



FROM HORIZON 2020 TO HORIZON EUROPE

MONITORING FLASH

#3 INTERNATIONAL COOPERATION

February 2019



This Monitoring Flash sheds light on the implementation of Horizon 2020 – the European Framework Programme for Research and Innovation 2014-2020 – where international cooperation is promoted and integrated as a cross-cutting priority. The analysis covers the applications and participations from entities located outside the European Union for the first 5 years of Horizon 2020.



HORIZON 2020 Key overview data

124

non-EU countries

participating to Horizon 2020 projects

4,700

participants

from non-EU countries in Horizon 2020

18%

success rate

of non-associated countries, higher than EU average of 15%

€300m

own contribution

of non-associated countries in Horizon 2020 projects

7%+4%

of participations

respectively from 16 associated + 108 non-associated countries



A VERY BROAD INTERNATIONAL OUTREACH Key overall messages

- With participants from 124 non-EU countries, Horizon 2020 demonstrates a very broad international outreach attracting talent from around the world in particular from higher education organisations.
- There is a certain level of heterogeneity in the cooperation patterns with third countries, reflecting the strategic targeting and diversity of objectives and benefits pursued through international cooperation:
 - Horizon 2020 is benefitting from excellence worldwide for increasing competitiveness, jointly tackling global challenges and increasing participation in international value chains through the involvement of participants from countries with advanced R&I capabilities.
 - Horizon 2020 also contributes to the integration of R&I systems in the ERA for countries which have a relative lack of R&I capacity, including through mobility of researchers.
- While the international dimension of Horizon 2020 has been reinforced for the second half of Horizon 2020, the identified trends also call for an intensification of international cooperation activities in Horizon Europe.

1 Introduction

This Monitoring Flash sheds light on the **state of play of international cooperation under Horizon 2020 after 5 years of implementation**¹. This evidence base should inform policy discussions on the Commission proposal for Horizon Europe (2021-2027) and is a natural follow-up of the first two Monitoring Flashes (European Commission, 2018b and 2018c), which focussed on the participations and collaborations of EU Member States². This Flash provides insights on the participation of non-EU countries, i.e. third countries, to Horizon 2020, based on their status in Horizon 2020:

- **Associated countries:** Albania, Armenia, Bosnia and Herzegovina, Faroe Islands, Georgia, Iceland, Israel, North Macedonia, Moldova, Montenegro, Norway, Serbia, Switzerland, Tunisia, Turkey, Ukraine.
- **Non-associated third countries:** countries that are not EU Member States and not associated to the Framework Programme.

*Box 1 How does international cooperation work in Horizon 2020?*³

- Association to the programme is limited to countries geographically close to Europe: Enlargement, EFTA and European Neighbourhood Policy countries, as well as countries already associated to FP7. Legal entities from associated countries can participate in actions under the same terms and conditions as entities from Member States.
- Legal entities from non-associated third countries can participate in projects in all parts of the programme, except for mono-beneficiary grants, specific close-to-market innovation activities and access to risk finance.
- Third-country nationals are eligible to apply for European Research Council grants when the host institution is in a Member State or associated country. Third-country nationals are eligible for all Marie Skłodowska-Curie Actions (except for the European Reintegration Panel under the Individual Fellowships scheme).
- Except for a few cases, only participants from low- and middle-income countries are automatically eligible to receive EU funding. EU funding can, exceptionally, be granted to other third-country entities whose participation is deemed essential for carrying out an action.

2 Why supporting international cooperation under the Framework Programme

It is essential for researchers and innovators in the EU to have access to knowledge, expertise and facilities that lie outside the Union. International collaboration is needed to tackle societal challenges that are global by nature, and it is key to ensure that EU companies stay competitive at the global scale. In this respect, EU-level action can help shaping global multilateral R&I policy agendas, activities and cooperation mechanisms.

International collaborative research and researchers' mobility worldwide are becoming key drivers of impact, and new major R&I players are emerging across the world. Over the last decade, the EU's share of global expenditure in R&D has dropped from one fourth to one-fifth (European Commission, 2018a). Although certain fields of research have been broadly international since several

¹ The cut-off date for the analysis data recorded in the Common Research Data Warehouse (CORDA), is 1/1/2019. Projects under Public-to-Public Partnerships, EIT's Knowledge and Innovation Communities (KICs) and direct actions of the Joint Research Centre are not included except when explicitly mentioned. Box 2 still provides insights on participations in Public-to-Public partnerships.

² Key data on the implementation of Horizon 2020 are publicly available on the Horizon 2020 Dashboard <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/projects-results;programCode=H2020>.

³ European Commission (2018a).

decades, in recent years the worldwide landscape of research and innovation (R&I) has undergone substantial transformations, shifting towards an increasingly globalised and multipolar network of science and technology actors. In this context, the European Union's political priority to remain a major global actor through an R&I system that is open to the world requires cooperating more closely with international partner countries. The scope and interconnectivity of global societal challenges such as health or climate also call for global mobilisation of resources and coordination of activities. Furthermore, an increasing number of research fields require infrastructures which are so sophisticated or costly that they exceed the capabilities of a single country, thereby leading to major multinational collaborations (European Commission, 2017). In this context, the EU needs to intensify its access to, and reap benefits from, the world's best talents, expertise and resources in R&I.

Horizon 2020 is an essential vehicle for realising the objectives of the EU's international cooperation strategy, as it enables collaboration between EU researchers and innovators and their best counterparts worldwide. Under Horizon 2020 targeted international cooperation actions shall be implemented on the basis of common priorities and mutual benefits, taking account of scientific and technological capabilities, market opportunities and expected impact. The objectives of international cooperation under Horizon 2020 apply in different ways depending on the international partner country or region, while areas for cooperation are identified on the basis of R&I capacities, market access opportunities, the contribution to international commitments, and the R&I framework conditions in place:

- For **EEA, EFTA and EU enlargement countries**, the focus is on fostering integration into the European Research Area;
- For **European Neighbourhood Policy countries**, the objective is to support a Common Knowledge and Innovation Space, including mobility for academics and capacity building;
- For **industrialised countries and emerging economies**, the focus is on increasing competitiveness, jointly tackling global challenges and increasing participation in international value chains;
- For **developing countries**, the emphasis is on promoting their sustainable development and addressing global societal challenges.

Evidence from the interim evaluation of Horizon 2020 (European Commission, 2017) but also from the FP7 ex-post evaluation of international cooperation (Farrell et al, 2015) showed the value of international cooperation not only to **tackle global challenges and to support economic growth but also to deliver excellent research**. As an illustration international collaboration increases the impact of scientific publications⁴: FP7 and Horizon 2020 peer-reviewed publications involving a contributor from at least one associated or third country are more cited than EU28 only publications and are cited at least three times more than the world average (European Commission, 2017).

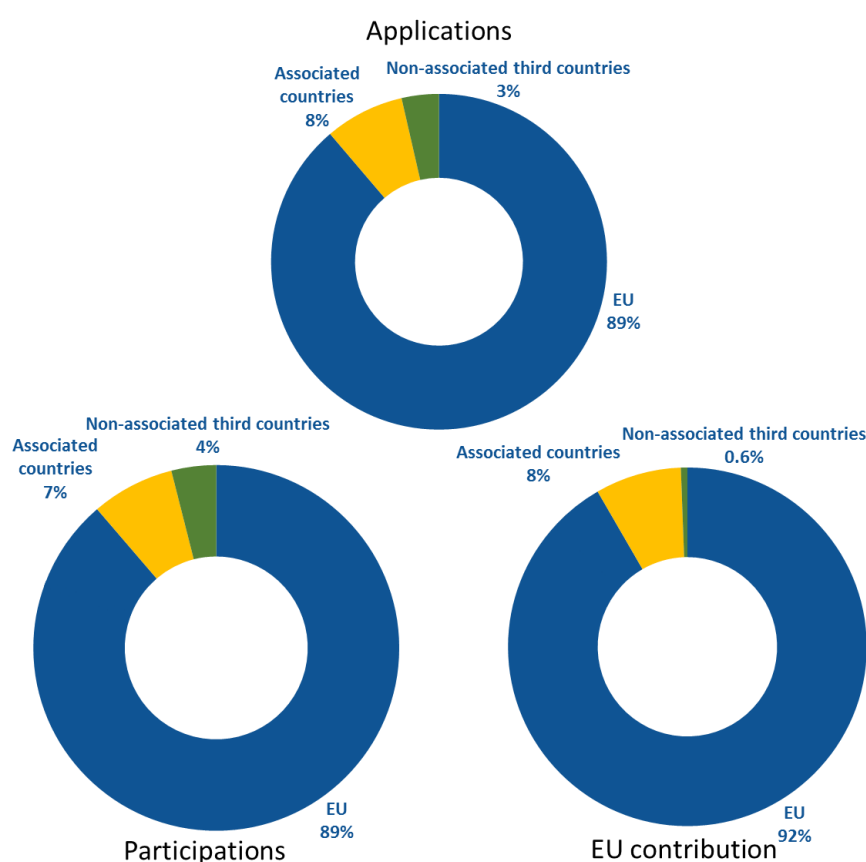
Conclusions from the evaluation emphasised the **need for intensifying international cooperation as a means to increase impact for the remainder of Horizon 2020 but also to seek alternative ways to increase participation of international partners in the longer term**.

⁴ Craciun and Orosz (2018) recently reviewed the evidence supporting the benefits and costs of transnational collaborative partnerships in higher education. While the authors stress that not all assumed benefits of international cooperation in higher education are backed up by empirical evidence, in particular regarding the socio-cultural impact, they consider that there is a large evidence base showing that international collaborations in research activities result in more and better publications and patents.

3 Overview of applications, participations and EU contribution to non-EU partners

EU Member States represent the vast majority of more than 650,000 applications and 100,000 participations in Horizon 2020 (89%) (Figure 1). A total of 4,700 distinct organisations from **16 associated countries and 108 non-associated third countries represent, respectively, 7% and 4% of participations so far** (8% and 3% of applications). In terms of funding, associated countries represent 8% of the EU contribution provided through the programme (EUR 3 billion), while non-associated third countries represent only 0.6% of the funding (EUR 0.23 billion).

Figure 1 Share of applications, participations and EU contribution by country group in Horizon 2020



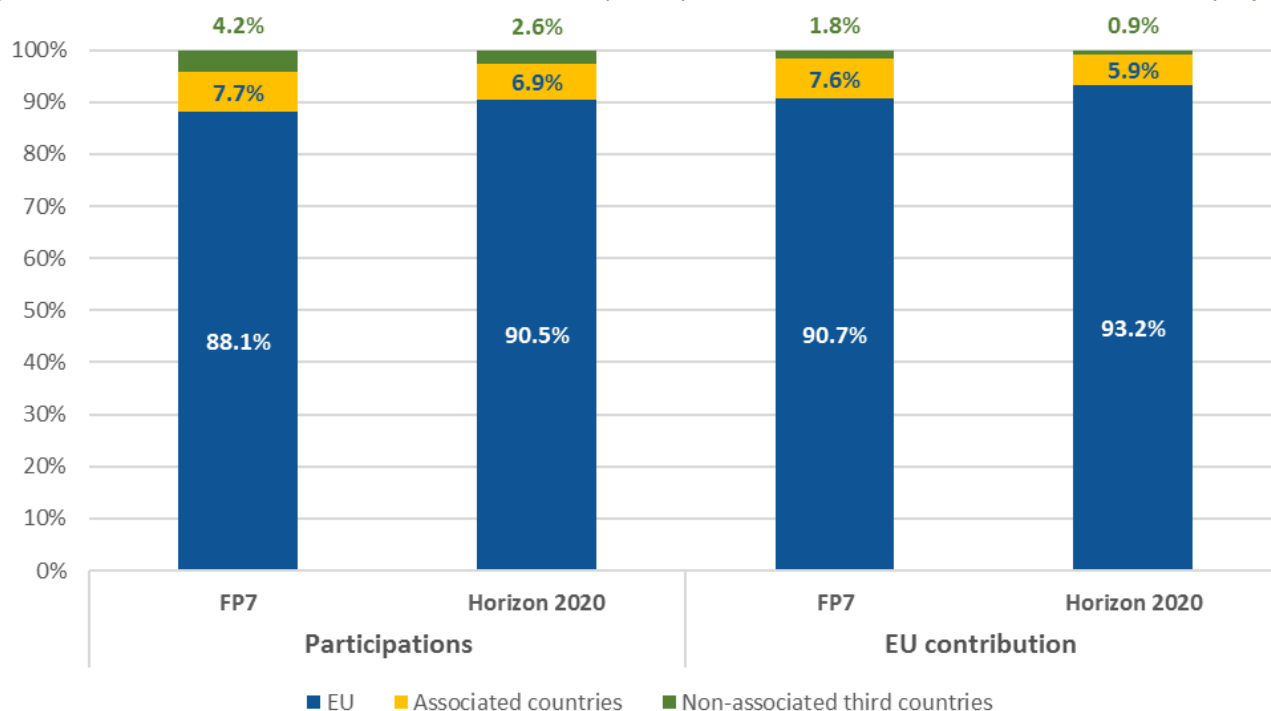
Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

The distribution of participations by type of participants is similar between associated countries and EU countries (see Annex), with higher education institutions and private companies being the most represented for these countries (each of these category represents more than 30% of participations from associated countries and EU member states). Regarding **non-associated third countries, there is a very large representation of higher education institutions** (58% of their participations), which is mainly driven by the large participation of these countries in Marie Skłodowska-Curie Actions⁵ (MSCA). On the other hand, **there is a low participation of private companies from non-associated countries** (12%⁶ against 35% for EU member states).

⁵ See also Section 5.
⁶ 16% without MSCA.

Figure 2 presents the evolution of participations to collaborative projects⁷ between the 7th Framework Programme (FP7) and Horizon 2020. The figure shows **that the share of participations from non-EU countries has shrunk between the two Programmes, especially for non-associated third countries**. These results are in continuity with the results of the interim evaluation of Horizon 2020 (European Commission, 2017) and can be mainly attributed to the discontinuation of dedicated funding schemes for international cooperation, and changes in eligibility conditions for EU funding for certain third countries. As regards associated countries the slight decline in participations between both Programmes (from 8% of the participations and funding in FP7, to 7% of participations and 6% of the EU contribution in Horizon 2020) can be explained by the partial association of Switzerland during the first years of Horizon 2020.

Figure 2 Evolution between FP7 and Horizon 2020 of participations and EU contribution in collaborative projects⁸



Note: Collaborative projects in FP7 exclude ERC and MSCA. Collaborative projects in Horizon 2020 exclude ERC, MSCA, SME instruments and Access to Risk Finance. Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

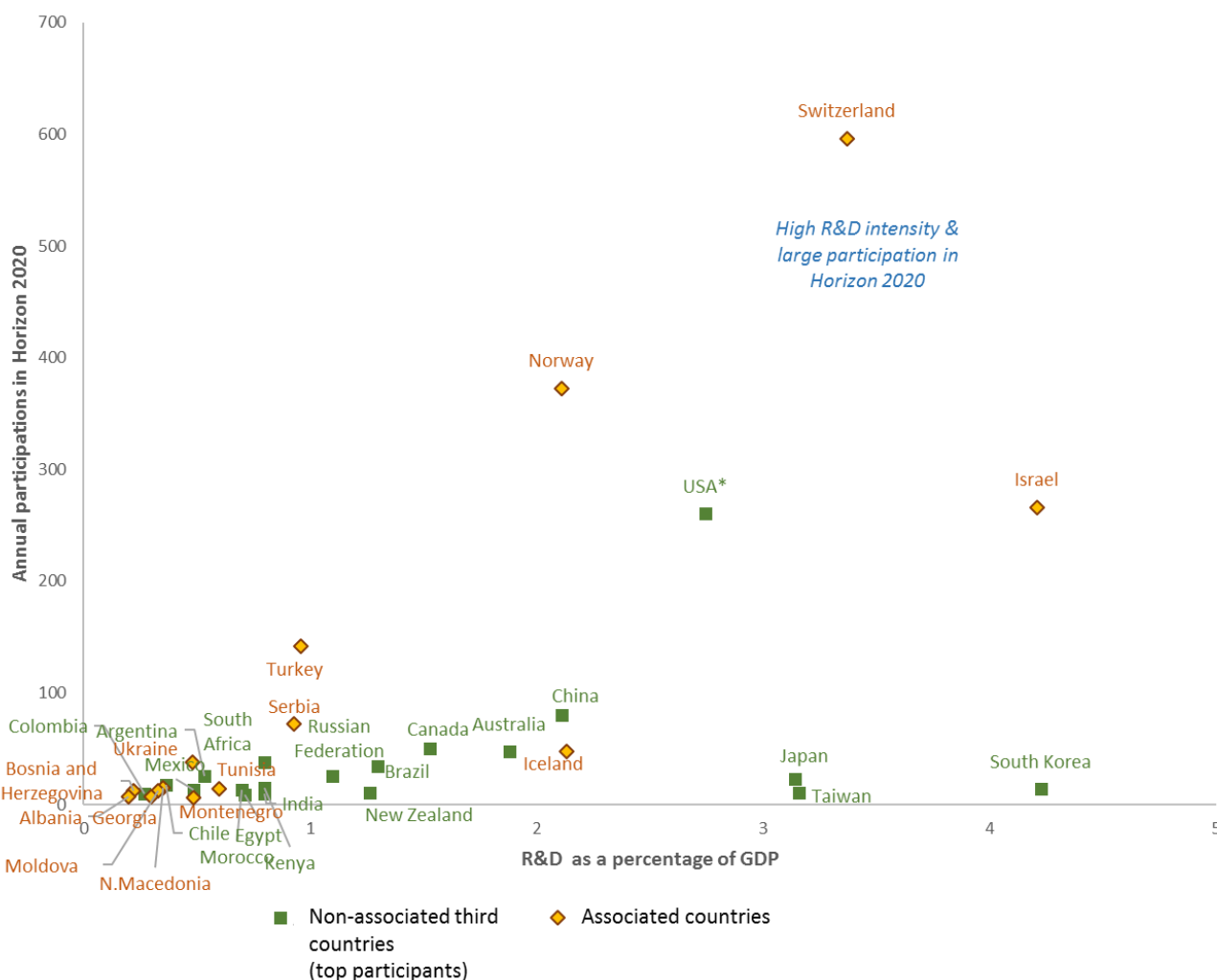
Putting in perspective the national R&I intensity and the level of participation to the Programme of entities from individual associated countries and the most active (in terms of participations) non-associated third countries, some country groups emerge (Figure 3). **Switzerland, Israel, and Norway perform fairly well in terms of R&D intensity and participate strongly in Horizon 2020**. In this sense, they are key non-EU participants in the programme, both in terms of engagement in the programme and intensity of their national R&I efforts. Among S&T advanced non-associated third

⁷ The focus here is on collaborative projects for comparability purpose with FP7. The figure excludes mono-beneficiary parts of the programme to which third countries are not automatically eligible to apply, and bottom-up parts. Collaborative projects in FP7 are all projects, with the exception of ERC and MSCA. In Horizon 2020, they exclude ERC, MSCA, SME instruments and Access to Risk Finance.

⁸ The definition of country groups is based on the situation in Horizon 2020.

countries, the USA also shows the largest number of participations, mainly due to the strong involvement of US universities in Marie Skłodowska-Curie Actions (MSCA)⁹ targeting researchers' mobility (see section 5) and the strong participation in the SC1 'Health, demographic change and wellbeing'. Other third countries with strong R&D intensities such as South Korea, Taiwan and Japan participate to a lesser extent in the programme.

Figure 3 R&D intensity and number of participations per year in Horizon 2020



Source: European Commission, DG RTD, based on Eurostat, OECD, World Bank and UNESCO for R&D intensity (last year available), and CORDA data for participations. *USA participations include 75% of participations in Marie Skłodowska-Curie Actions.

While participation is expected to correlate to some extent with the size of the countries¹⁰, this also shows a **relationship in the degree of participation in Horizon 2020 with the level of investment**

⁹ USA participations include 75% of participations in Marie Skłodowska-Curie Actions
¹⁰ When normalising by country population, Iceland and the Faroe Islands are the top associated countries in terms of participations per inhabitant, followed by Switzerland, Norway and Israel. Within non-associated third countries, New-Zealand, Australia and Canada have the highest number of participations per inhabitant. The US still presents a higher participation per inhabitant than most non-associated third countries.

made by countries in R&D as a percentage of GDP (i.e. R&D intensity), especially for associated countries.

More generally, this also illustrates that the highly competitive, excellence-driven nature of Horizon 2020 results in a differing level of engagement from third countries. Notably, **those countries with less R&I endowments (illustrated here by lower R&D intensity) participate less¹¹ than those with strong R&I support systems.** On the other hand, as shown by the interim evaluation of Horizon 2020 dedicated support for policy, mobility and coordination activities have proven beneficial for some of the countries participating less in Horizon 2020, in particular associated countries with less-developed R&I capacities. As an illustration, for associated countries from the European Neighbourhood, the association to the programme has also contributed to the integration of their R&I systems within the European Research Area (European Commission, 2018).

4 Countries associated to Horizon 2020

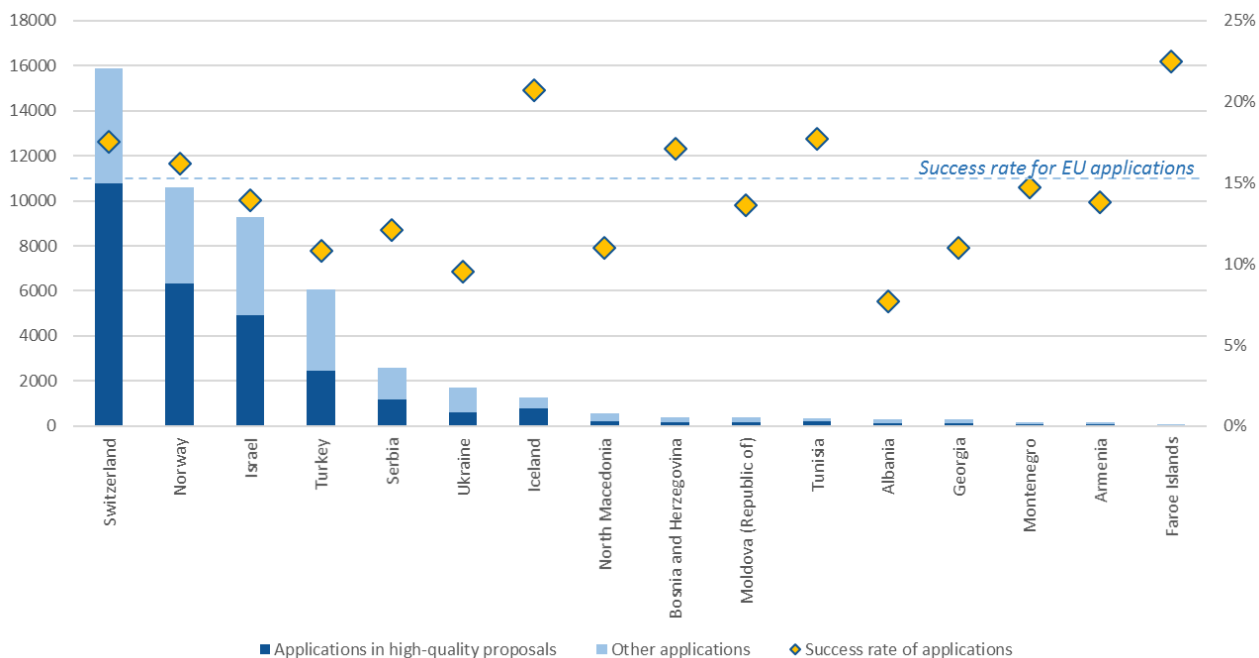
16 countries have signed an association agreement¹² to Horizon 2020. Within these countries, **Switzerland, Norway, Israel and Turkey are the countries submitting the highest number of applications** (Figure 4), with respectively 32%, 21%, 18% and 12% of applications from this group of countries. In addition, Switzerland is the associated country with the highest share of high-quality proposals submitted (67%)¹³, followed by Iceland (61%) and Norway (60%). This is higher than the EU average (57%). In terms of success rate, the success rate for applications from associated countries (15.1%) is slightly higher than the success rate for EU applications (15%). Whereas the EFTA countries of Switzerland, Norway, Iceland all perform better than the EU average this is also the case for the Faroe Islands, Bosnia and Herzegovina and Tunisia. On the other hand, associated **countries** such as the **candidate countries** and **most countries from the European Neighbourhood Policy** tend to show **lower performances than the EU average in terms of the quantity, quality and success of their applications.**

¹¹ The trend also holds when taking size into account, with Iceland, Norway, Switzerland and Israel showing the most participations per capita.

¹² Of these, 11 countries have been fully associated since the start of the programme. Four agreements were signed in 2015 and 2016, while Switzerland was partially associated until the end of 2016 and is now associated to all parts of Horizon 2020.

¹³ Defined as those proposals which were evaluated as passing the quality threshold for a specific call.

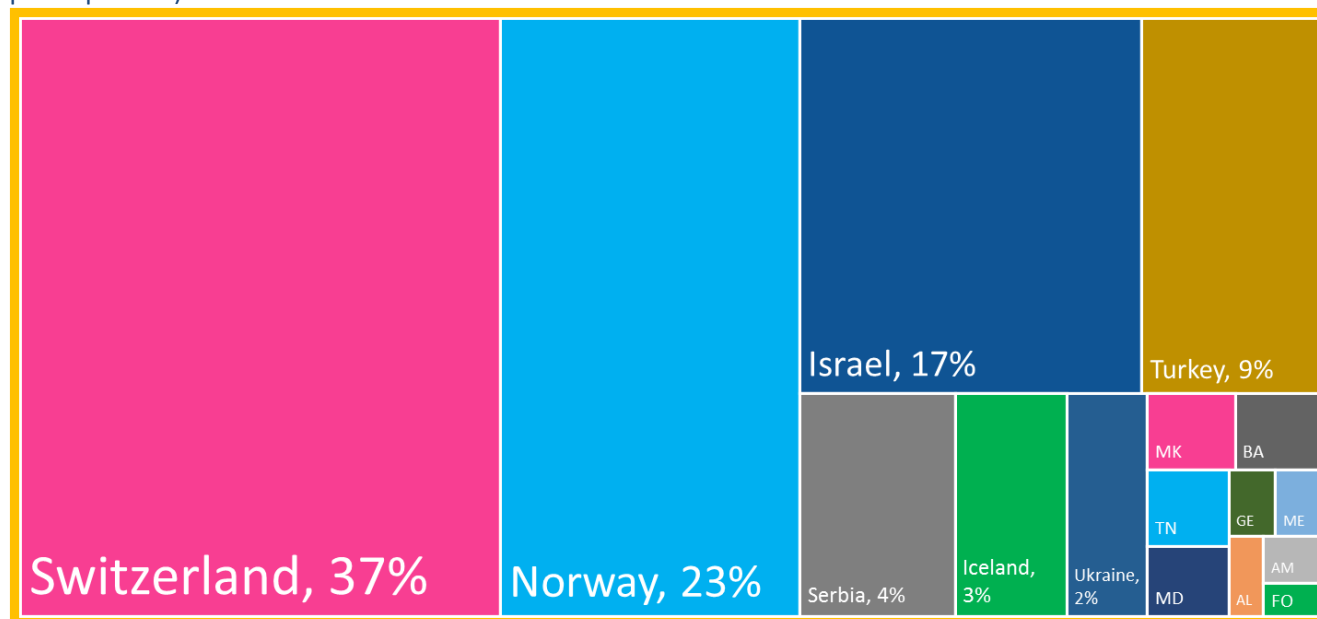
Figure 4 Applications (left axis) and success rate (right axis) of associated third countries



Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

In line with the high share of high-quality proposals submitted, **Switzerland is the most active associated country in terms of participations**, with 2,808 participations, i.e. 37% of participations from associated countries (Figure 5). Norway, Israel and Turkey account respectively for 23%, 17% and 9% of participations from associated countries. In line with their application patterns, associated countries with the smallest participation (less than 1% of participations from associated countries) are Tunisia, Moldova, Georgia, Montenegro, Albania, Armenia and the Faroe Islands.

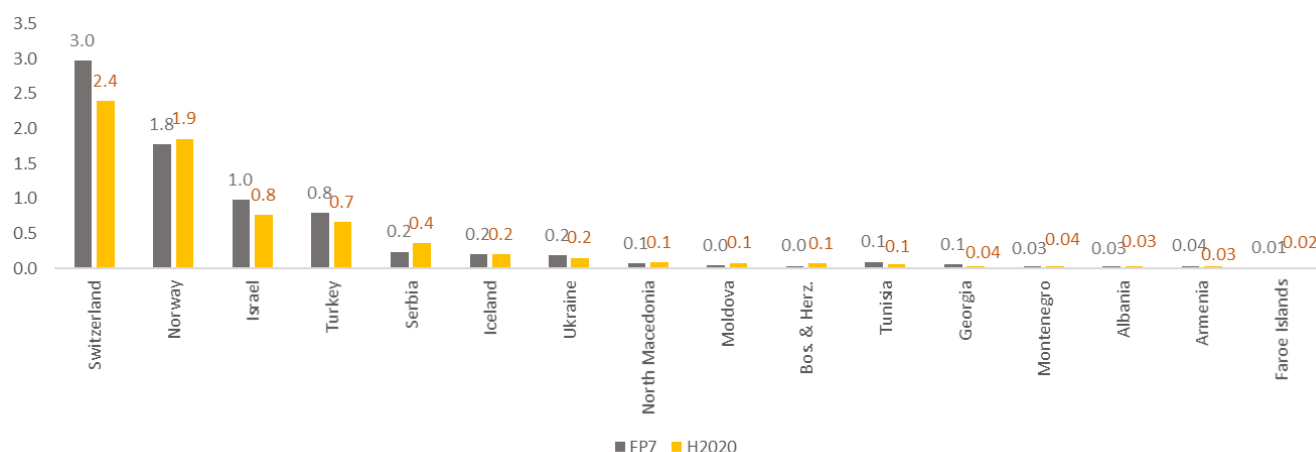
Figure 5 Number of participations from associated countries in Horizon 2020 (% of all associated countries participations)



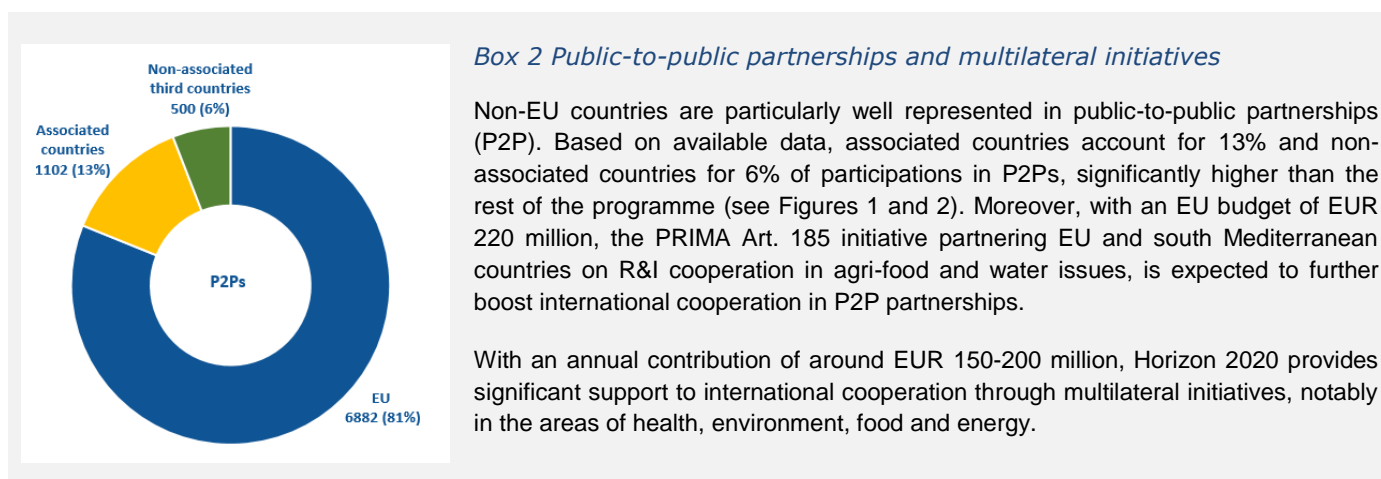
Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

Figure 6 presents the participations from associated countries in collaborative projects as a percentage of participations from all countries. Overall, **the ranking of countries in terms of participations is similar between FP7 and Horizon 2020**, with slight changes for some countries in terms of engagement in the Framework Programme. Within the most active countries, Switzerland, Israel and Turkey have experienced a decrease in their share of participations in collaborative projects between FP7 and Horizon 2020. The decrease for Switzerland can be mainly attributed to its partial association during the first years of Horizon 2020. On the other hand, Norway participates slightly more while Serbia has significantly increased its share in Horizon 2020 compared to FP7.

Figure 6 Participations from associated countries in collaborative projects in FP7 and Horizon 2020 (% of all participations in collaborative projects)

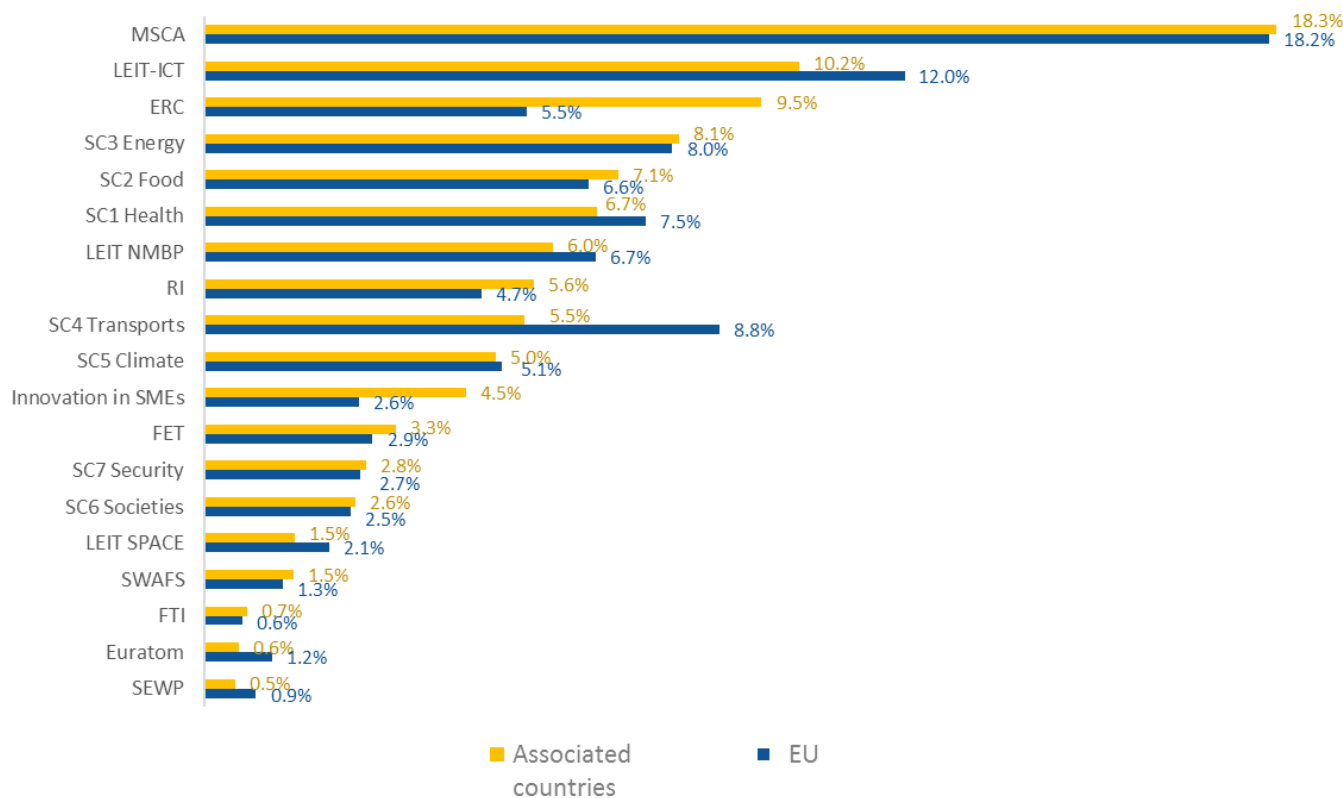


Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.



There is a strong similarity in the distribution of participations across the different programme parts between EU countries and associated countries (Figure 7). A fifth of participations are within the MSCA schemes targeting individual researchers. The main differences are observed in European Research Council projects, where the share of participations from associated countries is significantly larger than for EU participants (9.5% against 5.5%, corresponding to 36% of EU investment for associated countries) and in Societal Challenge 4 (“Smart, Green and Integrated Transport”) where it is lower (5.5% against 8.8% for EU participants).

Figure 7 Number of participations from associated countries by programme part (% of participations in the country group)



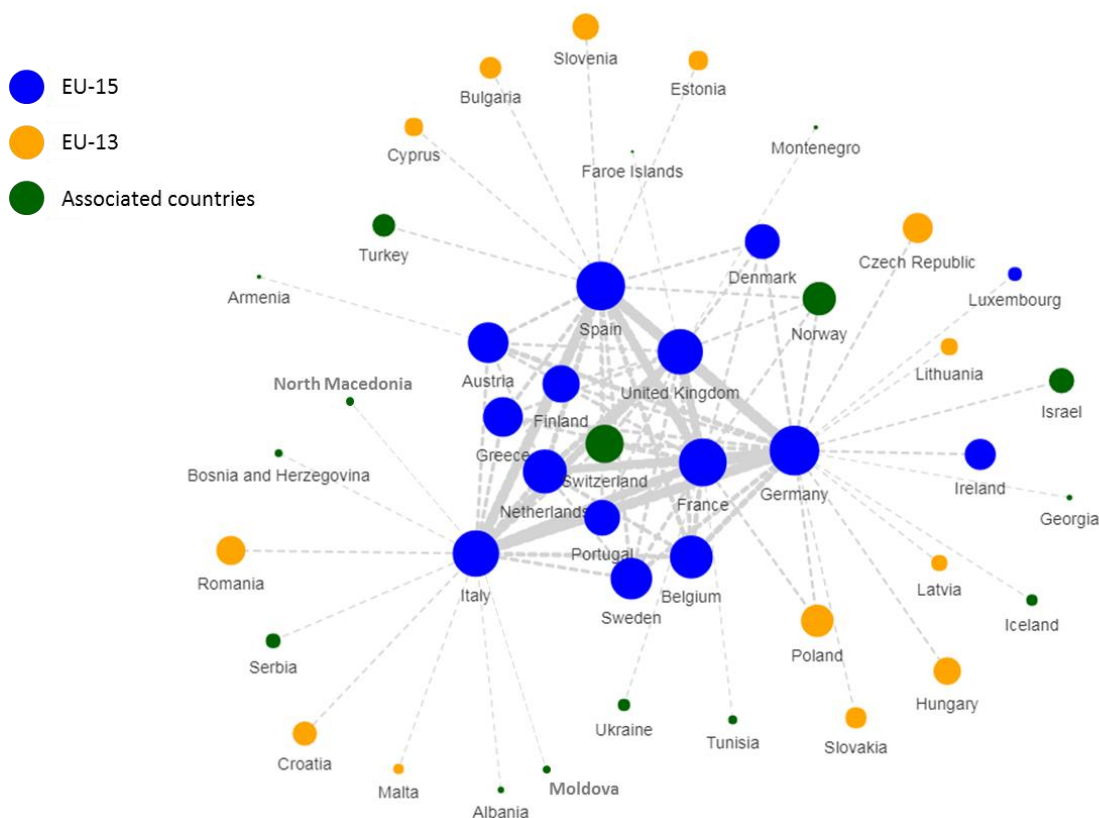
European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019. Definition of acronyms in Annex.

Looking closer at **collaboration networks** within Horizon 2020, Figure 8 maps collaborations (based on joint participations in projects) within organisations located in EU and associated countries. This shows two types of connections: (i) the single strongest connection of each country to another country, and (ii) the top 40 strongest connections within the network. The size of the nodes is proportional to the centrality of the countries.

From this analysis it comes out that **Switzerland occupies a very central¹⁴ position in the network of collaborations** amongst participants in Horizon 2020, next to other EU28 countries such as Sweden, Greece and Austria. Figure 8 also shows **which specific countries are the most frequent entry gates to Horizon 2020 for associated countries**. For example, Israel, Georgia and Iceland collaborate frequently with Germany, while Turkey shows a strong collaborative relationship with Spain. Norway displays close connections with Spain, the UK, France and Germany. Italy is a frequent collaborator for Serbia, Albania, North Macedonia, Moldova and Bosnia and Herzegovina, while France has strong connections with Ukraine and Tunisia.

¹⁴ Centrality can be defined as the importance of a country in the network of collaboration between Horizon 2020 participants. This importance as such can have different meanings, hence different definitions, with the most straightforward definition being based on the number of connections of a country's participants in the whole network.

Figure 8 Horizon 2020 network of projects' participations – Focus on EU28 and Associated Countries



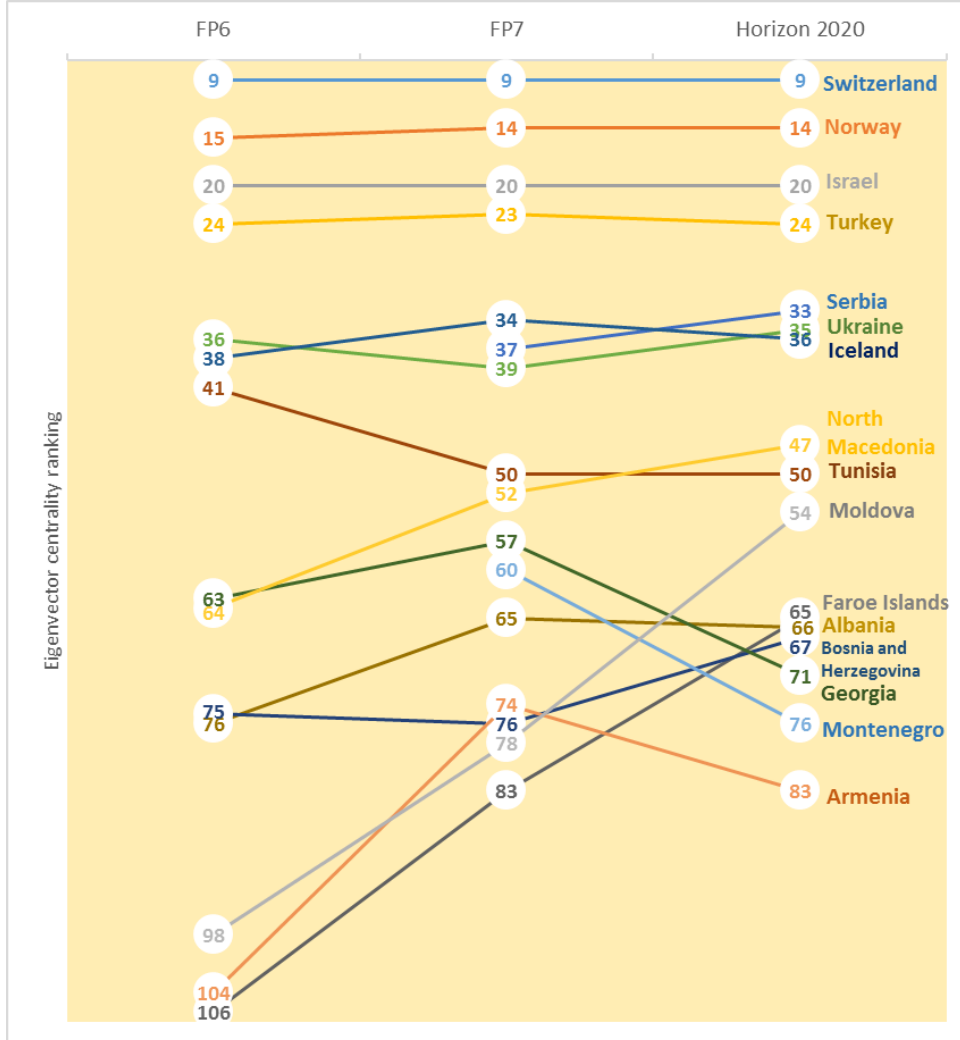
This graph represents the backbone of Horizon 2020. Nodes are countries of the participating organisations, and links represent strong¹⁵ connections based on Horizon 2020 projects. Non-associated third countries are not represented on the graph. Source: European Commission (2018c).

Participants from associated countries are on average less central in the network of Horizon 2020 collaborations than EU Member States, but they are characterised by a high degree of heterogeneity, with the least central country (Armenia) being ranked 83rd in terms of centrality amongst all countries participating in Horizon 2020 and the most central country (Switzerland) being in the 9th place¹⁶ (Figure 9). After Switzerland, the most central countries are Norway (14th), Israel (20th) and Turkey (24th). These four countries have been particularly stable in terms of centrality in the network since the 6th Framework Programme (FP6). They are followed by Serbia (33th), Ukraine (35th) and Iceland (36th), which have also been stable in this ranking since FP6. Participants from North Macedonia (47th), Moldova (54th), Faroe Islands (65th), Albania (66th) and Bosnia and Herzegovina (67th) have improved their position in the collaboration network since FP6.

¹⁵ The links displayed on this graph with N actors combines the N-1 links of a maximum spanning tree (MST) and the N-1 strongest links of the overall network. The MST represents the backbone of a weighted network and is based on three rules. First, it keeps only N-1 links from a network with N actors. Second, rule #1 should be satisfied while keeping the strongest links. Third, rule #1 and #2 should be satisfied without creating any isolate in the network.

¹⁶ Balland and Ravet (2018).

Figure 9 Ranking of associated countries in terms of centrality (within all countries)

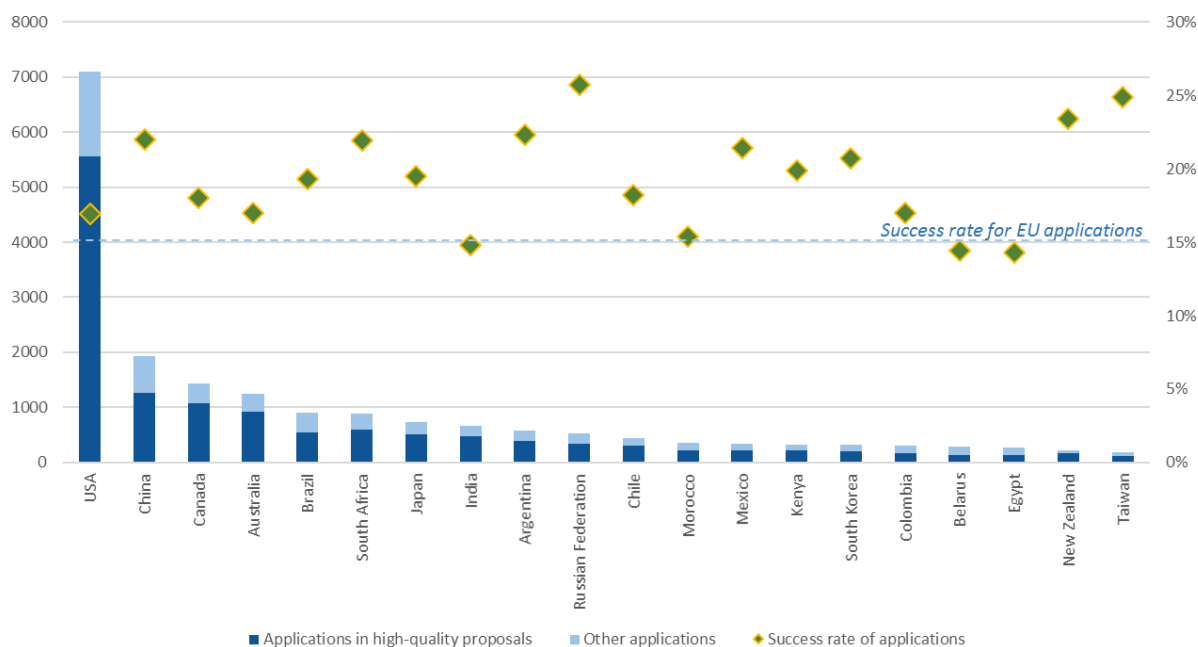


Source: Balland and Ravet (2018).

5 Non-associated third countries

With applicants from 163 non-associated third countries so far, Horizon 2020 demonstrates a very broad international outreach. The USA gathers about 30% of these applications (Figure 10), followed by China (8%), Canada (6%) and Australia (5%). Overall the top-20 applicant countries gather 81% of these applications whereas 45 countries submitted only 1 or 2 applications. The large share of applications from the USA is mainly explained by a high number of MSCA applications for individual researchers that involve US organisations. The **level of quality of the applications from these countries is also particularly high**: almost 80% of applications submitted by US participants were evaluated as high quality. This share is around 70% for many of the most active non-associated third countries, compared to less than 60% for associated countries and EU Member States. **In the same line the success rate for applications from non-associated third countries is higher than for other country groups (18% compared to 15% for EU applications)**. Still, some countries submit relatively less high-quality proposals than EU28 (57% of applications in high-quality proposals).

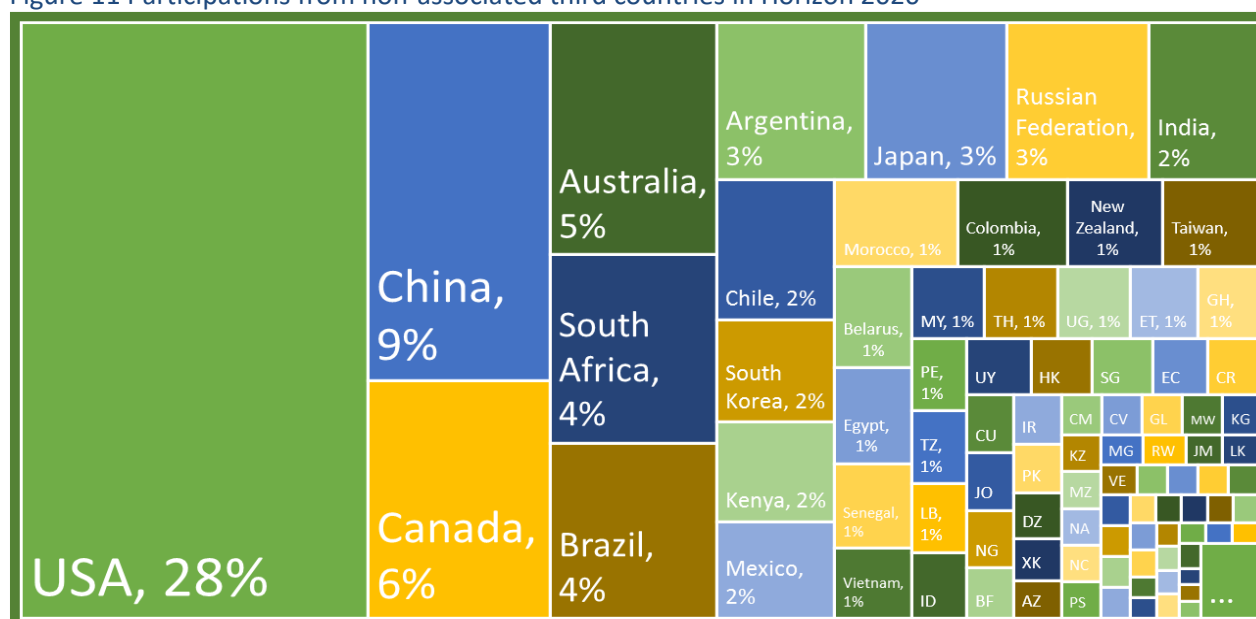
Figure 10 Number of applications (left axis) and success rate (right axis) of non-associated third countries



Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

Regarding participations, a total of **108 non-associated third countries** are represented in Horizon 2020 projects. **With over 1,100 participations so far, the USA accounts for 28% of participations from non-associated third countries** (Figure 11, with more data for all non-associated countries in Annex). The USA is followed by China (9% of participations from non-associated third countries), Canada (6%), Australia (5%), South Africa (4%) and Brazil (4%). Overall the top-20 participant non-associated third countries gather 81% of these participations, with a low level of participation for many developing economies.

Figure 11 Participations from non-associated third countries in Horizon 2020

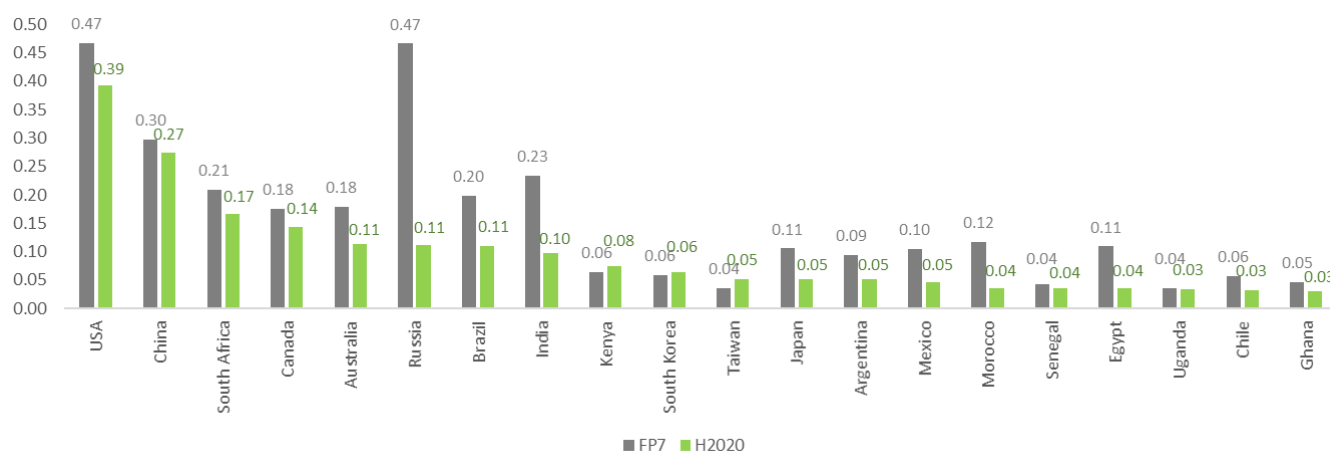


Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

Compared to FP7, **there is a clear drop in the participation of non-associated third countries** in collaborative projects¹⁷. Figure 12 shows that participations from most top non-associated third countries in collaborative projects represent a lower share of participations in Horizon 2020 compared to FP7, with Russia, Brazil, India, Japan, Mexico Morocco and Egypt exhibiting the largest relative decrease. As stated in Section 3, this can be mainly explained by the discontinuation of dedicated international cooperation schemes that existed in FP7 and the change in eligibility conditions for funding participants from Brazil, Russia, India, China and Mexico between FP7 and Horizon 2020. To counterbalance this trend, **international cooperation flagships were introduced in the Work Programme 2018-2020 of Horizon 2020** as a measure to strengthen strategic cooperation with key third partners on areas of mutual benefit.

The preliminary results of the 2018 calls exhibit an increase in the participations of non-associated third countries to collaborative projects to 3.6% in 2018 (based on around 40% of signed projects) as compared to 2.4% average for years 2014-2017. There is also a significant increase in non-associated countries' contributions to entities in collaborative actions (from €26 million in 2014 to €113 million in 2017¹⁸), due to efforts to extend dedicated Horizon 2020 co-funding mechanisms in international partner countries.

Figure 12 Participations from top-20 non-associated third countries in collaborative projects in FP7 and Horizon 2020 (% of all participations in collaborative projects)



Source : European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

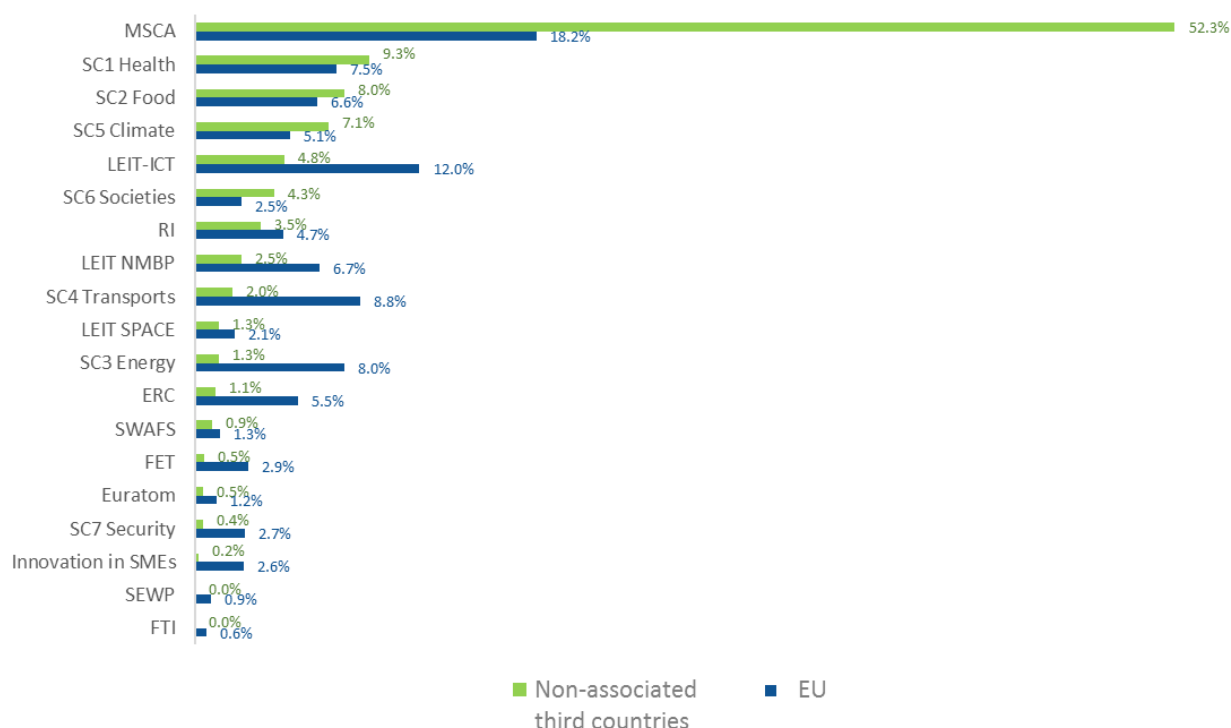
Figure 13 presents participations from non-associated third countries by Horizon 2020 programme part. **About half of these participations take place in MSCA projects** (52.1% of participations while MSCA represent 18.2% of EU participations). This corresponds to 11% of all participations and 0.1% of the EU investment in MSCA. This is driven by the USA, which constitutes 40% of these participations. Projects in the Societal Challenge 1 “Health, demographic change and wellbeing” are also particularly well represented (9% of participations from non-associated third countries). This can be partly explained by the fact that US participants are eligible to receive EU funding under this Societal Challenge. Other **programme parts with a large representation of participations from non-associated third countries are the Societal Challenge 2** (“Food security, sustainable agriculture and forestry, marine

¹⁷ As in Section 3, the comparison with FP7 is made on the basis of collaborative projects for comparability purpose.

¹⁸ Overall, the own contribution from non-associated countries has been about EUR 300 million so far.

and maritime and inland water research, and the Bioeconomy”, with 9.3% of participations) **and Societal Challenge 5** (“Climate action, environment, resource efficiency and raw materials”, with 7.1% of participations). Compared to EU participations, non-associated third countries participate significantly less in the programme parts dedicated to Leadership in Enabling and Industrial Technologies (LEIT), to Societal Challenge 4 (“Smart, green and integrated transport”) and Societal Challenge 3 (“Secure, clean and efficient energy”).

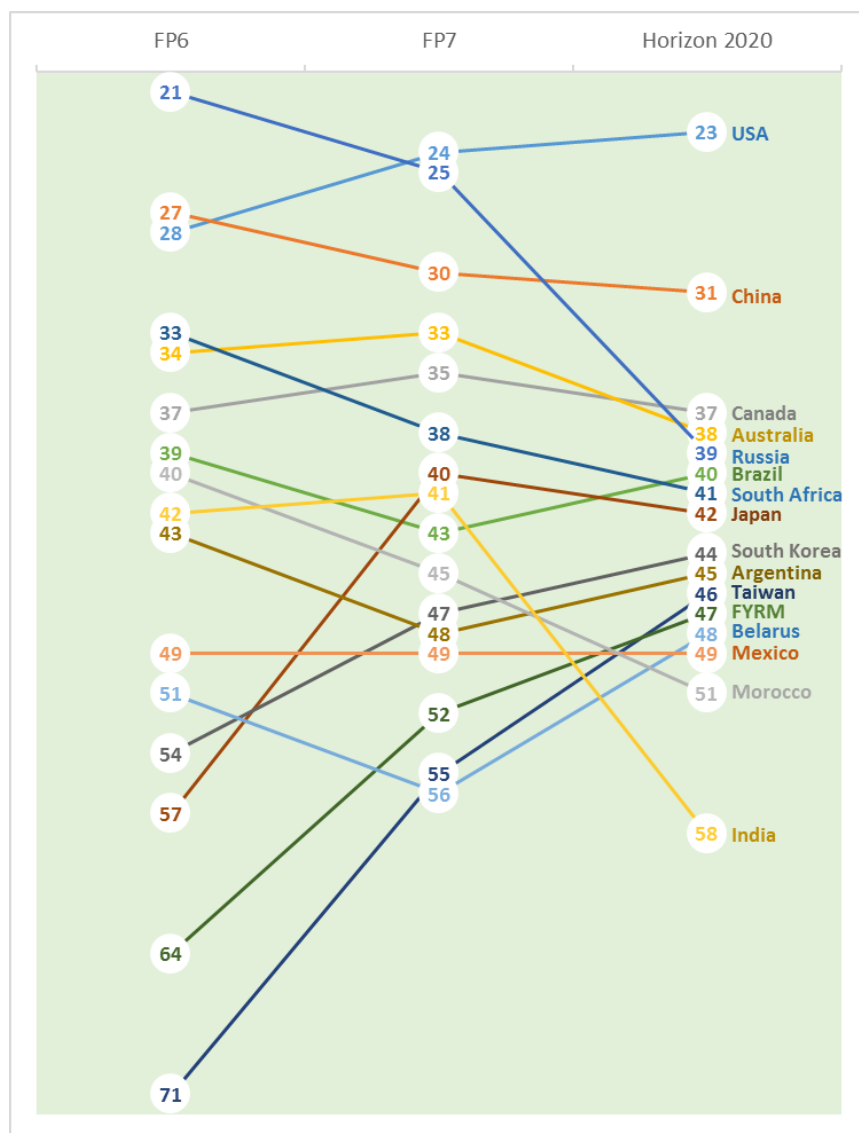
Figure 13 Participations from non-associated third countries by programme part (% of participations in the country group)



Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019. Definition of acronyms in Annex.

Participants from non-associated third countries are, on average, less central than participants from other country groups in the network of collaborations between participants (European Commission, 2018c). Similar to associated countries, their most frequent partners are participants from large EU countries such as the UK, Germany, France, Italy and Spain. As shown in Figure 14, US participants are still highly ranked in terms of centrality (23rd most central country in Horizon 2020) and this has been reinforced over time since FP6. The picture is mixed among BRIC countries, with China maintaining its second most central position within non-associated third countries, while the position of Russia and India has dropped in this ranking over time.

Figure 14 Ranking of top non-associated third countries in terms of centrality (within all countries)



Source: Balland and Ravet (2018). Note: top 15 most central countries in Horizon 2020 plus India.

6 Overall messages

With participants from 124 non-EU countries, Horizon 2020 demonstrates a very broad international outreach attracting talent from around the world in particular from higher education organisations.

The monitoring flash overall shows a certain level of heterogeneity in the cooperation patterns with third countries, reflecting the diversity of objectives and benefits pursued with international cooperation:

- Horizon 2020 is benefitting from excellence worldwide for increasing competitiveness, jointly tackling global challenges and increasing participation in international value chains through the involvement of participants from 108 non-associated third countries. Following a decrease of

participation from non-associated third countries in collaborative projects since FP7, **the international cooperation flagships of the Horizon 2020 Work Programme 2018-2020 are starting to partly reverse this picture, with encouraging preliminary results:** based on slightly less than half of projects from 2018 calls, the participation share of non-associated third countries is around 50% higher than the average during 2014-2017. Moreover, cooperation with both associated and non-associated countries has been reinforced in Public-Public Partnerships and multilateral initiatives. **Most of the collaborations are with a set of countries with advanced R&I capabilities in particular through researchers mobility schemes such as MSCA but also through specific projects and multilateral initiatives to support sustainable development and addressing global societal challenges including with developing economies.** Countries with strong R&I performance such as Switzerland, Norway and Israel are the most active associated countries, while almost one third of participations from non-associated third countries are from the USA (partly due to a large US participation in MSCA schemes).

- Horizon 2020 also contributes to the **integration of R&I systems in the ERA for countries which have a relative lack of R&I capacity as well as supports a Common Knowledge and Innovation Space, including through mobility for researchers.** The participation of countries with less-advanced R&I capacities can often prove challenging as shown by the **under-EU average performance in terms of the quantity, quality and success of applications** of these countries.

While the international dimension of Horizon 2020 has been reinforced for the remaining years of Horizon 2020 through targeted actions in the last Work Programme, **the identified trends also call for an intensification of international cooperation activities in Horizon Europe.** The proposal made for Horizon Europe based on its impact assessment (European Commission, 2018a) is expected to **enhance the excellence and impact of the programme, allowing EU participants to collaborate with the best minds in the world for increased excellence and competitiveness, for effectively tackling global challenges and for implementing global commitments.** In addition to fostering the creation and diffusion of high-quality knowledge in the EU, it would also give to the EU a higher influence in shaping global R&I systems. It would **enhance the EU's leading role in setting the policy agenda,** in particular for **addressing common challenges and for achieving the Sustainable Development Goals.** Horizon Europe is expected to be an effective instrument in Europe's efforts to harness globalisation by removing barriers to innovation and by establishing fairer framework conditions with international partners.

7 Towards Horizon Europe – based on the Commission proposal

Horizon Europe should promote and integrate cooperation with third countries and international organisations and initiatives based on **common interest, mutual benefit and global commitments to implement the UN Sustainable Development Goals.** International cooperation should aim to strengthen the Union's research and innovation excellence, attractiveness and economic and industrial competitiveness, to tackle global challenges, as embodied in the UN SDGs, and to support the Union's external policies. An approach of general opening for international participation and targeted international cooperation actions should be followed, including through appropriate eligibility for funding of entities established in low to middle income countries. At the same time, association of third countries to the Programme should be promoted.

Overall, as summarised in the impact assessment of Horizon Europe, the programme is expected to:

- Extend its openness to association of third countries to make cooperation and co-funding as smooth as possible;
- Continue its general opening for international participation, for entities from both industrialised and from developing countries, and continue its funding of entities from low-mid income countries and only exceptionally of entities from industrialised countries;
- Launch targeted actions to pursue strategic international cooperation in line with EU priorities; and
- Be more proactive in seeking synergies with other Union programmes, including the External Instrument.

8 References

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9 Annex

Table 1 Programmes parts in Horizon 2020

Acronym	Programme part
ERC	European Research Council
MSCA	Marie Skłodowska-Curie actions
FET	Future and Emerging Technologies
RI	Research infrastructures (including e-infrastructure)
LEIT	Leadership in enabling & industrial technologies
ARF	Access to risk finance
Innovation in SMEs	Innovation in SMEs
FTI	Fast Track to Innovation
SC1	Health, demographic change & wellbeing
SC2	Food security, sustainable agriculture and forestry,
SC3	Secure, clean & efficient energy
SC4	Smart, green & integrated transport
SC5	Climate action, environment, resource efficiency & raw materials
SC6	Inclusive, innovative & reflective societies
SC7	Secure societies
SEWP	Spreading excellence & widening participation
SWAFS	Science with and for society
Euratom	Euratom

Table 2 Participations by type of participant

Whole Programme	Associated countries		Non-associated third countries		EU28		Total	
Higher education	2918	38%	2392	58%	29241	32%	34551	34%
Private sector	2520	33%	477	12%	32190	35%	35187	33%
Public bodies	580	8%	266	7%	5055	6%	5901	6%
Research organisations	1298	17%	666	16%	20044	22%	22008	21%
Other	278	4%	288	7%	5262	6%	5828	6%
Total	7594	100%	4089	100%	91792	100%	103475	100%
Without MSCA	Associated countries		Non-associated third countries		EU28		Total	
Higher education	2099	34%	731	38%	20036	27%	22866	28%
Private sector	2202	36%	313	16%	28474	38%	30989	37%
Public bodies	531	9%	223	11%	4777	6%	5531	7%
Research organisations	1121	18%	462	24%	16927	23%	18510	22%
Other	248	4%	220	11%	4844	6%	5312	6%
Total	6201	100%	1949	100%	75058	100%	83208	100%

Table 3 Participations and EU investment through Horizon 2020 – associated countries

Associated countries	Nr of Horizon 2020 participations in signed grants by country of beneficiary	% of total Horizon 2020 participations	Horizon 2020 investment (EUR million)	% of total Horizon 2020 investment
Albania	27	0.03%	2.4	0.01%
Armenia	26	0.03%	1.2	0.00%
Bosnia and Herzegovina	63	0.06%	5.5	0.01%
Faroe Islands	18	0.02%	2.8	0.01%
Georgia	30	0.03%	2.7	0.01%
Iceland	243	0.23%	85	0.22%
Israel	1255	1.21%	732.6	1.88%
Moldova (Republic of)	56	0.05%	5.1	0.01%
Montenegro	29	0.03%	1.6	0.00%
North Macedonia	66	0.06%	7.3	0.02%
Norway	1746	1.69%	800.3	2.06%
Serbia	339	0.33%	72.3	0.19%
Switzerland	2808	2.71%	1128.9	2.90%
Tunisia	61	0.06%	7.7	0.02%
Turkey	652	0.63%	144.7	0.37%
Ukraine	175	0.17%	20.8	0.05%
Total	7594	7.3%	3020.9	7.8%

Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

Table 4 Participations and EU investment through Horizon 2020 – Non-associated third countries

Non-associated third countries	Nr of Horizon 2020 participations in signed grants by country of beneficiary	% of total Horizon 2020 participations	Horizon 2020 investment (EUR million)	% of total Horizon 2020 investment
Afghanistan	2	0.00%	0.8	0.00%
Algeria	12	0.01%	0.7	0.00%
Angola	1	0.00%	0	0.00%
Anguilla	4	0.00%	0.9	0.00%
Argentina	130	0.13%	5.3	0.01%
Australia	215	0.21%	4.9	0.01%
Azerbaijan	10	0.01%	0.5	0.00%
Bangladesh	3	0.00%	0.8	0.00%
Belarus	43	0.04%	2.3	0.01%
Benin	3	0.00%	0.8	0.00%
Bolivia	5	0.00%	0.2	0.00%
Botswana	3	0.00%	0.3	0.00%
Brazil	162	0.16%	9.7	0.02%
British Virgin Islands	1	0.00%	0.2	0.00%
Burkina Faso	13	0.01%	5.6	0.01%
Burundi	2	0.00%	0.1	0.00%
Cambodia	3	0.00%	0.5	0.00%
Cameroon	9	0.01%	0.7	0.00%
Canada	240	0.23%	4.7	0.01%
Cape Verde	9	0.01%	0.3	0.00%
Chile	91	0.09%	4.2	0.01%
China (People's Republic of)	362	0.35%	3.1	0.01%
Colombia	53	0.05%	3.8	0.01%
Costa Rica	16	0.02%	0.9	0.00%
Cote d'Ivoire	4	0.00%	0.2	0.00%
Cuba	15	0.01%	0.6	0.00%
Dominican Republic	1	0.00%	0	0.00%
Ecuador	17	0.02%	1.3	0.00%
Egypt	41	0.04%	3.5	0.01%
Ethiopia	27	0.03%	2.5	0.01%
French Polynesia	4	0.00%	0	0.00%
Gabon	2	0.00%	0.8	0.00%
Ghana	24	0.02%	4.4	0.01%
Gibraltar	5	0.00%	2.9	0.01%
Greenland	9	0.01%	0.7	0.00%
Grenada	1	0.00%	0	0.00%
Guatemala	3	0.00%	0.2	0.00%
Hong Kong	19	0.02%	0.6	0.00%
India	96	0.09%	2.4	0.01%
Indonesia	20	0.02%	1.2	0.00%
Iran (Islamic Republic of)	13	0.01%	0.6	0.00%
Iraq	4	0.00%	0.3	0.00%
Jamaica	6	0.01%	1.4	0.00%
Japan	124	0.12%	2.8	0.01%
Jersey	1	0.00%	0	0.00%
Jordan	15	0.01%	5.4	0.01%
Kazakhstan	8	0.01%	0.3	0.00%
Kenya	65	0.06%	9.8	0.03%
Kosovo * UN resolution	11	0.01%	1.1	0.00%
Kyrgyzstan	8	0.01%	0.5	0.00%
Lao (People's Democratic Republic)	2	0.00%	0	0.00%
Lebanon	21	0.02%	1.6	0.00%
Lesotho	1	0.00%	0	0.00%
Liberia	1	0.00%	0.1	0.00%
Libya	1	0.00%	0	0.00%

Non-associated third countries	Nr of Horizon 2020 participations in signed grants by country of beneficiary	% of total Horizon 2020 participations	Horizon 2020 investment (EUR million)	% of total Horizon 2020 investment
Liechtenstein	5	0.00%	0	0.00%
Madagascar	7	0.01%	0.1	0.00%
Malawi	9	0.01%	2.2	0.01%
Malaysia	29	0.03%	1.1	0.00%
Mali	4	0.00%	0.2	0.00%
Mauritania	1	0.00%	0.1	0.00%
Mauritius	2	0.00%	0	0.00%
Mexico	63	0.06%	0.9	0.00%
Mongolia	3	0.00%	0	0.00%
Morocco	59	0.06%	4.1	0.01%
Mozambique	8	0.01%	1	0.00%
Myanmar	1	0.00%	0.1	0.00%
Namibia	8	0.01%	0.6	0.00%
Nepal	5	0.00%	1.2	0.00%
New Caledonia	8	0.01%	0.3	0.00%
New Zealand	46	0.04%	1.8	0.00%
Nicaragua	1	0.00%	0.3	0.00%
Niger	3	0.00%	0.8	0.00%
Nigeria	15	0.01%	1.3	0.00%
Pakistan	13	0.01%	1.2	0.00%
Palestine	8	0.01%	0.3	0.00%
Panama	1	0.00%	0.1	0.00%
Paraguay	5	0.00%	0.3	0.00%
Peru	22	0.02%	1.8	0.00%
Philippines	5	0.00%	0.1	0.00%
Qatar	3	0.00%	0	0.00%
Russian Federation	124	0.12%	3	0.01%
Rwanda	7	0.01%	1.3	0.00%
Sao Tome and Principe	1	0.00%	0	0.00%
Saudi Arabia	5	0.00%	0	0.00%
Senegal	36	0.03%	3.1	0.01%
Seychelles	1	0.00%	0.1	0.00%
Sierra Leone	3	0.00%	8.1	0.02%
Singapore	19	0.02%	0.2	0.00%
South Africa	174	0.17%	27.5	0.07%
South Korea	67	0.06%	0.7	0.00%
Sri Lanka	6	0.01%	1.1	0.00%
Swaziland	4	0.00%	0.3	0.00%
Taiwan	46	0.04%	0.7	0.00%
Tajikistan	3	0.00%	0.4	0.00%
Tanzania (United Republic of)	22	0.02%	6	0.02%
Thailand	29	0.03%	1.1	0.00%
Togo	2	0.00%	0.1	0.00%
Turkmenistan	1	0.00%	0.1	0.00%
Uganda	29	0.03%	6.2	0.02%
United Arab Emirates	2	0.00%	0	0.00%
United States	1147	1.11%	45.1	0.12%
Uruguay	20	0.02%	2.8	0.01%
Uzbekistan	4	0.00%	0.1	0.00%
Venezuela	6	0.01%	0	0.00%
Viet Nam	30	0.03%	1.7	0.00%
Yemen	1	0.00%	0.1	0.00%
Zambia	5	0.00%	1.4	0.00%
Total	4089	4.0%	227.6	0.6%

Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

Table 5 Participations and EU investment by programme part

Programme parts	Participations				Horizon 2020 investment			
	Associated countries	% all part. in prog. part	Non-associated third countries	% all part. in prog. part	Associated countries	% total investments in programme part	Non-associated third countries	% total investments in programme part
ERC	724	12.4%	45	0.8%	1085.7	13.9%	9.7	0.1%
MSCA	1393	6.9%	2140	10.6%	275.9	7.1%	2.1	0.1%
FET	248	8.5%	20	0.7%	165.3	11.5%	1.4	0.1%
RI	428	8.7%	143	2.9%	122	7.8%	19.2	1.2%
LEIT-ICT	773	6.5%	196	1.6%	244.7	5.5%	12.5	0.3%
LEIT-NMBP	452	6.8%	101	1.5%	156	6.0%	7.4	0.3%
LEIT-SPACE	117	5.5%	52	2.4%	22.6	3.7%	4.2	0.7%
Innovation in SMEs	339	12.3%	8	0.3%	65.5	13.3%	0.2	0.0%
FTI	55	8.5%	1	0.2%	19	7.1%	0.3	0.1%
SC1 Health	509	6.5%	380	4.9%	129.4	3.8%	90.4	2.6%
SC2 Food	538	7.8%	327	4.7%	164.1	8.4%	23.9	1.2%
SC3 Energy	617	7.7%	52	0.6%	219	7.3%	5.4	0.2%
SC4 Transport	416	4.8%	82	1.0%	107.8	3.7%	2	0.1%
SC5 Climate	378	7.1%	292	5.5%	97.9	6.2%	26.3	1.7%
SC6 Societies	195	7.3%	174	6.5%	38.5	6.0%	17.6	2.7%
SC7 Security	210	7.9%	18	0.7%	60.8	7.5%	1	0.1%
SEWP	39	4.6%	2	0.2%	20.6	3.9%	0	0.0%
SWAFS	115	8.3%	37	2.7%	15.4	5.7%	3.1	1.1%
Euratom	44	3.9%	19	1.7%	10	1.6%	0.4	0.1%
Total	7594	7.3%	4089	4.0%	3020.9	7.8%	227.6	0.6%

Source: European Commission, DG RTD, based on CORDA data, Cut-off date 1 January 2019.

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#1 Country Participation

#2 Dynamic Network Analysis

#3 International Cooperation