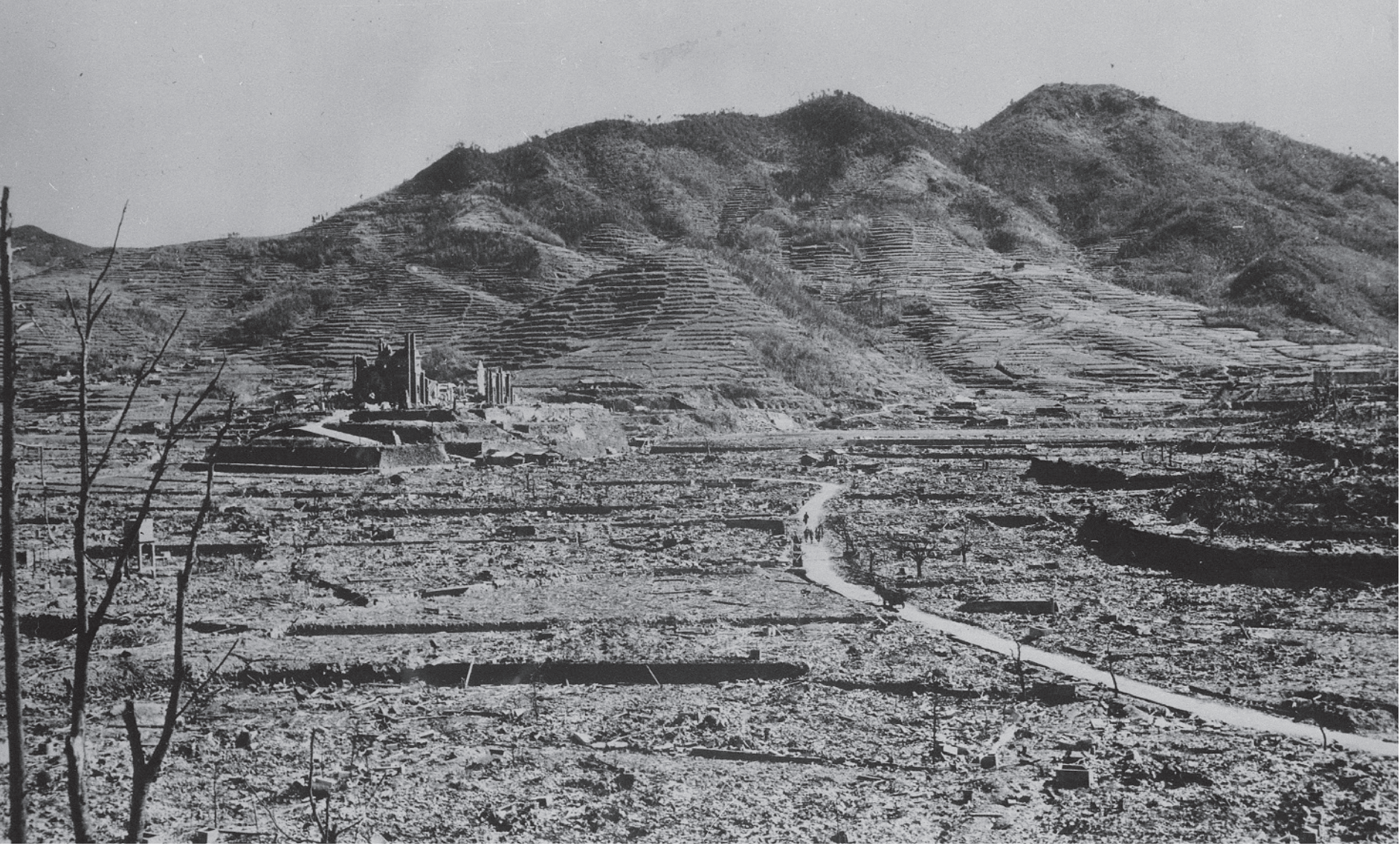


# Nagasaki, Japan

## Atomic bombing

On August 9, 1945, the U.S. detonated the nuclear bomb “Fat Man” over the Japanese city of Nagasaki, with a population of more than 240,000. The bombing resulted in the immediate deaths of 22,000 people. Those who survived the attack were left without help as hospitals and vital infrastructure had been completely destroyed. More than 64,000 people had died as a result of the bombing by the end of the year. Many of the survivors still suffer from long-term radiation effects today.



The shock wave from the bomb's detonation turned most of the city into rubble. The simultaneous fireball extinguished all life within a radius of about 1 km. The electromagnetic pulse caused by the nuclear explosion destroyed communication and power systems, obstructing attempts to help the casualties. Photo: NARA / public domain



August of 1945: This mother and her son survived the nuclear attack. Studies later found increased rates of leukemia and other cancers in the survivors. An estimated 120,000 Hibakusha are suffering from long-term effects of radiation exposure. Photo: NARA / public domain

### History

Just three days after the atomic bombing of Hiroshima, which had caused an estimated 45,000 casualties and had left 91,000 people injured, a second, nuclear-armed B29 bomber started from the U.S. base on the island of Tinian.<sup>1</sup> This time, the intended target was the industrial city of Kokura. Due to bad weather conditions, the pilot rerouted the plane to the secondary target site: Nagasaki, an important cultural hub and a harbor city with Mitsubishi factories.

The atomic bomb, nicknamed “Fat Man” due to its plump design, weighed about 4.5 tons, measured 4.5 meters in length and had the explosive capacity of about 22,000 tons of TNT. “Fat Man” was dropped over the densely populated city at 11:02 am local time and exploded about 500 m above ground.<sup>1</sup>

### Health and environmental effects

Elevations between the two rivers of Nakashima and Urakami roughly divided Nagasaki in two parts, each named after its river. Because Nakashima, in the eastern part of Nagasaki, was protected by a chain of hills, it was not completely destroyed. Nevertheless, the damage in Nakashima was by no means small. More than 18,000 buildings were damaged, almost 13,000 completely destroyed. In the suburb of Urakami, more damage was caused by the shock wave than in Hiroshima.

The explosion caused a giant fireball, completely vaporizing everything within a radius of about 1 km. The ensuing heat wave was strong enough to ignite fires and cause major burns as far as 5 km from the hypocenter. The fire also sucked out the oxygen from the surrounding area, so that people hiding in basements and bunkers died of asphyxiation.

A shock wave followed, which turned parts of buildings, vehicles, wooden beams, glass shards, animals and even people into projectiles, flying at speeds of more than 150 km/h.<sup>2</sup> Tens of thousands of people suffered from poly-traumatic fractures, penetrating trauma from flying debris and crushed organs in addition to burns. Eardrums and lungs ruptured many kilometers from the hypocenter.

Those who survived the fires and the effects of the detonation suffered from gamma-radiation emitted by the nuclear explosion. Exposure to more than 1 Sievert of radiation led to acute radiation sickness with severe burns, bloody diarrhea and vomiting, bleeding, immunodeficiency, anemia, blindness and damage to the central nervous system. Even far away from the hypocenter, people were exposed to radioactivity through plutonium-laden “black rain.” The inhalation or ingestion of this nuclear fallout, or of contaminated

### Ressources

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- 3 Pierce et al. “Studies of the mortality of atomic bomb survivors.” *Radiat Res.* 1996 Jul;146(1):1-27. [www.ncbi.nlm.nih.gov/pubmed/8677290](http://www.ncbi.nlm.nih.gov/pubmed/8677290)
- 4 Watanabe, T et al. “Hiroshima survivors exposed to very low doses of A-bomb primary radiation showed a high risk for cancers.” *Environ Health Prev Med.* Sep 2008; 13(5): 264–270. [www.ncbi.nlm.nih.gov/pmc/articles/PMC2698250/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2698250/)



food and water, led to severe internal radiation. Genetic mutations and radiation-induced cell damage led to a high prevalence of miscarriages, still-births, cancers, thyroid diseases and cardiovascular diseases in the survivors.<sup>1</sup>

The electromagnetic pulse caused by the nuclear detonation destroyed electric communication and power systems throughout the city. This was to prove fatal to the survivors, as health and emergency services were practically wiped out as a result.

According to official Nagasaki statistics, the total death toll from the atomic bombing amounted to about 73,000, with 74,000 people injured and 120,000 suffering from long-term effects of the blast and the radiation.<sup>3</sup>

### Outlook

The full extent of the Nagasaki bombing may never be known. Most still-births, malformations and deaths in the first years after the bombing were simply not examined. Corpses were quickly burned due to the chaos after the blast, fear of epidemics and the absence of scientific and medical infrastructure and personnel.<sup>1</sup> Scientific research began in 1950 and has been performed largely by the U.S.-based Atomic Bomb Casualty Commission and the Radiation Effects Research Foundation (RERF). Their studies found leukemia rates up to seven times higher than in control populations, as well as increased rates in almost all other cancers.<sup>3</sup> These studies did not examine the long-term effects of low-level radiation and the connection of radiation to non-cancer diseases and are thought to underestimate the full extent of radiation-induced morbidity and mortality.<sup>4</sup> Even today, the Hibakusha of Nagasaki still suffer from the atomic explosion that took place several decades ago. The chapter on Nagasaki is still not closed.

