

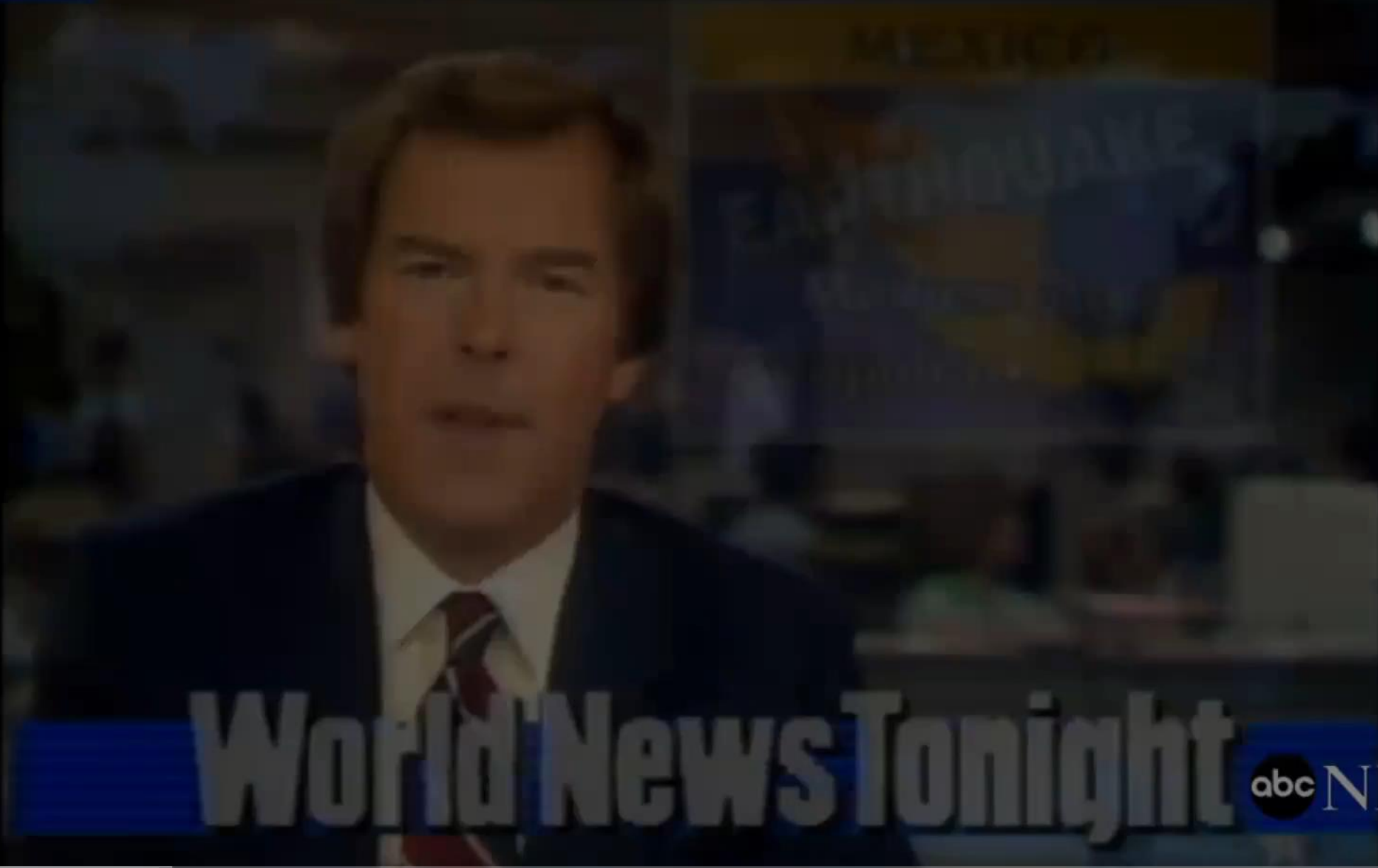
1985 MEXICO CITY EARTHQUAKE

A Case Study

September 19th, 1985 7:17:50 (CST)

- Duration: 3-4 minutes
- Epicenter: 18.350N 102.390W
- Moment Magnitude – 8.0
- Mercalli Intensity: IX
- Richter Scale: 8.1
- 10,000 people estimated killed, 50,000 estimated injured, 5 Million w/o power
- \$5 billion in damage, 250,000 people lost their homes
- Over 800 buildings crumbled (100,000 houses)
- Aftershocks: 7.5 Sept. 20th, 1985, 7.0 April 30th 1986

Sept. 19, 1985



World News Tonight

abc NEWS

Play



0:00 / 3:39





Earthquakes Don't Kill People, Buildings Do

Buildings Don't Kill People, Who Is Responsible?









MEXICO

MÉXICO CITY

OAXACA

CHIAPAS

GUATEMALA

8.2 EARTHQUAKE



Mexico at the junction of five tectonic plates



Why was Mexico City Affected so badly?

- Mexico City is built on an ancient sinking lake bed , wet sand (liquefaction)
- Building codes not adequate for earthquake protection and/or not enforced
- Dense population (2022 16,000 residents per square mile) Most populous metropolitan area in the Western Hemisphere with 22 million (2022) in the metropolitan area
- Earthquake waves were amplified x5 by resonance

When earthquake tremors hit solid rock, the rock simply shakes. But when they roll into the soft sediments of a basin, the vibrations can become trapped, reverberating back and forth through the material, explains Susan Hough, a seismologist with the USGS. "It's almost like a bathtub, the [seismic] waves will slosh back and forth," she says. Other seismologists have likened these lakebed dynamics to a bowl of Jello.

Liquefaction and Resonance

<https://www.smithsonianmag.com/science-nature/how-mexico-citys-unique-geology-makes-earthquakes-even-worse-180964972/>

Mexico City sits atop an ancient shallow lake, with soils made of sediments that washed in from the surrounding mountains thousands of years ago.

In the early 1300s, attracted by those fertile soils, the Aztecs selected an island in the lake on which to build their capital city, Tenochtitlan, which eventually became Mexico City.

Though the Spanish later drained the surrounding waters to prevent frequent flooding, the effects of that decision can still be felt today.

LESSONS LEARNED



Sept. 19th, 2017
32 years to the day

7.1 Earthquake
200 people died



Mexico City during and after the September 19, 2017 earthquake: Assessment of seismic resilience and ongoing recovery process

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Abstract

Mexico City was severely affected by the September 19, 2017 Puebla-Morelos earthquake ($M_w = 7.1$). City authorities confirmed that more than 12,000 structures for all uses were damaged as a consequence of this earthquake. In this paper, the focus of attention is devoted to trying to quantify in a simple manner how resilient the built environment in Mexico City was during the September 19, 2017 earthquake. Global statistics compiled for the severity of damage observed during this seismic event from detailed information gathered from well-documented and detailed damage surveys were used for this purpose. Also, an update is provided on how the seismic reconstruction and recovery processes of the built environment in Mexico City have been after this earthquake. This adaptive resilience has been assessed from reliable information and statistics of the ongoing reconstruction process of the affected built environment in Mexico City. The implementation of structural health monitoring programs for typical, representative buildings within the city would be germane to detect and correct potential structural deficiencies on time before the next strong earthquake may strike, then helping to improve the seismic resilience of the built environment.

Keywords September 19 - 2017 earthquake · Seismic resilience · Seismic recovery · Reconstruction · Adaptive resilience

1 Introduction

The capital of the New Spain, now Mexico City, was founded in the former Great Tenochtitlan, a small island in the center of Lake Texcoco, which was part of a hydrological basin composed of five lakes. According to the Mexican historian Alfonso Caso [12, 13, 24], the most appealing explanation for the meaning of the word Mexico from Náhuatl language roots is: "The center of the Moon's Lake". This definition is linked to the fact that the Aztecs or Mexica Empire founded their capital in this small island which was located in Lake Texcoco, also known by the Mesoamerican cultures as the

Moon's Lake. Later, the Spanish conquerors founded their capital in the ruins of the Great Tenochtitlan Island, to display and show their power to the conquered natives. This island was flat and very small. Then, during the raining season, it was common that it was flooded. Therefore, in the early 1600 s, the Viceroy of the New Spain, Luis de Velasco, hired a German engineer which adopted the Spanish name of Enrico Martínez, to start building the Great Channel to drain Lake Texcoco towards Lake Zumpango to avoid flooding of the original island and its surroundings during the raining season. That was the beginning of opening the basin of Mexico and the progressive draining and surface drying of most of the former five lakes for the following centuries, which lead to build what it is known today as Mexico City in very soft soils with important site effects.

Most of Mexico is located in a very active seismic region. Mexico City is relatively far away from the most active and higher potential seismic sources, the subduction zone along the Mexican Pacific Coast, where the closest high-potential seismic source, a $M_w = 8.4$ earthquake from the Guerrero Gap is close to 300 km from Mexico City. However, important site effects are present in Mexico City because of the political decision taken during the Spanish colonial period

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Earthquake Prediction

We can predict the where with a high degree of certainty, but we cannot predict the when.