TOBBMUN'26

TURKIYE ODALAR VE BORSALAR BIRLIGI SCIENCE HIGH SCHOOL
MODEL UNITED NATIONS CONFERENCE

COSA

UNDER SECRETARY GENERAL:

HÜSEYIN DEMIREL

ACADEMIC ASSISTANT:

KAAN MUŞTU

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1. Letter from the Secretary General,

Honourable participants of TOBBMUN’26,

As the Secretaries-General of TOBBMUN’26, taking place from January 17th to January 20th, we would like to extend our warmest welcome to all participants of this prestigious conference.

With its first official edition, and this years first conference in Antalya, of TOBBMUN, we are proudly bringing together enthusiastic and passionate individuals eager to experience, witness the best instance of diplomacy, collaboration, and intellectual exchange at its finest. As the years and institutions first conference in Antalya, we are confident that we will not only achieve but we will even surpass our motto.

Throughout the path we took in the MUN circuit, we have worked hard and tirelessly to build this conference upon the foundation of experience, dedication, and innovation. With the knowledge and expertise we have gained, we want to shed light on your experience as well and help you feel the same joy we did while creating and attending such committees.

With a blend of experienced and new generation of academic members, we strongly believe that TOBBMUN’26 will provide an unparalleled MUN experience for all of its participants. The seasoned members of our academic team contribute their deep knowledge and insight, while the newer members bring forward creativity and fresh perspectives.

We hope and believe that this conference will grant all participants a platform and an opportunity for all attendees to develop and acquire skills, learn how the dynamics of different specialized committees work, and engage in a constructive way. By organizing TOBBMUN’26, we are not only trying to create something remarkable but also to inspire and contribute to the growth of new members and delegates within the MUN community.

To achieve this, we have brought an academic team of unparalleled intellect and proven capability, supported by an organization team marked by its commitment and strength. When you attend TOBBMUN'26, you will start your MUN year at the very peak of excellence and in the rest of the year, you will continue striving to reach even higher summits.

Welcome to TOBBMUN’26,

With our warmest regards,

Secretaries – Generals of TOBBMUN’26,

Kuzey Karlık & Mustafa Aslan.

2. Letter from the Under Secretary General,

Dear Participants,

It gives me the utmost pleasure to serve as the Under-Secretary-General of the Committee on the Status of Atomic Energy (COSA) at this prestigious conference.

One of the largest problems in the current world is nuclear weaponry and its threats. So as the COSA committee we must take action and find useful solutions for a more peaceful world.

Every single delegate is encouraged to read this study guide carefully, conduct further and extra research specifically on their country, and come prepared for the committee. I sincerely hope that this committee will be an unforgettable experience for all of you.

For my closing remarks, I would like to express my thanks to the hardworking Executive Team . I also want to welcome each and every one of my delegates.

Last but not least, I would like to thank my handsome academic assistant Kaan Muştu for helping me create such an enjoyable committee.

Kind Regards

Under-Secretary General of the COSA

Hüseyin Demirel

demirelhuseyin0411@gmail.com

3. Letter from the Academic Assistant,

Dear delegates,

It is with the utmost respect and sincere aspiration to welcome you all to this prestigious conference and committee. Before prelude, I would like to extend my thanks to the Secretariat, the rest of the Executive Team, and the Academic and Organization Teams for their meritorious efforts on the creation of this conference.

Besides, I would like to thank my Under Secretary General, Hüseyin Demirel for his honorable, quite precious, in short; inutterable efforts and support for me. His support has been extremely helpful in every way up to this point, both in my real life and in my MUN journey. I am extending my profound gratitudes for everything.

As your Academic Assistant, I am highly suggesting you read this document thoroughly. We wrote a highly elaborated study guide for you all. Not considered countries' information but it includes every detail you would need generally. You should be completely prepared with all of the information you require; your country's policies, positions, atomic power, etc. In conclusion, I assure you all have your best times in this committee. Best wishes for your endeavors.

Kind regards,

Academic Assistant,

Kaan Muştu

4. Introduction to the Committee,

4.1. History of the Committee:

The Committee on the Status of Atomic Energy (COSA) was established under the General Assembly of the United Nations to provide governance over the threatening utilization of atomic energy. The origin traces to 1946, the United Nations Atomic Energy Commission's (UNAEC) establishment.

As the Cold War intensified; conflicts between the United States and the Soviet Union hindered the progress of the UNAEC. Its disintegration in 1952 left a huge gap within the international governance of nuclear energy. Therefore, the General Assembly was compelled to establish a new committee named COSA.

COSA's foundation was built upon three major components:

1. ***The militarization of nuclear energy and the proliferation of weapons of mass destruction.***
2. ***The unequal and threatening access to nuclear technologies, especially in developing countries***
3. ***The environmental and humanitarian consequences of nuclear tests and accidents.***

In due course, COSA evolved into an impartial general assembly platform that states could discuss and evaluate international agreements' efficacy on the political responsibilities of nuclear energies.

Albeit on the 21. century, the importance of COSA gradually increased due to the subsidence of the disarmament treaties, modernization of the nuclear arsenals, and mounting discourses of nuclear threats. These evolved the COSA into the linchpin of the reconciliation.

Today, COSA has huge liabilities to fill the gap between disarmament policies, governance of nuclear energies, and humanitarian safety. This committee serves to amicable utilization of the world's nuclear capacity and protect humanity from existential threats.

4.2. Functions of the Committee:

COSA is serving under the United Nations General Assembly and following its proposing, disputing and reporting procedures. Decisions are not indicating binding purposes, but its prepared draft resolutions and advisory reports could be submitted to GA's ballots. Also it could address the actions of related UN bodies (particularly IAEA and UNODA).

The main functions of COSA can be considered as:

- ***Nuclear disarmament and evaluating security policies,***
  It monitors the implementation of treaties such as;
  - NPT (Treaty on the Non-Proliferation of Nuclear Weapons),
  - CTBT (Comprehensive Nuclear-Test-Ban Treaty),
  - Bilateral disarmament agreements such as START and INF,
- ***Security, audit, and risk management,***
  COSA also works to strengthen international oversight mechanisms for the safety of nuclear facilities, waste management, and the control of materials that could be used in weapons production. In this context;
  - Evaluation of IAEA inspection reports,
  - prevention of technological leaks,
  - discussion of preventive measures regarding nuclear smuggling and terrorism,

  is among the committee's duties.
- ***Peaceful use and access equality,***
  COSA, proposing policies on simply access of developing states to pacific nuclear technology. The destination is, addressing the disposal of nuclear materials to produce energy, increase the effectiveness of medicine, agriculture and inquiry sectors.
- ***Environmental and humanitarian security aspect,***
  COSA, regulating labours on harassments of radioactive wastes' environmental influences due to nuclear accidents. Besides, preparing evaluation reports about nuclear disasters' long term health and ecological consequences.
- ***Nuclear risk analysis in crisis zones,***
  COSA could accomplish risk assessments by collaborating with UNSC on current and ongoing conflicts and crisis zones in case of raising nuclear threats. For example, the safety of the Zaporizhzhia nuclear facility in the Russo-Ukraine conflict, the nuclear tension between Iran and Israel in the Middle East, North Korea's nuclear test activities, etc.

In short, COSA is one of the most comprehensive General Assembly bodies on the peaceful utilization of nuclear energy and its global safeness. This committee not only regulates preventions on disseminations, it also incorporates the ethical, environmental and economical concerns.

5. Introduction to the Agenda Item,

5.1. Historical occurrence and spread of nuclear energy:

The improvement of nuclear energy is a decisive milestone in modern history. The prelude of this journey was the invention in 1938, defined as nuclear fission, by Otto Hahn and Fritz Strassmann. This invention could cause important scientific developments and sustainable use of atomic power. However, the utilization went wrong, as the Second World War broke out, and the world soon witnessed two acrimonious assaults, Hiroshima and Nagasaki.

The Manhattan Project led by the United States of America embodied the dark side of this invention. In 1945, the Japanese cities named Hiroshima and Nagasaki were nuked by the United States of America. These assaults were so devastating that nearly 143,000 people died, and the aforementioned territories were completely destroyed. As a consequence, these disasters unveiled the sheer destructiveness of atomic assaults and also paved the way for future potential nuclear attacks. Because of them, a new term, the nuclear era, emerged, and these disasters became its defining symbol.

Thereafter, the utilization of nuclear energy is divided into two different and contradicting paths. On one hand, especially in the Cold War era, it evolved to a power equilibrium component between the United States of America and the Soviet Union that was based upon disincentive precepts. In other words, it prevented direct conflicts but created a safeness concept that perpetually threatened the global scales. On the other hand, it is used in various beneficial areas: particularly in electricity production, medicine and agriculture.

This massive dissemination has reached such a point that governments have seen lead in nuclear developments and providing a huge nuclear arsenal as a power pretension and their national safety’s symbol, resulting in a completely destructive competition. The situation went out from being only a militaristic component. It just evolved an irrepressible penchant.

In addition to these, the situation was also not different within the civil nuclear technologies' increment. The mounting demand for energy, the limited availability of fossil fuels, and concerns about energy supply security have compelled too many countries to indicate demand on nuclear energy. The sustainability, efficiency and low carbon emissions have been seen as desirable, particularly for industrialized countries with high energy demands. (especially USA, Soviet Union, China, etc..)

Additively, the dissemination has also brought with it serious risks and problems. Nuclear accidents have clearly demonstrated how fragile and high-risk this technology is. Unfortunately a new disaster broke out. The increased confidence caused another destruction, the Chernobyl Accident. This accident is considered as one of the greatest bouleversement in the nuclear energy's history. This disaster not only caused environmental and human devastation, but also highly decreased the global confidence in nuclear energy. The long-term effects of radiation, cross-border environmental damage and medical problems that could last for generations have exposed the uncontrollable consequences. Similarly, other accidents have demonstrated the inadequacy of nuclear technologies' safeness and the acrimonious consequences of human faults.

Therefore, public perception has changed significantly. The pressure has increased in states. Anti-nuclear movements have gained strength and some states are compelled to re-evaluate their nuclear policies. This process has led to the questioning of the narrative that nuclear energy is a "clean and safe" source.

Within this period, some countries took the determinant responsibility in nuclear developments. Firstly, the United States of America distinguished itself both as being the initial firing point of nuclear weapons and led the spread of nuclear energy technologies. As a second, China has gradually expanded its nuclear capabilities, becoming a major nuclear power in terms of both military deterrence and energy security. Last but not least, North Korea has continued its nuclear development program on the grounds of national security and regime persistence, a situation that has caused critical concerns and diplomatic tensions in the global society.

The global dissemination has also given rise to various political tensions and security issues. The inequality between states possessing nuclear weapons and those without this capability has triggered discussions on justice and legitimacy. Nuclear programs of some states have been perceived as a direct threat by neighboring countries, leading to regional security conflicts. The nuclear arms competition, the risk of miscalculation, accidents, and the possibility of nuclear technology falling into the hands of non-state actors are among the main issues threatening global security.

To contain the mass dissemination of nuclear energy, a lot of international mechanisms were devised. Particularly the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), signed in 1968, aimed to limit the unrestrained spread of nuclear weapons, encourage the disarmament, and controlled use of eirenical nuclear technologies. Today, nuclear energy is seen as a crucial option for many countries in terms of low-carbon energy production. In contrast, the modernization of nuclear weapons, the risk of nuclear proliferation, and the probability of nuclear terrorism continue to pose serious threats to global safety.

In due course, confidence has fluctuated. The development of safety standards, the establishment of international oversight systems and technological advances have contributed to the renewed acceptance of nuclear energy.

5.2. Ongoing environmental, economic and social impacts:

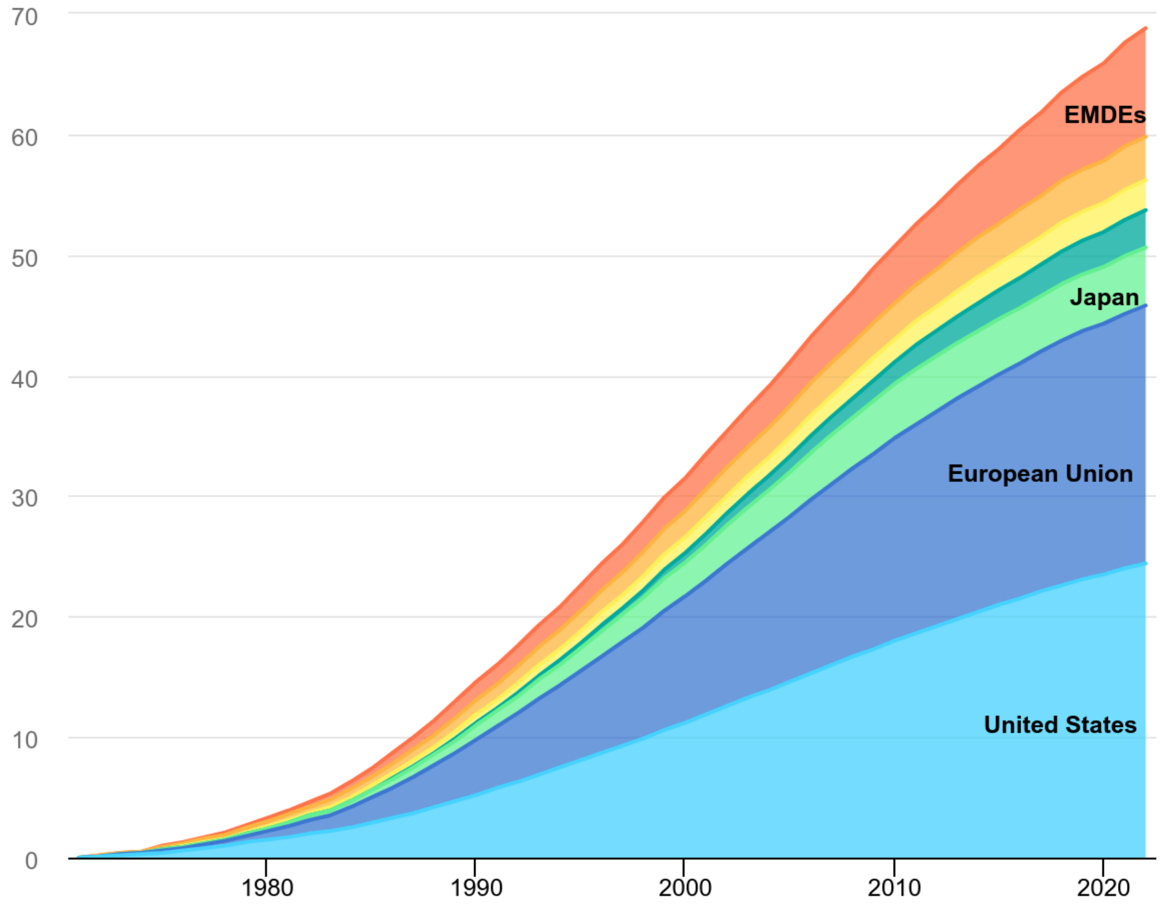
The environmental, economic and social impacts of nuclear energy have deepened and increased over time, depending on the development of the global energy systems. Initially viewed primarily as a military technology, nuclear energy began to directly influence peoples’ relations with the environment, economic approaches and public perception of risk as it transitioned to civil utilization. These impacts have not been limited to states with operational nuclear power plants; they have taken on a dimension that encompasses the entire international system through transboundary environmental consequences, economic burdens and perceptions formed into the public sphere.

Aforementioned impacts can be examined in 3 major titles:

1. Environmental impacts:

The environmental impacts must be assessed not only in terms of energy production outputs, but also in terms of all the processes involved in achieving these outputs. Although nuclear energy is often presented as an environmentally advantageous option due to its low carbon emissions, this approach reflects only a limited part of the environmental impacts. The true cost encompasses the entire cycle, from uranium mining and enrichment to plant construction and operation and finally to the safe storage of waste for thousands of years.

The role of nuclear energy in combating climate change has come to the fore again, particularly since the 2000s. Reports by the International Energy Agency and similar organizations reveal that nuclear energy contributes to the preservation of the global carbon budget because it does not directly emit greenhouse gases during electricity production. In this context, nuclear energy is seen as one of the few low-carbon sources with the "base load" capacity to replace fossil fuels such as coal and natural gas.

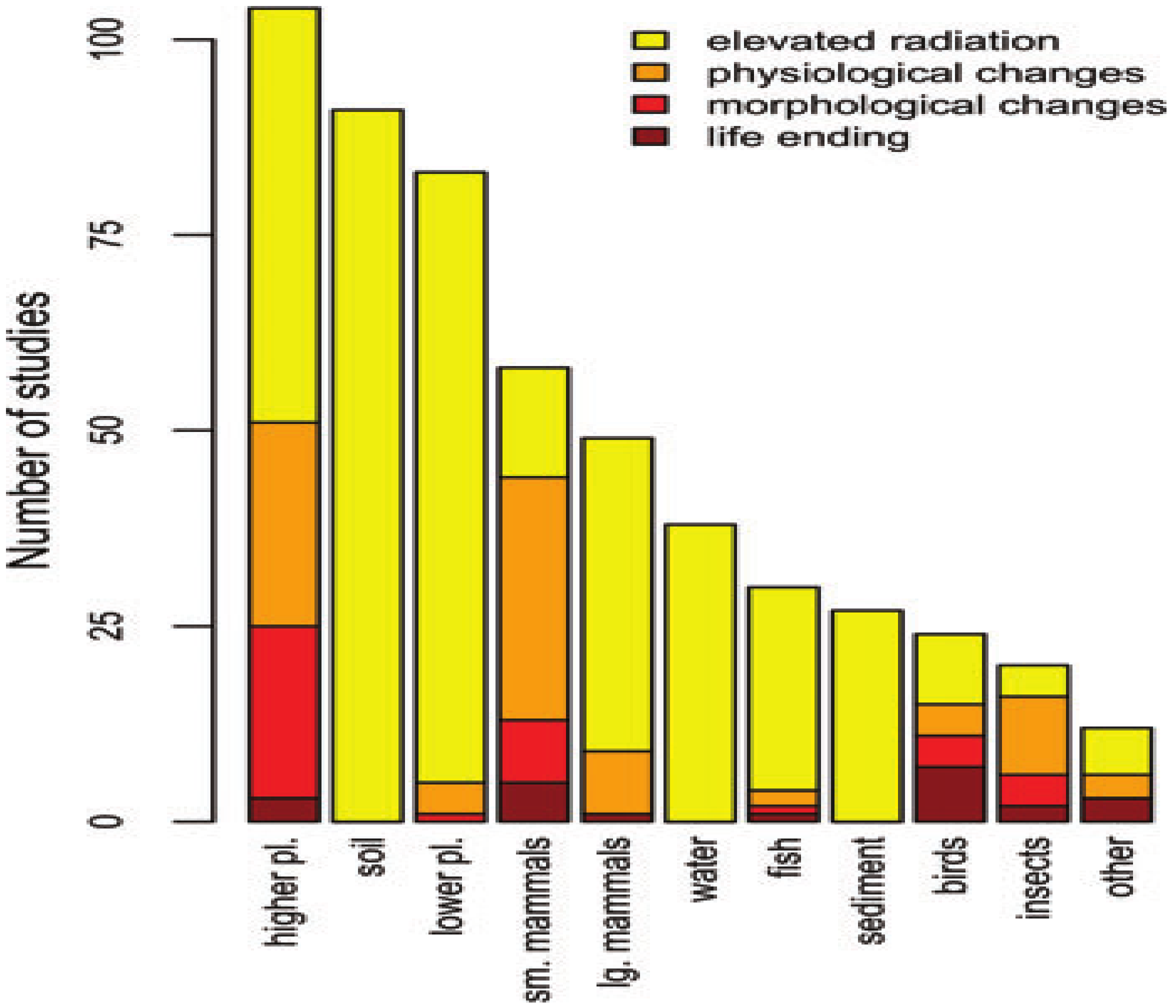


EMDEs = emerging market and developing economies including China. Avoided emissions are calculated starting from 1971.

However, this advantage does not mean that nuclear energy is “clean” in the absolute sense. Uranium mining activities are one of the most environmentally problematic stages in the nuclear energy chain. Radioactive waste generated during open-pit and underground mining causes permanent pollution in the environment, creating long-term damage, particularly to water sources and agricultural territories. Since these effects are mostly concentrated in developing countries, the environmental burden is unevenly distributed on the global scale.

The nuclear waste problem is one of the most critical and intractable issues among environmental impacts. High-level radioactive waste continues to pose a risk to living organisms for thousands of years. Current interim storage methods can only keep this waste safe for a limited period of time; permanent geological disposal projects, however, cannot be widely implemented due to technical difficulties, costs and public opposition. This situation means that environmental risks are being deferred to the future.

The most visible instances are nuclear accidents. As mentioned in the past title, the Chernobyl accident was not just a short-term environmental disaster; it caused ecological damage that lasted for decades and, in some areas, continues to this day. Radioactive materials accumulated in the soil, continuously affecting vegetation and biological populations and largely halting agricultural and livestock activities. On other hand, the Fukushima accident has added a new aspect to environmental discussions with its effects on marine ecosystems, creating global concern about the long-term environmental consequences of radioactive water.



The number of published studies on a given ecosystem component (pl. = plant; other includes amphibians, bacteria, mollusks, reptiles, and shellfish). The majority of studies examining morphological, physiological , or life ending consequences were undertaken in the direct vicinity of Chernobyl (91%).

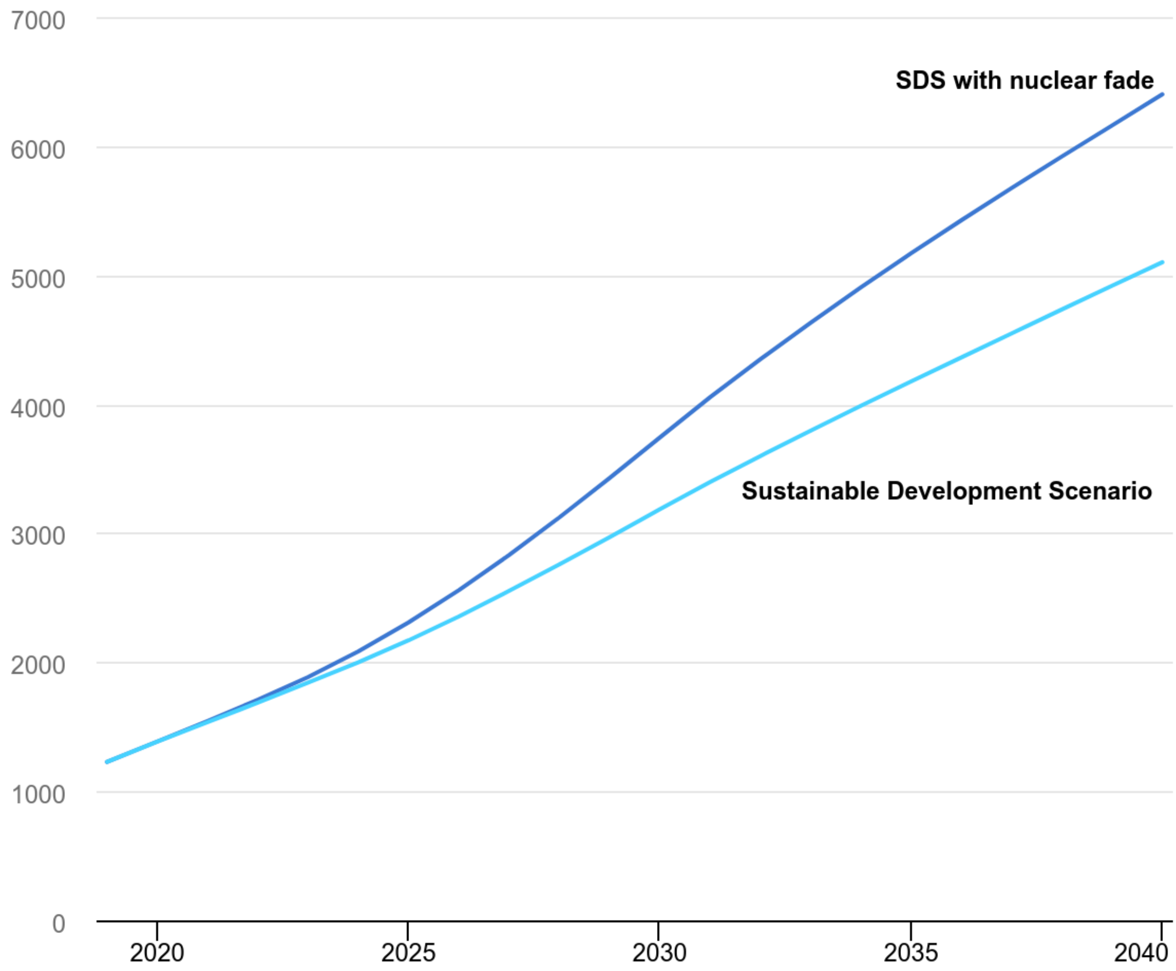
The acceleration of climate change has further complicated the environmental risk profile. Rising temperatures and water scarcity directly affect the cooling systems of nuclear power plants, while extreme weather events pose new threats to plant safety. Rising sea levels have become a serious risk factor for nuclear facilities located in coastal areas. While nuclear energy is presented as a solution to climate change, it has also become a technology that is vulnerable to the effects of climate change.

Additionally, the environmental impacts should also be assessed in terms of biodiversity as mentioned in nuclear accidents. Extensive safe zones lead to the fragmentation of natural habitats; the perception of radiation risk causes some areas to be closed to human and animal activity for long periods of time. This disrupts the natural balance of ecosystems and indicates that environmental impacts are not only chemical or physical, but also ecological.

Albeit, total impacts should not be assessed solely in terms of risks and disaster scenarios; the advantages it offers under certain conditions should also be analyzed. Particularly in energy-intensive industrialized countries, the replacement of fossil fuels with nuclear energy has directly contributed to reducing air pollution and particulate matter emissions. Considering the adverse effects of sulfur dioxide, nitrogen oxide and fine particulate emissions from coal and oil-based power plants on public health, the indirect environmental and health-related benefits become more apparent.

That is, nuclear power plants can generate a very large amount of electricity per unit of land area due to their high energy density. This feature allows nuclear energy to have a more limited environmental footprint in terms of land use, especially when compared to renewable energy sources. The areas required for large scale solar and wind power plants can lead to the fragmentation of natural habitats in some regions; the relatively compact structure of nuclear facilities can be considered an advantage in certain environmental contexts.

From another perspective, nuclear energy’s uninterrupted and predictable production capacity can reduce the need for fossil fuel based backup in energy systems. This can indirectly contribute to lower fossil fuel use and consequently lower total emissions especially considering the fluctuating production features of renewable energy sources. So, nuclear energy plays a complementary environmental role to renewable sources.



Furthermore, it should not be overlooked that approaches to safety and waste management in the field of nuclear technology have significantly evolved over time. New generation nuclear reactor designs have been developed with the goals of passive safety systems, more efficient fuel utilization, and waste reduction. While these technological advances do not completely eliminate the environmental risks of nuclear energy, they demonstrate that lessons learned from past accidents have been reflected in environmental policy and engineering practices.

Nevertheless, it should not be concluded that these positive aspects automatically make the potential risks acceptable. Those advantages are only meaningful when supported by strong regulatory frameworks, efficient oversight systems and long-term management plans. Otherwise, short-term environmental gains may be overshadowed by long-term and irreversible costs. Lastly, assessments require contextual analysis rather than absolute right or wrong judgements. Factors such as the urgency of energy needs, existing infrastructure, the potential of alternative energy sources and the level of environmental vulnerability can significantly alter the environmental balance sheet of nuclear energy country by country. Therefore, the assessments should be considered as based on country-specific analyses.

2. *Economical impacts:*

The economic impacts are much more complex than those of other energy sources due to the long term planning requirements of policies. Power plant projects generally cannot be implemented without government support due to high capital requirements, long construction periods and strict safety regulations. The construction cost of a nuclear power plant reaching billions of dollars makes these projects a serious burden on national budgets.

The economics of nuclear power involves consideration of several aspects:

- **Capital costs**, which include the cost of site preparation, construction, manufacture, commissioning and financing a nuclear power plant. Building a large-scale nuclear reactor takes thousands of workers, huge amounts of steel and concrete, thousands of components, and several systems to provide electricity, cooling, ventilation, information, control and communication. To compare different power generation technologies the capital costs must be expressed in terms of the generating capacity of the plant (for example as dollars per kilowatt). Capital costs may be calculated with the financing costs included or excluded. If financing costs are included then the capital costs change materially for nuclear in relation to construction time of the plant and with the interest rate and/or mode of financing employed.

- **Plant operating costs**, which include the costs of fuel, operation and maintenance (O&M), and a provision for funding the costs of decommissioning the plant and treating and disposing of used fuel and wastes. Operating costs may be divided into ‘fixed costs’ that are incurred whether or not the plant is generating electricity and ‘variable costs’, which vary in relation to the output. Normally these costs are expressed relative to a unit of electricity (for example, cents per kilowatt hour) to allow a consistent comparison with other energy technologies. To calculate the operating cost of a plant over its whole lifetime (including the costs of decommissioning and used fuel and waste management), we must estimate the 'levelized' cost at present value. The levelized cost of energy (LCOE) represents the price that the electricity must fetch if the project is to break even (after taking account of all lifetime costs, inflation and the opportunity cost of capital through the application of a discount rate).

- **External costs** to society from the operation, which in the case of nuclear power is usually assumed to be zero, but could include the costs of dealing with a serious accident that are beyond the insurance limit and in practice need to be picked up by the government. The regulations that control nuclear power typically require the plant operator to make a provision for disposing of any waste, thus these costs are 'internalized' as part of operating costs (and are not external). Electricity generation from fossil fuels is not regulated in the same way, and therefore the operators of such thermal power plants do not yet internalize the costs of greenhouse gas emission or of other gases and particulates released into the atmosphere. Including these external costs in the calculation for alternatives improves the economic competitiveness of new nuclear plants and other low-carbon sources of electricity.

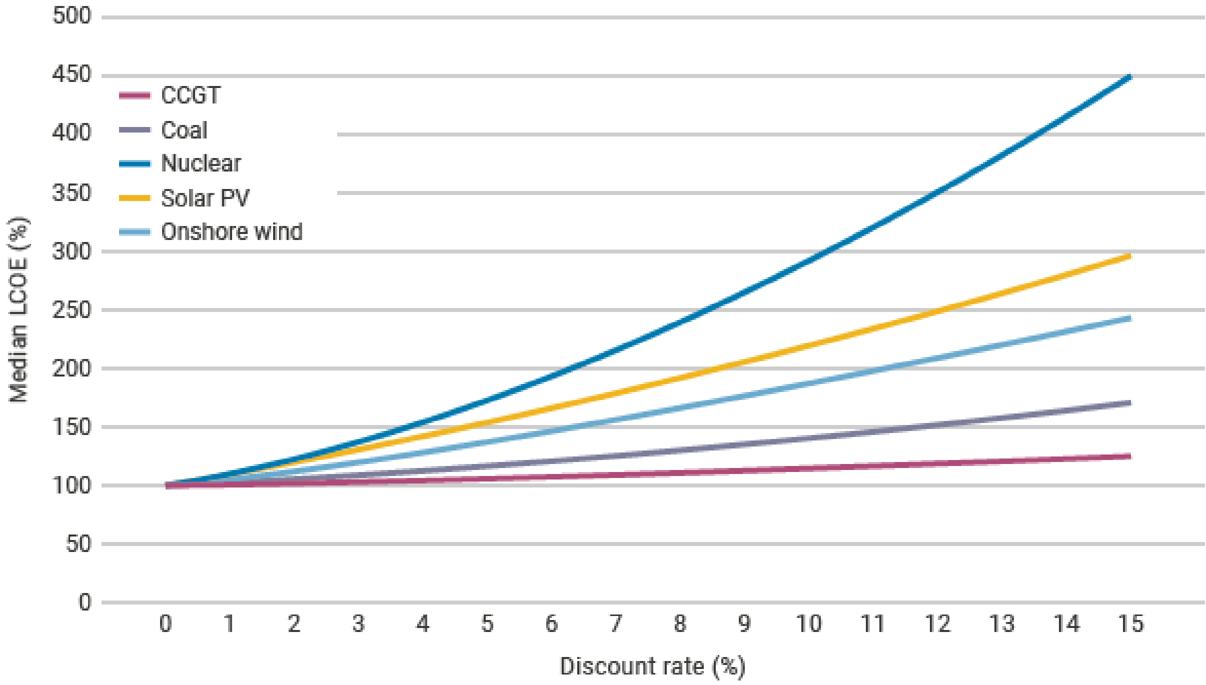
- **Other costs** such as system costs and nuclear-specific taxes.

This economical framework clearly demonstrates why nuclear energy should be addressed through long term policies rather than short term market mechanisms. Nuclear energy investments are not projects with quick returns; rather, they are infrastructure investments aimed at providing stable electricity production for decades. Therefore, focusing solely on initial costs when conducting an economic assessment can be misleading. The continuous and high volume of electricity production they provide over their long operating lives allows the initially high seeming costs to be balanced over time.

One of the most distinctive economic features of nuclear power plants is that, despite their very high capital costs, their operating and fuel costs are relatively low and predictable. Thanks to uranium's high energy density, nuclear fuel costs constitute only a limited part of total production costs. This makes nuclear electricity less dependent on global market fluctuations compared to fossil fuels. Especially during periods when oil and natural gas prices are rapidly affected by geopolitical crises, the price stability provided by power plants becomes a significant advantage for national economies.

However, the economic viability of nuclear energy is largely dependent on financing conditions. The long construction period extends the investment payback period and increases the impact of interest rates on total cost. Even small increases in interest rates can significantly raise the unit cost of electricity from power plants. For this reason, nuclear projects in many countries are supported through government guarantees, long term purchase agreements or public-private partnerships.

Levelized cost of electricity (LCOE) is an important tool for understanding the cost structure of nuclear energy. LCOE reduces all costs incurred over the lifetime of a plant to a single unit cost of electricity. But, this indicator does not always fully indicate the role of nuclear energy. Nuclear power plants have high capacity factors due to their ability to operate continuously for most of the year. This feature contributes to the balancing of the electricity grid and reduces the need for additional reserve capacity.

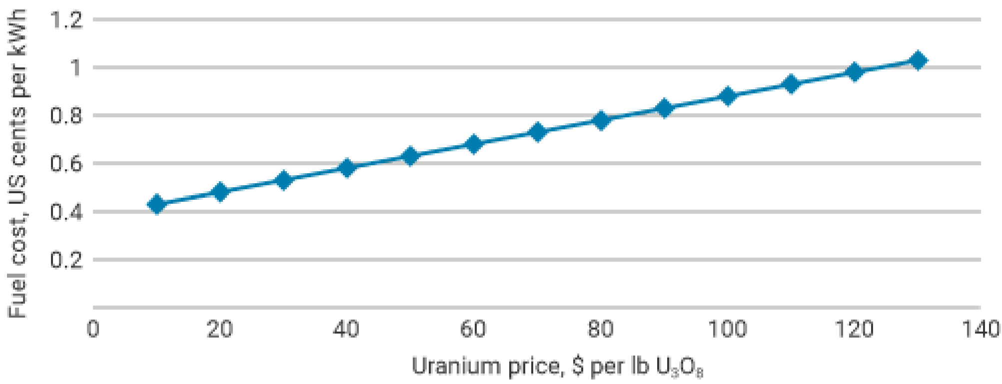


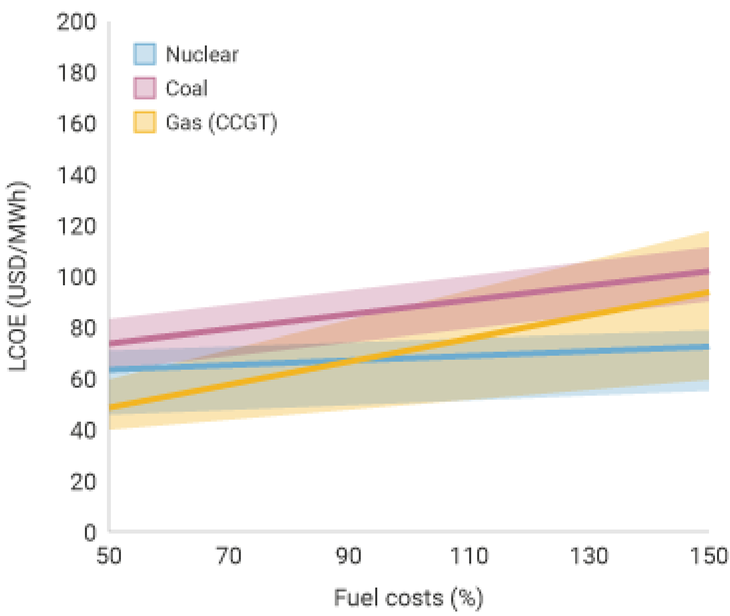
Effect of discount rate on levelized cost of electricity (LCOE) for different technologies

For states dependent on energy imports, nuclear energy offers an option that reduces external dependency. This can contribute to controlling the trade deficit and preserving foreign exchange reserves. Stabilizing energy supply also has an indirect but powerful impact on industrial production.

Also, fossil fuel based electricity generation incurs serious social costs such as air pollution, healthcare expenditures and climate change. A large part of these costs are not borne directly by energy producers and are spread across society as a whole.

In addition, the employment generated during the construction and operation phases provides long term contributions to local economies. These facilities which require a deeper workforce also create indirect benefits in the fields of education and technology. Tax revenues generated by the plants can support local governments' infrastructure and social service investments. Albeit, small modular reactors and advanced nuclear technologies have the potential to reshape the future of nuclear energy. Aiming for shorter construction times and lower initial costs, these technologies seek to reduce the economic risks of nuclear energy. Although these systems are not yet widely used. They are expected to contribute to making nuclear energy more accessible and a flexible economic option in the long term.





Note: Lines indicate median values, areas the 50% central region.

Additional Economic Risks:

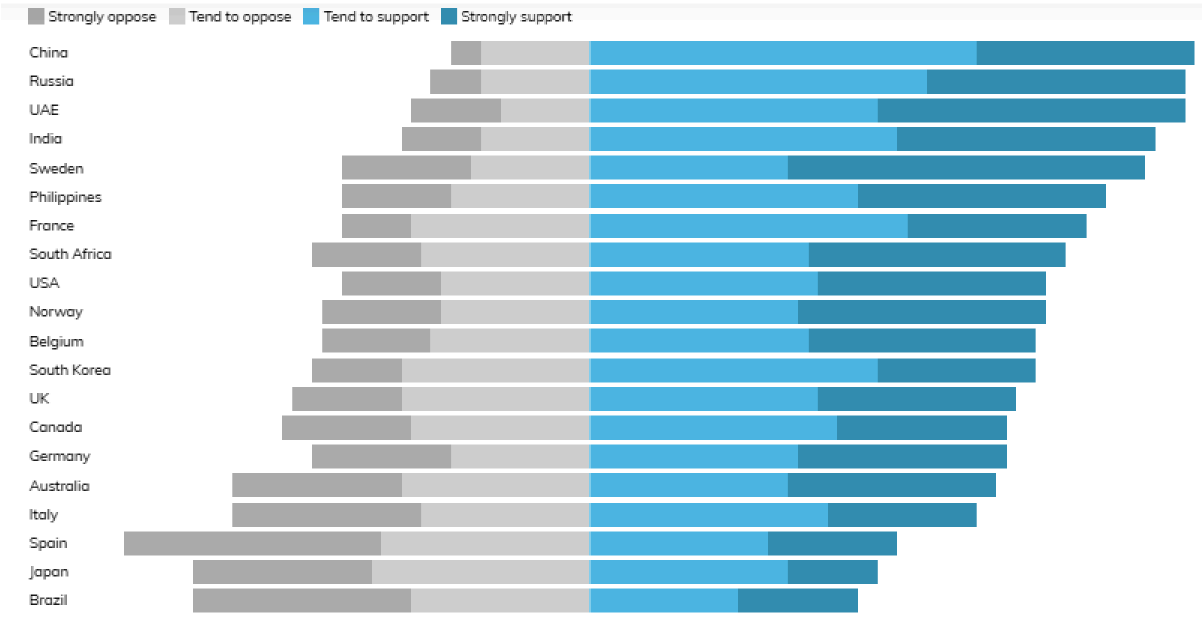
Nuclear accidents and security threats should also be taken into account. Large scale nuclear accidents can lead not only to interruptions in energy production but also to long term environmental cleanup costs, mandatory evacuations, health expenditures, agricultural and industrial losses and serious pressures on public budgets. The Chernobyl and Fukushima accidents clearly demonstrate that the economic effects of such events can last for decades. For example, the total cost of the Fukushima nuclear accident to Japan is estimated to be in the range of $200–250 billion; these costs include plant decommissioning, radioactive cleanup efforts, compensation and structural changes in energy supply.

Similarly, potential attacks or sabotage against nuclear facilities also pose serious economic risks. Although modern power plants are built to high safety standards, the uncertainty that could arise if such a threat materialized could lead to fluctuations in financial markets. Even if such security risks do not materialize directly, they can affect the economic perception of nuclear energy, making it difficult to manage different projects.

3. **Social** ***impacts:***

The social impacts of nuclear energy though often overshadowed by economic and environmental impacts. But, those are one of the most crucial factors that determine peoples' approach. We could consider them separately as perception of safety, health and environmental safety, intergenerational trust and so on.

To prelude, we should consider the perception of safety as playing a crucial role. We know that nuclear accidents are so rare but their strong and critical impact has left persistent marks on the peoples' memories. Disasters such as Chernobyl and Fukushima provide powerful examples of how public opinions perceive these risks. Therefore, anti-nuclear movements gained strength in many countries and public pressure changed the direction of energy policies. Germany's decision to phase out nuclear energy is one of the most striking examples of this social perception translating into political outcomes. You can see the variable perception percentage from the graph above.



Question asked: From what you know about nuclear energy, to what extent, if at all, do you support or oppose using it to generate electricity in your country?
Source: Radiant Energy Group, PACE Index 2023

People living in areas where nuclear power plants are to be built often have concerns about health, environment and safety, while at the same time expecting employment and economic development. In some regions, nuclear power plants increase local prosperity by creating long term job opportunities. Also in other communities, the perception of risk can lead to social tensions and protests.

Health is also a particularly sensitive area. The impact on public health is quite limited under normal operating conditions, but the fear of radiation created in society presents a powerful social impact. This situation raises the importance of communication about risks and transparency in the media. Lack of information or misinformation can pave the way for the distrust of nuclear energy. To decrease this probability, many international organizations emphasize that energy policies must be supported by open communication with the public and participatory decisions.

Also the long term management of radioactive waste creates the question of how today's energy needs burden future generations. This issue is not merely a waste management problem, it is an area of ethical and social responsibility. Society must strike a balance between the current benefits provided by nuclear power and the risks that might arise in the future. This debate is particularly pronounced among the young population and environmental movements. On the other hand, nuclear energy also has significant impacts in terms of scientific education, technological development and specialization. Countries with nuclear programs encourage education in engineering and physics, contributing to a highly qualified workforce development.

Some areas that need to be evaluated;

State Capacity and Institutional Legitimacy:

In countries with strong regulatory bodies, transparent oversight mechanisms and effective crisis management capabilities, nuclear energy can be perceived as an indicator of the state's scientific and administrative competence. Conversely, in countries historically associated with information concealment, delayed intervention or inadequate compensation mechanisms, nuclear projects have deepened public distrust and institutional skepticism.

Media, Information Flow, and Social Panic Dynamics:

A significant portion of the resulting social impacts stem not directly from radiation, but from the failure to manage the flow of information. In the cases of Chernobyl and Fukushima, conflicting official statements, delayed information sharing and alarmist language used in the media created long-term fear, uncertainty and distrust within society. This situation has led to psychological trauma, mass evacuations, and social breakdown even in areas not exposed to radiation. The lack of accurate, timely, and understandable communication during crises is considered one of the key factors that amplify the social impacts.

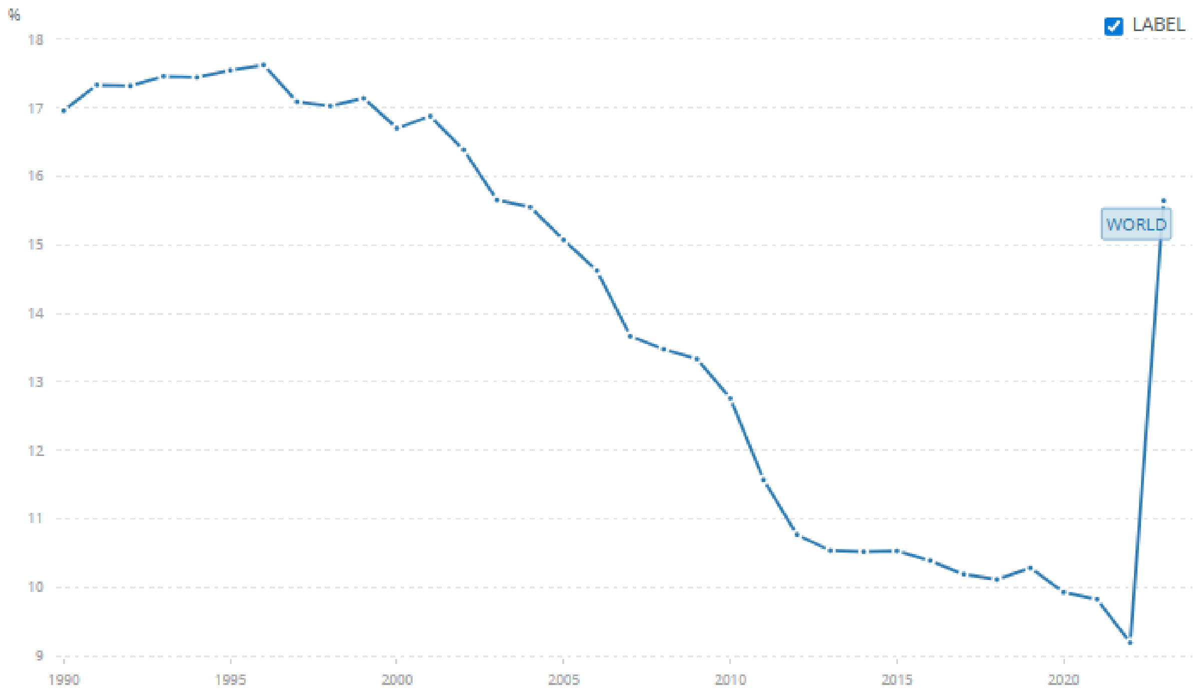
Diseases, Genetic Effects, and Social Concerns:

One of the most debated issues following nuclear accidents is the effect of radiation on cancer cases and genetic mutations. After the Chernobyl accident, a significant increase in thyroid cancer cases was observed, particularly in children; this led to nuclear energy being perceived as a permanent health threat by society. However, scientific studies show that the difference between high-dose exposure and low-dose environmental exposure is not sufficiently understood by the public. Nevertheless, the possibility of genetic damage and intergenerational health risks has led to indirect social consequences, such as social stigmatization, changes in marriage and migration behaviors, especially among communities living in areas affected by the accident.

Population effected	Radiation level on ground (kBq/ m^2 of Cs-137)	Number of people affected	Excess thyroid cancers	Collective effective lifetime dose (person-Sv)	Excess solid cancers & leukemia (excluding thyroid)	Excess cancer deaths (excluding thyroid)
Recovery operation workers		530,000		77,000	*9,000*	*4,000*
Evacuees		115,000		5,000	*600*	*300*
Residents of “more contaminated” areas	>555	25,000	6,000 by 2008	16,000	*2,000*	*1,000*
Residents of “contaminated” areas in Belarus, Ukraine and affected areas of Russia	>37	6.4 million		57,000	*6,000*	*3,000*
All other residents of Belarus, Ukraine and affected parts of Russia	<37	92 million		83,000	*9,000*	*5,000*
All residents of other European countries		500 million		163,000	*19,000*	*9,000*
All other people in the rest of the world; effects largely confined to northern hemisphere				64,000 (1988 UNSCEAR)	*7,000*	*4,000*
Total				465,000	*53,000*	*27,000*

Social Inequality:

Continuous and large-scale electricity production plays a critical role in ensuring the uninterrupted operation of healthcare services, educational infrastructure, and basic public services, particularly in industrialized and densely populated societies. Instability in energy supply can disproportionately affect low-income groups, deepening energy poverty; however, base load sources such as nuclear energy can indirectly contribute to reducing these social inequalities. In this regard, nuclear energy is considered not only a risk factor in terms of social impacts, but also a structural factor affecting quality of life.



Electricity production from nuclear sources (% of total)

5.3. Mounted political tensions and overthrown treaties:

Nuclear energy and nuclear technology have been one of the most sensitive and controversial areas of international politics since their inception. The possibility that the technical infrastructure of civilian nuclear programs could be converted for military purposes has positioned nuclear energy not only as a tool for development but also as a potential security threat. This dual character has weakened trust between states and led to the emergence of constant and layered political tensions surrounding nuclear energy.

Nuclear Energy and the Perception of Sovereignty:

For many countries, nuclear energy is perceived as a symbolic representation of energy independence and national sovereignty. Countries dependent on energy imports, in particular, have viewed nuclear programs as strategic investments that reduce external dependency. However, this perception has been met with skepticism at the international level due to the military potential of nuclear technology. This situation has created constant tension between the right to peaceful use of nuclear energy and global security concerns.

States presenting their nuclear energy programs as a matter of sovereignty has also led to resistance against international monitoring systems. This resistance has also caused the monitoring powers of institutions such as the International Atomic Energy Agency (IAEA) to occasionally become the center of political debates. Thus, even monitoring processes have been transformed into diplomatic crises.

The Fragile Balance Established by the Cold War:

The Cold War era was a period of systematic and institutionalized nuclear tensions. While the destructive capacity of nuclear weapons reduced the likelihood of direct war, it encouraged indirect conflicts and proxy wars. The treaties signed during this period aimed to contain nuclear armament rather than halt it completely.

The NPT has been one of the most comprehensive texts aiming to strike this balance. However, the hierarchy created by the treaty between nuclear-weapon and non-nuclear-weapon states has produced political unrest in the long term. The limited fulfillment of disarmament obligations by nuclear weapon states has undermined the legitimacy of the treaty. This has led some states to question their commitment to the treaty.

Violated and Ignored Treaties:

Over time, many nuclear arms control treaties have either been violated or repealed altogether due to changing security perceptions and political priorities. The end of the ABM Treaty demonstrated how defense systems can turn deterrence into instability. Similarly, the termination of the INF Treaty brought medium-range missiles back on the agenda and raised security concerns, especially in Europe.

The demise of these treaties has profoundly affected not only the relations between the states parties but also the global nuclear order. The ability to disregard treaties in favor of political expediency has undermined confidence in the binding force of international law. This loss of confidence has also made it difficult to negotiate new agreements.

One of the most controversial aspects of nuclear energy is the permeability between civilian and military use. The same technology can be used for energy production, but can also contribute to the development of nuclear weapons. This is particularly evident in uranium enrichment and fuel reprocessing activities.

This technical uncertainty has raised political suspicions and brought nuclear energy projects to the center of international crises. The diplomatic pressures that states face in defending their civilian nuclear programs illustrate why nuclear energy is not only technical but also intensely political.

Regional Crises and Nuclear Diplomacy:

Nuclear energy has become a key determinant of the balance of power in some regions. In regions such as the Middle East, South Asia and East Asia, nuclear capability has become associated not only with energy security but also with claims to regional leadership. This has put nuclear energy at the center of regional conflicts.

The diplomatic processes around the Iranian nuclear program have demonstrated the fragility of multilateral negotiations. The JCPOA has demonstrated how vulnerable technical inspections are when they are not backed by political consensus. The future of the agreement has been directly dependent on political changes.

The case of North Korea shows that nuclear capability can be developed despite international isolation. Sanctions and diplomatic pressure have been insufficient to completely halt the nuclear program. This highlights the limitations of the current nuclear order.

Socio-Political Impacts of Sanctions:

Sanctions against nuclear programs have often had social consequences beyond technical objectives. Restrictions on energy infrastructure have led to economic contraction and unemployment. This has resulted in the political consequences of nuclear energy being reflected directly on the population. Sanctions have also shaped the domestic politics of states. Economic pressures have increased social unrest and questioned the legitimacy of governments. This has placed nuclear energy at the center of domestic political debates.

At the same time, sanctions have tested the extent to which the international community can act collectively on nuclear issues. The lack of cohesion has reduced the effectiveness of sanctions. This has called into question the viability of the nuclear order.

Increased Competition:

Today, strategic competition among great powers has made nuclear treaty regimes even more fragile. New generations of weapon systems and technologies fall outside the scope of existing treaties. This makes the future of the nuclear order uncertain. At the same time, the role of nuclear energy in climate policies is in constant conflict with security concerns. While the need for low-carbon energy puts nuclear energy back on the agenda, political risks complicate this process.

This dual pressure leads to nuclear energy being perceived as both a solution and a risk. States are forced to make difficult choices between energy security and geopolitical stability. Therefore, nuclear energy will continue to be at the center of political tensions in the coming period.

5.4. Current nuclear threats and possible risks:

Today, nuclear threats are far more complex and multifaceted than the dual nuclear tensions of the classic Cold War era. Nuclear risks are no longer limited to the number or strength of weapons possessed by states; technological advancements, political instability, regional conflicts and the increasing role of non-state actors have fundamentally altered the nature of the nuclear threat. Therefore, modern nuclear threats constitute a broad spectrum of risks encompassing both military and civilian spheres.

Despite global efforts towards the peaceful use of nuclear energy, the current international system struggles to fully contain these risks. The weakening of treaties have made nuclear threats more unpredictable. This situation has transformed nuclear energy from merely a security issue into a structural problem threatening global stability.

The current nuclear threats and potential risks discussed under this heading encompass not only “possible scenarios” but also dangers that are currently taking shape. The following subheadings examine the different aspects of these threats in detail.

The Risk of Nuclear Weapons Proliferation and Uncontrolled Acquisition:

The increasing ease of access to nuclear technology and the questioning of international obligations by some states have increased the risk of proliferation. Countries that do not possess nuclear weapons but are approaching technical capacity represent a significant source of uncertainty for global security balances.

While the NPT regime theoretically aims to limit this proliferation, it faces serious practical challenges. The failure of nuclear-armed states to make sufficient progress on disarmament weakens the legitimacy of the treaty. This situation leads some countries to justify their tendency to develop nuclear capacity through criticisms of "double standards."

Furthermore, nuclear proliferation does not only mean new states acquiring this capacity. The modernization and improvement of existing nuclear arsenals also increase the risks. Low-yield or tactical nuclear weapons lower the nuclear threshold and increase the likelihood of their use.

The Risk of Regional Conflicts Taking on a Nuclear Aspect:

The tension between India and Pakistan in South Asia is one of the most concrete examples of this risk. Conventional conflicts between the two countries exhibit a structure susceptible to nuclear escalation in the event of miscalculation or a breakdown in communication.

In East Asia, the Korean Peninsula has become that nuclear threats are constantly on the agenda. North Korea's nuclear capabilities directly affect not only regional, but also global security.

In the Middle East, discussions about nuclear capabilities are further complicating existing conflicts. Political instability and a lack of trust in the region are increasing doubts about whether nuclear programs are being pursued for peaceful purposes. Similarly, in many regions, the concerns are mounting day by day and its consequences are disturbing and involve the public perceptions directly.

Also one of the most concerning aspects is the possibility of nuclear facilities becoming direct targets in the assaults. Civilian nuclear power plants and fuel storage areas are substantial risk zones in conflicts. Damage to these facilities can lead to immediate security problems and long term environmental and societal consequences. Targeting nuclear facilities in interstate conflicts raises serious problems under international law. Even if such attacks do not result in a nuclear accident, they can lead to widespread evacuations and economic losses. This demonstrates how fragile nuclear energy is in strains. In addition, the possibility of terrorist organizations targeting nuclear facilities should be considered also. The theft or dissemination of nuclear materials through sabotage is among the low probability but high impact scenarios. Such threats reveal that nuclear security is not solely an interstate issue.

Cybersecurity and Risks Related to Digital Systems:

Today, most nuclear facilities rely on digital control systems. This makes nuclear security vulnerable to cyber threats. Cyber attacks have the potential to disrupt the operation of nuclear systems without a physical attack.

Such attacks can not only cause direct damage but also lead to operators making erroneous decisions through the generation of false data. This increases the risk of accidental nuclear incidents. Since cyber threats are difficult to detect and identify their source, deterrence mechanisms are also weakened. Furthermore, rapid technological advancements in cybersecurity are causing existing security protocols to become obsolete quickly. The inability of nuclear facilities to adapt to this change leads to an accumulation of risks. This poses a serious threat, especially for older power plants. Cyber threats clearly demonstrate that nuclear risks are no longer limited to the physical realm but have gained a new security dimension in the digital domain.

Human Fault and Management Risks:

Historically, human fault and institutional weaknesses play a significant role in the majority of nuclear accidents. No matter how advanced the systems, the decisions of the people managing these systems, the functioning of the institutions are mainly decisive. Insufficient training, excessive workload and lack of communication can lead to serious consequences in nuclear facilities. (seen in the Chernobyl accident.) While such faults often begin as minor malfunctions, they can escalate into major accidents through chain reactions. Institutional culture is a critical factor in this context. Prioritizing cost or political pressure over safety can lead to the disregard of risks. Therefore, among current nuclear threats, invisible but highly effective managerial risks also hold a significant place.

Climate Crisis and Natural Disasters Increase Nuclear Risks:

Climate change is emerging as a new threat that indirectly increases the scale of nuclear risks. Extreme weather events, floods, rising temperatures and sea level rise can directly affect the safety of nuclear facilities. The Fukushima accident demonstrated the impact of natural disasters on nuclear facilities. This event showed how risks not foreseen during the design phase can lead to catastrophic consequences. Today, similar risks are becoming more common due to the effects of the climate crisis.

Difficulty accessing cooling systems, dwindling water resources and infrastructure damage make the safe operation of nuclear power plants challenging. In the context of the climate crisis, nuclear risks offer a striking example of how human induced threats and natural risks are intertwined.

Miscalculation and Perception Faults:

Perhaps the most dangerous aspect is the risk of escalation stemming from miscalculations and faults in perception. Technical failures in early warning systems and faulty intelligence could lead to the accidental activation of nuclear weapons.

Historically, such "near occurring" nuclear crises have demonstrated the substantiality of the human factor. Today, the acceleration of technology shortens decision making processes and increases the margin of fault. Furthermore, the nuclear rhetoric of leaders can harden perceptions even more during crises. Harsh and threatening language can trigger the defensive reflexes of the opposing side, rapidly escalating tensions. So, nuclear risks depend on political dimensions of decision making processes.

5.5. Past actions and potential precautions:

While the initial steps taken with the emergence of nuclear weapons were far more primitive and fragmented than today's comprehensive treaties, they laid the foundation for the idea of nuclear control. The initiatives undertaken in the late 1940s and early 1950s were primarily shaped by the realization of the devastating consequences for humanity of the uncontrolled proliferation of nuclear weapons. Although proposals developed during this period often failed due to political mistrust, the idea that nuclear energy should be treated as an international issue became entrenched.

One of the most important ideas from this early period was the proposal to place nuclear energy entirely under the control of an international authority. Although this idea was never implemented, it formed the intellectual basis for the monitoring and control mechanisms that would be established later. In particular, the understanding that atomic energy is not only a military tool but also an economic and scientific force became established during this period.

This process gave rise to the idea that states alone cannot manage nuclear risks and clearly demonstrated the need for multilateral cooperation. This awareness paved the way for institutionalized treaties and international organizations in the years that followed.

International Atomic Energy Agency (IAEA):

The International Atomic Energy Agency (IAEA) is an intergovernmental organization that seeks to promote the peaceful use of nuclear energy and to inhibit its use for any military purpose, including nuclear weapons. It was established in 1957 as an autonomous organization within the United Nations system though governed by its own founding treaty, the organization reports to both the General Assembly and the Security Council of the United Nations, and is headquartered at the UN Office at Vienna, Austria.

The IAEA was created in response to growing international concern toward nuclear weapons, especially amid rising tensions between the foremost nuclear powers, the United States and the Soviet Union.

The IAEA serves as an intergovernmental forum for scientific and technical cooperation on the peaceful use of nuclear technology and nuclear power worldwide. It maintains several programs that encourage the development of peaceful applications of nuclear energy, science, and technology; provide international safeguards against misuse of nuclear technology and nuclear materials; and promote and implement nuclear safety (including radiation protection) and nuclear security standards. The organization also conducts research in nuclear science and provides technical support and training in nuclear technology to countries worldwide, particularly in the developing world.

The IAEA's most critical role is to monitor nuclear facilities through its safeguards system and prevent the diversion of nuclear materials. Article III of the NPT provides the legal basis for these inspections. The Agency's reports have played a decisive role in determining the legitimacy of nuclear programs in many countries. However, the Agency's powers are limited by the level of cooperation of states, a situation that has led to serious debates in some crises.

While the IAEA's existence has ensured that nuclear energy is no longer a completely unregulated area, the question of how independent the Agency can remain from political pressure has always been a concern. This clearly demonstrates that nuclear governance is not only a technical issue but also a political one.

Nuclear Non-Proliferation Treaty (NPT):

The NPT is not merely a disarmament document; it is, in fact, a “framework agreement” that defines how the nuclear order will operate. Rather than aiming for the complete elimination of nuclear weapons, the treaty aims at controlling them and keeping them in the hands of the fewest possible number of actors. This approach is a product of a pragmatic perspective shaped by the realities of the Cold War. The success and failure of the NPT largely stem from this realism.

Article I defines the obligations of nuclear armed states. This article explicitly states that nuclear armed states cannot, under any circumstances, transfer nuclear weapons or control over them to another state. The critical point here is not only the physical transfer of weapons; control mechanisms and indirect assistance are also considered within this scope. In other words, a state providing support that facilitates the production of nuclear weapons is considered a violation of this article, just as much as a state “directly giving a bomb” to another country.

Article II is directed at non-nuclear-armed states and requires them to commit not to produce, acquire, or receive assistance in the production of nuclear weapons. This article is one of the clearest and strictest provisions of the NPT. However, it has also been criticized by some states for creating an "unfair status quo." This is because it effectively legitimizes the possession of nuclear weapons by certain countries while permanently excluding others.

Article III forms the basis of the inspection mechanism. According to this article, states that do not possess nuclear weapons agree to be subject to IAEA inspections to prove that their nuclear activities are for peaceful purposes. The main aim here is to prevent the civilian use of nuclear energy from being diverted to military purposes. However, the effectiveness of inspections is directly related to the level of transparency of the states, and this can lead to serious gaps in practice.

Article IV is an often overlooked but politically crucial article. This article emphasizes that all parties have the right to access peaceful nuclear technology. Therefore, the NPT is not merely a text imposing prohibitions, it is also a treaty granting rights. This equilibrium is one of the fundamental elements that makes participation in the treaty possible, especially for developing countries.

Article VI is considered the most controversial and "unfulfilled" clause of the treaty. It obligates nuclear armed states to engage in good faith negotiations toward nuclear disarmament. However, because it lacks concrete timelines or binding objectives, it has been subject to significant criticism over the years. Many states argue that nuclear powers have fulfilled this clause only symbolically.

Comprehensive Nuclear-Test-Ban Treaty (CTBT):

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) bans all nuclear test explosions, whether for military or civilian purposes. The Treaty was opened for signature in 1996 to stop the development of new nuclear weapons and prevent upgrades to existing ones, supporting global efforts in non-proliferation and disarmament.

Another key document is the resolution adopted by the States Signatories on 19 November 1996, which established the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO).

Although the Treaty has not yet entered into force, it has made a significant contribution to international peace and security. It has helped to establish a strong global norm against nuclear testing and built confidence that any nuclear test explosion would be reliably detected.

Article I stipulates the basic obligations under the Treaty. It states that each State Party agrees not to carry out, encourage, or support any nuclear weapon test explosion or other nuclear explosion, and undertakes to prohibit and prevent such activities at any place under its jurisdiction or control.

Article II provides for the establishment of the Comprehensive Nuclear-Test-Ban Treaty Organization in Vienna to oversee the implementation of the Treaty and to serve as a forum for consultation and cooperation among States Parties.

Article III focuses on national implementation measures, requiring each State Party to take the necessary legal and administrative steps to give effect to its Treaty obligations.

Article IV elaborates on the global verification regime to monitor compliance with Treaty provisions. The regime is to comprise a global network of monitoring stations (the International Monitoring System), an International Data Centre in Vienna, a consultation and clarification process, On-site Inspections and confidence-building measures .

Article V outlines measures to redress a situation which contravenes the CTBT provisions and to ensure compliance with the Treaty.

Article VI deals with the settlement of disputes that may arise concerning the application or the interpretation of the Treaty.

Article VII is concerned with amendments to the Treaty.

Article VIII stipulates when a review of the Treaty will take place after its entry into force .

Article IX states that the Treaty is of unlimited duration.

Article X deals with the status of the Protocol and the annexes.

Article XI is concerned with the signature of the Treaty.

Article XII deals with ratification of the Treaty.

Article XIII is about accession to the Treaty.

Article XIV is about the Treaty's entry into force . This will take place 180 days after the 44 States listed in Annex 2 to the Treaty have all ratified.

Article XV specifies that the Treaty shall not be subject to reservations.

Article XVI refers to the Depositary of the Treaty.

Article XVII deals with the authenticity of Arabic, Chinese, English, French, Russian and Spanish Treaty texts.

Strategic Arms Reduction Treaties (START I, START II, New START):

START I:

START I was one of the most comprehensive steps taken to control nuclear competition. The treaty reduced the number of warheads and meticulously regulated issues such as how these weapons were deployed and transported. In this respect, START I functioned more as a "nuclear accounting system" than a classic disarmament document.

Article II outlines the treaty's fundamental conceptual framework. This article provides clear definitions of what constitutes "strategic offensive weapons." Intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and strategic bombers are explicitly defined within this scope. The importance of these definitions lies in clarifying which systems the limitations introduced in subsequent articles apply to. The elimination of ambiguity in definitions made it difficult for parties to adapt the treaty to their own advantage.

Article III regulates quantitative limitations. According to this article, the parties commit to reducing the number of deployed strategic nuclear warheads below a certain upper limit. However, it is noteworthy that the limitation extends not only to the warheads themselves, but also to the launch systems carrying them. In other words, the treaty attempts to control the "potential held." This approach goes beyond mere numerical reduction, aiming for long-term strategic balance.

Article V addresses modernization and restructuring. While it does not completely prohibit parties from upgrading their existing systems, it includes provisions to prevent exceeding the limitations imposed by the treaty. This article acknowledges that technological progress cannot be completely halted, but aims to prevent it from escalating into an uncontrolled arms race.

Articles XI and XII form the backbone of verification and inspection mechanisms. These articles grant parties the right to mutual data sharing, notification obligations, and on-site inspections. On-site inspections, in particular, have enabled a level of transparency that seemed almost impossible during the Cold War. Thanks to these clauses, START I has ceased to be merely a treaty on paper and has become a practically enforceable agreement.

START II:

START II is the continuation of START I. One of the most critical provisions of the treaty was the ban on land-based ballistic missiles with multiple independently targetable warheads (MIRVs). MIRV systems were seen as elements that increase nuclear instability because they allow multiple targets to be hit with a single missile.

However, the implementation of its articles faced significant resistance due to political mistrust and strategic concerns. For Russia in particular, the elimination of MIRV systems meant a weakening of its deterrent capabilities. Although legally signed, the treaty never fully entered into force. This situation rendered START II a failed treaty.

New START:

New START aims to continue the legacy of previous START treaties with a simpler structure. While adapting to the changing security perceptions of the post Cold War era, the treaty managed to preserve verification and transparency mechanisms.

Intermediate-Range Nuclear Forces Treaty (INF):

The INF Treaty is unique in that it completely eliminates a specific category of weapons. The treaty prohibited the production, deployment, and use of land-based ballistic and cruise missiles with a range of 500 to 5500 kilometers. This meant not just a limitation, but outright annihilation.

The provisions of the INF imposed an obligation on the parties to destroy their existing systems and meticulously regulated the monitoring of this process. On-site inspections were one of the most innovative aspects of the treaty. However, technological advancements and political uncertainties have weakened the sustainability of the INF over time.

Bilateral Confidence-Building Measures and Hotlines:

Mechanisms outside of formal agreements, but vital for crisis management, have also played a significant role in mitigating nuclear risks. Direct communication lines (hotlines), in particular, aimed to prevent nuclear crises stemming from misunderstandings. These mechanisms were shaped more by practical needs than by written clauses.

Such arrangements clearly demonstrate that nuclear threats are linked not only to the number of weapons but also to a lack of communication.

6. Questions to be Addressed:

1) ***Following the weakening of fundamental treaties such as INF and START, how can arms control and disarmament mechanisms be strengthened to prevent a new global nuclear arms race?***

2) ***Are existing international monitoring and verification mechanisms, primarily the IAEA, sufficient to ensure transparency in nuclear activities, and how can the independence of these structures from political influence be increased?***

3) ***How can the distinction between civilian nuclear programs and military nuclear capacity be made clearer and more verifiable, while protecting states' right to access peaceful nuclear energy?***

4) ***How should the responsibilities of the international community be defined in the face of the transnational economic, social, and environmental impacts of nuclear accidents or deliberate attacks?***

5) ***How do increasing geopolitical tensions and the use of nuclear threats as a political tool affect global security, and what diplomatic means can mitigate these risks?***

6) ***Given radioactive waste and long-term nuclear risks, how should ethical principles and intergenerational responsibility be integrated into nuclear policies?***

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