I. EXECUTIVE SUMMARY

Before the 1990's, professionals working in the emergency and disaster field saw disaster management as the ultimate goal to achieve. Their focus was on identifying hazards and taking measures to minimize the impact of a disaster. At this time, there were two main types of organizations working in the field. On the one-hand, you had scientific and technical organizations analyzing the disaster and its impact, and on the other, there were relief agencies, health services, public works, the military and other logistical organizations addressing the needs of the people affected by the disaster.

In the 1990's, a change began to occur in the emergency and disaster field. The focus began to switch from disaster management to risk management. In 1996, the U.S. Agency for International Development's Office for Foreign Disaster Assistance (OFDA) implemented a strategic planning process that identified Prevention Mitigation and Preparedness (PMP) as critical to reducing the risk of countries exposed to natural and man-made disasters. In addition to the traditional preparedness and relief agencies, new players entered the field. These included development institutions, planning offices, and community organizations.

Since risk management is a relatively recent concept, its application in Latin America has been limited. In Latin America, risk management has been used more to deal with expensive physical infrastructure rather than with community needs such as health, housing, and agriculture. However, the severe impact of El Niño on countries throughout Latin America has provided an opportunity to examine how risk management can be applied at both the national and local level to deal more effectively with disasters. Using Bolivia as a case example, the present study outlines strategies and procedures that OFDA could promote and implement at the local level with low cost and high community participation in many cases of natural and man-made disasters. These strategies and programs both save lives and set up the conditions necessary to prepare for and mitigate the effects of the next disaster.

Bolivia is a compelling example as the country has been experiencing two very different climatic situations. Bolivia's high valleys and altiplano have been experiencing a severe drought, while floods have been occurring in the northern and eastern areas. The drought has been particularly alarming as it has been growing over time and has severely effected the indigenous population that lives in the region. This group makes up nearly 5% of the Bolivian population and is extremely poor, suffering from severe food insecurity. They were particularly hard hit by the drought due to already difficult living conditions, resulting from years of government neglect and lack of development in the region.

This paper, which is intended to be a decision making tool for future OFDA and USAID Missions, is based on the premise that OFDA and USAID may be able to better respond to impacts of droughts and food insecurity, by helping to develop effected communities in some areas of Bolivia. Pilot projects can be implemented that will explore appropriate ways to respond to the consequences of drought in areas of food insecurity. Critical to the success of such projects is identifying techniques that can be used to mitigate the

effects of drought both in seasonal occurrences and in future El Ninos. These pilot projects could serve as a model for the Bolivian Government and other organizations, including NGO's, to implement strong and consistent programs in drought areas. Similar programs could also be developed for other parts of Bolivia that are experiencing other climatic conditions such as heavy rain. For example, an early warning system could be designed for populations at risk from heavy rains, as well as systems that provide an adequate and timely response to the impact of flooding and for rehabilitation.

In order to implement effective programs that have long-term impact and respond to the consequences of drought in areas of food insecurity, three things must be developed:

1. indicators to define drought conditions;
2. an informal predictive device to evaluate social marginality; and
3. a list of response activities with long term impact.

In the final section of this paper, after the Bolivian case study, I will present methodology for each of these three areas and explain how they could be applied to the drought situation facing the indigenous people of the high valleys and altiplano of Bolivia.

II. CONCEPTUAL FRAMEWORK

Given the cross-disciplinary approach that is being used in this paper, it is necessary to define the different concepts that will be applied to the Bolivian drought situation. These include:

- Drought, with a focus on climatology.
- Food security.
- Marginalization
- Risk management.

Drought

Drought has many different definitions depending on the discipline and the context within which it occurs. For our purposes, the best definition of drought is the one provided by The National Center of Drought of Australia.

> "a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, although its characteristics vary significantly from one region to another. Drought is a temporary aberration and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate."

The Center also explains that drought should not be viewed as merely a physical phenomenon or natural event but as a result of the interplay between a natural event and

the demand people place on a water supply. Human beings often exacerbate the impact of drought. The Center sees recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships underscoring the vulnerability of all societies to this "natural" hazard.

In Latin America, the subject of drought has still not been addressed effectively. In order to determine the extent to which drought exists in different parts of the region, it will be necessary to do extensive data gathering, research, and analysis.

Food Security

When discussing food security, the situation is more complex as there are a diversity of definitions and approaches to the topic. This study will take a multi-sectoral and interdisciplinary approach to food security. Helen Young best expresses this approach in her recent article entitled "Food Security Assessment in Emergencies: Theory and Practice of a Livelihoods Approach."

> "The concept of food security has grown in importance over the past three decades. Concerns about food security in the seventies were more at the national and international level; the ability of countries to secure adequate food supplies. Only later did the level of analysis shift to a focus on food security at local level, and even to the household and individual, within."

According to Young, as an organizing principle or concept, food security encompasses two main elements:

1. availability of food which refers to the quality and quantity of the food supply; and

2. access to food, which is defined as an individual's entitlement to food through food purchases, exchange and claims.

Young explains that access to food is perhaps the core element of the concept of food security, and that entitlement theory represented a major paradigm shift in the understanding of famine and why particular people and households are affected. Access to food refers to how people acquire food or how they feed themselves. The ability of people to acquire food is reflected in their exchange entitlements. According to Amartya Sen (1981), famine is the result of a large number of people suffering a complete collapse in their exchange entitlements. Therefore, famine results from a food entitlement decline as opposed to a food availability decline. Exchange entitlements include:

- Production based entitlements (crops, livestock, etc)
- Own-labor entitlements (waged labor, professions)
- Trade-based entitlements (trading artisan production and natural resources e.g. forestry products)

- Inheritance and transfer entitlements (vis-à-vis the state, gifts, loans)

Marginalization

Marginalization is one of the main factors that contribute to a population's vulnerability to natural or manmade disasters. Therefore, marginalization should be studied in greater depth, and discussed within the field of Risk Management.

Marginalization can be discussed in a number of different contexts such as ethnic, religious, social, economic, political and educational. Each of these contexts requires a specific method of analysis. In the present study, we will be focusing on "ethnopolitical" marginalization that is significant for indigenous groups existing in the altiplano and high valleys of Bolivia. These groups can be considered as one of the populations under the greatest risk from drought in Bolivia.

Risk Management

To understand the concept and scope of risk management you first must break it up into its component parts. (Sarmiento, 1998b p16-18) **Risk** is defined as the probability of exceeding a specified level of social, environmental and economic damage, in a specific place and time. The Risk is specific. It applies to a defined subject or system exposed to a specific hazard. Risk results from the relationship between hazard and vulnerability. This is expressed by the equation **R = HV.** Risk can only be understood by comprehending the relationship between hazards and vulnerability. By understanding risks, we will be able to reduce both hazards and vulnerability before they become disasters.

Hazard is the result of a natural process or human activity that can strike a specific location with specific magnitude and duration. **Vulnerability** refers to the potential of a subject or system exposed to a hazard to be damaged. Though scientific and technical studies about hazards are important, we also need to understand the internal characteristics of the subject exposed to specific hazards.

Physical, social, economic, educational, political and cultural factors all contribute to what has been termed as global vulnerability. Wijkman and Timberlake state that "vulnerability is equal to the lack of development." Vulnerability, therefore, can be seen as an unresolved development problem.

The vulnerability of a population can be increased by a number of different factors:

1. A population's proximity or exposure to a hazard. Due to population growth, more people are living in disaster-prone areas such as by the side of a river and on unstable soils.

2. A population's level of access to resources and their ability for capacity building. If a high percentage of the population is worried about survival on a day to day basis, they are not taking precautions for a potential earthquake or flash flood. They are only thinking about how they can find food for today and tomorrow.

3. A population's marginality. Marginality is one of the main problems today. Ethnic, religious, social, economic, political and educational problems all contribute to this marginality.

All communities have a certain level of damage that they are prepared to support. This is known as acceptable risk. All of us in our daily lives make decisions about how much risk we are willing to accept. For example, when somebody is aware of the risks involved but decides anyway to live on a dike or near a seismic fault, he or she accepts risks.

At the local level, decision makers constantly have to determine what are acceptable risks for their community when undertaking development projects. When a mayor decides to build a bridge, he accepts a certain level of risk based on his knowledge of how fast the river flows, how high it rises, and the amount of money available to build the bridge. If the bridge is to be built on a river that is constantly flooding and changing course, building the bridge may not be worth the risk to the community.

Risk management focuses on interventions that avoid or minimize the effects of an adverse event. These interventions are for prevention (avoid risks) and mitigation (reduces risks) of the disaster. Risk management can also be applied to the concept of "assets" which is currently being discussed in relation to complex emergencies (Lautze-Hammock, 1996). In a risk analysis, "assets" should be taken into account in order to protect them before the occurrence of an adverse event, and to replenish these in the post event. "Assets" are critical to the recovery process in the aftermath of a disaster.

III. BACKGROUND ON EL NIÑO SOUTHERN OSCILLATION

As mentioned in the introduction, the impact of the El Niño Southern Oscillation (ENSO) on Latin American provided an opportunity to study the effectiveness of risk management in dealing with a wide range of disasters. ENSO refers to two phenomena that researchers have linked together: the "oceanic" or "El Niño Current" and the "atmospheric" or "Southern Oscillation". El Niño refers to a strong, warm, maritime current that occurs periodically at the end of December along the coasts of Ecuador and Peru. This current became known as El Niño through its association with Christmas and the birth of the child Jesus. The Southern Oscillation refers to a pendular relationship that exists in the barometric pressure of the southern Pacific Ocean. When the pressure is high in the western part of the southern Pacific, it is low in the eastern part, and vice

versa, causing notable changes in the direction and the speed of the winds on the surface of the water.

The changes related to ENSO[1] produce large variations in weather and climate around the world year after year. Monsoon rains, droughts, and other climatic changes that have occurred in the equatorial Pacific, the United States, Canada, Latin America, and Africa have been attributed to ENSO. These climatic changes have a profound impact on local communities. Droughts, floods, and heat waves can have a negative impact on health, agriculture, fisheries, and the environment. They also worsen air quality and increase the demand for energy. For example, changes in oceanic conditions have had disastrous effects on fish and sea birds along the coast of South America, negatively impacting the fishing and guano industries. However, some sea creatures such as wild shrimps benefit from the climatic changes associated with El Nino. This has been evident in unexpected, large harvests of wild shrimp that have occurred in some areas of South America.

Unlike annual climatic variations that are predictable, ENSO occurs at irregular intervals every two to seven years, always with different characteristics. Usually, it begins around Christmas and lasts from 12 to 18 months. The most serious recorded episode of El Niño occurred in 1982-83. This was followed by an occurrence in 1986-87, and a prolonged event that lasted from 1990 until 1995. The anomalies of the most recent ENSO started in May 1997 and continued up to the middle of 1998.

The magnitude and impact of this most recent El Niño was particularly severe. From the end of November 1997 through mid-year of 1998, ENSO caused severe rains in Ecuador and Peru and a shortage of rain in other parts of the hemisphere. The lack of rainfall had serious and prolonged effects on the economies of the countries of Latin America causing a reduction in water for drinking and agriculture, extensive forest fires, and disorders in electric generation, and navigation.

The intensity of El Niño depends on the magnitude of the anomalies and its area of influences (IDEAM 1997). Although this intensity influences the climatic effect, it is different from the magnitude of this effect and the impact it has on human activities. The magnitude of the climatic effect is determined by the time of year that the phenomenon occurs. The extent to which it has a socioeconomic impact on a local community depends on the vulnerability of that community and the types of socio-economic activity the community engages in. (Sarmiento 1998a). In the following case study on Bolivia, we will examine how the severe impact of El Niño on indigenous groups living in the altiplano was a result of the high vulnerability of the population due to its lack of development.

[1] Adapted from Chapter 3, J.P.Sarmiento "El Niño Southern Oscillation 1997/98. Experiencias de América Latina y el Caribe" OPSOMS, Draft. 1998.

IV. BOLIVIA: A CASE STUDY IN RISK MANAGEMENT

Basic demographic aspects of Bolivia

Bolivia is a country of 1,098,581 square kilometers that is located in central South America. The Andes Mountains reach their widest extent of 650 km in Bolivia and are divided into two great chains, between which lies the altiplano. The altiplano, at an average elevation of 12,000 feet, is one of the highest populated areas in the world. Narrow, step-sided valleys know as yungas crease the eastern slopes of the Cordillera Oriental and contain several important cities. To the east and north of the Cordillera Oriental, the land settles into the vast llanos that merge into the Amazonian jungle. The Andean area makes up 28% of Bolivian territory. The remaining 72% of the country is composed of the pits or basins of the Amazon and Silver Rivers. The Bolivian economy is based on the exploitation of oil and natural gas, the mining of silver and tin, and livestock and agricultural production.

Based on a 1992 census, Bolivia has a population of 6,344,396 inhabitants with a population density of 5.78 inhabitants/km2. It is estimated that poverty affects 69.8% of the population. 33% live in moderate poverty while 36.8% in extreme poverty. Based on a 1994 study, 7.8% of urban populations were illiterate and 31.1% of rural populations. The infant mortality rate for 1997 was 58/1000 in urban areas and 94/1000 in rural areas. The leading causes of infant mortality are acute diarrhea, acute respiratory infection, and perinatal diseases. Moderate and severe malnutrition in children under 5 reaches 13%.

The principal ethnic groups in Bolivia are indigenous people who make up more than 50% of the population. Highland indigenous people are the majority of the indigenous population in Bolivia. They are primarily Quechuan-speaking and Aymara-speaking Indians who live in the altiplano, or Andean region of the country. Most Aymara live in the La Paz department and Quechuan live in the departments of Cochabamba, Oruro, Potosí, Chuquisaca, and Tarija.

The division between Indian and non-Indian in Bolivia is quite significant. The people of European descent are considered "gente decente" or "refinado", which means decent people or refined people. This term does not refer to the color of skin of a person, but rather the way of life, which is adopted by a person. For instance, one can have dark skin color, but be a "persona decente", through his or her adaptation of the dominant elite norms, culture, and social links. The mestizo is an ambiguous term because it refers to a person of mixed blood, usually European and Indian.

Indians who are of mixed blood or have adapted to the way of life of the dominant class are considered to be cholos. Cholo is a term that connotes a person who is neither Indian nor "gente decente". This group of people are upwardly mobile in society, yet are still discriminated against by the dominant members. The last and lowest group within society is the indians, or rural. This group is highly discriminated against because its members are not assimilated into the dominant lifestyle and are the poorest class. Members of the dominant class often refer to Indian paternalistically are daughter or child, meaning are or daughter. A further division between these groups is that of location. People decent

located in urban areas, while cholos and Indian are located in rural, agricultural areas, or poor urban areas.

The distinction between Indian and non-Indian in Bolivian society is apparent through speech, education, and positions in public office, and the military. The "gente decente" (non-Indian) is always referred to in the formal you, or "usted", by those who are unfamiliar with the person. However, non-Indians do not refer to unknown Indians by formal you, or usted, but rather by the informal you, or "tu". Moreover, indigenous people are expected to ride in the backs of buses or stand on opposite sides of the street as the non-indigenous people.[2]

The Climatic Effect of ENSO 1997/98 on Bolivia.

During the short rainy season of 1997, there were flash floods in the northern and eastern regions of the country. The floods were concentrated in the departments of Santa Cruz, Cochabamba, La Paz, Beni, and Pando. The Civil Defense reported that nearly 26,800 people were affected by the floods during the period of December 1997 through July 1998. While floods were occurring in the northern and eastern parts of the country, drought spread to the altiplano and valleys of, Oruro, Potosí, Chuquisaca, Santa Cruz, and Tarija. Drought also occurred in the departments of La Paz and Cochabamba that were already experiencing flash floods. Taking into account the climatic and oceanographic conditions that are associated with the negative phase of the ENSO (La Niña), there could be a marked increase in precipitation during the normal rainy season of the second quarter of 1999. This could generate multiple emergencies in the low zones of the Andean Region.

Analysis of Bolivian Infrastructure and Its Vulnerability to ENSO

Health

In 1998, Bolivia developed a program for epidemiological surveillance that has made it possible to detect changes in the state of health of the population. Despite the existence of non-official reports of malaria and yellow fever outbreaks, the health department has not reported significant changes in the epidemiological profiles of the population due to ENSO. However, the existence of vulnerable groups that suffer from chronic situations such as malnutrition, could be at risk due to the shortage of water and the consequent migration as described by the Department of Civil Defense. Therefore, the situation should be carefully monitored.

Drinking Water

No detailed information exists about the quantity and quality of water resources in Bolivia. The census of 1992 estimates that only 54% of the population has access to drinking water. 81% of this population live in urban areas and 19% in rural areas. Based on information collected by the ENSO Coordinator, it is calculated that access to water

[2] Burke, Pamela, Highland Indigenous People of Bolivia, Minorities at Risk, 1995.

for more than 300,000 people has been affected by the drought. The first impact of the drought was a reduction in the drinking water supply. This was followed by a reduction in the amount of water available for agriculture and for animals. A USAID report estimates that the drought could cause a reduction of up to 30% in the available surface water for the department of Oruro and a 50 to 60% for Cochabamba.

Sewerage

According to the census of 1992, only 48% of all houses in Bolivia are connected to a sewerage system. The problems with the Bolivian sewerage system range from a lack of service in rural areas and marginalized urban areas, to serious deficiencies in the treatment and final disposal of solid liquid waste.

Electric Power

In Bolivia, fossil fuel generators, and hydroelectric and thermoelectric plants generate electric power. 87% of the urban areas receive electricity, while only 15% in the rural areas. Some plants have started rationing electricity as in Tarija where only 1,000 KW of its total requirement of 12,500 KW comes from a hydroelectic plant. This plant is functioning with a minimum water level. The water reserve of San Jacinto, which is used to generate energy for the southern part of the country, is presently not in use. Due to the shortage of water, water can only be used for irrigation and human consumption.

Housing

The adobe is the main type of housing used in the high valleys and altiplano of Bolivia. Family life revolves around this simple form of housing. Though in drought situations housing is not an important issue, it becomes critical in areas experiencing heavy rains. In March 1998, the Department of Civil Defense reported nearly 500 people without housing in the area of Guanay due to the intense rains that occurred north of La Paz on February 10. There is no available information regarding the housing needs of populations that migrated to the urban centers of La Paz, Cochabamba, Santa Cruz and Chapare.

Agriculture

To determine the impact of ENSO on agriculture, the Department of Civil Defense, USAID/Bolivia and the ENSO coordinator, conducted a fast rural evaluation in 90 communities of the high valleys and altiplano of Bolivia. They discovered that on 50,748 hectares planted with potato, wheat, oats, `cinchona`, corn, barley, fruits, and vegetables in drought areas, there were losses from 50 to 80%. Others studies showed a loss of 30 to 70%. These studies concluded that there were two different reasons for these losses:

1. the absence of adequate conditions of moisture in the areas of seeding; and
2. the broad dissemination of information about the potential negative impact of the ENSO phenomenon that acted as a disincentive for farmers.

In both situations there was an economic loss. However, in the second situation the seed was at least preserved for the next planting. Both situations also resulted in a major increase in the price of basic foods. The data varies for studies that were conducted in the

flood areas. It is possible that agro-industry owners who have a great deal of economic power in Bolivia influenced the Central Government to pass legislation and incentives in their favor that compensated for any losses they might have incurred .

Livestock

According to a February 1998 report from USAID/Bolivia, drought conditions caused a massive sale of livestock, resulting in a decline in prices. Livestock were sold in order to prevent greater losses and to get money to purchase food that was no longer being produced. The economic loss resulting from a reduction in the quantity of livestock in the high valleys and altiplano of Bolivia will be felt in the medium and long term. It is reported that close to 30% of the llamas, alpacas, sheep, goats, and cattle suffer from malnutrition and/or parasites. In order to address this situation, serious research must be undertaken to evaluate the state of agriculture and livestock in Bolivia.

The Effect of ENSO on the Bolivian Economy

For 1998, Bolivia reported an estimated GDP loss of 2.1 percent, 5 percent higher inflation, and $134 million loss in the agricultural sector. Unlike Ecuador, Bolivia did not accept the evaluation proposed by the Economic Commission for Latin America and Caribbean (ECLAC). It is unquestionable that ENOS 97/98 had an effect on the Bolivian economy. However, it cannot be specified in what way. In September, USAID/Bolivia reported that drought, not flooding in Bolivia created human misery. According to official figures, close to 120,000 families were affected by drought. There were also reports of significant rural-to-urban migration and an increase in urban settlements, unemployment and insecurity. Though all these issues are reported on frequently by the media and in official reports, there is no available information that estimates the magnitude of the problems. More in-depth studies and a careful analysis are required in order to establish the real impact of climate on GDP.

The Bolivian Response to the ENSO 97/98

Due to the magnitude of the disasters resulting from ENSO, the Minister of Defense created at the national level the UTOAF to coordinate mitigation and rehabilitation activities. Emergency management operations were assumed by the Department of Civil Defense with the support of other institutions such as the armed forces. Officially the Bolivian Department of Civil Defense is part of the armed forces and its director is always a high ranking military official. At the local level, communities responded to the disasters as best they could based on their limited resources. Grassroots organizations played an important role in implementing aid programs in collaboration with agencies and institutions that were providing the aid.

A major problem with Bolivia's emergency management structure was that the relationship between the UTOAF and the Department of Civil Defense was never clearly defined. This became evident in problems that arose in program implementation and

coordination with public and private organizations, both nationally and internationally. Also, the contingency plan that was developed lacked an emergency plan. This meant that specific levels of detail were lost in the schematic relations and the general framework. This resulted in serious communication and coordination problems among different public institutions. The contingency plan also had a definite bias. Its' programs favored areas that had experienced flooding, not the areas undergoing severe drought.

All available information on the situation in Bolivia indicates that the majority of aid mobilized by the Department of Civil Defense was used in flood areas. Additionally, all recovery and contingency plans, except for the terms agreed upon in international bank loans, focused on rehabilitation and reconstruction in the short and medium term. In all these plans, there was an alarming absence of permanent solutions for drought areas. This means that the problem of drought in the altiplano and valley's of Bolivia is ongoing and still needs to be addressed.

United States Response in Bolivia

Though the Bolivian government went through a recent decentralization process, the lack of resources at the local level and the severity of the disasters created a major dependency on the central government. The government's inability to meet communities' demand for aid resulted in a broad appeal to the international community for aid. The United States government responded to this appeal. According to the USAID Mission Disaster Relief Officer of Bolivia (Rubey, 1998), the U.S. government response to the disasters that occurred in Bolivia went through a number of different stages:

First stage:

1. In November 1997, a technical assistance team from OFDA visited Bolivia. Based on the climatic forecast of the National Oceanic and Atmospheric Administration (NOAA) and the International Research Institute for Climate Prediction (IRI), OFDA/LAC decided to include Bolivia in the study on risk management and ENOS which had been initiated months earlier in Ecuador and Peru. The objective of this study was to develop a strategy that enabled the USAID Mission in Bolivia and OFDA/LAC to work together on strengthening national structures in the area of emergency and disaster management in order to deal effectively with the impact of ENSO. An ENSO Coordinator was hired who had extensive experience in food programs and emergencies.

2. In late January 1998, USAID staff carried out five rapid appraisals that were the first to empirically base information on crop stress and potential harvest levels. The information was shared with the Government of Bolivia and other donors. Initially the government would not accept the results. However, after 4 months, the official figures were more in line with the data provided by AID. More in-depth studies and a careful analysis are required in order to establish the real impact of climate on GDP.

Second Stage:

3. Title II emergency programs were carried out in severely drought affected areas[3]. Almost $2 million were earmarked for areas that were proven to have high levels of food insecurity combined with severe drought conditions. Food-for-work activities were implemented and emergency rations were given out.

4. 8 Crisis Corp volunteers were sent to the departments of Cohabamba and northern Potosí to advise workers on such topics as drinking water supply, roads, and production.

Final stage:

5. $1 million in Title III resources in the form of potato seeds were given to Bolivia. 991 tons of potato seeds were dispersed to approximately 8,000 households.

6. Assistance was provided to the city of Potosí that was experiencing severe water shortages. 10 OFDA water tanks were given to the city. Awaiting UTOAF counterpart.

Analysis of Aid to Indigenous Communities in the Department of Potosi

The lack of Bolivian government aid to areas experiencing drought was very evident in the northern part of the department of Potosi where USAID carried out a number of aid projects. Using available demographic information and interviews with representatives of different social groups, I analyzed the different levels at which social marginalization occurs for the small indigenous communities living in this area. The levels I analyzed included the national, department, urban, rural, and local. The analysis took into account the socioeconomic status of these indigenous communities and their participation in public investment decisions and the political process.

National level

In the past, Potosí had great influence on state policies as it was a major center for the mining of tin, a mineral that was in great demand on international markets. However, with the decline in demand for tin and the subsequent drop in prices, Potosi lost the economic power it once had. Mine workers unions that were once strong and very influential were now weak and without influence. Today, Potosi is viewed at the national

[3] ***Information concerning the food program***

Title I - Food sale is done under the loan figure through the Department of Agriculture. The debt is frequently forgiven and the obtained resources are allocated to specific activities agreed upon mutually USG and the Country.

Title II - Donation of food, is done projects of "food for work", `"maternal and child`", "school", it is monetarized and the resources are reinvested in the same project.

Title III - Donation of food in kind, usually wheat. it is monetarized and the resources are invested in development projects.

level as a powerless area experiencing social conflict and in need of public investment.

Department level

At the department level, everything is centralized in the capital that also called Potosí. The northern area of the department where the indigenous communities live are not a priority for the departmental administration.

Urban vs. Rural Areas

In northern Potosí, investments are concentrated in the urban areas where the municipal capitals are found. Only two years ago, the rural areas were integrated into the investment process. Today, there is an enormous difference in the infrastructure of rural and urban areas and the availability of resources. Rural areas lack the opportunities of urban areas.

Local level

An implicit zoning exists in the rural areas of Northern Potosi. The area's limited private and public investments and resources stay in the valleys and areas that are fertile and have water. Conversely, there are few opportunities offered to communities that live on steep slopes that are difficult to access and have no vegetation and limited sources of water.

The indigenous communities included in this study have a fragile economy that is still based on a system of barter. Many of them still do not use money. They cultivate small plots of land using traditional techniques. Their limited agricultural production is used to barter for such basic food products as salt, sugar, and corn.

The drought completely disrupted this barter system. Due to the lack of water, communities had very small harvests and were unable to barter for needed food products. Seeds that could have been used for the next harvest ended up being eaten. Women responded to this economic crisis by producing textiles and other handicrafts that could be sold at the market.

The indigenous communities of north Potosi could have greatly benefited from aid projects that provided technical support in such areas as agriculture. The traditional farming techniques could have been improved through the optimal use of seeds, terracing, soil fertilization and irrigation. Based on my experience, these communities would have been very receptive to these types of long term aid projects. Though they are very traditional, there is a desire in the community to improve living conditions and pursue educational opportunities. Additionally, the pride that people have in their communities and their strong sense of social and cultural identity is a good foundation for the community's future development.

V. RECOMMENDATIONS FOR CHANGE

In order to respond effectively to the impact of ESNO we need to:

1. Understand drought, food security, marginality and assets; and
2. Undertake not just logistics but risk management.

By determining the impact of drought on a given marginal population, projects that have a long-term impact can be implemented that will strengthen communities, enabling them to better handle future disaster situations.

A successful approach to mitigate the effects of drought in Bolivia would involve a number of different components:

1. Indicators to define drought conditions
2. Food Security
3. An informal predictive device to evaluate socio-economic marginality; and
4. A list of response activities that have a long-term impact.

I will describe each of these below and explain how they can be applied to the Bolivian drought situation. I will also discuss how the role of institutions in the risk management process can be improved.

Indicators to define drought conditions

Though drought has caused severe environmental, social and political problems in areas of Latin America such as the altiplano and high valleys of Bolivia, no objective measurement system has been used to study the magnitude of the drought in the region. A number of drought indexes such as the Palmer Drought Severity Index have been developed which could be applied to the Latin American context. (See Annex) In order to address the problem of drought in Latin America, the following systems should be developed:

1. a climatic warning system that can be monitored, particularly in drought prone areas. This will enable informed decisions to be made based on indexes and verified scales.

2. the coordination of the climatic warning system with other programs being implemented by the National Service of Meteorology, CONALSA and the SINSAAT. This will avoid the duplication of efforts which was a big problem in the recent disaster response in Bolivia. The coordination plan should address at least the following areas:

    a. meteorology

b. agriculture (crop stress, harvest, price, and market)
c. health
d. water resources
e. transportation
f. housing
g. economic livelihoods

Food Security

Economic security in rural areas is predominantly determined by food security. This is much more than the availability of food. Food aid is an important part of the need in emergency situations, but it must be complemented with other approaches to insure a longer term impact of the aid. Once the assessment is completed and the area is determined to be highly food insecure and vulnerable to drought, then programs to increase food production, rural transport, effective trade and marketing are all potentially part of the solution.

In highly drought prone areas the projects and programs may require different assumptions than traditional development programs. These are programs that must be designed from the very beginning to withstand an inevitable future crisis. Programs to build assets must focus on assets that will survive the drought (or flood); programs that will increase food intake might have to rely on supplemental cash employment rather than rely exclusively on agriculture that will surely fail in times of hardship. The prescription cannot be made except on the ground with local communities, focusing on what the communities anticipate is possible. They are often the best judges of the actual risk of a new idea.

Informal predictive device to evaluate social marginality

In order to evaluate a community's level of social marginalization, a scale similar to the one I developed for north Potosi should be used. This would determine what communities are most vulnerable to disaster based on a number of different factors such as socio-economic status and political power. It is imperative that this analysis be done at different politico-administrative levels, from the national down to the very local.

By applying the social marginality scale in conjunction with the drought indicators, one could identify in a region where there was an overlap between areas experiencing the highest drought index and the highest vulnerabilities. Vulnerabilities in this context refer to exposure, marginalization at different levels of government, resources, and food insecurity. Linking drought with vulnerability is critical to developing programs and projects that save lives and have a long-term impact on a community.

Once a community has been identified as being very vulnerable to drought, high participatory techniques such as the Rural Rapid Appraisal (Sweetser 1997) should be

applied followed by Mary Anderson's approach on vulnerabilities and capacities. This approach could be complemented by other strategies such as saving lives and livelihoods or coping strategies (Lautze, Hammock, 1996). These approaches would determine a community's strengths and weaknesses, and its threats and opportunities, in order to undertake development programs within the community.

Risk Management

There are two crucial areas for effective risk management: excellent coordination at the national level and a broader definition of the types of programs and projects that are applicable in disaster prone areas.

The complex situation which risk management institutions operate in require a clear definition of roles at the national level. As suggested by the USAID Mission Disaster Relief Officer of Bolivia, there are basic guidelines that can be used to strengthen an institution's capacity to manage emergencies, promote fluid communication, define functions and provide technical advise. The success of these actions depends on close coordination among cooperating agencies and financial institutions. Good coordination is particularly critical in Bolivia whose recent disaster response was poorly coordinated.

In order to improve Bolivia's institutional capacity for risk management, the following steps should be taken:

1. Technical assistance should be provided at decision-making levels in Bolivia in subjects related to emergencies and disasters. These subjects would include development and disasters, policy and disasters, and risk management. Donors should also pressure the Government of Bolivia to develop improved coordination mechanisms.

2. Training courses on risk management and drought should be conducted for government institutions and NGOs in Bolivia.

Disaster response must not be limited to sending food, medicine and other materials into an emergency situation. It is important that a saving lives and livelihoods strategy be adopted, even in natural disaster situations. Listed below are number of short term strategies that should be implemented in order to save lives, attenuate the effects of drought on a rural population and have a long term impact on communities.

1. Provide communities with temporary food assistance that contributes to the satisfaction of its minimum food requirements. (Minimum food requirements as defined by Kelly (1992) are a supply of complementary rations according to anthropometric nutritional diagnoses)

2. Begin rehabilitation of the community, by engaging farmers in agricultural work, and paying them with food assistance.

3. Provide the communities damaged by the drought with seeds and agricultural tools in order to begin effective agricultural rehabilitation.

4. Assist communities in building an irrigation infrastructure in order to store small amounts of water.

5. Provide communities with technical advice and training in the areas of nutrition, health, agriculture and livestock.

6. Contribute to the social reorganization of rural communities affected by the drought. Times of stress often help to break down rigid social systems allowing for change to take place. It is important to harness this change into productive channels.

7. Build income diversification projects or components of programs of agencies that are assisting. These can take many forms, from credit to promote micro-enterprise to feeder roads and transportation to insure the marketing of goods. Recent research has shown how micro-credit, even in the most severe disasters, can help save lives and promote livelihoods. It is also possible to focus on asset preservation and enhancement, particularly assets that will withstand the pressures of the natural environment.

ANNEX

Indicators to define Drought Conditions

Recent advances allow us to establish objective measurement schemes to determine the magnitude of a drought. Based on a review of indexes of drought done by the National Center on Drought of Australia (1996), eight measurement scales are important in determining the level of drought. These are:

1. Percent of normal precipitation
2. Deciles
3. Palmer Drought Severity Index
4. Surface Water Supply Index
5. Standardized Precipitation Index
6. Crop Moisture Index
7. National Rainfall Index
8. Dependable Rains

Of these, the first three are of greater applicability and benefit to Latin America.

Percent of Normal Precipitation

The percent of normal precipitation is one of the simplest measurements of rainfall for a location. Analyses using the "percent of normal" are very effective when used for a single region in a single season. It is also easily misunderstood and gives different indications of conditions depending on the location and season. It is calculated by dividing actual precipitation by normal precipitation--typically considered to be a 30-year mean- and multiplying by 100%. This can be calculated for a variety of time scales. Usually these time scales range from a single month to a group of months representing a particular season, to an annual or water year. Normal precipitation for a specific location is considered to be 100%.

Deciles

Arranging monthly precipitation data into deciles is another drought-monitoring technique. It was developed by Gibbs and Maher (1967) to avoid some of the weaknesses within the "percent of normal" approach. The technique they developed divided the distribution of occurrences over a long-term precipitation record into sections for each ten percent of the distribution. They called each of these categories to "decile." The first decile is the rainfall amount not exceeded by the lowest 10% of the precipitation occurrences. The second decile is the precipitation amount not exceeded by the lowest 20% of occurrences. These deciles continue

until the rainfall amount identified by the tenth decile is the largest precipitation amount within the long-term record. By definition, the fifth decile is the median, and it is the precipitation amount not exceeded by 50% of the occurrences over the period of record. The deciles are grouped into five classifications, which are shown in Table 1. The Australian Bureau of Meteorology displays the current precipitation deciles for the previous month and three months across Australia.

Table 1: Decile Classifications for Dry and Wet Periods		
Deciles 1-2	lowest 20%	much below normal
Deciles 3-4	next lowest 20%	Normal below
Deciles 5-6	middle 20%	Normal near
Deciles 7-8	next highest 20%	Normal above
Deciles 9-10	highest 20%	much above normal

Palmer Drought Severity Index (PDSI)

In 1965, Palmer developed an index to "measure the departure of the moisture supply" (Palmer 1965). Palmer based his index on the supply-and-demand concept of the water balance equation, taking into account more than only the precipitation deficit at specific locations. The objective of the Palmer Drought Severity Index (PDSI), as this index is now called, was to provide a measurement of moisture conditions that were "standardized" so that comparisons using the index could be made between locations and between months (Palmer 1965).

The PDSI is a "meteorological" drought index and responds to weather conditions that have been abnormally dry or abnormally wet. When conditions change from dry to normal or wet, for example, the drought measured by the PDSI ends without taking into account stream flow, lake and reservoir levels, and other longer-term hydrologic impacts (Karl and Knight 1985). The PDSI is calculated based on precipitation and temperature date, as well as the local Available Water Content (AWC) of the soil. From the inputs, all the basic terms of the water balance equation can be determined, including evapotranspiration, soil recharge, runoff, and moisture loss from the surface layer. Human impacts on the Water balance, such as irrigation, are not considered. Complete descriptions of the equations can be found in the original study by Palmer (1965) and in the more recent analysis by Alley (1984).

Palmer developed the PDSI to include the duration of a drought (or wet spell). His motivation was as follows: an abnormally wet month in the middle of a long-term drought should not have a major impact on the index, or a series of months with near normal precipitation following a

serious drought does not mean that the drought is over. Therefore, Palmer developed criteria for determining when a drought or a wet spell begins and ends, which adjust the PDSI accordingly. Palmer (1965) described this effort and gave examples, and it is also described in detail by Alley (1984). In near-real cheats, Palmer's index is no longer a meteorological index but becomes a hydrological index referred to as the Palmer Hydrological Drought Index (PHDI) because it is based on moisture inflow (precipitation), outflow, and storage only, and does not take into account the long-term trend (Karl and Knight 1985). In 1989, a modified method to compute the PDSI was begun operationally (Heddinghaus and Sabol 1991). This modified PDSI differs from the PDSI during transition periods between dry and wet spells. Because of the similarities between these Palmer indexes, the terms "Palmer Index" and "Palmer Drought Index" have been used to describe general characteristics of the indexes.

The Palmer Index varies roughly between--6.0 and +6.0. Palmer arbitrarily selected the classification scale of moisture conditions (Table 2) based on his original study areas in central Iowa and western Kansas (Palmer 1965). Ideally, the Palmer Index is designed under that to--4.0 in South Carolina have the same meaning in terms of the moisture departure from a climatological normal as to--4.0 in Idaho (Alley 1984). The Palmer Index has typically been calculated on a monthly basis, and a long-term archive of the monthly PDSI values for every Climate Division in the United States exists with the National Climatic Data Center from 1895 through the present. In addition, weekly Palmer Index values (actually modified PDSI values) are calculated for the Climate Divisions during every growing season and are available in the Weekly Weather and Crop Bulletin.

These weekly Palmer Index maps are also available on the World Wide Web from the Climate Prediction Center."

Table 2: PDSI Classifications for Dry and Wet Periods	
4.00 or more	Extremely wet
3.00 to 3.99	Very wet
2.00 to 2.99	Moderately wet
1.00 to 1.99	Slightly wet
0.50 to 0.99	Incipient wet spell
0.49 to--0.49	Normal near
-0.50 to--0.99	Incipient dry spell
-1.00 to--1.99	Mild drought
-2.00 to -2.99	Moderate drought
-3.00 to--3.99	Severe drought
-4.00 or less	Overemphasize drought

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