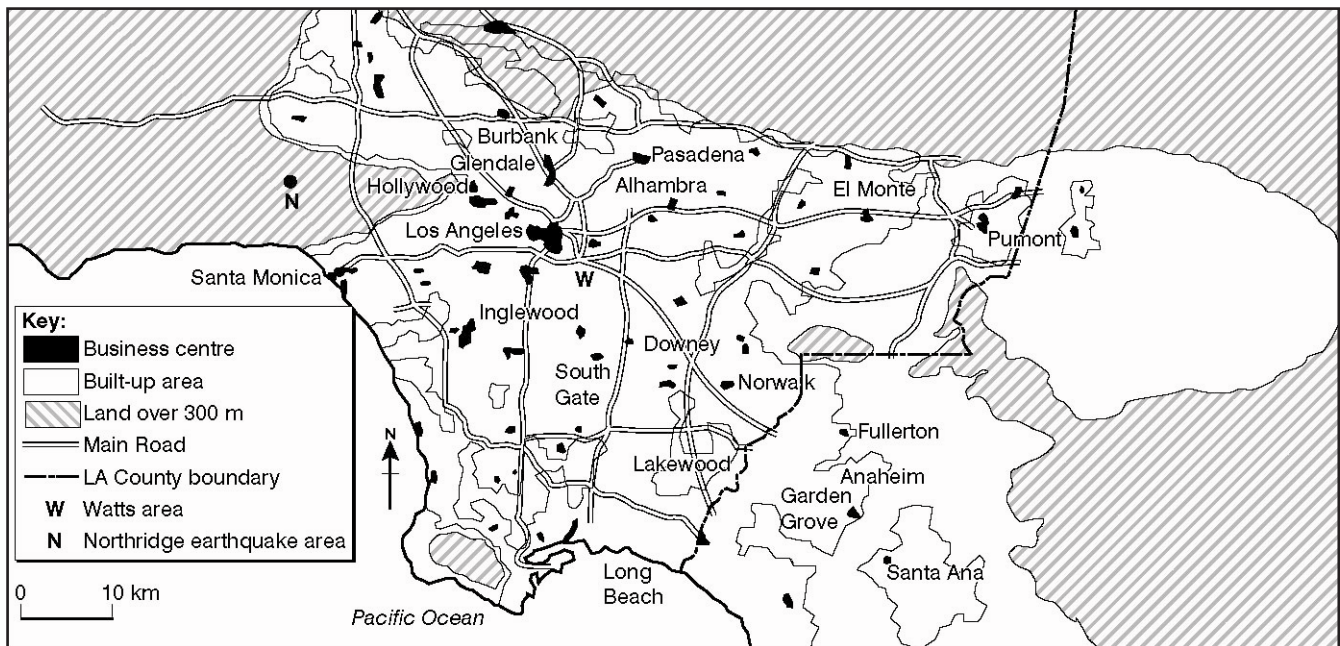


LOS ANGELES: A MULTIPLE HAZARD AREA

Figure 1: Los Angeles



Introduction

The present site of Los Angeles was first settled in 1781 by a group of sailors from Spain. For about one hundred years it grew slowly, but with the opening of trans-continental rail routes and the discovery of both oil and gold in the late 1880s, it started to expand. The establishment of the Hollywood film industry in the early twentieth century and the growth of the tourist industry in the 1920s and 1930s accelerated that growth. The whole of California became increasingly attractive, with its wonderful scenery and Mediterranean climate, and many people moved here from the eastern states. Today the greater Los Angeles urban area has a population of some 11 million people – an amazing figure when you consider how many hazards – both natural and man-made – its residents have to face on a daily basis.

Earthquakes

Los Angeles is situated on a heavily faulted area that is susceptible to frequent earth tremors and earthquakes. The most recent serious earthquake to affect the city was at Northridge in January 1994. This measured 6.7 on the Richter Scale, and even though it lasted for only 30 seconds the effects were

considerable and included:

- 60 deaths, mainly due to the collapse of apartment blocks
- several thousand injuries
- property damage valued at \$30 million
- the collapse of buildings and sections of freeways
- breakages in 250 gas mains resulting in explosions and secondary fires
- 200,000 people left without water
- 3 million people left with no electricity supply
- secondary damage such as landslips which blocked roads, eg the Pacific Coast Highway

Continuous earthquake mapping and data collection help a great deal in the predictions of the timing of future earth movements, their likely size and strength and the probable length of aftershocks. Building design techniques are also improving and during the recent Northridge earthquake a dam, freeway and a large hospital that underwent major repairs after the major 1971 earthquake this time withstood a virtually identical force.

The people and authorities of LA are learning how to cope with life in an earthquake zone. They are starting to believe that although earthquakes may be inevitable, a major disaster is not.

Life in an earthquake zone involves a considerable element of preparation and planning by many groups of people:

- Residents have to be in a permanent state of readiness for “the big one”. This involves having emergency supplies such as bottled water, food, torches, candles, battery radio, mobile phones etc. in a convenient, easily accessible place to help them to cope in an emergency situation, until normal water and power supplies are restored etc.
- Schools, large factories and office buildings have to have emergency plans and earthquake drills to practise what should be done in the event of a disaster.
- Emergency services, such as the fire and ambulance brigades, also have to have plans and drills so that they too would be able to cope in an earthquake situation and minimise the amount of injuries and deaths.
- Hospitals also need to have emergency procedures worked out so that they could cope with the extra patients produced by a major earthquake.
- Local authorities would be involved in the production of pamphlets, videos etc. to help people to prepare for a serious earthquake situation.

Figure 2: Incidence of earthquakes with a Richter scale measurement of over 5.5 since 1850

	No. of Earthquakes	Intensity
1850 – 1875	6	(6.2, 6.0, 6.5, 6.0, 7.0, 6.0)
1876 – 1900	8	(6.0, 6.0, 6.2, 6.2, 6.2, 6.5, 6.2, 6.5)
1901 – 1925	3	(6.5, 7.8, 6.3)
1926 – 1950	none	
1951 – 1976	none	
1976 – 2000	4	(5.7, 5.8, 6.2, 6.9)

NB. The Richter scale, which measures earthquake intensity, is a log scale. An earthquake with a value of 7.0 is 10 times as strong as one with a score of 6.0 and 100 times as strong as one with a score of 5.0.

Figure 3: Formation of smog in Los Angeles

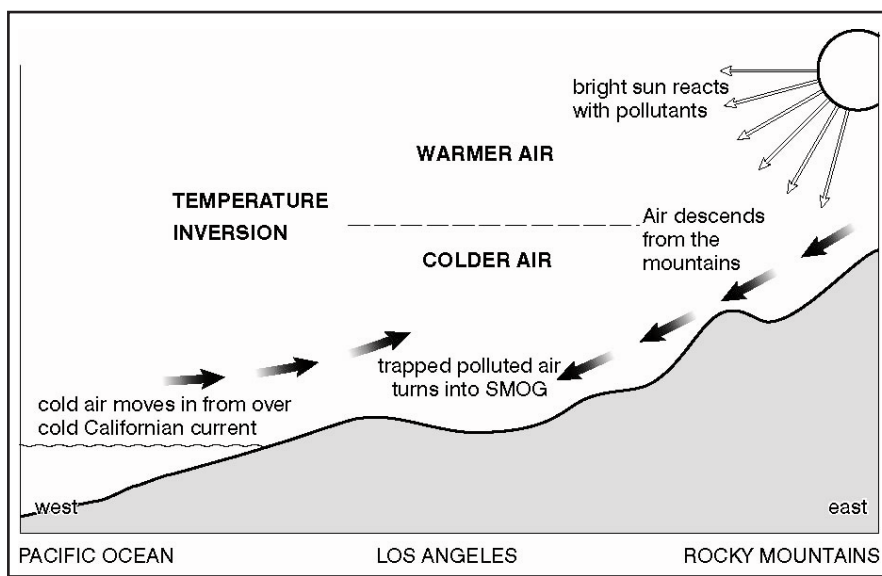


Figure 4: Climate data for Los Angeles

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	14.1	14.6	15.4	16.7	17.9	20.1	22.4	22.8	22.2	19.9	17.2	14.6
Precipitation (mm)	78.7	86.4	63.5	27.9	12.7	2.5	0	2.5	7.6	10.2	35.6	61.1

- Building and construction firms would have to work to very strict codes of practice to ensure that the damage to buildings, and thus to the people living and working there, was kept to a minimum.

Air pollution in LA

Los Angeles has long had a considerable air pollution problem, brought about mainly by industrial emissions eg from the oil industry and more importantly cars. Most families own one, two or more cars. The city is famous for its “car culture”, being the world’s most vehicle dependent city, where 90% of journeys are made by car. The

pollution problem is being tackled in several ways.

- **Improved public transport** eg the Metropolitan Transport Authority is developing subway lines and an over-ground, commuter, rail service serving outlying areas. In future a proportion of the sales tax in Los Angeles will go towards the development of new rail networks, improved bus routes etc.
- **Financial incentives.** These are available to employers who organise “car pooling”, where workers can share lifts, thus reducing the numbers of cars on the road.

- **Special lanes on freeways.** These are restricted for use by cars with at least one passenger.
- **Emission controls on vehicle exhausts.** California was one of the first states to require the use of catalytic converters.
- **Alternative fuels.** The use of lead-free petrol, electric cars and LPG (liquefied petroleum gas) vehicles has increased.

The city now has the strictest air quality standards in the USA and pollution levels are the lowest they have been for 40 years.

Smog in Los Angeles (see Figure 3)

Air pollution is one of the main contributory factors to another major concern in Los Angeles – smog. When cool sea air from the cold, offshore Californian current drifts inland, it meets warmer air over the city. When the air is calm, this can cause a temperature inversion, where the heavier cold air sinks into the city’s “basin-shaped” location. As the cold air mingles with the warmer, polluted air, fog is formed. The high levels of air pollution and the UV radiation from the bright sunshine turn this fog into a photochemical smog. This happens most afternoons in summer.

The amount and distribution of smog vary daily and seasonally. During one recent year, 100 days were classed as “very unhealthy” and a further 110 were “unhealthy”. Local residents suffer from the same amount of lung damage as someone who smokes 10 cigarettes per day. Smog also damages vegetation, irritates eyes and chests and generally is bad for health.

The Los Angeles Public Health Service gives out warnings when ozone levels are too high. These “smog alerts” warn people with lung complaints to stay indoors. If the situation becomes too serious, industries may even be closed until the smog clears.

Water supply

Situated as it is in a desert area, Los Angeles has a severe shortage of water supply. Much of the water it uses has to be piped a considerable distance, eg from the Colorado River Basin 400 km to the east. The Californian way of life, with garden sprinklers, swimming pools etc. adds to the considerable demands from business and industry.

Figure 5: Comparison of Crime in Los Angeles and New York (crimes per thousand population)

Type of Crime	Los Angeles	New York
Homicide (murder)	0.30	0.26
Rapes	0.52	0.38
Robberies	10.92	12.38
Assaults	12.85	8.61
Burglaries	15.98	14.03
Thefts	35.64	32.02
Car thefts	18.80	17.2
Arson	1.73	0.6

Recycled water is now a permanent element in the city's supply, and two projects have been completed. It is hoped to provide 40% of the city's supply in this way by 2010 and to recycle water from the harbour area for eg a power station and industrial uses.

Water conservation strategies have also been successfully and widely implemented, costing over \$60 million during the past five years. These include:

- the replacement of half a million toilets with an ultra-low-flush variety
- financial incentives for firms and individuals introducing conservation measures
- a water rate structure that penalises wasteful users and rewards conservation.

Flooding

The Long Beach area (see Figure 1) is a flood hazard zone due to coastal subsidence linked with oil extraction. The area is now 9 metres lower than it was 40 years ago! The construction of sea walls and the injection of water into the spaces left by the oil have not totally removed the threat. Similar flooding has also occurred due to subsidence linked with tectonic processes in other coastal areas of the city.

Tsunamis could also cause extensive coastal flooding. The Pacific Ocean coastline near to Los Angeles is particularly prone to these tidal waves, which are triggered by submarine earthquakes or volcanic activity. One could strike at any time with virtually no warning. The effects of such a

hazard are increased by the fact that most transport infrastructure and residential development is concentrated along the narrow coastal lowland area, as the ranges of mountains parallel to the coast limit expansion.

Inland, flash floods are common in winter when intense rainstorms saturate the ground and wash over the bare surface, removing everything in their path – houses, cars, roads etc.

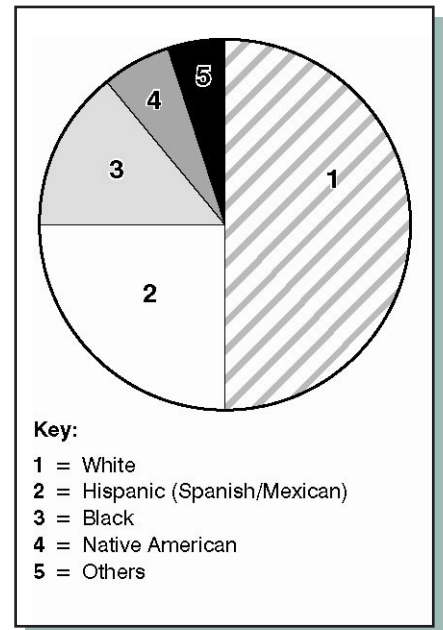
Landslides and mudflows

These occur almost every year, especially during the winter, due to:

- soft underlying rocks such as unconsolidated gravel, sand, clay and silt giving way
- seepage from sprinklers and pools which remove the saline minerals from the soil. These act as an adhesive, holding the soil particles together, and their removal makes the ground unstable and prone to slides
- the steepness of the coastal cliffs, which makes them unstable
- earth movements, which disturb unstable areas
- very heavy winter rain storms, which saturate the rocks and add to their mobility
- a lack of vegetation during summer and autumn, so that there are no roots to bind the soil together.

Material slides downhill under the force of gravity, engulfing homes, burying roads and sweeping away cars. The most dangerous zone is the area along Santa Monica Bay, where numerous residential developments are found because of the sea view and cooling breezes.

Figure 6: Ethnic composition of LA



Pollution of coastal areas

The large population of Los Angeles has an important effect on the condition of nearby coastal waters. Treated sewage is washed into the sea, as is a considerable volume of untreated "stormwater". This is the untreated contaminated water that drains from the streets through the municipal storm drain system. Refuse dumped on the ground or in gutters, eg fast-food wrappers, cigarette ends, pet droppings, etc, contributes to this type of pollution. This stormwater poses a serious health risk to people swimming or fishing within 400 metres of the outlets. Oil spills from offshore drilling rigs also occur. Beach attendances have fallen by 56% since 1983, and much of the coastal marine life is severely affected.

Brush fires

Most of the area around the city is covered with xerophytic (drought-resistant) brush vegetation. By autumn each year, after a long summer with little rain, this vegetation is tinder dry. There is a local, warm, dry wind known as the Santa Ana which blows across the area, drying it further, and fires start easily. Serious fires occurred in 1993 when over a thousand homes were destroyed and four people were killed. A 10 metre brush clearance zone around all houses is now demanded by Californian law to minimise the risk of fires spreading.

Crime

The city also suffers from certain social hazards. Crime rates are high within Los Angeles, which has large communities of socially disadvantaged people with many problems. There is a high incidence of drug usage and drug-related crime.

Since the 1980s there has been an increase in gang-related crimes connected with buying and selling drugs. There are also above average numbers of people with AIDS in Los Angeles, linked with the large drug-dependent community and drug culture of the city. Aids Programme of Los Angeles is an organisation that provides services and resources for the people who are HIV and AIDS sufferers.

Ethnic riots

Los Angeles has a diverse ethnic population (see Figure 6). Within the city there are certain ghetto areas with large concentrations of hispanic and black people. Conditions here are very poor, with substandard housing, poor educational and health facilities, unemployment, and low standards of living.

In 1965 the residents of one of these areas, known as Watts, rioted for five days. 34 people were killed, 1000 were injured and nearly \$40 million of property damage was done. In 1992 a further build-up of tension followed accusations of racial harassment, police brutality etc. More widespread riots occurred, resulting in 53 deaths, 2,400 injured and \$1 billion worth of damage. Racial tensions are a major concern in present-day Los Angeles, and the authorities are working hard to try to alleviate the situation.

The costs of living in a multiple hazard city

The local government authorities in Los Angeles have many additional costs connected with the many hazards that the city faces. These include:

- the additional cost when constructing roads, bridges and buildings so that they can withstand severe earthquake shocks with the minimum of damage; This is important to reduce the costs of repair and

rebuilding after a disaster. It is also vital so that a good system of communication can be maintained in the period immediately following a disaster for the rescue and emergency services to be able to reach the areas affected with the minimum amount of delay.

- the expense of monitoring air pollution levels and the introduction of various measures to reduce these to minimise health risks for the inhabitants;
- the cost of publicity and safety campaigns to increase hazard awareness.

Life can also be difficult for the people who live and work in Los Angeles.

- houses cost more as they have to be built to very stringent safety standards;
- house and life insurance policies are more difficult to obtain and more costly;
- people who work in the tourist industry find that there is a slump in trade after a serious earthquake incident;
- some people find that the physical and psychological effects of living in an earthquake zone and being under the daily threat of severe activity cause increased stress levels and conditions such as high blood pressure.

However life in such a zone does not always have negative effects. Some people in multiple hazard zones actually earn a living by doing so! Many scientists find employment in the universities and research establishments that are situated in the city. Workers are needed to monitor earthquake activity and pollution levels. People who work in media and publicity may also find employment in the production of

hazard management material and the reporting of any activity that does occur. Firms making detection equipment, burglar alarms, pollution monitors etc. will also thrive in this kind of hazardous environment.

Conclusion

Los Angeles suffers from a wide range of hazards. We may ask ourselves why so many people still choose to live in the city and why its population is still growing. The answer must surely be that the advantages outweigh the disadvantages. A warm Mediterranean climate, beautiful coastal and mountainous scenery and a luxurious lifestyle for many of the city dwellers would appear to outbalance the intermittent inconveniences of smog, flooding and fires.

Web sites

There are many of these under Los Angeles, or Problems in Los Angeles, including:
www.ci.la.ca.us/EAD/
www.greatestcities.com/los_angeles-8-c.html
[//geopubs.wr.usgs.gov/factsheet/fs094-96/](http://geopubs.wr.usgs.gov/factsheet/fs094-96/)

FOCUS QUESTIONS

1. Choose three of the following people and describe how their job might be affected by working in a city such as Los Angeles.
 Architect Insurance Salesman
 Head Teacher Social worker
 Fire officer Estate Agent.
2. In what ways might living in hazard-prone Los Angeles be different from life in a typical British town or city?
3. Using Figure 2, why might the earthquake researchers in Los Angeles feel that a "big one" is imminent?