

Reparative Regional Cooperation for Climate Change in Northeast Asia

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Abstract

In Northeast Asia, historical injustice appears to have built a virulent loop of judging and pleading. Conquering the historical hostility has turned to one of the most important challenges in the future of the region. This study develops a theoretical framework of a reparative regional cooperation for climate change with technological advance while coping with natural disasters and biological risks in Northeast Asia (NEA) by conducting a secondary research through case studies. The research underscores the urgent need for enhanced regional cooperation in Northeast Asia to effectively manage future natural disasters and biological risks, proposing a comprehensive framework that includes the establishment of specialty headquarters in each country and the adoption of a Northeast Asia Security Regime. It also highlights the unique specialties of China, Japan, and South Korea in managing wildfires, earthquakes, and biological risks respectively, suggesting these strengths be leveraged in a cooperative system for improved regional security, resilience and environmental management. For climate change adaptation, disaster risk reduction, technological advancement, and ideological reconciliation in Northeast Asia, both the natural and social dimensions of these crucial environmental challenges are addressed learning from history knowledge and practice for discussing the applicability of neoliberal institutionalism and the security cooperation for security and social changes in Northeast Asia.

Keywords: Climate change adaptation; disaster risk reduction; environmental management; regional environmental cooperation; technological solutions in environmental management.

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1. Introduction

Assisting one fifth of the world's population, Northeast Asia (NEA) is one of the three most developed regions in the world today, along with the European Union and North America, which has been encouraged by the expanded economic growth of China, Japan and South Korea. However, it is also the unique area in the world where the Cold War confrontation has resumed and where multilateral diplomacy has been defeated to drive any regional conformity as Europe.

In this zone, six countries - China, the United States (U.S.), Japan, South Korea, Russia and North Korea - have always been a place where nations produce disputes and play political games, and it is also one of the erratic regions in the world where conflicts happen constantly today [1]. Northeast Asia is a zone with many dilemmas, but also with great multi-dimension capacities. Because the key regional players are also global powers, transformation and trends in this area are reflected at global level [2].

Additionally, historical and territorial conflicts and the North Korean nuclear weapons matter have compounded the environmental management challenges in this region, such as climate change adaptation and disaster risk reduction. For example, historical conflicts remained from the historical wars – the Sino-Japanese War, the Russo-Japanese War, the Pacific War, the Korean War, and the Cold War, etc. - such as comfort women and territorial conflicts, which have led to constant oscillations in the bilateral bond between China and Japan, and South Korea and Japan.

Countries within the area have critical reciprocal distrust issues and are imperiled by the North Korean nuclear weapons matter, being stalled in a tardy and incipient progress of regional conformity in Northeast Asia [3].

Resilience and social improvements in Northeast Asia can be established with the help of modern technologies and digital solutions that support disaster and disease risk reduction and contribute to impact-based forecasting and improved risk analytics. Early warning systems are critical for resilience building, and impact-based forecasting can provide useful information for sectoral ministries, disaster and disease management agencies and other stakeholders to better prepare for and monitor potential disasters.

To achieve the greater potentials, distrust elimination and regional collaboration should be a priority for Northeast Asian countries with the support of technological cooperation. This paper aims to explore and propose strategies for improved environmental management in Northeast Asia, focusing on the role of international cooperation in addressing natural disasters and biological risks.

1.1 Background

The increasing occurrences of climate-related disasters in the region highlight the urgent need for robust environmental management strategies, including early warning systems and risk reduction education. According to the Asian Disaster Reduction Center, a quarter of the world's disasters occur in Asia according Natural Disaster Databook 2020 of Asian Disaster Reduction Center: floods, storms, and earthquakes are the most frequently occurring disasters during the past 30 years (1990-2019) on average in the Asian region with the

tendency of occurrences of climate-related disasters consistently remained high [4] .

China, Japan, and Korea have adopted a joint statement on disaster reduction cooperation for the sustainable implementation of the Sendai Framework^a measures to enhance response to natural disasters, exchange of risk reduction education, response measures, and strengthening exchanges in risk reduction education[5]. In order to enhance international cooperation, the following three areas have been launched for discussion including developing a comprehensive disaster management framework, developing measures and systems to reduce vulnerability to disasters and minimize damage from disasters, and strengthening effective disaster management at the national, local, and community levels [6].

Since the Northeast Asia region is characterized by frequent natural disasters and biological risks, it has established various forms of coordination and cooperation in disaster reduction measures. In particular, China, Japan, and South Korea have adopted the Joint Statement on Cooperation in Disaster Reduction and are members of the Asian Disaster Reduction Center (ADRC), and have established a system of mutual cooperation in disaster reduction.

1.2 Problem Statements and Hypothesis

Despite existing disaster prevention frameworks, human and economic suffering continues, demonstrating a need for more effective environmental management strategies. In 2022, China, Japan, and South Korea experienced several major natural disasters and the biological risk of Covid-19 pandemic, pointing out the necessity of establishing a strategy for international cooperation for coping with the future natural disasters and biological risks.

For example, in a period of only one month in August, China experienced five series of disasters, a severe drought, flood, lightning strikes, two typhoons(Mulan and Ma-onon), and forest fires. These series of natural disasters affected 41.9 million lives, 94 of whom were dead or missing. Economically, it caused a loss of nearly 43 billion yuan (\$6.1 billion).

For another example, a magnitude 7.4 earthquake occurred off the coast of Fukushima Prefecture at 23:36 on March 16, 2022. The earthquake struck 57 km off the coast of Honshu island, and tremors of magnitude 6+ were observed in Miyagi and Fukushima prefectures. This earthquake marks the 11th anniversary of the massive earthquake and tsunami that struck the region, of Tohoku, on March 11 2011 **【7】** .

The torrential rains fell in the entire South Korea, from August 8 to 17, 2022. The precipitation per hour in Seoul's Dongjak district was the heaviest in 80 years. According to the Korean Ministry of the Interior and Safety, 14 death, 6 were missing, and 26 injured were reported as well as more than 5,270 temporary evacuees. In Seoul, muddy water was seen flowing like a river on the streets and water flowing into buildings. The shocking news regarding this flood is that a family living in their semi-basement or *Banjiha* apartment was

^a International guidelines for disaster reduction actions for the 15-year period from 2015 to 2030, based on the Hyogo Framework for Action 2005-2015, which was the guideline for the period 2005-2015, and adopted at the Third United Nations World Conference on Disaster Reduction (WCDRR) in 2015.

isolated and killed by flooding[5]. Moreover, Northeast Asia is still suffering and recovering from the interrupts of Covid-19, economically and socially.

Based on the above representative cases of natural disasters and biological risk in the three countries in 2022, three problems are stated. First, Northeast Asia is facing an unprecedented natural disaster and biological crisis due to the topographic and climatic factors. Secondly, despite the existence of frameworks for disaster prevention and destruction, much human and economic suffering still occurs.

Thirdly, The three nations need to build a cooperative relationship in disaster response, utilizing their respective experiences. It is more difficult to build cooperative relationships in NEA than in other regions due to ideological differences, historical legacy, and other complex state relations.

However, it is hypothesized that enhanced cooperation on natural disaster and biological risk management in and beyond the NEA region can serve as a reparative mechanism, fostering deeper collaboration across economic, cultural, and political domains, and importantly, advancing the region's environmental management capabilities to address future challenges.

1.3. Scope and methodology

This study aims to develop a theoretical framework of international cooperation for improved environmental management in NEA and beyond, focusing on strategies for coping with natural disasters and biological risks. This research highly focuses on the cooperation of three countries including China, Japan, and South Korea in and beyond the region of Northeast Asia.

The Haiyan typhoon, which hit the Philippines, also is taken up as a case study and explores natural disaster response and disaster management collaboration with international organizations. This case is selected because its encouragement of a huge international humanitarian response and the support by the Government of the Philippines as well as its civil society, private sector and international partners for the major progress of relief, recovery and reconstruction.

The research time scope has been set up from 2013 in the Haiyan typhoon for learning from the history event to develop a reparative future of multi-lateral collaboration for NEA or a bigger region. This study develops a theoretical framework of international cooperation for a reparative future of NEA by conducting a secondary research through literature review and aims to envision a regional collaboration for coping with natural disasters and biological risks in and beyond Northeast Asia.

2. Theoretical framework and Literature Review

2.1 Previous Research

The recent explosion of study in Northeast Asia demonstrates a good understanding of the multifaceted effects of climate change, concentrating on various topics such as technology, policy, environmental politics, and civil

society participation. Nevertheless, a critical analysis indicates a segmented approach, with research frequently needing to examine the symbiotic link between these domains. While Xiangchengzhen & Serafettin Yilmaz (2020) advocate a forward-thinking framework for renewable energy, their proposals need to pay more attention to the geopolitical complexities and historical disputes present in the region, suggesting a chasm between theoretical frameworks and their practical applicability[8] .

Similar to this, there is a lack of depth and realism in addressing the asymmetric power dynamics and internal political resistances that characterize these nations, despite the pioneering nature of research into the intersection of environmental security and domestic politics, as seen in the works of Jong Kun Choi & Chung-in Moon (2010)[9].

Furthermore, Xie and his colleagues (2021) acknowledgment of civil society's expansion of environmental participation belies their assumption of a broad, encompassing regional unity, which ignores the stark cultural and political diversity that may undermine such cohesiveness [10].

However, although thorough and critical, foreign researchers frequently study Northeast Asia's environmental initiatives from a Western-centric standpoint, failing to recognize the region's particular difficulties and complexities.

Studies like Seiichiro Hasui & H. Komatsu (2021) offer important insights into the geopolitical dynamics influencing environmental cooperation. Still, they neglect to consider the persistent territorial and historical disputes that may obstruct cooperative efforts [11].

Furthermore, while Hani Al-Rawashdeh and his colleagues (2023) establish a robust and fact-based foundation for sustainable energy practices, it avoids addressing the economic issues inherent in the region's reliance on conventional energy sources and the glaring economic disparity across these countries [12].

T. Biersteker's (2020) critiques of the adherence of Northeast Asian nations to international environmental standards frequently lack a nuanced comprehension of the local obstacles, whether economic, political, or cultural, necessitating a more relativistic, sympathetic approach in future assessments[13].

The literature also demonstrates a troubling gap in understanding the ecological effects of climate change, with little discussion of biodiversity and ecosystem health despite the region's natural complexity. Studies by H. Pörtner and his colleagues (2023) and E. Zadereev and his colleagues (2020) are first steps but remain standalone initiatives that reveal a gap between ecological implications and policy formation.

This gap extends to the larger study field, where there is a glaring lack of an integrated, cross-disciplinary approach, underplaying Northeast Asia's unique historical, political, and social storylines and a lack of case studies on successful worldwide models [14, 15].

The current study develops a comprehensive, reparative, and collaborative paradigm for climate resilience to fill these academic gaps. This paradigm respects the geopolitical intricacies, economic limitations, social

differences, and ecological urgencies. It provides a more solid, comprehensive scholarly contribution to the discussion of climate change in Northeast Asia.

2.2 Theoretical framework of Making Social Changes

Concentration on historical knowledge and practices has not categorized our research as freedom, democracy and solidarity for futures-thinking, but stressed the necessity for conservation across diverse experiences for filling hopeful categories such as reparation with meaning in a way of considering how history can be a producing process for establishing futures are reparative rather than reproductive of injustices past and present. Improvements require changes driven by internal or external factors.

Neoliberal institutionalists believe that international institutions have an important economic and political role in affecting or regulating the behavior of governments and state actions with two conditions of the mutual interests and the institution's degree of institutionalization [16].

In comparison with realism, formal and informal rules have a more important role in neoliberalism even though for both theories world politics is interpreted from the viewpoint of states. Neoliberal institutionalism is interested in how institutions impact state action and what causes institutional changes.

In the paper *Power, Interdependence, and Nonstate Actors in World Politics*, Helen V. Milner [17] lists the key elements of the neoliberal institutionalism as follows:

“Emphases on nonstate actors, including international institutions, on forms of power besides military force and threats, on the role of interdependence in addition to anarchy in the international system, and on the importance of cooperation as well as conflict in international politics.”

Helen Milner described institutionalized cooperation in 2009 as “sustained policy coordination among states often guided by norms, rules, and practices codified in treaties, agreements, or international organizations[9].” Often this means that countries relinquish substantial amounts of their sovereignty and autonomy for the sake of cooperation in important policy areas.

One of the key elements of the neoliberal institutionalism is non-state actors in world politics. Neoliberal institutionalists believe that states are important but so are non-state actors such as international institutions, NGOs, and multinational corporations, and the focus is especially on international institutions or regimes.

Second key element is the emphasis on varieties in power other than military power and threats. Neoliberal institutionalism considers power resources to be without any single hierarchy and much wider than realism. Third element of neoliberal institutionalism is interdependence defining international system. Interdependence means mutual but not necessarily symmetric dependence benefiting all parties involved. Even in the absence of

highly institutionalized issue areas, relations among countries are often highly interdependent as flows of capital, people, raw material, and goods are beneficial and often even critical to all countries involved. Lastly, the final element of neoliberal institutionalism is its focus cooperation in world politics.

Therefore, the following recommendations are proposed to explore the reparative chance leading to the establishment of deeper cooperative relations in the economic, cultural and political fields in the future of NEA after the natural disaster and biological risk cooperation in and beyond the region is activated. Such institutionalized cooperation or global governance also implies that countries must comply with the rules, norms, and practices of the international institutions in both good times and bad.

Kyung Yung Chung discusses in 2005 that the feasibility and design of a military security cooperation regime in the two Koreas, the US, China, Japan, and Russia. He has identified four conditions to form a military security cooperation regime in Northeast Asia, and these include the evolution of military security cooperation arrangements that already exist, economic interdependence, transnational issues seen as common threats, and the powers either support a security regime or act as links between nations.

Moreover, Chung discusses nonmilitary, transnational security threats, such as infectious diseases and environmental degradation. In the case of infectious diseases, Chung argues that international cooperation and regional initiatives should be used for managing or mitigating of such diseases. As for the environmental degradation, there is a need for both immediate crisis response and a longer-term preventive defense such as early warning systems to be met in the near future learned from the history knowledge and practice .

This framework guides our exploration of how historical knowledge and practices can inform future strategies for environmental management in Northeast Asia. Based on the principles of neoliberal institutionalism, the development of international cooperation strategies for disaster management can be guided in several ways. For example, neoliberal institutionalism emphasizes the role of international institutions in affecting or regulating the behavior of governments and state actions, particularly in areas of mutual interest and where the institution's degree of institutionalization is high[18].

Therefore, international institutions like the United Nations Office for Disaster Risk Reduction (UNDRR) can play a crucial role in facilitating cooperation among countries, setting standards, and providing a platform for sharing best practices. Meanwhile, neoliberal institutionalism highlights the importance of non-state actors, including international institutions, NGOs, and multinational corporations, in world politics[19].

These actors can contribute to disaster management by providing resources, expertise, and innovative solutions as well as helping to bridge gaps between countries and foster cooperation. Moreover, neoliberal institutionalism emphasizes the role of interdependence in the international system [20], so that countries are not only affected by disasters within their own borders but also by disasters that occur in other countries. This interdependence can motivate countries to cooperate in disaster management to mitigate the shared risks.

Most importantly, neoliberal institutionalism focuses on cooperation in world politics , which suggests that countries can achieve more effective disaster management by working together, sharing resources and

information, and coordinating their actions. This cooperation can be facilitated by international institutions and agreements, such as the Sendai Framework for Disaster Risk Reduction.

2.3 Knowledge of Regional Social Security Improvement

The *Sendai Framework for Disaster Risk Reduction 2015-2030* was adopted by UN Office in 2015, and it is the successor to the Hyogo Framework for Action (HFA) 2005-2015. The Framework agreed on seven global targets such as reducing disruption of basic services and damage to critical infrastructure and increasing the access to and availability of multi-hazard early-warning systems. The Framework also outlines four priorities for action that apply nationally and cross-nationally across various sectors, including enhancing disaster preparedness for effective response and "Building Back Better" in recovery, rehabilitation, and reconstruction. The Framework notes that as global interdependence is increasing, there is a need for clear international cooperation, means of implementation, and an enabling international environment so that motivation, knowledge, and capacities for disaster risk reduction can be developed at all levels.

However, the implementation of the framework is not without its limitations. The study focused on Africa, underscores universal challenges such as the need for decisive action to reach the 2030 targets and the necessity for improved data and information management [19]. The need for risk awareness, stakeholder analysis, and the creation of a national information network highlights the potential areas for improvement in the implementation of the Sendai Framework [21].

Building resilient infrastructure is the key for improving the quality of life of people while keeping the threats of natural disasters and biological risks in mind. Investments in water and sanitation, telecommunications, transportation, and power reduce the economic impacts and lead to fewer disruptions [21]. Big data is also helping managing disaster and disease risk, as mobile phone data can be used to analyse a population's movement and behaviour, and social networks improve the ability of various organizations to monitor and respond to natural disasters and biological risks. In addition, big data is filling the gaps in multi-hazard early warning systems and helps the transition from early-warning to early-action. In the latter, risk prevention, forecast-based social protection and forecast-based financing are at the core [21].

Another technology-based solution is Internet of Things (IoT) that, when combined with satellite data and other sources such as user-generated data, can help forecast extreme events such as the earthquakes, tsunamis or pandemic. Additionally, machine learning can help predict earthquakes when combined with seismic data.

It is also important to keep in mind that even though technology alone cannot overcome socioeconomic exclusion of the disabled, digital technologies may help people with disabilities to better communicate, access information, and interact during times of disasters and diseases. Voice recognition, text-to-speech, gesture-controlled interface etc. help create accessible ICT that can be lifesaving when natural disasters strike [21].

3. International Cooperation for Social Security Improvement

Typhoon Haiyan, known in the Philippines as Super Typhoon *Yolanda*, was one of the most powerful tropical

cyclones ever recorded, which originated in the northeast Pacific Ocean. Super Typhoon Haiyan swept across the Philippines affecting 16 million people on November 8, 2013, and more than 28,000 people were injured and 6,300 died [23].

Originally, the Joint Typhoon Warning Center (JTWC) began monitoring a broad low-pressure area about 425 kilometers (265 miles) east-southeast of Pohnpei and the Japan Meteorological Agency (JMA) classified it as a tropical depression early on November 3 and assigned it the name Haiyan (Chinese: 海燕;) because the system quickly intensified into a tropical storm and officially identified Haiyan as a typhoon on Nov.5 [23]. The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) assigned the storm the local name Yolanda next day as it approached the Philippine Area of Responsibility.

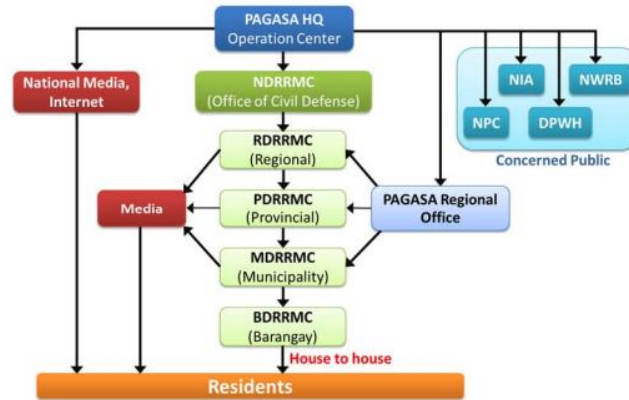
Haiyan caused massive damages in Philippines. A total of 3,424,593 families (16,078,181 persons) were affected in 12,139 barangays in 44 provinces, 591 municipalities and 57 cities with 1,140,332 damaged houses (550,928 totally and 589,404 partially)[24]. Especially, human casualties in Tacloban city and Palo and Tanauan municipalities of Leyte were very high.

3.1 Early Warning System and Disaster Information Transfer System

At 11:00 am, PAGASA announced the Sever Weather Bulletin, warning that the storm surges might reach up to a 7-meter wave height in the coastal areas of Eastern Samar, Samar, Leyte and Southern Leyte in Visayas [24]. A disaster information transfer system in Philippines is shown as Picture 1, which was provided by Dr. Mamoru Miyamoto (International Centre for Water Hazard and Risk Management [ICHARM]). Disaster information from PAGASA is transferred to the NDRRMC, National Media, and the public departments concerned such as the Department of Public Works and Highways (DPWH).

The NDRRMC transfers the information to the Barangay through the Regional, Provincial and Municipality Disaster Risk Reduction Management Councils (DRRMC). Then, the disaster information is conveyed to a house to a house in local barangays.

However, it is important to assess whether this information transfer system worked well or not during the Haiyan event and how long it took for the houses to receive this disaster information. Several problems related to the evacuation to prepare for Haiyan were found. Main problems were lack of education, poverty and inappropriate evacuation facilities. It is also a famous story of Haiyan that the evacuation facilities were not appropriate against the storm surges and enormously strong wind.



(Miyamoto, and his colleagues 2014)

Figure 1: Disaster Information Transfer System (2013 Haiyan).

3.2 International Emergency Response and Rescue

Following Typhoon Haiyan, the World Health Organization (WHO) has been supporting the Government of the Philippines in coordinating the incoming relief supplies from more than 30 international humanitarian health organizations. During the 10 days in Abuyong, Philippines, the Chinese medical rescue team consisting of 50 experts specialized in clinical medicine and disease prevention and control action was taken including medical treatment, environmental disinfection and health education.

Besides humanitarian teams and relief goods such as family tents, water purifiers, beef fried rice, blankets, and sanitation kits, South Korea deployed the emergency relief team and survey team together with 2 C-130 planes, Bi Ro Bong LST and Sung In Bong LST for humanitarian transport along with 520 members of the Republic of Korea Army; at the same time, Japan deployed the JDS Ise (DDH-182), JDS Ōsumi (LST-4001), Boeing KC-767 and C-130J Hercules along with 1,180 members of the Japanese Self-Defense Forces and Disaster Relief team [25].

The international emergency response to the Haiyan typhoon in Philippines contributed to reconstruct the local disaster health system by the activities from international medical emergency rescue. To improve the capacity of international medical emergency rescue in disaster, the special project of foreign medical emergency rescue should be set in countries' medical emergency rescue, and disaster emergency medical rescue should be reserved as a conventional capacity.

3.3 International Relief Efforts with Multi-dimension Task Forces

The UN activated the Cluster System, in which groups of humanitarian organizations (UN and non-UN) work to restore health, shelter, nutrition and economic activity. For example, the World Health Organization, which leads the Health Cluster, the largest one, has developed guidance on donations of medicine and healthcare equipment so that the Philippines receives supplies appropriate for this emergency:

- The aid contributions of China and the United States were given focus with regards to their involvement in the politics of the Philippines. China increased its contributions by US\$1.4 million in cash[26] and sent its naval hospital ship *Peace Ark* for disaster relief. The United States gave the Philippines an amount of US\$35 million worth of aid and deployed the United States Marines, United States Navy and United States Air Force in order to assist with the humanitarian operations[27].
- There were total 11 countries including South Korea \$ 5 million,
- Japan more than \$ 42 million[20]. Among all of them, the United Kingdom was the largest cash donation provider who offered 35 million Pounds cash support [29].

3.4 Post Disaster Reconstruction

The Strategic Response Plan was designed to support the Government of the Philippines' response to the immediate humanitarian needs of the people affected by Typhoon Haiyan , and complements the Government's Reconstruction Assistance on Yolanda. Following the track of Typhoon Haiyan , the Government has identified a priority corridor covering 171 municipalities in 14 provinces and four regions. Estimates for the number of affected total just over 14 million people.

Communities and local governments recovered from the disaster, built back safer, and avoided relapses while strengthening resilience. The strategic objectives of the plan are listed as blow :

- Typhoon-affected people meet their immediate food needs, avoid nutritional deterioration and build food security in ways that are sustained through stimulation of markets and production and access to life-saving community-based nutrition services.
- Families with destroyed or damaged homes, including the displaced population, attain protective and sustainable shelter solutions.
- Women and men whose livelihoods or employment have been lost or severely impaired regain self-sufficiency, primarily with the restoration of local economies, agriculture and fisheries.
- Prevent increases in mortality and morbidity and the outbreak of communicable diseases through immediate access to basic water, sanitation, hygiene, and health services.
- Affected people quickly regain access to community and local government services, including basic education and a strengthened protective environment.

3.5 Questioned areas

The integration of local-indigenous knowledge into disaster risk reduction (DRR) strategies is increasingly recognized as a valuable approach to managing environmental change and reducing the impact of disasters. This is particularly evident in the case of the Mamanwa indigenous peoples in Basey, Samar, who utilized their local-indigenous knowledge in response to Typhoon Haiyan [23]. Their practices included emergency evacuation and post-Haiyan relocation, food and livelihood security strategies, weather forecasts from animals and celestial bodies, and the role of community elders as local hazard forecasters. Moreover, local perceptions of recovery are often overlooked in the aftermath of disasters, even though they should be central to the recovery process.

Most affected people viewed recovery as a return to normalcy, with only a few associating recovery with reducing disaster risk, which contrasts with the 'building back better' concept widely used by policymakers, scholars, and humanitarian agencies, highlighting a divide in understanding and support that can lead to unsuccessful recovery. Coupled with social prejudice and discrimination against non-indigenous people, the integration of the local-indigenous knowledge into state DRR policies such as the Disaster Risk Reduction and Management Act and the Indigenous Peoples Rights Act has been lacking, which has hindered the full potential of local-indigenous knowledge in disaster management .

4. Regional Cooperation among Nations in NEA for Future Natural Disasters and Biological Risk

Conditions for regional cooperation among Nations in NEA have been investigated due to the strong need for fundamental change in security cooperation in NEA, especially for coping with future natural disasters and biological risks. The problems of cooperation in the region rely on the imbalance between economic cooperation and security cooperation which has delayed the institutionalization of regional cooperation solving the diverse regional challenges [30]. Because of the advancement of North Korea's nuclear capability which is dramatically changing the structure of economic benefits and security cooperation among South Korea, the United States, and China, South Korea thinks that the existence of such a system could induce North Korea to become a responsible regional member, be innovative and open, and contribute to Korean unification [30].

4.1 The Strategy, Comprehensive Approach, Supportive System and Models

As a base, the Paris Agreement is the main strategy pointing out a new direction for efforts to address global climate change, requiring all countries to gradually strengthen their commitments to reduce climate pollution. It provides a way not only for developed countries to help developing countries but also for other countries connected in certain ways to mitigate and adapt to climate change, creating a framework for transparent monitoring, reporting and strengthening individual and collective climate goals of countries [31]. On July 14, 2022, South Korea, China and Japan adopted a joint statement on disaster reduction cooperation after holding a ministerial conference on disaster reduction through video conference highlighting the resilience of nations and communities to disasters and promoting the disaster reductions. This is a great positive base for NEA to initialize the climate change regional cooperation with the structure recommended for coping with natural disasters and biological risks as its comprehensive approach to security encompasses politico-military, economic and environmental, and human aspects[32].

As Dr. Mautner Markhof suggested, the Northeast Asia Security Regime should be discussed through informal dialogue and working level meetings based on three areas just as the OSCE [33]:

- Important traditional and non-traditional security related issues, including cross-border issues and threats;
- Intensive and extensive cooperation in trade, investment, finance and other economic fields, as well as cooperation on energy and environmental issues;
- Determine basic principles, common interests and bridge construction;

In times of crisis, it is difficult to establish security and conflict management mechanisms. Common ground for progress at the OSCE can be found more effectively through diplomacy and cooperation rather than deterrence and confrontation. The vital need for a climate information system has been emphasized by scholars in 2016. More countries have begun to formulate national adaptation plans to strengthen national action programmes through appropriate climate information and coordinated policy actions, so that different types of institutions and actors can work together within a collaborative framework and use the resources of the global hydro-meteorological community which require reliable, relevant, available and timely climate information[34].

4.2 Climate Change Regional Cooperation Models

Based on the above case study, the Climate Change Regional Cooperation requires the following four models to work together coordinately:

- Early warning mechanism model;
- Preventive mechanism model which includes a complete legal system of disaster relief, the normalization of disaster prevention education and improvement of people's disaster prevention ability, cultivating high-quality professionals in disaster prevention and reduction, full play to media and network functions, an all-round material reserve system of "government, enterprises and families" as well as "Regional Disaster Prevention and Response Fund" or a special fund fixed through according system;
- Emergency rescue model highlighting an efficient disaster information system with volunteer disaster relief;
- Post disaster reconstruction model with an effective financial support system, a social insurance system for major natural disasters and a complete national disaster relief standard system ;

4.3 Climate Change Regional Cooperation with Specialties

4.3.1 Specialty in Wildfire– China

China has a long history of both using and managing fire use while still regularly forced to fight forest fires. Besides wildfire, through an overview of China's emergency early warning in 2021, it is proved the national emergency early warning information release system is an important part of the national emergency response system in China and the only early warning information release system of the State Council's emergency platform for preventing and reducing natural disasters, accident disasters, public health and social security incidents and their resulting losses, and maintaining the safety of people's lives and properties [35].

Chengdu City in southwest China's Sichuan Province has been praised for its use of a technology-based emergency response system to cope with wildfires [36], which launched a 24-hour emergency response system in 2010. Drones hovering in the sky, all-terrain vehicles rushing in. "The use of science and technology has helped reduce our daily workload and improve our ability to monitor potential forest fires...." [37].

Lessons learned from China's Forest Fire Emergency Mechanism

Wildfire, one of the most serious disasters in the world, making a huge threat to local economic development and residents' life and property safety. On May 6, 1987, Daxing'anling prefecture in China's northeastern Heilongjiang province experienced the most serious large-scale forest fire in the history of the People's Republic of China [38]. The key factors are emphasized as below [39]:

- Forward-looking and long-term disaster relief plans for future-oriented forest fire emergency management;
- Strict, accurate and practical emergency plans for forest fire disaster relief;
- A smooth disaster transmission system and a fire insurance and fire warning release system ;
- Emergency response mechanisms according to different fire warning levels;
- An overall social response mechanism across the country ;
- High-tech fire prevention warning and emergency command;
- Immediately efficient and orderly rescue activities .

4.3.2 Specialty in Earthquake (Japan)

Japan can learn lessons from past disasters and prepare for future disasters. Lessons learned in earthquake response could be applied to other disasters as well. Therefore, Japan should make such assistants the core of its international peace cooperation [40]. This earthquake, which occurred on March 16, 2022, was predicted in advance by an app called "Yureshiru" [41].

This application can forecast the occurrence of an earthquake equivalent to magnitude 6, and its prediction hitting rate is over 75%. It also provides a "family bulletin board" and "evacuation shelter registration" functions to help people prepare for the event of an earthquake. Lessons learned from past major earthquakes, and earthquake disaster prevention will help raise awareness of disaster prevention regularly [42].

Lessons learned from Japan

The idea of Build Back Better (BBB) has been recognized by the Sendai Framework for Disaster Risk Reduction as a key global priority for action in the next 15 years for both pre-and post-disaster planning and implementation [43]. BBB has a three-pronged approach, Disaster risk reduction, Community recovery, and Effective implementation. Japan recognizes that the idea of the BBB is at the heart of the Sendai Framework [44]. According to Japan's Disaster Preparedness, "BBB is the concept of building more resilient communities during the recovery phase of a disaster in preparation for the next disaster[44].

4.3.3 Specialty in biological risks – South Korea

In South Korea, a four-staged crisis warning system is used as a base for managing the emergence of new infectious diseases. The goals of crisis management system in regard to infectious diseases include establishing preparedness, responding and blocking further transmission in an effective manner, and disclosing transparent information to alleviate public anxiety [46].

The Korean government response framework includes three phases: detection, containment, and treatment, generally also known as 3T approach of testing, tracing, and treatment [46]. When the first case was reported in Korea, Korea started to focus on large-scale testing enabled by public-private partnerships. After the expansion of testing capacity, screening came into focus.

Screening stations and drive-through testing centers were set up in strategic locations and outside hospitals. As for containing and tracing, South Korea imposed special entry procedures such as designated entry lines, temperature checks, testing, and eventually mandatory quarantine for all travelers. Keeping borders open but tracing and quarantining travelers is in line with WHO recommendations.

Lessons and limitations of the Korean model

According to Soo Lim and Minji Sohn in 2022, there are several lessons to learn from Korea's COVID-19 strategy such as maintaining an active prevention strategy, preventing regular and timely vaccinations, decreasing the severity of infectious diseases, and carefully managing efforts among public domains, individuals, and private sector for the management of such diseases are essential [47].

As the pandemic is continuing, however, it is not possible say whether the Korean government strategies have been optimal. For example, some preventive measures such as collecting personal data on access to public facilities, history of phone calls, and credit card usage, raised concerns regarding privacy issues.

In addition, scholars have discussed why the Korean model for dealing with pandemics may not be applicable to everywhere because South Korea is practically an island and a highly urbanized country, which meant most COVID-19 cases were clustered, and therefore tracing of contacts might have been relatively easier. Big data of large populations is needed, and that, in turn, requires lots of human resources to analyze the data [48].

Korea is a technologically advanced country and able to quickly scale up technological solutions. Korean citizens are also quite tolerant of sharing personal data and of strict control mechanisms, which are required for the infectious disease management technology to function well.

Northeast Asia is a region where natural disasters and biological risks occur frequently, and therefore, it is necessary to minimize damage while coping with natural disasters and diseases. Natural disasters and biological risk might not be prevented from occurring, but it is possible to be prepared for them when they do occur.

Disasters and diseases threaten human lives in a wide range of ways, from human casualties to economic activities. Thus, NEA need to build reparative future through cooperative relations through disaster and disease response maintaining the regional peace and security.

To enhance the given content and make it more meaningful, we can provide more detail on the benefits of the reparative regional cooperation for climate change in Northeast Asia (NEA) for other countries, especially Jordan, and expand upon the potential repercussions this cooperation could have on a global scale.

Here is an improved version of the content, with an emphasis on the impacts and benefits for other Asian countries like Jordan, and globally:

5. Recommendations and Conclusion

Specialty headquarters are recommended to be established in specialty countries that can provide relief operations at the request of the affected country when natural disasters or biological risks occur in another country.

5.1 Recommendations for the Establishment and Operation of Specialty Headquarters

When a request for assistance is received from an affected country, an emergency response team will be dispatched, led by the Minister of Foreign Affairs in the specialty country, consisting of five teams, which play the following roles:

- The rescue team can be organized within the diverse human resources from states or non states departments or institutes composed of police, firefighters, and Coast Guard personnel who conduct rescue activities, including but not limited to search and rescue of victims caused by natural disasters or biological risks, and transporting them to a safe place.
- The medical team will consist of doctors and nurses, who set up clinics in the disaster or risk areas and provide first aid to the victims.
- The Infectious Disease Control Team is composed of physicians, nurses, and pharmacists who conducts activities aimed at minimizing the damage caused by infectious diseases in the occurrence of a disaster.
- The specialist team consists of specialists from relevant ministries and agencies, who provide expert advice and guidance to control the outbreak and to prevent the spread of disasters and diseases including specific support measures with a view to recovery.
- The Self Defense Forces is composed of the Army, Navy, and Air Force who are expected to play a central role in rescue and support activities.

As Neoliberal institutionalists believe, the non-state actors in international community can also play the important roles together with state actors. Those teams are implementing the varieties in power such as medical powers and support other than military power and threats.

Making maximum use of the speciality experiences in disaster and disease responses, the specialty country provides support in rescue, medical operations, and transportation of emergency relief supplies, in cooperation with the respective teams and the affected countries. Moreover, based on the experiences of speciality countries in dealing with disasters and diseases, they can provide effective advice on what kind of assistance is needed from other countries.

The feasibility and effectiveness of the dispatching five teams need to be improved since the current ideas looks too simple and common to be in effect, however, the simplified team also has strengths based on its nature such

as easier management or flexibility.

For example, it is easy for volunteers and organizers to recognize each other to play the right roles of rescuing, first-aid providing, managing infectious diseases or offering specialist advice.

According to the experience of the Project for Strengthening the ASEAN Regional Capacity on Disaster Health Management (ARCH Project), a Regional Coordination Committee of Specialty Headquarters can be established as a platform for providing strategic direction and strengthening regional coordination.

Project Working Groups and Sub-Working Groups can be set up as implementation bodies for the project activities with representatives of the participating countries. These groups can conduct a series of discussions for the development of a Standard Operating Procedure (SOP) for coordination, regional tools, and collective measures to overcome challenges.

Moreover, an important aspect of the establishment and operation of these headquarters would be the development of a regional health data sharing and protection policy, which would ensure that all relevant information is shared among the participating countries while also protecting sensitive data. The effectiveness of public health emergency management is the result of multiple factors which local governments should strengthen the coordination and integration of information, organization, and environment, improve the coordinated system associated with emergency management, promote the “two-wheel drive” of high-quality development as well as accurate prevention and control [3].

The use of digital health solutions can enhance access to services. For example, a cloud-based digital health solution was deployed to enhance childhood access to vaccination services for cross-border populations in Kenya and Uganda. The game relationship between conflict and cooperation among related subjects can be explored based on the perspective of game theory, which can help in making correct decisions in the complex accident management environment[49].

5.2 Implementation and Global Impact

Establishing Specialty Headquarters in countries with expertise in disaster relief is crucial for delivering effective emergency responses. Countries in Northeast Asia, primarily Japan, South Korea, and China, should form coalitions with other Asian nations, such as Jordan, sharing their specialized knowledge and resources. It's important that the cooperative measures developed in NEA are extendable to other Asian countries, like Jordan.

This can facilitate mutual growth and enable smaller nations to benefit from the established infrastructure and expertise available in NEA, helping them better combat climate-induced challenges and health emergencies. By adapting and employing advanced technologies in digital health solutions, countries can enhance access to services and responses in case of emergencies. Such advancements can play a pivotal role in regions like Jordan, where resource constraints may limit the development and implementation of high-end solutions.

A thorough strategy needs to be developed and implemented to facilitate the establishment of a regional health

data sharing and protection policy. Proper discussions and collaborations between nations can lead to the establishment of standardized operating procedures, promoting regional unity and co-operation.

The comprehensive implementation of such cooperation would not only benefit the participating countries but could serve as a model for global cooperation. Successful reparative regional cooperation in Northeast Asia and its subsequent extension to countries like Jordan would catalyze similar initiatives globally, fostering international unity in combating climate change and its associated risks.

5.3 Conclusion: Vision for Future Cooperation

With a particular focus on Northeast Asia's distinctive geopolitical and socioeconomic dynamics, this study set out to fill the vacuum in the literature about reparative regional cooperation for combating climate change. We identified many ways to improve cooperative climate action within the region by looking at various national policies, regional efforts, and the crucial role of technical and policy advances.

Our research suggests that nationalistic rivalry and historical conflicts frequently obstruct regional cooperation in Northeast Asia. However, climate change's growing threat calls for a paradigm shift favoring a more integrative and reparative strategy. We suggest a multilateral framework emphasizing open communication, shared technology and economic advantages, and shared environmental security objectives to do this.

Every country in NEA except North Korea have enough ability and willingness to operate the assistance teams regardless of the existence of a multilateral cooperation regime. However, this research proposes and highlights the speciality of each nation in NEA for the purpose of improving effectiveness and efficiency. Moreover, the cooperative system will provide an opportunity for NEA to play a much bigger and more important role in the international community for the regional security and social improvement as a whole.

Even though in this era of the US-China competition, the US now makes an every effort to line up their allies and partners including South Korea and Japan not only in the military security but also in the emerging security such as climate crisis, pandemics, and maritime security through existing bilateral or multilateral mechanisms, NEA is still facing security and social challenges within and among nations, which stress the necessity of a regional cooperative system for the sustainable development in NEA.

There is a significance of this research learning from history knowledge and practice for discussing the applicability of neoliberal institutionalism and the security cooperation for security and social changes in Northeast Asia. By promoting a regional cooperation for climate change coping with the nature disasters and biological risks for a reparative future of NEA, it helps to improve the mutual understanding instead of stressing the conflicts in Northeast Asia through the cooperative experiences enhanced by the technological advances while coping with natural disasters and biological risks. It further contributes to maintain the peace, social security and stability in the region.

Countries with reparative specialty should prepare for the formation of a cooperative advances for disaster response in NEA through study groups and expert meetings. Specialty countries should also create systems to

share know-how on disaster and disease response with other countries. Moreover, each specialty country ought to tackle resolving problems in any possible areas so that Japan, South Korea, and China can smoothly establish cooperative relations in disaster and disease preparedness.

The establishment of such specialty headquarters envisions a future where every country in NEA and extended regions like Jordan, can operate assistance teams efficiently. This would not only address and mitigate regional security and social challenges but also promote sustainable development. Strengthening the fabric of international relations, this regional cooperation aims to instill peace, security, and stability in the participating regions. By sharing specialized knowledge and resources, nations can foster mutual understanding and solidarity, reducing conflicts and enhancing cooperative experiences.

For this to be truly effective, addressing and resolving political issues through dialogue is paramount. A phased approach, focusing initially on areas of mutual interest such as disaster and health emergency response, could eventually lead to broader cooperation in economic and political realms.

The successful realization of this cooperative system could inspire replication in other regions, promoting global sustainability and cooperation. The enhancement and propagation of such a system are pivotal for building a more resilient and united global community, prepared to face the multifaceted challenges posed by climate change.

The learnings from this research and the application of cooperative mechanisms can serve as stepping stones for countries outside of NEA, like Jordan, enabling them to apply similar frameworks suited to their regional needs and constraints, thus fostering global resilience against climate change and natural disasters.

The development of such a cooperative mechanism not only paves the way for enhanced regional cooperation but can also serve as a beacon for global unity, extending its benefits to other countries in Asia, like Jordan, and potentially around the globe, fostering a collective approach to combating climate change, promoting peace, and ensuring sustainable development.

One drawback of the study is its dependence on recent publications and policy papers, which are always tainted by the prejudices and objectives of the countries that generated them.

Given the delicate nature of international interactions in Northeast Asia, where national narratives may distort viewpoints and interpretations, this constraint is especially pertinent. Future changes in geopolitics or advances in climate science and technology, which might significantly alter the landscape of prospective collaboration, should be considered in the analysis.

Although this study has limitations, it provides various approaches to achieve more fruitful regional collaboration. First, given that the study's primary focus is on partnership's political and technological components, it is necessary to thoroughly examine several sectors, including social, cultural, and grassroots environmental movements. Further research is needed in this area since the social effect of climate change, which includes public opinion and the participation of non-state actors, might significantly impact how regional

policies and initiatives are implemented.

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