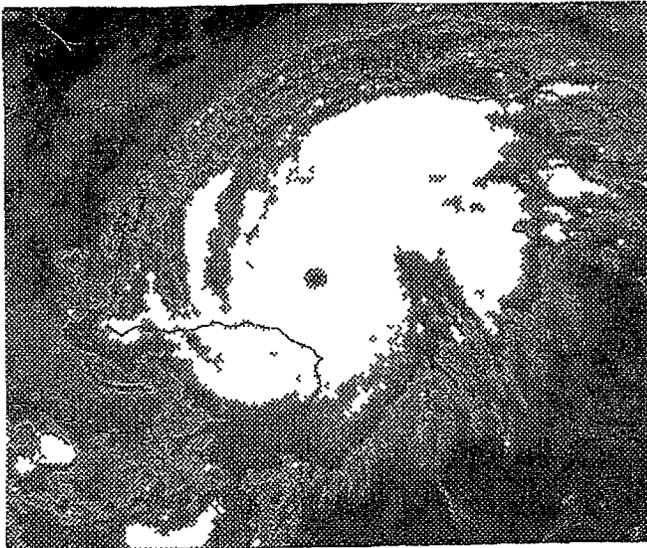


# **After Hurricane Mitch: Shelter and Municipal Infrastructure Reconstruction in Nicaragua Proposed Action Plan**

Prepared by  
**United States Government Interagency Task Force**  
United States Agency for International Development  
United States Geological Survey  
United States Army Corps of Engineers  
United States Department of Housing and Urban Development  
and  
AG International/PADCO, Inc



March 1999

**After Hurricane Mitch:  
Shelter and Municipal Infrastructure Reconstruction in Nicaragua  
Proposed Action Plan**

**United States Agency for International Development**

Kraig Baier  
Sonny Low  
Bob Kehew  
Fernando Cruz  
Edgar Pereira  
Walter Gomez

**United States Geological Survey**

Kevin Scott  
Mark Smith  
Richard Moore  
Rafael Rodriguez

**United States Army Corps of Engineers**

Eric Nelson  
Glynn Banks

**United States Department of Housing and Urban Development**

Nelson Carbonell

**AG International/PADCO, Inc**

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## List of Nicaraguan Agencies/Organizations

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AMUNIC	<i>Asociacion de Municipalidades Nicaraguenses</i> Association of Nicaraguan Municipalities
ANIA	<i>Asociacion Nicaraguense de Ingenieros y Arquitectos</i> Nicaraguan Association of Engineers and Architects
BAVINIC	<i>Banco de la Vivienda de Nicaragua</i> Nicaragua Housing Bank
CNC	<i>Cámara Nicaraguense de la Construcción</i> Nicaraguan Chamber of Construction
CRS	Catholic Relief Services
ENACAL	<i>Empresa Nacional de Acueductos y Alcantarillados</i> Nicaraguan Enterprise for Aqueducts and Sanitary Sewers
ENITEL	<i>Empresa Nicaraguense de Telecomunicaciones</i> Nicaraguan Telecommunications Enterprise
FISE	<i>Fondo de Inversion Social de Emergencia</i> Emergency Social Investment Fund
FUNDE	<i>Fundacion Nicaraguense de Desarrollo</i> Nicaraguan Development Foundation
IDR	<i>Instituto de Desarrollo Rural</i> Rural Development Institute
INEC	<i>Instituto Nicaraguense de Estadísticas y Censos</i> Nicaraguan Institute of Statistics and Censuses
INETER	<i>Instituto Nicaraguense de Estudios Territoriales</i> Nicaraguan Institute for Territorial Studies
INIFOM	<i>Instituto Nicaraguense de Fomento Municipal</i> Nicaraguan Institution for Municipal Development
INVUR	<i>Instituto Nicaraguense de Vivienda Urbana y Rural</i> Nicaraguan Urban/Rural Housing Institute
MAG	<i>Ministerio de Agricultura y Ganaderia</i> Ministry of Agriculture and Livestock
MARENA	<i>Ministerio del Ambiente y los Recursos Naturales</i> Ministry of Environment and Natural Resources
MTI	<i>Ministerio de Transporte e Infraestructura</i> Ministry of Transportation and Infrastructure
SAS	<i>Secretaria de Acción Social</i> Secretariat for Social Action
STP	<i>Secretaria Técnica de la Presidencia</i> Technical Secretary of the Presidency

## Executive Summary

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Hurricane Mitch devastated Central America in late October and early November 1998. To coordinate its response, the United States Government (USG) organized an Interagency Working Group, with several Subgroups. The Shelter and Municipal Infrastructure Subgroup dispatched a Task Force to Nicaragua in January 1999. On that team were representatives of

- the United States Agency for International Development (USAID),
- the United States Geological Survey (USGS),
- the United States Army Corps of Engineers (USACE), and
- the United States Department of Housing and Urban Development (HUD)

In addition to fulfilling its Terms of Reference, the team followed guidance provided by USAID/Nicaragua, regarding its areas of strategic focus and timeframe for reconstruction <sup>1</sup>

### Update on Hurricane Mitch

Next to Honduras, Nicaragua (population 4.5 million) was the country hardest hit by Hurricane Mitch. Mitch largely affected the rural north and northwest portions of the country — *Regiones I, II, and VI*. These *regiones* contain 69 municipalities — just under half of all of Nicaragua's municipalities. Damage was associated with historic rainfall levels, with some areas experiencing more than 5 feet of rain during a 10-day period. Nicaragua is periodically affected by hurricanes as well as earthquakes and volcano eruptions. Forecasters project that 1999 could be one of the worst years ever for hurricanes in and around the Caribbean basin.

In Nicaragua, Hurricane Mitch caused an estimated 2,863 deaths and left another 968 persons missing. Some 90 percent of the deaths were associated with one event — the burying of two hamlets in Posoltega by a volcanic mudflow. The Central Bank of Nicaragua estimated the cost of reconstructing damaged property at more than US\$1.3 billion. Much of the physical damage was in the shelter and infrastructure sectors.

In the shelter sector, about 370,600 persons (8 percent of total population) were evacuated during the hurricane, while 65,300 people were placed in temporary shelters. According to initial estimates, 41,420 housing units were damaged or destroyed by Hurricane Mitch. More recent estimates show 25,344 units damaged or destroyed — about 4 percent of total housing stock. Mitch worsened an existing housing deficit, estimated at between 350,000 and 500,000 units.

In the municipal infrastructure sector, Hurricane Mitch damaged secondary and unpaved roads, with reconstruction costs estimated at US\$156 million. Nationwide, about 1,168,000 persons — one-third of the national population — experienced water/wastewater service problems. Mitch damaged more than half of the nation's urban water systems, as well as rural facilities. The

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<sup>1</sup> Per this guidance, the shelter investigation focused on refugee resettlement rather than on broader structural issues in the shelter sector. The municipal infrastructure investigation (following the legal framework) centered on secondary roads and water/wastewater services.

Government of Nicaragua (GON) estimated total damage to water/wastewater infrastructure at US\$10.6 million. Damage to municipal infrastructure comes on top of existing shortfalls in service provision.

### **Hurricane Mitch Recovery: Current Status and Major Constraints**

The GON is coordinating post-Mitch reconstruction. Funds for reconstruction are included in the provisional 1999 national budget. Review of this budget suggests that the GON will assign lead roles in rebuilding municipal infrastructure to the Nicaragua Institute for Municipal Development (INIFOM) and in reconstructing housing to the nascent Nicaraguan Urban/Rural Housing Institute (INVUR). The GON is also developing a National Reconstruction Plan. To date, the municipal sector has unfortunately played little role in shaping this Plan, a situation that USAID/Nicaragua is trying to address. Individual ministries are also proceeding with reconstruction priorities.

Economic damage caused by Hurricane Mitch, coupled with chronic institutional weaknesses, limit local governments' ability to respond to Mitch without outside support. Preliminary data suggest that Mitch-related damage has reduced revenues by 30 percent in affected municipalities. At the same time, unanticipated expenses due to the emergency/reconstruction response have further strained municipal budgets. Municipalities were already suffering from relatively weak income bases.

**Shelter:** Most of the refugees that were in temporary shelter have now left those shelters. They have moved into resettlement areas, temporarily moved in with family members, or returned to their homes or lands.

Due to its multisectoral nature, coordinating the resettlement process has generally fallen to the municipalities. The resettlement process is generally proceeding relatively smoothly in the larger municipalities, but in a more disjointed manner in the smaller locales. A series of local bottlenecks can slow down the resettlement process, including:

- difficulty in identifying land that is environmentally suitable for resettlement,
- lack of access to land ownership data of an acceptable quality,
- lack of other types of geographic information,
- lack of resources to finalize purchase of lands, and
- lack of appropriate procedures for transferring title to beneficiaries.

Various agencies are currently supporting refugee resettlement efforts. The Task Force found, however, that affected municipalities and refugees were not receiving sufficient support in managing the overall resettlement process and overcoming local bottlenecks, as well as in developing and protecting new potable water solutions for rural populations.

The team identified a series of other related shelter and land concerns. Existing land use controls had not stopped people from building in hazardous areas. Due to geographic changes wrought by Mitch, many existing settlements will be at greater risk during future rainy seasons. Likewise, future natural disasters could further expose the problem of inadequate building.

construction techniques. Finally, a series of structural obstacles is preventing the housing and land markets from functioning adequately. International organizations currently engaged in shelter policy dialogue, however, report only modest successes in supporting reform of those markets.

**Municipal Infrastructure** River flooding damaged many bridges. Crews had temporarily repaired bridges on primary roads. However, such solutions will probably only last until the next rainy season. Little reconstruction had occurred to farm-to-market or community roads or bridges. In the past, lack of hydrologic information (and/or bottlenecks in information flows) appears to have prevented many bridges from being properly designed so as to accommodate normal amounts of rainfall. During Hurricane Mitch reconstruction, designing such facilities to take into account rainfall-runoff data would help ensure the effective use of scarce investment resources.

In river channels, local bank stabilization and debris removal efforts were still needed. In addition, some river channels (e.g., Río Grande de Matagalpa and Río Viejo) may have been significantly destabilized, this, however, requires further investigation. The agency responsible for collecting and analyzing such hydrologic and river channel data, the Institute of Territorial Studies (INETER), requires institutional strengthening.

Hurricane Mitch affected water and sewer lines, particularly facilities adjacent to bridges. Crews had generally attempted easy-to-fix repairs, but had not yet undertaken more difficult repairs. These repairs are urgent, as damaged systems can create water-borne disease problems. Many open-pit water wells still require repair and cleaning.

Various agencies are supporting the reconstruction of infrastructure. Constraints or gaps in infrastructure reconstruction include:

- lack of prioritization of highway reconstruction to reflect emergency transportation considerations,
- insufficient resources to finance reconstruction of municipal infrastructure,
- lack of municipal know-how in maintaining rural roads and using and maintaining donated heavy equipment, and
- sedimentation of port channels.

Where financing is available for municipal infrastructure, local governments often lack the institutional capacity to access those funds. Recognizing this constraint, two major development organizations have adopted the strategy of fielding municipal technical units (UTMs) to help smaller local governments apply for funding and otherwise administer the project development cycle. In 1999, agencies apparently plan to field UTMs in municipalities in *Regiones* II and VI, but the majority of *Region* I municipalities will lack such support.

### Proposed Plan of Action

The proposed USG Post-Hurricane Mitch Shelter and Municipal Infrastructure Reconstruction Program will seek to

- 1 improve basic infrastructure and service provision in municipalities affected by Mitch,
- 2 provide for more sustainable communities and infrastructure by means of improved use of environmental information, and
- 3 improve refugee resettlement solutions

To achieve these objectives, the Program is organized into three corresponding components. Program components, USG lead and supporting agencies, implementing agencies and organizations, counterpart agencies, and budget estimates are presented in the table below. Each USG agency will administer its own budget, as follows: USAID, US\$19.4 million, USGS, US\$2.965 million, USACE, US\$10.95 million, and HUD, US\$0.53 million.

### Program Summary

#	Component/ Subcomponent	USG Lead/ Supporting Agency	Implementing Agency/Organization	Counterpart Agency/ Organization	Total Budget (US\$000s)
—	Program coordination/administration	USAID	—	—	600
1	Reconstructed municipal infrastructure	—	—	—	13,200
1 1	Increased resources for municipal reconstruction	USAID	FISE	INIFOM	11,400
1 2	Improved municipal project development and implementation	USAID	FISE	INIFOM	1,400
1 3	Better use of donated heavy equipment by municipalities	USACE/ USAID	—	AMUNIC INIFOM	400
2	Improved environmental information	—	—	—	13,595
2 1	Reconstructed environmental monitoring systems	USGS/ USACE	INETER	—	2,635
2 2	Strengthened capacity for applied environmental analysis	USACE/ USGS	INETER MTI	Various GON agencies ANIA	10,600
2 3	Improved use of environmental data by municipalities	USAID/USGS/HUD	—	AMUNIC	360
3	Improved resettlement solutions	—	—	—	6,450
3 1	Improved resettlement processes	USAID	NGO/contractor	—	2,000
3 2	New/rehabilitated rural water systems	USAID/USACE	NGO	ENACAL	4,100
3 3	Improved self-help home construction techniques	HUD	—	ANIA CNC	350
—	<b>TOTAL</b>	—	—	—	<b>33,845</b>

In addition to these Program components, some Task Force members proposed additional areas for further investigation and possible action. They included modeling water quality for Lake Managua and Lake Nicaragua, modeling volcanic acoustic flow, increasing shelter provision, developing appropriate building and construction codes and standards, and assisting in national- and municipal-level disaster preparedness and response planning.

## **After Hurricane Mitch: Shelter and Municipal Infrastructure Reconstruction in Nicaragua Proposed Action Plan**

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### **Introduction**

Hurricane Mitch, one of the worst hurricanes of the century, swept across Central America in late October and early November 1998 (see Figure 1) <sup>2</sup> The disaster has prompted a massive response from the international community, including various agencies of the United States Government (USG) The USG organized an Interagency Working Group, with several Subgroups, to coordinate its reconstruction response To develop an action plan for reconstruction response in its area, the Shelter and Municipal Infrastructure Subgroup dispatched separate Task Forces to Nicaragua and Honduras, the countries hardest hit by Hurricane Mitch

The present report presents the findings of the Nicaraguan Task Force <sup>3</sup> The Task Force visited Nicaragua from January 19-29, 1999 The Task Force consisted of representatives of the United States Agency for International Development (USAID), the United States Geological Survey (USGS), the United States Army Corps of Engineers (USACE), and the United States Department of Housing and Urban Development (HUD)

The Terms of Reference (TOR) charged the Task Force with (1) assessing damage caused by Hurricane Mitch in the shelter and municipal/community infrastructure sectors, (2) evaluating current levels of reconstruction response, (3) developing a proposed strategy and action plan for additional reconstruction support, and (4) identifying assistance roles for members of the Interagency Task Force The team additionally sought to fulfill its TOR so as to best meet the needs of USAID/Nicaragua Immediately following Hurricane Mitch, USAID/Nicaragua decided to focus reconstruction assistance in four sectors municipal, health, micro-credit, and agriculture<sup>4</sup>, housing is not a Mission priority Mission officials also asked the Task Force to consider a two-year time frame for reconstruction

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<sup>2</sup> The hurricane path shown in Figure 1 does not represent the limits of significant rainfall or damage (see below)

<sup>3</sup> The current (final) version of the report incorporates comments made by USAID/Nicaragua officials and Task Force members on a draft (February 1999) version of the present report This report further synthesizes materials from earlier reports prepared by Task Force members and other inputs Those reports include the following *Assessment of Geographic Information Needs for Hurricane Mitch Reconstruction Response in Nicaragua* (Richard F Moore, USGS), *Damage Assessments of Community Infrastructure and Resettlement Camps* (USACE/USGS), *Volcanic Landslides Debris Avalanches and Debris Flows in Nicaragua Resulting from Hurricane Mitch, October-November 1998 Recommendations for Mitigation* (Kevin Scott USGS) *Hydrologic Assessment of the Central Highlands of Nicaragua January 21-24 1999* (Mark E Smith, USGS) *USAID Nicaragua Mission HUD Draft Report* (Nelson Carbonell, HUD), and *La Situacion Habitacional de Nicaragua Antes y Despues de Mitch* (Edgar Pereira) These reports are available either individually or else as a set, as a supplemental volume to the present report

<sup>4</sup> The USAID/Nicaragua post-Hurricane Mitch reconstruction response reflects a prioritization of sectors within current Mission Strategic Objectives (SOs) SO 1, 'More political participation, transparency and compromise,' includes Good Governance objectives that address the municipal sector SO 2, "Sustainable growth of small producers' income and employment," includes agricultural and micro-credit objectives SO 3, "Better educated, healthier, smaller families," includes health objectives The Mission is currently (February 1999) developing a Special Objective related to post-Hurricane Mitch reconstruction during a two-year time frame it is hoped that the present report will serve as an input into that process

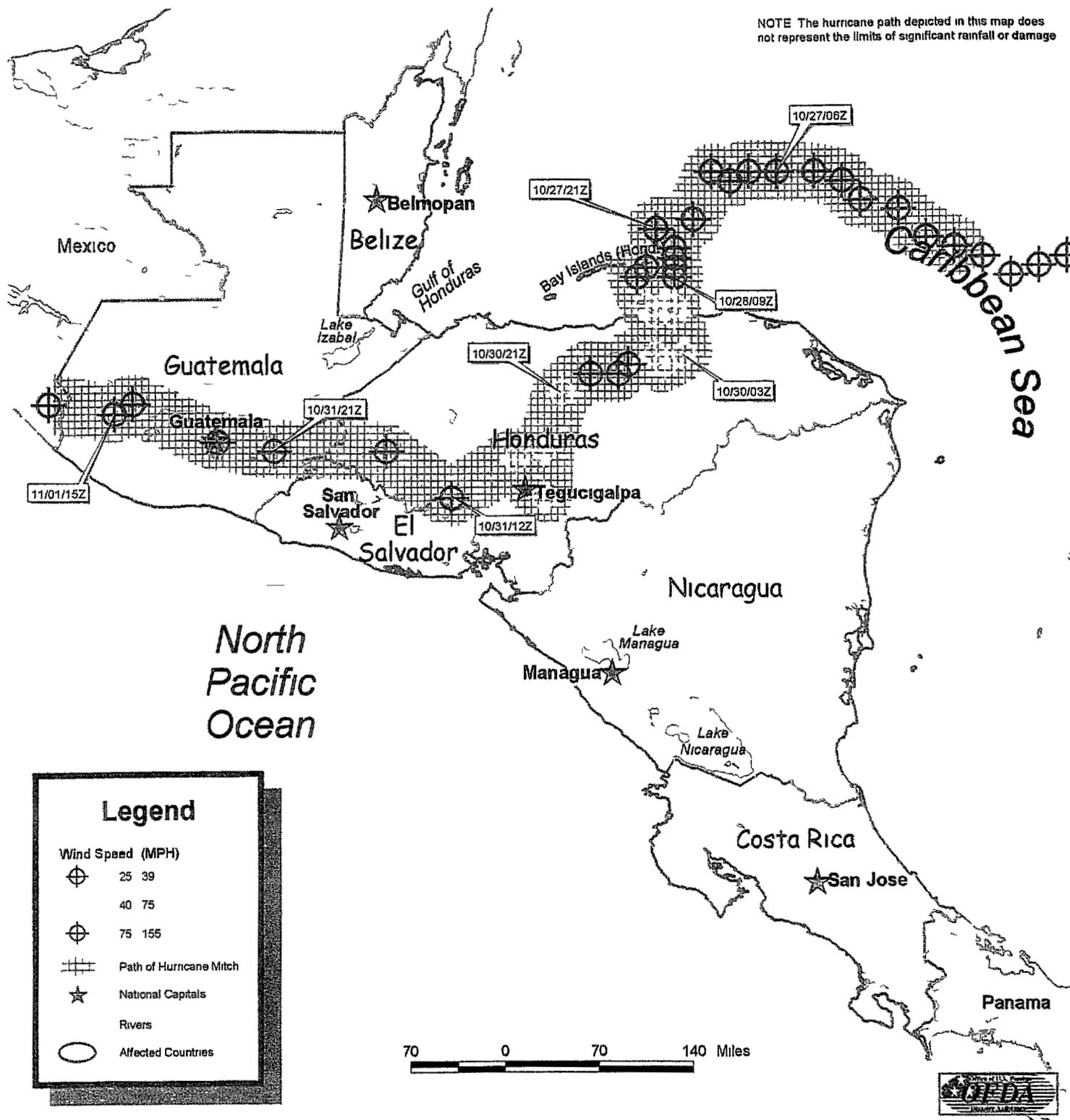
Figure 1

# Track of Hurricane Mitch

From October 26 to November 1, 1998



NOTE The hurricane path depicted in this map does not represent the limits of significant rainfall or damage





Bearing in mind those considerations, the Task Force's *shelter sector* investigation focused on the resettlement of refugees and other Hurricane Mitch-related shelter issues, rather than on long-term sector development. The *municipal infrastructure* investigation focused on infrastructure related to the following core municipal services affected by Hurricane Mitch<sup>5</sup>

- construction and maintenance of intra-municipal roads and bridges,
- storm sewer and drainage,
- potable water supply and distribution, and
- wastewater collection and treatment

While in-country, the Task Force met officials and other persons and gathered data.<sup>6</sup> The team broke into two groups and visited 10 municipalities in the area affected by Hurricane Mitch (see Figure 2 and Appendix A). These municipalities ranged in size from León (pop. 160,000, 1998 budget US\$3.8 million) to Posoltega (pop. 17,000, 1998 budget US\$0.1 million).

The assessment presented below uses the following methodology. Damage caused by Hurricane Mitch (Section 1) is compared with reconstruction efforts to date (Section 2) to yield the constraints or gaps in the reconstruction effort (Section 3). The proposed plan of action (Section 4) is designed to respond to those constraints or gaps in the effort.

## 1 Update on Hurricane Mitch Damage Assessment

Following summaries of Hurricane Mitch and its overall impact on Nicaragua, we present assessments of damage initially caused by Mitch in the shelter and municipal infrastructure sectors. (Recent reconstruction efforts have since improved the situation, as is presented in Section 2, below.)

### 1.1 Nicaragua and Hurricane Mitch

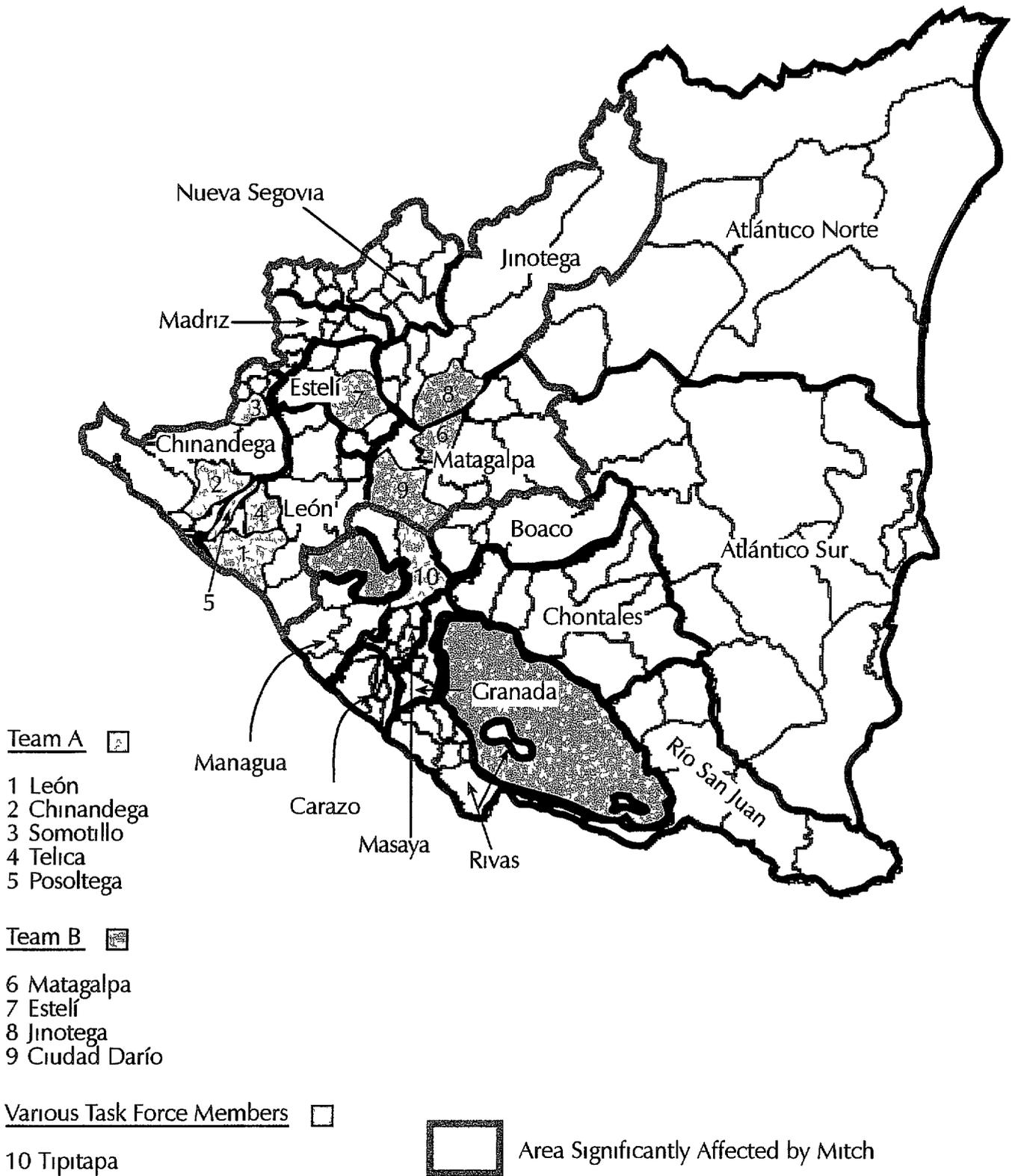
Nicaragua, population about 4.5 million, is the second poorest country in the Western hemisphere, with annual per capita income of US\$410 in 1997. The Nicaraguan economy has been booming recently, after falling in the 1980s and stagnating in the early to mid-1990s. In 1998, Nicaragua's economy was growing at an annual rate of about 6 percent and was the second fastest-growing economy in Latin America.

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<sup>5</sup> Municipal responsibilities are defined in the Municipal Law, No. 40, as amended by Law No. 261 (1997), see Article 7. Other laws and institutions also affect municipal responsibilities, actual local government responsibilities are discussed below.

<sup>6</sup> A list of persons interviewed is being supplied to USAID/Nicaragua under separate cover.

**Figure 2**  
**Municipalities Visited by Team in Area Affected by Mitch**





After Honduras, Nicaragua was the country hardest hit by Hurricane Mitch. At its peak, Mitch was a category 5 hurricane. Mitch largely affected the rural north and northwest portions of the country, closest to the storm's path (see Figure 1, page 2). Those areas, also shown in Figure 2 (page 4), include

- *Región I* (*Departamentos* of Nueva Segovia, Madriz, Estelí),
- *Región II* (*Departamentos* of Chinandega, León), and
- *Región VI* (*Departamentos* of Jinotega and Matagalpa) <sup>7</sup>

Together, affected *Regiones* I, II, and VI contain 69 *municipios* — just under half (47 percent) of all municipalities. This area is the focus of the present assessment. Other areas affected include areas adjacent to Lake Managua and lands along Rio Coco and Rio Grande de Matagalpa in the eastern part of the country.

Damage in Nicaragua was associated with historic rainfall levels, rather than with the high winds more closely associated with the storm's direct path. During a 10-day period, more than 5 feet of rain fell on some parts of northern Nicaragua. The highest levels of rainfall were recorded in *Region II*, followed by *Region VI* (see Table 1). According to the Institute for Territorial Studies (INETER), the recurrence interval for such a storm is greater than 500 years in the dry regions of San Isidro, around 200 years in other parts *Región VI* (Jinotega), and greater than 100 years for Chinandega <sup>8</sup>. These figures emphasize the extreme magnitude of Hurricane Mitch in Nicaragua.

**Table 1**  
**Peak Rainfall Recorded during 10-Day Period during Hurricane Mitch (by *Región*)**

<i>Region</i>	Municipality	Peak Rainfall Recorded in <i>Region</i>		Percent Above Normal*
		Millimeters	Inches	
II	Chinandega	1611.6	63.5	1,513%
VI	San Isidro B	784.8	30.9	2,796%
I	Ocotal	564.6	22.2	1,406%
III	Managua	544.9	21.5	811%

\* Percent difference from long-term average rainfall for the same 10-day period (1966-1998)

Source: INETER

<sup>7</sup> Nicaragua's territory is subdivided into *regiones* (9), *departamentos* (16), and *municipios* (147). Of those divisions, only *municipios* represent a true level of government. (The exceptions to this rule are the *Region Autonoma Atlantico Norte* [RAAN] and the *Region Autonoma Atlantico Sur* [RAAS].)

<sup>8</sup> A recurrence interval (or return period) of 100 years translates into a 1 percent chance of occurrence in a given year.



Hurricane Mitch was among the worst of a series of natural disasters that have periodically disrupted life in the Central American isthmus. Over the last 25 years, the City of León, for example, has been hit by six hurricanes and tropical storms, two volcano eruptions, and one tsunami. The U.S. National Oceanic and Atmospheric Administration (NOAA) projects that 1999 could be one of the worst years ever for hurricanes in and around the Caribbean basin, with around 14 named storms predicted.

## 1.2 Overall Impacts of Hurricane Mitch on Nicaragua

In Nicaragua, the storm caused some 2,863 deaths, left another 968 persons missing, and affected some 868,000 more. Some 90 percent of the deaths were associated with a single event: the burying of two *comarcas* (hamlets) in Posoltega by a volcanic mudflow (*lahar*) from Volcano Las Casitas (see Photo 1). Damage to property was largely associated with riverine flooding, flooding due to rainwater, and landslides (see Photos 2 and 3).

The Central Bank of Nicaragua preliminarily estimated the cost of reconstruction at more than US\$1.3 billion. The World Bank has estimated that direct and indirect damages amount to US\$900 million, costed at the actual (depreciated) value of buildings and infrastructure. Actual replacement costs of these facilities would involve an additional US\$1.2 billion.

Much of the physical damage caused by Hurricane Mitch in Nicaragua was in the shelter and infrastructure sectors. Inter-American Development Bank (IDB) and United Nations Development Programme (UNDP) estimates agree that, of the total damage caused in the social and infrastructure sectors, some 30–40 percent represented housing, while around 55 percent was in the transportation or water/sanitation sectors. The shelter and infrastructure sectors likewise represent top reconstruction priorities for local elected officials. According to a January 1999 survey, the top reconstruction priorities for 20 mayors in municipalities affected by Hurricane Mitch were housing/resettlement (25 percent), rural roads (18 percent), and bridges (11 percent), as well as aid to farmers (11 percent). Impacts in the shelter and municipal infrastructure sectors are described below.

## 1.3 Shelter

An estimated 370,600 persons were evacuated during the hurricane (8.2% of the population), and 65,300 people were placed in temporary shelters. Estimates of housing units damaged or destroyed by Hurricane Mitch have varied. The Government of Nicaragua (GON) initially estimated that 17,566 units had been damaged and 23,854 units destroyed, for a total of 41,420 housing units. More recently, the Secretariat for Social Action has estimated that 15,514 units were damaged and 9,830 units destroyed, for a total of 25,344 housing units — 4 percent of the country's pre-Mitch housing stock of 630,000 units. Three-quarters of the affected units were in *Regiones* I, II, or VI, and 70 percent were in rural areas. Hurricane Mitch exacerbated Nicaragua's current housing deficit, estimated at between 350,000 and 500,000 units.

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**Photo 1**  
*Mayor of Posoltega  
inspects debris from  
volcanic mudflow (lahar)  
from Volcano Las Casitas  
This single event killed  
more than 2,000 persons*



**Photo 2**  
*Destruction caused by flooding to a bridge in Somotillo*

**Photo 3**  
*Hurricane Mitch also  
damaged water/wastewater  
facilities, including this  
sewer line adjacent to a  
bridge site in Esteli*





## 1 4 Municipal Infrastructure

### 1 4 1 Roadway Network

The World Bank has estimated that Hurricane Mitch damaged about 8,000 kilometers of paved and unpaved roads, as well as more than 50 bridges, these figures include both facilities maintained by the Ministry of Transportation and Infrastructure (MTI) and secondary/unpaved roads maintained by municipalities or communities. The MTI and the GON Reconstruction Infrastructure Committee initially estimated total reconstruction costs at US\$804 million. About 20 percent of that total (US\$156 million) represents secondary and unpaved roads, which are presumably maintained by municipalities and communities (see Table 2) <sup>9</sup>

**Table 2**  
**Damage to Secondary and Primary Roadway Networks**  
**Preliminary Estimates of Reconstruction Costs**

Sector	Estimated Cost (US\$000s)
Highways/Primary Roads	647,637
Unpaved Roads	131,880
Secondary Roads	24,220
<b>Total</b>	<b>803,737</b>

Source: Central Bank, MTI, and Reconstruction Infrastructure Committee

### 1 4 2 Water/Wastewater

The Nicaraguan Enterprise for Aqueducts and Sanitary Sewers (ENACAL) estimates that at the height of the emergency, Hurricane Mitch had reduced water/wastewater services nationwide to about 40 percent of previous service levels. About 1,168,000 persons — one-third of the national population — experienced service problems: 998,000 persons in urban areas and 170,000 rural inhabitants.

More than half of the nation's urban water systems (79 of 152) were damaged by Hurricane Mitch <sup>10</sup>. Most damage occurred in *Regiones* I, II, III, and VI, but there was additional damage reported in *Regiones* IV and V (see Table 3). Fourteen of those systems (all in the *Departamentos* of Matagalpa and Jinotega) are administered by municipalities. Hurricane Mitch damaged nine urban wastewater systems. Damaged water/wastewater facilities included groundwater collection (24), wells (20), pumping stations (67), and about 52 kilometers of pipes.

<sup>9</sup> These estimates may be incomplete, as they include reconstruction of specific secondary roads in *Regiones* I and VI but not II, which was also badly hit by Hurricane Mitch.

<sup>10</sup> ENACAL owns all urban water/wastewater systems and administers most systems. The exceptions are municipalities in the *Departamentos* of Matagalpa and Jinotega, where responsibility for administering those systems has been delegated to those local governments.



**Table 3**  
**Water Systems Affected by Hurricane Mitch**

<i>Region</i> (in order of impact)	<i>Departamento</i>	No of Systems*	Population Affected
II	León	15	215,159
	Chinandega	12	229,407
I	Estelí	5	101,981
	Madriz	7	28,217
	Nueva Segovia	10	73,596
III	Managua	10	93,205
VI	Matagalpa	9 **	123,693
	Jinotega	5 **	42,341
V	Boaco	3	33,730
	Chontales	2	55,231
IV	Granada	1	1,714
<b>Total</b>	—	79	998,274

\* Systems administered by ENACAL unless noted otherwise

\*\* Systems administered by Municipalities

Source ENACAL December 1998

The hurricane also damaged about 958 rural water works 434 wells dug by hand, 200 wells with pumps, 243 gravity-operated mini-aqueducts, 46 mini-aqueducts with pumps, and 35 spring-water collectors. Many of these facilities are directly administered by local water committees.

ENACAL estimates total damage at US\$10.6 million. This amount includes US\$6.9 million for urban systems administered by ENACAL and rural systems, and US\$3.6 million for systems administered by municipalities. Damage to water/wastewater infrastructure comes on top of existing shortfalls in service. In 1998, for example, ENACAL estimated that only 33 percent of rural inhabitants enjoyed access to potable water.

## 2 Status of Hurricane Mitch Recovery

Following reviews of (1) GON coordination of the response and (2) overall municipal capacity to assist in response, we examine the status of recovery after Hurricane Mitch in the (3) shelter and (4) municipal infrastructure sectors.

### 2.1 Overall GON Coordination of Reconstruction

The GON is coordinating post-Hurricane Mitch reconstruction. Initially, six sectoral commissions formulated sectoral reconstruction plans. Shelter concerns were divided between the Social and Infrastructure Commissions, while municipal infrastructure was handled by the Infrastructure Commission. In February 1999, those sectoral commissions were phased out.



President Arnoldo Aleman is currently being advised by a National Planning Council,<sup>11</sup> whose responsibilities are related to formulation of a National Reconstruction Plan. The GON expects to present such a Plan to the Consultation Group Meeting scheduled for May 1999 in Stockholm.

The national budget, currently being debated by the National Assembly, contains resources to finance implementation of the National Reconstruction Plan for 1999 and provides some information on assignment of responsibilities. The Nicaraguan Institution for Municipal Development (INIFOM) is apparently being assigned a lead role in rebuilding local infrastructure. The provisional budget assigned US\$3.8 million to INIFOM for reconstruction activities, in addition to its normal budget. INIFOM officials indicate that these resources will fund roadway reconstruction as well as infrastructure related to municipal services (markets, cemeteries, and parks). Lead agency responsibility related to shelter remains less clear. The provisional reconstruction budget includes about US\$13.8 million to the Nicaraguan Urban/Rural Housing Institute (INVUR) for housing projects for those displaced by Mitch. The MTI and the Nicaragua Housing Bank (BAVINIC) may also play some role, however, documents available to the Task Force did not clarify specific responsibilities.

To date, the municipal sector has unfortunately played little role in shaping the National Reconstruction Plan. The exclusion of local representative governments from this process is unfortunate, given that several larger municipalities provided the Task Force with copies of approved capital investment programs and their updated reconstruction priorities. The Association of Nicaraguan Municipalities (AMUNIC), which is made up of member municipalities, is not a member of the National Planning Council. USAID/Nicaragua began to address this situation early in its response to Hurricane Mitch. Via its Municipal Autonomy and Development Project (discussed below), the Mission is supporting AMUNIC in bringing municipal priorities to the attention of those shaping the National Reconstruction Plan.

At the same time that the National Reconstruction Plan is being formulated, individual GON entities, supported by international organizations, are proceeding with immediate reconstruction priorities. Those actions in the shelter and municipal infrastructure sectors are described below in Sections 2.3 and 2.4, respectively.

## 2.2 Overall Municipal Capacity to Assist in Reconstruction

Economic damage caused by Hurricane Mitch is affecting municipal revenues, this impact in turn affects local governments' ability to respond to Hurricane Mitch and provide basic services. No comprehensive data are yet available that show this fiscal impact, trendline analysis is also somewhat premature due to normal month-to-month fluctuations. Some initial observations are, however, possible.

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<sup>11</sup> Members include representatives of the Ministerio de Transporte e Infraestructura, Ministerio de Relaciones Exteriores, Ministerio de Credito Publico, Ministerio de Fomento de Industria y Comercio, Ministerio Agropecuario y Forestal, Banco Central, Secretario de la Presidencia, Secretario Tecnico, Secretario de Accion Social, Secretario de Cooperacion Externa, Instituto de Desarrollo Rural, COSEP and a number of NGO, labor, and civil society organizations.



For two municipalities studied in detail, total income for December 1998 was substantially less than income of a year before. Moreover, the impact appeared somewhat greater in the smaller, poorer municipality. In León, total income for December 1998 had decreased by 23 percent over the year before, whereas income was down 31 percent in Telica for the same period (see Appendix B). A larger municipality like León, which in recent years has received about a third of its income from external donations, is less reliant on own-source revenues than is a small municipality like Telica. The economic impacts of Hurricane Mitch are, of course, felt in revenues mobilized locally, rather than in external donations.

To date, Hurricane Mitch has had an uneven impact on the various own-source revenues. In Telica, revenues from the property tax and the vehicle tax plummeted to virtually nothing after Hurricane Mitch, in November and December 1998. (Taken together, these sources account for more than a fifth of Telica's 1998 budget.) León showed similar declines in the vehicle tax and possibly in the property tax. Curiously, to date neither León nor Telica has shown decreases in income from the sales and service tax, the mainstay of municipal own-source revenues. This may reflect in part a short-term "counter-cyclical" impact of the hurricane, as certain sectors benefit from reconstruction contracts. In Telica, for example, an official reported that income from the sales and service tax was up, due to increased sale of cement block from a municipal-owned business resulting from reconstruction work.

At the same time as incomes were generally declining as a result of Hurricane Mitch, municipal budgets were further strained by increased expenses due to emergency response. Officials reported needing to meet a number of emergency demands during and after Hurricane Mitch that were not foreseen in approved budgets.

Hurricane Mitch affected municipalities already suffering from relatively weak income bases. In 1995, subnational spending in Nicaragua represented only 5.2 percent of total government spending. This is less than the ratios for subnational/total government spending in Guatemala (10.3 percent) and Honduras (12.3 percent) and well below averages for Latin America (14.6 percent) and industrial economies (34.9 percent). This relatively low level of municipal spending in Nicaragua implies little direct investment in public works. An INIFOM official estimates that, in recent years, a handful of larger municipalities may have invested up to 20-30 percent of their income in projects. (The USAID MADP, described below, is encouraging participating municipalities to invest in capital improvements.) Officials in Chinandega (pop. 117,000), for example, report that they invested 30 percent of their 1998 budget in public works, or about US\$784,000. Given Mitch's impacts on municipal income noted above, however, municipalities can be expected to curtail their capital investment based on own-source revenues over the next couple of years. Municipalities are not currently required to invest a minimum amount of their income in public works.

Current fiscal policies may particularly hurt smaller municipalities, while having an uncertain net impact on larger local governments. In January 1998, the GON reduced the incidence of the municipal sales and service tax — the most important source of municipal income — from 2.0 percent to 1.5 percent, this rate is scheduled to drop still further, to 1.0 percent, in January



2000 To make up for this loss, the Government and international organizations are helping municipalities strengthen their cadastres to improve property tax collections. While laudable, such compensating benefits may be largely confined to larger municipalities with the capacity to administer a cadastre, leaving poorer municipalities with a net loss. Unlike their counterparts elsewhere in the region, Nicaraguan municipalities receive virtually no intergovernmental revenue transfers<sup>12</sup>, depending on how they are structured, such transfers can be particularly important for smaller, poorer municipalities.

## 2.3 Shelter

### 2.3.1 Findings Regarding Resettlement Process Based on Field Visits

Most of the 65,300 refugees that were in temporary shelters during Hurricane Mitch have now left those shelters. This means that nearly all of the schools used as temporary shelters were available when classes resumed in mid-February 1999. These refugees have either moved into resettlement areas, temporarily moved in with family members, or returned to their homes or lands.

Due to its multisectoral nature, coordinating the resettlement process has generally fallen to the municipalities. The field investigation revealed that the resettlement process is generally proceeding relatively smoothly in the larger municipalities, but in a more disjointed manner and with less international support in the smaller municipalities.<sup>13</sup> The Municipality of León (pop. 162,000), for example, with the support of international agencies and various sister cities, is well along the way to resettling families who lived in the 423 houses destroyed by the hurricane. In Somotillo (pop. 25,000), on the other hand, of about 1,000 refugee families, only about 100 have located on lands provisionally identified for resettlement, leaving some 90 percent without even such *ad hoc* measures. Somotillo has a limited annual budget (US\$100,000 in 1998), has no active sister cities, and to date has attracted little international assistance.

Figure 3 shows a typical resettlement process. The Task Force found that a series of local bottlenecks can slow down this process. Bottlenecks in the initial steps of the process are particularly critical, as they impede subsequent subdivision, titling, improvements to basic services, household investment in homes, etc. While no municipality experienced all potential problems, a substantial number of municipalities visited were faced with at least one of the following bottlenecks:

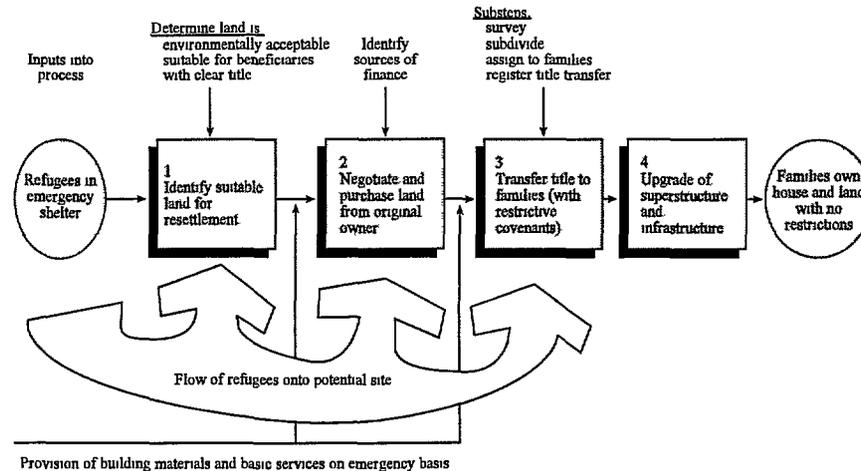
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<sup>12</sup> Nicaraguan municipalities receive a nominal transfer based on the number of primary and secondary students in each municipality.

<sup>13</sup> The exception to this rule is Posoltega. International media coverage of destruction caused by the *lahar* from Volcan Casitas has attracted a high level of response from the international community.



**Figure 3**  
**Major Steps in Refugee Resettlement Process**



**Difficulty in identifying land that is environmentally suitable for resettlement** This concern has been heightened due to recent changes in local hydrology and landslides. Temporary refugee sites inspected in Matagalpa and Jinotega, for example, were at risk from future flood or mud-landslide hazards. In Chinandega, officials had made one urban site available for emergency resettlement (El Limonal). Before proceeding with subdivision, however, they needed technical advice about the site's long-term suitability for housing, given that the site was bounded by a garbage dump, a primary sewage treatment facility, and a cemetery (see Photo 4). Such noncompatible adjacent land uses can contaminate groundwater and otherwise pose environmental risks to inhabitants. Environmental concerns can slow down the regularization of resettlement sites. Officials in Telica, for example, noted that they were waiting for some qualified person to inspect a proposed resettlement site and pronounce it safe to occupy before proceeding.

**Lack of access to land ownership data of an acceptable quality** Difficulty in identifying land with clear title, a widespread problem in Nicaragua, limits the investigation of alternatives and generally impedes the process. USAID/Nicaragua and other international agencies have been supporting modernization of land titling and registration systems, this process, however, is not yet complete.

**Lack of other types of geographic information** may also make it hard to identify land suitable for the target beneficiaries. Farmers need to live close to their farmlands, while urban workers require access to urban areas. Those conditions are not always met. Some refugees from the *lahar* tragedy in Posoltega, for example, are now living in settlements in Chinandega at some distance from their original lands (see Photo 5). Such displaced farmers may begin to gradually reestablish their homes on those at-risk lands, rather than face a long daily journey between home and field.

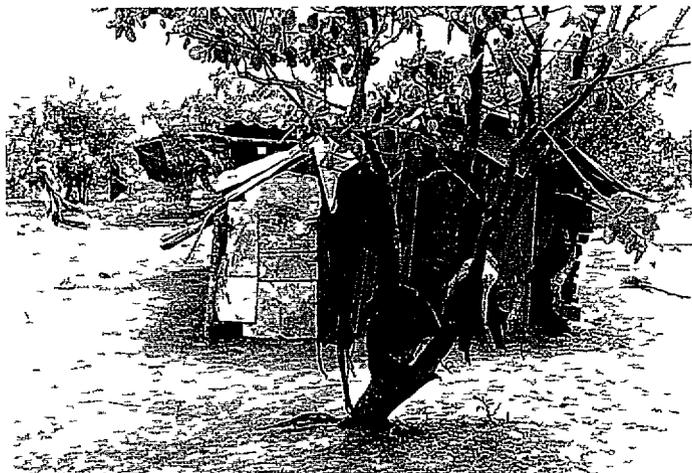


**Photo 4**  
*Garbage dump adjacent to refugee settlement El Limal in Chinandega. The dump itself is inappropriately sited next to a river visible in the middle ground. Flooding from Hurricane Mitch washed away much of the garbage.*



**Photo 5**  
*Survivors of the Las Casitas tragedy in refugee camp in Chinandega, at some distance from their original homes.*

**Photo 6**  
*Temporary shelter in Somotillo. Land had not yet been purchased or subdivided, which was impeding development of on-site infrastructure and household investment in homes.*





- **Lack of resources to finalize purchase of lands** In Jinotega, for example, municipal officials had been unable to afford privately owned land (which is suitable and available) to resettle refugees. In some municipalities (Somotillo, Posoltega), the Mayor had been promised some funds by the GON, but those resources had not yet materialized<sup>14</sup>. This has delayed land subdivision, causing people to erect provisional shelters without knowing which lot they will be eventually assigned (see Photo 6, page 14). Other mayors (e.g., Telica) have been successful in buying land or else in swapping land in exchange for forgiveness of municipal tax debt.
- **Lack of appropriate procedures for transferring title to beneficiaries** Few, if any, municipalities have advanced to this stage in the resettlement process. Discussions with local officials indicated uncertainty or at times dubious ideas about the best way to structure such transfers, for example, what restrictions (if any) should be placed on beneficiaries regarding reselling property titles.

### 2.3.2 Efforts to Support Resettlement Process to Date

The GON and international agencies have adopted different approaches in supporting the local resettlement process. Their strategies and areas of geographic focus are summarized in Table 4 and described in more detail in Appendix C.

**Table 4  
Support to Resettlement Process to Date**

Entity	Technical Strategy				Geographic Focus	
	Bldg Materials	Perm Shelter Solutions	Process (titling, etc)	Basic Envir Services	25 Muns *	Rest of Study Area
Secretaria de Accion Social						
Nica Housing Bank and others						
UNDP						
NGOs (CARE etc)						

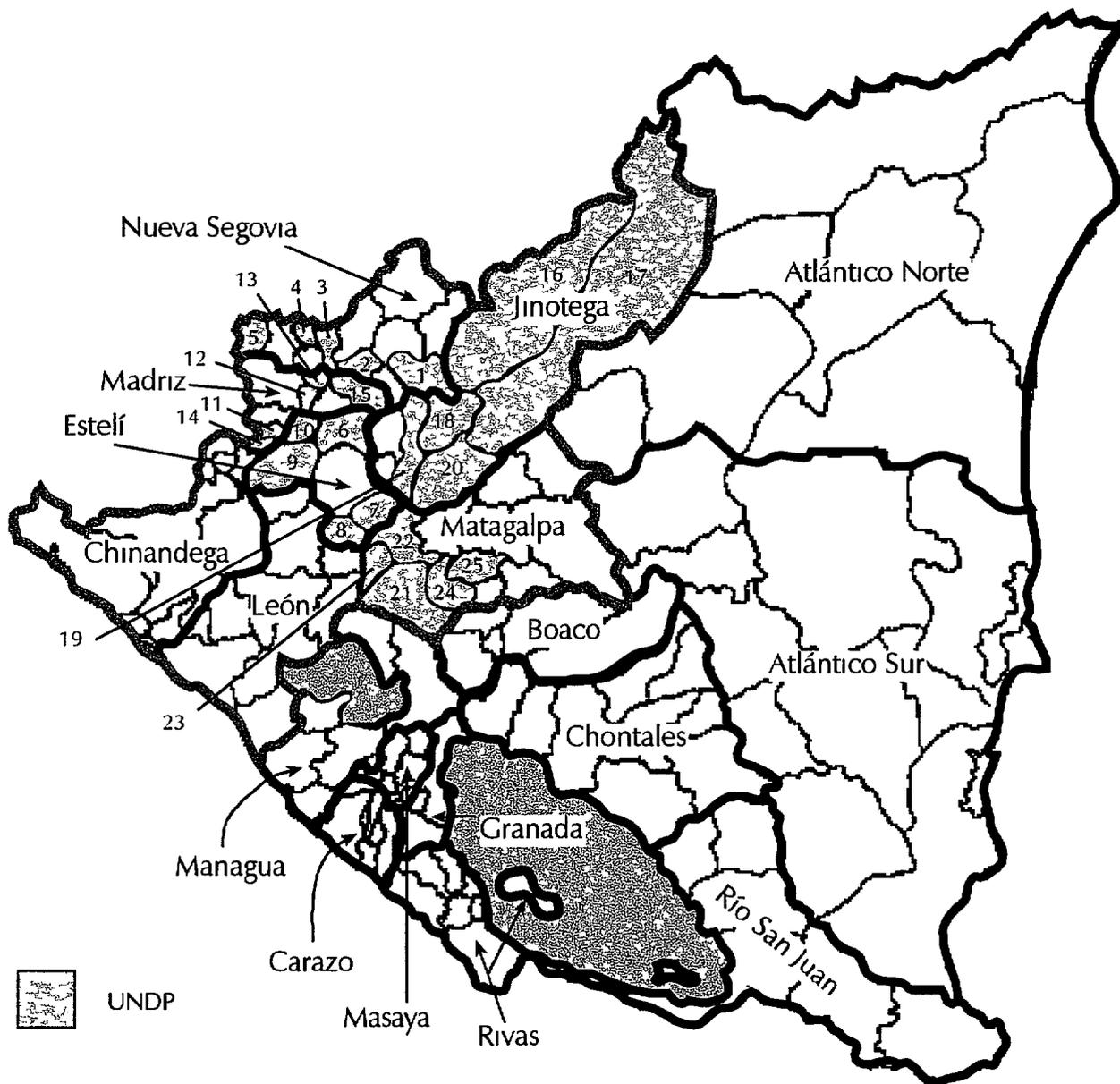
\* See Figure 4

Constraints or gaps in this assistance are as follows:

- The United Nations Development Programme (UNDP) is helping 25 municipalities in five *departamentos* manage the overall resettlement process (see Figure 4). Their US\$2.3 million project provides a small pool of resources to participating municipalities in the resettlement and reconstruction process (e.g., land identification, topographic and hydrologic analysis, legal advice on title transfer, etc.). This type of assistance is not, however, reaching the other 44 or so municipalities affected by Hurricane Mitch.

<sup>14</sup> The process for using GON resources to buy land for resettlement has yet to be finalized. An official from the Secretary of Social Action maintained that Central Government officials would be better able to strike hard bargains with landowners than would municipal officials, who might pay inflated sums to their cronies. This is debatable.

**Figure 4**  
**Municipalities Receiving Support in**  
**Managing the Resettlement Process**



<u>Nueva Segovia</u>	<u>Estelí</u>	<u>Madriz</u>	<u>Jinotega</u>	<u>Matagalpa</u>
1 Quilali	6 Condega	11 La Sabana	16 Wiwili	21 Ciudad Dario
2 C Antigua	7 La Trinidad	12 Yalaguina	17 Cua Bocay	22 Sebaco
3 Mozoute	8 San Nicolas	13 Totogalpa	18 Pantasma	23 San Isidro
4 Dipilto	9 San Juan de Limay	14 Cusinapa	19 San Rafael del Norte	24 Terrabona
5 Santa Maria	10 Pueblo Nuevo	15 Telpaneca	20 Jinotega	25 San Dionisio


 Area Significantly Affected by Mitch



- A representative of CARE indicated that, while donors have pledged sufficient resources to clear *existing* water wells, significant additional resources are needed to develop and protect *new* potable water solutions for rural populations affected by Hurricane Mitch. In Somotillo, refugees were still drinking untreated river water. They were in the process of completing a water well, but had no way to stabilize that well (see Photo 7). In Tipitapa, the 1,500 refugees at a camp called Tierra Prometida were walking some two kilometers for water. A water tank had been delivered, but was not yet operational.
- Building materials provided by the Secretaria de Accion Social were reaching many target beneficiaries. However, refugees generally had to supplement those materials to construct a shelter (see Photo 8). Likewise, some latrines, built using donated materials, were not being dug to sufficient depths and were being constructed on soils that will not percolate.

### 2 3 3 Other Shelter and Land Issues

Much of the destruction to shelter caused by Hurricane Mitch can be attributed to housing located in environmentally risky areas. Environmental risk is an important topic in a country like Nicaragua, where seismic activity, steep slopes, and volcanic activity often coincide with rich agricultural land, rivers, and human settlements. Planning and land use control systems were not functioning to the minimum extent necessary to identify areas prone to flooding and landslides and to keep people from building in those areas.<sup>15</sup> While a handful of larger municipalities have some capacity to regulate land use (e.g., Estelí, with a geographic information system unit and other resources), the great majority do not.

A related issue involves settlements that will be at greater environmental risk during future rainy seasons. This risk results from increased likelihood of bank sloughing, landslides, altered river channels, etc. The team observed some residents rebuilding homes where their previous dwellings had washed away (e.g., in Leon) or had been affected by mud/landslides (e.g., in Jinotega). In Somotillo, the mayor showed the Task Force an interrupted landslide brought about by Hurricane Mitch that could threaten several *comarcas* during the next rainy season (see Photo 9). The team likewise observed many potential unstable material masses in hillsides surrounding Matagalpa, which could be subject to release due to gravity or additional rainfall. Municipalities had received little technical support to date in identifying altered environmental risk to existing communities, or in controlling land use so as to reflect environmental risk.

INETER is widely seen as the responsible government agency to provide municipalities and government agencies with information on environmental risk among other responsibilities. INETER maintains national seismologic and volcanic monitoring systems, has prepared maps

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<sup>15</sup> Hurricane Mitch, considered by some a 500-year event, would have undoubtedly damaged or destroyed some houses even if land use controls had been designed to reflect 100-year flooding conditions. However, much less damage would have resulted under those conditions.

Another flooding-related problem involves formerly agricultural fields that the deposits of gravel or rocks or the stripping of topsoil due to flooding from Hurricane Mitch has rendered unusable in their present condition. This issue, which merits further attention, is outside the current SOW.



**Photo 7**

*Refugees in front of open pit water well they had dug in resettlement area in Somotillo They sought assistance to keep the well from collapsing during the next rainy season*



**Photo 8**

*El Limonal refugee site in Chinandega shows various construction techniques for shelter plastic sheets over wooden frame, cardboard over wooden frame and zinc sheets over wooden frame Refugees have generally supplemented donated materials (e g , zinc sheets) with other materials to complete construction*



**Photo 9**

*Members of Task Force with the Mayor of Somotillo (at center in straw hat) inspect a "split" in the hilltop that signals an interrupted landslide in Cerro Los Coyotes The next rainy season could bring an avalanche down on top of two hamlets located at the foot of the hill*



of volcanic risk, and has provided land use mapping services to several municipalities (e.g., Matagalpa). Unfortunately, limited personnel and resources,<sup>16</sup> spread thinly among a broad group of mandates,<sup>17</sup> have restricted INETER's direct support to local-level environmental decision making.

Building construction techniques represents another area of concern. A Task Force member concluded that homes were not being built to withstand high winds or earthquakes: roofs were not properly tied to bearing walls, masonry walls were not reinforced and tied to the foundations, exterior walls were not braced, etc. Future natural disasters that involve high winds or earthquakes could expose the problem of inadequate construction techniques to a greater degree than did Hurricane Mitch, which did not generally involve high winds in Nicaragua.

In broader terms, in recent years analysts have identified a series of legal and institutional obstacles that prevent the housing and land markets from functioning adequately. Those obstacles include the lack of a sustainable system of credit for lower-middle-income families, institutional weaknesses, a lack of inter-institutional coordination, ineffective government programs that produce a limited number of overly expensive housing solutions, inappropriate subdivision and building codes, etc. International organizations engaged in sector policy dialogue, however, report only modest successes in supporting reform of the housing and land markets over the last several years. For example, the GON has legally established INVUR, however, it has been slow to fund that organization. Nor has the GON completed liquidating BAVINIC as planned. The Government is, however, proceeding with streamlining the building permit process. Officials have scheduled the opening of a one-stop window in the Managua City Hall in early 1999.

## **2.4 Municipal Infrastructure**

### **2.4.1 Findings of Field Visits**

#### **Roads, Bridges, and Other Transportation Issues**

The Task Force observed much damage to bridges due to riverine flooding. Flooding was extensive. Close to Darío, high-water marks (debris in trees) were 4–5 meters above road level and perhaps 15–25 meters above the low-water channel. The total width of the channel during the flood appeared to be at least 100–150 meters wide, while the low-water channel was perhaps 15–20 meters wide. Such flooding washed out or damaged many bridges. In Estelí, for example, all major bridges in town were damaged or destroyed by flooding. Primary roads were, however, passable. Bridges on primary roads have been temporarily repaired, often using low-water

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<sup>16</sup> INETER's total budget in 1997 was about US\$5.1 million. Expenditures included about US\$4.1 million in capital investment and the rest in current expenses. Eighty-three percent of capital investment was financed by international organizations, principally the World Bank. In 1997, INETER boasted a staff of 365, including about 100 professionals and department heads and another 100 *tecnicos medios*. For further information on INETER, see Appendix D.

<sup>17</sup> INETER's organizational structure generally reflects its areas of technical expertise and responsibility. INETER includes departments of geography/cartography, meteorology, water resources, geophysics, land use planning (*ordenamiento territorial*), environmental (natural) risk and investment projects. See also Appendix D.



bridge crossings (see Photo 10) Such solutions, however, will probably only last until the next rainy season and may result in additional hazards as residents attempt to use these crossings during high flows

Little reconstruction had occurred to farm-to-market or community roads or bridges. Dirt or natural stone roadways were in various conditions. Some grading had been performed, but additional effort was needed in establishing river crossing approaches (usually sandy material), since most rivers are generally now deeper and wider than before the hurricane. Bridges damaged on secondary roads might not even feature temporary solutions (see Photo 11) <sup>18</sup>

Other urban damage observed in multiple locations involved the total removal of natural armoring of river banks. The team observed several bank failures adjacent to urban uses, including cemeteries (see Photo 12). Some reconstruction of damaged flood walls adjacent to urban streets and cemeteries was observed, but local bank stabilization efforts were still needed. Without such local stabilization, bank sloughing and head cutting are likely future events that will reduce the efficiency of the channels and create land loss for the property owners immediately adjacent to the channels.

In addition to such local channel stabilization concerns, large-scale channel destabilization is an issue that merits further investigation. For example, the area of overflow from Río de Grande de Matagalpa to Río Viejo visited by the Task Force may have been significantly destabilized. Río Estelí may experience major channel changes in the future. There may be other river systems in Nicaragua that are now unstable and will be subject to more channel changes in the future.

Debris removal is also a priority before the next rainy season. During heavy rains, debris in river channels might be moved into bridge openings and could conceivably cause the collapse of recently repaired bridges. Urban drainage systems likewise need to be freed of debris.

In the past, a lack of hydrologic information (and/or bottlenecks in information flows) appears to have prevented bridges and other water-related structures from being properly designed so as to accommodate "typical" amounts of rainfall. The Mayor of Chinandega, for example, reported that many rural bridges required annual maintenance, this suggests that many openings may be undersized. During the post-Mitch reconstruction phase, designing such facilities to take into account rainfall-runoff data will help ensure the effective use of scarce investment resources. Building structures without such information can result either in expensive over-design or in under-designed facilities that could be washed away in the next rainy season.

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<sup>18</sup> A related problem involves agricultural water supply dams that have been destroyed and not yet reconstructed. Without them, the agricultural sector's yields will suffer from lack of irrigation. Some activities proposed below (particularly Program Component 2) would provide data that would support reconstruction of these dams. USG agencies could provide further support. Further investigation of this topic, which is merited, is, however, outside the present SOW.



**Photo 10**  
*Temporary low-water  
bridge crossing on primary  
road near Leon*



**Photo 11**  
*Municipal official shows unrepaired bridge on secondary road  
in Leon. This bridge was only open to pedestrian traffic*

**Photo 12**  
*Bank sloughing in Jinotega destroyed  
part of a cemetery (at right)*





INETER is regarded as the responsible GON agency for collecting and providing environmental data useful to project design engineers. INETER maintains a hydrologic/meteorologic monitoring system, however, Hurricane Mitch destroyed much of this system, including 27 of 54 stream gauges and 67 of 346 meteorologic stations. The Task Force also observed that Hurricane Mitch altered watersheds due to scouring of new channels between low-lying adjacent rivers (e.g., Río Grande de Matagalpa and Río Viejo in the vicinity of Sébaco and the San Francisco dam). In those areas, the pre-Hurricane Mitch sets of river elevation versus rainfall data may not be applicable for future designs of bridges, flood wall, or other water resources-related structures. INETER has only limited capacity to analyze and model hydrologic/meteorologic data once they are collected, and virtually no capacity to assess changes to watersheds and river systems. Finally, INETER has limited seismic/volcanic monitoring capacity.

### **Water and Wastewater Systems**

The Task Force observed the partial destruction of water and sewer lines, particularly adjacent to bridge sites (see Photo 3, page 7). In Estelí, a sewer siphon crossing the river had been severed and raw sewage was draining into the river. Usually easy-to-fix repairs had been attempted, but the more difficult repairs, which require equipment to aid on trench excavation and armor protection to prevent future scour damage, had not yet been begun. The urgency of providing assistance along these lines cannot be stressed enough, since water-borne disease problems will probably increase with daily higher concentrations of human waste in the low-flow channels.

The repair of silted-in, open-pit water wells had generally not been performed. This was due to the lack of powered pumps to stir up silt deposits on the bottom of the wells prior to pumping the possibly contaminated waters out of the well. Chlorinating the well waters needs to be performed after silt removal operations in order to provide safe drinking waters for rural communities.

### **2.4.2 Reconstruction Efforts to Date**

Reconstructing municipal infrastructure affected by Hurricane Mitch involves either (1) increasing financing available for infrastructure (and in some cases directly undertaking reconstruction projects), or (2) assisting municipalities with managing project development and implementation.

### **Financing and Undertaking Reconstruction Projects**

Key GON and international agencies that are financing the reconstruction of municipal infrastructure are summarized in Table 5. Figure 5 shows their geographic areas of activity (see Appendix E for more detail).



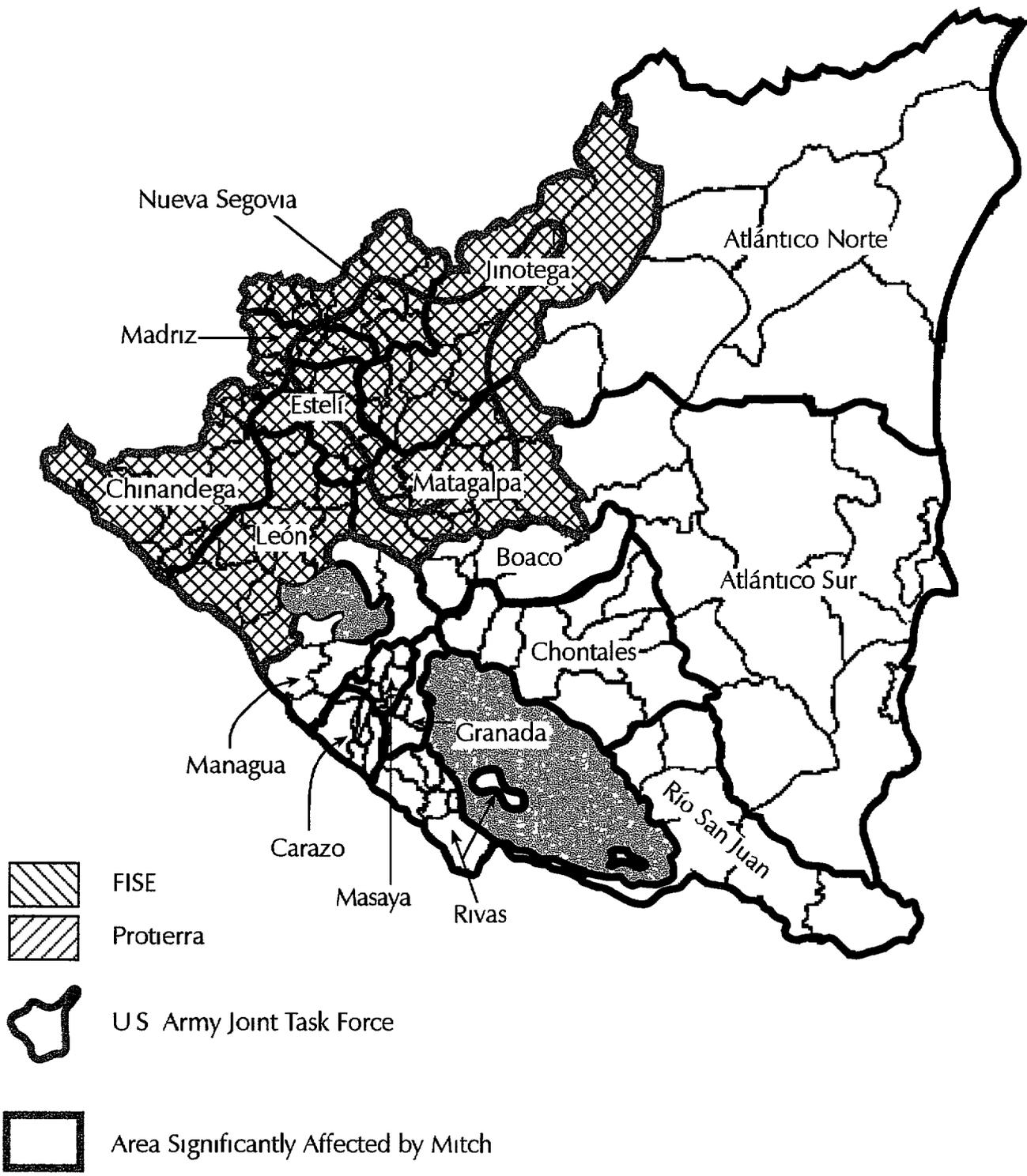
**Table 5**  
**Major Sources of Finance for Infrastructure Reconstruction**  
**(Municipal and Related Sectors)**

Entity	Infrastructure Sector				Region		
	Roads and Bridges		Water/Wastewater		I	II	VI
	Primary	Secondary	Urban	Rural			
Ministry of Trans and Infra							
US Army JTF							
FISE							
ENACAL							
KfW							
Protierra							

Major constraints to financing infrastructure reconstruction include the following

- Lack of prioritization of highway reconstruction to reflect emergency transportation considerations* As shown in Table 5, the Ministry of Transport and Infrastructure has focused on reconstructing highways and primary roads and bridges, rather than on municipal-level infrastructure, this reflects its legal mandate. To date it has secured financing from international agencies for about one-quarter of its proposed US\$600 million highway Reconstruction Plan (1999-2001). This Plan, however, does not rank those projects according to any criteria (e.g., emergency transportation considerations). Such ranking is particularly critical at present, given that many river crossings in the north are temporary, low-water crossings that could easily wash out, paralyzing even emergency movement around the country. Besides its importance for immediate reconstruction efforts, emergency transportation planning is also essential for future maintenance and capital investment programming.
- Insufficient resources to finance reconstruction of municipal infrastructure* The Emergency Social Investment Fund (FISE) is playing an important role in supporting municipalities in financing the reconstruction of secondary/rural roads and bridges, as well as water/wastewater infrastructure. Over the past two months, FISE has contracted some US\$10.9 million in 94 percent of the municipalities in the study area. This means, however, that FISE is nearly out of the US\$12 million in post-Hurricane Mitch emergency support provided by the IDB and the German cooperative agency KfW. Amounts for which FISE is currently negotiating will not be sufficient for FISE to cover both its traditional areas of focus (social infrastructure) and its new reconstruction priorities. The shortfall will be particularly felt in those municipalities that FISE is not targeting because of "extreme poverty" considerations.

**Figure 5**  
**Reconstructing Municipal Infrastructure:**  
**Major Sources of Finance and Reconstruction Assistance**  
**(in area affected by Mitch)**



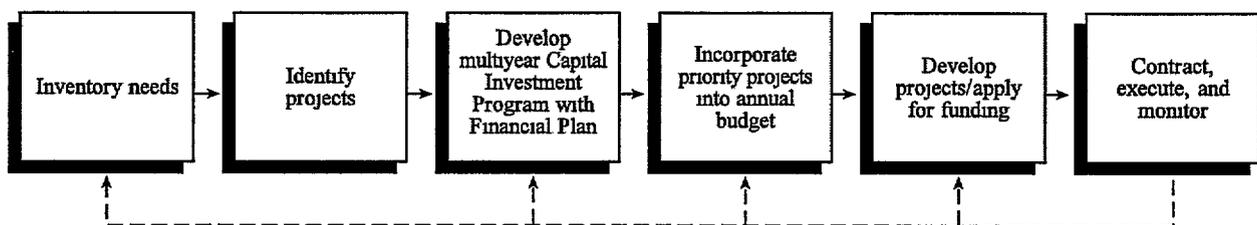


- *Lack of municipal equipment and know-how to maintain rural roads* The Task Force noted that, except for the largest municipalities, most local governments lack the equipment necessary to maintain rural roads. A large municipality like Leon boasts some 27 pieces of public works equipment, including bulldozers and compactors, this equipment may be sufficient to maintain roads both within its own borders and (by arrangement) in adjacent municipalities. Smaller municipalities may, however, own only one tractor, or no equipment at all. Some rural communities themselves provide minimal maintenance to unimproved roads using inadequate tools. Catholic Relief Services is currently trying to orchestrate the donation of used heavy equipment to municipalities (probably in the *Departamentos* of Jinotega, Matagalpa, Estelí, and northern Chinandega) that could be used to help maintain roads and provide other services.
- *Sedimentation of port channels* A final transportation-related problem involves the port channels. Several sea ports were affected by increased sediment loading as a result of Hurricane Mitch. Both the navigability of these channels as well as the salinity and sediment characteristics have changed as a result of the discharge of sediments and river flooding. Impacts to the shipping and the shrimping industries have occurred but have not been properly assessed. While some channels may currently be navigable, increased sediment discharges in the next rainy season could easily close the channels to shipping.

### Assistance in Project Development Cycle

Besides direct financing of municipal/community infrastructure, various agencies have strengthened municipalities in administering portions of the project development cycle. This cycle, shown in Figure 6, can be streamlined during post-disaster reconstruction periods. Bottlenecks can still occur, however, even in a streamlined process.

**Figure 6**  
**Steps in Typical Municipal Project Development Cycle**



Major organizations or projects helping municipalities strengthen their project development capacities are summarized in Table 6, their geographical areas of activity are shown in Figure 7 (see Appendix F for details)



**Table 6**  
**Assistance in Municipal Project Development Cycle**

Entity	Technical Focus/Mechanism		Geographic Focus/Region through 1999*			
	CIP or Project Prioritization via TA**	Develop/Implement Projects via UTMs***	Largest Municipalities	I	II	VI
USAID						
Protierra						
FISE						
DANIDA						

\* Probable programming for 1999

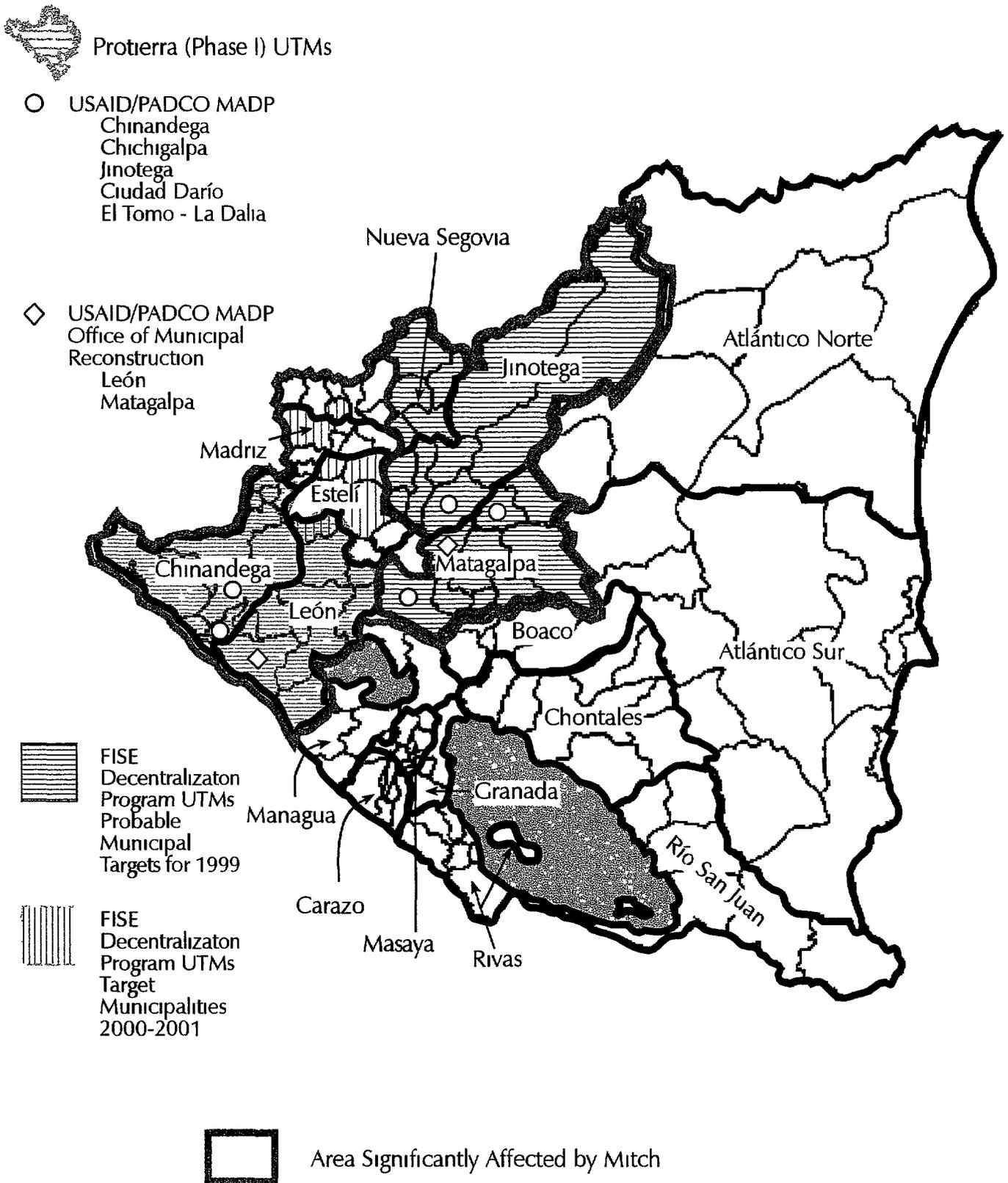
\*\* Capital investment programming via technical assistance

\*\*\* UTM = Municipal Technical Unit

USAID is helping selected municipalities, mostly *departamento* capitals (*cabeceras*), administer the project development cycle. The USAID/PADCO Municipal Autonomy and Decentralization Project (MADP) is currently active in seven municipalities in the area affected by Hurricane Mitch. (The Project will expand to additional municipalities in the near term, however, those municipalities have not yet been selected.) Among other activities, the MADP is helping municipalities develop capital investment programs. Since Hurricane Mitch, USAID has added a new component to the MADP. Regional Offices for Municipal Reconstruction located in León and Matagalpa are providing additional support to municipalities (both those participating in the Project as well as a handful of others on a case-by-case basis) in prioritizing and developing reconstruction projects.

Table 6 shows that development organizations (first Protierra and now FISE) are adopting the fielding of Municipal Technical Units (UTMs) as a strategy for helping smaller municipalities develop projects, apply for funding, and coordinate implementation. These units, which typically contain one or two *técnicos* or *medio técnicos*, are integrated into the municipal organizational structure. The UTMs have apparently been effective in developing projects — Table E-1 in Appendix E shows that municipalities in León and Chinandega with UTMs have recently been much more successful in getting projects funded by FISE than other local governments that lack UTMs. Despite the increasing acceptance of this approach, Figure 7 shows that municipalities in the *Departamentos* of Estelí, Madriz, and Nueva Segovia (western half) are not currently programmed to receive UTMs in 1999. These municipalities will thus be less prepared to apply for resources for municipal reconstruction.

**Figure 7**  
**Developing and Implementing Projects:**  
**Assistance to Municipalities in Affected Area**





### 3 Assessment of Major Constraints to Reconstruction

A comparison of the damage caused by Hurricane Mitch (Section 1, above) with the response to date (Section 2, above) shows where major constraints or gaps in the response occur. Those bottlenecks are summarized below, in general order of importance.

#### 3.1 Constraints Related to Reconstruction of Municipal Infrastructure

A serious constraint to reconstruction is a **shortfall in resources to finance reconstruction of municipal infrastructure**, particularly rural roads and urban and rural water/wastewater facilities.<sup>19</sup> The previous discussion included an estimate of US\$156 million to reconstruct secondary and unpaved roads, and upwards of US\$11 million for water/wastewater facilities. Immediately after Hurricane Mitch, FISE in particular played an important role in repairing roads, bridges, and water/wastewater facilities. However, FISE has almost used up its emergency reconstruction funds. Resources under negotiation with the World Bank and the IDB will not be nearly enough to cover both FISE's traditional areas of focus and new reconstruction priorities. This shortfall in resources will be particularly evident in municipalities not prioritized by FISE as suffering from "extreme poverty."

A related bottleneck to reconstruction is the **capacity of smaller municipalities to develop projects and supervise implementation**. To overcome this constraint, both FISE and Protierra have adopted strategies of establishing or strengthening UTMs in smaller municipalities. However, municipalities in the *Departamentos* of Madriz and Estelí and in the western half of the *Departamento* of Nueva Segovia either do not have or are not programmed to receive UTMs in 1999 (see Figure 8). This bottleneck to effective response coincides with some of the areas hardest hit by Hurricane Mitch, as well as some of the poorest municipalities.

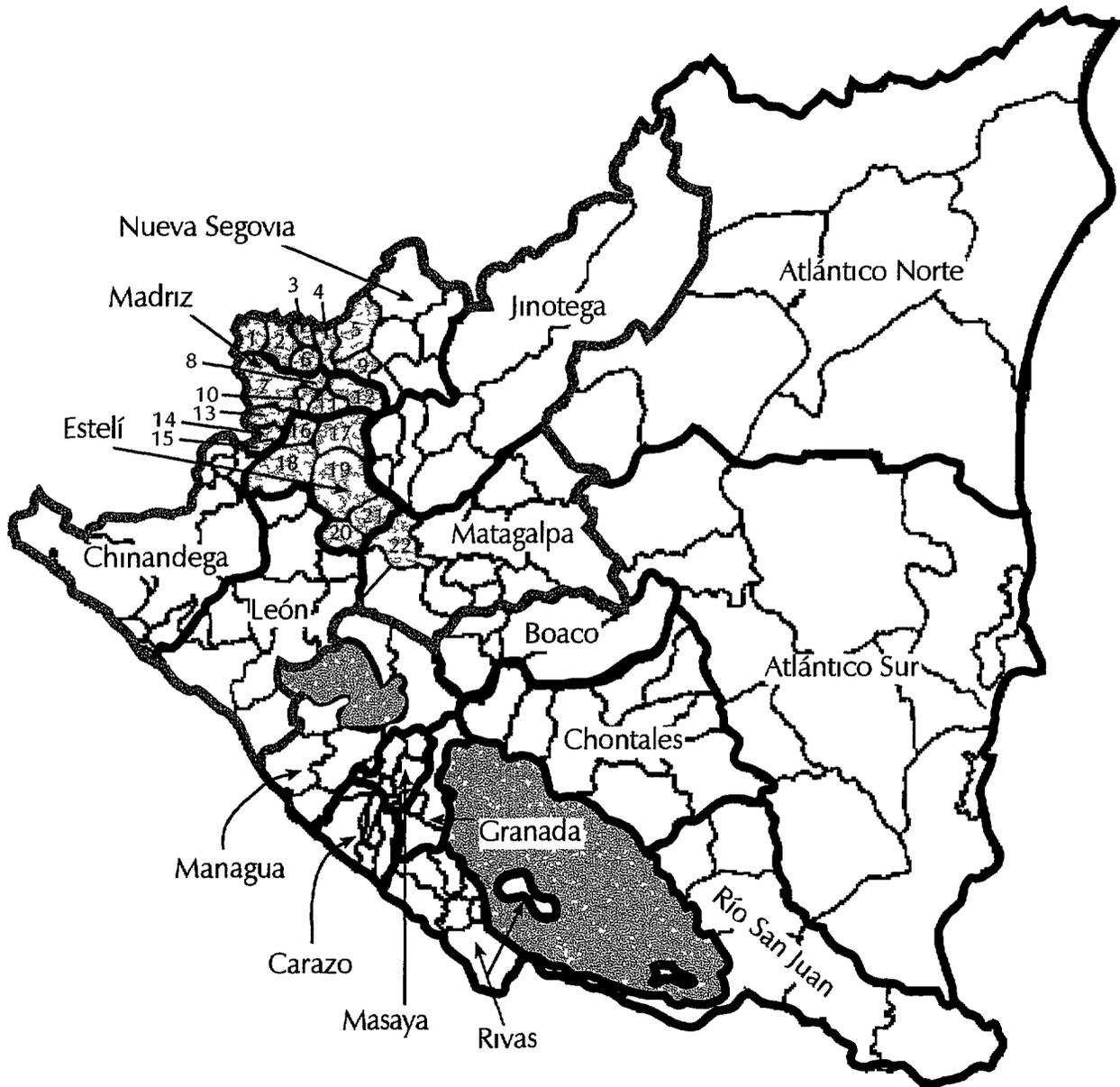
A related constraint is the **capacity of the GON to provide the necessary inputs to entities involved in developing infrastructure projects so as to ensure environmentally sustainable development**. Environmental monitoring systems have been damaged, and analytic capacity and tools are lacking. As noted earlier, without up-to-date hydrologic and watershed data, projects may be over- or underdimensioned (or otherwise not optimally designed), resulting in a waste of scarce development resources. Likewise, without the know-how to correctly prioritize projects, future natural disasters could shut down the nation's highway and navigable river networks during future rainy seasons.

A final constraint in reconstruction response is **municipal capacity to maintain rural roads**. The discussion above noted that Catholic Relief Services is helping address that constraint by coordinating the delivery of some equipment to Nicaraguan municipalities. The remaining gap, however, involves helping recipient municipalities to use that equipment effectively (both for road maintenance and other uses) and maintain it.

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<sup>19</sup> Primary roads and bridges also need attention, that subsector is however outside the current SOW

**Figure 8**  
**Municipalities in Inspected Area Not Yet Programmed to**  
**Receive Assistance in Developing Projects in 1999 via**  
**Municipal Technical Units (UTMs)**



Nueva Segovia

- 1 Santa María
- 2 Macuelizo
- 3 Dipilto
- 4 Mozonte
- 5 San Fernando
- 6 Ocotal

Madriz

- 7 Somoto
- 8 Totogalpa
- 9 San Juan de Río Coco
- 10 Yalaguina
- 11 Palacaguina
- 12 Telpaneca
- 13 San Lucas
- 14 Las Sabanas
- 15 San José de Cusinapa

Estelí

- 16 Pueblo Nuevo
- 17 Condega
- 18 San Juan de Limay
- 19 Estelí
- 20 San Nicolás
- 21 La Trinidad

Matagalpa

- 22 San Isidro



Area Significantly Affected by Mitch



### **3.2 Constraints Related to Resettlement of Hurricane Mitch Refugees**

First, the **capacity of INETER to provide geographic information to municipalities on environmental risk in a timely manner** represents a key constraint to effective resettlement and reconstruction

Second, **certain smaller municipalities lack the capacity to effectively manage and support the resettlement process**. The specific bottlenecks vary from community to community, they may involve identifying suitable land, purchasing land, or managing the transfer of title to beneficiaries. The UNDP is partially meeting this need (Figure 4), but many small municipalities affected by Hurricane Mitch lie outside the reach of that program

Third, **some refugees and municipalities lack the resources to ensure minimal levels of service provision**. As noted above, the Task Force was told that significant new resources are particularly required to provide new potable water solutions for rural communities affected by Hurricane Mitch. Finally, **some refugees lack the know-how to construct homes as safely as possible**. In many cases, home builders can improve the safety of their homes from future natural disasters at little additional expense



## 4 Proposed Plan of Action

To meet the needs presented above, the Interagency Task Force proposes the following plan of action. This plan, organized as the Post-Hurricane Mitch Shelter and Municipal Infrastructure Reconstruction Program, is presented as follows: (1) objectives and strategies, (2) program summary, (3) components, (4) phases and timetable, and (5) other areas for investigation.

### 4.1 Objectives and Strategies

Program objectives and strategies are as follows:

<p style="text-align: center;"><b>Objective 1</b> <b>Improved basic infrastructure and service provision in municipalities affected by Mitch</b></p>
--

Strategies to meet this objective are:

- increased financial resources for reconstruction (*see Subcomponent 1 1*),
- municipalities better able to develop and implement projects (*see Subcomponent 1 2*), and
- municipalities better able to use and maintain donated heavy equipment (*see Subcomponent 1 3*)

By helping municipalities better meet their current responsibilities, including rural road maintenance via use of donated heavy equipment, the Program will pave the way for future decentralization initiatives, a long-term Mission goal.

<p style="text-align: center;"><b>Objective 2</b> <b>Improved use of environmental information for more sustainable communities and infrastructure</b></p>
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Strategies to achieve this objective are:

- improved GON environmental monitoring systems (*see Subcomponent 2 1*),
- strengthened GON capacity for applied environmental analysis (*see Subcomponent 2 2*), and
- municipalities better able to use environmental information to guide development and design projects (*see Subcomponent 2 3*)

<p style="text-align: center;"><b>Objective 3</b> <b>Improved refugee resettlement solutions</b></p>
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Strategies to meet this objective are:

- improved resettlement processes and solutions (*see Subcomponent 3 1*),
- new and rehabilitated rural water systems (*see Subcomponent 3 2*), and
- improved skills and techniques for self-help home construction in resettlement areas (*see Subcomponent 3 3*)

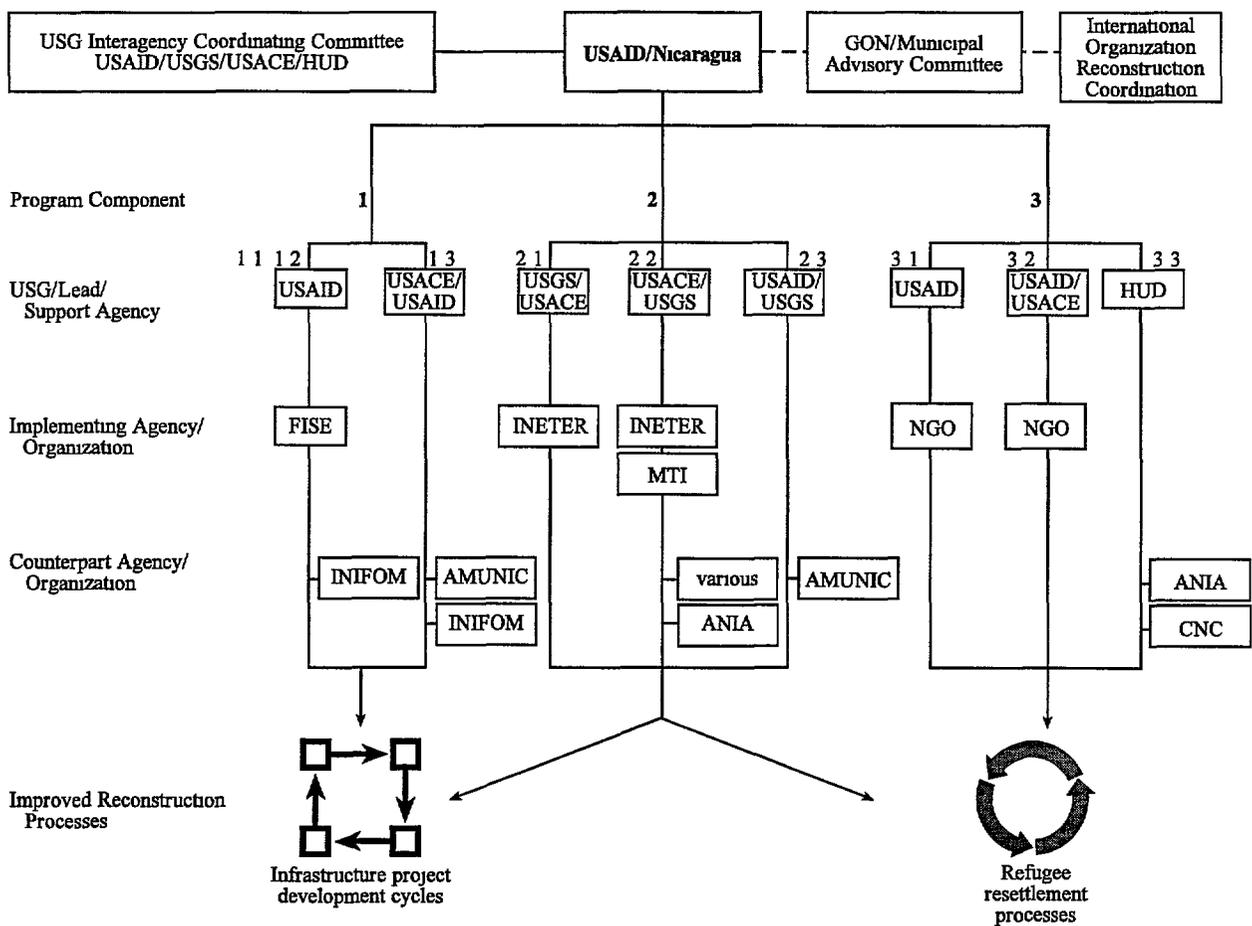


Strategies to achieve the objective of improved resettlement solutions do **not** include direct housing construction or sites and services activities. The field diagnostic showed that a number of agencies are investing in helping refugees with aspects of the resettlement process, but that those activities are at times disarticulated or impeded by bottlenecks. The proposed strategy thus seeks to leverage the investments of others by emphasizing support to the overall resettlement process.

#### 4.2 Program Summary

To achieve the three Objectives presented above, the Program is organized into three corresponding components. As shown in Figure 9, below, Component 1 supports the municipal infrastructure project development cycle, Component 3 supports the local resettlement process, while Component 2 provides important inputs to both of those processes.

**Figure 9**  
**Program Organization and Components**





Program components, organizational roles, and illustrative budget<sup>20</sup> are summarized in Table 7

**Table 7  
Program Summary\***

#	Component/ Subcomponent	USG Lead/ Supporting Agency	Implementing Agency/ Organization	Counterpart Agency/ Organization	Total Budget (US\$000s)
—	<b>Program coordination/adminmstration</b>	USAID	—	—	<b>600</b>
<b>1</b>	<b>Reconstructed municipal infrastructure</b>	—	—	—	<b>13,200</b>
1 1	Increased resources for municipal reconstruction	USAID	FISE	INIFOM	11 400
1 2	Improved municipal project development and implementation	USAID	FISE	INIFOM	1 400
1 3	Better use of donated heavy equipment by municipalities	USACE/ USAID	—	AMUNIC INIFOM	400
<b>2</b>	<b>Improved environmental information</b>	—	—	—	<b>13,595</b>
2 1	Reconstructed environmental monitoring systems	USGS/USACE	INETER	—	2 635
2 2	Strengthened capacity for applied environmental analysis	USACE/USGS	INETER MTI	Various GON agencies ANIA	10 600
2 3	Improved use of environmental data by municipalities	USAID/USGS/ HUD	—	AMUNIC	360
<b>3</b>	<b>Improved resettlement solutions</b>	—	—	—	<b>6,450</b>
3 1	Improved resettlement processes	USAID	NGO/contractor	—	2 000
3 2	New/rehabilitated rural water systems	USAID/USACE	NGO	ENACAL	4 100
3 3	Improved self help home construction techniques	HUD	—	ANIA CNC	350
—	<b>TOTAL</b>	—	—	—	<b>33,845</b>

\* Notes "Implementing agencies/organizations" are directly responsible for implementing their corresponding subcomponent "Counterpart agencies/organizations" are involved in coordination but are not directly responsible for implementation

Roles of USG agencies are summarized in Table 8 Roles of GON agencies are shown in Figure 9 and Table 7, above For more information on INETER as an implementing agency, see Appendix D

**Table 8  
Summary of USG Agency Roles**

USG Agency	Member Coord Comm	Component 1			Component 2			Component 3		
		1 1	1 2	1 3	2 1	2 2	2 3	3 1	3 2	3 3
USAID	Y	L	L	S			L	L	L	
USGS	Y				L	S	S			
USACE	Y			L	S	L			S	
HUD	Y						S			L

Note Y = yes, L = lead, S = support

<sup>20</sup> Budget estimates are costs to USG only, without GON or other counterpart contributions

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Each USG agency will receive and administer a separate budget for its areas of activity (see discussion of coordination below) Budget amounts by USG agency are shown in Table 9

**Table 9**  
**Program Budget Allocation by USG Agency (US\$000s)**

USG Agency	Coordination	Component 1			Component 2			Component 3			Total
		1 1	1 2	1 3	2 1	2 2	2 3	3 1	3 2	3 3	
USAID	600	11,400	1,400					2,000	4 000		19 400
USGS					2 635	150	180				2 965
USACE				400		10 450			100		10 950
HUD							180			350	530
Total	600	11 400	1 400	400	2 635	10 600	360	2 000	4 100	350	33 845

### 4 3 Program Components

#### 4 3 1 Overall Program Coordination

*Responsible agency* USAID  
*Proposed funding levels* US\$600,000

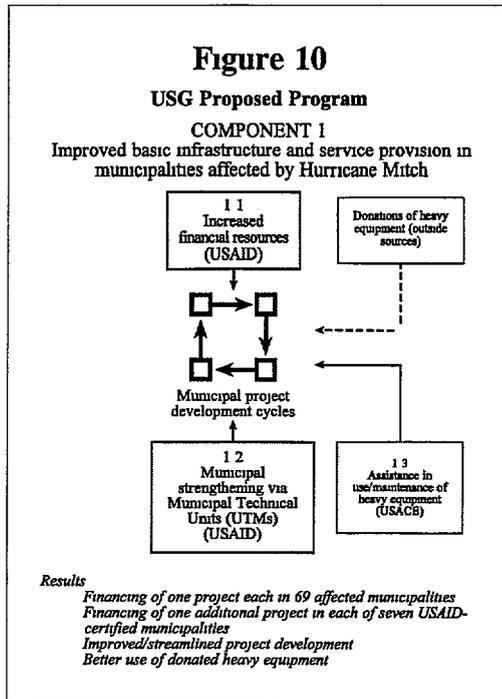
*How it will work* As shown in Figure 9, Program implementation will be coordinated by a USG Interagency Coordinating Committee, chaired by USAID, and composed of representatives of USGS, USACE, and HUD This Committee will meet regularly to review and approve consolidated Program work plans, etc

USAID/Nicaragua will coordinate Program implementation in the field In this capacity, USAID/Nicaragua will establish appropriate coordinating mechanisms (e g , prior approval for scheduling of all work carried out in the field) USAID/Nicaragua will also serve as the lead USG agency for implementing several Program subcomponents (see Table 8) Resources have been provided for additional human resource support for these activities

The Interagency Coordinating Committee will consult regularly with a GON/Municipal Advisory Committee (see Figure 9) Among other members, this Committee will include representatives of all implementing agencies/organizations (including FISE, INETER, and MTI) and counterpart agencies/organizations (including AMUNIC, INIFOM, ANIA, and CNC) The Committee will also coordinate with other international organizations supporting reconstruction in Nicaragua

#### 4 3 2 Component 1 Reconstructed Municipal Infrastructure

Component 1 is depicted in Figure 10, subcomponents are described below



**Subcomponent 1 1 Increased Resources for Municipal Reconstruction**

*Area of Geographic Focus* Area affected by Hurricane Mitch (see Figure 2)

*Area of Technical Focus* Primarily secondary transportation infrastructure (roads and bridges), water/wastewater facilities, flood protection and bank stabilization measures, and other municipal infrastructure

*USG Implementing Agency* USAID  
*Implementing Agency* FISE  
*Proposed funding levels* US\$11 4 million  
*Primary beneficiaries* Residents of municipalities in area affected by Hurricane Mitch

*Expected results*

Resources will be sufficient to finance 76 projects in the affected area, worth US\$11 4 million (an average of US\$150,000 per project)

*How it will work/absorptive capacity* Resources will finance an average of one project in each of the 69 municipalities affected by Hurricane Mitch via FISE. Municipalities apply to FISE to use those funds. The Task Force concludes that the affected municipalities — strengthened by the Municipal Technical Units established via this Program (see below) and other programs — will be able to absorb, on average, one USG-funded project each during the two-year reconstruction period. Likewise, the newly streamlined and deconcentrated FISE will be able to disburse those funds during the two-year period.

In addition to those projects, the seven municipalities in the affected area that have been certified by USAID will qualify to receive funding for an additional one project per municipality (Those seven municipalities are marked as “USAID/PADCO MADP” in Figure 7, page 27.) Following GON and USAID regulations as applicable, they will apply to USAID to administer those projects directly, with oversight and control provided by the ongoing MAD Project. By qualifying for USAID certification, those municipalities have demonstrated the absorptive capacity to implement those additional projects during the two-year reconstruction period.

**Subcomponent 1 2 Improved Municipal Project Development and Implementation**

*Area of Geographic Focus* Areas highlighted in Figure 8, in the *Departamentos* of Nueva Segovia, Madríz, and Estelí

*Area of Technical Focus* Developing project profiles, applying for project funding, and supervising implementation



<i>USG Implementing Agency</i>	USAID
<i>Executing Agency</i>	FISE
<i>Proposed funding levels</i>	US\$1.4 million This represents US\$35,000/year per municipal technical unit (UTM) for 20 municipalities over a two-year period
<i>Primary beneficiaries/ Expected results</i>	Residents of about 20 smaller municipalities in highlighted area shown in Figure 8, who benefit from improved municipal infrastructure/services Those 20 municipal governments, not currently programmed to receive UTMs in 1999, benefit from increased capacity during the two-year reconstruction period

*How it will work* Municipalities sign technical assistance agreement with implementing agency (FISE) In each municipality, Program pays salaries for one- to three-person UTMs over two-year period, while municipality provides office facilities, etc (It is hoped that municipalities will maintain the UTMs after the end of the Project, using their own resources ) UTMs assist municipalities in developing projects, applying for funding, and overseeing project implementation UTMs also assist municipalities with other, complementary reconstruction activities undertaken via other Program subcomponents, e.g., developing and implementing action plans to clear debris from wastewater systems and river channels

### **Subcomponent 1.3 Municipal Use and Maintenance of Donated Heavy Equipment<sup>21</sup>**

<i>Area of Geographic Focus</i>	Municipalities in area affected by Hurricane Mitch that receive donations of heavy equipment
<i>Area of Technical Focus</i>	Rural road maintenance, heavy equipment operation and maintenance
<i>USG Implementing Agency</i>	USACE, supported by USAID
<i>Counterpart Agency</i>	AMUNIC (organizational issues related to possible sharing of equipment among municipalities) and INIFOM (training)
<i>Proposed funding levels</i>	US\$400,000
<i>Primary beneficiaries</i>	Residents and officials in municipalities receiving heavy equipment donations
<i>Expected results</i>	Municipalities receiving heavy equipment are able to make more effective use of that equipment over a longer period In the long run, this should benefit decentralization initiatives, as municipalities demonstrate their capacity to fulfill their legal responsibilities

*How it will work* The USACE has experience in owning, operating, maintaining, repairing, and leasing all types of heavy equipment Equipment specialists within the Corps will provide

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<sup>21</sup> Heavy equipment suitable for maintaining rural roads and other uses is being donated by U.S. public agencies and private organizations, Catholic Relief Services is coordinating their donation to Nicaraguan municipalities affected by Hurricane Mitch Donation of heavy equipment to municipalities is thus outside the scope of the present Program

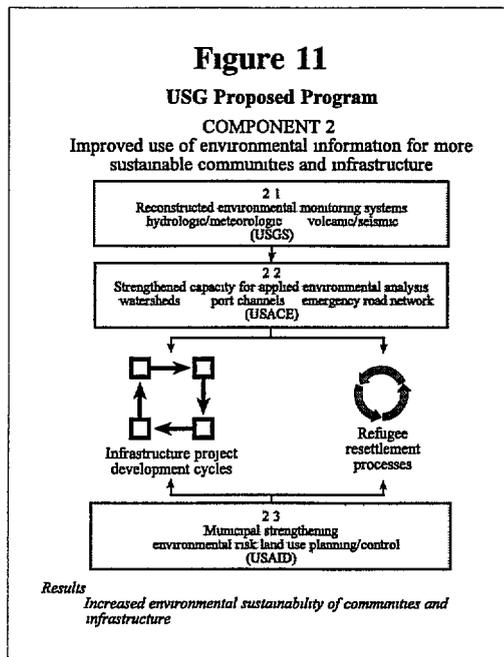
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training (supported by INIFOM) and field guidance in proper operation and maintenance of donated equipment and, if necessary, writing specifications for leasing equipment, transporting equipment to remote sites, etc. USAID and/or USACE experts (supported by AMUNIC) will also advise municipalities on organizational issues related to possible leasing or sharing of equipment among local governments, etc.

### 4.3.3 Component 2 Improved Environmental Information for More Sustainable Communities and Infrastructure

Component 2 is depicted in Figure 11, subcomponents are described below



#### Subcomponent 2.1 Reconstructed Environmental Monitoring Systems

*Area of Geographic Focus* Entire area affected by Hurricane Mitch (see Figure 2)

*Area of Technical Focus* Environmental information systems and applications related to (1) volcanic/seismic data, and (2) hydrologic/meteorologic data

*USG Implementing Agency* USGS Assistance to the volcanic/seismic system provided by staff based at the Cascades Volcano Observatory USACE provides support

#### Implementing Agency

INETER Volcanic/seismic monitoring will correspond to the *Dirección Geofísica*, hydrologic/meteorologic monitoring will correspond to the *Departamento de Hidrología Superficial*, and information dissemination/extension services will correspond to the *Dirección de Ordenamiento Territorial* (see Appendix D)

#### Proposed Funding Levels (with budget detail)

Total US\$2,635,000

*Volcanic/seismic monitoring total* US\$500,000 Estimate includes 1.25 person-years of senior USGS staff (110k), 4 person-years for INETER staff (130k), travel (55k), computer hardware/software, preparation of digital elevation models of study volcanoes (60k), preparation/distribution of CD ROM and map products (40k), Landsat and other satellite imagery (64k), aerial photography, and miscellaneous (41k)



	<i>Hydrologic/meteorologic monitoring total</i> US\$1 91 million Estimate includes replacing 27 stream gauges (1 2M), replacing 67 meteorological stations (560k), and training (150k)
	<i>Information dissemination total</i> US\$225,000 (Cost of maps included above )
<i>Primary beneficiaries</i>	Residents of municipalities in area affected by Hurricane Mitch, especially where volcanic, seismic, or hydrologic risk factors are of concern
<i>Expected results</i>	Environmental sustainability of infrastructure and communities is increased

*How the volcanic/seismic information system will be rebuilt* USGS provides training and technical assistance (including computer hardware/software and aerial and satellite imagery) to INETER. INETER, supported by USGS, carries out pilot applications of improved system by producing risk-assessment maps of drainages of 10-12 volcanic centers (Helicopter seeding of lahar-inundation areas upstream from Posoltega to be provided by U S Army in coordination with USGS )

*How the hydrologic/meteorologic information system will be rebuilt* USGS assists INETER and users in identifying applications and establishing corresponding minimum levels of accuracy. INETER replaces 27 stream gauges and 67 meteorologic stations that were destroyed. Training provided will include data collection, analysis, and system operation and maintenance (A pilot/demonstration activity that applies some of the information gathered is presented under Subcomponent 2 2, below )

*How information will be disseminated* (1) USGS/INETER make data available via publications, maps, and the Internet. Products include municipal-level environmental risk-analysis maps that incorporate both hydrologic/meteorologic and volcanic/seismic data. (2) INETER fields two full-time experts who will provide municipalities with advice on environmental concerns for specific sites (generally refugee settlements or else existing settlements now facing altered environmental conditions). (3) USGS/INETER hold workshops with GON agencies and ANIA to familiarize them with availability and applications of the information available. (4) USGS/INETER work with other GON agencies to build environmental sustainability criteria into project development/approval processes.

## **Subcomponent 2 2 Strengthened GON Capacity for Applied Environmental Analysis**

<i>Area of Geographic Focus</i>	Watersheds and river systems (where stability, channel changes, and sediment discharges are critical), primary highways, and ports in area affected by Hurricane Mitch
<i>Areas of Technical Focus</i>	(1) Watershed and river system assessment, (2) port channel assessments, and (3) emergency road network analysis
<i>USG Implementing Agency</i>	USACE USGS provides support
<i>Implementing Agency</i>	INETER, <i>Departamento de Hidrología Superficial</i> (watershed/river system assessment), <i>Departamento de Hidrografía</i> (port



	channel assessment), see Appendix D, and MTI (emergency road network analysis)
<i>Counterpart Agencies/ Organizations</i>	Various GON agencies (e.g., Civil Defense for emergency road network analysis), ANIA
<i>Proposed funding levels</i>	<i>Total for Subcomponent</i> US\$10.6 million <i>Watershed/river system assessment</i> US\$6.9 million (USACE) and US\$150,000 (USGS) <i>Port channel assessment</i> US\$2.8 million (USACE), including \$1.8 million in field data collection (1999) and \$1.0 million for modeling and training (2000). USACE assistance for both watershed and port channel assessments will include 15–20 person-years of senior-level personnel, a computer system to be transferred to INETER (\$100k), travel, lodging, meals, and incidentals for INETER staff traveling to the U.S. for training (\$200k), and field work (over \$1M) <i>Emergency road network analysis</i> US\$750,000 (USACE), including \$250k for investigation and analysis and \$500k for initial remedial actions
<i>Primary beneficiaries and expected results</i>	Residents in area affected by Hurricane Mitch will benefit from infrastructure that is more environmentally sustainable. The shrimping and shipping industries will benefit from improved ports. Farmers and others in the area affected by Hurricane Mitch will benefit from improved road circulation during natural disaster emergencies. INETER and MTI benefit from strengthened capacity.

*How the watershed/river system assessments will be conducted* USACE (supported by USGS) will provide training and technical assistance to INETER staff in watershed assessment techniques, including streamflow modeling, flood routing, sediment discharge computation, and channel stability analysis. USACE will also provide training in bank stabilization practices and debris removal.

To apply and develop new skills, INETER, supported by USACE and USGS, will conduct pilot assessments of seven major watershed regions affected by Hurricane Mitch. USACE support will gradually decrease as INETER staff increase in ability. Watersheds assessed will include Río Coco, Río Grande de Matagalpa, Río San Juan, Río Tamarindo toward Río Brito, Río Tamarindo toward Volcán Cosiguina, Río Estero, and Río Negro. Each assessment will typically involve acquiring existing and new data, assessing channel changes and future stability, assessing sediment sources, developing regional and municipal action plans for bank stabilization and debris removal, and providing input to bridge repairs. (Dissemination of information both here and below will follow procedures discussed under Subcomponent 2.1, above.)



*How the port channel assessment will be undertaken* USACE will provide INETER staff with training and technical assistance related to port channel assessment. Training will address hydrographic and geophysical surveying, sediment flux, salinity movement monitoring, computer modeling, etc. USACE will help INETER develop a periodic port channel monitoring program.

As a pilot application of the training, INETER, supported by USACE, will then assess four major port channels, including the Golfo de Fonseca. USACE's role will decline throughout the exercise as INETER's capacity increases. The assessments will evaluate the potential impact of sediment flux and salinity movement to navigation and the shrimping industry, and develop a remedial plan of action. A limited amount of those remedial actions will then be taken directly by MTI/USACE, other actions will be implemented outside the scope of the present Program.

*How the emergency road network analysis will be implemented* USACE will assist the MTI in analyzing traffic circulation under emergency natural disaster conditions. Hands-on training will occur via close collaboration of USACE and MTI officials. Hydrologic/meteorologic data and river channel data developed above will be analyzed together with road network, population, and economic information to identify major potential bottlenecks in traffic circulation under emergency conditions. This information will be used to develop an emergency transportation plan that will include project priorities and design criteria. This information will be reviewed with agencies and organizations involved in road network reconstruction.

### **Subcomponent 2.3 Strengthening Municipal Capacity to Guide Environmentally Sustainable Development**

<i>Area of Geographic Focus</i>	Twelve municipalities in area affected by Hurricane Mitch. To ensure sufficient absorptive capacity, selected municipalities should either (1) include UTMs fielded during 1999 (see discussion above) or (2) participate in the USAID MADP (see Figure 7).
<i>Area of Technical Focus</i>	(1) Environmental risk land use planning and (2) geographic information systems.
<i>USG Implementing Agency</i>	USAID, supported by USGS (GIS) and HUD (land use planning) <sup>22</sup>
<i>Counterpart Agency</i>	AMUNIC
<i>Proposed funding levels</i>	<i>Total</i> US\$360,000, broken down as follows: <i>Land use planning</i> US\$180,000. This includes two local consultants over a one-year period (\$70k), outside international support (\$50k), local legal assistance (\$20k), travel and related expenses (\$30k), and miscellaneous (\$10k).

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<sup>22</sup> This subcomponent should be implemented in close coordination with the USAID MADP. Thought should be given to direct implementation of this subcomponent by the MADP, particularly where selected municipalities are currently participating in that Project.



*GIS support* US\$180,000 For each municipality, this includes on-site training by professional contractor (\$30-45k), 2 PCs (\$17k), large format plotter (\$12k), GIS software (\$20k), etc

*Primary beneficiaries/  
Expected results*

Residents of 12 selected municipalities enjoy heightened "environmental security" Infrastructure is more environmentally sustainable Ten of 12 municipalities have land use legislation in place and increased capacity for guiding development Two municipalities have increased GIS capacity

*How land use planning for environmental risk will work* Two full-time planning experts, working in parallel, will work progressively with the target municipalities They will receive international support, particularly at the outset, from USAID and HUD along with its U S partners (e g , the American Planning Association) Local legal experts will be contracted as needed Steps in the process will include (1) helping municipal officials and community leaders interpret risk assessment maps prepared by INETER (see above), (2) drafting action plans to reduce environmental risk, (3) conducting workshops with municipal/community leaders to refine action plans, (4) implementing action plans, (5) drafting and approving municipal legislation related to environmental risk zoning, and (6) assisting municipalities and community groups to enforce approved legislation It is assumed that environmental risk zoning will serve as an input into municipal development plans being prepared via other municipal development activities outside the scope of the present Program

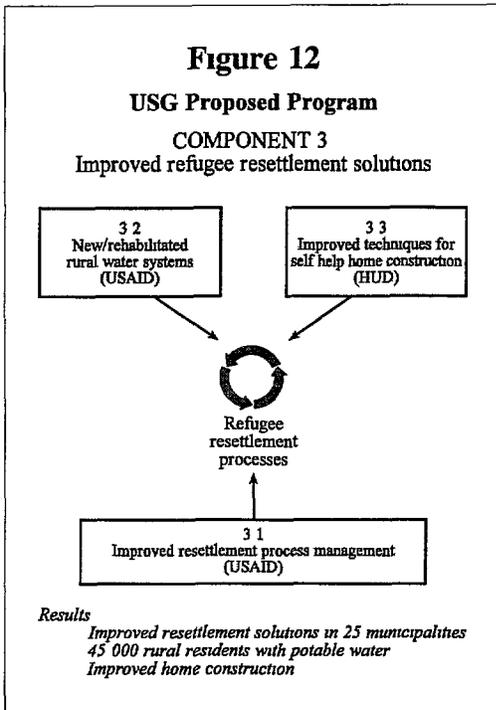
*How local GIS capacity will be built* Two municipalities will be selected for this pilot activity based on interest, need, and absorptive capacity Assistance will include on-site training, computer hardware (e g , 2 PCs, color printer, b/w printer, large format plotter), and software

*How municipal infrastructure will be made more environmentally sustainable* Information developed via Subcomponent 2 1, above, will be provided to UTMs in participating municipalities



### 4 3 4 Component 3 Improved Refugee Resettlement Solutions

Component 3 is depicted in Figure 12, subcomponents are described below



#### Subcomponent 3 1 Improved Resettlement Process Management

*Area of Geographic Focus* Twenty-five priority municipalities within area affected by Hurricane Mitch. Municipalities are prioritized if they still have significant refugee resettlement problems, if they are smaller, and if they are not receiving assistance in this area via other means (see Figure 4)

*Area of Technical Focus* Resettlement process

*USG Implementing Agency* USAID, supported by USACE Waterways Experiment Station if necessary (see below)

*Counterpart Agency* Certified international or national NGO, organization, or contractor

*Proposed funding levels* US\$2 million

*Expected results* Improved resettlement solutions in 25 municipalities

*How it will work* (1) If requested, the Program fields a resettlement coordinator to assist in municipal-specific resettlement issues (2) A certified NGO administers a fund for resettlement assistance. Municipalities, NGOs, and resettlement communities can apply to this fund for small grants to pay for activities that will improve or accelerate the resettlement process, e.g., investigating land title, surveying and subdividing land, land purchase, etc. The availability of these resources is made known via UTMs and municipal-level Program mechanisms described above

#### Subcomponent 3 2 New/Rehabilitated Rural Water Systems

*Area of Geographic Focus* Communities in area affected by Hurricane Mitch

*Area of Technical Focus* Rural water

*USG Implementing Agency* USAID, supported by USACE if necessary (see below)

*Implementing Agency* Certified NGO

*Counterpart Agency* ENACAL



<i>Proposed funding levels</i>	US\$4.1 million. This includes about US\$2.5 million in direct assistance, US\$1.5 million in logistics and support, and US\$100,000 for USACE support as needed.
<i>Primary beneficiaries</i>	About 45,000 residents of resettlement communities and other rural communities affected by Hurricane Mitch.
<i>Expected results</i>	Residents enjoy improved potable water.

*How it will work* USAID-certified implementing NGO manages the Program resources under USAID supervision. (In the case of CARE's rural water projects, ENACAL, in coordination with CARE, typically selects executing organization.) Executing organization collaborates with municipalities and communities. Depending on situation, potable water solution may involve constructing new communal wells, repairing/rehabilitating/enhancing rural water wells, mini-aqueducts (gravity or with pumps), water filtration, etc. Funds may be used for acquiring materials and equipment, training local communities, contracting professional services, protecting critical micro-watershed areas, etc.

USACE, particularly its Waterways Experiment Station, possesses capacity in water well repair, rehabilitation and enhancement techniques, etc. While some organizations active in Nicaragua possess relevant capacity, USACE will be available to provide supplementary training and technical assistance and consultation to national and local NGOs on an as-needed basis.

### **Subcomponent 3.3 Improved Techniques for Self-Help Home Construction**

<i>Area of Geographic Focus</i>	Area affected by Hurricane Mitch
<i>Area of Technical Focus</i>	Home construction
<i>USG Implementing Agency</i>	HUD
<i>Counterpart Organizations</i>	ANIA, CNC
<i>Proposed funding levels</i>	US\$350,000
<i>Primary beneficiaries</i>	Residents of refugee resettlement areas and others living in informal and formal housing.
<i>Expected results</i>	Home construction among beneficiaries becomes more environmentally sustainable.

*How it will work* (1) HUD and its development partners, including the National Association of Home Builders and others, develop a "best practices" training module on affordable, environmentally sustainable home construction techniques suitable for Nicaragua. (2) HUD and its partners conduct training workshops and provide technical assistance to communities affected by Mitch, *maestros de obras*, NGOs, municipal building officials, and other groups designing housing for low-income persons. (3) HUD transfers training modules to NGOs and training programs for *maestros de obras*. (4) HUD helps Nicaraguan organizations, such as ANIA and CNC, develop institutional ties to counterpart organizations in the U.S.



#### 4 4 Timetable and Priority Actions

The preliminary timetable for Program implementation, presented in Table 10, incorporates two key considerations. First, as noted above, USAID/Nicaragua has requested a two-year timeframe for Program implementation. Second, the Task Force considers some actions of immediate priority. Those actions should be undertaken before the next rainy season is well advanced. The rainy season begins around May 1999, while named storms usually form during late summer and fall.

**Table 10  
Preliminary Timetable for Program Implementation**

Program Component / Subcomponent / Selected Actions	Year/Quarter							
	1999			2000				2001
	2nd*	3rd	4th	1st	2nd	3rd	4th	1st
<b>1 Reconstructed municipal infrastructure</b>								
<i>1 1 Increased resources</i>								
<i>1 2 Improved municipal project dev't /implement</i>								
<i>1 3 Better use of donated heavy equipment</i>								
<b>2 Improved environmental sustainability</b>								
<i>2 1 Reconstructed environ monitoring systems</i> — Field support to mun's on site specific enviro issues — Hydrologic/meteorologic monitoring — Volcanic/seismic monitoring								
<i>2 2 Strength cap'ty for applied environ analysis</i> — Emergency road network analysis — Port channel assessment — Assessment of Rio Viejo and Rio Esteli channel changes — Assessment of other watersheds and river systems								
<i>2 3 Improved use of environ data by mun's</i>								
<b>3 Improved resettlement solutions</b>								
<i>3 1 Improved resettlement processes</i>								
<i>3 2 New/rehabilitated rural water systems</i>								
<i>3 3 Improved self-help home construction tech's</i>								

Note \* Priority period before the 1999 rainy season begins

#### 4 5 Areas for Further Investigation

In addition to the Program components presented above, some Task Force members and representatives of USG agencies have identified additional areas (described below) where USG support may be appropriate. Before proceeding to incorporate actions into the Interagency Program presented above, however, those areas require additional investigation and consideration. Some of these topics might additionally require support past the two-year reconstruction timeframe established by USAID/Nicaragua.



- *Water quality model for Lake Managua and Lake Nicaragua* USACE representatives noted that the water quality of these lakes was significantly affected by Hurricane Mitch. Pesticides (DDT), heavy metals (mine tailings), sediment, and sewage are some of the contaminants suspected to be associated with the extreme runoff from the hurricane. USACE could provide support to the GON in basin-wide water quality modeling, as well as a coupled hydrodynamic and water quality model to address short-term public health issues and long-term contaminant and natural resource management issues.
- *Volcanic acoustic flow modeling* If, in the course of proposed USGS work in Nicaragua, very high volcanic risk is identified upstream of significant populations, USGS would investigate the need to install acoustic flow monitors as part of a hazard mitigation plan. These monitors are small, solar-powered seismometers that detect the specific frequency of a moving debris flow.
- *Increasing shelter provision* HUD has advanced a series of recommendations that would increase shelter provision. Those approaches include the following:
  - ▶ Housing finance HUD has identified a sector of low- to middle-income families that would be in a position to borrow for housing, however, such financing is generally not available. To involve mainstream lenders, HUD would bring together mortgage bankers and others to work with Nicaraguan banks and institutions in developing strategies for lending to this sector of the population.
  - ▶ Joint ventures in housing construction HUD would also help stimulate joint ventures in housing and construction between private sector partners in Nicaragua and the U.S. that would promote local production.
  - ▶ Basic housing solutions HUD offers access to U.S. know-how and private sector entities interested in assisting reconstruction through donations and at-cost contributions of skilled labor and materials. In collaboration with USAID, HUD would design and procure basic housing solutions for distribution/sale to new land owners.
  - ▶ Community/cooperative banking HUD would also help adapt models for community and cooperative banking that have been used in poor communities and urban areas in the U.S., to help build NGOs and local community groups develop self-help banking strategies.
- *Developing appropriate building and construction codes and standards* HUD concluded that improving the regulatory framework would help reduce future risks due to poor building construction. HUD would work with its U.S. partners and the GON to help improve the Nicaraguan building and construction codes and standards.
- *National-/municipal-level disaster preparedness and response planning* Finally, several agencies (USAID Office of Foreign Disaster Assistance, HUD, NOAA) have noted the importance of preparing for and responding to natural disasters. This will involve clarifying roles and mechanisms among both national and local-level institutions. HUD's approach would additionally involve assisting U.S. municipalities to work with their Nicaraguan counterparts. This topic, as well as the roles of various USG agencies, requires further investigation.

**Appendix A**  
**Municipalities Visited by Team**  
**(by population size)**

Municipality (Team that visited)	Departamento	Extension	Population		1998 Approved Budget (C 000s)
			% Urban	Total	
Leon (A)	Leon	820	77	161,530	42,652
Chinandega (A)	Chinandega	647	83	117,037	29,526
Matagalpa (B)	Matagalpa	644	57	104,381	n/a
Estelí (B)	Estelí	754	77	92,988	n/a
Tipitapa (various)	Managua	973	82	82,808	8,038
Jinotega (B)	Jinotega	1,119	40	77,222	13 318
Ciudad Dario (B)	Matagalpa	806	27	35,871	n/a
Somotillo (A)	Chinandega	1,089	40	24,767	1,144
Telica (A)	Leon	400	27	22,779	1,381
Posoltega (A)	Chinandega	124	27	15,331	1,176

Note US\$1 00 = 11 3 Cordovas (late 1998 early 1999)

Source INIFOM 1999

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**Appendix B**  
**Impact of Hurricane Mitch on Municipal Revenues:**  
**Preliminary Indicators**

**Table B-1**  
**Income in the Municipality of León, 1997 vs 1998**  
**(fourth quarter, córdobas)**

Source	Year	October	November	December	% of Total Executed Budget
Sales and Services Tax	1997	882,583	867,305	775,758	25%
	1998	839,425	801,340	768,099	—
Property Tax	1997	114,629	103,073	797,473	3%
	1998	171,534	127,771	140,986	—
Vehicle Tax	1997	49,567	46,088	40,908	2%
	1998	113 820	12,152	9,490	—
Total Income	1997	1,862,706	1,687,064	2,495,116	100%
	1998	1,774,429	1,685,138	1,922,710	—

Note US\$1 00 = 11 3 Cordovas (late 1998 early 1999)

**Table B-2**  
**Income in the Municipality of Telica, 1997 vs 1998**  
**(fourth quarter, córdobas)**

Source	Year	October	November	December	% of Total Approved Budget
Sales and Services Tax	1997	31,673	35,915	23,589	—
	1998	16 047	12,522	26,151	29%
Property Tax	1997	56,486	10,882	15,438	—
	1998	4,559	661	140	18%
Vehicle Tax	1997	6,145	4,935	4,270	—
	1998	10,745	1,415	405	4%
Total Income	1997	199,773	103,441	214,049	—
	1998	87,713	238,552	147,165	100%

Note US\$1 00 = 11 3 Cordovas (late 1998 early 1999)

## Appendix C

### Efforts to Date to Support Resettlement Process

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The GON and international agencies have adopted different approaches in supporting the local resettlement process. First, as an immediate response to Hurricane Mitch, the **Secretary of Social Action** launched a US\$2 million project, "Provisional Program for the Relocation of Families in Temporary Shelters." This Project was designed to provide 4,932 refugee families in 45 municipalities with basic building materials (e.g., 14 sheets of 4' x 8' zinc) and household goods. This project was scheduled to last from December 1998 to January 1999. Field visits showed that refugees had received these supplies in several municipalities visited. Those materials generally, however, had to be supplemented with other building materials to construct a unit (see Photo 7, page 18). Likewise, some latrines, built using donated materials, were not being dug to sufficient depths or were being constructed on soils that will not percolate.

**Nongovernmental organizations (NGOs)** are assisting with the supply of temporary and permanent environmental services. CARE, for example, has been helping community water committees with clearing individual wells, installing new water purification systems on river banks, purifying water sources, erecting and maintaining water tanks, etc. The team observed such assistance in most but not all refugee areas. In Somotillo, for example, refugees were currently relying on unpotable river water. They had dug their own well using minimal tools and were in need of assistance in covering and lining the well so it would not collapse during the next rainy season (see Photo 8, page 18). A representative of CARE indicated that, while donors have pledged sufficient resources to clear existing water wells, significant additional resources are needed to develop new potable water solutions for rural populations affected by Mitch.

The **United Nations Development Programme** is helping 25 municipalities in five *departamentos* manage the overall resettlement process (see Figure 4, page 16). Their US\$2.3 million Project<sup>1</sup> provides a small pool of resources to participating municipalities to help them overcome specific obstacles in the resettlement and reconstruction process (e.g., land identification, topographic and hydrologic analysis, legal advice on title transfer, etc.). The Project does not, however, pay for the purchase of land. For implementation, the Project is fielding one *técnico per departamento*, and one *tecnico medio* for every one or two participating municipalities.

Following a different strategy, the GON and several donors are purchasing land and constructing units. The **Nicaraguan Housing Bank (BAVINIC)** has budgeted some US\$10 million for housing solutions for 1999, some of these resources can be used for purchasing land for refugee settlements. Several projects will help refugees construct some 6,000 permanent shelter solutions (see Table C-1). Most of these 6,000 units will involve auto-construction techniques and will include local infrastructure.

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<sup>1</sup> UNDP Project "Transición de la Emergencia hacia la Rehabilitación y Desarrollo de los Municipios en la Zona Norte del País Afectada por el Huracán"

**Table C-1**  
**Permanent Shelter Solutions Pledged (by Agency)**

<b>Agency</b>	<b>No of Shelter Solutions</b>
Red Cross (Nicaragua)	1,700
UNDP	1,000
Taiwan	963
GTZ	400
Banco de Posoltega	100
Others	approx 1,837
<b>TOTAL</b>	<b>approx 6,000</b>

*Source BAVINIC*

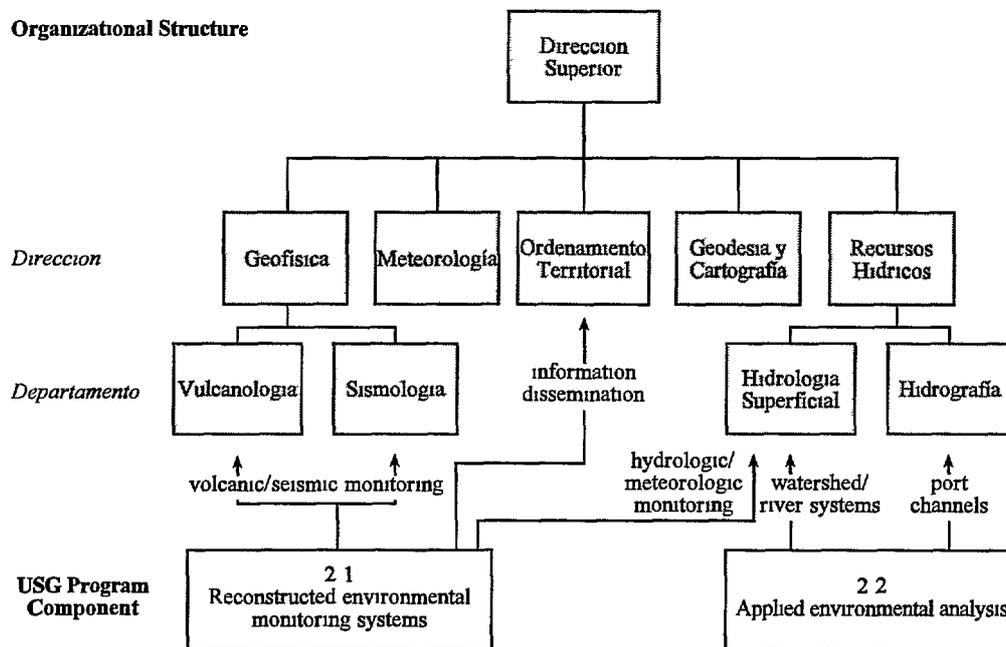
## Appendix D

### Program Implementation Strategy and Absorptive Capacity for Nicaraguan Institute of Territorial Studies

When appropriate, GON agencies should serve as development partners and/or beneficiaries in implementing the USG strategy. When crafting specific program components, however, care must be taken not only to propose the appropriate GON implementing agency, but also to design the component to take into account the absorptive capacity of that agency. This concern is particularly critical during post-emergency reconstruction, when agencies run the risk of becoming overwhelmed by a sudden influx of assistance from various international agencies.<sup>1</sup>

So as to design an effective program, the Task Force has particularly investigated a key implementing agency — the Nicaraguan Institute of Territorial Studies (INETER). INETER is proposed to implement Subcomponents 2.1 and 2.2 of the Program. Implementation responsibility will be distributed among several different *direcciones* and *departamentos* (see Figure D-1), this will help INETER from becoming overwhelmed by the Program.

**INETER as Implementing Agency  
Organizational Structure (Simplified) and  
Corresponding Program Subcomponent**



<sup>1</sup> In addition to the absorptive capacity of INETER, discussed below, the text offers additional discussion of the absorptive capacity of municipalities and FISE related to project development, see Section 4.3.2, Subcomponent 1.1

Each of the *departamentos* selected to assist in Program implementation has full-time professional and support staff who will receive training via the Program (see Table D-1)

**Table D-1**  
**Staff of Selected INETER Departments**

<i>Direccion</i>	<i>Departamento</i>	Staff	
		Professional	<i>Técnicos Menores</i> and Support
<i>Geofísica</i>	<i>Vulcanología/Sismología</i>	14	9
<i>Recursos Hídricos</i>	<i>Hidrología Superficial</i>	5	7
	<i>Hidrografía</i>	5	5

The only *departamento* scheduled to play a lead role in implementing more than one Program subcomponent is the *Departamento de Hidrología Superficial* (see Figure D-1). However, INETER's Director of *Recursos Hídricos* (who oversees that *departamento*) indicates that one of those two subcomponents, rebuilding the hydrologic/meteorologic monitoring system (2.1), is not labor-intensive and in fact could be contracted out. INETER will also complete this task relatively early in the implementation period. This will free up the staff of *Hidrología Superficial* to focus the bulk of its attention on Subcomponent 2.2 later in the Program.

Besides the ongoing assistance that INETER receives (see page 19) and the current proposal, it is somewhat difficult to foresee what other international assistance the Institute may receive during the two-year reconstruction phase. INETER has had conversations with representatives of a number of international agencies, however, to date few of those conversations have resulted in signed memoranda of understanding and/or concrete programs. Recent conversations with Japanese aid officials focused on supporting INETER to become a center for coordinating actions during a future natural disaster.

## Appendix E

### Efforts to Date to Rebuild Municipal Infrastructure

The Emergency Social Investment Fund (FISE) has been providing an effective response in rebuilding municipal/community infrastructure damaged by Hurricane Mitch. FISE refocused its emergency response on new priority sectors: road rehabilitation (with a priority on farm-to-market roads), bridges, water and wastewater system reconstruction, and public facilities. FISE also deconcentrated and streamlined its operations after the hurricane. Over the past two months FISE has contracted some US\$10.9 million and disbursed about US\$4.1 million, in 94 percent of the municipalities in the targeted *departamentos* (see Table E-1). The amount contracted to date represents about 90 percent of the US\$12 million in post-Hurricane Mitch emergency support provided to FISE by the IDB and the German cooperative agency KfW.

**Table E-1**  
**FISE Investments in Municipal/Community Infrastructure**  
**(November 1998-January 1999)**

<i>Departamento (Región)</i>	% of Municipalities that have Received Assistance to Date	No. of Projects	Amount Contracted (US\$ million)	Amount Disbursed (US\$ million)
Chinandega (II)	85% (11 of 13)	275	\$2.1	\$0.8
Leon (II)	100% (10 of 10)	334	\$1.8	\$0.6
Estelí (I)	100% (6 of 6)	79	\$1.1	\$0.6
Madriz (I)	100% (9 of 9)	104	\$1.1	\$0.6
Nueva Segovia (I)	100% (11 of 11)	127	\$1.1	\$0.4
Jinotega (VI)	86% (6 of 7)	92	\$1.0	\$0.4
Matagalpa (VI)	92% (12 of 13)	164	\$1.2	\$0.7
Managua and Rivas	—	70	\$1.3	\$0.0
<b>Total</b>	94%*	1,245	\$10.9	\$4.1

\* 65 of 69 municipalities in Chinandega, Leon, Estelí, Madriz, N. Segovia, Jinotega, and Matagalpa only

FISE officials indicate that they are committed, and have received funding, to continue their newly streamlined approach and deconcentrated structure in the future, with regional offices probably maintained in Matagalpa, Estelí, and Chinandega. FISE has programmed, and is currently negotiating, US\$164 million for municipal/community infrastructure investment during the 1999-2001 period<sup>1</sup> (for other plans, see below). Sixty-five percent of those funds will be directed to around 47 municipalities where populations are considered to be in conditions of "extreme poverty," most of which are in the area affected by Hurricane Mitch. Those municipalities will be entitled to apply for up to an average of US\$2.6 million for project funding over the three-year period. The other 100 Nicaraguan municipalities (including some in the area affected by Hurricane Mitch) would average up to about US\$0.6 million per municipality in project funding during that period.

<sup>1</sup> Those resources targeted at investment would represent the lion's share of a US\$194.9 million program, of which US\$169.5 million has already been secured via loans, non-reimbursable assistance, and local contributions.

**Protierra**, a World Bank-funded project administered by INIFOM, has targeted largely the same geographic area as has FISE for its financing of post-Hurricane Mitch reconstruction of municipal/community infrastructure (see Figure 5, page 24). Since Hurricane Mitch, Protierra has financed infrastructure investments, not only in its Phase I area of *Región II*,<sup>2</sup> but also in nearly 50 municipalities in *Región I* and *Región VI*. Protierra has focused on rural projects, such as wells and rural water systems, latrines, and repair of road maintenance equipment. These projects are generally smaller than FISE investments. For this immediate post-Hurricane Mitch response, the World Bank has made available some US\$4 million. After an evaluation in March 1999, the emergency program may continue through June. Protierra's future plans are discussed below.

The **U S Army Joint Task Force (JTF)** is financing and rehabilitating secondary roads and building low-water crossings in *Region I* (Nueva Segovia, Madriz, Estelí) and *Región VI* (Matagalpa and Jinotega, see Figure 5, page 24). As of mid-January 1999, the JTF had rehabilitated some 92 kilometers of roads, 7 drain culverts, and 3 river crossing culverts. The JTF had also designed and constructed a medical clinic in Wiwilí, repaired a water main in Ocotol, and undertaken dam and bridge feasibility studies. The JTF operations are scheduled to cease around April 1999. The U S Army is currently developing a proposed New Horizons exercise that would provide additional reconstruction support to Nicaragua beginning around April 1999.

**KfW**, the German technical assistance agency, has reportedly committed to financing the rebuilding of the water/wastewater systems administered by municipalities in Matagalpa and Jinotega. ENACAL has estimated the costs of this reconstruction at between US\$3.1 and US\$3.6 million.

**ENACAL** itself has undertaken reconstruction work in water/wastewater systems that it administers (not Matagalpa or Jinotega). Emergency efforts restored these systems from about 40 percent levels during the emergency to about 80 percent levels within 10 days of the end of the emergency. Some of this emergency repair, however, represents only a temporary solution. As noted above, ENACAL estimates the cost of restoring the urban systems that it administers, as well as the rural systems, at about US\$6.9 million (this cost includes the cost of its up-front emergency outlays). A US\$60 million loan from the IDB for water/wastewater infrastructure is currently drawing to an end. ENACAL is negotiating or has reached agreement with UNICEF, the Swiss cooperative agency, and CARE to finance repair of rural systems.

The **Ministry of Transport and Infrastructure** has focused on reconstructing highways and primary roads and bridges, rather than on municipal-level infrastructure. To date they have obtained financing from international agencies for about one-quarter of their proposed US\$600 million Reconstruction Plan (1999-2001), which focuses on the primary road network. This Plan, however, does not rank those projects according to any criteria (e.g., emergency transportation considerations). Such ranking is particularly critical at present, given that many river crossings in the north are temporary, low-water crossings that could easily wash out.

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<sup>2</sup> Protierra Phase I is also active in RAAS.

Without such ranking of projects, essential movement around the country could easily be paralyzed during the next rainy season

The **Nicaraguan private sector** has played an important role in post-Hurricane Mitch infrastructure reconstruction. The MTI has contracted with many contractors to rebuilt primary roads, etc via emergency streamlined procurement procedures. Construction contractors are represented by the Nicaraguan Chamber of Construction (CNC), which contains about 150 members, including a handful of larger contractors. Engineers and architects have formed the Nicaraguan Association of Engineers and Architects (ANIA). Members of both groups often have experience in both housing and infrastructure projects.

## Appendix F

### Efforts to Date to Support the Municipal Project Development Cycle

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USAID is helping selected municipalities, mostly *departamento* capitals (*cabeceras*), administer the project development cycle. The USAID/PADCO Municipal Autonomy and Decentralization Project (MADP) is currently active in seven municipalities in the area affected by Hurricane Mitch. (The Project will expand to additional municipalities in the near term, however, those municipalities have not yet been selected.) Among other activities, the MADP is helping municipalities develop capital investment programs. Since Hurricane Mitch, USAID has added a new component to the MADP. Regional Offices for Municipal Reconstruction located in Leon and Matagalpa are providing additional support to municipalities (both those participating in the Project as well as a handful of others on a case-by-case basis) in prioritizing and developing reconstruction projects.

Protierra has helped municipalities develop mostly rural projects, apply for financing, and monitor implementation in its Phase I municipalities in the *Departamentos* of Leon and Chinandega. Protierra has implemented this assistance by funding of Municipal Technical Units (UTMs) in participating municipalities. These units, which typically contain one or two *tecnicos*, are integrated into the municipal organizational structure. The UTMs have apparently been effective in developing specific projects — Table E-1 shows that municipalities in León and Chinandega have far outstripped other municipalities that do not have UTMs in getting projects funded by FISE.

In upcoming months, Protierra plans to field mobile technical teams to assist Phase I municipalities and UTMs in developing Municipal Development Plans. Completing this exercise, however, is dependent on receiving municipality-specific geographic inputs from INETER, the Ministry of Natural Resources (MARENA), and the Ministry of Agriculture (MAG). Those inputs are reportedly due by June 1999, officials note, however, that virtually none have been received to date.

Protierra emergency assistance in other *departamentos* affected by Hurricane Mitch has not involved the creation of UTMs, but only the financing of small projects (discussed above). Analysts are currently formulating Protierra Phase II. Phase II, scheduled to begin in 2000, will most likely involve the fielding of UTMs in participating municipalities. Phase II municipalities will probably be located in the *Departamentos* of Nueva Segovia, Matagalpa and Jinotega in the area affected by Hurricane Mitch, as well as Boaco and Chontales.

DANIDA has helped municipalities through its Municipal Development Program in the *Departamentos* of Nueva Segovia, Madriz, and Estelí develop investment plans. Since Hurricane Mitch, this program has also helped municipalities revise those investment priorities and apply for funding, largely to FISE.

FISE expects to begin implementing its Program for Municipal and Community Strengthening in earnest this year. Similar to Protierra, that Program will involve fielding UTMs in participating municipalities to conduct "participative micro-planning," develop municipal investment plans, and formulate and administer projects. FISE has targeted up to 60 participating municipalities for possible eventual participation in this Program, targeted municipalities in the study area are shown in Figure 7, page 27.<sup>1</sup> Targeted municipalities generally correspond to areas where extreme poverty is concentrated. Municipalities would be phased in over the three-year life of the Program. FISE is currently negotiating with a Swiss cooperative agency for about US\$1 million to begin this activity in about 30 of the targeted 60 municipalities. Municipalities in the *Departamentos* of Jinotega, Matagalpa, and the eastern part of Nueva Segovia are currently being discussed as targets for participation in 1999 (see Figure 7, page 27).

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<sup>1</sup> Participation would depend upon the reaching of agreements with those Municipal Councils. For Municipalities that do not participate in this specific Program, FISE would continue its normal operations.

