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INTERNATIONAL ATOMIC ENERGY AGENCY

Description of the Committee

The International Atomic Energy Agency (IAEA) is an independent organization that works in cooperation with the United Nations. It was created in 1957 to address the concerns and uncertainties raised by the discovery of nuclear energy. Led by Director General Yukiya Amano, the IAEA also has six Deputy Director Generals and 2,300 staff members from more than 100 countries.¹

The IAEA focuses on three main areas: safety and security; science and technology; and safeguards and verification. Through numerous missions and programs, the agency works with countries to ensure the safe use of atomic energy, stop the spread of nuclear weapons, and promote **sustainability** through the use of atomic energy. It is also recognized as the world's nuclear inspectorate.²



The head of the IAEA, Yukiya Amano, addressing the UN General Assembly

Source: UN Photo/Paulo Filgueras

Topic: The Effects of Atomic Radiation

Introduction

The word “atomic” immediately triggers a myriad of associations to important events in history. Whether it be the detonation of the Trinity, the first nuclear device on July 16, 1945, the bombing of Hiroshima, or the general military conflict and political challenges surrounding the Cold War, it is undeniable that “**the atomic age**” has left a lasting impression on our understanding of the terribly destructive qualities of atomic radiation.³ Yet after years of extensive research, one thing has become clear: Atomic radiation can also be highly useful. It is an extremely powerful tool, the merits of which are still being researched.

Atomic energy has a wide variety of uses. It is used medicinally to treat an array of diseases as well as in very common medical applications such as taking x-rays. It is also a source of electricity. Today, more than 30 countries use nuclear-generated power.⁴ However, despite its many benefits, nuclear energy has been and can continue to be used to build vastly dangerous and destructive weapons.

Background

Atomic energy, also known as nuclear energy, was first discovered in 1895. The field was further explored and developed from 1895 to 1945. Atomic energy began to be more deeply investigated and understood after 1939 due to increased government interest in creating atomic weapons. They saw the development of an atomic weapon as the key to winning World War II. After 1945, scientists began to explore the implementation of nuclear energy for naval use to create nuclear propulsion in submarines.⁵

Each major atomic event throughout history has left a lasting mark on the way the world views nuclear power. Many of the effects of atomic radiation are long-lasting, so these incidents remain in the public eye long after the initial disaster. The following examples highlight some of the dangers of the overwhelming power of nuclear weapons.



Little Boy and Fat Man

The first use of atomic energy as a weapon took place during World War II. On August 6, 1945, the United States dropped a plutonium-powered bomb called "Little Boy" on the Japanese city of Hiroshima. The explosion was equivalent to 15 kilotons of regular explosives. Three days later, "Fat Man" was dropped on Nagasaki, Japan, and exploded with an even more destructive force equal to 22 kilotons of regular explosives.⁶

The effects on the Japanese population were devastating. Combined, the two bombs are estimated to have killed over 210,000 people by 1950. Nearly half of those who died were killed upon impact by the bomb, while the other half of those deaths occurred in the years to follow. These later deaths were attributed mostly to diseases caused by radiation created from the explosion of the nuclear bombs.⁷

The atomic bombs dropped on Japan by the United States [source?]

The effects that the two bombs had on the land were equally harsh. Massive damage was caused by the initial atomic blasts, which wiped out nearly everything in their paths. The heat created by these blasts caused intense, widespread fires in both cities that lasted for days. What little was left after the bombings was destroyed by the fires. The explosions created enormous **mushroom clouds** that covered both cities with radioactive ash particles. Within a half hour of the bombing in Hiroshima, black rain began to fall. The rain carried debris, soot and **radioactive** ash, and fell as far as 18 miles (29km) from the bombing site.⁸ These bombings are, to date, the only instance in which atomic energy was used in a war.

CRITICAL THINKING

When the atomic bombs were used on Hiroshima and Nagasaki, the effects were severely damaging for both the people of Japan and the land. Many surrounding areas were affected as well. How do you think the radiation affected Japanese agriculture? Are the effects still evident?

Three Mile Island

The atomic accident at the Three Mile Island Nuclear Generating Station in Pennsylvania was caused by a core meltdown at the plant in 1979. The accident released radioactive gases and led to the disposal of 40,000 gallons of radioactive waste in a nearby river. This accident is attributed to poorly trained staff and negligence. Clean-up for this accident took over 20 years to complete. While there were no deaths or injuries as a direct result of the accident, several independent studies have been conducted and show that there was little radiation exposure to the surrounding communities.⁹



The Chernobyl Disaster

The Chernobyl disaster has been called “the worst nuclear power plant accident in history.” The accident occurred at the Chernobyl Nuclear Power Plant in Ukraine in 1986. A large amount of radioactive material was released into the air after a series of explosions and fires in the plant. The radioactive material spread throughout the air in Russia and Belarus, as well as other parts of Europe.

Crews cleaning up after the Chernobyl disaster

Source: UN Photo/Oleg Vklenko

A report by the United Nations Scientific Committee on the Effects of Atomic Radiation confirmed 64 deaths caused by the radiation released from Chernobyl. The radiation has been attributed to a rise in leukemia and thyroid cancer among children in the affected areas. That total is predicted to rise as cancer-related deaths continue to occur in young people who were exposed to the radiation.¹⁰

There have been other significant nuclear radiation leaks and accidents in other parts of the world as well. Any facility that houses, uses or is testing nuclear energy is susceptible to an accident. The international community has stepped up and begun to create more rules and regulations for working with atomic energy. With nuclear regulatory programs in place, fewer atomic energy incidents occur nowadays, but will never be completely avoidable.

The Nuclear Club

The Nuclear Club is the group of nine countries that have successfully detonated nuclear weaponry.

The United Kingdom	Russia	Pakistan
France	The United States	Israel
India	China	North Korea

Source: http://www.ehow.com/about_4603126_positive-effects-nuclear-energy.html

Current Situation

Today, atomic energy is more widely used than ever before. More than 440 commercial nuclear reactors operate in 30 countries. These reactors provide a significant portion of the world's energy, with some nations relying heavily on nuclear power.

CRITICAL THINKING

While the world has seen the positive effects of the use of atomic energy and radiation, it has also seen what a dangerous medium nuclear energy is. Do you think the good outweighs the bad? Should countries be allowed to experiment with nuclear energy, even though it can be extremely dangerous?

Radiation in Medicine

Radiology is a form of medical practice that uses radioactive imaging to effectively diagnose and treat a variety of diseases. Some of these imaging practices include x-rays, CT scans, MRIs and ultrasounds. Specialists in the imaging field are called radiologists. Through the use of radioactive imaging, doctors can see where exactly a bone is broken or take a picture of an unborn child. Radiation can also be used to treat cancer patients in the medical practice known as oncology. Depending on the condition of the patients, they can receive varying treatments of radiology or chemotherapy.

Radioactive materials have also been used in medicines, most commonly to treat the heart, thyroid, gallbladder and liver.¹¹ When combined with other pharmaceutical materials, these nuclear medicines have produced great results. However, radiation dosage in these medicines must be carefully monitored to prevent patients from becoming even sicker.

Fukushima

The 2011 Tohoku earthquake and tsunami caused terrible damage to the Fukushima Daiichi Power Plant in Japan. The damage caused a gaseous pressure build-up, which led to the intentional release of some of radioactive gas to alleviate that pressure. Radioactive material was also discharged into the sea. Due to the state the earthquake and tsunami had left Japan in, it has been hard for officials to contain the contamination. It has spread to at least five known water plants in Japan, and has had a major effect on the food supply.

The nuclear disaster in Fukushima has had widespread effects. A small amount of radiation from Fukushima has been found in approximately seven other countries. The Pacific Ocean has also been hugely affected due to the radioactive isotopes that have been released into it.

As of August 2011, the radioactive leak at Fukushima had not been contained. It is said that the land surrounding the plant may remain **uninhabitable** for at least two decades because of high radiation levels. An estimated 1,000 people will die of cancer-related deaths due to the disaster.¹² This radiation leak is the most recent incident involving atomic radiation in the world. While it was an accident caused by a natural disaster, it underscores the need for preparedness and planning whenever nuclear energy is involved.

International Action

The international community has played a major role in monitoring the use of atomic energy around the world. Exploring the uses of atomic energy has gone from being secretive to more open, but as the use of nuclear power as a source of electricity becomes more common, there has been a higher global demand to regulate its use. Much has been done to ensure that atomic energy is being used safely and for its intended purposes.

World Association of Nuclear Operators

After the meltdown of the Chernobyl Nuclear Power Plant in Ukraine in 1986, fear of another accident put pressures on nuclear operators worldwide. Since nuclear energy technology was still relatively new, there was a need for better understanding of how to safely construct, run and maintain a nuclear power plant. In October 1987, “The international Union of Producers and Distributers of Electric Energy (UNIPEDE) and the Institute of Nuclear Power Operations (INOP) co-sponsored the International Nuclear Utility Executive Meeting in Paris...where thirty of the world’s thirty two countries that have nuclear power plants operating or under construction were represented.”¹³ The World Association of Nuclear Operators (WANO) was founded in May 1989. The association's purpose is to make sure all nuclear reactor operators that are members operate under guidelines that ensure safety.

United Nations Scientific Committee on the Effects of Atomic Radiation

After World War II, the need to understand the risks and consequences of nuclear use became a growing concern to the international community, eventually leading to the unanimous passing of Resolution 913 (X) in 1955. This resolution sought to create a committee that would gather scientific data on ionizing radiation and use it to better understand its effects on people and the environment. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) was created by the resolution. The committee is made up of scientists from 21 different countries, including Argentina, Japan, the United States and Peru.¹⁴ The scientists who work for UNSCEAR work diligently to properly assess and document the amount of radiation exposure to the public and those whose occupations involve some kind of radiation.

IAEA Ministerial Conference on Nuclear Safety

The IAEA Ministerial Conference on Nuclear Safety was held in June 2011 at the agency's headquarters in Vienna. Deliberations at the conference centered on the nuclear disaster in Fukushima. The outcome of the deliberations was adoption of the Ministerial Declaration calling for major improvements in nuclear safety practices around the globe. The IAEA also has programs set up to help countries harness atomic energy as a sustainable resource. The agency currently has a program in place that is using **electron beam water waste treatment** to help countries suffering from a clean water shortage. It encourages the use of atomic energy to provide electricity and medicine in developing countries.¹⁵

The IAEA Plant Breeding and Genetics Laboratory

The IAEA Plant Breeding and Genetics Laboratory was created to focus on “the use of mutation techniques and modern bio technologies to develop better varieties of major and under-utilized food and industrial crops.” These techniques have been proven to help the global agriculture process by creating genetically altered crops that can grow in conditions they would not be able to normally. There have been experiments in which foods such as the banana have been genetically altered so that it can survive the harmful Banana Black Leaf Streak, which is caused by fungus.¹⁶ While the program is still in its early stages, it is making great progress.¹⁷

CRITICAL THINKING

The nuclear techniques being used on food have sparked global debates. While the techniques could be helpful to many countries, some scientists wonder what long-term effects the foods will have on consumers. Do you think the merits of “nuclear food” are worth the unforeseeable effects? Would your country benefit from using these foods?

Recommendations for Creating a Resolution

Much needs to be done to make the use of atomic energy safer. While many programs are currently in place, more need to be created to assure that nuclear energy is being used properly. More uniformity in the safety practices at nuclear power plants is necessary. Furthermore, several atomic radiation accidents have been attributed to negligence and poorly trained staff at power plants. To avoid future incidents of this kind, workers need to be more intensively trained to ensure that they can properly handle the hazardous material. A more stringent system should be put into place for reporting accidents and leaks at plants.

Questions to Consider

1. Does your country have an active nuclear power plant? Is it being used commercially, for research or to develop weaponry?
2. Is your country equipped with nuclear weaponry? If so, under what circumstances might you use them? If not, how safe do you feel your country is from nuclear attacks?
3. Does your country use atomic energy to generate any of its electricity? What effect has this practice had on your country?
4. Has your country ever had a nuclear accident? How did it affect your population? Are the effects still evident?
5. How has nuclear energy benefited your country? If not at all, do you feel that it could benefit your country?

Research Aid

The website for the International Atomic Energy Agency provides background information on the agency and its work with atomic energy around the world.

- **IAEA:** <http://www.iaea.org/>

This declaration was created during the IAEA Ministerial Conference on Nuclear Safety.

- **Declaration on Nuclear Safety:**
<http://www.iaea.org/Publications/Documents/Infcircs/2011/infcirc821.pdf>

The Nuclear Energy Institute focuses on clear-air energy.

- **Nuclear Energy Institute:** <http://www.nei.org/>

The nuclear weapons archive lists the known nuclear weapons that have been developed.

- **Nuclear Weapon Archive:** <http://www.nuclearweaponarchive.org>

The Nuclear Energy Today website provides factual information about the role of nuclear energy in the world.

- **Nuclear Energy Today:** <http://www.oecd-nea.org>

Terms and Concepts

Sustainability: the ability to be supported, upheld, or confirmed.

The Atomic Age: the current era characterized by the discovery, technological applications, and consequences of the use of nuclear energy.

Mushroom cloud: a mushroom-shaped cloud of dust and debris formed after a nuclear explosion.

Radioactive: emitting or relating to the emission of ionizing radiation.

Uninhabitable: unfit for living or use.

Ionizing radiation: radiation composed of particles that individually have sufficient energy (or can liberate sufficient energy) to remove an electron from an atom or molecule.

Electron beam water waste treatment: a technique used to cost-effectively make water safe for use.

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- ¹⁷“IAEA Ministerial Conference on Nuclear Safety,” International Atomic Energy Agency, June 2011, <http://www.iaea.org/conferences/ministerial-safety/>.