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Volcanic hazard or economic destitution: hard choices in Baños, Ecuador

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Abstract

In 1999, the entire population of tourism-dependent Baños, Ecuador, some 16,000 people, was evacuated in anticipation of a violent eruption of Mount Tungurahua. Subsequently, many areas in the risk zone experienced heavy ash falls, lahars, and landslides, although no cataclysmic events occurred. Many small rural communities were also evacuated. While these communities became impacted by the hazard, Baños avoided most direct effects. Conditions for all evacuees were grim, and their conditions compounded because Ecuador was simultaneously undergoing profound economic and political crises. Absent livelihood alternatives, community leaders from Baños organized a return to their town even though it remained under an evacuation order. An aggressive campaign brought tourists and more residents back and Baños revived economically; however, this was achieved at the cost of hazard awareness among both groups, tourists and residents, and public safety became compromised.

Keywords: Volcano hazard; Evacuation; Economy and tourism; Community recovery; Ecuador; Tungurahua Volcano

1. Introduction

There are several distinct types of hazards associated with volcanic eruptions, including tephra, lahars, and lava flows, each of which has different impacts on human systems and vary greatly in spatial distribution. Additionally, long-return periods may occur between eruptions or eruptive periods may be characterized by minor events. All of these factors influence perception of the associated risks and can contribute to a false sense of security (FEMA, 1997; Hodge et al., 1979; Johnston et al., 1999; Mileti et al., 1991; Newhall and Punongbayan, 1996; Simkin et al., 2001). Cognitive and situational factors shape how risk is understood and consequently how people respond (Tobin and Montz, 1997). In most cultures, systems of belief also play an important role in risk perception and response (Blong, 1984; Chester, 1993; Chester et al., 1985; Dibben and Chester, 1999; Lindell and Perry, 1992; Tierney et al., 2001).

Research on evacuations has firmly established that individuals will respond to evacuation warnings if they believe the threat to be real, if the impacts will be experienced by them and their families, and if responding to the warning will result in protection (Perry, 1979, 1994; Perry et al., 1982; Quarantelli, 1980). The literature also suggested that while some people may voluntarily leave when a hazard threatens, many await an official warning or order before leaving (Fischer et al., 1995; Perry, 1985) and that compliance is more likely if the source is considered reliable (Janda et al., 1996; Lindell and Perry, 1992). However, following an evacuation, returning home is often problematic and has received less research attention (Stallings, 1991).

A growing body of literature notes that contextual conditions of society affect response to and recovery from disasters. Most vulnerable groups in society, those least able to recover when disaster hits, are those who are already at risk in their normal daily lives due to unsafe conditions and the difficulty of economic survival (Blaikie et al., 1994; Cannon, 1994; Hewitt, 1997; Mileti

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et al., 1991; Tobin, 1999; Wisner, 2001). It does not follow, however, that affluent groups in society are not at risk. In some instances, the wealthy are equally exposed to the effects of hazards and may stand to lose more economically (Dibben and Chester, 1999).

Many tourist destinations are in hazardous areas, and the numbers of people visiting such locations have risen dramatically over the past years. Case studies and official reports on disasters often reference the adverse effect of these events on tourism and the resulting economic impact on communities (California Legislature, 1990; Gamble, 2000; Gardner, 1996; UNU/World Institute for Development Economics Research, 1995; U.S. Department of Commerce, 1996). The tourism industry has demonstrated an increased awareness of the susceptibility of tourists to the impacts of natural hazards. For example, the World Tourism Organization (1998) published a handbook that addressed disaster mitigation issues. Additionally, the U.S. Federal Emergency Management Agency developed a higher education course designed to assist emergency management of tourism (Drabek and Gee, 2000). Notwithstanding these important steps, the disaster/tourism/preparedness nexus has yet to receive intense scrutiny by academics. Among some notable exceptions are studies by Drabek (1991, 1994, 1995, 1996), Faulkner (1999, 2001), and Murphy and Bayley (1989).

2. Purpose of the research

The impacts of natural disasters can be far-reaching, devastating economies and disrupting society over many years. Furthermore, mitigation strategies, while usually saving lives and property, can also hinder long-term recovery efforts. Evacuation practices are a prime example; while securing lives from an immediate threat, economic recovery becomes compromised by taking people away from their livelihoods. This paper examines the hard choices facing disaster evacuees in Baños, Ecuador, where economic recovery, particularly of the tourist industry, and the maintenance of personal livelihoods were perceived as contingent upon a return to the high-risk area of ongoing eruptions. Specifically, this entails: (i) an examination of the return of evacuees to the dangerous area; (ii) an assessment of the perception of the risk by these returnees; (iii) a measure of the change in perception of these returnees over time; and (iv) a determination of what this says about evacuation and recovery. Thus, in this article, the economic impacts and recovery are considered, by looking at the various forces for change, including individual perceptions, and the socio-political constraints all within a provincial and national context.

3. Methodology

Data collected in three questionnaire surveys administered in Ecuador in June 2000 (131 respondents), January 2001 (171 respondents), and May 2002 (314 respondents) formed the basis for this study. Data included interviews with:

(i) Baños evacuees from the Tungurahua Province and former inhabitants of rural areas in adjoining Chimborazo Province (all of whom were living in resettlement shelters);
(ii) individuals who returned to live in Baños while it was still under an evacuation order;
(iii) individuals who returned home after the evacuation order was lifted; and
(iv) individuals in three non-evacuated communities.

Survey instruments incorporated specific questions on personal characteristics, such as age, family relationships, and household income, and were used to classify respondents' roles within household units. Several open-ended questions were also included in the structured questionnaire to obtain extra information from evacuees. Overall, the questionnaire surveys took approximately 30–40 min per respondent to administer. Respondents were selected at each site through existing contacts, resulting in a snowball effect that attracted additional persons. While this did not ensure complete randomness, the resulting sample did exhibit an apparent cross section of the local populations. Setting up a structured random sample was not feasible, given the conditions under which many respondents lived.

In addition, information was collected from volcano survivors through direct field-based observations and from qualitative studies using small focus groups. Contextual data were derived from historical, academic, and other texts; official government and non-governmental organization (NGO) documents; video-taped footage of the evacuation; personal interviews with authorities, community leaders, and other local residents (including focus groups); and monitoring of the on-line versions of Ecuadorian newspapers. Complete details of these studies can be found in two technical reports, see Tobin and Whiteford (2001a) and Whiteford et al. (2002), and in Lane (2003).

4. Tungurahua volcano and the physical setting of Baños

Baños is located at an altitude of 1800 m on the northern base of Mount Tungurahua (5023 m), a stratovolcano located in the Eastern Cordillera of the Ecuadorian Andes, on the border between Tungurahua and Chimborazo Provinces. Before the renewed volcanic activity in 1999, Mount Tungurahua had last seriously

threatened Baños between 1916 and 1918. During this episode, at least one pyroclastic flow and several major lahars descended river valleys immediately to the east and west of the town (Hall et al., 1999). Since then, population in these areas and in Baños has increased. Historically, Mount Tungurahua has experienced sudden, strong eruptions (Yépes, 2000). The surrounding landscape shows geologic evidence of widespread and, in areas, thick tephra deposits, while lahars and landslides have periodically blocked the courses of both the Pastaza River, which flows eastwards past Baños, and its affluent, the Chambo River, which borders the western flanks of Tungurahua (Hall et al., 1999).

Mount Tungurahua remained relatively dormant until 1993 when seismic activity gradually increased with more violent venting of gas and ash in September 1999. This initiated the latest active period with ash falling over the landscape, primarily to the west of the volcano and, on occasions, in the two provincial capitals: Riobamba (Chimborazo Province) and Ambato (Tungurahua Province). On September 15, 1999, the Civil Defense authorities issued a Yellow Alert, began a public awareness campaign, and engaged in estimating how many people would require evacuation (Hoy Digital, September 16, 1999). At the same time, the National Civil Defense formally authorized the provincial *juntas* in Tungurahua and Chimborazo, in coordination with other civil, military, and political authorities, to assume responsibility for organizing and implementing measures to mitigate the effects of an eruption (Hoy Digital, September 16, 1999). Volcanic activity increased dramatically throughout early October, and on October 16, 1999 the state of alert was raised to Orange Level (GVP, 1999). Since then, Tungurahua has been very active, periodically showering ash on adjacent communities (Tobin and Whiteford, 2002b).

The decision by authorities to evacuate Baños and other communities was a precautionary measure undertaken when scientists ascertained that a new, intense eruptive phase was underway and a major eruption seemed likely within days or weeks. Concerns increased, fueled by the unpredictable explosive characteristics of Tungurahua and the location of Baños on a small strip of level ground between the volcano and the Pastaza River gorge. At the time, a single road, set above the river on the northern flanks of Tungurahua, connected Baños with the nearest center capable of providing major assistance, the city of Ambato, which is located several kilometers to the northwest. After passing through Baños, this road continues on to the sparsely populated Amazon region in the east. This road, between Baños and Ambato, would almost certainly be destroyed in the event of a violent eruption, making it difficult for relief efforts to reach survivors (Lane, 2003). Another road leading southwards to Riobamba, the capital of adjoining Chimborazo Province, has been cut in at least six locations by lahars and will probably not be repaired in the near future.

5. Demographic background and economic foundations of the town of Baños

The town of Baños is the seat of Baños Canton. Most of the cantonal population is concentrated in the town: 71 percent according to the 1990 National Census and 73 percent according to the 2001 Census (INEC, 1999–2001). The distinguishing demographic features of Canton Baños are its relatively high rate of literacy and low rate of poverty relative to surrounding cantons. Available data on pre-evacuation demographics indicate that 19.4 percent of the cantonal population had completed secondary school. This was higher than in any other canton in Tungurahua Province with the exception of Ambato Canton, which includes the provincial capital. The incidence of illiteracy was the second lowest in the province: only 8.7 percent of the population of Baños could not read or write, compared with an overall average of 14.0 percent for the province (SIISE, n.d.). Poverty rates showed a similar pattern of relative well being: in 1995, Baños, at 63.0 percent, had the lowest rate of poverty of consumption in Tungurahua Province, where the average rate was 74.1 percent (SIISE, n.d.). Separate data indicated that the Canton of Baños also had the lowest percentage of the provincial population with basic needs unmet (Guzmán, 2001). It should also be noted that Baños has a low proportion of indigenous groups amongst its population in comparison with central Ecuador. The center for indigenous groups is in Riobamba in Chimborazo province to the west of Mount Tungurahua and in the provinces that comprise the Ecuadorian Amazon.

Baños' economy depends primarily on a single industry: tourism. Secular tourism has attracted visitors in considerable numbers since at least the early part of the 20th century, while religious tourism dates to shortly after the town's foundation in 1553 (Reyes, 2001). A shrine dedicated to the Virgin of Baños, the thermal springs emanating from the base of the volcano, a mild climate, and breath-taking scenery make Baños a center of relative prosperity compared to its rural neighbors. Tourism in Baños, therefore, includes many outdoor pursuits including hiking, horseback riding, and visiting the volcanoes. Baños is also a gateway to the Amazon, a starting point for many Amazon expeditions.

In late 1999, when Baños was evacuated, 95 percent of the community's economic activity depended on tourism (Rios, 2002). Indeed, in 1998, there were 135 tourist establishments listed in the tourist cadastre, including 40 full-service restaurants, 3 major hotels, and 56 other establishments offering accommodations, along with 18 travel agencies and a number of other businesses directly

engaged in tourist activities (Baños Tourism Cadastre, 1998). These figures do not reflect the number of stores selling souvenirs, or the innumerable street vendors and taxi drivers who depend on tourism.

Data developed by the Ecuadorian Red Cross reflect the importance of tourism, as an economic activity to the inhabitants of Baños (Ecuadorian Red Cross, 1999). This relief organization determined that among evacuees from the town of Baños, 29 percent were tourist business owners, 29 percent were owners of small businesses, 24 percent were urban poor, and 18 percent were underemployed middle-class, whereas evacuees from other communities were for the most part impoverished agriculturists (Ecuadorian Red Cross, 1999).

Baños ranks among the top five destinations in Ecuador for international tourists and in 2000 the town attracted approximately 23 percent of the country's 615,000 foreign visitors (Ministerio de Turismo, 2002). International travelers contributed US$402 million to the national economy in 2000, when Baños was evacuated for several months, and foreign tourism was Ecuador's third-ranked source of foreign revenue from the sale of goods and services (Ministerio de Turismo, 2002). Fifty-six percent of all tourists visiting Baños in November 2001 were foreigners. Among the 44 percent of visitors who were Ecuadorians, 18 percent visited the town for religious reasons (Municipalidad Baños de Agua Santa—Ministerio de Turismo, 2002).

6. Emergency evacuation and return

The evacuation of Baños and of nearby villages in Tungurahua Province, on October 16, 1999, in anticipation of a violent eruption, displaced approximately 19,000 people. Another 4000 people were evacuated from high-risk zones on the volcano's western and southwestern flanks, in adjoining Chimborazo Province, bringing the estimated total number of evacuees to 23,000. At the time of the evacuation, however, only 17 percent of evacuees took refuge in shelters (Aráuz, 2000). As the emergency dragged on, an even smaller percentage moved into resettlement shelters. Most evacuees stayed with relatives or friends, or rented temporary quarters. An unknown number made homes for themselves on the streets of the closest towns.

In one sense, the evacuation was a success. Baños, with its entire population of 16,000, and the surrounding communities, vacated within 48 h after the order. There had been some warning that an evacuation was possible and an evacuation exercise took place 2 weeks before authorities deemed it necessary. Some wealthier residents of Baños, and others with moveable assets or an alternative place to go, left voluntarily, in advance of the evacuation order (Yépes, 2000). This was also true of residents from a few rural communities located at higher elevations, mainly on the western and southwestern flanks of the volcano, where there was direct evidence of the effects of the volcano's activity. However, most Baneños were not prepared to leave their homes and possessions. The situation was compounded for rural dwellers that also had to abandon their crops and farm animals.

The evacuation, which would have been difficult to endure even during the best of times, occurred when the Ecuadorian economy was experiencing one of its worst downturns in history. As a result, many government institutions and private organizations, which might have been able to do more to assist the evacuees, lacked the resources to do so and were semi-paralyzed by widespread social and political unrest (Lane, 2003). An additional, local complication was the evacuation of Baños-disrupted transportation services on one of the few roads connecting Pastaza Province in the Amazon region of Ecuador with the central highlands and the Pacific coast. This disrupting of transportation further extended the economic ramifications of the evacuation to well beyond the confines of the town and its immediate surroundings.

7. The economic and political context of the evacuation

The depth of the economic crisis that confronted evacuees from Tungurahua is reflected in the national and provincial economic data. By October 1999, when the town of Baños evacuated, the national inflation rate was 43.1 percent; by the end of the year it reached 60.7 percent, and by the end of the following year the annual rate was 91 percent (INEC, 1999–2000). At the local level, conditions were in some instances even worse. For example, the inflation rate for 1999 in the provincial capital, Ambato, where the bulk of evacuees moved, was 69.25 percent, several percentage points higher than the national average. In 2000, the food/non-alcoholic beverages/tobacco component of the consumer price index in Ambato increased by 107.65 percent and health costs increased by 102.76 percent (INEC, 1999–2001). Health cost increases were compounded by decreasing public expenditures on the health system (ECLAC, 2001). Livelihood opportunities for evacuees were extremely limited: the official national urban unemployment rate for 1999, for example, was 15.1 percent, while underemployment rates for Ecuador in November 1999 were about 60 percent of the economically active population (Banco Central del Ecuador, 2002).

Political instability compounded the adverse economic situation. Strikes, work stoppages, and demonstrations by government workers and other groups frequently brought essential services, including health and education, to a standstill (Ecuador Debate 1999–2000; Unda, 2001). Under these conditions, government

agencies that might have been able to provide more assistance to evacuees were unable to do so. Some 3 months after the evacuation of Baños, the president was removed by a coup d'état effected principally by indigenous and labor groups and a faction within the Ecuadorian military. The evacuees from Tungurahua Volcano, therefore, were competing for livelihoods and government attention within this national context.

8. The return movement

After two-and-a-half months of waiting, during which conditions for evacuees deteriorated, community leaders organized a return to the town of Baños, although scientists still forecast a violent eruption and the government continued to enforce the evacuation order. On January 5, 2000, several thousand people advanced against the military units set up to prevent access and secure the hazard zone. After a brief but violent confrontation, the security forces gave way. Initially, not all the marchers stayed in Baños, but eventually the number of returned permanent residents grew to several thousand (Tobin and Whiteford, 2001a). By 2003, the Mayor of Baños (2003) estimated that 10,000 people had returned to the city.

The return movement was led principally by an organization called Hermandad Baneña, and was comprised of people from the tourist industry, including hotel owners/operators, tour guides, artisans' associations, and transportation unions. Pressure on the authorities to allow the return of evacuees also came from the Province of Pastaza. Additional support almost certainly came from some of the Dominican fathers who had stayed in Baños in contravention of the evacuation order and who, by early November 1999, while the order was still in effect, were calling on their parishioners to attend Sunday masses in the basilica in Baños (Mothes, 2000).

By the end of December, Hermandad Baneña had become sufficiently well organized to mobilize a return to Baños, which was announced on January 4, 2000 in a televised meeting with the Governor of Tungurahua Province. Hermandad Baneña demanded: (1) the reopening of the Baños–Ambato road leading to Pastaza Province; (2) demilitarization of the hazard zone; and (3) a return of the displaced population to Baños (PATV Producciones, n.d.). The Governor was opposed on the grounds that anyone who returned to the town would be in serious danger. The following day, between 2000 and 3000 people advanced on the military posts set up to prevent access to Baños and the neighboring hazard zone. In the ensuing skirmish, a civilian was killed and several military personnel were taken hostage by the crowd (PATV Producciones, n.d.).

Later that day, January 5, 2000, in the town of Pelileo, located between Baños and Ambato, the Hermandad Baneña and leaders from Pastaza Province signed an agreement with the Governor of Tungurahua Province. Their agreement provided, among other points, for the immediate withdrawal of military forces from the Ambato–Baños–Puyo road, the resumption of traffic on the road, and unimpeded reentry to Baños and neighboring communities for anyone who wished to return. It also acknowledged that anyone who returned would do so at his or her own risk. Therefore, responsibility for citizen safety was assumed by those who had organized the return (PATV Producciones, n.d.).

The plight of evacuees from Baños and the hardships experienced by some communities in Pastaza Province were legitimate causes around which to organize a return movement. The tourist industry also may have been pushing for a return rather than wait any longer because of the start of the high tourist season in June and July. A member of the tourist industry, in video footage filmed during the January 5 march, argued with the Colonel in charge of the military contingent on site. He wanted reoccupation of the town because "…we're the ones who are in contact with the international tour operators and we know that if Baños is not reactivated within at the latest… by the end of January that Baños will disappear from the world tourist scene…"(-transcribed from footage in untitled, undated video by PATV Producciones; researchers' translation). With mayoral elections scheduled, it was an opportune time for political candidates to ameliorate conditions for evacuees. The leader of the return movement did run for mayor, backed by Hermandad Baneña and other organizations, but did not win the election (La Hora, 2000d).

9. Economic recovery

For the return to be successful, people had to be convinced that the volcano was not a significant danger. Leaders of the movement, taped during the return march, emphasized repeatedly that Baños was not at risk because it was protected by a feature of the topography, that the hazard was not affecting the town, and that no one had died as a result of the volcano's activity (PATV Producciones, n.d.). These beliefs were still being expressed by some political leaders 2 years after the event (Mayor of Baños, 2003). On the second anniversary of the reoccupation of the town, a city council member said that the inhabitants decided to return because they "had come to the realization that nothing was happening in their town, that the volcano was not a danger, nor had it been a danger to them

throughout history'' (La Hora, 2002a; researchers' translation).

Although two thousand or more people participated in the return march, only a few hundred people actually resettled in town in the weeks following. Others returned sporadically until the immediate crisis had passed. In addition to the volcano hazard itself, several other factors may have contributed to residents' reluctance to stay permanently in Baños, including the lack of basic services and the provincial authorities refusal to allow schools to reopen in Baños. Further, the evacuation had effectively kept all but the most intrepid tourists away, so initially there was little demand for services and therefore few jobs. Some evidence suggests that most people who returned early were business owners and the elderly, and that many families with young children stayed away. A former resident of Baños explained her position this way: ''I'm not going to return. We have children, and we cannot put their lives at risk'' (Chile TV, 1999—researchers' translation).

9.1. Perceptions of the Volcano Hazard

Experiences with the volcano and with different evacuation strategies generated strong reactions from the local populations. We hypothesized, for instance, that fear and worry about the volcano hazard would be moderated by the need for economic livelihood. Hence, differences might be expected in the level of stress demonstrated by the various groups interviewed. Those who returned to the high-risk area early might be expected to exhibit less anxiety about the volcano than others exhibited.

As anticipated, by June 2000, those individuals living in the shelters and the resettlement area expressed the highest levels of fear, with over sixty percent in the very worried to extremely worried category. This compared with the Baños returnees, over seventy percent of whom had little or no worries. Only thirty percent of the control group was not worried about the volcano (Table 1). There was a statistically significant difference in these responses. This fits the cognitive dissonance models expounded upon in the literature (Blaikie et al., 1994); those who returned early would not express high levels of concern and thus rationalize their choice to live in a hazardous area. In contrast, those who had made the life-changing decision to relocate showed the highest concerns, which again justifies their decisions.

The same groups were re-interviewed in January 2001, approximately 4 months after the shelters closed and 1 year after the reoccupation of the town of Baños. Once again, a chi-square test indicated a significant difference at the 0.01 level in these responses (Table 2). Many respondents who had been in shelters (40.7 percent) and who had resettled outside of Baños (42.3 percent) were still very worried, or extremely worried about the volcano. At this time, even more Baños respondents, about eighty percent, had little or no worries about the volcano.

Similar responses were obtained regarding perceived risk of the volcano (Tables 3 and 4). Respondents were asked to rate the danger that existed to them or their families in June 2000 and in January 2001. For both surveys, those in the shelters and the resettlement group exhibited the highest perceived risk. Again, a chi-square test indicated a significant difference in the responses from the different groups. Returned Baños respondents were consistent in perceiving a relatively low level of risk. This pattern is also apparent in responses to the third questionnaire, although there is a small jump in the moderate category of perceived risk (Table 5).

Table 1
Degree of worry about volcano (June 2000)

JUNE 2000	Shelters		Resettlement		Returnees		Control	
Little or no worries	9	21.4%	5	22.7%	24	70.6%	10	30.3%
Somewhat worried	6	14.3%	3	13.6%	5	14.7%	4	12.1%
Very/extremely worried	27	64.3%	14	63.6%	5	14.7%	19	57.6%
Total	42	100%	22	100%	34	100%	33	100%

$\chi^2 = 26.43$, df = 6, $p < 0.01$.

Table 2
Degree of worry about volcano (January 2001)

JANUARY 2001	Shelters		Resettlement		Returnees		Control	
Little or no worries	13	48.1%	9	34.6%	67	79.8%	12	35.3%
Somewhat worried	3	11.1%	6	23.1%	6	7.1%	7	20.6%
Very/extremely worried	11	40.7%	11	42.3%	11	13.1%	15	44.1%
Total	27	100%	26	100%	34	100%	34	100%

$\chi^2 = 31.66$, df = 6, $p < 0.01$.

Table 3
Perceived risk—is the volcano a danger to you now? (June 2000)

JUNE 2000	Shelters		Resettlement		Returnees	
Little or no risk	7	16.7%	7	31.8%	9	75.0%
Moderate risk	7	16.7%	1	4.5%	2	16.7%
High to very high risk	28	66.7%	14	63.6%	1	8.3%
Total	42	100%	22	100%	12	100%

$\chi^2 = 18.15$, df = 4, $p < 0.01$.

Table 4
Perceived risk—is the volcano a danger to you now? (January 2001)

JANUARY 2001	Shelters		Resettlement		Returnees	
Little or no risk	10	41.7%	7	31.8%	50	62.5%
Moderate risk	3	12.5%	7	31.8%	15	18.8%
High to very high risk	11	45.8%	8	36.4%	15	18.8%
Total	42	100%	22	100%	80	100%

$\chi^2 = 11.97$, df = 4, $p < 0.05$.

Table 5
Worry and perceived risk (May 2002)

May 2002	Returnees		Perceived Risk	Returnees	
Not worried	63	59.4%	Little or no risk	68	64.8%
Somewhat worried	34	32.1%	Moderate risk	27	25.7%
Very worried	9	8.5%	High risk	10	9.5%
Total	103	100%	Total	105	100.0%

Since these people chose to return to Baños, their responses were expected, because it would seem logical that they would not have returned had they believed the volcano presented an imminent threat. These findings are not surprising. However, it is interesting to note that by May 2002 the percentage of people in Baños who indicated they were "somewhat worried" about the volcano had increased to 32.1 percent, from 14.7 percent in June 2000 and 7.1 percent in January 2001 (Tables 3–5). There are various ways of interpreting these data; although two hypotheses are probable, they both require further study. First, since the volcano has been highly active throughout this period, with violent eruptions and numerous smaller events depositing ash throughout the area, it is possible that residents are becoming more aware of the potential for catastrophe. Second, the final questionnaire survey may have included people who were forced to return because the displaced persons' shelters had been closed. Unfortunately, there exist no longer-term studies of evacuees returning to an ongoing hazardous area with which to compare these findings.

9.2. Tourism: force for change

Getting tourists and residents back to Baños became a priority for its community leaders. The tourist industry mounted an effective campaign designed to convince the domestic and foreign tourist trades that Baños was "back to normal." A pamphlet circulating within weeks of the return read: "Tungurahua Volcano is currently active and offers tourists a unique opportunity to admire, from the very streets of the town, a magical and colorful spectacle, one of nature's displays that can be experienced only once in a lifetime" (transcribed from undated broadcast on Chile TV; researchers' translation). The volcano, the source of the town's troubles, was to become its economic salvation.

In March 2000, a group of journalists was invited by the Municipality to come to Baños so they could verify—and report on—the town's successful recovery. Municipal authorities, some of which were owners of tourist businesses, had accused the press of irresponsible reporting and of having been partly to blame for the economic damage to the tourist industry. According to one council member, it was therefore the duty of the press to help with recovery (La Hora, 2000b).

Attempts to show the world that Baños was operating normally were not restricted to the activities of the Municipality or the Chamber of Tourism. A representative of a local union claimed in March 2000 that about 90 percent of the economy of Baños had recovered and that "as of this moment about 10,000 Baneños are living in town" (La Hora, 2000c). In truth, the town had far

from recovered and there were fewer than 4000 people in town (Mothes, 2000; Tobin and Whiteford, 2001a). Some community leaders may have exaggerated the size of the population in order to encourage more people to return in spite of the fact that in June 2000 the government evacuation order remained in effect and there was no ability to provide for sheltering-in-place. Apart from the main highway, which would almost certainly be destroyed during a major eruption, the only other way to exit the downtown area in 2000 was via an old suspension bridge over the Pastaza River. Therefore, had such an eruption occurred, the population of Baños would have been trapped.

The data suggest that people who returned to Baños while the evacuation order was still in effect did so in the expectation of improving their economic situation. In the June 2000 questionnaire, 77.7 percent of respondents indicated they returned because of a combination of lack of employment elsewhere and economic hardship experienced in the place to which they had evacuated, while 22.2 percent returned because of employment or business opportunities they believed were available in Baños (Table 6).

The authorities were being petitioned to downgrade the alert level from orange to yellow, but the governor of Tungurahua Province refused. However, in March 2000 he authorized resumption of some basic services and reopened the town's hospital, This was done with the understanding that town authorities would allow Civil Defense, rather than local groups, provide training in emergency response and preparedness (La Hora, 2000a), as had been previously agreed upon under the January "peace agreement." The opening of the various offices and agencies required that employees return to Baños. In June 2000, some workers at the town's hospital believed that they would lose their jobs had they not returned. Among these individuals, the fear of becoming unemployed may have outweighed fear of the hazard.

The difficulties encountered in getting the town back on its feet did not deter local leaders, and the campaign to get tourists and residents back continued. At his inauguration in August 2000, the new mayor called for all residents to return. He also announced that the town's tourism campaign would be a means of "getting the truth out about Baños and its [natural] beauty" (La Hora, 2000e). The mayor also stated that he would make a coordinated effort so that all residents would come back to their birthplace, "The recovery of tourism, with publicity campaigns carried in the various media, will make the truth about Baños and its beauty known.... Everything in Baños is peaceful, because the volcano, with all its power, has made a new source of revenue available to all families from Baños" (researchers' translation).

Finally, on September 5, 2000, the National Civil Defense authority lowered the alert level from orange (the level that had triggered the evacuation) to yellow for Baños although other hazardous areas around the volcano remained on orange alert. The step-down in alert status came 2 weeks before Holy Friday and the economically necessary and anticipated arrival of tourists to Baños (El Comercio, September 24, 2000).

Former evacuees were interviewed in January 2001. Their reasons for returning to Baños varied: 12.5 percent said the availability of work; 25.0 percent stated the adverse economic conditions in the communities where they were currently living; 7.5 percent listed the schools opening in Baños; and 2.5 percent said because the alert level had been lowered and/or Baños was no longer at risk (Table 7). These answers suggested that among the general population economic factors continued to be important in the decision-making process, out-weighing the official removal of the evacuation order. It should be noted, however, that the median family income for those who returned to Baños early was somewhat higher in January 2001 than for others (Tobin and Whiteford, 2002b). Incomes for early returnees to Baños were at 93 percent of pre-eruption levels, whereas for those who had remained in shelters for up to a year levels were at 90 percent, and for those

Table 6
Reasons for returning to Baños (June 2000)

Push factors	Percent	Pull factors	Percent
Suffered in shelters	11.1	Military had left	16.7
Lack of employment	44.4	Home and possessions	22.2
Economic hardship	33.3	Return to own land	5.6
Uncomfortable situations	5.6	Rebuild community	5.6
Volcano not a threat	5.6	Belong in Baños	11.1
		Others had returned	16.7
		Employment	22.2

Table 7
First reasons cited by respondents for returning to Baños (January 2001)

Push factors	Percent	Pull factors	Percent
Economic reasons	25.0	Community and property	31.3
Uncomfortable situations	12.5	Work availability	12.5
Forced to return	2.5	Others had returned	6.2
		School availability	7.5
		Alert level lowered/No longer dangerous	2.5

who had resettled elsewhere incomes had fallen to 48 percent. These data suggest that, in spite of all the hazards, returning home was substantially better, from an economic standpoint, than staying away. However, it is possible that the initial returnees were a select group who had more economic investment in the community than others. This needs further exploration in terms of economic recovery and capital distribution.

The economic recovery effort brought community leaders in Baños into direct conflict with the scientists responsible for monitoring the volcano and providing risk assessments, and with the Civil Defense authorities responsible for emergency management. Scientists at Ecuador's Geophysics Institute were accused of exaggerating the degree of risk posed by the volcano, and individuals connected with the tourist industry threatened to sue the Institute's director (La Hora, 2001). In August 2001, when ashfall from Tungurahua was causing serious problems in other areas, town authorities, fearful that tourists would be scared away, attempted to muzzle the press and the scientists (El Universo, 2001a,b).

Efforts to minimize the degree of risk may also be reflected by a lack of enthusiasm to pursue the necessary public awareness campaigns and preparedness programs. Civil Defense personnel were not welcome in Baños for several months following the return, and groups within the community insisted that they were capable of handling any emergency (La Hora, 2000f; El Comercio, 2000).

During research visits to Baños, there appeared to be no concerted, proactive effort to ensure that hazard information was readily available to tourists. Only a few establishments had posted the evacuation plan developed by Civil Defense, and many of the few public hazard signs had been defaced or stolen. Furthermore, no hazard notices or evacuation plans were posted in the bus terminal, and yellow stripes, painted on certain streets to direct inhabitants to less hazardous areas, were confusing to an outsider unfamiliar with evacuation procedures.

By 2003, however, the situation had changed somewhat. A planning document indicated that the Municipality recognized the lack of differentiation and specificity was a serious problem (Municipio de Baños de Agua Santa—Ministerio de Turismo, 2002). An evacuation exercise in August 2002 was further indication that emergency preparedness had finally moved onto the municipality's agenda and was being taken more seriously. However, only 30 percent of the population participated in this exercise (La Hora, 2002b). The Geophysical Institute and the town authorities are now working with greater cooperation (Yépes, 2003).

10. Conclusions

Baños evacuees faced particularly hard choices; some evacuees believed that their economic recovery was contingent upon a return to the area of high risk. Since most of the residents of Baños were either directly or indirectly involved with the dominant tourist industry, tour guides, hotel owners, restaurant owners, and service sector employees were all dependent on tourists returning to the community. That meant that great pressure was placed on officials to change the official risk category, regardless of whether or not the actual level of risk as determined by the geophysical institute changed. Certainly, the initial eruptions and subsequent evacuation stemmed the flow of visitors to Baños, and without tourists there could be no economic recovery for the community. Therefore, the economic recovery of Baños required an effort on the part of community leaders to change the perceptions of risk among tourists and evacuated residents.

Associated with this is the broader ethical issue of disseminating hazard information to tourists. Tourism revenues are often important to the economy of many less wealthy nations, and there is frequently a lack of economic alternatives to such tourism-dependent livelihoods. Even in hazardous conditions, such as around Mount Tungurahua, communities can continue to attract large numbers of tourists who are often ignorant of local hazards and frequently unable to communicate effectively in the local language. This practice can increase the degree of risk to which tourists are exposed in the event of a major disaster. The tourism industry, particularly the international tourism industry, therefore, should establish standards that encourage the disclosure of significant hazard data to potential travelers, particularly in the case of an ongoing hazard like Tungurahua. Nevertheless, it is true that some people will continue to visit hazardous places; when they decide to do so, however, they should have all pertinent information readily available to them.

Community leaders in Baños realized that no tourists meant no income and started an aggressive campaign to promote positive views of the community to the extent of advertising the volcanic activity as an attraction and telling residents and tourists that the volcano was not a threat. Tourist operators in Baños now advertise the erupting volcano as an attraction. The efforts of community leaders to encourage residents to return to Baños were undoubtedly aided by the limited number of alternative economic opportunities for evacuees in the places to which they had moved. This lack of opportunity was due in great part to a profound economic crisis in Ecuador that generated intense social and political conflict and, as a result, the semi-paralysis of many institutions involved in the disaster relief effort.

Even after the town's reoccupation, some evacuees believed the volcano still presented a high degree of risk. It is not possible to determine how widespread this belief was, because so few evacuees went to shelters and there are no statistical data on risk perception among the non-sheltered population. Although newspaper articles and statements by leaders in Baños cannot be taken as completely accurate reports of events, the reporting throughout 2000 and 2001 is consistent, and suggests that residents, like tourists, had to be convinced that the volcano was not an imminent threat. Ultimately, the town's economic recovery was dependent upon the success of that message.

There was a significant difference in the perception of risk among groups; those who returned early expressed less fear of the volcano and saw less danger than those who stayed away. These results support previous studies and mimic the cognitive dissonance model regarding perception. Nevertheless, this pattern, which has prevailed for over 2 years, changed over time with more returnees coming to see the volcano as a concern. How can we account for this change? The volcano continued to pose a significant threat, reduced neither by physical changes in the hazard, nor in the provision of alternative safety measures. In addition, it is possible that as more people returned to the community, an increase in perceived risk occurred because of the on-going nature of the disaster. Social pressures internal to the community, as well as the external context provided by national political and economic forces had contributed to the problem.

We know little about the socio-economic (and health) impacts of continued exposure to possible volcanic explosions, and yet more people now live in hazardous areas (Blaikie et al., 1994). Confounding this picture is the ongoing nature of volcanic eruptions that continue to create severe impacts on the livelihoods of the local population. In Baños, for instance, it is possible that the eruptive cycle could continue for several years and hence exacerbate economic problems. Based on the presented 4 years of research, we suggest there is a need for long-term studies of populations exposed to the chronic or on-going risk. What is needed is a chronicity model to try to explain differential responses to the ongoing risk and to determine if different attitudes of individuals towards chronic hazards, in part measured by perception of risk, result in different economic outcomes (Whiteford and Tobin, 2003).

Perception is relative and changeable, yet it can also be a significant determinant of risk-related action. The communication campaign designed to convince tourists to return may be a double-edged sword: one side used to generate tourist dollars in a tourism-dependent town, while the other side blunts real, necessary, and rational fears of a potentially deadly hazard. Much more can be learned by studying changing perceptions in situations of chronic danger, information critical to informed disaster management, and hazard planning. In this article, we only suggest some of the directions future research might explore.

11. Uncited references

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