establish collaboration and cooperation between El Salvador, Honduras, and Nicaragua over the management of key biological and ecological resources. The Alliance for Sustainable Development/Alianza para el Desarrollo Sostenible (ALIDES) provides an example of one such mechanism. ALIDES came into being in 1994 and establishes a set of norms to promote sustainable development in Central America. Objective number two of the ALIDES declaration states that among the primary goals of the accord is:

> *"the sustainable and integral management of the territories in order to guarantee the conservation of biodiversity in the region for our benefit and the benefit of humanity"*
>
> (ALIDES 1997)

The Central American National Councils for Sustainable Development (Consejos Nacionales de Desarrollo Sostenible Centroamericanos), responsible for the local implementation of Agenda 21, provide another mechanism for collaboration that allows for the explicit incorporation of civil society. Similarly, the Regional Biodiversity Convention (Convenio Regional de Biodiversidad) and the Central American Council for Protected Areas (Consejo Centroamericano de Areas Protegidas (CCAP) offer examples of successful inter-country collaboration that has led to the creation of the Mesoamerican Biological Corridor. The Mesoamerican Biological Corridor (Corredor Biológico Mesoamericano) (CBM) enshrines participation and collaboration between signatories to ensure the consistent application of rules and regulations for an array of natural areas critical for the maintenance of biodiversity in the region: biological reserves, buffer zones, and multiple use areas. The CBM has received extensive support from the United Nations and other bilateral and multilateral agencies such as the Global Environment Fund (GEF) and the World Conservation Union (IUCN), and could provide a useful umbrella organization with the necessary funds to establish collaboration for the sustainable management of the mangroves in the Gulf of Fonseca and elsewhere in the region.

Next Steps

☑ **Constitute a regional policy forum on sustainable mangrove management.** The mangrove ecosystem in the Gulf of Fonseca is a shared ecosystem. The effective management of this ecosystem requires the revision and harmonization of the normative and regulatory framework of each of the countries that share the coastal resources in the region. A regional forum should be constituted with the purpose of developing and implementing coordinated regulations to ensure the sustainable use and management of these coastal resources. This forum could be located under the Mesoamerican Biological Corridor initiative that would have as its primary goal the coordinated application of mangrove management policy. The multi-sectoral sustainability commissions should elect delegates to the regional forum to ensure that all interests within each country are fairly represented at the regional level.

Action 6: Collect Data on Key Indicators

There is an alarming lack of data on key biological indicators that describe the health and well being of the ecosystem. There is also a dearth of information on human-environment interactions that provide estimates of the level of use and the demands placed on the ecosystem by its many stakeholders. Without this data, governments and regulatory bodies will not be able to develop monitoring systems or to implement sustainable management initiatives.

One of the findings from the El Salvador and Honduras studies that was echoed by many participants at the March 2000 project conference was the lack of data on key environmental and biological indicators. Few studies exist that estimate mangrove fuelwood and timber consumption or forecast the future demands on the mangrove ecosystem in the region. Little is known about the maximum sustainable yield of woody biomass and fisheries in the mangrove forests and estuaries of the Gulf of Fonseca. There is a dearth of data on the current status of the mangroves: their coverage, density, age structure, and growth patterns. What data exist are scattered and inconclusive and do not provide sufficient detail for the development of parameters to guide the sustainable extraction of mangrove resources. The pronounced lack of data reflects the failure to undertake an exhaustive economic and social valuation of the goods and services provided by the mangrove ecosystem. Generating and collecting the information required to fill these gaps is essential if the stakeholders in the Gulf of Fonseca are to accurately assess the existing pressure on the mangrove ecosystem and develop an operational definition of sustainable mangrove management.

To fill these data gaps national governments need to collaborate extensively with the donor community, as well as with international bodies, the private sector, and local and regional NGOs.[20] Collaborative efforts need to focus on ensuring the effective dissemination of data and findings through public databases, media, and the internet. Information must reach all stakeholders or stakeholder representatives. Discussion should be promoted among national and international stakeholders (ministries, regional governments, academic institutions, researchers, policy makers, practitioners, and communities) concerned with local development and mangrove sustainability.

Next Steps

- **Collect data on ecological processes.** In order to operationalize the agreed definition of sustainable management, existing data need to be gathered together and additional data collected on the following ecological variables in each ecosystem:
  - Density and coverage by species of different mangrove varieties and maximum sustainable yield of mangrove timber and fuelwood (taking into account the impact on fisheries production);
  - Rate of sedimentation;
  - Ambient levels of contamination by solid waste, chemical runoff, and human effluent in the estuaries, identifying the source of each pollutant;
  - Inventories of biodiversity;

[20] International bodies under the United Nations could provide a useful channel for sharing information using existing mechanisms such as the Convention on Biological Diversity and the Convention on International Trade in Endangered Species of Wild Fauna and Flora as a pretext for such sharing.

- Estuarine production of shrimp larvae;
- Hydrological data on flows and recharge capacity; and
- Critical areas where biodiversity is threatened.

The data should rest in a single centralized archive in each country that will be accessible to anyone and freely exchanged between countries.[21]

☑ **Collect and bring together existing socio-economic data on human-environment interactions**. While there is comparatively more ecological data, few studies exist that explore human-environment interactions and forecast key components of the demand for ecological goods and services. The centralized archives should also have data on the following:

- Current and potential demand for fuelwood nationally and at the level of the department;
- Patterns of resource extraction by both men and women;
- Feasibility studies that explore the use of buffer zones and secondary forests to supplement the demand for mangrove fuelwood and timber;
- Research on alternative and appropriate technologies for domestic energy production;
- Cost-benefit analyses of mangrove management options and the trade-offs between different activities; and
- Valuation studies of the benefits derived from the use, transformation, and conservation of mangrove ecosystems.

☑ **Collect data that would support integrated ecosystem management and facilitate collaborative transboundary management strategies.** Data should be collected on all *ex-situ* management practices that include upstream decisions about land management, the use of chemical herbicides and pesticides, and the discharge of industrial and organic waste into rivers and tributaries. Regional collaboration will be required between governments from El Salvador, Honduras, and Nicaragua, as the entire mangrove ecosystem is surveyed, and information exchanged about management practices that affect transboundary watersheds feeding into the Gulf of Fonseca. The goal is to promote the development of unified management criteria that reflect the interests of all three nations in the sustainable management of the mangroves in the Gulf of Fonseca. The data collection and exchange could ideally be located under existing initiatives, such as the Mesoamerican Biological Corridor, which provide an established forum for collaborative activities to promote sustainable mangrove management.

[21] These data could be made available through the Geographic Information Systems that are being established in all three countries with co-financing from the Inter-American Development Bank.

Conclusion

The mangrove ecosystem in the Gulf of Fonseca is under threat. Viable solutions need to be found to decrease pressure on the ecosystem, reduce pollution, and foster sustainable use. Coastal communities, national and local governments, and environmental groups have voiced their concerns about the health of the ecosystem. The challenge is to bring these stakeholders together to discuss how sustainable management may be put into practice, to

build institutions that are effective and inclusive, and to allow those whose livelihoods depend on the mangroves to have voice in the management of these resources.

" It is of tremendous importance that the mangroves be conserved and in order to do this we must face the reality that they are currently being used unsustainably by many different groups. What is needed is to establish the rules of the game, founded on a goal of sustainable development. We need criteria that are scientific and data that are reliable."

—Alberto Zelaya, Honduran Association of Aquaculturists, Final Colloquia, San Salvador, March 2000

"We need to develop an integrated coastal zone management plan. This plan needs to provide a regulatory framework that is both technically sound and decentralized. This plan must also include the objective of sustainable local development that takes account of the economic needs of the coastal population."

—Cesar Abrego, Marine Biologist, Ministry of Environment and Natural Resources, Final Colloquia, San Salvador

"However strong is the poverty that confronts us, it does not overwhelm us. A community does not need money to be active, it needs force. We are ready to put our words into action. We wish to care for our environment and manage our own resources."

—Candida Rosa Calix, Community Leader, Honduras, Final Colloquia, San Salvador, March 2000

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