

- Acid rain



ENVIRONMENT

WHAT IS ACID RAIN?

Some clouds can harbour water that kills trees and melts statues

WORDS SCOTT DUTFIELD

Acid rain is the broad term used to describe precipitation that is more acidic than normal. Typically, rainfall has a pH of 5.6 – anything below that level is considered acid rain. Of course, clouds aren't in control of the pH of their precipitation – just like the rest of the natural world, it's impacted by pollution emitted by cars and industry. The two main gas pollutants responsible for acid rain are sulphur dioxide (SO₂), released as a byproduct of the fossil fuel industry, and nitrogen oxides (NOX) from vehicle exhausts. When these gases drift into the atmosphere, they interact with sunlight and water vapour to form sulphuric acid and nitric acid mists. Under warm temperatures, the clouds of acid mist remain as vapour. However, when temperatures cool, the vapour condenses and forms acidic droplets that fall to the ground as rain or snow. But industrial pollutants aren't the only way

these gases enter the environment: natural sources also release SO₂ and NOX into the atmosphere, such as volcanoes following a massive eruption.

Once in the environment, acid rain can wreak havoc on many ecosystems. For example, if you come across a forest of dying trees, there's a good chance that acid rain has played some part in their death. Acid rain can leach toxic metals from the soil, such as aluminium. Metals like aluminium prevent trees from taking up water and nutrients from the soil, ultimately starving them to death. At higher elevations, the acidic gases that don't make it into the clouds can also coat the surface of a tree's leaves, preventing them from being able to photosynthesise.

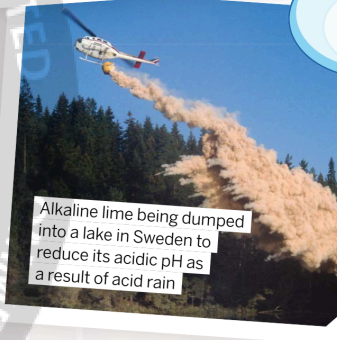
The direct effects of acid rain on human health, on the other hand, are few. However, in their gaseous states its ingredients can lead to many harmful respiratory issues, such as bronchitis and asthma attacks.

Did you know?

Most freshwater lakes have a pH of 6.5 to 8.5



A statue that has been corroded by exposure to acid rain



Alkaline lime being dumped into a lake in Sweden to reduce its acidic pH as a result of acid rain



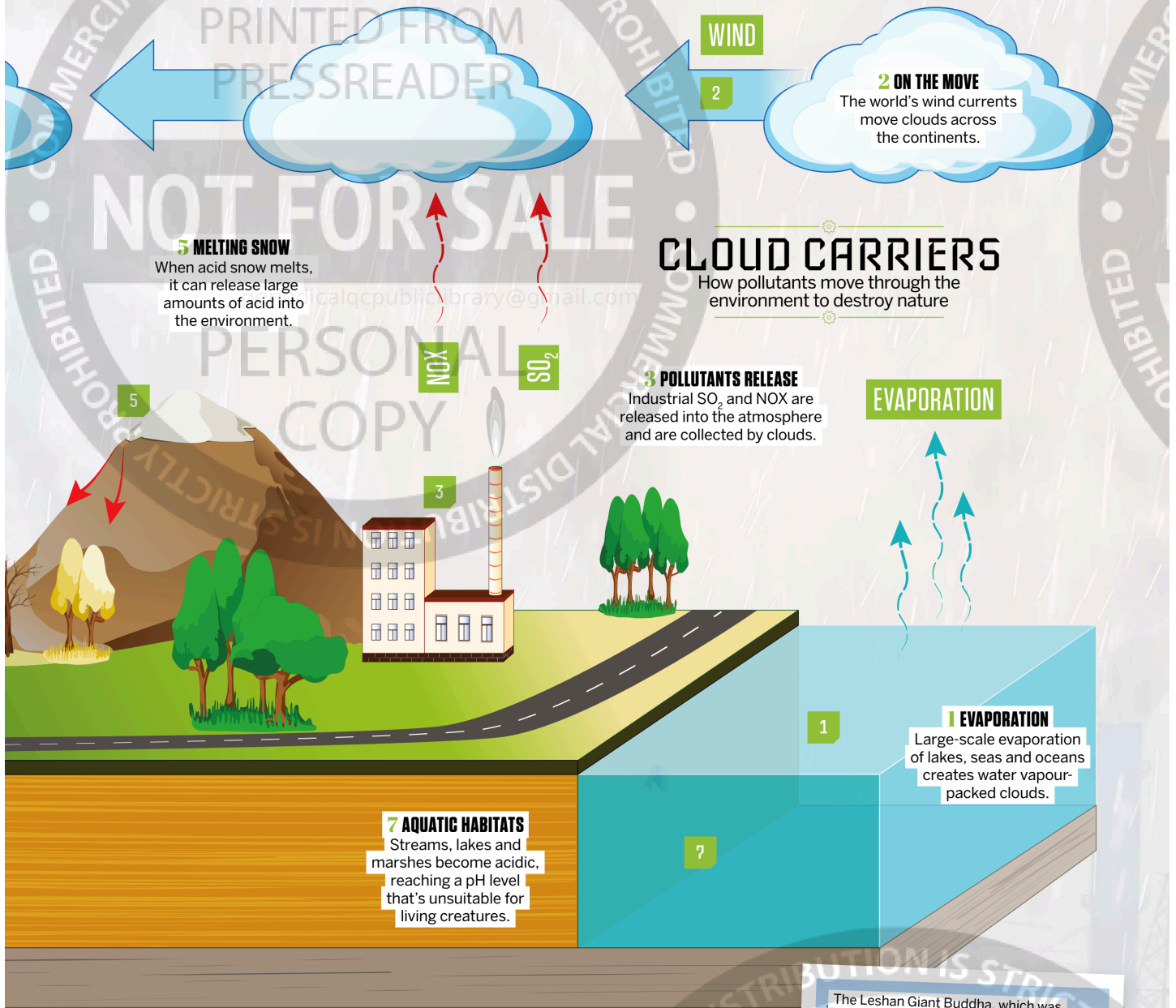
CLEANING UP THE RAIN

It wasn't until 1963 that anyone knew what acid rain was. While studying the ecology of forests in New Hampshire, scientists discovered that rain samples were up to 100 times more acidic than they expected. At its peak, acid rain stripped forests and obliterated lakes across Europe, Canada and the US. In 1982, pH readings of 2.83 were recorded over the Great Lakes of the US and Canada. For comparison, lemon juice has a pH of between 2.0 and 3.0. During the 1990s, legislation around the world was introduced to curb the release of SO₂. Between 1990 and 2017, the levels of SO₂ emissions released in the US plummeted by 88 per cent, thanks to the Clean Air Act of 1990. To combat the release of SO₂, many fossil fuel energy plants employ sophisticated air filters and 'scrubbers' to trap and store pollutants before they reach the atmosphere.



Industries with a greater risk of pollution, such as this cement factory, use sulphur dioxide scrubbers to minimise acid rain production

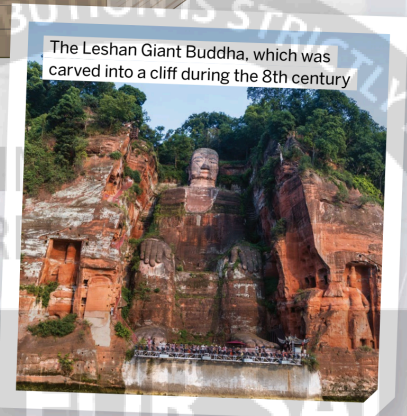
DID YOU KNOW? Between 1990 and 2012, acid rain levels dropped by 80 per cent in the UK



A MONUMENTAL ISSUE

One of the many consequences of acid rain is that it dissolves monuments and statues. When sulphuric acid and nitric acid come into contact with the materials used to build statues, such as marble and limestone, they can slowly dissolve a compound called calcite and erode the sculpture. The Leshan Giant Buddha in China is among the most afflicted by acid rain. As the world's largest stone Buddha, the statue was carved from a cliffside made of red sandstone around 1,200 years ago. A 71-metre-high symbol of eternity and

peace, the Leshan Buddha is an impressive feat of engineering. However, it's being dissolved by acid rain, leaving black and grey stains on its face and body. China is one of the world's largest fossil fuel users, which means that acid rain has already been a big environmental concern for the nation. But in 2023, 28.8 per cent of the monitored cities in China experienced acid rain, down from 44.4 per cent in 2013. Factories and power plants near the monument have been closed down to help prevent further damage.



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