

## The 1755 Lisbon Earthquake

### *A case study*

**A**t 9:30 on the morning of November 1, 1755, the city of Lisbon, Portugal, was struck by one of the deadliest earthquakes in history. Estimated at 8.6 Richter, the temblor was so great that the seiche effects (the standing wave in an enclosed or partially enclosed body of water) were observed as far away as Finland. About 20 minutes after the temblor, the first of three 15-40 foot tsunamis struck the waterfront area along the Tagus River.

Fires broke out almost immediately, the result of the use of candles and wood burning stoves. There is evidence that some of the fires may have been set by escaped convicts to cover looting. The fire burned for six days, gutting the center of the city.

The earthquake, tsunami, and fires destroyed 18,000 structures (about 85% of the buildings in the city) and killed an estimated 30,000-40,000 people (the exact number is the subject of debate). When told of the magnitude of the disaster, the King of Portugal, Joseph I, is supposed to have cried, "What are we to do?" to which a young courtier, Sebastião José de Carvalho e Melo, is said to have replied, "Bury the dead; feed the

living." Being the only one with a plan, he was placed in charge.

### **The Vision**

Carvalho understood from the outset the precarious position in which the disaster had placed the government. The fourth largest city in Europe and famous for its wealth, Lisbon was highly dependent on the trade that flowed through its port. Loss of that trade to competitors would severely damage Portugal's power in Europe and could potentially lead to the collapse of the monarchy. Consequently, the need to rebuild quickly and to do it in a grand style would be the driving force behind all Carvalho's actions.

### **Response**

Recognizing the need to preserve the workforce required for reconstruction, Carvalho deployed army units to turn back any who tried to leave Lisbon. He also halted evictions and any attempts at rebuilding.

Carvalho organized the city into a series of districts each under a leader with the authority necessary to bring order to the area, much as modern responders use incident command. Looters were hanged and the peace enforced. Commodities were commandeered and



Lucien Canton is a nationally recognized expert on strategic planning for crisis and disasters. A popular speaker and lecturer, he is the author of the best-selling *Emergency Management: Concepts and Strategies for Effective Programs* used as a textbook in many higher education courses.

Prior to starting his own company, Mr. Canton served as the Director of Emergency Services for San Francisco and as an Emergency Management Programs Specialist and Chief of the Hazard Mitigation Branch for FEMA Region IX.

Lucien G. Canton, CEM (LLC), is a management consulting firm specializing in helping managers lead better in crisis.

Lucien G. Canton, CEM (LLC)  
783 45<sup>th</sup> Ave  
San Francisco, CA 94121  
415.221.2562  
415.520.5218 FAX  
LCanton@LucienCanton.com  
www.LucienCanton.com

distributed as needed. Army units transported additional food and supplies from the surrounding countryside. To prevent gouging, Carvalho controlled food prices. He offered economic incentives for local fishermen to sell their catch in Lisbon.

One of the major response problems was the disposal of human remains. Normal burial practices and even mass graves proved inadequate, so bodies were eventually loaded on barges that were then sunk in the Tagus River.

## Reconstruction

In early December, the chief engineer presented Carvalho with a series of options for reconstruction, ranging from abandoning the ruins to completing razing and rebuilding the damaged area. Carvalho settled on a radical plan to complete transform the city from its medieval warren of twisting streets to a new city of broad avenues and spacious plazas.

Within a year, debris was cleared and construction begun. A royal decree in 1758 mandated the use of the reconstruction plan and gave owners five years to rebuild according to it. Carvalho used powers granted under the decree to clear the properties needed for reconstruction by offering proportionate plots in new locations or by outright purchase. Rebuilding not sanctioned under the plan was forbidden and illegal construction torn down. Funding for the reconstruction was provided by a 4% import tax.

## Mitigation

Quick construction was not Carvalho's sole vision. He wanted a city that would endure and that meant somehow mitigating future disasters. Working with the academic community, Carvalho designed a survey to

gather information on the effects of the earthquake.

The data from the survey was studied by engineers who devised a wooden cage designed to be incorporated into new buildings to strengthen them during earthquakes. The reinforced structures were dynamically tested by having soldiers march around them continuously, setting up ground vibrations that could potentially damage the structures. In addition to mandating the seismic reinforcement, Carvalho also reduced the height of buildings, further reducing the chance of structural failure in an earthquake.

Carvalho insisted that the streets of the new city be made broad to prevent the spread of fire. In another apocryphal story, when told he was building the streets too broad, Carvalho is said to have replied, "One day they will be too small."

## Social Impact

The Lisbon earthquake had a profound effect well beyond the efforts of Carvalho to rebuild Lisbon. It sparked a debate that would eventually shift the view that disasters were unavoidable acts of God to one that attempted to use science to explain them. In a debate with Voltaire, the philosopher Rousseau summed up this new attitude when he wrote, "...it was hardly nature that there brought together twenty-thousand houses of six or seven stories."

There is no doubt that Carvalho, later Prime Minister and Marquis of Pombal, had an advantage in the support of his King. But his broad vision and willingness to embrace new ideas earned him the title of the Father of Modern Mitigation and the distinction of being the first modern emergency manager. 