USING SCIENCE DIPLOMACY
FOR ADDRESSING GLOBAL CHALLENGES

Deliverable

D5.4 Infographics on EU science diplomacy

Project	S4D4C – Using science for/in diplomacy for addressing global challenges
Project Acronym	S4D4C
Project Number	770342
Deliverable:	D5.4
Submission Date:	16.04.2019 (update)
Responsible Author(s)	Maria Josten (DLR)

ABSTRACT

The present deliverable D5.4 describes the preparation of infographics/figures on EU science diplomacy. It gives an overview of the collected information, the visualization and expected benefit of the S4D4C infographics.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770342.

Document Control Sheet

Work Package Number	WP5
Work Package Title	Trainings and knowledge resources for science diplomats
Task Number	T5.1
Task Title	Development of training modules and overall curriculum
Deliverable Number	D5.4
Deliverable Title	Infographics on EU science diplomacy
File name	S4D4C_WP5_D5.4_Infographics_update_final
Number of pages	33
Dissemination level	Public
Main author	Maria Josten (DLR)
Contributors	Ewert Aukes (UT), Tim Flink (DZHW), Stella Reschke (DLR), Charlotte Rungius (DZHW), Mitchell Young (Charles University), discussions with all partners
Quality Assurance	Elke Dall (ZSI)

Versioning and Contribution History

Version	Date	Author/Editor	Collaborators	Description
_v0.1	08.02.2019	Maria Josten	Ewert Aukes Charlotte Rungius	First draft
_v0.2	28.02.2019	Maria Josten	Several S4D4C project partners	Adjustments (Input from Workshop in Brussels, February 25-26)
_final draft	28.02.2019	Elke Dall		Quality Assurance and finalization

_v0.3 (update)	12.04.2021	Maria Josten	Stella, Reschke, Several S4D4C project partners	Update of infographics
_v0.4	12.04.2021		Elke Dall, Maria Josten	Quality Assurance and final adjustments
_final	19.04.2021	Elke Dall		Final version for submission

Content

Tables

Figures

List of abbreviations

AAAS	American Association for the Advancement of Science
EU	European Union
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
PRIMA	Partnership for Research and Innovation in the Mediterranean Area
S4D4C	Using science for/in diplomacy for addressing global challenges
SDGs	Sustainable Development Goals
SESAME	Synchrotron-light for Experimental Science and Applications in the Middle East
SME	Small and Medium Enterprises
WP	Work Package

Infographic
noun [C]

uk /ˌɪnfəʊˈgræf.ɪk/ us /ˌɪnfoʊˈgræf.ɪk/

a picture or diagram or a group of pictures or diagrams showing or explaining information

Source: Cambridge Dictionary[1]

1. Executive Summary

This report addresses the preparation of infographics within the EU project "Using science for/in diplomacy for addressing global challenges" (S4D4C). Infographics provide valuable content for online and offline trainings, presentations as well as dissemination channels (e.g. policy blogs, twitter etc.). For the preparation of the content the project partners have used internal and external information sources. The S4D4C partners have developed **five S4D4C infographics/figures**, which include several elements:

- They offer a simple and understandable description on science diplomacy, comprising various and often diverging perspectives, policy approaches and activities – a good starting point for future science diplomats.
- They present the interaction among different stakeholders from policy, research and academia, private sector and the civil society.
- They examine, summarise and illustrate concrete science diplomacy examples and recommendations for policy actions.
- They can be used as a training material, in presentations and/or discussions in science diplomacy events.

The development of the infographics/figures took place in **two stages**:

- 1st stage: overview and examples.
  In 2018-2019 the S4D4C project developed two infographics "Science Diplomacy: Vision, Instruments and Actors" and "Partnership for Research and Innovation in the Mediterranean Area (PRIMA)"
- 2nd stage: illustration of science diplomacy development and current cases.
  In 2020 the S4D4C project published two further visual elements, one dedicated on the "Science Diplomacy Triangle of Society, Policy and Science" as well as a second one, entitled "Strengthening science diplomacy to tackle global challenges together – the case of the COVID-19 pandemic".

[1]See website: https://dictionary.cambridge.org/dictionary/english/infographic

The figures have been made publicly available to the wider audience via the S4D4C website, social media etc. They are downloadable here:

Title	Link
1) Science Diplomacy Description: Vision, Instruments and Actors	https://www.s4d4c.eu/training_material/figure-science-diplomacy-vision-instruments-and-actors/
2) Science Diplomacy Example: Partnership for Research and Innovation in the Mediterranean Area (PRIMA)	https://www.s4d4c.eu/knowledge_resource/partnership-for-research-and-innovation-in-the-mediterranean-area-prima/
3) Science Diplomacy Development: Triangle of Society, Policy and Science and 4) Science Diplomacy at the Intersection of Science Policy and Foreign Policy Discourses	https://www.s4d4c.eu/training_material/figure-science-diplomacy-triangle-of-society-policy-and-science/ and https://www.s4d4c.eu/training_material/figure-science-diplomacy-at-the-intersection-of-science-policy-and-foreign-policy-discourses/
5) Strengthening Science Diplomacy to Tackle Global Challenges Together – the Case of the COVID-19 Pandemic	https://www.s4d4c.eu/training_material/infographic-strengthening-science-diplomacy-to-tackle-global-challenges-together-the-case-of-the-covid-19-pandemic/

Table 1: Key infographics developed by the S4D4C project and sources

This deliverable presents the objectives of the materials and provides a description of the infographics/figures as well as the respective target groups.

Additionally, the document highlights six further visualisations developed within the S4D4C project. Yet, some useful infographics can be found on the web and further examples, related to science diplomacy, have been presented at the end of the documents in chapter 6.

2. Objectives

The S4D4C project aims to support the European Science Diplomacy community with the content, knowledge and skills necessary to successfully navigate the Science Diplomacy interface in Europe and beyond. To this end, S4D4C has developed a number of capacity building activities like a training curriculum[2], two in-person workshops in Trieste[3] and Vienna[4] as well as the S4D4C Online Course on European Science Diplomacy[5]. With the aim to gain the attention of a broad audience, the S4D4C project has created innovative training materials like infographics and a comic on European science diplomacy. These formats have been developed to make the project results accessible and useable.

Infographics are a type of material that can easily be shared in web-based media and visualize content to facilitate the understanding: With the preparation of S4D4C infographics the S4D4C project has provided valuable content for different training activities as well as existing communication channels (e.g. twitter). They complete complex analyses and offer a simple description of some S4D4C policy papers and recommendations. In this regard, the S4D4C infographics have increased the quality and impact potential of S4D4C outputs.

3. Implementation

3.1 Content

The S4D4C partners decided to publish different illustrations to explain the complexity of the topic "science diplomacy". Three main question had been addressed in the preparation of the S4D4C infographics:

1. **What is Science Diplomacy?**
   The term "Science Diplomacy" comprises various and often diverging perspectives, policy approaches and activities. There is not a single understanding or definition for this term. Countries and professionals understand science diplomacy in many different ways, as it has become multidimensional, multi-layered, very complex and has multiple meanings. Therefore, a simple illustration of links and interactions between diplomacy and science is needed as a suitable starting point for training activities. Within a training module, in order to equip the trainee with the skills to develop a comprehensive understanding of the term "Science Diplomacy", several aspects should be addressed including advantages, challenges and critical aspects.

[2]See Toolkit for Trainers available at: https://www.s4d4c.eu/toolkit-for-trainers/
[3]Science Diplomacy Workshop Trieste: https://www.s4d4c.eu/science-diplomacy-workshop-trieste-10-2019/
[4]Science Diplomacy Workshop Vienna: https://www.s4d4c.eu/science-diplomacy-workshop-vienna-11-2019/
[5]European Science Diplomacy Online Course: https://www.s4d4c.eu/european-science-diplomacy-online-course/

2. **Who are the main stakeholders of science diplomacy?**
   According to the nature of their work we identified different science diplomacy stakeholders like governmental stakeholders (nation states and subnational governments), intergovernmental and supranational stakeholders (multilateral international and supranational organisations), research and academic stakeholders (universities, research centres, national academies, learned societies), private sector (trans- or multi-national companies as well as Small and Medium Enterprises (SMEs) and the civil society (NGOs, private charities). The S4D4C case studies[6] have showcased examples of the role and influence of these stakeholders in the science diplomacy context.

3. **What are current examples in the field of Science Diplomacy?**
   There are several initiatives which are usually mentioned as best practices or flagships with regard to science diplomacy like SESAME[7] and PRIMA[8]. The ongoing COVID-19 pandemic provides an opportunity for a "live observation" of Science Diplomacy approaches at national, bilateral and especially at multilateral level. Therefore, the illustration of concrete examples, related to specific recommendations for policy, diplomacy and science, offers a good basis for exchange among current and future science diplomats.

3.2 Timeline and development

For preparing several infographics the interaction within the S4D4C project was crucial: it has led to bundling of knowledge and efficiency. Therefore, the preparation of the infographics took place in two stages:

- **1st stage: overview and examples**
  In the first development phase (2018-2019) the project partners collected relevant information about different definitions and science diplomacy stakeholders. Science diplomacy has been considered more and more as a set of practices and policy options that can be examined, intentionally fostered or even strategically implemented. Conceptualizing science diplomacy usually faces the challenge of bridging (or attuning) an abstract idea with the need of a precise and systematic understanding of real-world interactions. Based on the dimensions of science diplomacy described by the Royal Society[9] as well as the analytical work in the project, in particular WP4 "Science diplomacy governance framework", the concept of science diplomacy had been developed around three major hubs: diplomacy, scientific advice and science cooperation. These

[6]S4D4C Case Studies: https://www.s4d4c.eu/s4d4c-cases/
[7]SESAME – a synchrotron light source in the Middle East: an international research infrastructure in the making: https://www.s4d4c.eu/wp-content/uploads/2020/03/D3.2_7_SESAME_final.pdf (S4D4C case study report)
[8]PRIMA - Partnership for Research and Innovation in the Mediterranean Area: https://prima-med.org/
[9]The Royal Society and AAAS, "New frontiers in science diplomacy" (2010): https://royalsociety.org/~/media/royal_society_content/policy/publications/2010/4294969468.pdf

hubs then built the basis for explaining the term "Science Diplomacy" within the first S4D4C infographic.
The second infographic had been developed with the aim to show complex dialogue processes with different stakeholders in the field of science diplomacy. The PRIMA initiative was selected to serve as a good example for long-term negotiations.

- **2nd stage: illustration of science diplomacy development and current cases**
  In recent years, the term "science diplomacy" has gained increasing attention both within academia as well as the political sphere. As mentioned above, the term neither constitutes a ready-made empirical object nor provides a clear-cut definition. Instead, it is the interplay between science and foreign policy and international relations that creates the notion of science diplomacy. With two figures, "Science Diplomacy Triangle of Society, Policy and Science" and "Science Diplomacy at the Intersection of Science Policy and Foreign Policy Discourses" the S4D4C team has illustrated the increasingly blurred boundaries between the two spheres.

  Furthermore, under WP3 "European Science Diplomacy addressing global challenges", a mixed team of S4D4C partners have developed nine case studies. Each study provides an overview of the case and its background, context and governance arrangements, describing further the stakeholder landscape and addressing its governance practices. The case studies examine the use of knowledge, the relations between governance levels and provide a discussion on how the case has improved or changed the project team's understanding of science diplomacy.

  In 2020, the case studies were the basis of an additional publication entitled "The 'Matters' of Science Diplomacy: Transversal Analysis of the S4D4C Case Studies".[10] The transversal analysis provides insights on how to foster and advance the understanding and practices of science diplomacy. In line with the outcome of the case studies, COVID-19 has highlighted shortcomings in the current interactions between international relations and scientific cooperation. The crisis demonstrates the need for improving science diplomacy practices. In this regard, four key elements of the case studies have been discussed in the S4D4C policy brief "Building Better Science Diplomacy for Global Challenges: insights from the COVID-19 crisis"[11]: narratives, interests, values, and interdisciplinarity. An S4D4C infographic visualises these key elements. Together with facts and figures, it illustrates policy recommendations for a better crisis response in the future.

[10]More information available at: https://www.s4d4c.eu/s4d4c-cases/
[11]More information available at: https://www.s4d4c.eu/policy-brief-building-better-science-diplomacy-for-global-challenges-insights-from-the-covid-19-crisis/

4. S4D4C Infographics: Objectives, Description, Target Group

1st stage: overview and examples

4.1 Science Diplomacy Description: Vision, Instruments and Actors

Science diplomacy goes beyond international scientific collaboration but involves political actors and interests worldwide. Within the preceding two decades, science diplomacy "has become an umbrella term covering a range of formal and informal exchange, education, policy, and outreach efforts" (Basha 2016) and thereby plays a key role in responding to some of the most elemental challenges facing the international community (Copeland 2015). Based on the taxonomy developed by the Royal Society and the AAAS (2010), Figure 1 presents an overview of potential links and interactions between diplomacy and science that are together imagined as "science diplomacy":

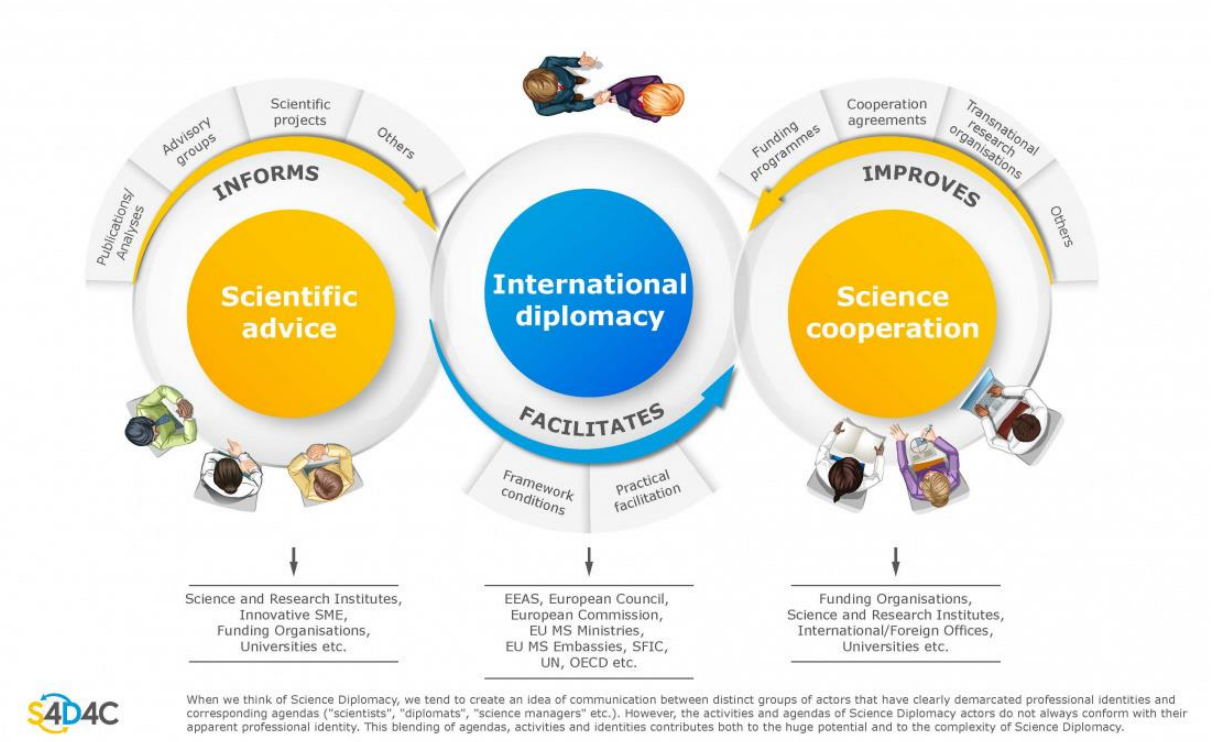


Figure 1: S4D4C Infographic "Science Diplomacy: Vision, Instruments and Actors"[12]

[12]More information available at: https://www.s4d4c.eu/training_material/figure-science-diplomacy-vision-instruments-and-actors/

Objectives

The S4D4C infographic "Science Diplomacy: Vision, Instruments and Actors" visualises various interacting aspects of science diplomacy, where international diplomacy draws on science-based advice, facilitates science cooperation and uses science cooperation to improve international relations.

It aims to clarify the various ways in which science diplomacy can contribute to solving global challenges, i.e. scientific advice, international diplomacy and science cooperation.

The figure shows that the interaction is only possible by involving different actors.

Description

Scientific advice: Firstly, science diplomacy aims at providing scientific advice. Scholars, researchers and scientist ought to provide policy makers with state-of-the-art information and evidence on the dynamics of global developments and identify scientific consensus, challenges and uncertainties. Scientific advice thus uses scientific knowledge in order to deliver the empirical information necessary for informed policy-making and thereby well-informed foreign policy decisions.

- **Examples**: A contemporary example is the Intergovernmental Panel on Climate Change (IPCC), the UN research and advisory body for assessing the science related to climate change. The objective of the IPCC is to provide governments at all levels with scientific information that they can use to develop climate policies. IPCC reports are also a key input into international climate change negotiations (see link to IPCC within the S4D4C knowledge platform[13] and link to IPCC home page[14]).
- **Stakeholders**: Universities, research institutions, innovative SMEs etc.

As such, **science advice informs international diplomacy** to ensure the effective uptake of high-quality scientific advice by policy-makers, global leaders and diplomats.

International diplomacy: Secondly, science and technology cooperation can contribute to create trusting and sustainable partnerships with countries, regions or political actors and thus to build international stability. The values of science, e.g. rationality and transparency, are universally applicable and thus "help underpin good governance and build trust between nations". Whenever there are difficult conditions between states or when a number of countries face common challenges, science diplomacy has the potential to contribute significantly to defusing the situation.

[13] More information available at: https://www.s4d4c.eu/knowledge_resource/ipcc/
[14] More information available at: https://www.ipcc.ch/

- **Examples**: The European Organization for Nuclear Research (CERN) (see link to CERN within the S4D4C knowledge platform[15] and link to CERN home page[16]), SESAME (see link to SESAME within the S4D4C knowledge resources[17] and link to SESAME home page[18])
- **Stakeholders**: European Commission, European External Action Service, the Joint Research Centre of the European Commission, ministries, embassies, United Nations, Organisation for Economic Co-operation and Development (OECD) etc.

Scientific collaborations mobilise scientific networks that are based upon a non-ideological basis and can thereby support foreign policy actions. At the same time, **international diplomacy facilitates science cooperation**.

Science cooperation: Finally, not only science has an important added value for the accomplishment of certain foreign policy objectives. Also vice versa, diplomacy plays a key role in creating favourable conditions for international scientific collaborations – either top-down, by setting strategic priorities, or bottom-up, by providing support for individual researchers. International research projects often require vast amounts of funds that are not affordable by a single country or region. In these instances, foreign policy and diplomatic tools are fundamental to provide the necessary resources and to support the scientific community in establishing and consolidating joint research programmes.

- **Examples**: Prime examples for this category are transnational research organisations or large research infrastructures[19] (such as the International Thermonuclear Experimental Reactor, ITER[20] and the Large Hadron Collider, LHC).
- **Stakeholders**: Funding organisations, science and research institutes, international/foreign offices etc.

Traditionally, science has played a central role in the development of hard power capabilities, such as military technologies and economic coercion. Science cooperation, however, primarily draws on the soft-power, i.e. to attract, persuade and influence both as a national asset and as a universal activity that transcends national interests. As such, **science cooperation might also improve international diplomacy**.

[15]More information available at: https://www.s4d4c.eu/knowledge_resource/large-scale-research-infrastructures/
[16]More information available at: https://home.cern/
[17]More information available at: https://www.s4d4c.eu/knowledge_resource/large-scale-research-infrastructures/
[18]More information available at: https://www.sesame.org.jo/
[19]More information available at: https://www.s4d4c.eu/knowledge_resource/large-scale-research-infrastructures/
[20]More information available at: https://www.iter.org/

Target group

The infographic is especially helpful to familiarize new SD actors with the subject matter and to expand the concept beyond the classical Royal Society/AAAS definition. It can serve as an introduction to further training materials.

Figure 1 can be presented within off- and online trainings, conferences and workshops.

4.2 Science Diplomacy Example: Partnership for Research and Innovation in the Mediterranean Area (PRIMA)

PRIMA devises new R&I approaches to improve water availability and sustainable agriculture production in a region heavily distressed by climate change, urbanisation and population growth. The partnership consists of 19 participating countries: Algeria, Croatia, Cyprus, Egypt, France, Germany, Greece, Israel, Italy, Jordan, Lebanon, Luxembourg, Malta, Morocco, Portugal, Slovenia, Spain, Tunisia and Turkey.[21] The initiative is a good example to illustrate how science diplomacy can be realised: Figure 2 visualises the negotiation processes by focusing on main milestones on the way of the initiative´s launch.

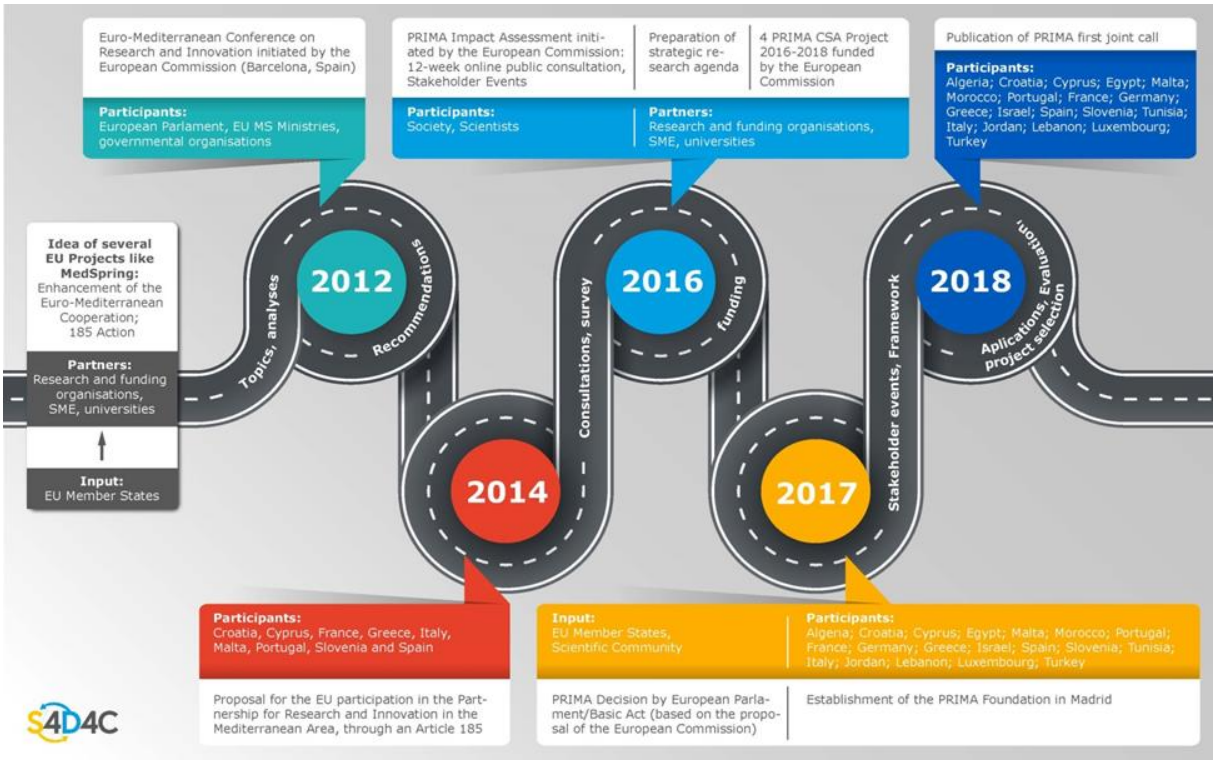


Figure 2: S4D4C Infographic "PRIMA as a case of science diplomacy"[22]

[21] More information available at: https://prima-med.org/about-us/prima-in-brief/
[22] More information available at: https://www.s4d4c.eu/knowledge_resource/partnership-for-research-and-innovation-in-the-mediterranean-area-prima/

Objectives

The S4D4C infographic "PRIMA as a case of science diplomacy" presents complex negotiation processes among different stakeholders. It highlights the need for interactions at different levels: between different countries, representatives of science and policy, the European institutions and society.

The figure visualises the tedium from the first idea of joint activities among several EU projects to the first official funding call of the PRIMA initiative.

Description

The PRIMA initiative[23] was established between 2012 and 2018[24], involving several negotiation steps which could be considered as milestones in the field of science diplomacy:

- **2012:** The Euro-Mediterranean Conference on Research and Innovation (Barcelona, Spain) marked the inception of the proposal for a Partnership for Research and Innovation in the Mediterranean Area (PRIMA).
- **2014**: Italian Minister of Education, Universities and Research Stefania Giannini submitted a proposal for the participation of the EU in the Partnership for Research and Innovation in the Mediterranean Area, through Article 185 of the Treaty on the Functioning of the European Union, to European Commissioner for Research, Science and Innovation Carlos Moedas.
- **2015-2016:** The European Commission services conducted an impact assessment of the PRIMA initiative to analyse the need for an EU action in this domain and the potential economic, social and environmental impacts of the alternative policy options.
  In the context of the PRIMA Impact Assessment, the stakeholder consultation process included the two activities: a 12-week online public consultation (objectives, possible actions), running from 1 February to 24 April 2016 (Society and Science (NGOs, SME, Universities): 562 replies received: 486 EU (86.5%) and 76 Non-EU (13.5%)) as well as a stakeholder event which took place in Malta on 17 March 2016.
- **2016-2018:** The 4PRIMA Coordination and Support Action, funded by Horizon 2020, set the ground for the launch of the initiative, by contributing to the alignment of R&I programmes on food systems and water use in the Euro-Mediterranean Area and through the definition of the PRIMA Strategic Research and Innovation Agenda (SRIA).
- **On 13 June 2017**, the European Parliament adopted the PRIMA Decision and **on 26 June 2017**, the Council of the EU endorsed the initiative.
- The Decision entered into force **on 7 August 2017**. The PRIMA Foundation was officially established, with its Secretariat based in Barcelona.
- **2018:** The first round of PRIMA calls for proposals was launched by the PRIMA Secretariat.

[23]Source: https://prima-med.org/about-us/prima-in-brief/
[24]More information available at: https://ec.europa.eu/info/research-and-innovation/research-area/environment/prima_en

In 2021, PRIMA has published several calls for proposal in scientific fields like water management, agri-food, water-energy-food-ecosystems etc.[25]

Target group

Figure 2 is especially helpful for providing an example for the duration of negotiations and the involvement of representatives from science, diplomacy, policy and society. It can be especially used for advanced training activities in the field of science diplomacy. When organizing in-person workshops, it is also recommended to invite experts involved in long-term initiatives like PRIMA who can explain in detail the challenges of negotiations and interactions among the different stakeholders.

2nd Stage: Illustration of Science Diplomacy Development and Current Cases

4.3 Science Diplomacy Development: Triangle of Society, Policy and Science

The global challenges of the 21st century – such as climate change, sustainable energy supply, food security or migration – do not stop at national borders. As a matter of fact, they can only be solved by both cross-border efforts at the international level and evidence-based policy-making supported by science. Finding solutions to this increasingly complex web of global challenges hence requires an ever-closer collaboration of scientific and diplomatic actors. Accordingly, the "call for science diplomacy is built both on the idea that the pressing challenges are global in nature (and therefore require global action) and that they have become more complex and therefore require international scientific endeavours and expertise" (S4D4C State of the Art-Report 2018: 16). As illustrated by Figure 3, this development has led to the politicisation of science as well as the scientification of politics whereas both have been corroborated by public media attendance and calls for public engagement.

[25]More information available at: https://prima-med.org/calls-for-proposals/

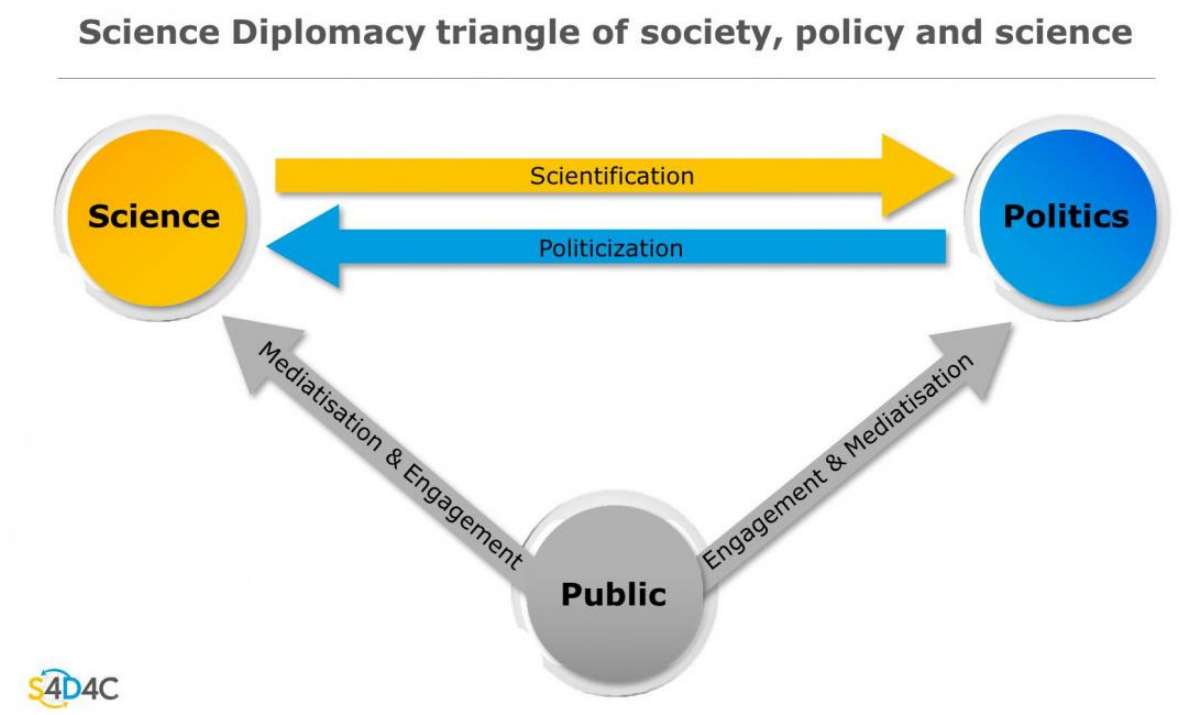


Figure 3: S4D4C Infographic "Science Diplomacy Triangle of Society, Policy and Science"[26]

In recent years, the term "science diplomacy" has gained increasing attention both within academia as well as the political sphere. Yet, the term neither constitutes a ready-made empirical object nor provides a clear-cut definition. Instead, it is the interplay between science and foreign policy and international relations that creates the notion of science diplomacy. Figure 4 illustrates the increasingly blurred boundaries between the two spheres and explains how this shift of paradigm has transpired over time.

[26]More information available at: https://www.s4d4c.eu/training_material/figure-science-diplomacy-triangle-of-society-policy-and-science/

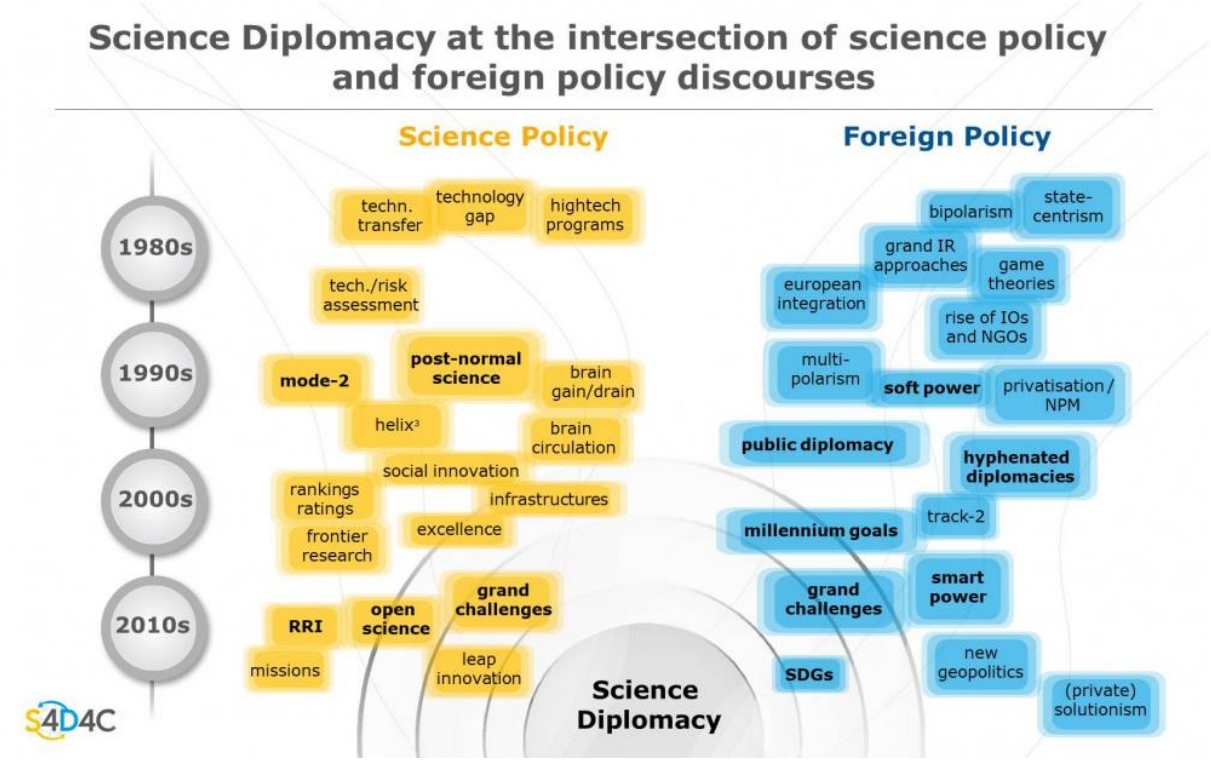


Figure 4: S4D4C Infographic "Science Diplomacy at the Intersection of Science Policy and Foreign Policy Discourses"[27]

Objectives

The two figures "Science Diplomacy Triangle of Society, Policy and Science" and "Science Diplomacy at the Intersection of Science Policy and Foreign Policy Discourses" provide scientists and diplomats with a deeper understanding of the origins and gradual emergence of the science diplomacy concept in the discourse of academics and practitioners.

The first figure presents the interaction between science politics and society. The second one shows the entire landscape of relevant actors pluralized and the increasing blurring of boundaries within each ecosystem, i.e. science and foreign policy, but also between the two.

Description

Figure 3 can serve as an introduction to Figure 4. As Figure 4 indicates, in the 1980s and 1990s, science and diplomacy in the theoretical discourse have been defined as **two separate spheres**. While the area of science has been considered "as a non-political, evidence-based and universal activity", the diplomatic arena has been attributed with the realm of politics and "**as the representation and negotiation of state interests**" (S4D4C State of the Art-Report 2018: 7). Both

[27]More information available at: https://www.s4d4c.eu/training_material/figure-science-diplomacy-at-the-intersection-of-science-policy-and-foreign-policy-discourses/

policy fields had their own proficiencies and foci. Over the last decades, however, we came to witness a slow but steady paradigm change with science diplomacy forming as "**a fusion of [these] previously distinct elements**" (Turekian et al. 2015).

While, from a historical point of view, there have been instances of science diplomatic activities in particular since the 1960s, it is important to note that these were **not labelled** as such at the time. Only in the early 2000s, a more frequent use and explicit application of the term has emerged (e.g. Lord & Turekian 2007). A growing body of policy papers and research articles has applied the label in more systematic ways ever since. As Flink and Rüffin (2019: 107) clarify: "This wave has seen a **growth of programmes and staff** dedicated to elements of science diplomacy, the consolidation of strategies with regard to countries and topics of interests, and attempts to coordinate (and sometimes streamline) actors under the label of science diplomacy. In addition, new actors, such as the European Commission, have entered the playing field." It follows that every scholar or science policy-maker can find her/himself in a **social setting that is of immediate diplomatic relevance**, just as well as every actor in the sphere of foreign policy can be confronted with a topic that is of scientific relevance or requires scientific expertise.

Figure 4 shows a **sociohistorical evolution** of concepts that expressed and structured leitmotifs in science policy on one hand, and foreign on the other hand. This new awareness was framed by popular concepts in the early millennium years, such as grand challenges, while responding to cross-border problems with scientific expertise and international policies was yet to be framed.

Target group

Figure 3 is especially useful to beginners in the field of science diplomacy.

Figure 4 can be used for beginners (in combination with Figure 3) as well as for advanced science diplomats. The target group should have an interest in science and be open to discuss theories and concepts. The trainer needs to have a basic understanding of the concepts used in the figure and be able to provide further reading to students who ask questions. Additional information is available in the S4D4C training materials[28].

[28]More information available at: https://www.s4d4c.eu/training_material/figure-science-diplomacy-at-the-intersection-of-science-policy-and-foreign-policy-discourses/

4.4 Science Diplomacy Example: Strengthening Science Diplomacy to Tackle Global challenges Together – the Case of the COVID-19 Pandemic

COVID-19 has highlighted shortcomings in the current interaction between international relations and scientific cooperation. The crisis demonstrates the need for improving science diplomacy practices.

The infographic below draws on **three S4D4C policy briefs**, where more detailed information on each of the elements can be found:

1. "Towards effective science diplomacy practice"
2. "Calling for a Systemic change: towards an EU science diplomacy for addressing global challenges"
3. "Building better science diplomacy for global challenges: insights from the covid-19 crisis"

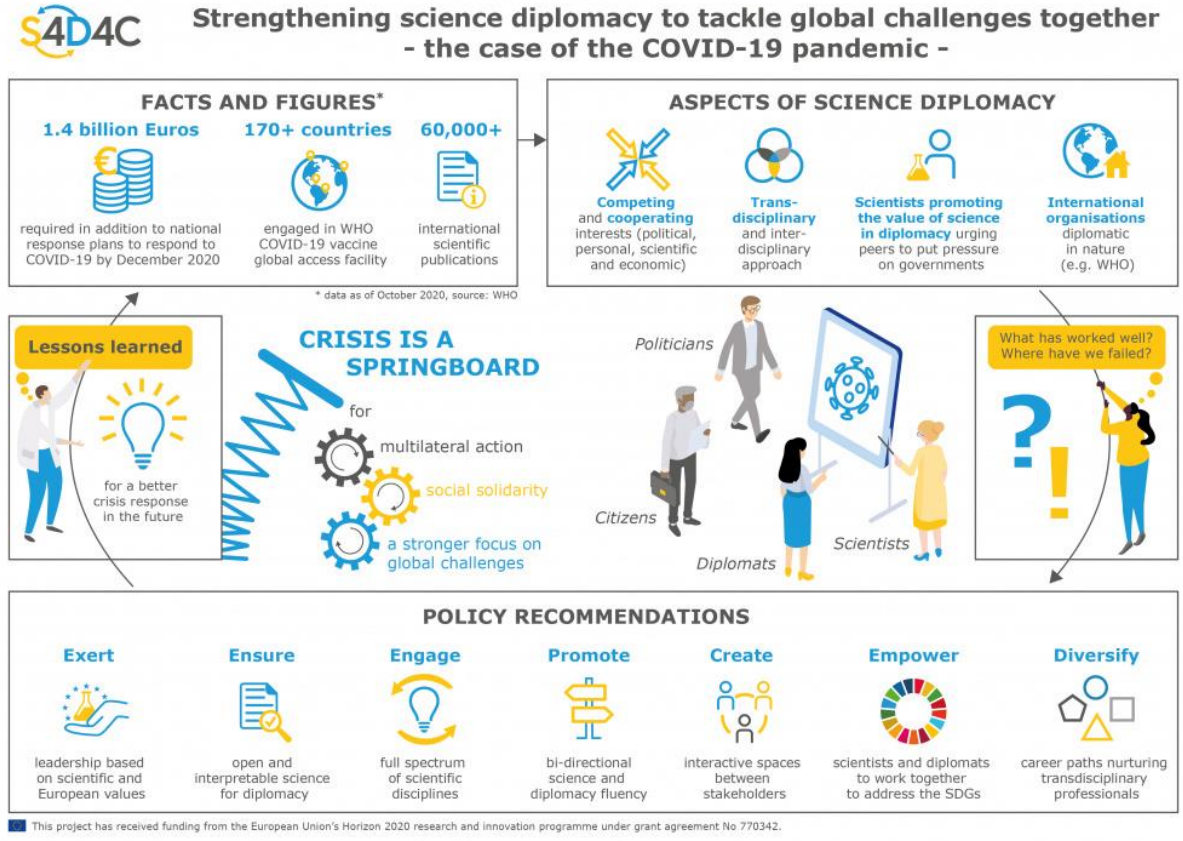


Figure 5: S4D4C Infographic "Strengthening Science Diplomacy to Tackle Global Challenges Together – the Case of the COVID-19 Pandemic"[29]

[29]More information available at: https://www.s4d4c.eu/training_material/infographic-strengthening-science-diplomacy-to-tackle-global-challenges-together-the-case-of-the-covid-19-pandemic/

Objectives

The aim of this infographic is to discuss recommendations for a better SD addressing global challenges, based on the COVID-19 pandemic. It presents policy recommendations which are not only linked to the COVID-19 pandemic, but are more general suggestions for scientists, science managers, policy-makers, diplomats and officials in international organisations on how science diplomacy can help addressing global challenges. It could therefore be a starting point for discussions on other global challenges and the role of science diplomacy.

Description

In the top left, in the box describing **facts and figures**, we see the various levels involved: geographical, administrative (here in terms of funding), and epistemic (here in terms of the extent of the science effort). It is important to recognise the incredible scale of scientific mobilisation that COVID-19 has generated. The number of publications is remarkable, not only in quantity, but also because these are nearly all open access. What should be noted is that this was negotiated in advance. Unlike many of the ad-hoc approaches to COVID, there was an 'Agreement on data sharing in public health emergencies' already in place before the crisis.

On the top right, we find a number of **key aspects of science diplomacy** – the transdisciplinary character of the scientific efforts, the roles of scientists and international organisations as key actors and arenas, and the difficult interrelationship between cooperative and competitive forces.

On the bottom, the graphic illustrates seven **policy recommendations**. Several themes are connecting these. Diplomacy is rooted in interactions and relationships, and science diplomacy needs to consider the underlying ways to make these effective. Ensuring openness and interpretable science for diplomacy, means that diplomats (of all sorts) have access to science. This access must be more than merely available, it must also make sense to them. Going back to the massive number of publications – this is both an opportunity and a threat – how does one sort through, much less absorb this massive amount of information? Promoting bi-directional fluency is critical for this – diplomats need to have a framework in order to make sense of scientific data, but it also goes the other way, scientists who are involved in diplomacy need to understand the politics involved in decision-making. Both sides have the tendency to simplify the context in which the other works. This is a mistake: scientists need to understand the **multiplicity of interests and possible solutions on a diplomatic level**, and diplomats need to understand the **contingency of scientific knowledge**.

How can this happen? A number of the policy recommendations address this. **Creating interactive spaces** and **empowering scientists, diplomats, and other stakeholders** to work together – directly on global challenges.

Diversifying career paths and creating positions for **transdisciplinary professionals**, so that we have people who can effectively translate from and to the languages of science and power.

We also need to **engage the full spectrum of scientific disciplines**. COVID-19 has established the importance of science for addressing global challenges. It has also shown the value of the **Humanities and Social Sciences** – which in the first phases of the crisis were crucial to establishing social distancing and models of flattening the curve. History as well tried to tell us that the 2018 Spanish Flu came back with a vengeance in the fall – regrettably, that lesson was not taken seriously enough.

Finally, it is important to **exert values-based leadership**. This infographic was written with an EU policy focus and uses the words **European Values** – but these are not exclusively European, they are the values of a liberal, democratic, rule and good-governance based multilateral world order. If the policy recommendations are taken seriously, the crisis can be a **springboard** for those values as well as for raising awareness of global challenges more broadly. But the stakes are high: science diplomacy efforts around COVID-19 will set the tone for our future ability to act resolutely (or flounder) when it comes to climate change, food and water security, and many other global challenges.

Target group

Figure 5 is especially helpful for providing recommendations for actions in science diplomacy, no matter if the audience are current or future science diplomats, scientists, policy makers or diplomats. It can be used for presentations or advanced training activities in the field of science diplomacy. The facts and figures in the graphic are based on information from WHO as of October 2020. They could be updated or accompanied by others.

5. Other visual elements and graphics used by S4D4C

Within the S4D4C projects the partners have developed several visual elements. They have been used in policy briefs and strategic papers.

5.1 Governance Framework and the New Protocol

S4D4C developed a governance framework based on conceptual considerations and empirical sources. Figure 6 below shows the development process: the empirical results gathered within S4D4C were accompanied by insights from innovation policy and governance studies as well as experience with another governance framework – for Responsible Research and Innovation – based on meta-governance thinking. By considering these various sources, it can be said that the **science diplomacy governance framework** is a result of interweaving 'top-down', i.e. relating to a priori knowledge, and 'bottom-up', i.e. relating to empirical knowledge, movements.

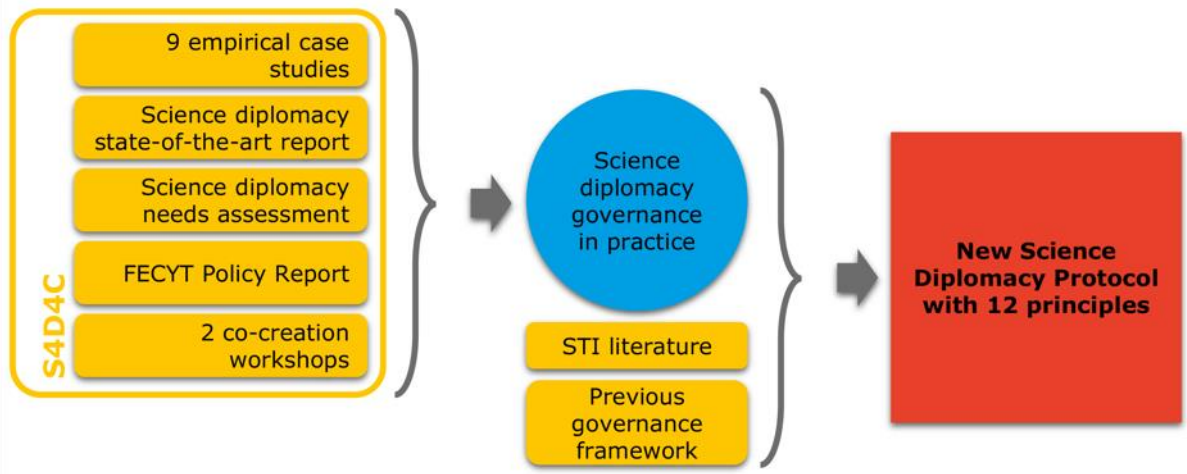


Figure 6: Governance Framework Development Process[30]

Based on the conceptual and empirical underpinnings, the S4D4C partners think about the domain of science diplomacy as **three partly overlapping arenas** characterised by different kinds of practices in the international politico-scientific context. The three arenas can be sketched as follows:

1. **'problem deliberation/reflection' arena**: actors engage through practices and mechanisms for co-reflection about issues calling for a science diplomacy process vis-à-vis SDGs. Typical actors in this arena are Civil Society Organization, NGOs, WHO, FAO.
2. **'scientific knowledge production' arena**: actors discuss and decide on required scientific insights, technological innovation and related

[30]More information available at: https://www.s4d4c.eu/backgroundprotocol/

infrastructures. Typical actors in this arena are universities, research institutes, NGOs.

3. **'politics and powering' arena**: it hosts decision-making on how a certain challenge should be governed, given specific knowledge needs. Typical actors in this arena are governments, international organisations, multinational companies.

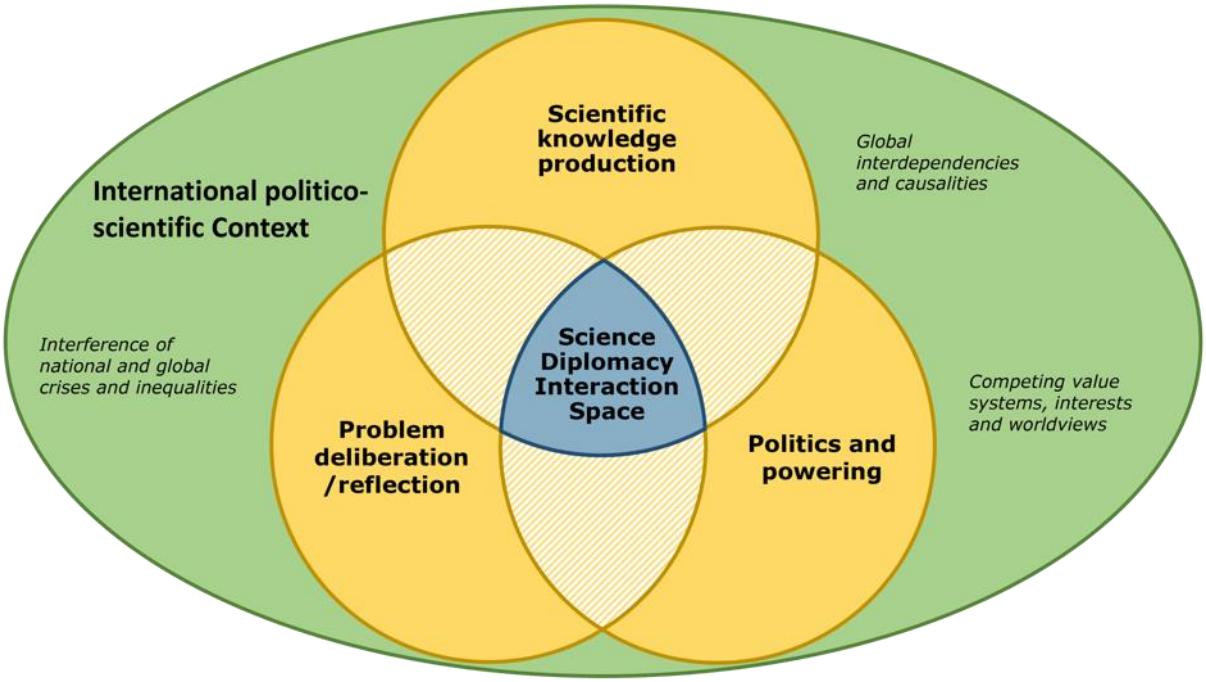


Figure 7: The Science Diplomacy Interaction Space[31]

Science Diplomacy is an area on the interface between foreign policy, problem articulation (e.g. concerning SDGs) and science that is characterised by fluidity and multi-interpretability. Its definition, stakeholders and job descriptions are not fixed. Based on that, a new Science Diplomacy Protocol capitalizes on these circumstances and proposes principles of interaction that are applicable to various configurations of stakeholders and topics pertaining to the challenges societies face today. This Protocol outlines a set of **twelve procedural and infrastructural principles** that need to be considered to create transformative science diplomacy interactions. The principles have been visualised as follow:

[31]More information available at: https://www.s4d4c.eu/backgroundprotocol/

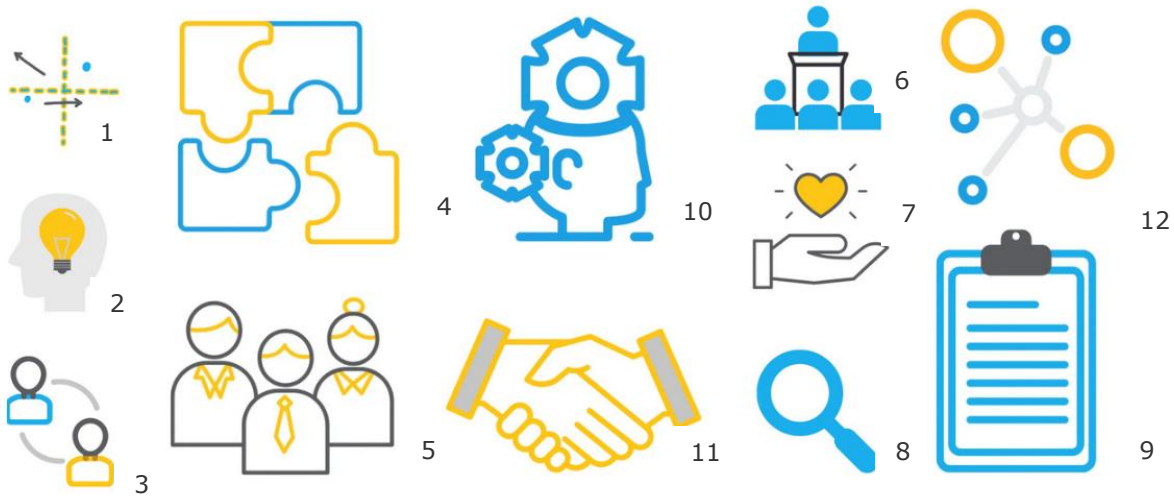


Figure 8: S4D4C Principles of the Science Diplomacy Protocol[32]

The procedural principles include: 1) Alignment, 2) Deliberation, 3) Reciprocity, 4) Complementarity & Manoeuvrability, 5) Inclusiveness, 6) Legitimacy, 7) Sensitivity, 8) Transparency and 9) Evaluation. The infrastructural principles cover: 10) Capabilities, 11) Trust and 12) Capacities.[33]

5.2 Calling for a Systemic Change

Science diplomacy can only thrive to its maximum if accompanied by a farsighted systemic change fostering higher and better interaction between stakeholders and their practice of exchanging knowledge. As a summary of a series of co-creation networking meetings of the European and global scientific, diplomatic and science diplomacy communities, the S4D4C project published a policy report "**Calling for a Systemic Change**"[34] in 2020. The report is divided into three sections:

1. **Where do we want to be?** The EU science diplomacy vision, mission and principles for addressing global challenges, which are inspired by the Madrid Declaration on Science Diplomacy[35].
2. **Where are we?** Main stoppers, warnings and drivers for addressing global challenges within each of the systems of science, diplomacy, and science diplomacy. (see Figure 9)

[32]More information available at: https://www.s4d4c.eu/wp-content/uploads/2021/02/The-New-Protocol-for-Science-Diplomacy_S4D4C-Policy-Brief-corrected.pdf
[33]More information available at: https://www.s4d4c.eu/protocol/
[34]More information available at: https://www.s4d4c.eu/wp-content/uploads/2021/03/S4D4C-Calling-for-a-Systemic-Change-Policy-Report-v2.0-1.pdf
[35]More information available at: https://www.s4d4c.eu/s4d4c-1st-global-meeting/the-madrid-declaration-on-science-diplomacy/

3. **How will we get there?** The systemic change towards EU science diplomacy for addressing global challenges, that includes a set of policy recommendations focused on an integrative transformation. (see Figure 10)

With the aim to visualise the aspects 2 and 3, two infographics/figures have been prepared. Figure 9 (related to aspect 2) offers a list of 12 items displayed per category: stoppers in red lights, warnings in amber lights, and drivers in green lights. Columns represent the nature of the system of said item: the first column addresses items related to science (as well as technology and innovation), the second column comprises items related to diplomacy, and third column involves items related to the science diplomacy system as such.

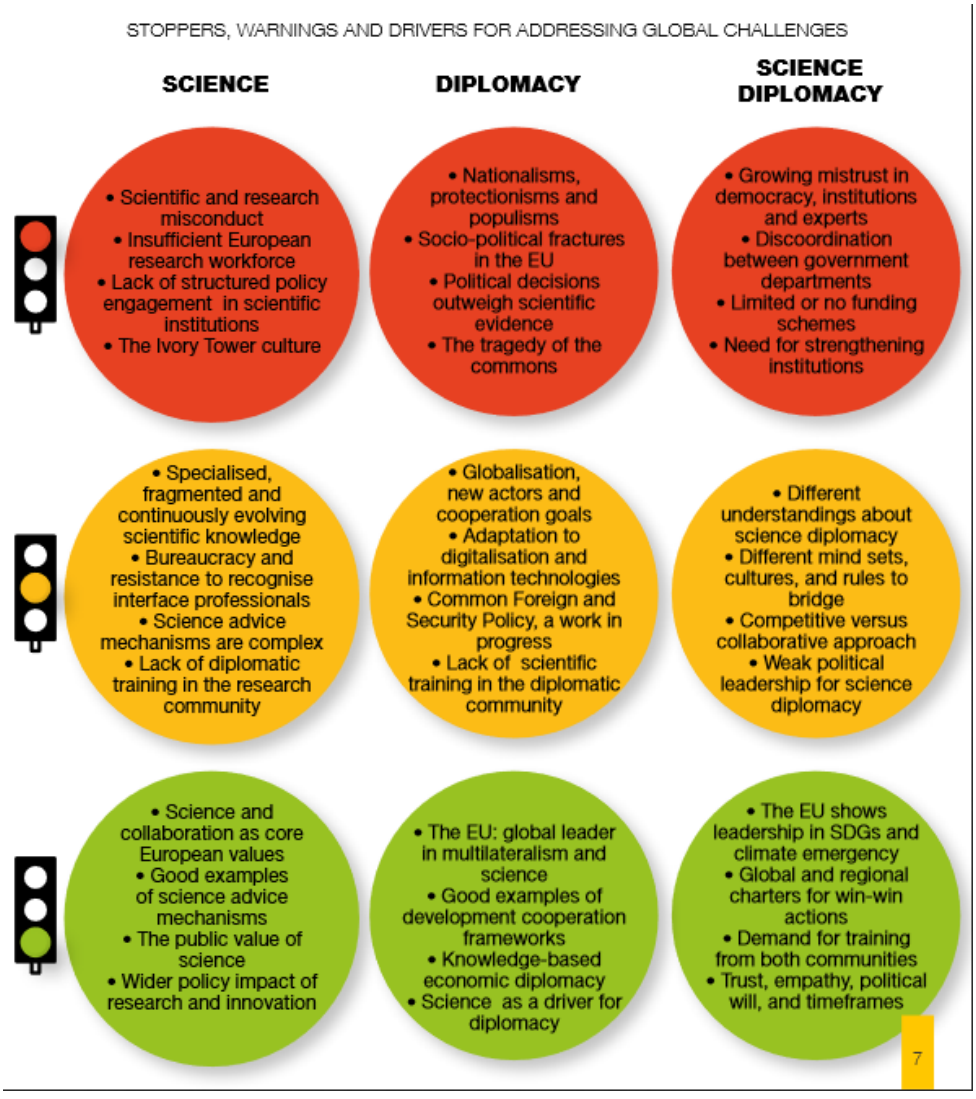


Figure 9: Stoppers, Warnings and Drivers[36]

[36]More information available at: https://www.s4d4c.eu/wp-content/uploads/2021/03/S4D4C-Calling-for-a-Systemic-Change-Infographic-v2.0.pdf (see page 7)

Figure 10 includes a set of policy recommendations focused on an integrative transformation that considers three transversal processes (learning system, integrative leadership and change of culture) in five key spheres (knowledge, governance with no silos, alliances, institutions, and people).

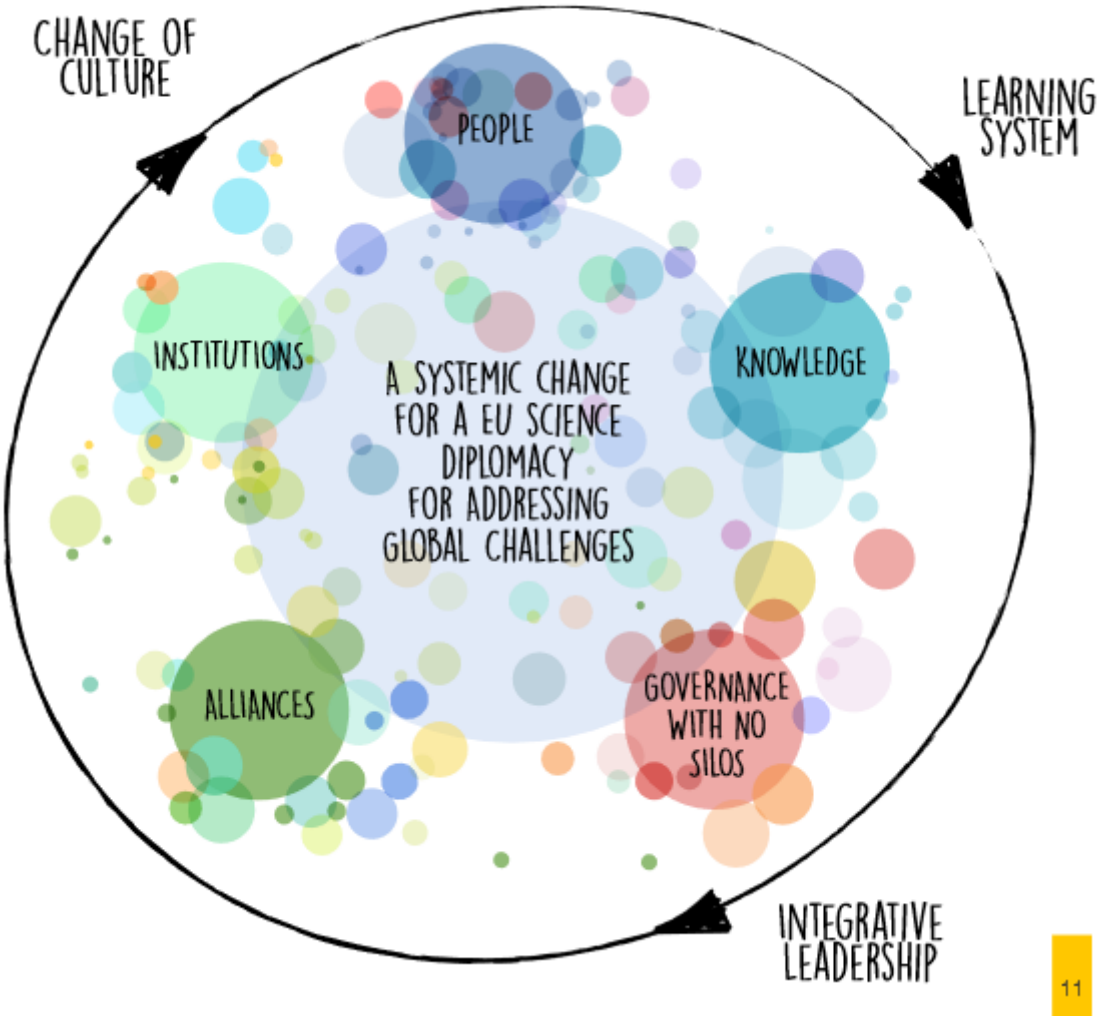


Figure 10: The systemic change towards EU science diplomacy for addressing global challenges[37]

6. The Power of Infographics

There are several further science diplomacy activities presented via infographics and we would like to encourage science diplomacy practitioners and scholars to use this instrument. It takes efforts and transdisciplinary cooperation with graphic designers and artists to come to good results and the necessary skills are not always available. Yet, some useful infographics can be found on the web – like the

[37]More information available at: https://www.s4d4c.eu/wp-content/uploads/2021/03/S4D4C-Calling-for-a-Systemic-Change-Infographic-v2.0.pdf (see page 11)

ones introduced by S4D4C and other stakeholders. In this chapter we introduce two more selected examples. The S4D4C project has not been involved in the development of these materials, but we want to highlight the diversity of visualisation and the plenty of different topics related to science diplomacy. Many more examples can be found.

6.1 Infographics related to the SDGs

2020 marks five years since the launch of the SDGs and the start of the decade of needed actions to achieve them. In the context of the Sustainable Development Goals, a lot of infographics have been produced that can also be used to illustrate the link between science and policy making in the international sphere. For example, the SDG Resource Centre offers a plenty of infographics at its website which map the state of research within each SDG area.[38] The analysis includes different figures offering interesting information on the role research plays in tackling some of the world's greatest challenges. Figure 11 shows such an example presenting facts related to the development of scientific publications, cooperations, etc. The United Nations´ website[39] offers further infographics that features different aspects of the 17 SDGs.

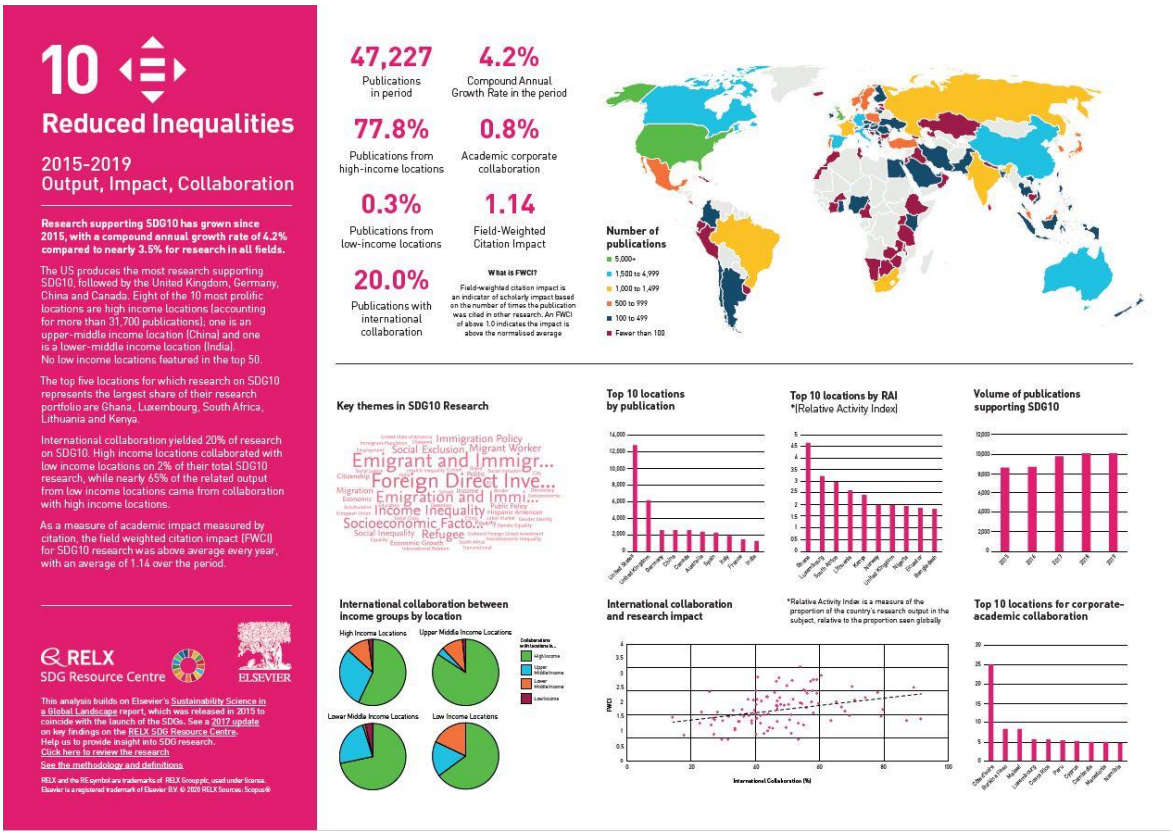


Figure 11: Research on Inequalities / SDG 10[40]

[38]More information available at: https://sdgresources.relx.com/special-issues/sdg-graphics

[39]See https://www.graphicnews.com/en/pages/33333/un-sustainable-development-goals

[40]See also Elsevier (2020), The Power of Data to Advance the SDGs:

6.2 Infographics related to EU Programmes

There are plenty of infographics available that graphically highlight the EU supported actions like the International Cooperation in Research within the Framework of Horizon 2020.[41] Horizon Europe – the new Framework Programme – is a highly anticipated programme. The European Commission has added various improvements that set the programme ahead of its predecessor. To realise its ambitious goals, it needs to be translated into concrete actions. The strategic plan 2021-2024 defines the orientations for the first four years of the programme and outlines the contributions of its various parts. It defines four key strategic orientations. The official EU publication[42] contains different figures and visual elements, for example:

Figure 12: Four Key Strategic Orientations for Greater Impact[43]

https://www.elsevier.com/__data/assets/pdf_file/0004/1058179/Elsevier-SDG-Report-2020.pdf

[41]Some examples:
https://www.nature.com/articles/d41586-019-01566-z
https://ec.europa.eu/easme/en/section/horizon-2020-environment-and-resources/infographics
https://www.phemonoe.eu/news-posts/infographic-eu-supported-international-cooperation-research/

[42]More information available at: https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/c5f77da0-8c52-11eb-b85c-01aa75ed71a1

[43]See page

6.3 Science Advice, Science Diplomacy and Science Communication Infographics from other organisations

Several international organisations publish graphic material about their own development – these can serve as examples to illustrate aspects of science diplomacy.

Organisation for the Prohibition of Chemical Weapons (OPCW)

The OPCW is the implementing body for the Chemical Weapons Convention, which entered into force on 29 April 1997. The OPCW, with its 193 Member States, oversees the global endeavour to permanently and verifiably eliminate chemical weapons.[44] With the infographic below it offers an insight into its structure and science diplomacy actions.

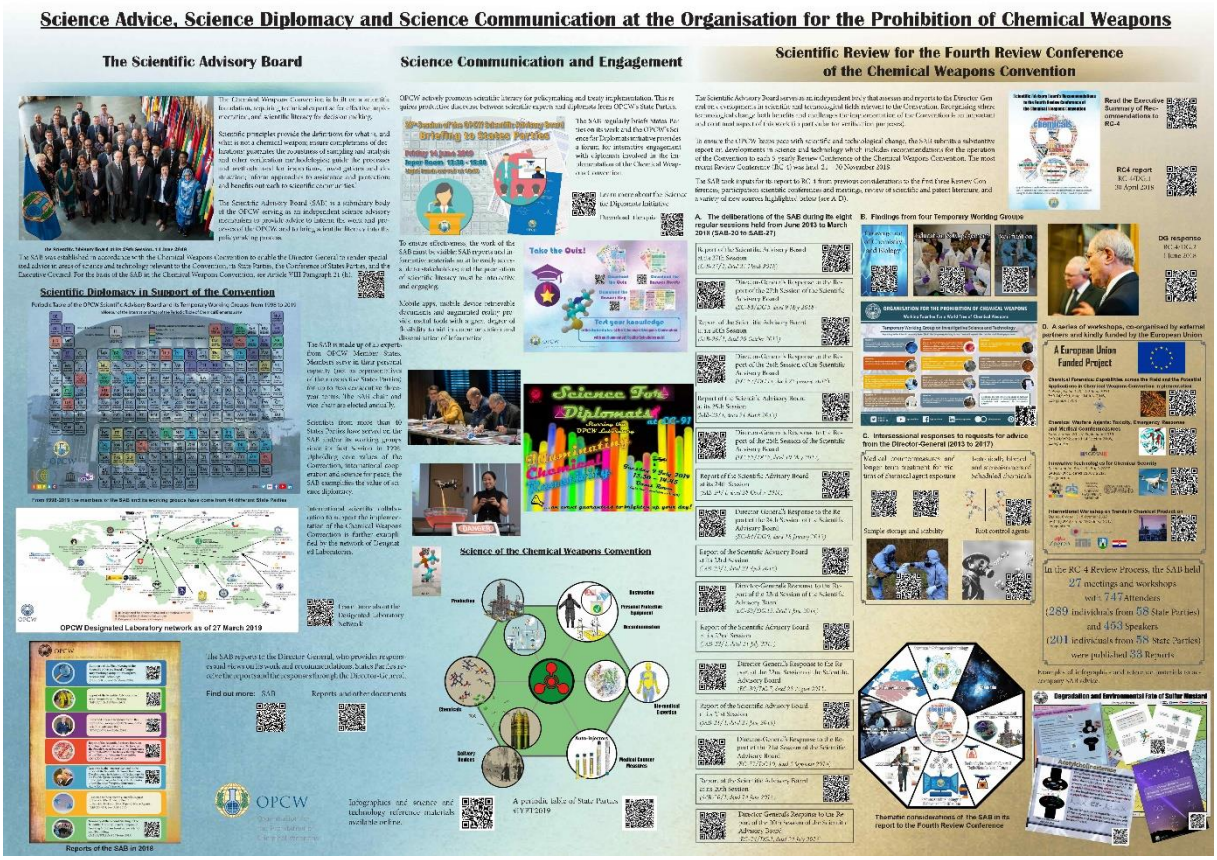
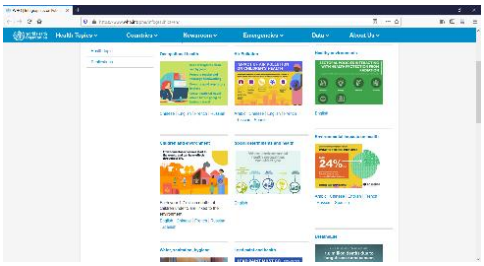


Figure 13: Science Advice, Science Diplomacy and Science Communication at Organisation for the Prohibition of Chemical Weapons (OPCW)[45]

[44]Source: https://www.opcw.org/about-us

[45]See pdf-file at: https://www.opcw.org/sites/default/files/documents/2019/07/Science_Advice_Diplomacy_and_Communication_%202019.pdf

World Health Organisation (WHO)



The WHO infographics help present ideas on how public health, environmental and social determinants of health affect your well-being in a clear and concise way.[46]

Healthy housing for sustainable future is just one example of the WHO topics presented with the help of infographics:

Figure 14: Let's Work Together for Housing Conditions That Promote Health[47]

[46]See WHO website: https://www.who.int/phe/infographics/en/
[47]More information available at: https://www.who.int/phe/infographics/sustainable-development/en/

7. References

Aukes, Ewert et al. (2020): Policy Brief "Towards effective science diplomacy practice" (Link)

Basha, B. Chagun (2016): Science Diplomacy for Sustainable International Development Motivation: Global Issues and Opportunities (Link to S4D4C Researcher´s Voice #3)

Copeland, Daryl (2015): Bridging the Chasm: Why Science and Technology Must Become Priorities for Diplomacy and International Policy. In Science & Diplomacy, Vol. 4, No. 3 (September 2015) (Link)

Flink, Tim and Rüffin, Nicolas (2019): "The current state of the art of science diplomacy". In Canzler, W.; Kuhlmann, S.; Simon, D. and Stamm, J. (eds.): Handbook on Science and Public Policy. Cheltenham: Edward Elgar, 104-121. (Link)

Flink, Tim; Schreiterer, Ulrich (2010): Science diplomacy at the intersection of S&T policies and foreign affairs: toward a typology of national approaches. In: *Science and Public Policy*, 37(9), November 2010, pages 665–677 (Link)

Gluckman, P.D.; Turekian, V.; Grimes, R.W.; and Kishi, T. (2017): Science Diplomacy: A Pragmatic Perspective from the Inside. In: *Science Diplomacy*, Vol. 6, No. 4 (December 2017) (Link)

Lord, Kristin M and Turekian, Vaughan (2007): "Time for a New Era of Science Diplomacy." www.sciencemag.org, SCIENCE 315.

Melchor, Lorenzo; Elorza, Ana and Lacunza, Izaskun (2020): Calling for a Systemic Change: Towards a European Union Science Diplomacy for Addressing Global Challenges. V 1.0. S4D4C Policy Report, Madrid: S4D4C. (Link)

Melchor, Lorenzo; Lacunza, Izaskun; Elorza, Ana (2020): What is Science Diplomacy? *S4D4C Online Course – Module 2* (Link)

New Realities in Foreign Affairs: Diplomacy in the 21st Century (2018), SWP Research Paper 2018/RP 11 (Link)

Royal Society, The (2010): New frontiers in science diplomacy. RS Policy document 01/10. January 2010 - RS1619. London: The Royal Society (Link)

Schot, Johan W.; Steinmueller, Edward (2018): Three frames for innovation policy: R&D, systems of innovation and transformative change (Link)

Turekian, Vaughan et al. (2015): "The Emergence of Science Diplomacy". In Lloyd, S. D. and Patman, R. (eds.): Science Diplomacy. New Day or False Dawn? Singapore: World Scientific Publishing Co. Pte. Ltd., 3-24. (Link)

UNESCO: Science, Technology and Innovation Policy Development, United Nations (Link)

Young, Mitchell et al. (2020): Policy Brief "Building better science diplomacy for global challenges: insights from the covid-19 crisis" (Link)