



Nuclear Weapons and the Environment

Basic Facts

- A new nuclear arms race was triggered in 2010 by the New Start Agreement, which allows for nuclear weapons “modernization.” The proposed budget for modernization is estimated at \$1 trillion over the next 30 years.¹
- 9 countries have nuclear weapons: The US, Russia, UK, France and China, as “legacy nuclear states,” plus Israel, India, Pakistan, and North Korea. There are an estimated 14,900 known warheads, as of early 2017.²

Pollution from Weapons Facilities and Nuclear Tests

- Nuclear weapons production sites produce vast amounts of radioactive waste, which can have devastating impacts on the surrounding environment.
- A clear example of this is the Hanford Nuclear Site in Eastern WA, which is the most contaminated nuclear site in the western world.³ At the height of plutonium production in 1957, eight plutonium production reactors dumped a *daily average* of 50,000 curies of radioactive material into the Columbia River. By comparison, only 15-24 curies of iodine-131 were released at Three Mile Island. Large volumes of radioactive waste have since been stored in 177 underground tanks, 67 of which have leaked a total of approximately one million gallons into the surrounding soil.⁴ Today, 53 million gallons of high-level radioactive and chemical waste, and 25 million cubic feet of solid waste, are stored at the Hanford site.⁵
- Since 1945, eight countries have conducted 2,054 nuclear test explosions in locations all around the world. 528 early tests were conducted in the atmosphere, spreading radioactive material throughout the atmosphere. Underground tests have also vented radioactive material into the atmosphere and contaminated soil.⁶
- Nuclear weapons testing has had a particularly harmful effect on land and marine environments due to bioaccumulation, meaning that radioactive material concentrates in organisms up the food chain. For example, Iodine-131 from US tests, especially during the 1950s, accumulated in rainfall runoff and in soil, which was taken up by grasses, then consumed by cows that produced contaminated milk, which was distributed throughout the US.⁷



Environmental Consequences of Uranium Mining⁸

- Tailings, or the by-product of uranium mining, contain many toxic materials and 85% of the radioactivity of the uranium ore. In Australia, one of the top uranium producing countries, mining one ton of uranium produces on average 848 tons of tailings and 1152 tons of low-grade ore and waste rock. This makes mining easily the largest point of radioactive waste production in the nuclear fuel/weapons production chain.
- Despite regulations, there have been many incidents of leaks and contamination from tailings into groundwater, waterways, and the nearby environment. For example, it was discovered after almost 10 years of operation that a tailings dam had leaked billions of liters of tailings into groundwater at the Olympic Dam in Australia.
- No closed uranium mine in the world has been successfully cleaned up⁹, and the waste remains radioactive and harmful for tens of thousands of years.

What would the aftermath of a nuclear war look like?



Climate Disruption^{10,11}

- A “limited” nuclear war between India and Pakistan involving 100 nuclear weapons could launch 6.6 million metric tons of black carbon aerosol particles into the upper atmosphere.
- Global average surface temperatures would cool by 1.25 °C initially, with greater cooling over large areas of North America and Europe, resulting in the coldest global temperatures of the last 1,000 years.
- This would also result in decreased global precipitation, especially over temperate grain-growing regions in North America and Europe, and a larger reduction in the Asian summer monsoon.
- A 2014 study demonstrates potential ozone losses of 20%-50% over populated areas.
- This would lead to widespread, devastating impacts on humans, crop production, and ecosystems, leading to a “nuclear famine.”

Impacts on Agriculture^{10, 11}

- In the decade following a “limited” nuclear war: US corn and soybean production would decrease by an average of 10%, Chinese middle season rice production would decrease by an average of 10 - 20%, and Chinese winter wheat production would decrease by an average of 31%.
- The growing season would be shortened by 10-40 days for 5 years.
- Declines in crop production would be accompanied by increases in food prices and decreased accessibility to food, especially for those already undernourished. Distribution, exports, and aid would likely decrease.
- In all, global food famine resulting from a nuclear war would threaten around two billion people. Resulting global conflicts and disease would affect hundreds of millions more.

References

- ¹ Reif, K. (2016, Aug 15). U.S. Nuclear Modernization Programs. *Arms Control Association*. Retrieved from <https://www.armscontrol.org/factsheets/USNuclearModernization>
- ² Kristensen, H.M., & Norris, H.S. (2017). Status of World Nuclear Forces. *Federation of American Scientists*. Retrieved from <https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/>
- ³ Brown, T.K. (2014, June 11). 25 years on at America's most contaminated nuclear waste site. *BBC News Magazine*. Retrieved from <http://www.bbc.com/news/magazine-26658719>
- ⁴ Washington Nuclear Museum and Educational Center. (2012). History of Hanford. *Washington Physicians for Social Responsibility*. Retrieved from <http://toxipedia.org/display/wanmec/History+of+Hanford>
- ⁵ United States Nuclear Regulatory Commission. (2013, Nov 19). *Hanford Site Disposal Facility for Waste Incidental to Reprocessing*. Retrieved from <http://www.nrc.gov/waste/incidental-waste/wir-process/wir-locations/wir-hanford.html>
- ⁶ Kimball, D. (2016, Sep). The Nuclear Test Tally. *Arms Control Association*. Retrieved from <https://www.armscontrol.org/factsheets/nucleartesttally>
- ⁷ Pravalie, R. (2014, Oct). Nuclear Weapons Tests and Environmental Consequences: A Global Perspective. *Ambio*, 43(6), 729–744. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4165831/>
- ⁸ Mudd, G.M. (2006, Nov). Uranium Mining: Australia and Globally. *The Energy Science Coalition*. Retrieved from <http://www.energyscience.org.au/FS06%20Uranium%20Mining.pdf>
- ⁹ International Campaign to Abolish Nuclear Weapons. (n.d.). *Production of Nuclear Weapons*. Retrieved from <http://www.icanw.org/the-facts/catastrophic-harm/production-of-nuclear-weapons/>
- ¹⁰ Helfand, I. (2013, Nov). Nuclear Famine: Two Billion People at Risk? *International Physicians for the Prevention of Nuclear War*. 2nd ed. Retrieved from <http://www.psr.org/assets/pdfs/two-billion-at-risk.pdf>
- ¹¹ Mills, M. J., Toon, O.B., Lee-Taylor, J., & Robock, A. (2014, Apr 1), Multidecadal global cooling and unprecedented ozone loss following a regional nuclear conflict. *Earth's Future*, 2(4), 161-176. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/2013EF000205/full>

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