

Summary of Preliminary CAPSS Findings

No one knows when the next large earthquake will strike San Francisco, but it is certain that a big one will come. When it does, the City's people and economy, its housing and businesses, its culture and character, will suffer heavy consequences. Recovery could take many years and the new, post-earthquake San Francisco that emerges could be different in notable ways.

This report selects four possible earthquakes that could strike the City and estimates the amount of damage and resulting ripple effects that each could cause. It looks only at damage to privately owned buildings and the impacts that flow from this. Damage to utilities, transportation networks, and public facilities have not been studied but are likely to add substantial consequences to those described here. Focusing on one of these scenarios, a magnitude 7.2 earthquake on the San Andreas fault directly offshore from San Francisco, illustrates the types of consequences the City can expect following its next large earthquake.

Here is a likely scenario in a magnitude 7.2 earthquake on the section of the San Andreas Fault directly offshore from San Francisco:

Overall Damage

- Around 25,000 buildings in the City will not be safe to occupy after the earthquake. Thousands more buildings will have light to moderate damage. Most of these will be wood frame soft-story buildings, but other structure types, notably concrete buildings built before the mid-1970's, will also suffer heavy damage.
- Around 4,000 buildings will need to be demolished and rebuilt. Many of these will be older and architecturally valuable buildings; some will be historic. The City will permanently lose the character and feel that these buildings contribute.
- Two hundred to three hundred people could be killed, and 7,000 more could have injuries requiring medical care. If the earthquake occurs during the day, older concrete buildings will be responsible for the largest share of casualties. If it occurs at night, soft-story residential buildings will cause the most casualties. Casualties could be much higher if a large, densely occupied building collapses.

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- Earthquake shaking sparks fires. It is expected that more fires will occur than the San Francisco Fire Department can address simultaneously, meaning some will burn unchecked for hours. An estimated XXX additional buildings could be destroyed by fire. Damage from fire could be much higher or lower than these estimates, depending on weather, wind, and many other factors.
- Economic losses will be huge. The cost for owners to repair or replace their damaged buildings could be \$30 billion. Most of this damage will be uninsured. Fewer than 10 percent of home owners in San Francisco carry earthquake insurance. An estimated 25 to 30 percent of commercial properties carry such insurance. An additional \$10 billion could be lost in damage to building contents, loss of inventory, relocation costs, income losses, rental income loss and wage loss directly linked to this damage. Post-earthquake fires could add \$XX billion to these losses. Secondary economic losses, stemming from reduced business and household spending, could add additional losses.

Damage to Housing

- The City will experience heavy losses to its housing stock. About 11,000 single family homes and more than 70,000 units in multifamily residences will not be safe for occupancy. For the buildings with the worst damage, particularly multifamily apartment buildings, repairs can take years. Market conditions at the time of the earthquake strongly influence how long repairs take. In a strong economy, when financing is readily available, buildings will be fixed quickly. If the earthquake occurs during a downturn when credit markets are tight, repairs can be stalled for years. After recent California earthquakes, the average time required for heavily damaged residences to be reoccupied is nearly two years. Buildings requiring demolition and reconstruction took, on average, more than three years before they could be reoccupied.
- An estimated 1,500 buildings, with about 10,000 units, that need to be demolished will be multifamily residential buildings. When these buildings are reconstructed, any new rental units will be exempt from rent control. Owners may find that building condominiums provides a higher rate of return on their investment, meaning that rental units could be permanently lost. Renters will be hit hard.

- All neighborhoods will suffer, but some will see worse damage than others. In this scenario, the Sunset and Richmond will see heavy damage due to their proximity to the San Andreas Fault, although these areas would not be so hard hit if an earthquake on the Hayward Fault shook the City from its eastern side. The Marina, Inner Mission, Bayview, Downtown and Mission Bay will see heavy damage due to poor soils. Neighborhoods with many damaged multi-unit apartment buildings, such as the Mission, Tenderloin, Chinatown and Western Addition, will be the slowest to recover because of the amount of damage these buildings will experience and the difficulty in arranging for repairs.
- Predictable issues will slow recovery. Nearly 100,000 buildings will need some repair, although many owners will choose to cover and repaint damage rather than repair it. This process will take years and will vary based on market conditions. A key issue that will slow recovery is the ability of building owners to arrange financing to cover the costs of the needed work, particularly owners of multifamily apartment buildings. Owners on fixed incomes with little savings will have the most difficulty financing repairs. In addition, construction workers will be in short supply. City agencies will have a huge workload to process permits for and review of all of this work. In many neighborhoods, locating space to stage construction materials and equipment in San Francisco's hilly neighborhoods with narrow lots and limited yard space will be a challenge.

Damage to Businesses

- Commercial spaces will also be hit hard. 21 million square feet of commercial space, over 900 buildings, mostly downtown, will be unusable immediately after the earthquake. Commercial buildings typically get repaired more quickly than residential buildings because owners often have an income source to finance repairs and are motivated to get rent paying tenants back in place but, again, it is highly dependent on market conditions at the time of the earthquake. In a time of high commercial vacancy rates, it could take years before all buildings are fully functional. Business interruption losses and government revenue losses will mount as the time to recover increases.
- Businesses and jobs will suffer. Businesses and workers that do not need to be in San Francisco may move. Key San Francisco industries, such as finance and technology, have been gradually shifting from San

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Francisco to other parts of the Bay Area in recent years. Heavy earthquake damage in the City could hasten this trend. The tourism industry will see severe impacts; visitors to the City can be expected to sharply decline in the years immediately following a large earthquake, which will impact the nearly 60,000 jobs that depend on these visitors. In the long-term, tourism and other businesses are likely to rebound and thrive, but not without some casualties. Many small and local businesses could close because they cannot weather an extended downturn in business or relocation from damaged facilities.

- The City will experience a temporary boom in the construction industry due to the massive repair and rebuilding effort required, but much of the benefit of this boom may be felt elsewhere. Many of these jobs are likely to be filled by workers from out of town, and much of the material needed for rebuilding, repair and refurbishing will be purchased elsewhere and transported to San Francisco.

The City's Resilience

- San Francisco has many characteristics that stand it in good stead to recover fully after the next earthquake – a diverse economy, a wealthy and well-educated population, world-class educational institutions, and a region that has been aware of and preparing for disasters for many years. It also has some characteristics that will pose a challenge, such as the City's high cost of living. While the City as a whole will recover in time, some people will be left behind.
- The elderly, poor, persons with disabilities, and non-native English speakers will have the hardest time recovering. Many of the services that support these communities, such as non-profit organizations and churches, could suffer damage to their own facilities and have a reduced capacity to help. Neighborhood businesses that people rely on, such as pharmacies and grocers, may not be open. An unknown number of residents who lose their home or job, and businesses that lose their buildings or customers, will leave the City pending repairs. Many will never return.
- The City knows little about the seismic safety of private facilities that serve vulnerable people, including assisted living facilities, private schools, daycares and medical clinics. Some of these buildings may be vulnerable structures; some may be unsafe.

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- City revenues will go down. San Francisco receives income from a number of tax and fee sources that will decrease due to reduced value of damaged property and interruption of businesses. Fees will drop in relation to the decrease in services and lack of use of revenue-supported facilities, such as parking lots. At the same time, City government expenses will increase as San Franciscans need services and the City needs to repair and replace its own infrastructure and buildings. Support from the federal and state level will cover only a fraction of these costs.
- Important City policy goals will suffer set backs, such as the City's environmental goals to reduce waste disposal and its carbon footprint. In the scenario earthquake, almost 7 million tons of debris will require disposal, and replacing and repairing damaged buildings will be energy intensive.

The next major earthquake that strikes San Francisco will change the City and its people. San Francisco is a world-class city with many special attributes that draw businesses, innovative people who want to live here, and visitors from around the world. In the long-term, San Francisco will recover and thrive, but it will be a different San Francisco. It is likely that the new, post-earthquake San Francisco will have less socio-economic diversity. The destruction of many affordable housing options, exacerbated by a limited housing market in the years it will take to rebuild the City, will make it difficult for middle and low income people to remain in San Francisco. Earthquake damage will stress businesses and the jobs they provide, particularly the many small and independent businesses in the City. It will change the way the City looks, with some of the most interesting and beautiful buildings and neighborhoods changed forever. It will make San Francisco more like every other city.

The scenarios described in this report present what is likely to happen if San Francisco makes no changes to its preparations for earthquakes. Much of this damage may be preventable. It is up to San Franciscans to decide whether and how much to invest in steps to reduce the consequences of the next major earthquake.