The deprived nature of many lands that would benefit most from nuclear excavations causes them to be uninhabited; so explosions should be safely possible. The results of these massive excavations could so enhance the area that populations might move in and efficiently use this previously uninhabitable land. Rich natural resources remain relatively untouched in many areas of the world because of the high costs of transportation to market. Peaceful nuclear explosions could create harbors for ocean shipping to solve this transportation problem.

These represent just a few of the general ways in which nuclear explosions might greatly benefit mankind by performing the massive excavations required in different kinds of large construction projects. They require careful planning and the utmost attention to public safety, but such explosions are manageable, can be safely conducted, may offer economic advantages, and can be put to work for man.

Underground engineering

Excavation, however, is just one possible peaceful use for nuclear explosions. Equally important are the various benefits envisioned for nuclear explosions deep underground.

If a nuclear explosive is emplaced far enough underground, the blast does not break the earth's surface. The following summarizes the sequence of events following the detonation of a 100-kiloton device buried at a depth of 900 meters; this is illustrated in Figure 8.

The total energy releases in less than one millionth of a second following the detonation. A strong spherical shock front moves outward, vaporizing, melting, crushing, displacing, and cracking the rock. Most of the energy of the shock wave deposits locally in the form of heat and as work on the surrounding rock. The rock vaporized by the shock wave expands as a gas bubble, forming a cavity that grows until the gas pressure approximately balances the overlying rock pressure. Cavity growth stops at a radius of about 45 meters. At this time the cavity is lined with about 60,000 metric tons of molten rock, and the cavity gas temperature has risen a few thousand degrees centigrade.

The cavity may persist for a while as vapors condense, temperatures and pressures drop, and a molten puddle collects at the cavity base. Then under most circumstances the roof of the cavity collapses to form a nearly cylindrical chimney of broken rock.