Council of the European Union

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COVER NOTE

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To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
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Subject:	COMMISSION STAFF WORKING DOCUMENT INTERIM EVALUATION of HORIZON 2020 ANNEX 1

Delegations will find attached document SWD(2017) 221 final - PART 5/16.

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EUROPEAN
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PART 5/16

COMMISSION STAFF WORKING DOCUMENT

INTERIM EVALUATION
of
HORIZON 2020

ANNEX 1

{SWD(2017) 220 final}
{SWD(2017) 222 final}

I. FURTHER INFORMATION ON THE IN-DEPTH ASSESSMENT OF PUBLIC-TO-PUBLIC PARTNERSHIPS

I.1. Introduction

Article 181 of the Treaty on the Functioning of the European Union (TFEU) calls for the EU and Member States to coordinate their research and technological development activities and invites the Commission, in close collaboration with Member States, to take any useful initiatives to promote this coordination. As a consequence, the current Framework Programme, Horizon 2020, specifically aims to establish synergies with national programmes and Joint Programming Initiatives (JPIs) by providing support to Public-to-Public Partnerships (P2Ps). These are now increasingly used to support the coordination of national programmes requiring collaboration on common challenges and currently form an integral part of Horizon 2020, in particular the pillar addressing societal challenges.

P2Ps support a wide range of activities, including research, coordination and networking, capacity-building and demonstration and dissemination activities. They are now core components of the European Research Area (ERA) Roadmap and national ERA action plans, notably for priority 2a of the ERA Roadmap (jointly addressing societal challenges).

This section is constructed as follows: Firstly, the available evidence and data concerning the three P2P approaches will be presented. Secondly, the results of recent evaluations of the Joint Programming[1] and ERA-NET Cofund instrument of Horizon 2020 will be presented. Lastly, the related analysis from the ERA Progress Report 2016[2] will be presented.

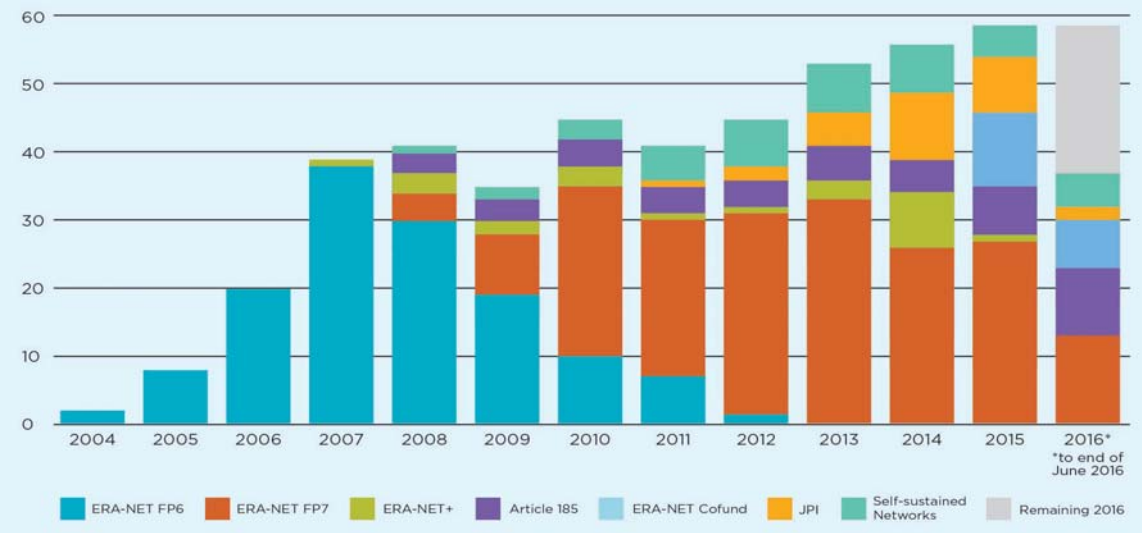
I.2. Overview P2Ps

The policy approach to foster alignment between Member States by supporting the networking of national programmes was introduced under FP6 in 2002 as a core component of the ERA policy framework[3]. In 2004 the first joint calls of national programmes were implemented. When looking at the overall picture of P2Ps since 2004, a clear upward trend and growing commitment from Member States can be observed – in total more than 480 joint calls have been implemented.

A summary of the calls that closed each year, since 2004, is shown in the following figure[4].

[1] http://bookshop.europa.eu/en/evaluation-of-joint-programming-to-address-grand-societal-challenges-pbKI0416204/
[2] http://ec.europa.eu/research/era/eraprogress_en.htm
[3] https://www.era-learn.eu/publications/ec-publications/the-era-net-scheme-from-fp6-to-horizon-2020
[4] https://www.era-learn.eu/publications/other-publications/2nd-annual-report-on-p2p-partnerships-2016

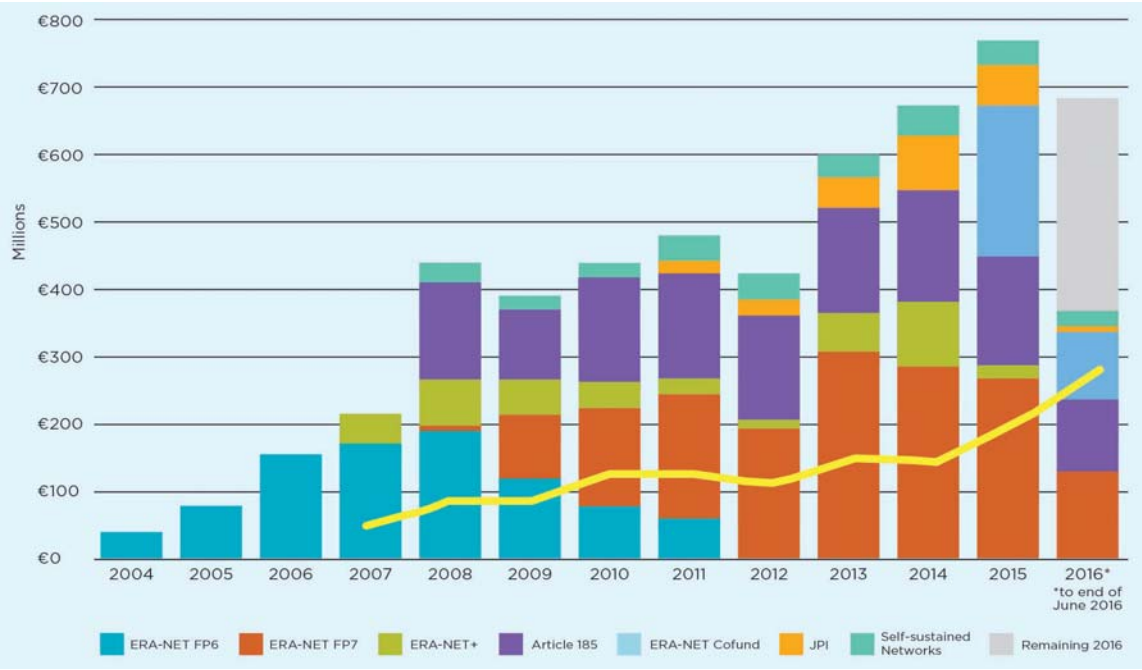
Figure 69 Calls published by Public-Public-Partnerships, by year and network type



Source: ERA LEARN, 2nd Annual report on p2P partnerships, 2016

The annual national financial contributions for P2Ps shows a clear upward trend since its inception in 2004 (see the following figure) as well. The additional EU funding (yellow line) displays an upward trend, underlining the joint efforts towards greater coherence between EU and MS R&D programmes.

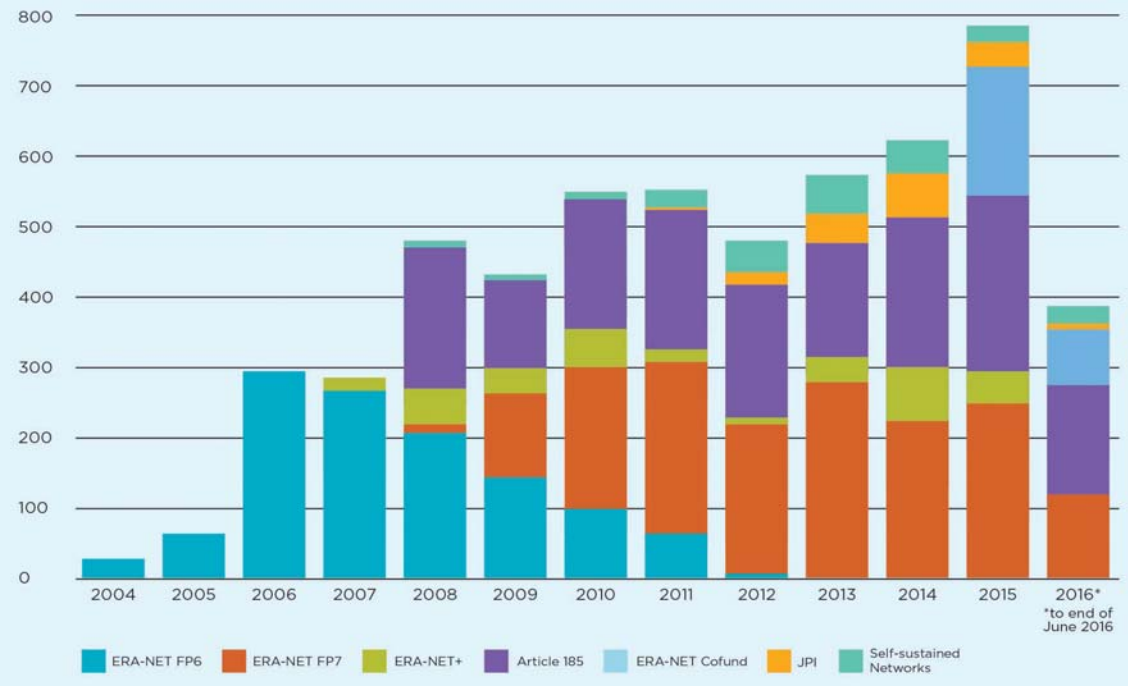
Figure 70 National Joint Call Budget (with EU Contribution for cofounding of calls overlaid in yellow) for all Calls closed 2004-2016, by network type



Source: ERA LEARN, 2nd Annual report on p2P partnerships, 2016

Accordingly, the number of projects funded by joint calls shows a clear upward trend. 2015 saw the highest number so far, with nearly 800 projects. In total, more than 5 500 projects have been funded through P2Ps since 2004.

Figure 71 Number of projects funded by P2Ps for all Calls closed 2004-2016, by Network Type



Source: ERA LEARN, 2nd Annual report on p2P partnerships, 2016

The following table presents the main features of an ERA-Net Cofund network. Compared to the ERA-Net + instrument of FP7, the number of countries per call increased by 50% (from 10 to 15 countries) and the EU13 participation rate nearly doubled, while the share of EU funding to partners in EU13 countries (budget) remained stable at around 5%.

Table 50 Main characteristics of an ERA-Net Cofund network (based on data from Horizon 2020 WP 2014/2015); data from ERA-LEARN 2020

	Number of countries per call /partners	Average call budget (M€)	Average project size (M€)	EU13 share	Third country share
ERA-Net CoFund	15	29	< 1	-participation: 20% - budget: 5%	- participation: 11% - budget: 4%

Source: https://www.era-learn.eu

The use of P2Ps within a variety of thematic fields is presented in the following table (2004 – 2015). It has to be noted, that the number of actions within the described fields is not an indication of impact with respect to mobilised funding and/or other policy objectives on national/EU level.

Table 51 Relevance for Horizon 2020 priorities and challenges: Active networks (2016) and research area addressed

Research area	Art.169 / Art.185 s	ERA-NETs	ERA-NET Cofund	ERA-NET Plus	JPIs	Other	Total
Biotechnology	1	4	0	1	5	1	**12**
Energy	3	6	9	5	3	5	**31**
Environment	3	7	9	3	6	9	**37**
Food, agriculture and fisheries	2	6	6	3	4	5	**26**
Government and social relations	2	0	0	1	2	0	**5**
Health	3	6	9	2	5	2	**27**
Industrial production	1	2	1	2	1	1	**8**
Information and communication technologies	3	3	0	2	2	2	**12**
Materials	1	4	2	2	1	1	**11**
Nanosciences and nanotechnologies	1	3	1	2	0	1	**8**
No specific thematic focus	0	1	0	0	0	2	**3**
Other	1	1	1	2	0	4	**9**
Security and defence	0	0	1	0	0	0	**1**
Services	2	0	0	0	1	1	**4**
Socio-economics sciences and humanities	2	1	3	2	3	2	**13**
Space	1	0	1	0	0	0	**2**
Transport	2	0	0	1	2	0	**5**

Source: https://www.era-learn.eu

I.3. ERA-NET Cofund under Horizon 2020

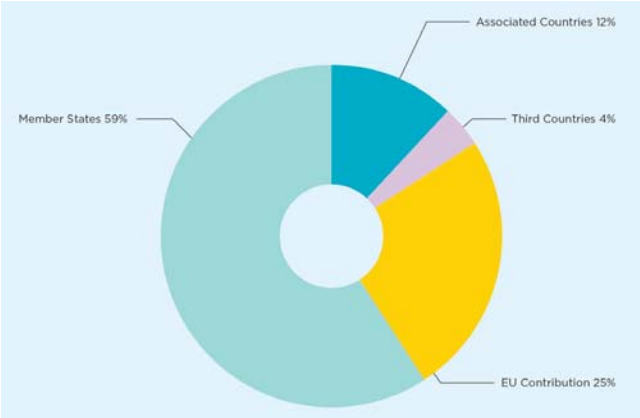
The ERA-NET Cofund instrument is a merger of the former ERA-NET and ERA-NET Plus instruments under FP7. ERA-NET Cofund actions should build lasting collaborations between Member States and their research funding organisations, also drawing on existing, long-standing partnerships that have been established over the past ten years.

The Horizon 2020 Work Programme 2014/2015 resulted in a total of 27 proposals selected for funding. The 27 networks from 2014/2015 bring together a total of EUR 728.5 million for the

cofunded calls. The leverage effect of the 27 actions is 2.31, i.e. for each euro invested by the EU, the participating countries invest an additional amount of EUR 2.31[5].

The following figure presents the respective financial contributions from P2P participants (WP 2014/2015 only).

Figure 72 Budget distribution (contribution to the co-funded calls) for the first 27 ERA-NET Cofund actions resulting from the WP 2014/5, by participant; source: ERA-LEARN 2020



Source: ERA LEARN, 2nd Annual report on p2P partnerships, 2016

Several Cofund networks have been initiated by JPIs. Nearly 50% of all calls in 2015/2016 (12 in total) stem from JPI-initiated ERA-Nets.

In addition, over 30 topics are included in the 2016/2017 Horizon 2020 Work Programmes. Funding from Horizon 2020 is expected to reach about EUR 280 million as pre-commited budgets from national sources rose to about EUR 700 million. Based on the planning of the current ERA-NET Cofunds and past experience, an overall leverage effect of 3-5 can be expected, as many additional calls without EU cofunding are planned.

Beyond the minimum obligation to launch and implement a co-funded joint call, ERA-NET Cofund actions engage in a variety of additional activities. These include implementing additional calls without EU co-funding, dissemination activities, strategy building, networking and expansion, or monitoring and evaluation activities[6]. The following table summarizes the budgets funded so far under Horizon 2020 and the relation to the Horizon 2020 priorities.

[5] A detailed overview on the ERA-Nets from WP 2014-2015 is presented in the Annual Report on P2Ps from ERA-LEARN 2020. See in particular Figure 11.5.4

[6] https://www.era-learn.eu/publications/ec-publications/analysis-of-era-net-cofund-actions-under-horizon-2020

Figure 73 Foreseen budgets from Horizon 2020 for ERA-NET Cofund actions published in the WPs 2014-2017

	2014		2015		2016		2017	
	€M	no	€M	no	€M	no	€M	no
Excellent Science								
Future and Emerging Technologies					18,0	2	5,0	1
Industrial Leadership								
ICT			6,0	1				
Nano, Materials, Biotech and Manufacturing			12,5	1	30,0	3		
Societal challenges								
Health, demographic change and wellbeing	27,4	4	15,0	3			5,0	1
Food security, agriculture, marine, bioeconomy	5,0	1	15,0	3	35,0	5	15,1	3
Secure, clean and efficient energy	36,8	3	36,3	4	45,8	5	33,5	4
Smart, green and integrated transport					10,0	1		
Climate action, environment, resource efficiency and raw materials	18,2	2	51,0	3	13,0	3	30,0	3
Europe in a changing world – inclusive, innovative and reflective Societies	5,0	1	5,0	1	5,0	1	5,0	1
Science with and for society					5,0	1		
Total	**92,4**	**11**	**140,8**	**16**	**161,8**	**21**	**93,6**	**13**

Source: European Commission, Analysis of ERA-NET Co-Fund under Horizon 2020[7]

I.4. Art.185 initiatives

On Art.185 initiatives there is the legal obligation to carry out individual interim and final evaluations. These will be summarized in a dedicated Staff Working Document on Art.185 initiatives, to be adopted October 2017. The following section will therefore only provide basic data on Art.185 initiatives.

Art.185 initiatives are jointly implemented multiannual programmes between Member States, including Associated Countries (AC) for the funding of research activities, in which the Union participates by providing funding. They were promoted by the Commission in 2001 as a way to implement the joint programming of research activities. The legal basis for their creation is Art.185 of the Treaty on the Functioning of the European Union (TFEU).

As stated in Article 26 of the Horizon 2020 Regulation[8], Art.185 initiatives are proposed only in cases *'where there is a need for a dedicated implementation structure and where there is a high level of commitment of the participating countries to integration at scientific, management and financial levels'*. In addition, under Horizon 2020, Art 185 initiatives have to apply the Rules of participation of Horizon 2020, unless derogations are introduced in their basic acts.

Five Art.185 initiatives have been established since 2003. The actions supported may cover subjects not directly linked to the themes of Horizon 2020, as far as they have a sufficient EU added value. The Art.185 initiatives currently active are:

(1) Active and Assisted Living Research and Development Programme (AAL2): innovative ICT-based solutions for active and healthy ageing.

[7] https://bookshop.europa.eu/en/analysis-of-era-net-cofund-actions-under-horizon-2020-pbKI0116995/
[8] http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/fp/h2020-eu-establact_en.pdf

(2) European and Developing Countries Clinical Trials Partnership 2 (EDCTP2): new or improved treatments for poverty-related diseases in sub-Saharan Africa; with

(3) The European Metrology Programme for Research and Innovation (EMPIR): new measurement solutions for industrial competitiveness and societal challenges;

(4) Eurostars 2: support to the transnational collaboration of R&D performing SMEs;

(5) BONUS: Joint Baltic Sea Research Programme

The following table summarises participation and financial contributions.

Figure 74 Participation and Financial contribution of the Union and the Participating States to the Art.185 initiatives under Horizon 2020 (in italic: contributions for the programmes under FP6/FP7

Art.185 initiatives adopted under Horizon 2020	Participating countries	EU (max) [Euro million]	Participating States (min) [Euro million]
Active and Assisted Living R&D Programme (AAL2) ***AAL (FP7)***	17 MS + 3 AC	175 *150*	175 *200*
European and Developing Countries Clinical Trials Partnership 2 (EDCTP2) ***EDCTP (FP6)***	15 MS + 2AC	683 *200*	683 *200*
European Metrology Research Programme (EMPIR) ***EMRP, FP7***	23 MS + 5 AC	300 *200*	300 *200*
Eurostars2 (for SMEs) ***Eurostars1 (FP7)***	28 MS + 5 AC	287 *100*	861 *300*
BONUS (FP7)	*8 MS*	*50*	*50*

Source: European Commission

Following a request made by nine Member States in December 2014, the European Commission adopted on 18 October 2016 a proposal to establish a new public-public Partnership for Research and Innovation in the Mediterranean Area (PRIMA) under Art.185 TFEU. PRIMA would focus on two key socioeconomic issues that are important for the region: food systems and water resources. The proposed decision would establish the partnership for a period of 10 years and would provide PRIMA with EUR 200 million in EU funds from Horizon 2020, to match the commitments of the participating states.

All currently active Art. 185 initiatives have been initiated under FP6 (EDCTP) or FP7. Consequently, these initiatives already comprise several years of activities, where results and impacts can be described. The five active Art. 185 initiatives display a variety of key characteristics – BONUS and EDCTP focus on specific regional issues (environmental quality of the Baltic sea and clinical trials for tropical diseases in Sub-Sahara Africa) – EUROSTARS has target group orientation (R&D intensive SME) while EMPIR and AAL focus on specific technologies with a, however, very different scope – AAL targets ICT solutions for active ageing with a strong end-user perspective while EMPIR focus on metrology technologies in diverse application areas.

Consequently, the desired impacts of the individual initiatives differ substantially – while for AAL and EUROSTARS the market share/additional turn-over of induced technological innovations are key impacts, the main objective of BONUS is an improved environmental management of the Baltic Sea. EDCTP, on the other hand, has desired impacts in the capacity building in Sub-Sahara Africa for the treatment of tropical diseases and a broad uptake of good practices i.e. by means of WHO guidelines for the treatment of HIV, Malaria or Tuberculosis. EMPIR has a clear industrial orientation, with its main impacts in the contribution/shaping of standards and norms and in the strengthening the uptake of industrial innovations to societal challenges, notably in the fields of energy, environmental protection and health.

Despite their variety, however, Art. 185 contribute to EU-policy objectives, it being competitiveness in the cases of AAL, EMPIR and EUROSTARS or global health in the case of EDCTP or sustainable development in the case of BONUS.

I.5. Joint Programming Initiatives

In July 2008, the Commission presented joint programming as a Member State-led process, designed to coordinate research in Europe and to address major societal challenges. The Joint Programming Process (JPP) aimed at restructuring the European research landscape through EU-level reorientation and joint programming of research activities in key areas.

The following section provides a short summary of the ten JPIs adopted by the Council. The Commission acts as an observer in all JPIs.

JPND (Neurodegenerative Diseases)
This JPI was the first to be launched in 2009. Its Strategic Research Agenda (SRA) was adopted in 2011 and the first implementation plan in 2012. It has the largest number of member countries (30). The EU FPs (FP7 and Horizon 2020) have supported JPND with two CSAs and one ERA-NET Cofund[9].

FACCE (Agriculture, Food Security and Climate Change)
The JPI on 'agriculture, food security and climate change' (FACCE) was launched in 2010. Its SRA was adopted in 2012 and the first implementation plan in 2013. The updated SRA was published in January 2016 as well as the Implementation Plan 2016-2018. It has 21 full members and a significant number of additional third countries are participating through Joint Calls. The EU FPs (FP7 and Horizon 2020) have supported FACCE with two CSAs and also ERA-NET contracts (FP7 ERA-NET Plus, two Horizon 2020 ERA-NET Cofunds)[10].

JPI HDHL (Healthy Diet for Healthy Life)
The JPI on 'a healthy diet for a healthy life' (HDHL) was launched in 2010. It has 19 member countries (including Canada) and six observers. New Zealand became the most recent full member. A second edition of the SRA has been produced and the current implementation plan (2014-2015) will be superseded by another for the 2016-2018 period. The EU FPs (FP7 and Horizon 2020) have supported JPI HDHL with two CSAs and one ERA-NET Cofund[11].

JPI CH (Cultural Heritage)

[9] http://www.neurodegenerationresearch.eu/
[10] https://www.faccejpi.com/
[11] http://www.healthydietforhealthylife.eu/

The JPI on 'cultural heritage and global change' was launched in 2010. It adopted its SRA in 2013 and implementation plan in 2014. It has 19 members and seven observers. The EU FPs (FP7 and Horizon 2020) have supported JPI CH with two CSAs and one FP7 ERA-NET Plus[12].

JPI-MYBL (More Years Better Lives)
The JPI for 'more years better lives' was launched in 2011 and adopted its SRA in 2014. The implementation plan is under development and there is a short term work programme for 2015-2016. There are now 17 full members (Israel and Slovenia recently joined) and one observer. The EU FPs (FP7 and Horizon 2020) have supported JPI-MYBL with two CSAs[13].

JPIAMR (Antimicrobial Resistance)
The JPI on 'anti-microbial resistance' was launched in 2011 and adopted its SRA at the end of 2013. The 1st implementation plan was adopted in 2014 with the second version adopted in 2016. It has 22 member countries. The EU FPs (FP7 and Horizon 2020) have supported JPI AMR through two CSAs and one ERA-NET Cofund[14].

Water JPI (Water Challenges for a Changing World)
The JPI on 'water challenges for a changing world' was launched in 2011 and adopted its first Strategic Research and Innovation Agenda (SRIA) in 2013 with the implementation plan adopted in 2014. It has 21 member countries and four observers. Another six third countries are participating in Joint Calls. The EU FPs (FP7 and Horizon 2020) have supported JPI Water through two CSAs and two ERA-NET Cofund actions[15].

JPI Oceans (Healthy and Productive Oceans)
The JPI on 'healthy and productive seas and oceans' was launched in 2011. Its SRIA was adopted in 2014 and the implementation plan in 2015. There are 21 members and one observer. The EU FPs (FP7 and Horizon 2020 have supported JPI Oceans through two CSAs and one ERA-NET Cofund[16].

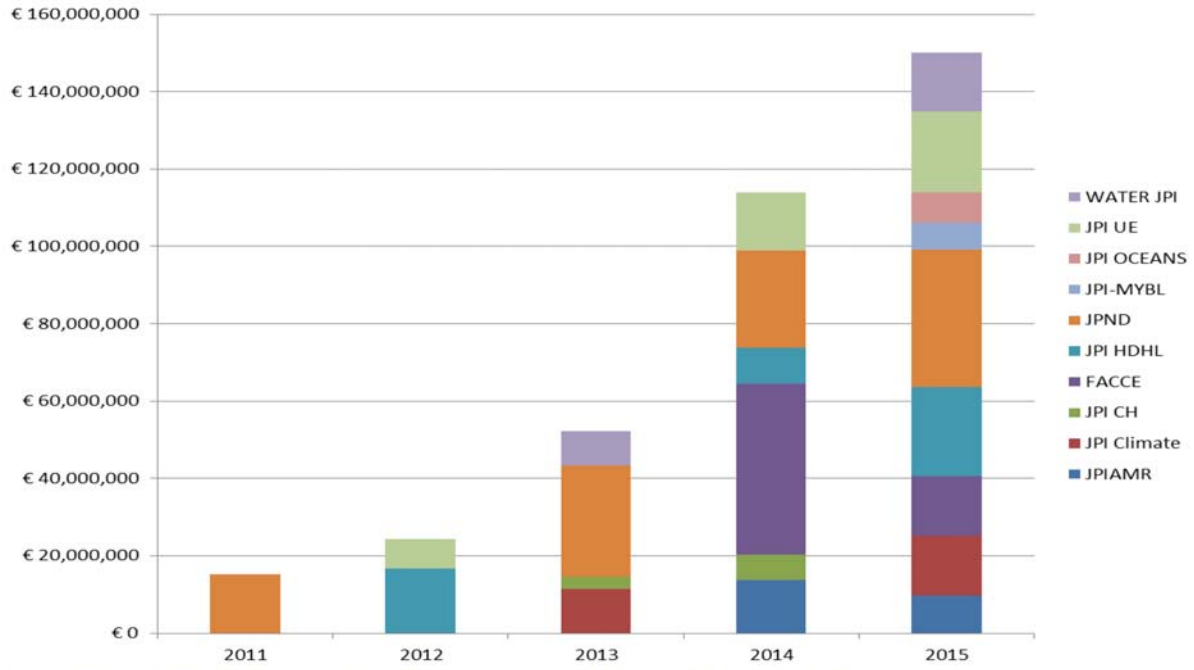
JPI Climate (Connecting Climate Knowledge for Europe)
The JPI on 'connecting climate knowledge for Europe' was launched in May 2011 with the adoption of the SRA. An implementation plan was adopted in 2013. JPI Climate has 17 full members and four observer institutions. Additional countries participate in individual activities. The EU FPs (FP7 and Horizon 2020) have supported JPI Climate activities through one CSA and one ERA-NET Cofund[17].

JPI UE (Urban Europe)
JPI Urban Europe was launched in 2011 and adopted its first SRIA at the end of 2015. It has 13 member countries, six observer countries and some dissemination partner countries. The EU FPs (FP7 and Horizon 2020) have supported JPI UE with two CSAs and two ERA-NET Cofunds[18].

[12] http://www.jpi-culturalheritage.eu/
[13] http://www.jp-demographic.eu/
[14] http://www.jpiamr.eu/
[15] http://www.waterjpi.eu/
[16] http://www.jpi-oceans.eu/
[17] http://www.jpi-climate.eu/home
[18] http://jpi-urbaneurope.eu/

While the implementation of joint calls is only one typical activity of JPIs, it remains currently the only activity where, at least to a limited extent, the alignment of national programmes to the JPIs can be quantitatively described[19]. The following figure shows the level of committed national budgets to the individual JPIs over the period 2011-2015, highlighting the clear upward trend in national commitments to JPIs joint calls.

Figure 75 National Budgets committed to calls launched by Joint Programming Initiatives

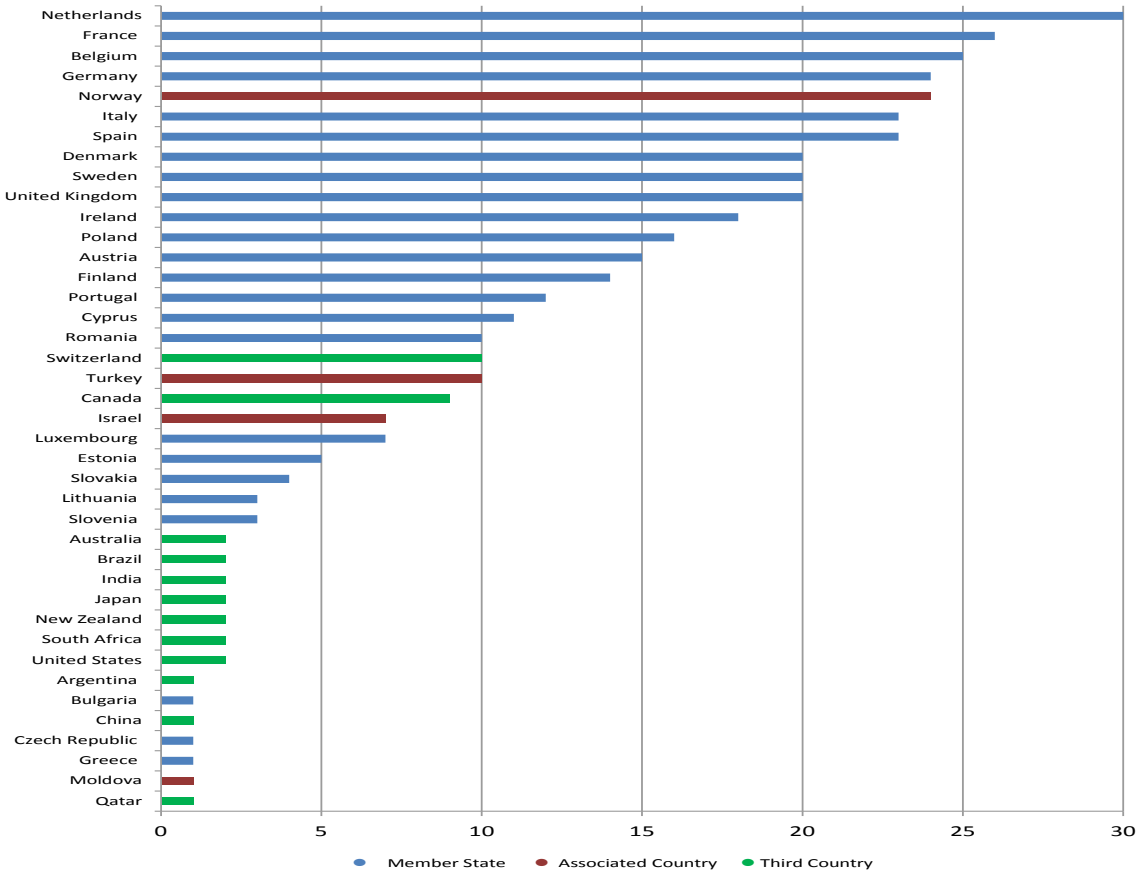


Source: ERA LEARN, Evaluation of Joint Programming to address grand societal challenges

A breakdown of the national contributions to the joint calls between 2011 and 2015 is presented in the following figure.

[19] As no data are available on total national competitive funding in the targeted fields, the ratio between national funding and contributions to JPIs can't be measured.

Figure 76 National budgets committed to calls launched by Joint Programming Initiatives between 2011-2015



Source: ERA LEARN, Evaluation of Joint Programming to address grand societal challenges

I.6. Evaluation Results on Public-Public Partnershipss

From the P2P portfolio, the Joint Programming Process (JPP/JPIs) and the ERA-Net CoFund instrument under Horizon 2020 have already been subject to evaluations, carried out with the support of independent experts.[20]

In addition, the ERA Progress Report 2016 analyses the progress of Member States with respect to the Top Action Priorities identified in the ERA Roadmap that was adopted by the Council in June 2015[21]. For the priority 2a (jointly addressing societal challenges) the Top Action Priority is "*Improving alignment within and across the Joint Programming Process and the resulting initiatives (e.g. Joint Programming Initiatives (JPIs)) and speeding up their implementation*".

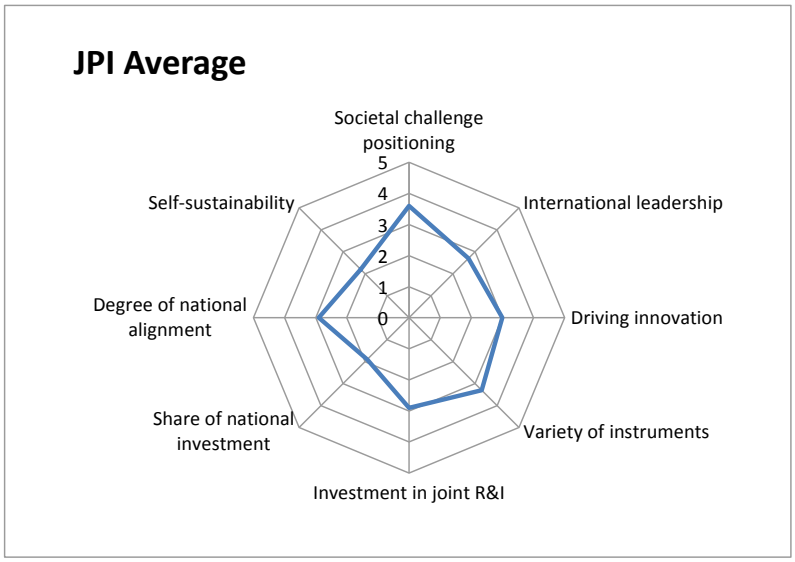
[20] For the Art 185 initiatives, a number of evaluations are underway, notably two final evaluations of the FP7 initiatives BONUS and EMPR and four interim evaluations of the Horizon 2020 initiatives AAL2, EDCTP2, EMPIR and EUROSTARS2. These will be accompanied by a meta-evaluation. Results will be presented in a separate Staff Working Document (SWD) by the end of 2017, accompanying the Commission Communication on the Horizon 2020 interim evaluation.

[21] https://era.gv.at/object/document/1817/attach/0_pdf.pdf

I.6.1. Evaluation of Joint Programming to Address Grand Societal Challenges

The **Joint Programming evaluation** developed a framework with eight indicators to enable a qualitative assessment of the JPIs with respect to their progress towards impact on the societal challenge and mobilisation of co-investment and alignment actions. The following diagram presents the overall qualitative "scores" for the ten JPIs.

Figure 77 Indicators and average scores of JPIs for a qualitative assessment of the JPIs with respect to their progress towards impact on the societal challenge and mobilisation of co-investment and alignment actions



Source: ERA LEARN, Evaluation of Joint Programming to address grand societal challenges

All JPIs were qualitatively assessed using this framework. This revealed some different patterns and the relative nascent nature of some JPIs. The key message from evaluation is that the Joint Programming Process does not yet have sufficient 'commitment' from national stakeholders to achieve its potential. Important considerations arising from this evaluation for national and EU policy stakeholders include:

- The Joint Programming Process offers the opportunity to create scale and scope in R&D in Europe but this will only become a reality if national, transnational and EU policies and priorities are developed in a more collaborative way;

- The deliberations for the next Framework Programme offers the option to design and implement a multi-level approach to joint programming leading to a critical mass of coordinated societal challenge R&D across Europe and at the EU/international level.

The overarching recommendation of the Expert Group is, therefore, that: "*Each of the JPIs (and any other prospective ones) should be invited to consider their longer term strategy in terms of socio-economic impact objectives/deliverables and what support instruments they would need from the next Framework Programme. Any such proposals should, of course, include firm commitments from national stakeholders (including how they will integrate the JPI within national programming) and, where appropriate, other societal challenge stakeholders such as industry*"[22].

22

I.6.2. Analysis of ERA-NET Cofund actions under Horizon 2020

An evaluation[23] of the ERA-Net Cofund instrument was carried out with the support of an independent expert group in 2016. The expert group analysed the ERA-Net Cofunds within the Horizon 2020 WP 2014/2015.

While the relevance of the ERA-NET Cofund instrument has been confirmed by the evaluation, coherence among ERA-NETs but also between the ERA-NETs and other joint initiatives is clearly underdeveloped. Consequently, coordination needs to be improved among different ERA-NET Cofund actions in similar areas, and between ERA-NET Cofund actions and other instruments and initiatives supporting public-public or public-private partnerships in research and innovation (such as Joint Programming Initiatives, Art. 185 initiatives, Public-Private Partnerships, Knowledge and Innovation Communities). ERA-NET Cofund actions are not deeply embedded in national policy portfolios and/or national strategies possibly reflecting Member States' lack of ambition to fully realise the instrument's potential. These remarks point to the urgent need to define a strategy for the ERA-NET instrument that is shared both by the different EC Directorates and among Member States.

According to the findings of the evaluation, the ERA-NET Cofund contributes significantly to strengthening transnational cooperation by establishing lasting cooperation among countries and creating a critical mass of resources to tackle EU societal challenges. It has contributed to the coordination of national programmes and to a lesser extent to the alignment of national policies. The instrument has facilitated widening participation of lower performing countries although more can be done in this area.

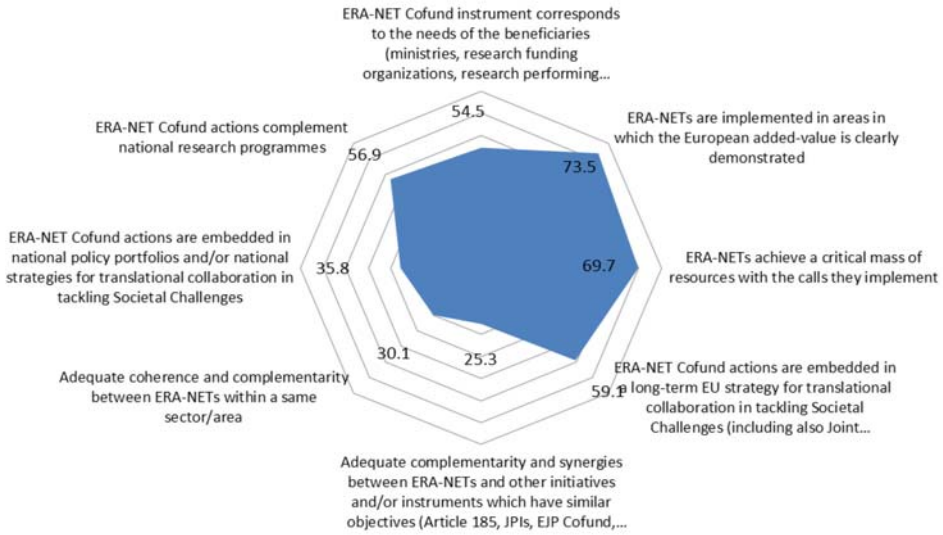
The overall recommendation of the expert group is that the "ERA-NET Cofund actions need to be underpinned by a comprehensive strategy in the challenge/thematic area addressed and synergies with other instruments and initiatives should be explored in order to achieve ERA objectives more efficiently".

The expert group strongly requested that strategies for challenges/thematic areas should be supported by an exercise — to be carried out by the interested Member States and Associated Countries assisted by the Commission — to determine complementarity and synergies with other existing P2Ps and PPPs as well as the Framework Programme Work Programmes. This also needs to address the request expressed by Member States for a balance of investments between P2Ps / PPPs initiatives and instruments and the 'regular' Horizon 2020 research and innovation actions.

The lack of a coherent overall strategy for implementing national / EU R&I policies on thematic priorities is shown in the following figure; While ERA-Net Cofund stakeholders acknowledge the EU added-value and the creation of critical mass, coherence within the ERA-Nets and with other P2Ps is not sufficiently developed.

[23] https://bookshop.europa.eu/en/analysis-of-era-net-cofund-actions-under-horizon-2020-pbKI0116995/

Figure 78 Relevance of ERA-NET Cofund actions to national / European policies



Source: Analysis of ERA-NET Cofund actions under Horizon 2020[24]

I.6.3. ERA Progress Report 2016: Priority 2a – jointly addressing societal challenges

The **ERA Progress Report 2016** concentrates on the headline indicators that have been identified by ERAC[25] to measure progress at Member State level in the eight ERA priorities identified in the ERA Roadmap of 2015. The findings show that priority 2a, together with the headline indicator for priority 3, has the highest growth rates among all eight ERA headline indicators with an annual growth rate of 7.8% between 2010-2014. While this result is an indication of the increasing internationalization of science in general, it also underlines the increasing importance that national governments in Europe attribute to the stronger policy-driven joint programming.

The following table presents the results of the ERA Progress Report 2016 for priority 2a (Technical Report by Science Metrix [26]):

[24] https://bookshop.europa.eu/en/analysis-of-era-net-cofund-actions-under-horizon-2020-pbKI0116995
[25] http://data.consilium.europa.eu/doc/document/ST-1208-2015-INIT/en/pdf
[26] http://ec.europa.eu/research/era/pdf/era_progress_report2016/era_progress_report_2016_technical_report.pdf

Figure 79 GBARD (EUR) allocated to Europe-wide transnational, as well as bilateral or multilateral, public R&D programmes per FTE researcher in the public sector (2010-2014); the explanation for the Swiss data outlier can be found in the Technical Report

Country	Weight in GDP	Score (2014)	CAGR (2010-14)	Lead/Gap to EU-28 CAGR	Trendline (2007-14)
EU-28		**2 507**	**7.8%**	**N/A**	
Cluster 1	25.9%	10 923	5.0%	-2.8	
Cluster 2	36.6%	3 642	5.4%	-2.4	
Cluster 3	36.2%	1 140	15.0%	7.2	
Cluster 4	1.2%	63	-22.8%	-30.6	
Cluster 1					
CH	4.1%	*27 941*	:		
BE	3.1%	9 251	1.0%	-6.8	
IT	12.6%	8 395	*18.1%*	10.3	
AT	2.6%	6 958	3.4%	-4.3	
IS	0.1%	*6 927*	:		
SE	3.4%	6 067	*-2.5%*	-10.3	
Cluster 2					
DE	22.8%	*4 686*	*-1.1%*	-8.9	
NO	3.0%	4 414	-3.9%	-11.7	
NL	5.2%	4 101	10.4%	2.6	
FI	1.6%	3 795	*-0.2%*	-8.0	
LU	0.4%	3 387	35.2%	27.4	
CY	0.1%	3 018	0.7%	-7.1	
IE	1.5%	2 951	5.7%	-2.0	
DK	2.0%	2 787	-3.7%	-11.4	
Cluster 3					
UK	17.6%	2 561	11.0%	3.3	
ES	8.1%	2 385	6.2%	-1.6	
HR	0.3%	1 569	22.5%	14.8	
CZ	1.2%	1 245	-3.4%	-11.1	
RO	1.2%	1 191	*9.5%*	1.7	
EL	1.4%	1 098	*-12.6%*	-20.4	
LV	0.2%	1 030	47.1%	39.4	
SI	0.3%	955	*-18.4%*	-26.2	
EE	0.2%	939	25.7%	18.0	
PT	1.4%	749	1.4%	-6.4	
PL	3.2%	678	76.8%	69.0	
LT	0.3%	220	24.8%	17.1	
HU	0.8%	194	3.8%	-4.0	
Cluster 4					
RS	0.3%	101	:		
BG	0.3%	97	*16.0%*	8.2	
SK	0.6%	52	15.7%	7.9	
MT	0.1%	0	-100.0%	-107.8	

Source: ERA Progress Report 2016, Technical Report[27]

This interpretation is reinforced by the additional EMM indicators, notably the Member States financial contributions to P2Ps within the EU R&D policy framework per FTE researcher in the public sector.. This additional ERA indicator showed the highest growth rate of all ERA indicators with an annual growth rate of 42.1 % in the years 2012-2014. Clearly, the provision of a common policy framework at EU level as well as the provision of additional financial resources (for Art 185 initiatives and ERA-NET Cofunds) acted as a catalyst for joint action

[27] http://ec.europa.eu/research/era/pdf/era_progress_report2016/era_progress_report_2016_technical_report.pdf

among Member States, and underlines the importance of EU policies and respective EU action for the implementation of ERA.

Figure 80 Member State participation (EUR) in Public-to-Public collaborations (ERA_Net Cofunds, Art. 185 initiatives and JPIs) per FTE researcher in the public sector (2012-2014)

Country	Weight in GDP	Score (2014)	CAGR (2012-14)	Lead/Gap to EU-28 CAGR	Trendline (2012-14)
EU-28		**512**	**42.1%**	**N/A**	
Cluster 1	3.6%	2 836	123.8%	81.8	
Cluster 2	14.6%	1 176	94.7%	52.6	
Cluster 3	81.8%	302	66.9%	24.8	
Cluster 4	N/A	N/A	N/A	N/A	
Cluster 1					
CY	0.1%	3 625	235.0%	192.9	
LU	0.4%	2 836	29.4%	-12.7	
SE	3.1%	2 046	107.2%	65.1	
Cluster 2					
AT	2.4%	1 610	49.9%	7.8	
DK	1.9%	1 358	99.1%	57.0	
LV	0.2%	1 334	232.2%	190.1	
NL	4.7%	1 087	90.3%	48.2	
BE	2.9%	1 064	55.5%	13.4	
MT	0.1%	1 047	:		
FI	1.5%	983	66.4%	24.3	
RO	1.1%	927	69.4%	27.3	
Cluster 3					
SI	0.3%	769	20.6%	-21.4	
IE	1.4%	739	33.7%	-8.4	
DE	20.9%	571	21.4%	-20.7	
FR	15.3%	439	33.0%	-9.1	
EE	0.1%	367	196.1%	154.0	
UK	16.2%	345	38.3%	-3.8	
ES	7.5%	312	34.7%	-7.4	
IT	11.5%	255	3.7%	-38.4	
PL	2.9%	253	23.1%	-19.0	
PT	1.2%	224	58.3%	16.2	
HU	0.7%	199	234.0%	191.9	
LT	0.3%	163	104.9%	62.9	
SK	0.5%	142	14.6%	-27.5	
HR	0.3%	133	249.5%	207.4	
CZ	1.1%	104	37.3%	-4.8	
BG	0.3%	103	93.1%	51.0	
EL	1.3%	18	-59.5%	-101.6	

Source: ERA Progress Report 2016, Data from ERA-LEARN 2020 – calculations by Science Metrix.

As this additional ERA-indicator is statistically one fraction of the headline indicator for this priority, it can be argued that the common EU policy framework and the additional resources provided by the EU R&D framework programmes led to a significant leverage effect at national level for participating in Joint Programming – notably as the growth rate for the additional indicator is about four times as high as for the headline indicator.

On average, the national P2P contributions account for 20% of the overall national GBARD to transnational programmes. The comparison between the two tables highlights some relevant strategies of Member States:

- Some Member States such as CY or HU invest nearly all available resources for transnational cooperation in P2Ps;

- For the large EU Member States such as DE or the UK, the national contributions to P2Ps are usually smaller than the EU average of 20%[28];

- A substantive group of Member States such as AT, BE, SE, FI or DK display declining overall funding for transnational cooperation while increasing their contributions to P2Ps, suggesting clear policy choices in favor of transnational programmes embedded in the overall EU policy framework of P2Ps.

The ERA Progress Report 2016 includes some analysis on the **National ERA Action Plans** (NAPs), which have been developed following the Council Conclusions on the European ERA Roadmap in 2015. So far, 24 Member States and four Associated Countries adopted a national ERA action plan.

The NAPs present a broad range of measures and activities of Member States and Associated countries to strengthen their participation in Joint Programming and to better align national and Europe-wide R&D programming. These include:

- Communication and information measures including better information of R&D actors concerning the opportunities and added-value from participating in Joint Programming;

- Governance and coordination measures are introduced by a number of Member States. Dedicated funding measures are introduced by a number of Member States for the participation in Joint Programming.

- Harmonisation of funding rules has been introduced by several Member States aiming at facilitating the national participation in the JPI's.

- Outreach measures towards smart specialization strategies and sectoral policies, especially focusing on better articulation between the European Structural and Investment Funds, notably the regional smart specialization strategies, and the SRIA's of the JPI's.

I.7. Lessons learnt

Based on the evidence accumulated to date, the strengths and weaknesses of P2Ps can be summarised as follows:

Strengths

- There is the potential for high European and national added value due to the more efficient and effective use of public resources;

- There has been a clear contribution to the better design and implementation of sectoral policies aligned towards societal challenges;

[28] Data for FR is not available.

- Participating countries invest significant amounts in P2Ps and consider that they offer effective ways of supporting trans-national collaboration;

- There have been significant streamlining, leverage and alignment effects as a consequence of the exchange of good practice, notably in terms of mobilising and aligning national resources with initiatives with similar objectives in other countries and with EU level objectives;

- The potential for cooperation with international partners both within and outside of Europe has been enhanced.

Weaknesses

- Despite their potential benefits, the long-term commitment of national funds to P2Ps is limited by budgetary and legal constraints;

- Although there have been alignment effects, the strategic positioning of P2Ps between national initiatives and EU initiatives is not always clear;

- The focus of P2Ps to date has been on competitive funding, which is in short supply in many countries, and the potential for aligning and integrating institutional support mechanisms remains relatively untapped (apart from the Art.185 on metrology);

- Many potential national partners in Joint Programming P2Ps lack the institutional, organisational and strategic management capacities to participate effectively;

- Weak interactions in some countries between national research communities and other actors located within national innovation systems (e.g. public authorities, industry and other end users) limit the potential for downstream impacts.

Some key issues are instrumental for an overall performance improvement of P2Ps: rationale, aims and objectives, scope and focus, governance, finance and impact.

(1) Rationale

The continued existence of Joint Programming depends on the articulation and acceptance at the highest levels of convincing arguments in its favour.

The case for Joint Programming was established in the last decade and financial support for initiatives to be undertaken has grown appreciably since. Nevertheless, it still accounts for only 3% of the Framework Programme budget and for an even smaller percentage of national expenditure on R&D. It suffers, therefore, from a lack of visibility when overarching strategies for research and innovation at national and EU levels are discussed at the highest policy levels. It seems that the arguments elaborated in the early days of Joint Programming[29] were still valid, but that they needed to be revisited and reiterated, with the criteria for establishing P2Ps clearly articulated and widely discussed in policy circles.

[29] See, for example, 'Towards Joint Programming in Research', SEC(2008)2282, Brussels, 17.07.2008 at http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2011935%202008%20ADD%202

(2) Aims and Objectives

There is a clear need for mutually agreed aims and objectives if performance is to be improved.

The evaluations of Joint Programming and of the ERA-Net CoFund noted that there had been mixed success to date in terms of ensuring that the wishes of all partners are respected when formulating the aims and objectives of individual P2Ps, and that this situation needed to be remedied in future. There is an even greater need for clarity concerning the specific aims and objectives of the Joint Programming process as a whole and the role of Joint Programming within national and EU contexts. Many individual initiatives coexist within a universe of multiple other initiatives at EU and national levels, with all the attendant potential for negative interactions and unrealised synergies in the absence of an overview of how everything fits together.

(3) Scope and Focus

A greater focus on the scope of initiatives is needed to make the best use of resources and avoid obvious barriers, traps and pitfalls.

Looking across all P2Ps, there is a tension, on the one hand, between the flexibility and multiplicity of choice offered by a wide range of joint initiatives and, on the other hand, the competing need to concentrate on a narrower range of initiatives and topics in order to make the best use of scarce resources. Finding ways of ensuring that strategic choices can be implemented in flexible ways is, thus, another key task for the future.

(4) Governance

Clear leadership, lines of responsibility and rules of procedure are essential to sound governance.

The evaluations expressed some concern about governance arrangements for P2Ps as a whole, and especially for the relative roles played by, for example, Framework Programme Committees and the governing bodies of JPIs in the formulation and implementation of research and innovation-related agendas in Europe. Both evaluations stress the administrative burden associated with the higher transaction costs of P2Ps is a particular problem that needed to be resolved. They also point to the continued existence of regulatory and legislative barriers to the full integration of joint activities at national level.

(5) Finance

Better mechanisms are needed to ensure more stable, longer-term financial arrangements.

The JPI evaluation highlighted that the current rather unstable financing mechanism at national level for P2Ps constitutes a major barrier for more impacts. Securing long-term financing while respecting the budgetary constraints and policy cycles of Member States undoubtedly remains an essential task for the future.

(6) Impact

The need to demonstrate the impact of P2Ps is vital if they are to realise their full potential within European research and innovation-related policy portfolios.

Both evaluations agreed about the need to realise the potential of Joint Programming by ensuring the attainment of expected impacts. Demonstrating impact is important if the value of P2Ps is to be recognised at ministerial levels and taken into account when formulating future strategies at both national and EU levels.

J. FURTHER INFORMATION ON THE IN-DEPTH ASSESSMENT OF PUBLIC-PRIVATE PARTNERSHIPS

J.1. Introduction

Public-private partnerships under Horizon 2020 represent the joining of forces between the EU and industry and provide funding for large-scale, longer-term and high risk/reward research. They set out financial commitments, over a seven year period from both the EU and from the industry partners. They each have clear objectives which need to be achieved by the Partnerships. They bring together companies, universities, research laboratories, innovative SMEs and other groups and organisations around major research and innovation challenges. They establish their own strategic research and innovation agendas and fund projects selected through open and competitive calls for project proposals.

The Joint Undertakings (JUs)[30] are public-private partnerships (PPP)[31] in industrial research at European level. They were set up in 2007-2008 under the Seventh Framework Programme (FP7) in five strategic areas — aeronautics and air transport, health, fuel cell and hydrogen technologies, embedded computing systems and nano-electronics. Bringing together industry, the research community, Member States[32], regulators and the EU to define and implement common research agendas and invest in large-scale multinational research activities, the Joint Undertakings are concrete examples of the European Union's efforts towards strengthening its competitiveness through scientific excellence, industry led research, openness and innovation.

Based on the experience acquired under FP7, a new generation of public and private partnerships was set up[33] by the European Commission, aiming to collectively pool more than EUR 22 billion of research and innovation investments. This led to the establishment of the following seven Joint Undertakings that organise their own research and innovation agenda[34] and award Horizon 2020 funding for projects on the basis of competitive calls: Clean Sky 2 (CS2), Fuel Cells and Hydrogen 2 (FCH2), Innovative Medicines Initiative 2 (IMI2), Electronic Components and Systems for European Leadership (ECSEL replacing ARTEMIS and ENIAC), Bio-based Industries (BBI), Single European Sky Air Traffic Management Research (SESAR) and Shift2Rail.

As Article 32 (3) of the Horizon 2020 Regulation requires the Commission to provide an in-depth assessment on the openness, transparency and effectiveness of Joint Undertakings, this analysis is organised around these three evaluation topics. Finally, it should be noted that the report reflects an aggregated assessment of all seven Joint Undertakings together, highlighting relevant individual examples, exceptions and deviations where needed. A more in-depth evaluation of Joint Undertakings will be available in Autumn 2017.

[30] Article 187 of the Treaty on the Functioning of the EU (TFEU) states that 'the Union may set up Joint Undertakings or any other structure necessary for the efficient execution of Union research, technological development and demonstration programmes'.
[31] In addition to the institutionalised PPPs, also the contractual Public-Private Partnerships (cPPPs) have a legal basis in Article 25 of the regulation establishing Horizon 2020. Please note that the assessment of cPPPs is not included in this document but will be part of the overall SWD, planned for 2017.
[32] Only ECSEL include Member States as part of the JU. All other JUs do not include Member States as such but nevertheless do consult them through the State Representative Group which is an advisory body.
[33] An exception is the SESAR JU for which the existing JU Regulation was extended.
[34] Exception is the SESAR JU agenda of which is set by the Member States, various Air Traffic Management. (ATM) stakeholders and the members of the PPP in the framework of the European ATM Master Plan.

Complementing the Joint Undertakings, the Commission in FP7 also engaged in structured partnerships with the private sector to seek direct input into the preparation of the work programmes in areas which were defined upfront and which are of great industrial relevance. Three such partnerships were launched under the European Economic Recovery Plan[35], and implemented through call topics under FP7 rules of participation with a total Union contribution of EUR 1.6 billion. The calls have been highly relevant to industry with about half of the project funding allocated to industry, and about 30% to SMEs.

Building on this experience, under Horizon 2020 ten contractual public-private partnerships[36] have been established: Factories of the Future; Energy-efficient Buildings; European Green Vehicles Initiative; 5G Infrastructure; Sustainable Process Industry; Robotics; Photonics; High Performance Computing; Big Data Value and Cybersecurity. These partnerships are implemented through calls with a total Union contribution of EUR 6.6 billion[37], are based on a contractual arrangement between the Commission and the industry partners, setting out the objectives, commitments, key performance indicators and outputs to be delivered.

An evaluation on contractual public-private partnerships (except Cybersecurity established in the second half of 2016), implemented within Horizon 2020 (cPPPs), will be prepared together with a Group of Experts between April and September 2017.

J.2. Openness

J.2.1. Openness to newcomers

In order to assess the openness of Joint Undertakings, especially towards newcomers, a distinction is made between the openness of its membership policy and the openness of its participation policy and procedures for the respective research activities.

J.2.1.1. Openness of the Joint Undertakings Membership policy

In most Joint Undertakings different levels of membership can be distinguished according to a "hierarchical" logic with different rights (e.g. decision making power within the JU, access to the JU research programme(s), share of EU contribution) and obligations (e.g. size of the fees and contributions to be paid to the JU, duration of the commitment). Although not the same for all Joint Undertakings, overall the following types of members can be distinguished:

- **Full members** (e.g. " BIC[38] " in BBI, the "Industrial members" in SESAR[39], the "Leaders" in CS2, the eight founding members in S2R, the Industry Grouping members and the Research Grouping members in FCH2, the Private Members Board in ECSEL)

- **Associated members** (e.g. "Associated Partners" of IMI2, the "Core" partners in CS2);

[35] COM(2008) 800.
[36] The first four take forward public-private partnerships established under FP7.
[37] Excluding budget for the Cybersecurity cPPP
[38] BIC: Bio-based Industries Consortium Asbl, a non-profit organisation established under Belgian law with its permanent office in Brussels, Belgium.
[39] Full members include public and private single entities, legal consortia and consortia established for the purpose of Membership of the SESAR JU (renewed and extended with the extension of the founding regulation) and in addition to the two founding members (EU and EUROCONTROL).

- **Partners** ("third parties" linked to the industrial partners in SESAR).

Overall, all Joint Undertakings have an open access policy towards membership and describe their procedure for membership on their respective websites. Depending on the level of the membership, some eligibility conditions and entry or annual fees apply. Besides the general condition that candidate members should have knowledge and expertise in the respective sectors of the Joint Undertakings, the membership criteria per Joint Undertaking can be summarised as follows:

- **BBI**: any legal entity that directly or indirectly supports R&I in a Member State or in an Associated Country;

- **CS2**: any legal entity established in a Member State or in an Horizon 2020 Associated Country may become a core partner;

- **FCH2**: any legal entity in a Member State or Horizon 2020 Associated Country, which is or plans to be active in the FCH sector and is sharing and supporting the objectives of the FCH 2 JU can apply to become member of the Industry or Research Grouping ;

- **IMI2**: any legal entity that directly or indirectly supports R&I in a Member State or in an Horizon 2020 Associated Country. Legal entities can also apply to become Associated Partners;

- **ECSEL**: Member States or Horizon 2020 Associated Countries; any country pursuing R&I policies in electronic components and systems; any legal entity that directly or indirectly supports R&I in a Member State or in an Horizon 2020 Associated Country;

- **S2R**: any legal entity, grouping or consortium of legal entities established in a Member State or in an Horizon 2020 Associated Country.

- **SESAR**: beyond the two founding members, any other public or private undertaking or body including those from third countries that have concluded at least one agreement with the European Union in the field of air transport[40] with the participation ensuring a proper balance between airspace users, air navigation service providers, airports, military, professional staff associations and manufacturers and offer opportunities to SMEs, academia and research organisations[41].

The openness of membership towards newcomers is highly impacted by the entry ticket system. As already mentioned, this is a system where candidate members are asked to make a substantial financial contribution and/or in-kind contributions to the Joint Undertaking in return for their membership. Although it has many advantages, it may also include some disadvantages that can impact the "openness" of the Joint Undertakings towards new members.

[40] Council Regulation (EC) No 219/2007 of 27 February 2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system (SESAR), Statutes of the Joint Undertaking, Article 1.
[41] Council Regulation (EC) No 721/2014.

Table 52 Advantages and disadvantages of the entry ticket system

Possible advantages	Possible disadvantages
• In return for the entry ticket, members are directly involved in the governance of the JU. • Members can contribute to the definitions and development of the multi annual action plans, annual work documents, call topics. • Members have access to the research programmes and activities of the JU and therefore also to the EU co-financing budget. • Organisations that make a significant (financial) contribution to the JU bring stability and tend to be strongly committed to the success of the programme. • As was mentioned by S2R, the entry ticket system results in lower overall co-financing rates for members and consequently in higher direct leverage effects as the members are required to make the majority of their in-kind contributions towards the indirect actions (projects) co-funded by the JU.	• Smaller entities like SMEs, smaller universities and research centres and small organisations coming from EU-13 countries may face difficulties to pay for the required entry tickets which represent significant contributions, unless forming consortia. • Entry tickets imply a long term commitment to the JU, often for the whole duration of the JU. Not all stakeholders (typically smaller entities) are able to make this long term commitment

Source: Information provided by the thematic units responsible for the seven respective Joint Undertakings

Another factor which influences the "openness" towards new members is the application procedure used for membership. While most Joint Undertakings apply a system where a request for membership can be submitted at any given time and is evaluated on a case by case basis, other Joint Undertakings organise competitive calls for (associated) membership on a periodic basis (e.g. S2R). In the latter case, although open to all, candidates have fewer opportunities to become members as they need to wait until a call is launched. The membership procedure can also include negotiations between the Joint Undertaking and the candidate as it is the case of SESAR.

J.2.1.2. Openness of the Joint Undertakings Participation policy

Concerning the openness of Joint Undertakings towards participation in their respective research activities and programme(s), we can distinguish two types of Joint Undertakings. Joint Undertakings that publish only calls that are open to both members and non-members (BBI, IMI2, FCH2, ECSEL) and Joint Undertakings that prescribe restricted research activities reserved to members only and, also, publish calls on other research activities open to non-members (SESAR, S2R, CS2).

In addition to the mechanism of open calls, several Joint Undertakings set aside part of the EU budget that is dedicated to non-members (S2R, CS2, SESAR, ECSEL) in order to demonstrate their openness to all potential beneficiaries regardless of type or size.

Some quantitative figures on the number of newcomers in the second generation and extended Joint Undertakings are:

- Overall for all Joint Undertakings, 27% of the beneficiaries are new;

- BBI: among the top 25 beneficiaries that receive the highest BBI JU contribution, 8 have never participated in any of the FP7 or Horizon 2020 calls before, which equals to 32% newcomers;

- IMI2: 50% new participants in signed grants;

- FCH2: 24% new participants in signed grants.

To conclude, although the criteria for membership to the Joint Undertakings can be considered straightforward and open, the size of the financial "entry ticket" or (annual) fees influences substantially the type, size or composition of the entities that can actually become a member and hence have access to the full package of benefits that a JU offers to its members. Due to the substantial financial commitments that members have to make, SMEs, small universities and research organisations may face financial barriers in becoming a JU member.

The openness to membership may also impact the participation in the research programmes and the respective EU budget. For some Joint Undertakings certain research activities or topics are only open to members (CS2, SESAR, S2R) and/or a fixed percentage of the EU budget is reserved for the non-members (S2R, ECSEL).

In order to overcome some of the entry barriers and to demonstrate openness towards newcomers and players like SMEs, universities and research organisations the Joint Undertakings introduced a number of mechanisms and tools:

- Applying different levels of membership, implying different levels of commitment as described above (IMI2);

- Applying different minimum contributions and fees or other in kind contributions for different types of players (e.g. lower fees for SMEs) (SESAR, FCH2);

- Organising calls which are reserved only for non-members (SESAR, S2R) or calls which are open to both members and non-members (BBI, IMI2);

- Reserving a minimum volume or percentage of the EU budget for non-members (e.g S2R, CS2, ECSEL, SESAR).

When assessing the openness towards membership, it has to be noted that not all stakeholders and, in particular SMEs, are interested in or willing to become a member of the JU. Membership brings along a long term commitment and some degree of additional bureaucracy. They are only interested in participating in the research activities as a beneficiary through the open calls.

J.2.1.3. Openness of the contractual Public-Private Partnerships

In the case of the contractual Public-Private Partnerships, their calls are included in the Horizon 2020 Work Programme and applicants are then subject to the same rules of participation as in other parts of the research programme.

a) In addition, the associations constituting the private side are open to new members. In many industrial sectors and contractual Public-Private Partnerships, the associations work closely with related European Technology Platforms to develop their strategies

and roadmaps. These platforms are also open to new members and do not require a financial commitment, thus opening up participation in particular to SMEs.

b) The SME participation varies across contractual Public-Private Partnerships and ranges from 11% to above 35%. The SME participation is based on optional self-declaration and Commission validation. As such, the numbers may be underestimated.

c) The strong participation of non-members, as well as highly innovative and research intensive industrial players, shows that the priorities of the contractual Public-Private Partnerships are highly attractive to a vast range of stakeholders.

All contractual Public-Private Partnerships display an adequate and satisfactory level of participation in terms of the targeted stakeholders within each field. Furthermore, the number of members of contractual Public-Private Partnerships is growing, highlighting the positive trend in terms of the level of engagement of the stakeholder community within the contractual Public-Private Partnerships. Each contractual Public-Private Partnership aims to engage the full technological value chain comprising of researchers, academia, manufacturers and users.

Table 53 Participation in calls of the contractual Public-Private Partnerships

Contractual Public-Private Partnerships[42]	FoF	EeB	EGVI	SPIRE	5G	HPC[43]	Photonics[44]	Robotics[45]	Big data[46]
% of Non-members in the participations	77	75	67	73	71	62	80	58	78
% of Non-members in the EC funding	77	70	53	71	60	60	71	46	71
% of Industry in the participations	61	57	60	59	64	22	51	37	55
% of SMEs in the participations	>35	>33	>15	>27	>17	>11	>28	18	>25

Source: European Commission,based on inputs from contractual Public-Private Partnerships

J.2.2. Attracting the "best players"

Judging from the Joint Undertakings memberships and their top ranking beneficiaries, one can conclude that the Joint Undertakings are able to attract prominent players in their respective fields of activity not only in terms of size and position in the market but also in terms of R&D intensity and innovation potential. The table below presents some of the "best" players by Joint Undertaking and sector of activity.

[42] Data referring to the 2014 calls unless otherwise stated. The Big Data cPPP contractual arrangement only entered into force on 1 January 2015, that for Cybersecurity on 5 July 2016.
[43] Approximate figures coming from 29 projects that started in 2015.
[44] Calculated for all funded projects in 2014-2016. The non-membership participation and funding is based on the 100 members of the board of stakeholders of the PPP.
[45] Relating to 2014 - 2016 calls.
[46] Calculated over all projects selected in the Big Data call of 2016. Both 'full members' and "associate members' of the Big Data Value Association (BDVA) are counted as 'members', the rest as "non-members".

Table 54 Overview of "best" Players by Joint Undertaking and sector of activity

Joint Undertaking	Sectors/subsectors	Presence of "best" players?	Examples of attracted members/participants
SESAR	Air Traffic Management (ATM) industry, including air navigation service providers, ATM systems manufacturers, aircraft manufacturers, airports, research institutes	The members of SESAR are indeed prominent players, for some subsectors even the **only** players in the market	11 manufacturing industries including AIRBUS, Dassault Aviation, Leonardo Finmeccanica, ENAV, DFS, Indra, Honeywell Aerospace, THALES,... 16 Air Navigation Service providers 7 airports including Paris, Heathrow, München, Fraport, Schiphol and Zürich 3 Research Institutes: DLR, NLR, SINTEF
BBI	BBI covers a wide range of distinct and broadly defined economic sectors, dedicated to the sustainable utilisation of Europe's renewable biological resources for industrial processing into a wide array of bio-based products such as Chemicals, Materials, Food ingredients and feed, and potentially Energy.	All sectors covered by the BBI JU are also active participants in the calls of the JU. The top 25 BBI JU participants in calls 2014-2015 in terms of requested EU contribution include 16 organisations that have already participated in FP7/Horizon 2020 projects, indicating their scientific and technological excellence.	Borregaard, Clariant Produkte GmbH, Novamont SPA, COSUN, UPM-KYMMENE, METABOLIC EXPLORER, AVANTIUM CHEMICALS,...
S2R	The entire rail value chain: railway manufacturing and supply industries, railway operating community and the railway research community	The members of S2R (excl EU) include the leading railway system integrators, manufacturers, infrastructure managers and passenger and freight rail operators of Europe. The members show a balanced representation of actors of the entire value chain, including SMEs and academia. The same objective of balanced representation has also been achieved in the first calls launched in December 2015	Alstom SA, AERFITEC, AMADEUS SA, AZD Praha, Bombardier, Deutsche Bahn AG, INDRA, Siemens, SNCF, Talgo, …
IMI2	Pharmaceuticals & Biotechnology industries	The best and main players are being attracted to IMI2 JU projects, both Universities benefiting from EU funding as well as Industries contributing in-kind (members). The participants of the 15 first signed grants include 50% top 200 worldwide universities ("Multirank 2016"), 3 top 10 universities ("Shanghai Academic Ranking of World Universities 2016"), 9 out of the top 10 EU Pharmaceutical & Biotechnology companies for R&D investments (2015 EU Industrial R&D Investment Scoreboard) and all top 15 world pharmaceutical & biotechnology companies for R&D investments. Additionally all industries contributing in-kind are amongst the top 500 R&D investors worldwide (all sectors)	5 major EFPIA members which are leading the 7 strategic Governing Groups advising IMI2 are: Novartis, Johnson&Johnson - Janssen, Sanofi, AstraZeneca, GSK 3 top 10 universities ("Shanghai Academic Ranking of World Universities 2016") are participants in the 15 first signed grants: Massachusetts Institute of Technology (USA), University of Oxford (UK and University of Cambridge (UK)
CS2	European Aeronautics and aviation industry (including the research centres)	The Cleansky membership includes the main European aeronautics companies and the main European Aviation research centres.	AIRBUS, Dassault, Fraunhofer Gesellshaft, Alenia, Rolls-Royce, SAAB, Thales,...

Joint Undertaking	Sectors/subsectors	Presence of "best" players?	Examples of attracted members/participants
FCH2	Fuel cell and hydrogen energy technologies in fields of transport (cars, buses and refuelling infrastructure) and energy (hydrogen production and distribution, energy storage and stationary power generation).	FCH2 succeeded so far to attract some of the biggest players in the field: • top-ranking car manufacturers • top energy and utility companies High innovators both for transport as for energy are well presented.	Car manufacturers: VW, Daimler, Honda, BMW, Nissan, Renault, Toyota, Hyundai, … Energy and utility companies: Bosch, Siemens, GE, Engie, Solvay,…
ECSEL	Electronic components and systems industry Semiconductor and smart system manufacturing	Looking at the top 30 ECSEL participants and their position in the top R&D in Europe and worldwide, we can conclude ECSEL attracts the major players, counting among its participants many of the top-ranking semiconductor and top multinational engineering and electronics companies	ASML, Infineon, Fujitsu, Applied Materials, STMicroelectronics, NXP Semiconductors, ON Semi, KLA-Tencor, FEI, THALES, SOITEC, Carl Zeiss, Daimler, Robert Bosch, Philips and LAM Research

Source: Information provided by the thematic units responsible for the seven respective Joint Undertakings

J.2.3. Participation of SMEs

As already mentioned, the entry ticket system can hamper the participation of SMEs in the JU activities. However, depending on their respective industrial specificities and characteristics, the Joint Undertakings take particular measures to increase the presence of SMEs in their activities. These measures include, among others:

- Giving SMEs a representation in the Governing Board so they can contribute to the definition of the Work programme (FCH);
- Applying lower entry fees in order to facilitate SME membership;
- Simplifying the rules for participation;
- Reserving access to funding only to SMEs and familiar research organisations, in certain type of actions (BBI);
- Defining call topics that appeal to SMEs;
- Explaining the Intellectual Property (IP) issues;
- Communicating better the opportunities and the benefits involved in SME participation.

The SME shares in Horizon 2020 proposals as well as in the already signed Horizon 2020 grants are summarised in the table below. A distinction is made between their shares in terms of number of applications/ participations and their shares in terms of EU contribution. Additionally, the success rates for SMEs participating in JU proposals are presented. The figures presented in the table refer to the (open) calls launched by the Joint Undertakings. They do not include the shares of SMEs in research activities which are reserved for members only.

Overall, 23,3% of all JU applicants are SMEs with 34,62% success rate among all applicants and requesting 19,3% of the total requested EU contribution.

In signed grants, SMEs represent 19,5% of all JU beneficiaries. In terms of EU contribution, SMEs received 18,4% of the funding. This also implies that Joint Undertakings almost but not completely meet the overall target of 20% of the Horizon 2020 budget being earmarked for SMEs.

The SME participation rates in Joint Undertakings operating under Horizon 2020, especially in terms of EU funding, are above the overall Horizon 2020 average so far: 18,4% against 15,9% in terms of EU contribution granted to SMEs. In terms of participations however, The share of SMEs in the JU's (19,5%) is slightly lower than the overall Horizon 2020 share of 19,8%.

It is important to mention that significant disparities in SME shares between the Joint Undertakings can be observed. One important explanation for these disparities is the differences in the structure of the respective industries of the different Joint Undertakings and consequently the type, size and number of players active in them.

Another explanation is the barriers that still exist in some sectors that prevent SMEs to participate. Examples of existing barriers mentioned amongst others by IMI2 are:

- Competition with other programmes at national level and EU level, sometimes more attractive to SMEs such as the SME instrument and Eurostars;
- The rather short deadlines in calls in combination with a rather long time to grant from an SME perspective;
- SMEs lack awareness about opportunities under IMI2 JU;
- SMEs have relatively weak links with the rest of the innovation ecosystem (academia, pharmaceutical industries) thus facing problems to join the right consortia;
- SME participation is harder for health research projects to attract SMEs because it is a capital intensive sector compared with other Horizon 2020 funded sectors.
- SMEs feel weak in consortia negotiations, especially on IP issues: SMEs come in late to the (large) consortia, have limited financial and personnel means to allocate time consuming and hard negotiation;
- Topics which are too narrow defined for SMEs; they need more flexibility.

Table 55 SME shares in Horizon 2020 proposals and signed Horizon 2020 grants for Joint Undertakings

Horizon 2020 JU	Proposals				Signed Grants	
	% of SME applications	% of requested EU funding	SME Success rate in terms of application	SME Success rate in terms of EU contribution	% of SME participations	% of EU funding granted to SMEs
SESAR	11,3%	8,4%	34,6%	55,6%	6,6%	8,3%
BBI	30,2%	29,6%	31,2%	25,4%	35,6%	29,2%
S2R	24,3%	16,2%	49,1%	37,4%	18,9%	9,6%
IMI	14,8%	11,8%	17,5%	18,7%	8,2%	10,1%
CS2	25,%	14,7%	24,4%	26,0%	27,4%	24,9%
FCH	22,4%	24,9%	29,8%	30,6%	26,5%	27,6%
ECSEL	27,4%	15,8%	55,12%	28,5%	19,2%	9,3%
TOTAL JU	**23,3%**	**19,3%**	**34,6%**	**29,6%**	**19,6%**	**18,4%**

Source: CORDA data as of 2 February 2017, Source for IMI2 data: JU Programme Office, IMI

Concerning the cPPPs, the participation of industrial organisations in the calls is around 60% with the exception of HPC, and the SME participation ranges from 11% to 35%.

Table 56 Share of industry and SMEs in the participations in contractual Public-Private Partnerships

Contractual Public-Private Partnerships [47]	FoF	EeB	EGVI	SPIRE	5G	HPC[48]	Photonics[49]	Robotics[50]	Big data[51]
% of Industry in the participations	61	57	60	59	64	22	51	37	55
% of SMEs in the participations	>35	>33	>15	>27	>17	>11	>28	18	>25

Source: European Commission, based on inputs from contractual Public-Private Partnerships

J.3. Transparency

By assessing the transparency of a JU and its research programmes and activities we want to assess to which extend the Joint Undertakings have an open and non-discriminatory attitude towards the wider community of stakeholders. All interested stakeholders should be aware of the existence of the JU and its activities, that they should know where to get the information needed, whether they have free and easy access to this information and whether rules and procedures such as, for example, on how to participate in the JU's activities are clear to all. It also measures to what extend the Joint Undertakings guarantee Open Access to information and project results including publications and Intellectual Property Rights (IPRs) which is obligatory under Horizon 2020 and which dissemination activities the Joint Undertakings have put in place in order to communicate project results and facilitate further exploitation opportunities. A more recent element of open access is "the open access to data", i.e., to the underlying research data produced during the lifecycle of the EU funded projects.

J.3.1. Inclusiveness of a wide community of stakeholders and easy and effective access to information

All Joint Undertakings have put in place a wide range of mechanisms in order to enhance an open and non-discriminatory attitude towards the wider stakeholder community, including the general public. These mechanisms include typically a wide range of communication tools (electronic vs non electronic; interactive vs non-interactive) and other mechanisms like collaboration, coordination, consultation and advisory mechanisms.

The table below summarizes the most common communication channels used by the Joint Undertakings for communicating and distribution of information to the relevant stakeholders:

[47] Data referring to the 2014 calls (unless otherwise stated). The Big Data cPPP contractual arrangement only entered into force on 1 January 2015, that for Cybersecurity on 5 July 2016.
[48] Approximate figures coming from 29 projects that started in 2015.
[49] Calculated for all funded projects in 2014-2016. The non-membership participation and funding is based on the 100 members of the board of stakeholders of the PPP.
[50] Relating to 2014 - 2016 calls.
[51] Calculated over all projects selected in the Big Data call of 2016. Both 'full members' and "associate members' of the Big Data Value Association (BDVA) are counted as 'members', the rest as "non-members".

Table 57: Overview of communication channels used by the Joint Undertakings for communicating and distribution of information

Communication tools used by Joint Undertakings	Electronic	Non-electronic
Interactive	• Dedicated interactive space on the official website of the Joint Undertakings: e.g. project ideas box, partnering platform • Use of the participant portal of the European Commission for the launch of the calls • Social media: Twitter, YouTube video's, LinkedIn, Facebook page • Webinars to provide information on calls	• Organisation of or participation in events on International or national level: e.g. big conferences, participation in events organised by individual JU members at national level, organisation of annual stakeholder meeting/event reaching out a broad range of categories of stakeholders
Non-interactive	• Periodical newsletters • Official JU website including all public documents like Annual Work Programmes, Annual Activity Reports, tender notifications, …	• Articles, publications in specialised or non-specialised written press, interviews • Distribution of information leaflets, brochures, flyers

Source: Information provided by the thematic units responsible for the seven respective Joint Undertakings

Overall, the approach of the Joint Undertakings towards their respective stakeholders is open and inclusive as they consider them as partners rather than competitors. The Joint Undertakings are employing not only the more "classic" range of communication tools but also other mechanisms that aim at enhancing this inclusiveness and transparency such as:

- Close cooperation and coordination with other Joint Undertakings (e.g. SESAR and CS2);
- Advisory bodies which represent all interested stakeholders (e.g. Open advisory bodies of S2R, the 7 Strategic Governing Groups at IMI2);
- Separate Memoranda of Understanding (MoUs) between the JU and European regions seeking synergies with other programmes (e.g. ESIF) (BBI);
- Distributing "seals of excellence" labels to proposals which were above threshold but could not be funded. Doing so, the proposal can maybe be picked up more easily by other support programmes (CS2).

The process involving industrial stakeholders within cPPPs is mainly based on publicly available strategic research agendas and roadmaps. There are also Partnership Boards between Commission services (DG RTD or DG CNECT) and the industrial association to ensure relevant needs and innovation trends are reflected in the programme. In addition, the Programme Committee configurations with Member State representatives for the various parts of Horizon 2020 give direct technical input on work programmes and are formally invited to support the work programme on the basis of a vote. Thus, national administrations have a major say on the contents of the work programme.

J.3.2. Open Access and Dissemination of project results

In order to communicate on and distribute project results to an as large as possible community, the Joint Undertakings use a variety of tools, very similar to the above mentioned communication tools:

- A dedicated section on the JU's website for dissemination of project results and publishable project summaries (SESAR, BBI, CS2). FCH2 for example has a fully searchable project database, accessible to all;
- Scientific Publications and Articles related to project results;
- Publication of a book summarizing important project results (ECSEL, CS1, FCH2 Annual Programme Review Report);
- Social Media such as Twitter, Facebook, YouTube to communicate and demonstrate project results;
- Organisation of and participation in events aiming at the distribution of project results (conferences, project demonstrations).

However, in order to achieve full Open Access, not only the Joint Undertakings but all beneficiaries should be aware and convinced of the benefits of an open access policy and take initiatives in order to make project results available to a wider public. Several Joint Undertakings therefore actively seek to promote the Open Access philosophy to their beneficiaries by regularly informing beneficiaries on open access and the common support services provided or by giving support and advice to beneficiaries on their dissemination activities through for example validating their project dissemination products.

A step beyond the Open access to project results including publications and Intellectual Property Rights (IPRs), is the **Open Access to Data**. During the reference period, the open access to research data was not yet an obligation and was done on a voluntary basis by the project beneficiaries. In general Joint Undertakings try to inform and raise the awareness of their beneficiaries on the issue and on the existing common support services and existing IT tools provided to facilitate this access to produced data sets. However, few beneficiaries so far seem to be convinced to take the step towards open access to data, and some beneficiaries face difficulties in sustaining important resources (including data) generated by the project and of the added value for the broader community. IMI2 JU plans to launch a special call for proposals at the end of July 2017 in order to ensure optimal exploitation of the key results from IMI JU projects that have finished or are near to finish. This call will also aim at facilitating access to and sustainability of key data sets, biological samples, cohorts, tools and models produced during the implementation of the projects.

All the cPPPs are fully integrated in the Horizon 2020 dissemination platforms. Moreover, the associations organise public events, forums, publications and announcements to further the added value and impact of individual projects. Open access to data has been introduced in the cPPPs: all new projects are by default in the programme, unless they opt-out with a justification.

J.4. Effectiveness

Due to the late adoption of the Council Regulations establishing the Joint Undertakings only few calls were launched in 2014. 2015 was the first year of actual implementation of the JU calls launched under Horizon 2020. More specifically, as of February 2017, 35 JU calls were launched and concluded. A total of 1677 eligible proposals involving 11719 applicants were submitted in response to these calls. Following evaluation and selection, 473 proposals (28%) were retained for funding with a total EU financial contribution amounting EUR 2.162,1 million. 351 grants totalling EUR 1.384,8 million of EU funding were already signed. Among the successful applicants, 15,4% were HES, 59,8% PRC and 18,7% REC. SME participation in selected proposals is 19,5 %.

The assessments on the progress made towards meeting the objectives (section 4.2) and the leverage effects (section 4.3), are based on partial data coming from a limited number of ongoing projects and/or on estimates based on forecasted project outputs.

J.4.1. Progress made towards meeting the objectives

All Joint Undertakings have included in their legal base a set of JU-specific objectives which they have to meet by the end of the programme period in addition to a set of common Horizon 2020 objectives. The progress towards achieving these objectives is measured by a set of Key Performance Indicators (KPIs) common to all Joint Undertakings[52] and a set of JU-specific KPIs[53]. These sets of KPIs are regularly monitored and reported on in the Annual Activity Reports of the Joint Undertakings.

Overall, on the basis of early and partial data available and on the basis of expected results of the already funded projects (no project reports are yet available), the Joint Undertakings are on track in terms of carrying out their planned activities, achieving their specific objectives and ultimately contributing to the overall Horizon 2020 objectives.

The table below gives an overview of the JU-specific KPIs per JU with a qualitative indication of their progress made so far based on the limited quantitative data available. A detailed quantitative overview of the KPI's can be found in the annex.

[52] Based on Annex II (PERFORMANCE INDICATORS) to Council Decision 2013/743/EU).
[53] With the exception of SESAR JU that is not subjected to a predefined set of KPIs.

Table 58 Overview of the JU specific KPIs

Objective	Key Performance Indicator	Qualitative assessment
IMI2		
IMI2's new calls for proposals support the implementation of the research priorities as set out in the Strategic Research Agenda and updated by the Governing Board	IMI2 KPI 1: Target number of priority areas defined in IMI2 JU's Annual Scientific Priorities for year n that are addressed by IMI's calls for proposals launched in year n	☺
IMI projects effectively deliver and disseminate high quality outputs[54]	KPI 3: Target estimated average number of IMI publications3 per EUR10 million of total IMI funding requested by the projects	☺☺
	KPI 4: Target to measure extent to which IMI's average impact factor of journals in which IMI publications have been published is higher than the EU average	☺☺
	KPI 5: Target to measure extent to which the citation impact of IMI publications is higher than the EU average	☺☺
	KPI 6: Target to measure the extent to which IMIs bibliometric indicators compare with those of other international funding bodies. • KPI 6.1: Target to compare the citation impact of IMI publications with the one of other international funding bodies • KPI 6.2: Target to compare the percentage of highly cited papers of IMI programme with the one of other international funding bodies	☺☺ ☺☺
IMI projects translate key scientific discoveries into clinical practice and regulatory framework	KPI 7: Target to measure the number of scientific advice and qualified opinions initiated by the IMI projects at the EMA and FDA	☺☺
IMI projects increase EU competitiveness and foster innovation	KPI 10: Target to measure, on average, the number of patent applications filed and/or awarded to those IMI projects which have been reimbursed at least for the third year of implementation	☺☺
	KPI 12: Target to measure the number of spin-off companies or foundations created as a result of IMI projects	☺☺
BBI		
Private funding balancing public funding in all types of projects	KPI 1: in cash contribution committed[55]	☹[56]
Appropriate balance between research, innovation and deployment	KPI 2: Balance (%) of R&D, demonstration and supporting projects	☺
New cross-sector interconnections in biobased economy	KPI 3: Number of cross-sector-interconnections in BBI projects	☺
New bio-based value chains	KPI 4: New bio-based value chains realised	☺☺

[54] The listed KPIs belong to IMI2. However the underlying figures currently provided in AAR2015 and soon 2016, relate to the outcomes of IMI JU projects (as outputs from IMI2 projects are still very limited).
[55] The term "in cash contribution" refers to the financial contribution mentioned in Article 12(3)(b) corroborated with Article 12(4) of the BBI JU Statutes annexed to the BBI Regulation.
[56] The seemingly little progress with regard to the in cash contribution is related to the matter of legal interpretation of the Council Regulation establishing the BBI JU. The search for a solution is currently ongoing including a possible amendment of the Council Regulation.

Objective	Key Performance Indicator	Qualitative assessment
New building blocks based on biomass of European origin	KPI 5: Number of new bio-based building blocks	☺☺
New bio-based materials	KPI 6:Number of new bio-based materials	☺
New "consumer" products based on bio-based chemicals and materials	KPI 7: Number of new bio-based consumer products	☺
Flagship bio refinery projects	KPI 8:Number of flagship biorefinery plants started based on BBI demonstration projects	☺☺
Shift2Rail		
No data available yet[57]		
CS2		
Reducing at the global fleet level, CO2 emission by 26%, NOx by 60% and noise area by 50% to 75%.	Reduction of CO2	☺
	Reduction of NOx	☺
	Reduction of Noise area	☺
FCH2		
	KPI 1: Share of the fund allocated to the following research activities: - renewable energy - end-user energy efficiency - smart grids - storage	 ☺ ☺ ☺ ☹
	KPI 2: Demonstrator projects hosted in MSs and regions benefiting from European Structural and Investment Funds	☺
ECSEL		
Programme Magnitude	KPI 1: RD&I effort in EUR (eligible costs)	☹
Funding Magnitude	KPI 2: Public contributions assigned to ECSEL projects	☹
Extending the Community with regards to country participation	KPI 5: Number of additional countries on top of the supporting countries	☺☺
SESAR[58]		
Cost Efficiency	Gate-to-Gate direct ANS cost per flight	☺
Operational efficiency	Fuel burn per flight	☺
	Flight time per flight	☺
Capacity	Departure delay	☺
	Additional flights at congested airports	☺
	Network throughout additional flights	☺
Environment	CO2 Emissions	☺
Safety	Accidents with ATM contribution	☺

☹: Little progress; ☺: On track; ☺☺: Exceeding targets

Source: based on data provided by thematic units responsible for the seven Joint Undertakings

[57] S2R is new and autonomous only as from May 2016, hence the lack of data on the KPIs.

[58]Please note that the KPIs listed in the table are not the KPIs included in the legal base of SESAR. The main performance criterion for the SESAR JU is how effective it has been in defining, producing and deploying in a coordinated way new innovative and harmonised ATM solutions that will improve the performance of European ATM system. This can only be measured once the solutions have been deployed and are operating (towards 2015). In the context of the objectives of the European ATM Master plan, SESAR developed a set of KPIs, as listed in the table, which measure the contribution of all SESAR solutions developed and validated by SESAR until 2015 compared to a baseline "no-SESAR" year (2005).

The contractual arrangements with the cPPPs build on industrial roadmaps with ambitious goals and KPIs related to technological achievements as well as market needs or e.g. in the manufacturing and processing industries the impact on energy or water consumption, or waste reduction. On track to achieve their objectives, the projects typically address industrially relevant demonstrators and pilots to validate technology developments and integration at higher technology readiness levels. Among the industrial commitments established for the cPPPs, they have to report on the development of new types of high-skilled jobs and of new curricula. The projects within the NMBP cPPPs have reported a wide range of results regarding new types of new high-skilled jobs, the highest average being in FoF (Factories of the Future), with 3.5 new jobs profiles per project. EeB (Energy-efficient Buildings) projects currently report 0.8 jobs per project, with 1.6 in FP7. Positive impacts on job creation and skills have also resulted from EGVI. EGVI also contributed to save time in performing research activities while structuring the whole value chain and avoiding duplication of efforts. Several similar initiatives have been implemented at national level, testifying to the benefit of this specific funding scheme.

J.4.2. European added value and leverage effects

The significance of the EU cooperation with industry in the context of a public-partnership in strategic areas is recognised in all seven Joint Undertakings operating under Horizon 2020. The Joint Undertakings are concrete examples of the European Union's efforts towards strengthening its competitiveness through scientific excellence, industry led research, openness and innovation. As an illustration of the significance of the Joint Undertakings it is worth mentioning the White Paper on the "21st Century Cures initiative"[59], issued in January 2015 by the US House of Representatives. Launched by the House's Energy and Commerce Committee, it studied what steps can be taken to accelerate the discovery, development and delivery of cures. It recognises that what is missing in the USA is a public-private partnership that would bring together the various stakeholders and would need to be "modelled after the Innovative Medicines Initiative".

A tangible metric for assessing the EU added value is the "leverage effect", defined as the total amount of funds leveraged through an Art. 187 initiative, including additional activities, divided by the respective EU contribution to this initiative. The Table below summarizes the leverage effect for the Joint Undertakings operating under FP7 and Horizon 2020.

For the Joint Undertakings operating under FP7 the target for the leverage effect was to achieve parity, i.e. that the contributions from the private side matched the ones of the EU. As the table shows, this target has been largely achieved. In the case of the FCH in particular, the target was slightly exceeded which can be considered as a success in a nascent sector.

For the data referring to Horizon 2020 the following clarifications should be noted:

- The Council Regulation establishing each JU sets out the total minimum contributions which members other than the EU (including members' constituent entities and

[59] https://energycommerce.house.gov/sites/republicans.energycommerce.house.gov/files/files/114/FINAL%20Cures%20Discussion%20Document%20White%20Paper.pdf .

affiliated entities and Associated Partners and their constituent entities and affiliated entities) have to provide to the JU throughout its lifespan[60] .

- The Council Regulations make a distinction between the required level of financial contribution (aiming to cover mainly the administrative costs of the JU) and the minimum amount of in-kind contribution. The in-kind contribution (IK) is calculated on the basis of costs incurred by members other than the EU in implementing additional activities and, also, in implementing indirect actions. Declared costs in implementing additional activities not included in the workplan but contributing to the objectives of the Joint Undertakings, can be considered as IKAA. The costs incurred in implementing indirect actions can be considered as IK after deduction of the contribution of the JU and any other Union contribution to those costs. They constitute IK to the operational costs of the JU (IKOP).

- Theoretically, only certified "in-kind contributions" should be taken into account in the calculation of the leverage, as requested by the Council regulation. As a consequence, while the figures provided for the whole period of Horizon 2020 are the legally foreseen ones, the figures provided for the calls launched so far take into account the "committed" IKOP as only few amounts of IKOP are certified so far.

- In order to have a common approach for the 7 Joint Undertakings for the calculation of the leverage effect achieved so far and taking into account the above points, the following formula was applied:

Total leverage = Operational leverage + Additional leverage

Where:

$$\textbf{Operational leverage} = \frac{\sum [\text{IKOP of private partners in signed GA (+Private FC)}]}{\sum [\text{EU contribution committed in the signed GA}]}$$

And for CS2, S2R, FCH and BBI:

$$\textbf{Additional leverage} = \frac{\sum [\text{IKAA of members }]}{\sum [\text{EU contribution committed in the signed GA}]}$$

Definitions:

- GA = Grant Agreement of an indirect action receiving an EC contribution
- IKOP = In-kind contributions for operational costs in an indirect action (see above).
- Private FC = Private Financial Contribution (when allowed in the Regulation).
- IKAA = Certified In-kind contributions of members for Additional activities.

The first calculations, based on the above formula and using the figures (committed amounts) reported in the Annual Activity Reports 2016 of the Joint Undertakings[61], demonstrate that the Joint Undertakings are well on track in achieving and, in some cases, exceeding the

[60] In the case of SESAR JU, the Council Regulation ((EU) No 721/2014 of 16 June 2014) does not set out the total minimum contributions which members other than the EU have to provide to the JU.
[61] Except for FCH, CORDA data (for calls 2014-2016) were used.

legally minimum foreseen leverage effect. As the number of signed grant agreements increases, a more detailed reporting on the leverage effect will be possible. It has to be stressed, however, that the overall leverage effect can only be assessed at the end of the programme.

A more in-depth evaluation of Joint Undertakings will be available October 2017.

The added value of cPPPs at the EU level derives from trans-national cooperation, supporting bridging the valley of death and, most significantly, creating a critical mass of excellence that can compete globally. Considering the large investments needed, Europe needs to build on complementary strengths. Intervention at EU level allows getting the major stakeholders and industrial players along the whole R&I value chain into the process of actively defining the roadmap and commit to the implementation. In this sense, there is significant added value of implementing Horizon 2020 funding through the use of contractual cPPPs.

In the case of the cPPPs under the NMBP thematic area, the leverage factors range between 1.5 and 3.5, on the basis of a methodology accounting only for current investments and discounting future investments. In EGVI projects, on the basis of 2014 estimates, the additional private investments are expected to lead to a leverage factor of 3. In the Photonics PPP, the industrial investment has been estimated as being 4.3. This is based on information received from 80 companies for their investment in 2014-2015. For the other cPPPs, given their recent start, it is too early to give figures based on project results. However, there are no indications that the leverage factor are deviating from the commitment laid out in the contractual arrangements. As with the Joint Undertakings, the overall leverage effect of each cPPP can only be assessed beyond the end of the programme.

Table 59 Leverage effects by Joint Undertakings under FP7 and Horizon 2020

Data on leverage effect for the Joint Undertakings under FP7 and Horizon 2020								
		FCH2	**CS2**	**IMI2**	**BBI**	**ECSEL**	**S2R**	**SESAR**
Horizon 2020 (over the whole period 2014-2020, according to the legal act)	Minimum in-kind contribution (in EUR million)	285	2 193.75	1 425	1 755	none	457	783.75[62]
	Total minimum contribution from members other than the EU Art.4(1) (in EUR million)	380	2 193.75	1 425	2 730	1 170.0[63] 1 657.5 (Art.4(2))	470 (of which financial: 13)	825 (of which financial: 41.25)
	Maximum EU contribution Art. 3(1) (in EUR million)	665	1 755	1 425[64]	975	1 184.874	450	585
	Target Leverage effect (Targeted **partial** leverage in the Council Regulation (only considering the contributions of Members other than the EU and not those of other project	**0.67**	**1.25**	**1**	**2.8**	**2.4**[65] **1,4**[66]	**1.04**[67]	**2**
Horizon 2020 – Estimated Leverage effect for	EU contribution (in EUR million) (as committed, source: AAR 2016)	285,99	**214,01**	275,8	414,1	463,4	88	235,8
	IKOP (H2020 project costs – EU funding; in EUR million)	279,28	**131,58**	263,5	180,39	1030	79,4	241,4

[62] This is the amount to which the members committed in the Membership Agreement signed in the context of Horizon 2020.
[63] The ECSEL Participating States shall make a financial contribution to the operational costs of the ECSEL Joint Undertaking that is commensurate with the Union's financial contribution of at least EUR 1 170 000 000.
[64] An additional amount of EUR 213 million will be contributed by the EU in order to match additional contributions from other Members, Associated Partners, or from their constituent entities or their affiliated entities, if there are any.
[65] COUNCIL REGULATION No 561/2014 (21) - In assessing the overall impact of ECSEL, investments from all legal entities other than the Union and the states participating in ECSEL are expected to amount to at least EUR 2 340 000 000 – this results in a leverage effect of 3.
[66] Targeted leverage on EU funding only (excluding other public funding, i.e. national funding).
[67] It is important to note that this figure is based on the ratio between the entire EU contribution to the S2R JU and the contribution of the JU private members. However, only a maximum of 70% of the EU contribution is to be targeted to the JU private members in accordance with the S2R Regulation. This means that in practice, the effective leverage effect of the EU budget spent with the JU members reaches 1.49.

	(source: AAR 2016)							
	IKAA certified (in EUR million)	**186,42**	**199,16**	**/**	**294,8**	**/**	/	/
	Leverage effect (based on committed amounts as reported in AARs 2016)	**1,63**	**1,55**	**0,96**	**1,15**	**2,17 (on EU funding only)**	0,90	1,02
FP7	Contribution from members other than the EU (in EUR million)	488.9	550.9	954.4[68]	Not applicable	Not applicable	Not applicable	1 300 (from FP7 and TEN-T)
	EU contribution (in EUR million)	450	550.9	965.7				700
	Leverage effect	**1.09** (target was slightly exceeded)	**1** (as foreseen in FP7)	0.99				**1.85** (for SESAR 1)

Source: Data provided by the Thematic Units responsible for the seven Joint Undertakings

[68] Commitments

J.5. Overview Joint Undertakings Key Performance Indicators

J.5.1. BBI

Little information is available on the concrete outcome of the on-going projects in terms of achieving the specific BBI JU KPIs as the majority of the data will be provided by BBI JU beneficiaries through project reporting later on.

Table 60: Key Performance Indicators for BBI

Key Performance Indicator	Objective	Target at the End of Horizon 2020	Outcome (available info calls 2014 and 20151.2 and AWP 2016)	AAR2015 Estimated contribution of 10 projects call 2014	AWP2015 Contribution to 2020 targets	AWP2016 Contribution to 2020 targets
PPP leverage: **- in cash contribution committed**	Private funding balancing public funding in in all types of projects	At least EUR 182.5 million financial contribution to the operational costs	EUR 0.75 million in cash at programme level in 2016. EUR 2.94 million in projects of the 2014 and 2015.2 calls	-	-	-
Balance (%) of R&D, demonstration and supporting projects	Reach an appropriate balance between research, innovation and deployment	On programme level reach a distribution of 30%, 30%, 34,75%, 3,25% for RIAs, IA-Demo, IA-Flagship, CSAs	The distribution so far, considering the projects of the 2014 and 2015 calls and the topics of the 2016 call, is: 24,2%, 35,8%, 36,5%, 1,5%.	-	-	-
N° of new cross-sector interconnections in BBI projects	New cross-sector interconnections in bio-based economy	36 by 2020	21-22	> 8	2-3	11
New bio-based value chains realised	New bio-based value chains	10 by 2020	21	10	3	8
Number of new bio-based building blocks	New building blocks based on biomass of European origin	5 by 2020 further increasing to 10 in 2030	17-18	6-7	3	8
Number of new bio-based materials	New bio-based materials	50 by 2020	29-30	5-6	8	16
Number of new bio-based 'consumer' products	New 'consumer' products based on bio-based chemicals and materials	30 by 2020	14	4	7	3

Number of flagship biorefinery plants started based on BBI demonstration projects	Flagship biorefinery projects	5 by 2020	7	1	3-5	3

Source: AAR BBI 2015, AWP BBI 2015 and 2016

J.5.2. Shift2Rail

The S2R JU was formally established in July 2014 and its first projects started summer 2016. Hence, we cannot report on progress towards meeting the KPIs at this moment.

J.5.3. IMI2

Figures on the IMI2 KPIs refer to the outcomes of IMI projects. Based on these outcomes, IMI is on track in achieving its objectives.

Table 61 Key Performance Indicators for IMI2

Key Performance Indicator	Objective	Qualitative assessment
IMI2 KPI 1: Target number of priority areas defined in IMI2 JU's Annual Scientific **Priorities for year n that are addressed by IMI's calls for proposals launched in year n**	IMI2's new calls for proposals support the implementation of the research priorities as set out in the Strategic Research Agenda and updated by the Governing Board	all scientific priorities identified in the Annual Work Plans are covered
KPI 3: Target estimated average number of IMI publications 3 per EUR10 million of total IMI funding requested by the projects	IMI projects effectively deliver and disseminate high quality outputs[69]	62 publications per €10 Million of EU contribution reported and accepted
KPI 4: Target to measure extent to which IMI's average impact factor of journals in which IMI publications have been published is higher than the EU average		large share of the publications is made of highly cited articles,
KPI 5: Target to measure extent to which the citation impact of IMI publications is higher than the EU average		the citation impact is significantly above the EU and worldwide average
KPI 6: Target to measure the extent to which IMIs bibliometric indicators compare with those of other international funding bodies. • **KPI 6.1: Target to compare the citation impact of IMI publications with the one of other international funding bodies**		Above target Above target

[69] The listed KPIs belong to IMI2. However the underlying figures currently provided in AAR2015 and soon in AAR 2016, relate to the outcomes of IMI JU projects, as outputs from IMI2 projects are still very limited.

Key Performance Indicator	Objective	Qualitative assessment
• **KPI 6.2: Target to compare the percentage of highly cited papers of IMI programme with the one of other international funding bodies**		
KPI 7: Target to measure the number of scientific advice and qualified opinions initiated by the IMI projects at the EMA and FDA	IMI projects translate key scientific discoveries into clinical practice and regulatory framework	10 in 2014 and 8 in 2015 = 18 (above target)
KPI 10: Target to measure, on average, the number of patent applications filed and/or awarded to those IMI projects which have been reimbursed at least for the third year of implementation	IMI projects increase EU competitiveness and foster innovation	21 patent applications have been filed until 31 December 2015, mostly by public participants in IMI consortia, such as academia, SMEs, and research organizations
KPI 12: Target to measure the number of spin-off companies or foundations created as a result of IMI projects		33% of finalized projects had created spin-off companies or foundations as a result of IMI JU projects

Source: AAR IMI2 - 2015

J.5.4. CS2

In order to assess the environmental impact of the Clean Sky technologies once integrated into a conceptual aircraft, a Technology Evaluator body is set up. Figures in this table refer to the outcomes of CS as evaluated by the Technology Evaluator (TE). The Horizon 2020 Clean Sky 2 programme also contains a technology evaluator. However, no projects have yet been finalised.

Table 62 Key Performance Indicators for Clean Sky 2

Clean Sky objectives at global feet level	CO2 Δ	-26%				
	NOx Δ	-60%				
	Noise Δ	-50% to -75%				
Assessment	**Metric**	**Mainliners and Regional fleet**			**Business fleet**	**Rotorcraft fleet**
Results from the TE airport level assessment	CO2 Δ	-30% to -40%			Not available	-10% to -20%
	NOx Δ	-35% to -45%			Not available	-30% to -64%
	Noise area Δ	-45% to -70%			Not available	Up to -75%
Results from the TE global fleet level assessment	CO2 Δ	-32%			20%	-15%
	NOx Δ	-41%			28%	
Vehicle	**Metric**	**Long range**	**Short Medium range**	**Regional**	**Business aircraft**	**Rotorcraft**
Results from the TE mission level assessment	CO2 Δ	-19%	-41%	Up to -27%	Up to -32%	Up to -58%
	NOx Δ	-39%	-42%	Up to -46%	Up to -32%	Up to -64%
	Noise area Δ	-67%	-68%	Up to -86%	Up to -50%	over -50%
	Noise Δ	-5.7 dB	-5.1 dB	Up to -15.7 dB	-5.5 dB	Not available

Source: Technology Evaluator (TE) results, 2015

J.5.5. FCH

Regulation 559/2014 lists 5 specific objectives for the FCH 2 JU, all of which have been addressed during the **first 3 calls** under Horizon 2020:

Table 63: 5 Specific Objectives of FCH

Specific objective	Share of the funds from calls 2014-16 allocated to the following research activities
Reduction of the production costs of FC for transport applications, while increasing their lifespan	51,73%
Increase the efficiency and durability of FC for power production while reducing cost	25,59%
Increase the energy efficiency of H2 production from water electrolysis and renewable sources	7,30%
H2 as storage medium for electricity from renewable energy sources	13,55%
Reduction of critical raw materials	0,17%
Cross-support actions (awareness, education, regulatory issues etc)	1,65%

Source: FCH Calls information 2014-2016

As regards the specific KPI's for FCH, the amount of data available from Horizon 2020 is currently limited to the projects resulting from the Call 2014 which have now started work:

Table 64: FCH' specific Key Performance Indicators

Specific KPI's	Reference (FP7 estimated average distribution)	Share of the funds from calls 2014-16 allocated to the following research activities
Renewable energy:	10%	8%
End user energy-efficiency:	37%	30%
Smart grids:	1%	11%
Storage:	3%	1%
Specific KPI	**Qualitative assessment**	
KPI 2: Demonstrator projects hosted in MSs and regions benefiting from European Structural and Investment Funds	The FCH 2 JU is making good progress towards the KPI of having demonstrator projects hosted in MS and regions benefiting from European Structural and Investment Funds: the project HyBalance is benefiting from Danish co-funding, and the project JIVE on fuel cell bus deployment (currently under GA negotiation) will use 5 additional funding schemes in parallel with that of the FCH 2 JU.	

Source: Estimated data based on call information for calls 2014-2016

J.5.6. ECSEL

Results on the KPIs are based on projects resulting from the 2014-15 calls (25 projects)

Table 65 ECSEL specific key performance indicators

Objective	Specific KPI	% of 2020 target reached
Programme Magnitude	KPI 1: RD&I Effort in € (eligible costs)	28%
Funding Magnitude	KPI 2: Public Contributions Assigned to ECSEL Projects	23%
Extending the Community with regards to country participation	KPI 5: Number of additional countries on top of the supporting countries	87%

Source: ECSEL Project data (25 projects) selected in 2014-2015 calls

It is too early to comment on the outcome of ECSEL. As a proxy, outputs cumulated under the preceding Joint Undertakings, ARTEMIS and ENIAC, give a good indication as to what can be expected. The 76 ARTEMIS or ENIAC projects that came to completion by the end of 2015 generated 237 patents, 20 trade secrets, 13 trademarks, 1382 exploitable foreground intellectual property items and 3841 scientific publications.

J.5.7. SESAR

The KPIs listed in the table are not the KPIs included in the legal basis of SESAR. The main performance criterion for the SESAR JU is how effective it has been in defining, producing and deploying in a coordinated way new innovative and harmonised ATM solutions that will improve the performance of European ATM system. This can only be measured once the solutions have been deployed and are operating (towards 2015). In the context of the objectives of the European ATM Master plan, SESAR developed a set of KPIs, as listed in the table, which measure the contribution of all SESAR solutions developed and validated by SESAR until 2015 compared to a baseline "no-SESAR" year (2005).

Table 66 SESAR key performance indicators in the context of the objectives of the ATM Master Plan

REF	Key Performance Area in SESAR2020 (A)	Key Performance Indicator in SESAR2020(B)	2014 Performance v 2005 Baseline (C)	2015 Performance v 2005 Baseline (D)	Performance 2015 v 2014
43	Cost efficiency: ANS productivity	Gate-to-gate direct ANS cost per flight	-3.56%	-3.82%	⇔
44	Operational efficiency	Fuel Burn per flight	-1.45%	-2.26%	↗
		Flight time per flight	-1.26%	-1.48%	↗
45	Capacity	Departure delay	-16.5%	-19.1%	n/a
		Additional flights at congested airports	12.10%	11.02%	⇔
		Network throughput additional flights	24.22%	33.41%	↗
46	Environment	CO2 emissions	-1.45%	-2.26%	↗
47	Safety	Accidents with ATM contribution	-40%	-40%	n/a

Source: SESAR AAR, 2015

K. FURTHER INFORMATION ON THE EUROPEAN INSTITUTE OF INNOVATION AND TECHNOLOGY (EIT)

K.1. Overview

The European Institute of Innovation and Technology's (EIT) overall mission is to contribute to sustainable European economic growth and competitiveness by reinforcing the innovation capacity of the Member States and the Union. As part of Horizon 2020, the EIT's specific objective is to integrate the knowledge triangle of higher education, research and innovation and thus to reinforce the Union's innovation capacity and address societal challenges. The EIT is designed to achieve these goals primarily through its Knowledge and Innovation Communities (KICs), which operate in specific societal challenges. In the period covered by the Horizon 2020 interim evaluation, KICs operated in the fields of climate change, health, energy, raw materials and the digital field.

K.2. Rationale

The long-term strategy of the EIT has been set up in the Strategic Innovation Agenda (SIA) 2014-2020, adopted by the European Parliament and the Council, on the basis of a Commission proposal. The SIA is a policy document outlining the priority fields of the EIT for future, including an overview of the planned activities for a period of seven years, in particular the priority fields for the EIT Knowledge and Innovation Communities (KICs) and their selection and designation.

The Horizon 2020 Regulation identified specific structural weaknesses in the EU's innovation capacity on which the EIT would focus its contributions. The EU has not been using a sufficient globally competitive scale of resources, including human resources, in poles of excellence, and has had, more widely, a relatively poor record in talent attraction and retention. The levels of entrepreneurial activity and mind-set across the EU have been low, which contributed to the under-utilisation of existing research strengths for creating economic or social value and the lack of research results brought to the market. Finally, there has been an excessive number of barriers to collaboration within the knowledge triangle of higher education, research and innovation on a European level, which contributed to low leverage of private investment in research and development.

K.3. Implementation

The EIT seeks to achieve its mission through a distributed network of thematically focussed Knowledge and Innovation Communities (KICs), which bring together higher education institutions, research organisations, industry and other stakeholders to create critical mass needed to stimulate innovation.

The KICs are thematically aligned with the Horizon 2020 societal challenges. There are currently five KICs, as presented in the table below.

Table 67 Knowledge and Innovation Communities of the European Institute of Innovation and Technology

Wave 1 KICs – established in 2010	Wave 2 KICs – established in 2015

1 Climate-KIC: addressing climate change mitigation and adaptation 2 EIT Digital: addressing Information and Communication Technologies 3 KIC InnoEnergy: addressing sustainable energy	4 EIT Health: addressing healthy living and active ageing; and 5 EIT Raw Materials: addressing sustainable exploration, extraction, processing, recycling and substitution

Another KIC has been recently been set-up (EIT Food in the field of sustainable supply chain i.e. from resources to consumers) and one is in the pipeline in 2018 (EIT Urban Mobility in improved mobility solutions), pending a positive outcome from the EIT review exercise. The call on a KIC on added-value manufacturing (launched in 2016) did not award any proposals.

The KICs are independent legal entities, structured around a partnership of core partners representing all sides of the "knowledge triangle". Each KIC also includes a large number of affiliated, associated or network partners that contribute to the KIC's activities, but do not participate directly in its governance. KICs apply an 'open' entry and exit approach with regard to the affiliated partners and so the wider KIC community is a 'living' network with evolving membership.

Each KIC is also organised around a small number of co-location centres (CLCs) which are intended to act as geographical hubs for the practical integration of the knowledge triangle. The CLCs have substantial autonomy and as such, are organised and structured according to their respective national and regional innovation context to include partners from research, education, business and at times, from local authorities. The CLCs build on the existing labs, offices or campuses of some of a KICs' core partners. They bring together, at a local or regional level, the education, research and industry partnerships of the KIC, thus permitting face-to-face contact and geographical proximity.

Each KIC (in conjunction with its CLCs) has to develop and deliver a portfolio of activities in three areas:

- *Research/ Innovation projects*: the KICs link universities/ research institutes and business through their innovation project portfolios. Innovation projects comprise demonstrators, pilots, proofs of concept etc. All innovation projects are required to develop clearly identified products that address a specific business opportunity that is supported by a market study.

- *Education:* a set of post-graduate (MSc/ PhD) programmes and executive/ professional development courses characterised by a multidisciplinary approach, significant business involvement in the development of learning outcomes and often, trans-national mobility.

- *Business Creation and support activities:* a range of business support services, often badged as a start-up accelerator scheme, to help entrepreneurs translate their ideas into successful businesses. These services focus on areas such as support for technology, market assessment, access to human resources and, last but not least, seed and venture capital through specific KIC innovation funds.

Additionally, the KICs/ CLCs engage in a range of outreach, communication and dissemination activities such as organisation of events, publication of material (e.g. success stories, newsletters etc.), networking etc.

More recently, the EIT has developed the EIT Regional Innovation Scheme (EIT RIS) which is a structured outreach scheme to support the integration of the Knowledge Triangle and increase the innovation capacity in areas and regions in Europe not directly benefitting from the KICs and their CLCs.

The **Performance Measurement System** (PMS) is a comprehensive system for continuous monitoring used by the EIT to keep track of the results achieved at all governance levels. This system encompasses all related EIT activities ranging from annual Key Performance Indicators (KPIs) data collection, continuous monitoring, the contribution of EIT to Horizon 2020, its methodologies to assess impact and the EIT's monitoring of its own operational performance in terms of effectiveness, efficiency and impact. In particular, the performance measurement is carried out at the following four levels:

- **KIC level**: monitoring of a KIC on the basis of its individual targets and Key Performance Indicators (KPIs) stipulated in a KIC business plan. These KIC-specific indicators are defined by the KICs based on their internal strategies and organisation as well as to define their activities and mobilise the resources needed.

- **Cross-KIC level:** The EIT monitoring of all KICs, which will focus on a series of EIT's strategic objectives, as identified in the EIT Scoreboard, covering a common set of indicators across all KICs. The indicators cover the attractiveness of education programmes, number of new graduates, number of business ideas incubated, number of start-ups created, knowledge transfer and adoption, and new or improved products, services and process launched.

- **EIT level:** The monitoring of the EIT's own activities that add value to the KICs and their stakeholders, combining quantitative and qualitative indicators in a medium-term perspective. It monitors on the one hand operational excellence and on the other its positioning, using indicators, inter alia, due dates for Grant Agreement completion, reporting acceptance and payment execution, percentage of processes formalised, talent on the job and level of satisfaction on EIT services.

- **Horizon 2020:** Monitoring and evaluation of the EIT as an EU innovation institute under Horizon 2020. The indicators for assessing the performance of the EIT are: organisations from universities, business and research integrated in the KICs; and collaboration inside the Knowledge Triangle leading to the development of innovative products, services and processes.

K.4. Achievements so far

The independent external evaluation of the EIT[70] has found that, even though the EIT has contributed to progress in the areas mentioned above, strong need still exists to pursue the EIT's mission[71]. In the open public consultation in the context of the evaluation, almost 90% of respondents said that Europe's innovation capacity depended on bringing together education, research, business and other innovation actors (knowledge triangle integration). Further, over 80% of stakeholders think that EIT's focus on specific societal challenges in

[70] The independent external evaluation of the EIT is a mandatory requirement from the Regulation (EC) No 294/2008 as amended by the Regulation (EU) No 1292/2013 establishing the European Institute of Innovation and Technology (EIT Regulation).
[71] ICF, Technopolis Group, Evaluation of the European Institute of Innovation and Technology (EIT), forthcoming

the Horizon 2020 context is important. Overall, stakeholders have recognised the EIT's progress in bringing together education, research and business organisation to create pan-European networks in specific fields.

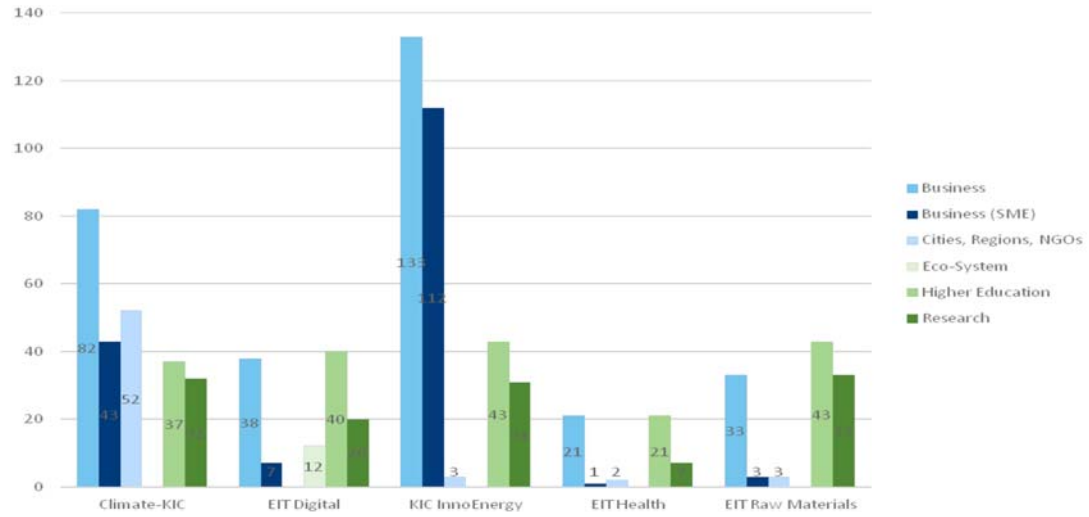
Two main indicators are indicated in the Horizon 2020 Regulation for assessing the performance of the EIT. In the following tables target and achieved results are reported (all the figures are cumulative).

Table 68 Organisations from universities, business and research integrated in the Knowledge and Innovation Communities (KICs)

		2014	2015	2016
Indicator 1: Organisations from universities, business and research integrated in the Knowledge and Innovation Communities (KICs)	**Target**	240	450	500
	Actual results	550	800	1015*

** Expected results, based on the indications in the KICs´ business plans. Source: EIT*

Figure 81 Breakdown of the organisations participating in the KICs (2015)



Source: EIT

It is worth noticing that around 43% of the participants are business (either big companies or SMEs); SMEs represent around 20% of the total participants.

Table 69 Collaboration inside the knowledge triangle leading to the development of innovative products, services and processes

Indicator 2: Collaboration inside the knowledge triangle leading to the development of innovative products, services and processes		**2014**	**2015**	**2016**
Number of start-ups and spin-offs set-up	**Target**	30	280	400
	Actual results	181	250	381*
Number of innovations	**Target**	300	800	1500
	Actual results	1184	2145	3565*

** Expected results, based on the indications in the KICs´ business plans. Source: EIT*

As it is possible to infer from the two tables, results achieved with respect to Indicator n.1 are well beyond the target. Same reasoning applies to the "Innovations" sub-indicator within Indicator n.2. The number of start-ups and spin-offs set-up by the KICs is slightly behind the target, even though KICs keep on generating new ventures at a faster pace; results for 2016 are still to be confirmed.

The table below shows target and achieved values for the cross-KIC level indicators (**core KPIs**) monitored by the EIT. The figures concern the **outputs and results** of the three first wave KICs (which comprises EIT Digital, EIT Climate and KIC InnoEnergy), over the period 2013-2015. As already mentioned, each KIC has also a set of KIC-specific KPIs that – as the core KPIs- are annually tracked, reported and audited.

Table 70 Innovation KPI performance of the KICs (2013-2015) (unmet targets in bold)

#	Code	Indicators	2013-2015 Actual	2013-2015 Target
1	*EIT01.01*	*Number of eligible applicants for EIT labelled PhD and Master programmes*	12,783	11,577
2	*EIT01.02*	*Number of available seats for EIT labelled PhD and Master programmes*	3,168	1,864
3	EIT02	Number of new graduates	776	***842***
4	EIT03	Number of business ideas incubated	1,249	1,076
5	EIT04	Number of start-ups/spin-offs created	216	***310***
6	*EIT05.01*	*Number of knowledge adoptions (by KIC partners) that are direct output of a KIC Activity*	429	326
7	*EIT05.02*	*Number of knowledge transfers (from one KIC partner to another KIC partner or to third parties) that are direct output of a KIC Activity*	308	260
8	EIT06	New or improved products/services/processes launched	212	***290***

Source: EIT

Those indicators reflect the portfolio of activities run by the KICs (education; business creation and support activities; support to innovation).

The indicators concerning the attractiveness of Education Programmes (n.1 and 2) show that the courses offered by the KICs attract an interest from students which is line what was expected at Business Plan level. Nevertheless, the number of new graduates is a bit below the target. Such indicator is expected to catch up in the coming years, thanks to the maturity those activities are achieving within the KICs portfolios.

As regards the support to entrepreneurship (indicators n.3 and n.4), despite the number of ideas incubated, the number of new ventures created is below the target. Business ideas are screened by the KICs, only the most promising ones are then passed to the following support stages (and encouraged to be transformed into new ventures); this aspect might partially explain the gap between target and actual results. Furthermore, some ideas might need a longer incubation period before being translated into a marketable proposal.

Finally, as regards the support to innovation, figures show that those activities are producing outcomes beyond the initial expectations, as evidenced by the adoption and the transfer of knowledge within the KICs and towards external partners. The only indicator that falls behind is the one related to new products/services/processes launched; 73% of the target has been achieved.

Overall, most of the objectives/actions defined in the 2013-2015 business plans have been achieved.

In order to provide some qualitative information complementing the abovementioned figures, some examples of achievements pursued in the different pillars of activities by the KICs can be highlighted, in particular:

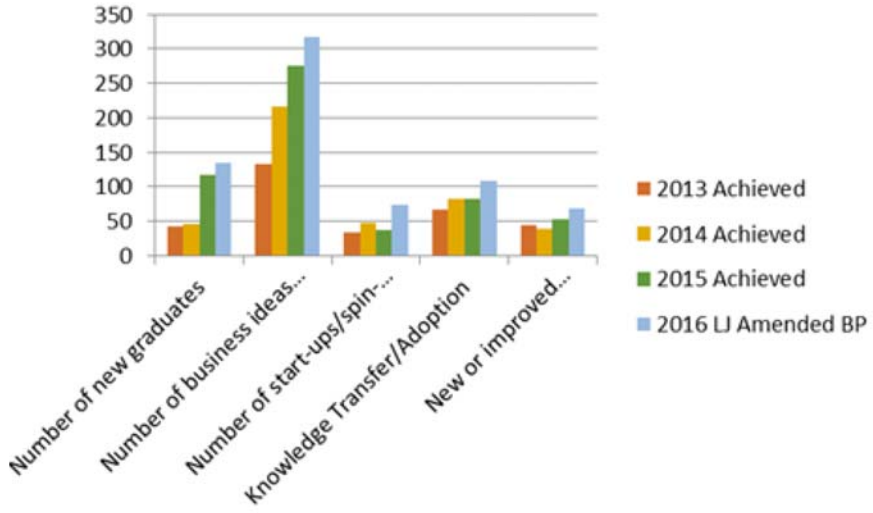
- In 2017, Forbes has chosen 18 EIT Community members for their annual Forbes 30 under 30 list.[72] The list features the best young innovators, entrepreneurs and game changers from Europe. In 2016, five EIT KICs' alumni have been selected for the Forbes' Magazine 30 under 30 list of Social Entrepreneurs. They were coming from KIC InnoEnergy (1) and Climate-KIC (4);
- A quarter of the 175 start-ups supported by KIC Digital raised private funding and attracted over EUR 20 million of external funds.
- KIC InnoEnergy has a portfolio of 68 companies in which the KIC retains an equity share; those companies have benefited from KIC´s support, and in return, the KIC received an equity share by each company supported. The portfolio is expected to start to deliver income for the KIC (from the sale of the equity participation) from 2017 - the KIC´s equity portfolio management is a very notable pillar of its Financial Sustainability Strategy;
- Success stories (support to scale-ups) in terms of leveraged funds:
    - Minesto, a Swedish scale-up working in marine hydrokinetic (wave) energy and supported by KIC InnoEnergy, raised about EUR 18 million in 2015 in its Initial Public Offering in the Stockholm stock market;
    - Tado sells smart thermostats that regulate the heating in the household according to the location data of inhabitants. Supported by Climate-KIC, the company has so far raised EUR 32 million investments. It has successfully launched its product internationally and is a competitor to Google‘s start-up Nest.

Given this track record, the report of the High-Level Group on the EIT appointed by Commissioner Navracsics[73] argues that the EIT should strive to remain the leading European performer of goal-driven innovation to address societal challenges through the integration of education, business and research. Furthermore, the HLG group thinks that EIT’s expertise and experience can play an important role in the future European innovation landscape, in particular with respect to the need for the EU to create ‘unicorns’ and breakthrough (disruptive) innovations. For this, the EIT can develop its own capacity for comparative innovation analysis and for communicating lessons learnt in various contexts.

[72] http://eit.europa.eu/newsroom/eit-innovators-named-forbes-list-2017
[73] The Future of the European Institute of Innovation and Technology (EIT) - Strategic Issues and Perspectives, 2016: https://ec.europa.eu/education/sites/education/files/eit-hlg-final-report_en.pdf

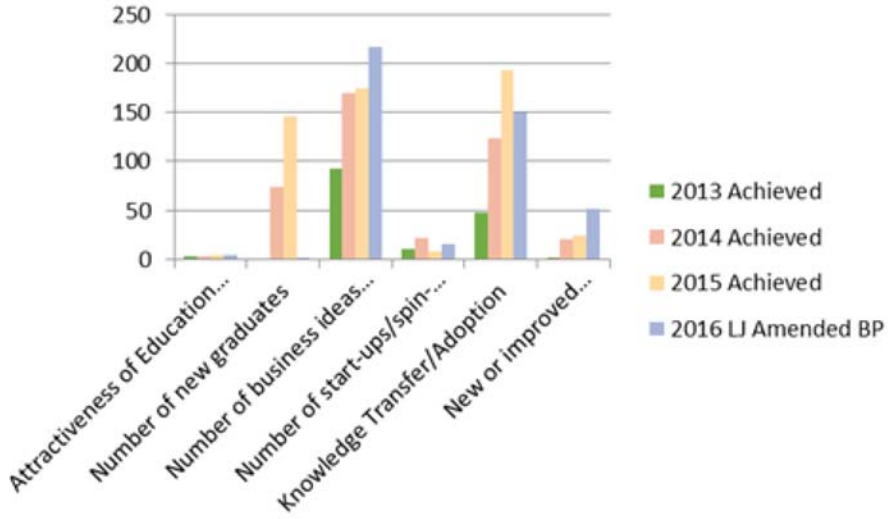
The following figures show the evolution of achieved KPI values per each of the KIC launched in 2010, over the period 2013-2015 (it also includes the expected results for 2016).

Figure 82 KPIs for Climate KIC



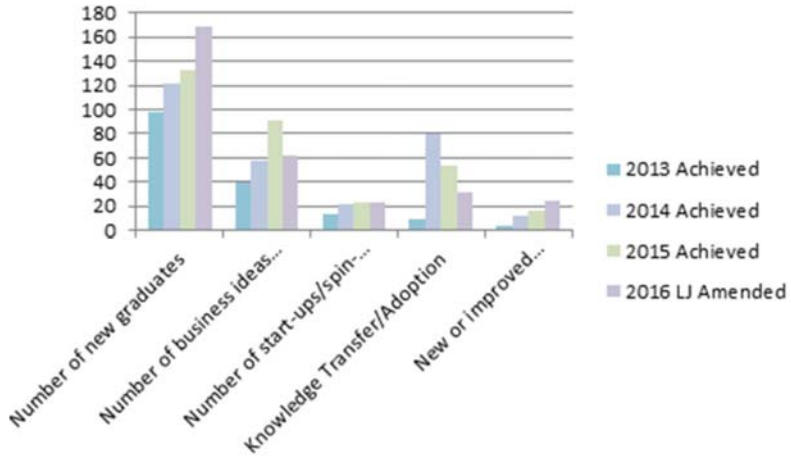
Source: EIT

Figure 83 KPIs for EIT Digital



Source: EIT

Figure 84 KPIs for KIC Innoenergy



Source: EIT

From those graphs, it appears that, in general, all the KICs are improving their performance with respect to the core indicators. It is also possible to infer which are the strongest and weakest areas of activities of each KIC: for instance, KIC Digital is well positioned in all areas, except for the creation of new ventures; on the other hand, KIC Innoenergy scores well in terms of new graduates, but is weaker in terms of innovations being generated by its activities.

EIT interim evaluation

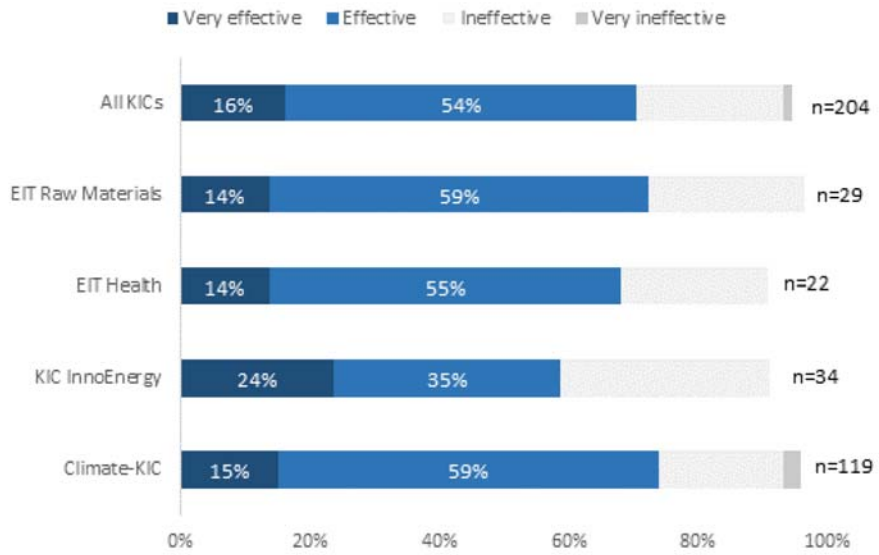
Further evidence on the KICs´ results is provided by the results of the evaluation exercise commissioned by DG EAC to external independent experts, in particular by the open consultation (open to all stakeholders in the course of the last quarter of 2016) and the survey carried out by the contractor hired by DG EAC to run an evaluation study[74].

Effectiveness

One of the aspects scrutinised through the evaluation exercise concerns the focus of the EIT on both societal challenges and knowledge triangle integration. According to the survey, 70% of KICs´ partners believe that the KICs have been 'effective' or 'very effective' in supporting knowledge transfer between businesses and universities/ research organisations.

[74] ICF, Technopolis Group, Evaluation of the European Institute of Innovation and Technology (EIT), forthcoming

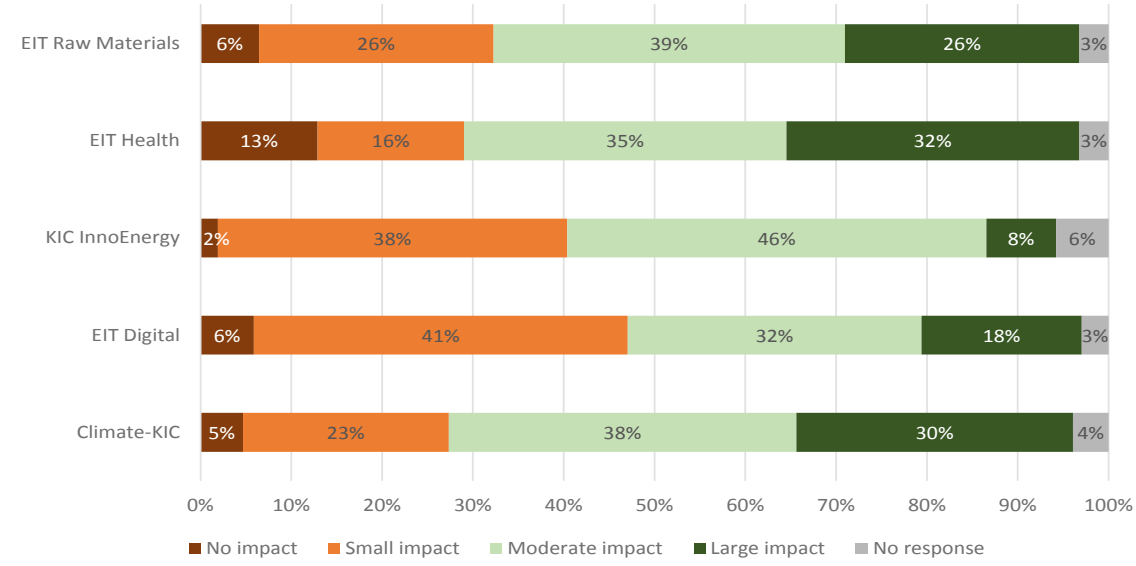
Figure 85 Effectiveness of KICs in supporting knowledge transfer between businesses and universities/ research organisations



Source: ICF survey (n=204). Question: Q How effectively do you think that the KIC is delivering activities in the following areas:… Supporting knowledge transfer between businesses and universities / research organisations

Furthermore, as part of the KIC partner survey, respondents were asked what impact they believed 'their' KIC had had on addressing societal challenges (Figure 87). As the data show, around two thirds of KIC partners believed the KIC had had either a 'moderate' or 'large' impact. The exception was in EIT Digital, where exactly 50% of respondents saw either a 'moderate' or 'large' impact on societal challenges, and a similar proportion (47%) saw 'no' or 'small' impact. This could at least in part relate to the point made previously: that EIT Digital's role within societal challenges tends to be indirect – a piece of technology that forms part of a wider solution.

Figure 86 The impact that KIC partners believed KICs has had on addressing societal challenges



Base = all respondents (Climate-KIC: 128; EIT Digital: 34; KIC InnoEnergy: 52; EIT Health: 31; EIT Raw Materials: 31) Question: Q25. What impacts has the KIC had, or you expect it will have, in the following areas: addressing societal challenges?

Finally, survey participants were asked to rate the importance of a number of aspects (characterising the KICs) for the EIT to achieve its mission of enhancing Europe's innovation capacity.

Table 71 How important are the following characteristics of the KICs in order for the EIT to achieve its mission of enhancing Europe's innovation capacity?

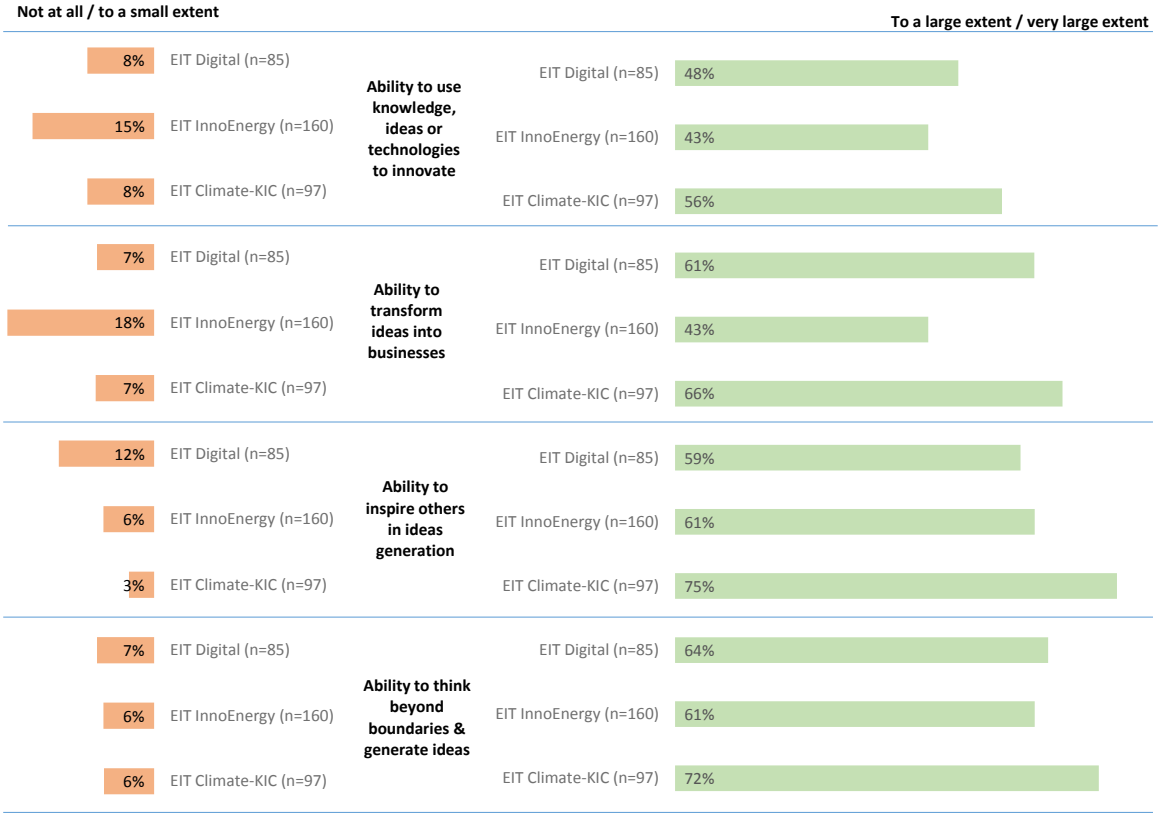
	Not important	Moderately Important	Very important	No opinion	No response
Involved with KIC/EIT	6%	35%	49%	10%	
Not Involved with KIC/EIT	15%	35%	37%	2%	12%

Base (all respondents) = Involved with KIC/EIT (51); not Involved with KIC/EIT (52)

Those findings are strengthened by the HLG report: the HLG advised maintaining this double focus and developing the EIT as the leading European performer in goal-driven innovation to address societal challenges.

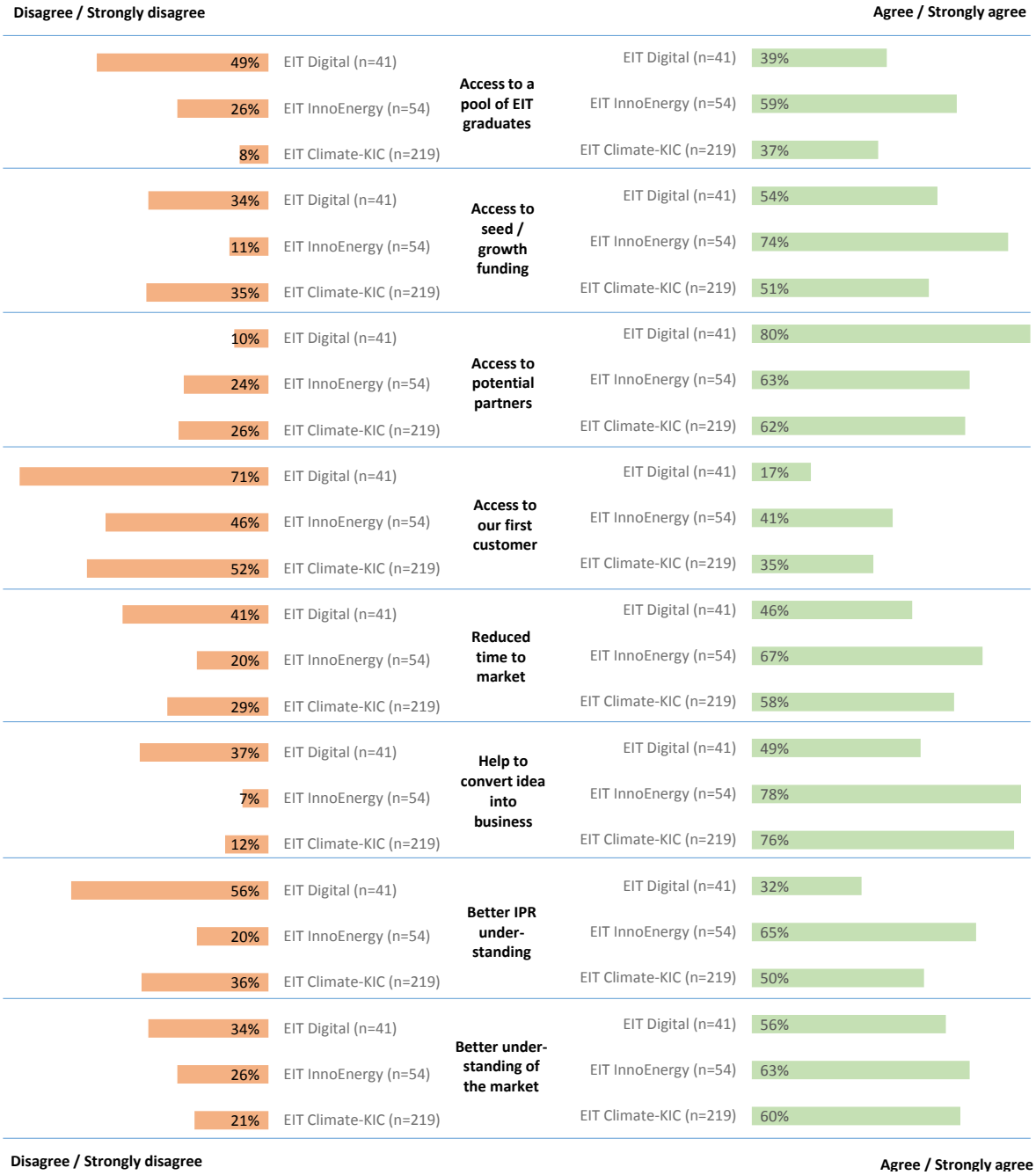
As regards the specific aspects of KICs activities, it is interesting to notice the results of the graduate survey on skills developed with EIT-labelled courses, as well as of the accelerator survey on the participation in a KIC accelerator programme.

Figure 87 Graduate survey: Skills developed by graduates of EIT-label programmes



Base: all respondents; note: excludes 'to a moderate extent' and no response so does not sum to 100%. Question: Q12. To what extent have you developed the following skills as a consequence of the EIT labelled programme?

Figure 88 Accelerator survey: Results of participation in a KIC accelerator programme

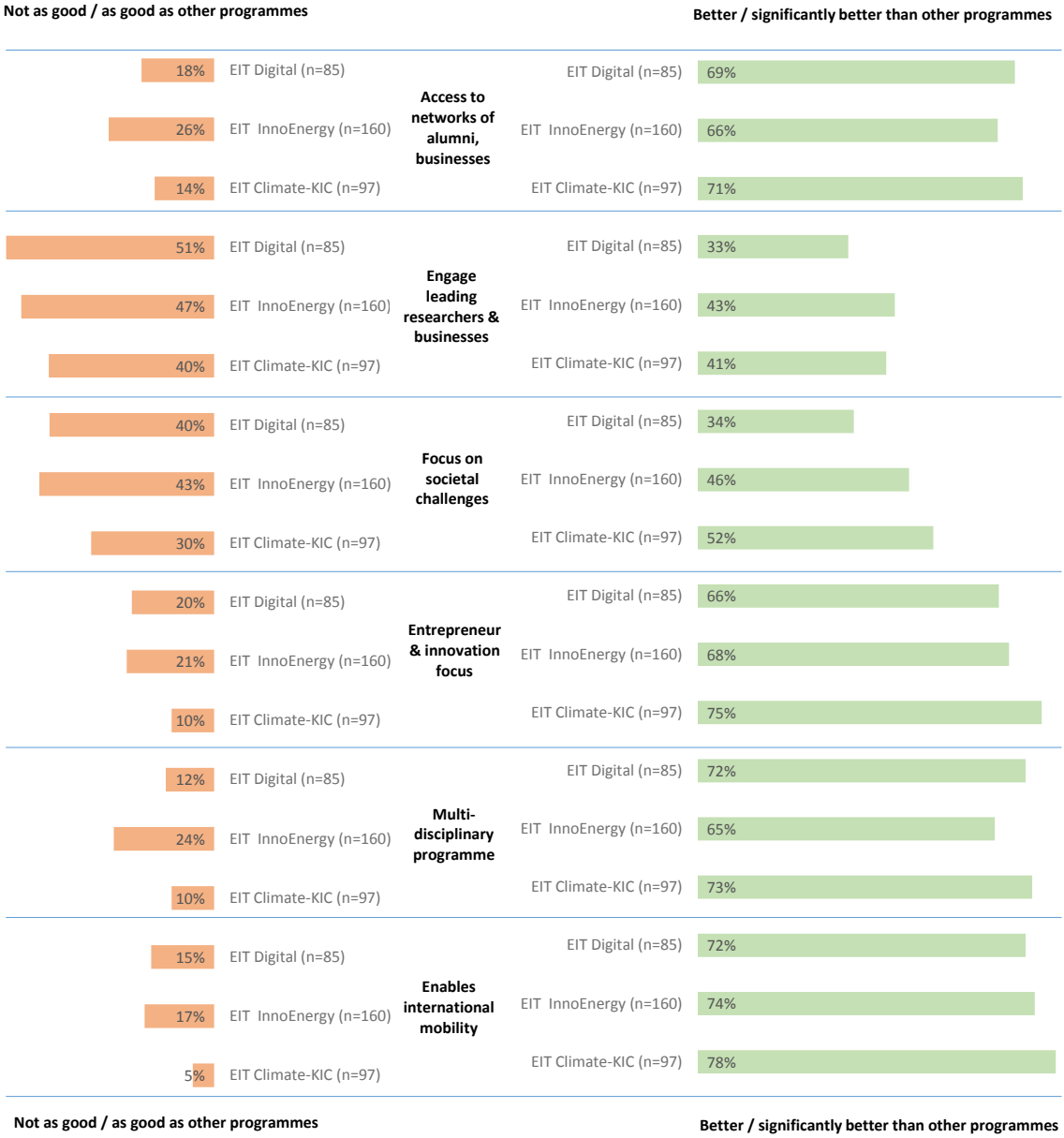


Base: all respondents; note: excludes no response so does not sum to 100%. Question: Q16. To what extent do you agree or disagree that your participation in the accelerator programme produced the following benefits or results?

Added-value

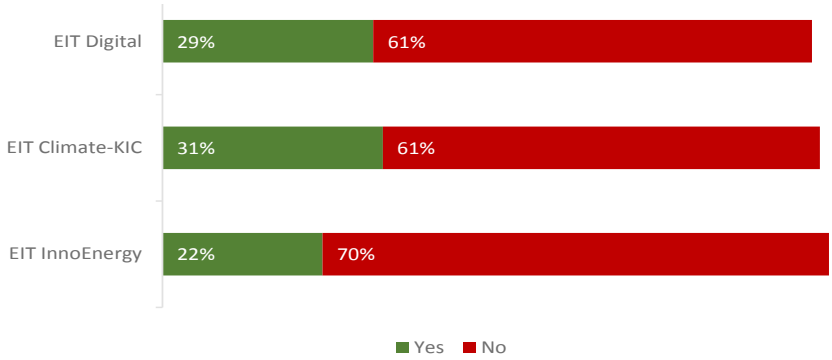
As regards the EIT added value, it is worth highlighting the response, within the graduate survey, about the key distinguishing features of EIT labelled programmes, as well as the response by companies to the Accelerator survey.

Figure 89 Graduate survey: the added value of the EIT-label education courses



Base: all respondents: note excludes 'no comment' and no response, so does not sum to 100%. Question: Q17. In your view, what are the key distinguishing features of the EIT labelled postgraduate programmes as compared to other similar programmes?

Figure 90 Accelerator survey: Whether businesses believed they could have received their support from another source



Source: Survey GHK, Q11. Do you think that you could have received this support from another source?

Finally, an aspect raised by the ECA report concerns the need to provide evidence on the leverage effect, in order to demonstrate the EIT's success in attracting additional funding for innovation, as well as the impact of EIT´s activities. On the matter, the EIT has recently issued a new set of EIT Core KPIs (which started to be tracked from January 2017), including one conceived to monitor the investments attracted by start-ups supported by KICs. The set of 11 indicators will help the EIT to provide evidence on the results and impact achieved.

K.5. Lessons learnt/Areas for improvement

The first three KICs, Climate-KIC, EIT Digital and KIC InnoEnergy, set up in 2010, are now running at full speed having reached the stage of maturity. They operate in a dynamic environment which might require sudden shift in strategy and in resource allocation in order to seize new market and societal opportunities and achieve the best possible results. This can be done thanks to the flexibility KICs have in shaping and selecting the activities to be carried out (which are then part of the business plan).

The two KICs launched in 2015 in the areas of Healthy Living and Active Ageing (EIT Health) and Raw Materials (EIT Raw Materials) are progressively consolidating their strategies and their portfolio of activities, creating the eco-systems that will deliver the first tangible results fostered by the integration of higher education, innovative research and business.

The KICs are also implementing strategies with concrete measures to ensure their long-term financial sustainability and comprehensive outreach to regions not yet involved in their activities. The EIT monitoring system keeps track of the results achieved to set incentives for KICs and, as appropriate, takes on board lessons learnt at individual KIC level and across KICs.

The ECA performance audit issued in April 2016[75] contained a set of four formal recommendations to which the EIT and Commission responded via an action plan. One of the 4 recommendations is already accomplished; the other outstanding 3 are in an advanced stage of implementation. In particular, an amended EIT legal basis, revising the EIT's funding model, is expected to be tabled to the European Parliament and Council in the first half of 2018.

Further recommendations have been given through the report of the High-Level Group appointed by Commissioner Navracsics[76]. It provided recommendations on strategic aspects of EIT and KICs´ operations, like on the need for the KICs to get more embedded into the local innovation systems, or the need to better communicate their unique selling points in order to improve the participation of businesses. Those contributions will be part of the reference documentation for the preparation of the next SIA 2021-2017 and the revision of the EIT legal basis.

[75] Special Report n.04, 2016 "The European Institute of Innovation and Technology must modify its delivery mechanisms and elements of its design to achieve the expected impact".
[76] The Future of the European Institute of Innovation and Technology (EIT) - Strategic Issues and Perspectives, 2016: https://ec.europa.eu/education/sites/education/files/eit-hlg-final-report_en.pdf

L. FURTHER INFORMATION ON THE FAST TRACK TO INNOVATION PILOT 2015-2016

The rationale for the FTI Pilot was the need for bottom-up, commercially driven, easily accessible grant support for RDI (Research, Development, Innovation, in particular support for scaling up successfully tested innovations) by high-potential growth businesses. The Pilot was designed to address:

- The sub-optimal performance of European industry and SMEs in the level of investment in innovation and production of new products and services;
- The relatively limited innovation outputs of industry that participated in FP7, and the need to attract new industry participants to EU Framework Programmes supporting Research, Technological Development and Innovation; and
- The problems in accessing innovation finance which are consequential of the high level of risk that innovation projects are exposed to.

The FTI Pilot was introduced in conformance with the Horizon 2020 legal basis. The Pilot Work Programme runs for 2015 and 2016, with an allocated budget of EUR 200 million for the two years. The FTI Pilot was introduced to offer a 'bottom-up' approach targeting business directly to help address the issues as outlined above, to attract high commercial and social potential participants, with a quicker appraisal and grant award for those with tested innovations but not yet fully scaled and launched on the market.

In line with article 32 of Regulation (EU) No 1291/2013, the FTI was subject to an in-depth assessment, as part of the interim evaluation, commissioned through public procurement. The summary of this assessment, presenting the main findings against the five criteria for evaluation defined by the EU Better Regulation Guidelines[77], is described below.

L.1. Relevance

The FTI is clearly highly relevant to the broad policy goals of Horizon 2020 to promote innovation and its application. As a Pilot testing a new approach, especially in the context of the proposal for an EU Innovation Council and associated ideas, the lessons are of particular value both for the remainder of the current programme period, but also for FP9 in the post-2020 period.

The interest in the FTI from businesses, relative to the allocated budget of EUR 200 million, is very high, with over 900 project applications over the first three cut-off dates of the call; with funding only available for 46 projects. Any continuation of the FTI would need to overcome this challenge of oversubscription; otherwise the very low chance of funding will deter potentially attractive projects.

L.2. Effectiveness

The legal basis of FTI is that set out for Horizon 2020 more generally, and that for Horizon 2020 innovation actions more specifically. FTI is therefore delivered through a standard Horizon 2020 project call, using a variation of the standard proposal template and required to

[77] http://ec.europa.eu/smart-regulation/guidelines/tool_42_en.htm.

apply the legal framework that establishes the size of project (limited to EUR 3 million of funding) and intervention rate, at a de facto rate of maximum 70% for private sector organisations, and 100% for public sector entities. It also requires the same partnership requirements (a minimum of three partners from three different Member States) as other innovation actions funded through Horizon 2020. Project applications are assessed using experts selected from the general pool of Horizon 2020 experts managed by the Research Executive Agency (REA), but selected by the Executive Agency for Small and Medium-sized Enterprises (EASME).

There is evidence that these requirements provide some limitation on the effectiveness of the FTI, especially in the partner requirements (which for near market ready projects are less relevant since they would have already been established).

There are also potential weaknesses in the appraisal process especially the potential lack of commercial investment experience. The project appraisal process, although carried out diligently, has not yet fully established the definition and interpretation of criteria that ensure the highest quality of project. Consequently there is some evidence that:

- Projects are at relatively early stages in developing innovations which is likely to limit the ability to demonstrate the acceleration of innovation to market;

- Some projects might be offering limited 'breakthrough' innovation, with limited commercial risk and low levels of additionality associated with funding; and

- Inadequate levels of business planning of some projects.

There is also some anecdotal evidence of the heavy use of bid writing contractors by project sponsors, which also has the potential to undermine confidence in the commercial 'buy-in' of projects to the commercialisation process. In this context due diligence is especially critical.

The real test of effectiveness in terms of the commercial results achieved cannot be known yet. The maximum duration of projects is 36 months. However, against a target to reach full commercialisation within 3 years of project start, only 25 per cent of projects responding considered that they would achieve this target. This raises the concern that projects are selected which have relatively immature innovation development and/or which lack adequate preparation and planning for the commercialisation process. The strength of this concern should be tested in the planned ex post evaluation of the FTI pilot.

The objective of attracting first time applicants to the FTI pilot has so far not been fully translated into the selection process – it is not a distinct selection criterion, and only a few national contact points advertise the programme specifically to new applicants.

L.3. Efficiency

A primary goal of the FTI was to reduce the time it takes to award grant decisions within six months of the application. After some learning and adjustments to the appraisal and award process for the first cut-off date, time to grant has been subsequently reduced throughout 2015 cut-off dates, even if clear challenges remain and the average time to grant for 2015 was at around eight calendar months (237 days).

The process of programme management is that used for all Horizon 2020 programmes. As noted the main concern in this process is the reliance on the standard proposal template and use of experts appointed from a general pool of Horizon 2020 experts, the question being whether sufficient competent expert evaluators in the domain of risk finance or investment are at hand to assess the 'bankability' of FTI proposals. As a result there must be potential to improve the quality of awarded projects.

In terms of the additionality associated with the funded projects, the majority of projects considered when asked what would have happened in the absence said that they would have continued with the project, albeit at a smaller and/or slower scale. In 25 per cent of cases the project would not have gone ahead.

L.4. Coherence

There is a small number of applicants for Horizon 2020 funding – especially concentrated with those who have applied under the SME Instrument – who find it difficult to understand the differentiating features of the FTI. In practice, given the focus on piloting a bottom-up approach through FTI, in contrast to the fragmented approach of the SME instrument, the risk of overlap and policy incoherence is small.

The focus of FTI on accelerating the commercial uptake of a number of innovations and the ability of larger firms to access the FTI pilot subject to confirming the additionality of funding provides a distinguishing character within Horizon 2020.

Were the FTI to expand to attract substantially larger projects (say over €5 million), these might be potentially better suited to funding through a financial instrument. The FTI, by focusing on smaller projects up to €3 million, could complement financial instruments directed at the same objectives.

L.5. EU added value

EU added value derives principally from bringing to market innovations that would otherwise remain in the development phase for longer periods of time, and in some potential cases being overtaken by innovations by competitor regions. In this context the instrument is highly supportive of the agenda being discussed by the proposed European Innovation Council (EIC).

The FTI as a Pilot has an intrinsic value from having successfully demonstrated the feasibility of, and demand for, a bottom-up approach to promoting innovation across a wide spectrum of technologies.