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Roadmaps for international cooperation

Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Report on the implementation of the strategy for international cooperation in research and innovation

{COM(2014) 567 final}

ROADMAPS FOR INTERNATIONAL COOPERATION

1. INTRODUCTION[1]

The Commission Communication 'Enhancing and focusing EU international cooperation in research and innovation: a strategic approach' called for a systematic and coherent identification of priorities for international cooperation with the EU's partner countries and regions, with a view to subsequently implementing these through activities with the necessary scale and scope, in particular in the context of Horizon 2020.

The Communication equally stressed that this strategic priority setting exercise should fully reflect the state of play in the policy dialogues between the EU and its partner countries. To ensure that international cooperation activities are developed on the basis of common interest and mutual benefit and create win-win situations, the Communication offered four criteria for guiding the identification process. International cooperation adds value when:

- Synergies and complementarities can be created as regards research and innovation capacity;
- There are opportunities for access to new or emerging markets;
- The activities contribute to meeting the EU's international commitments, as reflected e.g. in the Millennium Development Goals;
- There are adequate legal and administrative frameworks in place to engage in cooperation, also including lessons learnt from previous cooperation.

The Communication also called on this priority setting process to be reflected in multi-annual roadmaps for international cooperation with its key partner countries and regions.

On the basis of the approach outlined above, the Commission has, since the adoption of the Communication in September 2012 and, in particular, with a view to preparing for the launch of Horizon 2020, engaged in a systematic planning of priorities for cooperation in research and innovation.

The roadmaps for international cooperation which are included in this Staff Working Document provide examples of the outcome of this priority setting exercise. For each of the partner countries and regions, they provide a full overview of the framework governing the cooperation and the current state of play as regards the cooperation, including information on the way this has been addressed in the first Horizon 2020 work programmes. Most importantly, they provide an overview of what are considered to be the priorities for future cooperation (using a medium term perspective) with the partner in question, reflecting the current state of agreement in the policy dialogue.

The outcome of this priority setting exercise, as it is reflected in the Report and this accompanying Commission Staff Working Document, has led to the inclusion of the international cooperation activities in the first Horizon 2020 work programmes 2014-15, as listed in the annexes to each of the roadmaps. It will subsequently feed into the next Strategic Programming cycles for Horizon 2020 and will allow for an earlier identification of areas where there is potential to launch ambitious international cooperation initiatives with

[1] *It should be noted that amounts mentioned in this document for 2015 are subject to the availability of the appropriations provided for in the draft budget for 2015 after the adoption of the budget for 2015 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.*

appropriate scale and scope and for the inclusion of suitable modes of implementation in the next work programmes, thus resulting in a closer and more strategic integration of international cooperation in Horizon 2020.

2. ROADMAP FOR COOPERATION BETWEEN BRAZIL AND THE EUROPEAN UNION

1. BRAZIL AS A PARTNER OF THE EU

The relationship between Brazil and the EU is governed by the EU-Brazil framework co-operation agreement (1992). Brazil is a founding member of Mercosur with which the EU signed a Framework Co-operation Agreement in 1995. The Trade Agreement between the European Union and Mercosur was reinforced in Madrid (EU-LAC) in 2010. The EU and Brazil established a Strategic Partnership on the occasion of the first ever EU-Brazil Summit held in July 2007 in Lisbon, Portugal. Central topics of the partnership include effective multilateralism, cooperation on human rights, climate change, sustainable energy, the fight against poverty, Mercosur's integration process and Latin America's stability and prosperity.

The cooperation between the EU and Brazil on research and innovation is governed by the Agreement for Scientific and Technological Cooperation[2] (2004, entered into force in 2007 and renewed in 2012 for 5 more years). A Cooperation Arrangement under the existing bilateral Agreement was signed on 24 January 2013 in Brasilia between the Joint Research Centre (JRC) and the Brazilian Ministry of Science, Technology and Innovation (MCTI). In the area of Fusion Energy Research, an agreement (under the Euratom Treaty), was concluded in 2009 and entered into force in January 2013. Brazil is one of the first non-ITER parties with which Euratom has signed a bilateral cooperation agreement.

During the last decade Brazil progressed on several indicators related to scientific and technological performance. This is reflected in the increasing number of researchers, in the growth of R&D expenditure, and in the number of postgraduate scholarships, as well as in indicators of scientific publications and, more modestly, patents.

In 2010 R&D intensity was estimated at 1.16% GDP (up from 1.01 % in 2006), the share of private sector R&D (of GERD) was 47.3% (down from 50.1% in 2006) and the share of public sector R&D (of GERD) increased to 52.7% (up from 49.9% in 2006). The total number of scientists and researchers was about 234 000 in 2010, of which over 80% in higher education institutions. In 2009, Brazil published 2.69% of the world's scientific papers[3].

Launched by Brazil in December 2011, Science without Borders (CsF)[4] is a Brazilian programme that aims at internationalising the Brazilian Science & Technology system through a scholarship system for over 100 000 international fellowships for graduate and undergraduate students. After 1 year of operation, about 22 000 scholarships, with an approximate investment of EUR 407 million had been awarded for students going to the United States, Canada, United Kingdom, Germany, France, Italy, Belgium, the Netherlands, Spain, Portugal, Australia and South Korea.

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2 http://ec.europa.eu/world/agreements/prepareCreateTreatiesWorkspace/treatiesGeneralData.do?step=0&redirect=true&treatyId=2041

3 http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/br/country

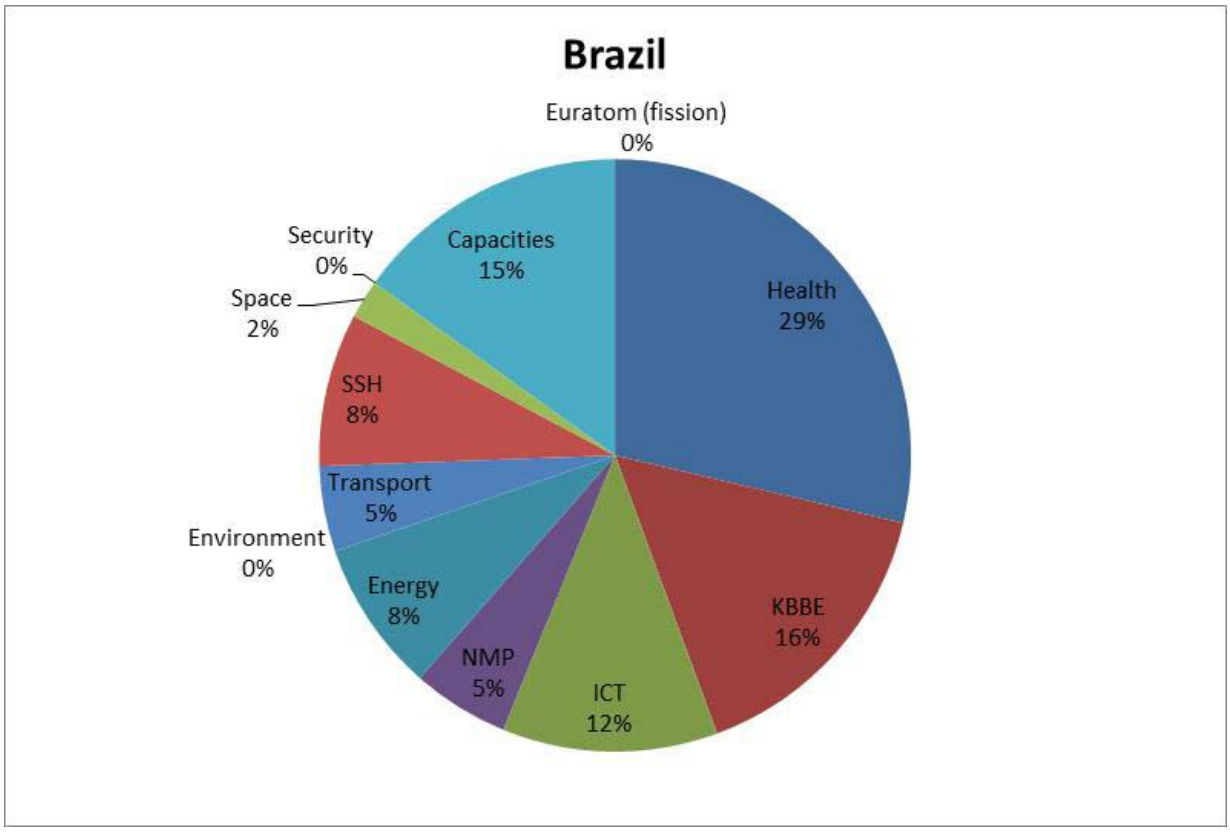
4 http://www.cienciasemfronteiras.gov.br/web/csf-eng/home

2. COOPERATION BETWEEN BRAZIL AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, Brazilian entities participated 211 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 31.3 million. The distribution of the Brazilian participation (by total cost of Brazilian participants) over the different FP7 subprogrammes is shown below.

With regard to fusion, there are presently about 15 on-going collaborative activities, involving 18 European research institutions and 14 Brazilian entities, and in particular, two specific JET (Joint European Torus, in Culham, UK) related projects. It has been also agreed that Brazilian scientists and PhD researchers can participate in JET activities.

1881 Brazilian researchers have been funded through the Marie Curie Actions (2007-2013) and Brazilian institutions have participated in 187 projects.



There is an on-going FP7 project (BBICE+) which supports the policy dialogue and durable partnerships between the EU and Brazil.

Brazil has been targeted as an important partner for cooperation in the first Horizon 2020 work programme (2014-15), encouraging cooperation with Brazilian researchers included in areas such as biofuels, ICT and marine research. A full list of topics included in the work programme 2014-2015 is provided in Annex.

The scope of direct scientific interactions carried out by the European Commission's Joint Research Centre with partners in Brazil include the areas of disaster prevention and crisis management; sustainable management of natural resources, in particular forests and water; energy with a focus on smart grids; food security; bio-economy; ICT, including geo-information and space applications; nanotechnologies.

Work is on-going to strengthen the synergies between the EU's cooperation with Brazil and the activities of the Member States (MS), including through the Strategic Forum for International Cooperation (SFIC). The collection of information carried out through SFIC indicates that the research topics addressed in cooperation with Brazil vary widely. It is noteworthy that a large number of agreements between individual Member States and Brazil do not have a specific thematic field and follow a bottom-up approach. They are often centred on researchers' mobility and, to some extent, access to European research infrastructures.

Finally, cooperation on research and innovation is a core area of the EU Brazil bilateral cooperation and it contributes significantly to the achievement of the EU's external policies. The importance of cooperation on research and innovation in addressing the shared economic, environmental and societal challenges within the context of the overall EU-Brazil relations has been reiterated at the XVth Joint Committee of November 2013 and at the EU-Brazil Summit of February 2014. Research and Innovation features prominently in the EU-Brazil Joint Action Plan on Competitiveness and Investment, which has been welcomed by leaders at the last Summit as a building block for future EU-Brazil cooperation on these themes. Moreover, remarkable synergies are been created between research policy and external action instruments. In some of the areas targeted for research and innovation cooperation, synergies are being built up with the Sector Dialogue Facility for Brazil, a DCI programme that aims at strengthening Sector Dialogues between Brazil and the EU in 33 different areas, among which research and innovation is an important priority.

For the future, in an effort to make research cooperation an integral part of a comprehensive package of external actions, and given the strategic role of Brazil in tackling the global challenges addressed by cooperation in research and innovation, more synergies will be sought with other external instruments, in particular with the Partnership Instrument.

Framework conditions for research cooperation in Brazil have been improving over the last decade. The government adopted two consecutive National Science, Technology and Innovation (STI) Strategies (most recent 2012-2015) to create a proper Science Technology and Innovation System. An improved innovation regulatory framework, a larger and more accessible funding structure and international cooperation are key elements of this strategy. Increasingly, the federal government and the regions (state governments) identify joint priorities and set the share of resources that each will contribute in the field of innovation. In practice, this implies more opportunities for cooperation (including with the EU) at grass-roots level, while inevitably it increases the complexity of the decision-making and implementation mechanism for research and innovation. Since 2004-2005, the legal framework allows for direct funding of business-led innovation through competitive grants and a wide range of fiscal incentives, particularly in green economy, housing technology and social housing. In the field of intellectual property rights (IPR), progress has been noted in Brazil over the last years regarding protection of IPR, particularly in terms of intensification of public-private cooperation in the fight against IPR infringements. There is, though, still room for improvement as regards the capacity of the registration authorities and the judiciary. Since 2008 an EU-Brazil IPR dialogue provides a forum for discussion of IPR issues of interest to either or both parties[5]. In the areas of standardisation, Brazil has shown interest in strengthening the capacity of its companies, especially of SMEs, as well as laboratories in the area of standardisation and technical rules through increased dialogue and EU-Brazil bilateral initiatives, so as to improve market accessibility from both sides for products and services. As regards the funding of research and innovation and innovation cooperation, the federal

[5] http://trade.ec.europa.eu/doclib/docs/2013/april/tradoc_151003.pdf

government is the main source of funding for universities and other research organisations. Over the past decade, state level research foundations have increased their funding of research. Petrobras (oil sector) is becoming a major source for funding innovation research in universities.

3. COOPERATION BETWEEN BRAZIL AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

In the framework of the policy dialogue between the EU and Brazil the following priority areas have been agreed for future cooperation with Brazil:

- Marine Research and bio-economy, food security, sustainable agriculture

  EU-Brazil cooperation on marine research can greatly contribute to the EU's Blue Growth strategy. It would build on a number of existing bi-lateral and multilateral cooperation frameworks involving Brazil. Likewise, cooperation on bio-economy research and innovation is vital to address global challenges such as food security and sustainable agriculture and Brazil is a leading country in bio-economy research.

  Further cooperation with Brazil will be based on the continuation of the EU-Brazil dialogue on marine research including a wide range of areas, such as sustainable Atlantic ecosystem approach, innovative use and conservation of Atlantic/marine biodiversity, seabed critical raw materials and ocean literacy. Interest has also been expressed concerning the sustainable development of aquaculture to support the production of safe seafood products, complying with international standards for trade, in particular through the establishment of a sound scientific basis for the elaboration and implementation of relevant policies (i.e. environmental protection, food safety, animal health and welfare).

  In the area of bio-economy, food security and sustainable agriculture, the following topics of mutual interest have been identified through the ongoing dialogues between the EU and Brazil: improvement of agricultural production systems and adaptation to climate change; nutritional aspects of food products; agro-economic areas, ecological intensification, low carbon agriculture, traceability, certification and standards with a view to improve quality and trade conditions.

- Energy

  While the EU has a leading position on many advanced biofuel technologies, Brazil has the capacity to turn advanced bio-fuels into commercial reality. Thus the EU and Brazil have a common interest in cooperating in this area.

  Decarbonising the transport sector is a major challenge in the global fight against climate change. As such, it is a crucial element in the EU Energy Roadmap 2050 and in the Brazilian National Policy for Climate Change. In the short to medium-term, biofuels are expected to be the main contributors to this de-carbonisation. In order to achieve the EU and Brazil policy targets in this domain, and to address concerns regarding environmental impacts of biofuels, new biofuels using sustainable feedstock need to reach the market. Brazil is an essential partner in this sector: it has outstanding expertise, a well-established and highly competitive first-generation industry, as well as optimal conditions for the development of a second generation biofuel industry.

  A coordinated call on advanced (second generation) biofuels will be prepared in the perspective of the second Horizon 2020 work programme. In addition, the Commission and the Brazilian party agreed to explore the potential for cooperation on other renewable areas, such as concentrated solar power, wind and smart grids and to establish a joint working group with this objective.

- Nanotechnology

  Nanosafety is a global issue, especially as trade flows involving nano-enabled products are increasingly global. Nano environmental, health and safety (Nano EHS) is of high importance to both the EU and Brazil, who have a shared interest in cooperating in research that supports the development of scientific evidence based regulation in this area.

  The EU has an extensive FP7 project portfolio covering nano-safety research, while Brazil has several national research networks involved in nano health and safety research. There is therefore a potential for enhancing cooperation in this area, including through Horizon 2020 nanotechnology and nano-materials calls planned for 2014 and 2015. The focus would be on research for the establishment of scientifically referenced regulation, internationally recognized and internationally compatible. The EU promotes government-level cooperation in the OECD working party on manufactured nano-materials (in particular through the NanoReg initiative, which is an FP7 project with a budget of EUR50 million (of which EUR10 million from FP7); followed by further regulatory research activities in Horizon 2020). Progress is being made to incorporate Brazilian contributions into NanoReg.

- Information and Communication Technologies (ICT)

  EU-Brazil research cooperation in the area of ICT, including cloud computing, is also regarded as having a crucial strategic value and high societal impact. It has been developing since the launch of the first coordinated call in 2011 and addresses a number of topics dealing with Future Internet, micro-electronics and micro-systems, cloud computing, technologies and applications for a smarter society and e-infrastructures. It is supported by an EU-Brazil Dialogue on Information Society with specific working groups in some areas addressing not only research and innovation matters but also ICT policy and regulatory aspects. As an example, cooperation on cloud computing covers standards, certification mechanisms, safe and fair contracts as well as legislative frameworks, aiming at facilitating the emergence of mutually recognized trusted cloud solutions. The third coordinated call focused on Advanced Cyber Infrastructure and will be launched in 2015. It will address topics on Cloud Computing, especially cloud-centric applications for big data; High Performance Computing applications to societal challenges supporting prediction and simulation of natural disasters, urban development or crisis management, and Experimental Platforms federating network resources in Brazil and Europe building on FIRE (Future Internet) developments. Joint work on the areas above is expected to be continued in the work-programme 2016-17 of Horizon 2020. The importance of ICT entrepreneurship for growth and jobs is reflected in a reinforced cooperation between "Startup Europe" and "Startup Brazil", exploring the mutual benefits of "apps" development by young web-entrepreneurs and SMEs, on top of open and common Future Internet platforms. On ICT infrastructure, the installation of a fibre-optic submarine cable linking Brazil and Europe directly will improve communications between the two continents, facilitate the take-up of broadband, stimulate ICT investments, reduce the interconnectivity costs for our businesses and researchers, enhance the protection of communications and provide better functional characteristics than through the USA or Africa. This cable can be used to implement more effectively public policies such as the bilateral cooperation on research and innovation.

In the area of nuclear fusion (Euratom-Fusion), the current bilateral collaborative activities, and notably those with the Joint European Torus (JET), should be endorsed under the bilateral work programme (see annex) at the first meeting of the Coordinated Committee of the enforced fusion Cooperation Agreement, planned to be held in 2014. This should pave the

way for the convergence of programmes (cooperation on the Brazilian Network for fusion) and the sharing of personnel and facilities, in particular of JET, with Euratom fusion associations. Brazil is interested to receive advice form Euratom on the future Brazilian fusion device to be installed at the new National Fusion Laboratory. This may also open possible routes for Brazil's potential involvement in the future operation and exploitation of ITER.

Cooperation in future years (2016 and 2017) will most likely continue to focus on these jointly defined priorities as well as on other areas that will be jointly identified and agreed upon within the existing institutional mechanisms under the ST & I agreement between the EU and Brazil.

At this stage, based on existing cooperation and talks, in relation to health, it is envisaged that Brazil and the EU may continue the cooperation in multilateral initiatives aimed at addressing global health challenges. In particular, Brazil has expressed interest to the EU on the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R).

Transport research cooperation may also lead to more targeted actions in the future:

- Aviation Pioneering: direct Brazilian participation (instead of being subcontractor to DLR) in the Multinational Civil Hypersonics Flagship initiative FP7 HEXAFLY-INT, led by ESA, kicked-off in April 2014 and aiming at a flight test in 2019.
- Aviation Safety: potential Brazilian involvement through Embraer Portugal in the large-scale coordinated research action on Safety (Horizon 2020 2014 call).
- Aviation Environmental-friendly fuels: through Horizon 2020 Energy calls, building upon Brazil-EU flight test joint project FP7 ITAKA and the support action FP7 COOPAIR-LA.
- A coordinated call for 2016+, with a focus on road transport and urban transport, supported by two FP7 coordination and support actions SOLUTIONS and VIAIGO PLUS.

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH BRAZIL IN HORIZON 2020 WORK PROGRAMME 2014-15[6]

	Identifier	Short title	Indicative budget (EUR million)
2014	NMP 26 (LEIT-NMP)	Joint EU & MS activity on the next phase of research in support of regulation NANOREG II	-
	NMP 27 (LEIT-NMP)	Coordination of EU an international efforts in safety of nanotechnology	-
	NMP 28 (LEIT-NMP)	Assessment of environmental fate of nanomaterials	-
	NMP 29 (LEIT-NMP)	Increasing the capacity to perform nano-safety assessment	-
	BG 14 (Challenge 2)	Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance	3.50
	BG 15 (Challenge 2)	European Polar research cooperation	2.00
	SC5-5 (Challenge 5)	Coordinating and supporting research and innovation for climate action-Climate change mitigation options	-
2015	H2020-EUB-2015 (LEIT-ICT)	EU-Brazil Research and Development Cooperation in Advanced Cyber Infrastructure	7
	NMP 30 (LEIT-NMP)	Next generation of tools for risk governance of nanomaterials	-
	INT 1 (Challenge 6)	Enhancing and focusing research and innovation cooperation with the Union's key international partner countries	1.95
	ISSI.5.2014.2015 (Science with and for Society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

[6] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020

Identifier		Short title	Indicative budget (EUR million)
2014-2015	Euratom-Brazil Fusion CA First Coordinating Committee	Convergence of programmes and sharing of personnel and facilities	-
		Mapping of bilateral collaborative activities	-

3. ROADMAP FOR COOPERATION BETWEEN CANADA AND THE EUROPEAN UNION

1. CANADA AS A PARTNER OF THE EU

Canada is one of the EU's oldest and closest partners. The negotiations of two ground-breaking agreements with Canada: the Strategic Partnership agreement (SPA) and the Comprehensive Economic and Trade Agreement (CETA) are being finalised. Once implemented, these two agreements will enhance economic and political relations, and spur cooperation and dialogue across a range of policy areas. The SPA will strengthen foreign policy and sectorial co-operation advancing EU-Canada relations beyond the 1976 Framework Agreement and the 2004 Partnership Agenda, while CETA will enable an ambitious liberalisation of our trade and investment relations. It will generate substantial new trade in goods and services as well as additional opportunities for investment. Once implemented, the agreement is expected to increase bilateral trade in goods and services by 22.9% or €25.7 billion, fostering growth and employment on both sides of the Atlantic. Overall, the EU-Canada agreement could lead to GDP gains for the EU of up to €11.6 billion per year.

The Agreement for Scientific and Technological Cooperation between Canada and the European Community 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 provide new directions for cooperation in the fields of science and technology.

In 2011 R&D intensity was estimated at 1.74% GDP (down from 2.07% in 2004). The share of private sector R&D (of GERD) was 46.5% and the share of public sector R&D (of GERD) 36.1%[7].

The 11th meeting of the EU-Canada JSTCC took place in Brussels on 6 March 2013. It mainly focused on Arctic and Marine related research (Blue Growth) and Research Infrastructures for Marine and Arctic research.

On 24 May 2013, the Galway Statement on transatlantic marine and arctic cooperation[8] was signed by Commissioners Geoghegan-Quinn and Damanaki, on behalf of the EU, and by high level representatives from Canada and the US. The goal of the statement is to work together in order to better understand the Atlantic Ocean and to promote the sustainable management of its resources. This is the starting point for a Transatlantic Ocean Research Alliance.

The Canadian research system is organised around three institutional structures: governments (federal and provincial), industry, and higher education. Each level of government is involved in research policy, which means a decentralized research system with varying degrees of overlap and partnering.

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

[7] Erawatch Country Overview – Canada (updated 25 September 2013)

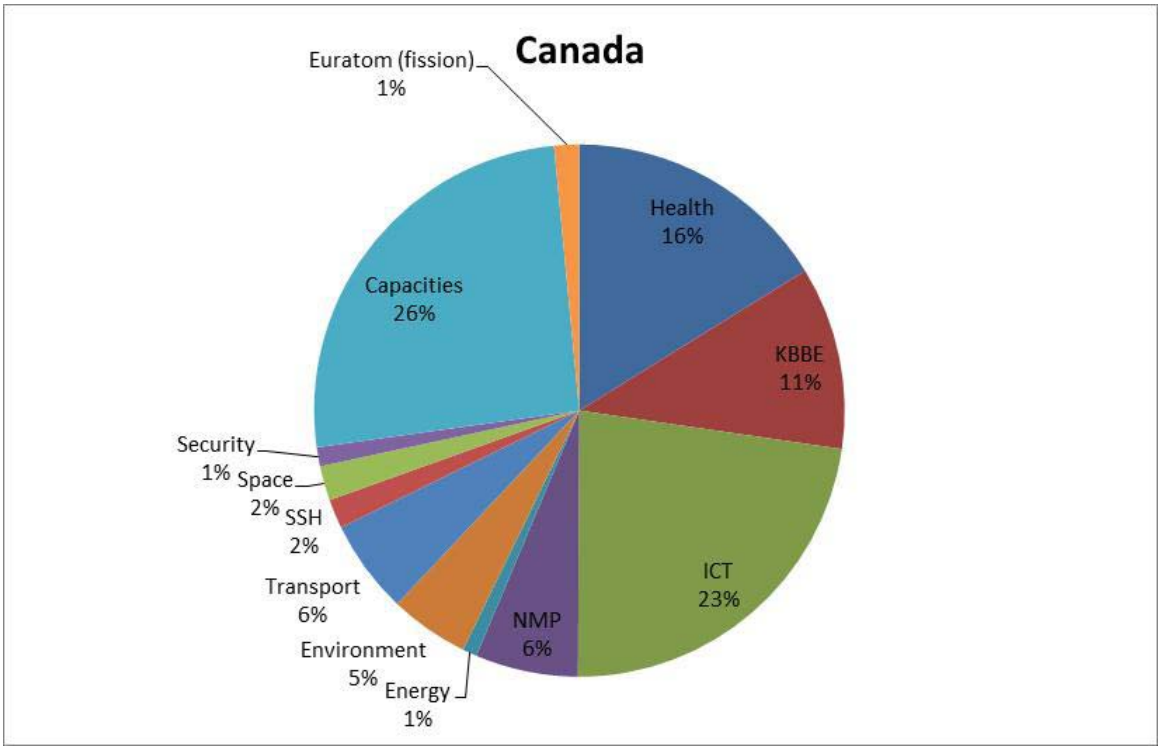
[8] http://www.innovation.ca/sites/default/files/Rome2013/files/Canada-EU-US%20Galway%20Statement%20on%20Atlantic%20Research%20Cooperation%202013.pdf

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.

2. COOPERATION BETWEEN CANADA AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, Canadian entities participated 190 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 10.3 million. The distribution of the Canadian participation (by total cost of Canadian participants) over the different FP7 subprogrammes is shown below.

Canadian researchers also have a high success rate in the People Specific Programme (Marie Curie Actions). As many as 504 Canadian researchers have been funded through the Marie Curie Actions (2007-2013) and Canadian institutions have participated in 145 projects.



There is an on-going FP7 project which supports the policy dialogue on research and innovation between Canada and the EU. ERA-Can Plus will raise awareness of the multiple research and innovation programme opportunities for Canadians in Horizon 2020 and for Europeans in Canada's research programmes. The ERA-CAN Plus project objectives and its Canadian and European partnership are in line with the new international cooperation strategy for research and innovation. It will support the implementation of our policy dialogue, for example, as follow up to the Galway Statement signed by Canada and the EU. The consortium brings together seven leading associations and organisations for research, innovation and public policy discussions from across Canada and Europe.

Canada has also been targeted as an important partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation with Canadian researchers included in areas such as marine and artic research (notably to implement the Galway declaration and the Transatlantic Ocean Research Alliance), health research or ICT. A full list of topics included in the work programme is provided in Annex.

Work is also on-going to strengthen the synergies between the EU's cooperation with Canada and the activities of the Member States (MS). The involvement of MS will take place at various levels, depending on the area of EU-Canada cooperation. The three most prominent examples are listed below.

- Marine and Arctic research:
  - ✓ The Joint Programming Initiative Ocean[9] will be a key partner in these activities.
  - ✓ The Seas ERA – NET[10] will be strongly involved in the EU-Canada information sharing exercise and planned coordination actions.
  - ✓ The Integrating Activity "INTERACT"[11] includes Research Stations from all Arctic countries including several from Canada.
  - ✓ Svalbard Integrated Earth Observing System (SIOS) is an international infrastructure project including Canada.
- The Health Research Institute Canada (CIHR) is connected to all relevant Joint Programming Initiatives and very strong coordination with Member States is therefore expected. For example CIHR is:
  - ✓ Member of the Joint Programming Initiative -Neurodegenerative Diseases (JPND);
  - ✓ Member of the Joint Programming Initiative - More Years Better Life (JPIMYBL);
  - ✓ Member and co-investor in the Joint Programming Initiative Antimicrobial Resistance (JPIAMR);
  - ✓ Negotiating its Membership with the Joint Programming Initiative A Healthy Diet for A Healthy Life (JPIHDHL).

A series of EU-Canada Health Research Roundtables have been organised on jointly identified health priorities. The most recent one took place in October 2012, having as shared themes: Big Data, Open Access and Public Health Data; E-Health; Evidence informed Health Care; Health Research Platforms; and Respiratory, Vascular, Stroke and Imaging. Canada is globally known for its very high quality of health related research and the EU-Canada cooperation can look back on very successful experiences.

Key aspects of this cooperation are:

- Cooperation supports the engagement of the EU to become a permanent observer in the Arctic Council[12].
- Cooperation supports reaching the Millennium goals, notably on:
  - o Combat HIV/AIDS, malaria and other diseases;
  - o Ensure environmental sustainability e.g. marine/arctic research

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9 http://www.jpi-oceans.eu

10 http:// www.seas-era.eu

11 http://www.eu-interact.org/

12 The Arctic Council received the application of the EU for observer status affirmatively, but deferred a final decision on implementation until the Council Ministers agree by consensus with the understanding that the EU may observe Council proceedings until such time as the Council acts on the letter's proposal.

– Cooperation supports the Commission's Atlantic Action Plan with a reference to trans-Atlantic cooperation in research and innovation.

Canada's innovation performance is estimated as lower in comparison to the EU and the innovation gap is further decreasing[13]. The federal government strongly supports innovation and supports emerging technologies in areas ranging from health to nuclear research. Examples include funding to Genome Canada, climate and atmospheric work through the Natural Sciences and Engineering Research Council of Canada (NSERC) or the Canada Brain Research Fund. The Strategic Aerospace and Defence Initiative (SADI) supports R&D in aerospace, defence, space and security technologies[14].

Canada provides innovative SMEs access to tax credit related to R&D. Venture Capital assists and finances firms (especially SMEs) from seed to expansion phases. Export Development Canada (EDC) provides private equity capital to assist firms to expand through export guarantee programmes. Canada invests to develop a stronger digital economy and the government supports the take up of ICTs by business through the Industrial Research Assistance Program, and increased student enrolment in digital economy-related disciplines. Canada is spending substantially on higher education. The government has made strategic investments to strengthen Canada's knowledge advantage such as the new Canada Excellence Research Chairs.

The general framework conditions for EU-Canada cooperation are improving in certain areas and provinces. During the last few years, some provinces have been quite keen to cooperate with the EU directly and have put in place matching funds for their researchers (e.g. Quebec) participating in the Framework programme. Others, notably Alberta, are seriously considering such an option.

Canadian participation in the 7th Framework Programme was as high as during all previous programmes together. Canada has established a good network of Canadian National Contact Points in the main areas for cooperation, so the basic information and conditions for cooperation are well known and disseminated.

Interestingly the Canadian Granting Councils are well aware of the European research landscape and the activities in the European Research Area (ERA). Several ERA-NET activities in our Joint programming initiatives have Canadian members and are well connected to the Canadian research institutions.

3. COOPERATION BETWEEN CANADA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

Three areas have been identified as priority areas for future cooperation during the last JSTCC meeting on 5 March 2013.

– Marine and Arctic Research

This includes the launching of the Transatlantic Research Alliance as agreed new framework for this cooperation. Canada has strong research capabilities and access to important waters/territories (including arctic) with strong research and innovation capacity. In 2013 Canada issued an implementation plan for its marine research approach. Canada's Northern Strategy[15] will help both sides to engage in this specific dialogue on Arctic cooperation issues. Such cooperation can build on existing cooperation in the

13 http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf
14 https://www.innovationpolicyplatform.org
15 http://www.northernstrategy.gc.ca/

context of international programs, such as WCRP (World Climate Research Programme), GEO (Group of Earth Observations), GCOS (Global Climate Observing System), SAON[16] (Sustained Arctic Observing Network – Arctic council) and others. Canada is also in the phase of designing the Canadian High Arctic Research Station (CHAR), which will serve as a hub for science and technology in Canada's North. The above mentioned activities underline the research capacities Canada has in this area which allows Europe to support its external policy in particular in relation to the Arctic Council activities. In the past Arctic research activities have benefited from good EU-Canada relations.

– Research infrastructure cooperation

Research infrastructures (in particular Arctic and Marine) represent one of the most successful areas of cooperation between EU and Canada, with huge progress since the last JSTCC meeting. The scope of cooperation has been extended to cover both arctic and marine infrastructures, which are relevant to major societal challenges and provide opportunities for collaboration in the development, management and use of these extremely costly infrastructures.

A high level symposium on Arctic and Marine Research Infrastructures was organised between Canada-EU-US. The symposium was held in September 2013 in the Canadian Embassy in Rome to discuss and investigate possible future fields of cooperation on research infrastructures with focus on Marine and Arctic.

The Canadian Foundation for Innovation (CFI) is by far the largest Research Infrastructure funding body and has been strongly involved in the EU-Canada cooperation in recent years.

– Health Research

Health represents one of the most successful areas of cooperation between the EU and Canada. It has also been a very active area of cooperation since the last Joint S&T Consultative Committee (JSTCC) meeting in 2011, with Canada being one of the most active third countries in the Health theme of FP7.

The high collaboration is proven by the joint collaboration in all the multilateral research initiatives that the EU has either started or joined. Some of them are the International Rare Disease Research Consortium (IRDiRC[17]) or the Global Alliance Alliance for Chronic Diseases (GACD[18]). The collaboration is excellent and both Canada and the EU are planning to work together on initiatives that are being established, such as the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R). Moreover, both Canada and the EU are members of the Human Frontier Science Programme (HFSP[19]). Canada has also expressed interest to join the European and Developing Countries Clinical Trials Partnerships (EDCTP2).

– Bioeconomy

Cooperation with Canada has been carried out in Bioeconomy, in the framework of the international Knowledge Based Bio-Economy (KBBE) Forum, a multilateral platform with Australia, Canada, New Zealand and the EU launched in 2010. Cooperation with Canada on bioeconomy related Research and Innovation should be strengthened in the

16 http://www.arcticobserving.org/
17 http://www.irdirc.org/
18 http://www.gacd.org
19 http://www.hfsp.org

framework of the International KBBE Forum at programme-level, and by linking with EU Member States efforts within Joint Programming Initiatives and ERA-NETS.

- Transport (including Aeronautics)

  Common policy challenges such as aviation safety, environmental impact and standardisation can benefit from more EU-Canada cooperation.

  A coordinated call in the field of Aeronautics has been confirmed by both sides for 2015 as follow up to the Canadian Networking Aeronautics Programme for Europe (project finished in 2013) which improved and increased engagement between the aeronautics R&D communities and networks in the EU and in Canada. In addition, Canada has expressed interest in the Clean Sky (II) Joint Technology Initiative. Potential routes for Canadian contribution and participation will be explored.

- Other planned/on-going cooperation initiatives

  In the field of energy research, knowledge-sharing and cooperation with Canada are encouraged by the first Horizon 2020 work programme with Canada in the field of carbon capture and storage and shale gas.

The cooperation priorities for the years to come may be in line with the existing ones. Health research and the very close cooperation with the Canadian Institutes of Health Research (CIHR) will be a key area of engagement as in the first years of Horizon 2020. The new area of marine and Artic cooperation is expected to be expanded, in particular on the Arctic Research issues, as it is only in its start-up phase. The type of activities could be more at the support of research mobility and programme level cooperation with the relevant Canadian entities. Nanotechnology, and in particular nano-safety, is an area under mutual investigation for expansion of the EU-Canada cooperation. The EU promotes government-level cooperation in the OECD working party on manufactured nano-materials (in particular through the NanoReg initiative, which is an FP7 project with a budget of EUR50 million (of which EUR10 million from FP7); followed by further regulatory research activities in Horizon 2020).

There could also be a revitalisation of the activities of the Knowledge Based Bio Economy (KBBE) platform in the multilateral framework with Canada which could be translated into opportunities in the calls 2016-2017.

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH CANADA IN HORIZON 2020 WORK PROGRAMME 2014-15[20]

Marine and Arctic research

	Identifier	Short title	Indicative budget (EUR million)
2014	BG 8 (Challenge 2)	Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of the maritime resources	20.00
	BG 13 (Challenge 2)	Ocean Literacy – Engaging with society – Social innovation	3.50
	BG 14 (Challenge 2)	European Research Alliance cooperation	3.50
	BG 15 (Challenge 2)	European Polar research cooperation	2.00
	INFRASUPP 6 (Research Infrastructures)	International Cooperation for research infrastructures	7.00
	INFRAIA 1 (Research Infrastructures)	Integrating and opening research infrastructures of European interest (area: "Research infrastructures for terrestrial research in the Arctic.")	140.00
2015	BG 1 (Challenge 2)	Improving the preservation and sustainable exploitation of Atlantic marine Ecosystems	20.00
	BG 7 (Challenge 2)	Response capacities to oil spills and marine pollutions	6.00
	SFS 10 (Challenge 2)	Tackling disease related challenges and threats faced by European farmed aquatic animals	-

Energy research

	Identifier	Short title	Indicative budget (EUR million)
2014-2015	LCE 15 (Challenge 3)	Enabling decarbonisation of the fossil fuel-based power sector and energy intensive industry through CCS	-

[20] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

2014	LCE 16 (Challenge 3)	Understanding, preventing and mitigating the potential environmental impacts and risks of shale gas exploration and exploitation	-

Other areas

	Identifier	**Short title**	**Indicative budget (EUR million)**
2014	NMP 26 (LEIT-NMP)	Joint EU & MS activity on the next phase of research in support of regulation NANOREG II	-
	NMP 27 (LEIT-NMP)	Coordination of EU an international efforts in safety of nanotechnology	-
	NMP 28 (LEIT-NMP)	Assessment of environmental fate of nanomaterials	-
	NMP 29 (LEIT-NMP)	Increasing the capacity to perform nano-safety assessment	-
	MG 1.4 (Challenge 4)	Coordinated research and innovation actions targeting the highest levels of safety for European aviation	15.00
	SC 5-13 (Challenge 5)	Strategic international dialogues and cooperation on raw materials with technologically advanced countries	5.00
2015	ICT 38 (LEIT-ICT)	International partnership building and support to dialogues with high income countries	3.00
	NMP 30 (LEIT-NMP)	Next generation of tools for risk governance of nanomaterials	-
	MG1.8 (Challenge 4)	Aeronautics R&I EU-CA Coordinated Call	16.00
	HCO 12 (Challenge 1)	ERA-NET: Antimicrobial resistance	5.00
	SFS 16 (Challenge 2)	Tackling malnutrition in the elderly	-
	SC 5-13 (Challenge 5)	Strategic international dialogues and cooperation on raw materials producing countries and industry	8.00
	ISSI.5.2014.2015 (Science with and for Society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

4. ROADMAP FOR COOPERATION BETWEEN CHINA AND THE EUROPEAN UNION

1. CHINA AS A PARTNER OF THE EU

Relations between the EU and China have developed fast since diplomatic ties were established in 1975. In particular, the creation of the EU-China Comprehensive Strategic Partnership in 2003 has deepened and broadened cooperation in a wide range of areas, and the EU and China have become highly interdependent as a result.

At the 16th EU-China Summit of 21 November 2013, both sides jointly adopted the EU-China 2020 Strategic Agenda for Cooperation and inaugurated the first High Level Innovation Cooperation Dialogue. The two sides will implement the Strategic Agenda for Cooperation through their annual Summit, which provides strategic guidance to their relationship, through the three pillars directly underpinning the Summit (the annual High Level Strategic Dialogue, the annual High Level Economic and Trade Dialogue, and the bi-annual People-to-People Dialogue) and through their regular meetings of counterparts and their broad range of sectoral dialogues.

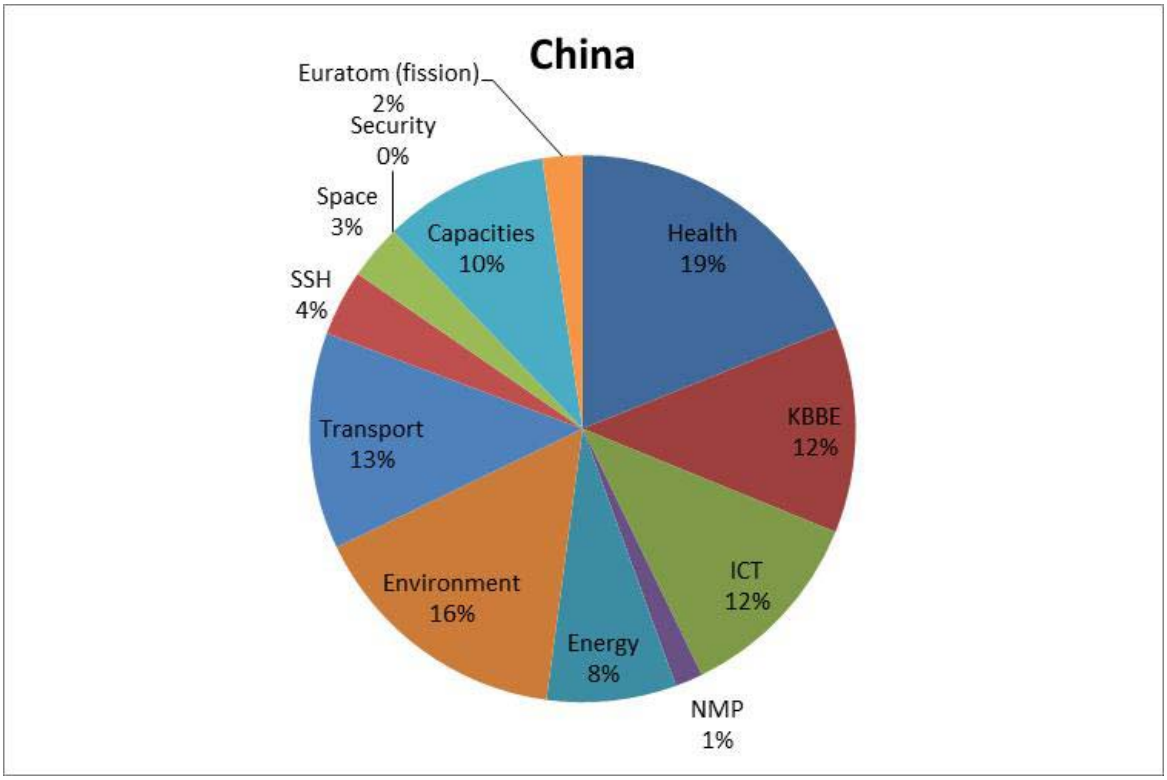
EU-China scientific cooperation is governed by a Science & Technology Cooperation Agreement signed in December 1999 and renewed for the second time in November 2009. The Agreement is implemented through a Joint Steering Committee. The last meeting was held in Brussels in June 2014.

In addition, an Agreement between the European Atomic Energy Community (Euratom) and the Government of the People's Republic of China for R&D Cooperation in the Peaceful Uses of Nuclear Energy (R&D PUNE) is in place since August 2008. China and Euratom are participating in an inter-governmental multilateral agreement on fission-related research, are partners of the ITER multilateral cooperation project on fusion research and participate, within the Generation IV international Forum, in the research and development activities of the Sodium Fast Reactor and the Very-High Temperature Reactor.

The performance of the Chinese research and innovation system has improved noticeably over the past decades. China is now a major player in terms of funding and human resources for research and development (R&D). China ranks first in terms of R&D staff with 2.5 million researchers. Its GERD has more than doubled in just five years (2005-10). R&D expenditure as a percentage of GDP reached 1.98 % in 2012 with a target of 2.2% of GDP by 2015 (12th Five-Year Plan) and 2.5% by 2020 (15-year Medium to Long-Term Science and Technology Development Plan). The business sector accounts for 72% of GERD (1.30% of GDP). However, performance in terms of patenting remains relatively limited (fifth place in 2012 regarding applications under the Patent Cooperation Treaty), and also in terms of knowledge-intensive services and high-technology manufacturing industries.

2. COOPERATION BETWEEN CHINA AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, Chinese entities participated 334 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 32.9 million. The distribution of the Chinese participation (by total cost of Chinese participants) over the different FP7 subprogrammes is shown below.



Research cooperation with China is also taking place in the framework of the Euratom-fission programme with two projects worth EUR 1.2 million, and within ITER on fusion research with 49 on-going collaborative activities involving 11 European entities and 13 Chinese research institutions.

3845 Chinese researchers have been funded through the Marie Curie Actions (2007-2013) and Chinese institutions have participated in 315 projects.

There is an on-going FP7 project, the Bilat Dragon Star to support the policy dialogue with China.

China has been targeted as an important partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation with Chinese researchers in areas such as Food, Agriculture and Biotechnology, Water, Energy, Information and Communications Technologies, Nanotechnology, Space and Polar research. A full list of topics included in the work programme is provided in Annex[21]. Furthermore, in the Euratom Work Programme (2014-2015) fusion and fission topics include cooperation with China.

The European Commission's Joint Research Centre is pursuing cooperation with China on the topics of air quality, disaster management, remote sensing and land management in line with the overall S&T priorities identified at the latest EU-China Summit and Innovation Cooperation Dialogue.

Work is also on-going to strengthen the synergies between the EU's cooperation with China and the activities of the Member States (MS). Within the Strategic Forum for International Cooperation (SFIC), the Commission and the Member States have been working on the identification of common challenges and priorities to be pursued with and vis-à-vis China. The network of EU Member States Science Counsellors in China has produced a series of

[21] See also https://ec.europa.eu/programmes/horizon2020/horizon-2020-whats-it-china

documents regarding IPR issues, setting up of joint research structures and an overview of EU MS activities.

Research and Innovation features high on the agenda of the EU-China Summits. A strong cooperation with China on research and innovation is one of the milestones of overall EU-China relations and contributes to reaching the objectives of the EU's external policies.

With the High Level Dialogue on Innovation Cooperation the two sides are committed to enhance their mutual understanding of their respective innovation policies and systems, to promote predictable, transparent and effective framework conditions related to innovation and to develop joint and coordinated actions for the development and deployment of innovative solutions.

Framework conditions for cooperation in research and innovation with China have been improving over the last few years, e.g. in adopting international standards and in IP protection and enforcement where China has come a long way in the last decade. However, there is still substantial room for improvement in infrastructures, the legal environment and practices related to IPR, standards, procurement and other framework conditions.

3. COOPERATION BETWEEN CHINA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

In the framework of the policy dialogue with China the following areas have been identified as priorities for EU-China cooperation:

- Food, Agriculture and Biotechnology

  Cooperation in these areas addresses important common challenges such as food security, food safety and healthy diets, animal health, sustainable agriculture and the development of a low-carbon economy. Given the economic weight of China, even small moves to more sustainability in primary production and processing can lead to substantial global benefits for the environment and climate. The opportunity to export sustainable solutions and scale-up the potential of the Chinese market will enhance European innovation and competiveness. China is also the world's largest aquaculture producer and marine related challenges are important for both Europe and China, making these further areas with potential for future cooperation.

  Cooperation in this area has been moving towards a strategic partnership, with the signature of a Letter of Intent between the European Commission and the Chinese Academy of Agricultural Sciences (CAAS). This new initiative will ensure concrete, substantial and balanced joint research and innovation cooperation activities on selected priorities of common interest to be supported.

- Sustainable Urbanisation

  Urbanisation of societies is an issue of crucial importance both for Europe and China, and it features high on the political agenda of both sides. Research and innovation are recognized components of the EU-China Sustainable Urbanisation Partnership as they play a key role in addressing the challenges urbanisation creates. Cooperation opportunities will be pursued in areas such as sustainable urban and peri-urban planning, green transport, clean technology, air quality, sustainable urban energy and disaster management. Effective links with the Joint Programming Initiative Urban Europe will be sought.

- Aviation

China is a large and growing market for the aeronautics industry and has developed state-of-the-art aeronautics technologies. Cooperation through collaborative research projects under FP7 allowed issues of common interest linked to global environment and safety issues to be tackled. Building on existing policy dialogue and past cooperation, intense preparatory work has been done in developing future joint initiatives on aviation. In consultation with EU and Chinese industry, stakeholders' priorities of common interest are being identified in areas such as environmental aspects of aviation, flow control, advanced materials, numerical simulation and validation methods, and efficient air transport. Cooperation in these areas will be sought through joint and coordinated EU-China calls for collaborative research and innovation projects.

- Environment

  The global dimension of Environment and Climate make them a priority for cooperation with China. The areas of water challenges, water for sustainable development and links between environment and urbanisation are considered as particularly important. China has considerable research capacity in this domain, and mutually beneficial cooperation opportunities can be found, particularly in the larger context of urbanisation issues. The importance of EU-China cooperation in the area of water is further underscored by the launch of the China-Europe Water Platform (CEWP) in March 2012 – a Member States' initiative to be implemented within the framework of the EU Water Initiative (EUWI) and China's framework of cooperation with Europe in the water sector.

- ICT

  Rapidly increasing wireless-traffic and applications pose challenges for both Europe and China. International collaborative research in the next 5 to 10 years will be key to developing the next generation of telecommunications. Cooperation involving industry and research institutes on information and communication technology will be enhanced through existing and further mechanisms. Key topics such as the next generation of network and communications infrastructure (5G), smart cities and internet of things will be explored.

- Energy

  Cooperation on coal-related technologies such as clean coal and carbon capture and storage (CCS) will continue being supported under Horizon 2020. In addition, EU-China cooperation opportunities are also being explored on renewable energy including in the fields of concentrated solar power and energy storage (batteries).

- Nuclear energy

  Euratom and China are increasing exchanges and cooperation on nuclear safety emergency response, nuclear fuel cycle, nuclear waste management and nuclear security. Also the strengthening of international non-proliferation regimes and related export control arrangements, as well as fighting against smuggling of nuclear material are matters for further potential cooperation. Education and training programmes oriented to post-doc and PhDs and safety of super critical water reactors (SCWR) are being pursued further.

- Euratom is also strengthening cooperation in the multilateral framework of the ITER project and building up a strategic bilateral partnership on fusion energy research. Furthermore, Euratom foresees bilateral cooperation at the Joint European Torus facility (JET) in support to ITER, where Chinese researchers are contributing in the field of diagnostics. Cooperation on fusion research with China, in particular on JET and on the

China Fusion Engineering Testing Reactor (CFETR), will be pursued through regular policy dialogue under the RD-PUNE agreement.

- Health

  In addition to the above, health research is an area where the EU and China have a lot to gain from closer cooperation. There is a strong tradition of cooperation on health both in the context of the EU Research Framework Programmes and in multilateral initiatives aimed at addressing global health challenges. These are in particular the International Cancer Genome Consortium (ICGC[22]), the International Rare Diseases Research Consortium (IRDiRC[23]) and the Global Alliance for Chronic Diseases (GACD[24]). China has expressed interest in joining the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R), on which the EU is currently working. There is scope for reinforcing cooperation with China on global health through Horizon 2020 and in international multi-partner research initiative such as, for example, the International Human Epigenome Consortium (IHEC[25]) or the Initiative for Traumatic Brain Injury Research (InTBIR).

In the field of materials, a coordinated call (which was decided with the National Science Foundation of China) resulted in three jointly financed projects in biomaterials, started in 2013. The outcome of the projects will be used to assess further cooperation opportunities.

In respect of industrial innovation, substantial progress has been made in developing a framework for cooperation to promote closer collaboration in mutual economic and strategic interest between EU and Chinese industrial clusters of businesses, researchers and innovators.

EU-China research and innovation cooperation is also to be strengthened by supporting the EU-China mobility of researchers and strengthening people-to-people contacts, from both the public and private sectors, in strategic research and innovation areas. This will be pursued through the Marie Skłodowska-Curie actions under Horizon 2020, the Erasmus + programme and the new initiative "EU-China Research and Innovation partnership" supporting mobility of EU researchers and innovators to China.

To cope with the growth of on-line collaboration between European and Chinese researchers the e-infrastructure link capacity between the two regions should be strengthened in the future, possibly through a long term arrangement.

22 http://icgc.org/
23 http://www.irdirc.org/
24 http://www.gacd.org
25 http://ihec-epigenomes.org

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH CHINA IN HORIZON 2020 WORK PROGRAMME 2014-15[26]

	Identifier	Short title	Indicative budget (EUR million)
2014	ICT 14 (LEIT-ICT)	Advanced 5G network infrastructures for the future internet	122.00
	NMP 26 (LEIT-NMP)	Joint EU & MS activity on the next phase of research in support of regulation NANOREG II	-
	NMP 27 (LEIT-NMP)	Coordination of EU an international efforts in safety of nanotechnology	-
	NMP 28 (LEIT-NMP)	Assessment of environmental fate of nanomaterials	-
	NMP 29 (LEIT-NMP)	Increasing the capacity to perform nano-safety assessment	-
	SFS 1 (Challenge 2)	Sustainable terrestrial livestock production	27.00
	SFS 3B (Challenge 2)	Practical solutions for native and alien pests affecting plants - EU-China cooperation on IPM in agriculture	-
	SFS 4 (Challenge 2)	Soil quality and function	-
	LCE 18 (Challenge 3)	Supporting Joint Actions on demonstration and validation of innovative energy solutions	95.50
	BG 15 (Challenge 2)	Polar Research	2.00
	WATER 5 1 (Challenge 5)	Strengthening international R&I cooperation in the field of water-Strategic cooperation partnerships	-
	SC5 5 (Challenge 5)	Coordinating and supporting research and innovation for climate action-Climate change mitigation options: a) climate change mitigation options	-
	WASTE 2	A systems approach for the reduction, recycling and reuse of food waste	-

[26] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

	(Challenge 5)		
	INT 1 (Challenge 6)	Enhancing and focusing research and innovation cooperation with the Union's key international partner countries	1.95
2015	ICT 25 (LEIT-ICT)	Generic micro- and nano-electronic technologies	3.00
	NMP 30 (LEIT-NMP)	Next generation of tools for risk governance of nanomaterials	-
	SFS 13 (Challenge 2)	Biological contamination of crops and the food chain	10.00
	SFS 18 (Challenge 2)	Small farms but global markets: the role of small and family farms in food and nutrition security	5.00
	MG 1-8 (Challenge 4)	International cooperation in aeronautics	16.00
	MG 5-5 (Challenge 4)	Demonstrating and testing innovative solutions for cleaner and better urban transport and mobility	57.50
	WASTE 7 (Challenge 5)	Ensuring sustainable use of agricultural waste, co-products and by-products	-
	ISSI.5.2014.2015 (Science with and for Society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020

	Identifier	**Short title**	**Indicative budget (EUR million)**
2014-2015	Euratom-China R&D-PUNE Agreement FU-2 Subcommittee	Programmating comparison of EU and Chinese fusion roadmaps and strengthening INCO activities in support to ITER	-
		Programmating comparison of EU and Chinese fusion roadmaps and strengthening INCO activities in support to ITER	-
		Chinese partnership in the JET programme	-
		Education & Training schemes at international level	-

5. ROADMAP FOR COOPERATION BETWEEN INDIA AND THE EUROPEAN UNION

1. INDIA AS A PARTNER OF THE EU

The EU and India launched a Strategic Partnership in 2004. It builds on the 1994 Cooperation Agreement on Partnership and Development. In this framework, an EU-India Joint Action Plan was adopted in 2005 and revised in 2008. It includes a significant research and innovation dimension. Furthermore, the EU and India hope to increase their trade in both goods and services and investment through the Free Trade Agreement (FTA) negotiations launched in 2007.

Cooperation between the EU and India in research and innovation is governed by the Agreement on Scientific and Technological Cooperation which was concluded in 2001. In 2012, the Commission published an independent review of the current agreement. The Agreement for Co-operation between the Government of India and the European Atomic Energy Community (Euratom) in the field of Fusion Energy Research was concluded in 2009. India is also a member of ITER. A Joint Declaration on Research and Innovation Cooperation was signed on 10 February 2012 at the EU-India Summit which aims at stepping up the cooperation towards building an Indo-European Research and Innovation Partnership with (i) larger scale, scope and impact, (ii) focus on common societal challenges, and (iii) enhanced synergies between India, the EU and its Member States.

In addition, an EU-India Energy Panel for dialogue and cooperation on energy issues was set up to promote enhanced cooperation on energy between EU and India. It aims at improving energy security, safety, sustainability, access and energy technologies. In the information and communication technology (ICT) area, the EU-India Joint ICT Working Group focuses on regulatory matters (spectrum policy, market access questions and standardisation), internet security, internet governance, and cooperation in ICT research and innovation. The European Business and Technology Centre in India (EBTC) created in 2009 has as objective to facilitate mutual business partnerships and technology transfer between the EU and India in the focal sectors of Environment, Energy, Biotechnology and Transport – and having Climate Change as cross-cutting issue. The EBTC mainly targets EU companies, especially SMEs, and provides services such as market insight, tender support and incubation services. Finally EURAXESS Links India is a networking tool for European researchers working in India and Indian researchers wishing to collaborate and/or pursue a research career in Europe. It provides information about research in Europe, European research policy, opportunities for research funding, for international collaboration and for trans-national mobility.

India is currently spending close to 1% of its GDP on R&D (with a share of 28% from the private sector). During the 11th Plan period (2007-2012), public investment in R&D has grown at 22% per year. It is the government's commitment to increase India’s R&D spending to 2% GDP during the 12th Plan period 2012-2017. The total number of Indian scientific publications almost doubled from 20,514 in 1996 to 40,062 in 2006. This did, however, only marginally increase India's share in the world output of science publications from 2.1% in 2000, to 2.3% in 2005. Over the last few years, the number of scientific publications increased by more than 12% per year against the global average of 4%.

India's developments, such as those in space technology with capabilities to launch commercial satellites and un-manned missions to the moon and to Mars, nuclear technology, pharma research capabilities in drug discovery and commercialization, ICT software, biotechnology in health and agriculture and the emerging capabilities in automotive research

and telecommunications, have contributed to the country's recognition as an important knowledge power in the global economy. India is also attracting attention as a vibrant and versatile source of frugal innovation, a cost-effective and inclusive innovation, leading to affordable products and services without compromising on quality and environment protection standards.

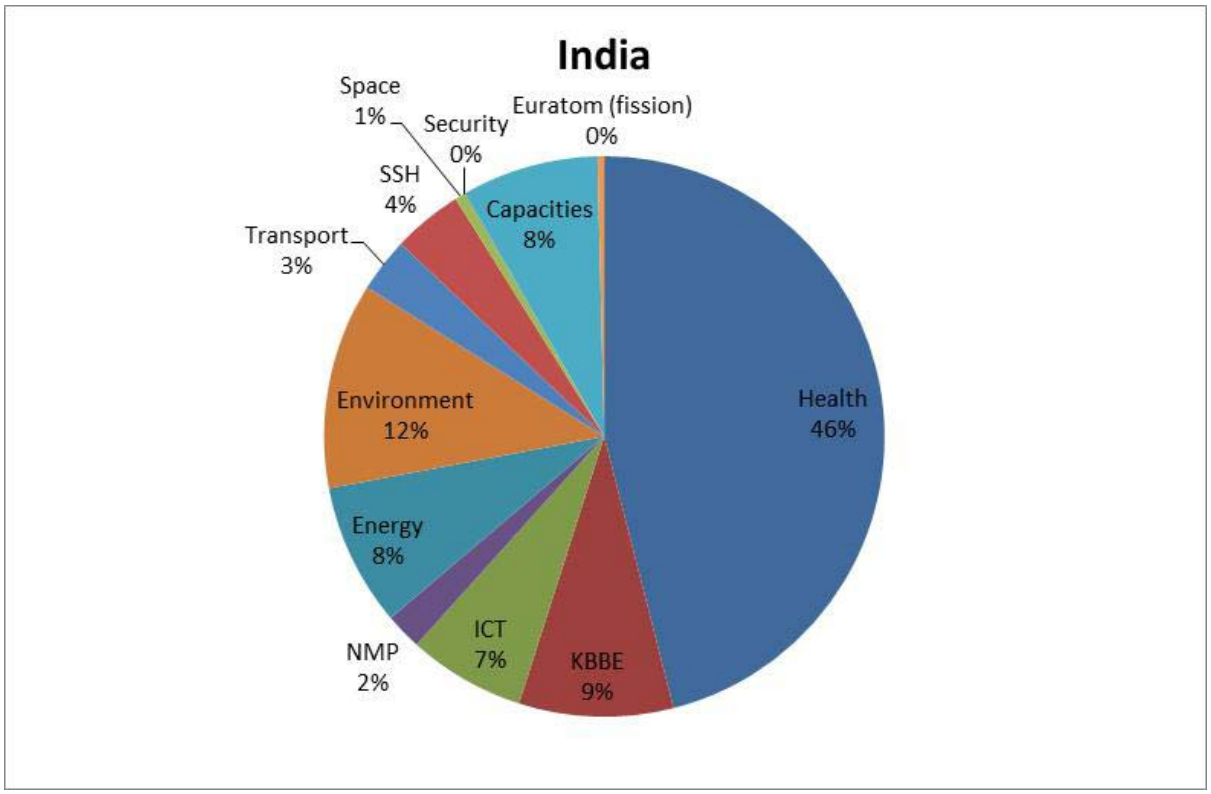
2. COOPERATION BETWEEN INDIA AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, Indian entities participated 258 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 37.4 million. The distribution of the Indian participation (by total cost of Indian participants) over the different FP7 subprogrammes is shown below.

India and Euratom co-operate within the ITER project and signed the bilateral Cooperation Agreement on fusion energy research. Under this framework three Indian and seven European research entities are implementing three specific JET projects and another 15 on-going collaborative activities. Under the Euratom FP7 and FP7 + 2, India participated in two fission projects.

1660 Indian researchers have been funded through the Marie Curie Actions (2007-2013) and Indian institutions have participated in 97 projects.

In addition to the above, several EU-India coordinated calls for proposals were successfully implemented in FP7 in the fields of computational materials science, food and nutrition research, solar energy research and water related challenges, with a total budget of EUR 60 million, co-funded by India and the EU.



Work is on-going to strengthen the synergies between the EU's cooperation with India and the activities of the Member States (MS). EU and Member States research & innovation cooperation with India shows a diversity of on-going bilateral initiatives, agreements and programmes, including many mobility schemes for students and researchers.

Within the Strategic Forum for International Cooperation (SFIC), the Member States and European Commission have been working since 2009 on an India pilot initiative on water and bio-resources related challenges. This pilot initiative led to a coordinated EU-India co-funded call of EUR 32 million in the field of water and bio-resources related challenges. Pursuant to the EU–India Joint Declaration on Research and Innovation Cooperation, it was agreed to establish a Group of EU/MS-India Senior Officials (GSO). The GSO aims at strengthening the Indo-European Research and Innovation Partnership through enhanced coherence and complementarities between India, the EU and its Member States. The first EU/MS-India GSO meeting took place on 8 October 2013 mobilising 20 Member States and 10 Indian Ministries and Departments. The FP7 projects[27] "Indigo Policy" and "Inno Indigo", were launched in December 2013 following up the successful FP7 "New Indigo" ERA-NET. They will be useful instruments to contribute to the preparation and implementation of coordinated EU/MS-India activities in research and innovation.

India has also been targeted as a partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation with Indian researchers included in areas such as water, nanotechnologies or agriculture. A full list of topics included in the work programme 2014-2015 is provided in Annex.

Framework conditions for cooperation in research and innovation between the EU and India are relatively satisfactory, resulting in a fairly stable and reliable climate for cooperation ensuring the overall success of EU-India cooperation in R&I. At the same time, as India is emerging as a preferred R&I partner and destination, its patent regime should be strengthened. Other existing challenges concern the complex legal framework, business transparency, nascent start-up market and venture capital market. Limited physical infrastructure also remains one of the roadblocks for furthering EU-India R&I cooperation. Additionally, procedural delays and capacity constraints in certain Departments inhibit the potential of cooperation in R&I. Indian organisations may face difficulties in accessing national funding when they want to engage with EU partners and such funding is usually not available for private-sector entities. Complex visa formalities and stringent procedure yield very high transaction costs for mobility of researcher and entrepreneurs with a negative impact on knowledge sharing and hence, innovation.

3. COOPERATION BETWEEN INDIA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

Through the ongoing dialogues with India, the following areas have been identified as priority areas for cooperation between the EU and India:

- Health

  India and the EU cooperate in multilateral initiatives aimed at addressing global health challenges, and also research on personalised medicine. One of these is the International Cancer Genome Consortium (ICGC, http://icgc.org/). India is, together with the EU, one of the members of the Global Alliance for Chronic Diseases (GACD, http://www.gacd.org/). Given the high prevalence of diabetes in both EU and India, a stronger collaboration within GACD would help to identify common solutions to tackle this chronic disease. India is also member of the Human Frontier Science Programme (HFSP, http://www.hfsp.org/).

[27] Supported through the FP7 Capacities INCO programme

- Water

  India and Europe face common challenges in the water area such as scarcity, over-abstraction, pollution, wastewater management, water use efficiency or climate change and its impact on water resources. The prime objective of EU-India collaboration in the water sector is to develop and adopt best suitable technologies and practices to tackle these challenges. The following have been identified as key research and innovation areas: integrated wastewater treatment technologies and management; water quality monitoring; water purification for safe drinking; water use efficiency in agriculture; urban water management including water reclamation and reuse; water purification, water quality and health issues; waste water treatment for safe reclamation and reuse; integrated water resources management; flood routing, forecasting and management.

- Bio-economy

  Ensuring global food security (inside and outside the EU) needs strengthened and more targeted international cooperation efforts in research and innovation to understand the different dimensions of food security. All these issues are highly relevant for the BRICs countries – including India - with their strong focus on food security research. A promising area for cooperation with India is therefore bio-economy, including food security, sustainable agriculture, and marine research. Topics of particular relevance for cooperation with India are the efficient utilisation of bio-resources, development of biomass crops and the general enhancement of waste utilisation and management in relation to urban development strategies. The optimisation of production systems, as well as the development of improved sustainable agricultural methods aiming at higher yield and crop productivity, are also of crucial importance in this respect.

- Energy

  India's independence in coal and gas ended in the 2000s, raising new concerns on energy external dependence, in particular since recent coal power plants were built to use imported coal. While two thirds of India's electricity currently comes from coal, it also has the fifth global wind capacity and exceeded its targets for non-hydro renewables, which are intended to represent one third of Indian power capacity by 2035. As ensuring efficiency and flexibility of coal power plants and developing competitive low-carbon energy are challenges shared by the EU, cooperation can contribute to making local coal resources more accessible and power plants more flexible, as well as supporting Indian efforts to develop low-carbon technologies.

- Fusion energy

  ITER constitutes the main benchmark for both Parties. The bilateral work programme (see annex), agreed at the second Coordinating Committee meeting, addresses the sharing of knowledge and will deepen the respective fusion programmes and strategic roadmaps. A specific India-Euratom task force enhances the bilateral partnership in JET (Joint European Torus) programme. Furthermore, cooperation on Education & Training programmes oriented to post-doc and PhDs has been proposed.

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH INDIA IN HORIZON 2020 WORK PROGRAMME 2014-15[28]

	Identifier	Short title	Indicative budget (EUR million)
2014	BG 15 (Challenge 2)	European polar research cooperation	2.00
	SC5 5 (Challenge 5)	Coordinating and supporting research and innovation for climate action-Climate change mitigation options	-
	WATER 5 (Challenge 5)	Strengthening international R&I cooperation in the field of water – Strategic cooperation partnerships	-
2015	ICT 25 (LEIT-ICT)	Generic micro- and nano-electronic technologies	3.00
	SFS 18 (Challenge 2)	Small farms but global markets: the role of small and family farms in food and nutrition security	5.00
	SC5-5 (Challenge 5)	Coordinating and supporting research and innovation for climate action-Climate change mitigation options	-
	ISSI.5.2014.2015 (Science with and for Society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020

	Identifier	Short title	Indicative budget (EUR million)
2014 - 2015	Euratom India Fusion CA Second Coordinating Committee	Partnership in the JET programme. *"Task Force on the JET ELM coils project"*	-
		European and Indian workshop on selected S&T fusion topics	-
		Mapping of bilateral collaborative activities	-

[28] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

6. ROADMAP FOR COOPERATION BETWEEN JAPAN AND THE EUROPEAN UNION

1. JAPAN AS A PARTNER OF THE EU

EU-Japan relations have developed steadily over the past two decades. Sharing many of the same challenges (energy security, access to critical raw materials, ageing populations), and defending a similar approach to key international challenges such as security and climate change, Japan is in many ways one of Europe's closest partner on the international stage. The 22nd EU-Japan Summit (7 May 2014) entitled *"EU and Japan Acting Together for Global Peace and Prosperity"* reiterated EU and Japan's *"strong, longstanding relationship founded on the common values of democracy, the rule of law, human rights, and shared principles such as open markets and a rules-based international system".*

While trade and investment remain the anchor, a wide range of dialogues and cooperation programmes are taking place in other areas. In particular, Japan has developed stronger political cooperation with the EU and is closely aligned with Europe on key issues including regional security (Ukraine, Iran, North Korea, South China Sea, etc.) and development goals (in particular, cooperation with Africa).

At the centre of the EU-Japan agenda are the twin negotiations launched in April 2013 on a Free Trade Agreement (FTA) and on a wider Strategic Partnership Agreement (SPA) covering political dialogue, cooperation in addressing regional and global challenges, and sectoral cooperation (including science and technology). As regards the SPA, four rounds of negotiations have taken place, starting from widely different philosophies. While the EU aimed at an ambitious and comprehensive agreement listing concrete cooperation objectives for the medium and long term, Japan's initial objective, in contrast, was for a more generic and 'minimalist' political declaration. Japan also gave top priority to the FTA, resisting the proposed linkage with the SPA. Both sides are now steering towards a middle ground, moving, in particular, towards an agreement to closely link the FTA and the SPA.

Negotiations have proceeded on the FTA, addressing a wide range of issues related to market access for goods, services and investment, procurement (including railways), and non-tariff measures. The May 2014 Summit noted the progress achieved in the area of trade in goods, with remaining issues still to be solved in other areas (procurement, services, FDI). The 6th round of negotiations in July 2014 marked the beginning of a second phase in the negotiations, following the 'one-year-on' progress review by the EU.

Japan is a global leader in science and technology, as witnessed, *inter alia*, by ten Nobel Prize winners in the 2001-2012 period. Gross expenditure on R&D (GERD) was 3.7% GDP in 2013 and the long–term goal of 4% remains. In addition to significant expenditure by government, industry dominates the Japanese R&D landscape, accounting for over 75% of Japanese R&D investments. However, the last two years have been marked by a decline in government S&T funding, including in the budgets for international cooperation initiatives.

Japan traditionally performs well in innovation rankings, immediately below the US and above the EU average. However, recent scoreboards document a decline in Japan's macroeconomic indicators for innovation, e.g. the 2013 *European Scoreboard on Innovation* puts South Korea well ahead of Japan.

Cooperation between the EU and Japan in research and innovation is governed by the 2011 Agreement on Scientific and Technological Cooperation. The EU-Japan Joint S&T Committee established under this Agreement has met twice (June 2011 and June 2013) to identify priorities for cooperation. Despite the EU's insistence to keep a yearly rhythm, the next meeting of the Joint Committee is scheduled only for March 2015.

In addition to the Joint S&T Committee, the 21st Summit in November 2013 mandated the setting up of a task force of senior officials to look at concrete ways to bring EU-Japan cooperation in research and innovation to its 'full potential'. This task force held its first meeting on 15 April 2014 in Tokyo. The joint report of the meeting was submitted, as requested, to the 22nd Summit on 7 May 2014. The work of the task force was formally recognised in the Summit conclusions, which also recommended that this high-level group should continue its work *"to explore more effective and efficient mechanisms to enhance future research cooperation'.*

In the area of nuclear energy, EU-Japan cooperation in fusion research dates back to 1988 with the signature of the Euratom-Japan Fusion Cooperation Agreement. Further to the ITER agreement of 2006, the 'Broader Approach' agreement providing for research and development complementary to ITER was signed in 2007 with the Japanese government. Japan also participates in fission research, together with Euratom, through the 'Generation IV International Forum' (GIF) intergovernmental agreement. An agreement between Euratom and the Japan Atomic Energy Agency, signed in 1990 and implemented through the Commission's Joint Research Centre, was amended in 2012 to include activities on nuclear security in addition to research on nuclear safeguards.

Framework Conditions for research and innovation with Japan are good, as could be expected from one of the world's leading scientific 'powerhouses'. As a WTO and OECD member, Japan offers a predictable legal framework, in particular regarding IPR protection.

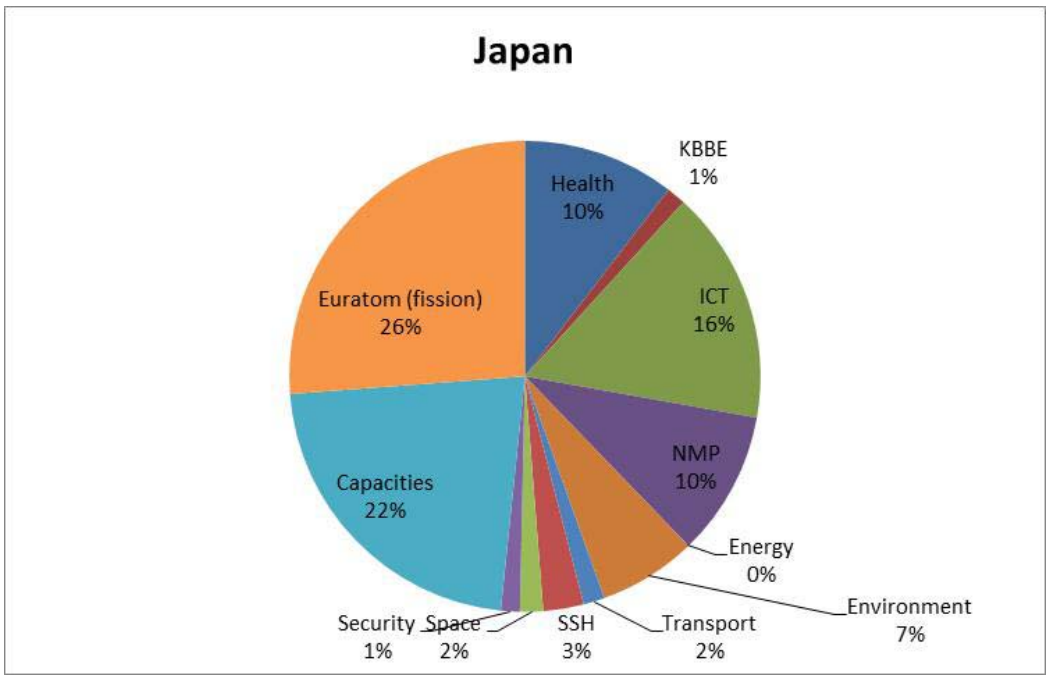
However, despite this framework, non-tariff barriers remain, particularly in the area of public procurement. As underlined by the current FTA negotiations and by a recent report by the EU-Japan Centre for Industrial Cooperation, EU companies encounter barriers both for large technology contracts where big Japanese *kereitsu* have a *de facto* monopoly (e.g. supercomputers, high speed trains), as well as for smaller contracts. Reasons include: a high degree of diversity in administrative procedures, often specific to individual procuring entities and the types of contract; little or no information in foreign languages; absence of published tender evaluation and negotiation methods. As a result, EU-supplied goods and services only accounted for 2.9% of total procurement value in 2011.

In the area of standards, the Japanese system also tends to favour insiders. Japanese Industrial Standards (JIS) are used in tender requirements and have been usually developed by domestic industrial associations. Foreign suppliers are forced to verify separately whether their products meet these standards, thus adding to extra time and costs when preparing a bid. Excessive use of standards, and last minute changes in standards, are also utilised to keep out foreign competition. A closer harmonisation of standards, called for by the EU-Japan Business Round Table, and discussed in the context of the FTA, would no doubt be beneficial for both sides.

2. COOPERATION BETWEEN JAPAN AND THE EU IN RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, Japanese entities participated 108 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 8.9 million. The distribution of the Japanese participation (by total cost of Japanese participants) over the different FP7 subprogrammes is shown below. To these figures must be added the 17 projects financed through 5 coordinated calls launched between 2011 and 2013 in the areas of energy, aeronautics, materials, and ICT.

416 Japanese researchers have been funded through the Marie Curie Actions (2007-2013) and Japanese institutions have participated in 59 projects.



Compared with other international partner countries, Japan's performance is relatively modest, ranking only 13th for participations by Japan-based research entities in FP7. However, by contrast, EU-based branches of Japanese companies have participated actively in FP7 (over 160 participations, notably in ICT). These willingly acknowledge the advantages of their involvement in EU programmes: setting up strategic partnerships with leading EU and international companies, faster standardisation processes, development of new applications and products for the global market. A key challenge in Horizon 2020 will be to ensure that Japan increases its overall participation in the Programme's 'General Opening' to a level matching the excellence of its science base and its economic strength.

Cooperation in the framework of the Euratom fission programme is well established with nine projects worth EUR 7.7 million (including Euratom funding of EUR 0.5 million). In fusion research Japan and Euratom have over 150 on-going collaborative activities involving 53 European entities and 35 Japanese research institutions. A number of these activities involve the Joint European Torus (JET) in areas considered critical for ITER.

The Commission's Joint Research Centre has also developed cooperation with Japanese partner institutions in fields including disaster management, structural engineering codes, standards & metrology and photovoltaïcs as well as in nuclear safety and security. FP7 cooperation with Japan in the field of space research has included 'Pulsed Chemical Rocket with Green High Performance Propellants' and 'High speed Key technologies for future Air Transport Research and Innovation'.

The 'Japan-EU Partnership in Innovation, Science and Technology' (JEUPISTE) project, funded under FP7, supports the policy dialogue between the EU and Japan and disseminates information on possibilities for cooperation.

Japan has also been targeted as a partner for cooperation in the first Horizon 2020 work programme (2014-2015), with topics encouraging cooperation with Japanese researchers in areas such as Aeronautics, ICT and Materials. Two new coordinated calls have been launched (ICT) or will soon be launched (Aeronautics).

Work is ongoing to strengthen the synergies between the EU's cooperation with Japan and the activities of the Member States. Synergies with cooperation at EU level are developed through the Strategic Forum for International Cooperation (SFIC). The successful ERA-Net

project CONCERT-Japan provides a good example of alternative approaches to funding EU-Japan projects. In addition to policy and brokerage activities the project launched two joint pilot calls on 'Natural Hazards & Disaster Management' and 'Energy Storage & Distribution' in close partnership with Member States, generating over EUR 5 million from two Japanese and 15 European participants. Benefitting from exceptionally strong support from Member States and from Japan's Science and Technology Agency (JST) these two calls financed a dozen separate projects. An additional call in Photonics has just been launched.

3. COOPERATION BETWEEN JAPAN AND THE EU: PRIORITIES FOR THE FUTURE

On the basis of the work of the EU-Japan Joint S&T Committee the following areas are considered to be priority areas for future cooperation with Japan:

- Critical Raw Materials

  Critical Raw Materials have been one of the most active areas of cooperation between the EU and Japan since 2010. This area is, in many ways, a model for such cooperation both at the policy level (common strategic interest), as well at project level (two successful coordinated calls, participation of Japanese experts in the last evaluation, active organisational involvement and financial support by JST). In addition, Japan has been a key partner in the EU-US-Japan Trilateral Dialogue launched at the initiative of the European Commission, in particular in the organisation of three successive high level conferences in Washington, Tokyo and Brussels.

- Transport research including aviation

  Transport research is another strategic area for cooperation with Japan, providing EU industry with opportunities to reinforce links with Japanese industrial partners and improve access to the Japanese market. The EU-Japan Working Group on aeronautics research was launched in June 2013, providing an efficient platform to manage on-going projects, define joint priorities, and prepare future cooperation. A support action in the 2014 work programme with a dedicated coordinated call foreseen for 2015 will support these activities. For future calls further targeted actions in the field of automated vehicles can be expected as an outcome of a trilateral (EU, Japan and US) working group.

- ICT

  ICT has long been the most active area of EU-Japan S&T cooperation, both at policy and project level. The EU and Japan have an active ongoing Information Society Dialogue, meeting each year, covering policy and regulatory issues, as well as research. The 20th meeting, on 4-5 December 2013 took stock of the progress achieved and confirmed the key priorities for future cooperation. A second coordinated call has been included in the work-programme 2014-15 of Horizon 2020 supporting joint research and innovation activities on Net Futures i.e. Future Internet, Internet of Things and Cloud Computing. Specific topics include technologies combining big data, internet of things, optical communications, access networks for densely located users and EU-Japan federated test-beds for smart ICT. Joint work on these areas is expected to be continued in the work-programme 2016-17 of Horizon 2020. In addition to these topics Japanese participation is also welcome in mainstream research and innovation dealing with new network infrastructures for Future Internet which includes 5G. : Possible cooperation on specific aspects of manufacturing technologies of micro-electronics. Prospects for further cooperation are also being explored in Cyber Security, Active and Healthy Ageing.

In addition to these three priorities, cooperation is also on-going in a number of other areas, including:

- Energy (non-nuclear)

  Cooperation with Japan on non-nuclear energy research and innovation has been well established in key areas such as hydrogen fuel cells, energy storage, carbon capture and storage, electric vehicles, and critical materials for energy. A successful coordinated call on photovoltaics was launched in 2011. However, more R&D cooperation with Japan could have been expected. It is hoped that joint activities will further develop following the adoption of Japan's first Basic energy plan since the Fukushima disaster, under which development of low-carbon energy is a priority. Cooperation in energy and energy research was also one of the issues emphasised by President Barroso at the 22nd EU-JP Summit.

- Space research and innovation

  The EU and Japan have an advanced space science and technology sector and a powerful space industry. Fostering a stronger involvement of Japanese scientists in Europe is of mutual benefit.

- Health

  Japan and the EU cooperate in multilateral initiatives aimed at addressing global health challenges. These are, in particular, the International Human Epigenome Consortium (IHEC[29]), the International Human Microbiome Consortium (IHMC[30]) and the International Cancer Genome Consortium (ICGC[31],). These initiatives will continue until at least 2015. Japan is the most significant funder of the Human Frontier Science Programme (HFSP[32]) to which the EU will continue to provide an annual contribution of around EUR 4.5 million.

- Security research

  There are complementary skills and technologies between EU and Japanese research centres and industry in the area of sensor technologies for security systems. It is intended to establish a joint plan with Japanese research funding institutions, to be implemented on the EU side through the 2016 Horizon 2020 work programme, towards the development and security-related use of advanced sensors and sensing systems.

- Euratom

  Exchanges and cooperation are being developed in two main areas. Firstly, tools for the fast and reliable prediction of the progression of severe nuclear accidents as well as for the anticipation of such accidents. Secondly, it includes cooperation on nuclear developments and interaction with society. Euratom and Japan will also continue to strengthen cooperation in the multilateral framework of the ITER project while building up a bilateral partnership on fusion energy research. Euratom is negotiating bilateral cooperation at the JET facility to support ITER and the bilateral fusion work programme is endorsed by the ITER Coordinating Committee.

29 http://www.ihec-epigenomes.org/
30 http://www.human-microbiome.org/
31 https://icgc.org/
32 http://www.hfsp.org/

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH JAPAN IN HORIZON 2020 WORK PROGRAMME 2014-2015[33]

	Identifier	Short title	Indicative budget (EUR million)
2014	H2020-EUJ-2014 (LEIT-ICT)	EU-Japan Research and Development Cooperation in Net Futures	6.00
	ICT 14 (LEIT-ICT)	Advanced 5G network infrastructures for the future internet	122.00
	NMP 26 (LEIT-NMP)	Joint EU & MS activity on the next phase of research in support of regulation NANOREG II	-
	NMP 27 (LEIT-NMP)	Coordination of EU an international efforts in safety of nanotechnology	-
	NMP 28 (LEIT-NMP)	Assessment of environmental fate of nanomaterials	-
	NMP 29 (LEIT-NMP)	Increasing the capacity to perform nano-safety assessment	-
	MG-1-8 (Challenge 4)	International cooperation in aeronautics	3.00
	SC5-13 (Challenge 5)	Coordinating and supporting raw materials research and innovation-Strategic international dialogues and cooperation on raw materials with technologically advanced countries	5.00
	NFRP 2 (Euratom)	Tool for the fast and reliable prediction of severe accident progression and anticipation of the source term of a nuclear accident	3.00
	NFRP 12 (Euratom)	Nuclear developments and interaction with society	2.50
2015	ICT 25 (LEIT-ICT)	Generic micro- and nano-electronic technologies	3.00
	ICT 38 (LEIT-ICT)	International partnership building and support to dialogues with high income countries	3.00

[33] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

	NMP 23 (LEIT-NMP)	Novel materials by design for substituting critical elements	-
	NMP 30 (LEIT-NMP)	Next generation of tools for risk governance of nanomaterials	-
	PHC 33 (Challenge 1)	New approaches to improve predictive human safety testing	30
	SFS 10 (Challenge 2)	Tackling disease related challenges and threats faced by European farmed aquatic animals	-
	SFS 16 (Challenge 2)	Tackling malnutrition in the elderly	-
	BG 15 (Challenge 2)	European polar research cooperation	2.00
	MG 1-8 (Challenge 4)	International cooperation in aeronautics	16.00
	ISSI.5.2014.2015 (Science with and for Society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020

	Identifier	**Short title**	**Indicative budget (EUR million)**
2014 - 2015	Euratom-Japan Fusion Cooperation Agreement Fifth Coordinating Committee	Mapping of bilateral collaborative activities	-
		Exploitation of Broader Approach projects beyond 2017 (including "auxiliary arrangements" of post-BA activities)	-
		Programmatic comparison of EU and Japanese fusion roadmaps and strengthening INCO activities in support to ITER	-
		Potential Japanese partnership in the JET programme	-

7. ROADMAP FOR COOPERATION BETWEEN THE REPUBLIC OF KOREA AND THE EUROPEAN UNION

1. KOREA AS A PARTNER OF THE EU

EU-Korean relations are based on the Framework Agreement (which entered into force on 1June 2014). The Republic of Korea (ROK) is the only country with whom the EU has signed a Framework Agreement (in 2010), a Free Trade Agreement (in 2011) and a Crisis Management Agreement (23 May 2014).

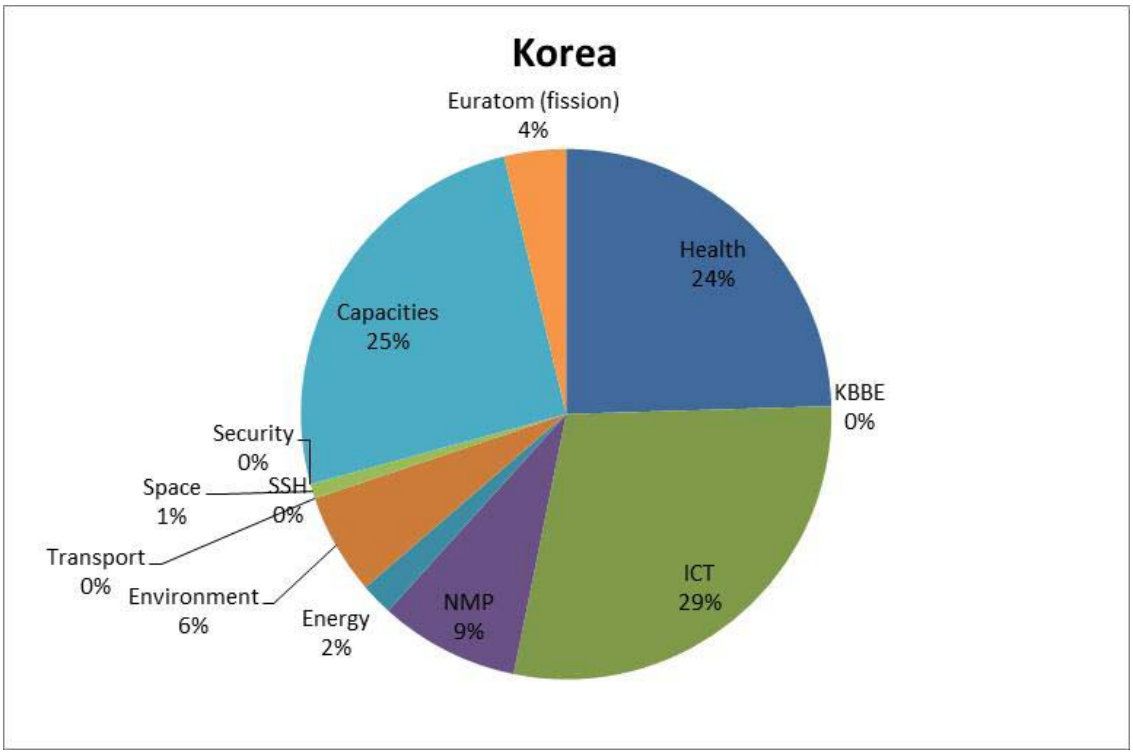
Cooperation between Korea and the EU on research and innovation is governed by the Agreement for Scientific and Technological Cooperation, which came into force in 2007. In 2013, the Commission published an independent Review of this S&T Agreement. In fusion research, Euratom and Korea are parties to the ITER International Agreement and have bilateral cooperation agreement on fusion energy, in force since 2006. In fission research, Euratom and Korea are signatories to the Generation IV International Forum (GIF).

In 2013, Korea joined the USA as the most innovative country in the Innovation Union Scoreboard. In 2012, Korea had the 2nd highest gross domestic expenditure on R&D (GERD) globally, at over 4% of GDP. In 2010, 72% of GERD was funded by industry, 27% by government and 0.2% from abroad.

At the 7th EU-ROK Summit in Brussels on 8 November 2013, a Joint Declaration commemorating 50 years of diplomatic relations was adopted and the summit set out a vision for future development, with focus on cooperation in research, high education and industry.

2. COOPERATION BETWEEN KOREA AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, Korean entities participated 65 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 1.9 million. The distribution of the Korean participation (by total cost of Korean participants) over the different FP7 subprogrammes is shown below.



153 Korean researchers have been funded through the Marie Curie Actions (2007-2013) and Korean institutions have participated in 14 projects.

A support action FP7 project, KONNECT[34] is helping the coordination of specific activities, such as networking events by thematic area, twinning events, training of National Contact Points (NCPs) and preparation of strategic reports – in synergy with the Joint S&T Committee[35].

Korea has been targeted as a partner for cooperation in the Horizon 2020 work programme 2014-2015, with topics encouraging cooperation with Korean researchers in areas such as 5G network infrastructures, nanosafety, factories of the future and animal health. A full list of topics included in the work programme 2014-2015 is provided in Annex.

Work is on-going to strengthen the synergies between the EU's cooperation with Korea and the activities of the Member States (MS), as MS consider cooperation with Korea as economically important.

In the period of the Euratom FP7 and FP7+2 (i.e. 2007-2013) there have been 5 Korean participations in Fission projects, while the number of bilateral Fusion collaborative activities have reached about 35 collaborative activities.

As regards framework conditions for cooperation, South Korea has strengths in many aspects. These include a sustained technology-based economic development, a national consensus on the importance of science, technology and innovation as drivers of future socioeconomic growth, high levels of GERD and BERD, a highly educated labour force, supportive and improving framework conditions for innovation, large firms that are internationally competitive, capability to produce talent and strong ICT infrastructure[36]. The EU and Korea are important trading partners. European companies are the largest investors in South Korea. South Korea is the EU's tenth largest trade partner and the EU is South Korea's fourth largest export destination (after China, Japan and USA).

Framework conditions for cooperation in research and innovation with Korea have been improving in recent years, particularly since the signing of the FTA with the EU in 2011, which has led to a level playing field in the areas of IPR and market access.

An example of a further positive effect of the FTA is the decreased reports by EU enterprises based in Korea of framework related issues to the EU Chamber of Commerce in Korea.

This improvement of framework conditions builds on the Korean government's increased investment in public R&D budgets since the late 1990s and improved framework conditions for Korean start-ups and tech-based SMEs (such as government-backed venture funds, tax waivers, military service exemptions for researchers).

The Third Science and Technology Basic Plan (2013-2017) aims to increase the contributions of R&D to economic growth from 35.4% to 40% through a 'Creative Economy Strategy' to support cutting edge innovation, including in SMEs and fostering high value services to drive a knowledge-based economy. This comprises enhancement and high efficacy of national R&D investment, including strengthening basic research in Korea; development of national strategic technology; strengthening long-term creative capability; supporting creation of new industry and creation of new jobs.

However, some issues still remain to be improved, such as the access to Public Procurement by European enterprises in South Korea, where calls are often only open for a short period.

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34 BILAT project supported through the FP7 Capacities INCO programme (Oct 2013 – Sept 2016)

35 http://www.haneurope.com; http://www.haneurope.or.kr

36 OECD Reviews of Innovation policy – Korea (2009) http://dx.doi.org/10.1787/9789264067233-en

Also improved access to research and innovation funding calls for EU SMEs based in Korea would increase their R&I activities. Reciprocity of access to such funding calls should be a continued target for these enterprises based in South Korea.

3. COOPERATION BETWEEN KOREA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

As agreed in the 5th Joint S&T Committee (Brussels, June 2013), the following have been identified as priority areas for future cooperation:

- Nanotechnologies:

  In this domain, Europe has a strong knowledge-base and Korea has rapid deployment capability. Synergies will allow the covering of the whole research-innovation chain. The focus in this area will be on nano-safety, where important synergies can be found from complementary strengths. Further developing harmonised regulation (e.g. in standards and safety) will also lead to reinforced market positions, both towards each other and towards markets in third countries. The EU promotes government-level cooperation in the OECD working party on manufactured nano-materials (in particular through the NanoReg initiative, which is a FP7 project with a budget of EUR50 million (of which EUR10 million from PF7); followed by further regulatory research activities in Horizon 2020). Good progress is being made to incorporate direct contributions from Korea into NanoReg.

- Energy:

  Synergies can be found in building on complementary strengths and addressing weaknesses, in particular on Smart Grids and Carbon Capture and Storage. In Smart Grids, both sides would benefit from regulatory harmonisation, especially on standards for new generation, high performance energy systems in critical areas (such as interoperability to enable better integration of urban infrastructures).

- ICT:

  The identification of areas of mutual interest has been further deepened with the realisation of a joint workshop in Seoul in October 2013 with the participation of more than 50 experts from EU and Korea. This workshop reviewed the topics for cooperation in the areas of 5G, cloud computing, Internet of Things and Future Internet. This potential for cooperation was reaffirmed at the EU-Korea Summit held in November 2013. It resulted in a joint declaration, during the visit to Korea of Vice-president Neelie Kroes in June 2014, where EU and Korea agreed to work together in the future generation of communication networks (5G), related global standards and interoperability and spectrum policy. This was accompanied by the signature of a Memorandum of Understanding between the EU and Korean industry associations representing 5G stakeholders, respectively, 5G Forum and 5G Public Private Partnership. Korea is already one of the countries targeted by research and innovation in new network infrastructures for Future Internet which includes 5G in work-programme 2014-15 of Horizon 2020. The more recent developments are expected to result in the inclusion, as part of work-programme 2016-17, of a coordinated call EU-Korea addressing the topics above. There have been also expressions of interest to explore opportunities for cooperation in cyber-security, demographic change and ageing society as well as the ICT aspects of smart cities dealing with mobility, security, energy and other utility services.

In addition to the above areas, Korea expressed interest in cooperation on Health through a number of multilateral initiatives, such as the International Rare Diseases Consortium

(IRDiRC[37]) and Global Research Collaboration for Infectious Disease Preparedness (GloPID-R[38]).

The EU-Korea Implementing Arrangement (IA) was signed at the 7th EU-ROK Summit (Brussels, November 2013) which aims to foster researcher mobility where European Research Council (ERC) grant holders in Europe have the opportunity to host top researchers from Korea. It is only the second ERC IA, the first being with USA (NRF).

Korea is associated to, and very active in, Eureka. Entities from Korea have already taken part in projects in the Eurostars initiative.

The third Coordinating Committee meeting under the bilateral fusion cooperation agreement, (October 2012), up-dated the bilateral work programme, which main pillars are the collaboration between the world leading tokamaks JET and KSTAR, mapping of bilateral collaborative activities and potential Korean participation in specific Broader Approach activities.

To further EU-Korea cooperation in the priority areas, proposed actions are currently being considered for inclusion in the next Horizon 2020 work programmes.

	Area	**Action under consideration**
2016/ 2017	ICT	Coordinated calls on Net Futures (5G, cloud, IoT, experimental platforms)
	Nano-technologies	Nano safety standardisation & regulation: participation in NANOREG initiative & other topics of mutual interest. Coordination and Support Action to foster closer links

37 http://www.irdirc.org/

38 http://glopidr.globe-network.org

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH KOREA IN HORIZON 2020 WORK PROGRAMME 2014-15[39]

	Identifier	Short title	Indicative budget (EUR million)
2014	ICT 14 (LEIT-ICT)	Advanced 5G network infrastructures for the future internet	122.00
	NMP 26 (LEIT-NMP)	Joint EU & MS activity on the next phase of research in support of regulation NANOREG II	-
	NMP 27 (LEIT-NMP)	Coordination of EU an international efforts in safety of nanotechnology	-
	NMP 28 (LEIT-NMP)	Assessment of environmental fate of nanomaterials	-
	NMP 29 (LEIT-NMP)	Increasing the capacity to perform nano-safety assessment	-
	FoF 4 (LEIT-NMP)	Developing smart factories that are attractive to workers	-
	SFS 10 (Challenge 2)	Tackling disease related challenges and threats faced by European farmed aquatic animals	-
2015	ICT 25 (LEIT ICT)	Generic micro-and nano-electronic technologies	3.00
	ICT 38 (LEIT ICT)	International partnership building and support to dialogues with high income countries	3.00
	NMP 30 (LEIT-NMP)	Next generation of tools for risk governance of nanomaterials	-
	FoF 11 (LEIT-NMP)	Flexible production systems based on integrated tools for rapid reconfiguration of machinery and robots	-
	FoF 13 (LEIT-NMP)	Re-use and re-manufacturing technologies and equipment for sustainable product life cycle management	-

[39] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020

	Identifier	Short title
2014 - 2015	Euratom-Korea Fusion CA	Specific cooperation between the JET and KSTAR programmes
		Mapping of bilateral collaborative activities
	Third Coordinating Committee	Potential Korean participation in specific Broader Approach activities

8. ROADMAP FOR COOPERATION BETWEEN RUSSIA AND THE EUROPEAN UNION

1. RUSSIA AS A PARTNER OF THE EU

The legal basis for relations between the EU and the Russian Federation is the Partnership and Cooperation Agreement (PCA), which came into force on 1 December 1997. At the Summit in St. Petersburg in May 2003, the concept of four common spaces was endorsed: a Common Economic Space; a Common Space of Freedom, Security and Justice; a Common Space of External Security; and a Common Space of Research and Education, including Cultural Aspects. Furthermore, an initiative to establish a Russia-EU Partnership for modernisation was endorsed at the 25th Russia-EU Summit in Rostov-on-Don in 2010. This partnership is designed to serve as a flexible framework for promoting reform, enhancing growth and raising competitiveness in Russia and the EU.

Cooperation in research and innovation between the EU and Russia is governed by an S&T agreement, which was originally signed on 16 November 2000 and has been renewed for consecutive 5-year periods until 20 February 2019. Agreements between the European Atomic Energy Community (Euratom) and the Russian Federation in the field of nuclear safety and in the field of controlled nuclear fusion have been concluded in September 2001.

Russia is the scientifically most important non associated neighbour country to the EU. Its R&D intensity is currently estimated to be 1.11% GDP (2011). A high share of Russian R&D is performed by the business sector (62.4 %), while the government provides the major share of funding (66.5%) (figures of 2009[40]).

The EU-Russia Year of Science 2014 was formally opened in Moscow on 25 November 2013 as a platform highlighting the intense EU-Russia relations in the area of scientific collaboration.

2. COOPERATION BETWEEN RUSSIA AND THE EU IN RESEARCH AND INNOVATION: STATE OF PLAY

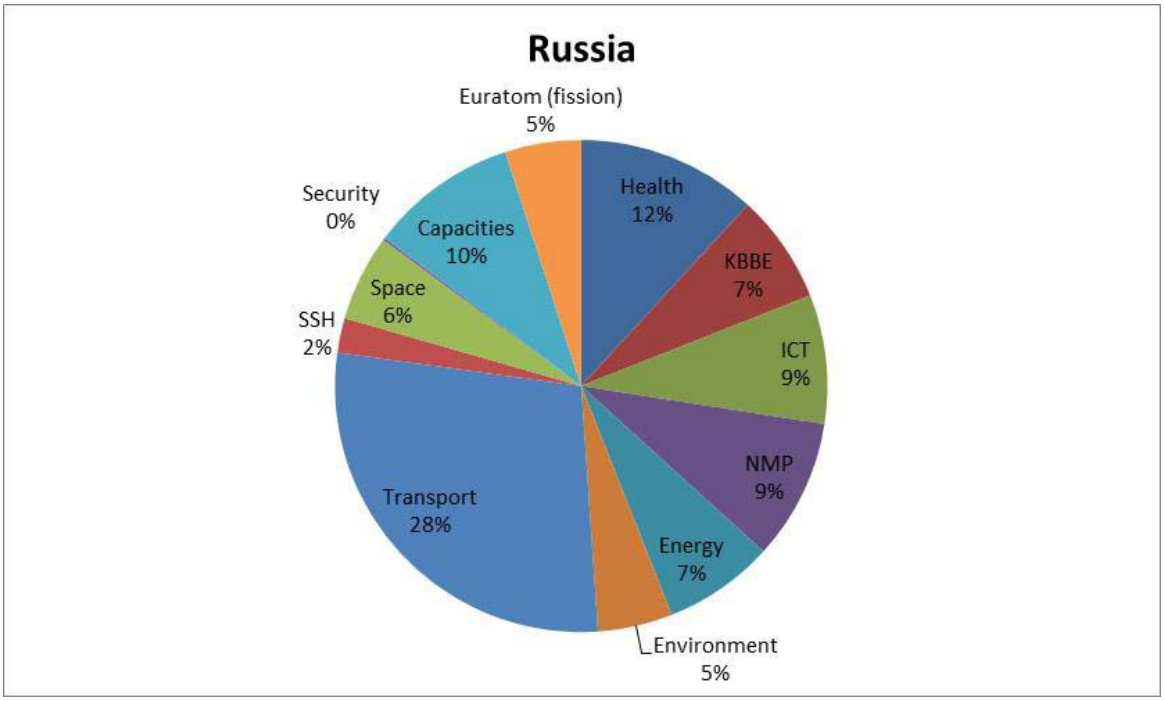
As of February 2014, Russian entities participated 509 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 69.2 million. The distribution of the Russian participation (by total cost of Russian participants) over the different FP7 subprogrammes is shown below.

In addition in FP7, 9 coordinated calls were published with Russia, funding an additional 28 projects on each side.

Russia also participates in ITER (thermonuclear fusion) and participation is strong in the Marie-Curie actions (supporting 1811 Russian scientists and 170 Russian organisations), and in the European Research Council (24 Russian scientists won grants).

1824 Russian researchers have been funded through the Marie Curie Actions (2007-2013) and Russian institutions have participated in 170 projects.

[40] National Science Board, Science and Engineering Indicators 2012, p. 4-47.



The policy dialogue between Russia and the EU is supported by several Coordination and Support Actions and in particular by the BILAT RUS Advanced project[41].

Russia has been targeted as an important partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation with Russian researchers in areas such as research infrastructures, polar research, high performance computing or aeronautics. A full list of topics included in the work programme 2014-2015 is provided in Annex.

Work is also on-going to strengthen the synergies between the EU's cooperation with Russia and the activities of the Member States (MS), for example through Russia's participation in large research facilities like XFEL, FAIR, CERN or the Space Station. Research initiatives by Member States have also been most actively engaged in the ERANET projects that published several calls with Russia for research and innovation projects.

Finally, on-going cooperation with Russia on research and innovation also contributes to reaching the objectives of the EU's external policies. Cooperation on research and innovation is seen as one of the positive and constructive areas of the EU-Russia policy relations and research cooperation is therefore an important element in the EU-Russia Partnership and Co-operation Agreement signed in 1994, as one of its four pillars – referred to as Common Spaces[42].

Framework conditions for cooperation in research and innovation with Russia have been improving over the last few years. Since 2002, the EU recognises Russia as a market economy country. Moreover, Russia joined the WTO in 2012, which means Russia must comply with all of the obligations of the WTO TRIPS Agreement setting out requirements for protecting and enforcing intellectual property rights. Information in the Internet is filtered by the Federal Service for Supervision of Communications, Information Technology and Mass Media, Roskomnadzor, blocking an increasing number of sites. At the same time there are obstacles

41 http://www.bilat-rus.eu

42 The four pillars are (1) economy & environment, (2) freedom, security & justice, (3) external security, (4) research & education, including cultural aspects.

limiting the potential for cooperation, such as different languages, geographical distance, bureaucracy, visa provision, legal regulations, diverse administrative and financial management, lack of financial resources, lack of information exchange and others[43].

3. COOPERATION BETWEEN RUSSIA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

On 28 June 2013, the Russian Federation and the EU convened a meeting of the Joint S&T Cooperation Committee, established under the Russia-EU S&T agreement to identify future areas of cooperation. Setting out priorities must, in the case of Russia, really be seen as an addition to the very active bottom-up collaboration provided through the general opening of Horizon 2020. Specific opportunities of collaboration are monitored and promoted in 13 thematic working groups on aeronautics, energy, environment and climate change (especially also related to the arctic), food, agriculture, biotechnology, health, ICT research, e-infrastructures, mobility, nanotechnology/materials, research infrastructures, and space.

Priority areas are:

- Aeronautics research

  With more than 40 projects with Russian participants in FP7 in aeronautics this is a flagship in EU-Russia research cooperation serving industrial needs and joint priorities in the aviation sector. The cooperation in aeronautics is coordinated through a dedicated working group. The cooperation will build on three FP7 coordinated calls which covered subjects such as flight testing of a high-speed vehicle for innovative passenger transportation, composite structures, noise control using plasma actuators, and flight data mining for enhanced safety, maintenance and joint standards.

- ICT research

  Russia is a leading country in several ICT related activities (e.g. space technology, satellite navigation), with good R&D capacity and scientific excellence in linked fields (e.g. mathematics, software). A coordinated call in FP7 addressed the areas of programming models and runtime support, micro and nano systems and photonics. Future cooperation will focus on high performance computing, building on the expertise available in Russia in mathematical modelling and algorithms for parallel programming.

- Research Infrastructures

  Collaboration in the domain of research infrastructures has been fruitful. Russian partners already participated in 28 projects of the FP7 Infrastructure programme. Russian delegates have made first formal presentations to the ESFRI steering board meetings. A recent delegation has visited 6 Russian Megascience projects[44]. There is good cooperation with Russia in ITER, CERN, the Space Station, FAIR and XFEL, JINR (Dubna), PNPI, and there is a trend towards more integration of Russian and European research infrastructures. However, there are unexplored options to collaborate in research infrastructure development and sharing in most of the scientific disciplines in addition to

[43] BILAT RUS Deliverable D 1.2 – Several case studies of good cooperation practice in S&T (continuously) and analytical summary report on the lessons learnt, Authors Dr. Anna Pikalova, Alexander Grigoriev, February 2011.

[44] The six Mega Science Projects are : Fourth Generation Special-purpose Synchrotron Radiation Source (SSRS-4 project); International project "IGNITOR"; Exawatt Center for Extreme Light Studies (XCELS project); Nuclotron-based Ion Collider Facility (NICA project); Super C-τ Factory; The Scientific and Research Reactor Complex PIK

high end physics and other natural sciences. Similarly, and this is connected to the ICT research target above, there are essential infrastructures serving the research community from the humanities to space shuttle engineering, like high performance computing facilities including development of both hardware and software. Common utilisation of data sources, like databases, archives and libraries, should also be considered when infrastructure collaboration is developed.

In relation to health, it would be important that Russia and the EU start cooperation in multilateral initiatives aimed at addressing global health challenges, such as the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R), currently under discussion.

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH RUSSIA IN HORIZON 2020 WORK PROGRAMME 2014-15[45]

	Identifier	Short title	Indicative budget (EUR million)
2014	INFRASUPP 6 (Research infrastructures)	International cooperation for research infrastructures	7.00
	FETHPC 1 (FET)	HPC Core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications	93.40
	BG 15 (Challenge 2)	European Polar research cooperation	2.00
	SC5-5 (Challenge 5)	Coordinating and supporting research and innovation for climate action-Climate change mitigation options	-
	INT 1 (Challenge 6)	Enhancing and focusing research and innovation cooperation with the Union's key international partner countries	1.95
	NFRP 2 (Euratom)	Tool for the fast and reliable prediction of severe accident progression and anticipation of the source term of a nuclear accident	3.00
	NFRP 12 (Euratom)	Nuclear developments and interaction with society	2.50
2015	MG 1-8 (Challenge 4)	International cooperation in aeronautics	16.00
	ISSI.5.2014.2015 (Science with and for Society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020 (2014-2015)

	Identifier	Short title	Indicative budget (EUR million)
2014-2015	Euratom-Russia Fusion CA Seventh Coordinating Committee	Potential Russian partnership in the JET programme	
		Potential Russian involvement in Broader Approach activities	
		Mapping of bilateral collaborative activities	

[45] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

9. ROADMAP FOR COOPERATION BETWEEN SOUTH AFRICA AND THE EUROPEAN UNION

1. SOUTH AFRICA AS A PARTNER OF THE EU

The Trade, Development and Cooperation Agreement (TDCA) constitutes the legal basis for the overall EU-South Africa relations. The TDCA covers political dialogue, the establishment of a free trade area, development co-operation, economic cooperation, and cooperation in several other areas. The agreement was signed in October 1999 and entered into force in 2000. The EU and South Africa subsequently established a Strategic Partnership, and in May 2007 adopted an Action Plan for its implementation. A first amendment of the TDCA provisions on political and economic cooperation was signed in the margins of the September 2009 SA-EU Summit. The Agreement between the European Atomic Energy Community (Euratom) and South Africa for co-operation in the peaceful uses of nuclear energy was concluded in 2013.

Scientific collaboration between South Africa and the EU takes place in the context of the Science and Technology Cooperation Agreement concluded in 1996 and entered into force in November 1997. Cooperation in S&T is also marked by ongoing strong dialogue through bilateral Joint Science and Technology Cooperation Committee meetings, the South Africa Department of Science and Technology (DST) 'Science at the Summit' initiative, and the Africa-EU Partnership for Science, Information Society and Space under the Joint Africa-EU Strategy.

In June 2008, the European "Cooperation in Scientific and Technical Research" (COST) Office and the DST concluded a "Reciprocal Arrangement", under which both sides provide funding for short-term scientific missions to be undertaken by South African and European researchers. The "Reciprocal Arrangement" entered into force on 1 July 2009. In 2013, South Africa signed a letter of intent to become a member of EUREKA, possibly already in 2014. EURAXESS Links[46] is considering expanding to South Africa in the near future. EURAXESS Links is the international arm of EURAXESS - a network for European and non-European researchers residing outside Europe and wishing to network with other researchers or to discover Europe's opportunities.

South Africa's level of investment in S&T (GERD) in 2010-2011 was 0.76% of Gross Domestic Product (GDP), down from 0.87% in 2009-10, 0.92% in 2008-9 and 0.93% in 2007-8[47]. The decrease is due to lower levels of private investment in R&D, whereas the portion of government investment has increased. The current level of investment falls short of the 2008 target of spending 1% of GDP on S&T as set out in the national R&D Strategy. South Africa is the country with the highest rate of R&D expenditure in Africa. The share of private sector expenditure in total R&D expenditure in South Africa is 43% (2010)[48]. In 2008 South Africa had a total of 1.41[49] researchers per 1000 employees and 26 doctorates[50] per million of the country's population (6.63/1000 in the EU and 9.4/1000 in the USA in 2009). On the continent, scientific production is dominated by South Africa with 47000 papers

46 http://ec.europa.eu/euraxess/index.cfm/links/index

47 SA Human Sciences Research Council

48 OECD Main science and technology indicators 2010

49 Human Sciences Research Council (HSRC), National Survey of Research and Experimental Development (2008/2009 Fiscal Year)

50 Academy of Science of South Africa (ASSAF), The PhD Study, September 2010

produced between 1999 and 2008[51]. As a share of world publications, the highest African performance is for South Africa in the field of plant and animal science (1.55% in 2010) followed by environment/ecology (1.29% in 2010).

2. COOPERATION BETWEEN SOUTH AFRICA AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, South African entities participated 228 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 32.9 million. The distribution of the South African participation (by total cost of South African participants) over the different FP7 subprogrammes is shown below.

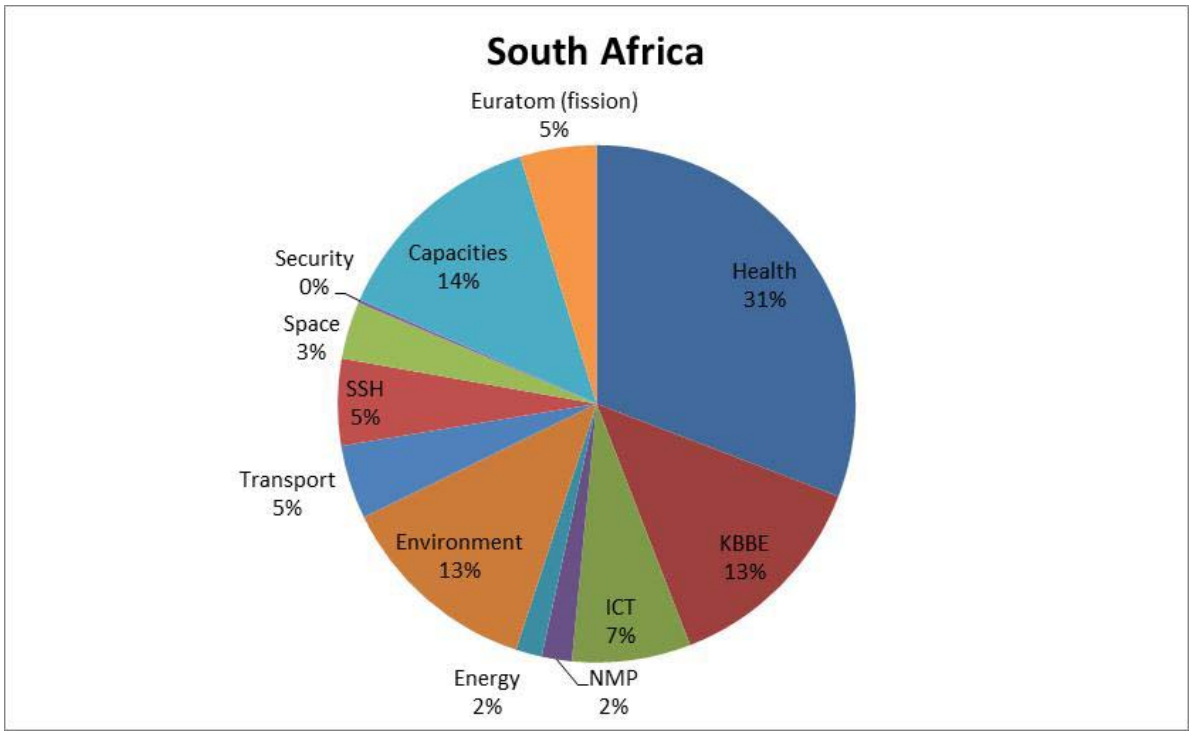
598 South African researchers have been funded through the Marie Curie Actions (2007-2013) and South African institutions have participated in 77 projects.

The EU and South Africa are also collaborating, together with other countries (China, Japan, USA) and international organisations (UN, OECD), on promoting common principles for international cooperation in research and innovation, referred to as Responsible Research and Innovation (RRI). The EU is also looking into extending the cooperation on the exchange of good practices in the field of Public Engagement and in particular multi-actor and public engagement and trans-disciplinary research to South Africa and the wider African region.

In addition, the European Commission's Joint Research Centre (JRC) has 23 cooperation partnerships with South Africa in fields such as remote sensing technologies, environment monitoring, and water and energy research. These successes are the result of a concerted effort to promote cooperation, also undertaken by the FP7 funded bilateral project 'European-South African Science and Technology Advancement Programme'[52] (ESASTAP Plus), a dedicated platform for the advancement of European – South African S&T cooperation, co-funded by the EU and South Africa and implemented by the Department of Science and Technology (DST) through South Africa's FP7 network of National Contact Points (NCPs).

[51] Thomson Reuters, Global Research Report, Africa, April 2010

[52] http://www.esastap.org.za/


South Africa
Euratom (fission) 5%
Health 31%
KBBE 13%
ICT 7%
NMP 2%
Energy 2%
Environment 13%
Transport 5%
SSH 5%
Space 3%
Security 0%
Capacities 14%

South Africa has also been targeted as a partner for cooperation in the 2014-2015 Horizon 2020 work programme, with includes topics to encourage cooperation with South African researchers in areas such as raw materials. A full list of topics included in the work programme 2014-2015 is provided in Annex.

Work is also on-going to strengthen synergies between the EU's cooperation with South Africa and the activities of the Member States (MS) and Associated Countries.

A number of prominent examples are listed below:

- The European and Developing Countries Clinical Trials Partnership (EDCTP)[53]:

  EDCTP is a programme conducted by a group of Member States (MS) jointly with the EU. It was established in 2003 by 16 European countries and the EU. It is a partnership between Europe and developing countries (including South Africa) that aims to accelerate the development of new and better medicines against poverty-related diseases such as HIV/AIDS, tuberculosis and malaria. EDCTP (2003-2012) supported 88 clinical trials in sub-Saharan Africa involving collaboration between medical researchers and health practitioners from Europe and sub-Saharan Africa, and South Africa had a leading role.

- ERA-NET Africa (ERAfrica 2010-2014)[54]:

  A collaborative platform between 10 EU MS and Associated Countries and 5 African Union MS, including South Africa, initiated by a EUR 2 million FP7 grant, has leveraged EUR 11 million in funding and resulted in three calls in the domain of renewable energy, new ideas and inter-facing challenges, which has given rise to 18 collaborative research and innovation projects.

- EU-Africa cooperation on STI:

  At the second meeting of the EU-Africa High Level Policy Dialogue on 28-29 November 2013, EU and African Union MS, including South Africa, committed to start working towards a long-term jointly funded research and innovation partnership in particular promoting food and nutrition security and sustainable agriculture that could be inspired by the achievements of EDCTP[55] and ERAfrica.

- European Innovation Platforms (EIP) and Joint Programming Initiatives (JPI):

  South Africa is actively looking to get involved in several of the EIPs and JPIs, such as the EIP on Raw Materials, the EIP on water and the JPI on water challenges for example, as well as the one on agriculture, food security and climate change.

- ESASTAP Plus:

  The bilateral project 'European-South African Science and Technology Advancement Programme' is actively looking at creating synergies between the EU MS cooperation with South Africa with that of the EU. Focus areas have been analysed, a joint pilot group of EU MS science counsellors and the EU science counsellor was set up and a feasibility study for setting up a joint liaison office of EU research organisations in SA is about to be launched.

On-going cooperation with South Africa on research and innovation also contributes to reaching the objectives of the EU's external policies. Research and innovation cooperation is acknowledged to be one of the most active areas of collaboration under the South Africa -

53 http://www.edctp.org/
54 http://www.erafrica.eu/fr/
55 http://www.edctp.org/

European Union Strategic Partnership, with a strong and longstanding relationship between the South African Department of Science and Technology and the European Commission, DG Research and Innovation (DG RTD).

Under the 2007-2013 EU Development Cooperation Instrument allocation for South Africa, EUR 30 million was allocated to an 'Innovation for Poverty Alleviation Programme', a sector policy support programme which focused on harnessing research and innovation as an instrument for poverty alleviation, in areas such as sustainable livelihoods, water, renewable energy and employment creation. Small businesses have been created in projects ranging from demonstration agronomy to ICT and renewable energy. Rural facilities and public schools were connected to internet through the Wireless Mesh Network and digital doorways have been installed throughout South Africa providing access to basic computer skills.

The EU has also committed EUR 130 000, funded through the TDCA Dialogue Facility[56], to a project to foster an innovation policy dialogue. The goal of this dialogue is to provide opportunities for the exchange of best practices and experiences with regard to innovation policy.

Also funded through the TDCA Dialogue Facility, support was provided for dialogue between the European Commission (DG RTD) and the Department of Science and Technology in the development of a research and development infrastructure roadmap. The Research Infrastructure Roadmap (RIRM) for South Africa led to the identification of 17 R&D infrastructure development projects.

Under the EU-ACP Cooperation Programme on Science & Technology[57] phase I (EUR 35 million 2000-2007), 3 out of 36 projects financed are led by South African institutions (8%), 12 South African institutions participate in 8 out of 36 projects (22%). The main fields of involvement are biodiversity, agriculture and research management. Information received regarding the outcome of the second phase (EUR 23 million, 2008-2013) indicates that 1 of the 21 projects is led by a South African institution, with 2 institutions participating in two other projects.

Under the Euratom FP7 and FP7+2 programmes, South Africa has participated in four fission energy related projects with three different entities.

South African researchers are also participating in projects launched by the African Union Research Grants[58] to which the EU has committed EUR 20 million (2008-2013). Themes include Agriculture, Energy, Water and Sanitation.

Regarding the Development Cooperation Instrument, the multi-annual indicative Programme for the period 2014-2020 will focus on three sectors taken from the National Development Plan of the Government of South Africa. These are (i) employment creation, (ii) education, skills development and innovation and (iii) building a capable and developmental state.

As regards framework conditions for cooperation, for more than a decade South Africa's democratic government has been developing the National System of Innovation (NSI)[59]. Despite the improvements made, a remaining problem lies in the commercialisation of research results[60] in which the major obstacle is financing (the market of equity and venture capital funds is private and few public initiatives exists, there is little investment by venture

56 http://www.dialoguefacility.org/

57 http://www.acp-st.eu/fr/node/1192

58 http://www.africa-eu-partnership.org/newsroom/all-news/african-union-research-grants-grants-2nd-call-are-signed

59 Most of the information comes from the report entitled 'map of the innovation landscape in South Africa and framework conditions', prepared by the FP7 funded bilateral project ESASTAP Plus.

60 OECD Review Report on South Africa (2006)

capitalists for early-stage entrepreneurs). New creative funding mechanisms that could help address this problem are emerging in some public-private partnerships. South Africa has been a WTO member since 1995 and is a signatory to the TRIPS Agreement that resulted in expanded commitments to internationally binding guarantees of intellectual property rights. Furthermore, there are more than 30 pieces of legislation, such as the IPR from publicly financed R&D Act, the Biodiversity Act and the R&D Tax Incentives, in South Africa that directly impact on the National System of Innovation. There is however still room for improvement in building capacity to implement and interpret these pieces of legislation. South Africa ranks 58 out of 142 countries in the WIPO Global Innovation Index 2013. The South Africa Bureau of Standards has acquired full membership in the International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC). Moreover, three South African organisations are members of the European Telecommunications Standards Institute (ETSI)[61]. South Africa can compete and cooperate with Europe due to its excellent state-of-the art infrastructure. South Africa leads the dynamic Southern African Research and Innovation Managers Association (SARIMA) which is active in promoting and facilitating the management of Research and Innovation. The main barriers for further cooperation are the lack of adequate information by EU and SA partners, the low administrative capacity in SA and the difficult procedures related to obtaining visa and working permits. Most South African research programmes are currently being accessed only by South African researchers and funding is only for South Africans. There is, however, willingness in some research managing organisations to open up their programmes to European researchers.

3. COOPERATION BETWEEN SOUTH AFRICA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

At the EU-SA Joint Science and Technology Cooperation Committee meeting (13 January 2014)[62], it was agreed jointly to step up cooperation in the following three flagship areas:

- Health

  The European Parliament (16 April 2014) and Council of the EU (6 May 2014) have formally approved the Commission proposal on the EU participation in the EDCTP2 programme. The EU decision allocates up to €683 million of EU funding to EDCTP2 to match at least an equal contribution – in cash or in kind – from the participating European states. The EDCTP2 programme aims to accelerate the clinical development of new or improved medical products against any poverty-related disease, including neglected ones, by supporting any stage in the clinical development but with a focus on phase II and III. Since 10 April 2014, EDCTP is formally established as an Association (under Dutch law) tasked to implement EDCTP activities, such as the EDCTP2 programme. The EDCTP Association is open to African countries for membership, and the first eight African countries, including South Africa, formally joined the EDCTP Association on 6 May 2014. The direct and full participation of African countries in the governance and the execution of the EDCTP2 programme is an historic step for EDCTP (http://www.edctp.org).

  The EU and SA will also explore the potential for the coordination of SA funded initiatives with future Horizon 2020 activities in relation to poverty-related and neglected

61 http://www.etsi.org/membership/current-members

62 The EU-SA JSTCC takes place on a yearly basis in the context of the EU-SA S&T Cooperation Agreement

diseases of poverty, including under EDCTP and the Innovative Medicine Initiative (IMI2[63]).

South Africa and the EU also cooperate in multilateral initiatives aimed at addressing global health challenges, such as the Global Alliance for Chronic Diseases (GACD[64]) in which both South Africa and the European Commission are members. The next call for proposals foreseen under GACD (2014) concerns in particular diabetes type II, which represents a serious health issue for both South Africa and the EU. South Africa has recently joined the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R).

Cooperating with South Africa in this domain contributes to the international commitments such as the health-related Millennium Development Goals (MDG 4 Reduce Child Mortality, MDG 5 Improve Maternal Health and MDG 6 Combat HIV/AIDS, Malaria and other diseases). It also contributed positively to the EU's research excellence and it offers European companies access to new markets. The track record of cooperation in this domain is very positive.

– Environment (Global Earth Observation)

International collaboration is essential to exploit the growing data output of Earth Observation and both Europe and South Africa need to have access to global datasets to address global challenges. This will only be achieved through international cooperation. South Africa in particular has set out a clear Earth Observation Strategy and possesses world class infrastructure and excellence. It is an active member in several EO-related international forums such as the Group on Earth Observations (GEO[65]) and the Partnership for Observation of the Global Oceans (POGO)[66]. South Africa has a particularly active role in shaping the next 10-year implementation plan of GEO, as it is a co-chair of one of its caucuses and co-drafts its research agenda. The EU and South Africa will further explore the possible inclusion of joint funding in the Horizon 2020 work programme 2016-2017 to support several initiatives such as GEOGLAM (Agriculture), EUBON (biodiversity), IAOOS (Integrated Atlantic Ocean Observing System) -Blue Planet Initiatives as well as the AfriGEOSS and Africa-EU GEO related cooperation.

Cooperating with South Africa in this domain contributes to international commitments such as those linked to the World Summit on Sustainable Development and the Millennium Development Goals (MDG 1 Eradicate extreme hunger and poverty and MDG 7 Ensure environmental sustainability). By making Earth observations freely and openly available, without any restrictions, we allow the service sector to develop new services and products. This leads to growth and job creation in Europe and South Africa and the provision of societal benefits for all citizens. The track record of cooperation in this domain is very positive, as was the case for example with the successful implementation of the FP7 funded GEONETCAB[67] project.

– Excellent Science - Research infrastructures

Radio astronomy: South Africa is a strong player in the domain of research infrastructures. This comes out most clearly in the collaboration on the Square Kilometre Array (SKA)[68] where there is a strong commitment to deliver the relevant infrastructure in

63 http://www.imi.europa.eu/
64 http://www.gacd.org/
65 http://www.earthobservations.org/about_geo.shtml
66 http://www.ocean-partners.org/
67 http://www.geonetcab.eu/
68 http://www.skatelescope.org/

Africa as well as to strengthen cooperation with the EU for instance through the African Very Large Baseline Interferometry (VLBI) Network[69] and participation to the European Research Infrastructure Consortium (ERIC) that will transform the Joint Institute for VLBI in Europe (JIVE)[70] into a legal entity.

In addition, in the area of radio astronomy, cooperation will be also fostered through the support for the Africa-European Radio-Astronomy Platform (AERAP).

The EU and SA agreed to convene a special workshop in 2014 to discuss synergy between the European Strategy Forum for Research Infrastructures (ESFRI) and SA research infrastructure roadmaps, in order to identify: a small number of ESFRI projects, where SA participation could be promoted; new large-scale research infrastructure projects, where SA-EU cooperation could be encouraged; opportunities to promote reciprocal access to existing South African infrastructures. More specifically, the focus will be in the following domains:

- ✓ Research vessels: investigating the feasibility of sharing polar vessels or large equipment in Antarctic (e.g. Polar Research Vessel SA Agulhas II);
- ✓ Biodiversity: sharing infrastructure capacities and strengthening on-going collaboration, e.g. through the South African Biodiversity Information Facility, involving pertinent ESFRI infrastructures (like LIFEWATCH, EMBRC, MIRRI);
- ✓ Health research: cooperation in multinational investigator-driven clinical trials (European Clinical research Infrastructure Network ECRIN) and sharing experience for capacity building in Africa[71], cooperation in collecting and management of biological and biomedical data including analysis and modelling tools (ELIXIR[72], BBMRI) and to co-operate on medical chemistry including HTS (EU-Openscreen[73]).

Future cooperation with South Africa will also focus on two promising areas:

– Marine and maritime research:

The EU and SA agreed to start a dialogue, through the establishment of a DST-EC marine science working group and explore the possibility of future participation by South Africa in the Transatlantic Ocean Research Alliance[74]. A first step will be to organise an exploratory expert workshop in 2014 to specifically examine South Africa's potential contribution to the Atlantic related research activities to be supported under Horizon 2020. Cooperation in this area will contribute to the international commitments such as the Millennium Development Goals (MDG 1 eradicate extreme poverty and hunger (target 1B achieve full and productive employment, MDG 7 ensure environmental sustainability (target 7 A reverse loss of environmental resources and B reduce biodiversity loss), MDG 8 Global partnerships (target 8F make available new technologies). It also contributed positively to the EU's research excellence and there is positive experience in working together in this area.

– Raw materials (Mining and minerals research and innovation):

South Africa is considering funding any participating entities from South Africa directly in proposals retained for funding in relation to topic NMP 24 -2015: Low-energy solutions

69 http://www.aerap.org/africanradioastronomy.php?id=32
70 http://www.jive.nl/
71 http://www.ecrin.org/
72 http://www.elixir-europe.org/
73 http://www.eu-openscreen.de/
74 Galway Statement (May 2013)

for drinking water production. The EU and South Africa will explore future possible collaboration with regard to the application of advanced materials and nanotechnology for environmental remediation in the mining sector.

In exploring the potential for mutually beneficial mining and minerals research and innovation cooperation between SA and the EU, a first step will be the organisation of an expert workshop in 2014, to consider cooperation opportunities in areas of shared interested identified in a common concept paper. If topics of common interest are identified, this could lead to a joint action as part of the European Innovation Partnership on Raw Materials.

There is positive experience in working together in this area. South Africa has well developed research capacity and the South African market is of clear interest to European companies.

Regarding nanotechnologies, for the time being potential collaboration opportunities exist mainly for water remediation and desalination technologies, such as addressed in a topic NMP-24-2015 Low-energy solution or drinking water production.

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH SOUTH AFRICA IN HORIZON 2020 WORK PROGRAMME 2014-15[75]

	Identifier	Short title	Indicative budget (EUR million)
2014	INFRASUPP 6 (Research Infrastructures)	International cooperation for research infrastructures	7.00
	SFS 6 (Challenge 2)	Sustainable intensification pathways of agro-food systems in Africa	1.00
	WASTE 4 (Challenge 5)	Towards near-zero waste at European and global level-Global waste dimension	4.50
	SC5-5 (Challenge 5)	Coordinating and supporting research and innovation for climate action-Climate change mitigation options	-
	SC5 13 (Challenge 5)	Coordinating and supporting raw materials research and innovation – Strategic international dialogues and cooperation on raw materials with technologically advanced countries	5.00
2015	ICT 39 (LEIT-ICT)	International partnership building in low and middle income countries	11.00
	SFS 18 (Challenge 2)	Small farms but global markets: the role of small and family farms in food and nutrition security	5.00
	WATER 5 (Challenge 5)	Strengthening international R&I cooperation in the field of water	-
	SC5 13 (Challenge 5)	Coordinating and supporting raw materials research and innovation- Strategic international dialogues and cooperation with raw materials producing countries and industry	8.00
	INT 1 (Challenge 6)	Enhancing and focusing research and innovation cooperation with the Union's key international partner countries	1.00
	ISSI 5 (Science with and for society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

[75] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

10. ROADMAP FOR COOPERATION BETWEEN THE USA AND THE EUROPEAN UNION

1. USA AS A PARTNER OF THE EU

The United States of America (US) are a long standing partner of the European Union, with the relations being formalised in 1990 with the adoption of the Transatlantic Declaration. Following the 2007 US-EU Summit, a Declaration on Enhancing Transatlantic Economic Integration and Growth laid the foundation for a growth driven agenda of dialogue. Since then, the Transatlantic Economic Council has become the primary forum for economic dialogue between the EU and the US. On 13 February 2013, the EU and US announced the launch of negotiations on a Transatlantic Trade and Investment Partnership (TTIP).

The cooperation between the EU and the US on research and innovation is governed by the Agreement for Scientific and Technological Cooperation, which was originally signed in 1998 and renewed thrice for 5 years each time. In June 2013, the Commission published an independent review of the current agreement[76]. Euratom and USA signed the bilateral cooperation Agreement on fusion energy research in 2001. USA together with Euratom is member of the ITER project. In fission Euratom and USA signed two Technical Exchange and Cooperation Arrangements, one on Nuclear related Technology research and one on Nuclear safety research. Both sides are members of the generation IV International Forum (GIF).

In 2011 R&D intensity was estimated at 2.77% GDP (up from 2.69% in 2007) against the objective of going beyond 3%[77]. The share of private sector R&D (of GERD) was 60% and the share of public sector R&D (of GERD) 33.4%.

As regards the Science Budget for the financial year 2014, an agreement reached by the US Congress in December 2013 has eased the 5% cut in across-the-board federal spending (known as sequestration). This provides a boost to research and innovation-related spending by a number of government departments and agencies over 2013 levels. For example the National Science Foundation (NSF) will receive $1.71bn (a 4.2% increase), the Department of Energy Office of Science will receive $50.7bn (a 9.7% increase) and the National Institute of Standards and Technology (NIST) gets a 10.4% increase to $850m.

While the increases undo the effects of sequestration for some agencies, they do not allow the fulfilment of the Administration's wish to follow a funding trajectory to double investment in science over a decade.

2. COOPERATION BETWEEN THE USA AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, US entities participated 486 times in FP7 signed grant agreements, receiving a total EU contribution of EUR 76.4 million. This despite the fact that participants from the US (as an industrialised country) did not automatically receive funding from FP7, except in the Health theme of the Cooperation Programme.

The distribution of the US participation (by total cost of US participants) over the different FP7 subprogrammes is shown below.

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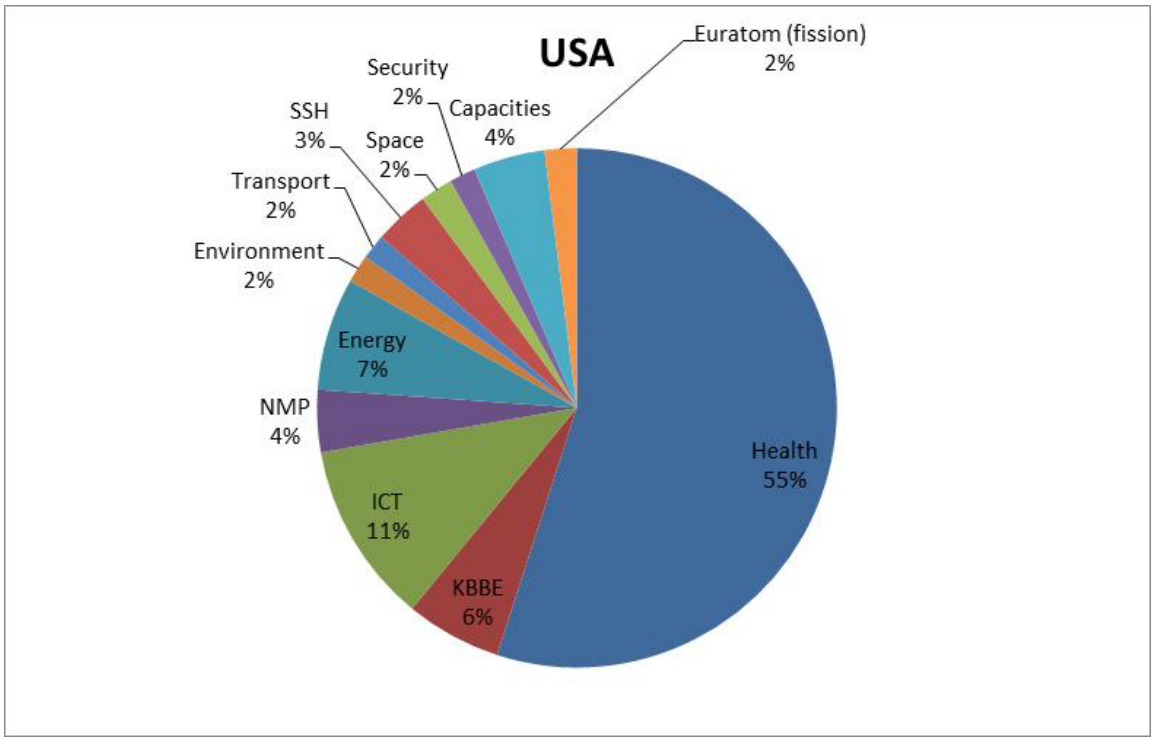
76 http://ec.europa.eu/research/iscp/pdf/evaluation-eu-us-agreement-st.pdf

77 Erawatch Country Overview – United States (updated 25 September 2013)



1383 USA researchers have been funded through the Marie Curie Actions (2007-2013) and USA institutions have participated in 932 projects.

There is an on-going FP7 project, BILAT EU-US[78], which is tasked to examine areas related to the framework conditions for cooperation (e.g. Intellectual Property, funding of US participants, contractual issues, financial and reporting issues including auditing, rules for participation, cooperation schemes, knowledge on innovation and technology transfer, transatlantic mobility).

The main cooperation on fusion energy research concerns the partnership in the ITER-IO Agreement supported by the bilateral Cooperation Agreement as legal framework for the implementation of more than 206 on-going collaborative activities between European and US entities. With regard to the fission research cooperation, USA have participated in eight fission projects under the Euratom FP7 and FP7+2.

In the context of the Agreement for Scientific and Technological Cooperation, Implementing Arrangements have been concluded between the Joint Research Centre and, respectively, the US National Oceanic and Atmospheric Administration (NOAA), in May 2012, and the US National Institute of Standards and Technology (NIST), in July 2013.

The USA has also been targeted as an important partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation with USA researchers included in areas such as marine and artic research (notably to implement the Galway declaration and the Transatlantic Ocean Research Alliance), health research, transport (incl. Aeronautics), materials research, raw materials, ICT, energy research and security research. The EC US Task Force on Biotechnology research aims to promote information exchange and coordination in biotechnology research among programmes funded by the European Commission and various US Government funding agencies. A full list of topics included in the work programme is provided in Annex.

[78] http://www.euussciencetechnology.eu/, BILAT project funded through the FP7 Capacities INCO programme

Work is also on-going to strengthen the synergies between the EU's cooperation with the USA and the activities of the Member States (MS), including through the Strategic Forum for International Cooperation (SFIC). This takes place at various levels and a number of prominent examples are:

- Marine and Arctic research:
  - ✓ The Joint Programming Initiative Ocean[79] will be a key partner in developing these activities.
  - ✓ The Seas ERA – NET[80] as well as other marine and arctic related ERA-NETs will strongly be involved in the EU-US information sharing exercise and planned coordination actions.
  - ✓ The Euro-Basin FP7 projects[81], the Research Infrastructures Integrated Initiatives INTERACT, Euro-ARGO and EUROFLEETS2[82]
- EDCTP 2[83]: a programme conducted by a group of Member States (MS) jointly with the EU.

Developing adequate framework conditions for the cooperation between the EU and the USA, which will involve close cooperation with SFIC and the MS Science and Innovation Counsellors in Washington.

Finally, on-going cooperation with the USA on research and innovation also contributes to reaching the objectives of the EU's external policies. In this respect, research and innovation activities contribute to combatting HIV/AIDS, malaria and other diseases and more in general support, reaching international commitments such as the Millennium Development Goals. Furthermore, research and innovation accompanies the work of the Trans-Atlantic Economic Council (TEC) or the EU-US Energy Council and it supports the EU's Blue Growth Strategy, the Atlantic Action Plan, the EU Arctic Strategy and the EU-US Aviation Agreements (interoperability, safety).

The general framework conditions for EU-US cooperation are improving continuously over various Framework Programmes and the EU and the US have since several years agreed on a reciprocal opening of some programme parts such as in the area of health research for example. While cooperation modes tend to become more visible and effective at programme level, bottom up project participation is also a strong feature in our cooperation. It appears that US Federal Entities still perceive barriers in certain parts of the EU grant agreement for US participation in Horizon2020. During the last Joint S&T Committee meeting between the EU and the US both sides agreed that progress on reciprocal understanding of legal, administrative and financial issues of Horizon 2020 as well as relevant US programmes was needed. As follow up, a first EU-US workshop was organised in December 2013. The objective was to define a working concept and roadmap helping to bridge the information gap regarding the EU and US funding systems for research and innovation. This process will highlight the main legal aspects of the respective grant systems and should remove barriers for reciprocal participation.

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79 http://www.jpi-oceans.eu

80 http://www.seas-era.eu

81 http://www.seas-era.eu, http://www.euro-basin.eu

82 http://www.eu-interact.org/, http://www.eurofleets.eu

83 http://www.edctp.org

Concerning innovation the US has excellent innovation framework conditions and its investment climate makes it a place to commercialize innovative products, services and solutions. In addition, the US has one of the world's strongest legal systems to protect intellectual property rights. According to the Innovation Union Scoreboard 2014, the US outperforms the EU in innovation but the performance lead is decreasing. The transatlantic innovation framework conditions are expected to improve in the future through the Transatlantic Trade and Investment Partnership (TTIP) currently under negotiation. The TTIP aims at removing trade barriers (such as tariffs, unnecessary regulations, restrictions on investment, divergent standardization) in a wide range of economic sectors and at making it easier for EU and US companies to invest in each other's economy.

3. COOPERATION BETWEEN THE USA AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

Based on the work of the Joint Consultative Group (JCG), established under the EU-US S&T agreement, future cooperation on research and innovation with the USA will address four priority areas:

- Marine and Arctic Research

  The US has enormous research capabilities in marine and arctic research. The National Oceanic and Atmospheric Administration (NOAA) is the largest organisation of that kind in the world with more than USD 5 billion annual budget. The US has access to important waters/territories (including arctic) and has just launched its new strategies for oceans[84] and arctic[85]. The US is also a major player in the Arctic Council to with the EU has been granted permanent observer status in May 2013. This cooperation will contribute to implementing the EU Blue Growth agenda[86], the Atlantic Action Plan[87] and the Transatlantic Ocean Research Alliance[88]. The priorities of the EU's Integrated Maritime Policy (IMP) and of the Blue Growth strategy feature prominently the Blue Growth call in the first WP2014-2015 of Horizon 2020.

- Health research

  The long lasting strong collaboration between USA and the European Union is proven by the joint collaboration in all the multilateral research initiatives that the EU has either started or joined. Some of them are the International Rare Disease Research Consortium (IRDiRC[89]) and the Global Alliance for Chronic Diseases (GACD[90]). The collaboration is excellent and both USA and the EU have strong capacities and a common vision on how to tackle the most important health problems. As in the past, the joint collaboration between USA and the EU will also represent the central nucleus around which other countries and funding agencies will join. USA is, with the EU, one of the members of the Human Frontier Science Programme (HFSP[91]).

  USA participants will continue to be eligible to receive EU funding in projects funded through the Horizon 2020 Health challenge, reflecting the reciprocal funding offered to

84 http://www.whitehouse.gov//sites/default/files/national_ocean_policy_implementation_plan.pdf
85 http://www.whitehouse.gov/sites/default/files/microsites/ostp/2013_arctic_research_plan.pdf
86 COM(2012) 494 final - Blue Growth opportunities for marine and maritime sustainable growth
87 COM(2013) 279 final - Action Plan for a Maritime Strategy in the Atlantic area Delivering smart, sustainable and inclusive growth
88 http://europa.eu/rapid/press-release_IP-13-459_en.htm
89 http://www.irdirc.org/
90 http://www.gacd.org/
91 http://www.hfsp.org/

EU participants by the NIH. At the last JCG meeting the possibility for the US to cooperate with the European and Developing Countries Clinical Trials Partnership (EDCTP 2)[92] was also highlighted in addition to the commitment from the Bill & Melinda Gates Foundation[93].

The interoperability aspects in eHealth are also part of the domains included in the scope of EU-US cooperation.

- Transportation Research

  The main purpose of the EU-US collaboration in transport research is to address global societal challenges and to pursue international standardisation requirements. Mutual benefit, joint priority setting, co-funding and critical mass through programme level cooperation should be the underlying features.

  EU-US cooperation in transport research has been growing steadily the last year. The USA and EU signed an Implementing Arrangement at the last JCG meeting (on 12 February 2013), covering Cooperative Activities in the Field of Research, Development, Technology, and Innovation Applied to all Modes of Transport. A steering group has been established to implement the agreement. Cooperation areas include transport infrastructure, traffic management, road safety, urban freight logistics and many others.

  Synchronized calls for proposals were identified as the preferred cooperation modality, combining focus and flexibility. The joint priority setting is underpinned by a series of joint symposia, organized jointly.

- Materials research / Critical Raw Materials / Nano safety and regulatory research / Health and Safety research (nano-EHS)

  Started in 2011 the EU-US-Japan 3rd Trilateral Conference on Critical Materials hosted in Brussels on May 29-30, 2013 gives future orientation to the EU-US cooperation in this area beside the discussions taking place under the Transatlantic Economic Council – Innovation Action Partnership (TEC-IAP). As follow up to the conference and TEC-IAP, efforts are now being made to involve US partners in forthcoming activities on substitution of critical materials (collaboration is also being pursued in the wider field of computational materials science and materials by design).

In addition, the following areas will also be pursued:

- Energy research

  EU-US cooperation on energy technology research and innovation will continue being promoted under the EU-US Energy Council and its Technology Working Group. Collaboration activities will concentrate along four priority areas: smart grids and energy storage, critical raw materials including for energy, fuel cell and hydrogen and nuclear fusion. Beside these areas included in the EU-US Joint Action Plan 2014-2015, knowledge-sharing and cooperation with the US is also encouraged by the first Horizon 2020 work programme in the field of carbon capture and storage and shale gas.

92 http://www.edctp.org

93 http://ec.europa.eu/commission_2010-2014/geoghegan quinn/headlines/news/2012/20120124_meets_gates_en.htm

- Future and Emerging Technologies

  A common denominator in the discussions with the US has been the need to tackle the paradigm shift in advancing common research endeavours while at the same time keeping in mind the need for transforming research leading to "excellent science" results into tangible economic benefits. The dialogue between EU and US is developing positively especially in the areas of brain research, interoperability of global data infrastructures and digital science policy framework. The EU Human Brain Project[94] (HBP) and the US BRAIN[95] Initiatives are two large-scale research initiatives focussing on the better understanding of the human brain and its diseases with highly complementary approaches. The US is developing new technology to generate brain data leading to a map of the human brain, while the EU is integrating brain data in computer models to simulate the human brain. The data helps build the models and the models help interpret the data. Bilateral discussions have been taking place to define policies for data sharing and related ethical aspects[96]. There are plans to hold a first workshop in Washington in November 2014 and the second in Brussels in spring 2015.

- eInfrastructures

  EU and US approaches to Open Access, Open Research Data and Digital Science appear to be quite similar. Informal contacts with the Office of Science and Technology Policy (OSTP), the National Science Foundation (NSF) and the National Institutes of Health (NIH) suggest that a more structured dialogue accompanied by an intensified collaboration would be mutually beneficial. The European and US initiatives on global interoperability of cyber-infrastructures/e-infrastructures also present a good opportunity to realise valuable synergies, especially in the context of multilateral initiatives such as the Research Data Alliance (RDA) and the G8+O6 Working Group on Data e-Infrastructures.

  Long term connectivity arrangements between Europe and the USA should also be pursued to cope with the growth of the research and education traffic of data between the two continents.

- Euratom-Fusion

  In fusion energy planned activities include evaluation of fusion roadmaps to deepen synergies and identify focused areas of cooperation as well as the cooperation in JET (Joint European Torus, in Culham, UK) enhancement project in support of ITER. Continuation of bilateral collaborative activities.

- Euratom-Fission

  The bilateral cooperation in the field of nuclear fission energy research cooperation will focus on nuclear safety as the highest priority, and on closer bilateral cooperation in order to advance in nuclear medicine and radiation protection.

In nanosafety and regulatory research, cooperation with the US is of special importance and is implemented through the Communities of Research. The EU promotes government-level cooperation in the OECD working party on manufactured nano-materials (in particular through the NanoReg initiative, which is an FP7 project with a budget of EUR 50 million (of

94 https://www.humanbrainproject.eu/

95 http://www.nih.gov/science/brain/

96 http://www.nature.com/news/brain-mapping-projects-to-join-forces-1.14871

which EUR10 million from FP7); followed by further regulatory research activities in Horizon 2020)

The cooperation priorities for the years to come may be in line with the existing ones. Health research and cooperation with NIH will be a key area due to the mutual opening of the respective programmes and the level of engagement will be as in the first years of Horizon 2020. The new area of marine and artic cooperation is expected to be expanded as it is only in its start-up phase. The type of activities could be more programme level cooperation with relevant US partners like NSF and NOAA. Energy research and in this relation material and raw materials aspects might depend on the progress of the work under the EU-US Energy Council. We also expect a revitalisation of the EU-US Task Force on Biotechnology which would be translated in opportunities in the calls 2016-2017. DG CNECT is exploiting closer collaboration with the US between the EU Human Brain Project[97] and the US BRAIN Initiative[98]. In ICT US is one of the countries targeted by research and innovation activities dealing with new network infrastructures for Future Internet which includes 5G in the work-programme 2014-15 of Horizon 2020. Concerning research activities in relation to critical raw materials, to date we don't have indication of any focus on this topic during the period 2016-2017.

97 https://www.humanbrainproject.eu/

98 http://www.nih.gov/science/brain/

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH USA IN HORIZON 2020 WORK PROGRAMME 2014-15[99]

Marine and Arctic Research:

	Identifier	Short title	Indicative budget (EUR million)
2014	BG 8 (Challenge 2)	Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of the maritime resources	20.00
	BG 13 (Challenge 2)	Ocean Literacy – Engaging with society – Social innovation	3.50
	BG 14 (Challenge 2)	Supporting international cooperation initiatives: Atlantic Ocean Cooperation Research Alliance64	3.50
	BG 15 (Challenge 2)	European Polar research cooperation	2.00
	INFRASUPP 6 (Research Infrastructures)	International Cooperation for research infrastructures	7.00
	INFRAIA 1 (Research Infrastructures)	Integrating and opening research infrastructures of European interest (area: "Research infrastructures for terrestrial research in the Arctic.")	140.00
2015	SFS 10 (Challenge 2)	Tackling disease related challenges and threats faced by European farmed aquatic animals	-
	BG 1 (Challenge 2)	Improving the preservation and sustainable exploitation of Atlantic marine Ecosystems	20.00
	BG 7 (Challenge 2)	Response capacities to oil spills and marine pollutions	6.00

Health research:

	Identifier	Short title	Indicative budget (EUR million)
2015	PHC 33 (Challenge 1)	New approaches to improve predictive human safety testing	30.00

[99] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

Transport research:

	Identifier	Short title	Indicative budget (EUR million)
2014	MG 1.4 (Challenge 4)	Coordinated research and innovation actions targeting the highest levels of safety for European aviation	15.00
	MG 5.2 (Challenge 4)	Reducing impacts and costs of freight and service trips in urban areas	-

Materials research / Critical Raw Materials:

	Identifier	Short title	Indicative budget (EUR million)
2014	NMP 20 (LEIT-NMP)	Widening materials models	-
	NMP 26 (LEIT-NMP)	Joint EU & MS activity on the next phase of research in support of regulation NANOREG II	-
	NMP 27 (LEIT-NMP)	Coordination of EU an international efforts in safety of nanotechnology	-
	NMP 28 (LEIT-NMP)	Assessment of environmental fate of nanomaterials	-
	NMP 29 (LEIT-NMP)	Increasing the capacity to perform nano-safety assessment	-
	SC5 13 (Challenge 5)	Strategic international dialogues and cooperation with raw materials producing countries and industry	5.00
2015	NMP 23 (LEIT-NMP)	Novel materials by design for substituting critical elements	-
	NMP 30 (LEIT-NMP)	Next generation of tools for risk governance of nanomaterials	-
	SC5 13 (Challenge 5)	Strategic international dialogues and cooperation with raw materials producing countries and industry	8.00

Energy research

	Identifier	Short title	Indicative budget (EUR million)
2014 - 2015	LCE 15 (Challenge 3)	Enabling decarbonisation of the fossil fuel-based power sector and energy intensive industry through CCS	-
2014	LCE 16 (Challenge 3)	LCE 16 – 2014: Understanding, preventing and mitigating the potential environmental impacts and risks of shale gas exploration and exploitation	-

Other activities

	Identifier	**Short title**	**Indicative budget (EUR million)**
2014	ICT 11 (LEIT-ICT)	Future Internet Research and Experimentation	1.50
	ICT 14 (LEIT-ICT)	Advanced 5G network infrastructures for the future internet	122.00
	FoF 4 (LEIT-NMP)	Developing smart factories that are attractive to workers	-
	DRS 4 (Challenge 7)	Crisis management topic 4 – feasibility study for strengthening capacity-building for health and security protection in case of large-scale pandemics – Phase I Demo	-
	BES 9 (Challenge 7)	Supply chain security topic 2 – technologies for inspections of large volume freight	-
	NFRP 2 (Euratom)	Tool for the fast and reliable prediction of severe accident progression and anticipation of the source term of a nuclear accident	3.00
	NFRP 12 (Euratom)	Nuclear developments and interaction with society	2.50
2015	ICT 25 (LEIT-ICT)	Generic micro- and nano-electronic technologies	3.00
	ICT 38 (LEIT-ICT)	International partnership building and support to dialogues with high income countries	3.00
	FoF 11 (LEIT-NMP)	Flexible production systems based on integrated tools for rapid reconfiguration of machinery and robots	-

	FoF 13 (LEIT-NMP)	Re-use and re-manufacturing technologies and equipment for sustainable product life cycle management	-
	SFS 16 (Challenge 2)	Tackling malnutrition in the elderly	-
	INT 1 (Challenge 6)	Enhancing and focusing research and innovation cooperation with the Union's key international partner countries	1.95
	DRS 1 (Challenge 7)	Crisis management topic 1 – potential of current mesures and technologies to extreme weather and climate events	-
	DRS 3 (Challenge 7)	Crisis management topic 3 – demonstration activity on large scale disasters' governance and resilience of EU external assets against major identified threats or causes of crisis	-
	FCT 16 (Challenge 7)	Ethical/Societal dimension topic 4 – understanding the underlying social, psychological and economic aspects of the genesis, methods and motivation of organised crime (including cyber related offenses)	-
	BES 8 (Challenge 7)	Supply chain security topic 1 – development of an enhanced non-intrusive (stand-off) scanner	-
	ISSI 5 (Science with and for society)	Supporting structural change in research organisations to promote Responsible Research and Innovation	12.00

EURATOM PROGRAMME COMPLEMENTING HORIZON 2020

2014 - 2015	Euratom US.DOE Fusion CA 14th Coordinating Committee	U.S.-Euratom Joint Action Plan in fusion R&D
		International network of programmes and facilities in support to ITER
		Assessment costs and approach to the ITER operation phase.
		Specific cooperation on fusion reactor materials
		Education & Training schemes at international level.
		Communication to general public in fusion topics involving academia, industry and laboratories.
		Mapping of bilateral collaborative activities.

11. ROADMAP FOR COOPERATION BETWEEN THE EASTERN PARTNERSHIP COUNTRIES AND THE EUROPEAN UNION

1. THE EASTERN PARTNERSHIP AS A PARTNER OF THE EU

The Eastern Partnership (EaP), launched at the Prague Summit of 7 May 2009, is a joint initiative of the EU and 6 Eastern European partner countries (Armenia, Azerbaijan, Belarus, Georgia, Republic of Moldova[100] and Ukraine) that aims to bring Eastern European countries closer to the EU.

It builds on existing bilateral relations between the EU and its partner countries and represents the Eastern dimension of the European Neighbourhood Policy (ENP). Central to the EaP are the negotiations on bilateral political Association Agreements including Deep and Comprehensive Free Trade Areas (DCFTAs) and corresponding Association Agendas or Action Plans.

The EaP follows two parallel tracks: bilateral and multilateral. The bilateral dimension supports closer bilateral relations between EU and each Eastern partner country. The multilateral dimension provides a forum for dialogue and exchange, via thematic platforms and flagship initiatives and strengthens activities in support of the EU bilateral relationship with each of the Eastern European partners. Partnership with civil society and other stakeholders is also a key priority of the EaP.

Among the six EaP countries, Ukraine is the only country having a bilateral S&T Agreement with the EU. At regional level, four multilateral policy platforms have been set up to deal with the topics of:

- democracy, good governance and stability;
- economic integration and convergence with EU policies;
- energy security;
- contacts between people.

Cooperation on research and innovation is addressed in the 4th platform, which also covers the fields of education, youth, culture and ICT. In view of addressing the bi-regional cooperation in research and innovation in an ad-hoc format, a dedicated Panel on research and innovation, attached to the 4th platform was launched on 13 November 2013. This new EaP Panel on research and innovation gathers senior officials and experts from Member States and Eastern European partner countries, as well as the Committee of the Regions and the EaP Civil Society Forum.

The Panel creation is in direct line with the development of a Common Knowledge and Innovation Space (CKIS), set as a key political objective of the ENP review of May 2011[101]. The CKIS is indeed meant to cover policy dialogue, national and regional capacity-building, cooperation in research and innovation, increased mobility opportunities for students, researchers and academics.

All EaP countries have a long tradition of scientific excellence, but have faced a dramatic decrease of their R&D intensity since the early 90s. That led to the shutting down or

100 Hereafter referred to as Moldova

101 "A new response to a changing neighbourhood", Joint Communication (EC/High Representative for the EU Foreign Affairs and Security Policy) to the European Parliament, the Council, the European economic and Social Committee and the Committee of the Regions, COM (2011) 303 of 25 May 2011

reorientation of many research branches as well as a significant decrease in the number of researchers.

The table below gives an overview of the main S&T indicators per country[102], highlighting in particular that Ukraine is by far the champion of the region in terms of S&T capacity.

Country	R&D expenditures as % of GDP	Number of research organisations	R&D personnel: Number of employees
Armenia	0,42	83	6.930
Azerbaijan	0,2	146	22.500
Belarus	0,65	446	20.571
Georgia	0,4	31	3.200
Moldova	0,45	38	4.760
Ukraine	0,82	1303	141.000

A common characteristic of the EaP countries is also that research is largely funded from the state budget with very limited contributions from the private sector. Research activities are mainly conducted in institutes and centres under the coordination of National Academies, with the exception of Georgia where research institutes have been integrated into the university system following a recently completed reform.

Because of the difficulties they are facing, all countries have launched ambitious national strategies to modernise and boost their research and innovation systems, notably through improving conditions for encouraging business activities and commercialization of R&D outcomes. This resulted in recent years in the emergence of many technology parks and incubators and reforms concerning venture funding or IPRs. It is in this context of on-going policy reforms that new dynamics exist for intensifying the bi-regional cooperation.

2. COOPERATION BETWEEN THE EASTERN PARTNERSHIP AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

There has been a total of 535 participations from EaP countries in 427 projects in FP7, representing a total contribution from the EU budget to those partners of EUR 45.46 million. This is, however, largely dominated by Ukraine, having alone a total of 273 participations for a total contribution from the EU budget of EUR 26.68 million. The participation in the different FP7 Specific Programmes Cooperation, People, Capacities and Euratom is as follows:

[102] Source INCONET-EECA White Paper, compilation of national statistics

Specific Programme	Participations	Number of projects
Cooperation	230	192
People	141	120
Capacities	151	104
Euratom	13	10

The table below illustrates the participation of the 6 EaP countries across the various priorities of the Cooperation programme.

Participant Country Name	**ENERGY**	**ENV**	**HEALTH**	**ICT**	**KBBE**	**NMP**	**SEC**	**SPA**	**SSH**	**TPT**	**Total**
Armenia		1	2	7	1	3			2		**15**
Azerbaijan		4		4	1				4		**13**
Belarus			3	12	1	4		1	4	2	**27**
Georgia		4	5	5	4	3			4	1	**26**
Moldova	1	1	6	6	1				1	3	**19**
Ukraine	9	24	8	10	16	20	3	14	9	20	**134**
Total	**10**	**34**	**24**	**44**	**24**	**30**	**3**	**15**	**24**	**26**	**234**

There is an on-going FP7 project, INCONET EaP[103], supporting the policy dialogue established through the EaP Panel on Research and innovation. The project aims at becoming the reference coordination platform to support the advancement of the newly established Panel on research and innovation. The project will provide analytical evidence and monitoring to feed the policy dialogue and to support joint agenda setting. It will focus activities on three main societal challenges related to climate change, energy and health.

The Eastern Partnership countries are also targeted as a partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation in areas such as transport or raw materials. A full list of topics included in the work programme is provided in Annex.

Work is also on-going to strengthen the synergies between the EU's cooperation with the Eastern Partnership countries and the activities of the Member States (MS). The identification of possible synergies will be addressed in the context of the EaP panel on research and innovation, of which the first meeting was held in Brussels on 13 November 2013.

[103] http://www.inco-eap.net, INCO-NET supported through the FP7 Capacities INCO programme

Finally, on-going cooperation with the Eastern Partnership countries on research and innovation also contributes to reaching the objectives of the Eastern Partnership policy that identifies support to competitiveness and economic development as a main priority.

The EaP is supported through the European Neighbourhood Policy Instrument (ENPI). For the period 2010-2013 the overall allocation to Eastern European countries has been EUR 205 billion of which EUR 358.6 million have been granted to regional initiatives (ENPI-East). The ENPI is replaced from 2014 by the new ENI (European Neighbourhood Instrument) with a total budget of EUR 15.4 billion, representing a 13.8% budget increase in comparison to ENPI in current prices.

ENPI funds are used to support capacity-building initiatives in the field of innovation at bilateral or regional level, through projects and programmes aiming to strengthen entrepreneurship, SMEs development (e.g the East-Invest regional programme[104]), and business environments. It is also to be noted the operational budget and work programme of the Platform 4 and the newly created Panel on research and innovation is funded through the ENPI.

3. COOPERATION BETWEEN THE EASTERN PARTNERSHIP AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

A double approach is proposed for identifying priorities for future cooperation with EaP countries:

a) common societal challenges to focus on; and

b) cross-cutting issues to address in priority in order to improve the cooperation framework conditions.

This priority-setting is based on contributions received from EU Member States and EaP countries that were consolidated by an expert group mandated by the EaP Panel on research and innovation.

a) Societal challenges

Collaborative research and innovation activities should be concentrated on the following priorities:

- Health, demographic change and well-being;

  EaP countries and the EU may start cooperation in multilateral initiatives aimed at addressing global health challenges, such as the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R), currently under discussion. This would allow EaP countries to take part in the decision phase of this new multilateral initiative, and be an opportunity to also consider other existing multilateral initiatives.

- Climate action and environment;

  Facing common regional and trans-boundary climate change and environmental challenges has always been a key priority in the EU's relations with the Neighbourhood countries. For the past ten years, this has been translated into wide-ranging cooperation with the Neighbourhood in an effort both to tackle common problems such as maritime pollution and share best practice with partners in the East. This has been achieved through action plans, which promote good environmental governance in partner countries to prevent environmental degradation and pollution, protect human health, and achieve a

104 www.east-invest.eu

more rational use of natural resources. Priorities are identified in key areas such as water quality, waste management, air pollution, natural disaster prevention and preparedness, climate change, and Forest Law Enforcement and Governance (FLEG). Research and innovation cooperation should support those different initiatives in order to foster tackling common climate and environmental problems which are best solved through regional collaboration.

- Secure, clean and efficient energy;

  As in FP7, the European Strategy Energy Technology Plan (SET Plan) - the technology pillar of EU energy policy - will continue providing the strategic orientations for EU energy research and innovation and its international dimension in Horizon 2020, including cooperation with the countries of the European Neighbourhood Policy (ENP). Stakeholders from EaP research and industrial entities are therefore invited to create partnerships with the corresponding SET Plan interlocutors, such as the European Industrial Initiatives and the European Energy Research Alliance (EERA), in order to identify opportunities of common interest and boost cooperation.

  In the field of nuclear energy, Ukraine is an important partner for the Euratom cooperation in both fission and fusion research; several proposals for bilateral research topics have been proposed and will be discussed in coming meetings under the Euratom cooperation agreements.

Although a challenge-based approach is proposed, particular attention should also be given to cooperation activities on key enabling technologies listed in Horizon 2020 with a particular focus on ICT and nanotechnologies. Amongst these deserve a special reference opportunities to work in applications of high performance computing, building on the expertise available in mathematical modelling and algorithms for parallel programming.

In order to narrow down the proposed cooperation domains to relevant sub-themes and topics for cooperation, the INCONET-EaP will organize thematic workshops involving scientific experts from both EU Member States and EaP countries.

The national authorities could include the identified priorities in bilateral cooperation programmes between EU MS and EaP countries. Such joint bilateral activities, in addition to their own value, could indeed multiply participation of EaP countries in Horizon 2020.

b) Cross-cutting issues

The cross-cutting priorities on which the efforts should be concentrated include:

- Sharing best practices between EU Member States and EaP countries in research and innovation management and establish a regional evaluation platform;

- Providing technical assistance and training to support EaP countries in improving their national research and innovation systems;

- Promoting researchers mobility and common use of research infrastructures, notably through the creation of a regional network of Centres of Excellence that could potentially be connected to ESFRI (the European Strategic Forum on Research Infrastructures);

  Regarding research infrastructures, the objective is to develop a better coordination and cooperation of European research infrastructures with their non-European counterparts; ensuring their interoperability and reach, and to pursue international agreements on reciprocal use, openness or co-financing. It should also help to monitor and analyse the

take-up of digital science and e-infrastructures by researchers and possible other users, such as citizens and the education sector, per country, region and research domain. It is notably envisaged to support through the European Neighbourhood Instrument an initiative (E@P.connect) for the development of a regional EaP Research and Education Network and its interconnection to GÉANT.

- Promoting the link between state-of-the-art EU initiatives such as research-intensive clusters and technology platforms with similar structures in EaP countries, and enhancing the participation of EaP countries private companies in these structures.

The cross-cutting issues could be promoted by the relevant national authorities in order to include them as priorities to be supported through relevant national, bilateral and EU programmes.

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH THE EASTERN PARTNERSHIP IN HORIZON 2020 WORK PROGRAMME 2014-15[105]

	Identifier	Short title	Indicative budget (EUR million)
2014	INFRASUPP 6 (Research Infrastructures)	International cooperation for research infrastructures	7.00
	MG 8.1 (Challenge 4)	Smarter design, construction and maintenance	19.00
	SC5 19 (Challenge 5)	Coordinating and supporting research and innovation in the area of climate action, environment, resource efficiency and raw materials-Facilitating transnational cooperation between NCPs in Societal Challenge 5	7.00 (for 2014 and 2015)
2015	SC5 13 (Challenge 5)	Coordinating and supporting raw materials research and innovation capacity-Strategic international dialogues and cooperation with raw materials producing countries and industry	8.00
	INT 2 (Challenge 6)	Encouraging the research and innovation cooperation between the Union and selected regional partners	1.50

105 Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

12. ROADMAP FOR COOPERATION IN RESEARCH AND INNOVATION BETWEEN THE SOUTHERN MEDITERRANEAN AND THE EUROPEAN UNION

1. SOUTHERN MEDITERRANEAN[106] REGION AS PARTNER OF THE EU

The Southern Mediterranean region is of strategic importance to both EU external and internal policies. The countries and people of the region face common challenges that include water scarcity, food security, weak social protection, old and new health problems, energy concerns, brain drain, migration, a lack of meaningful job creation job security and human development in terms of citizens' participation in political, social and economic development. Some of these major challenges may be addressed through innovative and knowledge-based approaches that are context specific and include participatory methods.

The EU response to the changes in the Arab world was articulated in 2011 when the EU offered its Mediterranean partners Ά Partnership for democracy and shared prosperity′ in the context of the European Neighbourhood Policy (ENP). The partnership focuses on three elements: democratic transformation, a partnership with people and civil society, and sustainable and inclusive growth. With regard especially to the last element, the EU has launched a number of initiatives with its Southern neighbours in the sphere of research, technological development and innovation. In its joint communication on 'A New Response to a Changing Neighbourhood'[107] the EU has set itself the goal to work together with its neighbours, both to the South and to the East, towards the creation of a Common Knowledge and Innovation Space (CKIS). The CKIS is meant to cover policy dialogue, national and regional capacity-building, cooperation in research and innovation, increased mobility opportunities for students, researchers and academics throughout the region and externally.

Moreover, the EU holds reinforced bilateral dialogues based on Science and Technology Agreements with a number of countries from the region - Tunisia (2003, into force in 2004), Morocco (2004, into force in 2005), Egypt (2005, into force in 2008), Jordan (2009, into force in 2010) and Algeria (signed 2012, entered into force in 2013).

The bilateral dialogues contribute also to the bi-regional Euro-Mediterranean cooperation in research and innovation, institutionalized in 1995, when in the context of the Barcelona process[108], a Euro-Mediterranean Committee in Research and Technological Development (MoCo) was established – recently renamed Euro-Mediterranean Group of Senior Officials in Research and Innovation (EU-Med GSO). The EU-Med GSO plays a central role in monitoring and stimulating the Euro-Mediterranean cooperation in research and innovation.

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106 For the purpose of this paper the South Mediterranean region includes the ENP countries in the South, namely Algeria, Morocco, Egypt, Israel, Jordan, Lebanon, Libya, Palestine, Tunisia and Syria. However, when looking at the statistical data offered below, it should be noted that Israel was associated to FP7 and is associated to Horizon 2020, making its situation completely different from the one of third countries not associated to FP. It can be also noted that Turkey, a major country in the South Mediterranean/Middle East, is not covered as it is a Candidate to EU membership – thus not covered by the ENP- and was associated to FP7.

107 *A partnership for democracy and shared prosperity,* COM (2011) 200 8.03.2011 and *A new response to a changing Neighbourhood,* COM (2011) 303 25.05.2011. Joint Communication of 25 May 2011 of the High Representative of the Union for Foreign Affairs and Security Policy and the Commission on 'A New Response to a Changing Neighbourhood', COM(2011) 303

108 http://europa.eu/legislation_summaries/external_relations/relations_with_third_countries/mediterranean_partner_countries/r15001_en.htm

Scientific, technological and innovation capacities of most Southern Mediterranean countries remain modest, as illustrated by the table below on R&D intensity (% GDP):

Country	2002	2004	2005	2006	2007	2008	2009	2010
Algeria		0,16 %	0,07 %					0,4 %
Egypt			0,24 %		0,23 %	0.27 %	0,21 %	
Jordan	0,34 %			0,52 %		0,43 %		
Lebanon				0,3 %				
Libya								
Morocco				0,64 %				
Palestine								
Syria		0,12 %						
Tunisia			1,02 %		1,02 %		1,1 %	
Israel			4,2 %				4,27 %	4,4 %

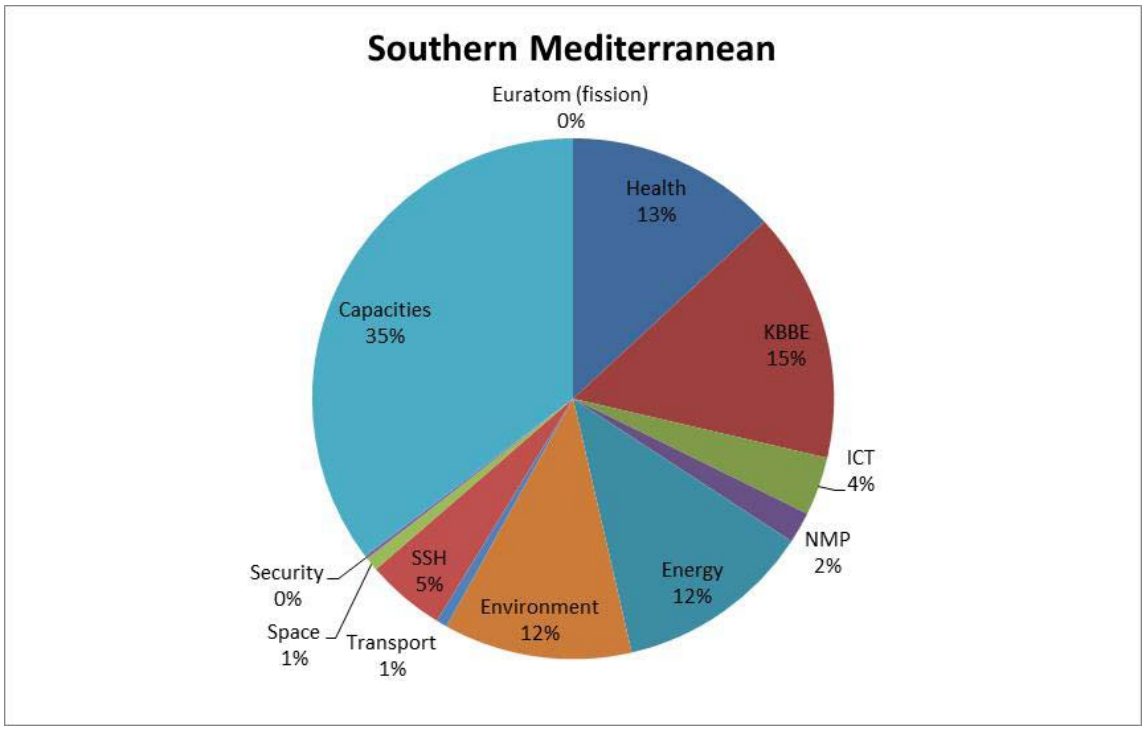
There is also a large diversification of budgetary sources. In Tunisia, the share of public expenditure is slowing down and the share of private funding is increasing. In Morocco, there is a clear growth of private funds jumping from 6% in 1998 to 12.3% in 2003. In Lebanon, the diversification of funding sources is very visible in some institutions such as the American University of Beirut or the Lebanese Agricultural Research Institute (L.A.R.I). Finally, some universities have created a direction for research with specific funding mechanisms (Lebanon, Palestine)[109].

2. COOPERATION BETWEEN THE SOUTHERN MEDITERRANEAN AND THE EU ON RESEARCH AND INNOVATION: STATE OF PLAY

As of February 2014, about 580 public and private entities from the South Mediterranean participated in FP7 signed grant agreements, receiving a total EU contribution of about EUR 60 million. The distribution of the Southern Mediterranean participation (by total cost of Southern Mediterranean participants) over the different FP7 subprogrammes is shown below.

Israel is not included in these figures as it was associated to FP7 and therefore enjoys a different status. The figures for Israel are 1861 Israeli participations amounting to a total of EUR 782 million of EU contribution to the Israeli entities.

[109] Final report of the INCO project n°INCO-CT-2004-510696 ESTIME: Towards science and technology evaluation in the Mediterranean Countries.



The policy dialogue with the Southern Mediterranean countries is supported, inter alia, by two FP7 regional projects, an INCO-Net (MED-SPRING[110]) and by an ERA-NET (ERANETMED[111]).

Among the sector specific ERA-NETs with a regional scope, ARIMNET[112] (1&2) which has as objective the coordination of agricultural research in the Mediterranean area, and to FORESTERRA in the field of forestry research [113].

Within the European Neighbourhood Partnership Instrument (ENPI) for the period 2007-2013 Research Development and Innovation Programmes dedicated to the South Mediterranean countries support bottom-up capacity building and actions, notably in Algeria (ESRS, higher education, mobility and research: EUR 38 million), Egypt (RDI: EUR 11 million for the first programme + EUR 20 million for its continuation), Jordan (SRTD: EUR 5 million for the first programme + EUR 5 million for the second programme), and Tunisia (PASRI: EUR 12 million). The ENPI will, from 2014, be replaced by the European Neighbourhood Instrument (ENI), which will provide increased support to 16 partner countries to the East and South of the EU's borders.

The Southern Mediterranean has been targeted as a partner for cooperation in the first Horizon 2020 work programme (2014-15), with topics encouraging cooperation in areas such as research infrastructures, road transport, water technologies or raw materials. A full list of topics included in the work programme 2014-2015 is provided in Annex.

Work is on-going to strengthen the synergies between the EU's cooperation with the Southern Mediterranean and the activities of the Member States (MS). At the Euro-Mediterranean conference on Research and Innovation organised by the European Commission, DG RTD, in Barcelona on 2-3 April 2012, the need for *a renewed EURO-MED Partnership in Science,*

110 http://www.medspring.eu
111 http://www.eranetmed.eu
112 http://www.arimnet.net
113 http://www.foresterra.eu

Technology and Innovation has been clearly expressed both by the EU Member States and the Southern Mediterranean Countries.

At the margin of the Informal Competitiveness Council held in Nicosia in June 2012, several EU MS, led by Italy, formed a core group to work towards an Article 185 TFEU in the Euro-Mediterranean region: the PRIMA - *Partnership in Research and Innovation in the Mediterranean Area* - initiative.

At the Competitiveness Council meeting of 26 May 2014 in Brussels under the Hellenic Presidency of the European Council, the PRIMA initiative received a strong political endorsement. The initiative is focusing on two research topics, Food systems and Water resources. At that meeting, the Presidency noted the strong and broad support for the principles that should underpin such an EU-Southern Mediterranean initiative: co-ownership and mutual interest. PRIMA is also a key priority for the Italian Presidency of the Council.

As regards framework conditions for research and innovation in the region, the current fragmentation of socio political structures, reinforced by endemic conflict in the region as well as their spill-over effects entails long term insecurity for society, polity and economy and can delay action towards innovation. Thus it is even more relevant to ensure an overarching responsibility for publicly and privately supported schemes for innovation. Publicly funded R&D can provide the best returns to research and development in economic recovery[114]. This will entail improving collaboration between the various actors of the innovation process and SMEs in urban and rural areas across a wide spectrum of activities under the rubric of R&D. Some of the specific challenges to strengthen innovation in the South-Mediterranean context include the following: poor availability of finance; outdated and often non-existent regulation and procedures; poor public procurement; poor collaboration across the region (South-South); lack of standardization and value based quality criteria for both processes and outcome of product development; costly to non-existent patents. The following areas may serve a thematic focus for a strengthened innovation framework addressing some critical challenges:

- focusing on job creation and quality of work for the young;
- broadening the innovation approach including public sector innovation;
- reinforcing the innovation ecosystem;
- developing an innovation-friendly regulatory environment;
- promoting a culture of resilience to change.

Notwithstanding such difficulties in context, a wide range of innovation instruments has been tested in practically all countries, most of which focus on networking, start-ups, incubators, technological poles and industrial clusters. These instruments make the assumption of the need to "expand" the research topics towards more applied research, a perennial problem in many Law and Middle Income Countries.

Progress in adapting and developing the R&I instruments has been hampered by the absence of monitoring and evaluation of the instruments in a coherent manner nor have the experiences been effectively shared between institutions or across countries. The overall assessment is that the countries are looking for larger initiatives, multi-actor partnerships and more ambitious support and are now convinced of the need to support all types of innovation.

[114] DG ENTR Euro-Mediterranean industrial cooperation 2014-2015 work programme-16.01.2014.

The Euro-Mediterranean cooperation plays a major role in this context, since a great deal of resources devoted to science and technology are channelled through the research and innovation Euro-Mediterranean cooperation.

Following the recommendation of the last EU-Mediterranean Group of Senior Officials (EU – Med GSO) on Research and Innovation, held in Brussels in December 2013, a Workshop on "Towards a Common Euro-Mediterranean Innovation Agenda" was organised in Brussels on 28 April 2014. The participants recommended: "*to explore the feasibility of a Pilot innovation regional action, which will consist ideally of several components - a technical assistance component to determine the structural measures needed to build the regional innovation landscape, clustering of on-going initiatives and establishment of a structured innovation framework/programme to fund bi-regional innovation activities".*

3. COOPERATION BETWEEN THE SOUTHERN MEDITERRANEAN AND THE EU ON RESEARCH AND INNOVATION: PRIORITIES FOR THE FUTURE

The following are proposed as priority areas for cooperation with the Southern Mediterranean countries. They were identified by the Euro-Mediterranean conference in research and innovation, held on 2-3 April 2012 in Barcelona and endorsed by the Euro-Mediterranean Group of Senior Officials (EU-Med GSO): Water availability and management, food security and agriculture; Renewable energy and efficiency; Fighting diseases and improving well-being; Green, efficient and integrated transport systems; Management of marine environment and resources; Changing science in changing societies.

Focus areas:

- Water availability and management and food security

  Mediterranean countries have a strong focus on water and food security research. Mutually beneficial cooperation will be continued with a focus on integrated approaches that optimise production and usage from natural resources in a sustainable manner under conditions of climate change (water scarcity and diminishing agricultural production). This cooperation has important links with the dialogue with Africa as well. Water and food are the two topics chosen by the PRIMA[115] core group of EU MS and Southern Med countries.

  The priority is addressed in Horizon 2020 work programme 2014-2015 in Societal Challenge 2 and Societal Challenge 5 (targeted call on rural areas and social innovation in the Southern Mediterranean as well as in the field of integrated water management in Southern Mediterranean).

- Renewable energy and efficiency

  The Mediterranean basin is suited to renewable energy resources. It enjoys an excellent solar potential with small cloud coverage and high irradiation factor throughout the year. Wind power and Mediterranean-specific biomass also constitute a potential to be developed further. By 2030, the energy demand in the South Mediterranean will be about four times higher than in the North calling for improvements in energy efficiency and for the exploitation of the renewable energy sources. Building on the successful cooperation in energy R&I, cooperation can contribute to develop the technologies needed for the transition to low-carbon energy and to improve energy security. The success of future

[115] Partnership in Research and Innovation in the Mediterranean Area

cooperation will depend on its ability to meet the needs of both sides of the Mediterranean.

- Fighting diseases and improving well-being

  There is a strong interest in the South Mediterranean for collaboration with EU on shared health problems, particularly on rare diseases, infectious diseases and non-communicable diseases such as diabetes, cancer and obesity. A number of multi-lateral initiatives might be an excellent opportunity to start cooperation between the EU and MED. One is the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R). The EU is currently working to set up the secretariat, which would help in establishing the initiative. Another initiative is the Global Alliance for Chronic Diseases (GACD[116]), in which countries such as India, South Africa and China are also involved. This initiative was established some years ago and new members, such as MED, might consider joining it for future programmes to be launched on chronic diseases (cancer, brain research etc.).

Other areas include:

Green, efficient and integrated transport systems: The potential for cooperation in surface transport research at the regional (Mediterranean) level will be explored. Areas of mutual interest in EU-MED cooperation could be ports and hinterland connectivity; logistics networks and transport networks; city development and urban mobility. Based on these, specific areas of cooperation identified are: innovative public transport solutions, transport infrastructures, urban logistics solutions. Transport research cooperation with a focus on transfer and capacity building of urban transport innovations (public transport, integrated planning, city logistics, road infrastructure), supported by two FP7 coordination and support actions SOLUTIONS and VIAGIO PLUS, may lead to more targeted actions in the future.

Management of marine environment and resources: The Mediterranean Sea is characterised by a combination of coastal and open sea dynamics and is often referred to as "miniature ocean" and a physical laboratory for marine environmental research. It is also one of the richest European regions in terms of species diversity. Therefore, together with their Northern counterparts the South Mediterranean countries have a direct interest in the sustainable management of the Mediterranean and the development of joint marine and maritime research and innovation. This direct interest was clearly expressed during the Union for the Mediterranean (UfM) Ministerial on Environment and Climate Change, held in Athens on 13 May 2014. In the ministerial declaration, countries renewed their support for the Horizon 2020 Initiative to de-pollute the Mediterranean Sea and reaffirmed the continued relevance of its four components, one of which is Research. Furthermore, UfM countries committed to develop the necessary incentives for increasing knowledge and technology transfer, calling for intensifying the efforts to transfer research results into policy decision-making. Several of them are involved in large FP7 marine projects in particular PERSEUS and COCONET funded under The Ocean of Tomorrow call together with Black Sea countries.

Changing science in changing societies: research and innovation need to understand the deep social, economic, political transformations of the region. These need to be supported by research and innovation, and by stronger engagement between R&I communities and the broader society. In this context a huge potential is represented by the scientific Diasporas of the South Mediterranean countries and the large young population. The priority is partly addressed in work programme 2014-2015 in Societal Challenge 6 (targeted topic on the EU

[116] http://www.gacd.org/

Neighbourhood policy, including topics focussing on the Mediterranean and the broader Middle-East).

Seismology: the Mediterranean area is a seismic prone area. Every year, one or more intense earthquakes occur and cause destruction and a number of victims. There is a need to improve knowledge on the data, the methods, and the seismic hazard assessments, in order to better quantify the uncertainties in the region.

In addition to the above, the development and/or exploitation of joint research infrastructures is of paramount importance in the Euro-Mediterranean research cooperation given the lack of high-quality and affordable research infrastructure in the region and their importance in addressing adequately most of the shared societal challenges in the broader Mediterranean region. This is addressed in work programme 2014-2015 in the Research Infrastructures programme where a topic has been included on the development of an inventory of the Research Infrastructure capabilities in the region (e.g. including the Jordanian efforts to build a synchrotron – SESAME). Based on this, inventory cooperation actions will be identified (e.g. solar power, renewable energies, repositories, the development of a regional Research and Education Network – ASREN - and its interconnection to GÉANT through Eumedconnect).

ANNEX: LIST OF TOPICS ENCOURAGING COOPERATION WITH THE SOUTHERN MEDITERRANEAN IN HORIZON 2020 WORK PROGRAMME 2014-15[117]

	Identifier	Short title	Indicative budget (EUR million)
2014	INFRASUPP 6 (Research Infrastructures)	International cooperation for research infrastructures	7.00
	MG 8.1 (Challenge 4)	Smarter design, construction and maintenance	19.00
	SFS 6 (Challenge 2)	Sustainable intensification pathways of agro-food systems in Africa	1.00
	SC5 19 (Challenge 5)	Coordinating and supporting research and innovation in the area of climate action, environment, resource efficiency and raw materials-Facilitating transnational cooperation between NCPs in Societal Challenge 5	7.00 (for 2014 and 2015)
2015	ISIB 3 (Challenge 2)	Unlocking the growth potential of rural areas through enhanced governance and social innovation	--
	SFS 18 (Challenge 2)	Small farms but global markets: the role of small and family farms in food and nutrition security	5.00
	WATER 5-3 (Challenge 5)	Strengthening international R&I cooperation in the field of water-Development of water supply and sanitation technology, systems and tools, and/or methodologies	-
	SC5 13 (Challenge 5)	Coordinating and supporting raw materials research and innovation capacity-Strategic international dialogues and cooperation with raw materials producing countries and industry	8.00
	SC5 18 (Challenge 5)	Coordinating and supporting Earth Observation research and innovation in the EU, and in the North African, Middle East, and Balkan region	-
	INT 2 (Challenge 6)	Encouraging the research and innovation cooperation between the Union and selected regional partners (Southern Mediterranean)	1.50
	INT 6 (Challenge 6)	Re-invigorating the partnership between the two shores of the Mediterranean	-
	INT 7 (Challenge 6)	Towards a new geopolitical order in the South and East Mediterranean	-

[117] Budgetary amounts are mentioned only where these are identified at topic level in the work programme. This may include support for several actions, possibly also targeted towards other partner countries and/or regions.

	INT 9 (Challenge 6)	The European Union, Turkey and its wider neighbourhood: challenges and opportunities	-