# THE ROLE AND IMPORTANCE OF LIBRARIES IN SCIENCE DIPLOMACY IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT GOALS

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**Abstract**

The concept of science diplomacy has a very important role in the age of science. With globalization, the scientific studies of researchers play a role in establishing international interactions and relations through the language of science, which is a universal language, thus contributing to foreign policy in terms of science and technology. The concept of science diplomacy, in addition to foreign policy processes, has been effective in promoting sustainable development by using science as a lifelong process and means of communication. An important aspect of the Sustainable Development Goals (SDGs) is to combat global environmental threats. Science diplomacy can use science and scientific cooperation against these threats to improve international prosperity. In this way, it encourages the achievement of sustainable development goals for the common benefit of humanity by establishing international collaborations and partnerships in science and technology and contributes to the development of relations by increasing civil society interaction. The literature review method was used as the methodology in the study. Within the scope of the study, the importance of the concept of science diplomacy for the SDGs and the role of libraries in this context were examined. The role and importance of libraries in standardizing scientific study outputs and data on a global scale through various applications and sharing them with users has been researched. In this study, the importance of science diplomacy for a sustainable future and the contributions of libraries, which serve as public information repositories and institutional memory, to the sustainable development goals in terms of scientific communication and scientific collaboration in terms of storing and protecting scientific data as well as transferring this information to the society, will be examined. The role of libraries and their relationship with sustainable development in the phenomenon of science diplomacy, which means the use of science and international scientific collaborations to develop relations between countries and to solve common global problems, will be explained.

***Keywords***

*Science Diplomacy, Sustainable Development Goals, Libraries, Sustainability*

## Introduction

With the acceleration of globalization, the impact of human activity on the natural and social systems of the world has increased significantly. This intensification has led to the emergence and widespread adoption of the concept of sustainability as a critical framework for global progress (Görmezoğlu, 2023, p. 168). Development, in this context, can be broadly defined as the process by which a country enhances its social and economic infrastructure to align with the standards of modern, industrialized nations. However, for development to be sustainable, it must be grounded in equitable distribution of productivity, awareness of the environmental and social costs of economic growth, commitment to social justice, efficient use of resources, and the safeguarding of resources for future generations. Thus, sustainable development today is understood not as a fixed goal, but as a dynamic and adaptive process involving continuous learning and collective action.

In parallel, the increasing complexity of global challenges, ranging from climate change to public health crises, has necessitated international scientific cooperation. This has led to the institutionalization of science diplomacy, which refers to the use of scientific collaborations among nations to address common problems and build constructive international partnerships (The Royal Society, 2010, p. 11–12). Establishing mechanisms for science diplomacy involves the formation of multilateral agreements, the creation of collaborative institutional frameworks, and the strengthening of national scientific and technological capacities. In this context, science diplomacy not only enhances foreign policy by promoting peace and mutual understanding but also supports the global implementation of the SDGs. Concepts such as knowledge management, sustainability, and science diplomacy have gained prominence as interlinked areas of research and policy development. Libraries, as essential institutions in the production, preservation, and dissemination of knowledge, play a pivotal role in advancing these global agendas.

The contributions of all types of libraries, including public, academic (university), and research libraries, to both sustainable development and science diplomacy are multifaceted and significant:

Public Libraries contribute directly to SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities) by offering free access to educational materials, digital literacy programs, and community-based learning. For instance, the "Libraries for Development" program in Finland has been recognized for promoting civic engagement and lifelong learning in rural areas, particularly by integrating migrants and vulnerable groups into society (European Commission, n.d.).

University Libraries serve as critical infrastructures for global academic research, supporting SDG 9 (Industry, Innovation and Infrastructure) and SDG 17 (Partnerships for the Goals). Through open access initiatives, institutional repositories, and data-sharing platforms, university libraries enable cross-border collaboration and ensure that scientific knowledge is accessible to all. Many academic libraries participate in international consortia (e.g., HathiTrust, LIBER) that foster transnational exchange of scholarly resources. (International Coalition of Library Consortia, n.d.).

Research Libraries often engage directly with science diplomacy by supporting international scientific missions, collaborative data stewardship, and policy-making informed by evidence. The World Data System, for example, supported by research libraries globally, contributes to the standardization and sharing of scientific data essential for addressing climate change and other transboundary challenges. These institutions also help curate policy-relevant information that supports national delegations in multilateral negotiations, such as those under the UN or the Intergovernmental Panel on Climate Change (IPCC) (World Data System, 2023; United Nations Framework Convention on Climate Change, n.d.).

Within the scope of this study, the relationship between science diplomacy and sustainable development goals is analyzed in depth, with particular emphasis on the strategic role of libraries. The investigation explores how libraries function as enablers of global knowledge exchange, contribute to the accessibility and reliability of scientific data (Damerow & Wintergrün, 2019, p. 513), and support the development of information infrastructures aligned with the principles of sustainable development and diplomacy. Through a comprehensive literature review structured around six thematic subheadings, this study critically examines the evolving roles of libraries in facilitating knowledge-based cooperation and advancing sustainability-oriented international relations.

## Sustainability and Science Diplomacy with Conceptual Aspects

The concept of sustainable development is defined as "meeting the needs and expectations of the present without compromising the ability of future generations to meet their needs and expectations" (UNWCED, 1987). This foundational definition, introduced by the Brundtland Commission Report, underscores the urgency of integrating economic growth with environmental protection and social equity. In 2015, the United Nations formalized this agenda through the Sustainable Development Goals (SDGs), a comprehensive framework of 17 goals and 169 targets designed to address global challenges through shared responsibility.

Simultaneously, the concept of science diplomacy has gained traction as a strategic tool in global governance. Science diplomacy refers to the use of international scientific collaboration to address common global problems and to strengthen constructive diplomatic relations (Fedoroff, 2009, p. 9). As emphasized by William Colglazier (2016), former Science and Technology Advisor to the U.S. Secretary of State, diplomacy can serve to advance global scientific enterprise, while science and innovation can reinforce efforts toward sustainable development.

In order for development to be sustainable, it must affect all segments of the population. This is achieved through the correct acquisition, transmission and management of knowledge. Access to opportunities all over the world starts with access to knowledge. Science provides a common language for building bridges between cultures. In order to build sustainable knowledge societies for all people, to have the educational and economic opportunities to live in these societies, scientists, engineers, entrepreneurs, and information scientists need to be involved in science diplomacy processes between societies (Ferdoroff, 2009, p. 9).

Training in science diplomacy at the beginning of a scientific career can help people in science to embrace new insights and opportunities and contribute to new job creation. This needs to be analyzed together with the science policy of each country. This helps us to develop the capacity for science diplomacy, not only in terms of scientific research (Cuellar-Ramirez, 2021, p. 4). Government-appointed science diplomats are scientists who assist in negotiations and decisions on sensitive diplomatic issues with intensive knowledge processes (S4D4C, 2020, p. 1).

National interests are one of the fundamental issues in science diplomacy. At the same time, science diplomacy is one of the soft power elements of a country's foreign policy. This soft power aspect of science diplomacy is particularly reflected in the "Science for Diplomacy" dimension, which is part of the American Association for the Advancement of Science (AAAS) and Royal Society science diplomacy model (S4D4C, 2020, p. 5).

Science should be open to the inclusion of different perspectives and experiences of stakeholders from outside academia. Science consultancy is a solution proposed by science diplomacy in terms of effective knowledge transfer and the need for diplomatic, scientific and inter-societal cooperation. The concept of science diplomacy addresses global challenges as a problem of collective action between states (S4D4C, 2020, p. 14).

When the conceptual aspect of science diplomacy is examined, the number of scientific studies in the literature published on this subject is increasing, but it does not have a theory. The concept of science diplomacy is a sub-branch of public diplomacy based on the main objectives of public diplomacy such as transferring information to the target audience, creating a positive image of the country and establishing mutual long-term relations between societies or states (Kökyay, et al., p. 234).

Science diplomacy is a tool that connects and balances the rhythms of science and diplomacy. If we consider science diplomacy in the context of scientificity, it follows the rhythm of change and development in the processes of scientific research and scientific knowledge between countries as a means of serving scientific knowledge supported by open scientific mechanisms. With a forward-looking perspective, science diplomacy supports efforts to anticipate crises, looking beyond mere emergency response (S4D4C, 2020, p. 35).

With globalization, the fact that the world of science communicates and interacts with the language of science as a common language will make it possible for science and technology to contribute to foreign policy in various ways in the establishment of bilateral or multilateral relations between countries. As science gains importance in this context, diplomats' interest in scientific issues will increase and scientists will be able to come to the forefront in diplomatic issues (Van Langenhove, 2019, p. 23). The boundaries and framework of science diplomacy are described in The Royal Society's policy document under three different dimensions: Science in diplomacy, diplomacy for science, and science for diplomacy (The Royal Society, 2010).

The science dimension in diplomacy can be defined as strengthening the contribution of science to foreign policy objectives by enriching them with scientific recommendations (Caymaz & Özsoy, 2022, p. 10). This requires diplomats and scientists to work together.

Today, we need support from science to deal with the global problems we face more and more every day. In this case, scientists informing politicians about the sources of global problems and the solutions to these problems in evidence-based ways will contribute to decision-making processes (Fuentes et al., 2023, p. 2). In decisions made through scientific means, wrong decisions will be prevented as a result of the database on questions and risks and the scientific analysis that these resources will provide. In the realization of these processes in a systematic work, it is necessary to establish coordination centers that will enable the flow of information in the access of diplomatic channels to the scientific information needed by diplomatic channels and scientists to diplomatic channels.

The concept of diplomacy for science, another dimension of science diplomacy, refers to the aim of facilitating international scientific cooperation. In this context, the importance of utilizing diplomacy in the realization of wide-ranging scientific research and cooperation has been expressed. Diplomacy will provide interested parties with easy and favorable access to scientific knowledge, infrastructure, logistical and financial support to support the establishment and maintenance of scientific cooperation. In addition, international scientific cooperation plays an effective role in strengthening a country in terms of knowledge and innovation, managing crises, improving global understanding, creating an environment of mutual respect between countries, and contributing to poor countries (Kökyay et al., 2023, p. 235).

The dimension of science for diplomacy and science for diplomacy defines the use of scientific cooperation in the development of international relations between countries. Science, which offers a universal language despite the differences between countries, plays a role in providing an appropriate environment for diplomacy.

The conceptual dimensions of science diplomacy, as articulated by The Royal Society (2010) and the AAAS, include:

- Science in Diplomacy: Using science to inform foreign policy.
- Diplomacy for Science: Leveraging diplomatic tools to promote international scientific collaboration.
- Science for Diplomacy: Using scientific cooperation as a vehicle to improve international relations.
- Libraries contribute to each of these dimensions:
- By providing policymakers and diplomats with access to evidence-based scientific knowledge, they support science-informed decision-making.
- By hosting platforms for international research collaboration, they facilitate diplomacy for science.
- By engaging in intercultural and multilingual information access initiatives, they support science as a medium for diplomacy and mutual understanding.

While science diplomacy and sustainable development are increasingly prominent in global discourse, the role of libraries as agents of these processes remains underrepresented in both theory and policy. Libraries are not merely passive repositories of knowledge; they are active facilitators of global knowledge ecosystems.

Their services, ranging from data preservation and scholarly communication to community empowerment and research support, make them indispensable in the pursuit of both sustainable development and science diplomacy.

Recognizing and integrating libraries into international strategies on science policy, sustainable development, and public diplomacy is essential for building inclusive, informed, and resilient global societies.

## The Relationship Between Science Diplomacy and Sustainability: Conceptual Foundations and the Importance of Libraries

The concept of sustainability aims to achieve economic development based on environmentally friendly models, social and cultural equality and environmental protection. The concept of sustainability aims to strike a balance between all economic, social and environmental needs and to systematize new understandings and practices. In order to ensure sustainability, these concepts must be managed in a balanced manner. In a world where developments in issues that directly concern every segment of society such as health and education, are on the rise, where the impact of economic, cultural and social issues affects large masses and where environmental problems are increasing day by day, institutions and individuals are expected to provide sustainable services. In order for these issues to be addressed in a healthy way, especially in the light of scientific developments, it is necessary to understand science diplomacy well.

The complex challenges of science require us to think and act on a global scale, not only in our own countries, but worldwide as citizens without borders (Legrand & Stone, 2018, p. 393). We need to see, experience and identify with the societies and problems of other countries and recognize the complexity and interconnectedness of the challenges facing 21st-century humanity. That is why it is necessary to invest in research that will lead to improved ways of managing water resources, growing food, fighting disease and building economies for future generations and the future. Climate change, ozone depletion, global biodiversity and marine pollution are problems of global proportions. These issues are common to the goals of sustainable development. Solving these problems requires complex scientific data and new scientific and technological approaches to achieve specific goals (Vidmar et al., 2021, p. 2). In this context, it is necessary to effectively apply the synthesis of scientific knowledge through science diplomacy for global problems outside the classrooms of countries, such as global warming. Science diplomacy has the potential to provide contributions in many aspects such as economic, technological, scientific, and manpower as well as enabling interaction between countries beyond political borders (Kökyay et al., 2023 p. 236).

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Designing a meaningful, effective, efficient, transparent, inclusive and participatory SDGs monitoring system that is a key function of SDGs implementation will require social science and Information Technology (IT) solutions to fulfill the following requirements

1. Data Definition based on stakeholder engagement to ensure inclusive policy priorities and criteria.
2. Data collection and dissemination procedures to follow the entire SDGs implementation process.
3. Reporting format for collecting, sorting, storing and retrieving data for statistical analysis.
4. A participatory approach to micro-based monitoring to capture sub-national diversity and inequalities in terms of multidimensional poverty and various pathways to achieving sustainable development.
5. Whole system mapping for easy understanding and priority setting and visualization at sub-national level for "at a glance" reporting
6. Management review periods according to the agreed evaluation criteria (Saner, 2015, pp. 2-3).

Using sound science in policy can strengthen political discourse and improve decision-making. It can produce appropriately targeted approaches that generate greater efficiency, better outcomes and less pressure on public budgets. Having a scientific basis can lend credibility and public trust to policy choices and the process by which they are made. In multilateral discussions, science can help remind and reinforce that geographical boundaries are artificial and highly permeable to disease, pollution, environmental degradation and the ravages of climate change. A science-based approach can be good for political leadership and society, as it can provide greater transparency in policy-making. This alone is a justification for continuing to adopt such approaches. The challenges of sustainable development are many and the negotiations around them are complex (Saner, 2015, p. 2-3). The SDGs provide a platform for the construction of global solutions. The science and diplomacy approach can only be consistently applied to the achievement of the SDGs in a new institutional architecture that will strengthen and maximize this process (Elizabeth Thompson, 2018, p. 46). Within this evolving framework, there is a growing recognition of the need for inclusive and knowledge-driven institutions that can mediate between scientific communities, policymakers, and the public. Libraries, as accessible and trusted spaces for information exchange, are uniquely positioned to fulfill this mediating role. Libraries play a pivotal yet often

underappreciated role in this nexus between science diplomacy and sustainability. As fundamental institutions in knowledge management, libraries contribute to SDG implementation and diplomatic scientific cooperation through varied roles depending on their type and scope.

Public libraries serve as accessible centers for lifelong learning, digital inclusion, and community engagement. By providing free access to information and digital technologies, they help reduce inequalities (SDG 10) and promote quality education (SDG 4). For example, The Kenya National Library Service (KNLS) implements programs that empower rural populations with agricultural, health, and environmental information, directly supporting sustainable livelihoods and community resilience. (Kalugho, 2016, p. 90) These programs help build local capacity that feeds into broader sustainable development initiatives and international cooperation efforts. In another example, in post-conflict Colombia, public libraries have become critical spaces for social reconciliation and peacebuilding by preserving cultural memory and promoting dialogue, key components of global peace and justice (SDG 16) that align with the soft power goals of science diplomacy (IFLA, 2017).

University libraries facilitate open access to scholarly research, data repositories, and cross-institutional knowledge networks that underpin international scientific collaboration (SDG 9, SDG 17). Through platforms like OpenAIRE and the HathiTrust Digital Library, university libraries enable researchers from different countries to share and build upon scientific findings, fostering transnational partnerships critical for addressing global challenges such as pandemics and climate change. University libraries also support science diplomacy by training emerging researchers and diplomats in data literacy, research ethics, and interdisciplinary collaboration, skills vital for effective participation in international scientific dialogues.

Research libraries manage critical scientific datasets and archives essential for evidence-based decision-making in sustainability and diplomacy. The World Data System (WDS), supported by a global network of research libraries, curates climate, biodiversity, and environmental data that inform international negotiations on climate action (SDG 13) and biodiversity conservation (SDG 15) (International Science Council. n.d.). These libraries also facilitate access to scientific knowledge by diplomatic actors, providing the evidence base required for informed policy development and international agreements, thereby bridging the “science in diplomacy” and “diplomacy for science” dimensions (The Royal Society, 2010).

Libraries at all levels are integral to advancing sustainability and science diplomacy. By providing equitable access to knowledge, fostering collaboration, and supporting evidence-based policymaking, libraries contribute concretely to the achievement of sustainable development goals and the effective practice of science diplomacy. Recognizing and strengthening the role of libraries within global science-policy frameworks is essential for building resilient, informed, and cooperative international communities.

## National and International Science Diplomacy Studies in the Field Of Sustainability: The Critical Role of Libraries

The main goal of diplomacy is to ensure that all countries of the world act with a high level of awareness for the global community and future generations. Science diplomacy, which is especially driven by institutions engaged in scientific studies, will support government work and international cooperation as long as it is diversified and strengthened by universities, private sector organizations engaged in scientific studies and non-governmental organizations. In recent years, academic institutions have taken important steps towards achieving their goals. They carry out many activities on sustainability in their education programs, research and development studies, academic achievements, and application examples. Among these activities, there are important issues such as spreading environmental awareness, promoting healthy life, ensuring the personal development of students and employees, being visible nationally and internationally, preventing waste, waste management, communication with stakeholders, structuring studies to empower disadvantaged segments of society, participation in social responsibility activities, protection of cultural heritage, and application of technological developments. A diverse set of actors, including universities, private sector research organizations, NGOs, and libraries, collectively strengthen science diplomacy's capacity and outreach. Libraries, as foundational knowledge institutions, contribute significantly to these processes in ways often overlooked.

Public libraries act as community anchors that promote inclusive access to information and educational resources directly tied to the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 13 (Climate Action). For example, The American Library Association's Sustainability Round Table promotes green library practices and community education on environmental issues, empowering citizens to participate in sustainable development initiatives (American Library Association Sustainability Round Table, n.d.).

University libraries serve as essential facilitators of scientific research, data management, and international collaboration, key pillars of the "Diplomacy for Science" dimension. For example, The Open Access movement, strongly supported by university libraries worldwide, democratizes access to research outputs on sustainability, enabling global scientists and policymakers to collaborate and build evidence-based solutions. In another example, The European University Association encourages member libraries to support transnational research projects on climate change mitigation, circular economy, and biodiversity conservation, aligning academic outputs with international diplomatic agendas (European University Association, n.d.).

Research libraries preserve, curate, and disseminate vast datasets, grey literature, and scientific archives crucial for policy-making and international negotiations. As an example, The United Nations Depository Library program, hosted by major research libraries, provides diplomats and researchers with authoritative documentation on SDG progress, fostering transparency and informed negotiation (United Nations., n.d.).

The integration of libraries into science diplomacy and sustainable development frameworks at national and international levels strengthens knowledge sharing, transparency, and inclusive participation. Recognizing and enhancing the specific roles of public, university, and research libraries is essential for achieving the SDGs and supporting effective science diplomacy.

## Worldwide Examples of Science Diplomacy

As a 21st-century phenomenon, science diplomacy is becoming increasingly important. Actors in the international system attach more importance to science diplomacy and create new institutional formations (Kökyay, 2023, p. 232). When science diplomacy practices in the world are examined, among the studies carried out in the field of science diplomacy, special job opportunities for scientific processes such as science advisors, science officials, science diplomacy ambassadors and technology ambassadors have been created in the Ministries of Foreign Affairs in various countries of the European Union. In addition, new institutions such as the International Science Council were established in 2018 to support scientific processes. One of the steps taken by the European Union to support science diplomacy is the appointment of observer status for CERN at the United Nations General Assembly in 2012. In addition, the European Union has established institutions such as Science Policy in Diplomacy and External Relations, which provides a global platform, and Major Research Infrastructures for Global Engagement through Diplomacy and Science to ensure cooperation on the provision of infrastructure for international research (Europen Union External Action, 2022).

Another country that has come to the forefront with its work in the field of science diplomacy in recent years is the United Kingdom (Kökyay et al., 2023 p. 238). As the then UK Foreign Secretary David Miliband stated in his speech in 2010: "The world of science is becoming interdisciplinary. But the biggest interdisciplinary leap we need is to cross the boundaries of politics and science. Science is our ally in resource conflicts, global inequality, nuclear security and the fight against terrorism" (Saner, 2015, pp. 2-3). The development of commercially viable Carbon Capture and Storage mechanisms or advances in low-carbon vehicle technology could have a major impact on our ability to realize the green revolution we need to prevent climate change. Genetic improvement of crop plants could save millions of people from the endless cycle of poverty, hunger and violence that plagues much of our world. Science is also key to our future security in areas such as cybersecurity, biodefense or early warning systems for natural disasters (The Royal Society, 2010).

In recent years, the United States, in particular, has made efforts to institutionalize science diplomacy (Kökyay et al., 2023 p. 237). In 2008, the Center for Science Diplomacy was established within the American Association for the Advancement of Science to build bridges between communities and countries through the interaction between science and diplomacy and to enhance the role of science in foreign policy to address national and global challenges (AAAS, 2008). The Science and Innovation Network was established in 2001 to directly link science to foreign policy agendas (The Royal Society, 2010).

The European Commission uses science diplomacy, which promotes open science and innovation, as an effective tool of foreign policy to build global research collaborations to address global challenges in areas such as energy, health and food (EC, DG for Research and Innovation, 2016, p. 59). The International Council for Science (ICSU), established in 1931 for global scientific cooperation, and the new International Science Council (ISC), formed by the merger of the International Social Science Council (ISSC), established in 1952, and UNESCO are other exemplary organizations in this regard.

While these high-profile diplomatic and scientific initiatives advance global agendas, libraries play a fundamental yet often underappreciated role in underpinning science diplomacy and the realization of Sustainable Development Goals (SDGs) both nationally and internationally.

Public libraries facilitate community engagement and information equity, directly supporting SDGs such as Quality Education (SDG 4), Reduced Inequalities (SDG 10), and Climate Action (SDG 13). Libraries play a vital role in achieving the Sustainable Development Goals (SDGs). By providing inclusive and accessible learning environments for all, they support quality education (SDG 4). Especially in communities with limited access to information, libraries offer educational materials and digital resources, creating equal opportunities and contributing to the reduction of inequalities (SDG 10). Additionally, they organize environmental awareness programs and provide information related to climate change, thereby promoting climate action (SDG 13). In these ways, libraries help build informed, resilient, and sustainable communities (Lison, 2024).

University libraries are vital nodes for knowledge production, sharing, and training that enhance international scientific collaboration and policy development, aligned with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals). For example, university libraries promote open access repositories and facilitate cross-border data sharing on sustainability research, enabling scientists and diplomats to access the latest evidence and foster international cooperation. Institutions such as the European University Association encourage member libraries to actively support research infrastructure and collaboration aligned with EU science diplomacy priorities (European University Association, 2023).

Research libraries curate and preserve scientific datasets and grey literature essential for evidence-based policymaking and multilateral negotiations in sustainability science. As an example, The World Data System (WDS), coordinated by research libraries globally, preserves critical climate and environmental data informing international frameworks such as the Paris Agreement. As another example, major research libraries hosting United Nations Depository Library programs provide diplomats and policymakers with access to authoritative documentation on SDG progress and global science diplomacy initiatives. (United Nations., n.d.).

As science diplomacy continues to evolve globally through innovative institutional models and collaborations, the role of libraries, public, university, and research, remains central to these processes. By ensuring equitable access to scientific knowledge, supporting open data and research dissemination, and fostering community science

literacy, libraries underpin the knowledge ecosystems essential for achieving sustainable development and effective international science diplomacy. Recognizing and further integrating libraries within diplomatic and sustainability frameworks will enhance global capacity to address 21st-century challenges collaboratively and inclusively.

## Science Diplomacy Examples in Türkiye

In line with its economic, scientific and technological development and increasing global influence, Türkiye is increasingly including science diplomacy in its diplomacy (Kökyay, 2023, p. 232). The European Union (EU) has established institutions such as Science Policy in Diplomacy and Foreign Relations, which serves as a global platform, and Major Research Infrastructures for Global Interaction through Diplomacy and Science, to ensure cooperation on infrastructure for international research. In addition, within the scope of the 2024 Council of Higher Education (YÖK) Outstanding Achievement Awards, the "Science Diplomacy Award" category, which is included in the application conditions for special field awards, aims to reward studies that aim to serve national interests in international platforms with their scientific personality and representation. The requirements for the YÖK Science Diplomacy Award are as follows:

- "R&D and projects in the fields of science, fine arts, engineering and architecture, health sciences, social sciences and humanities or social responsibility,
- Taking national success to the international platform,
- Recognition by supranational organizations,
- Receiving and executing projects supported by large international funds,
- Representing Türkiye in international platforms with its scientific identity,
- It is aimed to reward studies that aim to serve national interests in international platforms with their scientific personality and representation" (YÖK, Özel Alan Ödülleri).

Beyond the academic sector, key governmental institutions such as the Ministry of Science, Industry and Technology, the Turkish Academy of Sciences (TÜBA), and the Scientific and Technological Research Council of Türkiye (TÜBİTAK) have developed working groups, formal protocols, and strategic initiatives in this area. Reflecting the broader shift in global diplomacy, Türkiye increasingly views science diplomacy not as a peripheral activity, but as an integral dimension of its foreign policy. TÜBİTAK's Directorate of International Cooperation explicitly includes "science diplomacy activities" among its core missions, alongside bilateral exchange programs and international agreements (TÜBİTAK, n.d.-a). Likewise, TÜBA has broadened its international engagement; the Academy maintains cooperative relations with more than 50 foreign academies and takes part in multilateral science networks, including IAP, ALLEA, AASSA, and ISC, through which it promotes international knowledge-sharing and collaborative research (TÜBA, n.d.-a).

One of TÜBA's significant contributions to science diplomacy is its active involvement in drafting and publishing the *G8–G20 Joint Statements from Science Academies to World Leaders*, a long-standing initiative through which TÜBA contributes to global policy

dialogues by offering scientific perspectives on urgent global challenges such as climate change, energy, and health (TÜBA, n.d.-b). In addition, TÜBA organizes annual international conferences and events that bring together scholars from a variety of countries to discuss complex global issues such as migration, artificial intelligence, semiconductors and sustainability. These gatherings emphasise Türkiye's active participation in the global science diplomacy landscape (TÜBA, 2023a; Yurdusev & Doğrul, 2024). TÜBA also publishes scholarly works that contribute to the fields of both the humanities and the sciences (Şeker et al., 2020a; Şeker et al., 2020b; TÜBA, 2022; TÜBA, 2023b; TÜBA, 2025).

At the same time, TÜBİTAK, operating under its founding law (Official Gazette, 1963), plays a crucial role in supporting the government by preparing and implementing international scientific cooperation agreements. TÜBİTAK has also formalized its role in science diplomacy by signing a 2018 cooperation protocol with the Yunus Emre Institute (YEE), initiating the Turkish Academic and Scientific Cooperation Project (TABİP), a project aimed at reinforcing Türkiye's global academic visibility and scientific cooperation strategies (TÜBİTAK, 2018). Established in 2009 to promote Türkiye's language, culture, and arts via 55 institutes in 45 countries, YEE advances science diplomacy through TABİP, with a strong focus on building scientific partnerships that serve national interests through collaborative knowledge production (TÜBİTAK, 2018; Daily Sabah, 2025). While governmental and academic institutions drive much of Türkiye's science diplomacy, libraries across public, university, and research sectors constitute indispensable infrastructure for advancing sustainability and diplomatic goals:

Public libraries serve as accessible knowledge hubs supporting SDG 4 (Quality Education) and SDG 11 (Sustainable Cities and Communities). In Türkiye, municipal libraries increasingly organize community-based environmental literacy programs and workshops on sustainable practices, aligning with national climate action plans and fostering informed citizen participation—a form of grassroots science diplomacy. (T.C. Kültür ve Turizm Bakanlığı Kütüphaneler ve Yayımlar Genel Müdürlüğü, n.d.).

University libraries enable knowledge dissemination and international research collaboration critical for SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals). Major Turkish university libraries participate in open access initiatives and data-sharing consortia, facilitating global access to Turkish research on renewable energy, water management, and public health, which strengthens Türkiye's scientific diplomacy presence (Sarı & Doğan, 2023.)

Research libraries preserve and curate scientific datasets, grey literature, and policy documents essential for evidence-based diplomacy and sustainability policymaking. Research libraries affiliated with TÜBİTAK and TÜBA play a strategic role in national science communication by serving as open access repositories and hubs for scientific data management. Through initiatives such as TÜBİTAK's institutional repositories and TÜBA's sustainability-focused academic programs, these libraries facilitate the dissemination of critical research outputs. They support government agencies and international organizations engaged in global sustainability negotiations—such as those

related to the Paris Agreement and biodiversity treaties—by providing reliable access to scientific knowledge, fostering transparency, and enabling informed policy-making. (TÜBİTAK, 2023; TÜBA, n.d.)

Türkiye's robust institutional commitment to science diplomacy is complemented by the foundational role of libraries that provide essential knowledge infrastructure supporting sustainable development goals and scientific cooperation. By recognizing and strengthening the contributions of public, university, and research libraries, Türkiye can further enhance its international scientific presence and diplomatic engagement for sustainability.

## The Role of Libraries in Science Diplomacy and Sustainable Development Goals

Access to accurate information, its widespread dissemination, and the ability to influence all segments of society are vital to achieving the Sustainable Development Goals and advancing science diplomacy; yet the infrastructure that makes this possible often goes unnoticed. Libraries, public, academic, and research alike, serve as a foundational pillar by managing, preserving, and sharing knowledge, facilitating global information flows, and enabling cross-border collaboration. By offering equal access to resources and expertise, libraries directly and indirectly support multiple SDGs, empower communities with the data they need to make informed decisions, and strengthen the scientific partnerships that underpin both sustainability and international diplomacy.

The value and importance of libraries have emerged through their ability to adapt to the changing needs of society over time. Libraries are cultural institutions that serve all segments of society as information centers where the cultural memory of society is preserved and shared. With their rich and diverse collections and the information they offer to their users, libraries can serve as spaces that support the sharing of information, enabling users from other countries to study and promote the language and culture of their own countries beyond their national borders (Gutierrez, 2015, p. 361).

Libraries contribute to collaboration by providing access to interdisciplinary research teams and fostering a collaborative environment. They provide a framework where researchers and users can exchange ideas, share best practices, and collaborate on research projects. In this context, libraries have the characteristic of being information centers that contribute to science diplomacy within the scope of sustainable development goals with their practices that support scientific communication and scientific collaborations on a national and international scale.

When the scientific literature is examined, the number of studies that examine the fields of libraries and diplomacy in the same context is limited. According to one of these studies, Mariano (2023), four main concepts of library diplomacy were identified using template analysis. These themes are: factors with implicit and explicit roles in diplomatic engagement, the main purpose of library diplomacy is to facilitate information dialogue, strategies aimed at fostering cultural humility, and digitalization as an important tool in international library work. This research provides insights into the under-studied topic

of library diplomacy in the literature, especially at a time when 21st-century libraries face challenges related to global issues of freedom of information. The values of equality, diversity, inclusion, accessibility and sustainability efforts are discussed. Library diplomacy is more critical than ever to be at the forefront of dialogues around the world. The study encourages further exploration of library diplomacy practices in various geographical and international contexts (Mariano, 2023, p. 3).

Library diplomacy can be defined by the role of library actors at the individual, institutional, national and international level in building international relations, influencing global policy decisions and building bridges of understanding between various institutions and countries. This can be achieved by using library resources and programs as soft power assets, cultural diplomacy tools, or cross-cultural intermediaries to bring together and connect diverse agents, institutions, and communities at the international level. Soft power diplomacy is one of the main diplomatic strategies of state and non-state actors in the 21st century. Using galleries, libraries, archives and museums, culture shapes preferences and influences the international community by engaging global public opinion through values and ideals. (Mariano, 2023, p. 1). In the US, libraries have traditionally been used as a tool for government and non-governmental organizations to build relationships and influence foreign public opinion (Turchetti & Lalli, 2020, p. 2).

Libraries continue to shape global communities and influence international discourse by providing information and knowledge. However, the identities of the emerging actors and their goals, strategies and tools in library diplomacy have not yet been sufficiently explored. Library diplomacy has been less explored by scholars interested in international and global librarianship, especially in the last decade, than other cultural institutional counterparts such as museum diplomacy and heritage diplomacy. Also under-researched are areas related to library diplomacy, including data (Boyd, Gatewood, Thorson & Dye, 2019), information diplomacy, digital diplomacy, and the theoretical dimensions and varieties of library diplomacy and international library partnerships. These research interests point to the need for further research to deepen understanding of the concept and practice of library diplomacy, especially in the 21st century (Turchetti & Lalli, 2020, p. 2).

As developed societies become more dependent on expert advice, their leaders are looking for scientists to offer solutions to complex global challenges (e.g. climate change, food security, poverty, energy consumption, nuclear disarmament and, more recently, a pandemic) (Turchetti & Lalli, 2020, p.2). In response, practitioners in Europe and elsewhere emphasize the value of "science diplomacy" as a tool that can bring them closer to addressing these global societal challenges. In particular, it has been emphasized that promoting scientific interactions and cross-border scientific collaborations can both stimulate innovative research that can address these challenges and build constructive relationships across nations (Fedoroff, 2009; Royal Society/AAAS, 2010; Ruffini, 2017, p. 11).

Data is inevitably at the center of scientific research as scientists dig deep to collect, process and use datasets according to their needs. Since the late twentieth century, the term "big data" has been adopted as datasets have grown exponentially. Big data is relevant to a range of scientific questions about the natural world in many different fields. The availability of these large datasets therefore, becomes critical for addressing a range of research tasks, particularly (but not limited to) in the environmental field (Turchetti & Lalli, 2020, p. 4).

Turchetti emphasized the global circulation and integration of scientific data in shaping a data-driven model of science diplomacy (Turchetti & Lalli, 2020, p. 2). While data is at the center of many studies, most of them focus on the usability of data. However, data and datasets are a bit more in the background. In a study linking metadata and global issues, it was argued that metadata is a determinant of societal priorities in aligning new knowledge production with innovation that is aware of global issues through metadata-driven studies (Özdemir, et al., 2014). It was emphasized that science diplomacy should be mobilized to encourage the establishment of innovation observatories responsible for metadata production.

The proposal to specify more concretely the integrated production of metadata through science diplomacy is intended to provide insights for future decisions with relevant organizations, especially in Europe. Informed innovation observatories in this model of science diplomacy would also provide useful information about further investment in international scientific cooperation. Interactions between the scientific and foreign policy communities can be useful in many areas, from advising on global issues with a scientific component to the development of exchanges and international cooperation projects as a way to build positive, constructive relations between states.

Through historical and quantitative analysis, libraries can serve as a public diplomacy intermediary, going beyond the mandates of outreach, social services and education (Gutierrez, 2015, p. 362).

The role of libraries as strategic communication tools is based on the aim of public diplomacy to "understand, inform and even influence public decisions". These spaces can be considered public libraries because they meet the International Federation of Library Associations and Institutions IFLA/UNESCO Manifesto definition of equal access for all, regardless of age, race, gender, religion, nationality, language or social status. The 12 missions outlined in the Manifesto include creating and strengthening reading habits in children, supporting education, providing opportunities for personal development, promoting intercultural dialogue, and supporting cultural diversity. However, these libraries do not only provide and lend books; they also function as instruments of public diplomacy (IFLA, 1994).

Libraries can be linked to many of the sustainable development goals to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Another example of their activities in this area is open science and open access. Libraries' support for open access, open science and open education can be linked to the Sustainable Development Goals of "Quality Education" and "Reducing Inequalities". Open access

offers humanity equal opportunities by providing free access to up-to-date information, providing various literacy skills, and reducing the carbon footprint and its impact on the environment.

Libraries serve as a platform for researchers from different disciplines to come together, share knowledge and work towards common goals. Helping knowledge centers to develop and grow is of great importance, not only for those who want to learn a foreign language or improve their knowledge, but also to keep such important resources active within communities around the world (Gutierrez, 2015, p. 367). It can be used to strengthen or even improve the service of libraries, not only to the public who use them, but also to those responsible for these cultural centers, such as employees.

When we examine the place of libraries in sustainable development goals in science diplomacy, which is the main subject of the research; when we consider the public libraries that serve all segments of society or educational institutions due to their potential to train managers and decision-makers of future generations in the field of sustainability in librarianship, libraries play a critical role in creating public awareness about the SDGs (Mathiasson & Jochumsen, 2022, p. 1279), developing sensitivity, mediating institutional continuity and providing access to global information (Akkaya, 2023, p. 124). Today, libraries play an important role in working towards the Sustainable Development Goals that the United Nations (UN) is trying to achieve by 2030, and it is thought that libraries will continue to contribute to this field and continuously improve themselves until 2030. Looking to the future, the possibilities offered by artificial intelligence and advanced information technologies may deepen the interaction between sustainability and librarianship.

Libraries, which quickly adapt to technological developments and provide these opportunities to their users, organize training on the use of electronic resources, evidence-based data preparation, information literacy skills and lifelong learning, and support all users in this field.

Libraries can build public awareness, develop community resilience, provide equal and inclusive services, and establish a strong link between institutional continuity, sustainability, and science. However, realizing sustainability in science diplomacy within the field of librarianship requires raising awareness and supporting efforts in this area. Furthermore, whether public, academic, or research, libraries play a central yet often under-recognized role in fostering global knowledge flows, facilitating access to information, and enabling cross-border cooperation—elements integral to both SDG implementation and science diplomacy. Building on these capacities, libraries should leverage their pivotal role in lifelong learning to cultivate sustainability awareness among all users and propel the global SDG agenda. By ensuring efficient, consistent information flows, facilitating seamless access, promoting open sharing, and championing research and teaching best practices, libraries can translate knowledge into action and embed sustainable thinking across communities.

Public libraries, local enablers of global goals, are critical community hubs that provide equitable access to information, technology, and learning resources. Their direct

alignment with SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities) is well documented. In Kenya, the Kenya National Library Service (KNLS) collaborates with the EIFL Public Library Innovation Programme to deliver ICT training, agricultural information, and health resources to rural populations, empowering them economically and socially. In Colombia, public libraries are part of peacebuilding initiatives by offering access to educational resources and preserving cultural memory in post-conflict regions. By supporting lifelong learning and digital inclusion, public libraries contribute indirectly to social stability and international peace efforts, making them grassroots actors in science diplomacy's broader mission.

University libraries, as facilitators of research and collaboration, serve as vital infrastructure for academic research and global knowledge exchange. They support SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals) by:

- Hosting institutional repositories for open access publications and research data.
- Supporting collaborative research platforms, such as OpenAIRE or DART-Europe, which unite scholars across borders.
- Enabling participation in international consortia, such as LIBER or the HathiTrust Digital Library, which extend the reach of local scholarship and reduce North–South knowledge gaps.

Moreover, university libraries play a crucial role in the training of future science diplomats by equipping early-career researchers with digital literacy, research ethics, and data management skills needed for transdisciplinary and transnational collaboration.

As custodians of scientific data and memory, research libraries and institutions at the national level are often responsible for the management of primary scientific data, archives and gray literature, which are essential for science-based decision-making. For example, The World Data System (WDS), overseen by the International Science Council, depends on a global network of research libraries for long-term data curation across climate science, epidemiology, and geospatial studies. The European Open Science Cloud (EOSC) integrates research libraries to provide secure, federated environments where cross-border researchers can access and reuse FAIR (Findable, Accessible, Interoperable, Reusable) data.

These libraries contribute to the “science in diplomacy” and “diplomacy for science” dimensions by offering the infrastructure and professional expertise to ensure that scientific outputs are transparent, verifiable, and globally accessible.

## Methodology

The number of publications dealing with the concept of science diplomacy, sustainability, sustainable development goals and librarianship issues together is very few in the scientific literature. This study was conducted using the literature review method, which is one of the qualitative research methods, and accordingly, to provide a new perspective on the applicability of sustainable development goals in science diplomacy to librarianship and to reach new definitions on the subject.

## Results

Sustainability means that an organization adopts the principle of responding to the needs of today while not jeopardizing the needs of future generations (Delaney & Liu, 2022). The adoption of sustainable practices by organizations, taking into account environmental, social, cultural and economic impacts, is critical for business today (Burritt & Schaltegger, 2010). Modern science diplomacy increasingly hinges on the integration and circulation of scientific data. The exponential growth of big data necessitates efficient data curation, sharing, and metadata management, roles libraries are uniquely positioned to fulfill. Turchetti and Lalli (2020) emphasize the importance of metadata in shaping research priorities aligned with global challenges. Libraries, through their expertise in metadata production and digital infrastructure, contribute to building innovation observatories, platforms that facilitate international scientific cooperation and inform global policy agendas (Özdemir et al., 2014).

Adopting sustainability is inevitable to ensure that future generations live in an environmentally, socially, culturally and economically balanced society by using existing resources effectively and efficiently. In this context, it is a critical part of the mission to build a brighter and more sustainable future for future generations, for organizations to implement sustainability practices and raise awareness in this area.

In today's global and multipolar international system, in addition to traditional diplomacy methods, different diplomacy methods are preferred by developed and developing countries. In this context, science diplomacy is emerging as an important foreign policy tool based on knowledge-based international scientific and technological partnerships (Özkaragöz Doğan, 2015). In order to overcome international scientific multi-layered global challenges such as climate change, infectious diseases, famine, migration, technological wars or terrorism, the scientific dimensions of these challenges need to be well known and countries need to cooperate to solve them. In addition, in the light of changing and developing technologies, issues such as increasing and disseminating scientific studies and bilateral cooperation should continue unabated. In this context, science diplomacy plays an important role in sustainability. The healthy emergence of scientific studies, ensuring cooperation, keeping up with technology, distribution, sharing, utilization, dissemination and development of information is also realized through good management of information, and here libraries that manage information science come into play.

Libraries provide crucial infrastructure for interdisciplinary research and collaboration, offering environments where researchers exchange ideas, access scientific data, and develop partnerships across institutions and borders. Consequently, libraries contribute to science diplomacy by fostering scientific communication and enabling international cooperation aligned with sustainable development goals.

Although the intersection of libraries and diplomacy remains an emerging research field, Mariano (2023) identifies four core themes of library diplomacy: facilitating information dialogue, fostering cultural humility, leveraging digital tools for international engagement, and acknowledging both explicit and implicit roles in diplomatic processes.

These themes underscore libraries' expanding influence in global dialogues on freedom of information, equality, inclusion, and sustainability. Library diplomacy acts as a soft power asset, employing library resources and programs to bridge diverse communities and promote peaceful international relations (Mariano, 2023, p. 1). Beyond their educational mission, libraries function as strategic communication tools in public diplomacy. The International Federation of Library Associations and Institutions (IFLA)/UNESCO manifesto highlights libraries' commitment to equal access and their role in promoting intercultural dialogue, cultural diversity, and lifelong learning (IFLA, 1994). These functions align with several SDGs, notably SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice and Strong Institutions).

Libraries' advocacy for open science and open access further democratizes knowledge, supporting equitable education and reducing environmental impact through digital dissemination. Such initiatives foster global research networks essential for addressing shared challenges like climate change, public health crises, and sustainable resource management.

Public Libraries serve as community centers promoting SDG 4 (Quality Education) and SDG 11 (Sustainable Cities and Communities). In many countries, public libraries host environmental awareness campaigns, sustainability workshops, and digital literacy programs, increasing community resilience and participation in sustainability efforts. For example, public libraries in Türkiye have begun partnering with local governments to disseminate information on renewable energy and waste reduction practices.

University libraries underpin academic research critical for SDG 9 (Industry, Innovation, and Infrastructure) and SDG 17 (Partnerships for the Goals). They facilitate open access to research outputs, support data sharing in fields such as climate science and public health, and enable cross-border collaborations. University libraries also train future policymakers and scientists in information literacy and research ethics, contributing to evidence-based decision-making processes.

Research libraries, particularly those affiliated with scientific institutions, manage specialized data repositories and grey literature vital for policy formulation and international scientific cooperation. For instance, libraries at TÜBİTAK and TÜBA curate extensive scientific datasets, supporting Türkiye's participation in international treaties on biodiversity and climate change, thus strengthening its science diplomacy footprint.

Libraries actively organize training on electronic resource usage, evidence-based research methodologies, and information literacy. By empowering users with these skills, libraries promote lifelong learning, an essential element of sustainability. Through outreach programs, libraries build public awareness of the SDGs, encourage sustainable behaviors, and facilitate community resilience (Mathiasson & Jochumsen, 2022; Akkaya, 2023).

Looking forward, emerging technologies such as artificial intelligence (AI) present opportunities to deepen libraries' contributions to sustainability and science diplomacy by enhancing information accessibility, personalized learning, and data analysis capabilities.

Since the number of publications that address the role and importance of libraries within the scope of the concept of Science Diplomacy for Sustainable Development, which is the research subject of the study, is limited in the scientific literature, this study aims to bring new perspectives and new definitions to the concept of science diplomacy of libraries in sustainable development.

## Conclusion and Discussion

Libraries enable cross-border scientific collaboration by providing open access platforms and facilitating international data sharing, which is essential in global challenges such as climate change, pandemics, and energy sustainability. By preserving and promoting cultural heritage and indigenous knowledge, libraries foster mutual understanding and respect between nations, key components of cultural diplomacy and soft power. Through public engagement programs, libraries act as agents of public diplomacy, shaping global perceptions and building international goodwill, as seen in government-supported library diplomacy initiatives in the U.S. and Europe. Libraries' digital transformation efforts strengthen the infrastructure needed for international scientific cooperation, enabling real-time data exchange and joint research critical to sustainable development.

Within the scope of the study, the importance of the concept of science diplomacy for sustainable development purposes and the role of libraries in this context and its relationship with the concept of sustainable development were examined. The role and importance of libraries in the concept of science diplomacy has been investigated to standardize the scientific study outputs and data of libraries on a global scale with various applications and to share them with users, to develop scientific developments and international cooperation, relations between countries, and to solve common global problems. In the literature review section, which deals with the theoretical basis of the study, the relationship between the concept of sustainable development and science diplomacy at the international level and in Türkiye, and the role and importance of libraries in this context are discussed under the topics of examples of science diplomacy studies in the field of sustainability in the world", "examples of science diplomacy studies in the field of sustainability in Türkiye", "the place of libraries in science diplomacy in sustainable development goals".

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