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The Role of Science in Foreign Policy: Science Diplomacy of Jordan

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Abstract

Objectives: This study aimed to increase knowledge about the ways in which science diplomacy is viewed and practiced in Jordan.

Methods: A qualitative case study approach was used to accurately describe science diplomacy in terms of three empirical dimensions: (1) science for diplomacy, (2) science in diplomacy, and (3) diplomacy for science. A combination of scientific journal articles, official domestic and international documents, reports, and news stories was chosen from which to obtain data. An in-depth content analysis of documents and databases related to the topic was adopted to find predefined key terms used in science diplomacy, which were coded to indicate the conceptual dimensions of science diplomacy related to Jordan.

Results: Based on the findings, numerous themes relevant to the practice of science diplomacy were identified. First, Jordan employs the three dimensions of science diplomacy. Second, it is aware of the importance of science diplomacy in promoting better relations and tackling global challenges. Third, the related local institutions employ science diplomacy as part of the overall political strategy in Jordan.

Conclusions: The study's findings suggest that Jordan will likely take advantage of the practice of science diplomacy but that making progress in science diplomacy in Jordan requires more effort.

Keywords: Jordan, science diplomacy, international cooperation, Middle East.

دور العلم في السياسة الخارجية: الدبلوماسية العلمية الأردنية

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ملخّص

الأهداف: هدفت هذه الدراسة إلى زيادة المعرفة حول طرق النظر إلى الدبلوماسية العلمية وممارستها في الأردن.

المنهجية: تم استخدام منهج دراسة الحالة النوعية لوصف الدبلوماسية العلمية بدقة من حيث الأبعاد التجريبية الثلاثة: (1) العلم من أجل الدبلوماسية، (2) العلم في الدبلوماسية، و(3) الدبلوماسية من أجل العلم. جرى اختيار مجموعة من أبحاث المجلات العلمية والوثائق الرسمية المحلية والدولية والتقارير والأخبار للحصول على البيانات من خلالها. جرى اعتماد تحليل محتوى متعمق للوثائق وقواعد البيانات المتعلقة بالموضوع للعثور على مصطلحات أساسية محددة مسبقًا مستخدمة في الدبلوماسية العلمية، والتي جرى ترميزها للإشارة إلى الأبعاد المفاهيمية للدبلوماسية العلمية المتعلقة بالأردن.

النتائج: بناءً على النتائج، جرى تحديد العديد من الموضوعات ذات الصلة بممارسة الدبلوماسية العلمية. أولاً، يستخدم الأردن الأبعاد الثلاثة للدبلوماسية العلمية. ثانيًا، تدرك الدولة أهمية الدبلوماسية العلمية في تعزيز العلاقات الدولية ومواجهة التحديات العالمية. ثالثًا، تستخدم المؤسسات المحلية ذات الصلة الدبلوماسية العلمية كجزء من الاستراتيجية السياسية الشاملة.

التوصيات: تشير نتائج الدراسة إلى أن الأردن يمكن أن يستفيد من ممارسة الدبلوماسية العلمية، لكن تطويرها يتطلب المزيد من الجهد.

الكلمات الدالة: الأردن، دبلوماسية علمية، تعاون دولي، الشرق الأوسط.

Introduction

1.1 Background

Even though science and diplomacy have a long-standing relationship, the term "science diplomacy" was not coined until the twenty-first century (V. Turekian, 2018). Despite the term having acquired momentum in recent years, the field of science diplomacy remains an experimental, largely underexplored one (Epping, 2020). Considering science diplomacy as a new dimension and a particular field of international relations (Ruffini, 2017), it became essential for confronting global challenges (Echeverría King et al., 2021; V. Turekian, 2018), promoting diplomatic dialogues, and facilitating cooperation between countries (V. Turekian, 2018). The topic of science diplomacy is a subcategory of the larger field of diplomacy. Realists and neorealist scholars view diplomacy as state practice and an instrument for foreign policy (Gutenev, 2021; Szkarłat, 2020). However, neoliberal institutionalists argue that states are not isolated as single entities and that non-state actors influence foreign policy. Non-state actors play a significant role in science diplomacy (Szkarłat, 2020). The field offers considerable scope for political scientists, public policymakers, and those engaged in international relations to influence global relationships (Legrand & Stone, 2018). Science is considered a vital tool for achieving foreign policy goals (Epping, 2020).

The researcher found several definitions of science diplomacy. Whereas a precise interpretation of the term remains questionable (Mauduit & Gual Soler, 2020), it is essential to understand that science diplomacy is directly related to cooperation, peace, and solving common world problems. We cannot employ science to satisfy the interests of only one nation; if we do this, we will become part of the considerable debate between those with a state-centric view and those who focus on integrating and cooperating between countries and international institutions. However, when referring to science diplomacy, it is difficult to overlook the fact that its goals are a combination of competitive and cooperative nature (Szkarłat, 2020).

Despite expanding science diplomacy to achieve peace and cooperation between states worldwide, there are only limited holistic insights on how Jordan uses science diplomacy. Therefore, it is valuable to reflect on the overarching experience of Jordan, and we must understand and examine all pertinent contexts of Jordan's science diplomacy. Accordingly, this qualitative study explores Jordan's experience of science diplomacy.

1.2 Statement of the Problem

Security and peace in a region like the Middle East are vital, and new avenues of impact and opportunity have become accessible to governments parallel to the "conventional" methods of diplomacy (Legrand & Stone, 2018). For a country like Jordan, which is surrounded by many conflicts, it is essential to investigate all possible approaches to sustainable development and ways of maintaining and promoting peace. This study aims to understand science diplomacy as a new approach to help achieve cooperation regionally and abroad.

1.3 Research Objectives and Questions

The leading goal of this study is to explore the experience of Jordan in science diplomacy and determine how the country might seek to extend its activities in science diplomacy. To achieve these objectives, it is necessary to answer these questions:

1. What are the activities proposed by Jordan for science diplomacy?
2. Why does Jordan seek to extend these activities?

1.4 Purposes and Significance of the Study

The current study explored Jordan's experience in science diplomacy to investigate how this new field has influenced the development of better relations and the solving of common international problems.

The study is significant in many ways: First, a focus on Jordan's experience in science diplomacy can be beneficial for bringing more attention to this topic in a developing country with limited power in the international system. An analysis of

the current situation can be constructive in opening a track for future studies that could set forth possible policies and recommendations. Second, there is a lack of comprehensive scientific studies regarding Jordan's science diplomacy, and this study can help fill the gap; therefore, third, this study can also give public officials a better understanding of the topic's importance in international relations. Finally, the study can contribute positively to the development of Jordan in general and could influence the government to put more effort into science diplomacy.

This study focused on the years 2010 to 2022 because science diplomacy is a novel topic in international relations. Furthermore, the former decade was harsh because of the Arab revolutions, the Syrian civil war, and the continuous Arab-Israeli conflict.

1.5 Outline of the Study

The study sections are as follows: Section 2 provides the literature on science diplomacy around the world and in the Middle East and introduces a conceptual framework that defines the three dimensions of science diplomacy. To explain these dimensions, section 3 illustrates the methodology used. Section 4 explores the findings and investigates Jordan's application of the diplomacy findings, and section 5 provides the conclusion.

Literature Review

2.1 Review of Literature on Science Diplomacy around the World and in the Middle East

There is a lack of sufficient academic studies on science diplomacy. The researcher consulted those available about the Middle East, including Jordan and other world regions, to better understand the topic's history. Some nations in the Middle East are in the beginning phases of characterizing the essential methodologies they will use for science diplomacy. A shared view of efforts from other areas worldwide will encourage a local discourse that can empower effective connections with other areas, especially in addressing global challenges. The researcher reviewed global efforts to develop a fundamental discourse surrounding science diplomacy in Jordan, and the goal was to enhance plans for cooperation in the Middle East.

Dohjoka et al. (2017) argued that science alone could not settle the numerous political, security, and economic issues that Arab nations faced. Nevertheless, science diplomacy plays a significant role in addressing the Arab region's challenges. They introduced several endeavors of science diplomacy in the Arab region; the "Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME)" and "InterAcademy Partnership (IAP)". Two endeavors to spur science diplomacy in the region were planned by the coauthors in Jordan in 2015 and 2016. Dohjoka et al. (2017) suggested that empowering science cooperation among Arab nations could reinforce their diplomatic ties and build a scientific base incorporating regional decision-making to resolve common challenges.

Rungius et al. (2021) investigated SESAME specifically in terms of science diplomacy. The study mainly concluded that SESAME is an exceptional science collaborative and diplomatic effort in the Middle East. The primary goal of SESAME is to fulfill a scientific purpose that requires a distinctive form of international cooperation. SESAME is also a science diplomacy project to foster new relationships and intercultural understandings among scientists in this conflict-torn region. Rungius et al. (2021) unexpectedly found that SESAME would be most active in science diplomacy if it did not focus on science diplomacy at all costs. The project's other aim is to prevent brain drain and enable "brain circulation."

Echeverría King et al. (2021) proposed overall cooperation for science diplomacy in developing markets using Colombia's case study. They found that science diplomacy actors were scattered and that their practices were related to traditional diplomacy; this showed a need to improve the practices of science diplomacy. The study also revealed the need to mix policies in emerging economies. Echeverría King et al. (2021) provided practical recommendations and policy implications for improving science diplomacy.

Szkarłat (2020) introduced Polish science diplomacy. She argued that despite the absence of a worldwide model of science diplomacy, countries like Poland might benefit from the experiences of more progressive systems. Poland's domestic political situation significantly affects the country's science diplomacy, and the result is negative impacts on the continuum and consistency in the strategic planning and application of science diplomacy.

Gluckman et al. (2012) said that small countries such as New Zealand had shown more adaptability and agility in rebuilding their economies and their broader policy settings than many larger nations. Because of their smaller size, they have been able to communicate directly with stakeholders, including the public, and so have been more active. Additionally, because their economies are tiny, these nations have been more aware of and ready to connect with and benefit from international opportunities.

According to Hornsby & Parshotam (2018), many Sub-Saharan African nations' scientific and technological capacities remain inadequate. Science diplomacy is demonstrated by how scientific experience is entrenched within several international institutions. Scientists work to increase African governments' competence and involvement in this vital but frequently overlooked area of international governance.

Soler (2021) portrayed Latin American and Caribbean nations' different policies, approaches, and practices at the national, subnational, and regional levels. Soler (2021) outlined opportunities for directing these countries toward a common strategy for science diplomacy. The hope was to accomplish sustainable development by using science as a tool in the foreign policy of Latin American countries.

Arnaldi et al. (2021) said that science diplomacy is a field that is emerging from the interaction between international relations and science policies. They found that despite a growing interest in science diplomacy, Central, Eastern, and Southeastern Europe got limited attention from scholars.

Beginning about 2000, Karacan (2021) looked into how the rising notion of science diplomacy changed Turkish's STI approaches, with emphasis on interaction with EU science programs and associations. Despite escalating tensions between the two parties, Turkey and the EU continue to work together. As a result, scientific projects and activities in which Turkey has joined might help in expanding its science diplomacy.

2.2 Conceptual Framework

2.2.1 The Interaction between Science and Foreign Policy

The role of science in foreign policy was not apparent until the invention of the atomic bomb. The bomb's use in World War II caused scientists to get involved in worldwide talks on peace, nuclear nonproliferation, and security issues (The Royal Society, 2010). In the history of science diplomacy, many international organizations have had an essential role, such as the "North Atlantic Treaty Organization (NATO)", which established a science program in 1957. In the 1980s, the "United States National Academy of Sciences (NAS)" and the "Academy of Sciences of the USSR (ASUSSR)" had parallel "Committees on International Security and Arms Control (CISAC)". The eventual dialogue between Presidents Reagan and Gorbachev occurred because of the communication between the scientists on these committees (The Royal Society, 2010).

After the Cold War, the United States, the United Kingdom, and Japan increased interest in science diplomacy, mainly because of changing international relations. The diplomatic system became more complicated and had a sophisticated network, including state and many non-state actors, such as scientific bodies (The Royal Society, 2010).

In 2008, the "American Association for the Advancement of Science (AAAS)" founded the "Center for Science Diplomacy" to combine science with foreign policy to enhance international cooperation in the sciences, which might assist countries to build trust. (The Royal Society, 2010). The center aimed to strengthen science diplomacy and show its power in foreign policy. It supports the Royal Society fellows' efforts to involve statesmen in the dimensions of science diplomacy: "informing foreign policy objectives with scientific advice (science in diplomacy); facilitating international science cooperation (diplomacy for science); [and] using science cooperation to improve international relations between countries (science for diplomacy)" (The Royal Society, 2010, p. 15).

According to Dr. Nina Fedoroff, Science and Technology Adviser to the US Secretary of State, "Science diplomacy is the use of scientific interactions among nations to address the common problems facing humanity and to build constructive, knowledge-based international partnerships" (Fedoroff, 2009; The Royal Society, 2010, p. 2). However, one cannot neglect that science diplomacy is not just about international cooperation and interactions among nations; science diplomacy can achieve various national domestic goals (Gluckman et al., 2017).

2.2.2 Science in Diplomacy

The management of international relations has new challenges because of global risks such as energy insecurity, climate change, and food and water shortages (Lee, 2009). "Science in diplomacy" delves into the crucial role of scientific information in supporting foreign policy goals. It ensures policymakers' continuous and practical advice (V. C. Turekian et al., 2015). Scientists can deliver up-to-date information to policymakers regarding nature and socioeconomic systems. Furthermore, scientists may identify areas where there are doubts or where the evidence base is limited, which assists leaders in making sound decisions on a national and international level (V. C. Turekian et al., 2015). Expressly, the complex demands on policymakers in the 21st century require accurate advice and information on science and technology, and foreign policy decisions heavily depend on the scientific community's information (V. C. Turekian et al., 2015).

Science plays an important role in delivering solutions for current global challenges, such as pandemics, impacts from climate change, weapons of mass destruction, and global economic issues. A country's leaders concerned with foreign policy cannot address these challenges without (1) comprehending the science that drives the risk or challenge; (2) creating specialized establishments to distribute data and information about the challenge; and (3) dealing with specialists. Accordingly, policymakers need access to exceptionally knowledgeable individuals and clear and appropriate data (V. C. Turekian et al., 2015).

The efficient utilize of scientific recommendations in diplomacy needs worldwide politicians to have a basic degree of scientific proficiency or access to people who do. In the same way, it requires that researchers impart the results of their work in a clear and comprehensible manner; this forms a path to a deeper understanding by all (The Royal Society, 2010).

2.2.3 Diplomacy for Science

"Diplomacy for science" attempts to make international cooperation easy. It facilitates worldwide participation, regardless of whether seekers have vital hierarchical needs for exploration or are making a coordinated effort to strengthen links between scientists (The Royal Society, 2010). Diplomacy, for example, was supposed to enhance and assist the "Intergovernmental Panel on Climate Change (IPCC)" (Gluckman et al., 2017). "Diplomacy for science" is a function of the global political system that addresses scientific demands and goals. The current era necessitates international efforts in science to address legitimate issues such as an opportunity (e.g., making work grants available to scientists from many countries), innovation protection, protection against misfortune or harm caused by one party, and information exchange regulation. "Diplomacy for science" has evolved to refer to policies that allow for scientific research to progress (Flink & Rüffin, 2019).

2.2.4 Science for Diplomacy

"Science for diplomacy" utilizes science to help ameliorate international relations, particularly where there might be tension in an official relationship. "Science for diplomacy" depends on the "soft power of science", that is, its appeal and impact as a public resource and a widespread action that rises above public or hardliner interests (V. C. Turekian et al., 2015).

Science's soft power is related to international relations in a variety of ways, ranging from cultural diplomacy to more conventional forms of negotiation and mediation. (The Royal Society, 2010). According to the Royal Society (2010), some kinds of "science for diplomacy" include the following:

• Scientific collaborative arrangements have been utilized in political relationships, such as those involving the United States, the Soviet Union, and China throughout the 1970s and 1980s. Libya's biological, chemical, and atomic weapons programs were terminated in 2004 due to scientific evidence provided by the United States.

• New organizations can be set up to embody the objectives of "science for diplomacy". The "European Organization for Nuclear Research (CERN)" is the best model for such an organization. It was founded in 1954 to provide particle accelerator facilities, facilitate world-class physics research, and unite individuals to push the boundaries of science for the benefit of everyone (CERN, 2022). CERN facilitated some of the first postwar contacts among German and Israeli researchers. During the Cold War, it maintained open scientific relations with the Soviet Union and other eastern coalition nations.

• Educational scholarship programs are well-established mechanisms for forming networks and fostering collaboration. One good example is the Newton International Fellowships program, which is run by the Royal Society, Royal Academy of Engineering, and British Academy. It gives long-term backing to the best early-stage postdoctoral researchers worldwide so they can work with organizations in the United Kingdom.

• Track two diplomacy operates by including those who operate outside of an official negotiating or mediation procedure, such as scientists and scholars. To be efficient, it needs people with the most relevant information and much influence in their fields. Official track one processes should recognize the value of track two endeavors. For instance, when academics from various countries gathered during the Cold War, all were aware that they would provide feedback to their political leaders about their conclusions.

• Science-related events, particularly those focusing on the history of science, can accentuate the all-inclusiveness of science and the mutual cultural interests of attendees. The Islamic nations, China, and India are pleased with their contributions to science history (The Royal Society, 2010).

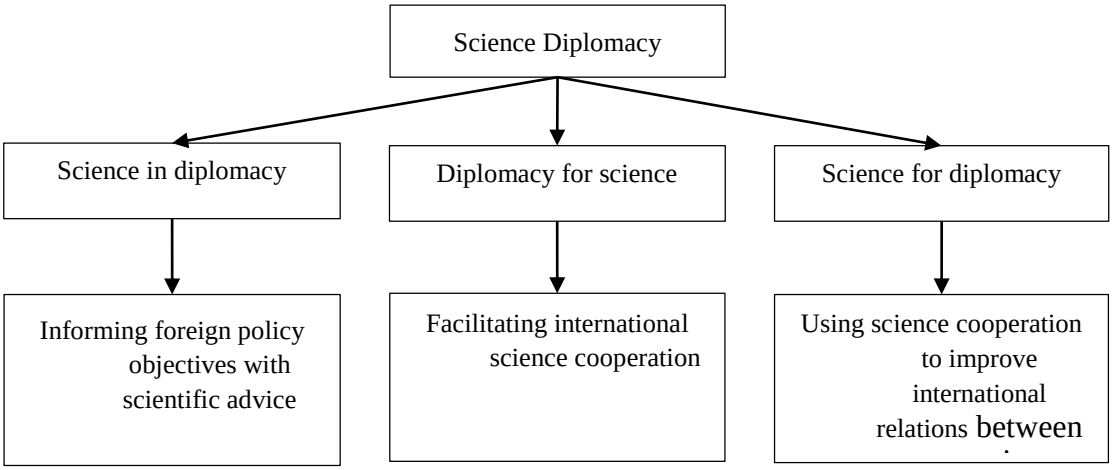

Figure 1: Categories Representing the Dimensions of Science Diplomacy

Note. The data in the figure are from "[New frontiers in science diplomacy]," by the Royal Society, 2010, p.15 (https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/2010/4294969468.pdf)

Method

3.1 Research Design

Given the small amount of literature on science diplomacy, it was best to begin looking at the topic using a scientific approach: The researcher focused on how science diplomacy was utilized in Jordan. Managing how and why questions necessitate a qualitative case study approach since it may reveal distinct science diplomacy models, the aim of a government launching science diplomacy, and, interestingly, how science diplomacy is applied in real life. The case study design additionally assisted us with zeroing in on the elements of a solitary setting, which were the initiators and beneficiaries of science diplomacy in our case (Meyer, 2001; Özkaragöz Doğan et al., 2021).

The case study examines phenomena in a delimited context, in this situation, the Jordanian experience of science diplomacy. The contextual investigation should pinpoint a representative case, which can be utilized to generalize in similar contexts (Echeverría King et al., 2021).

3.2 Data Collection

The data collection method should be related directly to the research questions and design. The choice of method is also subject to time limitations, financial funds, and access (Meyer, 2001). The researcher chose a combination of journal

articles, official domestic and international documents, reports, and news stories from which to obtain data. Most of the data were obtained from journal articles, and documents and reports from regional and international organizations including, the "European Commission (EC)", "IAP", "Middle East Desalination Research Center (MEDRC)", "Civilian Research and Development Foundation (CRDF)", "Economic and Social Commission for Western Asia (ESCWA)", the "Royal Society", "AAAS", the "Partnership for Research and Innovation in the Mediterranean Area (PRIMA)", and the "Union for the Mediterranean (UfM)".

3.3 Data Analysis

Document analysis is especially pertinent to qualitative case studies, which are serious investigations creating rich depictions of a phenomenon (Bowen, 2009). Document analysis consists of skimming (simplistic evaluation), perusing (wide-ranging evaluation), and understanding. This iterative cycle links a combination of content analysis and thematic study. Content analysis is the most common method of sorting data into categories that correspond to the central questions of the research, and the thematic analysis looks at themes that arise within the categories. The cycle includes a cautious, more engaged reperusal and auditing of the data. The researcher investigates the chosen information, codes it, and classifies it to reveal topics appropriate for a specific subject (Bowen, 2009).

Documents were analyzed to find predefined key terms used in science diplomacy, which were coded to indicate the conceptual dimensions of science diplomacy discussed in section 2. In this process, the coding was steadily refined; the analysis yielded the three significant dimensions of science diplomacy expressed in Jordan's external science policies. The data was then coded into phases and themes to represent the contextual factors. In a third step, the resulting datasets were classified according to whether they corresponded to the conceptual framework.

Results

This study addressed two primary research questions as follows:

1. What are the activities proposed by Jordan for science diplomacy?
2. Why does Jordan seek to extend these activities?

The data analysis produced findings on science diplomacy in Jordan. The concept of science diplomacy provided three main categories of analysis, and these were the categories that were used to define different aspects of Jordan's science diplomacy. The categories are presented in Figure 1 and described in the following section.

4.1 Jordan's Science Diplomacy in Practice

Jordan early recognized the importance of knowledge, science, and technology in our rapidly changing community and established avenues of communication and discussion. In this regard, the role of HRH Prince El Hassan bin Talal is essential; HRH established the "Royal Scientific Society (RSS)" in 1970 and the "Higher Council for Science and Technology (HCST)" in 1987 (Prince El Hassan bin Talal Official Website, 2022). Today, these institutions play a significant role in Jordan's science diplomacy (HCST, 2022; RSS, 2022). His daughter HRH Princess Sumaya bint El Hassan is also a strong supporter of science and science diplomacy; "Much work has been done in Jordan to cement the role of knowledge in our fast-changing society, and to open channels of communication and debate. People are curious and, more than ever, they look to science for answers. Perhaps the first undertaking of a science adviser in this context should be to capitalize on this curiosity—to build science communications structures in the Kingdom and beyond, so that good science is heard above all else," said Princess Sumaya bint El Hassan (2016). Therefore, it is noticeable that scientific facts are heard regardless of anything else.

HRH Princess Sumaya bint El Hassan introduced the necessity of science diplomacy to confront global risks and challenges. With these realities in mind, the Princess stated that citizens are not always best represented by statesmen. Yet, leaders in science diplomacy are emerging from more suitable power centers than foreign relations departments (Princess Sumaya bint El Hassan, 2012).

4.1.1 Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME)

The researcher would argue that SESAME is considered one of the most noteworthy examples of science diplomacy. Due to the SESAME synchrotron's opening in Jordan on May 16, 2017, scientists who ordinarily could not collaborate due to strained ties between their nations are now able to do so at a nearby facility (Kelly, 2017). His Majesty King Abdullah II of Jordan opened the proceedings alongside over 300 policymakers, scientists, and diplomats from the region, the EU, and beyond (King Abdullah II Official Website, 2017; Parlementaire Monitor, 2017). This indicated Jordan's notable attempt to reinforce the dimensions of science diplomacy. Jordan realized that there was a critical need for a way to create peace and harmony, and that is why people at SESAME chose to speak "science" (Kamel, 2018, p. 188).

SESAME is the Middle East's first synchrotron light source, one of around sixty synchrotrons globally. It was established with the assistance of the "United Nations Educational, Scientific, and Cultural Organization (UNESCO)" and is an autonomous, transnational, and multidisciplinary research facility. Different scientists from the region have started researching particle beams at the facility (Rungius et al., 2021). It was founded to promote scientific collaboration in a region where persistent conflicts had torn. The project was based on the possibility that hindrances and social differences can be conquered by persons who share the convictions of science. In this facility, the general research interests of S4D4C ("Using science for/in diplomacy for addressing global challenges") can be studied. Studies can address two questions: How can science diplomacy encourage international cooperation and help tackle global challenges? What can we learn from the example of SESAME about research frameworks that would lead to improved international relations and intercultural understanding and monetary and technological advancements? (Rungius et al., 2021).

SESAME can act as an example of "science in diplomacy" when considering global challenges, particularly peace and intercultural understanding. It also has much to offer for "diplomacy for science", that is, political activities that support global scientific collaboration with a focus on the level of application. The expediting of SESAME to be the first operational synchrotron in the Middle East is quite exceptional. The nations that use SESAME are Jordan, Turkey, Israel, the Palestinian Authority, Pakistan, Iran, Cyprus, and Egypt; not one has its synchrotron (Rungius et al., 2021). SESAME also highlights the value of scientific collaboration in bridging gaps between nations and promoting regional scientific enterprises. (Dohjoka et al., 2017).

4.1.2 Cooperation with the European Union

Jordan's science diplomacy is extensively connected to the EU. EU policymakers focus on significant global cultural, political, and ecological challenges, mainly in the quest for the public good of all people. Proof of this is found in their efforts for worldwide collaborations in science, including in the Middle East (López de San Román & Schunz, 2018).

In November 2009, the EU and Jordan signed a scientific and technological collaborative agreement and began activities on March 29, 2011. To carry out the agreement, an "EU-Jordan Joint Committee" was formed. Jordan is an important partner for the EU in research and development, mainly in projects like PRIMA that promote bi-regional science diplomacy. HCST co-chairs the UfM Regional Platform meetings, along with the "European Commission's Directorate-General for Research and Innovation". Jordan's HCST is a significant ally in Euro-Mediterranean collaborations for research and innovation. A vital effort is to investigate the way to improve Jordan's involvement in Horizon Europe; it is imperative to help scientists apply for calls under the excellent science pillar (European Commission, n.d.). Bilateral discussions among partners revealed many common concerns about difficulties in future overall strategic areas of research and innovation. Jordan and, certain, states in southern and eastern Europe are turning to the Mediterranean area to research water scarcity and sustainable agricultural development, and the effects of environmental and climate changes (European Commission, 2020).

An international agreement on Jordan's participation in PRIMA was signed by the EU and Jordan on November 10, 2017. The deal unites countries along the Mediterranean coastline in a research program that will focus on two of the significant challenges of the area: efficient and sustainable water and food supply systems. The agreement was signed during the "World Science Forum (WSF)", where Carlos Moedas, EU Commissioner for Research, Science, and Innovation, introduced the Horizon 2020 Work Program 2018–2020. Science diplomacy can be a result of the EU's research

and innovation policy and can be promoted through the calls of Horizon 2020. The Horizon program includes approximately 30 global collaborations of enormous scope and extent on topics of common interest and has a budget of over €1 billion. The agreement paves the path for Jordan's full involvement in PRIMA. Horizon 2020 supports PRIMA with €220 million, and various EU member states and southern Mediterranean countries provide €274 million. The EU participates in PRIMA based on Decision (EU) 2017/1324, adopted by the European Parliament and Council of the EU (European Commission, 2017).

The fifth meeting of the EU–Jordan Joint Science and Technology Cooperation Committee took place virtually on December 7, 2020. The meeting was co-led by the Directorate-General for Research and Innovation (DG RTD) and the head of the HCST of Jordan.

The "National Policy and Strategy for Science, Technology, and Innovation of Jordan (2021–2025)" focuses on water, food, energy, health, and education. These efforts are firmly connected with the priorities of the UfM platform for future collaboration in research and innovation in the Mediterranean area, in particular, climate change, renewable energy, and health. One subject to be investigated is the best role for Jordan in the "Framework Program for Research and Innovation Horizon Europe". Further collaborations can be advanced through Pillar II of Horizon Europe, for instance, in climate energy and mobility; food, bioeconomy, natural resources, and agriculture; health, culture creativity, and inclusive societies; and civil security for communities (European Commission, 2020). Points discussed at the meeting were (European Commission, 2020):

- PRIMA
- Research infrastructures and SESAME
- Research on health and Covid
- Marie Sklodowska-Curie Actions (MSCA)
- Open science

All states in the Middle East were encouraged to join Horizon 2020. Cooperation with the "Middle East Research and Innovation Dialogue (MERID)" was also encouraged; It uses research, science, and innovation as platforms for intercultural communication, comprehension, and peacemaking (López de San Román & Schunz, 2018).

4.1.3 InterAcademy Partnership (IAP)

IAP is another important example of science diplomacy. It is a worldwide network of national science academies, including those in Egypt, Morocco, Sudan, and Jordan. Its mission is to advance research by providing scientific advice to national and international governments (Dohjoka et al., 2017).

In November 2017, IAP had a substantial task in developing the first WSF plan. Nearly 3000 participants attended the WSF meeting in Jordan. They were from over 120 countries, including numerous countries in the Middle East and North Africa, making this the largest gathering yet at this biennial occasion for science policy. On November 10, the WSF released a Declaration, presented by HRH Princess Sumaya bint El Hassan, the forum's lead organizer, concentrated on some central concerns (IAP, 2017a):

- Managing natural resources equitably and sustainably to keep conflicts at bay and encourage peaceful development.
- Preserving scientific capacities, which are under threat from global migratory trends, is critical to maintaining peace, sustainable development, resilience, and recovery.
- Diversity is a critical facilitator of excellence in STI, and its relevance and influence must be optimized.
- Committing to ensuring the universal right to science
- Supporting the establishment of an Arab regional scientific forum, which would be the largest, most important gathering of its type in the Middle East

The WSF brings together prominent scientists, politicians, and international institutions to assess scientific trends and identify ways that science can confront poverty and boost just equitable, and inclusive social development. The 2017 event's theme of Science for Peace and Development directly reflected these goals. "We consider the Forum as a gift to the nation,"

said HRH Princess Sumaya bint El Hassan, president of Jordan's RSS and chair of the forum. "The whole country is buzzing. Everyone is talking about the World Science Forum" (IAP, 2017b).

4.1.4 Cooperation with the Economic and Social Commission for Western Asia (ESCWA) and Civilian Research and Development Foundation (CRDF)

On December 15, 2015, for the first time, representatives from the scientific, diplomatic, and relevant policymaking communities in STI, including those involved with the political national focal points of the UN Sustainable Development Goals (SDGs) in the Arab world, convened for a dialogue on regional opportunities for science diplomacy in everyday challenges (CRDF Global, 2015). The meeting reflected Jordan's initiatives to enhance science diplomacy in the Arab world. Jordan's RSS, along with ESCWA and CRDF, facilitated in December 2015 the first "Regional Forum on Science and Technology Diplomacy: Towards Transformative and Inclusive Partnerships for a Sustainable Future" (Dohjoka et al., 2017). It provided a chance to exchange knowledge and ideas to address future challenges facing Arab countries and introduce candidate projects for science diplomacy (ESCWA, 2015).

In 2016, The UN ESCWA Technology Center and Jordan's RSS, in partnership with the "International Network for Government Science Advice (INGSA)" and CRDF Global, organized the first "Arab Leadership Dialogue on Science Advice to Governments" (CRDF Global, 2017; Dohjoka et al., 2017; ESCWA, 2016).

The meeting was attended by 47 senior science and technology stakeholders from eight Arab countries and national, regional, and international organizations in New Zealand, Malaysia, Europe, and the United States to discuss ways of encouraging scientific recommendations and strengthening the ties between science and policy. They looked at lessons acquired from six case studies, including the Fukushima nuclear tragedy and national cases from Jordan and Lebanon, to pinpoint the opportunities and challenges that could arise when science is considered in policy decisions. They determined that scientific advice in the region has numerous formulas—which do not always follow a regular pattern—such as technical advice or advice in times of crisis. Sixteen Arab governments and their citizens would benefit from a partnership focusing on robust scientific advice that would strengthen the science-policy links (CRDF Global, 2017; Dohjoka et al., 2017).

4.1.5 Middle East Desalination Research Center (MEDRC)

In April 2021, an EU Commission conference on "Addressing Shared Challenges through Science Diplomacy: The Case of the EU–Middle East Regional Cooperation" was held in Jordan. The attendees stressed the links between scientific cooperation and peace. In the discussion panel on "Science Diplomacy in Action," participants presented "The MEDRC Model of Science Diplomacy." MEDRC Center Director Ciarán Ó Cuinn discussed MEDRC's work in developing cooperative cross-border projects and dialogues in the field of Middle Eastern freshwater scarcity (MEDRC, 2021).

4.1.6 Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA)

PERSGA is a notable example of cross-line collaboration in the Red Sea area. It is an intergovernmental organization based in Saudi Arabia that is part of the Arab League. It was founded in 1995 with the primary goal of protecting the Red Sea and Gulf of Aden's coastal and marine environments. PERSGA also plans to teach and foster officers working in Marine Protected Areas and offer specialized help and direction for marine monitoring programs in its participating nations. PERSGA generated the last Red Sea status report in 2009. It featured the necessity to increase PERSGA's endeavors and build up other foundations that could gather information, determine its meanings and significance, and back information obtainment projects and comprehensive rational examinations of data in the region. The nations participating in PERSGA are Djibouti, Egypt, Jordan, Saudi Arabia, Somalia, Sudan, Yemen, and Eritrea (Kleinhaus et al., 2020).

4.1.7 Genetic Organizations

Without much of a stretch, science could unite Middle Eastern people with various perspectives and aspirations, making this aggrieved region of the planet another place where rational accomplishments and progressive clinical advancements are found. In April 2011, a global advanced course and session referred to as "Frontiers in Human Pluripotent Stem Cells"

during an "International Congress on Fertility and Genetics" took place in Amman, Jordan. It was facilitated by the "International Cell Research Organization (ICRO)", a UNESCO-associated nongovernmental organization (NGO), and the "Jordanian Society of Fertility and Genetics". Participants in the course comprised trainees, scientists, and medical professionals from the Middle East (Sarkadi & Schatten, 2011).

Conclusion

This study demonstrates how science diplomacy in a relatively small country like Jordan may build science frameworks through global cooperation and rational discussions to drive public policy and foreign strategic decisions. Science diplomacy is an extension and association effort that seeks solutions to global concerns, and it has provided sound recommendations that might aid in judgments concerning international policies and actions. The strong efforts of His Majesty King Abdullah II, HRH Prince El Hassan bin Talal, HRH Princess Sumaya bint El Hassan, Jordan's HCST, and the RSS were featured.

Different nations, particularly in Europe, have procedures for science diplomacy as part of their scholastic and governmental programs. It is hoped that Jordan will adopt a comprehensive program for incorporating a variety of practices of science diplomacy, particularly contemporary practices. Jordanian efforts in science diplomacy are usually coordinated with the EU and its efforts in improving limits and abilities, administering programs and encouraging researchers to engage in scientific work and innovations, and providing an arena in which collaborations can be maintained to benefit international work in science and all world citizens. For science diplomacy to be enacted in Jordan, it is crucial to have a public program devoted to it that will consider public needs. This would guide the trajectory of science and innovation and boost the information economy in Jordan.

More instruments to advance and invigorate coordinated efforts worldwide are also needed, such as allowing science practitioners to have more contact with all types of citizens. Learning guidelines ought to regulate scientific strategies for every one of the actors associated with Jordan, and learning networks can share experiences and trade information.

In terms of global challenges, this study revealed apparent efforts in Jordan to confront these challenges. However, more clarification of the SDGs and other missions of Jordan are needed.

This study has provided insights into the efforts for science diplomacy in Jordan. A fundamental limitation is the limited sources on the topic. In addition, the qualitative nature of the study means that the results may not be generalizable to other countries. The researcher strongly recommends that future research explore the benefits of science diplomacy for Jordan's sustainable development.

This study recommends that an administrative strategy be drawn up that describes how strategies for science, technology, and innovation can be merged with international efforts for handling local, regional, and worldwide issues.

The literature search about some emerging economies showed limitations in scope, implementation, and proposals that could further develop communication among those involved in science diplomacy. This was demonstrated in two ways: (1) specific aims resulting from sustainable development and global challenges, and (2) critical local issues that have a global effect (Echeverría King et al., 2021). In addressing the administration of science diplomacy, a general plan for bolstering economies should be introduced, and ideas for strategy implementation should be investigated. What advantages would Jordan get from science diplomacy? Furthermore, can science diplomacy assist in building the economy and making significant connections with neighbors abroad?

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