

ERAC-SFIC 1359/19

**NOTE**

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From: SFIC Secretariat  
To: SFIC delegations

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Subject: Final report of the SFIC Benchmarking Working Group on the  
Benchmarking exercise on strategies and roadmaps for international  
cooperation in R&I

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Delegations will find attached the final report of the SFIC Benchmarking Working Group on the Benchmarking exercise on strategies and roadmaps for international cooperation in R&I, as adopted at the SFIC plenary on 18 December 2019.

SFIC

Strategic Forum for International S&T Cooperation

BENCHMARKING EXERCISE ON STRATEGIES  
AND ROADMAPS FOR INTERNATIONAL  
COOPERATION IN R&I

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*Final Report*

*December 2019*

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## 1. Foreword

This report has been drafted by an ad hoc Working Group<sup>1</sup> of the Strategic Forum for S&T Cooperation (SFIC). According to the mandate<sup>2</sup> of the Benchmarking Working Group, the analysis provided is based on data collected between the second semester of 2018 and the first semester of 2019 on two different strands:

- The collection of available National Action Plans (NAPs) and the comparison of their chapters for ERA priority 6 with regard to different predefined categories;
- The design, implementation and analysis of a survey sent to all SFIC delegations on frameworks, structures and activities of EU Member States and Horizon 2020 Associated Countries in their S&T cooperation with third countries.

The data collected formed the basis of the information used to provide the deliverables identified in the mandate. They are presented in the following way:

- The present report with its two main parts;
- The outcome of the survey itself;
- The main findings of the data analysis identifying key elements in support of ERA priority 6 as well as elements for a draft SFIC opinion on international strategies in R&I.

The work of the Benchmarking Working Group has been integrated into the overall missions of SFIC and its activities over recent years. As a dedicated configuration of the ERAC, SFIC's task is to provide strategic advice on international S&T cooperation within the context of the European Research Area (ERA), especially in the context of ERA priority 6 (international cooperation). The ERA Roadmap 2015-2020 identified the development and implementation of joint strategic approaches and actions for international STI cooperation as a top action priority for international cooperation on the basis of Member States' national priorities.<sup>3</sup>

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<sup>1</sup> The following SFIC delegations were represented in the Benchmarking Working Group : DE, DK, ES, FI, FR, HU, NO, UK, COM. The present report was drafted by Jonas Abs, Kristof Bertram, Ágota David, Armela Dino, Axel Leisenberg and Olivier Steffen.

<sup>2</sup> Mandate of the SFIC ad hoc Working Group for a benchmarking exercise on strategies and roadmaps for international cooperation in R&I (hereafter *Benchmarking Working Group*) of 28 September 2018, doc. *ERAC-SFIC 1356/18*.

<sup>3</sup> ERAC Opinion on the European Research Area Roadmap 2015-2020 of 20 April 2015, doc. *ERAC 1208/15*

The establishment of the Benchmarking Working Group is the expression of SFIC's ambition to develop a more coherent and integrated approach among Member States, Associated Countries and the European Commission. The results of the Working Group's work are to be considered as a contribution towards this objective, as they provide an analysis of relevant data of countries' strategic approaches and their actual activities in R&I cooperation with third countries. Where appropriate, the Benchmarking Working Group integrated the results of the SFIC ad hoc Working Group on a Toolbox for International cooperation whose final report<sup>4</sup> was adopted by the SFIC plenary in 2018.

The group has carried out its work in the spirit of the Sustainable Development Goals (SDGs). The collaboration with scientific teams and access to research infrastructures worldwide is crucial in tackling global challenges as well as in strengthening the competitiveness of the European research and innovation landscape and the attractiveness of the European Union as a major R&I player.

The present report is structured in the following way: the **first part** is stock taking and comparing the chapter related to ERA priority 6 of the National Action Plans (NAPs) of EU Member States and Horizon 2020 Associated Countries with the main objective of mapping out the different strategic approaches of those countries to international cooperation in R&I. The **second part** provides an analysis of the outcomes of the survey on frameworks, structures and activities in bilateral S&T cooperation with third countries conducted by the Benchmarking Working Group. The **third part** summarises the main findings of the work of the Benchmarking Working Group while identifying key elements in support of ERA priority 6.

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<sup>4</sup> SFIC (2018): Overview of Tools for International Research Cooperation in Science and Technology Matters. Final Report (December 2018).

# PART I. Strategic approaches to S&T cooperation with third countries: comparing National Action Plans (ERA priority 6)

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## 2. Objectives of the NAP comparison

In the context of the globalisation of knowledge flows and value chains, policy makers at European level, in EU Member States and Horizon 2020 Associated Countries have identified international cooperation in research and innovation as strategically important in maintaining and developing the global competitiveness of their R&I systems. They develop different approaches and strategies on international cooperation in research and innovation, based on a wide range of objectives such as scientific excellence, science diplomacy, the development of the European Research Area (ERA), and responding to global challenges.<sup>5</sup>

In order to develop appropriate joint strategic approaches and actions for international R&I cooperation, and according to the mandate of the SFIC Benchmarking Working Group, there is a need to map out and compare those national initiatives, frameworks and roadmaps of Member States and Associated Countries for R&I cooperation with third countries.

Although not every country has developed a specific national strategy for R&I cooperation with third countries, most of them have published 'National Action Plans' (NAPs). The development of NAPs responds to a particular dynamic laid down in the EU treaties, namely the achievement of '*a European research area in which researchers, scientific knowledge and technology circulate freely*'<sup>6</sup> with the aim of strengthening the EU's scientific and technological basis. In 2012, international cooperation in research and innovation was integrated as a 6<sup>th</sup> priority into the structure of the European Research Area.<sup>7</sup> According to the Council Conclusions of 29 May 2015, Member States were invited to start implementing several top

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<sup>5</sup> Cf. Klaus Schuch *et al.* (2019): MLE on National Strategies and Roadmaps for International Cooperation in R&I: National Strategies and Roadmaps for International Cooperation in R&I. Thematic report No 1: Design and Development of National Strategies.

<sup>6</sup> Article 179 §1 of the Treaty on the Functioning of the European Union (TFEU)

<sup>7</sup> Commission Communication of 15 September 2012 'Enhancing and focusing EU international cooperation in research and innovation: A strategic approach', doc. COM(2012)497.

action priorities through appropriate actions in their action plans or strategies to be developed by 2016 (known as ‘National Action Plans’).<sup>8</sup> In this respect, the first part of the benchmarking exercise focuses on the objectives and actions identified in the field of international cooperation on research and innovation within the NAPs.

As regards this particular dynamic in the EU context, the definition of objectives and actions relating to the ‘international cooperation’ part of NAPs is, in most cases, independent of the national strategies on international cooperation in research and innovation that a number of countries developed. Nevertheless, establishing the NAPs for ERA priority 6 obviously forms part of the national considerations of a country’s approach to international cooperation in research and innovation.

In this context, the NAPs can be considered as part of the benchmarking exercise, as nearly all EU Member States and Horizon 2020 Associated Countries developed them within the same framework conditions and in the same period of time. The objectives and actions of ERA priority 6 within the NAPs are mapped out and compared in the following chapters and have been placed in different categories. Every comparison by category is first introduced by explaining the rationale of the categories, before the data is analysed.

### **3. Comparison of National Action Plans (NAPs)**

The comparison encompasses a total number of 30 National Action Plans, of which 27 are from EU Member States (the four parts of the NAP of Belgium’s communities and federal level are counted separately) and three from Associates Countries.

#### **3.1. Preamble**

- **Rationale**

The preambles to the NAPs’ internationalisation chapters provide an overview of the countries’ internationalisation activities. They provide an introduction to the general considerations as regards the procedure applied for developing objectives and actions.

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<sup>8</sup> Council conclusions on the European Research Area Roadmap 2015-2020, doc. CC 9351/15.

- **Comparison of the NAPs**

This analysis compares the different introductions by reference to three main criteria:

**1. *Background/National policy context***

The NAPs are often part of a global strategic approach; some are part of the country's national R&I strategies. The internationalisation of the ERA is seen as beneficial in raising the excellence of European research.<sup>9</sup>

Some countries also highlight the importance of international science diplomacy (*e.g.* ES) as a channel of communication and a means of fostering policy objectives.

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<sup>9</sup> It should be noted that some countries referred to their cooperation with European partners within the European framework programmes for research and innovation and not with international partners abroad. As this was not part of the exercise, this feedback has been discarded.

## 2. Aims and principles

Many countries make no reference to the aims they follow in their international R&I cooperation in the context of ERA priority 6. Those that do, cite the following objectives:

### Science-related aims

- Promote international cooperation in the R&D sector, both at national and EU level
- Establish scientific leadership and excellence
- Maintain current status or reinforce their global influence (i.e. larger countries)
- Respond to cooperation requests in a targeted manner and associating all relevant national stakeholders
- Increase visibility of national progress, increase political and economic relevance, break isolation
- Increase the ERA's appeal for talented scientists and investors from around the world

### Economy-related aims

- Seize the chances of globalisation regarding job creation and economic growth
- Facilitate access to emerging markets

### Society-related aims

- Respond to major societal challenges

Certain international research and development cooperation principles are also mentioned, such as reciprocity of access to funding and markets, equality of treatment, common welfare and the protection of intellectual property.

## 3. Tasks

Despite the very general character of the introductions, they include many details on how to achieve the goals of ERA priority 6. The following tasks are cited:

#### Analysis and strategy

- Identify needs and priorities
- Rank action points for cooperation
- Set up a strategic agenda or roadmap for R&I with a strong pillar for internationalisation; develop an export strategy and work further on bilateral cooperation agreements
- Develop toolkits for complementary cooperation instruments

#### Institutions

- Set up an international coordination body for research funding
- Appoint a commission of inquiry to examine how internationalisation can be increased at higher education institutions

#### Operational level

- Create communities with researchers who speak the same language abroad
- Develop bilateral cooperation on multilateral initiatives
- Develop a common understanding and share common principles, e.g. for evaluation

#### Follow-Up

- Monitor progress

### 3.2. *Priorities and key elements in support of priority 6*

#### • **Rationale**

This category provides an overview of the whole strategic approach of a Member State or Associated Country to ERA priority 6, with references to the most important anticipated outcomes and the means to achieve them.

The priorities and key elements that Member States and Associated Countries are setting should also be reflected in other categories, such as focused thematic issues, instruments and indicators. The benchmarking of this specific category might therefore provide general aspects on the strategic approach of Member States and Associated Countries to international cooperation in research and innovation.

#### • **Comparison of the NAPs**

The way priorities are identified and addressed differ from one NAP to another. Some countries choose to define very precise objectives for the upcoming years, which make their priorities very clear (*e.g.* AT, CY, DE). In this respect, there are some overlaps with the analysis of the category ‘focused thematic issues...’, as it was not always possible to separate both aspects, according to the NAPs.

Different approaches to priority-setting by Member States and Associated Countries can be identified: some could be defined as strategic concepts, while others are more action-oriented approaches.

### ***1. Strategic concepts***

Strategic concepts aim to develop a proper strategy or action plan for international cooperation in research and innovation at the national level (*e.g.* AT), that goes beyond the ERA National Action Plan. Thus, the National Action Plan provides guidance on how to elaborate such a strategy that sometimes includes the identification of the needs and priorities of stakeholders.

For several Member States and Associated Countries, the internationalisation of higher education institutions also plays a role. This includes the incoming and outgoing mobility of students and researchers, which illustrates the synergies with the higher education sector, as higher education institutions are important research performing actors.

The quest for greater influence, notably via the concept of science diplomacy (*e.g.* ES), is another key point. In this respect, international cooperation in research and innovation is seen as a means with which to strengthen foreign policy, through economic or geopolitical priorities.

Better coordination of national stakeholders involved in activities abroad and/or better coordination of actions and actors (RPOs) in the host country is another priority and might be seen as a practical step towards a more strategic approach.

Some NAPs also identified the fostering of cooperation between academia and business as a priority and the boosting of participation of private actors in international cooperation.

## **2. Action-oriented approaches**

Action-oriented approaches aim to implement and promote an existing strategy and S&T agreements. Increased participation with third countries within the EU Framework programme for R&I is often cited in this respect, as well as related multilateral initiatives such as PRIMA, BlueMed or the participation in Joint Programming Initiatives (JPIs). For some countries, this approach also aims to foster international openness in terms of R&I (*e.g.* BG). Several countries take a geographical approach centred on regions (*e.g.* ES). In this case, the promotion of existing S&T agreements plays a particular role, as does access to research networks worldwide, especially where the objective is to better integrate the country's research and innovation system abroad.

Finally, it is possible to distinguish between NAPs that specifically aim to make an impact at national level and those that mention European objectives (such as the consolidation of the ERA, an enhanced role for the SFIC, *e.g.* DE, FR).

### **3.3. Geographical areas**

- **Rationale**

This section focuses on the priority geographical areas that the countries with NAPs have indicated in their NAPs under ERA priority 6.

The objective is to highlight the most commonly mentioned geographical areas or countries detailed by the respondents, and to carry out a brief analysis of the main characteristics related to the geographical areas, as set out in the NAPs. The information provided is heterogeneous in nature, which somewhat challenges the cross-cutting analysis in generic terms. The information in this section refers only to that included in the NAPs, and therefore those countries that have not explicitly mentioned any geographical areas in their NAPs will not appear below.

- **Comparison of the NAPs**

Most of the countries with NAPs focus their prospective international cooperation activities on countries or larger geographical zones. Some countries, such as BE (Brussels capital region), BE (Flemish Community), BG, CY and LT do not explicitly mention any areas.

International cooperation priorities in terms of geographical areas cover all geographical areas, with a special focus on certain countries as detailed below.

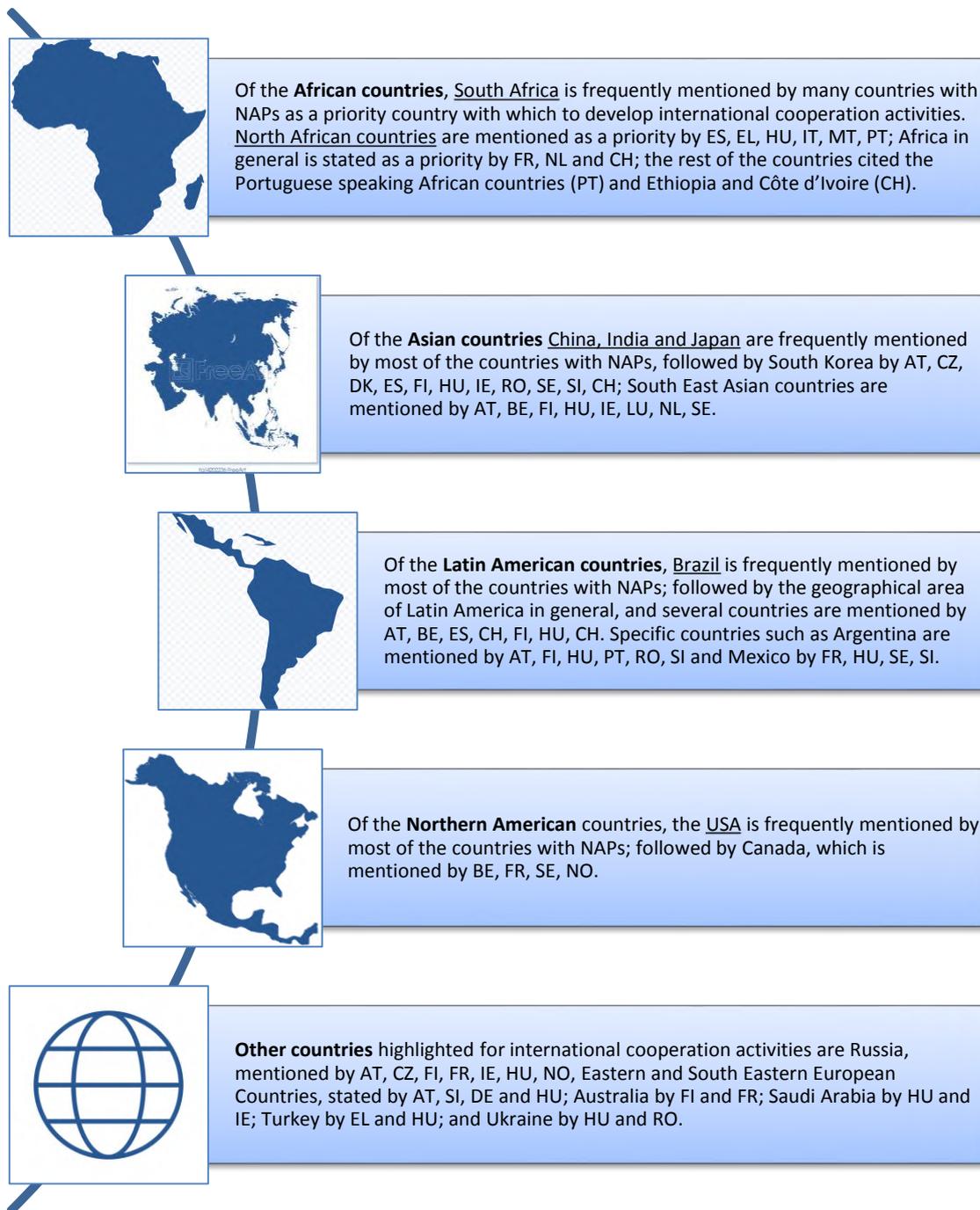


Figure 1. International cooperation priorities of countries with NAPs in terms of geographical areas

### 3.4. *Focused thematic issues*

- **Rationale**

The category 'focussed thematic issues' aims to provide an overview of the different fields of cooperation the NAPs are centred on. There is partial overlap with the category 'priority / key elements in support of priority 6' (although the latter has a more strategic focus), this is why the analysis of this synopsis only takes into account the actual thematic issues identified in the NAPs. Data on the strategic approach has been transferred to the synopsis 'priority / key elements in support of priority 6'.

- **Comparison of the NAPs**

In general terms, a couple of NAPs make reference to the bottom-up approach and do not identify thematic priorities. The latter fall under the responsibility of research performing organisations (*e.g.* BE (Flemish Community)), BE (Brussels capital region)) or are defined directly with the priority partner countries (NO). Others identify diversification of their economy, social well-being and sustainability goals as a general thematic focus (*e.g.* LU) or focus specifically on SMEs (*e.g.* SE). Student mobility (in line with the internationalisation of higher education institutions and taking into account the logic of the knowledge triangle) is another thematic priority (*e.g.* CH, FR).

Regarding the scientific, thematic focus for international cooperation in research and innovation, few NAPs explicitly mention specific fields of action:

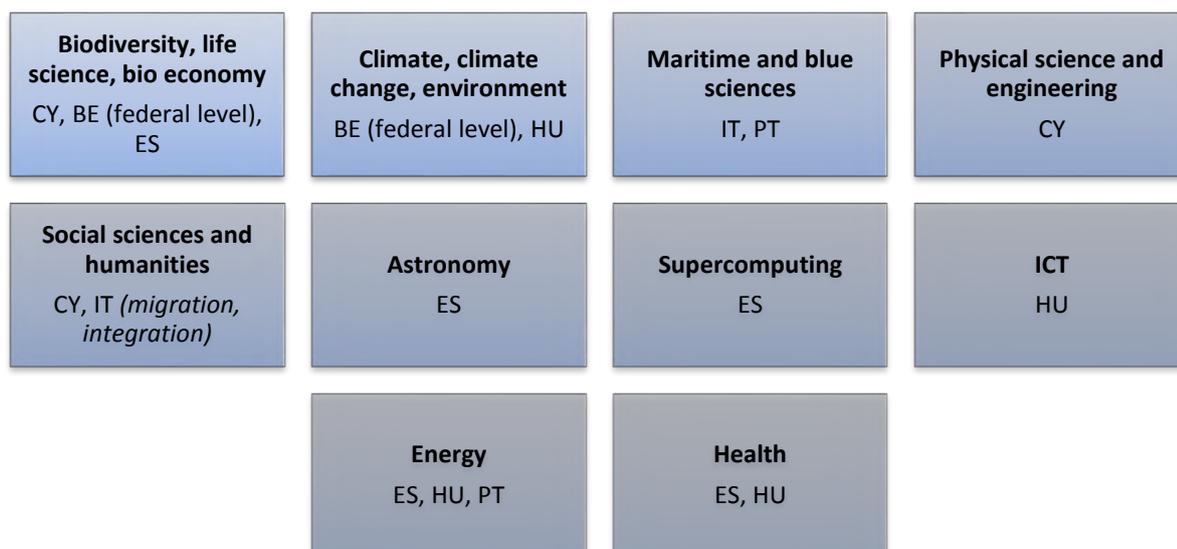


Figure 2. Scientific thematic focus of countries with NAPs for international cooperation in research and innovation

### 3.5. Instruments, tools, measures or supporting programmes

- **Rationale**

Member States and Associated Countries develop and use different portfolios of instruments and tools in order to implement the objectives of their NAPs. When analysing this part of the NAPs the aim was twofold:

1. to identify the most common instruments applied by the countries;
2. to give best practice examples and complementary ideas to further improve the portfolio of tools and instruments.

Such good examples can be thought-provoking and utilised in two ways when planning the next generation of ERA roadmaps. Countries can diversify their portfolio of instruments by:

1. simply adding existing instruments they had not previously mentioned in their NAP;
2. extending their existing set of instruments by adding new measures.

- **Comparison of the NAPs**

Generally speaking, various types of calls for proposals are still the most commonly used international cooperation instruments.<sup>10</sup> They were explicitly mentioned 17 times in the NAPs. In addition to bilateral schemes, the importance of multilateral cooperation is also increasing. Besides mobility funding, the financing of joint research projects is also gaining importance.

Many countries mention that their active participation in European or other international programmes and organisations is a good tool for international cooperation. Programmes like the European RDI framework programmes (including ERA-Nets or institutionalised partnerships like PRIMA), EUREKA, EUROSTARS, EURAXESS, COST, research infrastructures (e.g. SciColl, Global Science Forum, CERN), as well as international organisations and fora like the G7/G20, the Carnegie and the Belmont Forum, the OECD, UNESCO or the UN were listed by the countries.

As NAPs were meant to facilitate the implementation of the ERA, a number of countries focus on ERA-related tools and fora when describing their portfolio of instruments. BE, DE, FR and RO highlight SFIC as an ideal forum for supporting internationalisation; some other countries mention JPIs as coordinated initiatives to tackle global challenges.

The role of science diplomacy, science counsellors and dedicated centres/agencies for promoting science and technology abroad are also often highlighted in the NAPs. While some countries (*e.g.* DE, FR) have overarching, general instruments or refer to their national strategies as the main instruments for implementation (*e.g.* NO, BE (Wallonia)), some other countries name very concrete fields/priorities with very concrete partner countries (*e.g.* IE with UK, US and Northern Ireland, PT with the Community of Portuguese-speaking Countries and marine research). Other countries (NL, SE, CH) define themselves as knowledge nations. They aim to create an attractive environment for research at home in order to be able to invite and host excellent scientists. The UK takes a unique approach in that it uses science to provide development assistance.

A number of countries have provided us with a comprehensive set of instruments (*e.g.* AT, CH). The Austrian portfolio of instruments is presented here as a good example. Austria

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<sup>10</sup> In the case of the NAPs of LT and BA we could not identify concrete instruments of implementation, so our general remarks will not refer to these countries.

differentiates between bilateral instruments (bilateral treaties, agreements and calls for proposals), European instruments (Horizon 2020, EUREKA, EURAXESS) and external representation (RTI foreign offices and related portals). Then, they merge all three pillars by coordinating cooperation efforts between the RTI foreign offices of Member States and the EU, as well as by participating in joint awareness-raising measures.

### **3.6. Indicators**

- **Rationale**

The rationale of having an overarching strategy for international cooperation in research and innovation is based on a determination to take stock of the precise state of play, to analyse developments and to enable meaningful foresight activities.

All of these approaches require the ability to reliably measure both the input and the output of R&I activities. The purpose of indicators is to develop transparent, realistic and comparable means to collect this information.

- **Comparison of the NAPs**

Of the 30 countries that have taken part in this exercise, 20 have provided detailed feedback regarding the use of indicators.

Among the indicators that were cited most frequently are the following:

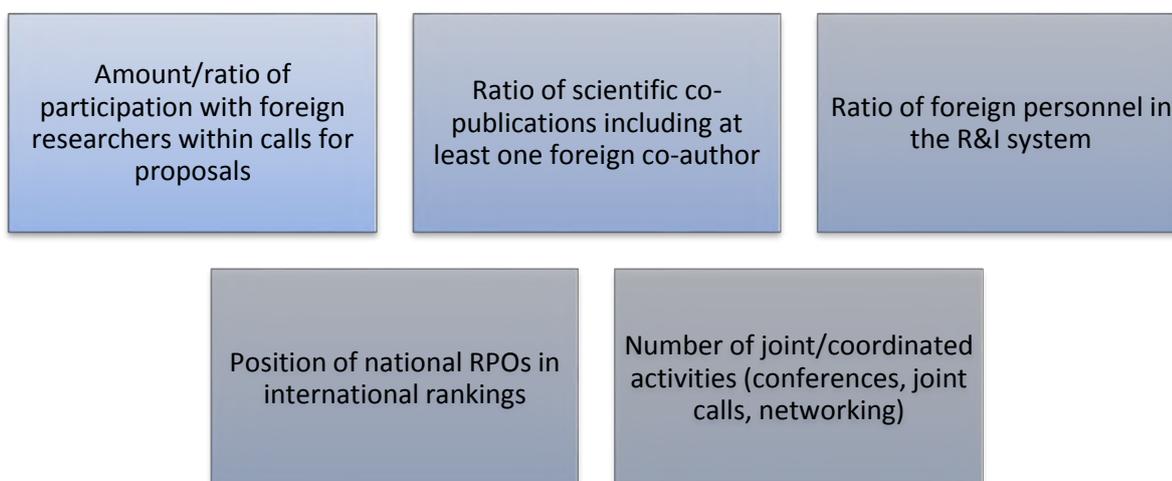


Figure 3. Indicators frequently cited in NAPs

Some countries (with the Horizon 2020 typology as an obvious reference) use a dedicated **measuring frame** for cooperation with the EU and the Associated Countries on one hand, and with the rest of the world on the other. This is not the case of all countries however, leaving some ambiguity as to what types of countries are covered by the general designation of ‘international cooperation’.

Several countries stressed the **importance of the comparability of data** (i.e. to use the same frame of reference, the same methodology and the same units in all evaluations). This is relevant within a single country, but much more so in a comparison between European countries. For instance, even though most countries include *co-publications* as a factor, the way that it is measured varies considerably: ratio or absolute number; public/private research; whether global output is taken into account when comparing different countries, etc.

International cooperation seems to be measured **first and foremost in a quantitative and not a qualitative** fashion: only one country mentioned ‘impact’ as a key factor in deciding whether to initiate, expand or adjust its international outreach. Overall, the approach seems largely input- rather than output-oriented.

Finally, while some respondents cited the importance of international co-patents, there was **relatively little information on indicators specifically focusing on innovation.**

### **3.7. Most important actors**

- **Rationale**

This section presents the most important stakeholders carrying out the international cooperation priorities mentioned in the NAPs of Member States and Associated Countries.

The objective of this section is to highlight those relevant actors able to enhance international cooperation activities from the ERA perspective.

- **Comparison of the NAPs**

Most of the countries have identified **multiple actors**, except for EE and NL, who have included a sole entity. The institutions mentioned by the countries range from federal government departments to universities, resulting in a wide range of heterogeneous stakeholders.

Most countries have identified their **ministry in charge of research and innovation** as the most important actor of the NAP. In addition to this, there are several countries that have included their **ministry of foreign affairs** (AT, BE, EL, ES, FR, NO, DK) as a key important stakeholder.

Excluding ministerial departments, the most relevant actors are:

- **Funding agencies and research funding organisations** for AT, BE, EE, ES, DK, FI, FR, HU, LU, MT, NL, RO, SE, SI, NO, DE and CH;
- **Research performing organisations and universities** for DK, FI, FR, DE and LU;
- **Entities dedicated to supporting business R&D and innovation** for DK, FI, FR, MT, SE, UK, NO, DE and CH;
- **Education institutions** for FI, FR and NO;

- **Other entities that promote international cooperation** ES-Global Spain; BE-WBI-AVEX as a multi-stakeholder forum for the Internationalisation of STI; UK-British Council.



Figure 4. Visual representation of frequency with which most important actors are mentioned in NAPs as regards international cooperation priorities

Moreover, three countries with NAPs specify the **European Commission** and **other countries** as relevant actors (IT, PT, DE). IE indicates that stakeholders from international cooperation countries are important.

#### 4. Conclusions of the comparison of the NAPs

- The analysis shows the large diversity of the examined **introductions** – from describing the background to detailing the tasks followed in international cooperation. In our opinion, those introductions which concretely describe the aims of the respective country can be seen as best practice examples. They best set the scene for the measures described in the following parts of the internationalisation chapters.
- However, **priority-setting and key elements** within the NAPs take different forms. The priorities identified are reflected and detailed within the other categories.
- Regarding **geographical areas of cooperation**, the European Research Area aims to develop international cooperation activities with all the regions of the world, mainly

focusing on those countries that show good potential for developing research and innovation and with which there are already existing collaborations.

- Regarding **thematic issues**, NAPs may have too broad a scope to refer to specific themes for most Member States and Associated Countries, which are often the subject of dedicated roadmaps.
- **Instruments, tools, measures or supporting programmes:** approaches not only differ in their level of complexity but also in the manner in which they select priorities. Generally speaking, calls for proposals are still the most commonly used instruments, both for funding mobility and for funding joint research activities. Nevertheless, many countries place great emphasis on their cooperation in European programmes or other international organisations, infrastructures or fora. While certain countries concentrate their efforts on bilateral cooperation, others highlight the potential for cooperation in the framework of the European Research Area, taking full advantage of SFIC. Another set of countries facilitates incoming mobility in order to create an attractive environment for international collaboration at home.
- **Indicators** are a key part of the international R&I strategy in a large majority of cases. While there is consensus on some types of data (because it is collected via the OECD, or because it can easily be provided by analysing the databases of the EU framework programmes in R&I), the variety in terms of nature and roles within each strategic framework is quite large. The headline indicator used for the ERA<sup>11</sup> is a common characteristic cited in most cases, but is generally supplemented by a number of others.
- European Research Area countries have identified a variety of stakeholders as **important actors** for the development of their international cooperation strategy, such as the ministerial departments in charge of research and innovation as well as external affairs, funding agencies and research funding organisations, research performing organisations and universities, entities dedicated to supporting business R&D and innovation, etc. This typology helps to better understand the various dimensions of international cooperation strategy in research and innovation.

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<sup>11</sup> Collaborative papers with non-ERA per 1 000 researchers.

## PART II. SFIC survey on bilateral S&T cooperation with third countries: frameworks, structures and activities

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### 5. Objectives and methodology of the survey

This part of the report draws on and analyses the main findings from the survey identified in the mandate of the Benchmarking Working Group as a specific deliverable.

The survey was designed in late 2018 with the objective of identifying the main features of international cooperation that Member States and Associated Countries engage in with third countries. The survey had three main parts: S&T agreements, joint structures and joint activities. A fourth part was added following evaluation of impact instruments and is applicable to all of the other, main parts.

After the agreement on its design by the SFIC Plenary, the survey was sent to the SFIC delegations. Answers from 22 delegations were received during the first half of 2019.

The information given below was analysed and drafted by the Benchmarking Working Group members in July and August 2019.

The structure of the report below follows the main structure of the survey and therefore includes:

- A section on S&T agreements that describes the types of agreements that the countries that participated in the survey mentioned as a means of collaboration with third countries, the main institutions involved with these agreements, the topic of agreements, where explicitly mentioned, and, finally, the existence of a Joint Science and Technology Cooperation Committee Meeting.
- A section on joint structures that draws on the main structures that the countries that participated in the survey have in third countries, whether these are representation bureaus from the governmental or institutional perspective, science counsellors, or any other structure such as joint structures, internship programmes, etc.

- A section on joint activities that is divided into three subsections on joint calls, joint mobility schemes and joint networking and other activities. The joint calls subsection summarises the characteristics of the joint calls that the countries that participated in the survey have with third countries, referring to both collaboration frameworks and collaborations that are active in 2019. The joint mobility schemes subsection refers to the joint mobility schemes' presence in third countries. The joint networking and other activities subsection highlights the most important features of the activities that the countries that participated in the survey have in the third countries.
- A section on evaluation of impact provides indications on mechanisms that a couple of countries that participated in the survey use to evaluate their S&T agreements, joint structures and joint activities with third countries.



## 6. Analysing the survey outcomes

### 6.1. S&T agreements

In many countries intergovernmental S&T agreements or inter-institutional memoranda of understanding provide the general framework conditions for bilateral STI cooperation activities. This section will describe the data obtained by the survey, analyse the characteristics of the agreements and shed light on the countries' priorities and activities associated with these agreements.

The framework for cooperation between the countries that participated in the survey and third countries is provided by 'agreements' in more than half of the cases, and 'memoranda of understanding' in more than one third of the cases. In certain occasions, other types of documents are concluded or there is no signed framework document that would regulate bilateral cooperation.

Most of the agreements are intergovernmental S&T agreements, but there are also cultural (PL, FR), educational (PL, IE), interinstitutional (SI, NO) or cooperation agreements (CY, ES). S&T agreements typically focus on scientific and technological cooperation in general: responding countries hardly indicated any scientific priorities directly related to the agreements. Most of the agreements are signed at government level, by the ministries responsible for science. There is a wide range of other cooperating ministries and bodies responsible for the implementation or preparation of documents: they are mainly responsible for economics and trade (IE, FR, NO, FI), education (PL, IE, FI) or foreign affairs (FR, DK, PL) but other ministries, like the Prime Minister's Office (FR), the cultural ministry (PL) or the ministry of Social Affairs (SE) were also mentioned, as were science funds and research councils (AT, CH, FI, IE, NO, LT), other funding agencies (AT, CH, IE, ES, DE, FI) or sectoral research performing organisations (ES).

Memoranda of understanding (MoU) are also often very general, but as the signing parties might also be sectoral ministries or organisations, some of the MoUs are more specific, and resemble sectoral agreements. They are signed either by ministries or by implementing agencies that are often related to innovation financing, which also determines the content of

the agreements. Such sectoral agreements are sometimes called work agreements or programmes of cooperation.

The survey results show that certain countries almost exclusively conclude intergovernmental agreements (*e.g.* DE, FR, PL, SI), while others prefer more flexible MoUs (*e.g.* BE, FI, NL). There are also countries that combine both forms of documents (*e.g.* AT, HU, NO, SE). In spite of the fact that many countries state that they have agreements with specific countries, the survey indicates that these agreements do not always result in concrete activities. This may suggest that there is no sustained connection between the collaboration framework and the collaboration activities. In this regard, there is no difference between the two main types of document either: both types of agreement might result in very active cooperation or no cooperation at all. We might draw the conclusion that agreements more often result in concrete cooperation activities where they are concluded with the most important partner countries.

Both types of general agreement are often supplemented by work programmes, protocols, conclusions of Joint Committee meetings, action plans (FR) or Programmes of Cooperation (NO). These additional documents are flexible enough to define the actual scientific areas for cooperation.

Certain countries have certain specificities: in the case of SE, more general S&T agreements are supplemented by sectoral agreements, signed by sectoral ministries with the most important partner countries. In the case of DE, one general agreement – called a Science and Technology agreement – is almost always coupled with another more specific agreement, which is devoted to one specific scientific field. PL has a high number of scientific and cultural agreements, but many of them are not implemented by concrete cooperation activities.

Historical ties, language similarities and regional proximity also matter when selecting partner countries: ES has strong connections with Latin America showing S&T cooperation with 20 Latin-American countries; PL has an agreement with four out of the five Central Asian countries. Certain EU Member States also have agreements with countries like Brazil, China or Canada at regional level.

Certain countries also mention science for development activities: the 'Ibero-American Programme of Science and Technology for Development' in ES operates with Latin-American countries or cooperation between CH and Ethiopia are good examples of this kind of cooperation.

The growing importance of innovation and market-oriented research is reflected in the emergence of new types of agreements and cooperation activities. IE focuses on trade development with Russia, Saudi Arabia and South Korea with the help of a Joint Economic Commission. Business Finland has concluded an interinstitutional MoU with Thailand in order to support innovation and start-up ecosystems. AT supports digitalisation and start-up ecosystems for example with Singapore and Japan.

In certain cases cooperation activities are carried out without any type of formal agreement. AT has a large number of P2P activities with Canada, although no agreement has been signed between the two countries. FR cooperates with Madagascar and has set up a Joint Steering Board on Higher Education, Research and Innovation with Senegal, but has not concluded an STI agreement with these countries. FR also cooperates with New Zealand in a bottom-up way. Neither NL nor CH have an agreement with Singapore, but both have science attachés in the city-state.

Certain points within the survey questions were interpreted in different ways by the responding countries. ES also provided data on its cooperation activities with third countries in the framework of multilateral programmes and schemes like ERA-Nets, while other countries mainly focused on their bilateral cooperation activities. AT and SE also mentioned some agreements that are planned but have not yet been concluded.

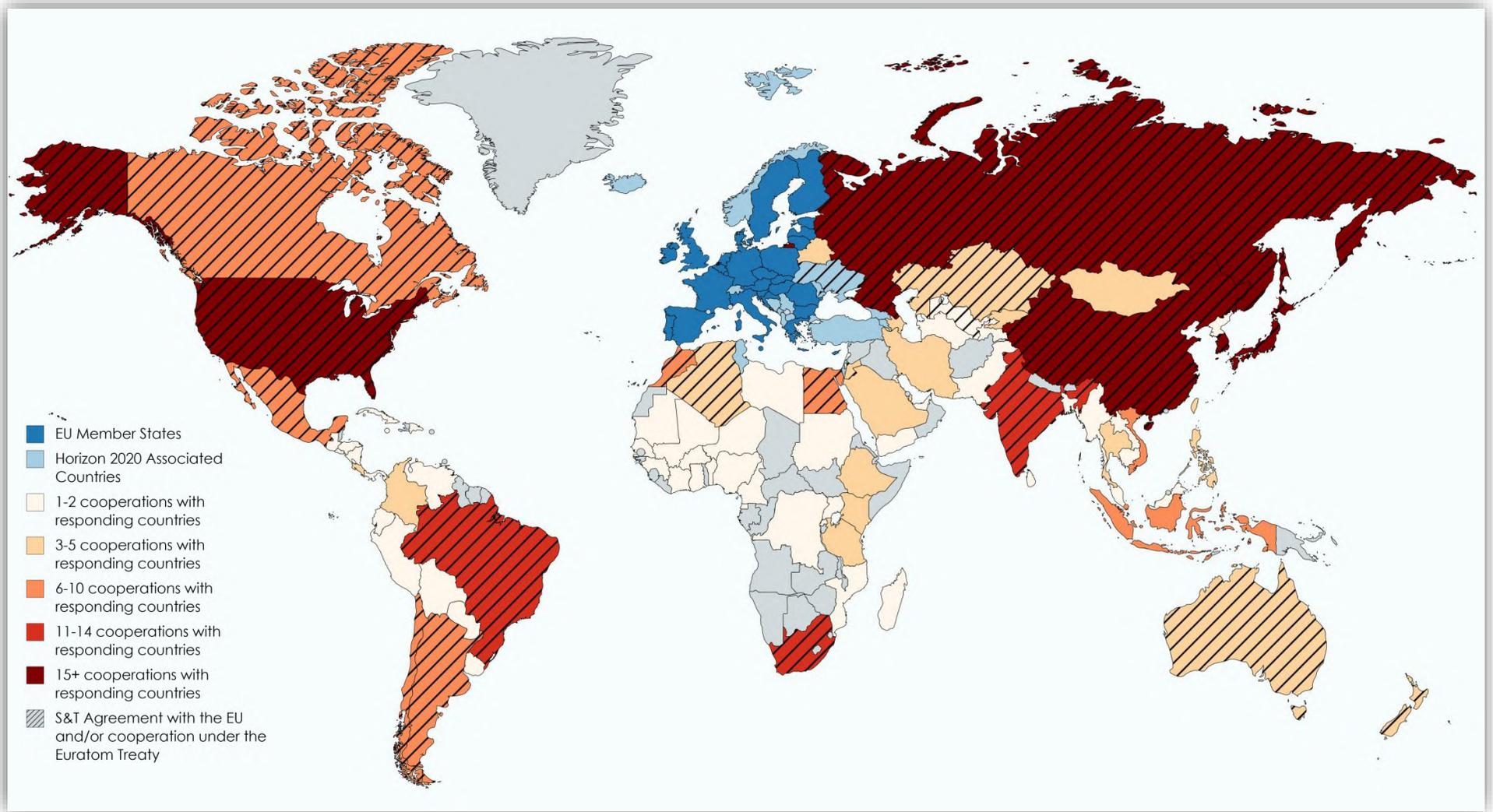


Figure 6. Map showing the frequency with which the countries that participated in the survey cooperate with third countries (S&T agreements, joint structures and/or joint activities).

## 6.2. Joint structures

The survey asked about existing joint structures, in particular *Representation bureaus (RPOs, universities, etc.), science counsellors abroad and other structures*. This part of the survey thus covers national activities and structures that relate to the areas of science diplomacy and research marketing. Of particular importance are the *science counsellors abroad*. They represent a ministry or a governmental agency of a country that participated in the survey in a host country. First of all, they are relevant actors in implementing national strategies and roadmaps. The general objective of S&T counsellors is to optimize the framework conditions for the exchange of knowledge on science and research with the host country. The aim of the counsellor is to strengthen bilateral cooperation in research, innovation and, possibly, also education.

The goal of international research marketing is to sharpen the image of the national research landscape or of the European Union as a place to study and research and to enhance visibility abroad. Ministries, higher education institutions, research performing organisations and research funding organisations are important stakeholders in this respect. Measures taken by them include communication or marketing activities designed to reach a targeted audience abroad.

Beyond the individual networking of researchers, scientists, students, experts and organisational networking activities (e.g. university cooperation agreements), countries are increasingly trying to stimulate international cooperation and networking with dedicated activities and measures. In connection with the National Action Plans, this survey asked about the current implementation status of these strategic plans.

According to this survey, 10 out of 22 countries were using the *Representation Bureaus* of higher education institutions or research and funding organisations more or less extensively, as they provide a direct channel and demand-oriented contact between the science communities. These countries are: AT, BE, DE, DK, FI, FR, ES, NL, SE and CH. This tool is used to create a tangible impact on the science landscape and is able to bridge politically difficult relationships.

Most of the countries - in this survey, 14 out of 22 states - are sending science counsellors abroad. Delegations that reported science counsellors abroad included: AT, CH, DE, DK, EL, FI, FR, ES, HU, IS, NL, NO, PL and SE. The survey shows that *science counsellors* are sent into states that are of special interest for science cooperation. That is why, in some states, a large number of counsellors from different MS/AC are posted: China (14), USA (12), Japan (11); counsellors are also posted in states that are of special interest compared to others in the same region, such as Brazil (8), South Korea (8) or South Africa (6). If one looks at the role played by individual counsellors in their diplomatic representations, it is also noticeable that the countries that participated in the survey hope that this instrument will boost economic development and the exchange of innovation. It was often mentioned that counsellors in a double role or larger function are also responsible for innovation exchange and knowledge transfer. So, there is more of a focus on an overall internationalisation strategy in science cooperation, compared to the Representation Bureaus, which are instruments of targeted implementation.

*Other joint structures* were indicated by eight out of 22 countries: CH, DE, DK, FI, FR, ES, HU and SE. These *other joint structures* are built up as, for example, joint committees or commissions for the coordination of activities or joint stakeholder groups in order to intensify the direct exchange of research results between two states. These structures often follow a political agenda to strengthen their cooperation and to follow up on high level meetings. In most of the mentioned cases those structures take a thematic approach and they are often in place for a shorter time than in institutional cases of joint research institutes, joint labs or joint higher education institutions, which were also mentioned as *other structures* e.g.: the French Telecom joint lab with Tomsk State University, the German University in Cairo, or the Spanish CDTI Intern network in the CDTI offices in third countries.

### 6.3. *Joint activities*

- **Joint calls**

The data collected from the countries that participated in the survey in the Benchmarking Working Group survey was used as the basis for a collaboration framework and joint calls

with most of the third countries that appear in the survey, a total of 51 countries. The remaining 34 countries<sup>12</sup> do not have any joint calls for 2019, even though they demonstrated some form of collaboration throughout the survey.

Below there is a graph highlighting the number of country collaborations that occur with the third countries that have shown more than one collaboration with the countries that participated in the survey. China has 16 collaborations with countries that participated in the survey, followed by India (11), Brazil and Russia (10); Japan, South Africa and South Korea each have eight collaborations with countries that participated in the survey.

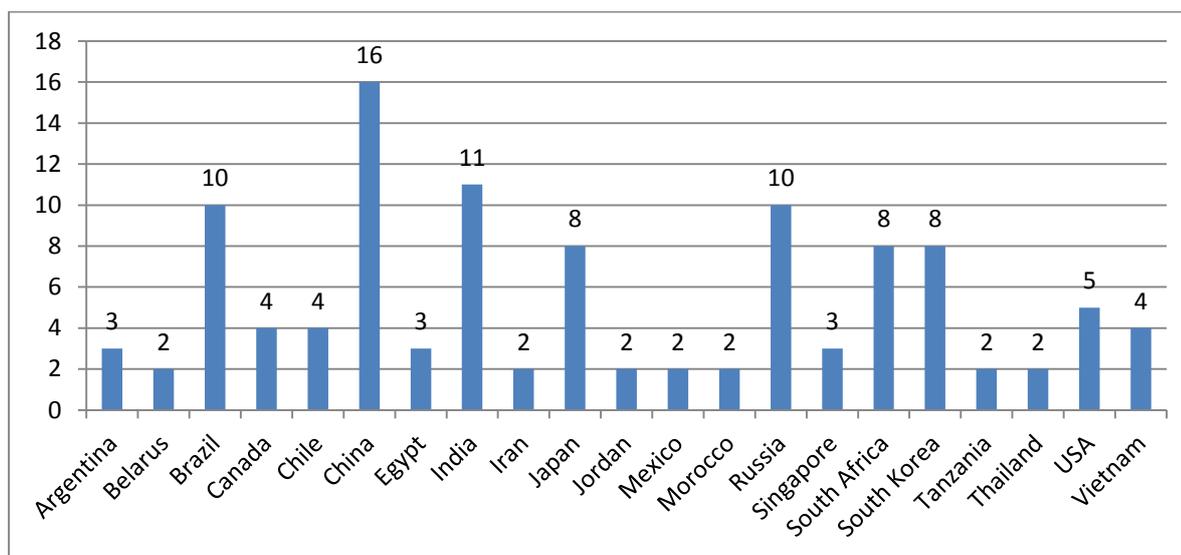


Figure 7. Third countries with more than one country collaboration (joint calls) with countries that participated in the survey

All country collaborations can be found in detail in the survey. The collaborations given above express the existence of joint calls. Their type ranges from bottom up calls to more targeted ones. Most of the answers mention that the calls are “open”, “strategic”, “multi-thematic”, etc. Among the answers that included topics, the most common ones were: food and agriculture, biodiversity, health, maritime affairs and industrial collaborations. There were mentions of seed capital and higher education joint calls, but no specific information was given.

<sup>12</sup> Countries with no joint calls are: Angola, Azerbaijan, Bangladesh, Benin, Cambodia, Equatorial Guinea, Guinea, Honduras, Cameroon, Kazakhstan, Kuwait, Kyrgyzstan, Libya, Madagascar, Mauritania, Mali, Mozambique, Nicaragua, Niger, Nigeria, North Korea, Pakistan, Palestine, Philippines, Qatar, Senegal, Sri Lanka, Sudan, Tadjikistan, Turkmenistan, United Arab Emirates, Uzbekistan, Venezuela and Yemen.

The duration of the calls - where this information is given - varies between one and three years.

- **Joint mobility schemes**

The joint mobility schemes are one of the most prominent instruments of joint activity that countries use in the context of international research and innovation collaboration.

According to the data collected by the survey, a total of 32 third countries have at least one joint mobility scheme with a country that participated in the survey.



Figure 8.

*Joint mobility schemes of countries that participated in the survey*

20 third countries are a partner in more than one joint mobility scheme. Those that have accumulated more schemes are China and Japan with nine schemes, followed by Brazil (seven), and India, Russia and South Korea with five schemes each.

As regards the countries with more schemes, **China** collaborates with the following countries: 1) Hungary has a call for mobility in the thematic fields of Life Sciences, Material Sciences, Physics, Energy, Agriculture and Food Technologies; 2) Austria funds travel and

accommodation costs for bilateral research projects; 3) France funds the PCH Cai Yuan Pei Mobility Scheme; 4) Switzerland, through the Leading House and SNSF scheme; 5) Spain, through the National Health Institute (ISCIII); 6) Belgium funds exchanges of researchers in several initiatives; 7) Romania funds two visits per year, one per party; 8) Denmark has several schemes involving exchanges of PhD students and lecturers; and 9) Finland, through the Academy of Finland and CAS, CASS and NSFC.

As for **Japan**, collaboration exists with: 1) Hungary, that covers mobility costs; 2) France, through its PHC Sakura mobility scheme; 3) Belgium, through a two-year project for the exchange of researchers; 4) Poland, in targeted cooperation on coal-based energy production; 5) Switzerland, through the Leading House and SNSF scheme; 6) Denmark, on the exchange of PhD students; 7) Finland, through the Academy of Finland; 8) Spain, on staff exchanges and through the National Health Institute (ISCIII), and 9) Norway, on postdoctoral fellowships between the Research Council of Norway and the Japan Society for the Promotion of Science.

The diversity of answers is such that some countries filled in their higher education collaboration schemes, whilst others limited their answers to the research or research and innovation parts.

- **Joint networking and other activities**

The joint networking activities are the third type of activity that the countries that participated in the survey have with third countries and they are used to a lesser extent than the joint calls or the joint mobility schemes. The networking activities are developed with 21 countries around the world.

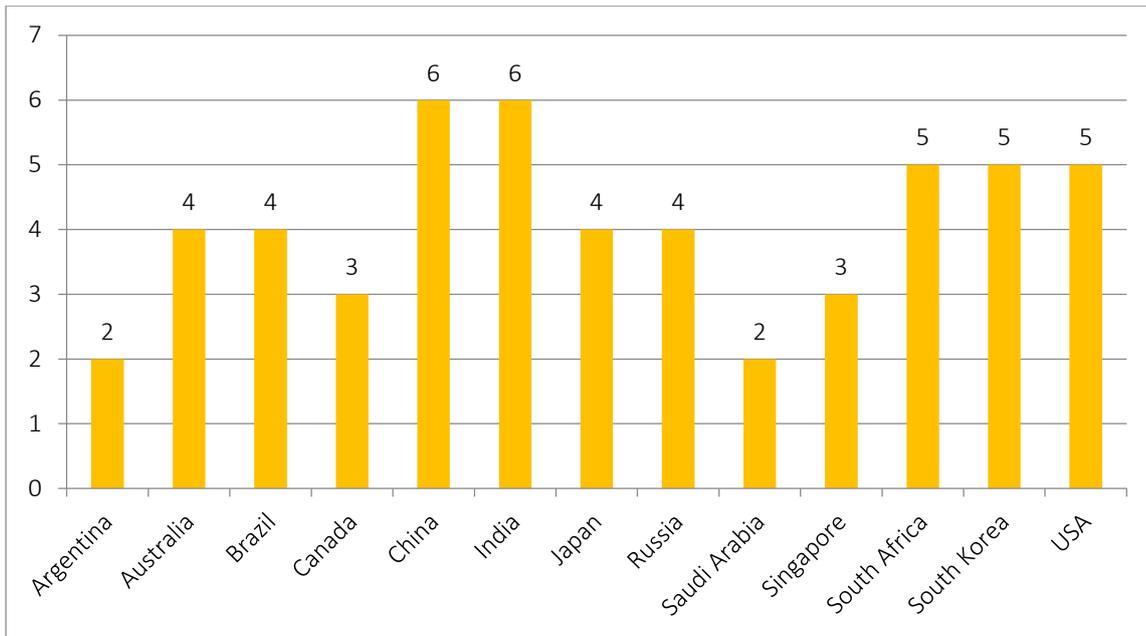


Figure 9. Joint networking activities of countries that participated in the survey

13 third countries are partners in more than one Joint Networking activity (see graph). Those that accumulated more activities are China and India, with six countries that participated in the survey, followed by South Africa, South Korea and the USA, each developing activities with five countries that participated in the survey.

As regards the countries with more schemes, **China** collaborates with: 1) Germany, through exploratory and networking measures; 2) Switzerland, by SC/Swissnex; 3) Spain, through CDTI and the National Health Institute (ISCIII); 4) Denmark, through the International Network Programme; 5) Greece, through carrying out workshops; and 6) Finland, through the China Law Centre and the Sino-Finnish Joint Learning Innovation Institute (JoLII) in coordination with Helsinki University.

In **India**, there is collaboration with: 1) France, through the Indo-French Research club on Water Network; 2) the Netherlands, through the I-NL Techsumit; 3) Switzerland, by SC/Swissnex; 4) Finland, through the Finnish universities and the Indian Institute of Technology; 5) Spain, through the National Health Institute (ISCIII), and 6) Denmark, through the International Network Programme of the Danish Ministry of Higher Education and Science.

Regarding **any other kind of activity** in international collaboration with third countries, the countries that participated in the survey have added some different types of activities, such as, for example: the Academia Industry Training Camps (CH), Capacity Building activities (ES), Higher Education activities and University Agreements (FR), Innovation Centre Activities (DE, DK), Innovation Missions (NL), Innovation Week (CH), Joint participations on ERANETs (AT), Market Entry Camps and Venture Activities (CH), Research Infrastructure/facilities (ES) and Technology Transfer activities and Technology Parks (ES).

#### 6.4. Evaluation of impact

Insights on the general evaluation of impact patterns of S&T agreements, joint structures and joint activities with third countries were provided by AT, DE, DK, FR, ES, HU and RO, while the other countries did not indicate any evaluation of impact mechanism.

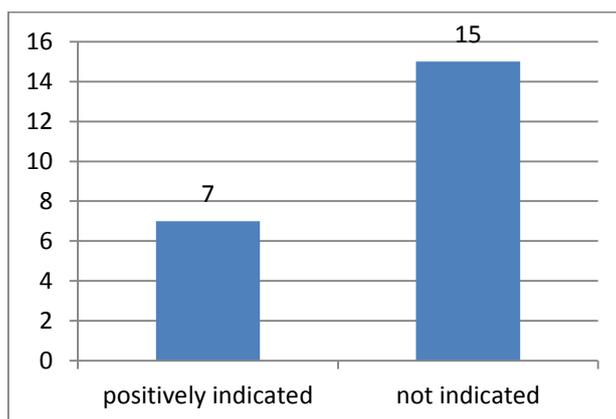


Figure 10. Evaluation of impact mechanisms of countries that participated in the survey

The scope of this document does not allow the proper interpretation of the lack of data regarding the evaluation of impact mechanisms, as it is not clear if the absence of any indication means the absence of all kind of evaluation. Indeed, evaluation of impact could be carried out in a formal way (*e.g.* where provision for such a process is contained in the S&T agreement and then conducted), but could also be carried out informally (*e.g.* in the context of discussions during a joint committee meeting). However, the question in the survey focused on formal methods of evaluation; this leaves open the question of what kind of informal evaluations may take place with regard to the various activities of Member States and Associated Countries with third countries.

For the purpose of this report, we should take a closer look at those few examples with some kind of general approach to evaluation of impact of S&T agreements, joint structures and joint activities with third countries that may serve as good practices: AT has a general programme evaluation for governmental agreements (MoU or S&T agreements) about every five years. DE highlighted that capacity to evaluate is increasingly becoming part of the process of creating new calls with third countries (including the analysis of the effect of the funding call, a common guide for evaluation and external evaluation). HU indicates that indicators are checked regularly at reporting. FR has a system of regular impact evaluation of bilateral measures via a dedicated structure in the French Ministry for Higher Education, Research and Innovation, based on the evaluation carried out by a network of about 100 independent experts.

## 7. Conclusions of the survey outcomes

The answers given by 22 Member States and Associated Countries to the survey show the following:

- On the **S&T agreements**: intergovernmental S&T agreements and interinstitutional memoranda of understanding are still the prevailing forms used for bilateral STI cooperation. Nevertheless, data from the survey shows that, on the one hand, cooperation is also possible without any written agreement; on the other hand, many high-level agreements do not result in concrete cooperation activities. We have also seen that both intergovernmental and interinstitutional agreements can be either very general or quite specific. The same applies to their implementation: both types of agreements might lead to active cooperation with the partner country. It is the importance of the partner country that defines the level of implementation. There are not only more agreements concluded with the most important partners like Brazil, China, Japan, Russia, South Korea or the US, but a higher than average percentage of these agreements lead to active cooperation. This not only shows the scientific power of these third countries, but also their potential for and commitment to international cooperation.
- On the **joint structures**: the extensive presence of joint structures proves their importance for the countries that participated in the survey in terms of international cooperation. The countries build on these instruments in order to advance developmentally or economically. The analysis also shows that the structures are strongly geared towards supporting not only research but also innovation and/or higher education development, as illustrated by the dual role of many counsellors with links to innovation transfer, development approaches or

economic cooperation. It can also be concluded that both governmental and societal approaches and tools are relevant to establishing a fruitful environment for exchange and collaboration.

- On the **joint activities**, and more specifically:
  - Regarding the joint calls: the collaboration of the countries that participated in the survey with third countries is active, as evidenced by joint calls in nearly 50 countries, being mainly focused in 11 countries, with most of the participation in China, India, Brazil, Russia, Japan, South Africa and South Korea.
  - Regarding the joint mobility schemes: many countries that participated in the survey use joint mobility schemes as a tool for international cooperation in higher education, research and innovation. The schemes are concentrated in 32 countries worldwide; those that accumulate the most schemes are China and Japan (nine schemes each), Brazil (seven), and India, Russia and South Korea (five schemes each).
  - Regarding joint networking and other activities: the countries that participated in the survey collaborate and engage in joint networking the most with China, India, South Africa, South Korea and the USA. Moreover, other kinds of instruments for joint activities exist, except for the joint calls, joint mobility schemes and the joint networking activities that several countries put in place in collaboration with third countries, such as Academia-Industry Training Camps, Capacity Building Activities, Engineering Schemes, etc.
- On the **evaluation of impact**: relatively few countries participating in the survey provided information on general approaches to evaluation of impact of their S&T agreements, joint structures or joint activities with third countries. The approaches that some countries indicated may serve as examples of good practice.

## PART III. Main findings and key elements in support of ERA priority 6

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Based on the outcomes of this joint exercise, the members of the Benchmarking Working Group submit to the SFIC plenary the following elements for further consideration, in view of a SFIC opinion:

- Member States and Associated Countries take a broad range of approaches to drafting and implementing their policies in the area of international cooperation in research and innovation with third countries. As a whole, and taking into account the approach of the European Commission, cooperation encompasses all the regions of the world and a massive number of third countries. It should be noted that R&I cooperation frameworks, structures and activities are concentrated in a limited number of (mostly industrialised and BRIC) countries that show particular promise in terms of research and innovation.
- Even though the actions of Member States, Associated Countries and the Commission are not always aligned for these focus countries, their priorities are often quite similar, displaying good potential for joint approaches (*e.g.* in terms of earmarking of calls in the work programmes of Horizon 2020 and, later, Horizon Europe). Moreover, by comparing the results of this analysis with previous similar activities, it turns out that the list of most important partner countries appears to be quite stable, also over longer time-periods. This stability would allow us to set up mid-term joint approaches at national and European level. The Commission might also rely on the data provided by the survey associated with this document when planning and implementing its bi-regional STI policy dialogues.
- SFIC could act as a sounding board in the identification of joint identify key focus countries or regions (on the basis of the data collected by the Benchmarking Working Group and lessons learnt from the Mutual Learning Exercise (MLE) on national strategies and roadmaps for international cooperation in R&I) and work on a proposal on framework conditions for joint approaches.
- In addition to its current role as an advisory body, SFIC might also be used as an initiator and platform for joint action. Based on the evidence provided by this report, cooperation activities might be harmonised between interested Member States, Associated Countries and the Commission, while increasingly and continuously taking into account the Sustainable Development Goals (SDGs).
- In order to maintain the evidence basis to show common interests in specific focus countries, the collection of relevant data on structures and actions with third countries should ideally take place on a more regular basis, and also include relevant data from the Commission. This should be considered in connection with the request by SFIC to see the international

cooperation activities of Member States and Associated Countries integrated into the EU Research and Innovation Observatory (RIO).

In view of Horizon Europe, international cooperation within the framework programme for research and innovation should remain a key priority to facilitate the financing of research and innovation cooperation with third countries and the emergence of new collaborations in the spirit of the SDGs.<sup>13</sup> In order to ensure the success of the abovementioned approaches and joint actions, dedicated instruments for international STI cooperation should be provided by Horizon Europe.

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<sup>13</sup> Cf. SFIC opinion on international cooperation in 'Horizon Europe' of 15 January 2019, doc. *ERAC-SFIC 1351/19*.