



Natural Hazards and the Cultural Heritage of Guatemala: An Overview from the Vantage of the Quirigua Archaeological Park¹

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Introduction

Guatemala boasts a unique and varied cultural heritage, not only in terms of the number of sites and artifacts, but also its nearly four thousand years of history. The geographical and geological conditions of our country, while providing the defining characteristics of its physical environment, also put the population and cultural heritage at constant risk, with frequent natural disasters such as earthquakes, volcanic eruptions, hurricanes, and catastrophic flooding. These types of natural events have increased in recent years, not only in their frequency but also in their magnitude, as influenced by climate change. This has forced us to become aware of the effect and impact of human activity on our natural environment and the resultant natural disasters, and it highlights the need to more effectively protect this environment on which human lives and our infrastructure and cultural heritage depend.

Guatemala has suffered natural disasters on many occasions and there is much evidence of this at the archaeological site of Quirigua, an ancient Maya city located in the northeast of the country of Guatemala. Situated next to the Motagua River, near the point where it leaves the highlands and enters a floodplain before emptying into the Caribbean Sea, Quirigua's location has left it vulnerable to hurricanes and flooding, as well as earthquakes given that the Motagua River follows an active tectonic fault line. This article presents evidence of the types of damage and losses that Quirigua has suffered due to these types of extreme events, especially those caused by hydrometeorological factors.

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The Physical Environment of Guatemala

Guatemala's natural territory covers 108,889 km² and is bordered to the north and west by Mexico, to the east by the Atlantic Ocean (Caribbean Sea), Belize, Honduras, and El Salvador, and to the south by the Pacific Ocean. Guatemala extends from 13° 44' to 18° 30' North latitude, and from 87° 24' to 92° 14' West longitude (Piedra Santa 1996:1-2) (Figure 1). Guatemala can be divided into three geographical and archaeological regions: the Pacific Coast, the Highlands or Altiplano,

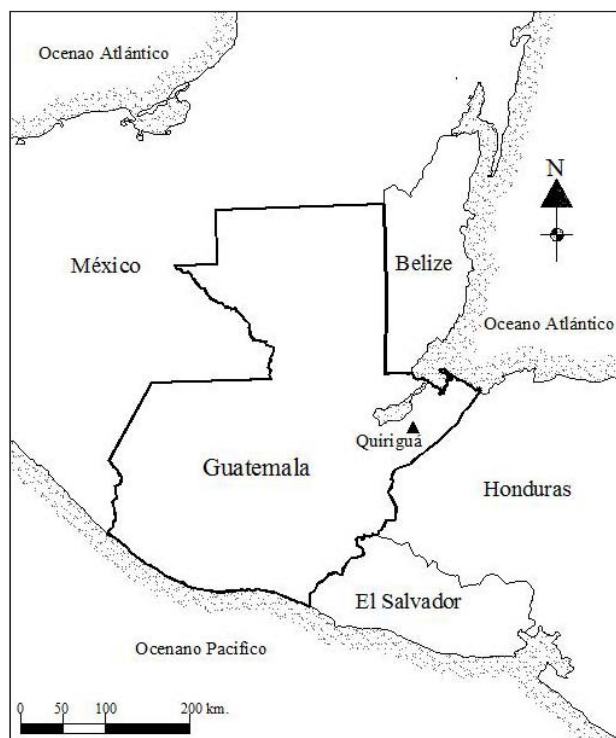


Figure 1. Map of Guatemala and its territorial extent (by J. Crasborn).

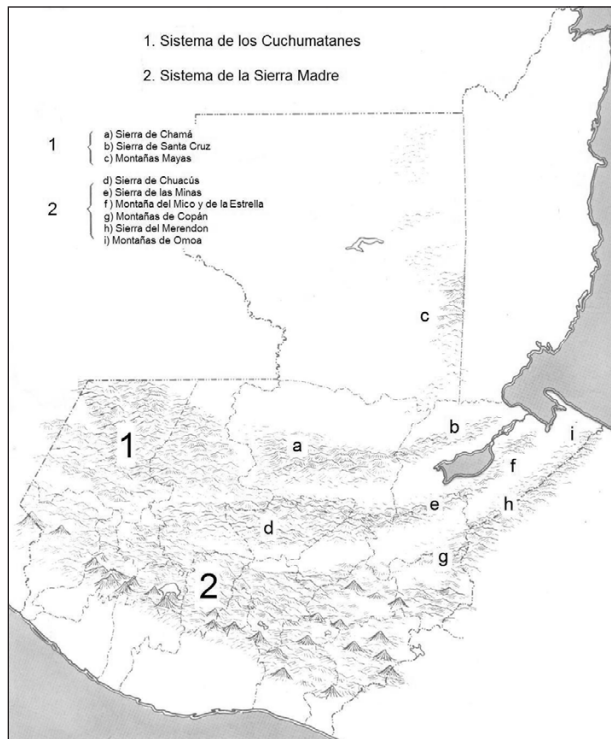


Figure 2. Mountain ranges of Guatemala (from Piedra Santa 1996:22).

and the Lowlands in the north. Each of these zones features topography that rises from sea level to as high as 4000 meters above sea level, and each is characterized by distinctive climates and vegetation (Dengo 1999:51-53; Piedra Santa 1996:1-2) (Figure 2). Administratively Guatemala is divided into eight regions, which are composed of 22 departments and further subdivided into 333 municipalities. In only three of these municipalities have no archaeological materials been found, and it is likely that this reflects a lack of investigation rather than a true lack of material evidence of ancient human occupation (Figure 3).

According to data compiled by the Department of Prehispanic and Colonial Monuments (DEMOPRE) of the General Directorate of Cultural and Natural Heritage of Guatemala, there are at least 2200 archaeological sites in the country that date to the Prehispanic epoch, from 2000 BC until AD 1524, which must be added to the numerous monuments, houses, and churches from the Colonial (AD 1524-1821), Republican (AD 1821-1898) and Contemporary (AD 1898-1944) periods. While this presents Guatemala with a truly enviable wealth of archaeological and historical materials, it also presents a problem, given the truly enormous task of policing, maintaining, and protecting all of these sites and artifacts.

The Cultural Heritage of Guatemala and Threats from Natural Disasters

We use the term “cultural heritage” to refer to those material assets (both movable and fixed), customs, and traditions of a country, which have special value (archaeological, historical, artistic, or spiritual) and help strengthen national identity. In the case of Guatemala, this heritage is quite large, being the result of a variety of historical processes that span a period of almost 4000 years. The cultural heritage of any country is at risk of damage and destruction from human sources, both accidental and intentional (Figure 4), as well as natural factors, including the sun, wind, rain and others (Figures 5). As these risks have been discussed in detail by other authors, this paper does not concentrate on them.

It should be noted that natural damage can occur and be accelerated by various causes, among which are climate change and global warming. Guatemala, due to its geographical location and geological situation, is subject to frequent earthquakes, volcanic eruptions, hurricanes, thunderstorms, landslides, and catastrophic flooding, all of which have claimed human lives, inflicted massive economic losses, and caused damage to the nation’s infrastructure and property. This has been the case ever since Guatemala’s Colonial period, exemplified in the mudflow from the Agua volcano in 1541 that forced the movement of the capital from the valley of Almolonga to that of Panchoy, and subsequently the 1773 earthquake

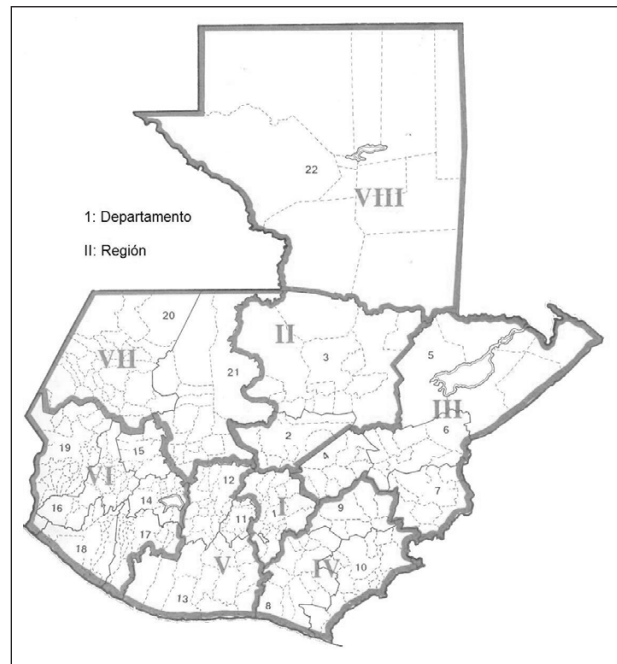


Figure 3. Political and regional divisions of Guatemala (from Piedra Santa 1996:3).

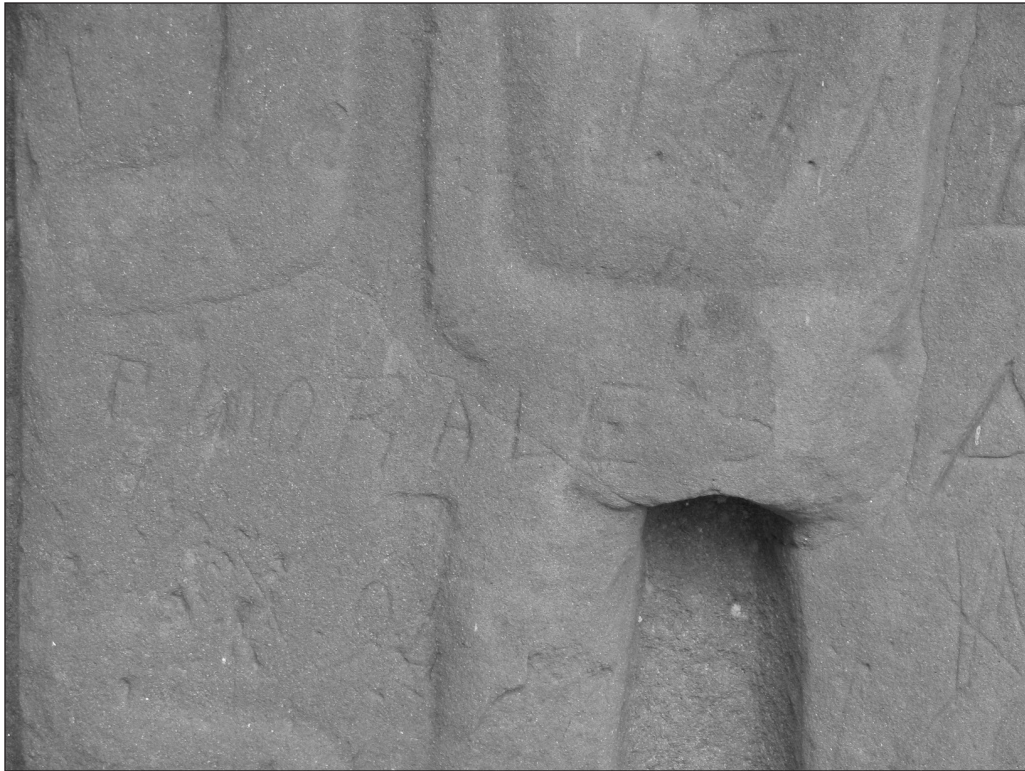


Figure 4. Anthropogenic damage to monuments: graffito on Stela A of Quirigua (photo: M. Díaz, 2009).



Figure 5. Damage from natural sources: eroded stone wall at Tikal (photo: J. Crasborn, 2010).

that forced another movement into the Valley of La Ermita, where the capital remains at present (Gellert 1994:3). Apart from these one cannot forget to mention the tragic 1976 earthquake, which not only resulted in terrible destruction but also sparked an inventory and assessment of damage to Prehispanic and Colonial archaeological sites by UNESCO, the General Directorate of Cultural and National Heritage of Guatemala, and the National Council for the Protection of Antigua, Guatemala. As well as providing a description of damages, this report also included a list of technical needs and their costs in order to repair the damages and guard against further deterioration (UNESCO 1985:26-49).

It is important to note that in Guatemala there are laws governing archaeological research and the cataloguing of artifacts, which include penalties for damages to the national heritage. However, there are still no specific national laws, regulations, or a manual of procedures to be followed in the case of damage from natural disasters, although many sites and museums have their own contingency plans for disaster prevention and reduction. The government did establish the National Commission for Disaster Reduction (CONRED), which was created in 1969 following Hurricane Francelia. This organization is dedicated not only to responding to natural disasters but also to their prevention and minimization, through monitoring at-risk areas, the provision of an early warning system, and training. This institution prepared the National Policy to Reduce the Risk of Disasters in Guatemala, which was adopted by the national government in December, 2010. It is the result of interagency work between several different institutions and organizations, both public and private, under the coordination of the Executive Secretariat of the National Coordinator for Disaster Reduction (SE-CONRED).

By instituting a National Policy to Reduce the Risk of Disasters, Guatemala is carrying out Priority 1 of the Hyogo Framework for Action: "Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation," which requires the existence of a national policy framework for disaster risk reduction, including plans and activities at all administrative levels, from national to local. The implementation of this policy is of vital significance and highlights the importance of cooperation across public and private lines, involving both civil society and international support. All of these play a role in institutionalizing and strengthening a culture of disaster prevention and resilience. The National Table of Dialogue to Reduce Disaster Risk

must be the guarantor of the implementation of this policy and at the same time the location where the diverse actions on this theme are unified, in order to permit its future updating within the national and international contexts. It should be noted that the underlying goal of this policy is based upon the desire to safeguard human life and prevent and ameliorate the effects on communities and settlements of natural disasters, which are also the cause of great economic losses to the country and threaten the safe and sustainable development of the nation.

Stages and Phases of Disasters

There is a general recognition of a cyclical sequence of interrelated stages called the "Cycle of Disasters," the stages of which are: prevention, mitigation, preparedness, warning, response, rehabilitation, and reconstruction. Originally "development" was considered a separate stage but has now been considered as integral to all other stages. Development is seen as the cumulative and durable increase in the quality and quantity of goods, services, and resources of a country and its people, coupled with social changes, with the aim of improving and maintaining safety and quality of life without compromising resources for future generations. Therefore, the sequence mentioned above, in order to effectively manage disasters, is designed to: prevent disasters, mitigate loss in the event of disasters, prepare for probable consequences of disasters, warn of an imminent event, and respond to and recover quickly from disasters. Tasks are carried out in three phases, corresponding to before, during, and after disasters.

Phases of Disaster

Before: Pre-disaster activities (stages) include prevention, litigation, preparation, and alert. Prevention: the goal of this stage is to prevent disasters from striking. Litigation attempts to minimize the impact of disasters, keeping in mind that at times this is impossible. Preparation structures the response. Alert is the formal declaration of approaching or immediate occurrence.

During: Disaster response activities (steps) are carried out immediately after the event occurs, during the emergency period. These activities may include evacuation, search and rescue, and healthcare, all performed during the time when the community is disorganized and basic services are not functioning. In most disasters this period is short, except in such cases as drought, famine, and civil strife. It is the most dramatic and traumatic,

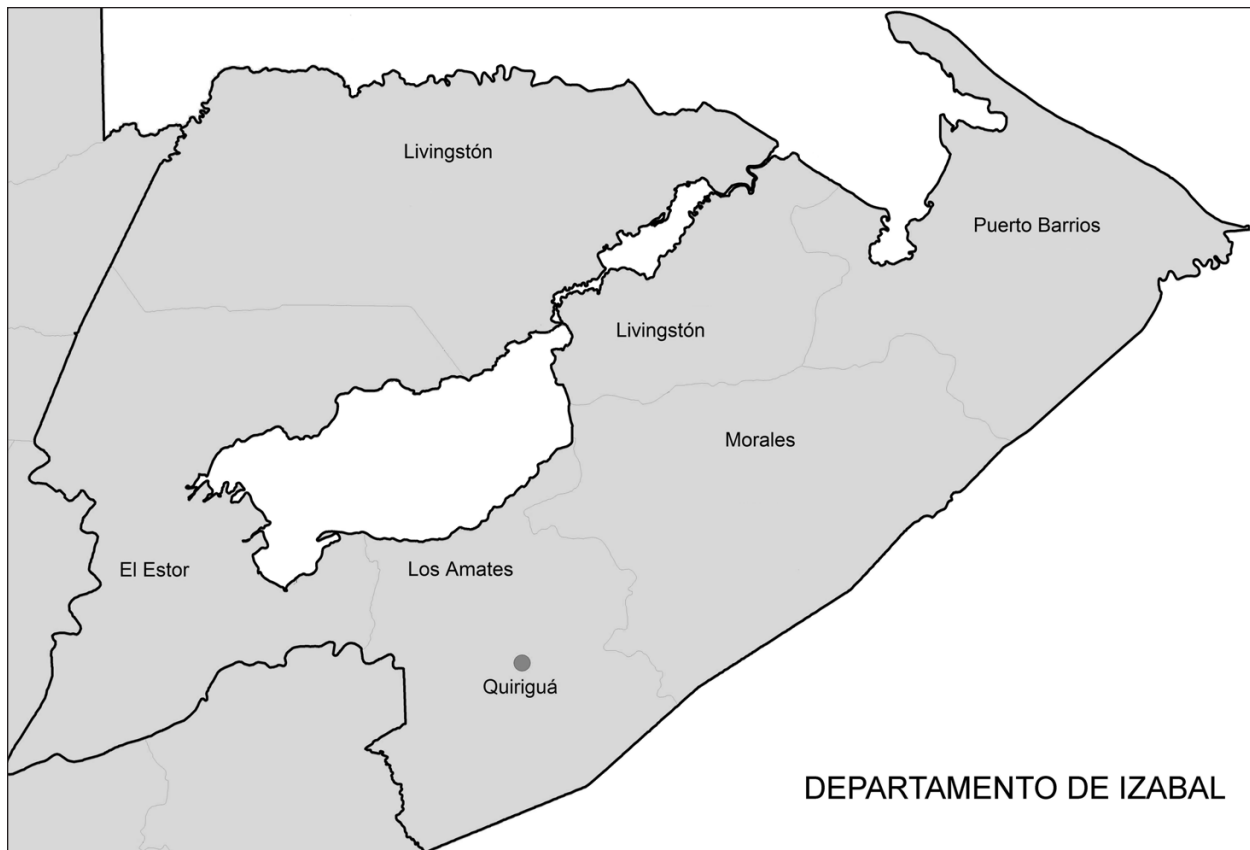


Figure 6. Map showing location of Quirigua (by F. Tello, 2009).

which necessitates the focusing of attention by the media and the international community.

After: Post-disaster activities (stages) that correspond generally to the recovery process include the following. Rehabilitation: a transitional period that begins at the end of the response phase, which establishes, at least short-term, basic services. Reconstruction consists of the repair of infrastructure and medium- or long-term restoration of the production system, in order to meet or exceed the pre-disaster level of development.

Over time, the governmental disaster reduction institution has not only become more professional, but also decentralized, and there are now offices in each of Guatemala's Departments, facilitating the treatment and prevention of disasters. Likewise, the government has developed manuals of procedures and has signed agreements with other nations in Central America, as well as coordinating responses with them.

Case Study: Quirigua Archaeological Park

Quirigua Archaeological Park is located in northeastern Guatemala, in the municipality of Los Amates, and the department of Izabal, bearing

the coordinates 15 16' 10" North Latitude and 89 02' 25" West Longitude, and located at an elevation of 75 meters above sea level (Figure 6).

This ancient Maya city was located on the northern bank of the Motagua River, and covers 10 km within the valley of the same name. The city was founded in AD 426 as a colony of Copan (Honduras), which was responsible for the control of products and consumer goods such as jade, obsidian, quetzal feathers, and basalt. It would have been a crossroads for those traveling to the highlands of Guatemala or to the Caribbean coast. Without a doubt this privileged position along these trade routes had important consequences for the inhabitants of the city and their history, as archaeologists continue to investigate and uncover today.

The earliest reference to Quirigua dates from the late eighteenth century, when around 1798 Don Juan Payes y Font acquired some land east of the town of Los Amates, extending to the Motagua River, where he would later, in the company of his children, discover the site and its monuments (Ponciano et al. 2008:100). Many years would pass, however, before this discovery reached a wide audience. This occurred when John L. Stephens published his famous *Incidents of Travel in Central*

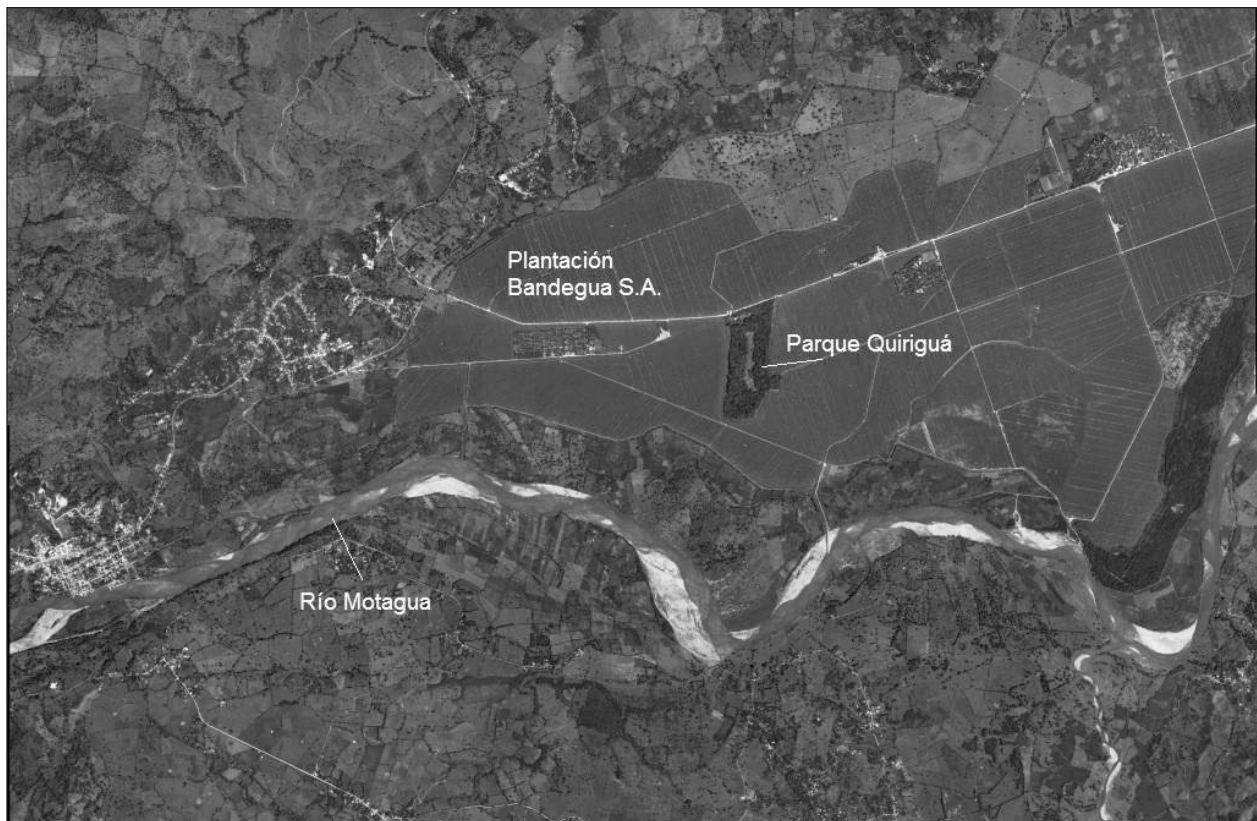


Figure 7. Aerial photograph of Quirigua (courtesy of Registro de Información Catastral, 2009).

America, Chiapas, and Yucatan in 1841, in which appeared a brief description of the site and its monuments and the first drawings of a few of its stelae (Stelae E and F) (Stephens 1841:129). This book inspired the British explorer Alfred Maudslay to make several trips to the site between 1881 and 1884, and his investigations are considered the first scientific research to be carried out at Quirigua. Maudslay's work included various activities, but it is notable that he reported that he was unable to locate all of the mounds and monuments described by Stephens, something that he attributed to a major flood of the site in 1852, as reported by Schetz in 1854 (Maudslay 1889-1902:4:1-6).

After these early reports there was growing interest in the site, and so beginning in 1910 the School of American Archaeology and later the Carnegie Institution of Washington undertook a series of investigations, which would ultimately extend until 1934 (Morley 1936:6-15). One of the most significant achievements of this era is that in 1910 the United Fruit Company of the United States, which had acquired the land from Mr. Payes, set aside 34 hectares of the property as a natural and cultural reserve, and this became the core of today's archaeological park. It is noteworthy that since 1910 the park has remained almost unchanged, despite the development of

the surrounding land and its transformation for the intensive production of bananas and cattle. Today the archaeological park is one of the last remnants of subtropical rainforest in the Motagua Valley, and thus has an important natural as well as cultural function (Figure 7). As a result of the deforestation necessary for this agricultural development, the park's cultural and natural assets are at greater threat, and conservation has become more problematic. At the same time, it presents an environment more similar to that in existence during Quirigua's Classic-period apogee, and so the vulnerability of the site today to natural disasters, such as flooding from the Motagua River and the geological fault that underlies this area is not a novel situation in the history of the site.

Robert Sharer (1990:76) has argued that from the first reports on Quirigua no author noted any remaining stone roofs at the site, and archaeological research has since confirmed that all of the buildings at the site built with stone vaults had collapsed in ancient times, perhaps from seismic activity (Figure 8). Sharer has pointed out that the presence of buttresses at the base of the main buildings in the site center is a clear example of the kind of modification performed by the ancient Maya to respond to earthquakes and prevent risk of collapse (Figure 9).



Figure 8. Remaining vault of Structure 1B-4 of Quirigua (photo: J. Crasborn, 2010).

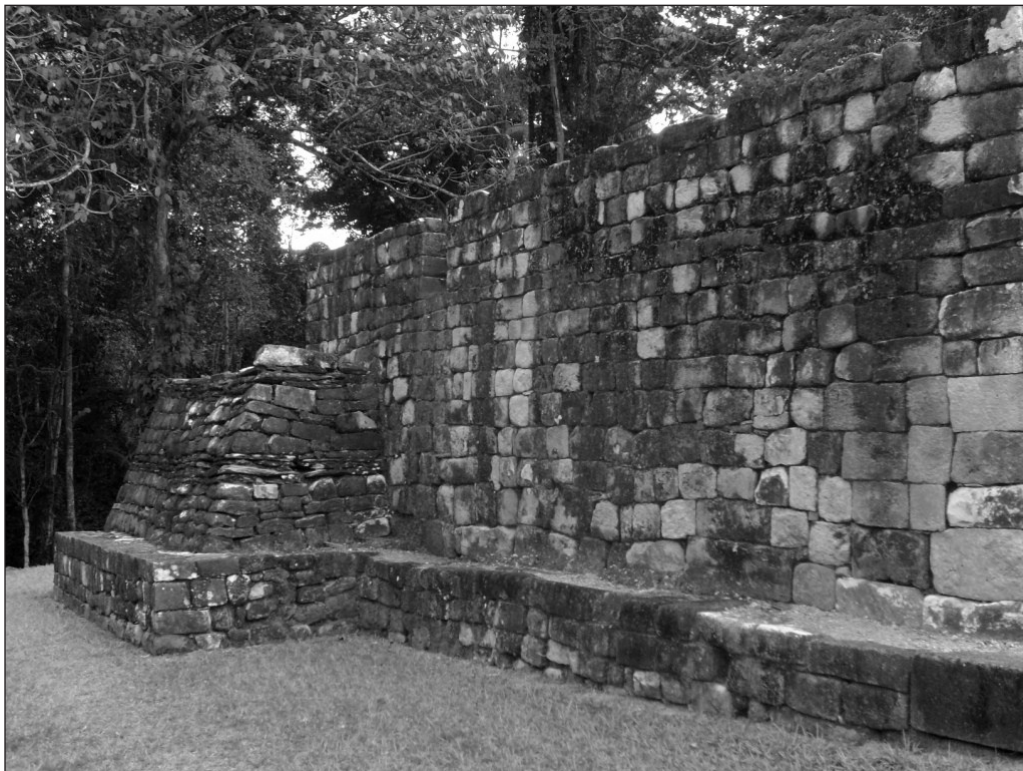


Figure 9. Buttress added to reinforce the walls of Structure 1B-3 of Quirigua (photo J. Crasborn, 2009).

Meanwhile, Sharer (1990:105-106) and Jones, Sharer, and Paredes (2008:4) indicate that based on their excavations in the 1970s, which uncovered massive alluvial deposits in excavations across the site, at the end of the Early Classic period (ca. A.D 550) the site suffered one or more severe floods. This flooding interrupted the site's history, and it appears not to have recovered its earlier prosperity until the mid-seventh century, when the city resumed production of new monuments and construction of new structures. The ancient Maya would have been well familiar with such phenomena, and David Stuart (2001) and Stephen Houston (2006) have identified hieroglyphs that refer to events such as earthquakes, hurricanes, and floods in Classic-period inscriptions.

In recent years Quirigua has been hit at different times by various natural disasters. A severe flood occurred in 1946, but no scientific data on this event were recorded. The next disaster came thirty years later, with the earthquake of February 4, 1976, which was a 7.5 magnitude on the Richter scale. This earthquake caused damage to the buildings of the Acropolis and caused some minor damage to Stelae H and J, which had been restored in the 1930s by the Carnegie Institution. Infrastructure at the site suffered little damage, however (Bevan and Sharer 1983:110-117). Despite the risks to which the park of Quirigua is subject, in 1981 UNESCO decided to award the title of World Heritage site, due to the size and artistic quality of its monuments, which deserve to be preserved for future generations.

In August of 1989 a strong hurricane hit the park, felling many trees, and while no damage to buildings or monuments occurred, a guard was killed by a falling branch. Later, on October 31, 1998, Tropical Storm Mitch hit Quirigua and the attendant flooding of the Motagua River laid a layer of sediment up to a meter thick over the site. The Ministry of Culture and Sports, with the support of UNESCO, removed this sediment and cleaned the site, and fortunately the monuments and structures of the site were not damaged from this flooding. More recently, on April 17, 2010, the park was subjected to another hurricane, and severe winds caused significant damage to the forest in the park, with the loss of more than 100 trees of different species. The Ministry of Culture and Sports directed cleanup efforts, and once again no monuments or structures were affected, with only modern touristic infrastructure suffering any damage (Figure 10). Finally, as happened in 1998, on May 31, 2010, Tropical Storm Agatha caused another flood, which again did not affect the site's

monuments and structures, but damage occurred to the park's infrastructure and 0.20 m of sediment was deposited across the site (Figure 11).

Preventative Measures: Short, Medium, and Long Term

It is clear that Quirigua was and remains a place that has always been subject to natural disasters, and has perhaps paid a high price for the privilege of controlling one of the most important trade routes of the Prehispanic era. And while it is impossible to predict when a natural disaster may occur, there are various actions that can be undertaken to minimize the impact these have on the archaeological site. At Quirigua the first such step was provided in 2008 when the Ministry of Culture and Sports presented the park management plan. This plan includes 23 goals for research, protection, and conservation of the site and park, including a contingency plan. With the support of the Royal Embassy of the Netherlands, this document was drawn up in 2009, but human and economic factors have prevented the full implementation of the plan. This has been one of the greatest advances in establishing coordination with other institutions such as the National Commission for Disaster Reduction (CONRED), the National Commission of Protected Areas (CONAP), the municipality of Los Amates, and the Bandegua company.

As mentioned above, Quirigua is susceptible to many types of disasters, and it is very difficult to take measures to protect the monuments against such events as earthquakes. In the case of hurricanes, the only measure that has been successfully implemented is the regulation of shade or the removal of branches from trees close to monuments, restored architecture, and public use areas, in order to avoid any damage that would occur from their collapse. With regard to flooding, an ambitious project has been initiated that will take time to achieve full results. During Tropical Storm Agatha, for example, it was noted that the perimeter mesh fence functioned as a sieve, not allowing much organic material (e.g., branches) to enter the stream and be carried to other sectors. For this reason, among others, there are plans to strengthen the perimeter fence of the park by building a "living fence" of trees and plants along the inner side of the metal fence, aiming to reduce further the amount of debris that may enter the park during a flood. The Bandegua company has begun the work of strengthening the banks of the Motagua River and has supported the idea of a living fence and may build a second one on its land surrounding Quirigua, which would function



Figure 10. Hurricane damage from April, 2010, caused by the collapse of the thatch shelter over Quirigua Stela A (photo: J. Crasborn, 2010).



Figure 11. Mud covering Zoomorph O in 2010, the result of flooding at Quirigua from Tropical Storm Agatha (photo: by J. Crasborn, 2010).



Figure 12. Damage caused by Tropical Storm Agatha in the storage building constructed in 2000 (photo: by J. Crasborn, 2010).

to create a buffer zone between its property and that of the park.

Another major aspect is the protection of information and assets that are safeguarded within the park, such as documentation, equipment and tools, and most importantly the collection of archaeological materials. What follows is a summary of events that have occurred at Quirigua, in order to illustrate our proposals for the protection of these assets in the future.

During the archaeological research of the University of Pennsylvania in the 1970s, a camp was built at ground level to be used as a laboratory and warehouse of archaeological materials, which remained until 1998 when Tropical Storm Mitch flooded the park. At this time water and mud entered the building and covered and undermined many of the shelving units, causing considerable damage to archaeological materials in storage, as well as the loss of identification codes and the mixing of materials, with the result that much of the original context and provenience of these artifacts was lost. Because of this situation, in 2000 the Ministry of Culture and Sports began construction of a new storage building, taking into account future flooding by constructing the floor 0.50 meters above ground level. At the time it was

believed this was adequate for future flooding, but Tropical Storm Agatha in 2010 proved that this height was too low, causing further damage (Figure 12).

For this reason another storage building is planned, to be built on two levels, where the first level will consist of a series of columns 2.5 meters in height, properly distributed in order to withstand the impacts of future floods and earthquakes. Artifact storage will take place on the upper floor, leaving the lower level as a workplace for the analysis of archaeological materials (Figure 13). The government of Japan had planned on financially supporting the construction of this building, but unfortunately the catastrophic earthquake and tsunami this nation faced in March of 2011 has forced it to redirect these funds to its own recovery and rebuilding effort, and Guatemala is still in the process of trying to acquire funding for this new construction.

Finally, another major challenge that remains is to adapt the existing infrastructure, such as the visitors' center and other areas within the park, in order to make them less susceptible to damage in future natural disasters, and protect human lives, park infrastructure, and the monuments and structures of the ancient city of Quirigua.

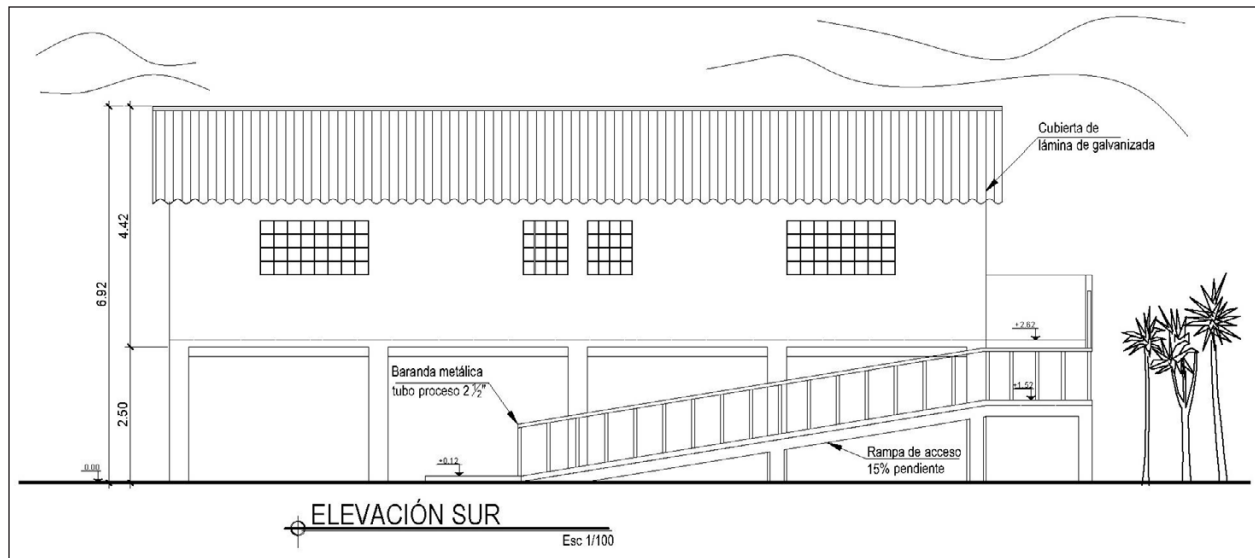


Figure 13. A sketch of the proposed new storage building for Quirigua (drawing by D. Gonzáles, 2010).

Final Comments

Climate change and its effects are a phenomenon we are experiencing today, and the fear of new natural disasters continues and has increased thanks to popular films and pseudoscientific publications, which often depict an impending apocalyptic end to humanity, such as the hype around the completion of the thirteenth baktun of the Maya Long Count calendar (concluding a period of roughly 5200 years). While many of these depictions are quite fanciful, they are not entirely without a basis in reality, and, as we have seen, the risk of loss of human lives and damage to national heritage sites from natural disasters is only too real.

Therefore, it is necessary to evaluate the risks for each particular site and establish contingency measures for the short, medium, and long term. This also requires the establishing of partnerships in order to exchange experiences and coordinate measures to tackle the challenge of protecting and preserving the cultural heritage of Guatemala from future disasters.

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