

Earth & Space

Rapid increase of nuclear weapons in India and Pakistan may lead to local and global catastrophes

by **Owen B. Toon**¹ | Professor; **Alan Robock**² | Distinguished Professor

¹: Department of Atmospheric and Oceanic Sciences, Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado

²: Department of Environmental Sciences, Rutgers University, New Brunswick, New Jersey

This Break was edited by Max Caine, *Editor-in-chief* - TheScienceBreaker

ABSTRACT

A nuclear war between India and Pakistan could be triggered by the ongoing conflict over Kashmir. The direct effects of this nuclear exchange would be horrible, and 50 to 125 million people could die. Much of the world would suffer crop losses, possibly leading to mass starvation, a global catastrophe. But this problem was created by people and can be solved by them.



Image credits: Pixabay

India and Pakistan achieved independence from the United Kingdom just after World War II. During the partition of the British Indian Empire, the princely State of Jammu and Kashmir became divided between India, Pakistan and China. India and Pakistan have had four wars over control of Kashmir and numerous border skirmishes. In 2019, India and Pakistan bombed each other's territories in response to a terrorist incident in Kashmir that killed 39 Indian Police. India subsequently changed its Constitution and put its portion of Kashmir under the control of the central government instead of having local self-rule. This further inflamed tensions between the two nuclear-armed countries.

India tested a nuclear weapon in 1974, and both countries tested weapons in 1998. Since 1998 the two countries have engaged in a nuclear arms race. While the arsenals of both countries are shrouded in secrecy, the number of weapons in each country is estimated at 130-150 from counting nuclear-capable aircraft, missiles, and ships. Given the rate of increase in nuclear weapons each country may have as many as 250 nuclear weapons by 2025, a similar number to those owned by China, Britain, France and Israel. It is even possible that by 2025 Pakistan could have the world's third-largest arsenal, behind the United States and Russia. The destructive power of these weapons is not known and controversial. India

exploded a weapon in 1998 with about three times the power of the bomb dropped by the United States on Hiroshima, Japan in World War II, which killed about 100,000 people. Pakistan claims to have exploded a weapon with twice the power of the Hiroshima bomb in 1998. Both countries now claim to have weapons ten or more times more potent than the Hiroshima bomb.

Nuclear weapons were built to destroy cities. During World War II fleets of hundreds of bombers were used to carry bombs weighing just a few kilograms whose purpose was to penetrate roofs and start fires that would burn down cities. Many cities in Europe were partially destroyed, including Hamburg and Dresden, as well as 67 cities in Japan, including Tokyo. Of course, large numbers of aircraft and crew were lost in these bombing raids. The nuclear weapon dropped on Hiroshima only required a single aircraft to destroy much of that city by fire, and three days later another 70,000 people were killed by one atomic bomb dropped on Nagasaki.

There is a danger of nuclear war between India and Pakistan because of their on-going dispute over Kashmir, and because of the actions of terrorist groups inflaming the population. Pakistan is much smaller than India in population, geographic size and the size of its military. Should Pakistan believe it is about to be attacked by India, it might feel it necessary to respond with nuclear weapons, before being overrun by the Indian military.

There are about 60 cities in Pakistan with a population above 100,000 people, and about 450 such cities in India. With 100 nuclear explosions in Pakistani cities and 150 in Indian cities, we find that 50-125 million people would die nearly instantly from blast, radiation and fires. This local catastrophe would be the highest death rate and total number of deaths in history. About 60 million people died over six years in World War II.

Our simulations show that smoke from burning cities would rise high into the atmosphere, reaching altitudes where it never rains. The smoke would spread across the Northern Hemisphere within weeks, worldwide within a month, and without rain remain aloft for about ten years. The smoke would absorb sunlight in the upper atmosphere, heating the air, and destroying the ozone layer so that the ground would be bathed in dangerous ultraviolet light. Less sunlight would reach the ground than usual, causing global cooling. The lower sunlight and cold temperatures would lead to agricultural failures, which would be particularly important in high latitude regions such as Scandinavia and Russia. However, much of the world would suffer crop losses, possibly leading to mass starvation, a global catastrophe.

We hope the people, politicians, and generals in Pakistan and India will understand these dangers and solve their differences without war. Much greater damage can occur from wars between Russia and the U.S. which have about 14,000 nuclear weapons. The 2017 U.N. Treaty on the Prohibition of Nuclear War is now open for ratification. Currently, 35 nations have ratified it and when 50 have, it will come into force. This is an opportunity for the nine nuclear nations to end the threat that the continued existence of nuclear weapons presents.