

# CTBT: Ending Nuclear Explosions

## WHAT IS THE CTBT?

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) bans nuclear explosions by everyone, everywhere: on the Earth's surface, in the atmosphere, underwater and underground.

## WHY IS THE CTBT IMPORTANT?

It makes it very difficult for countries to develop nuclear bombs for the first time, or for countries that already have them, to make bombs more powerful. It also prevents the huge damage caused by radioactivity from nuclear explosions to humans, animals and plants.

## MORE THAN 2000 NUCLEAR EXPLOSIONS BETWEEN 1945 AND 1996

Over 2000 nuclear tests were carried out between 1945 and 1996, when the CTBT opened for signature: by the United States (1000+), the Soviet Union (700+), France (200+), the United Kingdom and China (45 each). Three countries have broken the de facto moratorium and tested nuclear weapons since 1996: India (3) and Pakistan (2) in 1998, and the Democratic People's Republic of Korea (DPRK) 6 tests from 2006 to 2017.

## THE TREATY IS ALMOST UNIVERSAL BUT HAS YET TO BECOME LAW

Many attempts were made during the Cold War to negotiate a comprehensive test ban, but it was only in the 1990s that the Treaty became a reality. Negotiations on the CTBT began in Geneva in 1994 and the Treaty opened for signature on 24 September 1996.

186 countries have signed the Treaty, of which 174 have also ratified it (as of August 2022), including three of the nuclear weapon States: France, the Russian Federation and the United Kingdom. But 44 specific nuclear technology holder countries must sign and ratify before the CTBT can enter into force. Of these, eight are still missing: China, Egypt, India, Iran, Israel, North Korea, Pakistan and the USA. India, North Korea and Pakistan have yet to sign the CTBT. The most recent nuclear technology holder country to ratify the Treaty was Indonesia on 6 February 2012.

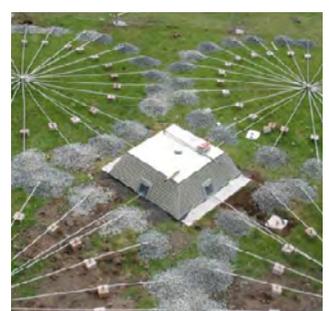
## HEADQUARTERS IN VIENNA

Since the Treaty is not yet in force, the organization is called the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Organization (CTBTO). It was founded in 1996, has over 270 staff from over 80 countries, and is based in Vienna. It is headed by the Executive Secretary, Robert Floyd from Australia. The CTBTO's main tasks are the promotion of the Treaty and the build-up of the verification regime so that it is operational when the Treaty enters into force. The annual budget is around US\$130,000,000.

## VERIFICATION REGIME TO MAKE SURE THAT NO NUCLEAR EXPLOSION GOES UNDETECTED

The Treaty has a unique and comprehensive verification regime to make sure that no nuclear explosion goes undetected. This regime consists of three pillars:

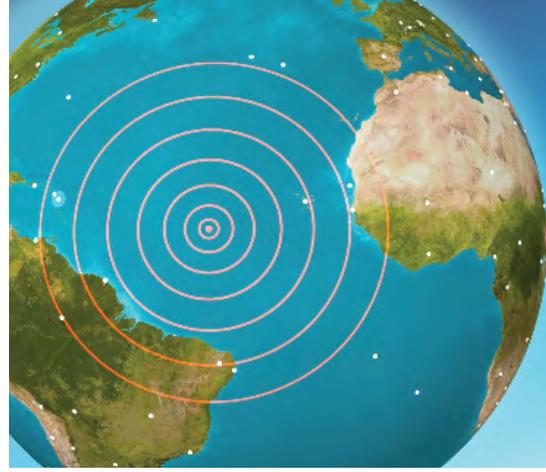
1. **The International Monitoring System (IMS)** will, when complete, consist of 337 facilities worldwide to monitor the planet for signs of nuclear explosions. More than 300 facilities – around 90% of the total – are already up and running.



*continues on next page*



1. THE VERIFICATION REGIME STANDS READY.



2. AN EXPLOSION TRIGGERS SHOCKWAVES THAT ARE DETECTED BY SEVERAL STATIONS ...

The IMS uses the following four state-of-the-art technologies (numbers reflect final configuration):

- **Seismic:** 50 primary and 120 auxiliary seismic stations monitor shockwaves in the Earth. The vast majority of these shockwaves – many thousands every year – are caused by earthquakes. But man-made explosions such as mine explosions or the North Korean nuclear tests in 2006, 2009, 2013, 2016 and 2017, are also detected.
- **Hydroacoustic:** 11 hydrophone stations “listen” for sound waves in the oceans. Sound waves from explosions can travel extremely far underwater.
- **Infrasound:** 60 stations on the surface can detect ultra-low frequency sound waves (inaudible to the human ear) that are emitted by large explosions.
- **Radionuclide:** 80 stations measure the atmosphere for radioactive particles; 40 of them also pick up noble gas. Only these measurements can give a clear indication as to whether an explosion detected by the other methods was actually nuclear or not. They are supported by 16 radionuclide laboratories.

2. **The International Data Centre** at the CTBTO’s headquarters in Vienna receives the data from the global monitoring stations. The data are processed and distributed to the CTBTO’s Member States in both raw and analyzed form. When North Korea tested in 2006, 2009, 2013, 2016 and 2017, the Member States received information about the location, magnitude, time and depth of the tests within two hours.
3. **On-site inspections** can be dispatched to the area of a suspicious nuclear explosion if the data from the IMS indicate that a nuclear test has taken place there. Inspectors will collect evidence on the ground at the suspected site. Such an inspection can only be requested and approved by Member States once the CTBT has entered into force. Large-scale on-site inspection exercises were carried out in September 2008 in Kazakhstan and in November 2014 in Jordan.

**CIVIL AND SCIENTIFIC USES:  
FROM TSUNAMI WARNINGS TO CLIMATE CHANGE**

The huge amount of data collected by the stations can also be used for purposes other than detecting nuclear explosions. They can provide tsunami warning centres with almost real-time information about an underwater earthquake, helping to warn people earlier and possibly saving lives. During the 2011 Fukushima power plant accident, the network’s radionuclide stations tracked the dispersion of radioactivity on a global scale. The data can also support scientific research to help us better understand the oceans, volcanoes, climate change and many other issues.



3. ... WHICH IMMEDIATELY TRANSMIT THE SIGNALS THROUGH SATELLITES ...



4. ... AND SECURE DATA CONNECTIONS ON THE GROUND TO THE CTBTO IN VIENNA.



5. FROM THE CTBTO, RAW DATA AND THEIR ANALYSIS ARE DISTRIBUTED TO THE CTBT MEMBER STATES.

For more information  
[www.ctbto.org](http://www.ctbto.org)