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The Relationship between Science Diplomacy and Global Governance in Confronting Global Catastrophic Risks

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Abstract:

This study examines the link between science diplomacy and global governance in confronting global catastrophic risks and how it is reflected in the development of contemporary discussions of handling global risks. To this end, the study focused on the three dimensions of science diplomacy, the nature of the global risks in our hyper-globalized world, and the gaps in global governance. The study objectives were to determine how science diplomacy can foster international relations in responding quickly to global issues and understand how global governance structure affects the way nations respond to global issues, in addition to determining the link between science diplomacy and global governance in handling global risks. The study adopted the qualitative approach to the data based on the research questions. The relevant data consisting of books and journal articles were obtained through an online search from different databases, of which data obtained were analyzed to answer the research questions. The results found that science diplomacy enhances mutual gains and capacity development of nations to tackle global challenges. In addition, the global governance structure affects the policy reinforcement capacity of international organizations tasked with confronting global issues in the contemporary world. Since the topic is current and it is an ongoing debate among scholars, a recommendation for comprehensive research is necessary for more insight into the subject. This paper also provides a good foundation for researchers.

Keywords: Science diplomacy, global governance, global catastrophic risks, international relations, globalization.

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Introduction:

Although globalization has brought about many benefits that people can enjoy in the contemporary world, it has also exposed the world to negative consequences that threaten human existence. Studies have shown that most of these risks are caused by humans, thereby making humanity a powerful threat to the environment that must be regulated to reduce global risks (Van Langenhove, 2016, p.4). Some of the common global risks facing the contemporary world include the COVID-19 pandemic, which has recently shown the staggering impacts of infectious diseases, climate change due to high levels of carbon dioxide in the atmosphere, which has led to challenging weather events and many deaths, as well as nuclear, biological, and chemical warfare (Engström, 2021, p.1; Westin et al., 2021, p.8-12), which have become a threat to human existence. These risks are catastrophic since they have the potential to cause severe damage to people's well-being on a global scale (Bostrom & Cirkovic, 2011, p.1). This is because no single nation can handle these global risks due to their complexity.

Therefore, to improve the well-being of people on the planet, nations need to work together to achieve the capability of confronting these global concerns effectively using sophisticated modern science and technology. This led to the development of science diplomacy and global governance to improve international relations to foster quick responses to the global threats affecting the well-being of the people on the planet. According to the Royal Society, science diplomacy can be defined as the use of scientific information to make foreign policy decisions, coordinate scientific collaboration

and exchange using diplomacy to internationalize resources, and employ collaboration agreements to benefit an individual's country (Galluccio, 2021, p.27). Although science diplomacy has gotten more attention for its importance in tackling global challenges, critics believe that its means and ends are still unclear (Rungius & Flink, 2020)Fostering another type of science diplomacy driven by a combination of states, scientists, and the multilateral system could help fill this gap (Van Langenhove, 2016). In the twenty-first century, political efforts to employ science in meeting global challenges increased because of the great importance of scientific information. This opened the door for a new way of adapting our world's complex findings of science and technology to foreign policy (Kunkel, 2021).

On the other hand, global governance has been defined as a purposeful order that emerged from processes, formal agreements, institutions, norms, and policies that regulate behavior for the common good of the people (Benedict, 2015, p.155). Whereas global governance has been used to address horrendous challenges, critics argue that several inadequacies still exist in its application (Engström, 2021). The world's multilateral system is facing many difficulties in governance, such as authority for policymaking on global challenges, which remains with nation-states. Therefore, addressing worldwide issues requires a profound comprehension of the problems in question.

This paper argues that the complexity of systems in the world has shaped new relations between states and people in all nations. Today we see various kinds of global risks resulting from the complex networks and infrastructures of the world. For instance, COVID-19 started with one person and then spread to affect many people worldwide. One factor in its spread was the ability of people to travel anywhere in the world in less than 24 hours. Because of this, the infection could be passed on by a person even before symptoms of the disease appear. In another example of global consequences, the eruption of an Icelandic volcano in 2010 caused a considerable haze to settle over Europe for 1 week and a resulting stoppage of air travel in that region. Many other examples reveal weak points in the global system that can cause, or have caused, colossal system failures. Global risks can affect every person, and any failure on the personal level or state level will probably affect every country because of the complex connections between people and nations. Therefore, an examination of systemic risk is a good entry point for research on this new level of connection.

Thus, the significance of this study is that it interprets global catastrophic risks to set up a good case study on the links between global governance and science diplomacy in global risk response. The current research offers evidence of and recommendations for better connections in tackling global challenges.

Research Questions

- What is the proper way to utilize science diplomacy in bringing about better international relations to solve global catastrophic risks?
- How does the global governance structure affect the way nation-states deal with global catastrophic risks?
- How can we pinpoint the linkage between science diplomacy and global governance to deal with global catastrophic risks?

This study is divided into six sections. Section 2 highlights the current evaluation of science diplomacy in dealing with global catastrophic risk, the current global governance structure in dealing with global catastrophic risk, the current global risk situation, and the current linkage between global governance and science diplomacy in solving global risks. It also contains the theoretical underpinnings. Section 3 contains the methodology, design, and data obtained. Section 4 describes the results and discussion of the research study. Section 5 provides the conclusion and recommendations.

Literature Review

Current State of Science Diplomacy in Dealing with Global Risks

Indeed, there has been a continuous transformation of local to global policies regarding the use of science and technology, as illustrated by several cross-border treaties and agreements on how to tackle global risks. This is evidenced by the gradual opening up of the participation of science and technology as well as optimizing its participation in the global governance system (Van Langenhove, 2016). In this regard, science diplomacy examines the role science plays in global policymaking. Whereas there is no consensus on the definition of science diplomacy, scholars have alluded to the three main dimensions of science diplomacy: science in diplomacy, science for diplomacy, and diplomacy for science when discussing global risks (Barbarino, 2021; *New Frontiers in Science Diplomacy*, 2010).

Science in Diplomacy

Science in diplomacy is the enhancement of foreign policy decisions with scientific information. It involves mobilizing the science and technology resources within the national borders to develop a policy or technology to help fight global risk (Van Langenhove, 2016, p.19). Science in diplomacy aims to enhance foreign policy actions using scientific knowledge to ensure global success in confronting global catastrophic risks. For instance, the World Meteorological Organization (WMO) and the International Council of Scientific Unions (ICSU) joint activities and collaborations toward a global response to ozone depletion through robust data gathering led to the signing of the Montreal Protocol, which became one of the most successful agreements to eradicate CFC gases (Van Langenhove, 2016, p.10). Further, the UN agencies, together with WMO, established the Intergovernmental Panel on Climate Change (IPCC), which provided periodic data policymakers on climate change to assist in international actions and negotiations that individual governments should take to respond to climate change. More importantly, the findings of the IPCC led to the establishment of the Kyoto Protocol and the Paris Agreement (Barbarino, 2021, p.1), which spearheaded the global response to climate change. At the country level, science in diplomacy can be incorporated into the science and technology advisory boards in the form of high-level groups or councils to deliberate on international matters.

Although the IPCC has created an intergovernmental body that brought together governments, scientists and policymakers globally to efficiently respond to global risks, the challenge is role conflict between the UN agencies, WMO, and IPCC due to the complexity of the structure. The IPCC is perceived to act independently beyond its legal mandate, thereby creating mistrust in responding to global risks. For this reason, there is a knowledge gap in understanding how nations can maneuver through these complex structures of the existing international agreements and organizations to respond to global risks through consensus.

Science for Diplomacy

Science for diplomacy uses collaborations and innovations in science to improve worldwide relations and form bonds between countries (Barbarino, 2021, p.1). It happens when there is a strained relationship between nations or in case there is a common threat that individual states cannot solve independently. In this regard, scientific collaboration plays a significant role in establishing collaborative relationships that are not based on ideologies. Science for diplomacy aims to promote foreign policy actions using scientific networks to confront common global risks (Van Langenhove, 2016, p.19). A notable example is the Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME), which was initiated in 2017 under UNESCO in Jordan to unite researchers in the Middle East and the Mediterranean Region to ensure access to scientists in all research areas freely. Another important example is the Abdus Salam International Centre for Theoretical Physics (ICTP), a partnership between the

International Atomic Energy Agency (IAEA) and the government of Italy in 1963 to promote cooperation. These agreements promoted cooperation between the East and West and also between North and South, thus, building bridges, fortifying scientific and social relationships among societies, and encouraging strong international bonds through scientific cooperation.

Over the years, science for diplomacy has led to the spread of state-driven collaborations of scientific communities to promote science for diplomacy. Countries have established scientific programs and attachés in their embassies as well as establishing offices in foreign countries to facilitate science diplomacy. This has been fueled by the perceived notion that science diplomacy has a uniting power, and it is the light that illuminates where other diplomacy and international politics have failed (Selleslaghs, 2017, p.6). For this reason, states collaborate to share their scientific knowledge and resources through collaboration to tackle global risks.

While science for diplomacy has improved cooperation among states worldwide, there is a gap in understanding how scientifically disadvantaged nations can benefit from these international collaborations even without contributing much to the relationships. This majorly affects developing and less developed countries in certain geographies since global risks affect all or most of the countries in the world, and therefore, it requires every nation's contribution.

Diplomacy for Science

Diplomacy for science enhances worldwide scientific collaborations through diplomatic assistance using various approaches, such as bottom-up or top-down (Barbarino, 2021, p.1). It involves employing tools of diplomacy to assist the scientific community through collaboration agreements at institutional and government levels. Diplomacy for science aims to ensure maximum benefit from foreign science capacity to enhance country-level capacity (Van Langenhove, 2016, p.19). Examples of diplomacy in science include the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) in Switzerland, formed in 2008, and the Extreme Light Infrastructure (ELI), which operates a network of high-powered laboratories (Barbarino, 2021, p.1). Multiple levels of political involvement have been used to fund these science projects to benefit partner states.

However, the funding and support provided to these international projects sometimes contain some stringent measures that may prevent some developing countries from benefiting from foreign science capacity. For instance, although the U.S. offered a gift of mobile radioisotope laboratories to IAEA in 1958, the offer was meant to maintain authority and keep a closer check on IAEA and international nuclear energy regulations (Rentetzi, 2021, p.1). These strings attached to the agreements for sharing foreign scientific capacity may contribute to the loss of sovereignty among less developed nations as they attempt to benefit from the foreign capacity to enhance national capacity. As such, there is a knowledge

gap in examining ways in which these foreign capacities can be shared with minimal strings to help all nations develop internal capacity to respond to global risks.

Current State of Global Governance Structure in Dealing with Global Risks

In the 1990s, global governance grew for three main reasons: technology and development, an increasing number of nonstate actors, and the interest in the concept of supranationalism (Weiss, 2014). Supranationalism "involves states working with one another in a manner that does not allow them to retain complete control over developments. That is, states may be obliged to do things against their preferences and their will because they do not have the power to stop decisions. Supranationalism thus takes inter-state relations beyond cooperation into integration and involves some loss of national sovereignty" (Nugent, 2006, p. 558). This reason is not widely known as yet (Weiss, 2014). For instance, the coronavirus pandemic has uncovered the unpredictable, delicate nature of global governance organizations and the restrictions of power and authority despite emergencies of massive scope. One upsetting ramification is that crises should be fast-approaching and unmistakable to produce a significant governance reaction. It is a fact that activities will be conflicting and difficult to support over the long run. The possibilities are unfavorable for approaching emergencies other than the pandemic, for example, climate change (Levy, 2021).

Global governance can be better understood by looking at its five main gaps, which are knowledge, norms, policies, institutions, and compliance (Weiss, 2014). Addressing these gaps will help in developing the field.

Knowledge

The first gap to be addressed is the knowledge gap. There is a need to build standard dimensions and definitions and obtain sufficient information about a problem before taking any steps to resolve it (Weiss, 2014, p.12). In this regard, the differences in ideologies among nations and the population pressure of individual countries significantly influence the knowledge gap in understanding global governance. Such knowledge gaps are caused by the lack of sufficient information or data on global risks, which leads to less understanding of the power of collective responsibilities in tackling global risks (Weiss, 2014, p.12). In addition, the constant clash among various scientific minds due to ideological differences on global risks has slowed the pace of responding to the risks on time. On the other hand, such clashes have generated an impressive counter-balance to realize optimum solutions to global challenges, such as COVID-19 and climate change. Therefore, it is important to examine how the knowledge gap can be minimized at the local and global levels to improve global solutions.

Norms

Norms are behaviors reflecting values. States and international institutions must close the normative gaps. Norms are extremely crucial to individuals, nations, and institutions since they build reputations and images from norms. In this regard, nations earn reputation and respect as powerful states and avoid being singled out to have flaunted international norms (Henkin, 1979). Whereas states have different norms based on national policies, scientists across the globe have attempted to mobilize data to understand international norms better in terms of how they are managed, fused globally, internalized by nations, and how they are incorporated into international regimes (Weiss, 2014, p.13). This is because some developed states tend to use their powers to develop norms that mostly favor them. For this reason, there is a need to understand how international norms can be created in a way acceptable to all nations to help fasten the response to international threats.

Policies

These are interlinked governing principles, agreed-upon actions, and programs to implement the set goals for global risks. Examples of such policies are contained in the Comprehensive Test Ban Treaty and Kyoto Protocol to regulate nuclear weapons and global warming (Weiss, 2014, p.15). In this regard, both national and foreign policies are considered when dealing with global risks. It is also important to recognize that the policies of countries differ in that some are considered soft laws while others are relatively hard. Therefore, international policies may be considered

ambiguous compared to country-level policies. This creates a gap in understanding the global governance policy structure that all nations can adopt effectively when confronting global risks.

Institutions

Policies need a new institutional structure and must avoid ad hoc initiatives. For instance, organizations such as WTO, World Bank, and other international security agencies have been affected by their inability to resources to be self-sustaining without relying on some states. Inadequate resources and funding have prevented these international bodies from being autonomous in their operations (Weiss, 2014, p.16). This makes it a problem to handle global risks. Additionally, filling the institutional gap means that gaps in laws and norms must also be filled. Intergovernmental organizations that are effective and assumed to be legitimate for solving global challenges must be set up.

Compliance

Global compliance requires monitoring of participating nations and detecting those that abandon agreed-upon norms and commitments. This is because countries possess varying powers such that influential institutions and trade movements, such as IMF and WTO, tend to make enticing demands that less developed countries may hesitate to refuse (Weiss, 2014, p.18). Due to such influences, powerful states may deviate from operating within the set norms. Moreover, the lack of reinforcement groups, such as the international military, to discipline member states renders

international governance structure compliance limited. This is because international organizations will have to rely on some states to help reinforce compliance (Ngoepe et al., 2019, p.3). Therefore, there is a need to examine further how global governance can be enhanced to increase compliance with international norms for responding to global issues.

Current Global Risks Situation

Global Complex System

Networks are connections, and for this study, connections are among people and nations. Trade relationships, immigration activities, social contacts, and many other kinds of interactions become easy because of critical infrastructures, such as roads, airline routes, sea routes, computer linkages, and electric circuits. They have helped shape broad connections so that the international system has become a complex network (Centeno et al., 2015, p.66).

Systemic Risks

Although there is no universally acknowledged meaning of systemic risk (Collier & Lakoff, 2011) it is acknowledged that risk analysis looks at two factors, systemic risks, and emerging risks. Systemic risks are individual failures that could spread and affect the components of the complex international system step by step. Emerging risks are dangers that have not been seen before but are expected to happen; they result from the nature of the complex system and cannot be forecast (Centeno et al., 2015, p.69). Global catastrophic risks include weapons of mass destruction (i.e., nuclear,

biological, and chemical weapons), climate change, ecological collapse, pandemics, asteroid impacts, supervolcanic eruptions, dangerous uses of artificial intelligence, effects of nanotechnology, and damage from quantum computing (Westin et al., 2021).

Risks from Networks

The complex networks that facilitate global connections, such as the internet and traffic routes on sea and land and in the air, are usually stable. They can, however, be targets for attack, which could have severe consequences all over the world. Viewing the world as a complex network can foster an analysis that could bring about a better world (Centeno et al., 2015, p.70).

Current Linkage between Global Governance and Science Diplomacy in Solving Global Risks

Contemporary global challenges have a scientific dimension, and it has become clear that no country can solve these challenges alone. There is a need for global governance based on international scientific collaborations. The Sustainable Development Goals Agenda is concerned with the importance of scientific advice in policymaking (Ruffini, 2020a).

Science diplomacy is an instrument of foreign policy that has been developed in scientific and diplomatic communities, which have different but not opposing interests. Analyzing science diplomacy in light of significant international theories, mainly realism, liberalism, and constructivism, shows that the scientific community acts in diplomacy and that science is a topic of

diplomacy, a goal of diplomacy, and a means of diplomacy (Aranda, 2022, p.166).

The function of science diplomacy is not equal between countries. Developed countries utilize science diplomacy as an instrument of their foreign policy. However, many developing countries have started to do this as well and recognize that science diplomacy can enhance international cooperation and tackle global challenges (Buyuktanir Karacan, 2021)2021.

Both of science diplomacy's facets-namely, its cooperative and competitive facets-were discussed in this paper. Inquiries have been made about why the prevailing discussion of science diplomacy is concerned with cooperative activities in the world and the quest for shared interests but gives little consideration to activities motivated by competitive efforts. This underlines the need to expand the meaning of science diplomacy by discussing its double nature, both cooperative and competitive (Ruffini, 2020b).

The competitiveness becomes more noticeable when one looks at the use of scientific findings, especially in terms of development. The current COVID-19 emergency has focused on the race for immunization, scientific difficulties for the business sector, reputation and power issues, and the natural competitiveness in scientific endeavors as it transforms into rivalries between nations. Diplomacy for science is not always related to collaborations; in the 1990s, some of the best scientific "brains" from around the world were induced by some Western countries to emigrate and carry out their research in those countries. This only confirms

that one direction taken by scientific strategies is the competitive direction.

Current practices are shown by different actions. At a gathering of counselors and attachés involved in cultural and scientific activities at French embassies, the French Minister of Foreign Affairs began by praising French diplomacy and stressing the global extent of France's messages. He then encouraged the continued promotion of this capital. He did not emphasize cooperation with other countries but rather encouraged competition among diplomats responsible for academic, scientific, or cultural efforts as they acted in foreign situations. When looking at the United Kingdom's Science and Innovation Network, it was noted that the road map for British science representatives living in Paris had the goals of helping the UK, developing advances in the UK, and impacting the scientific policies of the French government, industrial sector, and scholarly community to benefit the UK. Official plans in some European Union (EU) nations do not hesitate to connect their international initiatives related to science to their country's general competitiveness (Ruffini, 2020b). In any case, since the 1990s, the EU has developed new plans for ecological and environmental issues that have added to its status as a worldwide player and regulating actor in these fields. Its environmental diplomacy has become essential to its external strategy of confronting worldwide difficulties (Tomalová & Ullrichová, 2021, p.473).

Whenever nations such as China, Brazil, Turkey, or India participate in science diplomacy, they trust in the excellence of worldwide scientific collaborations. They consent to follow the general direction of development toward better governance. At the same time, they are searching for the best ways to attract scientific assets for their national well-being (Ruffini, 2020a).

These examples are not an attestation. Nonetheless, they should cause researchers to be aware of the one-sided and competitive aspects of science-related foreign policy activities (Ruffini, 2020b).

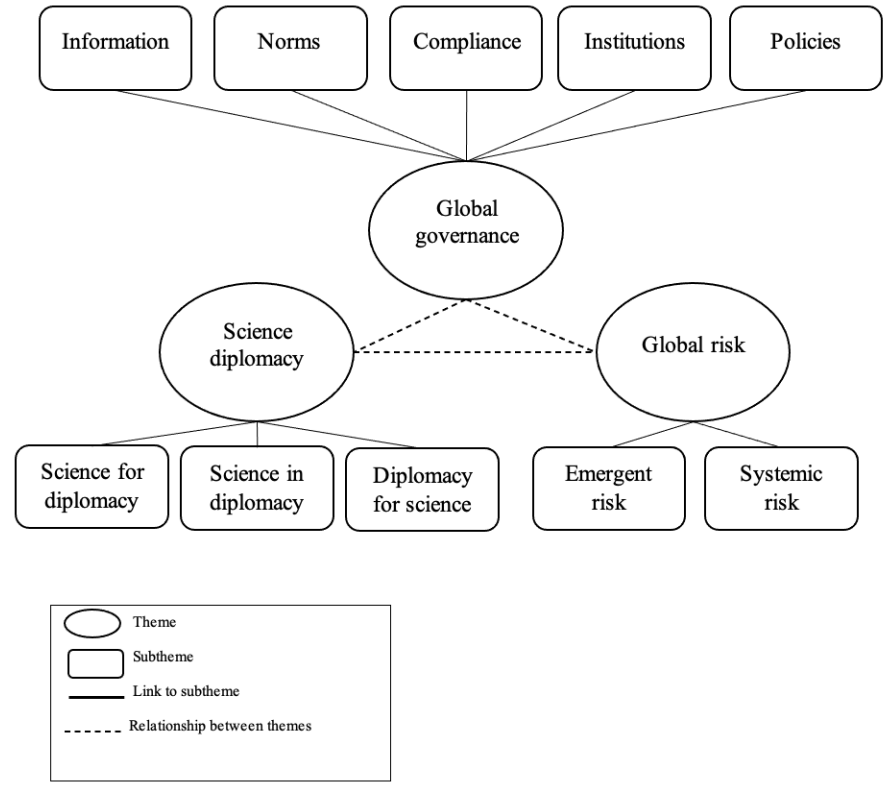
Conceptual Framework

The researcher chose to focus on the theoretical and conceptual framework of the topic, and thus, for the data analysis, the researcher zeroed in on a nitty-gritty investigation of a specific part of the dataset that was deciphered in terms of a particular theoretical focal point (Byrne, 2021, p.1394). The researcher applied a reflexive thematic analysis with a deductive approach. Using a solely deductive approach is challenging. It is essential to appreciate the connection between various items of information to recognize repeated shared traits of a pre-existing theory or conceptual framework (Byrne, 2021, 1397). This approach to coding permits analysts to uncover unexpected findings as opposed to merely summing up the information. The information is deciphered through the analyst's suppositions, responsibilities, and insights. Such a coding interaction can show themes reflecting patterns of shared meaning (Morgan, 2022).

The strategy employed in the six-phase analytical process (Byrne, 2021, p.1398) was as follows: In phase 1, the researcher became familiar with the data; in phase 2, generated the initial codes; in phase 3, generated themes from the codes; in phase 4, did a recursive review of potential themes; in phase 5, defined and named themes; and in phase 6, described the results. Figure 1 shows the thematic map.

Figure 1

Final Thematic Map



Final Thematic Map*Note.* This figure was produced by the author, summarizing the themes and subthemes that emerged from the data analysis.

In sum, the current study aimed to explore these critical questions: (1) What is the proper way to utilize science diplomacy in bringing about better international relations? (2) How does the global governance structure affect the way nation-states deal with global catastrophic risks? (3) How can we pinpoint the linkage between science diplomacy and global governance to deal with global systemic risks? To answer the questions, three major theoretical underpinnings were considered: (1) the dimensions of science diplomacy, (2) the nature of global systemic risks, and (3) the gaps in global governance. Identifying those categories helped in addressing the aims of the study summarized in section 4.

Methodology

The researcher conducted a systematic review of the latest data from academic journals and books, on the significant increase in concern about science diplomacy, global governance, and global risks after the COVID-19 pandemic. Different academic databases were used to find the sources. This method was helpful because the data were considered reliable (Morgan, 2022, p.64). When gathering the data, the researcher focused on their authenticity, credibility, representativeness, and meaning (Morgan, 2022, p.68). For the sampling technique, the researcher used the keywords "science diplomacy" AND "global challenges" AND "global risk" AND "global governance" to find sufficient information to address

the study's objectives. The technique became more advanced as the researcher also consulted references in the initial academic journals and books.

Results and Discussion

From the literature search, data that met the search criteria were analyzed to help answer the research questions. The results are organized based on the research questions as follows.

What is the proper way to utilize science diplomacy in bringing about better international relations to solve global catastrophic risks?

One way to utilize science diplomacy to bring about better international relations to fight global risks, such as COVID-19, is by promoting mutual growth or gains for all member states of the internationally established agreements. Countries tend to increase their commitments to support international movements, organizations, or agreements when they feel that they are mutually gaining from the introduced science and technology that is being shared to mitigate the effects of global risk. For instance, Sharma et al. (2022) argued that global catastrophic risks not only shift the relationships among policymakers, governments, and scientific communities but also affect cooperation between developed, developing, and underdeveloped countries. As such, South-South Cooperation (SSC) was established to support North-South development cooperation to realize the SDGs. This finding explains why countries maneuver their way through complex international

structures to realize optimum gains from the agreements.

In addition, science diplomacy can be used to develop the capacity of nations to tackle global catastrophic risks. Without empowering the nation-states to develop internal response mechanisms to the risks, it would be difficult to realize international success in combating global risks. For instance, while researching science diplomacy for climate action, Cuellar-Ramirez (2021) found that the scientific community should develop the capacity to integrate scientific know-how into society to help build a resilient society that can respond to global threats effectively. Training and development have been an effective undertaking to improve the capacity of individuals in society. This finding adds knowledge to the diplomacy for science, which is concerned with increasing the capacity of nations to confront global challenges. Moreover, the results confirm the assertions by Moomaw (2018, p.78) that successful science diplomacy needs input from scientists with a deeper understanding and can contribute to the policymaking process. Therefore, it is pretty clear that nations with limited capacity to confront the risks would be in disadvantaged positions when working independently rather than collectively to fight a global threat.

Whereas there are already established global systems and organizations that can be used to confront global disasters, such as the UN agencies, Kontar et al. (2020) found that establishing knowledge exchange centers (KECs) nationally through science diplomacy can help reduce global threats. KEGs are envisaged to

foster inclusive discourse to assist in proactive decision-making by sharing knowledge about the risk with the participating nations for faster response (Kontar et al., 2020, p.3). One of the key pillars of KEGs is to engage the global diplomatic community, which is diplomacy for science, given that diplomatic efforts are required to create effective programs for tackling global threats. The proposal to have knowledge exchange centers tends to concur with the findings by Sharma et al. (2022, p.294) that there is a need for countries to foster need-based technological transfer among developing and less developed nations as well as to create many fronts for mutual sharing of resources, expertise, and geopolitical. The sharing of knowledge on the global platforms, thus, requires strong science diplomacy to provide the needed collaboration among nations possessing divergent knowledge, skills, and expertise to tackle global threats.

How does the global governance structure affect the way nation-states deal with global catastrophic risks?

Global governance structure affects countries' response to global risk in that lack of or weaker international policy reinforcement capability has prevented international organizations from fulfilling their mandates. There is indeed no internationally recognized military or law enforcement agency to ensure that countries comply with the set policies for tackling global issues. As such, overreliance on individual countries' goodwill to support these international organizations has dragged the implementation process. For this reason, López-Claros et al. (2020, p.5) suggested strengthening

international law enforcement and legal institutions would be a better way to solve global crises. Despite the presence of global mechanisms, such as international laws and policies put in place to uphold international cooperation, there is a feeling that such mechanisms are inadequate to effectively confront the global issues affecting the globe. For instance, Abdenur and Plataforma (2020, p.18), while exploring global governance on global risks using the capacity of the UN systems to handle global risks, found that there is a gap in the UN risk monitoring capacity having a narrow focus on risk exposure. In addition, López-Claros et al. (2020, p.14) found a challenge in the current operations of the General Assembly and proposed redistributing powers at the General Assembly and the voting pattern at international forums to help reduce the powers of some states that use their influence to further their interests. For example, countries such as the United States and China proved to be untrustworthy in observing the provisions of the Kyoto Protocol on global warming and have continuously increased their greenhouse gas emissions. As economic powerhouses, there is nothing that other states to the Kyoto Protocol agreement could do to the two nations. This finding also explains why IMF and WTO, among other international bodies, have not been so effective in executing their duties since they have limited reinforcement capacity, as stated by Weiss (2014). Thus, it could be argued that if the international systems set by organizations like the UN have some flaws and the agreements are less influential in correcting global issues, then the global governance system has an issue in dealing effectively with the threats. Therefore, strengthening the institutions to enforce international laws and guarantee adequate compliance will

increase the effectiveness of nations in confronting global threats. In addition, the proposal to have the UN International Security Force derive its powers from the General Assembly through the Executive Council (López-Claros et al., 2020, p.16) can facilitate international policy compliance.

Whereas there were good global governance structures in place after World War II, Levy (2021) found that these structures were already weakened long before the current global threat of COVID-19. The weak and fragmented global governance structure has shaken global institutions ranging from trade, health, and climate change, leading to the rise of private and voluntary governance (p.564). The governance shifted from the normal formal governmental rules and laws to more voluntary and disclosure-based systems, such as ESG and CSR, which are spearheaded by private players. This rise of private and voluntary governance has, however, been criticized for preventing accountability and inclusivity. In addition to the emergence of private governance, the decline in the global governance structure is likely to hinder the rise in economic nationalism of many countries. Therefore, the governance deficit in the international arena has significantly been a hindrance to the actions of governments to tackle emerging global threats. Furthermore, the establishment of G7 and G20 was viewed to have provided another avenue for reinforcing the existing mechanisms of international collaborations by bringing together the world's largest economies to lead the global response to the world's threats. However, their contributions have been challenged by their overreliance on the domestic political will of the leaders,

who have been accused of bending the agendas of these groups in a manner that is inconsistent with the world's needs (Dupont, 2020). For this reason, an effective and credible mechanism to foster international collaborations legitimately and act in the best interest of mankind rather than for country specifics is necessary if the world has to respond to the striking world challenges. Finding a striking balance between international policies and norms that promote global economic development to provide opportunities to all nations, especially economically disadvantaged nations, is an undertaking that the current intergovernmental system cannot achieve to realize the needed level of cooperation. Therefore, empowering individual states to develop norms and policies that conform to the needs of the planet while at the same time building the capacities of less developed nations can enhance collaborative response to world threats effectively

How can we pinpoint the linkage between science diplomacy and global governance to deal with global catastrophic risks?

Indeed, many scholars have demonstrated that the combination of science diplomacy and global governance has a greater impact on how nations confront the world's catastrophic risks that are ailing the planet. For instance, whereas science diplomacy provides scientific information to handle the risks, the global governance structure provides a channel through which nations can share scientific information to help the countries respond to the catastrophe. A study by Abdenur and Plataforma (2020, p.17) found that linking global interdisciplinary scientific counsel to provide

global advice is crucial to winning the war on global risks. To this end, facilitating effective channels of communication among nations through the use of ICT innovations can help strengthen emergency communications prior to the occurrence of the risk and improve coordination during a global disaster. For example, to strengthen the coordination and knowledge sharing among nations, the UN collaborated with two giant global satellite firms, Vizada and Inmarsat, through science diplomacy to acquire 70 satellites for the International Telecommunications Union (ITU) to help relay voice and broadband data any time there is a global disaster (Abdenur & Plataforma, 2020, p.19). The consumption of scientific knowledge, thus, requires a well-constituted governance structure that promotes the equal provision of information to all nations when and where it is needed.

The power of science diplomacy and global governance in sharing knowledge and information to confront a global risk was evident during the COVID-19 outbreak. For instance, the use of Analytical and Artificial Intelligence-based predictive Models (AAIMs) during COVID-19 enabled clinical, epidemiologists, economists, and policy experts to develop models and analyze data from the pandemic into a usable form to scale up global decision-making (Galvin et al., 2021, p.1). Without access to the data and data models for the present COVID-19 pandemic, many countries would be unable to manage the pandemic effectively, especially due to the constantly changing testing and containment measures adopted globally. The whole idea of flattening the curve of infection rates emanated from the data shared on international communication

platforms regarding the rate at which the disease spreads and the severity of the cases reported from other countries. These helped countries reorganize their national healthcare systems to confront the virus. In addition, (Ivanov & Dolgui, 2020, p. 2907) found that the ability of firms to maneuver through complex supply networks with changing structures, behaviors, and roles enabled firms to maintain collaborative networks to ensure constant supplies. In this regard, having such collaborative networks enabled various clinical experts to track the ongoing vaccine development across the globe and the sharing of approved vaccines through a clear global governance structure to ensure that all countries can fight the pandemic. The systemic risks highlighted by (Collier & Lakoff, 2011) was evident in the decision by China not to disclose the true status of COVID-19 for political reasons, which fueled the rapid spread of the COVID-19 disease in the U.S. (Galvin, 2021, p.1). However, the scientific innovation of various vaccines developed by firms from developed countries and their political will to share the vaccines with other nations has helped the world to mitigate the severity and spread of the disease, thus, making an effective global governance system a vital tool for fighting global risks.

The current global issues tend to be beyond an individual country's capacity to solve due to their complexity. As such, there is a need for collaborative global governance based on international science and technology. For instance, the COVID-19 pandemic illustrated how states might act alone instead of in international cooperation (although there were also instances of cooperation). Despite the increasing importance of science diplomacy, its practice

and nature are still unexplored and unclear and it is a cross-border field (Melchor, 2020) Science diplomacy can be a factor in the narrative of a crisis. Tackling global challenges requires worldwide collaborative efforts, such as science diplomacy. Cooperation among all of the actors in the international system is essential (Rungius & Flink, 2020, p.102) First, science diplomacy can be an immediate reaction to a threat to humanity and can let people know that help is on the way. Second, science diplomacy can convey a sense of capability and success even though significant risks are present. The global risk narrative shows that science diplomacy can be essential mitigation for disaster and can provide a spark of hope (Rungius & Flink, 2020, p.102).

Collective action by global governance that includes science diplomacy can provide solutions based on scientific grounds. Science diplomacy can be seen as trustworthy and informative because science is perceived as a logical field of knowledge that can lead to collective action in the international arena (Rungius & Flink, 2020, p.102) In this context, the role of science diplomacy in setting up global governance and forming relations between international actors is not based on the state-centric view, even if its actions appear state-based (Hocking, 1999). Scientific communities are often more flexible in response to global challenges than other communities because they operate outside the restrictions of state bureaucracies and political disputes. Science diplomacy should be taken seriously. It requires a combination of diplomacy and theories of international relations within a global governance paradigm. Incorporating science and diplomacy into a meaningful conversation

will help advance the significance of science diplomacy (Kaltofen & Acuto, 2018a). The intertwined processes of science diplomacy enable the building of shared interests, and this is needed for the functioning of the participants in the short term and the long term (Berkman, 2020).

Science diplomacy opened the doors for many actors, such as diplomats, decision-makers, and scientists (Flink, 2020), to explore global issues. Thus, efficacious science diplomacy expects states' representatives to have a sound comprehension of basic science (Moomaw, 2018, p.78). It can be said that involving science in international negotiations is vital. Moreover, a deeper understanding of global scientific governance can likely succeed if scientists and diplomats benefit from joint education (Mauduit & Gual Soler, 2020).

Conclusion and Recommendations

Conclusion

This research explored the interaction between science diplomacy and global governance in enhancing the hope of confronting global catastrophic risks and developing the contemporary discourse on science diplomacy and global governance. It involved the review of articles related to the study of objectives, which include the use of science diplomacy and global governance in fostering international relationships needed to confront global risks being experienced in the contemporary world.

The analysis showed the desirable common concerns of science diplomacy and global governance and also the ability of scientists to act rapidly and practically in addressing global challenges. The study also revealed that the collaborative nature of science diplomacy is greatly affected by competition among member states of an international agreement due to a lack of political will. For this reason, the success of international institutions and agreements to react to global risks depends on the funding and the willingness of states to share their scientific knowledge to help combat global risks. Therefore, science in diplomacy, in which science is viewed as a foreign policy instrument to enhance a state's national interests. The promotion of science diplomacy as a stable and effective tool for confronting global risks is vital.

Furthermore, a lack of good global governance structure, which is determined by international leaders' political will to establish an intergovernmental body consisting of experts from all aspects of life to conduct research and communicate data to member states, is found to hinder global response to world risks. This is due to the lack of autonomy of international bodies and organizations to reinforce global norms and policies that can enhance quick response to global disasters. Thus, a proposal to have UN International Force could be a good idea to improve compliance with international norms, policies, and laws.

Overall, science diplomacy and global governance are found to jointly affect the pace at which nations react to global risks. For instance, science provides knowledge and data on global risks, while governance enhances the coordination and dissemination of data for quick decision-making. Therefore, it can be concluded that science and global governance complement each other in confronting global issues.

Recommendations:

Investigating the connection between science diplomacy and global governance is a complicated undertaking that requires a comprehensive examination of diverse resources. This study provided a general overview of the importance of filling governance gaps and employing science diplomacy in solving global risks. Now, in our hyper-globalized world, this is more important than at any other time because of the complexity of the network in the international system. Some scholars can insist, driven by the realist school of thought, that the competitive nature of the international system is here to stay and that filling gaps in governance may lead to conflicts with the traditional entity of the sovereign state. Another debate has a direct relationship with science diplomacy, particularly its dimension of science in diplomacy, in which foreign policy relies on scientific advice. The advice may affect the core national interest of the state or the generation of better relationships with other states and collaborations for solving world problems and confronting the risks threatening humanity. Science in diplomacy may also reflect both areas, as some scholars have shown. The topic itself is so important and has been an ongoing investigation

by scholars in recent years, and very limited data is available on it. Many questions need to be answered, and much future research is needed to investigate global risks independently and how they are linked to science diplomacy and global governance structure. Further research could focus on the role of science in exploring the weak points in our complicated system, which might affect decision-making domestically and globally.

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الصلة بين دبلوماسية العلوم والحوكمة العالمية في مواجهة المخاطر الكارثية العالمية

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ملخص البحث:

تبحث هذه الدراسة في العلاقة بين دبلوماسية العلوم والحوكمة العالمية لمواجهة المخاطر الكارثية العالمية، وكيف انعكس ذلك على تطوير المناقشات المعاصرة حول التعامل مع المخاطر العالمية. ولهذه الغاية، ركزت الدراسة على الأبعاد الثلاثة لدبلوماسية العلوم، طبيعة المخاطر العالمية في عالمنا المفرط بالعولمة، والفجوات في الحوكمة العالمية. هدفت الدراسة إلى تحديد كيف يمكن لدبلوماسية العلوم أن تعزز العلاقات الدولية للاستجابة بسرعة للقضايا العالمية، وفهم كيفية تأثير هيكل الحوكمة العالمية على طريقة استجابة الدول للقضايا العالمية، والعلاقة بين دبلوماسية العلوم والحوكمة العالمية من أجل التعامل مع المخاطر العالمية. اعتمدت الدراسة المنهج النوعي؛ إذ تم الحصول على البيانات ذات الصلة والمكونة من الكتب وأبحاث المجلات العلمية من خلال البحث عبر الإنترنت في قواعد بيانات مختلفة، ثم حلّلتُ هذه البيانات التي تم الحصول عليها للإجابة عن أسئلة البحث. ووَجَدَت النتائج أن دبلوماسية العلوم تعزز المكاسب المتبادلة، وتنمي قدرات الدول لمواجهة التحديات العالمية. بالإضافة إلى ذلك، يؤثر هيكل الحوكمة العالمية على قدرة تعزيز السياسات للمنظمات الدولية المكلفة بمواجهة القضايا العالمية في العالم المعاصر. نظرًا لأن الموضوع حديث، وهو مثار نقاش مستمر بين العلماء، فإن التوصية بإجراء بحث شامل ضرورية لمزيد من التبصر في الموضوع. توفر هذه الورقة أساسًا جيدًا للباحثين

الكلمات الدالة: دبلوماسية العلوم، الحوكمة العالمية، المخاطر الكارثية العالمية، العلاقات الدولية، العولمة

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