European Commission

Joint Research Centre

Annual Activity Report 2018

ANNEXES

Joint Research Centre

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ANNEX 1: Statement of the Director in charge of risk management and internal control[1]

I declare that in accordance with the Commission's communication on the internal control framework[2], I have reported my advice and recommendations on the overall state of internal control in the DG to the Director-General.

I hereby certify that the information provided in the present Annual Activity Report and in its annexes is, to the best of my knowledge, accurate and complete.

29 March 2019

Signed

Delilah Al-Khudhairy

[1] In the JRC, the Director in charge of the 'Strategy, Work Programme and Resources' is entrusted with the function of 'Risk Management and Internal Control' (RMIC) and reports directly to the Director-General.

[2] C(2017)2373

ANNEX 2: Reporting – Human Resources, Better Regulation, Information Management, External Communication and Infrastructure

2.2.1 Human Resources

Objective: The DG deploys effectively its resources in support of the delivery of the Commission's priorities and core business, has a competent and engaged workforce, which is driven by an effective and gender-balanced management and which can deploy its full potential within supportive and healthy working conditions.			
Indicator 1: Percentage of female representation in JRC middle management **Source of data:** SEC(2017)359			
Baseline (01/01/2016)	Target (01/11/2019)		Latest known results (31/12/2018)
16 %	35 %		16 %
Main outputs in 2018:			
Description	Indicator	Target	Latest known results
In order to improve the **female representation in middle management** positions according to SEC(2017)359 the JRC's plans the following main outputs:	Overall indicator: First time appointment of female Heads of Unit	The overall target is to nominate 7 new female Heads of Unit by 1 November 2019. By end of 2018 the first 6 of these nominations must take place.	1 new first time female Head of Unit appointment in 2018 (6 appointments out of 7 remaining)
1a. Continuous awareness-raising towards potential female candidates about available vacancies	1a. Percentage of applications from internal female staff to published Head of Unit vacancies	1a. Double the amount of applications received by female applicants	1a. 26 % of internal female applications (14 out of 55 applicants for 7 published vacancies; baseline – 7 applications received in 2017)
1b. Close monitoring of upcoming Unit Head vacancies, whether retirement, resignation or mobility and evaluate current female talent pool in respect	1b. Number of female staff selected to published Head of Unit positions	1b. For vacancies appearing in 2018 ensure a minimum of 6 females selected	1b. 7 published Heads of Unit vacancies resulting in 1 female appointment[3]

[3] No female applicants for one post; the female candidate selected for another post withdrew her application and was the only female applicant; two posts were assigned for between-DGs mobility for male Heads of Units

to the vacancies			
1c. Roll out of inclusive talent management programme based on recommendations from the 2016/17 pilot talent management programme evaluation	1c.i. Number of participants in the new talent management programme	1c.i > 50 participants	1c.i 62 participants were admitted to the inclusive talent management programme
	1c.ii. Participants' evaluation of the talent management programme vacancies	1c.ii 75 % satisfaction rate from participants to the inclusive JRC talent management programme	1c.ii no data available since programme is still ongoing (programme launch has been in October 2018, envisaged end date is April 2019)
1d. JRC sponsorship of the LEAD@COMM Network which would help female staff grow potential and support the JRC succession plan from its pilot Talent Management Programme	1d. Number of LEAD@COMM initiatives sponsored by the JRC for helping female staff to grow	1d. At least 6 LEAD@COMM initiatives which take the form of lunch-time lectures, networking events, discussion panels, workshops/trainings and continuing the support to the career days as organised by HR services. The JRC sponsorship will be in the form of budget, provision of meeting rooms, video-conference facilities, support of senior management, and provision of mentors and coaches.	1d. 12 initiatives were sponsored, including the 2018 DG Human Resources' career day[4]

Indicator 2: Staff engagement index **Source of data:** EC staff satisfaction survey		
Baseline (31/12/2014)	Target	Latest known results (31/12/2018)
64 %	68 % (2020) 69 % (2018)[5]	68 %

Main outputs in 2018:			
Description	Indicator	Target	Latest known results
2. In order to increase **staff engagement** the following main outputs are planned:			
2a. Competence development and management of talent within the context of the JRC change agenda and the	2a. Staff satisfaction survey indicators	2a. JRC Staff engagement in the Commission staff satisfaction survey to	2a. 68 % (vs. 69 % EC average)

[4] The LEAD@COMM network was launched in October 2017 as a result of the JRC 2016/17 pilot talent management programme and is already a vibrant network where experiences are being shared and peer support given.

[5] Target 2020 as in the Strategic Plan; target 2018 as in the Management Plan 2018

Commission HR strategic agenda		remain above the EC average	
2b. Staff Satisfaction Survey Action Plan: several actions will be carried out and followed-up in the following areas: mobility, knowledge sharing & communication, well-being and physical working environment. An additional action plan for mobility has been drawn up following a recent cross-JRC working group. The additional actions include consolidated recruitment plans, Competence mapping, Career day, and career and mobility actions for contract agents	2b. Degree of implementation of the actions planned (Staff Satisfaction Survey Action plan and additional mobility plan)	2b. 100 %	2b. 100 % - the Staff Satisfaction Survey Action Plan has been fully implemented; the JRC mobility scheme has been launched with ongoing implementation of actions beyond 2018; a JRC specific career day took place 8 March 2018
2c. Extend talent management programme to a larger more inclusive population	2c. Design, adoption and roll out of a new inclusive JRC talent management programme	2c. 75 % satisfaction rate from participants to the inclusive JRC talent management programme	2c. no data available since programme is still ongoing (programme launch has been in October 2018, envisaged end date is April 2019)
2d. Implementation of the JRC mobility package	2d.i Participants to the initiatives in the mobility package 2d.ii. Number of people participating to the JRC short term exchange programme and the Visiting Researcher programme (VRP)	2d. 75 % satisfaction rate from participants	2d. no quantitative data available yet – short-term exchange programme and VRP still ongoing
2e. Embedding of the Commission's Diversity and Inclusion Strategy C(2017)5300 into a JRC Action Plan	2e. Regular monitoring of the implementation of the specific JRC Action Plan is in line with the action plan of the DG Human Resources and	2e. Monitored throughout the year	2e. actions in 2018 focussed on women and the support of female representation in management (workshops for female staff with administrator level responsibilities, launch of a

	Security translating the Commission's Diversity and Inclusion Strategy		new talent development programme, promotion of female candidates for the corporate FTDP - Female Talent Development Programme)
2f. As part of the JRC 2030 Strategy and its Knowledge Management pillar, provision of skills to staff through learning and development to interact more effectively with policy makers	2f.i. Number of specific training courses linked to the JRC Knowledge Management key pillar 2f.ii. Participants' evaluation to specific training courses	2f.i & 2f.ii. Positive feedback from participants to training courses (at the moment no current value is available)	2f.i. & 2f.ii 14 courses have been organised with 174 participants 83 % overall satisfaction rate (due to delays in availability of courses, training offer continues during 2019)
	2f.iii. Number of people participating to the JRC short term exchange programme	2f.iii. At least 20 participants	2f.iii 25 JRC staff have participated in 2018

Indicator 3: Percentage of staff who feel that the Commission cares about their well-being
Source of data: EC staff satisfaction survey

Baseline (31/12/2014)	Target (31/12/2020)	Latest known results (31/12/2018)
47 %	50 %	66 % (EC average 52 %)

Main outputs in 2018:

Description	Indicator	Target	Latest known results
3. In the context of the JRC's implementation of the '**health and well-being**' Commission Strategy, the main outputs will be training and awareness-raising activities.	3a. Number of training and awareness-raising activities carried out to promote a fit@work culture at all JRC sites	3a. At least 3 activities on at least 1 site	3a. 41 activities were organised (18 in Ispra, 6 in Geel, 6 in Petten, 5 in Karlsruhe, 3 in Seville, 3 Brussels)
	3b. Number of nutrition awareness actions in the canteens, social and cultural activities, specific training programmes and ergonomic actions at all JRC locations	3b. 1 campaign in all sites	3b. 53 activities were organised (20 in Ispra, 17 in Geel, 3 in Petten, 3 in Karlsruhe, 4 in Seville, 6 Brussels)

	3c. Number of events promoting the role of the medical services and the social support to staff at all JRC locations	3c. 1 event in each site	3c. 25 events were organised (3 in Ispra, 2 in Geel, 2 in Petten, 1 in Karlsruhe, 14 in Seville, 3 Brussels)
	3d. Results from surveys carried out as a means to get staff opinion on ongoing actions on the needs and suggestions for future initiatives	3d. 75 % satisfied with initiatives provided	3d. 81 % satisfaction rate with volunteering initiatives
	3e. Number of mindfulness training/workshops to be organised at all JRC sites	3e. 1 workshop in each site	3e. 10 workshops were organised (3 in Ispra, 2 in Geel, 2 in Petten, 1 in Karlsruhe, 1 in Seville, 1 Brussels)
	3f. Number of flagship volunteering initiatives organised in Ispra and Brussels	3f. 1 initiative in Brussels and 1 in Ispra	3f. 2 volunteering initiatives took place (1 in Brussels, 1 in Ispra)
	3g. Number of other volunteering initiatives at other sites (Petten, Geel, Karlsruhe and Seville)	3g. Promote volunteering in other sites with 1 initiative per site	3g. 4 volunteering events took place (1 in Petten, 1 in Geel, 1 in Karlsruhe, 1 in Seville)

2.2.2 Better Regulation

N/A

2.2.3 Information management aspects

Objective: Information and knowledge in your DG is shared and reusable by other DGs. Important documents are registered, filed and retrievable			
Indicator 1: Percentage of registered documents that are not filed (ratio) **Source of data:** ARES/NOMCOM, SG, DIGIT, JRC DMO			
Baseline (2015)	Target		Latest known results (2018)
1.5 %	0 %		0.5 %
Indicator 2: Percentage of HAN files readable/accessible by all units in the JRC **Source of data:** HAN statistics, JRC DMO			
Baseline (2015)	Target		Latest known results (2018)
17.6 %	60 %		49.4 %
Indicator 3: Percentage of HAN files shared with the other DGs **Source of data:** HAN statistics, JRC DMO			
Baseline (2015)	Target		Latest known results (2018)
1.97 %	2 %		25.44 %
Main outputs in 2018:			
Description	Indicator	Target	Latest known results
Fully reviewed filing plan by document management correspondents in all JRC lead departments ('chef de file'). This review will foster increased visibility and accessibility of JRC information	Regular monitoring of filing plans	100 %	63 %
HAN Integration of JRC IT tools supporting core business (JPB) and collaborative platforms (SharePoint, Connected).	JRC undertakes the necessary steps once Commission Central Services have adopted integration projects	Q4	Coordination meetings took place, workshops were set up, actions for JPB and collaborative platforms were endorsed.
Training and capacity building for scientists and policymakers (including Commission staff) in evidence and policy	Number of JRC staff trained	> 250	290 scientists and policymakers (75 JRC staff; 215 Commission staff/other organisations)

Country and regional knowledge management methods and practice	Number of users in the Commission Country Knowledge communities who have viewed at least something in the previous 30 days (i.e. active users)	> 50 % (Year-to-Year)	Due to technical issues exact numbers of active users are currently not being measured

2.2.4 External communication activities

Objective: Citizens perceive that the EU is working to improve their lives and engage with the EU. They feel that their concerns are taken into consideration in European decision making and they know about their rights in the EU.			
Indicator 1: Percentage of EU citizens having a positive image of the EU **Source of data:** Standard Eurobarometer (DG COMM budget)			
Baseline (2014)	Target (2020)		Latest known results (2018)
Total 'Positive': 39 % 'Neutral': 37 % Total 'Negative': 22 %	Positive image of the EU ≥ 50 %		43 % 'Positive' 36 % 'Neutral' 20 % 'Negative'
Indicator 2: Articles in the media - Total number of articles in the media **Source of data:** JRC internal indicator			
Baseline (2015)	Target (2020)		Latest known results (2018)
2770	3000 (2018) 3500 (2020)		3322
Indicator 3a: Access to JRC websites - Number of page views on the JRC website **Indicator 3b. Access to JRC websites - Number of visits to the JRC website** **Source of data:** JRC internal indicator			
Baseline (2015)	Target (2020)		Latest known results (2018)
3a. 7.7 million 3b. 2.8 million New baseline (2017) due to changes in monitoring tools (2016) and site architecture: 3a. 3.2 million 3b. 1.4 million	3a. 4.8 million 3b. 2.4 million		3a. 4 million 3b. 2 million
Main outputs in 2018:			
Description	Indicator	Target	Latest known results
Key publications such as JRC Digital Newsletter and the JRC annual report	Number of subscribers	20 000	21 787

Press trips	Number of press trips Number of participants	3 20	9 86
JRC annual conference	Number of views (streaming and of the annual conference's web pages)	10 000	JRC annual conference replaced by the 'Knowledge Week'; 1 350 participants from 46 DGs and agencies, 1 000 remote viewers
Participation at ESOF 2018 (EuroScience Open Forum), the largest interdisciplinary science meeting in Europe	Number of JRC activities presented	7	7
Direct reach of the DG communication actions via websites (EU Science Hub), social media and key known multipliers	Number of social media followers[6]: Twitter 'EU ScienceHub' Facebook LinkedIn YouTube	 20 000 followers (25 % increase) 10 000 followers (30 % increase) 25 000 followers (25 % increase) 1 500 subscribers (50 % increase)	 26 110 followers (54 % increase as compared to 2017), 1.49k posts 14 170 followers (57 % increase), 446 posts 30 580 followers (40 % increase), 437 posts 1 680 followers (51 % increase), 40 videos published

The JRC committed EUR 2.3 million to external communication actions: producing publications, organising events and exhibitions showcasing the JRC's value added, running of the JRC Visitor Centre (Ispra site), and maintaining and further developing digital communications (the EU Science Hub at Europa site, collaboration platforms and the social media actions). The higher than planned spending is due to two additional JRC exhibitions organised at the European Parliament in Strasbourg (FR), and in Sofia (BG) accompanying a high-level conference during the Bulgarian EU Presidency.

Annual communication spending (based on estimated commitments):			
Baseline(2017)	Target (2018)	Total amount spent	Total of FTEs working on external communication
EUR 1.9 million	EUR 1.9 million	EUR 2.3 million	5 (officials); 11 (total)

[6] Source: the accounts and monitoring tools Brandwatch and Social Baker

2.2.5 Infrastructure

a. Infrastructure development

Objective: **Infrastructure development: Harmonise the approach to infrastructure development across the JRC.** **Energy conservation: Drive energy efficiency gains.** **Operational efficiency: Increase efficiency of site-related facilities and services.**			
Indicator 1a: Surface area calculations **Definition: Surface area of new buildings delivered and buildings demolished and refurbished in line with Directive 2012/27/EU** **Source of data:** JRC internal indicator and Directive 2012/27/EU			
Baseline	Interim milestone	Target	
On JRC sites (Brussels excluded), there are 196 427 m^2 of buildings not compliant to the energy standards. New buildings delivered: 0 m^2 Buildings demolished: 4 625 m^2 Buildings refurbished: 1 826 m^2 (0.9 % of total surface as defined in Directive 2012/27/EU article 5)[7]	Annual assessment of the total surface not meeting the national minimal standards in terms of energy efficiency on the basis of article 5 of the Directive 2012/27/EU	In order to fulfil the 'exemplary role of public bodies' buildings' as described in the Energy Efficiency Directive 2012/27/EU, the minimum of 3 % for refurbishment should be reached annually.	
Main outputs in 2018			
Description	Indicator	Target	Latest known results (31/12/2018)
At global level, the JRC refurbished 1 826 m^2 to current standards in energy efficiency.	1 826 m^2	3 %	0.9 %
In **Ispra**, the refurbishment of part of building 17 'JRC Archive', 46i 'Centre for Advanced Studies' and 62c 'Clearance Storage	1 826 m^2	3 %	1.7 %

[7]

JRC site	Surface not compliant with energy standards	New buildings	Demolitions	Refurbishments with % according to 2012/27/EU	
Geel	29 423	0	0	0	0.0 %
Ispra	107 806	0	4 625	1 826	1.7 %
Karlsruhe	31 637	0	0	0	0.0 %
Petten	19 981	0	0	0	0.0 %
Seville	7 580	0	0	0	0.0 %
Total	**196 427**	**0**	**4 625**	**1 826**	0.9 %

Warehouse'. In **Karlsruhe,** 31.657 m^2 of older existing buildings (Wing A-B-D-E-F-G-H) are out of the range of the national minimum standards in terms of energy efficiency on the basis of article 5 of the Directive 2012/27/EU. 9 498 m^2 of more recent buildings are compliant (Wing NCO in 2013: 7 927 m^2, Wing R+S in 2015: 1 571 m^2). In **Petten**, 2018 saw the modification of the sub-structure of building 310 in preparation of a future Creative Hub.	0 m^2 0 m^2	3 % 3 %	0 % 0 %
Indicator 1b: Nearly zero-energy buildings **Definition: Implementation of Energy Performance of buildings Directive 2010/31/EU** **Source of data:** JRC internal indicator and Directive 2010/31/EU			
Baseline	Interim milestone	Target	
In **Ispra**, there are not yet any 'Nearly zero-energy building' already built. However the project for building 102 currently in construction is compliant with this classification. In **Geel**, two buildings are in compliance with the latest Belgian regulations. In **Karlsruhe** there is no 'Nearly zero-energy building' foreseen for the next years. In **Petten**, there is no 'Nearly zero-energy building' already built. In **Seville**, JRC services are currently hosted in a 'Class D' building. The approved Seville Site Development Plan envisages the construction of a bespoke	Given the usual duration for construction works for significantly big buildings, all projects related to the construction of new buildings on RC sites should already foresee only zero-energy characteristics.	After 2018, all new buildings constructed on JRC sites should be 'nearly zero-energy buildings' in line with Directive 2010/31/EU article 9 paragraph 1 (b).	

nearly zero-energy building.			
Main outputs in 2018			
Description	Indicator	Target	Latest known results (31/12/2018)
In **Ispra**, the construction of building 102 has started. Final delivery is expected for January 2020.	10 500 m^2	Nearly-zero Energy building	Construction started in April 2017 for final delivery in 2020. When in use, this building will contribute to a reduction of roughly 4.5 % of the total energy consumption of Ispra site, after demolition or shutdown of 10 smaller obsolete buildings.
In **Petten**, the engineering phase for a new Access and Security Centre (ASC) has started and is expected to be completed in 2019 followed by the construction.	630 m^2	Energy-efficient building	Construction will start at the end of 2019 if the procurement procedure is successful.
In **Karlsruhe**, the new laboratory building Wing M in the range of national minimum standards in terms of energy efficiency is under construction.	6 440 m^2		Construction ongoing. Delivery foreseen in 2020.
JRC Infrastructure Development Plans	Development plans available for all sites	In line with the JRC strategy 2030, all sites should have an approved development plan covering the period until 2030 that would fit with the financial perspectives at Commission level	Completed

b. Decommissioning

Objective: Implement the Decommissioning & Waste Management Programme (see progress indicators in Annex 13)			
Main outputs in 2018 (Main outputs for 2018 for the four relevant JRC sites by site can be found in Annex 13):			
Description	Indicator	Target	Latest known results
New Progress Report from The Commission to the Council and the European Parliament including revised budget[8]	Documents available	Q4/2019	Expert review launched
Decommissioning of Nuclear Installations and Management of Radioactive Waste: Management of Nuclear Liabilities arising out of the activities of the JRC carried out under the Euratom Treaty	See Annex 13	See Annex 13	See Annex 13

c. Supplementary research programme for the High Flux Reactor in Petten (The Netherlands)

Objective: Operation of the high-flux reactor			
Main outputs in 2018:			
Description	Indicator	Target	Latest known results
Reporting on High Flux Reactor (HFR) activities 2014-2015	Report and Staff Working Document (SWD)	Q2	Report from the Commission to the Council and European Parliament COM(2018)76 final and SWD(2018)46 final, 27/02/2018

[8] The Communication will present the achievements since the last Communication (i.e. for the period 2013-2018), the current status including difficulties, and an outlook for the future programme 2021-2027.

ANNEX 3: Annual accounts and financial reports

Annex 3 Financial Reports - DG JRC - Financial Year 2018

Table 1: Commitments

Table 2: Payments

Table 3: Commitments to be settled

Table 4: Balance Sheet

Table 5: Statement of Financial Performance

Table 5 Bis: Off Balance Sheet

Table 6: Average Payment Times

Table 7: Income

Table 8: Recovery of undue Payments

Table 9: Ageing Balance of Recovery Orders

Table 10: Waivers of Recovery Orders

Table 11: Negotiated Procedures (excluding Building Contracts)

Table 12: Summary of Procedures (excluding Building Contracts)

Table 13: Building Contracts

Table 14: Contracts declared Secret

TABLE 1: OUTTURN ON COMMITMENT APPROPRIATIONS IN 2018 (in Mio €)					
			Commitment appropriations authorised	Commitments made	%
			1	2	3=2/1
Title 02 Internal market, industry, entrepreneurship and SMEs					
02	02 03	Internal market for goods and services	3.5662045	3.5662045	100.00 %
Total Title 02			3.5662045	3.5662045	100.00%
Title 05 Agriculture and rural development					
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.1362364	9.13620798	100.00 %
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.006812	1.0950127	54.56 %
Total Title 05			11.1430484	10.2312207	91.82%
Title 07 Environment					
07	07 02	Environmental policy at Union and international level	1.152	1.152	100.00 %
Total Title 07			1.152	1.152	100.00%
Title 10 Direct research					
10	10 01	Administrative expenditure of the 'Direct research' policy area	429.4734499	400.362974	93.22 %
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	116.4241565	34.8439065	29.93 %
	10 03	Euratom Programme - Direct actions	30.78797908	11.1912259	36.35 %
	10 04	Other activities of the Joint Research Centre	363.1557894	35.5703882	9.79 %
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	30.11409995	30.1057497	99.97 %
Total Title 10			969.9554749	512.074244	52.79%
Title 34 Climate action					
34	34 02	Climate action at Union and international level	1.304	1.304	100.00 %
Total Title 34			1.304	1.304	100.00%
Total DG JRC			987.1207278	528.32767	53.52 %

* Commitment appropriations authorised include, in addition to the budget voted by the legislative authority, appropriations carried over from the previous exercise, budget amendments as well as miscellaneous commitment appropriations for the period (e.g. internal and external assigned revenue).

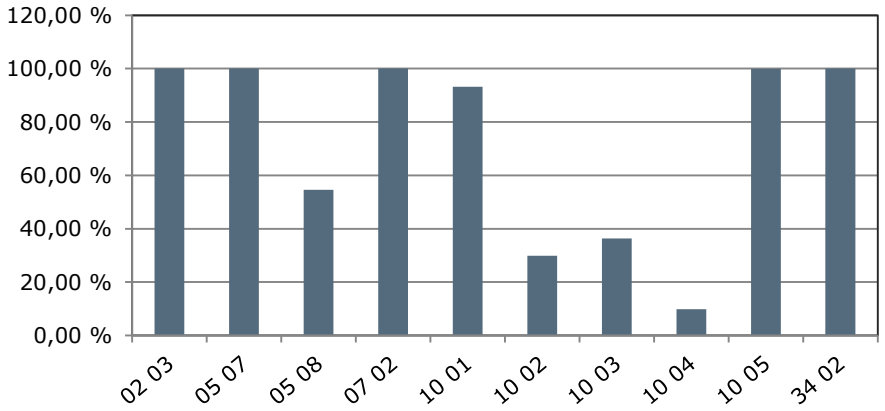


TABLE 2: OUTTURN ON PAYMENT APPROPRIATIONS IN 2018 (in Mio €)					
Chapter			Payment appropriations authorised *	Payments made	%
			1	2	3=2/1
Title 02 Internal market, industry, entrepreneurship and SMEs					
02	02 03	Internal market for goods and services	0.3468	0.3468	100.00 %
Total Title 02			0.3468	0.3468	100.00%
Title 05 Agriculture and rural development					
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.1362364	9.1169499	99.79 %
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.260481	2.21089477	97.81 %
Total Title 05			11.3967174	11.3278447	99.40%
Title 10 Direct research					
10	10 01	Administrative expenditure of the 'Direct research' policy area	209.8743375	103.480273	49.31 %
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	115.4101076	32.8778072	28.49 %
	10 03	Euratom Programme - Direct actions	27.85509399	10.8872356	39.09 %
	10 04	Other activities of the Joint Research Centre	278.2798593	28.6566908	10.30 %
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	25.94654523	25.9457262	100.00 %
Total Title 10			657.3659437	201.847733	30.71%
Title 29					
29	29 02	The European statistical programme	0.028925	0.028925	100.00 %
Total Title 29			0.028925	0.028925	100.00%
	Total DG JRC		669.1383861	213.551302	31.91 %

* Payment appropriations authorised include, in addition to the budget voted by the legislative authority, appropriations carried over from the previous exercise, budget amendments as well as miscellaneous payment appropriations for the period (e.g. internal and external assigned revenue).

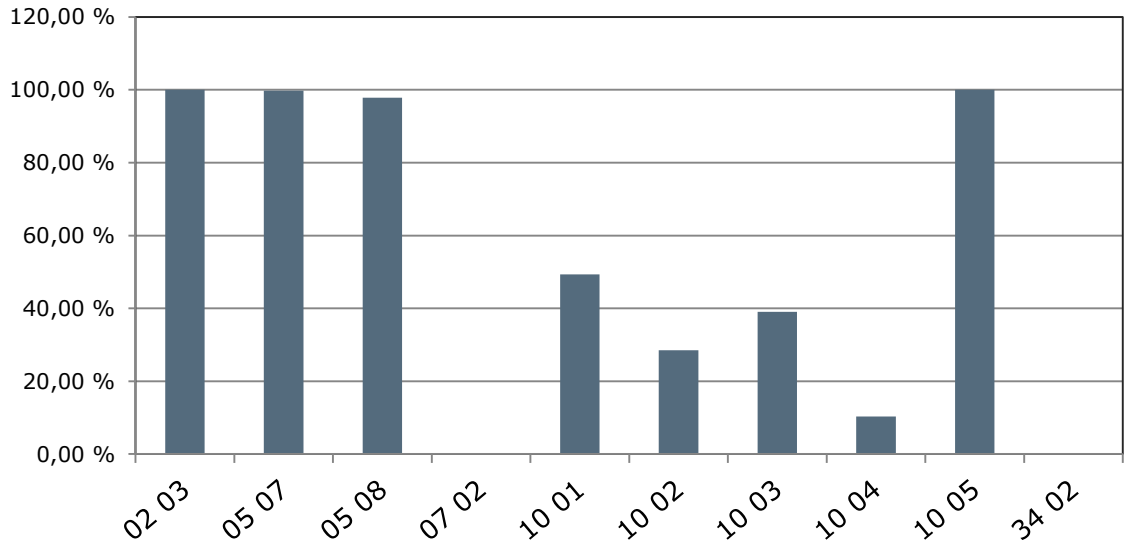


TABLE 3: BREAKDOWN OF COMMITMENTS TO BE SETTLED AT 31/12/2018 (in Mio €)

Chapter			2018 Commitments to be settled				Commitments to be settled from financial years previous to 2018	Total of commitments to be settled at end of financial year 2018	Total of commitments to be settled at end of financial year 2017
			Commitments 2018	Payments 2018	RAL 2018	% to be settled			
			1	2	3=1-2	4=1-2/1	5	6=3+5	7
Title 02 : Internal market, industry, entrepreneurship and SMEs									
02	02 03	Internal market for goods and services	3.5662045	0.35	3.2194045	90.28 %	0.00	3.22	0.00
Total Title 02			3.5662045	0.35	3.2194045	90.28%	0	3.2194045	0
Title 05 : Agriculture and rural development									
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.136208	7.91	1.2292313	13.45 %	0.01	1.23	1.22
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	1.0950127	0.01	1.087311	99.30 %	0.20	1.28	2.41
Total Title 05			10.231221	7.91	2.3165423	22.64%	0.2019486	2.51849087	3.630798
Title 07 : Environment									
07	07 02	Environmental policy at Union and international level	1.152	0.00	1.152	100.00 %	0.00	1.15	0.00
Total Title 07			1.152	0.00	1.152	100.00%	0	1.152	0
Title 10 : Direct research									
10	10 01	Administrative expenditure of the 'Direct research' policy area	400.36242	339.56	60.80323	15.19 %	24.71	85.52	90.50
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	34.843906	10.80	24.040546	68.99 %	8.27	32.31	33.50
	10 03	Euratom Programme - Direct actions	11.191226	4.07	7.1258866	63.67 %	2.37	9.50	10.39
	10 04	Other activities of the Joint Research Centre	35.570388	14.72	20.847069	58.61 %	3.92	24.77	21.08
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	30.10575	5.53	24.5709	81.62 %	31.87	56.44	56.08
Total Title 10			512.07369	374.69	137.38763	26.83%	71.140016	208.527647	211.5409
Title 29 :									
29	29 02	The European statistical programme	0	0.00	0	0.00 %	0.00	0.00	0.03
Total Title 29			0	0.00	0	0.00%	0	0	0.028925
Title 34 : Climate action									
34	34 02	Climate action at Union and international level	1.304	0.00	1.304	100.00 %	0.00	1.30	0.00
Total Title 34			1.304	0.00	1.304	100.00%	0	1.304	0
	Total DG JRC		528.32712	382.95	145.37958	27.52 %	71.341964	216.721543	215.2006

= 'Breakdown of commitments remaining to be settled (in Mio EUR)'

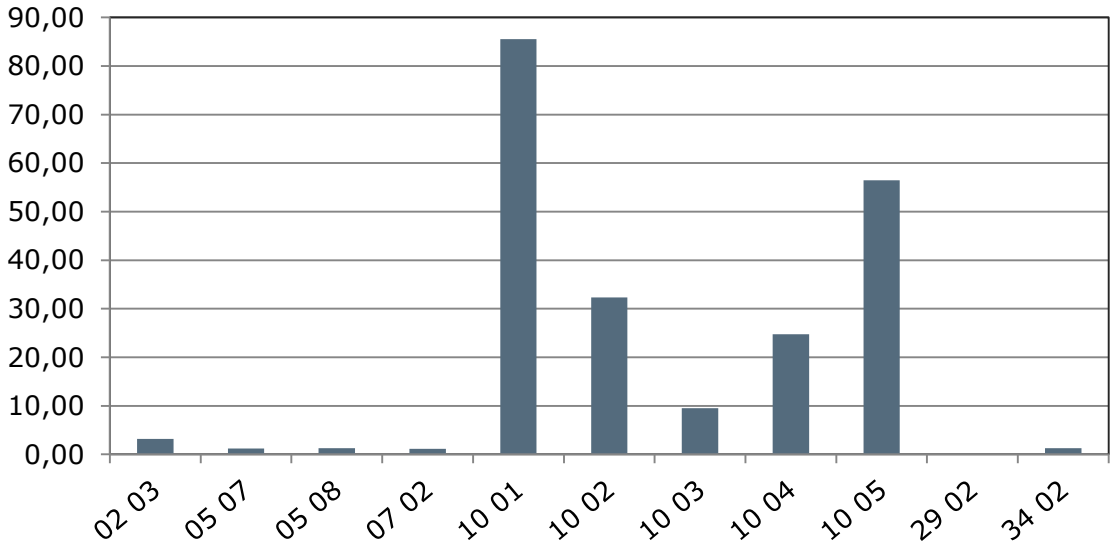


TABLE 4: BALANCE SHEET JRC

BALANCE SHEET	2018	2017
A.I. NON CURRENT ASSETS	207,196,315.11	202,771,680.86
A.I.1. Intangible Assets	964,106.79	1,690,236.35
A.I.2. Property, Plant and Equipment	206,214,335.58	201,063,571.77
A.I.6. Non-Cur Exch Receiv & Non-Ex Recoverab	17,872.74	17,872.74
A.II. CURRENT ASSETS	(1,027,594,480.37)	(873,017,940.43)
A.II.2. Current Pre-Financing	6,062,864.55	7,375,158.36
A.II.3. Curr Exch Receiv &Non-Ex Recoverables	(1,085,334,859.68)	(925,289,504.70)
A.II.4. Inventories	51,515,893.01	44,683,226.01
A.II.6. Cash and Cash Equivalents	161,621.75	213,179.90
ASSETS	**(820,398,165.26)**	**(670,246,259.57)**
P.I. NON CURRENT LIABILITIES	(1,902,225,313.39)	(1,904,010,572.16)
P.I.2. Non-Current Provisions	(1,902,221,470.37)	(1,904,006,729.14)
P.I.3. Non-Current Financial Liabilities	(3,843.02)	(3,843.02)
P.II. CURRENT LIABILITIES	(37,736,010.44)	(33,873,642.17)
P.II.2. Current Provisions	(30,590,055.08)	(30,288,272.54)
P.II.3. Current Financial Liabilities	-	-
P.II.4. Current Payables	(7,136,938.79)	(3,576,394.41)
P.II.5. Current Accrued Charges &Defrd Income	(9,016.57)	(8,975.22)
LIABILITIES	**(1,939,961,323.83)**	**(1,937,884,214.33)**
NET ASSETS (ASSETS less LIABILITIES)	**(2,760,359,489.09)**	**(2,608,130,473.90)**
P.III.2. Accumulated Surplus/Deficit	5,147,833,607.06	4,175,210,777.48
Non-allocated central (surplus)/deficit*	(2,387,474,117.97)	(1,567,080,303.58)
TOTAL	**0.00**	**0.00**

It should be noted that the balance sheet and statement of financial performance presented in Annex 3 to this Annual Activity Report, represent only the assets, liabilities, expenses and revenues that are under the control of this Directorate General. Significant amounts such as own resource revenues and cash held in Commission bank accounts are not included in this Directorate General's accounts since they are managed centrally by DG Budget, on whose balance sheet and statement of financial performance they appear. Furthermore, since the accumulated result of the Commission is not split amongst the various Directorates-General, it can be seen that the balance sheet presented here is not in equilibrium. Specifically the negative amount of Current Assets is due to the balance of the Ispra Liaison Account.

Additionally, the figures included in tables 4 and 5 are provisional since they are, at this date, still subject to audit by the Court of Auditors. It is thus possible that amounts included in these tables may have to be adjusted following this audit.

TABLE 5: STATEMENT OF FINANCIAL PERFORMANCE JRC		
STATEMENT OF FINANCIAL PERFORMANCE	**2018**	**2017**
II.1 REVENUES	(95,575,666.11)	(100,022,078.25)
II.1.1. NON-EXCHANGE REVENUES	(56,489.61)	(19,735.06)
II.1.1.5. RECOVERY OF EXPENSES	(4,052.29)	(7,466.40)
II.1.1.6. OTHER NON-EXCHANGE REVENUES	(52,437.32)	(12,268.66)
II.1.2. EXCHANGE REVENUES	(95,519,176.50)	(100,002,343.19)
II.1.2.1. FINANCIAL INCOME		14,550.96
II.1.2.2. OTHER EXCHANGE REVENUE	(95,519,176.50)	(100,016,894.15)
II.2. EXPENSES	240,992,709.62	1,072,644,907.83
II.2. EXPENSES	240,992,709.62	1,072,644,907.83
II.2.10.OTHER EXPENSES	140,695,304.51	965,971,795.55
II.2.2. EXP IMPLEM BY COMMISS&EX.AGENC. (DM)	97,433,694.60	102,375,576.61
II.2.6. STAFF AND PENSION COSTS	2,857,294.17	4,280,056.69
II.2.8. FINANCE COSTS	6,416.34	17,478.98
STATEMENT OF FINANCIAL PERFORMANCE	**145,417,043.51**	**972,622,829.58**

Explanatory Notes (facultative):
The accounting situation presented in the Balance Sheet and Statement of Financial Performance does not include the accruals and deferrals calculated centrally by the services of the Accounting Officer.
The 2017 amount of II.2.10 OTHER EXPENSES was so high due to the impact in the Statement of Financial Performance of the change of estimation of the Decommissioning Provision.

TABLE 5bis: OFF BALANCE SHEET JRC		

OFF BALANCE	2018	2017
OB.1. Contingent Assets	17,418,575.61	20,235,360.73
GR for performance	14,743,402.13	15,328,637.66
GR for pre-financing	2,675,173.48	4,906,723.07
OB.2. Contingent Liabilities	(3,012,578.00)	(3,012,578.00)
OB.2.7. CL Legal cases OTHER	(3,012,578.00)	(3,012,578.00)
OB.3. Other Significant Disclosures	(36,404,048.37)	(49,592,019.49)
OB.3.2. Comm against app. not yet consumed		-
OB.3.3.7.Other contractual commitments	(35,056,520.43)	(49,197,466.93)
OB.3.5. Operating lease commitments	(1,347,527.94)	(394,552.56)
OB.4. Balancing Accounts	21,998,050.76	32,369,236.76
OB.4. Balancing Accounts	21,998,050.76	32,369,236.76
OFF BALANCE	**-**	**(0.00)**

Explanatory Notes (facultative):

TABLE 6: AVERAGE PAYMENT TIMES FOR 2018 - DG JRC

Legal Times

Maximum Payment Time (Days)	Total Number of Payments	Nbr of Payments within Time Limit	Percentage	Average Payment Times (Days)	Nbr of Late Payments	Percentage	Average Payment Times (Days)
30	19706	18213	92.42 %	15.8682809	1493	7.58 %	43.635633
38	1				1	100.00 %	39
45	2	2	100.00 %	19			
60	446	437	97.98 %	25.798627	9	2.02 %	66.666667
90	15	13	86.67 %	41.7692308	2	13.33 %	123.5

Total Number of Payments	**20170**	**18665**	**92.54 %**		**1505**	**7.46 %**	
Average Net Payment Time	**18.1902826**			**16.1191535**			**43.87641196**
Average Gross Payment Time	**21.75815568**			**19.42384141**			**50.70830565**

Suspensions

Average Report Approval Suspension Days	Average Payment Suspension Days	Number of Suspended Payments	% of Total Number	Total Number of Payments	Amount of Suspended Payments	% of Total Amount	Total Paid Amount
0	50	1431	7.09 %	20170	21,594,697	9.08 %	237,769,764

Late Interest paid in 2018			
DG	**GL Account**	**Description**	**Amount (Eur)**
JRC	65010000	Interest expense on late payment of charges	1 309.99
JRC	65010100	Interest on late payment of charges New FR	3 271.68
			4 581.67

TABLE 7: SITUATION ON REVENUE AND INCOME IN 2018								
Chapter		Revenue and income recognized			Revenue and income cashed from			Outstanding balance
		Current year RO	Carried over RO	Total	Current Year RO	Carried over RO	Total	
		1	2	3=1+2	4	5	6=4+5	7=3-6
40	MISCELLANEOUS TAXES AND DEDUCTIONS	25,478,595	0	25,478,595	25,478,595	0	25,478,595	0
41	CONTRIBUTIONS TO THE PENSION SCHEME	22,422,378	0	22,422,378	22,422,378	0	22,422,378	0
60	CONTRIBUTIONS TO UNION PROGRAMMES	-343	4,963	4,620	-343	4,963	4,620	0
62	REVENUE FROM SERVICES RENDERED AGAINST PAYMENT	86,573,781	5,097,426	91,671,207	83,287,063	5,031,426	88,318,489	3,352,719
66	OTHER CONTRIBUTIONS AND REFUNDS	2,018,400	123,848	2,142,248	1,994,566	115,801	2,110,367	31,880
Total DG JRC		**136,492,812**	**5,226,236**	**141,719,048**	**133,182,259**	**5,152,190**	**138,334,449**	**3,384,599**

TABLE 8: RECOVERY OF PAYMENTS
(Number of Recovery Contexts and corresponding Transaction Amount)

INCOME BUDGET RECOVERY ORDERS ISSUED IN 2018	Irregularity		Total undue payments recovered		Total transactions in recovery context (incl. non-qualified)		% Qualified/Total RC	
Year of Origin (commitment)	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount
2014					1	16,873.54		
2015					1	718.69		
2016					2	1,185.27		
2017	2	1,043.31	**2**	**1,043.31**	9	14,452.38	22.22%	7.22%
2018	7	2,679.64	**7**	**2,679.64**	20	7,210.49	35.00%	37.16%
No Link					32	179,736.33		
Sub-Total	**9**	**3,722.95**	**9**	**3,722.95**	**65**	**220,176.70**	**13.85%**	**1.69%**

EXPENSES BUDGET	Error		Irregularity		OLAF Notified		Total undue payments recovered		Total transactions in recovery context (incl. non-qualified)		% Qualified/Total RC	
	Nbr	Amount	Nbr	Amount	Nbr	Amount	Nbr	Amount	Nbr	Amount	Nbr	Amount
INCOME LINES IN INVOICES												
NON ELIGIBLE IN COST CLAIMS												
CREDIT NOTES									1102	14,755,147.84		
Sub-Total									**1102**	**14,755,147.84**		
GRAND TOTAL			**9**	**3,722.95**			**9**	**3,722.95**	**1167**	**14,975,324.54**	**0.77%**	**0.02%**

TABLE 9: AGEING BALANCE OF RECOVERY ORDERS AT 31/12/2018 FOR JRC						
	Number at 01/01/2018	**Number at 31/12/2018**	**Evolution**	**Open Amount (Eur) at 01/01/2018**	**Open Amount (Eur) at 31/12/2018**	**Evolution**
2010	1	1	0.00 %	945.00	945.00	0.00 %
2014	1		(100.00 %)	7,500.00		(100.00 %)
2015	2	2	0.00 %	67,114.60	67,114.60	0.00 %
2016	8	3	(62.50 %)	6,484,092.15	6,172,998.86	(4.80 %)
2017	66	4	(93.94 %)	10,111,528.61	5,277,113.26	(47.81 %)
2018		40			10,155,405.75	
	78	**50**	**(35.90 %)**	**16,671,180.36**	**21,673,577.47**	**30.01 %**

TABLE 10: RECOVERY ORDER WAIVERS IN 2018 >= EUR 60.000						
	Waiver Central Key	**Linked RO Central Key**	**RO Accepted Amount (Eur)**	**LE Account Group**	**Commission Decision**	**Comments**

Total DG JRC	

Number of RO waivers	

There are 3 waivers below 60 000 € for a total amount of -34,896.4

None of your Recovery Order Waivers (if any) reaches EUR 60.000

TABLE 11: CENSUS OF NEGOTIATED PROCEDURES - DG JRC - 2018

External Procedures > € 20,000

Negotiated Procedure Legal base	Number of Procedures	Amount (€)
Art. 266.1(a) (External Actions) - Service entrusted to public sector bodies or non-profit institutions or associations	3	600,000.00
Total	**3**	**600,000.00**

Internal Procedures > € 60,000

Negotiated Procedure Legal base	Number of Procedures	Amount (€)
Annex 1 - 11.1 (a) - Follow-up of an open/restricted where no (or no suitable) tenders/requests to participate have been submitted	1	230,000.00
Annex 1 - 11.1 (b) - Artistic/technical reasons or exclusive rights (technical monopoly, captive market)	3	542,200.68
Annex 1 - 11.1 (e) - New services/works consisting in the repetition of similar services/works	1	1,191,600.00
Annex 1 - 11.1 (f) (ii) - Supplies of products manufactured for research, experimentation, study or development purposes	1	225,000.00
Art. 134.1(a) (Without prior publication) No tenders or no suitable tenders have been submitted	2	3,520,400.00
Art. 134.1(b) (Without prior publication) Work of art, technical reasons or protection of exclusive rights	6	4,235,163.96
Art. 134.1(e) (Without prior publication) New services or works consisting in the repetition of similar services or works	2	2,554,044.60
Art. 134.1(f)(ii) (Without prior publication) Supplies : manufactured for the purpose of research, experiment, study or development	1	78,961.00
Art. 134.1(f) (i) (Without prior publication) Supplies : additional deliveries	1	445,000.00
Art. 134.1(f) (Without prior publication) New services or works consisting in the repetition of similar services or works	1	158,001.00
Art. 135.1(a) (After prior publication) Submission of irregular or unacceptable tenders	1	100,000.00
Total	**20**	**13,280,371.24**

Additional comments

Art. 134.1(a) (Without prior publication) No tenders or no suitable tenders have been submitted
Art. 134.1(b) (Without prior publication) Technical or artistic reasons, or reasons connected with the protection of exclusive rights
Art. 134.1.e (Without prior publication) New services or works consisting in the repetition of similar services or works
Art. 134.1(f)(i) (Without prior publication) Supplies: for additional deliveries which are intended either as a partial replacement of supplies or installations or as the extension of existing supplies or installations,
Art. 134.1(f)(ii) (Without prior publication) Supplies : where the products are manufactured purely for the purpose of research, experimentation, study or development;
Art. 135.1(a) & 135.4 Submission of irregular or unacceptable tenders
Art. 135.1(b) The contract cannot be awarded without prior negotiations because of specific circumstances related to the nature, complexity or the legal and financial make-up of the contract or the risks attached to the subject matter of the contract;

It is of note that only twenty exceptional negotiated procedures were concluded during 2018, a drop from 2017 when twenty-nine procedures of this legal type were concluded.

TABLE 12: SUMMARY OF PROCEDURES OF DG JRC EXCLUDING BUILDING CONTRACTS

External Procedures > € 20,000

Procedure Legal base	Number of Procedures	Amount (€)
(Ext. act) Exceptional Negotiated Procedure with a single offer (Art. 266 RAP)	3	600,000.00
Total	**3**	**600,000.00**

Internal Procedures > € 60,000

Procedure Legal base	Number of Procedures	Amount (€)
Call for expressions of interest - List of vendors (Art. 136.1(b) RAP)	2	187,151.00
Competitive procedure with negotiation (Art. 135 RAP)	6	5,392,080.00
Exceptional Negotiated Procedure after publication of a contract notice (Art. 135 RAP)	1	100,000.00
Exceptional Negotiated Procedure without publication of a contract notice (Art. 134 RAP)	13	10,991,570.56
Negotiated procedure middle value contract (Annex 1 - 14.2)	24	2,969,452.70
Negotiated Procedure with at least five candidates below Directive thresholds (Art. 136a RAP)	41	4,370,381.39
Negotiated procedure without prior publication (Annex 1 - 11.1)	6	2,188,800.68
Open Procedure (Art. 104(1) (a) FR)	71	135,820,013.04
Open Procedure (Art. 127.2 RAP)	1	125,020.00
Open procedure (FR 164 (1)(a))	10	34,699,629.12
Restricted Procedure (Art. 104(1) (b) FR)	8	8,140,323.40
Total	**183**	**204,984,421.89**

TABLE 13: BUILDING CONTRACTS

Legal base	Contract Number	Contractor Name	Description	Amount (€)

TABLE 14: CONTRACTS DECLARED SECRET

LC Responsible Organisation DG Code	LC Contract/Grant Type	LC Date	Legal base	Contract Number	Contractor Name	Description	Amount (€)
JRC	Direct	05/12/2018	Annex 1 - 11.1 (i) - Secret contract or contract requiring special security measures	CCR.G.C9 36577	IDROGEA SERVIZI SRL*	SPECIFIC GEOLOGIC AL AND TOPOGRAP HICAL SURVEY	0.00
				1			**0.00**

ANNEX 4: Materiality criteria

The objectives of the internal control system are defined in the Financial Regulation (cf. Art. 36). The Authorising Officer by Delegation (AOD) needs to define specific management targets and, in particular, needs to have objective criteria **for determining which weaknesses** should be subject to a formal reservation to his/her declaration.

The JRC considers weaknesses to be either of a quantitative nature i.e. significant errors affecting legality and regularity of the underlying transactions, or of a qualitative nature. Qualitative weaknesses might arise from significant control system weaknesses, significant reputational events which materialised, insufficient audit coverage and/or inadequate information from internal control systems, critical issues reported by the European Court of Auditors (ECA), the Internal Audit Service (IAS) or OLAF.

The materiality criteria related to the JRC's budget and operations are applied to the results of *ex-ante* and *ex-post* controls, exception reporting, reports from authorising officers by sub-delegation, reports from authorising officers in other DGs managing budget appropriations in cross-delegation and work done by the IAS and other auditing bodies as well as feedback during the self-assessment of internal control.

Determining specific materiality criteria involves making a judgment in both **qualitative and quantitative terms.**

In **qualitative** terms, when assessing the significance of any weaknesses, the JRC takes the following factors into account:

- the nature and scope of the weakness;
- the duration of the weakness;
- the existence of compensatory measures (mitigating controls which reduce the impact of the weakness);
- the existence of effective corrective actions to correct the weaknesses (action plans and financial corrections) which have had a measurable impact.

In **quantitative** terms, to make a judgment on the significance of a weakness, the JRC **quantifies** the potential financial impact ('monetary value of the identified problem'/'amount considered erroneous'/'the amount considered at risk') in monetary terms.

The following three types of reservations may be associated with the activities of the JRC in case the thresholds set by the materiality criteria are exceeded. Events with a reputational impact for the JRC are assessed by taking into account the nature of the impact on reputation, the breadth of awareness of the event and the duration of impact on reputation.

1. Materiality criteria for making a reservation in the context of Financial Management

The voted budget in commitments managed directly by the JRC each year is around EUR 401 million. Around 59 % of the budget is dedicated to staff costs. The remainder is dedicated to site and infrastructure management and to operational expenses e.g. purchasing equipment. According to the DG Budget guidance[9], any DG with a programme affected by errors for which the financial exposure from the amount at risk is above the materiality threshold of 2% of the relevant related payments should make a reservation.

The reservations may be associated with the following financial management activities:

- Payment processing in which significant amounts of funds are inappropriately paid

[9] 'Guidance on the calculation of error rates, the financial exposure as amount at risk, the materiality for a potential reservation and the impact on the AOD's declaration'

to beneficiaries. These include payments to staff and/or ineligible payments to suppliers.

- Procurement activities which result in a significant loss of funds from the JRC budget. Such activities may be associated with distortion of market conditions and not opening up the market to competition.
- Favouring third parties to work with the JRC in the context of its contractual income operations where for example insufficient amounts are charged by the JRC for its services.
- Reputational events creating lasting damage related to financial operations, including procurement. Reservations will be made if serious cases of fraud occur during the processing of financial transactions.

2. Materiality criteria for making a reservation in the context of the core activities of the JRC

As the science and knowledge service of the Commission, the JRC has the responsibility to support EU policies with independent evidence throughout the whole policy cycle. Events that risk significantly undermining the credibility and or impartiality of the JRC's scientific results and outputs would be considered as significant reputational events which have materialised that could lead to a reservation being made. This is relevant in cases where such operations would lead to lasting damage to the Commission's image or serious breaches on provisions of the Treaty.

The JRC is accountable for a wide range of administrative and support services. Events that damage the reputation of the European Commission in the long term associated with mismanagement and/or malpractice of the JRC in particular when legal provisions are not respected, would lead to a reservation being made.

The JRC has important responsibilities to ensure the safety and security both of its staff and the population in areas around the research centres. Reputational events occurring as a consequence of serious negligence, breaches in the application of safety legislation or mismanagement, would lead to a reservation being made.

If the JRC was the subject of litigation and subsequently lost a legal case the matter would be assessed to determine whether the reputation of the European Commission had been significantly and adversely affected in the long term, this would lead to a reservation being made.

3. Materiality criteria for making a reservation in the context of Control Systems Weaknesses and Auditing Activities

The JRC works to ensure that the Commission's Internal Control Framework is implemented effectively. Should one control principle not be sufficiently well implemented, or should there be a serious error in the application of any of the control principles, or any critical issue reported by OLAF, a reservation would be made.

The JRC is periodically audited by the IAS and the ECA. These bodies issue recommendations scaling from critical to important. In the case of critical recommendations or in the case of a number of 'very important' recommendations creating a combined effect on the state of internal control, a reservation would be envisaged; if the identified weaknesses led to a significant loss of funds or caused lasting damage to reputation, then a reservation should be made. In any case, if the JRC did not, or could not, appropriately address a critical recommendation, or the combined effect of a number of recommendations, rated 'very important', or for which there is a significant delay in the implementation of the action plan, a reservation would be made.

ANNEX 5: Relevant Control Systems (RCSs) for budget implementation

RCS: Procurement in direct management mode
Stage 1 – Procurement
A - Planning

Main control objectives: Ensuring that the decision to tender is optimal

Main risks	Mitigating controls	Coverage frequency and depth of controls	Cost-effectiveness indicators
The needs are not well defined (operationally and economically) and that the decision to procure was inappropriate Discontinuation of the services provided or delays/extra work in the project execution due to a late contracting	Preparation of detailed procurement planning and regular follow-up via Public Procurement Management Tool (PPMT)	**Coverage**: 100 % of the forecast procurements > EUR 15 000	**Effectiveness**: Benefits: Rejection of unjustified purchases, avoidance of litigation and compliance with Financial Regulation and Procurement rules **Efficiency**: Number of procedures closed during the year: 334 Average cost per tender: Cost of control on procurement (EUR 5 534 634) / number of procedures closed during the year (372) = **EUR 14 878** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 5 534 634) / Total contract value (EUR 211 196 334*) = 2.62 % * Contracts above EUR 15 000
	Note to AO(S)D on justification (economic, operation) for launching a procurement process	**Coverage**: 100% of the forecast procurements	
	Preparation of detailed procurement planning and regular follow-up via PPMT	**Coverage**: 100 % of the forecast procurements > EUR 15 000	
	Continuous monitoring during the call for tender procedure for successful award of the contract and close monitoring of contract execution.	**Coverage**: All key procurement procedures having significant impact on the objectives of the DG	

B - Needs assessment & definition of needs

Main control objectives: Ensuring that the call for tender is optimally done

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
The best offer/s are not submitted due to inadequate market analysis and / or poorly defined technical specifications	Financial circuit (OVA and or AOS approval and supervision of specifications)	**Coverage**: 100 % of the specifications are scrutinised **Depth**: Determined by the amount and/or the impact on the objectives of the DG if it goes wrong	**Effectiveness:** Benefits: Rejection of unjustified purchases, avoidance of litigation and compliance with Financial Regulation and Procurement rules **Efficiency**: Average cost per tender**:** Cost of control on procurement (EUR 5 534 634) / number of procedures closed during the year (372) = **EUR 14 878** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 5 534 634) / Total contract value (EUR 211 196 334*) = 2.62 % * Contracts above EUR 15 000
	Additional controls namely by procurement staff above the financial threshold of EUR 15 000	Coverage: 100 % of procedures > EUR 15 000	
	Public Procurement Advisory Group (PPAG) – *ex-ante* control	**Coverage**: Threshold (100 % > EUR 500 000 and 100 % of negotiated > EUR 60 000) and random sampling (others > EUR 60 000 < EUR 500 000) **Depth:** Depends on the sensitivity Risk based approach focused in particular on the selection criteria	

C – Selection of the offer & evaluation

Main control objectives: Ensuring that the selection of the contractor is optimal

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
The most promising offer not being selected, due to a biased, inaccurate or 'unfair' evaluation process	Opening committee and evaluation committee	**Coverage**: 100 % of the offers analysed **Depth**: all documents transmitted	**Effectiveness**: Benefits: Rejection of unjustified purchases, avoidance of litigation and compliance with Financial Regulation and procurement rules **Efficiency:** Average cost per tender: Cost of control on procurement (EUR 5 534 634) / number of procedures closed during the year (372) = **EUR 14 878** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 5 534 634) / Total contract value (EUR 211 196 334*) = 2.62 % * Contracts above EUR 15 000
	Public Procurement Advisory Group *ex-ante* control	Coverage: Threshold (100 % ≥ EUR 500 000 and 100 % of negotiated > EUR 60 000) and random sampling (others > EUR 60 000 < EUR 500 000) **Depth**: In terms of justification of the draft award decision	
	Opening and evaluation committees' declaration of absence of conflict of interest and confidentiality	**Coverage**: 100 % of the members of the opening and the evaluation committees	
Inconsistency between the signed contract, the specifications, the offer, the conclusion of the evaluation committee and the awarding decision	Verification by procurement officers and financial verifying agents and authorising officers	**Coverage**: 100 % checked	**Effectiveness:** Benefits: avoid contracting with 'excluded' suppliers that would not be able to fulfil the contract requirements **Efficiency:** Average cost per tender: Cost of control on procurement (EUR 5 534 634) / number of procedures closed during the year (372) = **EUR 14 878** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 5 534 634) / Total contract value (EUR 211 196 334*) = 2.62 % * Contracts above EUR 15 000
	Exclusion criteria documented	**Coverage:** 100 % checked Depth: required documents provided are consistent	
	Public Procurement Advisory Group *ex-ante* control	**Coverage:** Threshold (100 % ≥ EUR 500 000 and 100 % of negotiated > EUR 60 000) and random sampling (others > EUR 60 000 < EUR 500 000) **Depth**: Depends on the sensitivity risk-based approach focused in particular on the selection criteria	
	Early Warning System (EWS)	**Coverage**: 100 % checked	

Stage 2 – Financial transactions

Main control objectives: Ensuring that the implementation of the contract is in compliance with the signed contract

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
Contractor does not comply with the offer done / signed contract	Monitoring respect of contractual provisions	**Coverage**: 100 % monitored **Depth**: Follow-up of the deadlines and the deliverables mentioned in the contract	**Effectiveness:** Benefits: Detect error before payment, sound financial management and respect of contractual provisions **Efficiency:** Average cost per payment and cost over annual amount disbursed:(EUR 7 198 217) / number of financial transactions (28.025) = **EUR 257** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on the financial circuit: EUR 7 198 217) / value of payment executed[10] (EUR 233 190 314) = 3.09 %
Amount paid is disconnected from the quality and the timing of the deliverables	Conform to the fact	**Coverage**: 100 % of transactions	**Effectiveness**: Benefits: avoid paying undue amounts **Efficiency**: Average cost per payment and cost over annual amount disbursed: (EUR 7 198 217) / number of financial transactions (28.025) = EUR 257 **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on the financial circuit: EUR 7 198 217) / value of payment executed[11] (EUR 233 190 314) = 3.09 %
	Financial circuit: all steps financial and operational	**Coverage**: 100 % controlled **Depth**: check of all required documents in the contract	
	Signature at higher senior management level for amounts > EUR 134 000	**Coverage**: 100 % of transactions > EUR 134 000 **Depth**: The depth depends on the risk criteria	
	Sensitive functions	**Coverage**: AOSDs and OIAs mainly	

[10] Excluded: payments done by the Paymaster's Office (PMO) (mainly related to salaries and business travel), and 'Hors Budget' Payments i.e. payments made to consolidate accounting data.

[11] Excluded: payments done by the Paymaster's Office (PMO) (mainly related to salaries and business travel), and 'Hors Budget' Payments i.e. payments made to consolidate accounting data.

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
Risk of late interest payments and discontinuity of business because contractor fails to deliver due to delayed payments.	Close monitoring of every step in the payment process, in particular payment delays	**Coverage**: 100 % of transactions	**Effectiveness**: Benefits: Sound financial management and respect of contractual provisions **Efficiency**: JRC Payments in time (93 %) - According to the applicable financial regulation version **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on the financial circuit (EUR 7 198 217) / value of payment executed[12] (EUR 233 190 314) = 3.09 %

[12] Excluded: payments done by the Paymaster's Office (PMO) (mainly related to salaries and business travel), and 'Hors Budget' Payments i.e. payments made to consolidate accounting data.

Stage 3 – Supervisory measures

Main control objectives: Ensuring that any weakness in the procedures (tender and financial transactions) is corrected

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
An error or non-compliance with regulatory and contractual provisions, including technical specifications, or a fraud is not prevented, detected or corrected by *ex-ante* control, prior to payment	*Ex-post* controls on procedures / contractors	**Coverage**: Risk-based percentage or financial controllers check each other's work once a year **Depth**: Review of the procedures implemented (procurement and financial transactions)	**Effectiveness**: Detected error rate from *ex-post* controls: value of error(s) / total value of payments checked **Benefits**: Irregular payments detected, issues are followed and addressed and improvement of processes and procedures **Economy (costs):** Estimation of cost of staff involved mainly linked to *ex-post* controls Costs *ex-post* controls / total value of transactions checked by *ex-post* controls Costs *ex-post* controls / total number of transactions checked by *ex-post* controls
	Whistle blowing (after yearly reporting of awarded contractors)	**Coverage**: Potentially 100 %	
Management of the procurement is not improved in general	Review of *ex-post* results	**Coverage**: 100 % at least once a year **Depth**: Look for any systemic problem in the procurement procedure and in the financial transaction procedure and any weakness in the selection process of the *ex-post* controls	
	Review of exception reporting	**Coverage**: 100 % at least once a year **Depth**: Look for any weakness in the procedures (procurement and financial transactions)	

RCS No 2: Managing Income from Contractual Actions

This RCS applies to income generated by the JRC through providing, under contract, scientific and technical services to customers both within and outside the European Institutions.

Stage 1: Contract Proposal Phase

Main control objectives: Ensuring the JRC only commits to revenue generating operations through contractual contracts when appropriate

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
The risk of carrying out projects which are not in line with the JRC work programme and which do not meet customer expectations, might lead to reputational issues.	Risk assessment carried out on each contractual project proposal and reviewed by management Project check list for each contractual project proposal is subject to management review.	**Coverage**: 100 % (risk assessment and project check list for all projects proposals). **Depth**: All documents transmitted	**Effectiveness** Benefits: Only project proposals with an acceptable level of risk and which are in line with work programme which could meet customer expectations are accepted. JRC contractual cashing (in %) - up to 15 % of the institutional budget 21.68 % **Economy (costs):** Estimated time taken by responsible scientist and management to prepare and review risk assessment against project proposal value. Cost of control on contractual project proposals / Total contractual project forecast value 0.029 % Cost of control on contractual project proposals / Number of proposals selected during the year 0.029 % (all proposals past management review)
	For Commission customers project proposals – high level management review and hierarchical validation	**Coverage**: 100 % (all Commission project proposals). **Depth**: May be determined by the amount and/or the impact on the objectives of the DG if it goes wrong	**Effectiveness** Benefits: Only project proposals with an acceptable level of risk and which are in line with work programme which could meet customer expectations are accepted. **Efficiency:** Estimated time taken by each actor in the management review procedure. **Economy (costs):** Total cost of control of management review / Total project

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
			forecast value of Support to Commission contracts **0.019 %**
Financial risk on Third Party Work (TPW) contracts – risk of non-payment by third parties	50 % up-front payment is requested on all TPW contracts. Checking and follow-up of receipt of up-front payment by financial officers	**Coverage**: 100 % check of receipt of TPW up-front payments.	**Effectiveness** Rate of default (if any) on TPW contracts:0 Benefit: reduced risk from third party default **Economy (costs):** Estimated time taken by financial officers to request and monitor TPW up-front payment against project value Cost of control for up-front payment / Project value of all TPW contracts **0.15 %**
Financial loss due to underestimation of cost of deliverables	Approval of Cost Evaluation Form by Head of Unit.	**Coverage**: 100 % (All cost evaluation forms authorised by the Unit Head)	**Effectiveness** Benefit: Reduced risk of financial loss due to overspending on contractual contracts **Efficiency** Estimated time taken by financial officers to request and monitor TPW up-front payment against project value **Economy (costs):** Estimated time for Unit head to approve the project proposal cost evaluation. Cost of control / Value of cost evaluation form **0.01 %**

Stage 2: Contract Preparation Phase

Main control objectives: Ensuring all contractual contracts signed by the JRC for the provision of scientific/technical services meet the appropriate contract standards.

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
Inappropriate contract wording may expose the JRC to additional liability.	Wherever possible standard templates are used. All contracts are checked and verified by the contractual financial officers and in particular for any deviation from standard clauses, and for any non-standard clauses an opinion of the legal unit may be sought.	**Coverage**: 100 % (all contracts reviewed at the level of the contractual financial officers).	**Effectiveness** Benefit: The JRC is not exposed to any additional liability **Economy (costs):** Estimated time taken for the contractual financial officers to verify all contracts. Cost of control / Total value of contracts signed **0.01 %** Total cost of controls / number of contracts signed EUR 92.5
Failure to properly forecast revenue in the associated initial Forecast of Revenue (FOR) may result in inadequate credit commitments being available.	All FORs are checked by the Financial Initiating Agent (FIA), verified by a financial verifying agent (FVA) and authorised by the authorising officer (AOS) who is also responsible for the legal commitment (i.e. signing the contract).	**Coverage**: 100 % as all FOR are checked, verified and authorised (Financial Circuits). **Depth**: The depth depends on the risk criteria	**Effectiveness** Benefit: Elimination of errors on FOR, respect of financial circuits. **Efficiency** Estimated time of staff involved, (FIA; FVA & AOS). **Economy (costs)**: Cost of control / Total value of FORs signed **0.04 %** Cost of control / number of FORs **EUR 81.8**

Stage 3: Contract implementation phase

Main control objectives: To guarantee the correct financial management of all revenue generating operations through contractual contracts

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
Failure to cash appropriately might lead to financial and reputational loss.	Budget consumption is verified by the contractual financial officers (FIAs) prior to billing the customer. All Recovery Orders (ROs) are checked by FIA against contract and budget consumption, verified both by the FVA and authorised by the AOS.	**Coverage**: 100 % (all ROs are checked, verified and authorised). – Financial circuits **Depth**: The depth depends on the risk criteria	**Effectiveness** **Benefit:** Correct billing of customers, sound financial management and respect of contractual provisions. **Efficiency** Time taken by, FIA, FVA and AOS to verify ROs against the total value of ROs issued. **Economy (costs):** Time taken by, FIA, FVA and AOS to verify ROs against the total value of ROs issued. Total cost of controls / Total value of recovery orders **0.11 %**
	Independent audits are systematically carried out For Framework Programme (FP) contracts with a reimbursable value > EUR 325 000	**Coverage:** Independent audits of FP contracts with a reimbursable value > EUR 325 000 Depth: The depth depends on the risk criteria	**Effectiveness** Benefit: reduced risk of errors for contracts with a reimbursable value > EUR 325 000, system improvements and compliance with FP provisions. **Efficiency** Time to provide audit certificate **Economy (costs)** Costs of audits / Total value of contractual projects audited 0.15 %
Risk of late interest payments and discontinuity of business because contractor fails to deliver due to delayed payments.	Close monitoring of every step in the revenue process, including contractual cashing rates	**Coverage**: 100 % of RO transactions	**Effectiveness** **Benefits**: Sound financial management and respect of contractual provisions JRC contractual cashing (in %) - up to 15 % of the institutional budget

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
			21.68 % **Efficiency** Estimated time of staff involved, (FIA; FVA & AOS). **Economy (costs):** Estimated time of staff involved, (FIA; FVA & AOS).
Incorrect implementation of procedures and work instructions for contractual activities, resulting in a lack of harmonisation across the JRC	*Ex-post* control exercise, analysing 16 randomly chosen contracts out of a pool of living and recently closed contracts	A comprehensive review of the correct application of procedures and work instructions to a randomly selected group of contracts covering all JRC sites.	**Effectiveness** Benefit: Increased harmonisation of contractual contract management across the JRC sites **Efficiency** Estimated time of staff involved **Economy (costs)** Estimated time of staff involved **EUR 8 140** Cost of control / Total Value of contractual cashing = 0.01 %

ANNEX 6: Implementation through national or international public-sector bodies and bodies governed by private law with a public sector mission (if applicable)

N/A

ANNEX 7: EAMR of the Union Delegations (if applicable)

N/A

ANNEX 8: Decentralised agencies (if applicable)

N/A

ANNEX 9: Evaluations and other studies finalised or cancelled during the year

Study project ID	Title of the study	Study internal ID	Study overview	Study reason	Associated services	Study cost	Note	Title of the deliverable
6854	Address inequalities in access to student mobility based on exchange of university credits	O	The study will use data from Graduate surveys from 3 Member States to characterise the inequality in access to credit mobility and whether coming from a disadvantaged status has a negative impact on the probability of credit mobility.	General study		15000	Abandoned due to change in policy priorities	
6866	The effects of education on intergenerational mobility	O	This study looks for answers to the key question 'Does promoting education make the income distribution more egalitarian in the long-run?' Answering this question is key in assessing whether educational policies are an effective tool for fighting economic inequality and eradicating poverty.	General study		15000	Contributions to debate on social mobility and the role of education	The effects of education on intergenerational mobility
6867	What works in education: from science to policy making	O	This study will discuss how to approach the issue of "what works in education" from a policy relevant research perspective.	General study		15000	Abandoned - change of priorities	
6869	Dynamics and impacts of Social Policy Innovation on the resilience of local ecosystems	O	The objective of the study is to explore and better understand the dynamics and impacts of Social Policy Innovation strategies on the resilience of local ecosystems, analysing initiatives contributing to the societal resilience at different levels through qualitative and quantitative analyses.	General study	Directorate-General for Employment, Social Affairs and Inclusion	45000	Support to activities in the area of social policy innovation	Testing a New Conceptual and Analytical Framework: Cross-case analysis from a Social Policy Innovation and Resilience Perspective
6870	Exploring youth digital talent readiness for the future of work in Europe	O	The objective of the study is to support developing a framework to measure the contribution of digital skills and employability measures to foster the digital talent readiness of youth in Europe in light of the need to respond to pressing challenges, such as in particular youth unemployment, and to ensure that the EU is resilient to future possible economic, social and natural shocks.	General study	Directorate-General for Employment, Social Affairs and Inclusion	37400	Support to activities in the area of social policy innovation	Exploring youth digital talent readiness for the future of work in Europe

6871	Systematising and monitoring welfare reform strategies and measures against the digital transformation effects on labour market and society	O	The objective of the study is to support shaping a theoretically informed framework that can be used to systematise welfare reform strategies and measures against the digital transformation effects on labour market and society. This study aims at understanding the role and the scope of social policy innovation within the broader context of the welfare reform strategies and measures currently available across EU Member States.	General study	Directorate-General for Employment, Social Affairs and Inclusion	60000	Abandoned - change in priorities	
6872	Mapping and analysis of social policy innovations across the EU	O	The objective of the study is to collect data to consolidate the research conducted so far by the JRC in the area of Social Policy Innovation and enhance it through a comprehensive analysis according to an analytical framework developed earlier, which will aid in the establishment of a 'Social Policy Innovation Network (SPIN)'	General study	Directorate-General for Employment, Social Affairs and Inclusion	60000	Support to implementation of the European Pillar of Social Rights	Mapping and analysis of social policy innovations across the EU
6877	Dual-use trade control relevance of nano-technologies	O	This study examines the types of nanotechnology that are currently approaching a sufficient level of commercial maturity, or close to moving on from fundamental to applied research with a proliferation potential. It will focus in the first place on risks related to the miniaturisation and nanotech top-down of existing listed dual-use items. It will assist in differentiating between general-purpose and specific equipment needed for the developing/producing nano-enabled dual-use items, trying to identify certain choking points in the development/production process. The study will develop on the manufacturing processes, outlining the world distribution of producers and the involved economic sector.	General study	Directorate-General for Trade	30500	Prenormative study to anticipate future needs to amend the technical annex of the Regulation 428/2009 under delegated act to the Commission	Dual-Use Challenges of Nanotechnology: A Net Assessment
6878	Topical study on loss of essential power system	O	This study aims to support the in-depth analysis of nuclear power plants events related to failure of non-interruptible power supplies of the essential I&C system. Final objective is to draw the generic and case-specific lessons from the events contained in the databases that can be used to support the regulatory action of the members of European Clearinghouse.	General study	Directorate-General for Energy	14990	Contribution to implementing Council Directive 2009/71/EURATOM amended by Council Directive 2014/87/Euratom	Loss of Essential Power System - Topical Study

6879	Evaluation of socioeconomic impacts of Arctic observational systems	O	The study will quantify societal and economic benefits and co-benefits of enhancing Arctic observation systems and compare them with investment and management costs.	General study	Directorate-General for Climate Action, Directorate-General for the Environment, Directorate-General for Research and Innovation	129815	Support to implementing EU policy on the Arctic (Decision No 1386/2013/EU on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'; JOIN (2016) 21 Joint Communication to the European Parliament and the Council 'An integrated European Union policy for the Arctic'); JRC113246	Impact Assessment Study on Societal Benefits of Arctic Observing Systems: Evaluation of costs and benefits
6882	Protocol for literature meta-analysis on agriculture impacts on the environment	O	To provide quantified information on the effectiveness of Ecological Focus Area measures. Information drawn from existing literature through a systematic review, and synthesised in an evidence synopsis.	General study	Directorate-General for Agriculture and Rural Development, Directorate-General for the Environment	60000	Abandoned - change of priorities	
6889	A review of intergenerational mobility and its drivers	O	Given the crucial role of education in providing individuals (through human capital accumulation) with the opportunity to climb up the social ladder, the study will privilege an education/human capital perspective to explain the low rates of social mobility. It will address measurement/methodological issues, by differentiating between absolute (intergenerational) and relative social mobility (or social fluidity); social mobility measured as transitions into a different class/occupation or mobility across income/wealth quintile (or both). Additionally, the study will explore the relationship between intergenerational mobility and the composition of public spending (in terms of both expenses items and their intergenerational implications such as pensions vs education across different cohorts).	General study		9000	Contribution to debate on social mobility and the role of education in the context of European Pillar of Social Rights and the Future of Europe	A review of intergenerational mobility and its drivers 10.2760/610312

6892	Location-enabled digital platforms	O	Current state-of-play of Digital Platforms and their potential impact on the public sector. The role of location in these environments will be assessed.	General study	Directorate-General for Informatics	251424	Support to EC Programme Interoperability Solutions and Common Frameworks for European Public Administrations, Businesses and Citizens (the ISA2 Programme; Decision 2015/2240)	Digital Platform for public services
6895	Effectiveness of IPR systems	o	The objective of the study is to provide with the help of the OECD-EUIPO database in combination with other firm-level databases economic (econometric) evidence on the impact that counterfeiting might have on innovation of firms in the digital sector.	General study	Directorate-General for Communications Networks, Content and Technology	50000	Support to Digital Single Market	Impact of counterfeiting on the performance of digital technology companies
6896	Assessing digital competence	O	The JRC has developed a digital competence framework for citizens (DigComp 2.1). This study aims to set up a valid and reliable assessment instrument to evaluate digital competence based on DigComp. This assessment instrument should be targeted to individuals with no and low digital skills (see definition of the Digital Skills Index of the Digital Agenda Scoreboard of the European Commission). The main aim of this contract will be to pilot the assessment instrument developed by the JRC in three Member States of the European Union.	General study	Directorate-General for Employment, Social Affairs and Inclusion	83950	A New Skills Agenda (COM(2016) 381 final)	Assessing digital competence
6920	Case studies on innovative Training and Development (T&D) practices in Higher Education	O	This study will consist of identification and analysis of 6-10 cases of how innovation in teaching practices in Higher Education using digital technologies can be organised as part of Training and Development, aimed at understanding challenges and opportunities.	General study	Directorate-General for Education and Culture	43700	Communication on a renewed EU agenda for higher education (COM(2017) 247 final)	Case Studies on Training and Development on Innovative Practices in Higher Education

6921	Evidence on Innovative Assessment: Literature review and case studies	O	The objective of this contract is to provide an overview of more recent, innovative (digital and non-digital) assessment strategies and to provide evidence on how these are and can be used to develop assessment schemes that reflect innovative learning and teaching practices and support the development of Key Competences.	General study	Directorate-General for Education and Culture	55300	Communications on school development and excellent teaching for a great start in life (COM(2017) 248 final) and on a renewed EU agenda for higher education (COM(2017) 247 final)	Innovating Professional Development in Higher Education: An Analysis of Practices
6924	Supply-use based econometric input-output multipliers of output, income, employment and CO2 emissions	O	An alternative econometric approach to estimate the impact effects of changes in exports or domestic final demand on output, value added, employment and carbon dioxide emissions in the European Union.	General study		55000	Contribution to impact assessment methods	Supply-use based econometric input-output multipliers of output, income, employment and CO2 emissions
6929	State-of-play location-enabled APIs	O	APIs (Application Programming Interfaces) represent technical solutions for reliable identification and exchange of data. The study aims to identify the current state-of-play of API landscape and their potential impact on the public sector. The role of location on these environments will be assessed.	General study		66600	Support to European Interoperability Framework, EU eGovernment Action Plan, and implementation of the 'Once-only' principle	Digital Government Benchmark - API study
6931	Community engagement in INSPIRE	O	Study on community engagement including how to deal with community feedback and how to improve user involvement.	General study	Directorate-General for the Environment	50000	Abandoned - change in priorities	

6939	Assessing the innovation capability of EU companies in developing dual-use technologies	O	The increasing technological edge of the civilian sector in the field of defence makes the discussion of dual use technologies and goods particularly relevant. The study must focus on emerging, cross-cutting technologies that can be used for both civil and military purposes: the so called dual-use technologies, which can be truly important not only for firms in the aerospace and defence sector but also to other industries. To this end an analytical framework must be set up to identify the most important actors (in terms of size and/or innovativeness) of the European defence innovation ecosystem and to compare them with their main non EU competitors. The innovation capability of these companies in developing dual-use technologies must be analysed, highlighting the strengths and weaknesses of the European innovation ecosystems, and shedding insights on the actions that can be taken by policy makers.	General study	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs	42000	Support to research and innovation policy	Assessing the innovation capability of EU companies in developing dual-use technologies 10.2760/032120
6941	Report on mapping analysis for each of the S3Energy partnerships (bioenergy, sustainable buildings, solar, smart grids and renewable marine energy)	O	Technical and analytical work to support the work of the five S3 energy partnerships (bioenergy, smart grids, sustainable buildings, marine renewable energy and solar energy) including development of theoretical framework, methodologies, collection and analysis of data, and reporting on the findings. Experts are expected to support regions during the implementation of their Smart Specialisation Strategies in the area of energy and for the uptake of the mainstream energy investments. The main aim of these activities will be to encourage and support regions to deliver real projects on the ground.	General study	Directorate-General for Energy, Directorate-General for Regional and Urban Policy	74250	Support to S3 energy partnerships	Report on mapping analysis for each of the S3Energy partnerships (bioenergy, sustainable buildings, solar, smart grids and renewable marine energy)
7046	Innovation Camp Methodology Guide	O	This Methodology Guide is conceived to encourage regions and cities from all over Europe to adopt the Innovation Camps methodology as a tool to address collectively and effectively societal and economic challenges concerning local societies in a European context - notably in the field of Research and Innovation Smart Specialisation Strategies (RIS3) through an open, collaborative and inclusive Entrepreneurial Discover Process (EDP) between Quadruple Helix actors (i.e. government, industry, academia, and civil society).	General study	Directorate-General for Regional and Urban Policy	13800	Tool for regions to put Entrepreneurial Discovery Process in practice in the context of their Smart Specialisation strategies; cooperation with CoR	Innovation Camps Methodology Handbook: Realising the potential of the Entrepreneurial Discovery Process for Territorial Innovation and Development 10.2760/243875

7047	Place-based innovation ecosystems: fieldwork for case study #4	O	This case study is the fourth one of a series devoted to study place-based innovation ecosystems in a set of regions which are comparatively advanced in terms of their regional smart specialisation strategy (RIS3) plans, notably in terms of adopting a quadruple helix stakeholder model. Such analysis aims to understand their specific contribution to make their region's innovation plans to succeed, investigating their key enabling factors, drivers, dynamics, governance and sustainability, as well as mapping in a relational model the diversity of intermediary institutions and places making part of, as well as their interlinks and ecosystem orchestrators. The study will provide an example of a place-based start-up ecosystem.	General study	Directorate-General for Regional and Urban Policy	13800	Cooperation with CoR	Place-based innovation ecosystems: Technology Park in Ljubljana (Slovenia)
7048	Place-based innovation ecosystems: fieldwork for case study #5	O	This case study is the fifth one of a series devoted to study place-based innovation ecosystems in a set of regions which are comparatively advanced in terms of their regionals smart specialisation strategies (RIS3) plans, notably in terms of adopting a quadruple helix stakeholder model. Such analysis aims to understand their specific contribution to make their region's innovation plans to succeed, investigating their key enabling factors, drivers, dynamics, governance and sustainability, as well as mapping in a relational model the diversity of intermediary institutions and places making part of, as well as their interlinks and ecosystem orchestrators. The study will provide an example of innovation districts in the USA.	General study	Directorate-General for Regional and Urban Policy		Cooperation with CoR	Place-based innovation ecosystems: Innovation Districts in Boston-Cambridge (US)
7050	2017 JRC Productivity and Impact Evaluation (PRIME)	O	The 2017 JRC Productivity and Impact Evaluation (PRIME) assesses the impact of the JRC direct actions under Horizon 2020/EURATOM programmes in 2017, based on internal peer evaluation of project results. This is a regular, annual exercise providing information for the JRC strategic decision-making and external evaluations.	Evaluation			Annual evaluation of the JRC's outcome	JRC Productivity and Impact Evaluation Report - PRIME 2017

7171	Place-based Innovation Ecosystems: fieldwork for case study #3	O	This case study is the third one of a series devoted to study place-based innovation ecosystems in a set of regions which are comparatively advanced in terms of their regional smart specialisation strategy (RIS3) plans, notably in terms of adopting a quadruple helix stakeholder model. Such analysis aims to understand their specific contribution to make their region's innovation plans succeed, investigating their key enabling factors, drivers, dynamics, governance and sustainability, as well as mapping in a relational model the diversity of intermediary institutions and places making part of, as well as their interlinks and ecosystem orchestrators. This case study provides an example of a place-based innovation ecosystem built around a large enterprise.	General study	Directorate-General for Regional and Urban Policy	9000	Cooperation with CoR	Place-based innovation ecosystems: Volvo companies in Gothenburg (Sweden)
7309	Market and industrial development intelligence for sustainable advanced biofuels	O	The study aims to provide a complete picture of the recent market status and development trends in the advanced biofuels technologies sector, both in Europe and globally. Currently, most pathways of advanced biofuels production are not yet commercial, although there are first-of-a-kind and demonstration plants for which commercial demonstration or early stage of development is on-going. The study shall be focused on different advanced biofuels conversion pathways/sub-technologies.	General study		100000	Support to research and innovation energy strategy	Report on market and industrial development intelligence for sustainable advanced biofuels: Final Report

7714	Information on Arctic observational systems and societal benefit areas	O	To collect information on existing and future observational systems in the Arctic, including estimates of their costs and variables observed by those systems and by linking societal benefit areas to Arctic observational systems.	General study	Directorate-General for Climate Action, Directorate-General for the Environment, Directorate-General for Research and Innovation	55115	Support to implementing EU policy on the Arctic (Decision No 1386/2013/EU on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'; JOIN (2016) 21 Joint Communication to the European Parliament and the Council 'An integrated European Union policy for the Arctic')	Impact assessment study on societal benefits of arctic observing systems: Final report., Impact assessment study on societal benefits of Arctic observing systems 10.2760/713084
7715	Alternative aviation fuels indirect land use change simulations - Global Biosphere Management Model (GLOBIOM)	O	This study will include parameter updates for the Global Biosphere Management Model (GLOBIOM) which is used in performing indirect land use change (ILUC) simulations to calculate emissions from the production of biofuels used in aviation (e.g., immature area share in Indonesia, updated conversion pathways, allocation of electricity).	General study		30000	Contribution to sustainable mobility	GLOBIOM Model ILUC Simulations from Aviation Biofuels Production - Extended set of GLOBIOM preliminary runs: Final report
7844	World's most advanced and innovative public organisations in the field of learning organisation/knowledge management	O	The study serves to rank the top 10 - most advanced and innovative public organisations in the field of learning organisation /knowledge management, describing the main achievements of the organisation in terms of organisational learning/knowledge management/collaboration/change management.	General study		15000	Support to implementing Commission corporate strategy on data, information and knowledge management	World Class Knowledge Management Organisations (JRC113361)

9017	Assessment of options for the continuous management of scientific expert bodies in support of the Medical Devices (EU 2017/745) and In Vitro Diagnostic Medical Devices Regulations (EU 2017/746), in particular with regard to routine regulatory advice typically administered by EU agencies	O	The study will assess in first step and on the basis of the JRC exploratory study, the workload of panels and resources required to administer the panel's work, taking also into consideration the scientific dynamism of the medical device area. In a second step, the study should systematically assess the workload of agencies in various relevant policy areas (e.g. EMA, EFSA, ECHA) in regard to the administration of expert input. In a third step, information retrieved under steps 1 and 2 will be synthesised to explore possible options of managing permanently expert panels under the new medical device legislative framework and the resulting costs for the Union.	General study	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Directorate-General for Health and Food Safety	50000	Abandoned - change of priorities	

ANNEX 10: Specific annexes related to 'Financial Management'

Table Y Overview of the estimated cost of controls <u>at Commission (EC) level</u>:

Procurement in Direct Management Mode							
Ex-ante controls			**Ex-post controls**			**Total****	
EC total costs (in EUR)	**funds managed (in EUR)***	**Ratio (%)*:** *Total ex ante control cost in EUR ÷ funds managed in EUR*	**EC total costs (in EUR)**	**total value verified and/or audited (in EUR)**	**Ratio (%):** *Total ex post control cost in EUR ÷ total value verified and/or audited in EUR*	**EC total estimated cost of controls (in EUR)**	**Ratio (%)*:** *Total cost of controls ÷ funds managed*
12 741 569	233 190 314	5.46	89 288	41 447 891	0.2 %	12 830 857	5.50
REVENUE FROM CONTRACTUAL ACTIVITIES							
Ex-ante controls			**Ex-post controls**			**Total****	
EC total cost (in EUR)	**funds managed (in EUR)***	**Ratio (%)*:** *Total ex ante control cost in EUR ÷ funds managed in EUR*	**EC total costs (in EUR)**	**total value verified and/or audited (in EUR)**	**Ratio (%):** *Total ex post control cost in EUR ÷ total value verified and/or audited in EUR*	**EC total estimated cost of controls (in EUR)**	**Ratio (%)*:** *Total cost of controls ÷ funds managed*
193604	80 291 704	0.24 %	8140	8 620 486	0.09 %	201 744	0.25 %
OVERALL estimated cost of control at EC level							
Ex-ante controls			**Ex-post controls**			**Total****	
EC total cost (in EUR)	**funds managed (in EUR)***	**Ratio (%)*:** *Total ex ante control cost in EUR ÷ funds managed in EUR*	**EC total costs (in EUR)**	**total value verified and/or audited (in EUR)**	**Ratio (%):** *Total ex post control cost in EUR ÷ total value verified and/or audited in EUR*	**EC total estimated cost of controls (in EUR)**	**Ratio (%)*:** *Total cost of controls ÷ funds managed*
12 935 173	313 482 018	4.12	97 428	50 068 377	0.20 %	13 032 601	4.16

* ratio possibly '*Not Applicable (N/A)*' if a RCS specifically covers an Internal Control Objective such as safeguarding sensitive information, reliable accounting/reporting, etc

** any 'holistic' control elements (e.g. with 'combined' *ex-ante* & *ex-post* characteristics) can be mentioned in the total column (without being in either one of the *ex-ante* or *ex-post* columns), provided that a footnote clarifies this (their nature + their cost). *Example: MS system audits in shared management.*

1. Credits cross-sub-delegated

- **Cross-sub-delegations received**

The JRC received cross-sub-delegated authority to use the budgetary resources of other Directorates-General and services of the Commission. Such authorisation is linked to specific research projects or actions. The services and amounts concerned are summarised in table A10-1.

Table A10-1. Cross-sub-delegations received

DG/Service	Associated budget in 2018[13] *(C1 commitment accepted) In EUR 1 000s*	Nature of service managed by the JRC
DG AGRI	0	Assigned to Directorate D for the Union participation at the World Exposition 2015 - 'Feeding the Planet - Energy for Life' in Milan
DG CLIMA	0	Assigned to Directorate D for project 'LUCAS samples – Analysis'
DG DEVCO	0	Assigned to Directorate D for the Project 'NEPAD African Network of Centres of Excellence on Water Sciences and Technology (II phase)'
DG DEVCO	241	Assigned to Directorate E and Directorate I for the Project Gestion du Programme African Peace Facility (APF) – 4eme phase de cooperation avec AU – Continental Early Warning System (AU CEWS)
DG DIGIT	2 210	Assigned to Directorate B and Directorate I for ISA2 - Action 2.4, Action 3.7, Action 10 'ELISE'
DG ENER	490	Assigned to Directorate G for 'Technical support to operation of the OSL at Sellafield and the LSS at La Hague' and 'Operation of the OSL at Sellafield and the LSS at La Hague; Compucea Missions'
DG ENV	0	Assigned to Directorate F for the EP Pilot Project on 'Promoting alternatives to animals testing'
DG GROW	17 715	Assigned to Directorate D and Directorate E for the programme 'Copernicus' and to Directorate B for 'Pilot project for essentiality checks of Standard Essential Patents'
DG NEAR	90	Assigned to Directorate A for the 'TAC – Travel Accommodation and Conference facility for Western Balkans and Turkey'

- **Cross-sub-delegations given**

The JRC has provided sub-delegations to other Directorates-General of the European Commission for the following budget lines:

- 10 02 01 'Horizon 2020 — Customer-driven scientific and technical support to Union policies'.

[13] When the budget is zero, it means that no C1 commitments were accepted in 2017 but RAL management only.

Table A10-2: Cross-sub-delegations given

DG/Service	Associated Budget in 2018 *(C1 commitment accepted) In EUR 1 000s*	Nature of Service managed by the Other Services
DG ESTAT	40	Contribution of the JRC to the purchase and annual update of geographic database

- **Co-delegations**

The JRC has put in place horizontal co-delegations[14] (art. 3.2 of the Internal Rules) with other Directorates-General of the European Commission for the following budget lines:

- 10 01 05 'Support expenditure for operations of Direct research, policy area'
- 02 030100 'Operation and development of the internal market of goods and services'
- 05 07 01 02 'Monitoring and preventive measures — Direct payments by the Union'
- 05 08 03 00 'Restructuring of systems for agricultural surveys'
- 07 02 01 00 'Contributing to a greener and more resource-efficient economy and to the development and implementation of Union environmental policy and legislation'
- 11.06 62 01 ' Scientific advice and knowledge'
- 29 02 01 00 'Providing quality statistical information'
- 34 02 02 'Increasing the resilience of the Union to climate change'.

Table A10.3: Horizontal co-delegations.

DG/Service	Associated budget in 2018 *(C1 commitment accepted) In EUR 1 000s*	Nature of the Co-Delegated Service
DG AGRI[15]	9 130	Control with Remote Sensing Programme – Acquisition of satellite imagery under the 2018 Control with Remote Sensing (CwRS) work programme and their free of charge supply to the MS
DG AGRI	2 006	AGRI4CAST project – Implementation of the Operational MARS Crop Yield Forecasting System, The project results in the production of monthly MARS Bulletins, bi-weekly briefings on agro-meteorological conditions to AGRI, and additional ad-hoc analyses upon request
DG BUDG	95	Contribution to DG BUDG Services related to ABAC.
DG CLIMA	1 304	Project 'LUCAS samples – Analysis'
DG DIGIT	3 107	Contribution to DG DIGIT IT services foreseen in the

[14] In accordance with Art. 3.2 of the Internal Rules (Decision C(2015) 1423 final of 05/03/2015 on the Internal Rules on the implementation of the general budget of the European Union (European Commission section) for the attention of the Commission department)

[15] The two co-delegations with DG AGRI are Horizontal Co-Delegation type I (Art. 3.3 of the Internal Rules) for which the Fund Management Centre in ABAC is 'JRC' and as a result appear in Tables 1 to 3 of Annex 3 even though the budget title is DG AGRI's (i.e. 05) and not JRC (i.e. 10).

		MoUs
DG DGT	46	Contribution of the JRC to DGT Translation Services
DG ENV	1 152	Project 'LUCAS samples – Analysis'
DG ESTAT	0	Improved data quality of the 2018 LUCAS Survey due to careful preparation
DG GROW	3 566	Contribution to VELA Laboratories
DG HR	3 099	Contribution to the cost of activities managed by DG.HR.AMC8 (stagiares and grant holders salaries and administration, training and recruitment)
DG HR	217	The JRC social costs in Ispra managed by the Medical Services
DG HR	386	Contribution to the cost of the medical services in the sites
DG MARE	0	Contribution to the Scientific, Technical and Economic Committee for Fisheries (STECF)
OIB	487	Contribution to the Ispra costs related to canteen & cafeteria, childcare and lodging managed by OIB
PO	174	Contribution of the JRC to PO Publication Services

The JRC has put in place vertical co-delegations (Art. 3.2 of the Internal Rules) with other Directorates-General of the European Commission for the following budget lines:

- 10 01 05 'Support expenditure for operations of Direct research, policy area'.

Table A10-4. Vertical co-delegations

DG/Service	Associated budget in 2018 *(C1 commitment accepted) In EUR 1 000s*	Nature of co-delegated service
DG HR	0	Payments of Interim staff in Brussels
PMO	0	Payments of core and contractual staff expenditure

2. Expenditure operations

The JRC carries out its expenditure operations through procurement operations. An internal control template covering JRC's procurement is available in Annex 5 of this AAR.

The table below depicts the type of procurement procedures larger than EUR 60 000 carried out during 2018.

Management mode: Direct centralised

Key figures:

- There were 192 large value (> EUR 60 000) contracts signed valued at approximately EUR 164 million[16].
- 54 % of the files were awarded through an open procedure.

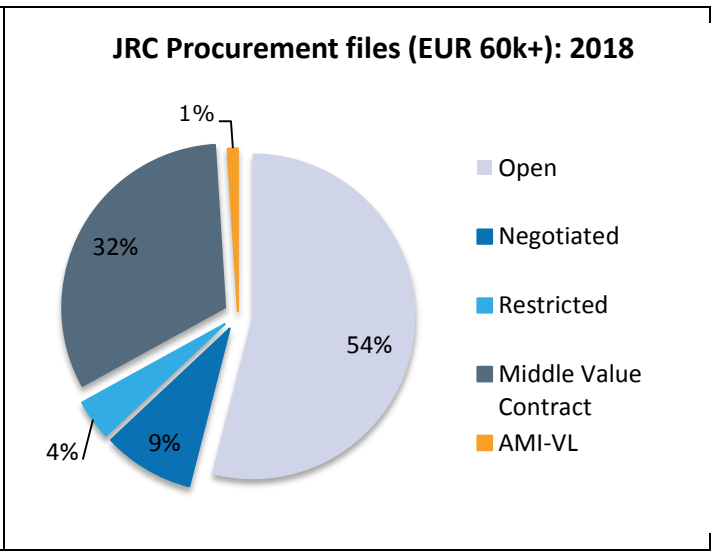


Figure A10.5. Procurement procedures (> EUR 60 000) contracted in 2018.

3. Revenue operations

The JRC has a mandate to carry out revenue generating operations through contractual activities, which is set out in a series of Council Decisions and Resolutions:

- The Council Resolution of 29 June 1988 introduced the concept of competitive activities (currently called contractual activities) performed by the JRC for third parties and in support of the Commission. It clearly differentiated between the JRC's institutional task of executing specific research programmes and its work for 'other Commission services and for third parties'.
- The Council Decision of 3 May 1989 formalises the concept of the JRC performing third party and support to the Commission activities and clearly indicates that this will be 'against payment'.
- The idea is further developed in the Council Resolution of 29 April 1992 in which the Council indicates that it 'considers that the JRC should further optimize the use of available staff and equipment in fields where it has the competence and should, in addition to its task of executing specific research programmes and exploratory research, seek to pursue its work of providing services'.
- In the Council Conclusions of 26 April 1994 on the role of the Joint Research Centre the Council reaffirms that the JRC must 'pursue and reinforce its move towards a more contractual approach on the basis of a genuine customer/contractor relationship' according to a set of guidelines provided in annex to the conclusions.

Contractual activities (formerly called competitive activities) may be defined as the provision by the JRC of scientific and technical services to other bodies both within the European Institutions and for third parties. Three distinct types of contractual activities exist:

1. Support to Commission services

   Support actions carried out by JRC for other Commission services for work that is additional or complementary to its institutional work programme. An

[16] The amount of EUR 168 million is higher than the annual budget because the associated contracts run over several years.

administrative arrangement (AA) is negotiated with the other Commission DG setting out the legal, financial and technical framework of the support to be offered.

2. Indirect actions within the scope of the research framework programmes

   Indirect actions are calls for proposal launched by the research family DGs, or their agencies, within the scope of research framework programmes. The JRC participates under the same conditions and with the same rights and obligations as any other research body.

3. Third party work

   Third party work is carried out for clients outside the Commission and in accordance with the Council Decision of 1989 and with Article 183 FR and Article 256 RAP for the JRC, allowing the JRC to provide services to third parties.

Figure A10.6 depicts the contractual contracts signed during 2018, the type and their value.

Management mode: Direct centralised

Key figures:

124 new forecast of revenue for contractual contracts were signed in 2018 with a value of EUR 80 million.

EUR 80 million of contractual income was cashed in 2018.

Support to Commission services are the main source of contractual income.

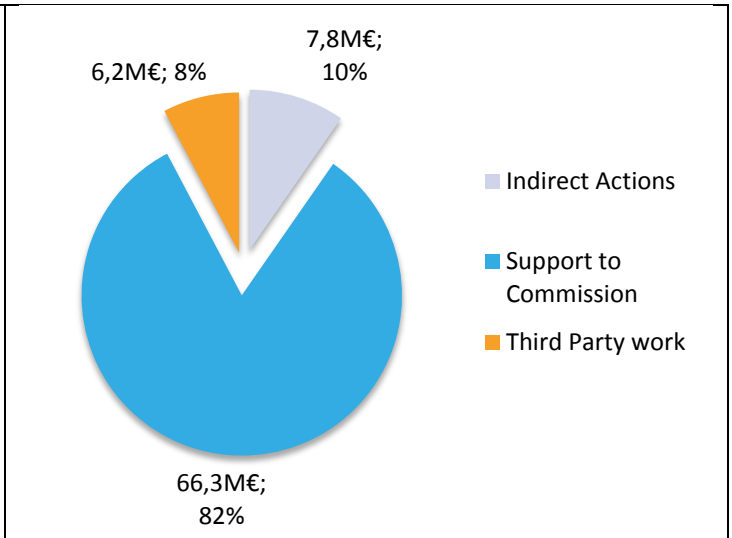


Figure A10.6. Contractual income generated by the JRC in 2018.

The additional income generated through contractual activities is used for purchasing scientific equipment and services, hiring temporary staff, and for financing part of the JRC's infrastructure used for these tasks. An internal control template covering the JRC's income from contractual activities is available in Annex 5.

4. JRC financial circuits and segregation of duties[17]

Basic principles

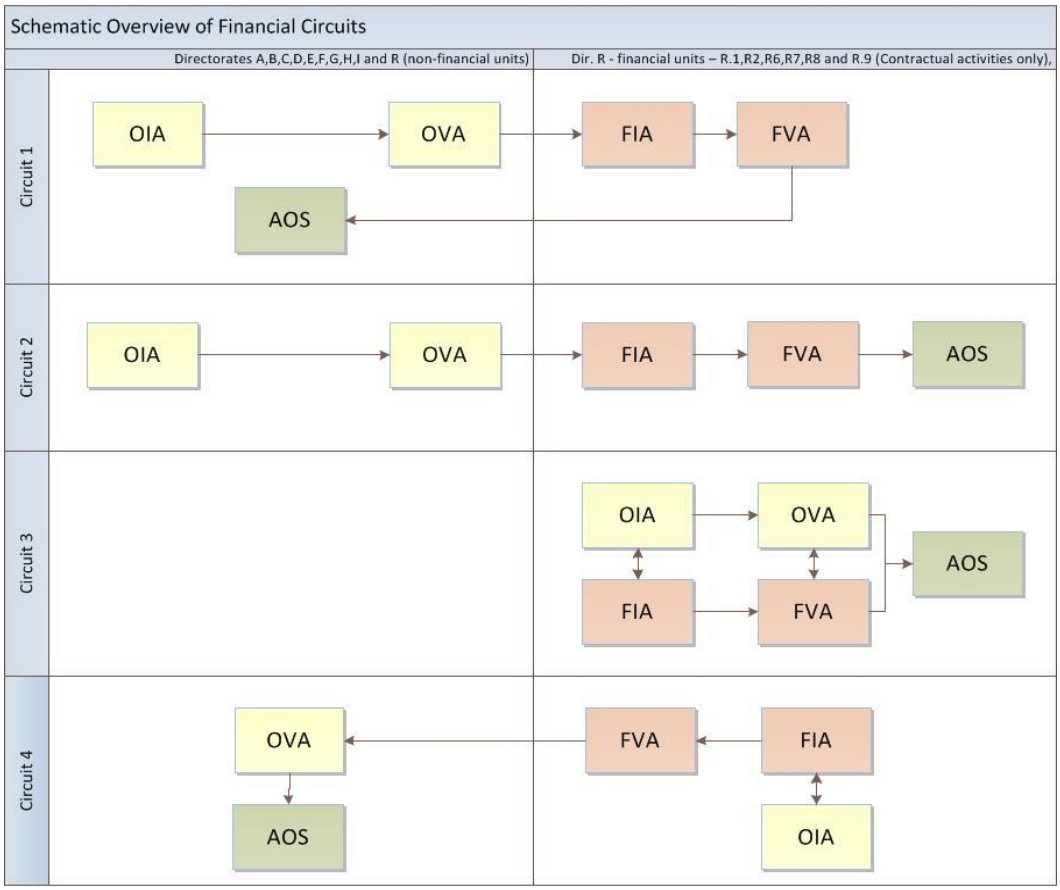
- Four eyes principle/Segregation of duties: before an operation is authorised, all aspects of this operation (both operational and financial) have to be verified by at least one member of staff other than the one(s) who initiated the operation. Therefore, the initiating and verifying function on one side, and the initiating and authorising function on the other side, can never be combined (Art. 74.5 FR).

[17] Extract from the 'JRC Financial Circuits and Segregation of Duties'

- Independence of the verifier: the person executing the verifying function for an operation cannot be in a subordinated role to the person who initiates this operation (Art. 74.5 FR).
- Single signature: except in well-defined cases (as defined in Art. 29 IR) the budgetary and legal commitment relating to the same transaction has to be signed by the same authorising officer.

Basic circuits

The AOD may decide on the financial circuit(s) to be applied for the transactions under his/her responsibility. At the JRC, the type of financial circuits chosen is determined by the nature of the financial transaction which is undertaken, as well as by geographical considerations. In any event, all staff having the role of financial agents (FIA and FVA) are based in the financial units of Directorate A and R. A schematic representation of the JRC circuits can be shown as follows:



Circuit 1 is the model which is used for the majority of transactions at the JRC. In this model there is a clear segregation between the operational and financial roles, respectively, and FIA/FVA are hierarchically independent from the AOS. It concerns transactions relating to:

- Scientific activities;
- Site management such as infrastructure and maintenance;
- Decommissioning activities;
- Centrally managed operations such as training, informatics, or communication;
- Income-generating transactions forecasts of revenue, recovery orders) not related to the JRC contractual activities.

In case of transactions < EUR 144 000 for commitments and < EUR 500 000 for payments involving two or more units from the same directorate, the AOS will be the Head of the Unit in which the OIA is placed. The other Heads of Unit are to be appropriately involved in the workflow.

In case of transactions involving two or more actions with budget lines from different Directorates the AOS will be the Director (Directorate R).

Circuit 2 is used when the operational actors are situated in a different unit than the financial actors, the AOS being a hierarchical superior to the FIA and the FVA. It can cover the following transactions:

- Activities involving more than one directorate, where OIA and OVA are situated in directorates other than the Resources Directorate.
- Low-risk transactions (e.g. validation of payment orders for reimbursement of candidates/experts).
- Mass upload for payments (applied for grant holder and trainee salary payments, reimbursement of candidates or experts). For these transactions the workflow may represent a variation to circuit 2 in the sense that the OVA function may be carried out in the financial unit.

Circuit 3 is applied where all operational and financial initiating and verifying functions are carried out within one or more financial units within Directorate R, the AOS being the hierarchical superior of the operational and/or financial agents. It may cover the following transactions:

- Activities on administrative or staff-related budget lines.
- Activities of primarily technical nature on scientific budget lines (e.g., de-commitment operations for low amounts, GL account re-booking, re-booking of amounts within a commitment, FDI extension, negative payment/repayment, correction of recovery context).
- Activities of primarily technical nature related to revenue (e.g., de-forecast and reforecast for guarantee funds (multi-directorate), budgetary shifts during a contract (multi-directorate), GL account corrections (multi-directorate), de-forecast at end of contract).

Depending on the risk involved as well as the complexity of the transaction being processed, this circuit allows for the number of financial agents to be reduced to a minimum of two persons: one person combining the OIA/FIA responsibilities, and a second combining the OVA/FVA/AOS responsibilities.

Circuit 4 is the model which is used for income-generating transactions related to the JRC specific contractual activities foreseen in the Financial Regulation (Art. 183 FR).

In this model the FIA and OIA responsibilities are combined in the financial units, while the OVA role remains in the operational side and the AOS is the hierarchical superior of the OVA.

In some cases, an additional verification function may be carried out by an agent from a different unit. This is for example the case for purchases of IT goods/services, where such additional verification is formalised in JIPSY through validation by a central IT Resources Manager (IRM).

Changes to authorised sub-delegations

There were a number of changes in 2018 to limits of sub-delegation to simplify processing transactions balanced with giving appropriate weight to risk management and responsibilities, as follows:

- alignment of threshold limits of Heads of Unit and Deputy Heads of Unit (EUR 144 000) and (an increase) for payments to EUR 500 000, and
- increase of threshold limits of Heads of Department for both commitments and payments to EUR 1 000 000 (from EUR 144 000).

5. Reporting on financial management outputs for the year

Overarching objective: The Authorising Officer by Delegation should have reasonable assurance that resources have been used in accordance with the principles of sound financial management, and that the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions including prevention, detection, correction and follow-up of fraud and irregularities.

Objective 1: Effective and reliable internal control system giving the necessary guarantees concerning the legality and the regularity of the underlying transactions		
Indicator 1: Estimated error rate **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)
0.5 % - Average error rate (AER)	Below the JRC's materiality criteria of 2 % per year until 2020.	0.5 % - Average error rate (AER) The JRC's detected error rate for 2017 is 0 % which confirms the positive the trend of the past years and indicating that there are no issues concerning the JRC's legality and regularity of the underlying transactions. Nonetheless, the JRC took a most conservative and prudent approach and estimated it to be at 0.5 %.
Indicator 2: Estimated overall amount at risk for the year for the entire budget under JRC responsibility **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)[18]
EUR 1.03 million	Amount at risk below the JRC's materiality criteria of 2 % of the total budget per year until 2020.	EUR 0.93 million – despite the fact that the JRC's detected error rate is 0 % it has estimated its average error rate to be 0.5 % which is a more conservative and prudent approach.
Indicator 3: Estimated future corrections **Source of data:** DG BUDG and Internal		
Baseline (31/12/2017)	Target	Latest known results (31/12/2018)[19]
EUR 0.04 million	100 % recoveries and correction of specific errors	EUR 0.1 million
Indicator 4: Proportion of exceptions **Source of data:** Internal		
Baseline (31/12/2017)	Target	Latest known results (31/12/2018)

[18] The reader is referred to Part 2 of the AAR specifically Table 2.1.1.1-2 (Estimated overall amount at risk at closure) and the related footnotes for more explanation about Indicator 2's latest known results.

[19] The reader is referred to Part 2 of the AAR specifically Table 2.1.1.1-2 (Estimated overall amount at risk at closure) and the related footnotes for more explanation about Indicator 3's latest known results.

0.22 %	< 1 % of transactions per year	0.24 % The exceptions and non-compliance events amount to 0.24 % of the total number of transactions, meeting the target set of less than 1 % of transactions subject to exception. To put the exception reporting into context, the JRC dealt in 2018 with 28 084 transactions and most of them were payments (20 568).
Indicator 5: Quality of procurement procedures submitted to the PPAG **Source of data:** Internal		
Baseline (31/12/2017)	Target	Latest known results (31/12/2018)
95 %	≥ 95 % per year	97 % In 2018, 87 files were screened by the PPAG, representing a value of approximately EUR 180 Million. In the vast majority of cases, 84 files (97 %), this scrutiny resulted in a favourable opinion being issued, which confirms the positive trend in the past years and the level of quality of the JRC's procurement procedures submitted to the PPAG.

Main outputs in 2018:

2018 saw a number of initiatives targeted at streamlining the JRC's financing and procurement operations. The sharp reduction in staff over recent years has given increased impetus to doing better with less. As a result, new and innovative techniques have been introduced.

Electronic signature of contracts: Over five hundred contracts were signed in this way during 2018 avoiding the same number of paper files being sent from one JRC site to another for signature.

Mitigating measures to reduce the number of failed calls for tender: An in-depth analysis was undertaken of the number of failed procedures experienced by the JRC with a number of concrete recommendations made some of which have already been implemented

Other highlights:

A new ***ex-post* control exercise** was introduced in 2018 for contractual contracts further strengthening the JRC assurance statement. A total of 16 randomly chosen contracts were reviewed. No serious errors were found and the results of the exercise focused on improving harmonisation of contractual activities across the JRC sites.

In collaboration with the Service Department for Administration and Payment of Individual Entitlements (PMO), DG for Informatics (DIGIT) and DG Research and Innovation (RTD) both the Commission **Advanced Gateway Meeting (AGM) application** and the JRC internal process were adapted to allow for a greatly increased level of automation in the way external experts are invited and reimbursed. Pilot meetings were successfully processed and a full roll-out is foreseen for 2019.

A new and fully automated **'Financial Report for Management'** giving senior management the details and overview required to ensure 'smart' financial management. Financial reporting for staff has also become easier with the **Financial Data Mart platform** now open to individuals to make their own financial reporting.

The **Public Procurement Management Tool (PPMT)** was further developed to offer extended support for operational staff dealing with very low value purchases (<=€15.000): defaulting/reuse of data wherever possible, contextual help, population of templates, system checks and warnings.

The new PPMT functionality supporting very low value purchases was rolled out to all the JRC sites and made mandatory for all new requests for purchases after 31/12/2018. In addition, PPMT was confirmed as the corporate pre-award back-office procurement tool, part of the pre-contracting eProcurement solution which will be rolled out to all DGs and Executive Agencies (EA) by end 2019. PPMT is already used by the JRC, Infrastructure and Logistics in Brussels (OIB), European External Action Service (EEAS), Executive Agency for Small and Medium-size enterprises (EASME) and DG for Communications Networks, Content and Technology (CONNECT).

As Business Domain Owner for **eProcurement** the JRC participates actively in the Grants and Procurement Steering Board (GPSB) as well as in the definition of the business requirements and IT landscape of the eProcurement solution to be rolled out by end 2021. The eProcurement project has already delivered a number of tangible benefits for the procurement user community across the European Commission:

- eSubmission with simplified security, allowing for electronic submission and opening of offers for open procedures, is now rolled-out to all DGs and EAs;
- The validation of participants in eSubmission calls for tenders (legal identification and status and, optionally, preparation of financial capacity assessment) is now performed centrally by the Research Executive Agency.
- The ***F & T (Funding & Tenders)*** Portal has been released. The portal will eventually serve as the single entry point for calls for tenders and calls for proposals.
- A harmonised filing plan for eProcurement for all DGs and EAs has been developed and presented to SG.
- Some procurement templates have been harmonised to maximise the possibilities to be pre-filled automatically with data from the eProcurement tools.
- High level business models prioritised pre-contract processes have been prepared and validated.

Objective 2: Effective and reliable internal control system in line with sound financial management.

Indicator 1: Conclusion reached on cost effectiveness of controls – Area 'Procurement'
Source of data: Internal

Baseline 2017	Target 2018	Latest known results 2018
Yes	Yes	Yes – To reach this conclusion the JRC analysed the evolution of the efficiency and cost-effectiveness indicators from 2017 to 2018, and took into account also the results obtained since 2014. The overall cost of control indicator is below the target set of < 6 %. The result achieved for the different stages of procurement is less than the target set for 2018 as shown below for indicators 1(a) to 1(c). In addition it is difficult to estimate the amount of procurement procedures and payments which will be carried out in a particular year.

Indicator	Baseline (31/12/2017)	Target 2018	Latest known results (31/12/2018)[20]
1 - Overall cost of control (%)	6.28 %	< 6 %	5.46 %

[20] The reader is referred to Part 2.1.1.2 of the AAR for details about the indicator values.

1(a) Cost of controls of the procurement stage up to selection of the offer and evaluation	3.21 %	< 4 %	2.62 %
1(b) Cost of controls of the financial transaction	3.7 %	< 4 %	3.09 %
1(c) Cost of supervisory measures (*ex-post* controls)	0.3 %	< 0.4 %	0.04 %

Indicator 2: Conclusion reached on cost effectiveness of controls – Area 'Contractual Income'
Source of data: Internal

Baseline 2017	Target 2018	Latest known results 2018
Yes	Yes	Yes - To reach this conclusion the JRC analysed the evolution of the efficiency and cost-effectiveness indicators from 2015 to 2018

Indicator	Baseline (31/12/2017)	Target 2018	Latest known results (31/12/2018)[21]
1 – Overall cost of control (%)	0.22 %	≤ 0.3 %	0.25 %

Indicator 3: Implementation of Internal Control Principles in the JRC
Source of data: Internal

Baseline (31/12/2016)	Target (2020)	Latest known results (31/12/2018)
3.4	3.6	3.3 The indicator's numerical value represents the weighted average of the results of the survey that was carried out in 2018 to assess the staff perception of the degree of implementation of the Internal Control Principles in the JRC and to appraise if the internal control systems are effective. The 2018 value of 3.3 is slightly lower than the target set and unchanged from 2017. Nevertheless, this evidences a rather stable situation with respect to staff perception of the degree of implementation of the internal control principles in the JRC. Considering also the detected error rate of 0 % in the last 2 years, this evidences that the internal control principles in the JRC have been implemented effectively. The trend for this indicator since 2014 is given in the Executive Summary (b) KPI 5

Indicator 4: Timeliness of payments
Source of data: Internal

Baseline (31/12/2017)	Target	Latest known results (31/12/2018)
93 %	Target of ≥ 95 % per year	93 % A lower value than the target and steady at the same average of the last 2 years. The average is heavily affected by the late payments occurring in January (timeliness of 77.8 %) and February (timeliness of 85.5 %) due to the carry-over activities. Constant efforts are made to ensure that the vast majority of the payments are made within the legal time limits.

Indicator 5: Contractual income
Source of data: Internal

[21] The reader is referred to Part 2.1.1.2 of the AAR for details about the indicator value.

Baseline (31/12/2017)	Target (2020)	Latest known results (31/12/2018)
23.51 %	15 %	21.68 % The contractual cashing indicator (as a percentage of the institutional budget[22]) has decreased from 23.51 % of last year to 21.68 %, which remains significantly higher than the target of 15 % and clearly evidencing the efficiency of the controls performed.

Objective 3: Minimisation of the risk of fraud through application of effective anti-fraud measures, integrated in all activities of the JRC, based on the JRC's anti-fraud strategy (AFS) aimed at the prevention, detection and reparation of fraud.

Indicator 1: Updated anti-fraud strategy of the JRC, elaborated on the basis of the methodology provided by OLAF.
Source of data: Internal

Baseline	Target	Latest known results 2017
December 2013[23]	Update every 3 years, as set out in the AFS	In 2017, the JRC's anti-fraud strategy and its action plan were updated to contribute to the Commission's anti-fraud strategy update and take into account the latest OLAF's methodological guidance.

Indicator 2: Regular measurement of the ethical climate and the fraud awareness for target population(s) as identified in the JRC's AFS.
Source of data: Internal

Baseline (31/12/2016)	Target (2020)	Latest known results (31/12/2018)
All staff – 4.2 Management – 4.6 Staff (other than management) -3.9	Ethical climate rating 4.5 on a scale 1 (disagree) to 5 (agree)	All staff – 3.5 Management – 4.6 Staff (other than management) – 3.1 Compared to 2017, the results show a decrease in the anti-fraud awareness, except for the staff with management role where the results remained high. A high rate of 'don't know' replies from staff without management role contributed to the decrease.

Indicator 3: Regular monitoring of the implementation of the anti-fraud strategy and reporting on its result to management.
Source of data: Internal

Baseline (31/12/2016)	Target (2020)	Latest known results (31/12/2018)
Monitored regularly throughout the year and formal reporting at least once per year	Twice per year	Monitored throughout the year; formal reporting delayed to early 2019

[22] The institutional budget means 'budget for JRC (direct actions) under the Framework Programme for Research

[23] Year of first launch

ANNEX 11: Specific annexes related to 'Assessment of the effectiveness of the internal control systems'

N/A

ANNEX 12: Performance tables

Note on JRC work programme and performance indicators. Following a well-established process, the JRC's broad work programme for 2018-2019 was developed in consultation with partner DGs and adopted by a Commission decision ensuring political relevance and alignment with Commission's general objectives and the Commission work programme, and continued support related to legal and/or contractual obligations. JRC's work programme is a rolling plan giving the JRC the ability to adapt rapidly to changing needs and to take up emerging issues.

The largest part of the JRC's work contributes to four Commission general objectives, namely general objectives 1, 3, 4 and 9 as described in the JRC's strategic plan (SP) 2016-2020 (see Table 1 for correspondence of objectives). However, the JRC also contributes to the goals of the other priorities of the Juncker Commission, and provides further cross-cutting support to all general objectives (GOs) by its knowledge management capacity. Its performance is therefore reported either for the four main general objectives or for all activities, according to set criteria.

Number of policy related outputs refers to studies, technical systems, data sets, data bases or standards resulting from its research activities and operational services; examples can be found in Annex 15.

General objective 1: A new boost for jobs, growth and investment		
Impact indicator 1: Percentage of EU GDP invested in R&D (combined public and private investment) **Source of the data**: Eurostat [24]		
Baseline (2012)	**Target** (2020) Europe 2020 target	**Latest known results** (2017)
2.01 %	3.00 %	2.07 %
Impact indicator 2: Employment rate population aged 20-64 **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020) Europe 2020 target	**Latest known results** (2017)
69.2 %	At least 75 %	72.2 %
Impact indicator 6: GDP growth **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020)	**Latest known results** (2017)
1.8 %	Increase	2.4 %

[24] Please note that Eurostat periodically revises its published data to reflect new or improved information, also for previous years. The latest published data is available by clicking on 'bookmark'. The 'latest known value' column reflects the data that was available at the time of the preparation of the AARs 2017 and it is the reference point for the AARs of Commission services.

Impact indicator 9: Resource productivity: Gross Domestic Product (GDP, €) over Domestic Material Consumption (DMC, kg)
Explanation: The indicator focuses on the sustainability of growth and jobs.
Source of the data: Eurostat

Baseline (2010 - Eurostat estimate)	**Target** (2020)	**Latest known results** (2017)
1.8 EUR/kg (EU-28)	Increase	2.04 EUR/kg (EU-28)

Specific objectives 1.1 to 1.9 (contributing to H2020 Specific Objective 17):
A well-informed European policy-making, appropriately and timely supported by the JRC through the provision of high quality and innovative scientific and technical studies, tools, data, materials, models and standards, in the following areas:

Related to spending programme: H2020

(Specific objective 1.1) Agriculture and rural development
(Specific objective 1.2) Education, culture, youth and sport
(Specific objective 1.3) Environment
(Specific objective 1.4) Maritime affairs, fisheries and aquaculture
(Specific objective 1.5) Health and food safety
(Specific objective 1.6) Regional policy
(Specific objective 1.7) Research, science and innovation
(Specific objective 1.8) Transport
(Specific objective 1.9) Employment, social affairs, skills and labour mobility

Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[25] in year N / total number of policy deliverables planned for year N
Source of data: JRC internal indicator (based on JRC output records and planning data; PUBSY/JPB)

Baseline (2015)	**Interim Milestone** (2017)	**Target**	**Latest known results** (2018)
88 %	> 88 %	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	140 %

Result indicator 2: Weighted average of overall customer satisfaction
Source of data: JRC internal indicator

Baseline (2017)[26]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2018)
N/A	N/A	N/A	N/A

[25] JRC's work programme is a rolling plan while the rate is calculated against a baseline set in the management plan; plans are updated during the execution year to accommodate new requests and needs of partner DGs.
[26] New indicator. Pilot tests were run in 2017 and 2018. Prior to this, and continuing as far as institutional work is concerned, feedback was/is being collected in a decentralised way. The time series data is being collected to derive a baseline and a target value.

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2018 (2019; JRC activities)			
Main outputs in 2018:			
Policy–related outputs/Main expenditure outputs[27]			
Description	Indicator	Target date	Latest known results (situation on 31/12/2018)
Outputs in the area of 'Agriculture and rural development'	Policy related outputs	Throughout 2018	66
Outputs in the area of 'Education, culture, youth and sport'	Policy related outputs	Throughout 2018	9
Outputs in the area of 'Environment'	Policy related outputs	Throughout 2018	122
Outputs in the area of 'Maritime affairs and fisheries'	Policy related outputs	Throughout 2018	49
Outputs in the area of 'Health and food safety'	Policy related outputs	Throughout 2018	70
Outputs in the area of 'Regional policy'	Policy related outputs	Throughout 2018	55
Outputs in the area of 'Research, science and innovation'	Policy related outputs	Throughout 2018	57
Outputs in the area of 'Transport'	Policy related outputs	Throughout 2018	35
Outputs in the area of 'Employment, social affairs, skills and labour mobility'	Policy related outputs	Throughout 2018	15
Total number of policy related outputs (e.g., studies, technical systems, data sets, data bases or standards resulting from its research activities and operational services; examples can be found in Annex 15)			**478**

General objective 3: A resilient European Energy Union with a forward-looking climate change policy		
Impact indicator (11): Greenhouse gas emissions (index 1990=100) **Source of the data**: European Environmental Agency		
Baseline (2013)	**Target** (2020) Europe 2020 target	**Latest known results** (2017 prox estimates by EEA)

[27] For the JRC, the distinction policy-related outputs and expenditure outputs is not relevant as all policy-related outputs are expenditure outputs, given that the JRC activities are funded by a spending programme.

80.4 %	At least 20 % reduction (index ≤ 80)		78.1 %	
Impact indicator (12): Share of renewable energy in gross final energy consumption **Source of the data:** Eurostat				
Baseline (2013)	**Interim Milestone**		**Target** (2020) Europe 2020 target	**Latest known results** (2016)
	(2013/ 2014)	(2015/ 2016)		
15.2 %	15.6 %	16.9 %	20 %	17.0 %
Impact indicator (13): Increase in energy efficiency – Primary energy consumption **Source of the data:** Eurostat				
Baseline (2013)	**Target** (2020) Europe 2020 target		**Latest known results** (2016)	
1 571.2 million tonnes of oil equivalent (Mtoe)	20 % increase in energy efficiency (No more than 1 483 Mtoe of primary energy consumption)		1 542.7 million tonnes of oil equivalent (Mtoe)	
Impact indicator (14): Increase in energy efficiency – Final energy consumption **Source of the data:** Eurostat				
Baseline (2013)	**Target** (2020) Europe 2020 target		**Latest known results** (2016)	
1 108.2 million tonnes of oil equivalent (Mtoe)	20 % increase in energy efficiency (No more than 1 086 Mtoe of final energy consumption)		1 107.8 million tonnes of oil equivalent (Mtoe)	
Specific objectives 3.1 to 3.3 (contributing to H2020 Specific Objective 17 and to EURATOM Research & Training Programme Specific Objectives 9, 10, 11, 12 and 13): A well-informed European policy-making, appropriately and timely supported by the JRC through the provision of high quality and innovative scientific and technical studies, tools, data, materials, models and standards, in the following areas: (Specific objective 3.1) Climate Action (Specific objective 3.2) Energy (Specific objective 3.3) Safe and secure use of the nuclear energy				Related to spending programmes: H2020 and Euratom
Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[28] in year N / total number of policy deliverables planned for year N **Source of data:** JRC internal indicator (based on JRC output records and planning data; PUBSY/JPB)				

[28] JRC's work programme is a rolling plan while the rate is calculated against a baseline set in the management plan; plans are updated during the execution year to accommodate new requests and needs of partner DGs.

Baseline (2015)	**Interim Milestone** (2017)	**Target**	**Latest known results** (2018)
77 %	> 77 %	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	98 %
Result indicator 2: Weighted average of overall customer satisfaction **Source of data:** JRC internal indicator			
Baseline (2017)[29]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2018)
N/A	N/A	N/A	N/A
Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2018 (2019; JRC activities)			
Main outputs in 2018:			
Policy–related outputs/ Main expenditure outputs			
Description	Indicator	Target date	Latest known results (situation on 31/12/2018)
Outputs in the area of 'Climate Action'	Policy related outputs	Throughout 2017	41
Outputs in the area of 'Energy'	Policy related outputs	Throughout 2017	76
Outputs in the area of 'Safe, secure and sustainable use of the nuclear energy'	Policy related outputs	Throughout 2017	137
Total number of policy related outputs (e.g., studies, technical systems, data sets, data bases or standards resulting from its research activities and operational services; examples can be found in Annex 15)			**214**

General objective 4: A deeper and fairer internal market with a strengthened industrial base		
Impact indicator (16): Gross value added of EU industry in GDP **Source of the data**: Eurostat		
Baseline (2014)	**Target** (2020)	**Latest known results** (2017)
17.1 %	20 %	17.6 %
Impact indicator (17): Intra-EU trade in goods (% of GDP) **Source of the data:** Eurostat		

[29] New indicator. Pilot tests were run in 2017 and 2018. Prior to this, and continuing as far as institutional work is concerned, feedback was/is being collected in a decentralised way. The time series data is being collected to derive a baseline and a target value.

Baseline (2014)	Target (2020)	Latest known results (2015)
20.3 %	Increase	20.2 %

Completed evaluations:

Specific objectives 4.1 to 4.2 (contributing to H2020 Specific Objective 17):
A well-informed European policy-making, appropriately and timely supported by the JRC through the provision of high quality and innovative scientific and technical studies, tools, data, materials, models and standards, in the following areas:
(Specific objective 4.1) Internal market, industry, entrepreneurship and SMEs
(Specific objective 4.2) Customs risk management policy and the fight against fraud

Related to spending programme: H2020

Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[30] in year N / total number of policy deliverables planned for year N
Source of data: JRC internal indicator (based on JRC output records and planning data; PUBSY/JPB)

Baseline (2015)	Interim Milestone (2017)	Target	Latest known results (2018)
85 %	> 85 %	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	160 %

Result indicator 2: Weighted average of overall customer satisfaction
Source of data: JRC internal indicator

Baseline (2017)[31]	Interim Milestone (2017)	Target (2020)	Latest known results (2018)
N/A	N/A	N/A	N/A

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2018 (2019; JRC activities)

Main outputs in 2018:

Policy–related outputs/Main expenditure outputs[27]

Description	Indicator	Target date	Latest known results (situation on 31/12/2018)
Outputs in the area of 'Internal market, industry, entrepreneurship and SMEs'	Policy related outputs	Throughout 2017	152

[30] JRC's work programme is a rolling plan while the rate is calculated against a baseline set in the management plan; plans are updated during the execution year to accommodate new requests and needs of partner DGs.
[31] New indicator. Pilot tests were run in 2017 and 2018. Prior to this, and continuing as far as institutional work is concerned, feedback was/is being collected in a decentralised way. The time series data is being collected to derive a baseline and a target value.

Outputs in the area of 'Customs policy and the fight against fraud'	Policy related outputs	Throughout 2017	9
Total number of policy related outputs (e.g., studies, technical systems, data sets, data bases or standards resulting from its research activities and operational services; examples can be found in Annex 15)			**161**

General objective 9: Europe as a stronger global actor			
Impact indicator (32): Sustainable Development Goal 1.1.1: Proportion of population below international poverty line **Source of the data**: World Bank (poverty rate); UN Population Division (population weights)			
Baseline (Computed on country level data from 2012 or before, drawing on World Bank data for the poverty rates, and UN Population Division data for the weights; extracted in January 2019 [November 2017] to take into account data revisions)	**Interim milestone**	**Target** (2030) UN Sustainable Development Goals	**Latest known results** (Computed on country level data from 2017 or before, drawing on World Bank data for the poverty rates, and UN Population Division data for the weights; extracted in January 2019)
17.1% (including the graduated countries - Partnership countries for which bilateral assistance is phased out) 29.5% (excluding the graduated countries) For the calculation of the baseline, beneficiary countries under the Development Cooperation Instrument and European Development Fund have been taken into account. Beneficiaries under the European Neighbourhood Instrument and EU-Greenland Partnership Instrument have been excluded.	Rolling On course for 2030 based on annual progress report prepared by UN Secretary General.	0 %	14.6 % (including the graduated countries - Partnership countries for which bilateral assistance is phased out) 26.8 % (excluding the graduated countries)

Specific objectives 9.1 to 9.2 (contributing to H2020 Specific Objective 17 and to EURATOM Research & Training Programme Specific Objectives 9, 10, 11, 12 and 13): A well-informed European policy-making, appropriately and timely supported by the JRC through the provision of high quality and innovative scientific and technical studies, tools, data, materials, models and standards, in the following areas: (Specific objective 9.1) Global safety and security (Specific objective 9.2) International cooperation and development	Related to spending programmes: H2020 and Euratom

Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[32] in year N / total number of policy deliverables planned for year N
Source of data: JRC internal indicator (based on JRC output records and planning data; PUBSY/JPB)

Baseline (2015)	**Interim Milestone** (2017)	**Target**	**Latest known results** (2018)
72 %	> 72 %	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	90 %

Result indicator 2: Weighted average of overall customer satisfaction
Source of data: JRC internal indicator

Baseline (2017)[33]	**Interim Milestone** (2017)	**Target**	**Latest known results** (2018)
N/A	N/A	N/A	N/A

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2018 (2019; JRC activities)

Main outputs in 2018:

Policy–related outputs/Main expenditure outputs[27]

Description	Indicator	Target date	Latest known results (situation on 31/12/2018)
Outputs in the area of 'Global safety and security'	Policy related outputs	Throughout 2017	93

[32] JRC's work programme is a rolling plan while the rate is calculated against a baseline set in the management plan; plans are updated during the execution year to accommodate new requests and needs of partner DGs.

[33] New indicator. Pilot tests were run in 2017 and 2018. Prior to this, and continuing as far as institutional work is concerned, feedback was/is being collected in a decentralised way. The time series data is being collected to derive a baseline and a target value.

Outputs in the area of 'International cooperation and development'	Policy related outputs	Throughout 2017	42
Total number of policy related outputs (e.g., studies, technical systems, data sets, data bases or standards resulting from its research activities and operational services; examples can be found in Annex 15)			**135**

General objective 1: A new boost for jobs, growth and investment

General objective 3: A resilient Energy Union with a forward-looking climate change policy
General objective 4: A deeper and fairer internal market with a strengthened industrial base
General objective 9: Europe as a stronger global actor

Specific objective 10: In order to ensure the most relevant and timely scientific support to the European policy-making, the JRC will effectively and efficiently coordinate its activities related to the management of the JRC WP cycle, of the relations with policy DGs and other policy and scientific stakeholders and knowledge management. Note: this specific objective refers to a) the policy support coordination activities and b) knowledge management activities not mentioned in the JRC WP 2017-18. This specific objective covers all areas of work of the JRC (i.e. all CGOs, as explained in the 'Strategy' chapter of the Strategic Plan)	Related to spending programmes: H2020 and Euratom

Impact indicator: Not applicable, given the diversity of activities. Indicators are available on output level, in the MP 2018.

Baseline	Interim Milestone	Target
N/A	N/A	N/A

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2018 (2019; JRC activities)

Main outputs in 2018:

Policy–related outputs/Main expenditure outputs[27]

Description	Indicator	Target	Latest known results (2018)
'Science Meets Parliaments' and 'Science Meets Regions' events to strengthen dialogue with inter-institutional partners and the EU Member States	Number of new regions reached	6	The new pilot project involves > 22 regions
Extension of Collaboration arrangements with the Brazilian Ministry of Science, Technology, Innovations and	Agreements updated	Q4	Extension of arrangement with MCTIC, arrangement

Communications (MCTIC) and the US National Institute for Standards and Technology (NIST), as part of the implementation plan on strategic partnerships			with NIST under preparation
Round-tables with European Institute of Innovation and Technology (EIT), and Knowledge Innovation Communities (KICs), as part of the implementation plan on strategic partnerships	Number of events	6	6
Information materials to stakeholders e.g., monthly 'Science & Policy briefing' to ensure impactful outreach	Number of subscribers	300 (increase of 10 % as compared to 2017)	> 340
Coordination of agreements with international institutions, as the Commission (technical) representative in Euratom (Euratom-Japan Atomic Energy Agency, Euratom-USA and EC support programme to IAEA)	Number of steering committee meetings	3	6
'Putting Science into Standards' Workshop 'Quantum Technologies' aiming to bring together stakeholders in the fields of standardisation and research	Number of participants	150	Workshop postponed to March 2019
Steering the continuous scientific development of the JRC through novel instruments like the JRC Art and Science initiative: SciArt Summer School on Big Data	Number of external SciArt experts and artists participating in the summer school	25	33
Underpinning policy support and excellence in research by exploratory research (ER) with partner institutions and through building competences in emerging, policy relevant areas	JRC scientific staff actively involved in the JRC Exploratory Research (ER) Programme	> 1.8 %	2 % of the JRC staff was engaged in exploratory research under the ER programme, CAS and CDP
	Percentage of exploratory research activities from 2018 call proposing research in or related to social sciences, art or humanities	> 20 %	40 %

Collaborative Doctoral Partnerships (CDP) scheme, allowing higher education institutions gain a better understanding of research needs at different stages of the policy cycle while advancing the JRC's relations with leading academic institutions	Percentage of CDP negotiations concluded during 2018 Percentage of CDP agreements concluded, under which students are recruited in 2018 by either university or the JRC	75 % (of 30) 50 %	10 %; due to a change in national law (IT), the CDP agreements ready for signature needed to be renegotiated 33 % one student selected in 2018 (see above)
Open access to the JRC's research infrastructures (physical)	Number of new JRC research infrastructures launching calls for open access	4	5 (nuclear research facilities, energy storage testing installations)
Coordination of the JRC's Standardisation related activities: executing the JRC's leadership task of Action 2 – Linking Research and Innovation with Standardisation, within the framework of the Joint Initiative on Standardisation (Commission, European standardisation organisations and other stakeholders)	Number of reports to responsible DG	1 (Q1)	2 (Q1 and Q4)
JRC Centre for Advanced Studies (CAS), building advanced competences in selected scientific topics	Number of fully established CAS projects (all staff recruited and kick-off meetings held in Q1)	4	4
Development of the JRC Academy implementation plan, implementing the JRC's education and training strategy	Degree of completion	100 %	100 %; 20 % implemented
Free access to the JRC's knowledge resources	Share of the JRC's peer-reviewed publications published with open access[34]	95 %	95 %

[34] JRC publication and procurement data

General objective 1: A New boost for jobs, growth and investment
General objective 3: A resilient Energy Union with a forward-looking climate change policy
General objective 4: A deeper and fairer internal market with a strengthened industrial base
General objective 9: Europe as a stronger global actor

Specific objective 11 : To ensure the highest quality of its policy support, the JRC will effectively and efficiently maintain scientific excellence in its core competences Note: this specific objective covers all areas of work of the JRC (i.e. all CGOs, as explained in the 'Strategy' chapter of the Strategic Plan)	Related to spending programmes: H2020 and Euratom

Result indicator 1: Proportion of peer-reviewed publications in the top 10 % most-cited journals[35] – Number of peer-reviewed publications in the top 10 % most-cited journals listed in Scopus (SJR) / total number of peer-reviewed publications in journals listed in Scopus
Source of data: JRC internal indicator (data from Scopus/SciVal[36])

Baseline (2015)	**Interim Milestone** (2018)	**Target** (2020)	**Latest known results** (2018)
36 %	> 36 %	> 36 %	38 %

Result indicator 2: Proportion of JRC scientific publications published in peer-reviewed journals and proceedings – Number of peer-reviewed publications / total number of scientific publications (i.e. Pubsy category 2.x 'Scientific output')
Source of data: JRC internal indicator (based on JRC own records)

Baseline (2015)	**Interim Milestone** (2018)	**Target** (2020)	**Latest known results** (2018)
65 %	> 65 %	> 65 %	71 %

Result indicator 3: Proportion of peer-reviewed publications co-authored with non-JRC authors – Number of peer-reviewed publications co-authored with non-JRC authors/total number of peer-reviewed publications
Source of data: JRC internal indicator (based on JRC own records)

Baseline (2013)	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2018)
73.5 % 2015: 71.5 %	72 ± 3 %	72 ± 3 %	76 %

Result indicator 4: International collaborations – Number of peer-reviewed publications co-authored with organisations from countries outside ERA/total number of peer-reviewed publications
Source of data: JRC internal indicator (based on JRC own records)

Baseline (2013)	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2018)

[35] This indicator has been introduced following a recommendation of the 2015 audit on the JRC SPP cycle activities.
[36] Abstract and citation database of peer-reviewed literature (Elsevier publishing company)

24 % 2015: 24.3 %	24 ± 3 %	24 ± 3 %	26 %
Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2018 (2019; JRC activities)			

Main outputs in 2017:			
Policy–related outputs/Main expenditure outputs[27]			
Description	Indicator	Target	Latest known results (situation on 09/02/2018)
Publication of scientific results in peer reviewed journals	Peer-reviewed publications listed in SCI-e and SSCI	> 680	680[37]

[37] Control with external references database returns 730 peer-reviewed articles for 2018 (Scopus; February 2019)

ANNEX 13: Indicators and outputs related to decommissioning

Objective: Implement the Decommissioning & Waste Management Programme

Brief description:
The decommissioning activity aims to progressively dismantle the JRC's nuclear installations, either already obsolete (with no foreseen further use) or 'future liabilities' (still in use). It also intends to treat 'historical' waste (i.e. waste accumulated in the past) and waste arising from the dismantling operations. In 1999, the Commission decided to launch a programme to meet this objective. By this choice, the Commission shifted to the practice adopted by most EU Member States, preferring to start the decommissioning immediately after shutdown of the installations rather than deferring decommissioning in the hope that decreasing radiological activity would reduce the financial burden. The programme started in 1999 under the assumption, made for budgetary planning reasons, that the decommissioning of the last nuclear installation and the final disposal of historical wastes would be achieved around 2035. An updated JRC strategy and budget (2017) defined a new timeline for the four JRC sites up to 2060. To address the challenges of the D&WM Programme, the Commission has reflected on options to further improve the management and governance of the programme and proposes to explore transfer of liabilities to Member States hosting JRC sites. In June 2018, the Commission adopted a new proposal for a Council Regulation that establishes a dedicated funding programme for 2021-2027. It covers the D&WM programme and the Commission's financial support to Bulgaria and Slovakia to optimise synergies and knowledge sharing and secure meeting the relevant obligations. It can bring added value through becoming a benchmark within the EU for safely managing technological issues in nuclear decommissioning and disseminating knowledge to Member States.
Due to the status of their facilities and to their respective environment, the Ispra site (IT) is engaged in a wider range of activities than the three other sites Geel (BE), Karlsruhe (DE) and Petten (NL), where most facilities are still operational.

Main outputs in 2018

Description	Intermediate target (end of 2018)	Final target	Latest known result
At JRC level			
New Progress Report from the Commission to the Council and the European Parliament including revised budget	Document available	Publication 2019	Expert review launched
Decommissioning and waste management activities at Ispra site			
Management of Nuclear Material (NM) and High Level Waste (HLW) up to its Intermediate Storage	Decision on reprocessing alternative Nuclear test completed for the temporary	Storage of NM and HLW ready (2026) Temporary storage area formally in	Decision at HLSC to start working on dry storage option without precluding the reprocessing alternative Nuclear test completed

	storage area completed Contract for transfer of fuel remnants awarded (pot D1)	operation (2019)	
Establishment of waste treatment and characterisation facilities	Supply of electromechanical equipment contract activated	Grouting facility ready to operate (2022)	Civil works of grouting station completed; construction of equipment started (completion expected 2022)
	Procurement of waste package containers (IP2 containers): confirmation of acceptance at National Repository	First batch of final waste package containers available (1Q 2020)	Acceptance at national deposit of containers certified by letter of comfort; procurement of first batch planned in 2019
Decommissioning of obsolete facilities including clearance	1st waste super-compaction campaign: approval of the operational plan (OP) by safety authorities	1st batch of historical waste Characterisation and super-compaction (2020)	Letter of comfort on the OP received, pending approval of PO by safety authority, then start of first campaign in 2020
	Clearance of waste from decommissioning	'FARO' facility fully decommissioned, including removal of material and waste (2021)	Appointment of new clearance coordinator
	License conversion for the obsolete liquid treatment station (STRRL facility)	STRRL facility (excl. Tank Farm) decommissioned (2026)	Pending; Conversion file updating (115 ter)
Pre-decommissioning - waste management activities at Karlsruhe site			
Management of Nuclear Material and High Level Waste (HLW) up to its Intermediate Storage Reduction of commercial spent fuel	Qualification of welded pins and organisation of transport with/by owner	100 % of commercial spent fuel on which post-irradiation experiments have been completed removed	Transport spent fuel batch back to owner (Phillisburg) Organisation of transport for Gundremmingen spent fuel ongoing

Reduction of JRC-owned legacy spent fuel and nuclear materials	Improved characterisation of obsolete irradiated and nuclear inventories and identification of alternative disposal routes	100 % of obsolete JRC-owned spent fuel and nuclear materials removed	Results of the feasibility study are analysed
Residual contribution to German waste repository (residual budget as updated by German Authorities in 2014)	Budget will be committed in accordance with the requirements of the competent German authorities[38]	100 % of the budget committed (in 2027)	66 % of budget committed
Decommissioning of obsolete equipment	12 glove boxes decontaminated and dismantled Different routes for dismantling of legacy glove boxes will be assessed Call for tender for radiation protection officer taking care of clearance measurements Ideally disposal of historical waste packages completed	100 % of legacy glove boxes dismantled (date not defined) Minimised liabilities, maximised use of 'clearance' disposal path 100 % of historical waste packages disposed	72 % (285/400) of glove boxes dismantled Process launched Characterisation of waste completed 75 % of drums evacuated
Pre-decommissioning and waste management activities at Geel site			
Management of Nuclear Material and High Level Waste (HLW) up to its Intermediate Storage	Agreement reached with the Belgian national safety agency (NIRAS[39]) on nuclear material that can be accepted as unconditioned waste	100 % of identified materials evacuated	

[38] Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (BMU) https://www.bmu.de/
[39] Nationale instelling voor radioactief afval en verrijkte splijtstoffen https://www.niras.be

Decommissioning of obsolete equipment	50 % of clearance measurements of the dismantled van de Graaff (VDG) equipment done 50 % of obsolete glove boxes evacuated Clearance measurements effluent tank; demolishing of tank and evacuation as radioactive or cleared waste	100 % of obsolete VDG equipment evacuated 100 % of obsolete glove boxes evacuated Collection tank, pumping room and all pipes leading to the central collection tank evacuated	10 % of clearance measurements done Postponed to 2019 (50 %) and 2020 (50 %) Clearance measurements postponed to 2019; collection tanks has been disconnected from piping network in 2018
Pre-decommissioning - waste management activities at Petten site			
Management of Nuclear Material and High Level Waste (HLW) up to its Intermediate Storage	A detailed inventory is ongoing. Waste will be subject to a framework contract which will require additional help and resources (cf. steel waste)	100 % of JRC legacy waste (un-irradiated experimental fuel) evacuated.	A detailed check of the nuclear waste inventory was carried out in 2018, not yet finalised
Decommissioning of obsolete equipment	Due to the complexity, new waste discoveries and the expected duration of the waste evacuation process, it was decided to establish a multi-annual framework contract covering all JRC-owned waste items; preparation of technical specifications for this framework contract will start when human resources will be allocated	Steel decontaminated and recycled; activated steel and slag sent to the Dutch nuclear waste processing and storage company COVRA	A detailed check of the nuclear waste inventory was carried out in 2018, not yet finalised

Decommissioning of HFR	Development of strategy Detailed cost estimation report and a report on dismantling of buildings were delivered in 2018	Decommissioning of HFR (date not defined) Updated decommissioning plan (every 5 years)	 The reports on decommissioning plan, cost evaluation and decommissioning of conventional building have been delivered in 2018

ANNEX 14. JRC Core Indicators

Management information need	Indicators	Definition	Target (year)	Value 2018	Comments
Perspective 1: Outputs & impact					
Impact of policy support					
SP General Objectives *SPP Key performance indicator 1*	Policy support impact	Number of occurrences of tangible specific impacts on European policies resulting from technical and scientific policy support provided by the JRC	388 (2018) 402 (2020)	388	
Scientific productivity					
SP Specific Objective 11 *SPP Key performance indicator 2*	Proportion of peer-reviewed publications in the top 10 % most-cited journals	Number of peer-reviewed publications in the top 10% most cited journals listed in Scopus (SJR) / total number of peer-reviewed publications in journals listed in Scopus	> 36 % (2020)	38 %	
SP Specific objective 11	Proportion of JRC scientific publications published in peer-reviewed journals and proceedings	Proportion of JRC scientific publications published in peer-reviewed journals and proceedings / total number of 'scientific outputs' (Pubsy categories 2.x)	> 65 % (2020)	71 %	
MP Specific objective 11	Peer-reviewed publications listed in SCI-e and SSCI	Number of peer-reviewed publications listed in SCI-e and SSCI	> 680 (2018) 666 (2020)	680	

Management information need	Indicators	Definition	Target (year)	Value 2018	Comments
Achievement of policy related objectives and deliverables					
SP: Specific objectives 1.1 to 1.9 *Specific objectives 3.1 to 3.3* *Specific objectives 4.1 to 4.3* *Specific objectives 9.1 to 9.3*	Proportion of achieved planned policy deliverables	Number of planned policy deliverables achieved in year N / total number of policy deliverables planned for year N	N/A	126 %	New indicator. The time series data is being collected to derive a baseline and a target value.
Customer satisfaction					
SP: Specific objectives 1.1 to 1.9 *Specific objectives 3.1 to 3.3* *Specific objectives 4.1 to 4.3* *Specific objectives 9.1 to 9.3* *SPP Key performance indicator 4*	Weighted average of overall customer satisfaction	Weighted average of overall customer satisfaction	N/A	N/A	New indicator. Pilot test was run in 2017. The time series data is being collected to derive a baseline and a target value.
Scientific collaboration and networking					
SP Specific objective 11	Peer-reviewed publications co-authored with non-JRC authors	Number of peer-reviewed publications in high-impact journals co-authored with non-JRC authors/total number of peer-reviewed publications high impact journals	72 ± 3 % (2020)	76 %	
SP Specific objective 11 *SPP Key performance indicator 3*	International collaborations	Number of peer-reviewed publications high impact journals co-authored with organisations from countries outside ERA/total number of peer-reviewed publications high impact journals	24 ± 3 % (2020)	26 %	
Policy support productivity					
MP: Specific objectives 1.1 to 1.9 *Specific objectives 3.1 to 3.3* *Specific objectives 4.1 to 4.3* *Specific objectives 9.1 to 9.3*	Policy related outputs	Number of policy related outputs	1016 (2018)	1282	

Management information need	Indicators	Definition	Target (year)	Value 2018	Comments
Public visibility					
Part 2.E	Articles in the media	Total number of articles in the media	3500 (2020; provisional)	3322	New indicator introduced in 2017. The time series data is being collected to derive a baseline and a target value. Previous targets should be discarded.
	Access to JRC websites	Number of page views on the JRC website	3a. 4.8 million (provisional)	> 4 million	The statistical tool used to monitor this indicator changed as from 01/01/2017. Results are not comparable. Previous targets should be discarded.
		Number of visits to the JRC website	3b. 2.4 million (provisional)	> 2 million	
Perspective 2: Organisational management					
Financial Management					
Part 2.B - Objective 1 (Indicator 5)	Quality of procurement procedures submitted to the PPAG	Proportion of positive opinions of the Public Procurement Advisory Group (PPAG)	≥ 95 % (2018)	97 %	
Payments					
Part 2.B - Objective 2 (Indicator 4)	Timeliness of payments	Proportion of payments done within legal time limits	≥ 95 % (2018)	93 %	
Internal Control					
Part 2.B Objective 2 (Indicator 3) SPP Key performance indicator 5	Implementation of Internal Control Standards in the JRC	Average of scores obtained from the annual survey on the implementation of Internal Control	3.4 (2018) 3.6 (2020)	3.3	The indicator's numerical value represents the average of scores, ranging between 1 ('Fully disagree') and 5 ('Fully agree')

Management information need	Indicators	Definition	Target (year)	Value 2018	Comments
Income from additional activities					
Part 2.B, Objective 2 (Indicator 5)	Contractual income	Annual cashed income from activities outside Institutional budget (% of the Institutional budget)	15 % (2018)	21.68 %	
Perspective 3: Working environment					
Equal opportunities					
SP Part 2.A (Indicator 1)	Percentage of female representation in middle management	Number of women/(Number of women + men) in middle management positions	35 % (2019)	16 %	35 % by 2019 for the JRC as defined in SEC(2017)359

ANNEX 15. Examples of JRC's activities, achievements and impact

This annex contains parts of the JRC Annual Report 2018[40] which gives an overview of JRC's scientific achievements and activities as well as of corporate initiatives.

Table 15-1 contains short descriptions of cases where JRC's work had policy-impact by incorporation of its scientific and technical knowledge into policy proposals and when it directly helped in implementing EU policies. The total number of such cases, identified through JRC's internal productivity and impact evaluation, constitutes the value for the key performance/result indicator 1 'policy support impact'.

These examples relate to all JRC's scientific activities.

A new boost for jobs, growth and investment

Collective and coordinated efforts at European level continue to be needed to put Europe on the path to renewed economic prosperity. As the first of the 10 Juncker priorities, Commission work in this area covers a variety of policies, a number of which the JRC contributed to in 2018.

Informing the correlation between external trade and employment, ensuring EU leadership on technologies critical to e-mobility, ensuring a sustainable growth of the EU blue economy, promoting swifter innovation-to-market translation, preventing land degradation and the loss of vital soil services, and supporting the European cultural heritage are all but a few examples of Commission activities that the JRC backed with its expertise in 2018.

EU exports to the world support 36 million jobs across Europe

The JRC and the Commission's Directorate-General for Trade have collaborated to produce two studies on the impact of external trade on employment and income respectively.

Following up a first edition in 2015, the 2018 edition of EU exports to the world: effects on employment features a series of indicators to illustrate in detail the relationship between trade and jobs for the EU as a whole and for each EU Member State using the new World Input-Output Database for the year 2016 as its main data source.

Amongst many interesting findings, the study established that EU exports to the world support 36 million jobs across Europe, two thirds more than in 2000. And 14 million of these jobs are held by women. In addition, EU exports to the world generate € 2.3 trillion of value added in the EU.

Since the beginning of this Commission in 2014, the number of jobs supported by exports has increased by 3.5 million. Exports also create and support jobs all across the EU, and the numbers are increasing. The highest increases since 2000 have been seen in Bulgaria (+312 %), Slovakia (+213 %), Portugal (+172 %), Lithuania (+153 %), Ireland (+147 %), Estonia (+147 %) and Latvia (+138 %).

These figures highlight an important positive spill over effect from exports to the world. When EU exporters in one Member State do well, workers in other Member States also benefit. This is because firms providing goods and services along the supply chain also

[40] Triollet, R., McCafferty, E., Alvarez Martinez, A., Bellan, E., Kennedy, P., Al Khudhairy, D., JRC Annual Report 2018, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-00655-8 (online); 10.2760/197350 (online); JRC115957

gain when their end-customer sells the final product abroad. For example, French exports to the rest of the world support around 627 000 jobs in other EU Member States.

Finally, EU exports to countries around the world support almost 20 million jobs outside the EU. These jobs have more than doubled since 2000. For instance, more than 1 million jobs in the United States are supported by the production of US goods and services that are incorporated into EU exports through global supply chains.

An interactive map featuring 28 country factsheets and 1 EU factsheet complemented the publication of the study.

Ensuring EU leadership in batteries innovation and manufacturing

In the years to come, the competitiveness of the EU automotive sector will increasingly depend on a strong independent capacity to develop and produce batteries. In 2017, The European Commission launched the European Battery Alliance to establish competitive, innovative and sustainable battery manufacturing in Europe. The JRC contributes to various dimensions of this initiative.

In preparation of the Eco-design regulation that will set performance and sustainability criteria for the EU market, the JRC assessed standardisation gaps in performance, degradation and lifetime of electric vehicle batteries. It also proposed measuring and testing methods to evaluate the compliance of electric vehicle batteries with Eco-design requirements.

Long-term reliability of batteries is another essential aspect for both product developers and users. In the frame of its Exploratory Research Programme, the JRC identified thermal propagation (a defective battery cell spreads fire throughout an entire pack and its surroundings) as a key challenge for safer Li-ion battery systems. Further pre-normative research is needed to develop testing methods and standards but also faster and more accurate early detection tools. This is important, as Li-Ion batteries are in high demand in the automotive industry, but also in many other applications.

Using Li-ion batteries as one of the key solutions to power mobility raises concerns as regards the availability of raw materials for their production, such as cobalt. In a recent report the JRC anticipated a demand-supply gap as early as 2020 and pointed to a fragile global supply chain (more than half of the worldwide supply is mined in the Republic and Congo and half of the refined cobalt worldwide is produced in China) leading to rising prices in the mid-to-long term. A set of measures is proposed, including promoting cobalt extraction and attracting private investment, consolidating trade agreements with other cobalt producers, encouraging cobalt recycling, and assess potential substitute to cobalt (e.g. nickel).

Helping keep marine pollution at bay

In its 2018 Annual Economic Report on EU Blue Economy, the JRC presented the current status, recent trends and opportunities in economic activities related to oceans, seas and coastal areas. With a turnover of € 566 billion, the sector generates € 174 billion of value added and creates jobs for nearly 3.5 million people. In several EU member states, the blue economy has grown faster than the national economy in the last decade and proved more resilient in riding the financial crisis wave, thus softening the effects of the downturn on coastal economies.

The marine environment's ecosystem services and economic opportunities shouldn't be taken for granted though. Threats to water quality and biodiversity are plenty. Among other instruments, the EU's Marine Strategy Framework Directive (MSFD) requires Member states to address these and take action. In 2018, the JRC helped the Commission propose new legislation and Member states and others meet their obligations.

The JRC compiled a single reference list of contaminants to support the harmonised assessment and identification of substances deserving particular attention. The list features priority, regulated substances and 'emerging pollutants' i.e. substances still largely unregulated, which damage potential is real yet poorly understood. The prominence of 'emerging pollutants' on the list highlights the importance of work to understand their environmental occurrence and potential effects, agree on the most significant substances and incorporate them into future regulation as necessary.

JRC scientists also produced the first EU-wide analysis on the most frequently occurring beach litter. Plastic bottle caps and cigarette butts but also crisp packets, sweet wrappers, strings, fragments of plastic objects and cotton buds make it to the top ten of most frequently found items, which account for nearly 70 % of the total rubbish found on European beaches. These findings directly fed into the Commission proposal for new EU rules on single-use plastics presented in May 2018.

Match-making for faster innovation to market

In April 2018, the European Commission launched the Innovation Radar – a data-driven online tool to help match innovators with those who can help get their innovations to market.

According to the Innovation Radar, EU-funded R&I projects yield on average two innovations. Exploiting the full potential of those innovations requires further nurturing as projects typically focus more on technology than on commercialisation and deployment. The main stumbling blocks for innovators exploiting their ideas are financing, intellectual property and regulation. At the same time, innovators in EU funded projects need support in partnering with other companies, expansion to new markets and business plan development.

Matching European innovations with entrepreneurs to exploit their full potential is fundamentally a data challenge. The JRC offered its big data and knowledge management expertise to create the Innovation Radar in view of increasing the return on EU investment into research and innovation, and make it more transparent and accountable.

With its real-time data collection and intuitive interface, the Innovation Radar allows identifying high-potential innovations and the innovators behind them in EU-funded R&I projects. In essence, it is a policy tool for innovation management and commercialisation, designed to connect innovators in EU RDI projects and external stakeholders, such as investors, technology scouts or incubators.

To capture the different maturity levels of innovations on their way to commercialisation, the JRC scientists established four categories based on the Innovation Management and Innovation Readiness Indicators: exploration (getting things started), creation (technology preparation), commitment (market preparation) and optimisation (ready for the market). These four levels can be used as search filter within the Innovation Radar.

The Innovation Radar tool can be accessed via the web or as a Smartphone app (download from the iOS and Android app stores).

Land degradation threatens the well-being of people and the planet

The world's first comprehensive evidence-based assessment of land degradation and restoration highlighted some sobering facts about how worsening land degradation caused by human activities is undermining the well-being of 3.2 billion people (two fifths of the world's population), driving species extinction, intensifying climate change, and leading to increased risk of migration and conflict.

The Summary for Policymakers of the landmark Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Assessment Report on Land

Degradation and Restoration, co-chaired by a JRC scientist was launched in March 2018.

The report details the dangers of land degradation, which cost the equivalent of about 10 % of the world's annual gross product in 2010 through loss of biodiversity and ecosystem services, together with a catalogue of corrective options. Avoiding, reducing and reversing land degradation is an urgent priority to mitigate climate change, and protect biodiversity and vital ecosystem services.

Another recent JRC study published in Land Degradation and Development Journal identified soil erosion as the biggest threat to soil fertility and productivity. It combined biophysical and macroeconomic models to determine direct and macroeconomic costs of soil erosion, and the results are striking. At EU level, soil erosion affects over 12 million hectares of land – about 7.2 % of the total agricultural land – and leads to € 1.25 billion loss in crop productivity and a cohort of indirect costs in terms of biodiversity loss and damage to public infrastructures.

A separate report focusing on soil contamination allows for a modest degree of optimism as it observed that over 5000 new sites are under remediation or risk-reduction measures since 2011, even though there are more than 650k officially registered contaminated sites across Europe. A significant effort is being made by Member States to identify priority sites for remediation or risk reduction measures.

Science and innovation supporting the European cultural heritage

In 2018, the JRC lent its expertise to preserving and promoting our cultural heritage, from the safety and security of buildings, through three-dimensional (3D) laser scanning technologies to neutron resonance analysis for archaeological applications and more.

The recent earthquakes in central Italy have reminded us how urgent and important it is to adopt a methodology to improve the stability and seismic protection of cultural heritage buildings, traditionally more vulnerable than modern ones.

The JRC's European Laboratory for Structural Assessment (ELSA) in Ispra, Italy, has a long history of work in the field of cultural heritage, combining research and interventions on monumental buildings damaged by earthquakes. The JRC characterises the behaviour of historical structures during earthquake events and helps define and assess retrofitting and restoration methods. Sometimes the JRC also intervenes in culturally significant buildings damaged centuries earlier.

JRC researchers have also developed a 3D laser scanning technology that can be transported to the damaged zone in a backpack. Originally developed for nuclear safeguards, this technology can be applied for the detailed 3D mapping of damaged historical buildings, which is the basis for damage assessment and the planning and monitoring of reconstruction efforts.

JRC's Geel Linear Accelerator (GELINA), an electron accelerator-driven neutron facility, is normally used for nuclear research activities. Out of its original applications, JRC researchers have developed a non-destructive analysis technique called Neutron Resonance Analysis (NRA) to determine the elemental composition of objects. NRA has been employed to reveal the secrets of archaeological artefacts, whether to uncover imitations or investigate their fabrication methods.

Other activities relevant to cultural heritage this year included the publication of the report are capitals the leading cultural and creative cities in Europe?, and Cultural Gems, an app under development to promote cities' cultural heritage through a gamified exploration experience.

Knowledge Gateway on Health Promotion and Disease Prevention

This Gateway provides public health policy makers and citizens with short, impactful, concise and up-to-date briefs on how to promote health and well-being while reducing the risk of non-communicable diseases.

https://europa.eu/!hr96Nh

Change your diet to save both water and your health

A detailed nationwide food-consumption-related water footprint study takes into account socio-economic factors of food consumption, for both existing and recommended diets in France, Germany and the UK.

https://tinyurl.com/yb66a5lx

Critical raw materials: are we circular yet?

The answer is "no, not yet". Critical raw materials are not used to their full extent as part of the circular economy and there are several improvement opportunities to reuse and recycle these materials.

https://europa.eu/!gD46cR

EU coal regions: opportunities and challenges ahead

Over the past decades EU coal production and consumption has been in steady decline. Regions across Europe face challenges and opportunities as coal is phased out to make way for renewables, innovation and digitalisation.

https://europa.eu/!Jg49pK

The e-vehicle market in Europe is slowly gaining momentum

A new JRC analysis on the deployment of electric vehicles (EV) in Europe concludes that the sector evolved significantly between 2010 and 2017, although progress is still small to be characterised as full-scale commercialisation.

https://europa.eu/!hQ86pJ

Reporting cancer burden statistics and trends across Europe

The JRC launched the European Cancer Information System, a one-stop-shop for geographical and temporal patterns of cancer incidence, mortality, and survival from data available at country or regional levels.

https://europa.eu/!qw49Tr

A resilient European energy union with a forward-looking climate change policy

The EU's energy and climate policy aims to promote the transition towards a competitive low-carbon and resilient economy that helps in slowing down global warming and mitigating its effects while ensuring affordable, secure and sustainable energy for businesses and households.

In 2018, the JRC's contributions to climate change policy covered both mitigation and adaptation efforts, notably through economic and climate modelling/assessments,

monitoring and analysing emissions from different sources, assessing climate change impacts (economic and non-economic), vulnerability, resilience, and adaptation options. On energy specifically, the JRC contributed to carrying out security, safety, risk and techno-economic assessments of the EU's energy supply, assessing the resilience of the EU power grid to natural hazards, promoting nuclear safety, and supporting the implementation of renewable energy and energy efficiency legislation.

Sustained climate action brings multiple benefits

The EU has long been spearheading the global efforts to mitigate climate change. A recent update of the Emissions Database for Global Atmospheric Research (EDGAR) shows that global fossil CO2 emissions are still rising (+ 23 % in 2017 with respect to 2005), although not in Europe (- 16 % compared to 2005). Man-made methane emissions are also on a non-sustainable path (17 % increase from 1990 to 2012). The JRC found that without specific measures to reduce overall methane emissions from the energy, waste, wastewater and agriculture sectors there could be between 40 000 and 90 000 more premature deaths globally by 2050, due the impact that methane has on ozone concentrations.

Indisputably, sustained climate action at global level is urgently needed. In its Global Energy and Climate Outlook (GECO) 2018 report, the JRC quantified the actions needed to limit temperature rise to 2 °C, a level where both natural ecosystems and human economic activities can survive: halve total global greenhouse gas emissions in 2050 compared to 1990 levels, expand the use of renewables to half the world's energy system, and increase the role of electricity energy consumption. Aiming for 1.5 °C would require even larger reductions, particularly in the 2020-2040 period, as also confirmed by the IPCC special report, co-authored by one of the JRC scientists. The GECO 2018 also indicates that such actions would still produce global economic growth despite the increased investment needs. This analysis underpins the Commission´s Long-Term Strategy for the evolution of the EU's energy and climate objectives published on 28 November 2018 in preparation for the UNFCCC process. The corresponding macro-economic and employment analysis also features directly in the in-depth assessment that complements the Communication Long-term Strategic Vision: A Clean Planet for All.

Beyond global warming control, climate action has many side benefits. By combining climate, energy, atmospheric chemistry, and economic models, a Nature Communications report authored by the JRC found that it also improves air quality, prevents deaths and enhances food production. An integrated policy approach maximizes benefits for climate, energy and health and unlocks the potential to reach several Sustainable Development Goals. The First Clean Air Outlook, to which JRC researchers contributed with a macroeconomic cost-benefit analysis captures these co-benefits.

Assessing climate change impacts for a resilient Europe

While emissions reduction research supports the 'how' of climate action, the JRC also provided valuable insights on 'why' and 'where' that action is important - by assessing the potential impact of climate change across sectors and spaces.

The JRC's PESETA III report contains much of that work. It shows how, in the absence of adequate adaptation measures, Europe is in danger of being exposed to more frequent and intense extreme weather conditions, which will also have significant economic impacts. The report quantifies these impacts and highlights that acting now to limit emissions can prevent the worst effects. Insights from the report helped inform a review of the EU's 2013 strategy on adaptation to climate change.

Several JRC studies call for adequate adaptation measures in specific areas. For example, scientists explored the potential future impact of coastal flooding. With one in three EU citizens living within 50 km of the coast, the increase in extreme sea levels caused by climate change could lead to between € 93 billion and € 961 billion annual damage across

the EU by the end of the century, with up to 3.65 million EU citizens being affected every year. These impacts were found to be greatly reduced with effective emissions reduction and coastal adaptation measures. A separate study on river flood risks found that most of Central and Western Europe will experience substantial increase in flood risk at all warming levels, and the higher the warming, the higher the risk.

On health impacts, a JRC report warns of the threat posed by the spread of arboviruses (arthropod-borne viruses). Spurred on by climate change, international travel and international trade, disease-bearing insects are spreading to ever-wider parts of the world.

JRC scientists also demonstrated how clearing vegetation from land is causing the Earth's surface to heat up. Activities like cutting down evergreen forests for agricultural expansion in the tropics create energy imbalances that lead to higher local surface temperatures and contribute to global warming.

Supporting Member States and neighbouring countries to increase their level of security of gas supply

Natural gas is one of the main sources of energy contributing to the European energy needs. Nevertheless, gas supply is jeopardised by a number of possible events (intentional and unintentional). Regulation 2017/1938 is the main legal tool to address and improve security of gas supply in the EU. Key elements of this Regulation are the Risk Assessment (RA, to be developed at national and regional level), the Preventive Action Plan (PAP) and the Emergency Plan (EP).

Over the last nine years, the JRC has accumulated knowledge and developed tools (hydraulic regional and national models, mass-balance EU-wide models, tools to identify relevant events and scenarios, etc.) to implement RAs and plans. In particular, in 2018 the JRC has supported five Risk Groups (RG, i.e. groups of countries jointly affected by specific gas supply routes disruptions): the Ukraine RG, the Belarus RG, the Libyan RG, the Trans-Balkan RG and the North-Eastern RG[41]. In most cases the support consisted in helping define the key scenarios considered in the RA and estimating consequences of each scenario using available models. In some cases, as for example the Trans-Balkan RG, the JRC has also provided support estimating probabilities of scenarios.

The JRC provided significant support to Ukraine in the same field, helping the country to align its legislation with EU legislation and to implement it with the best available tools. In particular, the JRC has developed together with Ukrainian experts the RA for the gas years 2016-2017, 2017-2018 and 2018-2019. The JRC has also delivered yearly recommendations to improve security of gas supply in the country. Finally, the JRC has organised two table top exercises (2017 and 2018) to train Ukrainian experts in the implementation of Ukraine's National Action Plan (equivalent to the EU emergency plan) and identified solutions for improving it.

Setting the course for Energy efficiency

JRC's work throughout 2018 continued paving the way towards achieving the Energy Union Strategy objective of ''putting energy efficiency first''. An analysis on Energy Consumption and Energy Efficiency Trends in the EU-28 noted progress in reducing energy consumption in the EU over the 2000-2016 period but highlighted that while in 2014 the EU already met its 2020 final energy consumption target, consumption grew again in 2015 and 2016, moving away from the 2020 objective.

The potential for further reductions is still vast. On cogeneration for instance, the JRC assessment of the Member States reports produced in implementation of Article 14 of the

[41] AT, BE, BG, CZ, DE, EE, EL, FI, HR, HU, IT, LT, LU, LV, MT, NL, PL, RO, SK, SL.

EED confirms that the economic potential identified by Member States back in 2011 has in most cases not been exhausted, but awareness of the energy efficiency potentials in the heating and cooling sector has grown.

The pulp and paper industry – Europe's fourth most energy intensive– is another sector that can reduce its energy consumption even with increased production. A JRC study on Energy Efficiency and GHG emissions scenarios in this sector estimated a possible reduction of 14 % by 2050 compared to 2015 levels if only new mills adopt existing best practices and technologies as they become operational.

Over the past few years the huge data centres powering the internet have significantly improved energy efficiency through the adoption of best practices, thanks to, among others, non-regulatory initiatives such as the JRC managed EU Code of Conduct. In an award ceremony celebrated in 2018 the efforts of the best companies in class were recognised.

JRC research also showed local level action is key to fully achieve energy efficiency measures potential, e.g. through initiatives such as the Covenant of Mayors. The JRC found that cities already reduced their emissions by 23 % in 2016, well above the EU 2020 emission reduction target. A 2018 JRC analysis of the Mediterranean region showed that more can be achieved by, among others, strengthening technical capacities (e.g. through the Guidebooks developed by the JRC) and financing.

Supporting the EU in meeting renewable energy objectives

The recast Renewable Energy Directive foresees a binding, renewable energy target of 32 % for 2030, including a review clause by 2023 for an upward revision of the EU level target. 14 % of the energy consumed in transport must also be renewable. The JRC calculated the default emissions values and contributed to defining the sustainability criteria for bio-based fuels. The default emission values of alternative aviation fuels, which can be used by airline operators in the frame of Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) are also based on JRC research.

The agreed renewable energy targets are expected to spur rapid growth in the renewable energy industry. This is confirmed by the 2018 JRC PV Status Report which found that the installed PV power capacity of 408 GW at the end of 2017 could triple by 2023. Already at the end of 2018, worldwide solar PV power is expected to exceed 500 GW capable of producing roughly 2.8 % of the worldwide electricity demand. The EU's share in 2017 is about 26 % of the world-wide installed capacity and can provide about 4.5 % of its electricity demand. For less developed countries, particularly in Africa, renewables can grow exponentially due to their high potential for increasing access to modern energy services. A JRC owned off-line app is being implemented to support rural electrification with off-grid systems on the ground in Burkina Faso.

Innovation has been playing a key role in this transformation and the JRC is actively enabling it, among others, through its pre-normative laboratory work on energy rating standards and measurements of new innovative photovoltaic systems (e.g. organic, bifacial, perovskites). It also shed light on an array of innovations that can bring ocean energy to the market, an emerging sector where Europe has the opportunity to maintain its leadership. The JRC found that a more accelerated development of future emerging technologies for ocean energy relies upon the adoption of a systemic approach, the transferability of solutions from other sectors as well as the development of new technologies and materials.

Supporting the implementation of EU Nuclear safety policy

Nuclear power plants (NPPs) currently produce around a third of the electricity consumed in the European Union. Nuclear energy is presently an asset in combatting climate change, meeting increasing energy demands and the need for energy security. Many EU

NPPs will enter into long term operation in the coming years and comprehensive ageing management programmes for nuclear plant and equipment are vital to maintain high level of nuclear safety in the EU.

In 2014, the Directive establishing a framework for the nuclear safety of nuclear installations has been amended to increase transparency on nuclear safety matters; establish new provisions for on-site emergency preparedness and response as well as to set up an EU system of peer reviews for nuclear installations. Peer reviews aim to provide a mechanism for EU Member States to examine topics of strategic importance to nuclear safety, to exchange experience and to identify opportunities to strengthen nuclear safety.

Ageing management was the first focus for the topical peer reviews. Coordinated by the European Nuclear Safety Regulators Group (ENSREG), which assembled a team of experts from the European nuclear regulatory authorities, the National assessment reports of 16 EU Member States and 3 EU Neighbouring Countries (Norway, Switzerland and Ukraine) having NPPs or research reactors, were peer reviewed.

Mandated by the amended Council Directive, the European Commission Directorate-General for Energy participated in the peer review, supported by JRC nuclear safety experts. JRC's expertise in the relevant areas was instrumental to the thorough assessment of the sub topics of the aging management, namely electrical cables, concealed piping, reactor pressure vessels or equivalent structures, and concrete containment structures. The JRC team also discussed and identified good practices and areas for improvement in the peer review workshop and contributed in the drafting of the final report.

Forest Fires in Europe, Middle East and North Africa 2017

The report combines data from the JRC-managed European Forest Fire Information System (EFFIS), and statistics and information provided by EU Member States and neighbouring countries.

https://europa.eu/!BB44Cr

Is snow load on roofs increasing with global warming?

A JRC research published in Climate Risk Management suggests that a European project would help National Competent Authorities to redraft the national snow load maps for design of buildings with the Eurocodes.

https://tinyurl.com/yc88joqq

Sharing nuclear safety best practices

The JRC celebrated the 10-year anniversary of 'the EU Clearinghouse', a regional network of nuclear safety regulatory authorities and their technical support organisations sharing best operational practice.

https://europa.eu/!uh69MU

Global wheat yields at risk due to ozone pollution

The benefits of increasing global wheat yield are significantly offset when increasing concentrations of ground-level ozone force crops to divert resources away from growth and seed production to fight the pollutant.

https://tinyurl.com/ybrdmwzx

Credible accounting of mitigation in managed forests

A JRC-led group of forestry research experts has developed a rigorous new fact-based carbon accounting system that reflects how forest management practices can help mitigate greenhouse gas emissions.

https://tinyurl.com/y8dvj8rh

Drought and Water Crisis in Southern Africa explained

A JRC technical report has found that the massive water shortage that happened in 2018 in the Western Cape Province in South Africa, while exceptional, is characteristic of longer-term weather patterns.

https://europa.eu/!WP36fR

A connected digital single market

The internet and digital technologies have a huge transformational impact on our economy and society. However, fragmentation and barriers in digital services across the EU reduce the chance of reaping the full benefits of the digital economy in the EU single market. The digital single market strategy was launched as a set of 16 important initiatives tackling the various obstacles and opportunities to the digital transformation.

The JRC is supporting the Commission in shaping and implementing these initiatives aimed at ensuring that Europe's economy, industry and employment take full advantage of what digitisation offers. Boosting digital literacy in education, assessing digital employment trends, gauging the influence of creative content streaming platforms, or ensuring that eCall devices meet compatibility and performance requirements, are so many examples of activities that the JRC pursued in 2018.

Insight into the present and future of Artificial Intelligence in Europe and the world

As early Artificial Intelligence (AI) applications enter our everyday lives, Europe must act swiftly to shape its own AI future. The main message of the JRC report Artificial Intelligence: A European perspective is clear: at stake is whether this future and its many ramifications in our lives, jobs and interpersonal and societal relations, will still be in our hands or decided elsewhere.

The report takes stock of current global developments and lays out some of the options and pitfalls for EU policymakers in the face of strong competition, and competing visions, from other global players. It also looks at recent AI developments linked to increased processing power, improvements in algorithms, and the exponential growth of digital data. While these can be extremely beneficial, they also raise many concerns, especially in sensitive areas like political campaigning, human resource management or the criminal justice system. Without a full understanding of the inner workings of many AI technologies, our ability to exert human supervision, assess algorithms scientifically, or recover from adversarial events, is limited.

AI players are currently concentrated in the US, China and Europe, and their respective vision often differs. In between 'AI for profit' and 'AI for control', Europe could embrace 'AI for society', and make fair AI systems that are 'secure and ethical by design' the hallmark of European development in this field.

Other important aspects the report addresses include the AI specialists' brain drain, the risks of European data hosted outside Europe, or the jobs landscape shift and its implications to name a few.

To get AI right, the report concludes, the EU needs a coordinated strategy built on our strengths in research and industry; on our traditions in balancing the individual and societal interest; and on our diversity, which could be harnessed through local data sharing ecosystems.

The Commission presented its European approach to artificial intelligence in April 2018 and a coordinated plan (insert link when available) in December 2018. It also set up the European High Level Group on Artificial Intelligence to draft ethics guidelines.

#Blockchain4EU: Blockchain for Industrial Transformations

Blockchain and other Distributed Ledger Technologies (DLTs) are immutable, encrypted and timestamped databases, in which data is recorded, validated and replicated across a decentralised network of nodes. A range of opportunities and challenges could emerge through such technologies that will potentially enable parties who are geographically distant, or have no particular trust in each other, to record, verify and share digital or digitised assets on a peer-to-peer basis with fewer to no intermediaries.

The #Blockchain4EU: Blockchain for Industrial Transformations project, coordinated by the JRC's EU Policy Lab, explores the existing, emerging and potential applications based on Blockchain and other DLTs for industrial / non-financial sectors. It relied upon an innovative experimental approach to generate ideas on how Blockchain and other DLTs could exist in the near future and ultimately test new narratives and plausible scenarios around it.

The project entailed a mix of desk and qualitative research with a series of interviews, surveys, and ethnographic explorations, together with co-creation workshops. These 'prototyping for policy' workshops resulted in the collaborative envisioning, design and creation of five prototypes aimed at physically showcasing how Blockchain could be applied in five specific sectors: energy, transports and logistics, creative industries, advanced manufacturing and health.

The outcomes of the project and the accompanying report were presented at a closing event in May 2018. The researchers signaled a number of key insights for implementation and uptake by industry, businesses and SMEs. They also put forth a number of strategic recommendations and notably urged policy-makers to support experimentation and piloting with simplified requirements; support the integration of Blockchain with other key industrial technologies; stimulate open source knowledge sharing; foster interoperability and open standards; promote adequate digital skills training; design stable regulatory frameworks; and champion Blockchain in public and governmental sectors.

Boosting digital literacy, a key role for schools

In January 2018, the European Commission launched the Digital Education Action Plan to promote better use of digital technologies for teaching, and improved digital competences among students and teachers.

Most relevant in this context, the JRC has produced competence frameworks to allow citizens (DigComp), teachers (DigCompEdu), schools and educational organisations (DigCompOrg) as well as education and employment authorities to assess and improve these skills. Among these tools, SELFIE enables schools to better embed digital technologies into teaching, learning and student assessment.

After a successful pilot in 2017, involving 650 schools in 14 European countries, the full version of SELFIE was released in October 2018 in all 24 official EU languages for all schools to use free of charge. SELFIE gathers – anonymously – the views of students, teachers and school leaders on how technology is used in their school. This is done using short statements and a simple 1-5 agreement scale. The statements cover areas such as

leadership, infrastructure, teacher training and students' digital competence. The information is used to generate a report on strengths, weaknesses and potential areas for improvement, which in turn helps initiate the dialogue within the school and action plan to improve the use of digital technologies. The Digital Education Action Plan foresees the scaling up of SELFIE to one million users by the end of 2019.

In 2018, the JRC also published a report on Young Children (0-8) and Digital Technology which confirmed schools' critical influence on the acquisition of digital competences - including creative use, when digital technologies are integrated as active learning tools rather than mere information sources. It also urged schools and teachers to enhance children's digital and media literacy as early as possible and highlighted the importance of developing a digital competence curriculum and digital pedagogies as part of teachers' training.

Digital employment platforms: gauging labour markets and policy implications

In response to calls by the European Council and the European Parliament, the JRC, in collaboration with the European Commission's department for employment, social affairs and inclusion, has produced a survey and the subsequent report Platform Workers in Europe, as an initial attempt to provide quantitative evidence on digital platform work and reflect on its policy implications.

According to the survey, which gathered responses from more than 32 000 people across 14 Member States, one in every 10 adults (16-74 years) has used online platforms at least once to offer labour services. While for the majority it remains only a sporadic source of secondary income, 2 % of the surveyed adult population works more than 20 hours a week or earns at least half of their income via online labour platforms.

The survey helped to outline the main socio-demographic characteristics of platform workers, learn about their working conditions and motivations, and describe the type of services provided through digital labour platforms.

The emergence of digital platform work has important implications for employment, education and welfare policies. A critical obstacle to designing appropriate policy responses is the lack of reliable evidence. The report's findings suggest an emerging phenomenon of increasing importance but still modest size.

If platform work remains significant but small in the future, a two-pronged policy response is likely to suffice, focusing on fully grasping its job creation and innovation opportunities, and adjusting existing labour market institutions and welfare systems to the new reality and mitigating its potentially negative consequences for working careers and working conditions.

However, if platform work continues to grow in size and importance to become a more significant reality in our labour markets, or if some of the key features of platform work (such as the rating mechanisms) spread across other forms of employment, policy interventions may need to be further advanced.

Saving lives on our roads: ensuring 112 emergency auto-call technology works

An eCall device works by receiving the signals from EU's Galileo and GPS satellites. When fitted to a vehicle, eCall will automatically dial 112 - Europe's single emergency number - in the event of a serious crash with vital information like the vehicle type, the location and time of the accident and the direction of travel (most important on motorways), even if the driver is unconscious or unable to make a phone call. By speeding up emergency response times by up to 40% in urban areas and 50 % in rural areas, the technology could save 2500 lives across Europe each year.

The JRC and the Agency responsible for the EU's satellite navigations system (GSA) have

released guidelines to ensure that eCall devices meet compatibility and performance requirements. This will help test centres and manufacturers to be fully prepared ahead of their compulsory installation in all new cars and vans from the end of March 2018.

The guidelines follow intensive testing of the eCall on-board units at the JRC's state-of-the-art Global Satellite Navigation System (GNSS) laboratory in Italy, where manufacturers have been sending in their devices for testing and preliminary feedback on a voluntary, free-of-charge basis. The testing campaign has also been extended to manufacturers of the eCall testing platforms that will be used by the technical centres approving these devices for installation. The testing campaign has proved popular so far, with many manufacturers sending samples of their eCall modules and 4 major commercial vendors making their eCall testing platform equipment available to the JRC.

As well as being a major innovation in road traffic safety, the roll-out of eCall through EU Regulation 2017/79 will provide the second largest market for Galileo and other satellite positioning systems, after the location based services running on smartphones. By working closely with industry, scientists are helping to ensure that the implementation of the Regulation goes smoothly.

'Cyber Chronix': GDPR explained through gaming

The JRC has launched 'Cyber Chronix', a mobile game to help raise awareness of privacy risks and data protection rights in the context of the entry into force of the European General Data Protection Regulation (GDPR).

https://europa.eu/!kv46tJ

How safe is your email?

My Email Communications Security Assessment (MECSA), an online tool developed by the JRC, allows you to check whether your email provider offers a good level of protection in your email communications.

https://europa.eu/!HK67Xg

Streaming platforms influence consumer choice and artists revenue

The JRC looked into how digitisation and online distribution impact revenue streams in the music sector and lead to new consumption patterns, both relevant to the European Commission's Music Moves Europe framework.

https://europa.eu/!XN84bu

Blockchain potential to transform education

Blockchain technology can help improve old models of data management and bring benefits to learners and educational institutions in the EU - if policymakers are well prepared to embrace the change.

https://europa.eu/!bt77yg

A new lab for the smart communities of the future

Officially launched in November 2018, the JRC's new Smart Grid Interoperability Laboratory researches and evaluates ways to achieve integration and interoperability between smart devices and systems.

https://europa.eu/!JF36Hd

A deeper and fairer economic and monetary union

Completing the economic and monetary union remains a key objective of the European Commission's current term. Putting the public finances of Member States on a sound and sustainable footing is critically important for the stability and prosperity of the euro area. Completing the financial union is equally important. Ensuring fair taxation and the good functioning of welfare systems is also crucial. A well-regulated capital markets union encompassing all 28 Member States should mobilise capital in Europe and channel it to all companies — including SMEs — so that they can carry out the long-term sustainable projects that are needed to expand and create jobs.

In 2018, the JRC carried out socioeconomic analyses to improve macroeconomic, budgetary, structural, and financial development policies in the EU. It monitored foreign direct investment and assessed Member States' resilience to the financial crisis. It looked into correlations between private investments and employment and growth. It provided modelling and economic analyses too, in support of fiscal policies.

Learning from the financial crisis: ranking EU Member States' resilience

The financial and economic crisis that started in 2007 was felt across the EU but its impact was uneven. A JRC report looked at countries' resilience, and concluded that mere 'shock absorption' may not be the only possible or best strategy looking forward. Instead, adaptation and transformation have helped some countries use the crisis as an opportunity. The JRC study measured the degree of economic and societal resilience of each Member State during and after the crisis, and identified particular country characteristics linked to resilience. It also looked at which EU countries were able to use the crisis as an opportunity to 'bounce forward' and emerge stronger.

The analysis is based on the JRC conceptual framework for resilience, which places at its core the wellbeing of individuals. Broadening the perspective from a purely economic to a socio-economic viewpoint considerably changes the assessment of country resilience. For example, Bulgaria proves more resilient when social variables such as exclusion, happiness and health are included in the analysis, while Hungary becomes less resilient when the social dimension is factored in. The importance of this broader perspective further reinforces the case for the European Pillar of Social Rights, and for strengthening the social dimension in the work of the European Semester.

Resilience is not necessarily to bounce back to the pre-crisis stage, but to bounce forward and potentially improve upon it. Country performance in this respect is markedly varied: while Germany, Malta and Slovakia managed to bounce forward in many areas, countries like Greece, Italy and Spain haven't across most socio-economic dimensions. Countries have been generally able to 'bounce forward' more as far as monetary aspects of wellbeing (GDP, consumption and income) are concerned, compared to non-monetary aspects of wellbeing (e.g. happiness, equality, social inclusion and youth employment, education or training). This latter finding again confirms the need to consider the social dimension in crisis response and economic management.

Screening Foreign Direct Investment in strategic economic sectors

During the last years, a growing number of foreign acquisitions of European companies became controversial and calls for action at EU levels intensified. Both the European Parliament and Council asked the European Commission to screen third country foreign direct investments in the EU in strategic industries, infrastructure and key future technologies. In response, the Commission put forth the Communication Welcoming FDI while Protecting Essential Interests, which notably announced an in-depth analysis of FDI flows into the EU, to be carried out by the end of 2018.

The JRC contributed to this initiative by producing a comprehensive picture of foreign ownership of EU enterprises based on available firm-level data sets and inward foreign

investments based on bilateral data. The JRC contribution was used by the Directorate General for Trade to assemble the Commission Staff Working Document on FDI flows into Europe.

In particular, the JRC constructed a dataset of European firms, listed and unlisted, controlled by owners located outside the European Union. Stock data on foreign ownership were complemented by flow data on merger and acquisitions and greenfield investments made by non-European investors. These data enable the European Commission and policy makers to have a picture (from 2007 up to now) of the industrial sectors and the countries mostly interested by non-European investments, and access to information on both the controlled firms (e.g. market share and employment) and on the controlling firm (e.g. private firms or state controlled firms).

JRC scientists found that non-European control about 150 thousand firms in Europe. The lion's share of Non-European investors is coming from US or Canada (31%) and they control more than half of all foreign assets in Europe and about half of the employment in foreign controlled firms. EFTA (Switzerland and Norway) represents the second largest investor, while offshores countries the third (particularly Bermuda, Cayman and British Caribbean) with 13 % and 11 % respectively of the foreign control.

Assessing the impact of the Investment Plan for Europe on jobs and growth

Since the global economic and financial crisis, the EU has been suffering from low levels of investment. The Investment Plan for Europe, the so-called Juncker Plan, was adopted to address this situation by removing obstacles to investment, providing assistance to investment projects, and by making smarter use of financial resources. One pillar of the Investment Plan, the European Fund for Strategic Investments (EFSI), was launched to mobilise private investment in the EU, in collaboration with the European Investment Bank (EIB) Group.

The Joint Research Centre worked with the Commission and the EIB to quantify the impact of the Investment Plan and provide evidence on its positive impact on jobs and growth across the EU.

The JRC teamed up with the EIB to conduct a macroeconomic assessment of the impact of the Bank's operations under EFSI. The first results are documented in a joint EIB-JRC paper. Using RHOMOLO, a well-established regional macroeconomic model, the JRC was able to determine that the Juncker Plan already increased EU GDP by 0.6 %, a figure set to reach 1.3 % by 2020. It also showed that EFSI already supported more than 750 000 jobs, and it is expected to rise to 1.4 million jobs by 2020.

Further to this, the JRC also applied its modelling expertise to assess the combined macroeconomic impact of the full and timely implementation of regulatory reforms identified in the domain of the Digital Single Market, the Single Market Strategy, the Capital Markets Union and the Energy Union. JRC figures helped the Commission carry out a stock-taking exercise of the Investment Plan, as outlined in its 'Investment Plan for Europe: stock-taking and next steps' Communication. They also showed that those reforms may result in additional 1 million jobs created by 2030 and an additional increase of EU GDP of 1.5 % by 2030. This analysis is based on the expected removal or reduction of existing barriers to investment by the legislative proposals the Commission has adopted as part of these four policy packages.

Macroeconomic forecasting using detailed structural modelling

The Global Multi-country (GM) model is a macro-economic model jointly developed by the JRC and the Directorate-General for Economic and Financial Affairs (ECFIN) to perform forecasting, medium term projections and spillover analysis in sync with the EU's annual cycle of economic surveillance procedures (the European Semester).

In Spring and Autumn Forecasts 2018, JRC and ECFIN analysts continued putting the GM model to good use to understand the drivers of euro-area Gross Domestic Product (GDP) growth. It also contributed to Thematic Boxes that are included in the Spring and Autumn Forecast Documents.

The thematic Box I.3 of the 2018 Spring Forecast provides a model-based decomposition of the euro-area recovery since 2013, extending historical time series with 2018 Spring forecast data from the European Commission. The estimated GM model attributed the post-2013 euro area GDP growth recovery mainly to the sustained recovery in domestic demand, supported by persistently strong growth in the rest of the world, and by temporary boost from falling commodity prices in 2014-2015. The box also discussed how inflation below trend mainly reflected the legacy of the demand slump and foreign factors.

The thematic Box I.3 of the 2018 Autumn Forecast presents a decomposition of the growth forecast. The discussion focused on the forecast for 2019 annual real GDP growth and discussed inflation and trade balance implications. Taken together, the results presented in the box attributed above-trend euro-area real GDP growth in 2019 to the strengthening of private domestic demand and continuous monetary accommodation. The former, however, remains below the sample average, which also explains low levels of inflation and a significant part of the trade balance surplus in the Euro area.

Using a structural model enables a policy meaningful interpretation of macroeconomic data as it allows decomposing the dynamics of GDP, inflation, consumption, investment, trade, employment, etc. into key drivers, like the evolution in domestic and foreign demand, commodity prices, productivity, fiscal and monetary policy.

European Semester tax and social benefits reforms analysis: increasing focus on fairness

The JRC has long been supporting the Commission services in charge of tax and social policy issues, including the Directorate General for Employment, Social Affairs and Inclusion, the Directorate General for Economic and Financial Affairs and the Directorate General for Taxation and Customs Union. In 2018, these support activities expanded significantly, in particular in the context of the 2018 European Semester, for which the JRC was asked to provide detailed modelling analyses of reforms discussed or enacted in the EU Member States.

The scope of analyses carried out for the European Semester was also significantly extended to better cover fairness aspects. A number of social policy reforms were analysed including among others, minimum income schemes in Spain, social security contributions and minimum wages in Romania and family support policies in Italy. In order to be in a position to assess the impact of these reforms on income distribution and poverty, the JRC had to grow its modelling toolbox.

EUROMOD-based simulations were used to develop a number of indicators. Analysing the fairness dimension of reforms was made possible by decomposing standard inequality indicators (such as the Kakwani index) in order to isolate the role played by the progressivity of the tax and social benefit system. A social welfare indicator was also developed in order to assess jointly the impact of reforms on households´ income level and inequality.

The JRC provides policy DGs with a broad range of fairness and inequality-related indicators for different types of households, distinguishing them by employment, age and family status. Such analysis allows the identification of individuals and households categories most at risk of social exclusion. All reforms analysed by the Commission services for the European Semester are considered systematically from a fairness perspective, along with their fiscal impact, thanks to JRC support.

Taxation of the digital economy – underpinned by science

JRC scientists have supported the digital economy taxation package by providing data and estimates on corporate profit allocation of Web companies and by analysing the macroeconomic impact of the proposal.

https://europa.eu/!gu33kB

Supporting a stronger international role of the euro

The 2018 Communication Towards a stronger international role of the euro used the JRC evidence on the use of the euro in invoicing done by aircraft manufacturers, one of the key strategic sectors identified by the Communication.

https://europa.eu/!hn38Cb

Exploring the resilience of the financial system

The first Annual Conference of the JRC Community of Practice in Financial Research took place in November 2018. It covered topics such as banking regulation, systemic risk, Fintech, financial networks and sustainable finance.

https://europa.eu/!GH48uc

Informing European Deposit Insurance Scheme (EDIS) negotiations

The JRC examined EDIS design options, explored risk-based options for payment distribution, and quantified the liquidity shortfalls impact for deposit insurances, of a non-Banking Union Member State joining EDIS.

https://europa.eu/!WP88Cc

A deeper and fairer internal market with a strengthened industrial base

The internal market is key to boosting growth and jobs. The areas with the highest growth potential are services, networks and the digital economy. Industry accounts for over 80 % of Europe's exports and private R & I and almost 25 % of jobs in the private sector. The EU's internal market policy focuses on helping to turn the EU into a smart, sustainable, and inclusive economy by implementing the industrial and sectoral policies under Europe 2020.

In 2018, JRC's activities contributing to strengthening the internal market included standardisation, reference measurements and product safety; support for industrial sectors to enhance their environmental efficiency, energy performance, climate resilience and GHG emissions reductions; resource efficiency and the circular economy, and more.

JRC ramps up its leading role in vehicle emissions oversight

Achieving deep CO_2 and pollutant emissions reductions in the transport sector remains a persistent challenge, in particular in the context of the Commission's strategy for a climate neutral Europe by 2050.

The regulatory initiatives to address this – e.g. the new Type Approval Framework and the certification procedure for heavy duty trucks – should pave the way to significant improvements in vehicle emissions performance. But according to a JRC study published this year, continuous monitoring is critical for ensuring the implementation of and compliance with the new vehicle emissions legislation. In this context, the JRC has been

assessing vehicle emissions control technologies and vehicle emissions performance both in laboratory and on-road (the results are summarised in a Science for Policy report). Among other tools, and to improve the methodology and support Member States led investigations, it put to good use testing protocols and new emission measurement methods to identify anomalies in emissions patterns potentially caused by defeat devices.

These tests are part of a set of activities that will prepare the JRC to take up the role of checking – on behalf of the Commission – the compliance of vehicles with the type approval regulation and the Real Drive Emissions requirements. In the same context, the JRC signed the contract for building two new facilities (VELA 10 and VELA 11) which are scheduled to start testing cars in 2020.

Besides its foreseen role in monitoring compliance, the JRC continued preparing the ground for a future regulatory initiative for certifying CO_2 emissions and fuel consumption for other heavy duty vehicles, namely buses and coaches. Following a test-campaign to investigate the possibility of extending the existing methodology for trucks to coaches and buses and to check the representativeness of the CO_2 emissions calculations made by the official simulator (VECTO), the JRC confirmed already the practical feasibility of an ex-post verification method based on transient, on-road tests for buses and coaches, even though further testing is needed.

New test methods for plastic and rubber product safety

JRC scientists have developed new methods to better measure the content and migration of Polycyclic Aromatic Hydrocarbons (PAHs) from rubber and plastic items.

PAHs are a group of hazardous compounds - many of which are known carcinogens - that can be found in the raw materials used in the manufacturing process of products ranging from children's toys to bicycle grips and sporting goods. They are also found in products made from secondary raw materials, such as granules and mulches used in synthetic turf pitches, or in loose forms at playgrounds and other sports facilities, often coming from end-of life rubber tires. Considerable public attention has been paid in recent years to the potential for children and adults to be exposed to PAHs through skin contact, including inside the mouth.

While current EU legislation already limits PAH levels in consumer products, these new methods give laboratories a novel, sensitive and cost-effective analytical method to determine PAH content in rubber and plastic. They will also enable tests to be carried out to reliably determine the migration rate of PAHs from these products, should a migration based limit for PAHs be considered in the future.

The novel and more sensitive analytical methods, together with new insights into the migration behaviour of PAHs from different types of plastic and rubber materials, provided by JRC scientists as an outcome of this project, will contribute to the discussion about the revision of the PAH limit values in the REACH Regulation and to possible future standardisation work in this domain.

Owners and operators of sports fields will also be enabled to determine compliance with limits that could be proposed in the context of the on-going REACH restriction revision process.

Minimum quality requirements for water reuse in agriculture

Water scarcity and shortages are a growing problem around the world. Pressures from droughts and urban development exacerbated further by climate change, have put a strain on the freshwater supplies also in Europe. Recycling waste water has become increasingly important for improving efficient water use.

Agriculture – especially agricultural irrigation – is one of the areas which offer many

opportunities for reusing treated waste water. However, before recycled water can be reused in agriculture, the treated water must meet the necessary safety and quality standards to safeguard human health and the environment.

The JRC has published a report on the minimum quality requirements for the use of treated waste water for agricultural purposes.

At the moment, a lot of the waste water which could be reused is wasted. We are not using the available water to its full potential. In support of the EU's efforts to encourage an efficient use of water, the report assessed the health and environment related risks linked to the reuse of waste water in agricultural irrigation and developed the minimum quality requirements to be respected so that recycled water can be used safely in agriculture.

The report establishes the microbiological and physico-chemical parameters, the associated limit values and monitoring frequencies for the use of treated waste water in agricultural irrigation. It also defined the preventive measures to be adopted and established the main elements for the implementation of a risk management framework, as recommended by the World Health Organisation.

The JRC report is an important contribution to the EU's Circular Economy objectives, it was used as basis for defining EU legislation on the reuse of water in agriculture, notably the Commission proposal for a new Regulation on the use of treated water for irrigation, which was adopted in May 2018. The impact assessment that accompanied the proposal was also largely based on a 2017 JRC Hydro-economic analysis on the potential of water reuse for agricultural irrigation in the EU.

New EU emission standards for waste treatment and guidance for industrial installations

New emissions and efficiency standards emerged from a review of the Best Available Techniques (BAT) Reference Document (BREF) for Waste Treatment. BAT conclusions provide national authorities with the technical basis for lowering the environmental impact of existing waste treatment installations and setting permit conditions for new ones. The JRC led the drafting of the BAT conclusions through its European Integrated Pollution Prevention and Control Bureau with the involvement of experts from industry, EU public authorities, environmental NGOs and other services of the European Commission.

While the main aim is to reduce emissions, other environmental issues – such as energy efficiency, resource efficiency (water consumption, reuse and recovery of materials), prevention of accidents, noise and odour, management of residues – are also covered. The BAT conclusions also include standards for how the technology is used and how installations are designed, built, maintained, operated and decommissioned.

The BAT conclusions include BAT-associated emission levels (BAT-AELs), which have the potential to drive significant emissions reduction from the waste treatment sector when translated into emission limits. They apply to the most common waste treatments, including mechanical, biological and physico-chemical treatments and treatment of water-based liquid waste, but also to temporary waste storage and independent waste water treatment plants.

The existing waste treatment installations (i.e. first permitted before the publication of the BAT conclusions) have four years to comply with the new standards. New installations need to comply immediately.

In a related development, the JRC published a new guidance document to help Member States competent authorities regulate emissions to air and water from large industrial installations. The new guidance does not contain BAT conclusions, but supports their

implementation and drafting and contains useful information for operators. It will facilitate the development of new or improved environmental standards in the future.

Supporting Member States and the Commission in tackling food quality and food fraud issues

The issue of dual quality foods in the single market was discussed in April 2018 in a European Parliament event gathering industry and consumer representatives, politicians, and policymakers to assess progress and explore the way forward. At this occasion, Tibor Navracsics, Commissioner for Education, Culture, Youth & Sport, responsible for the JRC, announced a new EU harmonised testing methodology for comparing food quality characteristics. He also presented the work of the JRC-operated Knowledge Centre for Food Fraud and Quality.

In recent years, studies in some Member States had uncovered differences in the composition or characteristics of certain branded foods, but based on different approaches, their results were not readily comparable. The new harmonised methodology makes recommendations for the selection of products, their sampling and testing and data interpretation. It can be used to assess objectively the differences between food products offered on the Internal Market. It was developed by the JRC in close cooperation with food supply chain stakeholders, Member States experts, and relevant Commission services. It also served as a basis for a pan-European testing campaign which was launched end of 2018.

The Knowledge Centre for Food Fraud and Quality was launched in March 2018 as a network of experts in and outside the Commission, providing EU policymakers and national authorities with access to up-to-date scientific knowledge on food authenticity and food quality issues. It notably coordinates market surveillance activities, operates an early warning and information system on food fraud, links information systems of Member States and the Commission, and generates country-specific knowledge.

In another 2018 development related to food and nutrition, JRC scientists have compiled a report which indicates the sugar content of several food and drink categories available on the European market in 2015. It provides a baseline to monitor implementation of sugar reduction initiatives and supports the EU target to reduce added sugars by a minimum of 10 % by 2020.

Supporting customs policies and the fight against customs fraud

Customs play a crucial role in the implementation of the internal market. As the volume of traded goods arriving and leaving EU constantly increases customs authorities need to persistently improve the efficiency and effectiveness of their controls protecting the financial interests of the Union as well as its safety and security. The recent amendment to legislation (EC) 515/97 gave to EU customs access to a new source of information on the status and movement of all shipping containers transporting goods to the EU by maritime means. But the nature and volume of now accessible data challenges the effective usage of this new source of information.

The JRC collaborated with the Directorate-General for Taxation and Customs Union and European Anti-Fraud Office (OLAF) to develop the ConTraffic prototype data analysis and visualisation system. This prototype demonstrates a number of techniques that allow customs officers to use the new source of information efficiently on the status and movement of shipping containers. This prototype is used systematically by customs officers around Europe in their daily work. In 2018, the JRC provided support to OLAF in the implementation of an operational system based on the technology developed in ConTraffic. Also, the ConTraffic prototype was used in the pilot analysis of millions of import declarations and provided indications to customs officers about potential fraud cases. JRC's support in the customs anti-fraud domain further extended in 2018 with a new project in collaboration with OLAF on the mapping of data and best practices in EU

and the sharing of knowledge in this domain by establishing a community of practice and organizing visits and workshops.

The JRC also concluded a study on the importance of the new data source on the movement and status of shipping containers for customs risk management. The report not only demonstrates and documents the importance of using analysis of real customs data but also proposes solutions and methods for the integration and usage of this new data source in customs operations.

Customs controls face increasing amounts of chemical products with false declarations that are entering the EU market. Many of these products are synthetic designer drugs also known as NPS, which are not controlled under international law. The JRC supported the Customs' Laboratories European Network (CLEN), coordinated by DG Taxation and Customs Union, with scientific expertise for the identification of new psychoactive substances (NPS) in seized samples.

JRC experts share insight on updated EU Bioeconomy Strategy

The JRC played a key role in the preparation of the updated EU Bioeconomy Strategy. It provides the Commission services with data, models and analyses of EU and global biomass potential, supply, demand and sustainability.

https://europa.eu/!mk84BN

Distribution of bumblebees across Europe

Declining plant and crop pollination threatens ecosystems and agriculture. Scientists have mapped the distribution of bumblebees in Europe and created a predictive map to monitor and mitigate bumblebee decline.

https://europa.eu/!MD79QV

First global seafood consumption footprint published

Global seafood consumption more than doubled in half a century. Now over 20 kg per capita per year, it challenges the sustainability of fish stocks and puts the impact of seafood supply chains under scrutiny.

https://europa.eu/!pw93YP

Predicting the spread of invasive pest threatening EU forests

JRC scientists co-authored a published article describing a new spread prediction model of the pine wood nematode (PWN), most harmful for EU forests, and as such regulated as "quarantine pest" under EU law.

https://europa.eu/!fF44Qw

Record high profits for EU fishing fleet, 2018 report finds

The 2018 Annual Economic Report on the EU Fishing Fleet shows record-peak levels in economic performance of the EU fishing fleet in 2016 and closely links this achievement to the use of sustainable fishing methods.

https://europa.eu/!hN64cb

Securing raw materials for the future

The Raw Materials Scoreboard 2018 points to some encouraging signs of development

and recovery in the raw materials sector, but more efforts are needed to diversify supply and increase use of secondary materials.

https://europa.eu/!uT73Cg

Towards a new policy for migration

In May 2015 the European Commission presented a comprehensive European Agenda on Migration, intended to address immediate challenges and equip the EU with the tools to better manage migration in the medium and long term in the areas of irregular migration, borders, asylum and legal migration. The European Agenda on Migration has guided the EU's response to immediate challenges. The work now focusses on long-term solutions to equip Europe with future-proof means of managing migration responsibly and fairly.

Contributing to this Agenda, in 2018 the JRC issued — in the context of the Knowledge Centre on Migration and Demography — the Atlas of Migration as well as the International Migration Drivers report, and launched together with the International Organization for Migration (IOM) the Big Data for Migration Alliance.

Better data for evidence-informed migration policy

A major challenge to effective migration policy is the need for a comprehensive evidence base. There are official statistics, but migration phenomena are complex and only part of them can be captured through these statistics. In addition, there is an emerging pool of potential data sources that could provide valuable, real-time insights, which remain largely untapped for the time being.

Through the European Commission's Knowledge Centre on Migration and Demography (KCMD), the JRC is helping ensure that policymakers are equipped with the tools needed to source and make use of existing data available and the potential of innovative data sources.

The JRC Science for Policy report, 'Towards an EU Policy on Migration Data' shows where policymakers get most of their data, and where the biggest gaps are. The report also highlights approaches to make better use of existing data – such as the increasing use of administrative data, to produce more frequent and timely migration statistics. In addition, the report reflects on the opportunities presented by new sources such as Big Data.

The KCMD also launched the Big Data for Migration Alliance this year, together with IOM's Global Migration Data Analysis Centre. The Alliance promotes dialogue and collaboration among policy-makers, international organisations, NGOs, data providers, national statistical offices and researchers. It aims to harness the potential of Big Data sources for migration policymaking, while ensuring ethical data use and individual privacy protection. At the launch, the JRC presented a methodology to estimate the number of foreign-born people living in a given country based on data from the Facebook advertising platform.

In December, world leaders met at the UN Intergovernmental Conference in Marrakesh to adopt the Global Compact for Safe, Orderly and Regular Migration. The JRC and the International Centre for Migration Policy Development co-organised an official side event exploring the latest evidence on the drivers and root causes of migration, as well as the latest tools and approaches available for effective migration policy design.

What causes people to migrate?

A global analysis of intentions to migrate found that individuals preparing to move abroad are more likely to do so out of aspiration for a better life, economic opportunities and

development of skills, rather than sheer desperation. JRC scientists analysed intentions to migrate in different forms: the desire to move abroad, actual plans, and preparations. While being dissatisfied with one's own standard of living is associated with a higher probability to desire and to plan a move abroad, the link with making concrete preparations is less obvious.

Building on these and other findings, the JRC also released a Science for Policy report which uses the best available data to quantify the relative importance of different factors that shape international migration. 'International Migration Drivers' confirms that the key drivers of international migration are mainly structural: economic development in countries of origin, migrants' social networks and demographic change. The report helps policymakers to better understand current and potential future trends across the world.

Both the European Agenda on Migration and the Global Compact for Safe, Orderly and Regular Migration, explicitly state the need to improve the management of migration by addressing the 'root causes which cause people to seek a life elsewhere' and 'mitigating the drivers and structural factors … that compel [people] to seek a future elsewhere'. Despite using different terms such as drivers, root causes, determinants and push and pull factors, the rationale behind these statements is the same: the management of migration requires a deep understanding of what determines migration in the first place.

This research builds a bridge between the complexity emerging from research and the need for digestible answers for policy. Taking a quantitative approach, the JRC scientists address this complexity by exploring how multiple drivers of migration change in relation to development stages of countries and different dimensions of migration. The study establishes anchoring points built upon empirical evidence to support the discussions about the future of migration. If policies are to address the structural factors driving international migration, such as poverty, unemployment and demographic trends, then a long-term approach is vital.

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Illustrating the evidence with a new Atlas of Migration

The first issue of the Atlas of Migration provides insights on migration for all EU Member States and 44 non-EU countries. With data visualisations and maps, the Atlas of Migration provides a snapshot of migration in 2017, providing a knowledge base for use by policy makers in migration and related areas, relevant stakeholders, businesses, researchers and the general public.

The publication presents the available data on a range of migration-related fields in a format that is both easy to access and to understand – which can help policymakers and citizens alike to get a good grasp of migration related issues. It condenses statistics from multiple sources, including Eurostat for the EU Member States and several international statistical sources for the non-EU migration profiles and the thematic analysis.

The Atlas is structured around three sections, each with a distinct focus. Migration profiles of EU Member States provide an annually updated picture of demography, migrant stocks and flows, legal migration, asylum, irregular migration, naturalisation and integration. Non-EU migration profiles cover similar aspects to the EU country profiles for 44 key countries of migration origin and transit, with additional information on development and humanitarian aid, remittances and socioeconomic characteristics. A thematic analysis presents this year details and trends on forced displacement in Africa. The thematic analysis will change with each annual edition of the Atlas.

The annual publication of the Atlas shows a snapshot of the situation in each year, visualising the data in an easy to understand format. A set of online resources accompanying the book will be made available in early 2019, allowing for interactive exploration of its data.

With better and broader global data in the future and the visual presentation approach adopted in the Atlas, the European Commission's Knowledge Centre on Migration and Demography hopes to build a more complete picture of migration around the world.

New perspectives on African migration

The number of people in Africa moving from their home country is set to increase in line with population growth over the coming decades, according to the findings of a joint study from the JRC and the European Political Strategy Centre (EPSC).

Scientists analysed past and present migration patterns from and within Africa, as well as the drivers behind them. Their findings give insights on the potential effects of policy decisions on migratory flows, and project potential scenarios for the future, up to 2050.

Every year, some 1.4 million Africans leave their country of birth for a longer period of time or for good. This is expected to reach 2.8-3.5 million per year by 2050, in line with population growth. Although 27 % of Africa's adult population would like to move to another country, only 1 % are actively preparing for such a move and only 0.12 % of all Africans actually migrate annually.

On average, Africans who take concrete measures to migrate are likely to be better educated and economically in a better position than those who want to migrate but have not taken concrete steps to do so. Factors stopping people from taking such steps may include lacking the necessary economic means or information. More than 50 % of all those who prepare their departure have completed secondary or tertiary education.

Socioeconomic development, better education, job creation and improved income opportunities contribute to higher migration. Direct investment in the continent and in general economic development will reduce population growth and improve living conditions, but also increase the ability of people to migrate. The study finds a nonlinear relationship between GDP, income and emigration rate.

And it will take around 30-40 years until the majority of African countries reach a GDP per capita threshold where emigration becomes less likely.

Climate change will also remain a key determinant for migration. Its destabilising effects will potentially accelerate future migration within Africa and to neighbouring parts of the world.

Data challenge provides insights on migration and local integration

In November, JRC scientists and researchers from across Europe presented the final results of the Data for Integration (D4I) challenge, which gave researchers access to a unique dataset on migration and diversity at the local level.

The final results include maps showing the extent to which migration is not only limited to big cities, with rural areas and small towns being increasingly characterised by high levels of social and cultural diversity.

The D4I dataset covers 8 countries and 45,000 local administrative units, with a detail down to street level. JRC scientists generated maps by harmonising and spatially processing official 2011 census statistics collected from national institutes in France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain and the UK.

Challenge participants explored the impact of migration and diversity on policy relevant issues such as housing markets, the level of segregation within cities, and access to services. They also looked at the possibility that support for anti-immigrant parties might be stronger among those people who live in areas with the lowest concentration of migrants in the community.

The results provide useful information on the diverse communities living in the EU and open new windows of analysis for understanding the local impact of migration across the continent.

Insights such as these also provide policymakers with a better overall picture to develop local policies that help migrants integrate in their host countries. The project supports the Commission's aim to facilitate evidence-based migrant integration policies.

The JRC also took part in the 5th Global Mayoral Forum, a City-led dialogue on migration and development supported by local, regional and international partners. At a breakout session organised together with the City of Athens, the JRC demonstrated how it is contributing to the implementation of the Global Compact for Migration at EU city level with data, tools, platforms and analyses – including the new insights offered by the D4I initiative.

Future of populations and migration

If population dynamics remain similar to the averages between 1960 and 2015, the EU population could increase to 512 million by 2035 while this of Sub-Saharan Africa could double to around 2.2 billion by 2060.

https://europa.eu/!Jd76hj

Migrant workers and the digital transformation in the EU

The digital transformation may be opportune for workers with the right skills but others' tasks could soon be taken over by computers. Migrant workers are in a more precarious position compared to others, JRC study finds.

https://europa.eu/!Fk86bT

A gateway to knowledge on migration

A new web portal allows any user – whether analyst, scientist, policymaker or interested citizen – to discover a wealth of information related to migration flows, trends and their impact on societies across the EU.

https://europa.eu/!Wg33qR

A stronger global actor

Today’s interconnected and interdependent societies are facing unprecedented global challenges and transnational security threats, such as climate change, extreme poverty and instability. However, this also opens up new opportunities for more sustainable development, equity and peace. For Europe, it also represents the opportunity to show leadership and promote its values and vision on current and future global challenges.

To that effect, in 2018 the JRC has significantly increase its cooperation and capacity building activities with the African continent, not least on critical themes such as food security, or desertification. Improved connectivity with Asian countries is also an area where much progress has been made. The JRC is also addressing CBRN-E threats and emergency preparedness at a global level. Last but not least it continues contributing valuable climate and environmental expertise that extend way beyond EU borders.

Stepping up cooperation with Africa

In 2017, the landmark publication of the JRC's Africa Report and its successful promotion during the Abidjan EU-AU Summit manifested a renewed and improved cooperation between African stakeholders and the EU in a number of scientific areas. Throughout 2018, the JRC continued building upon this momentum and sustaining it continuously.

Noteworthy is the expansion of the JRC's territorial and urban development research focus to African cities and territories. The JRC cooperated with relevant Commission Directorate Generals, the Union for the Mediterranean, and United Nations-Habitat to produce base land use maps and indicators for African regions and cities, and future African urban scenarios until 2050.

In March, the JRC took part in the Next Einstein Forum in Kigali, Rwanda, with the objective to connect science, society and policy, lead Africa on the path of innovation and fulfil the potential of its youth. At the Forum, a JRC side event discussed scientific capabilities in Africa, reflected on the challenge of delivering knowledge to support decision making and reflected on fostering innovation in Africa, through the Smart Specialisation approach notably.

As a follow up on the 'Commission Communication on a new Africa-Europe Alliance for Sustainable Investment and Jobs: taking our partnership for investment and jobs to the next level' the JRC also created an internal Task Force on Africa. Its core objective is to support and have the desired impact on the future implementation of the Africa-EU partnership Agenda, which has been rapidly evolving away from the traditional donor-based model towards long-term cooperation on jointly identified, mutual and complementary interests.

In December in Pretoria, the JRC also organised a capacity building seminar on Evidence-informed Policymaking in Africa; in cooperation with pan-African partners: African Union Commission, African Academy of Sciences and International Network for Government Science Advice – Africa branch, as well as UK Research and Innovation and South Africa's Department of Science and Technology.

Iran-EU: supporting the implementation of the Joint Comprehensive Plan of Action

The Joint Comprehensive Plan of Action (JCPoA) is the culmination of 12 years of diplomacy facilitated by the EU, unanimously endorsed by UN Security Council Resolution 2231. The JCPoA is a key element of the global effort for nuclear non-proliferation and crucial for the security of the region. Its successful implementation continues to ensure that Iran's nuclear programme remains exclusively peaceful.

In 2018, the JRC initiated the cooperation with Iranian scientists on research and trainings (together with the Directorate-General for Research and Innovation) and hosted several visits to its Ispra, Geel and Petten sites, offering training and capacity building in areas such as food safety and radiation protection. In November, nine Iranian scientists also took part in a JRC-organised seminar on radioactivity measurements and metrology. The JRC and the Nuclear Science and Technology Research Institute of Iran agreed to define and implement a joint research project on 'Capability building and improvement of traceability of nuclear measurements'.

The JRC provides ongoing technical and scientific support to the European External Action Service in its role of coordination in the JCPoA implementation, be it through its participation to coordination and technical meetings of E3+3 (China, France, Germany, Russia, United Kingdom, United States) and Iran, or in the working group on the modernisation of the Arak Heavy Water Research Reactor related to its redesign and reconstruction to reduce plutonium output. The JRC also contributes to the technical elaboration of the proposals for the Fordow facility conversion.

The JRC also supports the implementation of technical projects funded under the EU instrument for nuclear safety cooperation under the responsibility of the Directorate General for Development and Cooperation (DG DEVCO). These include capacity building of the Iranian nuclear regulatory authority, the design of a Nuclear Safety Centre and support to both the regulatory authority and the operator of the Bushehr Nuclear Power Plant to perform nuclear 'stress tests'. The JRC also supported DG DEVCO on defining the scope of cooperation with Iran on the development of export control, a key element of the JCPOA.

Study and online tool measure how well Europe and Asia are connected

In October 2018, at the occasion of the 12th Asia-Europe Meeting (ASEM) Summit in Brussels, the European Commission presented the ASEM Sustainable Connectivity Portal – a JRC-developed online tool offering a wealth of data on the political, economic and social relationship between the two continents.

The ASEM Sustainable Connectivity Portal and its accompanying study 'Exploring ASEM sustainable connectivity. What brings Asia and Europe together?' offer insights into the state of connectivity between 30 European countries, 19 Asian countries, Australia and New Zealand (together representing the ASEM countries). According to the study, connectivity inside Europe and inside Asia is currently five times stronger than connectivity between Europe and Asia.

The potential to enhance these links is substantial, not only in terms of economic gains. The study demonstrates that better connected countries have lower levels of poverty, more equal societies, more students in tertiary education, freer press and lower levels of corruption, better minorities' inclusion.

The Connectivity Portal is meant to help policymakers, businesses, investors and researchers to identify gaps in cooperation, and better exploit the untapped potential. It gathers in one place a wealth of connectivity-related data coming from a range of international sources and original research for the 51 ASEM countries and puts for the first time a spotlight on the importance of sustainable connectivity.

A total of 49 indicators, ranging from the number of border crossings, the quality of network connection, through the number of embassies, technical barriers to trade, common language users, to CO_2 emissions per capita and the proportion of youth not in education, employment or training, are grouped into two composite indicators.

The 'Connectivity index' measures cross-border connectivity in physical, economic/financial, political, institutional and people-to-people dimensions. The 'Sustainability index' measures sustainability related to connectivity.

JRC shares insight with international community on emergency preparedness and response

An emergency situation, whether natural or human-made, is a challenge both for political leaders and for authorities responsible for managing the related crises. Governments need a structurally robust system to effectively cope with the complexity, novelty, uncertainty, and social expectations inherent to modern crises.

To assess similarities in emergency preparedness and response across sectors, identify lessons learned and set out good practices for the nuclear sector the JRC has joined forces with the Nuclear Energy Agency (NEA) and the Organisation for Economic Co-operation and Development (OECD). The results of this collaboration are published in NEA's report: Towards and all-hazards approach to emergency preparedness and response (OECD NEA EPR).

The JRC's contribution includes a number of recommendations based on insights related

to emergency preparedness and response from in-depth analyses of chemical accidents, as well as natural hazard-triggered technological (Natech) accidents, using data from the JRC's Major Accident Reporting System (eMARS) and the JRC's Natech accident database (eNATECH).

The JRC scientists notably recommended boosting preparedness to limit the damages and long term impacts from a disaster. To that effect, it is vital to keep track of lessons learned from past events, identify gaps in emergency preparedness and find innovative ways to manage both expected and unexpected parts of the response. Training and coordination between internal and external responders on site-specific scenarios is another critical element of preparedness, especially in Chemical and Natech accidents.

Natech accidents pose specific challenges as several accidents can happen simultaneously and impact large areas, affecting people, the natural and built environment, as well as neighbouring industry and infrastructures. So on- and off-site emergency plans for accidents involving hazardous materials should account for the risks from natural hazards, and on-site emergency plans should assume that offsite response resources are unavailable under natural disaster conditions.

Enhancing the framework against CBRN-E threats

The JRC is strengthening its support to the EU Action Plan to enhance preparedness against chemical, biological, radiological and nuclear security risk,by developing cross cutting umbrella initiatives to holistically address the threats, gaps and challenges, capacity building (detection; dual use applications, strategic trade and export control; precursors; prevention; protection; standardisation), event cycle (anticipation; preparedness; detection; crises management; response; recovery and forensics; adaptation; lessons learned), interoperability and harmonisation, internal and external dimensions.

Concrete examples of JRC activities include the development of online training courses and handling new projects within the Chemical Biological Radiological and Nuclear Risk Mitigation Centres of Excellence (CBRN-CoE) initiative. For instance, the JRC concluded a review of Detection methodology and portable devices for the bio-threats and has launched a similar action for the chemical threat. The JRC also continued its activities in the field of dual use materials, i.e. materials with civil applications that might also be used for military purpose, notably its support to the EU Partner-to-Partner Capacity-Building in Dual-Use Export Control. The JRC also strengthened its actions on precursors (innocent chemical compounds, which combined might give origin to a dangerous substance) and reinforced internal collaboration to handle this specific thematic.

In aviation security, the JRC has developed a test kit to verify the performance of Explosive Trace Detection (ETD) equipment. In 2018, the test kit was made available to Member States' authorities, and dedicated training courses were given at JRC Geel. The Commission's ETD test kit is now used across European airports, and has become a de facto standard for the performance assessment of deployed ETD equipment.

In general, the JRC continued contributing to creating a more robust EU framework for reducing the threats of CBRN-E attacks and incidents, strengthening security measures, increasing resilience and preparing for an effective response in case prevention fails.

New World Atlas of Desertification shows unprecedented pressure on natural resources

Twenty years after the last edition, the JRC published a new edition of the World Atlas of Desertification, which unfortunately shows that pressures on land and soil have increased dramatically. This new and much more advanced edition of the Atlas gives policymakers comprehensive and easily accessible evidence-based insights into land degradation, its causes and potential remedies to tackle desertification and restoring degraded land.

The Atlas provides examples of how human activity drives species to extinction, threatens food security, intensifies climate change and leads to people being displaced from their homes. The main findings show that population growth and changes in our consumption patterns put unprecedented pressure on the planet's natural resources.

Over 75 % of the Earth's land area is already degraded, and over 90 % could become degraded by 2050. Globally, a total area half of the size of the European Union (4.18 million km²) is degraded annually, with Africa and Asia being the most affected. The economic cost of soil degradation for the EU is estimated to be in the order of tens of billions of euros annually.

Land degradation and climate change could lead to a 10% reduction of global crop yields by 2050. Most of this will occur in India, China and sub-Saharan Africa, where it could halve crop production.

While land degradation is a global problem, it takes place locally and requires local solutions. Greater commitment and more effective cooperation at local level are necessary to stop land degradation and biodiversity loss. Further agricultural expansion, a leading cause of land degradation, could be limited by increasing yields on existing farmland, shifting to plant-based diets, consuming animal proteins from sustainable sources and reducing food loss and waste.

The Atlas also contains a large number of facts, forecasts and global datasets that can be used to identify important biophysical and socio-economic processes that, on their own or combined, can lead to unsustainable land use and land degradation.

Observing the Arctic provides benefits beyond climate change insights

Accelerated warming and rapid environmental changes in the Arctic require a sustained, integrated and pan-Arctic observing system, capable of giving timely access to information and data about the Arctic, better-documenting processes within key sectors and better-informing decision-making. Within this context, long-term investments in research, operational infrastructure and logistical support services are essential.

The JRC produced a cost-benefits analysis of Arctic observing system under the European Commission's Impact Assessment on a Long-Term Investment on Arctic Observations (IMOBAR) project, which makes the case for sustained, long term Arctic observation.

Scientists assessed ten case studies to identify the impact of insights gained from monitoring the Arctic. They concluded that societal benefits of Arctic observation far outweigh the investment required to conduct it.

Even in a very conservative scenario, with lowest total benefits compared with highest total costs and considering the range of uncertainties and underestimates, annual economic benefits from the limited number of economic activities considered exceed by at least 50 % total annual investments in Arctic observing systems. Over the next decade the report identified overall observation-linked economic benefits of between 183 and 341 million euros per year, from required annual investments ranging from 70 to 135 million.

Additional economic returns may be expected from impacts on human health, ecosystem preservation and global benefits like predicting global sea level rise. While the study focused on local-to-regional benefits, the proposed analytical framework can be further developed to accounting for societal benefits of Arctic observing systems beyond the Arctic region.

The study was an EU contribution for the Second Arctic Science Ministerial conference held in Berlin from 25 to 26 October 2018 producing a Joint Statement signed by representatives of 26 nations on international research collaboration in the Arctic.

Global Report on Food Crises sheds light on 2017 status

Major risks of famine were averted in the four countries declared at risk in early 2017: Yemen, Somalia, South Sudan and North Nigeria. But the severity and complexity of food crises around the world remain.

https://europa.eu/!QX96Dr

JRC launches largest database on cities

With every high density area of at least 50,000 inhabitants covered, i.e. 10,000 urban centres across the globe, the city centres database shows growth in population and built-up areas over the past 40 years.

https://europa.eu/!ku33Ry

Global hotspots for potential water disputes

JRC scientists have identified the hotspots where countries competition over the use of shared water resources could lead to disputes. The study aims to support strategies to encourage cross-border cooperation.

https://europa.eu/!ng88Rp

Contributing to IAEA Symposium on International Safeguards

The JRC contributed broadly to IAEA's 2018 symposium on 'Building Future Safeguards Capabilities', with no less than 11 abstracts and 3 panel chairs, 9 panel presenters, 4 roundtable members, and 3 interactive-corner speakers.

https://tinyurl.com/y9fvyg2h

JRC analysis assists response to Laos dam collapse

The JRC provided situation maps and analysis reports to the European Commission's Emergency Response and Coordination Centre, in collaboration with UN services and under the Global Disasters Alerts and Coordination System framework.

https://europa.eu/!hU97KG

Carbon Offsetting and Reduction Scheme for International Aviation

The JRC has been leading on methodology and computation of global default values for aviation alternative fuels counting towards emissions reduction and offsetting of international aviation in the CORSIA scheme.

https://europa.eu/!GU64vU

Six steps to achieving the Sustainable Development Goals

The World in 2050 (TWI2050) initiative launched the report 'Transformations to Achieve the Sustainable Development Goals' at the United Nations High Level Political Forum in New York. This report sets out six key transformations that will enable the world to meet the United Nations Sustainable Development Goals (SDGs).

Three years on from the adoption of the 2030 Agenda which sets out the 17 SDGs that aim to ensure a more sustainable future for everyone, we still have a long way to go to achieving these goals. The TWI2050 report argues that the global transformation is still possible, but requires strong political commitment and immediate and ambitious action.

The JRC is among the more than 60 authors of the new TWI2050 report, which outlines the major challenges facing humanity with respect to achieving the transformative changes toward a sustainable future. Rather than projecting into the future, the report describes the challenges from a 'backcasting' perspective, namely what needs to be done now and in the immediate future to steer the international community, in a cooperative way, toward achievement of the 2030 Agenda and good life for all on a healthy planet beyond 2030.

JRC work supports redefining the quantity in the new SI (System of Units)

The International system of units, SI, has been transformed from a system of manmade objects, towards the application of devices using certain selected natural constants as a base. This is the largest revision of the SI system since 1890.

Already in 1983 (at the 18th General Conference on Weights and Measures, CGPM) the unit of time (the second) and the unit of length (the metre) were defined in terms of natural constants.

At the recent, 26th, CGPM it was decided, among other things, to replace the kilogram artefact, which over time has shown to be the hardest change to make.

The JRC made two important contributions to the work in introducing the explicit constant formulation of SI. First it helped determining the isotopic purity of the material Si-28 used in the Avogadro project (which was important in this redefining of kilogram as it provided accurate measurement of the Planck constant). Second, it helped determine Boltzmanns constant, k, via acoustic resonance in argon at the triple point of water, the JRC contributed by determining the purity of the argon gas used.

The EU citizens will not notice anything in their daily life. Buying a kilogram of bananas or potatoes will be the same as before. The main impact is where accurate measurements are a basic prerequisite, like in science, engineering, industry, health and commerce. In addition, accurate and traceable measurements contribute to better management of resources, sustainable growth, a clean environment, and to a better world to live in.

Table 15-1. Examples of cases where the JRC's work had policy-impact by incorporation of its scientific and technical knowledge into policy proposals and when it directly helped in implementing EU policies. The total number of such cases, identified through the JRC's internal productivity and impact evaluation, constitutes the value for the key performance/result indicator 1 'policy-support impact'. Source: JRC own records; annual internal well-established peer evaluation process using a documented method with pre-set criteria (Productivity and Impact Evaluation (PRIME)).

Description
Commission General Objective 1
Contribution to CAP2020+ legal proposal and to its associated Impact Assessment with environment / climate data and analysis The JRC covered e.g., GHG emissions, biodiversity – landscape features, soil erosion, carbon sequestration, water use. Five impact indicators (out of 12 for the environment / climate objectives) are expected to be provided by the JRC.
Soil biodiversity The JRC developed the first Global Soil Biodiversity Atlas that contained assessments of potential global soil biodiversity and global pressures on soil. The data has been used in the WWF Living Planet Report 2018 which is the world's leading, science-based analysis on the health of our planet and the impact of human activity. The final declaration of UN Convention on Biological Diversity COP 2018 (Sharm El Sheikh, Egypt) references the Atlas as an approach to advance the implementation of biodiversity commitments through enhanced cooperation as part of the post-2020 global biodiversity framework.
Provision of data based scientific advice for Alien Species policies in Europe The scientific knowledge generated in the context of the European Alien Species Information Network (EASIN) contributed to the prioritisation of marine invasive alien species for risk assessment, in the context of the EU Regulation on Invasive Alien Species (1143/2014) and to shaping an EU-wide ecosystem assessment under Action 5 of the EU Biodiversity Strategy to 2020 in relation to pressure from invasive alien species.
Support to the implementation of the Marine Strategy Framework Directive, the development of the EU Plastics Strategy and new Directive on single use plastic products The reports and data provided by the JRC illustrate the leakage of plastics into the environment. They provide analyses of data across Europe and list the most common litter items, with a specific analysis of single use plastics (ca. 50 %) and fishery related items. This data has underpinned the EU Plastics Strategy and the related legislative proposal on single-use-plastics and fishing gear.
The EU landing obligation for fisheries – establishing discard plans for fisheries in the Mediterranean Sea, North Sea, South Western Waters, North Western Waters, and Baltic Sea under the remit of Common Fisheries Policy Discard plans presented by Member States regional groups to the Commission are given to the Scientific Technical and Economic Committee for Fisheries (STECF) for review. The scientific policy advice by STECF is coordinated by the JRC and in 2018 led to the adoption of discard plans for fisheries through 10 individual Commission delegated regulations.
Support to EU policies for the marine environment & blue economy The Digital Observatory for Protected Areas (DOPA) Explorer developed by the JRC is the most advanced global information system characterising the world's terrestrial, marine and coastal protected areas. It is one of the 23 new commitments of the EU for healthy, safe and clean oceans and is used by the UN Convention on Biological Diversity (CBD) to assess global progress of the Aichi Target 11 to 2020 on terrestrial and marine protected areas.
Risk assessment of nanomaterials and nanotechnologies used in food and feed The JRC supported the European Food Safety Authority (EFSA) by guidance on human and animal health aspects of the risk assessment of nanoscience and nanotechnology applications in the food and feed chain. This guidance helps applicants prepare complete applications for nanotechnology use and risk assessors to evaluate nano applications' safety.
Provision of data by the JRC-EUROCAT (European network for the Surveillance of Congenital Anomalies in Europe) Central Registry to the European Parliament and for European epidemiological and clinical studies on congenital anomalies This JRC Central Registry collected and managed the data from population-based registries of the EUROCAT network, and provided tailored datasets for six European epidemiological and clinical studies.

Improving the safety assessment of cosmetics without animal testing
The JRC participated in developing a set of principles for carrying out the safety assessment of cosmetics using alternative (non-animal) testing methods, and guidelines on how to apply a scientifically robust methodology, under the auspices of the International Cooperation on Cosmetics Regulation (ICCR).

Policymakers and stakeholders regularly use the Health Promotion and Disease Prevention Knowledge Gateway
The JRC has selected the most relevant and authoritative publications, gathered EU and national data and collected recommendations and policies to summarise the most important facts for policymakers, addressing Member States' priorities in health promotion and disease prevention. Topics in 2018 were 1) EU burden from non-communicable diseases and key risk factors, 2) Health inequalities: dietary and physical activity related determinants, and 3) Cost of Non-Communicable Diseases in the EU.

Support to European Union Reference Laboratories (EURLs) concerning proficiency testing
The implementation of European food/feed control according to (EC) No 882/2004 asks the EURLs organise proficiency testing on a regular basis. The outcome is used to monitor the capabilities of the National Reference Laboratories (NRLs), to provide, if needed, training and, in extreme cases, to denominate NRLs. Besides serving the EURLs it operates self, the JRC supported the EURL for foodborne viruses with unique norovirus materials.

Supporting the EU regulations, the EU action plan on drugs and helping the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and Customs to protect EU citizens against harmful New Psychoactive Substances (NPS)
The EU Action Plan on Drugs 2017-2020 (2017/C 215/02) defines JRC as one of the providers of support to implementing relevant EU legislation. In 2018, the JRC contributed to risk assessments that led to control measures through Council Decisions (EU) 2018/747 & 748 and the UN Commission of Narcotic Drugs. The JRC provided advice on identifying NPS that were EMCDDA reports and Early Warning System notifications and supported customs laboratories in analysing unknown samples.

Support to UN ICAO on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)
The First Edition of Annex 16 — Environmental Protection, Volume IV — Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was adopted by the Council of ICAO in June 2018. JRC quantitative analysis was used to define the default values for alternative (bio-based) aviation fuels to be used by regulated parties under CORSIA to claim for offsets of their emissions.

Council Recommendation confirms DigComp and EntreComp as the main reference frameworks for digital and entrepreneurial skills
The 2018 Council Recommendation on key competences for lifelong learning proposes eight key competences that are crucial to prepare people for today's societies. Digital competence and Entrepeneurship are two of the eight key competences. The definition and description of these two competences is fully based on, and aligned with the DigComp and EntreComp frameworks developed by the JRC.

Commission General Objective 3

Key contribution to the LULUCF Regulation
In 2016, the Commission put forward a legislative proposal to include the Land Use, Land Use Change and Forestry (LULUCF) sector in the EU 2030 Climate Policy Framework. The JRC approach were a key contribution to the LULUCF Regulation (2018/841) defining the accounting methodology for the assessment of mitigation impacts of forest activities.

New EU Directive on the promotion of the use of energy from renewable sources (RED Recast, 2018/2001)
EU legislation fixes a minimum requirement for GHG savings for biofuels and solid/gaseous biomass. The 'default' and 'typical' values in Annex V and VI calculated by the JRC attribute GHG savings to all commercially available biofuels and bioenergy pathways relevant in Europe, thus determining their eligibility to financial support and incentives.

New IAEA nuclear safety guideline on operating experience feedback for nuclear installations
The JRC has contributed to drafting the new specific safety guide of the International Atomic Energy Agency (IAEA): 'Operating Experience Feedback for Nuclear Installations' (SSG-50) published in 2018, using the experience gained through the operation of the Clearinghouse network. The IAEA Safety Standards are recognised for serving as a global reference for protecting people and the environment and for contributing to a high level of nuclear safety worldwide.

Contribution on Research Innovation and Competitiveness to A Clean Planet for all Communication - COM(2018)773
The JRC provided data to assess where the EU is today in terms of low-carbon energy R&I, to highlight strengths and weaknesses and thus set the vision for the way forward in advancing the European R&I system.

Four amendments to the Correlation Regulation
The JRC monitors the application of the Correlation Regulations (EU) 2017/1152 and 2017/1153 reflecting the change in the regulatory test procedure with regard to light commercial vehicles and passenger cars, to update the model used to the changes in vehicle technologies, and to support DG Climate Action in amending the legislation when changes are required to the tool or to the procedure to apply it. In 2018, the JRC provided scientific inputs to draft the amending legal texts (EU 2018/1002 and 2018/2043 to amend the EU 2017/1153, and EU 2018/1003 and 2018/2042 to amend EU 2017/1152).

Peer review of the nuclear stress tests in Belarus
The JRC supported DG Energy in implementing the EU nuclear safety stress tests in Belarus following a joint declaration of a high-level meeting (2011) on comprehensive risk and safety assessments of nuclear plants.

Operation of the Euratom on-site laboratories at La Hague (F) and Sellafield (UK)
The JRC operates the on-site laboratories to perform nuclear material analyses (up to 900 samples per year), allowing the European Commission to assure that nuclear material is only used for declared purposes.

Analytical service - nuclear material analyses for safeguards, forensics and decommissioning to DG Energy, IAEA, and other customers
The JRC analyses annually a total of 600 nuclear and 100 environmental samples taken by the IAEA and EURATOM inspectors to detect early the misuse of nuclear material or technology, and to provide credible assurances that States are honouring their safeguards obligations.

The Nuclear Safety Directive's Topical Peer Review on ageing management of nuclear power plants
The JRC's nuclear safety experts contributed to the Topical Peer Review on ageing management of nuclear power plants required by EU Nuclear Safety Directive.

Support to in-field physical inventory verifications at European nuclear fuel fabrication facilities
The JRC 'Combined Product Uranium Concentration and Enrichment Assay' (COMPUCEA) technique is deployed for in-field physical inventory verifications carried out annually at European fuel fabrication plants. During joint inspections by DG Energy and IAEA, analysts of the JRC measure the uranium concentration and enrichment in uranium fuel pellets.

Providing guidance to implement safeguards by design on facilities for long-term spent fuel management
JRC and DG Energy experts, through the Commission's Support Programme (SP) to the IAEA which is coordinated by the JRC, contributed to drafting and review of the IAEA guideline 'Facilities for long term spent fuel management' for designers of nuclear facilities to facilitate the implementation the safeguards-by-design approach.

Analyses to support DG Energy and DG Environment in the frame of the Espoo Convention for the long-term operation (LTO) of nuclear power plants (NPP)
The EU is a contracting party to the Espoo Convention which sets out the obligation to assess the environmental impact of certain activities at an early stage of planning and to notify and consult each other on all major projects likely to have significant adverse environmental impacts across borders. The Implementation Committee of the convention opened an initiative in 2013 on applying the Espoo Convention to decisions on the lifetime extension of NPPs. The JRC supported DG Energy by investigating the current situation in Europe.

Dissemination of nuclear power plants operating experience through nuclear safety authorities
The EU has set up in 2008 a regional network the 'EU Clearinghouse' to help the regulators and operators learn from past events and accidents to prevent future ones. The network is operated by a centralised office located at the JRC.

Commission General Objective 4

Supporting the Bioeconomy strategy
A study on the techno-economic and profitability analysis of food waste biorefineries at European level contributed to drafting the EU Bioeconomy strategy.

Input to 3rd Mobility Package - Annex on Battery Strategic Action Plan including open access to JRC battery testing laboratory

The JRC contributed through a study on EU competitiveness in the global battery sector and its technical expertise to the Battery Strategic Action Plan (SWD(2018) 245) which forms an annex to the 3rd mobility package, outlines the commitments made by the Commission to support the establishment of a sustainable battery value chain in Europe.

Commission General Objective 9

JRC Ecological Coverage Indicator becomes UN Reference

JRC developed a new indicator on the protection of ecosystems in support to the global biodiversity strategy of the UN Convention on Biological Diversity (CDB) ratified by the EU.

Geospatial situation awareness for crisis monitoring support to the European External Action Service IntCen: Situation Room

The Global Crisis Atlas provides map-based geospatial information for situation awareness to the EEAS, EU Member States and EC services, enhancing EU crisis preparedness, for better crisis management. The S/T Facility allows for the analysis of situations and emerging crises using a range of information sources, including remotely sensed data, web-based information systems, and conflict related news sources, exchanged also with international institutions including UN, World Bank and others.

Assessing the impact of BREXIT on EU27 dual-use exports to the UK

As of UK's withdrawal date, the export of dual-use goods from EU27 to the UK will be subject to a licensing requirement if the UK is not included in EU General Export Authorisation (EU GEA) E001 like other third countries with a low proliferation risk profile. JRC estimated the expected increase in the EU27 dual-use licensing effort in the scenario that the UK is not added to EU GEA E001.

Supporting export control

The JRC supported the monitoring and the effective implementation and enforcement of dual-use trade restrictions (controls and sanctions) to destinations of concern and assessed the impact of the measures.

Examples of tangible impact of JRC activities related to the General Commission Objectives 2, 5, 7 and 8

Contributing to DESI - The Digital Economy and Society Index (DESI) - Research and Innovation and R&D horizontal sections

The JRC provides the EC with comparable statistics on ICT for EU and the main economies worldwide and it is recognised and acknowledged as a permanent monitoring tool of ICT sector and ICT sector R&D macro-economic data to monitor and assess the impacts of related policies. The JRC produced the data on which the estimates have been computed, and the diagrams.
The data and analysis published allow monitoring progress and policy-impact. It also allows benchmarking EU and countries' performance in essential technological domains.

Digital Innovation Hubs (DIHs) Catalogue contribution to the digitisation of the European industry

The JRC's DIHs Catalogue helps implement the Digital Innovation Hubs initiative, one of the four pillars of the 2016 EC Communication on digitising the European industry. It advances EU goals on bringing artificial intelligence to small businesses, encouraging Member States and regions nurture DIHs and supporting DIH-related funding actions.

Investment plan for Europe: stock-taking and next steps

JRC evaluated the macroeconomic impact of the legislative proposals contained in the third pillar of the Investment Plan for Europe. In particular, the JRC studied a number of proposals related to the Capital Markets Union, the Single Market Strategy, the Digital Single Market, and the Energy Union.

Evaluation of the European Fund for Strategic Investments

The Economics Department of the European Investment Bank (EIB) together with the JRC carried out a quantitative analysis to evaluate the macroeconomic impact of the investments supported by the EIB Group within the EU-28. The methodology used helps capture both the short- and long-term effects of implemented investment projects.

Support the hybrid threats file through large scale exercises

JRC supported the execution of the PACE 18 exercise which was the biggest and most complex strategic exercise that the EU has ever executed, focusing on a hybrid threats scenario. JRC developed and delivered POSEIDON, the system which enabled the communication among the more than 900 players from 28 Member States and Schengen Associated Countries and EU institutions.

Support to civil-defence interface in the domain of critical infrastructure protection

The JRC's Geospatial Risk and Resilience Assessment Platform (GRRASP) for assessing interdependencies and resilience in critical infrastructures contributes to implementing the EU-NATO joint declaration (Warsaw summit 2016) and NATO's 7 baseline requirements for resilience.

Change of the Community statistics on migration and international protection - Towards an EU Policy on Migration Data

The JRC contributed to the proposed revision of Regulation (EC) No 862/2007 on Community statistics on migration and international protection through its' Knowledge Centre for Migration and Demography.

Providing up-to-date estimates and trends on Venezuela's migration crisis

At the request of the European External Action Service (EEAS), the JRC analysed the Venezuelan migration crisis by describing key aspects of the crisis and presented up-to-date estimates of the number of people displaced in the absence of timely and reliable official data.