Hiroshima atomic bomb case study example

War, World War 2

Introduction

Question 1. how and why the incident happened (what conditions allowed the incident to happen)?

Hiroshima is located in the west of the largest Japanese island of Honshu. The town's name translates as " Wide Island". It is so named because the bayou Ota, flowing from the mountains to the plains Chugoku, where the Hiroshima formed at the confluence of the Inner Sea 6 islands protrude into Hiroshima Bay. They located the city. Hiroshima worth almost entirely in the valley, only slightly above sea level; to the north-west and north-east lie the hills, up to 700 feet (Rotter, 2008).

Hiroshima history dates back to the XVI century. When the local feudal lord Mori Terumoto commanded to build a snow-white Castle carp (Ridzë). Name of the castle is no accident - the river was known then an abundance of fish. During the Edo period (1603-1867) it was a typical medieval fortress town. Until 1868, it served as the seat of Clan Asano. While on the site of modern Hiroshima Prefecture were the province of Aki and Bingo, which, during the transition to a prefectural system of administrative division in 1876 were combined.

Hiroshima was of great military importance. It was the headquarters of the 2nd Army, engaged in the defense of all of southern Japan. Hiroshima was a communication center, a transit and a rallying point for the troops.

Preparing for Bombardment

In the spring of 1945, a group of surveying the Manhattan Project was tasked to select an object for the first use of the atomic bomb. The group consisted

of mathematics, theoretical physicists, specialists Blasters and meteorologists. This group made up mostly of scientists, came to the conclusion that the object of such an unprecedented bomb type must satisfy the following conditions (according to Robert Oppenheimer):

- “ Since it is expected that the atomic bomb should produce the greatest destruction by the primary shock wave, and the subsequent destruction - due to the action of fire, the object must contain a large percentage of densely spaced frame buildings and other structures, which are easily destroyed by the shock wave and fire;
- As estimated, the main effect of the devastating impact of the shock wave propagates in a bomb attack on the area of a circle with a radius of more than a mile. Consequently, the chosen object must be a closely built-up area of about the same size;
- Featured property must have extensive military and strategic importance;
- The first goal should be possible to choose from such objects that have not been bombed to the effect of a bomb was clear enough.”

It was further agreed that the American air units before the application of an atomic bomb would not bomb four Japanese cities. This gesture did not mean the act of mercy in these four cities. They simply took care of the usual bombings since intend to convert into the ruins of a new deadly bomb.

Question 2: A person or persons responsible for the incident

In May 1945, the United States government has already selected four goals for the application of nuclear attack. It was a city of Kyoto, Hiroshima, Yokohama and Kokura. United States initially rejected the idea of using only bombs at military installations. They wanted to have a maximum

psychological effect on the whole of Japan, thus making the entire world community to recognize the importance of nuclear weapons.

July 25, the 33rd President Harry Truman ordered American troops to bomb one of the cities with the objectives has been Hiroshima, Nagasaki, Kokura and Niigata. To the extent that the bombs Americans planned to continue bombing. July 26 the United States, China and Great Britain signed the Potsdam Declaration, which demanded the surrender of Japan, but the impending nuclear attack is not mentioned. Japan rejected the surrender.

In May and June the American 509th Air Force landed on the island of Tinian in the Mariana Islands archipelago, and on July 26 here was delivered the atomic bomb " Little Boy", destined for Hiroshima. Until August 2 to the island have been delivered and the components of the second bomb called " Fat Man." Aviation was ordered to begin any day of the bombing after 3 August, when the weather conditions are favorable for flights.

Question 3: The affected population (whom?) and how they were exposed (air, water, soil, food and so on).

At the time of the attack the population of Hiroshima, where the headquarters of the commander of the defense of southern Japan Marshal Syunroku Hut, was about 245 thousand people. August 6 at 8: 15 pm local time, the American B-29 bomber « Enola Gay» under the command of Paul Tibbets dropped from a height of more than 9 km atomic bomb Little Boy with a diameter of 0. 7 meters and a length of 3 meters and a mass of 4, 400 kg at the center of Hiroshima. After 45 seconds, an explosion power of 16 kilotons. Within minutes, 90% of the population who were at a distance of 800 meters from the hypocenter, transformed into coal, leaving only

remnants of houses silhouettes. After the explosion and a huge shock wave originated firestorm that killed those who had survived the explosion.

The number of deaths directly from the explosion was, according to various estimates, up to 80 thousand people. A few days later the survivors began a strange disease that would later be called X-ray and that killed up to 166, 000 people.

In July 1945, after the report of a military pilot scout, was finally taken the decision to bomb Hiroshima due to the large size of the city, there is a finding of military stores, as well as the location of the town among the hills, which were to play a role in focusing the direction of impact.

The atomic bomb with the name “ Little Boy” was delivered in July 26 by cruiser " Indianapolis" on the island of Tinian (on the way back to the cruiser was attacked by a submarine and killed almost the entire crew. When August 6 strike group took off from Tinian, building nuclear bombs, located in the bomb bay " Enola Gay", was covered with the multitude both humorous and serious slogans.

August 6 an hour before the bombing in designated areas in front of the aircraft carrier took off the B-29 " Enola Gay" came three reconnaissance weather. At 70 km from the aircraft carrier was bomber to photograph the explosion.

When the bombers reached the center of the city, one of them threw a small parachute, after which the aircraft flew away. Immediately thereafter, 8 hours and 15 minutes, there was a deafening explosion, which seemed to be in an instant tore the sky and the earth. The bomb exploded with a blinding flash in the sky, a huge gust of air racing and a deafening roar that spread

for miles from the city; accompanied by the destruction of the first sounds of crumbling houses, sprawling fire, a giant cloud over the city.

Within a few hours after the disaster at Hiroshima nobody in Tokyo did really know what happened there. The very first official announcement was contained in a telegram to a senior civilian official Chugoku district. It said that Hiroshima was attacked by " a small number of planes," who used " an entirely new type of bomb." Morning of August 7, Deputy Chief of General Staff Shavabe received a report, a phrase which seemed completely incomprehensible: " The city of Hiroshima in an instant was completely destroyed a bomb."

Question 4: The chemical or chemicals that were involved (what?)

A blinding flash and a terrible roar break - and then the whole city covered huge clouds of smoke. And when, finally, the flame went out, the whole town was in ruins. It was a horrible sight, which still has not seen the story. Piled everywhere charred and burned corpses, many of them frozen in the position in which they found a blast. The tram, which was one of the skeletons, was full of corpses, to hold on to the straps. Many of those who survived, moaning from burns that covered the entire body. Everywhere could be faced with the spectacle, reminiscent of scenes from hell.

This one bomb capacity of 20 thousand tons of TNT, razed to the ground 60 percent of the city of Hiroshima. 306545 residents of Hiroshima were affected by the explosion 176987 people. Dead and missing 92, 133 people severely wounded and 9, 428 people sustained minor injuries - 27 997 people. This information was published in February 1946, the headquarters

of the American occupation army in Japan. In an effort to reduce its responsibility, Americans, as far as possible, have underestimated the number of victims.

Question 5: The main adverse health effects due to the environmental chemical exposure, Also pretty grim one on the effects and after-effects of war

Various buildings within a radius of 2 kilometers from the epicenter of the explosion were completely destroyed, and within a radius of 12 kilometers have been more or less considerable damage. People killed or severe burns within 8. 6 kilometers, charred trees and grass at a distance of 4 kilometers. The explosion and subsequent fire after it has been turned into ashes to 09. 10 all town houses, which were 95 thousand.

Birds fly past burned in the air, and dry, combustible materials such as paper, ignited at a distance of 2 km from the epicenter. Light radiation burns dark drawing clothes in the skin and leaves silhouettes of human bodies on the walls. Were outside of homes people have described the blinding flash of light, which at the same time came the stifling heat wave. Blast wave, all stationed near the epicenter, followed almost immediately, often knocking down. Located in the building, as a rule, to avoid exposure to light radiation from the explosion, but the blast wave - shards of glass hit most of the rooms, and all the buildings, except for the most durable, collapsed. One teenager was thrown by the blast from his house across the street, while the house collapsed behind him. Within minutes, 90% of people who were at a distance of 800 meters or less from the epicenter, died.

The blast shattered windows were at a distance of 19 km. Located in the

building for a typical first reaction was the thought of a direct hit bombs. Numerous small fires that occurred at the same time in the city soon merged into one large firestorm that created a strong wind (speed of 50-60 km / h) directed to the epicenter. Firestorm has captured more than 11 square kilometers of the city, killing all who did not get in the first few minutes after the explosion (Weart, 1988).

According to the memoirs Akiko Takakura, one of the few survivors who were in the time of the explosion at a distance of 300 m from the epicenter.

A few days after the explosion of the survivors, doctors began to notice the first symptoms of exposure. Soon, the number of deaths among the survivors began to grow again, as patients who seemed to have started to recover, began to suffer from this strange new disease. Death from radiation sickness peaked 3-4 weeks after the explosion and began to decline only after 7-8 weeks. Japanese doctors thought typical of radiation sickness, vomiting and diarrhea symptoms of dysentery. Long-term health effects associated with exposure, such as increased risk of cancer survivors haunted for the rest of life, as well as a psychological shock from the experience during the explosion. Never in the past, the human imagination could imagine such extent of damage and such cruelty. City poured black rain that could not extinguish the fire, and only increased the panic. Rescue, medical care in the first hours of a loss to fire and destruction of infrastructure. The exact number of victims will probably never be fixed - there was nobody to be considered. From those who were near the epicenter, there was nothing - literally an explosion vaporized people.

Question 6: The short- or long-term outcomes from the incident (clean up, moving of exposed populations, legislation, etc)

Studying the effects of the atomic bombing of Hiroshima and Nagasaki, the American Strategic Air Command was forced to conclude: " If we talk about Japan as a whole, experienced its losses and military failures, for example, on Saipan, the Philippines and Okinawa twice surpassed in importance atomic bomb in the sense of belief in the inevitability of population destruction. From this perspective, conventional air raids on Japan, in its entirety, three times superior to its significance atomic bomb. Deterioration of living conditions, such as food shortages and malnutrition have also played an increasingly important role in the realization of the impossibility of the Japanese people to continue the war than the atomic bomb. "

In explosions at Hiroshima and Nagasaki about 200 different types of radioactive isotopes were formed, which have avoided further decay products of nuclear fission of uranium and plutonium. Under the influence of these materials explosions, as well as others irradiated with neutrons emitted by the bomb were thrown high into the air.

Stirring huge amount of air born in irradiated materials in combination with heat and heat flows from firestorms resulted in both cities to the rain for 30-40 minutes after the bombing. Because radioactive particles were mixed with soot from the fire engulfed the city, the result is terrifying - and a threat to health - that was " black rain". This " black rain" has reached the earth's surface like a sticky, dark, highly radioactive liquid. It not only soiled skin, clothing and buildings, but also swallowed when breathing and consumed through contaminated food and water, causing radiation poisoning (Falk,

1982).

About 3% of the energy bombs at Hiroshima and Nagasaki was spent on the generation of ionizing radiation - high-energy particles and rays of sufficient energy in order to ionize the neutral atoms, that is they knock electrons. Part of the ionizing radiation was absorbed by the air, but neutrons (electrically neutral subatomic particles) and gamma and X-rays (forms of electromagnetic radiation of extremely high energy) reaches the ground. These rays and hit the living tissues. Near the epicenters of the two explosions doses were high enough to be immediately fatal to those who have not been killed in flash, an explosion and fire.

The initial flash of radiation from the two bombs, among other things, led to the formation-induced or residual radioactivity. In the area of the explosions were exposed to soil and other materials. Absorption of " slow neutrons" all kinds of substances caused the formation of new isotopes emitting ionizing radiation (Compton, 1956).

Question 7: The importance of this incident within the environmental health field (i. e., what did we learn from the incident?)

Japanese physicists, the study area near the epicenter in Hiroshima, found unusually high levels of radiation in the soil, horse bones and even sulfur contained in the electrical insulation of telephone poles. As a result, near the epicenter of both cities found many rare radioactive elements in the soil, tile roofs, asphalt and concrete. There have been many cases of the effects of radiation on plants and animals. Living tissues may be exposed to ionizing radiation either directly (that is, it emits a blast), and by the action of or absorption material fallout emitting residual radiation. The danger in any

case is the same.

The concept of the " radioactive contamination" did not exist in those years and therefore the question then was not even raised. People continued to live and rebuild the destroyed buildings in the same places where they were before. Even the high mortality rate in the coming years, as well as diseases and genetic abnormalities in children born after the bombing, were not initially associated with radiation exposure. Evacuation of the population from the contaminated areas was not carried out, since no one knew about the presence of radioactive contamination.

The bombardment and subsequent events seemed to the Japanese the unmitigated disaster. They could never imagine anything worse. And the whole world experienced such a shock, which mankind had never experienced. 140, 000 died from the explosion and its aftermath in Hiroshima and 74, 000 in Nagasaki. This is only approximate (and clearly reduced) data of the US intelligence. Apparently, there were many more victims. Hiroshima was destroyed by 60%, Nagasaki by 36% (Bartlett, 1991).

It seemed that in these places people would never live This feeling arose from all who have seen the ruined cities. For example, there is the evidence of the English engineer John Spragens, who had been a prisoner of war in Nagasaki on August 9, and survived only because at the time of the explosion he was in a bomb shelter (in contrast to the majority of residents in both cities). In 1979, 34 years after the bombing, he returned to Nagasaki and was amazed: " It is incomprehensible how they managed to rebuild it all, and just in 34 years! When I left, there was nothing but a pile of rocks and

debris here." At that time many people thought so at the mere sight of destruction. Furthermore, in those days the humanity had not yet had a clear understanding of radiation and had no special fear of it. After all, it was the first large-scale use of the atom in general and the first use of the atomic bomb. There was no research and understanding of the potential dangers and possible consequences in those days. And this may be one of the factors that allowed the Japanese to so quickly build the new cities instead of the destroyed ones.

However, it is now known that the bombs dropped on Hiroshima and Nagasaki were not very powerful. In addition, they exploded before they reached the ground, high in the air. Due to this fact the poison contained in them (whose quantity was insignificant) flew into the air and almost did not touch the ground. Therefore, the main shock was produced by the blast wave and fires.

It turns out that a week after the attacks, these cities did not represent any danger to human health. Moreover, much more damage to the the gene pool and the environment was caused by the atmospheric nuclear weapons tests, which were conducted by the USA and the USSR in 1950-1960's. Until now, the radioactive particles thrown into the stratosphere during these tests are returning to the Earth.

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