

Local-level Economic and Social Consequences

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INTRODUCTION

While not a major focus of the North American media, the earthquakes that occurred in northeastern Ecuador on the night of March 5, 1987, were of considerable significance within Ecuador. At the national level, the country's already deteriorating economy suffered a major blow when Ecuadorian oil production was disrupted by earthquake-related damage to the Trans-Ecuadorian pipeline. According to the United Nations Economic Commission for Latin America and the Caribbean (ECLAC, 1987), the Ecuadorian oil fields had accounted for about 60 percent of the nation's export earnings. Thus, Ecuador's ability to meet its internal operating costs and to make interest payments on its foreign debt were severely impaired. Within a week after the earthquakes, the national government instituted several extreme economic measures, including suspension of the external debt payment to private banks, increased fuel prices, a national austerity plan, and a price freeze on selected essential goods.

The earthquake's social consequences and accompanying demands for response and recovery assistance were relatively unusual with respect to their variety and geographic scope. Damage to the Trans-Ecuadorian pipeline resulted in both a major reconstruction cost and a major loss of national revenue. The damage to housing was spread over a large area and distributed mostly among households of limited resources. The loss of a major transportation route created problems for thousands of people who otherwise suffered no direct damage.

At the most basic level, the tremors were particularly frightening to the populations most directly affected. No earthquakes of a similar magnitude had occurred in the affected area of the country for more than 30 years. The two major tremors, 3 hr apart, left in their wake not only a variety of

types of damage and social consequences, but considerable further hazard in the form of thousands of weakened buildings and the threat of additional landslides. Fortunately, within the next few months there were no substantial aftershocks, although about 20 of the thousands of aftershocks that occurred were perceptible to human beings.

This chapter describes the local-level consequences of the earthquakes that were noted during brief visits to three of the affected provinces. The observations reported here are mainly based on visits to several of the affected communities to view the damage, and on conversations with a variety of local officials, recovery program representatives, and local residents encountered along the way. A few documents and newspapers also were reviewed. The information from the communities was gathered approximately 16 weeks after the earthquakes, and thus refers mostly to consequences experienced and actions taken in the disaster-stricken areas up to the middle of June 1987.

The communities discussed here are located in regions of Ecuador known generally as the *Oriente* and the *Sierra* (Figure 2.1). The Oriente extends eastward from the flanks of the Andes and forms part of the Amazon Basin. Damage to the communities in the Andean region, known as the Sierra, occurred mainly in the relatively densely populated central valley N of the capital city, Quito.

As described in earlier chapters, the mass-wasting phenomena that resulted from the earthquakes occurred in the mountainous western fringes of the Oriente in the vicinity of Reventador Volcano (Figure 1.1). The communities visited in this region (Figures 1.1, 1.2, 4.3) included Lago Agrio at the northern edge of the affected area, Baeza at the southern end, and some smaller villages between Baeza and the bridge site where the Salado River joins the Coca River. These communities are located in Napo Province.

In the Sierra, where damage was mostly limited to specific types of structures affected by ground shaking, exploratory visits were made to parts of the capital city of Quito, to the town of Tabacundo, the village of Olmedo, and the city of Ibarra and its environs (Figure 4.3). These communities lie in northern Pichincha Province and in southern Imbabura Province (Figure 4.1). Carchi Province (Figure 4.1), N of Imbabura Province, also was considered part of the disaster area, but was not visited.

IMMEDIATE CONSEQUENCES AND EMERGENCY-RESPONSE ISSUES

There was little major damage to structures in Quito, although observers reported some rather spectacular fireballs that accompanied the consequences to the power system of the first strong ground movement. Within a few hours, the electricity and phone service were back to normal. Later damage

assessments revealed minor cracking in various buildings around the city, and somewhat more serious damage to several colonial-era churches and cathedrals in the oldest section of Quito, as well as to some of the older houses.

The earthquakes were felt with sufficient intensity in Quito to alert national and international agencies to the possibility of serious consequences and to the need to begin an immediate assessment of the situation. The various environmental clues led to some degree of uncertainty in the first few hours. For example, preliminary damage assessments had to be reexamined once the second and more damaging quake ($M_s=6.9$) occurred 3 hr later. Also, there was initial concern, because of the location of the epicenter and reports of landsliding, as to whether a volcanic eruption had been involved, or might be expected. Secondly, even before dawn, because of the evidence of landslides that resulted in flooding along the Coca and Aguarico rivers and in a broken oil pipeline along the Coca, attention of emergency responders and assessment teams was initially focused on the greatly affected but sparsely populated area immediately E of Reventador Volcano (Figure 1.2). The Ecuadorian military detachment in Lago Agrio was first on the scene on Friday, March 6, beginning its reconnaissance and search-and-rescue missions at dawn.

On Saturday, March 7, assessments were made by U.S. experts. Also by Saturday, the extensiveness of the damage to houses in the Sierra had become evident. For the most part in the Sierra, damaged houses had not collapsed immediately, and there was no loss of life or need for search-and-rescue efforts.

The major effects were determined to be of three general types:

- Direct effects of the landslides, debris flows, and flooding to the infrastructure in the area, including damage to roads and bridges and in particular the Trans-Ecuadorian oil pipeline and the parallel Poliducto gas line. This damage in turn had secondary effects on both the local and national economies.
- Direct effects from the ground shaking on housing and some public buildings in communities N of Quito, and also to some extent in the Oriente.
- Indirect effects on the population of Napo Province that no longer had land access to the rest of the country, as a result of the only road from the town of Lago Agrio to the Sierra region and the capital city of Quito being impassable.

This chapter provides a brief review of the emergency-response-related issues and of the most significant aspects of the emergency period as they differed in the Oriente and the Sierra. It then describes emerging long-

term impacts observed in June 1987, followed by sections on the economic and social impacts and recovery activities observed in the Oriente and the Sierra.

THE EMERGENCY PERIOD IN THE ORIENTE

Beginning with the effects on Napo Province, the most evident direct physical damage from the earthquake was on the flanks of Reventador Volcano and on the floodplains of the drainage systems in this mountainous area. Virtually all of the loss of life associated with the event occurred in Napo Province. The most common estimate of the number of deaths related to the earthquakes is about 1,000. Those who lost their lives were caught by the landslides, or were swept away in the rivers swollen by the debris flows of saturated soil, rock debris, and vegetation from the steep volcanic slopes. These victims typically were residents of plantations or small settlements in the hills and on the floodplains in the area between Baeza and Lumbaquí (Figure 7.1).

In general, the area has only recently been settled by farmers who came there as part of the national agrarian reform and colonization program. Previously, the area was inhabited by various indigenous groups that to a

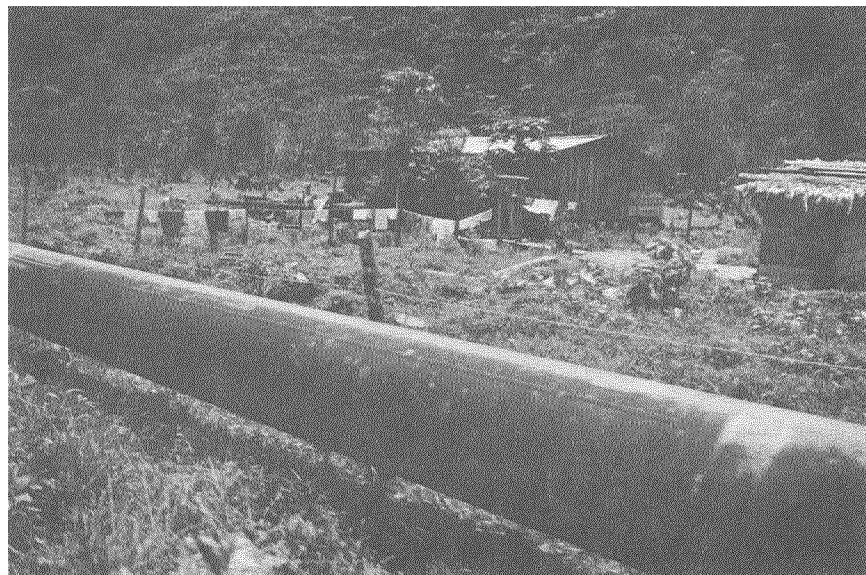


FIGURE 7.1 Typical preearthquake dwelling along the Trans-Ecuadorian pipeline and highway near Reventador Volcano. (1978 photograph by S. D. Schwarz.)

great extent have been pushed farther into the jungle as land is provided to the new settlers. Estimates of the numbers of settlers that were killed or missing as a result of the earthquake vary considerably because there are no reliable data on how many people were living in the area affected by the landslides, and it is assumed that many bodies have not been recovered from the rivers. No specific information was found on whether or not indigenous settlements were included among those destroyed.

Those who were fortunate enough not to be caught in the landslides and debris flows were stranded if they were located on the N side of the Coca River between the bridge at the confluence of the Salado and Coca rivers and the bridge over the Aguarico River. Most of those who were stranded were evacuated by helicopter in the first day or two after the earthquakes, because it was believed that the area was too hazardous for them to remain.

These evacuations and the search-and-rescue operations were carried out by the Ecuadorian Air Force and Special Forces. Provisional shelter was found in convents, schools, and private homes until tent camps could be established in Lago Agrio and in the villages between the Salado River bridge and Baeza. It generally is estimated that around 4,000 to 5,000 people were evacuated. About 500 to 1,000 people eventually were taken to camps in Quito, and about 1,000 stayed in the camps in the Oriente. It is likely that the majority of the evacuees moved in with relatives or friends near the disaster area or in other parts of Ecuador. Some families stayed in Lum-baquí and other nearby settlements, but had to have supplies airlifted across the Aguarico River to them. Eventually this airlift was replaced by canoes and, for a short time, a footbridge (which subsequently washed out). Airlifts for supplies were coordinated by an emergency operations committee that met daily in Lago Agrio, and were carried out by the Ecuadorian Air Force. Lago Agrio itself did not suffer flooding or earthquake damage.

In the area most heavily damaged by the landslides, much vegetation was lost from the mountainsides, leaving the area even more vulnerable to future landsliding. Plantations, grazing land, and other agricultural developments, as well as livestock, also were destroyed by landslides, debris flows, and flooding. Many vehicles were lost or damaged, and others were stranded in the area until the road could be reopened. This caused hardship for survivors who depended on the vehicles for their livelihood.

The sediment in the rivers from the landslides and debris flows did considerable damage to fisheries for great distances downstream. Although about 100,000 barrels of oil spilled into the river when the pipeline was broken, any environmental effect it may have had was overwhelmed by the effects of the sediment and other debris in the water. The destruction of the fish population undoubtedly had negative consequences, in particular to indigenous groups engaged in subsistence fishing. There also were reports

of sediment and other contamination in the rivers causing short-term health problems and making the water unusable until the rivers cleared.

Some tourism was said to have been affected for a short time by the debris load in the rivers, since one of the attractions in eastern Napo Province is boat excursions along the jungle rivers. However, most of this activity is centered in towns that are farther E or S; thus, the economic effects, if any, were not felt in Lago Agrio.

In the small towns S of the area most damaged by landslides, some dwellings were damaged by the groundshaking. In particular, houses constructed of concrete blocks suffered the greatest damage, since most of them had been poorly constructed. To a great extent, these were the homes of people who had prospered enough to move out of the more traditional wooden houses. A few wooden houses also suffered some degree of distortion, or had damage to their concrete foundations. Baeza, the largest town S of the landslide area, presented the most significant example of extensive damage to concrete block homes (Figure 7.2), as well as to some wooden structures.

Although no long-term camp for evacuees from the landslide zone was established in Baeza, many of the town's own residents were dislocated from their damaged or collapsed homes and had to find other lodging or



FIGURE 7.2 Damaged concrete-block dwelling in Baeza, Napo Province.