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NOTE

From:	SFIC Secretariat
To:	SFIC delegations
Subject:	Overview of Tools for International Research Cooperation in Science and Technology Matters

Delegations will find attached the final report of the Toolbox Working Group adopted via the written procedure.

Overview of Tools for International Research Cooperation in Science and Technology Matters

Developed by a SFIC Working Group

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List of Abbreviations

AC	Associated Countries
CYTED	Ibero-American Science and Technology Programme for Development
DSC	Diplomat Science Club
EHEA	European Higher Education Area
ERA	European Research Area
EC	European Commission
EJP	European Joint Programme Cofund
EU	European Union
GPC	High Level Group for Joint Programming
GROW	Graduate Research Opportunities Worldwide
INTPART	International Partnerships for Excellent Education, Research and Innovation
IPR	Intellectual Property Rights
JPI	Joint Programming Initiative
LoI	Letter of Intent
MoU	Memorandum of Understanding
MS	Member States
NSF	National Science Foundation
PIRE	Partnerships for International Research and Education
RCN	Research Council of Norway
RPO	Research Performing Organisation
S&T Counsellor	Science & Technology counsellors

SFIC	Strategic Forum for International Cooperation
STI	Science, Technology and Innovation
TRL	Technological Readiness Levels

1 Introduction

The **Strategic Forum for International Cooperation – SFIC** is an advisory body to the European Council and the European Commission. It furthermore serves as a networking and information exchange and sharing platform between the Member States (MS), Associated Countries (AC) and the European Commission (EC) regarding initiatives in the area of international Science, Technology & Innovation (STI) cooperation.¹ Additional tasks are the pooling of relevant knowledge concerning third countries, regular consultation between the partners in order to identify their respective objectives and common priorities in terms of STI cooperation as well as coordinating activities of a similar nature implemented by Member States and the European Union (EU) as appropriate.

A working group was set up by SFIC in the autumn 2015 to develop a toolbox for the implementation of international STI cooperation activities. The participating states in the Toolbox Working Group were Austria, Czech Republic, Germany, Finland, France, Spain, Norway, Sweden and Portugal. As outlined in the working group's mandate², the “practical overview [shall help] [...] Member States, Associated Countries and the Commission in their implementation of international STI agreements and STI cooperation activities at bilateral and multilateral level.” The most relevant users of this document are ministries and funding organisations that need to get an overview of international cooperation in science and technology matters and the relevant instruments and experiences.

The activities of the working group can be summarised as follows:

- Documentary analysis of overall STI policy for international cooperation, international cooperation in European STI policy, international cooperation with third countries and regions and reviews of STI agreements between EU and third countries.³
- Toolbox Survey (also named SFIC Survey): The working group developed a questionnaire to gather information on relevant instruments for in-

¹ SFIC is composed by the European Commission, all European Union Member States and several non-EU countries as observers

² Mandate of the SFIC Working Group on a Toolbox for International cooperation - extension of mandate duration, Brussels, March 10 2017 (ERAC-SFIC 1355/17).

³ A summary of the analysed studies and reports can be found in appendix A.

international cooperation from member states and associated countries.

19 out of 43 states participated in the survey and provided information on their STI cooperation activities at bilateral and multilateral level.⁴

- Stakeholder workshop: The SFIC members of the working group organised a stakeholder workshop on 20 September 2016. The aim of the workshop was to identify and share experiences of different tools/instruments for international collaboration with third countries and discuss experiences of best practice. A total of 23 participants took place in the workshop.⁵
- Workshop on best practices: In a second workshop, taking place on 7 December 2017, SFIC members identified and discussed best practice examples in the fields of funding schemes, policies and roadmaps, STI agreements and networking.

This study cannot offer a comprehensive description of all kinds of international cooperation organised by the SFIC member countries. Rather, it should be understood as a source of relevant experiences of other MS/AC and the EC that could serve as input for the design and implementation of own new instruments.

This report focuses on six different types of instruments in international STI cooperation:

- strategies and roadmaps,
- STI agreements,
- STI counsellors,
- aligned funding schemes,
- research and innovation networking activities,
- international research marketing.

⁴ 15 out of the 19 responding countries were Member States, namely: AT, BE (BE-F, BE-FI, BE-B), BG, CY, CZ, DE, DK, ES, FI, FR, LT, MT, PT, RO, SE. Moreover, the following four Associated Countries participated in the survey: BA, CH, IS, and NO. The summary of the findings can be found in appendix B.

⁵ There were representatives from the following organisations: EDCTP, JPI Urban Europe, JPI Oceans, EUREKA1, JP Concentrated Solar Power (CSP), JP Carbon Capture and Storage (CCS). The following SFIC delegations also participated in the workshop: SE, DE, NO, CZ, FI, ES, FR, BE (Flemish) and EC. The summary report can be found in appendix C.

For each type, it is firstly described what is commonly understood under the type of instrument and the purpose of it is illustrated. Moreover, the underlying design principles and ways of implementing the instrument described. Based on this general information, the report highlights best practice examples for each type of instrument and gives recommendations based on the available material.

2 Strategies and Roadmaps for International STI Cooperation

2.1 What are Strategies and Roadmaps for International STI Cooperation?

Strategies and Roadmaps for International STI Cooperation can be defined as initiatives designed to identify, at the level of a country or a region, a medium to long-term strategic planning framework, based on thematic priorities, towards individual third countries and/or regions.

2.2 Purpose

Defining an internationalisation strategy or a roadmap can be based on one or a combination of the following arguments:

- The creation of an internationalisation strategy or a roadmap is a powerful way to implement current political priorities and to smoothly adapt to the international context – for example, to provide an efficient framework to attract the best researchers and students to a given country.
- Internationalisation may help to improve the quality of research through cross-fertilisation, competition, combining complementary knowledge, and by means of creating access to world class researchers and facilities. For sake of greater efficiency, a strategical framework is needed in order for the cooperation to be effectively implemented.
- A coordinated approach contributes towards achieving a greater impact – especially in domains that are close to the market (high **Technological Readiness Levels - TRL**).⁶
- A common strategy is necessary in order to foster a sustainable, long-term collaboration.

⁶ Technology Readiness Levels (TRL) are a type of measurement system used to assess the maturity level of a particular technology. Each technology project is evaluated against the parameters for each technology level and is then assigned a TRL rating based on the projects progress. There are nine technology readiness levels. TRL 1 is the lowest and TRL 9 is the highest. See https://www.nasa.gov/directorates/heo/scan/engineering/technology/txt_accordion1.html. Retrieved from the World Wide Web on 21st November 2018.

2.3 Design & Implementation

An internationalisation strategy or a roadmap exercise requires a prior mapping of existing instruments, approaches, and expectations from stakeholders, which in itself provides a first level of decision-making support for policy makers.

Regarding the broad organisation of the strategic framework, different approaches have been discussed during the exchanges that took place in the framework of the SFIC toolbox working group. While some countries try to integrate in their strategy the three aspects of the so-called **Knowledge Triangle** (i.e. covering the fields Higher Education, Research and Innovation) in a common framework, others rely on a different logic (e.g. Research and Innovation together, with Higher Education as a separate item).

Insights from the SFIC-Survey

About half of the (19 responding) MS/AC have governmental strategies, guidelines or roadmaps for international STI cooperation or are in the process of formulating one. The majority of those internationalisation strategies, guidelines and roadmaps follow a thematic approach. A few of the internationalisation strategies also combine a thematic approach with a regional focus. Examples are:

- [Beyond Europe](#), AT, 2013
- [Switzerland's International Strategy for education, research and innovation](#), CH, 2010
- [Internationalisation of Education, Science and Research](#), DE, 2017

Moreover, most of the (19 responding) MS/AC have strategies dealing with internationalisation in one way or another but do not necessarily focus on it. Among those are also strategies with a specific regional or thematic focus:

- [Science diplomacy for France](#), FR
- [Parliamentary Resolution on Iceland's Arctic Policy](#), IS, 2011

Furthermore, other national stakeholders than the government have strategies or roadmaps dealing with internationalisation. The institutions that publish such strategies range from science foundations, academies, research performing organisations (RPOs), research funding organisations to higher education institutions. One example is: [Guidelines on international cooperation for 2016-2020](#), Research Council of Lithuania

In all cases, a combination of thematic and geographical approaches prevails; what changes is the priority setting.

According to the SFIC Survey, the typical duration for each strategic framework averages 10 years. The oldest consolidated approach towards international cooperation in R&I still in effect dates back to 2008. Most frameworks were defined in the period from 2010-2015.

The SFIC Survey furthermore showed that in most cases, the Ministry of Research is not the only one to be involved in the agenda-setting: Foreign Affairs and Economy are often associated (and even leading in one case). In several instances, personnel within each of the ministries act as part of a common task force (sometimes under the general direction of the Office of the Prime Minister or equivalent, which serves as an arbiter in case of divergences).

A key factor is the reconciliation between the bottom-up approach, based on the existing cooperation on stakeholder level, and the top-down approach, which entails a necessary priority-setting process. Most countries rely on a combination of several instruments in order to facilitate this: (online) surveys and consultations, interviews with stakeholders, feedback from **Research Performing Organisations (RPOs)** and from dedicated personnel within the diplomatic network abroad. Among the pitfalls of this approach is the risk of neglecting the prospective dimension, thus creating a catalogue of the existing schemes and instruments rather than a strategic framework.

Building a national roadmap or internationalisation strategy is a long-term process. Frameworks are either considered “living documents” and adjusted as soon as the need arises (in terms of geographical and thematical priorities), or subjected to a pre-defined revision after a period between 2 or 5 years.

Some countries use **indicators** in order to facilitate the monitoring process. One example is the ratio of international co-publications according to the overall scientific output.

National strategies are often based on the general setting provided by the **European Research Area (ERA)** and/or the **European Higher Education Area (EHEA)**. The degree and the type of integration vary: While some countries use the ERA/EHEA as a canvas, others integrated it as a sub-part within their national strategy. In some cases, the national framework predates the ERA roadmap, which implies a refocusing of national priorities.

2.4 Best Practices

The **EU multiannual roadmaps for international cooperation** have been highlighted as a particularly significant element of fostering coherence between MS, AC and EC. These roadmaps are part of a staff working document which accompanies the Commission Communications on the *Implementation of the strategy for international cooperation in research and innovation* (published in 2014 and updated in 2016).⁷ Developed by the Commission following a request from the Council of the European Union in 2012, these documents are recognised as an important instrument used also in the national programming of R&I, in order to avoid redundancies and to foster synergies.

In order to ensure that the Commission's strategic framework takes into account the approaches and instruments of the MS and AC, a series of workshops were organised in 2014 and 2016. This is a positive development which should be pursued in the future, with a focus on a prospective connection of the roadmaps with the corresponding work programmes of the 8th framework programme Horizon 2020 and the follow-up programme Horizon Europe.

⁷ http://cache.media.education.gouv.fr/file/Cooperation_Internationale/40/7/progress_report_oct-2016_647407.pdf. Retrieved from the World Wide Web on October 15th 2018.

3 Science, Technology & Innovation Agreements

3.1 What are STI Agreements?

Science, Technology & Innovation agreements (STI agreements) are essential instruments of international cooperation in research and research funding. Frequently, they constitute important mechanisms for promoting and facilitating international cooperation, often by forming legal bases and platforms for further cooperation.

STI agreements are constituted by different kinds of agreements or contracts between two or more international partners with the intent of facilitating cooperation in research. The agreements usually specify areas of cooperation between two or more parties, and sometimes mechanisms of the cooperation. The agreements can have different status in terms of the extent to which they are legally binding (see also Section 3.3 for further information). They can also vary in terms of the number of parties being involved: Bilateral agreements encompass two parties that contract with each other, while multilateral agreements can include a larger number of parties that contract with each other. Many different types of organisations and entities can also constitute the contracting parties; here we limit ourselves to primarily discuss cooperation agreements between different governments or public authorities.

3.2 Types of Agreements

If we consider STI agreements in terms of the contracting parties, several different categories are easily identifiable, including:

- **EU level agreements.** The European Union has entered into STI agreements with multiple other third countries. These include the USA, Brazil, Russia, India China, South Africa, Japan and Canada among others. According to the EU, the “agreements constitute a framework and a privileged forum to identify common interests, priorities, policy dialogue and the necessary tools for STI collaboration.” The agreements vary somewhat in form and content, some of them specify topical priorities. All the EU STI agreements are available here:

<http://ec.europa.eu/research/iscp/index.cfm?lg=en&pg=countries>

- **Intergovernmental multilateral level agreements.** In some cases, multilateral agreements exist between different ministerial institutions from different nations. For example, the Ibero-American Science and Technology Programme for Development (CYTED) was signed in 1984 by 21 Ibero-American countries aiming at promoting cooperation in science, technology and innovation (Higher Education Institutions, Research Centres and Innovative SME) for the harmonious development of Ibero-American countries.⁸ Another example is the Arctic Council which includes the Scandinavian countries, Finland, Iceland, Russia, Canada and the USA.⁹ It broadly aims to promote cooperation between the Arctic states, indigenous communities and other Arctic inhabitants, not least what concerns environment and sustainable development. In effect it is also heavily engaged in issues about research.
- **Bilateral STI agreements on the ministerial (or governmental) level.** These agreements are typically established by the relevant research or innovation ministries of two nations that are interested in cooperating with each other. It is also possible to have the governments, or cabinets as the contracting parties. Sweden, for example, has bilateral cooperation agreements with around 15 nations such as the USA, China, India, Japan, South Africa and Singapore (usually with the Swedish Ministry of Education and Research as the responsible contracting party). Germany similarly has bilateral STI agreements with around 50 non-European nations. Among many other nations these agreements include cooperation with India, Argentina and Vietnam.
- **Bilateral (or multilateral) STI agreements on the level of public research funding agencies.** Frequently, individual public STI agencies have signed bilateral STI agreements. These agreements often work in tandem with more overarching STI agreements on the ministerial level, but can also be freestanding. The survey conducted by SFIC gives an impression about the number of such agreements (see the below box “Insights from the SFIC Survey”).

⁸ See <http://www.cyted.org/en/>. Retrieved from the World Wide Web on October 9th 2018.

⁹ See <https://gwichincouncil.com/about>. Retrieved from the World Wide Web on October 9th 2018.

3.3 Legal Forms of STI Agreements

STI Agreements can take on different legal forms, such as

- Memorandum of Understanding (MoU)
- Letter of Intent (LoI)
- Joint Declaration, during bilateral and multilateral summits etc.
- Agreement

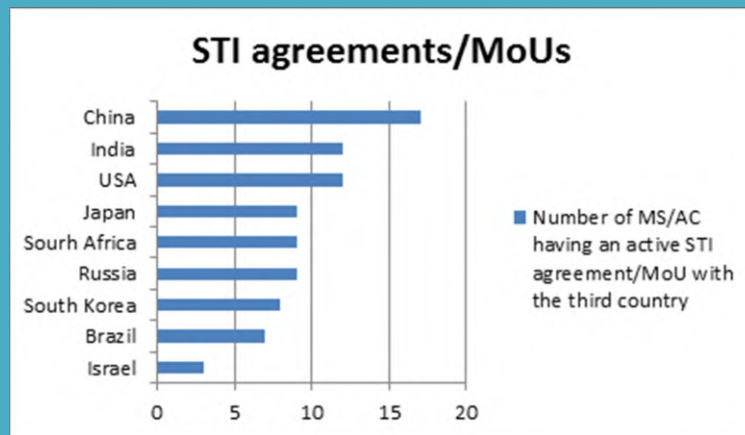
As (all of) the above agreements normally operate beyond the remit of the legal system of any single individual nation's legal system, they typically are not strongly binding in a legal sense. Nevertheless, each of the agreements does signal some degree of commitment by the contracting nations and is perceived to incur some level of obligations.

Of the different categories mentioned above, MoU and LoI are the least binding. Although this may vary from case to case, they are often considered more as signals of intent to cooperate rather than to undertake specific obligations. The different forms of STI agreements may also work in tandem with each other. For example, two nations may often use a MoU or LoI as a preparatory step towards later forming a more binding 'agreement'. Similarly, where a cooperation agreement exists on a ministerial level between two nations, and defines the overarching framework of cooperation, this cooperation can often be filled with more specific content through the signing of a MoU regarding cooperation in which the topical content of the cooperation is more clearly specified.

Joint Declarations and agreements are typically those considered to be most binding. Both represent a concord of understanding and intention, between two or more parties, with respect to the effect upon their relative rights and duties, of certain past or future facts or performances.

Insights from the SFIC-Survey

All the (19 responding) MS/AC have bilateral STI agreements or Memorandums of Understanding (MoUs) with one or several third countries. The third countries, with which most of the responding MS/AC have an active STI agreement are China, India, USA, Russia, and South Africa. The chart below illustrates the number of (the 19 responding) MS/AC having active STI agreements with the third countries.



In the bilateral STI agreements/MoUs (and the joint committee meetings), MS/AC thematically prioritise the areas of engineering and technology and natural sciences.

National stakeholders involved in third country cooperation in S&T (amongst others the implementation of bilateral STI agreements and/or in joint committee meetings) are usually numerous and diverse. In most MS/AC are a multitude of stakeholders involved, such as

- ministries, (of science, research, foreign affairs, economy, innovation and technology, education, industry etc.)
- universities,
- academies,
- RPOs, and
- research funding organisations.

3.4 Purpose

STI Agreements can serve many different purposes or objectives, and frequently any one agreement can also serve more than one objective, some of them being mentioned below:

- **Achieving research excellence and reputation.** Naturally one objective of many STI agreements is that through cooperation, the quality of research in each of the participating nations will be strengthened and enhanced. It may also enhance the reputation of a research nation if it cooperates with another leading research nation.
- **Ensuring access to cooperation.** In some cases, a formal STI agreement is needed to provide a legal basis for cooperation, it may be a prerequisite for researchers from some nations to interact with each other. This may for example include regulated access to geographical areas, to research equipment, to persons, data and samples of different kinds as well as other potentially valuable resources.
- **Regulating Intellectual Property Rights (IPR).** In some cases, formalised STI agreements may be required to clearly regulate IPR issues (and other judicial questions), when different legal standards, norms and practices provide insufficient common standards to provide the foundations for successful research collaboration.
- **Capacity building and human capital.** In some cases, STI agreements can be established to provide a basis for capacity building or the training of human capital. This may especially be the case if a less research intense nation collaborates with a more research intense nation.
- **To promote economic cooperation and the opening of markets.** STI agreements may often be entered into as part of a more overarching attempt to increase economic cooperation between two nations, for example when entering into free trade agreements. In these cases, the free flow of information is sometimes seen as one aspect of the free movement of a range of valuable resources between two economies.
- **Diplomatic reasons.** Sometimes STI agreements may reflect an ambition to promote closer relations between two nations in entirely different policy areas, for example security questions. In these cases, it might be seen as mutually friendly gestures for two nations to enter into cooperative STI agreements even if there is only a limited ambition to cooperate within the area of research itself.

3.5 Design of STI Agreements

When setting up an STI agreement, the following aspects should be considered:

- **Symmetry between partners:** There is not necessarily symmetry between the types of partners that enter into the agreement.¹⁰ Is there a problem, for example, if one contracting party is a public agency or authority while the other party is a ministry? This need not in itself imply any asymmetry, since in some nations ministries fulfil the same functions (including direct research funding) as those that are fulfilled by agencies in other nations. It seems to be important, however, that both parties have roughly corresponding expectations of what is entailed by their STI agreement. The parties should also have corresponding capacities to deliver on the obligations undertaken in the STI agreements in question. In cases where the contracting partners (say ministries) are not necessarily the organisations that assume responsibility for implementing the agreement, it may need to be clarified in the agreement which organisation (e.g. a national agency) is responsible for implementation.
- **Principles regarding the basis on which the cooperation activities should be conducted.** Such principles can for example regulate that funding should be reciprocal and on the base of equality, or alternatively that one partner undertakes to carry a greater burden. Depending on the situation, different principles may be most suitable. More detailed provisions regarding such principles provide clarity, but make the agreements also less flexible for change when the need arises.
- **Broadly defined or narrowly focused agreements?** Another question is whether an STI agreement is broadly defined or if it is focused and contains a high level of specificity. Some STI agreements can for example focus on research cooperation within specified topical areas. Many ministerial level agreements are, however, very broad in scope in order to be able to facilitate a broad range of cooperative activities, not all of

¹⁰ In some cases, agreements may also be asymmetric in terms of contracting partners. The Swedish Innovation Agency Vinnova has for example a cooperation agreement directly with the Chinese Ministry of Science and Technology.

which can necessarily be identified when the agreements are initially set up.

Such agreements have the advantage of being flexible, encompassing many different interests in cooperation, and not being very information demanding when the agreement is set. On the other hand, a more focused agreement provides more clarity as to what the different actors want to cooperate about, and what it takes to make the cooperation successful. A more focused agreement can, possibly, reflect a greater commitment on behalf of the contracting partners. When broadly defined agreements exist on the ministerial level, they are often complemented by more focused implementation agreements or work programmes for which agencies may take responsibility.

- **Mechanisms for implementation and follow up.** Feedback on what works well - and what does not - provides a basis for developing the cooperation in a successful direction. Such mutually agreed procedures to support and follow up cooperation can enhance the cooperation between parties. Many STI agreements specify that some kind of joint committee meetings should take place in order to prioritise future areas of cooperation and to monitor and evaluate already undertaken cooperation initiatives. Some agreements also specify the framework conditions for such joint committee meetings.
- **Settlement of disputes.** STI agreements can contain stipulations that clarify how any disputes arising within the remit of the cooperation can be settled.
- **Periods of validity.** Many STI agreements clearly stipulate for what time periods they are regarded as valid and how potential extension procedures look like. While in some cases explicit renewals are necessary in other cases the agreements are prolonged automatically if no partner objects.
- **Motivation, commitment and reciprocity.** Ultimately what may be most important for the success of any cooperation is not necessarily what is expressed or written into any STI agreement but the extent to which the parties are committed to working together and reciprocally cooperate with each other. This includes for example the mutual willingness to fund

cooperative activities and to provide access to data, IPR and other resources.

Some design aspects of STI agreements are mentioned above, though the list is not exhaustive. The setup of an STI agreement depends on several conditions, like what the objectives of the agreement are and also the particular character and capacities of the actors that take part.

3.6 Best Practices

In 2013 the EC published a report on best practice in science, technology and innovation cooperation between Africa and Europe. The findings in this report may not be perfectly transferable to individual country level, but they do provide some interesting indications and can be quite useful for other initiatives. Potentially the identification of success criteria and main barriers as well as the conclusions about impacts could be very useful for the assessment of other initiatives.

Among the **key success criteria**, we find:

- Strong interpersonal relations, mutual trust, institutional diversity and complementary skills.
- At the programme and regional level, MS commitment, the policy and regulatory environment and national commitment to STI.
- High-level political and executive support for cooperation.

Some **main gaps, barriers and challenges** are identified:

- The absence of joint funding mechanisms,
- unstable funding landscape, not contributing to suitable instruments,
- the participation of SME and the industry-academia relationship,
- linking STI policy to other domains such as education
- a shortage of skilled human resources in both technical and administrative functions,
- weak societal institutions,
- poor infrastructure,
- fragmented policy and a weak regulatory environment.

The EC report further states that success criteria have to do with the level of commitment of the cooperating parties: co-responsibility, co-leadership and co-funding. As such the criteria may be difficult to design or formulate, rather they point towards the underlining motivations that countries have for entering into specific agreements (more than how the agreements themselves are formulated). As such, much of the most important work should possibly be done before entering into the agreements – in terms of carefully analysing what countries and organisations one really is strongly committed and motivated to cooperate with in research, technology and innovation.

It should perhaps also be noted that some of the findings above may mostly reflect specific attributes of cooperation between (relatively more research intense) Europe and (relatively less research intense) African nations. In this

context, questions regarding capacity building, human resources, poor infrastructure and weak societal institutions may be very relevant, but they may be less relevant when European nations for example seek to cooperate with USA or Japan.

4 Science & Technology Counsellors

4.1 What are Science & Technology Counsellors?

Science & Technology counsellors (S&T counsellors) normally represent a ministry or a governmental agency of a given country in a host country. The basis for the work of the counsellor is a STI agreement (see previous Chapter) between the countries.

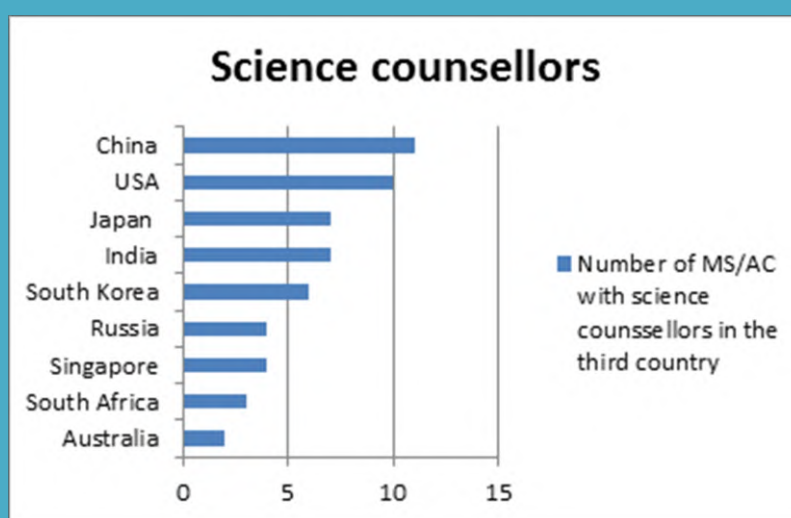
S&T counsellors are an important basis for international STI cooperation. First of all, they are relevant actors in implementing national strategies and roadmaps. The general objective of S&T counsellors is to optimise the framework conditions for the exchange of knowledge on science and research with the host country.

The aim of the counsellor is to strengthen the bilateral cooperation in research, innovation and possibly also education. Important tasks include:

- To promote the policy dialogue between the two countries,
- to coordinate activities and optimise the use of resources,
- to identify areas of cooperation in research and innovation (through for example the preparation of analyses and reports on policy developments in STI in the respective host country),
- to identify joint funding possibilities,
- to organise meeting places for research institutions and industry,
- to share information through web portals, meetings and newsletters,
- to give advice to the government, relevant institutions and industry in both countries.

Insights from the SFIC-Survey

The majority of responding MS/AC use science counsellors in their third country cooperation. China and the USA are those third countries, where most of the (19 responding) MS/AC have science counsellors. The below chart shows those third countries where most (of the 19 responding) MS/AC have science counsellors as well as the number of MS/AC per third country.



Different criteria determine in which third countries science counsellors are located. The three criteria that most MS/AC referred to are:

- strategic objectives,
- importance of the third country in research and development (R&D),
- and cooperation agreements/activities.

The science counsellors of the responding MS/AC usually have similar tasks. Science counsellors mostly support bilateral cooperation in S&T and identify new cooperation opportunities. Also, they are to a great extent responsible for reporting on topics and developments in science and research.

Science counsellors provide information to different institutions such as ministries (of research, science, education, foreign affairs, economy, innovation and technology, trade and industry) to local embassies and government agencies.

4.2 Best Practices

Meetings among science counsellors are a frequently used instrument for information exchange in general or with regards to one particular host country. In the following, various meetings are referred to as examples on the national, European and international level:

4.2.1 National level

The **German** Ministry for Education and Research and the Federal Foreign Office organise alternately a seminar for the German Counsellors for Science and Technology. About 35 Counsellors for Science and Technology of the important diplomatic representations are invited to participate. At the five-day event, the following points and aspects are usually addressed and discussed: strategy and administration, Regional Day (with country lectures), Europe and Internationalisation Strategy, research funding and marketing, science and innovation.

4.2.2 European & International Level

Counsellors covering Science, Technology, Innovation and Higher Education from the Embassies of Sweden, Finland, Iceland, Denmark and Norway are working together to promote Nordic cooperation with **Japan**. Four times a year, one Embassy takes the responsibility to host a seminar on a thematic area. The aim is to involve Japanese co-organisers and speakers, as well as experts from the Nordic countries. Topics that have been covered are: Nordic innovation, Sustainable development, Digitalisation, Social Innovation, Energy, Higher education & research, Gender equality.

The **EU** is represented through some 140 EU Delegations and Offices around the world. These delegations also work with science and innovation, and many of them have a dedicated S&T counsellor. Especially in large countries where many countries are represented, the EU delegations are potential hubs for international cooperation.¹¹ Especially in large countries like the USA, China, and Japan, European representatives have regular contact and cooperate on specific issues and events.

¹¹ See https://eeas.europa.eu/headquarters/headquarters-homepage/area/geo_en. Retrieved from the World Wide Web on 23 November 2018

In **Washington DC**, all the STI Counsellors meet on a regular basis. The "**Diplomat Science Club (DSC)**" is a monthly meeting point organised by the French embassy. At these events there is often a discussion on relevant topics with a representative from a US research authority/agency.

In **Tokyo**, many of the European embassies have dedicated science and technology personnel. The mandate and ambitions vary, but an important task for most countries is to follow and report on Japanese science, technology and innovation policies.

The EU delegation in Tokyo is playing an important role in connecting EU and associated countries' science and technology counsellors. Meetings are held every month, to share information and to discuss the development of cooperation with Japan. A Japanese speaker from government, academia or industry is invited to give a keynote lecture. The EU delegation is also hosting networking events with invited Japanese guests when key personnel from the Commission is visiting Japan.

Among the European embassies in Tokyo, the French seem to be particularly active in hosting various bilateral seminars and workshops, and they are generous in sharing information with other European colleagues. The science and technology counsellors are informally sharing best practice through the "Science and Technology Diplomatic Circle", co-chaired by the American, Swiss and Norwegian Science and Technology Counsellors and the EURAXESS' Japan representative.

The European science Counsellors in **Beijing** have regular meetings managed by the EU-delegation. The latter organises among other things a "tour de China" and other visits and meetings with S&T leadership and research institutions of different provinces.

The Science Counsellors at the Embassies in **New Delhi** interact with several Indian ministries. Joint bilateral calls are common with the Department of Science and Technology and the Department of Bio-Technology, and are occasionally negotiated and published with other ministries. For instance, the Indian Ministry of Earth Sciences published a joint call with the Norwegian Research Council on Polar Sciences and Geo-Hazards, The Netherlands has had joint call with the Ministry of Electronics and Information Technology.

The EU delegation in New Delhi holds monthly meetings for Science counsellors from all MS/AC participating in Horizon 2020 (H2020). These meetings are

valuable platforms for sharing of information and planning of joint activities between EU and the MS/AC for mobilising of Indian stakeholders to joint Indo-European H2020 calls or H2020 calls with Indian Co-funding mechanism. Joint trips to various Indian states for outreach to selected Indian research institutions gives good opportunities to promote both European and bilateral collaboration opportunities. The tours provide in addition a very valuable source for learning about the vast Indian R&I landscape. The monthly meetings provide access to a good and resourceful network for informal exchange of information and experience between the MS and AC.

5 Aligned Funding Schemes

5.1 What are Aligned Funding Schemes?

An aligned funding scheme spells out the funding rules for collaborative research projects. The **High Level Group for Joint Programming (GPC)** defines alignment as “[...] the strategic approach taken by Member States to modify their national programmes, priorities or activities as a consequence of the adoption of joint research priorities in the context of Joint Programming, with a view to implement changes to improve the efficiency of investment in research at the level of Member States and the European Research Area”.¹²

5.2 Types of Funding Schemes

For funding international STI cooperation, the following instruments can be used:

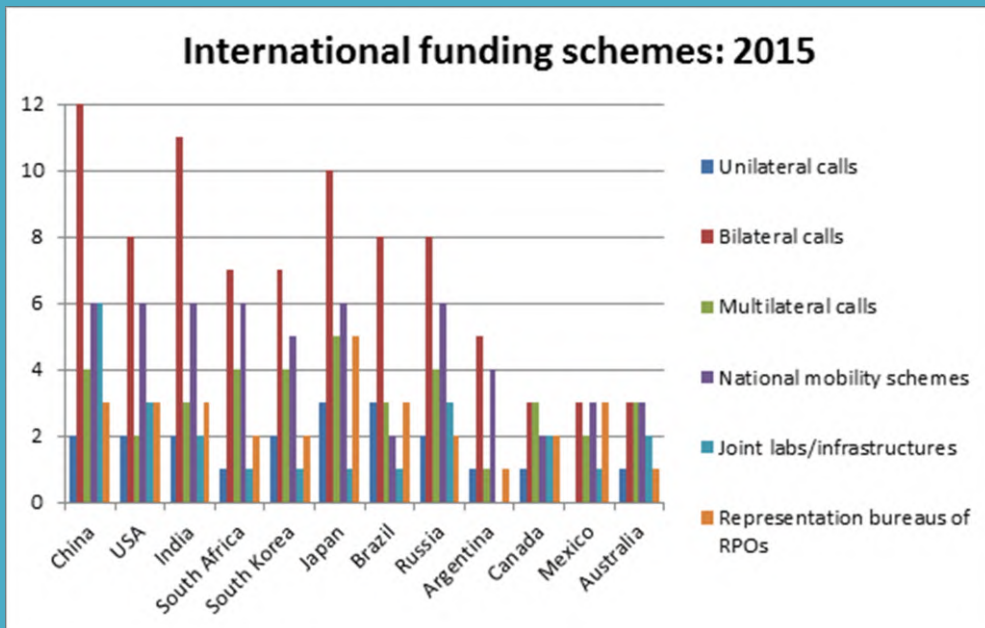
- **Unilateral programmes and calls**, where a MS/AC implements a call unilaterally (without the third country), but third country cooperation is a requirement or strongly encouraged in the projects themselves (because e.g. research is taking place in the third country or participation of third country participants in workshops or other events is necessary). Third country participants would in this case have to find own sources of funding.
- **Bilateral programmes and calls**, where a MS/AC and a third country implement a call together. Topics for funding and peer review processes are as far as possible jointly agreed on. Funding is usually based on the principle of a “virtual common pot” (each country funds its own researchers/teams).
- **Multilateral programmes and calls**, where several MS/AC and third countries implement a call together. Topics for funding and peer review processes are jointly agreed on. Funding is usually based on the

¹² See https://www.era-learn.eu/documents/d4-1_reportonthedefinitionandtypologyofalignment_inra_final_nov2015.pdf, p.5. Retrieved from the World Wide Web on 12 November 2018.

principle of a “virtual common pot”, in some cases with a top-up of the Commission. Examples are ERA-NETs, JPI, EJP, Belmont Forum, CYTED, and EUREKA.

Insights from the SFIC-Survey

The chart below displays those third countries that most of the (19 responding) MS/AC indicated to have a funding scheme or joint institution with in 2015 and the number of MS/AC per funding scheme and joint institution (for the 2010 chart, see the summary with the findings of the Survey). The chart demonstrates that bilateral calls are the most common instrument. In 2015, they were on average used by more than twice as many MS/AC as multilateral calls. National mobility schemes are the second most common scheme with the majority of illustrated third countries. Representation bureaus of RPOs are on average more popular than joint labs and infrastructures; they are used by almost twice as many MS/AC as joint labs and infrastructures.



5.3 Purpose

When deciding for setting up or participating in an international STI funding scheme, MS/AC should take into consideration the following criteria and possible benefits:

- **Meet global challenges:** Worldwide, scientists are trying to find answers to global challenges such as climate change or rare diseases. Through international cooperation, national and international STI policies are streamlined and duplications reduced.
- **Leverage funding:** International cooperation allows for larger research volumina. By pooling joint resources – even if in virtual common pots – countries are able to finance larger projects than they would by themselves.
- **Explore competencies and complementarities:** International funding schemes give access to expertise and data available in other countries. Through international cooperation, collaboration with the world's best performers can be achieved. And with different research systems, countries are likely to find synergies by linking up.
- **Attract talents:** By opening up to international partners, MS/AC can more easily attract excellent researchers from abroad. This should be complemented by attractive conditions and programmes.
- **Access new markets:** International STI cooperation paves the way for companies searching for access to new markets worldwide. This is especially the case for entities directly involved in the funded STI projects.
- **Capacity building:** Low research-performing or simply smaller countries are given the possibility to build up their research capacities.
- **Science diplomacy, international cooperation as an aim by itself:** Irrespective of their benefits for science, technology or innovation, international STI funding schemes may serve as a vehicle for strengthening MS'/AC's ties with partners from abroad. The same aim could be followed through cooperation in other policy fields, e. g. economic or cultural cooperation.

The above-mentioned criteria should be reflected in the choice of an appropriate funding scheme.

5.4 Preparation of a Funding Scheme

When preparing an **aligned funding scheme** with international partners, different aspects have to be decided on:

- **Focus:** Various instruments can be used for funding research with international partners, including:
 - direct research funding,
 - innovation funding, aiming at higher TRL,
 - the funding of joint research infrastructures, e. g. joint laboratories,
 - mobility schemes, which give researchers from both countries/regions the possibility to perform research in the respective partner country/region.
- **Target Group:** The actors targeted by international funding schemes may be:
 - Higher education institutions,
 - Research institutions,
 - Business actors (such as Large-Scale enterprises as well as SME),
 - Other stakeholders.

5.5 Design & Implementation

When designing and implementing a joint international call, the following aspects have to be considered and streamlined for all the participating partners or at least be matched with one another in order to fit the different framework conditions in the respective research systems:

- **Timeline:** The timing of the call has to be matched with national processes, especially with annual or multiannual budgeting in the countries covered.
- **Budget:** The budget should be fixed in advance of the call. Not that this may cause problems as advance planning of national resources may often be conditional on national annual or multiannual budgeting, cf. “Timelines”.

- **Eligibility criteria:** These may strongly differ among regions/countries. Certain eligibility criteria should be streamlined for participants from all countries participating, whereas others may also differ for each participating country, like it is the case in ERA-Net Cofund actions.
- **Evaluation criteria and process:** As is the case of eligibility criteria, some or even all evaluation criteria may be streamlined for all the partners, whereas others may be individual for each partner country/region. Different evaluation processes have an impact especially on the timeline. Agreeing on a joint list of evaluation criteria is the requirement for having a joint project selection process.
- **Consortium Agreement:** Partners of the joint funding scheme should be advised to lay down their relation with each other and the consequences of an eventual breach of contract in a consortium agreement. A model consortium agreement for ERA-NETs Cofund can be found at https://www.era-learn.eu/manuals-tools/p2p-in-h2020/practical-documentation_.
- **IPR:** Intellectual property rights have to be guaranteed. There should be detailed regulations for the storage of the research results, notably against the background of open access rules.
- **Accompanying activities:** The value of joint funding schemes is not limited to monetary funding. It can likewise be found in networking activities, which help solidify the international research networks, often through the establishment of personal contacts. These activities should be planned in advance, including the necessary budget.
- **Monitoring/impact:** A system to verify the impact of the funded projects should be set up, if possible not only at individual national basis.

5.6 Best Practices

5.6.1 Joint Programming

The most well-known joint programmes are the ten JPIs established by the European Union, covering some of the main global societal challenges. The goals of these initiatives are to align national research in the MS and AS countries, but they are also open for cooperation with countries outside Europe. The struc-

ture, participation and activities of the JPIs are described on the respective websites.

http://ec.europa.eu/research/era/joint-programming-initiatives_en.html

In 2017 an evaluation of the JPIs was carried out by a panel of experts appointed by the EC. The findings, analyses and recommendations in this report are relevant for all kinds of international joint research programmes. The report also presents a tool for the assessment of joint programmes.

The report is available on the ERA-LEARN website:

<https://www.era-learn.eu/publications/ec-publications/evaluation-of-joint-programming-to-address-grand-societal-challenges-final-report-of-the-expert-group>

5.6.2 ERA-LEARN

The **ERA-LEARN project**, funded by the European Commission since 2009, has developed a learning platform with lots of information and material about joint programming. Especially the "Manual and toolbox for call implementation" should be mentioned. Even if this toolbox is designed to serve ERA-NETs and other European multinational programmes, it is still a very useful tool for other kinds of international research cooperation. The toolbox goes into all the important aspects of a joint call, like call planning and preparation, submission of calls, funding issues, evaluation procedures and the monitoring of funded projects. This toolbox also provides useful examples and templates that could be adapted to other types of cooperation.

<https://www.era-learn.eu/manuals-tools/call-implementation>

5.6.3 Mobility, networking and strategic partnerships

PIRE (Partnerships for International Research and Education) is a National Science Foundation (NSF) program that supports international activities across all NSF supported disciplines. The primary goal of PIRE is to support high quality projects in which advances in research and education could not occur without international collaboration. PIRE seeks to catalyse a higher level of international engagement in the U.S. science and engineering community.

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505038

GROW (Graduate Research Opportunities Worldwide) is a NSF programme that gives opportunities for U.S. graduate students to engage in international research collaboration. GROW offers funding for international stays of 2-12 months, with the duration varying by country and partner organisation. The list of partner countries is available on the GROW website:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504876

INTPART (International Partnerships for Excellent Education, Research and Innovation) is funded by The Research Council of Norway (RCN) and funds partnerships between Norwegian higher education and research institutions and excellent partners in eight prioritized countries: Brazil, Canada, China, India, Japan, Russia, South-Africa and the USA. Special emphasis is on integrating higher education- and research, and may include business partners.

<http://www.forskningsradet.no/prognett-internasjonale-stipend/Homepage/1224066982949>

5.6.4 Other examples

The **CYTED Programme** has been developed from research thematic networks to research projects and more recently adding the innovation actions, innovation projects, technology transfer and technological cooperation (called CYTED Fora). This cooperation is made possible by a high level commitment, since CYTED has been included in Ibero-American Summits since 1995.

INNO-INDIGO is an ERA-Net multilateral funding platform launched by the EC to promote research cooperation between India and European researchers.

6 Research and Innovation Networking Activities

Within international cooperation in science, research and innovation, networking is an inherently important ingredient of most activities and programmes. Establishing a research network is essential for any international collaboration activity and for working together in interdisciplinary international consortia.

6.1 Definition and Purpose

Beyond the individual networking of researchers, scientists, students, experts and the organisational networking activities (e.g. university cooperation agreements), countries increasingly try to stimulate international cooperation and networking with dedicated activities and measures. Networking with STI stakeholders in the respective country or region is for example done by S&T counselors (see Chapter 4).

From a strategic perspective, building research networks is important especially for fragmented scientific communities and smaller research groups in scientific terms as well as with view to combining financial resources. In addition, networking also provides added value in pooling expertise around specific research questions and addressing related societal challenges.

In this chapter, we will focus on activities that are research and innovation oriented, at least partly funded, implemented or stimulated by public governments and not in the first place regarded as funding instruments.

6.2 Types of Research and Innovation Networking Activities

Networking activities in research and innovation can take many forms. The probably most common ones are **thematic workshops, joint seminars and conferences** that constitute easily accessible ways of linking scientific communities along with specific joint interests and priorities and provide an entry point to further networking and cooperation.

Example:

Austrian Research and Innovation
Talks

<https://arit2017.splashthat.com/>

Science Days or Science Weeks are short-term international gatherings, aiming to foster interdisciplinary exchange and encourages fellow participants to connect and learn from each other.

Examples:

<p>Science Days</p>	<p>Austrian-Canadian Science and Innovation Days 2017</p> <p>ASEAN-EU Science, Technology and Innovation Days (e.g. 2014, 2015, 2016)</p>	<p>https://www.b2match.eu/at-can-stidays2017</p> <p>http://www.stidays.net/</p>
<p>Science Weeks</p>	<p>Research Council of Norway (RCN) has organised "Science weeks" in USA, Canada and Japan. These events have brought together researchers and policy makers on topics such as Energy, Arctic research and Marine/maritime issues.</p>	<p>http://injapan.no/arctic2016/ Japan-Norway Arctic Science and Innovation Week 2016</p>

Some countries even organise **Years of Science**, related to specific, mostly broader research themes and/or specific bilateral cooperation efforts. These years of science require long-term strategic planning as they usually include a number of different networking and cooperation activities reaching from joint events to joint calls / joint research projects, involving numerous stakeholders.

Examples:

Germany / UK	Year of Science 2016/2017 – Seas and Oceans https://www.wissenschaftsjahr.de/2016-17/weiterfuehrende-informationen/englisch/science-year-201617-seas-and-oceans.html
UK / Russia	UK-Russia Year of Science and Education 2017 https://www.britishcouncil.ru/en/programmes/uk-russia-science-education

Although often based on individual level contacts, **diaspora networks and alumni networks** are also increasingly part of the international STI efforts of public administrations and serve a wider purpose of:

- keeping connections to the respective national STI experts abroad, providing networking opportunities for the STI expat communities abroad and
- keeping in touch with former national and international students and researchers that have spent parts of their careers in the respective country or at the respective university/research organisation.

Examples:

Austria	<i>The Research and Innovation Network Austria</i> for North America http://www.ostaustria.org/rina and http://www.ascina.at/
France Alumni	https://www.francealumni.fr/en

<ul style="list-style-type: none"> • Alumni Portal Deutschland • German Academic international Network 	https://www.alumniportal-deutschland.org/en/ https://www.gain-network.org/de/
<ul style="list-style-type: none"> • Global Portuguese Scientists • Stimulating Processes for Innovation and Development based on Research networks with Portugal – SPIDER 	https://gps.pt/ http://www.spider.fct.pt/

6.3 Multilateral and EU-initiated Activities

For many years the EU has provided funding through **INCO-NET and BILAT projects**. These projects brought together policy makers, researchers, the private sector and other stakeholders to identify STI priorities and support the definition of STI cooperation orientations, thus strengthening the participation of the targeted countries/ regions in the Framework Programme. Moreover, they carried out strategic analysis of STI trends, mapped research capacities and provided systematic monitoring and review of cooperation activities in order to support the update of STI policies and priorities.

Examples:

BILAT USA 4.0 project	http://www.euussciencetechnology.eu/
B.BICE+ - EU and Brazil co-operation	http://www.b-bice-plus.eu/about-us/the-project/

Within Horizon 2020, the European Commission has launched a new initiative called “**Centres/Networks of European Research and Innovation**”. It aims at creating a network of centres in some of the world's most dynamic and innovative countries and regions that will connect and support European researchers and entrepreneurs globally. Member States are thereby joining their efforts in providing services for their national stakeholders, building where possible on existing European science, technology and innovation structures in order to ensure economies of scale while avoiding unnecessary duplication.

Such Centres are currently being created in Brazil, China and the USA.

Brazil	http://www.cebrabic.eu/
China	http://www.eucentres.eu/china/
USA	http://www.picasso-project.eu/2017/04/06/nearus-launched/

6.4 Best Practices

An example of a **comprehensive strategic approach to networking** is the Finnish **FinCEAL Plus project** (2017-2018) which aims to provide strategic support to maintain and enhance the cooperation between research and science policy communities in Finland, Europe, Africa, Asia, and Latin America and the Caribbean (LAC). It includes a series of activities like partnership support grants, targeted travel grants, thematic networking, a database of Finnish researchers and research conducted on Africa, Asia or the LAC region.

http://www.unipid.fi/en/page/157/developing_finnish_science_technology_and_innovation_cooperation_between_europe_africa_asia_and_the_lac_region/

7 International Research Marketing

7.1 What is International Research Marketing?

International Research marketing can be understood as a concept with the goal to sharpen the image of one's national research landscape or of the European Union as a place to study and research and to enhance visibility abroad.

7.2 Purpose

Activities and measures are usually part of achieving objectives which are set out in broader STI or internationalisation strategies. These objectives can be:

- Attracting excellent research talent/researchers from abroad,
- building-up new or foster existing international STI cooperation,
- acquiring investments in STI.

Ministries, universities, research performing organisations and research funding organisations are important stakeholders in this respect. Measures being taken by them include communication or marketing aspects to reach a targeted audience abroad.

Different stakeholders all over Europe have gained a lot of experience in this field, but examples of strategic collaboration between the European level and Member State level like the Destination Europe- or Euraxess initiatives are rare.

7.3 Types of Research Marketing Activities on National and EU-Level

Research marketers draw on a wide spectrum of activities in order to promote a given country as a location for research, to encourage mobility and to stimulate collaboration among the research-active community. Activities include workshops for sharing news and views on research marketing, delegations and press trips, and participation in international conferences and career fairs abroad. Several countries promote national research activities online and /or in social media channels. Prizes and awards are specific measures at the inter-

section of research, research marketing and communication, aiming to showcase scientific achievements or talent. Beyond the long list of more general prizes and awards, in quite a number of cases the prizes are also related to international topics and international collaboration efforts.

7.4 Best Practices

In what follows, best practices are shown for three types of research marketing activities, namely websites, social media channels as well as prizes and awards.

Websites

<p>Research in Germany https://www.research-in-germany.org/en</p>	<p>The “Research in Germany” portal is the central information platform of the initiative to “Promote Innovation and Research in Germany” by the Federal Ministry of Education and Research (BMBF). Editorial responsibility lies with the German Academic Exchange Service (DAAD).</p>
<p>Research in Estonia http://researchinestonia.eu/</p>	<p>Provides information about research in Estonia and is administered by the Estonian Research Council.</p>
<p>Euraxess – Researchers in Motion https://euraxess.ec.europa.eu/</p>	<p>Euraxess is a unique pan-European initiative providing access to a complete range of information and support services to researchers wishing to pursue their research careers in Europe or stay connected to it.</p>
<p>Study and research in Portugal https://www.study-research.pt/en</p>	<p>Presents Portugal as a hub for creativity and innovation as well as a gateway to the world.</p>
<p>http://ec.europa.eu/research/infocentre/theme_en.cfm?item=International%20cooperation</p>	<p>The most recent Success stories from EU funded Research in the area of International Cooperation</p>

Social media

<p>Research in Germany https://de-de.facebook.com/Research.in.Germany/</p>	Facebook page
<p>Research in Estonia https://de-de.facebook.com/www.researchinestonia.eu/</p>	Facebook page
<p>Estonia – a place for science https://www.youtube.com/channel/UC5hJ4T1rhDE6m5A0Tc9iPRw</p>	YouTube
<p>Austria – Room for ideas https://youtu.be/Dbcf3uS0fOs</p>	YouTube

Prizes and awards

Germany	<p><i>Green Talents</i> - International Forum for High Potentials in Sustainable Development is an annual award focusing on young international researchers in the field of environmental and sustainability research. www.greentalents.de. Awardees come from countries all over the world (182 alumni from 51 countries till 2016).</p>
Austria	<p><i>Danubius Award and Danubius Young Scientist Award</i> have been created to honour scientific achievements and talent in the 14 countries of the Danube Region.</p>

Appendix A: Overview of studies and reports on international STI cooperation: Findings and recommendations

Prepared by MEYS in cooperation with the Technology Centre ASCR

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1 Overall STI Policy for International Cooperation

1.1 International Cooperation in Science, Technology and Innovation: Strategies for a Changing World (2012, European Commission)

Key words: European Union, innovation, programmes, global processes, recommendations, strategy, development

Summary:

The report of the Expert Group provides advice for the further development of international STI cooperation policy of EU and the international dimension of ERA. It also focused on the wider context: it assesses drivers of globalization of STI and the position and role of the EU within these global processes. It comes into conclusion that fundamental changes in the global research and innovation landscape are taking place and that the increasingly pressing global challenges urgently require a strategic and forward-looking response at EU level.

Main findings:

This report gives advice for the further development of international cooperation policy of EU in STI and the international dimension of ERA. It derives its recommendations from the main finding, that EU STI policies already have international dimensions in their current form, e.g. in thematic programmes of the Framework Programme, but they are fragmented, driven by diverse and sometimes conflicting objectives, lacking in strategy, strategic intelligence and effective instruments. Thus, a strategic approach towards internationalization and international cooperation needs to be adopted. More specifically, the report gives following recommendations:

- Develop a strategy with special focus on strengthening European attractiveness as international research and innovation hub and partner in order to strengthen European competitiveness and prosperity.

- Theme- and problem-oriented prioritization is needed rather than a geographic one; Grand Challenges as a clear prioritization tool should be mainstreamed also in the international dimension. Prioritization of international collaboration should closely follow priorities of the EU's core research and innovation programmes while the geographical approach should be the core of their implementation strategy. The International perspective needs to be more fully integrated into 'regular' programmes at EU level.
- Make the Horizon 2020 truly open and attractive to the best and brightest in the world, allowing European actors to work with the best brains wherever they are.
- Strengthen framework conditions for removal of possible international cooperation barriers
- Design targeted initiatives (multilateral, bilateral, and unilateral) for strengthening cooperation in selected areas.
- Focus on firms as innovation is truly needed.
- Exploit variable geometry to the full - with flexible arrangements (within EU and with countries outside EU) including multilateral platforms for strategic cooperation.
- All initiatives must be based on more evidence- or analysis-based decision-making, including forward looking analysis to inform decision making about likely trends and future changes and systematic exchange of experiences.

1.2 **Basic Principles for Effective International Science, Technology and Innovation Agreements (2014, European Commission)**

Key words: international STI agreements, analysis, typology, impact, efficiency, umbrella agreements

Summary:

This policy-oriented study contributes to comprehensive understanding of the range of existing international STI agreements used by the European Union, Member States and the USA. It explores the impact of STI agreements and potential scope for developing umbrella agreements between the EU and Member States with third countries. The report consists of three sections that present respectively (A) insight into STI agreements used by the EC, Member States, and the USA, developing a typology of such STI agreements; (B) information about the impact of STI agreements, based on scientific literature as well as evaluations and reviews; (C) alternatives for the current situation, findings on feasibility of an umbrella STI agreement, and recommendations.

Main findings:

Basically, fifteen reasons for signing STI agreements can be distinguished, both at scientific and policy or decision-making level. These reasons (or rationales) can be grouped into two paradigms. Most of the rationales that focus on cooperation fall under the 'narrow STI agreements paradigm'. A small number of reasons fall under the 'broad STI agreements paradigm'. They focus on what we might refer to as science diplomacy or even high level politics.

Bilateral STI agreements have in general three objectives: the facilitation of cooperative activities in fields of common interest in STI, the increase of general welfare of the signatory countries, and explicit diplomacy objectives. There are some fundamental differences in design of STI agreements as practised by EU and the United States, e.g. in terms of intellectual property rights or the focus on

the reciprocity principle. As to impact, it is concluded that little can be said about the quantitative impacts of bilateral STI agreements.

Five concluding recommendations based on the findings of the study are presented. Regarding the current agreements, harmonisation and improvement of terms of reference for reviews, evaluations and impact assessments of STI agreements are recommended. The European Commission is recommended to reconsider the way the reviews or evaluations and impact assessments of the bi-lateral agreements are set up. As to the current agreements, the study concludes that any sort of IPR arrangement in an STI agreement should be kept as minimalist as possible. The European Commission is recommended to check IPR annexes so that they do not restrict the freedom of European research organisations and firms to apply IP laws implemented in the EU and in Member States.

Finally, as regards the basic principles umbrella (further referred to as “BPU”) , it is advised to explore the possibilities at a more concrete level. Member States, together with the European Commission, are recommended to set up a body that would explore the practical possibilities of a BPU. Even though the added value of a more concerted action under BPU is clear, a BPU Steering Group could explore and support the willingness of individual Member States to invest in such a concerted action. As to various standpoints of BPU to be considered, geographical scope, power of BPU or governance of the process might be the most important ones.

2 International cooperation in European STI policy and Seventh Framework Programme

2.1 European Added Value of EU Science, Technology and Innovation actions and EU-Member State Partnership in international cooperation (2014, European Commission)

Key words: 7th Framework Programme, actions, EAV, analysis, coordination

Summary:

This study identifies major areas of European added value (EAV) of international STI cooperation actions, based on data collection through interviews, surveys and case studies. Although primarily oriented at the EU level, the study attempts not only to analyse the EAV relevance for European beneficiaries, but also for beneficiaries in the non-EU countries. The objectives of the study are the following:

- To define under which circumstances international STI cooperation objectives and actions are carried out at the EU level (these can be either coordinated or joint EU-Member State actions or solely EU actions) will be more effective than those carried out at national level.
- To make suggestions for defining and measuring this added value, with a specific focus on actions carried out through the EU's 7th Framework Programme for research and innovation.
- To define the means of actions, and types of measures that might be taken at the EU level (including and distinguishing those which promote joint EU-MS actions) that are highly effective in achieving desired international STI cooperation objectives.

Main findings:

The study on the EAV of international STI cooperation leads to several conclusions. First of all, the EAV is a multifaceted and changing concept that can only be understood by relating drivers and objectives of actions to outputs and im-

pacts, and by assessing the additional benefit of collective actions compared to national or 'private' actions. The EAV can vary significantly due to large diversity of rationales and expected benefits of international cooperation at the EU level depending on actors, domain and level of application. The study shows that identifying and assessing EAV is not unambiguous. The concept of the EAV can have different meanings to different actors (e.g. researcher, policy-makers etc.) and also depends largely on the size of the country. Moreover, five criteria for added value are identified in the study: 1) Networking 2) Facilitation of excellence and capacity building 3) Coordination of critical mass 4) Mutual learning and harmonisation 5) Avoiding redundancies/acting economically and effectively. The study is concluded by five key recommendations as to different aspects of the EAV in international STI cooperation:

- Continue with successful actions and instruments that support funding for research undertakings. Make sure that long-term planning leads to sustainability of international engagement at the national level, supported by joint EU-MS partnerships for a limited period of time if needed.
- Continue the support of best practices sharing and making information available through contact points or peer-learning activities with country-specific or thematic focus.
- Explore whether it is effective and efficient to combine existing instruments, with a specific thematic or geographic focus.
- Increase the focus on development of framework conditions for innovation in EU-third country collaborations and explore to what extent an EAV rationale for innovation activities exists as it is not necessarily obvious in case of increasingly competitive domains.
- Pay also close attention to future monitoring and evaluation of the EAV.

2.2 International Science and Technology Cooperation in the EU's Seventh Framework Programme: the specific programme 'Cooperation' and its thematic areas (2014, European Commission)

Key words: 7th Framework Programme, international S&T cooperation, practices, research, assessment

Summary:

The study aims at international research and innovation cooperation in the EU Seventh Framework Programme for Research and Innovation (FP7) with a special focus on third countries and the 'Cooperation' specific programme of FP7. The aim is to get a comprehensive overview of the multifaceted international research and innovation cooperation of the EU with third countries (not associated with FP7).

Using research and assessment criteria such as the relevance of international cooperation activities in relation to the general strategy, programme efficiency and effectiveness or programme impacts, the study examines principles of international cooperation in research and innovation, assesses fulfilment of thematic goals and geographical directions and provides recommendations. Selected case studies focus on relation between policy objectives and expected impacts, role of third country partners, management and efficiency or the role of National Contact Points in third countries.

Main findings:

The integration of European excellence in research and innovation into global context and establishing strategic partnerships with third countries in selected scientific fields have belonged to the main objectives of international cooperation in FP7. Moreover, activities concentrated on specific problems of third countries or of global character together with improvement of access to global research and facilitating contact with international partners represent integral part of international cooperation. Particular activities in the field of international

cooperation are based on Framework Programme research activities and 10 specific thematic areas are covered by the 'Cooperation' specific programme of FP7, differing slightly in dedicated budget.

The most important partners for FP7 international cooperation are the United States of America, China, India, Brazil, Russia and South Africa. Research teams from these 6 countries have been involved in 1 493 projects (43.3% of the total) with financial contribution of over 223 million EUR (48.33% of the total). 70% of all coordinators are from the United Kingdom, Germany, France, Italy, Spain and the Netherlands.

In general, implementation of international cooperation is provided by several key players: policymakers both in MS/AC and partner countries, agencies in charge of R&I policy implementation and other stakeholders such as user groups. Assessment and information dissemination initiatives as well as activities to explore thematic subject matters are positively assessed. Involving experts, R&I players and stakeholders (including those from third countries) can contribute to both the overall policy and implementation. The S&T dialogue might consist of workshops, seminars or other similar activities with participations of experts and research institutions. Equally important is to retain the flexibility of a combined bottom-up approach with an adequate policy umbrella. Role of National Contact Points, or liaison officers, is positively appraised by third countries as a direct contact plays important role in disseminating information and sustainability of international cooperation projects.

2.3 Commitment and Coherence: Ex-Post Evaluation of the 7th Framework Programme (2007-2013) (2015, European Commission)

Key words: ex-post evaluation, 7th Framework Programme, third countries

Summary:

This report presents findings of ex-post evaluation of the 7th Framework Programme as well as general recommendations for the EU Framework Programme for Research and Innovation (HORIZON 2020) and RTD policies and programmes at both the EU and national level. It informs the EU institutions,

Member States, the research community and also the general public about the achievements of FP7 and challenges ahead. Its primary aim is to contribute to the continuous improvement of the design and implementation of the EU Framework Programmes in general and the HORIZON 2020 in particular. It also focuses on contribution of the 7th Framework Programme to international collaboration with third countries.

Main findings:

International cooperation was one of the most important objectives throughout the history of the EU Framework Programmes as well as a central objective of the FP7. Promoting international collaboration was set as an objective in order to support European competitiveness globally, create contacts with scientists from outside Europe in order to provide them access to research networks, and address specific global challenges that affect third countries. In addition to a specific sub-programme addressing international collaboration (the INCO programme within FP7-CAPACITIES), international collaboration became an integrated issue within FP7-COOPERATION. FP7-PEOPLE addressed the objectives related to strengthening human potential and attracting third country scientists. No specific goals were formulated for FP7-IDEAS in terms of cooperation with partners from third countries.

Although FP7 stated to be open to any country willing to participate, international collaboration was limited by the funding eligibility criteria which differed for particular non-EU countries. As set out by the guiding notes and work programmes, FP7 funding was limited to EU Member Countries, Associated Countries and International Partner Cooperation Countries, while countries classified as high income (e.g. USA, Japan, Taiwan) were in general not eligible to receive FP7 funding for their research activities carried out within an FP7 funded project (with some exceptions).

Thus, the shares of partners from outside Europe remained low in FP7. It was lowest in terms of partners from high income third countries that could become strategic partners for Europe in its effort to foster its scientific excellence and innovations. The lack of a more strategic approach to international collaboration persisted and led to an opaque situation with different, to some extent opposing, logics. Even though the integration of international cooperation across the programme has been an important move in FP7, the lack of a strategic approach with clear objectives remained a weakness. Therefore, the High Level Expert

Group sees an urgent need for a thematically differentiated strategy on international cooperation and increased efforts for bilateral agreements on STI collaboration. Investments in international cooperation have to be made by strategic involvement of partners from outside the EU in areas of key importance to European goals. This includes leadership in innovations, global societal challenges as well as in science diplomacy.

3 International cooperation with third countries or regions: priorities, best practice and monitoring

3.1 Commission Staff Working Document: Roadmaps for international cooperation (2014, European Commission)

Key words: roadmaps, third countries, regions, European Union, STI cooperation, priorities, HORIZON 2020

Summary:

This Working Document provides an overview on roadmaps on international STI cooperation between EU and selected third countries or world regions. The document accompanies the Report on the implementation of the strategy for international cooperation in research and innovation and includes information about current state of play in terms of cooperation, priorities and areas of possible cooperation for prospective years.

Main findings:

Since the adoption of the Communication 'Enhancing and focusing EU international cooperation in research and innovation: a strategic approach' in September 2012, the Commission has been engaged in a systematic planning of priorities for cooperation in research and innovation. The document provides overview of the framework governing the cooperation and the current state of play for each of the partner countries and regions. Additionally, the document includes information about Horizon 2020 work programmes. The document recommends following thematic priorities:

- For Brazil: Marine research and bio-economy, food security, sustainable agriculture, energy, nanotechnology, Information and communication Technologies (ICT).

- For Canada: Marine and arctic research, research infrastructure cooperation, health research, bioeconomy, transport (including aeronautics)
- For China: food, agriculture and biotechnology, sustainable urbanisation, aviation, environment, ICT, energy, nuclear energy
- For India: Health, water, bio-economy, energy, fusion energy
- For Japan: Critical raw materials, transport research including aviation, ICT, energy (non-nuclear), space research and innovation, health, security research
- For the Republic of Korea: Nanotechnologies, energy, ICT
- For Russia: Aeronautics research, ICT research, research infrastructures
- For South Africa: Health, environment (Global Earth Observation), excellent science – research infrastructures, marine and maritime research, raw materials (mining and minerals research and innovation)
- For USA: Marine and arctic research, health research, transportation research, materials research / critical raw materials / nanosafety and regulatory research / health and safety research (nano-EHS), energy research, future and emerging technologies, eInfrastructures, nuclear fusion and fission
- For Eastern Partnership Countries: Health, demographic change and well-being, climate action and environment, secure, clean and efficient energy
- For Southern Mediterranean: Water availability and management and food security, renewable energy and efficiency, fighting diseases and improving well-being

3.2 Overview of international science, technology and innovation cooperation between Member States and countries outside the EU and the development of a future monitoring mechanism (2013, European Commission)

Key words: implementation, monitoring, indicators, methodology, STI policies, international

Summary:

This study provides an overview of EU Member States international STI policies and policy implementation, and offers analyses of evolution and trends in the international STI cooperation policies of EU Member States and their implementation of over the last 10 years. Moreover, the study proposes a set of recommendations for a practical and cost effective methodology for monitoring of the implementation of EU Member States' STI cooperation policies with international partner countries.

Main findings:

The report identifies the rationales underlying international STI cooperation. The effort to achieve research excellence in selected fields of science, including building of STI capacities at home as well as other countries belongs to main motivations. Another strong rationale is the fostering of competitiveness and innovation. The STI Cooperation is seen as an important instrument furthering foreign policy goals. Another significant aspect is higher possibility to tackle impacts of Grand Challenges. Based on these goals, a wide range of policy targets are identified - international publications, international cooperation, student and researcher mobility and capacity building. A number of corresponding instruments and measures are employed such as bilateral and multilateral agreements and MoUs, mobility schemes, partnership programmes and initiatives and foreign branches.

Substantial part of conclusive remarks is drawn to the central issue of the report - the system of monitoring and indicators. A number of barriers to the use of indicators for monitoring and evaluation purposes are identified, like the absence of accepted definitions of widely used concepts, the variation in the understanding of disciplinary and thematic boundaries, and the lack of routines for monitoring and collection of data relating to international STI. Thus, a list of potential indicators is proposed for the monitoring of MS' activities in international STI cooperation. Finally, several recommendations are made to contribute to the design of a system of indicators for the monitoring of MS international STI activities. It is necessary to provide an improved definitional framework for concepts such as 'international cooperation' and 'international mobility', and as a next step, clarification of the purpose for indicator design and use is necessary.

3.3 Mapping of best practice regional and multi-country cooperative STI initiatives between Africa and Europe — identification of financial mechanism(s) 2008–2012 (2014, European Commission)

Key words: Europe, Africa, STI, best practice, gaps, impact, multilateral cooperation, framework

Summary:

This study provides an overview of the science, technology and innovation cooperation between Africa and Europe and assesses existing STI cooperation initiatives, with the aim to identify successful, best practice models of cooperation between Africa and Europe. The study also aims at identifying gaps and effective financial mechanisms for Europe-Africa cooperation.

Main findings:

The study positively evaluates the Europe-Africa STI cooperation as a very rich, complex and steadily developing. Most important factors for its successful advancement is a support for partnership building. The study assesses partner-

ships as a cornerstone and necessary vehicle of further collaboration progress. The extensive system of bilateral and multilateral relationships and activities are now driven by shared values and policy objectives, where also effective leadership plays crucial role.

The study further appraises a co-ownership as a core value of Europe-Africa cooperation. The single most important factor in fostering co-ownership is co-financing, whether through joint financing with existing instruments, or through the creation of new, dedicated co-funded instruments. The current funding for bi-regional cooperation is, however, rather dependent on European and, to a lesser extent, international instruments, weakening the potential for genuine co-ownership.

A focus on sustaining effective partnerships, investing in the capacity to deliver, is likely to enhance the overall quality and effectiveness of cooperation. Collaborative models that support the consolidation of long-lasting partnerships are therefore seen by many experts as ideal as well as – at the project level – effective partnerships with full and committed partner engagement, strong interpersonal relations, mutual trust, institutional diversity and complementary skills, visionary leadership and coordination.

At the programme and regional level, MS commitment, the policy and regulatory environment and national commitment to STI create a conducive environment. The study further reveals that the high-level political and executive support for bi-regional cooperation is often behind successful initiatives. Evidence from some initiatives suggest that formal collaboration instruments such as MoUs and STI agreements facilitate successful programmes.

The study concludes that Europe-Africa STI cooperation is generating tangible outputs and simultaneously contributing to the knowledge economy. The dependence on a skewed funding landscape, contributing to a slew of issues linked to access to financing and the suitability of instruments are found as the most important barriers to effective collaboration. Therefore, the design, piloting and scale up of co-financing arrangements using existing instruments and the joint financing of new instruments are among the highest priorities for collaboration. Also the participation of SMEs, notably those in Africa is a significant gap, as well as the industry-academia relationship, translational as well as cross-cutting activities and the links of STI policy to other domains, notably higher education; and investment in partnerships. A shortage of skilled human resources

in both technical and administrative functions, weak societal institutions and institutional capacity are also among the identified gaps.

3.4 Science Europe: Practical Guide to Three Approaches to Cross-border Collaboration (2014, Science Europe)

Key words: cross-border cooperation, research organizations, models, guide, lead agency

Summary:

This document is a practical guide to three different approaches to international cooperation, developed for the use of Science Europe Member Organisations and other research organisations inside or outside of Europe. Its main purpose is to help to facilitate the organisational and administrative processes associated with the conduct of scientific work. Providing better and more efficient means for organisations to apply a set of the three optional models and successful and easier implementation of the models are topics of this document.

Main findings:

This document refers to three different models, with application and administrative procedures being described. Examples from various organisations are mentioned together with practical advice.

The Money follows Researcher scheme allows for the portability of research grants. Under the terms of this agreement, it is possible for researchers moving to another country to take with them the remainder of their national grants. The grant can then be continued and completed at the new research institution within the original terms and objectives.

Money Follows Co-operation Line models simplify the financing of cross-border collaborative projects by including a foreign investigator directly in a national grant. Such a policy is an effective mechanism to encourage research excel-

lence through international collaboration. An organisation can fund a project which is partly carried out abroad; this means that a proportion of a grant may be spent on a researcher from another country. Usually, only direct costs are included; salary may or may not be included. Sub-contracting of technical services is therefore out of scope of this instrument.

The Lead Agency model is based on the following: Research Funding Organizations (RFOs) from two or more countries engage in a co-operation in which one of the RFOs involved takes a leading role; this means that it is in charge of carrying out the review process and making a recommendation on whether or not to approve an application. The partner organisation(s) make the formal decision on the basis of the review documentation and the recommendation of the Lead Agency. It is anticipated that the partner organisation follows the recommendation of the Lead Agency. Deviation from this recommendation should be justified. The different project parts are then financed by the respective RFOs so that no money needs to be transferred across borders.

3.5 Opportunities, Challenges and Good Practices in International Research Cooperation between Developed and Developing Countries (2011, OECD)

Key words: OECD, development, collaborative research, issues, good practices, recommendations

Summary:

The report deals with issues that are of attention of scientists and administrators who seek to design, initiate and manage collaborative research programmes and projects (incl. both scientific and development goals). The report identifies good practices and new ideas, and presents options for concrete actions, accumulated during the course of the OECD GSF (Global Science Forum) activity. The GSF activities produce findings and recommendations for actions by governments, international organisations, and the scientific community.

Main findings:

In this report, issues and options are presented, covering the major aspects of collaborative research. First of them is the achieving of an optimal balance between the imperatives of research (bottom-up initiatives, peer review, etc.) with top-down strategic development priorities. For the OECD activity three areas emerged in which such balance must be sought: scientific achievement and development impact, inputs and contributions from the research partners, and top-down and bottom-up approaches.

Other issue to deal with is the development of human capabilities, national science and technology capacity, and expertise in science policy in developing countries. Capacity building is a multi-dimensional concept, even when it is applied to the narrow topic of collaborative research. Three key dimensions were identified: selecting the appropriate partner/beneficiary; strengthening networking; and optimising the skills that will be strengthened or transferred.

The report also concludes that another aspect of collaborative research is promoting co-ownership of the outcome and applying and transferring results of joint research to local communities or industries in both industrialised and developing countries and to society in general. Moreover, evaluation of the outcomes using appropriate methodologies and indicators represents similarly important issue.

4 Reviews of S&T agreements between European Union and third countries

4.1 A Review of the S&T agreement between the European Union & the Republic of Korea (2013, European Commission)

Key words: Republic of Korea, European Union, Horizon 2020, roadmaps, S&T cooperation, foresight, communication

Summary:

This review investigates the scope and nature of the S&T cooperation between EU and the Republic of Korea and proposed recommendations within existing policy and programme instruments to further enhance of its level. The paper also includes positions of selected EU countries towards S&T cooperation and agreement with the Republic of Korea.

Main findings:

In general, the report recommends a more strategic and long-term approach as to S&T collaboration. Specific measures are proposed to be accepted in two main areas – various mechanisms for realizing policy objectives as well as measures within general policy approach and context are suggested. As to the former, the key is to find the right channels for communication, as the design of competences and the terminology used in the Republic of Korea is different to that of the EU and the Member States. To improve this situation there is a need to change the way the EU interacts with its Korean partners. The EU needs to find the resources to identify the right people to talk to and at appropriate level. A deepened cooperation based on a long-term thinking is essential as well.

The road mapping process based on the mechanism of identification of technologies or research fields that both parties want to explore through S&T collaboration must also involve European and Korean industrial stakeholders as well as any other key stakeholders that are identified during the process. Other

ministries and institutions can be involved as appropriate. The implementation of a roadmap should lead to the establishment of Joint Initiatives or wider use of variable geometry instruments or mobility programmes on important themes of mutual interest. All of them would be then jointly funded, managed and coordinated. Also better use of the BILAT and ERA-NET mechanism should be in place in order to move beyond a primary focus on “matching” partners towards focus on “structuring” collaboration. The improvement of the mutual visibility of the EU and Korean S&T systems is vital.

As to the measures within policy approach and content, there is a need of timely relevant information sharing as there has not yet been created a shared view on what kind of data needs to be shared and how to do this effectively. A possible way for improvement is to discuss this item during intergovernmental meetings and formally agree on a basic set of information to be shared.

Additionally, a more participative approach is needed to develop S&T collaboration with the Republic of Korea. According to the study suggestions, the EU-Korean collaboration could benefit from joint foresight exercises in a number of areas, particularly on the main themes of Horizon 2020. It could also serve as a way to address practical policy challenges such as how to explore, initiate or prepare the ground for deeper cooperation. Next to other efforts, this would lead to enhancement of a more structured quest for suitable areas for cooperation.

4.2 Evaluation of the EU-US Agreement on S&T (2013, European Commission)

Key words: European Union, United States of America, S&T Agreement, evaluation, bilateral cooperation

Summary:

This review seeks to provide timely and evidence-based advice to the European Commission on the process of the EU-US S&T Agreement renewal. The review seeks to examine the value of the agreement and also to outline what is needed for improving its operation and impact. In other words, the report analyses the

role and potential of the EU-US S&T agreement as a tool to increase the volume and intensity of partnership between both parties. The EU-US cooperation is described separately for Ireland, Germany, France and Spain from a bilateral perspective.

Main findings:

The report finds cooperation on science and technology between the United States of America and EU entities as very intense. The mobility of researchers, the number of co-publications or the technology balance demonstrates that both parties mutually recognise themselves as key actors in knowledge generation, even in the context of emergence of other partner countries (Asian countries, single EU Member States etc.). The technology cooperation is mainly driven by private sector through a large presence of facilities of US-based firms in the EU, and in the last years, the growth of the EU-based facilities in the US.

The recommendations identified by the authors of this report can be classified in two main groups. The first one contains recommendations on policies or strategies which are mainly identified to reinforce the political dimension of the EU-US S&T Agreement and potential advantages of using it as a platform for more intense long-term and strategic bilateral cooperation. These include e.g. a higher level of coordination of S&T strategies with respect to the US in the framework of international strategy for ERA and HORIZON 2020, or the need to complement common S&T discipline-based priorities by a move to address grand challenges in order to increase the strategic focus of the agreement.

The second group are the recommendations on operational policies for a transfer facilitation of policy goals to the implementation domain while keeping in mind the need to increase the interest of public and private S&T entities in the EU and the US to cooperate more closely. Recommendations on operational policies include e.g. enforcing agreements at the level of programme managers or in specific programmes as joint cooperation instruments, exploration of possible use of co-funded schemes to implement the agreements' goals, or better coordination and promotion of open access of researchers to research infrastructures and an increasing use of e-science. Moreover, the creation of working groups to deal with issues which both parties identify as priorities could become a key element to speed up the EU-US cooperation in science and technology. As an opportunity in the future, the report proposes to reinforce the in-

ternational dimension of the new ERA initiatives driven by MS, like the JPIs, to facilitate the cooperation with the US and with other advanced countries. Increasing the level of knowledge of US potential participants on the S&T opportunities offered in the EU by the EC or by the Member States and vice versa belongs to another recommendation given by the report.

4.3 Review of S&T cooperation Agreement between the European Union and Government of the Republic of India (2012, European Commission)

Key words: India, European Union, S&T agreement, cooperation, knowledge, evaluation, SMEs, programme

Summary:

This report is a review of the last five years of the EU-India Science and Technology Cooperation Agreement (2007-2011) implementation and assessment of its impact. It contextualises the agreement in the wider institutional and policy developments in India and in the European Union during the reviewed period. Suggestions are put forward for strengthening and enhancing mutually beneficial scientific and technological cooperation in the future.

Main findings:

The report points out that EU-India S&T cooperation may play a major role in designing and enhancing future development strategies in the EU and in India. Relying on the Europe 2020 Strategy and India's Decade of Innovation, both the EU and India emphasise that innovation is a key instrument in supporting competitiveness and in promoting efficiency in the use of resources to meet societal needs. A joint focus on EU-India S&T partnership with the aim of enhancing the excellence in research is also mentioned.

The report shows that the EU-India Agreement in S&T Cooperation appears to be only partially adequate to the task and there is a room for significant im-

provements. Recommendations are given in three complementary directions, as described below.

There is a vital need to improve EU-India mutual knowledge since economy and society of the EU and India show a different structure as well as organisation. For that reason, instruments such as e-learning courses, knowledge sharing and training materials on India and the EU should be designed and implemented, with a focus on industries and services, science, innovation, education and research. Also the DG R&I together with the DG Enterprise and relevant private sector stakeholders should cooperate in designing strategic concepts and business models for the promotion of innovation and new technologies through European and Indian public-private partnerships. In addition, on the basis of cooperation with European and Indian leading schools of engineering and management, the EU and the Member States could launch a EU-India competition for proposals in inclusive, frugal and reverse technologies to provide sustainable solutions to various economic and social problems, both in India and Europe.

The report also recommends addressing the weaknesses of EU-India S&T Cooperation Agreement, especially in terms of monitoring and evaluation of common projects, or the enhancement of joint coordination of calls as an instrument of EU-India S&T partnership. Moreover, within Horizon 2020, the EU and Member States leading institutions providing scientific research should create joint funding schemes for S&T cooperation with India. The EU also should review its various programmes sponsoring enterprise, sector and regional development, and selectively encourage some of its beneficiaries (large firms, clusters, etc.) to pool together and explore new S&T ventures together with Indian partners. Special focus should be put on SME clusters and promote matching between European SME clusters and Indian SME clusters in selected areas.

Finally, there is a need to overcome asymmetric interests by integration of European and Indian private sector interests into the EU-India policy in S&T (trade, outsourcing, FDI, technology transfers, IPRs and licensing). Asymmetrical interests are a major obstacle to the conclusion of the EU-India FTA, EU-India scientific and business interests in the pharmaceutical sector and IPR.

4.4 Review of S&T cooperation Final Report between the European Union and the Federative Republic of Brazil (2012, European Commission)

Key words: Brazil, European Union, S&T agreement, alignment, reciprocity, review, recommendations

Summary:

This report evaluates the EU-Brazil S&T cooperation between 2007 and 2011 in the context of the renewal of the Agreement for Scientific and Technological Cooperation between the European Community and Brazil. Its contents and conclusions represent results of review of available documentation, a series of interviews held with stakeholders from Brazil, selected Member States, and the European Commission as well as the personal opinion of the authors, based on their own experience.

Main findings:

The report reviews and assesses particular aspects of the EU-Brazil science and technology cooperation, providing simultaneously a number of recommendations. As to the thematic orientation and focus, the cooperative activities could be oriented to a few strategic fields, where both sides have expressive political interest and a clear mutual understanding on what can be achieved and which socio-economic impacts can be expected. At the same time, the recommended scaling up of the significance of the agreement should be reflected by a higher dimension of financial resources attributed to it. This way Europe and Brazil would give its partnership in S&T a greater relevance, more appropriate to their potentials. This thematic cooperation should be fostered by implementing sub-agreements under the Agreement, to secure continuity and sustainability of the cooperative projects.

In terms of participation of relevant stakeholders and the private sector, it is necessary to incorporate the full potential of relevant stakeholders on both sides in the planning and subsequent implementation process, especially with the view on innovation.

In order to improve reporting on the level of effectiveness, it would be important to develop a systematic reporting in relation to the status, results, and impact of the activities performed, as well as a follow up of the activities proposed in previous meetings and a degree of implementation efficiency. As the report assumes cooperative activities will predominantly happen in Brazil, a mutually agreed and supported management mechanism which serves for continuity in the execution and the timeliness of all activities could be established. This coordination mechanism could serve to possible alignment of the Member States activities. At the same time, reciprocity at all levels of the agreement should be a basic principle of the future cooperative activities.

As to alignment and coherence with activities of the Member States, under the subsidiary principle, and given the existing parallelism of cooperative agreements on EU and MS level with Brazil, it seems necessary to coordinate activities to give European-Brazilian cooperation in S&T a stronger scope and impact on a global level. An inventory of ongoing programmes and activities with Brazil at the MS and EU level might serve as a basis for future strategic planning. Commission services could lead the effort of better alignment and coherence, up to coordination between the EU and MS programmes, for example on the SFIC platform.

4.5 Review of the S&T Cooperation Agreement between the European Union and Russia (2013, European Commission)

Key words: Russia, European Union, S&T agreement, cooperation, review, assessment, recommendations

Summary:

This report provides a review of the EU-Russia cooperation in the field of research and development by assessing in particular the implementation and impact of the S&T Cooperation Agreement concluded between the European Community and the Russian Federation. The report presents various platforms and instruments being used for implementation of the agreement (e.g. the Sev-

enth Framework Programme, EU-Russia coordinated calls), focusing also on the bilateral level of cooperation between Member States and Russia. Major findings and recommendation are included in the report, covering also possible obstacles and barriers to effective cooperation.

Main findings:

The review finds the science and technology cooperation as an example of successful and promising areas in EU-Russia relations, giving positive signals to the general EU-Russia relationship as well. The S&T Agreement is considered as important and balanced legal basis for the cooperation and a flexible framework for developing mutual cooperation. Assessing the state of cooperation, Russia is positively regarded as partner for S&T cooperation due to compatibility of thematic priorities which contributed to high number of participants in the EU Framework Programmes.

The review also reflects a number of administrative obstacles and barriers, which in some cases have hindered efficient cooperation. In the future, they may prevent a faster enlargement and further improvement of EU-Russia S&T cooperation. Hence, the following are recommended the S&T programs of the partners should continue supporting the “general openness” principle as a prerequisite for successful cooperation. A strategic EU-Russia Task Force should be established to support the work of the Joint EU-Russia Committee on cooperation in the field of science, technology and innovation, and to monitor the implementation of its recommendations and decisions.

Coordinated calls for projects and programs are considered to be suitable instrument, favoured also by the Russian side. As to recommendations regarding organizational and technical improvements, harmonization of the administrative procedures of S&T programmes and calls, including the processes of expert evaluation (common acceptance of projects’ selection procedures and criteria) is proposed. Other recommendations include e.g. establishment of representations of Russian science organizations such as the Russian Academy of Sciences in EU Member States, visa facilitation for scientific and academic personnel between EU Member States and Russia, or facilitation of customs procedure for the exchange of project results, including biological samples, materials and equipment for scientific purposes.

Appendix B: Summary: Findings from the Toolbox Survey

Introduction and abstract

The Strategic Forum for International Science and Technology Cooperation (SFIC) is an advisory group to the Council and the European Commission (EC) in the field of international cooperation in science and technology (S&T). In 2015, SFIC established a working group to develop a toolbox for international cooperation. According to the mandate for the working group, it is to develop a practical overview for the Member States, Associated Countries and the European Commission in their implementation of international S&T agreements and cooperation activities at bilateral and multilateral level.

In order to do so, the working group developed a questionnaire to gather information on relevant instruments for international cooperation from member states and countries associated to Horizon 2020 (MS/AC). 19 out of 43 MS/AC participated in the survey and provided information on their science, technology and innovation (STI) cooperation activities at bilateral and multilateral level.

The survey's findings reveal that most MS/AC have ongoing cooperation relations in STI with China, India, and the USA, irrespective of the instrument. Thematically, MS/AC on average focus their cooperation relations with third countries on the areas of engineering and technology and natural sciences.

International cooperation activities have increased recently. Different funding schemes (e.g. bilateral calls, multilateral calls) and joint institutions with third countries clearly reflect this general increase. International cooperation is highly bilateral, as bilateral calls are compared to others the most common instrument in international STI cooperation. In 2015, bilateral calls were, for instance, used by more than twice as many MS/AC as multilateral calls.

Participation

The questionnaire was sent to 43 MS/AC in June 2016. In total, 19 MS/AC have responded to the questionnaire. 15 out of the 19 responding countries are MS: AT, BE (BE-F, BE-FI, BE-B), BG, CY, CZ, DE, DK, ES, FI, FR, LT, MT, PT, RO, SE; and 4 out of them are AC: BA, CH, IS, and NO.

Strategy for international cooperation

About half of the responding MS/AC (AT, CH, CZ, DE, ES, FI, FR, IS, LT, SE) already have governmental strategies, guidelines or roadmaps for international STI cooperation or are in the process of formulating one. The majority of those internationalization strategies, guidelines and roadmaps follow a thematic approach. A few of the internationalization strategies also combine a thematic approach with a regional focus.

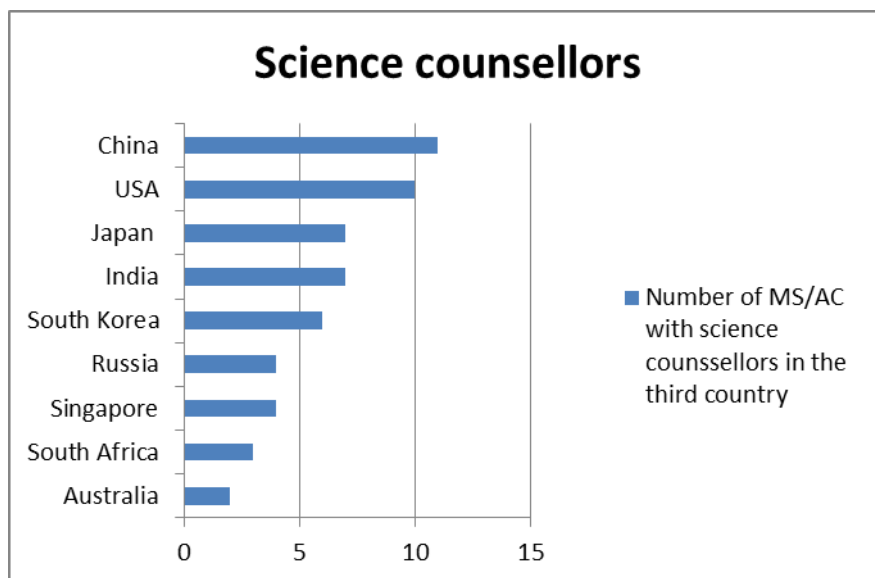
Moreover, most of the responding MS/AC (those with an internationalization strategy and those without) have strategies dealing with internationalization in one way or another. This

includes strategies with a specific regional or thematic focus (e.g. science diplomacy) and strategies by other national stakeholders than the government. The institutions that usually publish such strategies range from science foundations, academies, research performing organizations (RPOs), research funding organizations to higher education institutions.

Other responding MS/AC (BE, BG, CY, DK, MT) referred to bilateral agreements that they have instead of or in addition to internationalization strategies and that mainly build the basis of their internationalization activities.

Science counsellors

The majority of responding MS/AC (AT, BE, CH, CZ, DE, DK, ES, FI, FR, IS, LT, NO, SE) use science counsellors in their third country cooperation. China and the USA are those third countries, where most responding MS/AC have science counsellors. In China, 11 out of 19 responding MS/AC have science counsellors (AT, BE, CH, DE, DK, ES, FI, FR, LT, NO, SE). In the USA, this figure is 10 out of 19 (AT, BE, CH, DE, DK, ES, FI, FR, NO, SE). The below chart shows those third countries, where most MS/AC have science counsellors as well as the number of MS/AC per third country.



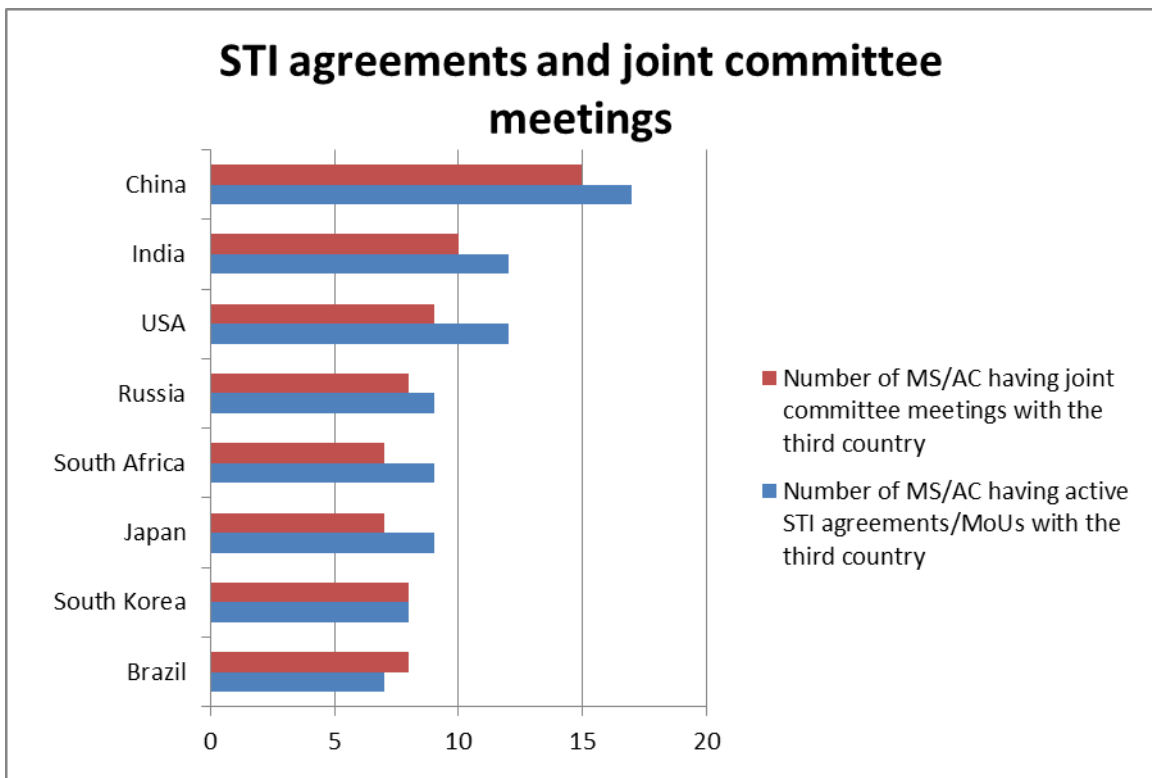
Different criteria determine in which third countries science counsellors are located. The three criteria that most MS/AC referred to are strategic objectives, importance of the third country in research and development (R&D), and cooperation agreements/activities.

The science counsellors of the responding MS/AC usually have similar tasks. In 12 of 19 responding MS/AC, science counsellors support bilateral cooperation in science and technology (S&T) and identify new cooperation opportunities. 5 of 19 responding MS/AC have science counsellors in third countries in order to get reports on topics and developments in science and research. The institutions that the science counsellors inform about ongoing developments and activities in the third country and that they report to are diverse. They are ranging

from ministries (of research, science, education, foreign affairs, and economy) to local embassies and government agencies.

STI agreements and joint committee meetings

All 19 responding MS/AC have bilateral STI agreements or Memorandums of Understanding (MoUs) with one or several third countries and most of them also conduct regular joint committee meetings with them. The third countries, with which most of the responding MS/AC have an active STI agreement and regular joint committee meetings, are China, India, USA, Russia, and South Africa. With China, for instance, 17 out of 19 responding MS/AC have an active STI agreement and 15 out of 19 responding MS/AC conduct regular joint committee meetings. The chart below illustrates the number of MS/AC having joint committee meetings and active STI agreements with the third countries.



In the bilateral STI agreements/MoUs and joint committee meetings, MS/AC thematically prioritize the areas of engineering and technology and natural sciences. This becomes particularly apparent in MS/AC’s cooperation relations with China, India and the USA.

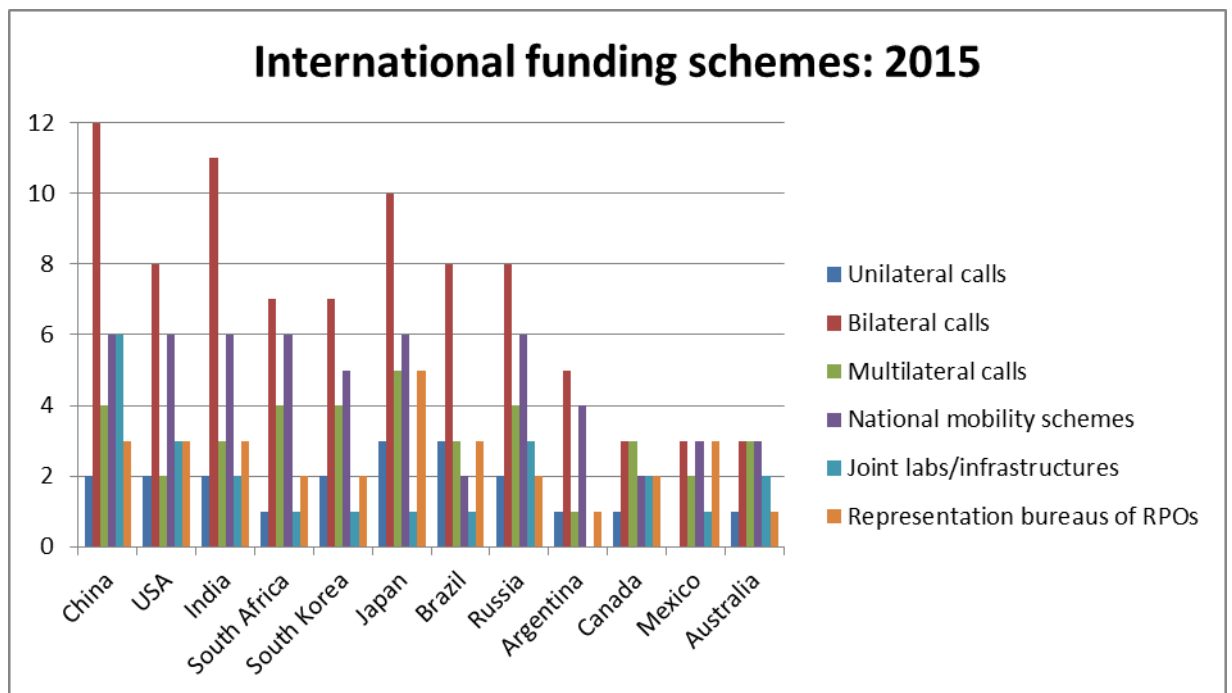
National stakeholders involved in third country cooperation in S&T (amongst others the implementation of bilateral STI agreements and/or in joint committee meetings), are usually numerous and diverse. In most MS/AC are a multitude of stakeholders involved, such as ministries, universities, academies, RPOs, and research funding organizations.

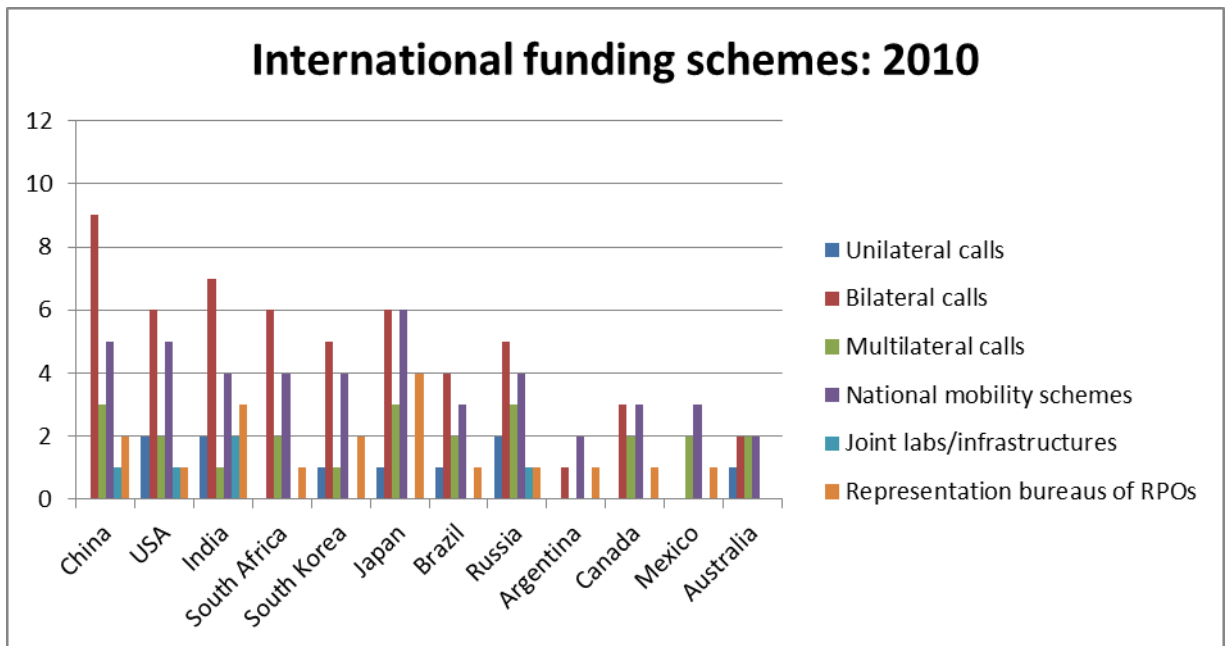
International funding schemes

The funding schemes and joint institutions that are part of this evaluation are unilateral, bilateral and multilateral calls, national mobility schemes, joint labs and infrastructures, and representation bureaus of RPOs. The schemes are funded through the ministry or an agency on behalf of the ministry.

The charts below display those third countries that most MS/AC indicated to have a funding scheme or joint institution with in 2015 and 2010 and the number of MS/AC per funding scheme and joint institution. A comparison of the two charts demonstrates that the number of used funding schemes and joint institutions generally increased between 2010 and 2015. In 2015, MS/AC published twice as many bilateral and multilateral calls as in 2010.

Both, in 2015 and 2010, bilateral calls are the most common instrument. In 2015, they were on average used by more than twice as many MS/AC as multilateral calls. National mobility schemes are the second most common scheme with the majority of illustrated third countries. Representation bureaus of RPOs are on average more popular than joint labs and infrastructures; they are used by almost twice as many MS/AC as joint labs and infrastructures. Whereas joint labs and infrastructures were only rarely used in 2010, they were part of the cooperation activities of some MS/AC five years later.





International research marketing

With regards to activities in the context of international research marketing activities, two tools are used by a great majority of responding MS/AC. 15 out of 19 responding MS/AC use websites as marketing tools and 13 out of 19 organize events. Social media is used by half of the responding states. Other instruments, such as fairs, press releases, marketing material, lectures at foreign universities, and media/public relations are used by less than half of the responding MS/AC.

Success factors and risks

Lastly, the responding MS/AC provided insights with regards to success factors and risks in international STI cooperation. The following measures, activities, and instruments are according to the responding MS/AC particularly successful:

- trustful relationships/presence in the country,
- (joint) calls/funding,
- bilateral and multilateral cooperation,
- the EU's Research Framework Programme,
- commitment of partners/administrative facilitation.

The responding MS/AC observe the following risks and obstacles in their third country cooperation:

- political situation/culture,
- lack of funds/personnel,
- different framework conditions (IPR, (funding) rules, visa requirements etc.),
- lack of industrial cooperation,
- missing impact/difficult to evaluate.

Appendix C: Summary report from the stakeholder workshop on SFIC Toolbox (20 September 2016)

The aim of the workshop was to identify and share experiences of different tools/instruments for international collaboration with third countries and discuss experiences of best practice.

A total of 23 participants took place in the workshop. There were representatives from the following organizations, EDCTP, JPI Urban Europe, JPI Oceans, EUREKA¹, JP Concentrated Solar Power (CSP), JP Carbon Capture and Storage (CCS). The following SFIC delegations also participated in the workshop SE, DE, NO, CZ, FI, ES, FR, BE (Flemish) and EC.

COST did not take part in the workshop itself but contributed with input through a bilateral meeting after the workshop.

The first part of the meeting consisted of a presentation and status of the work carried out by the working group on the toolbox and a short overview of the survey questionnaire on bilateral cooperation sent to all SFIC delegations. These presentations were given by Bjorn T. Kjellemo from the Research Council of Norway respectively Jana Schnieders from the German Federal Ministry of Education and Research and Sarah Kraus from DLR.

After the presentations the workshop then moved on into a more interactive part. The participants were divided into four groups for the sake of easier discussions around the questions. All groups got to discuss all questions.

The questions for discussion were the following:

- What are your guiding principles when engaging in third country cooperation, e.g. by country, region or thematic area? – Rapporteur Olivier Steffen (French Ministry for Higher Education and Research)
- What kind of collaborations with third countries have been successful and why? – Rapporteur Jan-Arne Eilertsen (The Research Council of Norway)
- What tools/instruments do you use (including e.g. mobility, infrastructures etc)? - Rapporteur Tereza Čížková (Czech Ministry of Education, Youth and Sports)
- How do you follow-up and monitor the impact of your international cooperation?- Rapporteur Christian Hansen (Vinnova)

Summary of the discussions

What are your guiding principles when engaging in third country cooperation, e.g. by country, region or thematic area?

National authorities

Almost all had overarching strategy but left a lot of room for thematic bottom-up contributions, which are analysed in order to provide coherent framework conditions. Challenge is often to integrate the prospective dimension so that the strategy is not just an inventory of the existing.

Different countries use different approaches Germany uses a dual approach having both thematic priorities combined with regional strategic focus points. The guiding principles are defined in the Strategy of the Federal Government for the Internationalization of Science and Research "Strengthening Germany's Role in the Global Knowledge Society" (2008).

France international cooperation is subject to a dedicated strategic paper to be published in 2017. It will be revised every 2 years. It is designed as an umbrella for the bottom-up cooperation with the various S&T partners around the world. Sweden works mainly bottom-up although with a country framework.

Spain has a thematic approach as main priority based on an analysis of the bottom-up approaches. Geographical / regional approach is rather based on common interests in a given field, or need for expertise in an area. Belgium has a multi-layered approach based on their national set-up where the federal level only is responsible for some sectors (development aid, scientific excellence (bottom-up); diplomatic criteria): rather fragmented. The federal level is only active in some sectors (space, development aid). In all cases: combination of thematic and geographical approaches. What changes is the priority.

- Low TRL tends to favour a thematic approach, high TRL rather a geographical approach.
- Additional criterion of opportunity: willingness to cooperate? Money to bring to the table?

European Energy Research Alliance

Mix of thematic approach (quality) and pragmatic approach based on funding possibilities (third countries that could contribute with their own budget). There is however a clear need to strengthen cooperation within Europe before going beyond to third countries. International cooperation is among the key indicators.

COST

COST is a bottom up networking instrument. It means that it does not have any country/geographical/ thematic prerequisite for the COST Actions it funds, but require scientific excellence. International cooperation is built on the needs and in the context of the scientific area of the COST Action.

General

International cooperation considered a source of opportunity (even at high TRL). In-

interesting process going on in Eureka, with a number of third countries playing the role of regional ambassador (South Africa, South Korea and Canada).

JPI Urban Europe uses its Strategic Research and Innovation Agenda as the main reference but that it is designed so as to allow us to attune to third country thematic priorities in urban transitions. (Illustrated for instance by China ongoing discussions and collaboration understandings as well as the Belmont Forum collaboration around the Food-Energy-Water Nexus in urban sustainable development).

What kind of collaborations with third countries have been successful and why?

National authorities

Germany pointed at the German experiences with "International years of science" with partner countries, such as China, Russia, South Africa, and Turkey. This initiative gives high visibility for the relations to one country. The outcomes are specific events, cooperation at project level and long lasting cooperation. There is a focus on mutual trust, excellence in science and research marketing.

Sweden has good experiences with involving large multinational companies in building relations to countries like Brazil and South Africa in important policy areas. The aim is to build mutual trade and business relations.

Norway has implemented an international partnership programme to support long term strategic relationships between research institutions in Norway and institutions in eight countries outside of Europe. There is an annual call. The programme is funding networking activities, exchange of students and staff etc.

JP: EDCTP, Urban Europe, Ocean

The JPI Oceans has developed a toolkit for the planning and implementation of joint actions. This toolkit can be used to aid decisions on the design, selection and management of joint actions. It contains several good examples and useful templates.

<http://www.jpi-oceans.eu/toolkit>

JPI Oceans have good experience from cooperation with USA/Canada/Brazil/South Africa based on national funding only. If there is no additional funding available, national priorities have to be aligned and then the partners join with in kind funding.

The EDCTP grants as an instrument designed to reduce the social and economic burden of poverty-related diseases in developing countries, in particular sub-Saharan Africa. Projects should have at least two European and one African partner. It is crucial that all partners are equal.

EUREKA

The EUREKA collaboration with South-Africa, Canada and South Korea is considered very successful. The three countries are funding their own activities. This model could also

include other countries. EUREKA could play a larger role, since all projects are international, and in principal anyone can participate if there is funding available.

COST

As the collaboration with third countries happen on the basis of ascertained mutual benefit, the individual researchers find their partners from third countries (or vice versa) based on their needs, the international cooperation aspects of the COST Actions are understood as successful as it answers the needs of the users.

General

Some elements for a successful collaboration with third countries were mentioned:

- Having available funding going both ways.
- Using mobility schemes is good to build relations.
- Having thematic priorities.
- Having good will and trust.
- Agree on clear evaluation criteria.

Other elements that contribute to a good research collaboration is for instance to have national strategies towards third countries aligned to EU strategies. Also, using already established frameworks such as JPIs and ERA-Nets.

One option that could be further developed is the possibility to give top-up funding for new or existing projects, if they include partners from third countries. The main funding sources are national or EU. Specific international funding will be small. From this perspective the idea of top-up funding for existing is an interesting option.

What tools/instruments do you use (including e.g. mobility, infrastructures etc)?

General

Organizations of various types define their principles for International cooperation with third countries by formulating and following strategies, concept papers or other documents. Selecting partner countries and appropriate tools might derive from priorities given by strategic documents as well as from the need to optimize funds.

For the purpose of identifying tools and instruments used for cooperation with third countries, it is primarily necessary to focus on partner institutions as such. A personalized approach is vital as there might be substantial differences among them, mainly in functioning, priorities or general approach toward cooperation in RDI and its development. As some institutions might favour a top-down approach with more coordinated priority settings and topic-defined research (and also using matching tools), the others choose rather a bottom-up principle.

As to the specific tools and instruments that were mentioned are:

- unilateral or bilateral call
- mobility programs, incl. those promoting early-stage cooperation
- multilateral cooperation (often on various European platforms)
- joint/targeted call
- “lead agency” model applied to above mentioned forms
- H2020, MSCA, Destination Europe, other EU initiatives, programs etc.
- infrastructures cooperation support, research networks support
- universities cooperation
- science counsellors and diplomats
- networking activities

Networking activities and their promotion were identified as substantial for development of RDI cooperation with third countries and their various forms were discussed e.g. thematic workshops and conferences, match-making events, using existing platforms for addressing stakeholders and partners or internet and social media tools.

Recommendations and challenges in regard to RDI cooperation with third countries and using particular tools were also discussed during the workshop. Bringing together actors from wide range of institutions such as universities, research institutions and private sector is important basis for prospective cooperation. Using already existing tools for cooperation combined with promoting European approach instead of a national one is also advisable. As to the most imminent challenges for fruitful RDI cooperation with third countries, administrative and financial aspects or differences among various third countries partners were mentioned. The necessity of attracting foreign companies and enterprises belongs to the most important challenges as well.

How do you follow-up and monitor the impact of your international cooperation?

National authorities

Most collaborations are based on an official agreement with another country. These are often established for political reasons, just as much as for specific scientific or business reasons. Agencies, councils etc often have some freedom to execute the collaboration based on their own choices, but are often expected to follow the intentions of the government agreements. In some Member States, a Memorandum of Understanding (MoU) is established following a strategic agenda or strategy, but are rarely followed up in a structured way. Agencies or councils in some countries are pretty strictly monitored with a regular, reoccurring, revision of goals and achievements. Evaluations are often performed on thematic base rather than country by country. Some countries are working on national processes to develop indicators to measure the impact of internationalization in S&T.

National funding organisations in some MS follow individual projects up to a larger extent than programmes or collaboration frameworks. The lack of follow-up and monitoring on at programme level is also due to the fact that the collaboration is often seen as important no matter the outcomes of certain activities.

The difficulty using indicators to follow-up bilateral agreements was also mentioned. There is a risk that indicators measure something else than was intended by the agreement.

JP: EDCTP, Urban Europe, Ocean

1. Some of the organisations have a rather strict requirement from its member states to show impact through funded projects. For the platforms partly funded by Horizon 2020, international collaboration is part of expected activities, but it is rather up to the platform how to organise such collaborations. Impacts from such international collaboration are mainly seen on long term basis, e.g. tackling joint challenges over time.

So far Horizon-2020 related platforms have mainly followed up by providing figures like number of people involved. One of the platforms performs follow-up through a standardised method (Evaluation and Results Based Management). However, most platforms seem still to be struggling with the definition of how to monitor impact from third country collaborations.

As with bilateral collaborations on national level, follow-up is mainly consist of joint meetings with the collaborating partners where alignment to policy, funding schemes and project implementation is evaluated in general terms. For some platforms, some pressure exist since outside bodies (e.g. G7) expects or requires special follow-up from the activities of the platform.

EUREKA

EUREKA has a rather rigid system to monitor performance and impact. The indicators covers e.g. who receives funding, number of jobs created, and impact on economic growth.

The network also has associated non-European member countries, which are evaluated every third year in sense of participation, funding etc. The platform also provide national impact analysis for their members.

Requirements to follow up on specific measures, e.g. Mobility of researchers and Gender also exist.

General

Some general aspects regarding follow-up and monitor the impact of international cooperation were:

- The importance of differentiating between long and short term impact

of programmes (and projects).

- A set of indicators and measurement system can provide good feedback, but it is still difficult to monitor and evaluate everything of importance.
- A “learning mechanism” is welcomed (connected to the suggestion above).

Finally it was suggested that SFIC could initiate a process to develop common requirements on agreements for international collaboration, for instance a model on how to evaluate collaboration.