

Evaluating Indonesia's Energy Resilience Amid Major Power Rivalry in the Indo-Pacific

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Abstract

Weapons of Mass Destruction (WMDs), particularly nuclear weapons, possess immense destructive power through nuclear fission and are capable of causing mass casualties and long-term environmental damage. This research aims to analyze the positive and negative impacts of nuclear weapons on global stability, as well as their influence on international relations and the balance of power among nations worldwide. This research employs a qualitative descriptive-analytical approach. Data were collected through library research using scientific journals, reports from international institutions, and media coverage and were analyzed using content analysis techniques to identify patterns and relationships among the arguments presented. The findings reveal that nuclear weapons have a dual impact. On the one hand, they may provide nuclear-armed states with a sense of security and deterrence in safeguarding their national interests. In addition, nuclear technology based on controlled fission can be used for peaceful purposes, including electricity generation through nuclear power plants (NPPs). On the other hand, the negative impacts are considerably more significant, including heightened tensions and insecurity among neighboring countries, threats to global peace, disruption of the balance of power, and risks of severe environmental damage and harm to future generations in the event of nuclear accidents, proliferation, or misuse. Nuclear weapons are highly destructive weapons that may provide strategic deterrence and security advantages to nuclear-armed states while simultaneously posing serious threats to global peace and the balance of power among states. Therefore, the possession and potential use of nuclear weapons require stringent international oversight, responsible governance, and sustained disarmament and non-proliferation efforts to reduce the risk of catastrophic consequences in the future.



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INTRODUCTION

Weapons of Mass Destruction (WMDs) are weapons capable of causing large-scale death, destruction, or disruption and generally include nuclear, radiological, chemical, and biological weapons (Ahmed & Al Diab Al Azzawi, 2024; Cordesman et al., 2022; Nichols et al., 2022; Polat, 2024). Another definition describes WMDs as weapons capable of inflicting extensive casualties and widespread destruction when employed in armed conflict or against civilian populations. Such weapons may involve nuclear, biological, chemical, or radiological mechanisms (Wirtz, 2013). Simply put, WMDs are weapons capable of causing extensive

destruction and significant casualties on a large scale. Their destructive effects can be comparable to those of atomic weapons, particularly in terms of their capacity to cause mass casualties and widespread physical damage (Encyclopaedia Britannica, n.d.-c). In this paper, the researchers focus on one category of WMDs: nuclear weapons. Nuclear weapons derive their explosive energy primarily from nuclear fission or, in thermonuclear weapons, from a combination of nuclear fission and fusion, thereby possessing an extraordinary potential for mass destruction.

Nuclear weapons were first used in warfare in 1945 during World War II, when the United States dropped atomic bombs on the Japanese cities of Hiroshima and Nagasaki. These bombings caused massive immediate casualties, while many additional deaths occurred subsequently as a result of burns, injuries, radiation exposure, and other long-term health effects. The unprecedented destructive consequences of these attacks demonstrated the strategic significance of nuclear weapons and subsequently influenced how major powers conceptualized national defense, deterrence, and military security.

Weapons of mass destruction are generally classified into several categories, including biological weapons, chemical weapons, and nuclear weapons (Encyclopaedia Britannica, n.d.-c). Biological weapons employ pathogenic microorganisms or biological toxins, including certain bacteria, viruses, fungi, or toxins, to cause disease or death in humans, animals, or plants. Rather than being weapons of "mass deterrence," they are more accurately classified as biological weapons of mass destruction. The development, production, acquisition, stockpiling, and use of biological weapons are prohibited under international frameworks such as the Biological Weapons Convention (BWC), which was opened for signature in 1972. Furthermore, chemical weapons employ toxic chemicals and their precursors to cause death, injury, temporary incapacitation, or sensory irritation through their chemical effects (Encyclopaedia Britannica, n.d.). Chemical weapons were used extensively during World War I and included agents such as chlorine, phosgene, and sulfur mustard (Encyclopaedia Britannica, n.d.-b). Meanwhile, nuclear weapons are among the most destructive weapons ever developed. Although they have been used in warfare only twice, their destructive effects are exceptionally severe and may result in long-term humanitarian and environmental consequences. The atomic bombings of Hiroshima and Nagasaki in 1945 caused tens of thousands of immediate deaths, with the overall death toll increasing substantially in the following months as a result of injuries and radiation-related effects (Kristensen et al., 2023).

From the perspective of nuclear physics, nuclear reactions should not be characterized as entirely "clean" simply because they do not involve conventional combustion. Nuclear fission does not directly produce carbon dioxide through combustion; however, it generates ionizing radiation, radioactive fission products, and radioactive waste that require stringent management (Lamarsh, 2002). Nuclear reactors operate through controlled nuclear fission, during which a heavy atomic nucleus absorbs a neutron and splits into lighter nuclei, releasing additional neutrons, gamma radiation, and substantial amounts of energy. These released neutrons can initiate further fission reactions, creating a controlled chain reaction within the reactor. In nuclear engineering, an important distinction is made between fissile materials, which can sustain a nuclear fission chain reaction with thermal neutrons, and fertile materials, which can be converted into fissile isotopes through neutron absorption and subsequent radioactive decay (Lamarsh, 2002).

In practice, nuclear weapons represent a serious threat not only to individual states but also to global security. Nuclear weapons have been used in warfare only twice, both during World War II, when the United States dropped atomic bombs on Hiroshima and Nagasaki in Japan. World War II, which lasted from 1939 to 1945, involved numerous states and major powers and became the first and, to date, only armed conflict in which nuclear weapons were used. In the contemporary international system, nine states are generally recognized as possessing nuclear weapons: the United States, Russia, the United Kingdom, France, China, Israel, India, Pakistan, and North Korea (Bell, 2024).

Although nuclear weapons have not been used in armed conflict since 1945, their continued existence poses significant risks to the global population. Nuclear weapons are classified as weapons of mass destruction (WMDs) because of their extraordinary capacity to cause widespread casualties and destruction. A single nuclear weapon detonated over a densely populated area could destroy large portions of a city, cause enormous numbers of casualties, and seriously damage the surrounding environment. Moreover, radioactive fallout and other long-term consequences of nuclear detonations may adversely affect human health, ecosystems, infrastructure, and future generations, potentially resulting in catastrophic humanitarian and environmental consequences (Wirtz, 2013).

Previous studies have examined various aspects of nuclear weapons and nuclear technology, including their role in international diplomacy (Purwono & Zuhri, 2010), the potential of nuclear technology as an alternative energy source through nuclear power plants (Arindya, 2014; Sukir & Soenarto, 1993), and the threat posed by nuclear weapons to world peace (Yustiningrum, 2007). In addition, previous scholarship has addressed other categories of WMDs, including chemical and biological weapons. Chemical weapons, which were used extensively during World War I, employ toxic chemical agents, whereas biological weapons employ pathogenic organisms or toxins. International legal regimes have subsequently sought to prohibit their development, production, stockpiling, and use. However, most previous studies have tended to examine individual dimensions of nuclear weapons or nuclear technology—either their security implications or their peaceful energy applications—without providing a comprehensive analysis of their broader implications for global stability. Furthermore, limited research has systematically integrated balance-of-power theory to explain how nuclear weapons influence state behavior and international relations in a comprehensive manner. To address this gap, this research adopts the concept of balance of power as its primary theoretical framework, rooted in realist theory within international relations. Realists contend that states are inherently competitive and self-interested actors operating within an anarchic international system in which survival and security are paramount (Schweller, 2016). To ensure their security, states seek to accumulate power, including military capabilities, to deter potential threats. The balance-of-power concept posits that when one state develops overwhelming capabilities or demonstrates behavior perceived as threatening, other states may respond by strengthening their own capabilities or forming alliances to counterbalance it, thereby preventing the concentration of power in a single actor. This framework is particularly relevant to the analysis of nuclear weapons because the possession or expansion of nuclear capabilities by one state may prompt strategic responses from others, thereby shaping regional and global security dynamics.

The objectives of this study are threefold: to analyze the potential positive implications of nuclear weapons for national security and international relations; to examine their negative consequences for global peace, environmental sustainability, and human security; and to evaluate the role of nuclear weapons in shaping the balance of power among states in the contemporary international system. This research is expected to provide both theoretical and practical contributions. Theoretically, it contributes to the study of international relations by enhancing understanding of how weapons of mass destruction, particularly nuclear weapons, influence global stability and the balance of power. Practically, the findings may serve as a reference for policymakers, diplomats, and international organizations in developing strategies related to nuclear non-proliferation, arms control, disarmament, and the peaceful use of nuclear technology while also increasing public awareness of the risks and potential benefits associated with nuclear technology. By offering a balanced assessment of the strategic implications and risks of nuclear weapons within a unified theoretical framework, this study seeks to address the identified research gap and contribute to a more comprehensive understanding of the role of nuclear weapons in contemporary global politics.

METHOD

This research employed a qualitative method with a descriptive-analytical approach. Data were collected through library research using secondary sources, including scientific journals, academic articles, reports from international institutions, and relevant media coverage on weapons of mass destruction and nuclear weapons. The data were analyzed using qualitative content analysis by identifying, classifying, and interpreting relevant information to examine patterns and relationships among arguments concerning the impact of nuclear weapons possession on global stability. The findings were subsequently interpreted using the balance-of-power concept as the theoretical framework to explain how the possession and development of nuclear weapons by one state influenced the behavior of other states in maintaining strategic equilibrium and international stability. This analytical process was used to address the research question concerning the implications of nuclear weapons for global stability.

RESULTS AND DISCUSSION

Nuclear weapons are classified as *Weapons of Mass Destruction*, or among the most powerful and largest weapons in the world. The presence of nuclear weapons certainly has both positive and negative impacts, and has given rise to various perspectives, both pro and con. It is undeniable that nuclear weapons will have many impacts, including both positive and negative ones. After discussing the background of the problem and using eight journals as a literature review, the researcher's discussion will focus on how nuclear weapons have both positive and negative impacts in various fields globally, and also answer the stated problem formulation.

On the topic that the researcher uses, namely nuclear weapons as a weapon of mass destruction *The concept of balance of power*, which is used as a force by countries around the world to defend their respective countries, falls under realist theory. Realists believe that states and humans are inherently aggressive and egocentric, making international politics an arena for struggle to gain and maintain power. To maintain power, they can build up military strength

and weapons to guard against unforeseen events (Albert, 2025; Ataka, 2024; Dunne, 2024; Umar, 2024).

The realist position, with its *balance of power concept*, creates a bipolar structure and creates a "negative" peace. When a country exhibits suspicious behavior, other countries attempt to balance or even surpass the suspected country's power in order to defend and protect their own. The researcher chose *the balance of power concept* because, according to their research, it can answer the research questions in this paper. The balance of power concept can demonstrate whether a country's possession of nuclear weapons will create a sense of security and peace among the world's nations or lead to a competition to maintain their respective security and stability.

As written in the eighth journal entitled "**THE ROLE OF NORTH KOREA'S NUCLEAR AS AN INSTRUMENT OF INTERNATIONAL POLITICAL DIPLOMACY** (Purwono & Zuhri, 2010)" discusses further the nuclear weapons used by North Korea in conducting diplomacy and also making nuclear weapons a national interest in protecting the regime, security (military), and also the economy.

However, on the other hand, *the balance of power* can also be understood and further analyzed in the discussion of the sixth journal. Still related to *the balance of power* which is also further explained in the sixth journal entitled "**NUCLEAR WEAPONS PROBLEMS AND THE FUTURE OF WORLD PEACE** (Jargin, 2016)." This journal discusses how the existence of nuclear weapons can threaten world peace. This can be further understood with the example of North Korea. North Korea uses nuclear weapons to maintain its security and national interests. However, on the other hand, North Korea also causes panic and tension for surrounding countries by possessing active nuclear weapons.

In addition to enhancing the security of each country through various fields, nuclear can also be an alternative energy to become a Nuclear Power Plant (PLTN) that has a fairly low risk to the surrounding environment. In the second journal entitled "**SAFETY STUDY OF NUCLEAR POWER PLANT** (Bolton, 2021)" by Radita Arindya, (2014) it is stated that in the process of nuclear power plants, standardization is needed that must strictly supervise the nuclear construction process. However, according to the research group, the author does not explain in detail how the form of nuclear supervision standardization is carried out during the construction process for the use of nuclear power in the nuclear power plant itself.

The use of Nuclear Power Plants is also a topic of controversy for the journal "**CRITICAL DISCOURSE ANALYSIS OF NUCLEAR POWER PLANT DEVELOPMENT DISCOURSE IN ONLINE MEDIA**" by Shiddiq Sugiono. This concept is related to the use of technology and social media. The relationship between the two creates a hegemonic construction in the flow of information and media, but the author does not include in detail the critical attitudes and actions towards nuclear power as well as the objectivity of online media that indicates the power of the nuclear industry. From the journal "**THE DANGER OF NUCLEAR PLTN TO THE ENVIRONMENT: AN ANTICIPATION OF PREVENTION** (Utomo et al., 2019)" by Sukir and Sunaryo Soenarto, (1993) it is explained in detail that nuclear power can be an alternative resource to replace water resources, natural gas, petroleum, geothermal, and natural gas.

power plants (NPPs) are also considered a type of energy source that can be used long-term and is relatively inexpensive, but they can be extremely dangerous if leaks occur,

damaging the environment and living things. Besides their usefulness in everyday life, according to the journal "NUCLEAR WEAPONS PROBLEMS AND THE FUTURE OF WORLD PEACE," Gartzke & Kroenig, (2016, 2017) work on nuclear weapons also has the potential to threaten world peace. For example, North Korea's nuclear tests have affected the security and stability of other countries. These tests have aroused suspicion and anxiety in other countries, making them feel their national peace is threatened. Given that nuclear weapons are one of the largest and most powerful weapons with devastating effects, it is understandable that other countries would feel uneasy and threatened.

Using the research question " **What impact does the presence of nuclear weapons have on the global world?**" and the chosen *balance of power concept*, it can be concluded that nuclear weapons have various impacts on global life and international relations between countries. These impacts are divided into positive and negative ones. The positive impact of nuclear weapons is the emergence of a sense of security and protection because a country possesses nuclear weapons for national protection. However, nuclear weapons also have negative impacts. These negative impacts impact both the environment and other social beings. For example, the possession of nuclear weapons by a country will create tension between surrounding countries and also cause discomfort. In addition to the impacts related to other countries, nuclear weapons also have a negative impact on the surrounding environment.

CONCLUSION

Weapons of Mass Destruction (WMDs), particularly nuclear weapons, possess immense destructive power derived from nuclear fission and are capable of causing mass casualties and long-term environmental devastation. The analysis revealed that nuclear weapons have dual implications. On the positive side, their possession may provide nuclear-armed states with a sense of security and strategic deterrence in safeguarding national interests. In addition, nuclear technology based on controlled fission can be utilized for peaceful purposes, including electricity generation through nuclear power plants. On the negative side, nuclear weapons threaten global peace, heighten tensions among neighboring states, affect the balance of power, and pose potentially catastrophic consequences for present and future generations if used or mishandled. Although nuclear weapons have not been used in armed conflict since World War II, their continued possession by nine nuclear-armed states continues to pose substantial risks to international security and strategic stability.

Based on these findings, several recommendations are proposed. Nuclear-armed states should strengthen their commitments to nuclear non-proliferation, arms control, and disarmament frameworks and engage in constructive diplomatic dialogue aimed at reducing nuclear risks and stockpiles. The international community, particularly the United Nations and relevant international institutions, should strengthen monitoring, verification, and compliance mechanisms concerning nuclear agreements. Furthermore, states should support the safe and peaceful development of nuclear energy while maintaining rigorous safety, security, and environmental standards. Future research should expand this study through comparative analyses of nuclear-armed and non-nuclear states, evaluations of international disarmament initiatives, and examinations of emerging nuclear security dynamics. Such research may provide more comprehensive insights into managing nuclear risks and promoting sustainable international peace and security in the contemporary era.

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