ECOSOC

Topic Brief 1

Promoting the use of nuclear energy systems and safe nuclear waste disposal methods

General Overview

Nuclear energy consumes a significant part of the world energy mix, contributing to sustainable economic growth, improved human welfare, and the mitigation of the negative impacts of climate change. With that said, it is important to note that the disposal of radioactive waste can directly affect the sustainable development of nuclear energy, either fostering or preventing its future use.

Recently, countries have faced a dilemma regarding the safe disposal of nuclear waste, collecting and storing highly radioactive material in inactive nuclear power plants that cannot handle its toxicity and extreme reactions, triggering widespread contamination of this material in air and water. To give an example, the “Chernobyl Disaster” of 1986 occurred as a result of a rupture in the reactor vessel, causing a large amount of toxic waste to burst. To this day, its plant’s reactors contain an enormous amount of nuclear waste that will remain dangerous for tens of thousands of years.

Keeping that in mind, it is widely agreed upon that deep geological disposal is the best solution for the final disposal of most radioactive waste produced; this process is preceded by the storage of such used fuel under water for at least five years.

Timeline

- **1942–1945:** Manhattan Project develops nuclear fission; nuclear energy first applied militarily (Hiroshima & Nagasaki, 1945).
- **1954:** First civilian nuclear power plant opens in Obninsk, Soviet Union, marking the start of peaceful nuclear energy use.
- **1957: International Atomic Energy Agency (IAEA)** established to promote peaceful nuclear cooperation and ensure safety.
- **1968: Nuclear Non-Proliferation Treaty (NPT)** signed, balancing peaceful nuclear use with restrictions on nuclear weapons.

- **1979: Three Mile Island accident (USA):** Raises global alarm about reactor safety.

- **1986: Chernobyl disaster (USSR/Ukraine):** Causes widespread radiation contamination, leading to global reevaluation of nuclear safety.

- **1997: Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management** adopted under the IAEA. This was a legally binding international framework on nuclear waste disposal.

- **2000s:** Expansion of nuclear power in **China, India, and South Korea**, making Asia a key area for nuclear growth.

- **2011: Fukushima Daiichi disaster (Japan):** Earthquake and tsunami trigger meltdown, leading Germany and others in the EU to begin phasing out nuclear power, while Japan temporarily shuts down its reactors.

- **2014:** EU adopts the **Directive on Nuclear Safety**, strengthening waste management rules and promoting geological repositories.

- **Paris Agreement (2015):** Nuclear energy re-enters global climate discussions as a low-carbon alternative.

- **IAEA safety review missions** (2016–2019) support developing nuclear programs in Africa and Asia

- **2021:** Finland approves **Onkalo**, the world's first **deep geological repository** for high-level nuclear waste, setting a global precedent.

- **2022: France, UK, Poland, Czech Republic** announce investments in new nuclear reactors as part of climate strategies.

- **2022**: **Japan restarts reactors** after a decade of safety upgrades post-Fukushima.

- **2023: EU Taxonomy Regulation** officially labels nuclear energy as "green investment" under strict waste management conditions.

- **Early 2025:** UN and IAEA debates focus on balancing **nuclear expansion** with **standardizing waste disposal technologies**, especially deep geological storage.

- **Mid–Late 2025: African nations (e.g., Egypt, Ghana, Nigeria, South Africa)** advance nuclear energy projects with IAEA assistance.

Key terms

- **Nuclear energy:** The energy released from the nucleus of atoms during nuclear fission (when atoms split) or fusion (when atoms combine). Unlike fossil fuels, nuclear power is a low-carbon source of energy, producing little to no CO2.
- **Nuclear waste:** A type of waste made of radioactive atoms, left over after atoms split in the production of nuclear energy.
- **Deep geological disposal:** A beneficial method of radioactive waste disposal, where the waste is isolated deep underground (hundreds of meters below the surface) in stable geological formations. This method is seen as the most effective and least intrusive to the natural environment in the long-term.
- **Nuclear reactor:** Otherwise known as nuclear power plants, nuclear reactors are nuclear energy systems that use heat (produced from nuclear fission) to convert boiling water into pressurized steam, spinning large turbines that generate electricity.
- **Weapons of Mass Destruction (WMDs):** Weapons made of radioactive material with the capacity to inflict death and destruction indiscriminately on a massive scale. Modern WMDs are classified into three types: Nuclear, biological, or chemical.
- **Nuclear Non-Proliferation Treaty (NPT):** An international treaty established in 1968 with the aim to promote cooperation in the peaceful use of nuclear energy and prevent the spread of nuclear weapons.
- **Nuclear stigma:** The negative perception and social disapproval associated with nuclear weapons and nuclear power.

- **Energy security:** The uninterrupted availability of energy sources at an affordable price.

- **Relevant parties**

Countries with Advanced Nuclear Programs: Operate many nuclear power plants, produce large amounts of nuclear waste, and lead in technological development.

- *United States*
- *Russia*
- *France*
- *China*
- *Japan*
- *South Korea*

Countries Developing or Expanding Nuclear Energy: Looking to nuclear power for energy security, but face scrutiny over safety and potential weapons proliferation.

- *India*
- *Pakistan*
- *Iran*
- *United Arab Emirates*
- *Turkey*
- *Egypt*

Non-Nuclear/Anti-Nuclear States: Oppose or phase out nuclear energy due to risks, environmental concerns, and public opinion.

- *Germany*
- *Austria*
- *Denmark*
- *New Zealand*

Nuclear Waste Disposal Leaders: Pioneering deep geological disposal methods.

- *Finland*
- *Sweden*
- *France*

International Organizations & Treaties

- **International Atomic Energy Agency (IAEA):** Monitors nuclear programs, enforces safety standards, and ensures compliance with peaceful use.
- **United Nations Environment Programme (UNEP):** Involved in environmental implications of nuclear waste disposal.
- **Nuclear Non-Proliferation Treaty (NPT) signatories:** 191 states balancing peaceful use with disarmament.
- **World Health Organization (WHO):** Addresses public health impacts of radiation.

Useful Resources

- https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste
- https://earth.org/nuclear-waste-disposal/
- https://www.sipri.org/sites/default/files/2025-04/eunpdc_no_95_0.pdf
- https://www.gao.gov/nuclear-waste-disposal
- https://greenamerica.org/fight-dirty-energy/amazon-build-cleaner-cloud/10-reasons-oppose-nuclear-energy
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