

Roadmap for EU - Canada S&T cooperation

1. CANADA as a partner of the EU

Canada is one of the EU's oldest and closest partners and the diplomatic relations started formally in 1976. The EU and Canada work closely together on global challenges and regional stability throughout the world. Canada also participates in EU election observation missions. European and Canadian representatives meet regularly to exchange views at all levels, from bilateral summits of leaders to meetings between officials on specific issues including in various multilateral fora. The EU-Canada Partnership Agenda adopted at the Ottawa Summit on 18 March 2004, identifies ways of working together to move forward, especially where joint action can achieve more than acting alone. The Partnership Agenda acknowledges the significant evolution of EU-Canada relations as a result of developments in the EU since 1976 when the relationship with Canada was first formalised through the Framework Agreement on Economic Co-operation. This was the first formal agreement of its kind between what was then the European Economic Community (EEC) and an industrialised third country. What started out in the 1950s as a purely economic relationship has evolved over the years to become a close strategic partnership. The Strategic Partnership Agreement (SPA) – provisionally applied since April 1st 2017 - together with CETA – which provisionally entered into force since September 21, 2017 - marks the beginning of a new, dynamic chapter in the long-standing partnership between the EU and Canada. SPA greatly broadens the range of cooperation in comparison to the 2004 EU-Canada Partnership Agenda it builds on.

[Latest EU-CANADA Summit]

At the last Canada-EU Summit which took place in Brussels 27 October 2016 the leaders adopted a joint Declaration committing to renew the strategic partnership between both sides.

They committed to step up cooperation on ocean issues, including governance and on the Arctic by jointly working toward the establishment a pan-Arctic observing system. They also agreed to increase coordination and cooperation with the Arctic Council and to ensure the full implementation of the EU's observer status. In this context, both sides will continue to enhance cooperation under the Transatlantic Ocean and Arctic Research Alliance. The leaders recognised the importance of increasing our cooperation on scientific research and signed an Implementing Arrangement to facilitate cooperation of Canadian researchers in the Horizon 2020 programme.

They also committed to continue developing common principles and enhancing framework conditions for researchers from Canada and the European Union through programme level activities and alignment of respective funding streams.

[EU-CANADA non-S&T cooperation agreements]

In addition to trade relations, other policy sectors are also important in the relationship: cooperation in justice and home affairs, education & training.

Canada is one of the world's five largest energy producers and has benefitted from the revolution in unconventional oil and gas production. The Canadian government puts more emphasis on environment and climate and a greater attention is given to renewables. Furthermore, the EU and Canada agreed to continue discussions within a revitalised High Level Dialogue on Energy.

Canada's Prime Minister Justin Trudeau underscored already early 2016 the strong partnership between Canada and the European Union and affirmed the desire to further strengthen the relationship. At COP 21, Canada has been particularly active on helping to secure a robust transparency and accountability regime and overall an ambitious outcome at the Paris Conference not least by supporting the 1.5°C target. The federal government intends jointly with the provinces and territories to reach the national emissions reduction targets.

[EU-CANADA S&T cooperation agreements]

The Agreement for Scientific and Technological Cooperation between Canada and the European Union has been in place since 1996 and is not limited in time. The responsibility for the S&T cooperation dialogue lies with the EU-Canada Joint Science and Technology Cooperation Committee (JSTCC). The JSTCC meets on a regular basis to review progress and provides new directions for cooperation in the fields of science and technology. Furthermore, in 1998 Canada and Euratom signed the Agreement for cooperation in the area of nuclear research.

[R&I landscape in CANADA]

Canada's science and technology governance structure is characterised by a high degree of diversity and is organised around a number of key players, including industry, governments (both federal and provincial and territorial) and universities and colleges. Policy design and implementation is a shared competence between the federal and the provincial and territorial governments. Canada's provincial and territorial governments seek national and international partnerships and investment in science, research and technology, in parallel as well as in partnership with the Canadian federal government. The provinces and territories provide most of the basic physical infrastructure and operating costs for education and for research in Canada's universities.

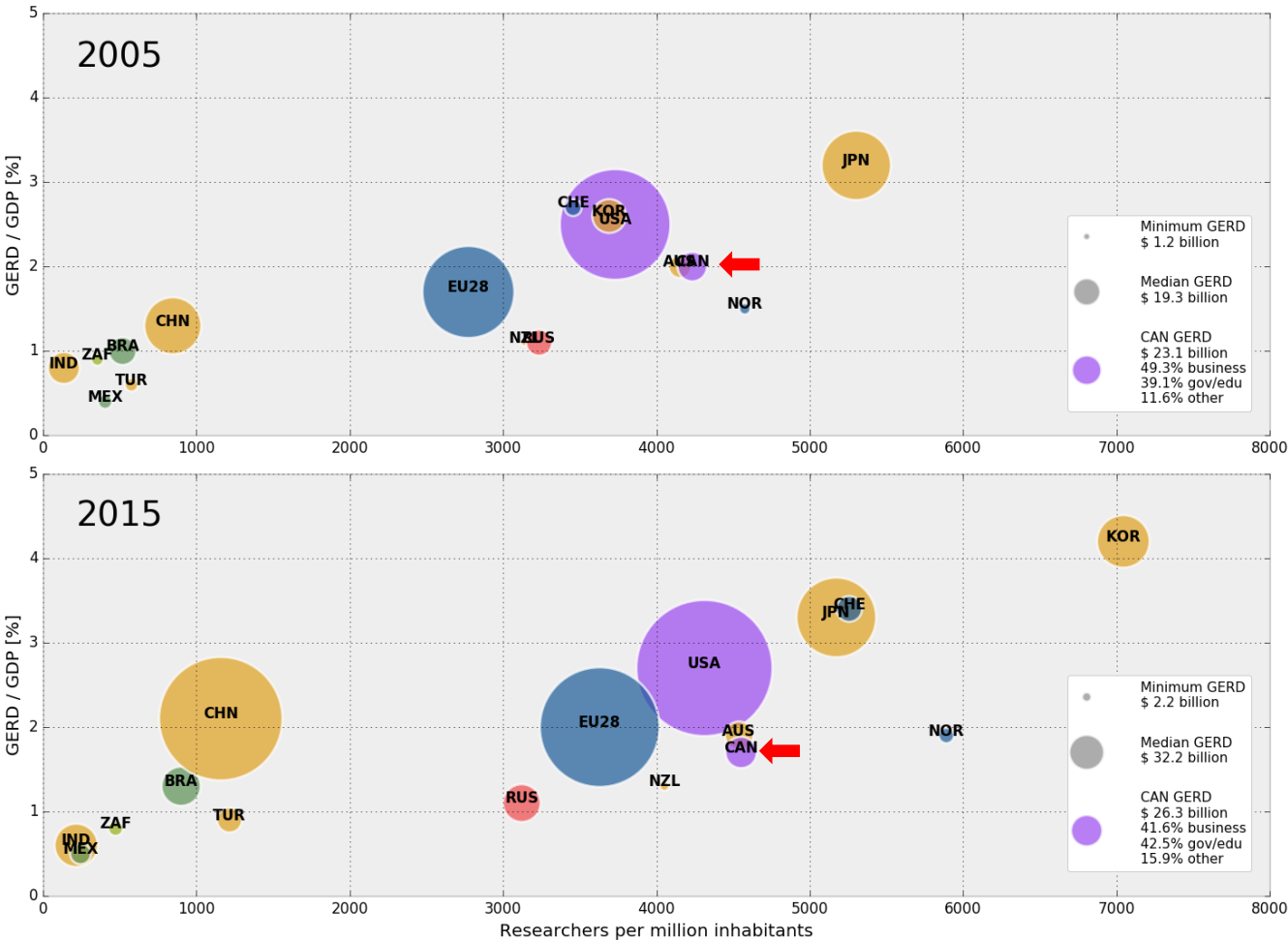
Canada has a well-established and strong post-secondary education system and benefits from some world-class university research. As result health and medical research as well as physics and psychology are extremely strong scientific areas. Strengths in industrial research can be found for example in aeronautics, ICT or oil and gas extraction.

Many of the industrial or business sectors which play an important role for innovation in Canada are under the responsibility of the provincial or territorial authorities. These sectors include education, health, construction and natural resources (agriculture, oil and gas, mining, and forestry). The distributed responsibility did in the past not contribute to a distinct overall Canadian "national innovation policy", which has changed under Prime Minister Trudeau.

Canada puts increased emphasis on supporting the development of applications of commercial interest and value. Earlier 2018 the Canadian federal government announced the final list of five successful consortia ("innovation superclusters") that would benefit from a share in a federal funding package of a total of CAD 950 million (over five years). The initiative helps to address the Canadian innovation challenge to transform Canada's research strengths into strong business innovation and commercialization outcomes.

Mona Nemer was appointed Chief Science Adviser for Canada on 26 September 2017, to provide impartial scientific advice to the Prime Minister and the Minister of Science, and to help ensure that government science is fully available to the public.

Figure 1: Expenditures in Research & Development and researchers per million inhabitants



Note: GERD in current PPP; Top chart: Data for CHE from 2004. Bottom chart: Data on researchers per million inhabitants for BRA from 2014, for CAN from 2014, for MEX from 2013 and for AUS from 2010.
 Source: DG RTD - International Cooperation
 Data: UIS, OECD, EUROSTAT; extraction date: 11/10/2018

2. State of play of EU-CANADA S&T cooperation

2.1. On-going FP7 and Horizon 2020 cooperation

Since FP7 the EU-Canada S&T relation have constantly grown and be turned into a vast cooperation taking shape and expanding more and more under Horizon 2020. The main areas and activities of this cooperation can be listed in short as follows:

- *Aviation:* Following previous EU-Canada coordination in this area the number of projects with Canadian partners substantially increased under Horizon 2020. The National Research Council of Canada (NRC) had a key role in joint flight testing between EU, Canada and US partners in South America, in the aviation safety critical domain of High-Altitude-Ice-Crystals.

Co-funded jointly by the Consortium for Aerospace Research and Innovation in Canada (CARIC) and the Natural Sciences and Engineering Research Council of Canada (NSERC) the first Horizon 2020 coordinated call on Aeronautics was finalised and projects selected on both sides started to cooperate as of 2016 in safety related domains as Electromagnetic-Compatibility and Icephobic coatings and also in Additive Manufacturing for Aviation. Furthermore, the first Canadian participation in the Public-Private Joint Technology Initiative CleanSky2 has taken place, in the domain of helicopters – in line with the cross-cutting nature of the supply chain.

Exchanges between Horizon 2020 and CARIC confirmed the interest in increasing the scale and scope of our cooperation through the Horizon2020 flagship "Safer and greener aviation in a smaller world".

- *Marine and Arctic research:* On May 24 2013 Commissioner Damanaki and Commissioner Geoghegan-Quinn signed on behalf of the European Union the Galway Statement, and agreed with the United States and Canada to join forces on Atlantic Ocean research by launching the Atlantic Ocean Research Alliance. The agreement focuses on aligning ocean observation and other research efforts of the three partners. The goals are to better understand the Atlantic Ocean and to promote the sustainable management of its resources. The work also studies the interplay of the Atlantic Ocean with the Arctic Ocean, particularly with regards to climate change. Since the signing of the Galway Statement in May 2013 and the launch of working groups (on marine research and on Arctic research) cooperation continues to gather momentum and global international recognition. Canada has access to important waters and territories especially in the Arctic. In spite of its formal bilateral genesis (EU-US and EU-Canada), to all intents and purposes, in the past years the cooperation has become effectively trilateral. The Horizon 2020 programme has played a driving role in its implementation, having funded 140 million Euros in the first years of the Horizon 2020 through Blue Growth calls for proposals.

The various Trilateral EU-US-Canada working groups have delivered excellent results on various cooperation areas (seabed mapping, observing systems, aquaculture, ocean literacy, ocean health and stressors).

The European Commission will further invest over EUR 60 million under Horizon 2020 from 2018-2019 in calls for proposals dedicated to research in the Atlantic Ocean. This funding will go towards assessing ecosystems, seafloor mapping and developing innovative aquaculture systems, with the aim of having, by 2020, more than 500 research teams working from the Antarctica to the Arctic.

The years 2015-2017 were extremely positive for the international scientific cooperation in the Arctic as a whole. The Atlantic Ocean Research Alliance was instrumental to prepare for the first Arctic Science Ministerial and it is engaged to support the second Arctic Science Ministerial in 2018. Both sides improved greatly the alignment of funding priorities and programmes between the EU and Canada. The European Commission is continuing and even stepping up the investments in Arctic research and innovation, with an expected average investment of more than 20 million Euro per year for the last three years of Horizon 2020.

- *Research Infrastructures*: Cooperation between Canadian and European Research Infrastructures is well consolidated. Canada is involved in the activities of CERN and other major European initiatives such as the European Strategy Forum on Research Infrastructures (ESFRI) roadmap Square Kilometre Array (SKA) telescope. Research Infrastructures is one of the dimensions that contribute significantly to the marine and Arctic cooperation with Canada. Canada is an active member of the G7 Group of Senior Officials on global Research Infrastructures and, in such context, the Canadian High Arctic Research Station (CHARS) is identified as one of the case studies around which to analyse possible global collaboration.
- *Bioeconomy*: Bioeconomy is a strategic priority in Research and Innovation for Canada and for the EU. In the Bioeconomy area, the EU is launching the International Bioeconomy Forum (IBF). The aim of IBF is to provide a flexible multilateral instrument for international cooperation, specific to the bioeconomy, capable of adapting to emerging global needs. IBF will align research funding programmes and focus the global effort on specific research areas of global interest; identify emerging needs, issues and future research trends; create a knowledge exchange on critical areas and develop a policy dialogue, especially on bioeconomy indicators and on availability of biomass, essential for measuring progress of the bioeconomy at international level. Canada supported actively the launch of the IBF as co-chair to boost globally the cooperation on a number of key R&I activities and horizontal activities in the Bioeconomy area.
- *Health*: Concerning health research, both EU and Canada continue to be jointly involved in all the multilateral research initiatives that the EU has either started or joined. Some of them are the International Rare Diseases Research Consortium (www.irdirc.org), the Global Alliance for Chronic Diseases (www.gacd.org), the International Human Epigenome Consortium (www.ihec.org) or the International Initiative for Traumatic Brain Injury Research (<http://intbir.nih.gov/>). Moreover, both Canada and the EU are members of the Human Frontier Science Programme (www.hfsp.org). Last but not least, Canada continues to invest as part of several Joint Programming initiatives such as the Joint Programming on Neurodegenerative Diseases

(www.neurodegenerationresearch.eu/) and the Joint Programming Initiative on Anti-Microbial Resistance (www.jpamr.eu/). Furthermore, funding agencies from Canada participate in the E-Rare-3 ERA-NET which coordinates research programmes on rare diseases¹. Cooperation with the Canadian Institute of Health research (CIHR) is very close and there are cases where Canadian researchers have been supported by CIHR matching funding when participating in Horizon 2020.

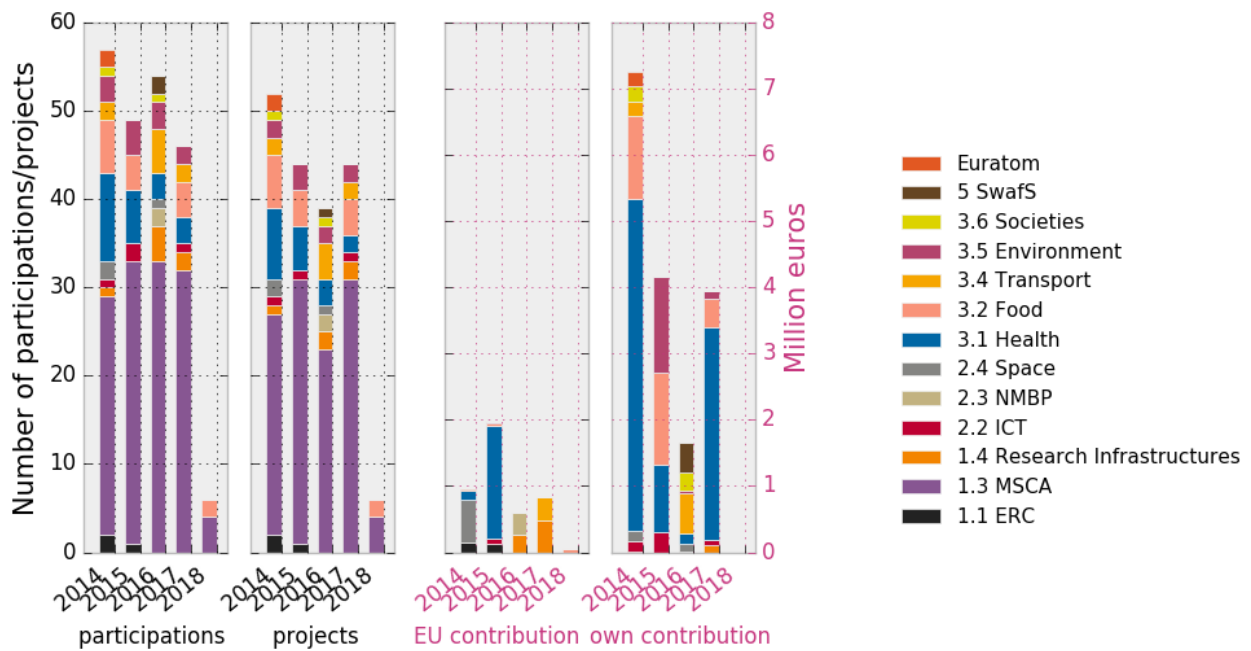
- *Nuclear:* With regard to fission research cooperation, two Canadian research entities participated in the past in three Euratom FP7 projects on severe accident and waste/spent fuel management. Presently one Canadian research entity is participating in two Horizon 2020 projects, on emergency preparedness and emergency response and on radioactive waste disposal, of the present Euratom fission research programme.
- *Other cooperative activities:* Other areas of great importance that are not thematic in nature were also explored during the last EU-Canada committee meeting.

One area where Canada has a strong interest to cooperate with Horizon 2020 is social sciences and humanities. The former EU funded T-AP initiative is a collaboration between key humanities and social science funders from South America, North America, and Europe. The Platform underpins a truly trans-Atlantic network of programme managers, and social sciences and humanities research councils and facilitators, with Canada coordinating the Americas.

As part of the EUREKA network the National Research Council Canada (NRC) manages Canada's EUREKA National Office and provides Canadian companies with a first contact point in Canada for EUREKA's global network.. NRC's Industrial Research Assistance Program (IRAP) can provide funding for EUREKA projects to eligible SMEs.

¹ <http://www.erare.eu/>

Figure 2: Participation of Canada in Horizon 2020



Note: Participations of beneficiaries, third-parties and partner-organisations.
 Source: DG Research and Innovation - International Cooperation
 Data: CORDA (JRC, EIT and art.185 not included); extraction date: 15/10/2018

Canadian applicants are involved 434 times in 339 eligible proposals to collaborative actions² of Horizon 2020, of which 89 were mainlisted, leading to a success rate of 2630% (as compared to 15.8% overall). Canadian entities have 81 participations in 69 signed grants, receiving 4.4 million euros from EU while 17.8 million euros is the contribution of Canadian beneficiaries.

Regarding the Marie Skłodowska-Curie Actions (MSCA), Canadian entities have participated 128 times in MSCA actions (55 in Individual Fellowships, 40 in the RISE, 24 in the ITN and 9 in the COFUND programme) while 175 researchers of CA nationality have participated in MSCA actions.

Currently there are 66 principal investigators of Canadian nationality holding an ERC grant who are based in host institutions in ERA, their highest concentration in the UK and the Netherlands.

The Implementing Agreement between EC and the Canadian Tri-agency Institutional Program Secretariat (TIPS) was signed on 27 October 2016 and already 642 ERC principal investigators expressed their interest in hosting researchers from Canada and finally 4 Canadian investigators joined the teams of the principal investigators.

² Here referring to all actions except for ERC, MSCA, actions under the SME Instrument and Access to Risk Finance.

2.2. Current framework conditions for EU-Canada S&T cooperation

European and Canadian program owners and managers are preparing for more Programme Level Cooperation and exploring how Canadians and Europeans may partner under existing frameworks/joint programmes to better align the respective funding streams. This programme level cooperation exchange involves the major Canadian Granting Councils at federal level as well as the relevant provincial authorities.

While there is no federal matching fund in Canada concerning Horizon 2020, there seems to be a growing interest in the provinces to use provincial funding programmes to support Canadian participants in Horizon 2020 projects. For example researchers from Quebec can apply for funding through a programme for international cooperation: "Programme de soutien à la recherche (PSR)- Soutien à des initiatives internationales de recherche et d'innovation (SIIRI)".

3. Priorities for the future in S&T cooperation

3.1. Areas of future S&T cooperation agreed at latest Joint Committee/High Level Dialogues

An expansion of the EU-Canada S&T cooperation can be expected as well in the existing cooperation area and into new areas:

- *Aeronautics*: Building upon the positive experience of the first coordinated call in Horizon2020, Canada (CARIC) and the EU may enlarge the scale and scope of cooperation through the Horizon2020 multinational flagship "Safer and Greener Aviation in a smaller world", notably through the following topics where Canada's participation is explicitly encouraged:
 - Innovative technologies for improving aviation safety and certification in icing conditions
 - Future propulsion and integration: towards a hybrid/electric aircraft.

In addition, part of the call topic on Human Factors on Transport Safety is also devoted to aviation and encourages for international cooperation, including references to simulators, where Canada is a leader.

- *Marine and Arctic*: EU-Canada marine science cooperation is moving from strategic planning to implementation of priority activities in the form of large and concrete research projects the start of Horizon 2020. The trilateral marine working group EU-Canada-US is exploring opportunities to strengthen industry engagement with the Galway Statement initiative on Atlantic Ocean Cooperation³. It is also working on increasing the coordination with the Canada-EU Arctic Working Group and developing concrete milestones for implementation of the Galway initiative, including alignment of programmes and funding. The area of marine and Arctic cooperation is expected to further expand as implementation of the Galway Statement is taking shape. The type of activities could be more programme level cooperation in form of programme

³ https://ec.europa.eu/research/iscp/pdf/galway_statement_atlantic_ocean_cooperation.pdf

alignment with relevant Canadian partners. New calls are lined up in the last work programmes (2018-2020) of Horizon 2020, with an All Atlantic ambition. The G7 initiative 'The Future of Seas and Oceans' will be supported by a major call for proposals of 18 million € EU funding, matching investments from G7 countries and other global partners.

The vast majority of topics comprised in the Focus Area 'Building a low-carbon, climate-resilient future' encourages international cooperation. Some topics are generally encouraging international cooperation and others are specifically mentioning major emitters.

- *Nanosafety and Technologies for Global Health Care (safety of medical devices):*

Nanosafety research issues are of global nature and international collaboration in this area will be crucial for potential calls to come in the H2020 NMBP⁴ WP 2018-2020, specifically in topics on nanosafety and the governance package. Engaging in international S&T cooperation is essential to strengthen the attractiveness and economic and industrial competitiveness and to tackle global societal challenges. Future research projects under Horizon 2020 in this area are most likely expected to include direct participation of relevant Canadian entities. In addition, participation is expected from countries actively involved in the work of OECD-WPMN, the NanoSafety Cluster and the NANoREG project is strongly encouraged.

The EU recently set up the European Observatory on Nanomaterials (EUON) with the aim to support transparent and reliable information about safety, innovation, research and uses of nanomaterials. The participation of Canada to this Observatory is welcome; some countries already have expressed interest to get engaged.

Technologies for Global Health Care (safety of medical devices): Along with the US, Europe, Japan and Canada have mature, large-scale healthcare markets and are part of the main global regulatory domains in healthcare. The promotion of regulatory harmonisation and global cooperation between them will not only enhance trust in European healthcare product regulations, but also promote the adoption of common reference and technical standards world-wide and at the same time maintain and enhance access to world-wide markets.

As new regulations on medical devices and in vitro diagnostic medical devices will affect imports/exports from and to the EU, EU-Canada cooperation in the area of regulatory science for medical technology products is strongly encouraged.

- *ICT:* Both sides noted in the past that cyber-security could be a potential area of cooperation under ICT. Recognizing that ICT is a cross cutting theme, there are many other opportunities for collaboration which should be discussed on a regular basis between the EU and Canada.

⁴ Nanotechnologies, Advanced materials, Biotechnology, Advanced manufacturing and Processing

- *Health*: Given the excellent cooperation, it is expected that EU and Canada will continue cooperation on all new areas that will emerge in the years to come. CIHR is very strongly involved in most of, if not all, EU based public-public partnerships either in form of ERA-NETs or in form of Joint Programming activities.
- *Researcher Mobility (Marie Skłodowska-Curie Actions (MSCA))*: Both sides plan to continue to promote the MSCA, especially to non-academic organizations. Canadian Co-funding is now provided by Mitacs for participation in Research and Innovation Staff Exchanges (RISE) as part of the Marie Skłodowska-Curie actions. Graduate students and post-doctoral fellows in Canada may receive funding through the Mitacs Globalink Research Award, or through the Mitacs Accelerate International program, to conduct research projects at universities and businesses in the EU Member States and the countries associated to Horizon 2020.
- *Energy research*: Both sides are interested to deepen transatlantic dialogue on environmental issues related to Carbon Capture and Storage (CCS) and unconventional hydrocarbons development, to accelerate learning and to provide advanced training. Connecting pilots and projects across the Atlantic should bring the benefits of cross-validation of technologies, sharing results, distributing tasks, bundling expertise and expanding professional networks. The Horizon 2020 workprogramme for 2020 could envisage a joint call on Bio-Fuels with Canada if budgets could be matched.
- *Research Infrastructures*: Collaboration between Europe and Canada in the domain of Research Infrastructures is highly important. Increased cooperation on marine and Arctic Research Infrastructures (interoperability, data management, better use and access, funding strategy, innovation and links with industry) is planned.

In this context, the EC may facilitate links between the Canadian High Arctic Research Station and the Svalbard Integrated Arctic Earth Observing System⁵, a project identified as Landmark on the European Strategy Forum on Research Infrastructures (ESFRI) roadmap.

3.2. Potential new areas of future S&T cooperation proposed at latest Joint Committee/High Level Dialogue, through SFIC, or by thematic services

The Canadian government has indicated that Canadian governmental services will explore ways to expand the cooperation fields beyond the areas mentioned above. High on the cooperation agenda are topics like environment and climate change-related research as well as energy research fully in line with the existing high level dialogues between both sides on these areas.

Both sides also identified as possible new area for cooperation migration related research. It is planned that SSHRC in Canada will support researchers participating in migration related calls under Horizon 2020 in 2018 and 2019.

⁵ <http://www.sios-svalbard.org/>

3.3. Improvements in framework conditions agreed at latest Joint Committee/High Level Dialogue and additional framework conditions to be addressed at future policy dialogue meetings

Since September 2017, DG RTD has started to establish jointly with Global Affairs Canada a "Programme Level Cooperation – Task Force" to strengthen these ties even more and to boost Canadian co-funding for the remaining three years of Horizon 2020. All Canadian Granting Council and Canadian funding bodies as well as provincial authorities can take part in this Task Force to further exploit the possibilities of Canadian co-funding parallel to Horizon 2020 projects.

The Canadian federal budget 2018 established a new tri-council fund to support research that is international, interdisciplinary, fast-breaking and higher-risk with a funding of CAD \$ 275 million over five years. It is expected that these fund can help to support Canadian cooperation with Horizon 2020.

ANNEX: HORIZON 2020 WORK PROGRAMME 2018-20 TOPICS EXPLICITLY ENCOURAGING COOPERATION WITH CANADA

	Topic identifier	Topic title
2019	INFRAIA-01-2019	Integrating Activities for Advanced Communities
	LC-CLA-07-2019	The changing cryosphere: uncertainties, risks and opportunities
	LC-MG-1-7-2019	Future propulsion and integration: towards a hybrid/electric aircraft
	MG-2-9-2019	Integrated multimodal, low-emission freight transport systems and logistics (Inco Flagship)
	MIGRATION-01-2019	Understanding migration mobility patterns: elaborating mid and long-term migration scenarios
	MIGRATION-03-2019	Social and economic effects of migration in Europe and integration policies
	MIGRATION-06-2019	Addressing the challenge of migrant integration through ICT-enabled solutions
	MIGRATION-07-2019	International protection of refugees in a comparative perspective
	NMBP-15-2019	Safe by design, from science to regulation: metrics and main sectors (RIA)
	BG-07-2019-20	G7 initiative 'The Future of Seas and Oceans'
	SU-SPACE-22-SEC-2019	Space Weather
2020	NMBP-16-2020	Safe by design, from science to regulation: behaviour of multi-component nanomaterials (RIA)
	NMBP-17-2020	Regulatory science for medical technology products (RIA)

Figure 3: Canada – Top scientific areas compared to EU28 in terms of citation impact of publications

	Scientific Area	Share in world output	Share of international co-publications	Citation Impact	
				Difference with EU28	8-year trend
High publication output	Medicine: General Medicine	3,5%	44%	+0.95	↓
	Medicine: Cardiology and Cardiovascular Medicine	4,4%	48%	+0.64	↑
	Medicine: Pulmonary and Respiratory Medicine	5,2%	47%	+0.63	↑
	Computer Science: Signal Processing	4,2%	41%	+0.55	↑
	Medicine: Pharmacology (medical)	3,4%	47%	+0.51	↑
	Physics and Astronomy: Nuclear and High Energy Physics	4,3%	73%	+0.46	↑
	Psychology: General Psychology	6,0%	35%	+0.46	↑
	Computer Science: Information Systems	3,1%	49%	+0.46	↓
	Biochemistry, Genetics and Molecular Biology: Cancer Research	3,9%	60%	+0.45	↑
	Computer Science: Human-Computer Interaction	4,2%	40%	+0.44	↑
Low publication output	Nursing: Emergency Nursing	2,3%	43%	+1.43	↑
	Medicine: Critical Care and Intensive Care Medicine	5,1%	52%	+1.32	↑
	Medicine: Biochemistry (medical)	2,7%	55%	+1.16	↑
	Social Sciences: Archeology	3,1%	49%	+1.02	↑
	Medicine: Family Practice	6,5%	17%	+1.01	↓
	Nursing: Pediatrics	3,8%	23%	+0.97	↑
	Health Professions: Medical Laboratory Technology	2,9%	48%	+0.81	↑
	Arts and Humanities: Archeology (arts and humanities)	2,7%	49%	+0.77	–
	Business, Management and Accounting: Industrial Relations	3,1%	41%	+0.72	↑
	Business, Management & Accounting: Business & International Management	3,2%	52%	+0.71	↑

Source: DG Research and Innovation – International Cooperation

Data: Elsevier SciVal; extraction date: 6/8/2017; publications' window: 2011-2013; citations' window: 3 years

Note: These tables show scientific areas in which the country's academic publications have a higher citation impact than EU28, and whether this difference has decreased, increased or remained the same in the past 8 years. They are grouped in two tables. The top table focuses on areas with high share of publications in the country's total output of publications and the bottom table on those with low share of publications. Scientific areas are based on Elsevier 'All Science Journal Classification'. For each area, the country's share in the world output of publications and the share of international co-publications are also shown.

Figure 4: Canada – Specialisation compared to EU28 in selected technologies based on PCT patents

	Technology	2014 PCT patents	2014 PCT patents of EU28	2014 Specialisation compared to EU28	8-year trend
OECD classification	Nanotechnology	17	137	2,08	↑
	Pharmaceuticals	212	2.524	1,43	↓
	Biotechnology	231	2.745	1,42	↓
	ICT	1.193	14.579	1,39	–
	Medical technology	308	3.879	1,34	–
	Selected environment-related technologies	201	3.663	0,93	↓
WIPO classification	Civil engineering	283	1.632	3,36	↑
	IT methods for management	62	425	2,82	↑
	Micro-structural and nano-technology	11	86	2,48	↑
	Analysis of biological materials	44	426	2,00	↑
	Surface technology, coating	50	635	1,52	↑
	Control	57	784	1,41	↑
	Measurement	167	2.297	1,41	↑
	Computer technology	123	1.762	1,35	↓
	Pharmaceuticals	101	1.581	1,24	↓
	Medical technology	176	2.801	1,22	↑
	Furniture, games	59	952	1,20	↑
	Biotechnology	82	1.400	1,13	↓
	Other special machines	92	1.692	1,05	↓

Source: DG Research and Innovation – International Cooperation

Data: OECD (top table) WIPO (bottom table); extraction date: 6/8/2017

Note: The top table shows the relative specialisation of the 2014 PCT patent output of the country with respect to EU28, calculated as (# of patents of country in technology X / # of patents of country in all technologies) / (# of patents of EU28 in technology X / # of patents of EU28 in all technologies). It also shows whether the relative specialisation has increased, decreased or remained the same in the past 8 years. The selected technologies are classified based on the OECD database. The bottom table shows the same information for the top-13 technologies with the highest specialisation index with respect to EU28 - this time the technology classification is based on the WIPO database. Both tables also show the country's and EU28 total number of PCT patents under each technology in 2014.