

Committee: United Nations Development Programme

Topic: The Question of Uses of Atomic Energy in Developing Countries

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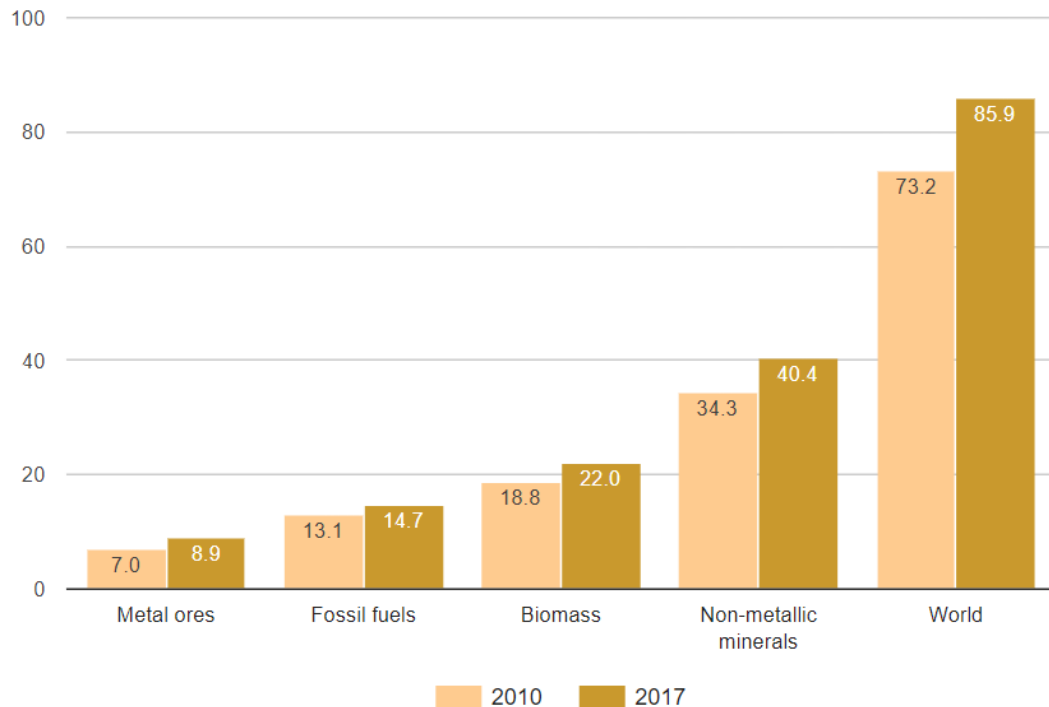
Introduction

The UNDP (United Nations Development Programme) works within 170 countries and territories to eradicate poverty and reduce inequality. In 2015, the United Nations Member States adopted 2030 Agenda for Sustainable Development consisting of 17 SDGs (Sustainable Development Goals), which are an urgent call for action by all countries. The UNDP works to host SDGs.

The world's reliance on natural resources has accelerated over the last two decades. The global material footprint grew 17.4% from 73.2 billion metric tons in 2010 resulting in 85.9 billion metric tons in 2017. Additionally, the use of natural resources sparked 65% in 2019 compared to 2000. In 2015, the material footprint per capita in high-income countries was over 10 times larger than in low-income countries. Urgent action is crucial to decrease our reliance on raw materials and “circular economy” approaches to reduce negative environmental pressure and impact. Fossil fuel subsidies are creating unrecoverable harm. These result in detrimental consequences of air pollution and global

warming.

Material footprint by type of material, 2010 and 2017 (billions of metric tons)



“- SDG Indicators.” United Nations, unstats.un.org/sdgs/report/2020/goal-12/. Accessed 10 Aug. 2023.

This graph shows the material footprint of each material.

Globally, most electricity is still generated by burning coal, oil, or gas, which produces greenhouse gases that trap the sun’s heat. To attain the 12th SDGs (Sustainable Development Goals), which is to ‘Ensure sustainable consumption and production patterns’, constant energy source development is the key point. Those should generate electricity emitting little to no greenhouse gases or pollutants into the air. As one of the reliable energy sources, nuclear or atomic generation has the potential to provide us continuous reliable power with a high capacity factor of about 90%. Moreover, nuclear waste produced after the atomic energy generation can also be recycled, making nuclear energy a recyclable energy source. However, this interminable generation source requires additional electricity systems for load balancing and backup which can cost 3–10 times higher than for other generators. Due to the cost burden, developing countries are unable to have easy access to atomic energy.

There are also several things nations should bear in mind while generating nuclear energy. Initially, nuclear energy should be developed peacefully. In other words, countries should ‘Prohibit the

production of nuclear weapons'. Initiated with the TPNW (Treaty on the Prohibition of Nuclear Weapons), several treaties are encouraging the prohibition of nuclear weapons. Moreover, they should strictly manage radioactive wastes. These consist of radioactive materials and tend to release plutonium, negatively affecting the environment. Exposure to these radioactive disposals can cause cancerous growths as well as genetic drawbacks.

To keep in mind, there have been two major nuclear reactor accidents in the history of civil nuclear power, Chernobyl and Fukushima Daiichi. These resulted in initiating a fire and releasing a massive amount of radioactive material. Therefore, countries are taking actions to introduce atomic energy into developing nations while dealing with safety issues.

About 30 countries are considering, planning or starting nuclear power programmes, and a further 20 or so countries have at some point expressed an interest. Mainly due to the concerns about environmental issues, developing countries, including LEDCs (Less Economically Developed Countries) as well as developed countries are putting efforts to produce energy without fossil fuels. Bangladesh, Egypt and Turkey are examples of developing countries that are constructing their first nuclear power plant. With the internationally growing interest in nuclear energy, several methods have been implemented to make nuclear energy more widely utilized. As an attempt to distribute nuclear energy technology, The IAEA (International Atomic Energy Agency) is transferring nuclear technology to Member States through the 'Technical Cooperation programme'. Moreover, in March 2023, 11 European nations also committed to cooperate in the Nuclear energy field.

Definition of Key Terms

Sustainable Development Goals

Also called SDGs, are 17 main global goals which were adopted by the United Nations in 2015. To be more specific, they aim to eliminate deprivations while also dealing with environmental issues by the year 2030. As the main committee in charge of development, UNDP is assisting to implement the Goals in 170 countries and territories.

Atomic energy

Also known as nuclear energy is an energy type released through a nuclear reaction. Atomic energy is one of the leading low carbon power generation methods. Globally, nuclear energy provides approximately 10% of the world's electricity. More than 50 nations are utilizing this source of energy.

Compared to fossil fuels, atomic energy provides carbon-free electricity. Nuclear power plants have the ability to produce at their maximum energy output more often than other energy sources. They generate 93% of the time. In comparison with other energy generating facilities, nuclear energy plants also require less physical space.

On the other hand, nuclear reactors are highly costly. The total costs will be in the range of \$6 billion and \$9 billion for each 1,100 megawatt plant, approximately \$4,200,000 more expensive than wind plants.

Greenhouse gas

Atmospheric gases absorb and re-emit energy from the atmosphere down to the Earth's surface. Greenhouse gases shields and traps infrared radiation, protecting the Earth. On the other hand, they heat the surface of the planet to trigger an increase in the Earth's temperature. Carbon dioxide, methane, and nitrogen oxide are the main examples of greenhouse gases.

Greenhouse effect

The process in which greenhouse gases are re-emitted to the Earth's surface. Greenhouse effect is the main cause of climate change. The consumption of greenhouse gasses significantly increased with the Industrial revolution from the late 1700s to early 1800s. Moreover, nowadays, there are loads of carbon dioxide, the main example of greenhouse gas, in the atmosphere, causing more severe greenhouse effects. This situation triggers constant rise in the sea level, migration of animal species, and rapid seasonal change in agriculture.

Radioactive material

Radioactive material is any material containing unstable atoms that emit ionizing radiation as it decays. A definite fact regarding radioactive materials is that they give harm to the environment.

Radioactive waste

Also called nuclear waste is a byproduct from nuclear reactors, fuel processing plants, hospitals and research facilities. They contain radioactive materials and they can be classified into 3 main types, low-level waste(LLW), intermediate-level waste(ILW), and high-level waste(HLW).

LLW are generated from hospitals and industries. Since these contain short-lived radioactive materials, these aren't required to shield during handling and transport. ILW are more radioactive than

LLW, requiring some shielding. HLW are generated through burning uranium fuel in the nuclear reactor. These are ought to be cooled and shielded.

Global Material Footprint

Also called MF, is a consumption-based indicator of resource use. It is one indication of the pressures placed on the environment to promote economic growth and to satisfy the material needs of people.

Nuclear meltdown

Nuclear meltdown refers to an accident when core damage occurs due to overheating. The major cause of nuclear meltdown is the loss of sufficient cooling for the nuclear fuel within the reactor core. The Chernobyl disaster and the Fukushima nuclear disaster are the main nuclear meltdowns. Nuclear meltdown can result in widespread contamination of air and water.

Background Information

The History of Atomic Energy

In 1789, Uranium was first investigated by a German chemist. Atomic energy was first discovered in 1938. The idea of nuclear power began when physicist Enrico Fermi first showed that neutrons could split atoms. In fact, the U.S Navy was the initial organization to develop practical atomic power. Their purpose was to propel submarines and aircrafts. In 1954, the world's first nuclear power plant in Russia, Obninsk Nuclear Power Plant, generated around 5 megawatts of electricity. Nuclear energy development started to grow in interest starting from the 1973 oil crisis. Nations such as France and Japan, who were relying on oil invested in these energy.

IAEA (International Atomic Energy Agency)

The nuclear era initiated as the United Nations was constituted, ending World War II. Therefore, by the first General Assembly's resolution, the UN Atomic Energy Commission was established. The International Atomic Energy Agency was established in 1953, aiming to promote peaceful use of atomic energy technologies. The organization works within 164 nations often encouraging nuclear cooperation. IAEA is within the United Nations system however an independent organization. IAEA

conducts technical cooperation programmes to assist its Member States and promote the exchange of scientific and technical information between them.

There are four regional cooperative agreements working under the guidance of IAEA. The AFRA(African Regional Cooperative Agreement for Research), ARCAL(Cooperation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean), ARASIA (Cooperative Agreement for Arab States in Asia for Research), and RCA (Regional Cooperative Agreement for Research). Via these agreements, developed and developing countries work together to cultivate nuclear technology in such ways as building partnership in research and training projects.

Chernobyl disaster

The Chernobyl disaster, also known as the world's worst nuclear accident, occurred on April 26th, 1986 in the Chernobyl Nuclear Power Plant. The Chernobyl disaster occurred due to a flawed reactor design that was operated with inadequately trained personnel. All of the fires were put out in a few hours. However, unfortunately, radiation doses on the first day caused 28 deaths and six of them were firemen. The firefighters and power plant workers also received high enough radiation doses to result in acute radiation syndrome (ARS). The Chernobyl Nuclear Power Plant Zone of Alienation was officially designated as an exclusion zone around the site of the Chernobyl nuclear reactor disaster.



Photo of Chernobyl after the accident

Lallanilla, Marc, and Laura Geggel. "Chernobyl: The World's Worst Nuclear Disaster." *LiveScience*, 18 Apr. 2023, www.livescience.com/planet-earth/nuclear-energy/chernobyl-the-worlds-worst-nuclear-disaster.

As an action to deal with this issue, the "Act on the Precautionary Protection of the Population against Radiation Exposure" was adopted on 19 December 1986. The purpose of this Act was to adopt a new legal framework for monitoring environmental radioactivity and to keep the radiation exposure of humans.

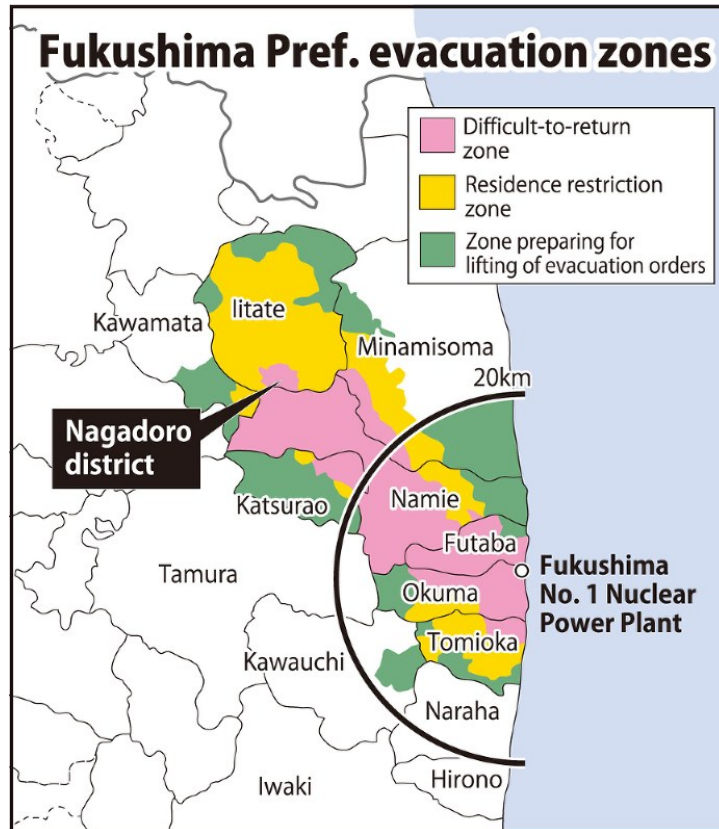
Moreover, The IAEA has provided environmental support to Ukraine, Belarus and Russia, who were directly affected by this disaster, to manage radioactive waste while strengthening the safety levels at the Chernobyl nuclear power plant. The International Chernobyl Radiation Information Network and Chernobyl forum was also established under IAEA, the world bank, and other UN organizations.

Fukushima Nuclear Disaster

On March 11th, 2011, the nuclear accident occurred at Fukushima Daiichi Nuclear Power Plant, Japan. The earthquake generated a detrimental tsunami, damaging the nuclear power plant's emergency diesel generators and losing electric power. Soon after the accident, radiation released into the atmosphere made 110,000 residents evacuate from the communities surrounding the power plant. Contaminated with radioactive elements, water was also released into the Pacific Ocean.

As a consequence of this accident, the Fukushima population were suffering from psychological and mental health issues. The number of post-traumatic stress disorder (PTSD) patients increased among evacuees. In fact, psychological disorders, such as hyperactivity, emotional symptoms, and conduct disorders, have been reported among evacuated Fukushima children.

The government is making efforts focusing on the decommissioning of the Fukushima Daiichi Nuclear Power Station (NPS) where the accident happened. Keeping in mind the accident at the Fukushima nuclear power plant on March 11, 2011, a 'Restricted Area', where entry is prohibited, has been designated at 20 km from the Nuclear plant.



Evacuation zones after the Fukushima Nuclear disaster

“5 Years after Fukushima Meltdowns, off-Limits Zone in Iitate Languishes.” The Mainichi, mainichi.jp/english/articles/20160309/p2a/00m/0na/021000c. Accessed 3 Aug. 2023.

Recycling Nuclear waste

Approximately 97% of the nuclear waste, especially uranium, could be used as fuel in certain types of reactor. Currently, recycling has mostly been focused on the extraction of plutonium and uranium, as these elements can be reused in conventional reactors. These separated plutonium and uranium can subsequently be mixed with fresh uranium and made into new fuel rods. Used fuel can also be recycled for other purposes. Curio, for example, has recently developed a chemical process to turn nuclear waste into usable products such as isotopes, which are used to make ingredients needed to produce power sources for space missions and batteries. To create a sustainable nuclear fuel cycle, countries such as France and Japan are already safely recycling nuclear waste.

IFNEC (International Framework for Nuclear Energy Cooperation)

IFNEC assists the development of nuclear energy technologies and deals with the proliferation of nuclear weapons. In 2006, the US initiated this cooperation. Especially developing nations considering nuclear plants can be provided some assistance from IFNEC partners. They can provide guidance for assessing countries' infrastructure needs and help the nations to meet their other needs too. For countries that have no existing nuclear power infrastructure, IFNEC partners can share knowledge and experience to enable developing countries to make informed policy decisions on whether, when, and how to pursue nuclear power without any need to establish sensitive fuel cycle facilities themselves.

123 Agreements

In 1954, the United States established the Atomic Energy Act and made agreements with countries to facilitate cooperation in such fields as technical exchanges, scientific research, and safeguards discussions. Via this agreement, moreover, U.S. nonproliferation principles established the legal framework for significant nuclear cooperation with other countries.

This Agreement is regulating strong nonproliferation requirements. The U.S. State Department is responsible for negotiating 123 Agreements, with technical assistance. The United States currently has 23 agreements in force that govern peaceful nuclear cooperation with 47 countries, the International Atomic Energy Agency, and the governing authorities on Taiwan.

The OECD Nuclear Energy Agency (NEA)

NEA is an intergovernmental agency, operating within the OECD, that fosters international cooperation with sophisticated nuclear technology infrastructures. NEA currently consists of 33 countries across Europe, North America, and the Asia-Pacific region. In 2019, NEA discussed with ROSATOM, which is the Russian state company that specializes in atomic energy, and the European Commission to broaden its influence. Currently, NEA established Nuclear Safety Research Joint Projects Week. Members of NEA reviewed the experience gained in the last 40 years of NEA nuclear safety research joint projects with close to fifty projects successfully completed.

Possible solutions

Financial aid toward developing countries

Generating atomic energy requires a massive budget, mainly due to the high cost of construction. Therefore, even though countries, especially developing countries, are willing to make nuclear energy, they face financial difficulties. This can lead to a constant increase of the use of fossil fuels and result in more devastating environmental issues. MEDCs can financially provide assistance to LEDCs in order to deal with enduring environmental issues.

Strict laws toward nuclear waste

Nuclear waste can trigger detrimental effects to both the environment and living beings. However, due to steps and cost required until legally releasing nuclear waste, some nuclear corporations tend to illegally discard nuclear waste, significantly polluting the ocean. Spent reactor fuel assemblies are highly radioactive. Therefore, it must be stored in specially designed pools of water, cooling the fuel and acting as a radiation shield. Governing nuclear power plant decommission is also crucial. The EU tightened the laws of nuclear waste in 2011. The new legislation required governments to present a timetable for the construction of disposal facilities. Nations should strongly restrict the release of nuclear waste by laws and punish those who aren't following the laws.

Partnership between MEDCs and LEDCs

MEDCS, especially countries such as France, United States, and Russia who are highly developed in atomic energy technology, can make partnerships with developing countries. Through partnerships they can exchange resources and technologies to achieve a decrease in the global material footprint. The US built partnerships with developing countries and assisted them through such methods as IFNEC and 123 agreement. Countries such as Russia, China, and the European Union are also assisting developing countries to generate nuclear energy on their own by building partnerships. In fact, in June, 2023, Pakistan and China signed a \$4.8 billion deal to build a nuclear power plant.

Regulations on Uranium mining

Uranium mining can contaminate the environment with radioactive materials. Uranium mining facilities produce tailings which pose serious environmental and health risks in the form of Radon emission, windblown dust dispersal and leaching of contaminants including heavy metals and arsenic into the water. Moreover, while uranium mining is the primary process of nuclear power generation, it is also the step for producing nuclear weapons. Therefore, frameworks of uranium should be suggested.

The World Nuclear Association's "Charter of Ethics" and the World Nuclear Association's "Principles of Uranium Stewardship" are the providing guidelines about uranium mining. In 2022, Saudi Arabia has recently regulated a new law to auction up to three mining licenses. The minister mentioned that the bidders on these licenses may focus either on technology, a contribution to the local community or other criteria.

Major parties involved

United States of America

The USA accounts for more than 30% of worldwide nuclear generation of electricity. Moreover, nuclear energy takes 20% of the United State's electricity overall and about 55% of its carbon-free electricity. The United States is currently the largest contributor to IAEA, providing more than \$395 million since 2015. It has also established a governmental agency, Nuclear Regulatory Commission, to be in charge of regulation related to atomic energy.

Russian Federation

Russia is leading in fast neutron reactor technology. Russia has 37 nuclear reactors. Russia constructed the world's first nuclear power plant in 1954, the 5 MWe Obninsk reactor. The Russian Federation has also initiated the state corporation, Rosatom, which specializes in atomic energy. In 2020, Rosatom became a member of the United Nations Global Compact Network, the largest corporate social responsibility and sustainable development initiative for businesses across the world.

State of Japan

Due to the fatal effects of nuclear bombs during the wartime and the Fukushima Nuclear Disaster, Japan has emphasized the importance of the peaceful use of nuclear energy. Recently, the International Atomic Energy Agency has approved a plan by Japan to release more than a million tons of treated nuclear waste water from the destroyed Fukushima power plant into the ocean. This is triggering a global dispute over nuclear waste.

French Republic

Nuclear energy is occupying 70% of France's total electricity. France also exports electricity often due to low cost of generation. Moreover, about 17% of France's electricity is from recycled nuclear fuel. France started to primarily get into nuclear energy development with the 1973 oil crisis. The prime minister, Pierre Messmer, announced the 'Messmer Plan', aiming to generate all of the electricity from nuclear energy.

European Nations

The Eu (European Union) has established an international organization called the European Atomic Energy Community(EAEC or EURATOM) by the Euratom treaty. This organization has a purpose of developing atomic energy and distributing it to its member countries. Though, United Kingdom ceased to be a member of this organization, they have made a UK-EU Trade Cooperation Agreement to constantly share the programmes.

Ukraine

Ukraine is a developing nation which is heavily dependent on nuclear energy. Ukraine has 15 reactors generating about half of its total electricity. Ukraine had been receiving nuclear service from Russia, however recently made efforts to reduce the dependence.

The People's Republic of Bangladesh

In 2010, Bangladesh joined a civilian nuclear agreement with the Russian Federation and framework agreements for peaceful nuclear energy applications with the US, France and China. Bangladesh is currently under construction of its first nuclear power plant, Rooppur Nuclear Power Plant. The IAEA

has supported Bangladesh with a technical cooperation programme and the Peaceful Uses Initiative. This support includes INIR (Integrated Nuclear Infrastructure Review) missions, which assess a country's progress and make recommendations.

Republic of India

Currently, about 3% of the total electricity in India is atomic energy and India has more than 22 nuclear reactors. Since India's Atomic Energy Act 1962, the government has played a central role in developing and running nuclear power stations. The Indian government is aiming to grow its nuclear power capacity as part of its massive infrastructure development programme. The country is expanding the capacity by locating plants in diverse cities.

The Argentine Republic

Argentina possesses 3 nuclear power plants and they are in charge of approximately 10% of the countries' electricity. Since 2014, Argentina has started to rely on China in nuclear energy construction. In February 2022, Argentina signed an agreement for China to build an \$8 billion nuclear power plant, Atucha III, with Beijing agreeing to finance 85 percent of the cost. Argentina has also recently asked China to fully finance its nuclear power plant.

United Arab Emirates

The UAE government formally declared in April 2008 that it was considering nuclear energy as an additional option to help the nation meet its rising energy needs. The United Arab Emirates' Policy on the Evaluation and Potential Development of Peaceful Nuclear Energy, or the Nuclear Policy, came to the conclusion that nuclear energy was the most reliable, environmentally promising, and economically competitive energy source available. A key component of a stable, credible, safe, and secure nuclear program, according to the Nuclear Policy, is the creation of an independent, watchful, and effective regulatory agency. By Decree No. 6 of 2009, Concerning the Peaceful Uses of Nuclear Energy, the Federal Authority for Nuclear Regulation (FANR) was founded on September 24, 2009, in conformity with the Federal Law.

Saudi Arabia

There are no nuclear power stations in Saudi Arabia. However, in preparation for rapid expansion in domestic energy demand, the nation has plans to establish a domestic nuclear sector. The government wants to replace oil-fired power facilities with nuclear ones in order to free up oil for export. After their neighbor in the Persian Gulf, the United Arab Emirates, the Saudi program is regarded as the second most advanced in the Arab world. The King Abdullah Center for Atomic and Renewable Energy (KAcare), led by former energy and trade minister Hashim Abdullah Yamani, was established in 2010 to handle Saudi Arabia's nuclear program. KAcare will represent Saudi Arabia at the IAEA and be in charge of managing Saudi nuclear energy, overseeing the production of nuclear power.

Timeline Of Events

Date **Description of event**

| | |
|--------------|---|
| 1789 | Uranium was discovered by a German Chemist, Martin Klaproth. |
| 1932 | James Chadwick discovered neutrons. |
| 1930s | The idea of nuclear power began when physicist Enrico Fermi first showed that neutrons could split atoms. |
| 1954 | Obninsk Nuclear Power Plant was the world's first nuclear plant to generate electricity for power. |
| 1957 | The IAEA (International Atomic Energy Agency) was established as an intergovernmental organization. |
| 1979 | The first major nuclear accident, Three mile Island Accident occurred in the US Releasing radioactive gasses and radioactive iodine into the environment. |
| 1986 | Chernobyl occurred in Pripyat, which is located near Ukraine and Russia. This nuclear disaster was initiated during the safety test of a steam turbine. |
| 2005 | India–United States Civil Nuclear Agreement was established. |
| 2011 | The Fukushima nuclear disaster occurred at the Fukushima Daiichi Nuclear Power Plant. The Tōhoku earthquake and tsunami, which is until now recorded as one of the most powerful earthquakes, damaged the nuclear plant and released some of its electricity. |
| 2015 | The 17 Sustainable Development Goals were adopted by the United Nations. |

UN Involvement, Resolutions, Treaties and Events

- The United Nations founded the United Nations Atomic Energy Commission(UNAEC) in 1946, by the first resolution of the General Assembly. The UNAEC aims to deal with issues related to atomic energy and encourages the peaceful use of them.
- In 1957, the International Atomic Energy Agency was established as an autonomous organization within the United Nations system. The organization reports to both the General Assembly and the Security Council of the United Nations. The IAEA supports several Regional and Cooperative Agreements to strengthen the contribution of nuclear science and technology to socioeconomic development in different regions.
- The UN established the Sustainable Development Goals and included the 12th goal which is to Ensure sustainable consumption and production patterns. This goal includes developing sustainable sources of energy including nuclear energy.
- UNDP support for the development of atomic energy amounted to about 22 million dollars.
- United Nations General Assembly Resolution 1, 24 January 1946

United Nations General Assembly Resolution 1 was the first resolution to be passed in the United Nations General Assembly. Via this resolution, the IAEA was constituted.

- Convention on the Physical Protection of Nuclear Material(CPPNM), 1980

The CPPNM establishes legal obligations for Parties regarding the physical protection of nuclear material used for peaceful purposes during international transport. Moreover, it forbids actions related to illegal trafficking and administers assistance in the event of sabotage.

- International Convention for the Suppression of Acts of Nuclear Terrorism, 2005

The convention defines the act of nuclear terrorism as the use or threat to use nuclear material, nuclear fuel, radioactive products or waste, or any other radioactive substances with toxic, explosive, or other dangerous properties. The convention aims for the cooperation of nations in order to prevent nuclear terrorism and arrange legislative and technical measures.

- The Nuclear Non-Proliferation Treaty (NPT) is an international treaty whose objective is to achieve the peaceful use of nuclear energy. NPT was implemented in 1970. The treaty is reviewed every five years in meetings called Review Conferences. Even though the treaty was originally conceived with a limited duration of 25 years, the signing parties decided, by consensus, to unconditionally extend the treaty. NPT primarily states about non-proliferation, disarmament, and the right to peacefully use nuclear energy.

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