

BUFFER ZONE IN INDONESIAN TERRITORY TO ANTICIPATE IMPACTS OF NUCLEAR WAR ON KOREAN PENINSULA

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The nuclear issue on the Korean Peninsula in recent decades is considered to have become one of the serious threats to security and stability in East Asia in particular and the world in general. Being an endless topic of conversation is based on the politics applied by North Korea which makes the international world always alert. Indonesia is directly or indirectly one of the countries that will be affected by the Korean peninsula nuclear war. The impact of radiation from the Korean Peninsula nuclear war affects health impacts, environmental impacts and socio-economic impacts. Buffer zones as one of the alternative steps to mitigate the impact of nuclear war. The method used in this research is a literature review that refers to the development of political issues between the North Korean and South Korean blocks, the theory of buffer zones that have been applied in warfare and studies of the impact due to nuclear radiation that has occurred. The purpose of this research is to mitigate and minimize the impact of the Korean peninsula nuclear war that will be received by the Indonesian region. From the results of the discussion, it can be concluded that the buffer zone is effective as an anticipation of the threat of nuclear war on the Korean peninsula because it can create a security and preparedness zone for the population and planning for strengthening infrastructure that supports the anticipation of the impact of nuclear war. The results of this study contribute to be used as a basic material for strategies to deal with nuclear war on the Korean peninsula.

Key Words: *Buffer Zone, Anticipate nuclear war, Literature review*

1. INTRODUCTION

The Korean Peninsula was originally part of the Japanese empire until the outbreak of World War II when it was decided that the Korean Peninsula was divided into

two along the 38th parallel. It is known that although the history, national language race and geographical area of the two Korean peninsula countries are almost the same because of different ideologies the behavior of these two countries

is different in viewing the world this is a challenge to resolve the nuclear energy and missile conflict on the Korean Peninsula. This region has become strategic in East Asia and continues to be involved in security issues, especially related to North Korea's nuclear and missile development (Khoiriyah, 2020). Over the past three decades, the Korean Peninsula nuclear issue has been considered one of the most serious threats to security and stability in Northeast Asia (Barannikova, 2022).

North Korea's increasing nuclear capability continues to carry out the mission of developing nuclear weapons to be able to demonstrate its existence in international diplomacy, as well as being a tool in policy-making for the benefit of the regime. The development of North Korea's nuclear weapons can exacerbate the security dilemma of regional countries in East Asia which then destabilizes regional relations which will strengthen the alliance between the United States and Japan (M manoe, 2022). Seeing these developments, Indonesia must plan prevention and preparation to minimize the impact that will be received.

The impact of nuclear war that occurs in the surrounding area has harmful effects, both short-term and long-term effects. The impact of nuclear radiation can threaten the

security and defense of a country, security threats include health and food and affect the economic stability of the affected country and the stability of the population's security defense (Dzaky, 2023). The government's participation in preventing these events needs new thoughts or alternatives as an initial stage of prevention. Thus, it is hoped that Indonesia will be able to carry out mitigation and planning to face the threat of nuclear war on the Korean peninsula by preparing areas that may be affected, as well as all facilities and infrastructure needed to support readiness in facing the threat of nuclear war to minimize the losses that will be received.

Buffer zone is a zone or area that has a geographical location and strategic function that is made to detect, track to reduce the impact of potential nuclear threats to areas that are at high risk of becoming targets of nuclear attacks in this region as the first layer in the defence of a country. To ensure the security and territorial integrity of a country. Indonesia, as a major country in the Indo-Pacific region, the determination of the Indonesian Buffer Zone (IBZ) will have significant implications for regional and global security (Moreta et al., 2024). The development of a buffer zone as an anticipation of nuclear threats is a new thing that we need to

analyse to maximize the benefits obtained.

This research has several objectives. First, to find out what impacts will occur in the Indonesian region due to radiation from the Korean peninsula nuclear war. Second, which areas are likely to be affected by the Korean peninsula nuclear war? Third, how the buffer zone strategy is applied in the Indonesian region to minimize the impact received due to the Korean peninsula nuclear war?

This research provides several contributions. First, research on the anticipation of the threat of nuclear war on the Korean peninsula is beneficial to public awareness of the dangers posed by nuclear radiation, knowing procedures during emergency conditions, evacuation routes and shelter locations and community preparedness in dealing with emergencies. Third, this research can be taken into consideration to analyze planning strategies in dealing with disasters due to nuclear radiation.

2. LITERATURE REVIEW

2.1. Nuclear Threat

North Korea has again become the focus of international attention with its nuclear program. Nuclear development was first carried out during the reign of Kim Il-Sung with the construction of a nuclear complex in Yonghyeon. The nuclear complex

is currently a weapons procurement base for North Korea. During the reign of Kim Jong-II. The North Korean nuclear threat is increasing, and the phenomenon of North Korea's nuclear weapons testing is a threat to security stability (M manoe, 2022). In the context of international politics, the possession of nuclear weapons by a country does have a very high bargaining value, so nuclear can be used as an instrument of state power. The nuclear program is considered to have an impact on the emergence of major disasters such as famine, misery and death. In addition to endangering the environment, health and human life, it seems that the nuclear program also affects the economic downturn in some regional countries.

The reason North Korea uses nuclear as a diplomatic tool is the survival, economic and security regime because it thinks that as a small country with many limitations, it needs a strategy to achieve its national interests, including its nuclear development (Andi & Ahmad, 2010). North Korea's nuclear program is an integral part of the country's political economy, serving as an important tool for the Kim regime to maintain power. The program is used as a bargaining chip in international diplomacy, allowing North Korea to extract economic concessions from other countries, which is vital to its struggling economy (Habib, 2011).

2.2. Theory of Buffer Zone

The tension of the political situation on the Korean peninsula is an issue that never subsides, the conflict between North Korea and South Korea is often involved in unstable regional tensions due to various background factors. The background of the Korean conflict, the role of the Soviet Union and China in supporting North Korea, as well as US support for South Korea, and the role of Japan in the struggle for influence in Korea, which was originally only economic and regional interests, increased as the Cold War ideological competition (Rustamana et al., 2023). Coupled with the military power of North Korea, which continues to test nuclear bombs, making threats from South Korea directly and neighboring countries that may be affected, one of which is Indonesia. As a step to anticipate the nuclear impact on the territory of Indonesia, we need to study how to overcome it to minimize the effects on the territory of Indonesia.

The buffer zone strategy is not a new concept, the buffer zone concept evolved from the desire to protect the core area more than the buffer zone conservation area to minimize negative impacts to humans in particular. A buffer zone is a region or area placed around a country to provide protection and slow or inhibit the progress of a potential aggressor before it reaches the core area (Moreta et al., 2024). So the main purpose of the buffer zone for anticipating nuclear threats on the Korean

peninsula is to reduce the risks that arise such as the risk of spreading nuclear radiation to other areas and cooperate with other countries to coordinate in dealing with the threat of nuclear war on the Korean peninsula.

Some purposes of buffer zones in times of war. Demmers' exploration of violent conflict theories suggests that buffer zones can help manage group dynamics by reducing direct interactions between conflicting parties, thus lowering the likelihood of violence (Demmers, 2016). The model of war zone stressors by Fontana and Rosenheck underscores the psychological toll of war, including PTSD. Buffer zones can potentially reduce exposure to direct combat stressors, thereby mitigating psychological harm to military personnel and civilians alike (Fontana & Rosenheck, 1999). The concept of buffer zones as a means of conflict mitigation and resource management in conservation can also be relevant in managing the aftermath of nuclear events, where resource allocation and community involvement are critical (Paudel et al., 2007). Critics argue that buffer zones can be ineffective or even counterproductive, as they may not address the underlying causes of conflict and can become areas of hidden competition and tension (Behner & Meibauer, 2016).

3. METHOD

This research uses the literature review method. The literature review in this study first examines various previous research studies. Second, summarize and describe the results of previous research that are relevant to the topics discussed in this study. Third, determining research questions and answering research questions based on a summary of previous research to be applied to the topic of this research problem.

Before starting the research, the researcher will compile the research stages that we can see in Fig.1 below.

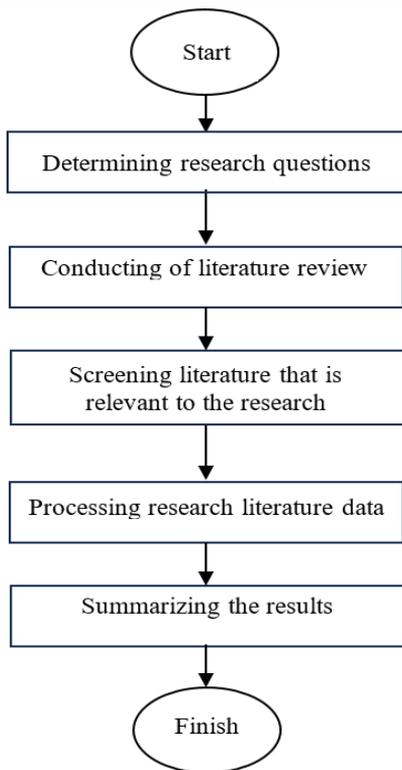


Fig.1 Research Stages

Furthermore, the research flow is discussed and described based on the literature review, will be drawn in a conceptual framework. Starting from taking the topic of buffer zones as an anticipation of the threat of nuclear war on the Korean peninsula, describing the theory of buffer zones with various objectives ranging from environmental, military and socio-economic designations. From the topic taken buffer zone theory for the military, the next step is to determine the research questions by the objectives of this research discussion. Furthermore, from the basis of the literature review, a discussion will be carried out to find answers to the research questions, which will conclude the discussion according to the topic taken.

From the conclusion of the literature review, the objectives and benefits that can be applied in the event of a nuclear war can be taken to minimize the impact of threats and losses incurred and become a planning material for overcoming and mitigating natural disasters and disasters due to war. The following conceptual framework is shown in Fig. 2.

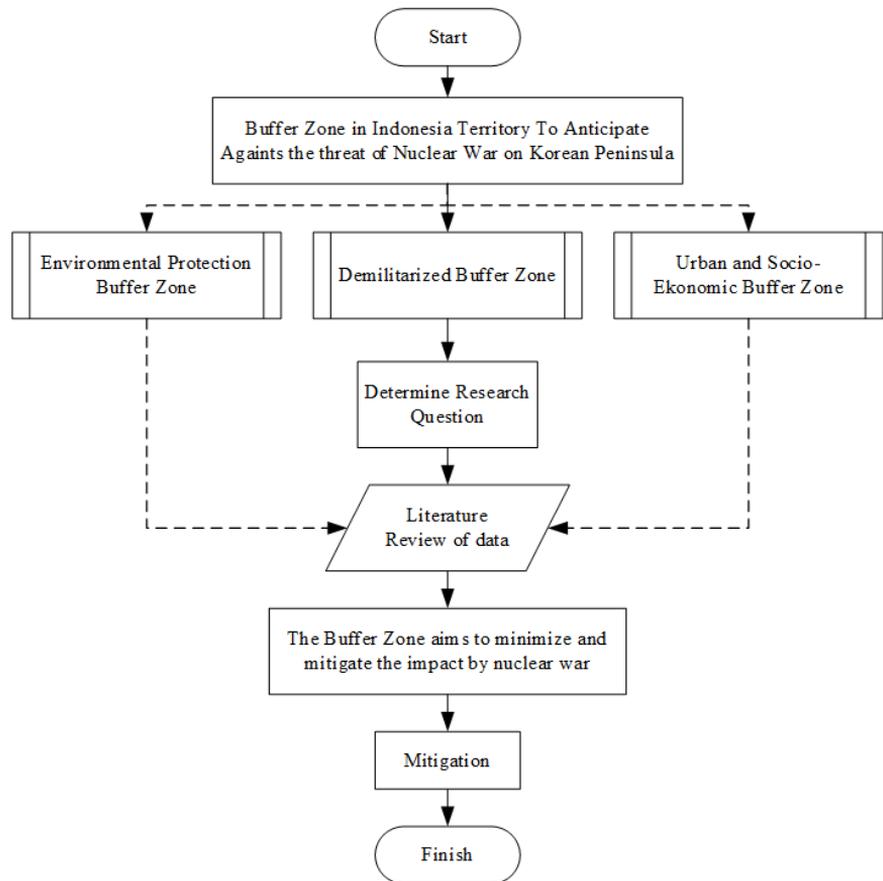


Fig. 2 Conceptual Framework

4. RESULT AND DISCUSSION

4.1. Areas Likely to be Affected by Nuclear Radiation

Looking at the boundaries of Indonesia's territory that is directly affected by the Korean peninsula nukes are the Natuna region to the

North Maluku Sea area. Furthermore, we can focus on which areas are most likely to be affected by the nuclear fallout. From the areas mentioned earlier, if we draw a straight line and calculate the distance of about 5,500 Km from the Korean peninsula to the Indonesian territory, the North Sulawesi Sea and

the North Maluku Islands are the most likely areas to be affected. North Sulawesi has several islands that are quite far apart in the north which borders directly with the Philippines, namely Marore Island, Miangas Island and several large islands, namely the Talaud Islands, Sangihe Islands and Morotai Islands in the North Maluku Islands.

The factor that affects the spread of radiation due to the Korean

Peninsula nuclear war in the Indonesian region is the wind that can carry radioactive particles. The most influential wind factor is the monsoon wind that carries hot air from the Siberian plateau north of the Korean peninsula. The western monsoon winds blow from October to April, assuming the possibility of radiation being able to reach Indonesia with weather support.

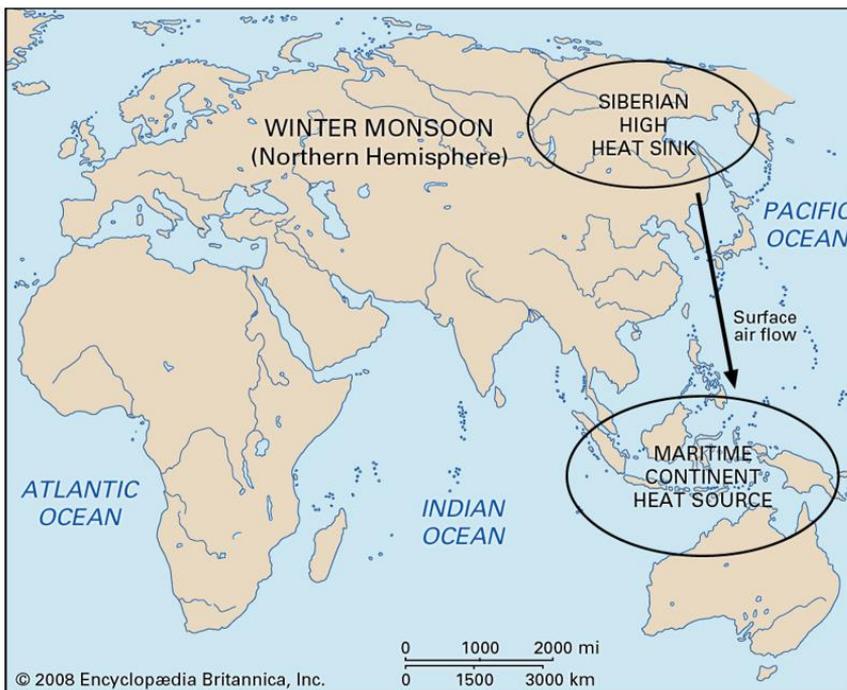


Fig. 3 Direction of monsoon winds
(Source: <https://www.britannica.com/>)

From the data of the Central Statistics Agency (CSA) in 2024, the population of the Sangihe Islands is 142,850 people, the Talaud Islands

98,300 people. According to Central Statistics Agency (BPS) in 2022, the population of Morotai Island is 78,270 people. In total, there are

about 319,420 people who are included in mitigation and evacuation planning when the impact of nuclear radiation on the Korean peninsula occurs. With a large number of people, an appropriate evacuation strategy and information dissemination on nuclear radiation disasters are needed.

Table 1 Total Population Data

<i>NO</i>	<i>Regency/ City</i>	<i>Total Population (people)</i>
1	Sangihe Islands	142.850
2	Talaud Islands	98.300
3	Morotai Island	78.270

(Source. <https://www.bps.go.id/>)

4.2. Impacts Posed by Nuclear Radiation.

4.2.1. Impact of Nuclear Radiation for Health

Several impacts will arise due to nuclear radiation. The health effects of radiation exposure can cause acute health problems. Long-term implications due to radiation at low radiation doses can increase the risk of cancer, especially thyroid cancer.

High radiation effects can affect cells that divide rapidly, also called acute radiation syndrome (ARS) can cause severe skin injuries due to exposure to gamma and beta radiation and aggravated by radioactive aerosols. In this case, the most vulnerable victims of nuclear radiation are children and pregnant women because they are in the process of development.

Table 2 Literature review impact nuclear radiation for health.

Title, Authors	Type	Conclusions
Research Progress on the Impact of Nuclear Radiation in Food on Human Health (Han Wen, 2024)	Science and Technology	Irradiated food has an impact on human health, with high doses causing acute illnesses and low doses potentially leading to chronic diseases. Pregnant women, infants, and children are more sensitive to nuclear radiation, and irradiated food may pose health risks such as cancer, genetic mutations, and immune system effects.
Radioactive releases from the nuclear power sector and implications for	BMJ Paediatrics Open	The paper highlights the disproportionate impacts of radioactive releases on women and children, especially in frontline and Indigenous communities, due to their increased sensitivity to toxic exposures

Title, Authors	Type	Conclusions
child health (Cindy folkers, 2022)		during development.
A brief overview of radiation waste management and nuclear safety (Manyika Davy, 2023)	Physics & astronomy international journal	Some radionuclides have half-lives of more than a quarter of a million years, posing a serious threat to future generations who will have to deal with such long-lasting nuclear waste.
Health Effects of Ionizing Radiation on the Human Body (Jasmine talapko, 2024)	Medicine journal	the consequences of acute radiation syndrome (ARS) on various systems in the human body, including the respiratory system, nervous system, hematopoietic system, gastrointestinal tract, and skin, due to the effects of radiation on cells and tissue
Effect of Ionizing Radiation on Human Health (Ashish Chaturvedi, 2019)	International Journal of Plant and Environment	The paper discusses the harmful effects of ionizing radiation on human health, including radiation-induced cancer, which poses a certain risk even at low doses of radiation.
Health Effects of Radiation Exposure to Human Sensitive Organs Across Some Selected (R. Usman, 2022)	Journal of oncology research	The conclusion drawn from the findings is that the background radiation levels in Plateau State do not pose an immediate health concern for sensitive organs, but long-term exposure over approximately seventy years could potentially lead to health issues such as cancer.

4.2.2. Impacts of Nuclear radiation or environment

The impact on the environment is that it can contaminate groundwater sources, the sea in this case fishery products and agricultural products because research results show that radionuclides can persist in ecosystems for years leading to bioaccumulation in the food chain

(Proshad et al., 2023). The immediate and long-term consequences can alter the ecological balance and pose significant risks to biodiversity and human populations. Thirdly, the economic impacts include some disruption of trade and tourism routes due to related health issues due to exposure to nuclear radiation.

Table 3 Literature review impact of nuclear radiation for environment.

Title, Authors	Type	Conclusions
An Overview of the Measurements of Primordial Radionuclide Concentrations in Soil and Radon Concentrations in Water Samples. (Sardar othman, 2022)	Asian Journal of Research and Reviews in Physics	Highlights the health risks associated with radioactive materials in soil and water, emphasizes the impact on human health, especially in terms of the development of cancer, and suggests areas that should be avoided due to radiological hazards.
Release of Radioactive Particles to the Environment (Brit Salbu, 2024)	Radiation research Journal	Radioactive particles released into the environment can be transported across great distances, affecting ecosystems far from their source. This was especially observed after the Chornobyl accident, where radioactive particles were detected throughout Europe.
Research on the Granger Causality Experiment of Fukushima Nuclear Wastewater Discharge on Changes in Oil Market Prices (Zhen Cui, 2024)	Highlights in Science Engineering and Technology	In linear experimental analysis, the discharge of nuclear wastewater led to an increase in the price of oil during the same period. However, the Granger causality experiment results showed no significant direct relationship between nuclear wastewater discharge and changes in oil prices.
Environmental Contamination from Nuclear Events (Johnson & Lee, 2021)	Environmental impact Journal	Examines radionuclide persistence in ecosystems and its effects on food safety.
Safe from Harm? Massive Attack Nuclear Worst-Case Scenario for Civil Protection in Germany Regarding High-Risk Zones of Exposure, Vulnerability, and Safe Havens (Fekete A, 2022)	Multidisciplinary Digital Publishing Institute	A spatial assessment of Germany and Europe was conducted using a geographic information system. Circles of buffer zones from the effects of nuclear explosions and fallout buffers show the potentially exposed areas around major cities.

4.2.3. Impacts of nuclear radiation for socio-economic

The socio-economic impacts are diverse, including health, social behaviour, economic behaviour and demographic changes. Socially, there is a decrease in social interaction, decreased happiness levels and social isolation. Economic behaviour changes, namely the displacement of middle and upper-economic communities, result in unbalanced demographics that have the potential to hamper economic recovery and infrastructure development.

Other impacts include several disruptions, namely trade routes and tourism due to health issues due to exposure to nuclear radiation. The consequences of the impact of nuclear radiation require careful planning and hard efforts to overcome this problem because it includes building and improving health facilities, social improvement and economic improvement strategies to reduce long-term socio-economic impacts. And what is no less important is the mental and psychological aspects of society facing this disaster due to nuclear radiation.

Table 4 Literature review Impact nuclear radiation for social economic.

Title, Authors	Type	Conclusions
Economic Analysis of Climatic and Agricultural Impacts of Nuclear War (Zhang et al. 2018)	Global trade analysis project	Socioeconomic impacts of nuclear events, highlighting the need for analysis on economic behaviour and biophysical drivers. The paper also discusses potential responses to changes in agricultural markets, including behavioural changes such as migration and technological advances.
Who Will Shape the New World Order? (K. Aiginger, 2022)	Inter economics journal	The potential for nuclear conflict could also alter policy priorities, potentially delaying climate policies and investments in renewable energy as countries focus on immediate security concerns.
Post-War Capital Accumulation and the Threat of Nuclear War (Joel Slemrod, 1982)	Social Science Research Network	This paper shows that the threat of nuclear war has the potential to affect not only the level of private savings but also other economic factors such as the level of investment in human capital, asset prices, interest rates, and inflation rates.
Global research on nuclear energy in	Global research on	Economic interests play a crucial role in driving research on nuclear energy from

Title, Authors	Type	Conclusions
the context of health and environmental risks, considering economic interests (D. Klingelhöfer, 2023)	nuclear energy in the context of health and environmental	health and environmental perspectives, highlighting the importance of considering socio-economic parameters in evaluating the sustainability of nuclear energy.
Comparing Economic and Crop Models: The Case of Climatic and Agricultural Impacts of Nuclear War (Gal Hochman, 2019)	Global trade analisis project	Highlighted the importance of preserving the world trading system to prevent widespread famine and suffering due to nuclear wars

4.3. Buffer zones as mitigation against the effects of nuclear war

With the establishment of areas that have been mentioned as buffer zones, these areas are areas that are prepared as nuclear disaster alert areas. Several stages have been set by the disaster management agency in Indonesia, against the threat of natural disasters, or in this topic is the threat of nuclear war on the Korean peninsula if the situation heats up. The development of the Korean Peninsula nuclear war issue must always be monitored as an early action to prepare for all forms

of possibilities that occur, with consideration of all factors that will support the impact to the territory of Indonesia. This nuclear countermeasure planning is carried out to secure the population of the region from nuclear radioactive radiation so that the losses incurred can be minimized as well as possible. The following is a review of literature studies used as the basis for planning and the purpose of how the buffer zone is used to anticipate the impact of the Korean peninsula nuclear war.

Table 5 Literature review buffer zone.

Title, Authors	Type	Conclusions
Analysis of Indonesian buffer	Jurnal Studi Islam dan	Identify and determine perceptions of Indonesia's outer islands, which will be

Title, Authors	Type	Conclusions
zone location selection in anticipating an increase in conflict escalation in the Indo-Pacific region. (Y.A Moreta et al. 2024)	Humaniora	used as buffer zones using the Delphi method. Then the island areas selected as Indonesian buffer zones can be developed and utilised properly and appropriately.
The Power Rivarly between China and India: Managing the Buffer Zone between the Two States. (Horehaj, Adam, 2019)	Charles university digital repository	Managing the Buffer Zone between Two Countries examines the strategic behaviour of China and India about the buffer zone located around their common border.
Peran Nuklir Korea Utara Sebagai Instrumen Diplomasia Politik Internasional. (A. Purwono, ahmad, 2010)	Jurnal ilmu politik hubungan iternasional	North Korea considers the deterrent effect of having a nuclear strike capability will guarantee the survival of the Pyongyang regime, which is none other than the communist regime that still wants to exist in the hemisphere.
Nuclear-weapon-free zone initiatives: challenges and opportunities for regional cooperation on non-proliferation (Hamel-greenm 2009)	Global Change, Peace & Security journal	nuclear weapon states' review of the current non-proliferation benefits of nuclear-weapon-free zones; commissioning of new studies by UN Experts on nuclear-weapon-free zones; regional studies on the human, economic, and climate impacts of nuclear war; and new efforts at the regional level for nuclear-weapon-free zones to establish new zones and strengthen existing ones.
Explanation of the Structural and Functional Characteristics of Geographical Buffer spaces (MR. Hafiznia et al. 2013)	Geopolitics Quarterly journal	The study aims to understand and explain the nature and structural-functional characteristics of buffer spaces, emphasizing their role in preventing direct contact and conflict between rival powers through mutual or unilateral agreements.
Effectiveness of protected area	Journal of Environmental	Suggest that the institutional platform provided by the Buffer Zone program to

Title, Authors	Type	Conclusions
revenue-sharing program: Lessons from the key informants of Nepal's buffer zone program. (S. Dixit et al. 2024)	Management	stakeholders, rather than the shared income itself, creates greater impact on integrated conservation and development. Findings also suggest that the effectiveness of such programs can be further enhanced by providing local Buffer Zone institutions with a modicum of autonomy to meet local needs.
Zones of Dissonance and Deceit: Nuclear Emergency Planning Zones. (Overy, 2020)	GeoHumanities and Health Journal	The paper concludes that Emergency Planning Zones (EPZs) around nuclear power stations serve to create an illusion of safety through a flawed 'health and safety' narrative, masking the inherent dangers of nuclear power and radiation.

The results of this countermeasure planning are expected to minimize losses due to nuclear radiation that may occur or be affected in the region. Currently, seeing the position of the buffer zone area which is an island located quite far from the safe zone for evacuation, what can be done to overcome the impact of nuclear radiation is to evacuate the population to an area designated as a safe zone. Areas bordering the buffer zone or safe area as an evacuation site must be planned or prepared infrastructure, health facilities and infrastructure to support or save victims.

By the emergency evacuation procedures issued by the National

Disaster Management Agency. Firstly, the current condition is the pre-disaster stage which includes prevention and mitigation as well as preparedness. In this stage are structural efforts to prepare facilities and infrastructure as well as counseling to the public about the impact of nuclear warfare and raising awareness of emergencies (Rocchio & Domingo-Calabuig, 2023) Second, the emergency stage, which includes the determination of emergency status, rescue and evacuation processes, basic logistical support and the main protection of vulnerable groups (children, women and the elderly).

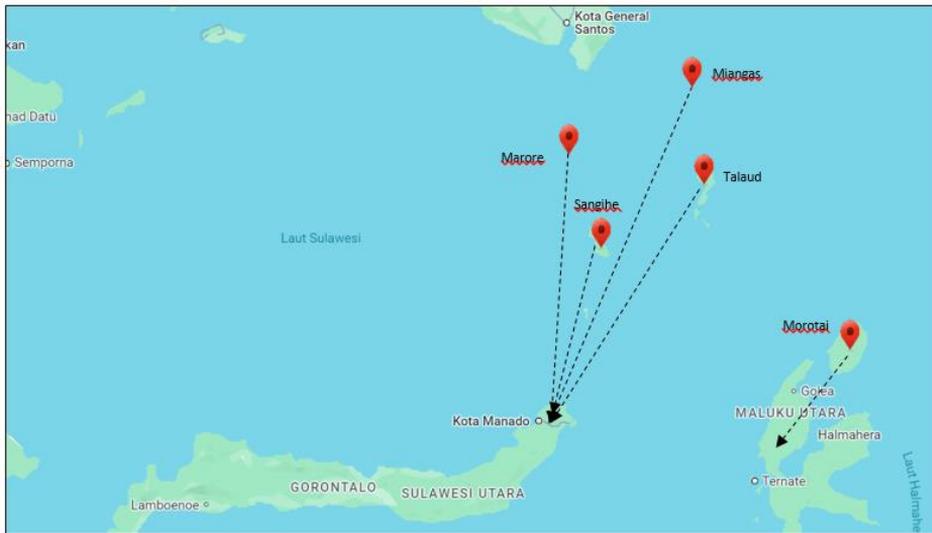


Fig. 3 Evacuation map from buffer zone
(Source: <https://www.google.com/maps/>)

Evacuation planning is by sea and air, of the four main islands planned only Marore Island does not have an airport, the other three islands each have their airport. A rapid evacuation process can be carried out by aircraft prioritising vulnerable groups and other evacuations are carried out by sea. Stakeholders must involve various stakeholders who have facilities and infrastructure in this evacuation process. Furthermore, logistical support and other resources to support during evacuation or evacuation shelter safe evacuation places in Manado and Ternate

according to their respective provinces.

5. CONCLUSION

The issue of the Korean peninsula nuclear conflict is still a hot international discussion, especially in the East Asian region. The impact also affects the territory of Indonesia, the impact of various aspects, one of which is the most dangerous nuclear radiation. The impact on health, on the environment and the socio-economy. Buffer zone that can be applied in the territory of Indonesia in

anticipating the impact of the Korean peninsula nuclear war, in the current condition the most relevant buffer zone that can be applied in the territory of Indonesia is the evacuation of personnel. To Minimize losses due to the impact caused.

From the research, several topics can be taken that can be continued into further research. First, infrastructure planning for special health facilities for nuclear radiation victims. Here it can be determined which areas are planned as evacuation sites or safe zones. Second, the design of infrastructure for early detection of nuclear threats placed in border areas prone to nuclear radiation disasters. Third, the creation of a planned evacuation pattern in the event of a disaster due to nuclear war.

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