European Commission

2019
Annual Activity Report
Annexes

Joint Research Centre

Joint Research Centre

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ANNEX 1. STATEMENT OF THE DIRECTOR IN CHARGE OF RISK MANAGEMENT AND INTERNAL CONTROL

I declare that in accordance with the Commission's communication on the internal control framework[1]*, 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.

31/03/2020

Signed

Delilah Al-Khudhairy

[1] C(2017)2373 of 19.04.2017.

ANNEX 2. REPORTING – HUMAN RESOURCES, BETTER REGULATION, INFORMATION MANAGEMENT AND EXTERNAL COMMUNICATION

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 - female first appointments in middle management **Source of data:** SEC(2017)359			
Baseline (01/05/2017)	Target (01/01/2020)		Latest known results (31/12/2019)
16.4%	35% 7 female first appointments in middle management positions[2]		22% 6 appointments in 2019 + 1 nominated to take service as from 16/01/2020
Main outputs in 2019:			
Description	Indicator	Target	Latest known results
Promotion of female representation in middle management	Number of first time appointments of female Heads of Unit	5	4 new first time female middle managers appointment in 2019 and 1 nominated to start 16/01/2020
	Number of internal female candidates applying for middle management positions	At least 1 female applicant per middle management vacancy	For 8 published vacancies, in total 19 internal female applicants
	Number of awareness-raising initiatives or activities to improve female representation in middle management	At least 1 initiative such as LEAD@COMM	1 LEAD@COMM lunchtime seminar on developing female talent; 1 LEAD@COMM workshop on networking during JRC career days in Ispra
	Number of candidates for corporate Female Talent Development Programme (FDTP) 2019	3 proposed candidates	3 candidates were admitted to the FTDP 2019
Indicator 2: Percentage of staff who feel that the Commission cares about their well-being **Source of data:** EC staff satisfaction survey			

[2] The target set in SEC(2017)359 (8 females) was lowered to 7 females with agreement with the SG after its adoption.

Baseline (31/12/2014)	Target (2020)		Latest known results (31/12/2018)
47%	50%		66% (EC average 51%)
Main outputs in 2019:			
Description	Indicator	Target	Latest known results
Training and awareness-raising activities contributing to the implementation of the Commission's health and well-being strategy through promoting Fit@work culture as well as the role of the medical and social support services available to staff at all JRC sites	Number of training and awareness-raising activities	> 3 activities at each site	53 activities were organised (18 in Ispra, 3 in Geel, 18 in Petten, 6 in Karlsruhe, 3 in Seville, 5 in Brussels)
	Number of events	> 1 event at each site	42 events were organised (12 in Ispra, 13 in Geel, 9 in Petten, 5 in Karlsruhe, 2 in Seville, 1 Brussels)
	Satisfaction rate	> 75% satisfaction	85% satisfaction rate across all initiatives
Indicator 3: Staff engagement index **Source of data:** EC staff satisfaction survey			
Baseline (31/12/2014)	Target (2020)		Latest known results (31/12/2018)
64%	68%		68% (EC average 69%)
Main outputs in 2019:			
Description	Indicator	Target	Latest known results
Action plan as follow-up on staff opinion survey 2018	Approval of action plan by Director-General, including targeted communication measures	Q2	The staff survey follow-up action plan was endorsed by senior management in June 2019 together with an implementation roadmap; the first actions were implemented by end 2019
JRC Strategy 2030 Engagement Pulse survey	Implementation of follow-up actions on 2018 survey	Q2	Several initiatives were launched in Q2 to underpin staff awareness and commitment to the JRC Strategy 2030. E.g. communication campaign to illustrate 'Strategy Success stories'
	New 2019 survey completed	Q4	The survey was postponed to 2020, to avoid overlapping surveys in a short period after corporate staff opinion survey
Staff mobility package	Satisfaction rate of short-term exchange, Visiting Researcher and job-shadowing programmes	> 75%	96% for the Visiting Researcher Programme; overall positive qualitative feedback for all short-term exchange and the job shadowing programmes

Extend talent management programme for AD and AST officials	Number of participants	> 50 participants > 75% satisfaction	62 participants (52 AD, 10 AST) from all JRC sites 82%; 70% found that the programme helped to identify their challenges
Embedding of the Commission's Diversity and Inclusion Strategy C(2017)5300 into a JRC Action Plan	Updated Action Plan including communication actions	Q4	The action plan following up on the staff survey 2018 has been revised and further actions have been taken to support the female representation in management positions, including promotion of female candidates for the female talent development programme

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:** HAN statistics			
Baseline (2015)	Target		Latest known results (2019)
1.5%	0%		0.6%
Indicator 2: Percentage of HAN files readable / accessible by all units in the JRC **Source of data:** HAN statistics			
Baseline (2015)	Target		Latest known results (2019)
17.6%	60%		63.2%
Indicator 3: Percentage of HAN files shared with the other DGs **Source of data:** HAN statistics			
Baseline (2015)	Target		Latest known results (2019)
1.97%	2% (SP) 60% (Internal target 2019)		30.79%
Main outputs in 2019:			
Description	Indicator	Target	Latest known results
Fully reviewed filing plan by document management correspondents in all JRC lead departments ('chef de file') to increase accessibility of JRC information	Review completed	Q4	Review completed; all lead departments involved

HAN (Hermes-Ares-Nomcom) integration of JRC IT tools supporting core business (JPB) and collaborative platforms (SharePoint, Connected)	Integration completed	Q4	Integration put on hold
Training and capacity building in evidence and policy for a) scientists (JRC) and b) policymakers (Commission staff at policy DGs).	Number of participants Number of courses	150 (40 places available for external participants) 13	a) 235 (JRC scientists) b) 15 (Commission staff at policy DGs) 18
Country and regional knowledge management methods and practice – new Communities of Practice (CoP) moderated by qualified community managers	Number of new Member States and Regions CoPs	4	4
Report on the first year of operating the Commission one-stop-shop on collaboration	Report delivered	Q1	Report presented to the Commission Information Management Steering Board on 02/04/2019
Training on specific intellectual property (IP) issues	Number of participants (Commission, Parliament and agencies staff)	Increase by 5% as compared to 2018	11%
Intangible (IP) Asset catalogue/ management tool to retrieve information on IP assets owned or licensed in by the Commission and to manage IP rights, contracts and disputes	Beta version available through MyIntracomm/Top Tools All Commission departments deploying the tool	Q1 Q4	01/05/2020; 6 DGs participated in a pilot Roll-out to entire Commission postponed until 31/03/2020, as defined in the action plan following an IAS audit
New content on corporate IP website to help Commission staff with practical IP questions	Number of new guidelines Number of new articles	2 (data acquisition; reuse instruments) > 10	3 (guidelines on distribution of Commission software; reuse guidelines; guidelines on IP rights in social media) 5 (illustrations, websites, software and Commission decision and IP)

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			
Baseline (2014)	Target (2020)		Latest known results (2019)
Total 'Positive': 39% 'Neutral': 37% Total 'Negative': 22%	Positive image of the EU ≥ 50%		42% 'Positive' 37% 'Neutral' 20% 'Negative'
Indicator 2: Articles in the media - Total number of articles in the media **Source of data:** JRC internal indicator (JRC European Media Monitor)			
Baseline (2015)	Target (2020)		Latest known results (2019)
2,770	3,500 (2020)		4,393
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 indicators			
Baseline (2015)	Target (2020)		Latest known results (2019)
3a. 7.7 million 3b. 2.8 million	3a. 4.8 million 3b. 2.4 million		3a. 4.4 million 3b. 2.3 million
Main outputs in 2019:			
Description	Indicator	Target	Latest known results
Key publications such as JRC Digital Newsletter and the JRC annual report	Number of subscribers	> 20,000	23,325
Press trips	Number of press trips Number of participants	3 40	3 35
Euronews Futuris episodes on science for policymaking	Number of episodes	3	3
Direct reach of the DG communication actions via websites (EU Science Hub), social media and key known multipliers	Number of social media followers:[3] Twitter 'EU ScienceHub' Facebook LinkedIn YouTube (subscribers)	 > 29,000 > 15,000 > 30,000 > 1,800	 36,600 19,850 49,180 2,380

[3] Sources: Social Bakers; Brandwatch; Facebook Insights; Twitter Analytics; LinkedIn Analytics; Youtube Analytics

JRC Flagship event 2019	Number of attendees (physical and online) Number of views (streaming and of the annual conference's web pages) Satisfaction rate (rating satisfactory and above)	> 500 > 1,000 ≥ 85%	3,000 (EC Knowledge Week in Brussels, Luxembourg, Ispra and Parma) and 1,000 (webstream) > 5,000 (proxy: programme of the EC Knowledge Week) 98%
Museum cooperation: Exhibition 2019	Number of visitors	> 10,000	450,000 (satisfaction rate 90%)
Local and global outreach events (exhibitions)	Number of visitors	> 5,000	> 21,000 (JRC events) > 250,000 (participation in other events)
Innovative outreach activities (tedx, petcha kutcha, etc.)	Number of participants and viewers	> 1,000	> 1,400 participants > 6,700 views (tedx)
Visitor Centre engagement 2019	Number of visitors Satisfaction rate (rating satisfactory and above)	> 3,500 ≥ 85%	> 4,000 92%
Events for JRC Alumni and the JRC Alumni Network	Number of registered members	> 550	556

The JRC committed EUR 1.9 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).

Annual communication spending (based on estimated commitments):			
Baseline(2018)	Target (2019)	Total amount spent	Total of FTEs working on external communication
EUR 2.3 million	EUR 1.936 million	EUR 1.9 million	9 (statutory); 15 (total)

2.2.5 Infrastructure

1. 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	
31/12/2015 – SP 235,321 m^2 31/12/2018 – AAR2018 196,427 m^2 buildings not compliant to the energy standards (all JRC sites, excluding Brussels).	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 2019			
Description	Indicator	Target	Latest known results (31/12/2019)
In order to fulfil the 'exemplary role of public bodies' buildings' as described in the Energy Efficiency Directive 2012/27/EU, the JRC will deliver new buildings, demolish old ones and refurbish others In **Ispra**, the refurbishment of building 58 and the thermal insulation of 26a and 26b were the main contributors to the significant improvement.	Total surface (new, refurbished, demolished) meeting the national minimal standards in terms of energy efficiency 1a) construction of new buildings and other facilities 1b) full refurbishment of buildings	Annual increase of 3%	13,587 m^2 [4] **Total increase 5.7%** 1a) 3,584 m^2 (Ispra, buildings 10p and 23b) 1b) 10,693 m^2 (Ispra, buildings 10, 26a, 26b, 46d and 58 -

[4] Total refurbished (10693m^2) – demolished (690m^2) + new constructions (3584m^2)

			increase of 10.8%)
	1c) demolition of buildings		1c) 690 m^2
In **Karlsruhe,** 31,657 m^2 of older existing buildings are not in 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 buildings are compliant	0 m^2		0%
In **Petten**, 2019 saw the completion of the first phase of the Creative Hub.	0 m^2		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**, building 58, after full refurbishment, is now the first nearly zero-energy building on site. In **Geel**, two buildings are compliant with the latest Belgian regulations. In **Karlsruhe** there is no 'nearly zero-energy building' foreseen for the next years.	Given the usual duration for construction works for significantly big buildings, all projects related to the construction of new buildings on JRC 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).	

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 nearly zero-energy building.			
Main outputs in 2019			
Description	Indicator	Target	Latest known results (31/12/2019)
In **Ispra**, the full refurbishment of building 58, now hosting 100 colleagues, enabled this infrastructure to become the first nearly-zero energy building on site.	2,522 m²	Nearly-zero energy building	
Construction of building 102	10,500 m²	Nearly-zero energy building	Construction started in April 2017 for final delivery in April 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 been completed and the tendering process has started.	500 m²	Energy-efficient building	Construction will start in Q2 2020 if the procurement procedure is successful.
A partial relocation of staff allowed for a more efficient energy usage in Building 320, which is currently unoccupied. The lowered heating requirement has led to a 50% energy saving in Q4 2019, compared to the same period of 2018 and related to building 320	250 m²	Energy savings	50% saving for heating in Q4 2019 vs. Q4 2018.
In **Karlsruhe**, the new laboratory building Wing	6,440 m²		Construction ongoing. Delivery foreseen in

M in the range of national minimum standards in terms of energy efficiency is under construction.			2021.
JRC Infrastructure Development Plans	Development plans available for all sites	Q2 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

2. Decommissioning

Decommissioning of nuclear installations is a complex and lengthy process that goes beyond the duration of multiannual financial frameworks and in most cases exceeds two decades. A dedicated Decommissioning and Waste Management Programme (D&WMP)[5] was launched in 1999[6] in an effort to set the necessary framework to progressively eliminate historical liabilities and restore nuclear sites devoid of any radiological risks. The planning and budget of the programme are periodically reviewed to align the progress of projects with the priorities and needs of the programme.

Objective: Implement the Decommissioning & Waste Management Programme (see progress indicators in Annex 13)			
Main outputs in 2019 (Main outputs for 2019 for the four relevant JRC sites by site can be found in Annex 13):			
Description	Indicator	Target	Latest known results
Evaluation of the D&WM programme for the period 2013-2018[7]	Document published	Document published (2020)	A draft under revision by Expert Group
Decommissioning of nuclear installations and management of radioactive waste:	See Annex 13	See Annex 13	See Annex 13

[5] Currently funded under Title 10 – Direct Research

[6] Communication from the Commission to the European Parliament and the Council - Historical liabilities resulting from nuclear activities carried out at the JRC under the Euratom Treaty - Decommissioning of obsolete nuclear installations and waste management COM(1999)114

[7] Replacing the Progress Report from the Commission to the Council and the European Parliament

management of nuclear liabilities arising out of the activities of the JRC carried out under the Euratom Treaty			

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

The main objectives of the supplementary research programme for the High Flux Reactor (HFR) are:

- to ensure the safe and reliable operation of the HFR, for guaranteeing an steady and reliable neutron flux for experimental purposes,
- to allow efficient use of the HFR by research institutes in a broad range of disciplines: materials science, reactor ageing and life management, with the aim of improving the safety of nuclear reactors , medical isotopes, nuclear fusion, fundamental research and waste management, including the study of safety issues of nuclear fuels for reactor systems.

While the HFR is mainly used for the commercial production of radio-isotopes, it also serves as a training facility which allows doctoral and post-doctoral fellows to perform research activities through national or European programmes.

Main outputs in 2019:			
Description	Indicator	Target	Latest known results
Reporting on High Flux Reactor (HFR) activities 2016-2019	Preparation for the final report (review of HFR annual report)	Q4	Initial steps

ANNEX 3. Annual accounts and financial reports

Annex 3 Financial Reports - DG JRC - Financial Year 2019

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 2019 (in Mio EUR)					
			Commitment appropriations authorised	Commitments made	%
			1	2	3=2/1
Title 02 Internal market, industry, entrepreneurship and SMEs					
			1	2	3=2/1
02	02 02	Competitiveness of enterprises and small and medium-sized enterprises (COSME)	0.22	0	0.00 %
	02 03	Internal market for goods and services	3.12	3.12	100.00 %
	02 06	European Earth observation programme	19.21	19.21	100.00 %
Total Title 02			22.55	22.33	99.04 %
Title 04 Employment, social affairs and inclusion					
			1	2	3=2/1
04	04 03	Employment, Social Affairs and Inclusion	1.28	1.28	100.00 %
Total Title 04			1.28	1.28	100.00 %
Title 05 Agriculture and rural development					
			1	2	3=2/1
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.73	9.73	100.00 %
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.2	2.15	97.54 %
Total Title 05			11.93	11.88	99.55 %
Title 07 Environment					
			1	2	3=2/1
07	07 02	Environmental policy at Union and international level	0	0	0.00 %
Total Title 07			0.00	0	0.00%
Title 08 Research and innovation					
			1	2	3=2/1
08	08 02	Horizon 2020 - Research		0	
Total Title 08				0	
Title 10 Direct research					
			1	2	3=2/1
10	10 01	Administrative expenditure of the 'Direct research' policy area	141.82	112.69	79.46 %
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	129.32	42.16	32.60 %
	10 03	Euratom programme - Direct actions	38.31	12.28	32.06 %

	10 04	Other activities of the Joint Research Centre	374.36	37.86	10.11 %
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	30.9	30.9	100.00 %
Total Title 10			702.57	235.89	33.58 %

Title 13 Regional and urban policy					
			1	2	3=2/1
13	13 03	European Regional Development Fund and other regional operations	1.28	1.28	100.00 %
Total Title 13			1.28	1.28	100.00 %

Title 22 Neighbourhood and enlargement negotiations					
			1	2	3=2/1
22	22 01	Administrative expenditure of the 'Neighbourhood and enlargement negotiations' policy area	0.09	0.04	44.44 %
Total Title 22			0.09	0.04	44.44 %

Title 26 Commission's administration					
			1	2	3=2/1
26	26 01	Administrative expenditure of the 'Commission's administration' policy area	0	0	0.00 %
	26 03	Services to public administrations, businesses and citizens	2.62	2.62	100.00 %
Total Title 26			2.62	2.62	100.00 %

Title 32 Energy					
			1	2	3=2/1
32	32 03	Nuclear energy	0.47	0.47	100.00 %
Total Title 32			0.47	0.47	100.00 %

Title 34 Climate action					
			1	2	3=2/1
34	34 02	Climate action at Union and international level	0	0	0.00 %
Total Title 34			0.00	0	0.00%

Total DG JRC	754.92	275.78	36.53 %

** 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 1 (Commitments) has been aligned to table 2 (payments) to show figures by the DG actually using the funds, in line with the cut-off report and the budget cycle dashboard

Note : The figures are those related to the provisional accounts and not yet audited by the Court of Auditors

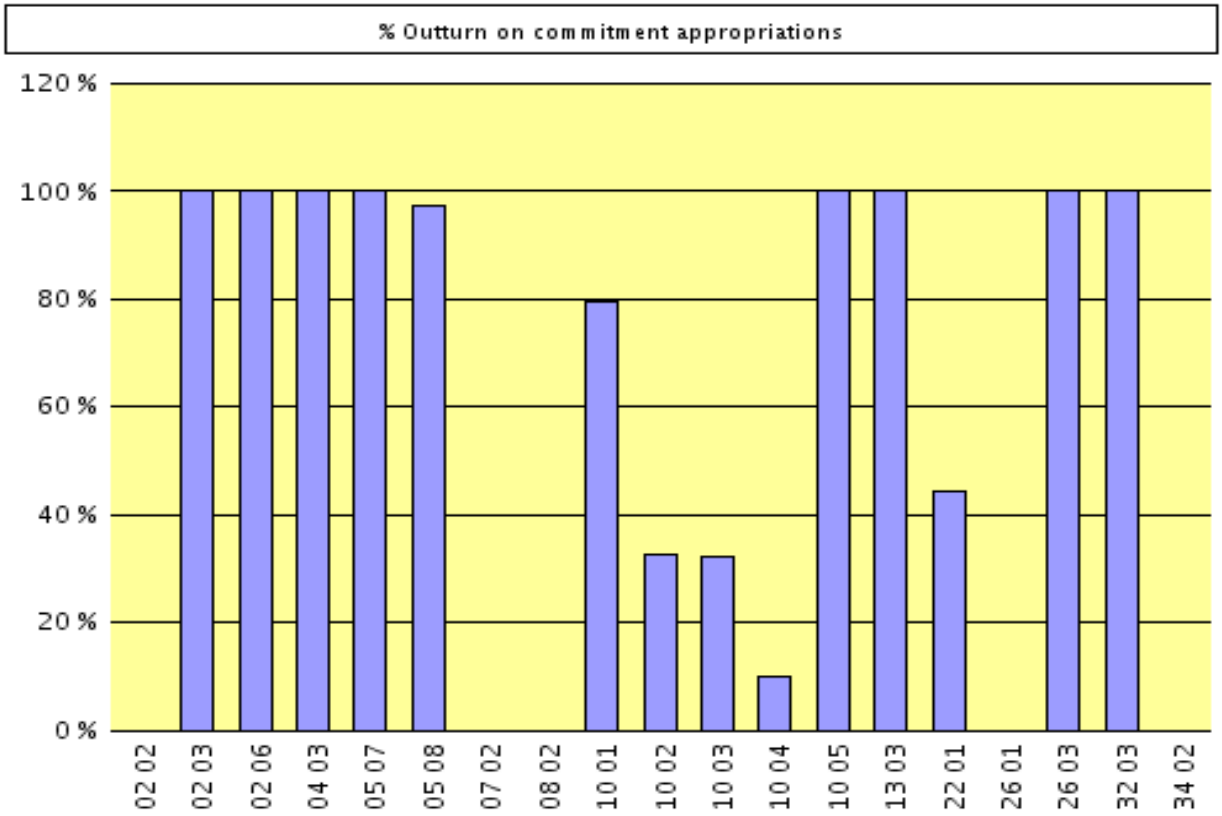
% Outturn on commitment appropriations
120 %
100 %
80 %
60 %
40 %
20 %
0 %
02 02
02 03
02 06
04 03
05 07
05 08
07 02
08 02
10 01
10 02
10 03
10 04
10 05
13 03
22 01
26 01
26 03
32 03
34 02

TABLE 2: OUTTURN ON PAYMENT APPROPRIATIONS IN 2019 (in Mio EUR)					
Chapter			Payment appropriations authorised *	Payments made	%
			1	2	3=2/1
Title 02 Internal market, industry, entrepreneurship and SMEs					
02	02 02	Competitiveness of enterprises and small and medium-sized enterprises (COSME)	0.22	0.07	30.00 %
	02 03	Internal market for goods and services	2.53	2.53	100.00 %
	02 06	European Earth observation programme	20.3	20.3	100.00 %
Total Title 02			23.05	22.89	99.34%
Title 04 Employment, social affairs and inclusion					
04	04 03	Employment, Social Affairs and Inclusion	0.08	0.06	71.43 %
Total Title 04			0.08	0.06	71.43%
Title 05 Agriculture and rural development					
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.73	9.47	97.35 %
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.07	1.97	95.04 %
Total Title 05			11.8	11.44	96.94%
Title 07 Environment					
07	07 02	Environmental policy at Union and international level	0.01	0.01	100.00 %
Total Title 07			0.01	0.01	100.00%
Title 10 Direct research					
10	10 01	Administrative expenditure of the 'Direct research' policy area	223.75	92.61	41.39 %
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	123.71	35.12	28.39 %
	10 03	Euratom programme - Direct actions	34.95	11.23	32.14 %
	10 04	Other activities of the Joint Research Centre	289.5	32.49	11.22 %
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	29.06	29.05	99.97 %
Total Title 10			700.97	200.51	28.61%
Title 13 Regional and urban policy					
13	13 03	European Regional Development Fund and other regional operations	0.2	0.2	99.90 %
Total Title 13			0.2	0.2	99.90%
Title 22 Neighbourhood and enlargement negotiations					
22	22 01	Administrative expenditure of the 'Neighbourhood and enlargement negotiations' policy area	0.09	0.02	22.98 %
Total Title 22			0.09	0.02	22.98%
Title 26 Commission's administration					
26	26 01	Administrative expenditure of the 'Commission's administration' policy area	0.01	0	0.00 %
	26 03	Services to public administrations, businesses and citizens	0	1.51	11 635%

Total Title 26			0.01	1.51	11,653.05%
Title 32 Energy					
32	32 03	Nuclear energy	0.37	0.36	98.26 %
Total Title 32			0.37	0.36	98.26%
Title 34 Climate action					
34	34 02	Climate action at Union and international level	0.26	0.26	100.00 %
Total Title 34			0.26	0.26	100.00%
Total DG JRC			736.84	237.28	32.20 %

** 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).*

Note : The figures are those related to the provisional accounts and not yet audited by the Court of Auditors

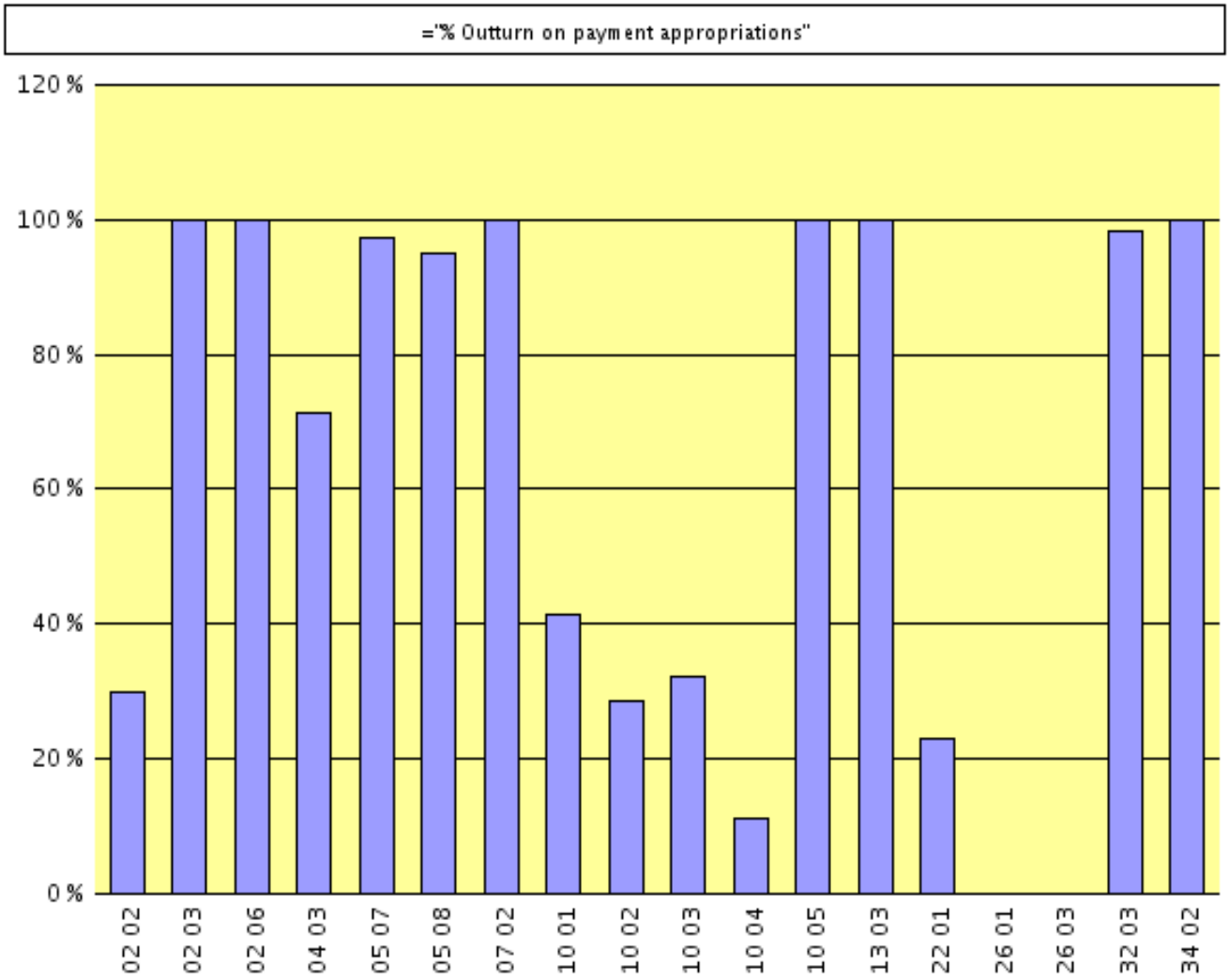

TABLE 3: BREAKDOWN OF COMMITMENTS TO BE SETTLED AT 31/12/2019 (in Mio EUR)									
Chapter			2019 Commitments to be settled				Commitments to be settled from financial years previous to 2019	Total of commitments to be settled at end of financial year 2019	Total of commitments to be settled at end of financial year 2019
			Commitments	Payments	RAL	% 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 02	Competitiveness of enterprises and small and medium-sized enterprises (COSME)	0.00	0.00	0.00	0.00%	0.15	0.15	0.22
	02 03	Internal market for goods and services	3.12	0.00	3.12	100.00%	0.69	3.81	3.22
	02 06	European Earth observation programme	19.21	5.53	13.68	71.24%	5.28	18.96	20.70
Total Title 02			22.33	5.53	16.80	75.26%	6.12	22.93	24.14
Title 04 Employment, social affairs and inclusion									
04	04 03	Employment, Social Affairs and Inclusion	1.28	0.06	1.22	95.49%	0.00	1.22	0.00
Total Title 04			1.28	0.06	1.22	95.49%	0.00	1.22	0.00
Title 05 Agriculture and rural development									
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.73	8.41	1.32	13.54%	0.15	1.47	1.23
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.15	0.61	1.54	71.78%	0.08	1.62	1.65
Total Title 05			11.88	9.02	2.86	24.07%	0.23	3.09	2.89
Title 07 Environment									
07	07 02	Environmental policy at Union and international level	0.00	0.00	0.00	0.00%	1.45	1.45	1.45
Total Title 07			0.00	0.00	0.00	0.00%	1.45	1.45	1.45
Title 08 Research and innovation									
08	08 02	Horizon 2020 - Research	0.00		0.00	0.00%	0.10	0.10	0.10

Total Title 08			0.00		0.00	0.00%	0.10	0.10	0.10
Title 10 Direct research									
10	10 01	Administrative expenditure of the 'Direct research' policy area	112.69	43.63	69.06	61.28%	17.91	86.97	78.24
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	42.16	14.84	27.32	64.80%	10.04	37.35	32.26
	10 03	Euratom programme - Direct actions	12.28	4.47	7.81	63.61%	2.43	10.24	9.50
	10 04	Other activities of the Joint Research Centre	37.86	16.98	20.88	55.15%	6.42	27.31	24.77
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	30.90	3.41	27.49	88.97%	29.60	57.10	56.44
Total Title 10			235.89	83.33	152.57	64.68%	66.40	218.97	201.21
Title 13 Regional and urban policy									
13	13 03	European Regional Development Fund and other regional operations	1.28	0.20	1.08	84.33%	0.00	1.08	0.00
Total Title 13			1.28	0.20	1.08	84.33%	0.00	1.08	0.00
Title 22 Neighbourhood and enlargement negotiations									
22	22 01	Administrative expenditure of the 'Neighbourhood and enlargement negotiations' policy area	0.04	0.01	0.03	80.18%	0.04	0.07	0.05
Total Title 22			0.04	0.01	0.03	80.18%	0.04	0.07	0.05
Title 26 Commission's administration									
26	26 01	Administrative expenditure of the 'Commission's administration' policy area							
	26 03	Services to public administrations, businesses and citizens	2.62	0.12	2.50	95.56%	1.20	3.70	2.67
Total Title 26			2.62	0.12	2.50	95.56%	1.20	3.70	2.67

Title 32 Energy									
32	32 03	Nuclear energy	0.47	0.30	0.17	36.17%	0.09	0.26	0.15
Total Title 32			0.47	0.30	0.17	36.17%	0.09	0.26	0.15
Title 34 Climate action									
34	34 02	Climate action at Union and international level	0.00	0.00	0.00	0.00%	1.04	1.04	1.30
Total Title 34			0.00	0.00	0.00	0.00%	1.04	1.04	1.30

Total :	**275.78**	**98.55**	**177.2**	**64.26 %**	**76.67**	**253.9**	**233.97**

Table 3 (RAL) has been aligned to table 2 (payments) to show figures by the DG actually using the funds, in line with the cut-off report and the budget cycle dashboard

Note : The figures are those related to the provisional accounts and not yet audited by the Court of Auditors

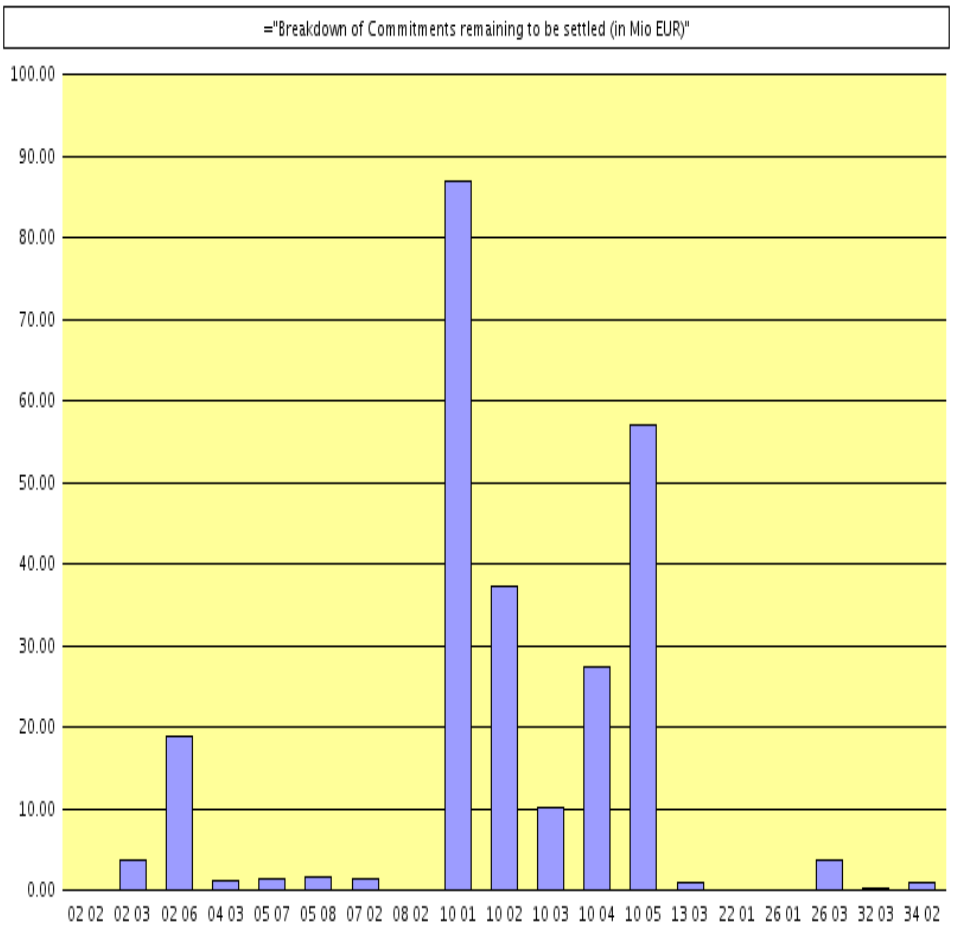

TABLE 4: BALANCE SHEET for DG JRC

BALANCE SHEET	2019	2018
A.I. NON CURRENT ASSETS	215,083,818.22	207,196,315.11
A.I.1. Intangible Assets	1,227,413.89	964,106.79
A.I.2. Property, Plant and Equipment	213,838,531.59	206,214,335.58
A.I.6. Non-Cur Exch Receiv & Non-Ex Recoverab	17,872.74	17,872.74
A.II. CURRENT ASSETS	- 1,195,904,610.25	- 1,027,594,480.37
A.II.2. Current Pre-Financing	7,734,011.94	6,062,864.55
A.II.3. Curr Exch Receiv &Non-Ex Recoverables	- 1,250,339,319.66	- 1,085,334,859.68
A.II.4. Inventories	46,647,505.04	51,515,893.01
A.II.6. Cash and Cash Equivalents	53,192.43	161,621.75
ASSETS	**- 980,820,792.03**	**- 820,398,165.26**
P.I. NON CURRENT LIABILITIES	- 2,100,899,678.99	- 1,902,225,313.39
P.I.2. Non-Current Provisions	- 2,100,895,835.97	- 1,902,221,470.37
P.I.3. Non-Current Financial Liabilities	- 3,843.02	- 3,843.02
P.II. CURRENT LIABILITIES	- 39,756,015.50	- 37,736,010.44
P.II.2. Current Provisions	- 31,165,381.45	- 30,590,055.08
P.II.3. Current Financial Liabilities	-	-
P.II.4. Current Payables	- 8,581,518.24	- 7,136,938.79
P.II.5. Current Accrued Charges &Defrd Income	- 9,115.81	- 9,016.57
LIABILITIES	**- 2,140,655,694.49**	**- 1,939,961,323.83**
NET ASSETS (ASSETS less LIABILITIES)	**- 3,121,476,486.52**	**- 2,760,359,489.09**

P.III.2. Accumulated Surplus/Deficit	5,293,250,650.57	5,147,833,607.06

Non-allocated central (surplus)/deficit*	- 2,171,774,164.05	- 2,387,474,117.97

TOTAL DG JRC	**-**	**-**

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.

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 for DG JRC

STATEMENT OF FINANCIAL PERFORMANCE	2019	2018
II.1 REVENUES	- 86,948,914.43	- 95,575,666.11
II.1.1. NON-EXCHANGE REVENUES	- 31,771.80	- 56,489.61
II.1.1.5. RECOVERY OF EXPENSES	- 17,480.70	- 4,052.29
II.1.1.6. OTHER NON-EXCHANGE REVENUES	- 14,291.10	- 52,437.32
II.1.2. EXCHANGE REVENUES	- 86,917,142.63	- 95,519,176.5
II.1.2.2. OTHER EXCHANGE REVENUE	- 86,917,142.63	- 95,519,176.50
II.2. EXPENSES	**437,971,813.47**	**240,992,709.6**
II.2. EXPENSES	437,971,813.47	240,992,709.6
II.2.10.OTHER EXPENSES	331,303,868.11	140,695,304.51
II.2.2. EXP IMPLEM BY COMMISS&EX.AGENC. (DM)	104,076,830.89	97,433,694.60
II.2.6. STAFF AND PENSION COSTS	2,581,183.16	2,857,294.17
II.2.8. FINANCE COSTS	9,931.31	6,416.34
STATEMENT OF FINANCIAL PERFORMANCE	**351,022,899.04**	**145,417,043.51**

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 increase of II.2.10 OTHER EXPENSES is due to the impact in the Statement of Financial Performance of the change of estimation of the Decommissioning Provision.

As far as the Balance Sheet is concerned, the credit balance of Current Assets is due to EUR 1.266 million of credit balance on Intercompany accounts.

TABLE 5bis: OFF BALANCE SHEET for DG JRC

OFF BALANCE	2019	2018
OB.1. Contingent Assets	**15,223,282.65**	**17,418,575.61**
GR for performance	13,540,288.12	14,743,402.13
GR for pre-financing	1,682,994.53	2,675,173.48
OB.2. Contingent Liabilities	**- 2,860,000.00**	**- 3,012,578.00**
OB.2.7. CL Legal cases OTHER	- 2,860,000.00	- 3,012,578.00
OB.3. Other Significant Disclosures	**- 28,632,217.35**	**- 36,404,048.37**
OB.3.3.7.Other contractual commitments	- 27,099,712.29	- 35,056,520.43
OB.3.5. Operating lease commitments	- 1,532,505.06	- 1,347,527.94
OB.4. Balancing Accounts	**16,268,934.70**	**21,998,050.76**
OB.4. Balancing Accounts	16,268,934.70	21,998,050.76
OFF BALANCE	**-**	**-**

It should be noted that the balance sheet and statement of financial performance presented in Annex 3 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.

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 6: AVERAGE PAYMENT TIMES FOR 2019 - DG JRC

Legal Times							
Maximum Payment Time (Days)	**Total Number of Payments**	**Nbr of Payments within Time Limit**	**%age**	**Average Payment Times (Days)**	**Nbr of Late Payments**	**%age**	**Average Payment Times (Days)**
17	1	1	100.0 %	9.00			
30	18736	17487	93.3 %	16.00	1249	6.67 %	44.47
55	1	1	100.0 %	11.00			
57	1	1	100.0 %	13.00			
58	1	1	100.0 %	7.00			
60	524	514	98.1 %	28.05	10	1.91 %	71.5
68	1	1	100.0 %	16.00			
85	1	1	100.0 %	9.00			
90	11	11	100.0 %	21.36			

Total Number of Payments	**19277**	**18018**	**93.47 %**		**1259**	**6.53 %**	
Average Net Payment Time	**18.20**			**16.35**			**44.69**
Average Gross Payment Time	**21.32**			**19.18**			**51.93**

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	47	1284	6.66 %	19277	21,448,100	8.90 %	240,934,480

Late Interest paid in 2019			
DG	**GL Account**	**Description**	**Amount (Eur)**
JRC	65010000	Interest expense on late payment of charges	201.38
JRC	65010100	Interest on late payment of charges New FR	7 709.20
			7 910.58

TABLE 7: SITUATION ON REVENUE AND INCOME in 2019 for DG JRC								
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	26,097,834.51		26,097,834.51	26,097,834.51		26,097,834.51	0.00
41	CONTRIBUTIONS TO THE PENSION SCHEME	22,624,671.28		22,624,671.28	22,624,671.28		22,624,671.28	0.00
62	REVENUE FROM SERVICES RENDERED AGAINST PAYMENT	86,492,345.54	3,352,718.81	89,845,064.35	78,469,324.82	3,292,552.81	81,761,877.63	8,083,186.72
66	OTHER CONTRIBUTIONS AND REFUNDS	1,836,994.05	31,880.19	1,868,874.24	1,685,287.41	29,616.59	1,714,904.00	153,970.24
Total DG JRC		**137051845.4**	**3384599**	**140436444.4**	**128877118**	**3322169.4**	**132199287.4**	**8237156.96**

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

INCOME BUDGET RECOVERY ORDERS ISSUED IN 2019 Year of Origin (commitment)	Irregularity		Total undue payments recovered		Total transactions in recovery context (incl. non-qualified)		% Qualified/Total RC	
	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount
2014					1	3220		
2017					1	540		
2018					5	6325		
2019	1	971	**1**	**971**	12	9968	8.33%	9.74%
No Link					37	383158		
Sub-Total	**1**	**971**	**1**	**971**	**56**	**403211**	**1.79%**	**0.24%**

EXPENSES BUDGET	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
INCOME LINES IN INVOICES										
NON ELIGIBLE IN COST CLAIMS										
CREDIT NOTES	2	447164			**2**	**447164**	1207	14,306,837	0.17%	3.13%
Sub-Total	**2**	**447164**			**2**	**447164**	**1207**	**14,306,837**	**0.17%**	**3.13%**

GRAND TOTAL	**3**	**448134.8**			**3**	**448134.8**	**1263**	**14710048**	**0.24%**	**3.05%**

TABLE 9: AGEING BALANCE OF RECOVERY ORDERS AT 31/12/2019 FOR JRC

	Number at 01/01/2019	Number at 31/12/2019	Evolution	Open Amount (EUR) at 01/01/2019	Open Amount (EUR) at 31/12/2019	Evolution
2010	1	1	0.0 %	945	945	0.0 %
2015	2	1	-50.0 %	67,115	60,166	-10.4 %
2016	3		-100.0 %	6,172,999		-100.0 %
2017	4		-100.0 %	5,277,113		-100.0 %
2018	40	2	-95.0 %	10,155,406	647,264	-93.6 %
2019		47			8,942,445	
	50	51	2.0 %	21,673,577	9,650,820	-55.5 %

Note: The figures are those related to the provisional accounts and not yet audited by the Court of Auditors

TABLE 10 :Recovery Order Waivers >= 60,000 € for DG JRC in 2019

	Waiver Central Key	Linked RO Central Key	RO Accepted Amount (EUR)	LE Account Group	Commission Decision	Comments

Total DG JRC	**Nil**

Number of RO waivers	**Nil**

TABLE 11: CENSUS OF NEGOTIATED PROCEDURES - DG JRC - 2019

Internal Procedures > EUR 60,000

Negotiated Procedure Legal base	Number of Procedures	Amount (EUR)
Annex 1 - 11.1 (a) - Follow-up of an open/restricted procedure where no (or no suitable) tenders/requests to participate have been submitted	6	1,602,452.76
Annex 1 - 11.1 (b) - Artistic/technical reasons or exclusive rights or technical monopoly/captive market	15	2,812,772.62
Annex 1 - 11.1 (c) - Extreme urgency caused by unforeseeable events not attributable to the contracting authority	1	88,000.00
Annex 1 - 11.1 (e) - New services/works consisting in the repetition of similar services/works	4	1,862,000.00
Annex 1 - 11.1 (f) (i) - Supplies of additional deliveries	2	467,830.08
Total	**28**	**6,833,055.46**

During the course of 2019 the JRC had 28 contracts signed under the exceptional negotiated procedure (Annex 1 - 11.1).

Four of these 28 procedures increased the contract threshold of satellite imagery and validation contracts where the JRC was bound to deliver under Regulation 377/2014 with an initial predefined budget. Due to the success of these contracts and related increase in demand for greater quality products the JRC had to increase thresholds of under Annex 1 – 11.1(e).

Of the 15 notified as I.11.1(b) for reasons of 'technical monopoly' 14 related to technical compatibility requirements of previous purchases of scientific equipment, for example, maintenance and upgrades that the JRC cannot give to any other organisation aside from the original equipment contractor, which holds intellectual property rights.

In addition, the JRC has to ensure comparability of results and when a laboratory is accredited to ISO 17025, calibration and maintenance of the equipment must be carried out by the original manufacturer.

The JRC has strong mitigating measures in place with a positive ex ante visa required by the financial legal services before this type of procedure is launched. In addition, all such procedures above EUR 60,000 are analysed and reviewed by the JRC's public procurement advisory group (PPAG) before contract signature

TABLE 12: Summary of Procedures for DG JRC

Internal Procedures > EUR 60,000

Procedure Legal base	Number of Procedures	Amount (EUR)
Competitive procedure with negotiation (Annex 1 - 12.1)	5	4,212,799.07
Competitive procedure with negotiation (Art. 135 RAP)	1	7,999,470.60
Negotiated procedure middle value contract (Annex 1 - 14.2)	49	5,867,310.47
Negotiated procedure without prior publication (Annex 1 - 11.1)	28	6,833,055.46
One-step procedure based on a call for expressions of interest - Vendors' list (Annex 1 - 13.3 (b) (i))	1	89,280.00
Open Procedure (Art. 104(1) (a) FR)	1	336,312.00
Open procedure (FR 164 (1)(a))	53	114,974,364.25
Restricted Procedure (Art. 104(1) (b) FR)	2	3,100,000.00
Restricted procedure without Dynamic purchasing system (FR 164 (1)(b))	7	32,301,610.16
Total	**147**	**175,714,202.01**

Table 12 (Summary of procedures) includes all procurement procedures also negotiated procedures and those leading to a building contract

TABLE 13: BUILDING CONTRACTS

Legal base	Contract Number	Contractor Name	Description	Amount (EUR)

TABLE 14: CONTRACTS DECLARED SECRET in 2019 for DG JRC

Legal Base	Procedure subject	LC/FW?	LC Contract/Grant type or FW type	LC Date	Contract/FW Number	Contractor Name	Contract/FW Subject	Amount (EUR)
Annex 1 - 11.1 (i) - Secret contract or contract requiring special security measures	JRC/IPR/2019/NP/1481 - PROJECT DESIGN OF BLDG 102 DATA CENTRE	Legal commitment	Direct	23/05/2019	CCR.R.C937541	RETHINK ENERGY SRL	PROJECT DESIGN DATA CENTRE BUILDING 102	45,000.00
Annex 1 - 11.1 (i) - Secret contract or contract requiring special security measures	JRC/IPR/2019/NP/3517 - BLDG 102 DATA CENTRE WORKS SUPERVISION	Legal commitment	Direct	14/11/2019	CCR.R.C938354	RETHINK ENERGY SRL	DIREZIONE LAVORI ED. 102	50,000.00
					2			**95,000.00**

ANNEX 4. Materiality criteria

As from 2019[8], a '*de minimis*' threshold for financial reservations is introduced. Quantified AAR reservations related to residual error rates above the 2% materiality threshold are deemed not substantial for segments representing less than 5% of a DG's total payments and with a financial impact below EUR 5 million. In such cases, quantified reservations are no longer needed.

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 the European Anti-Fraud Office (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

[8] Agreement of the Corporate Management Board of 30/4/2019.

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 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

[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'

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 for budget implementation (RCS)

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: 282 Average cost per tender: Cost of control on procurement (EUR 4,301,250) / number of procedures closed during the year (282) = **EUR 15,252** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 4,301,250) / Total contract value (EUR 179,457,385*) = 2.40% * 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

<table>
<tr><th>Main risks</th><th>Mitigating controls</th><th>Estimated coverage frequency and depth</th><th>Cost-effectiveness indicators</th></tr>
<tr><td rowspan="3">The best offer/s are not submitted due to inadequate market analysis and / or poorly defined technical specifications</td><td>Financial circuit (OVA and or AOS approval and supervision of specifications)</td><td>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</td><td rowspan="3">Effectiveness:
<u>Benefits</u>: 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 4,301,250) / number of procedures closed during the year (282) = EUR 15,252

Economy (costs):
Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 4,301,250) / Total contract value (EUR 179,457,385*) = 2.40%

* Contracts above EUR 15,000</td></tr>
<tr><td>Additional controls namely by procurement staff above the financial threshold of EUR 15,000</td><td>Coverage: 100% of procedures > EUR 15,000</td></tr>
<tr><td>Public Procurement Advisory Group (PPAG) – ex ante control</td><td>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</td></tr>
</table>

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 4,301,250) / number of procedures closed during the year (282) = **EUR 15,252** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on procurement (EUR 4,301,250) / Total contract value (EUR 179,457,385*) = 2.40% * 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 **Economy (costs):** Estimation e cost per tender: Cost of control on procurement (EUR 4.301.250) / number of procedures closed during the year (282) = **EUR 15 252** of cost of operational and financial staff involved Cost of control on procurement (EUR 4,301,250) / Total contract value (EUR 179,457,385*) = 2.40%
	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	

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
		particular on the selection criteria	* Contracts above EUR 15,000
	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 6,611,250) / Number of financial transactions (26,610) = **EUR 248** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on the financial circuit: EUR 6,611,250) / value of payment executed[10] (EUR 241,684,889) = 2.74%
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 6,611,250) / Number of financial
	Financial circuit: all steps financial and operational	**Coverage**: 100% controlled **Depth**: check of all required documents in the contract	

[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.

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
	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	transactions (26,610) = **EUR 248** **Economy (costs):** Estimation of cost of operational and financial staff involved Cost of control on the financial circuit: EUR 6,611,250) / Value of payment executed[11] (EUR 241,684,889) = 2.74%
	Sensitive functions	**Coverage**: AOSDs and OIAs mainly	
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 6,611,250) / Value of payment executed[12] (EUR 241,684,889) = 2.74%

[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.

[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) / Ttotal 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 **19.35%** **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 **0.026%** Cost of control on contractual project proposals / Number of proposals selected during the year **0.026%** (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):**

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
			Total cost of control of management review / Total project forecast value of Support to Commission contracts **0.017%**
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 Head of Unit)	**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 Head of Unit 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 **0.05%** Cost of control / Number of FORs **EUR 138**

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 **0.08%**
	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 **0.4%**
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

Main risks	Mitigating controls	Estimated coverage frequency and depth	Cost-effectiveness indicators
			the institutional budget **19.35%** **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 and/or EU Trust Funds (if applicable)

N/A

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

Study project ID	Title of the study	Study reason	Study overview	Study internal ID	Associated services	Study cost (EUR)	Note	Title of the deliverable
6850	Systematic literature review and data collection on interaction effects for chemical mixtures	General study	To review recent literature on toxicity of chemical mixtures to identify the relevance of (eco)toxicological interactions, including synergistic and antagonistic effects.	0		60,000	Support to the EU policy on chemical mixtures and combined exposure	Systematic review of ten years of research on interactions in chemical mixtures of environmental pollutants - final report
6852	Systematic literature review and data/information collection on uses and requirements of convergence of technologies in the medical/health field	General study	The aim of this study is to perform a review of available information on uses and regulatory requirements of 1) innovative materials and processes in the field of medical technologies with focus on nanomaterials and additive manufacturing 2) tissue reconstruction in regenerative medicine with focus on bioprinting and 3) digital health. The outcome of the study will be used by JRC as background document in view of a regulatory preparedness analysis of technological convergence in selected cases of the medical field.	0		40,000	Contribution to the smart regulation approach of the European Commission aiming to address upfront the innovation effects of new regulatory proposals in its impact assessments Abandoned due to change in priorities	
6868	Policies for improving participation to and completion of tertiary education by disadvantaged students	General study	This study will contain a review of policies that have been found to stimulate entry and improve the likelihood of completion of tertiary education by students from disadvantaged groups.	0		27,425	Contributions to evaluation of education policies	Social Inclusion Policies in Higher Education: Evidence from the EU; doi 10.2760/944713

6885	Piloting MDD-W as a nutrition sensitive indicator for the Food Security and Nutrition Action; Myanmar	General study	The main aim of this study is to evaluate the feasibility and pertinence of using MDD-W as a monitoring indicator for the EU action on food security and nutrition by conducting a pilot study of MDD-W data collection areas targeted by EU programme. The specific objectives are: 1. To pilot the operationalisation of including MDD-W in the monitoring and evaluation framework of food and nutrition security interventions; 2. To assess the performance of MDD-W as an indicator of the monitoring and evaluation framework of food and nutrition security interventions. This will be a second pilot to be conducted in a country with conditions contrasting with the ones of Chad that is covered by the first pilot (2017-2018).	0	Directorate-General for International Cooperation and Development, European External Action Service	100,000	EU Action Plan on Nutrition Abandoned due to change in priorities.	
6890	Higher Education Institutions and Local Development	General study	The study will create a dataset combining information from different sources to capture in a better way the outputs and outcomes of universities and HEIs. The study will also conduct an empirical analysis of the complementarity and substitution effects of the different activities of universities (teaching, research, knowledge transfer) and their contributions to growth and development.	0		58,000	Communication on a renewed EU agenda for higher education (COM(2017) 247 final)	Study on Higher Education Institutions and Local Development; doi 10.2760/369557
6893	FRAND and Open Source, licensing terms and WS	General study	The objective of the study is to identify possible commonalities and barriers for interaction between standardisation and open source processes.	0	Directorate-General for Communications Networks, Content and Technology	130,000	Digital Single Market	The Relationship Between Open Source Software and Standard Setting; doi 10.2760/163594
6894	Interplay of Standard Developing Organisations and Intellectual Property Right Systems in the ICT Industry	General study	The study should find out whether the current model of governance for the interplay of IPR systems and SDOs in Europe is well functioning from a welfare perspective.	0	Directorate-General for Communications Networks, Content and Technology	194,450	Support to Digital Single Market	Making the Rules: The Governance of Standard Development Organizations and their Policies on Intellectual Property Rights; doi 10.2760/48536
6923	Circular economy of traction batteries	General study	The contract is intended to support the Commission in the assessment of opportunities in developing a circular economy model for traction batteries for electric vehicles while creating sustainable value for the EU.	0		110,600	Contribution to implementing Circular Economy package	Circular Economy Perspectives for the Management of Batteries used in Electric Vehicles; doi 10.2760/537140

6925	Sectoral analysis and assessment of geographical concentration of EU industries	General study	Economic theory predicts several effects of the EU-wide economic integration process triggered by the Single Market, among them an increase in sectoral specialisation and geographical concentration of industries. The objective of the study is to collect relevant empirical evidence and use it to carry out a scientific assessment of the validity of the theoretical predictions.	0		55,000	Contribution to analysis of effects of Single Market	Sectoral Analysis and Assessment of Geographical Concentration of EU Industries; doi 10.2760/575675
6930	The role of INSPIRE in the digital transformation	General study	The study will provide evidence, facts and figures regarding the impact of the INSPIRE framework and its implementation on the digital transformation within the public administration and public/private partnerships. It shall analyse the current status of SDI/INSPIRE in Europe in general, its evolution in brief, and how it is turning or not in an open SDI. A deeper analysis is also asked to be conducted in three countries. The different components of the SDI/INSPIRE are to be analysed (organisation and coordination, strategy and policy coherence, data and services interoperability and availability, metadata, geoportal(s) and platforms).	0	Directorate-General for the Environment	99,715	INSPIRE directive and digital transformation	The role of Spatial Data Infrastructures in the Digital Government Transformation of Public Administrations; doi 10.2760/324167
6932	Study on blockchains for public sector	General study	The goal of this study is to investigate: What is the relevance of blockchain technology for Digital Government services and more specifically in the European Union? What is the current landscape of blockchain use cases for Digital Government services in the European Union? What are the current attitudes towards blockchain technology in the European Commission? What potential scenarios for the development and usage of this technology for Digital Government services in the European Union?	0	Directorate-General for Communications Networks, Content and Technology, Directorate-General for Informatics	66,600	Contribution to EC Programme Interoperability Solutions and Common Frameworks for European Public Administrations, Businesses and Citizens (the ISA2 Programme; Decision 2015/2240)	Blockchain for digital government; doi 10.2760/942739

6933	GDPR and location privacy	General study	A study on the implications of the new General Data Protection Regulation (entering into force in May 2018) on location privacy issues. The JRC European Union Location Framework Action of the Programme 'Interoperability Solutions for Public Administrations' (led by DIGIT) has prepared initial guidance on location privacy and GDPR. However, it has not yet taken action to promote the guidance, assess readiness in Member States, ensure the guidance is 'fit for purpose' or provide any direct support leading up to the GDPR deadline. These actions form the scope of this study.	0	Directorate-General for Communications Networks, Content and Technology, Directorate-General for Informatics	20,000	Contribution to EC Programme Interoperability Solutions and Common Frameworks for European Public Administrations, Businesses and Citizens (the ISA2 Programme; Decision 2015/2240)	Guidelines for public administrations on location privacy; doi 10.2760/546158
6934	Support to multimodal travel information services	General study	In May 2017 the Commission adopted the delegated regulation of the ITS Directive for the provision of EU-wide Multimodal Travel Information Services (MMTIS). This initiative will provide the necessary requirements to make EU-wide multimodal travel information services accurate and available across borders. It establishes the specifications necessary to ensure the accessibility, exchange and update of standardised travel and traffic data and distributed journey planning for the provision of multimodal travel information services in the European Union. INSPIRE is part of the required standards and this study aims to support Member States in the implementation of the regulation by identifying which specific data categories of its Annex I are covered by INSPIRE, the availability of relevant datasets, whether they are INSPIRE compliant and, if not, when they will be INSPIRE compliant. Moreover, the study will include a comparison of the use of the different standards in the domain of MMTIS: NeTEx/Transmodel, DATEX, IATA and TAP-TSI EDIFACT, relative to INSPIRE.	0	Directorate-General for Informatics, Directorate-General for Mobility and Transport	100,000	Implementing Commission Delegated Regulation (EU) 2017/1926 on provision of EU-wide multimodal travel information services	INSPIRE-MMTIS: overlap in standards related to the Delegated Regulation (EU) 2017/1926; doi 10.2760/404745
6935	Data for European ICT industries Analysis 2nd Phase (DICTA2)	General study	The study produces data and analyses on the ICT sector and on ICT research, development and innovation in the EU and beyond, based on official statistics but ensuring comparability over time and across EU and non -EU countries.	0	Directorate-General for Communications Networks, Content and Technology	130,000	Contribution to European Digital Progress Report indicators and analysis	The 2019 PREDICT Key Facts Report; doi 10.2760/06479

6937	Quality of Standard-Essential Patents (SEP)	General study	The objective of this task is to provide evidence on the role of patent quality in the context of standard setting, patent assertion and for innovation in the ICT industry in general.	0	Directorate-General for Communications Networks, Content and Technology		Abandoned - integrated in a JRC study	
HFR	The impact of globalisation on industrial dynamics of world top innovators	General study	Globalisation has been steadily increasing in the past decades producing concerns about unequal distribution of its economic benefits. This study takes an actor perspective of the largest corporate R&D investors and compares the impact of the increasing role of Chinese companies in the global R&D landscape on their EU and US counterparts with respect to M&A activity, greenfield fdi, technology and collaboration.	0	Directorate-General for Research and Innovation	30,000	Abandoned - integrated in a JRC study	
7717	Social impact of connected and automated transport	General study	Research on the social implications of connected and automated vehicles in manufacturing.	0		25,500	Contribution to Cooperative, Connected and Automated Mobility (CCAM)	Exploring the economic effects of connected and automated vehicles in manufacturing
9012	Aviation alternative fuels emission values	General study	Calculator for aviation alternative fuels actual emission values submission.	0		60,000	Abandoned due to change in priorities	
9014	Mechanistic analysis of repeated dose toxicity studies	General study	Contract to harvest and analyse mechanistic knowledge related to target organ toxic effects after repeated exposure to gain a better understanding of the mechanisms involved and their human relevance.	0		140,000	Support to EU Reference Laboratory for Validation of Alternative Methods (ECVAM) established through Directive 2010/63 Abandoned; no contractor found	
9016	Literature review on safety & performance of transcatheter aortic valve implants (TAVIs)	General study	The study will comprise an evidence-based appraisal/systematic review on the safety and performance of transcatheter aortic valve implants (TAVI) in view of identifying possible health and safety concerns as well as performance benefits versus the comparator method (open heart surgery) and to describe the evolution of TAVI devices and TAVI target groups in recent years so as to gauge possible 'off-label' use.	0	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Directorate-General for Health and Food Safety	80,000	Support to EU policy on medical devices and in vitro diagnostics. Abandoned but will be taken up by the JRC.	

9018	Topical study on events related to the containment	General study	A topical study on operating experience in nuclear power plants conducted by the EU Clearinghouse.	0			Abandoned due to expiring of framework contract	
9155	Digital Competence for Educators Self-Reflection Tool (DigCompEduREFLECT)	General study	Develop a validated self-reflection tool for educators' digital competence, targeted to educators in primary, secondary, initial VET, higher and adult education, with a pilot in at least 3 European Member States.	0	Directorate-General for Education and Culture	80,000	Abandoned. The study will be re-launched in 2020, under AA with DG EAC (JRC 35645-2019 DigCompEdu)	

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ANNEX 10. Specific annexes related to 'Financial Management'

10.1 Annex related to 'Audit observation and recommendations'

Table 10.1-1 Recommendations in new audit reports (January 2020)

New audits	Recommendations by rating	
	Very important (VI)	Important (I)
Site management and infrastructure support services	2	3

Table 10.1-2. State of play as at 31/01/2020 of recommendations implemented and submitted to the IAS for review.

JRC Recommendations Implementation[13]	Important	Very important	Closed by the IAS	Under IAS review
Scientific project management	3	1	0	4
Intellectual property rights	1	1	2	0
Management of intra-muros contractors	1	0	1	0
IT security in the JRC ICT systems	1	3	2	2[14]
Recruitment of temporary scientific staff	1	1	0	2
Competitive activities	1	0	0	1
Total	**8**	**6**	**5[15]**	**9**
Grand total implemented and submitted for review	**14**			

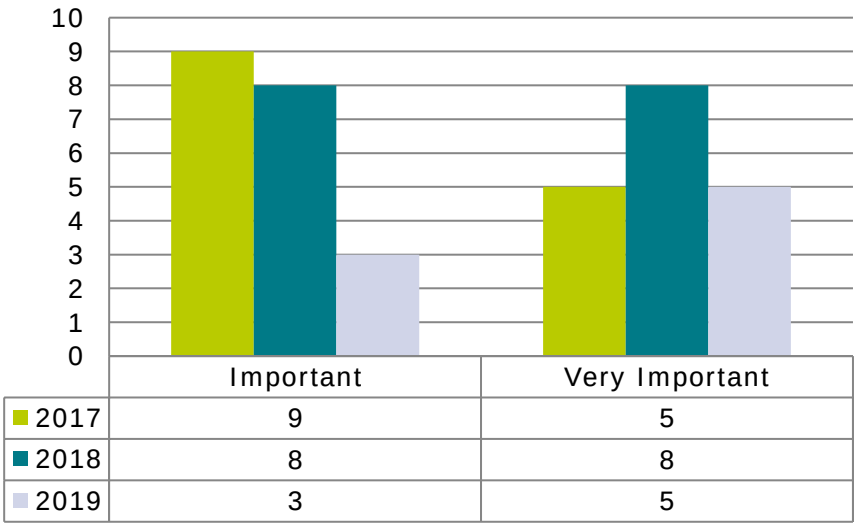
[13] 'By implementation' means that the JRC has completed all mitigating actions agreed and has submitted these actions to the IAS for review. The outcome of the IAS review could be:

a) to close the recommendation as adequately and efficiently implemented,
b) to reopen it as non-efficiently implemented or
c) to reopen and downgrade it (applicable to 'very important recommendations' only).

[14] One of which is very important.

[15] Out of which three very important

Recommendations overview



	Important	Very Important
2017	9	5
2018	8	8
2019	3	5

JRC recommendations under implementation	Recommendations by rating	
	Very important (VI)	Important (I)
Recruitment of temporary scientific staff	1	0
Intellectual property rights	1	1
Decommissioning & waste management	1	1
Total	3	2

10.2 Specific annexes related to 'Financial Management'

Table 10.2-1 Overview of the estimated cost of controls at Commission (EC) level:

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*
10,912,500	241,684,889	4.52	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*
165,339	78,582,725	0.21%	8,140	9,069,897	0.09%	173,479	0.22%
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*
11,077,839	320,537,614	3.46	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.*

Table 10.2-2. Financing sources for 2019.

ABB Activities	Description	Payment appropriations (in EUR)
10 01 and 10 02	Horizon 2020 (2014-2020) - The EU Framework Programme for Research and Innovation	272,121,093
10 01 and 10 03	Euratom (2014-2018) - Research and Training Programme of European Atomic Energy Community complementing the Horizon 2020 Framework Programme	129,139,061
10 05	Decommissioning - The Decommissioning Programme pursuant to Article 8 of the Euratom Treaty	27,000,000
EFTA States Contribution		6,464,594
Voted budget (total of above 4 headings)		434,724,748
External assigned revenue	Supplementary credits from Association Agreements to H2020 and Euratom	24,099,944
	Contractual income	78,582,725
Internal assigned revenue		4,375,241
Co- and cross-delegations received[1]	Co-delegations	40,214,596
	Cross delegations	118
Grand total financing sources 2019 in payments[2] [3]		581,997,372

[1] More information on co- and cross-delegations can be found in Annex 10.2, subsection 1.

[2] This total does not include appropriations carried over from previous exercises nor the High Flux Reactor (HFR) appropriations.

[3] This total includes the salary budgets of the JRC staff (officials, contract staff and seconded national experts).

10.2.1. Credits cross-sub-delegated and co-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 10.2-1.

Table 10.2-1. Cross sub-delegations received.

DG / Service	Associated budget in 2019[16] *(C1 commitment accepted) In EUR 1,000s*	Nature of service managed by the JRC
DG DEVCO – EDF	118	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)

- **Cross-sub-delegations given**

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

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

Table 10.2-2. Cross Sub-Delegations given

DG / Service	Associated Budget in 2019 *(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[17] (art. 3.2 of the Internal Rules) with other Directorates-General of the European Commission for the following budget lines:

- 02.0201 'Promoting entrepreneurship and improving the competitiveness and access to markets of Union enterprises'
- 02.030100 'Operation and development of the internal market of goods

[16] When the budget is zero, it means that no C1 commitments were accepted in 2019 but RAL management only.

[17] 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)

and services'

- 02.060100 ‘Delivering operational services relying on space-borne observations and in-situ data (Copernicus)’
- 04.037728 ‘Pilot project —Implementation of the research methodology ‘Multidimensional Inequality Framework’ research methodology for the European Union’
- 05.07 01 02 'Monitoring and preventive measures — Direct payments by the Union'
- 05.08 03 00 'Restructuring of systems for agricultural surveys'
- 05.08 80 ‘Union participation at the ‘Feeding the Planet —Energy for Life’ World Exposition 2015 in Milan
- 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'
- 07 02 77 41 ‘Pilot project —Promoting alternatives to animal testing’
- 10 01 05 'Support expenditure for research an innovation programmes in the “Direct Research” policy area'
- 10.0201 ‘Horizon 2020 - Customer-driven scientific and technical support to Union policies
- 11.06 62 01 'Scientific advice and knowledge'
- 13.037726 ‘Pilot project —Integrated techniques for the seismic strengthening and energy efficiency of existing buildings’
- 21. 020701 ‘Environment and Climate Change’
- 22.010401 ‘Support expenditure for the Instrument for Pre-accession Assistance (IPA)’
- 26.010401 ‘Support expenditure for interoperability solutions for European public administrations, businesses and citizens (ISA²)
- 26.030100 ‘Interoperability solutions and common frameworks for European public administrations, businesses and citizens (ISA²)
- 29 02 01 00 ‘Providing quality statistical information, implementing new methods of production of European statistics and strengthening the partnership within the European Statistical System information'
- 32 03 01 ‘Nuclear safeguards’
- 34 02 02 'Increasing the resilience of the Union to climate change'
- FEDF-BFEDF-04.20.50-11 - European Development Fund (EDF) – Contributing to stability and peace and conflict prevention -

Table 10.2-3. Horizontal co-delegations.

DG/Service	Associated budget in 2019 (C1 commitment accepted) In EUR 1,000s	Nature of the Co-Delegated Service
DG AGRI	9,730	Assigned to Directorate D for the Control with Remote Sensing Programme – Acquisition of satellite imagery under the 2019 Control with Remote Sensing (CwRS) work

		programme and Land Parcel Identification Quality Assurance (LPIS QA)
DG AGRI	2,146	Assigned to Directorate D for 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 AGRI	0	Assigned to the JRC for the European Union participation at the World Exposition 2015 - 'Feeding the Planet - Energy for Life' in Milan.
DG BUDG	932	Contribution of the JRC to DG BUDG for services related to ABAC and the development of SUMMA
DG CLIMA	0	Assigned to Directorate D for Project 'LUCAS samples – Analysis'
DG DEVCO	0	Assigned to Directorate D for project 'NEPAD African Network of Centres of Excellence on Water Sciences and Technology (II phase)"
DG DEVCO - EDF	0	Assigned to Directorate E and Directorate I for the Project of the European Development Fund (EDF) 'Gestion du programme African Peace Facility (APF) – 4eme phase de cooperation avec AU – Continental Early Warning System (AU CEWS)'
DG EMPL	1,275	Assigned to Directorate I for the Pilot project —Implementation of the research methodology 'Multidimensional Inequality Framework' research methodology for the European Union
DG DIGIT	2,519	Contribution of the JRC to DG DIGIT for IT services foreseen in the MoUs.
DG DIGIT	2,628	Assigned to Directorate B for programme ISA2 - Action 4.1 'ELISE' and to Directorate I for Action 2.4' "Interoperable meta data and processing components for open source information mining" and Action 3.7 'COMPARED'
DG DGT	23	Contribution of the JRC to DG DGT Translation Services.
DG ENER	470	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 D for Project 'LUCAS samples – Analysis'
DG ENV	0	Assigned to Directorate F for Pilot project —Promoting alternatives to animal testing
DG ESTAT	0	Assigned to Directorate D for Project 'LUCAS samples – Analysis'
DG ESTAT	40	Contribution of the JRC to DG ESTAT for the purchase and annual update of geographic database
DG GROW	3,121	Assigned to Directorate C for VELA Laboratories
DG GROW	19,208	Assigned to Directorates D, E and I for the programme 'Copernicus'
DG GROW	0	Assigned to Directorate B for 'Pilot project for essentiality checks of Standard Essential Patents'
DG HR	3,342	Contribution to the cost of activities managed by DG.HR.AMC8 (stagiares and grant holders salaries and administration, training and recruitment).
DG HR	173	The JRC social costs in Ispra managed by the Medical Services.
DG HR	697	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).
DG NEAR	90	Assigned to Directorate A for the 'TAC – Travel Accommodation and Conference facility for Western Balkans and Turkey'.
DG REGIO	1,275	Assigned to Directorate E for the Pilot project 'Integrated techniques for the seismic strengthening and energy efficiency of existing buildings'
OIB	456	Contribution to the Ispra costs related to canteen & cafeteria, childcare and lodging managed by OIB.
PO	236	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'
- 10.0201 'Horizon 2020 - Customer-driven scientific and technical support to Union policies'
- 10.0301 'Euratom activities of direct research'
- 10.0501 'Decommissioning of Euratom obsolete nuclear facilities and final disposal of wastes'.

Table 10.2-4. Vertical co-delegations.

DG / Service	Associated budget in 2019 *(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 and AGM payments

10.2.2. 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 2019.

Management mode: Direct centralised

Key figures:

- There were 146 large value (> EUR 60,000) contracts signed valued at approximately EUR 175 million[18].
- 53% of the files were awarded through an open procedure.

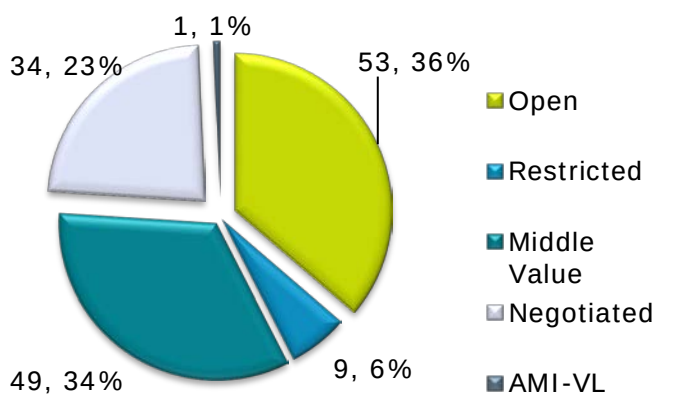


Figure 10.2-1. Procurement procedures (> EUR 60,000) contracted in 2019 (absolute numbers and percentages against all contracts).

10.2.3. 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'.

[18] The amount of EUR 175 million is higher than the annual budget because the associated contracts run over several years.

- 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 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 10.2.2 depicts the contractual contracts signed during 2019, the type and their value.

Management mode: Direct centralised

Key figures:

116 new forecast of revenue for contractual contracts signed in 2019 with a value of EUR 83.4 million.
EUR 78.6 million of contractual income cashed in 2019.
Support to Commission services are the main source of contractual income.

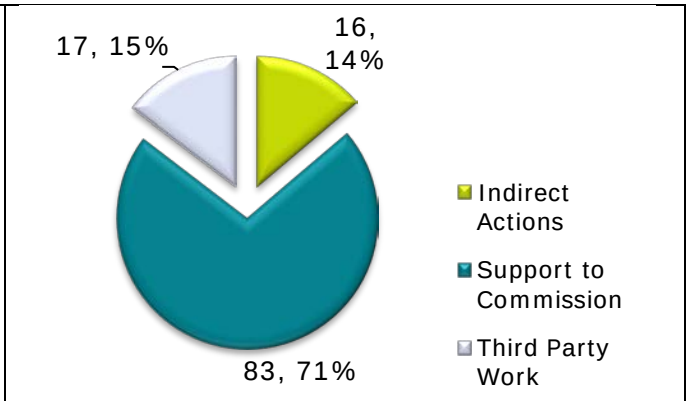


Figure 10.2-2. Contractual income generated by the JRC in 2019 (absolute numbers and percentages against all contracts)

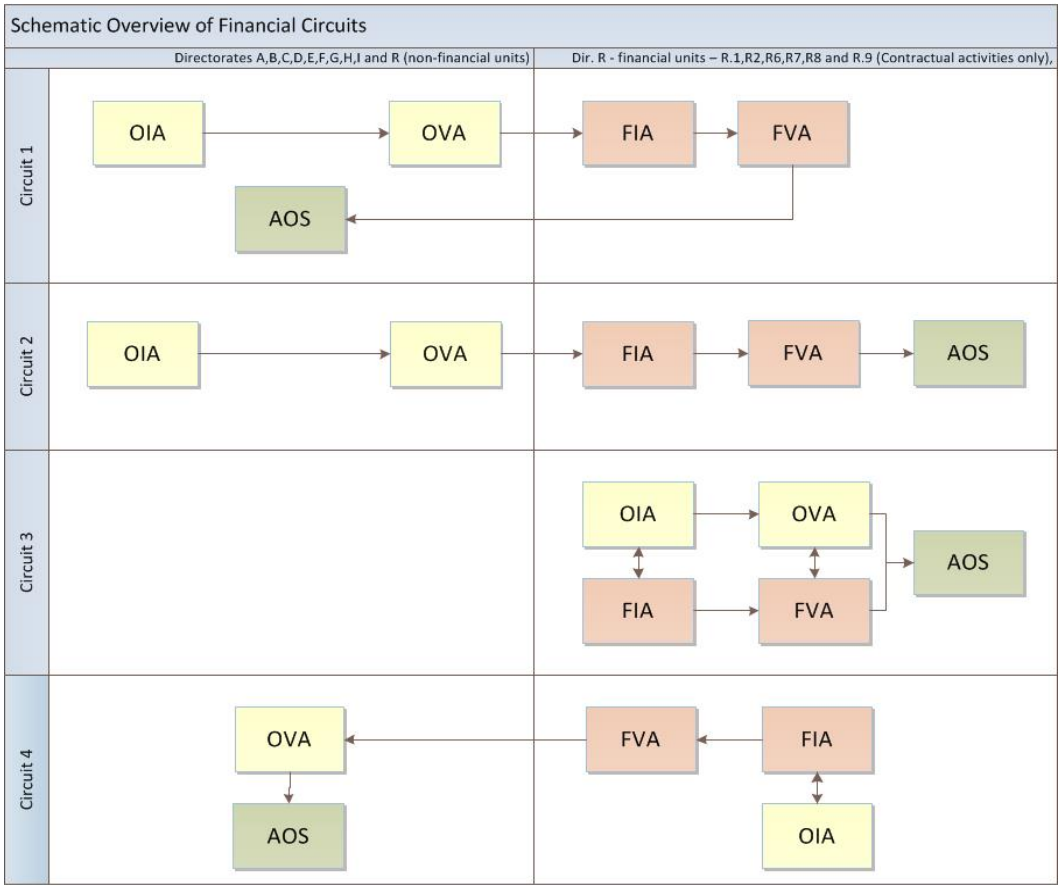
10.2.4. 4. JRC financial circuits and segregation of duties[19]

- **Basic principles**

- Four eyes principle/segregation of duties: 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).
- 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 taking in consideration the nature of the financial transaction or geographical issues. 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 most used circuit at the JRC. FIA/FVA are hierarchically

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

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,
- mass upload for payments (applied for grant holder and trainee salary payments, reimbursement of candidates or experts).

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,
- activities of primarily technical nature related to revenue.

Depending on the risk involved as well as the complexity of the transaction being processed, this circuit allows a minimum of two persons: one combining the OIA/FIA responsibilities, and a second one 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 his the hierarchical superior.

In some cases, an additional verification function may be carried out by an agent from a different unit.

Changes to authorised sub-delegations

In 2019 changes were applied 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,

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

10.2.5. Accounting controls

The controls carried out in 2019 have followed the Annual Accounting Quality Plan. The controls performed are additional to the ex ante controls performed by financial verifying agents and sub- delegated authorising officers on each transaction, in compliance with the Financial Regulation.

The controls on the general ledger (GL) account of invoices were performed on a sample[20] of payment transactions equivalent to 65% of the monetary value of invoices and internal documents registered by the JRC.

Assets wrongly treated as expenses errors found in the sample having an impact on the accounts amounted to EUR 5.1 million and these were duly corrected. Errors where a wrong economic outturn category (operational vs administrative expenditure vs staff expenditure) was chosen, amounted to a net EUR 60,489 and duly corrected. Considering the correction of errors carried out and that the sample has been taken using a risk-based methodology, the overall estimated error rate is less than 1.2% thus confirming the reliability of the JRC's accounts.

Additional checks on the administrative expense category revealed a total amount of EUR 507,787. Corrections were done and the correct administrative GL account was chosen. This latter type of error has no impact on the accounts.

10.2.6. *Ex post* supervisory controls

The JRC's *ex post* controls strategy is implemented using a representative stratified sampling methodology at site/sector level (1 file for payments lower than EUR 1,000; 2 to 3 files for payments between EUR 1,000 and EUR 15,000; 4 to 5 files for payments between EUR 15,001 and EUR 60,000; 4 to 5 files for payments between EUR 60,001 and EUR 144,000; 3 to 4 files for payments above EUR 144,000 and 2 files for payments corresponding to the 10 highest value time). The sampling is done at site level, i.e. Brussels, Geel, Petten, Karlsruhe, Seville and Ispra. The two sectors in Ispra are subject to the review of an additional *ex post* controller, since the importance in size and the number of files sampled.

In 2019, *ex post* controls were carried out on 120 payments[21] and 69 associated procurement files related to legal commitments (including specific contracts on framework contracts) entered in the course of the year.

The findings relate mainly to the lack of certain formalisation aspects in the finalisation of the procedures, which did not lead to a financial loss for the JRC. In few *saisines a posteriori* situations, of a small financial value, the budgetary commitment was made after the legal commitment. The JRC's detected error rate is 0% confirming the trend of the past years and indicating that there are no issues concerning the JRC's procurement and payments activities. The *ex post* findings have been discussed with the units concerned and an agreement on the

[20] Using a risk-based sampling methodology.

[21] Includes payments carried out by JRC using cross sub-delegations received.

findings was reached. Corrective actions will be taken and the formalisation aspects noted from the *expost* supervisory controls will be included as part of the ongoing training courses and lessons learnt, thus leading to continuous improvement in the procurement process.

7. 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 (31/12/2018)	Target	Latest known results (31/12/2019)
0.5% - Average error rate (AER)	Below the JRC's materiality criteria of 2% per year until 2020	0.5% The JRC's detected error rate for 2019 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 (31/12/2018)	Target	Latest known results (31/12/2019)[22]
EUR 1.1 million	Amount at risk below the JRC's materiality criteria of 2% of the total budget per year until 2020	EUR 1.2 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 (31/12/2018)	Target	Latest known results (31/12/2019)[23]
EUR 0.1 million	100% recoveries and correction of specific errors	EUR 0.1 million

[22] 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.

[23] 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 latest known results for indicator 3.

Indicator 4: Proportion of exceptions **Source of data:** Internal		
Baseline (31/12/2017)	Target	Latest known results (31/12/2019)
0.22%	< 1% of transactions per year	0.29% The exceptions and non-compliance events amount to 0.29% 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 2019 with 32,282 transactions and 19,841 of them were payments.
Indicator 5: Quality of procurement procedures submitted to the PPAG **Source of data:** Internal		
Baseline (31/12/2017)	Target	Latest known results (31/12/2019)
95%	≥ 95% per year	97% In 2019, 104 files were screened by the PPAG, representing a value of approximately EUR 184 million. In the vast majority of cases, 101 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 2019:

A number of initiatives set out in the JRC's Management Plan for 2019 brought real efficiency gains as the year progressed.

As the business domain owner for the **eProcurement project** the JRC oversaw real and substantive progress with the following highlights:

- The successful roll-out of PPMT (the JRC's 'back office" IT platform for EU procurement) across all of the Commission's twenty-seven Directorates-General;
- The creation of a revamped PRI(S)MA site on connected, providing a single source of information on all things related to EU procurement within the JRC;
- Over twenty authorised officers now using electronic signatures saving over 1,000 paper files throughout the year with approval given by the ICT programme office for full roll out to all JRC authorising officers in 2020.

The **AGM ('A new Gateway to EU Meetings')** experts payments system went from a pilot to full implementation for all credit lines, saving many thousands of individual IT interactions by financial actors.

Training has taken on a new impetus in 2019 with over fifty different training sessions targeting both internal and external stakeholders on different aspects of the very broad church that is JRC finance and procurement, e.g. PPMT and AGM. In parallel, a new initiative to ensure operational actors are sufficiently trained according to their appointed roles has been refined and presented to the senior management. This will ensure that those who wish to be involved in public procurement will need to first be

trained and, as importantly, successfully tested on their understanding, before being permitted to be part of the buying process.

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 2018	Target 2019	Latest known results 2019
Yes	Yes	Yes – To reach this conclusion the JRC analysed the evolution of the efficiency and cost-effectiveness indicators from 2017 to 2019, 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 2019 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 (31/12/2018)	Target 2019	Latest known results (31/12/2019)[24]
1 - Overall cost of control (%)	5.46%	< 6%	4.52%
1(a) Cost of controls of the procurement stage up to selection of the offer and evaluation	2.62%	< 4%	2.4%
1(b) Cost of controls of the financial transaction	3.09%	< 4%	2.74%
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 2018	Target 2019	Latest known results 2019
Yes	Yes	Yes - To reach this conclusion the JRC analysed the evolution of the efficiency and cost-effectiveness indicators from 2015 to 2019

Indicator	Baseline (31/12/2017)	Target 2019	Latest known results (31/12/2019)[25]
1 – Overall cost of control (%)	0.25%	≤ 0.3%	0.22%

Indicator 3: Implementation of internal control principles in the JRC
Source of data: Internal

Baseline	Target	Latest known results

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

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

(31/12/2016)	(2020)	(31/12/2019)
3.4	3.6	3.5/5 The indicator's numerical value represents the weighted average of the results of the survey that was carried out in 2019 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 overall results show a general improvement of the perception regarding the implementation of the internal control principles (around +13%): major progress has been made on the risk assessment component, while the internal communication still shows potential for improvement, especially regarding awareness of the whistleblowing procedure. 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 (31/12/2018)	Target	Latest known results (31/12/2019)
93%	Target of ≥ 93% per year	93.5% A higher value than the target and steady at the same average of the last 2 years. The average was heavily affected by the late payments occurring in January (timeliness of 79.7%) due to the carry-over activities and the introduction of two new systems dealing with payments for experts (AGM and EMI) both of which far exceeded the outputs target towards the end of the year (97%).
Indicator 5: Contractual income **Source of data:** Internal		
Baseline (31/12/2018)	Target (2020)	Latest known results (31/12/2019)
21.68%	15%	**19.35%** The contractual cashing indicator (as a percentage of the institutional budget[26]) has decreased from 21.68% of last year to 19.35%, which was expected since the target 2019 was significantly higher than the target 2018; nevertheless, in 2019 the indicator remains significantly higher than the target of 15% and clearly evidencing the efficiency of the controls performed.

10.3 Annex related to 'Fraud prevention, detection and correction'

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

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

the methodology provided by OLAF. **Source of data:** Internal		
Baseline	Target	Latest known results 2017
December 2013[27]	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 (31/12/2019)
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: 3.8 Management: 4.5 Staff (other than management): 3.6 Compared to 2018, the results show an increase in the anti-fraud awareness from 3.5/5 to 3.8/5. In addition, a significant drop in the percentage of the 'don't know' replies from staff members (from 17% to 5%) and 0% of 'don't know' replies from staff with a management role
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 (23/07/2019)
Monitored regularly throughout the year and formal reporting at least once per year	Twice per year	Monitored throughout the year; formal report issued on 23/07/2019

10.4 Annex related to Chapter 1.3. 'Other control objectives: safeguarding of assets'

1. eProcurement project

The main achievements for 2019 are detailed below.

ePreparation

The roll out of PPMT to all Directorates-General of the European Commission and its executive agencies was completed. Additional features leading to further efficiency gains were delivered, including:

[27] Year of first launch

- a structured file in ARES with a sub-file to store tenders received via eSubmission,
- population of a draft contract notice,
- populated and harmonised procurement templates,
- corporate documentation,
- creation of the call for tender space in eTendering,
- eSignatory in ARES giving approval of the opening committee.

Integration with other parts of the eProcurement suite (e.g. eTendering, eNotices, eSubmission) also advanced substantively in 2019.

Submission and evaluation

The main achievement in 2019 was the roll out of the new eSubmission solution integrated with MyWorkplace, ARES and the Finance and Tendering Portal.

The new version integrates with ARES and received tenders are automatically stored in a sub-file created by PPMT accessible only by the Evaluation Committee. With the good cooperation of the Secretariat-General, this solution is also available where the contracting authority does not use ARES.

Esubmission is already in use and is mandatory for tenders using the open procedure – with more than thirty calls published and a number of opening sessions performed successfully.

A study on the existing evaluation tools SEP Evaluation, (grants domain in the research family), and PROSPECT, (external actions calls for proposals) was completed. The study analysed the tools' strengths and weaknesses from a procurement perspective and included a basic gap analysis with key business requirements in the procurement domain. As a next step, a detailed business analysis will define the requirements for the eEvaluation procurement solution.

Contract management

Business process modelling was a priority throughout the year and will remain so for some time.

In the frame of the OPSYS[28] programme, a first pilot for contract management was deployed in production. This development will act as the basis for the future eProcurement contract management solution for functionalities not covered by SUMMA[29].

At the same time, a prototype on a standard S4Hana (SAP) system was set up and shown to the user community. This prototype demonstrates the out-of-the box functionalities of S4Hana.

Inventory management and logistics

[28] https://europa.eu/capacity4dev/opsys

[29] SUMMA programme will replace ABAC, the corporate information and accounting IT tool

The proof of concept for inventory trackers was delivered and will be rolled out to production.

For the business modality 'Movement of goods', a prototype with the new S4Hana architecture has been completed, and further solution design and a detailed gap analysis started.

In addition to the above a number of transversal activities spanning across the four business processes were undertaken namely:

A study on low value procurements has been delivered and presented to the user community.

A study on interoperability with solutions such as BRIS and eCertis has started. Efforts were directed towards corporate rollout and migration strategy.

E-invoicing - the solution has been aligned to the European standard and integrated with PEPPOL 3.0.

2. JRC assets

The JRC assets comply with the following criteria: a) acquisition value above EUR 5,000; b) controlled by the JRC, c) expected to be used during more than one reporting period. Items with an acquisition value below the EUR 5,000 threshold are booked as expenses in the accounts. Nevertheless the JRC records sensitive items below this threshold in the inventory system (ABAC ASSETS) to have control over them.

The organisation of asset management in the JRC is determined by the nature of the activities. There is a management centre per operational site, having functions as inventoried items manage. Each site has a write-off committee that supervises the site asset management activities and issues an annual activity report. The JRC asset manager and the JRC accountant provide support and coordination to the operational sites and liaise with the Commission services in matters concerning asset management.

The JRC owns stock with a value of EUR 46 million (as reported in the JRC's balance sheet in Annex 3, Table 4).

The JRC site in Geel produces reference materials for sale. A specific IT tool, PROFIT, is used for the management of the stock and the sales. The valuation of the JRC stock is carried out, according to International Public Sector Accounting Standards (IPSAS) rules at the net realisable value, which is estimated to be lower than the production cost. The stocktaking in 2019 was carried out in accordance with the approved sampling procedure using a method which had not been subject to a finding from ECA during their statement of assurance (DAS) audits.

The JRC has a stock of nuclear fissile materials for research purposes in its sites in Geel, Karlsruhe and Ispra. A dedicated accounting tool is used to ensure that all requirement of the Euratom agency are met which guarantees the correctness of the stock movements of these materials.

The Ispra central workshop store uses a dedicated IT tool to manage the stock of raw-materials used in the scientific laboratories and for site management purposes.

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 2019-2020 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 [30]		
Baseline (2012)	**Target** (2020) Europe 2020 target	**Latest known results** (2018)
2.00%	3.00%	2.12%
Impact indicator 2: Employment rate population aged 20-64 **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020) Europe 2020 target	**Latest known results** (2018)

[30] 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.

69.2%	At least 75%	73.2%
Impact indicator 6: GDP growth **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020)	**Latest known results** (2017)
1.7%	Increase	2.0%
Impact indicator 9: Resource productivity: Gross Domestic Product (GDP, EUR) 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)
1.84 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: (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		Related to spending programme: H2020
Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[31] 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** (2019)
88%	> 88%	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	94%
Result indicator 2: Weighted average of overall customer satisfaction **Source of data:** JRC internal indicator			

[31] 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 (2017)[32]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2019)
N/A	N/A	N/A	N/A
Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2019 (2020; JRC activities)			
Main outputs in 2019:			
Policy–related outputs / Main expenditure outputs[33]			
Description	Indicator	Target	Latest known results (situation on 31/12/2019)
Outputs in the area of 'Agriculture and rural development'	Policy related outputs	16	46
Outputs in the area of 'Education, culture, youth and sport'	Policy related outputs	6	15
Outputs in the area of 'Environment'	Policy related outputs	46	88
Outputs in the area of 'Maritime affairs and fisheries'	Policy related outputs	6	38
Outputs in the area of 'Health and food safety'	Policy related outputs	14	58
Outputs in the area of 'Regional policy'	Policy related outputs	22	47
Outputs in the area of 'Research, science and innovation'	Policy related outputs	12	48
Outputs in the area of 'Transport'	Policy related outputs	16	21
Outputs in the area of 'Employment, social affairs, skills and labour mobility'	Policy related outputs	10	8
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)			**369**

[32] 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.

[33] 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.

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)
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** (2018)
	(2013/ 2014)	(2015/ 2016)		
15.2%	15.6%	16.9%	20%	18.0%

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** (2018)
1 577.4 million tonnes of oil equivalent (Mtoe)	20% increase in energy efficiency (No more than 1 483 Mtoe of primary energy consumption)	1 551.92 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)
1 115.45 million tonnes of oil equivalent (Mtoe)	20% increase in energy efficiency (No more than 1 086 Mtoe of final energy consumption)	1 124.14 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[34] 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** (2019)
77%	> 77%	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	106%

Result indicator 2: Weighted average of overall customer satisfaction

Source of data: JRC internal indicator

Baseline (2017)[35]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2019)
N/A	N/A	N/A	N/A

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2019 (2020; JRC activities)

Main outputs in 2019:

Policy–related outputs/ Main expenditure outputs[33]33

Description	Indicator	Target date	Latest known results (situation on 31/12/2019)
Outputs in the area of 'Climate Action'	Policy related outputs	14	19
Outputs in the area of 'Energy'	Policy related outputs	40	103

[34] 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.

[35] 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 'Safe, secure and sustainable use of the nuclear energy'	Policy related outputs	45	106
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)			**228**

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** (2018)
17.0%	20%	17.1%

Impact indicator (17): Intra-EU trade in goods (% of GDP)
Source of the data: Eurostat

Baseline (2014)	**Target** (2020)	**Latest known results** (2018)
20.3%	Increase	21.7%

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[36] 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** (2019)
85%	> 85%	Indicator introduced in 2016. Long-term target not set; data	100%

[36] 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.

		and time series are being assessed.	
Result indicator 2: Weighted average of overall customer satisfaction **Source of data:** JRC internal indicator			
Baseline (2017)[37]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2019)
N/A	N/A	N/A	N/A
Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2019 (2020; JRC activities)			
Main outputs in 2019:			
Policy–related outputs / Main expenditure outputs[33]			
Description	Indicator	Target date	Latest known results (situation on 31/12/2019)
Outputs in the area of 'Internal market, industry, entrepreneurship and SMEs'	Policy related outputs	38	112
Outputs in the area of 'Customs policy and the fight against fraud'	Policy related outputs	3	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)			**106**

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	**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 2020)

[37] 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.

2017] to take into account data revisions)			
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[38] 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** (2019)
72%	> 72%	Indicator introduced in 2016. Long-term target not set; data and time series are being	86%

[38] 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.

		assessed.	
Result indicator 2: Weighted average of overall customer satisfaction **Source of data:** JRC internal indicator			
Baseline (2017)[39]	**Interim Milestone** (2017)	**Target**	**Latest known results** (2019)
N/A	N/A	N/A	N/A
Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2019 (2020; JRC activities)			
Main outputs in 2019:			
Policy–related outputs / Main expenditure outputs[33]			
Description	Indicator	Target date	Latest known results (situation on 31/12/2019)
Outputs in the area of 'Global safety and security'	Policy related outputs	23	75
Outputs in the area of 'International cooperation and development'	Policy related outputs	19	23
Outputs in the area of 'Neighbourhood And Enlargement Negotiations'	Policy related outputs	N/A	2
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)			**100**

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

[39] 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.

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 2018-19. 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 2019.

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

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2019 (2020; JRC activities)

Main outputs in 2019:

Policy–related outputs / Main expenditure outputs[33]

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	23	20
Building partnerships with international organisations, as part of the implementation plan on strategic partnerships	Number of new formal understandings with international partners Number of formal meetings with international organisations	3 20	1 agreement with CERN 8 meetings with Chinese partners
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	8
Follow-up of bilateral agreements with Member State's main national research organisations and associations in the	Number of steering committee meetings	4	3

context of the Euratom programme			
Coordination of agreements with international institutions, as the Euratom (technical) representative (Euratom-Japan AEA, Euratom-USA, GIV International Forum and EC support programme to IAEA)	Number of steering committee meetings	4	4
Information material for stakeholders: monthly 'Science & Policy briefing' to ensure impactful outreach	Number of subscribers	250	281
Open access to JRC knowledge resources	Share of JRC peer-reviewed publications published in compliance with the JRC open access policy and Horizon 2020 principles[40]	95%	96%
Steering the continuous scientific development of the JRC through novel instruments like JRC Art and Science initiative, allowing JRC scientists engage with the public and have a better understanding of societal concerns; Resonances II Science and Art Festival and Exhibition on the topic of Big Data	Number of visitors	> 25,000	Exhibition in the BozarLab (Brussels) had 1035 visitors[41]. A Resonances III installation was placed visibly at the entrance of the Bozar where roughly 26,887 visitors passed. Approximately 2000 internal and external visitors visited the full Resonances III exhibition at JRC Ispra. Other: Milan Digital Week (400 visitors), STEM-A in Milan

[40] Corresponding author must be affiliated with the JRC.

[41] The number of visitors to the full Resonances III festival and exhibition in Brussels was lower than estimated because the contract was made with the BozarLab and not with the Bozar. However, over the course of the year, the Art and Science Resonances was promoted during several smaller scale exhibitions and events.

			(100), Pohoda Festival (5000), Smile-to-vote at JRC site in Brussels and EU Parliament (500)
Exploratory research (ER) programme with partner institutions underpinning policy support and excellence in research, and building competences in emerging policy relevant areas	Share of JRC scientific staff actively involved through the ER Programme, the Collaborative Doctoral Partnership (CDP) scheme or the Centre for Advanced Studies (CAS) Share of exploratory research activities from 2019 call proposing research in or related to social sciences, art or humanities	> 3% > 35%	2.6% of JRC scientific staff were working in exploratory research, including ER, CAS, CDP 50%
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 JRC relations with leading academic institutions	Number of doctoral students co-supervised by JRC through the CDP scheme	≥ 15	16 students started under the scheme. 15 students started at the universities and 1 in JRC in the field of machine learning. 17 new CDP agreements were signed in the course of 2019.
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)	≥ 5	5 projects running in 2019
Open access to JRC research infrastructures (physical)	Number of users	100	56 The number of users is lower than expected because many calls were opened in Q4. Also, in some fields few or no proposals were received. Therefore, the calls reopened or the

			duration was prolonged into 2020.
	Number of calls Number of new JRC research infrastructures providing access through the scheme Number of scientists trained in using JRC research infrastructure	7 3 45	19 4 19 Only 1 call was opened instead of 2
Coordination of JRC Standardisation related activities: executing JRC 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)	Report to responsible DG (DG Internal Market, Industry, Entrepreneurship and SMEs)	Q1	All documents related to Action 2 on linking research and innovation with standardisation were delivered in Q1
Setting up of JRC Academy, as part of the JRC Education and Training strategy and aligned to a wider EU Academy concept, to provide courses in different areas at the science policy interface and promote existing training capability at JRC	Setup of learning platform Number of pilot online courses	Q2 ≥ 5	The Information Technology and Cybersecurity Board (ITCB) approved the development of an EU Academy instead of a JRC Academy, which delayed the development of the platform.

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[42] – 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[43])

Baseline (2015)	**Interim Milestone** (2018)	**Target** (2020)	**Latest known results** (2018)
36%	> 36%	> 36%	40.5%

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%	76%

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%	75%

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)
24% 2015: 24.3%	24 ± 3%	24 ± 3%	23%

Completed evaluations: JRC Productivity and Impact Evaluation (PRIME) 2019 (2020; JRC activities)

Main outputs in 2017:

Policy–related outputs / Main expenditure outputs[33]

Description	Indicator	Target	Latest known results

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

			(situation on 09/02/2018)
Publication of scientific results in peer reviewed journals	Peer-reviewed publications listed in SCI-e and SSCI	> 680 (SP 2020) > 659 (FP 2019) 666 (FP 2020)	601[44]

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 those already obsolete (with no foreseen further use) or those still in use ('future liabilities'). 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, starting the decommissioning of the facilities ceasing operation immediately after shutdown rather than deferring decommissioning assuming that lower 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 nuclear installations considered and the final disposal of historical wastes would be achieved around 2035. The updated JRC strategy and budget (2017) define 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 to 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. The Commission proposal has not yet been adopted by the Council.

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 2019:

Description	Intermediate target (end of 2019)	Final target	Latest known results
At JRC level			
Evaluation of the D&WM programme[45]	Document published	Document published (2020)	A draft under revision by Expert Group

[44] Control with external references database returns 880 peer-reviewed articles for 2019 (Scopus; February 2020)

[45] Replacing the foreseen Progress Report from the Commission to the Council and the European

New instrument for the next Multi-annual Financial Framework[46]	Definition of organisational and planning approach to implement the new instrument at JRC (2019-2020)	Implementation of new instrument (2021)	Awaiting adoption of the Council
Decommissioning and waste management activities at Ispra site			
Management of Nuclear Material and High Level Waste up to its Intermediate Storage	Continuation of preparatory work for the most effective dry storage option. Decision on reprocessing alternatives Transit Safe Area approved for operation Completion of dry pits emptying (early 2019) Preparatory work for Roman pits emptying	Roman pits emptied (2022) Storage facilities for nuclear material and High Level Waste ready (2024)	Started investigations on potential routes for off-site storage Management decision on reprocessing postponed to 2021 Transit Safe Area commissioning completed, waiting license from national authority Last dry pit expected early 2020
Establishment of waste treatment and characterisation facilities	Supply of electromechanical equipment Procurement of containers launched Specific contract signed for 1st super-compaction campaign after approval by safety authorities	Grouting facility (2021) Final waste package containers (2021) Waste characterisation and super-compaction	Grouting station construction ongoing Procurement containers postponed Super-compaction pending approval from national authority

Parliament

[46] European Commission draft proposal for a Council Regulation establishing a dedicated financial programme for decommissioning of nuclear facilities and management of radioactive waste, and repealing Council Regulation (Euratom) No 1368/2013, COM(2018)467 final

	Launch of construction of facility for retrieval of bituminised waste		Contract for construction of retrieval facility started
Decommissioning of obsolete facilities including clearance	Intermediate Storage Facility license modification approved 'Clearance' of waste from decommissioning defined STRRL license conversion	 'FARO' facility decommissioned (2020) STRRL facility (excl. Tank Farm) decommissioned (2024)	Intermediate Storage Facility license modification granted
Pre-decommissioning - waste management activities at Karlsruhe site			
Management of Nuclear Material and High Level Waste in view of its Interim Storage and/or removal Reduction of commercial spent fuel inventories	Qualification of welded pins and organisation of transport with/by owner for spent fuel	100% of commercial spent fuel on which post-irradiation experiments have been completed, returned to utilities (2021)	Transportation license (for one transport) issued by German ministry in December 2019 One transport scheduled in February/March 2020
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 (2035)	Ongoing: progress in identification and characterisation of materials
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	100% of the budget committed (2027)	Start-up of the German final repository is delayed to 2027

Decommissioning of obsolete equipment	10 glove boxes decontaminated and dismantled Different routes for dismantling of legacy glove boxes to be assessed 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	10 glove boxes decontaminated in 2019 Assessment ongoing Disposal of historical waste ongoing
Pre-decommissioning and waste management activities at Geel site			
Management of Nuclear Material and High Level Waste up to its Intermediate Storage	Agreement reached with NIRAS on nuclear material that can be accepted as unconditioned waste	100% of identified materials evacuated (in 2022)	Discussions have been started with NIRAS on acceptance of nuclear material as unconditioned waste
Decommissioning of obsolete equipment	75% of clearance measurements of VDG equipment done 75% 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 (in 2020) 100% of obsolete glove boxes evacuated (in 2020) Collection tank, pumping room and all pipes leading to the central collection tank evacuated (in 2019)	50% of obsolete VDG equipment has been cleared or disposed as radioactive waste Request for disposal for 30% of glove boxes has been made to NIRAS Clearance measurements of 100% of collection tank and pumping room has been made; demolishing and evacuation as cleared waste scheduled in 2020; removal and clearance measurements of remaining pipes to be finished by 2022
Pre-decommissioning - waste management activities at Petten site			

Management of Nuclear Material and High Level Waste up to its Intermediate Storage	Agreement with the HFR license holder on the final inventory for the legacy waste in the Petten site	100% of JRC legacy waste (also un-irradiated experimental fuel) evacuated	Agreement on inventory ownership under administrative finalisation
Decommissioning of HFR	Provide the financial guarantee requested by the regulatory body in close cooperation with other JRC services; Contacts with Dutch Authorities and Government to explore different options for HFR decommissioning	Decommissioning of HFR (tentative shutdown date: 2025-2026) Updated Decommissioning Plan (every 5 years)	Updated decommissioning plan finalised (2018)

ANNEX 14: JRC core indicators

Management information need	Indicators	Definition	Target (year)	Value 2019	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	398 (2019) 402 (2020)	343	
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)	40.50% (22/01/2020)	
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)	76%	
MP Specific objective 11	Peer-reviewed publications listed in SCI-e and SSCI	Number of peer-reviewed publications listed in SCI-e and SSCI	> 659 (2019) 666 (2020)	601	
Achievement of policy related objectives and deliverables					

Management information need	Indicators	Definition	Target (year)	Value 2019	Comments
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	SOs 1.1 to 1.9 = 94% SOs 3.1 to 3.3 = 106% SOs 4.1 to 4.3 = 100% SOs 9.1 to 9.3 = 86%	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	100% of customer are very satisfied or satisfied about how the JRC managed the project	New indicator. Pilot test was run in 2017. It is not possible to break down the feedback according to the specific objectives
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)	75%	
SP Specific objective 11	International	Number of peer-reviewed	24 ± 3%	23.16%	

Management information need	Indicators	Definition	Target (year)	Value 2019	Comments
SPP Key performance indicator 3	collaborations	publications high impact journals co-authored with organisations from countries outside ERA/total number of peer-reviewed publications high impact journals	(2020)		
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	1150 (2019)	Total JRC policy related outputs **1133** SOs 1.1 to 1.9 = 369 SOs 3.1 to 3.3 = 228 SOs 4.1 to 4.3 = 124 SOs 9.1 to 9.3 = 100	
Public visibility					
Part 2.E	Articles in the media	Total number of articles in the media	3500 (2020; provisional)	4393	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 (2020)	> 4.4 million	The statistical tool used to monitor this indicator changed as from 01/01/2017. Results are not comparable.
		Number of visits to the JRC website	3b. 2.4 million (2020)	~ 2.3 million	

Management information need	Indicators	Definition	Target (year)	Value 2019	Comments
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% (2019)	97%	
Payments					
Part 2.B - Objective 2 (Indicator 4)	Timeliness of payments	Proportion of payments done within legal time limits	≥ 95% (2019)	93.50%	
Internal Control					
Part 2.B Objective 2 (Indicator 3) SPP Key performance indicator 5	Implementation of internal control principles in the JRC	Average of scores obtained from the annual survey on the implementation of Internal Control	3.6 (2020)	3.5	The indicator's numerical value represents the average of scores, ranging between 1 ('Fully disagree') and 5 ('Fully agree')
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% (2020)	19%	
Perspective 3: Working environment					
Equal opportunities					
SP Part 2.A (Indicator 1)	Percentage of	Number of women/(Number of	7 first female	6 first female	7 first appointments by

Management information need	Indicators	Definition	Target (year)	Value 2019	Comments
	female representation in middle management	women + men) in middle management positions	appointments (2019) 35% (2019)	appointments 22%	2019 for the JRC as defined in SEC(2017)359

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

Introduction

Part 15.1 of this annex (Table 15.1) lists all the **Knowledge and competence centres**. The knowledge centres and competence centres are integral parts of the knowledge management activities of the JRC. These virtual entities bring together experts, stakeholders and knowledge from inside and outside the European Commission. Knowledge centres are built around topics, while competence centres focus on analytical tools. Together, they inform policymakers, stakeholders and interested citizens about the latest scientific findings relevant to their respective remits. They provide contextualised evidence, reviews, data analysis and visualisation, communicating in a concise way through visual and digital channels. In 2019, a new competence centres was launched, bringing the total to 13 operated by JRC. Emulating the JRC's initiative, the Knowledge Centre on Interpretation launched by the Directorate-General for Interpretation in 2018 consolidated its position as the single go-to space on conference interpreting and more.

Part 15.2 presents a list of the latest **#Facts4EUFuture Flagship reports**. The EU, as all global actors, is facing major worldwide transformations and will be for years to come. The new European Commission will be under tremendous pressure to take a leading role in tackling the many challenges of change. To address the challenges and ensure competitiveness and well-being for all EU citizens, the Commission needs to have of a solid analytical basis. This is why the JRC initiated in 2018 the production of a series of future-oriented "flagship" reports to provide a more solid understanding of some aspects of such challenges. The first report focused on Artificial Intelligence (published in December 2018). In 2019 the JRC published seven more, described in table 15.2, which provide a state of the art analysis of highly political current research, integrating novel JRC data with broader overviews of the state of global knowledge in the field. They translate complex research into information that can be used for decision-making. A transversal reading of the reports may highlight some interrelated challenges the EU will have to face in the near future, such as the need for governance and the importance of rebuilding trust, ensuring sustainability, and investing in the EU's competitive advantage at global level.

The remainder of this annex 15 highlights some of the **JRC's scientific achievements and activities**[47] as well as of corporate initiative. The examples relate to all JRC's scientific activities and are ordered under the 10 Commission priorities. A table at the end of this annex lists 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'.

[47] As also described in the JRC Annual Report 2019

15.1 Knowledge and competence centres

Table 15.1 - Knowledge and competence centres – bringing scientific knowledge and tools to the policymakers

The Knowledge Centre for Territorial Policies (KCTP)
It gathers, manages and makes sense of the vast amount of knowledge available on European cities and regions to help boost their competitiveness, preserve their diversity, and improve the quality of life of their citizens, while strengthening the Commission's overall support to territorial development.
The Knowledge Centre on Migration and Demography (KCMD)
It provides evidence and knowledge for EU policies related to migration and demography. Supporting the European Agenda on Migration, the focus is on analysing comprehensively and systematically developments on a global scale and their societal impact on the EU in the medium to longer term.
The Knowledge Centre for Disaster Risk Management (DRMKC)
It gathers, manages and makes sense of the vast amount of knowledge available on European cities and regions to help boost their competitiveness, preserve their diversity, and improve the quality of life of their citizens, while strengthening the Commission's overall support to territorial development.
The Knowledge Centre for Bioeconomy (BKC)
It collects, structures and makes accessible data and information on the bioeconomy from different sources, pulling together the knowledge and expertise needed to assess the status, progress and impact of the bioeconomy.
The Knowledge Centre for Food Fraud and Quality (KC-FFQ)
It aims to create a formalised science/policy interface to support initiatives for safeguarding the quality and authenticity of agri-food products and protecting the integrity of the food chain. It complements the activities of the EU Food Fraud Network.
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It aims to create a formalised science/policy interface to support initiatives for safeguarding the quality and authenticity of agri-food products and protecting the integrity of the food chain. It complements the activities of the EU Food Fraud Network.
The Knowledge Centre on Global Food and Nutrition Security (KC-FNS)
It makes the existing information and tools available to EU policymakers and stakeholders, identifies priority topics to foster better knowledge and collaboration around these, and promotes the European Commission's role in generating new knowledge and supporting relevant international initiatives.
The Competence Centre on Composite Indicators and Scoreboards (COIN)
It develops methodologies to construct robust composite indicators that help policymakers shape policy and monitor progress. COIN is renowned worldwide for its expertise on statistical methodologies and technical guidelines.
The Competence Centre on Microeconomic Evaluation (CC-ME)
It helps to enhance the EU policy process through ex-post causal evaluation and impact assessment. It also provides advice on data collection and evaluation design, capacity-building on counterfactual methods, microeconometric analysis and counterfactual impact evaluation.
The Competence Centre on Text Mining and Analysis (TMA)
It addresses policymakers' needs for timely access to relevant information that is often buried in large amounts of textual data. TMA is relevant to virtually all policy areas and the centre provides the skills and expertise required: computational linguistic research, applied IT and support.
The Competence Centre on Modelling (CC-MOD)
It leverages modelling capacity and competences across the Commission and beyond. Starting with a Commission-wide modelling inventory, it supports the proper documentation, use and reuse of models, further helps in identifying

common approaches to quality and transparency of model use, and establishes a community of practice on modelling.
The Competence Centre on Foresight (CC-Foresight)
It provides direct strategic and future-oriented input into EU policymaking, boosts the uptake of foresight and forward-looking approaches, and continuously advances in-house foresight capacity, methods and tools to make it more practical for decision-making processes. One of its prominent outputs is the Megatrends Hub, a dynamic collective intelligence system assessing a set of 14 global megatrends relevant for the future of Europe.
The Competence Centre on Technology Transfer (CC-TT)
It complements other JRC activities in the broader domain of support to innovation policies and makes available operational experience and understanding of the technology transfer process – for example, for the practical implementation of smart specialisation strategies and for a deeper understanding of the role of technology transfer in innovation ecosystems.
The Competence Centre on Behavioural Insights
It provides the competences and tools for applying behavioural evidence in policymaking, liaising with international players such as the OECD through a Community of Practice. It identifies behaviours and specific groups to be analysed, collecting the relevant evidence, testing alternative policy interventions and eventually informing policy decisions.

15.2 #FACTS4EUFUTURE FLAGSHIP REPORT

With its wide range of expertise, the JRC was able to look at multifaceted issues through an interdisciplinary analysis. The reports make the point on current knowledge and evidence, and they translate complex research into useful information for decision-makers. They also look at future developments, and in some cases develop future scenarios.

Blockchain Now and Tomorrow

Blockchain technology is still in the embryonic stage and faces many challenges, such as performance and scalability, energy consumption, data privacy, integration with legacy infrastructures, or interoperability. Still based on a limited set of proven use cases, blockchain often entails additional risks and barriers for businesses and organisations piloting it or interested in its deployment.

Blockchain will complement or interact with other key digital technologies, such as artificial intelligence, internet of things, data analytics, cloud computing, robotics and additive manufacturing. To avoid overlaps and maximise impact, Blockchain should be developed in connection to initiatives and programmes relevant to these.

Policy dilemmas today involve balancing adequate enforcement of existing regulations from day one, and flexibly accommodating an evolving technology with both foreseeable and unforeseeable benefits. Foresight and trend monitoring can help achieve this and enable preparedness and adaptation to an increasingly rapid pace of change.

The report was published on 8 October 2019.

The changing nature of work and skills in the digital age

New technologies do not seem so far to have a large impact on employment levels, but they will reshape millions of jobs in the EU: they are changing what people do on the job, and how they do it, by adding new tasks, modifying existing ones, and transforming work organisation. This is leading to the growth of employment and salaries in occupations requiring digital or non-cognitive skills, or a combination of both.

Digital technologies provide incentives for employers to contract out work, while enabling workers to work remotely and in novel structures. Thus, they are one of the main drivers of the rise of platform work, solo freelancers, and work contracts of short duration in the EU.

The employment landscape is evolving differently across the EU, with the divide between and within EU Member States remaining large, and at times widening, especially between capital city and other regions.

The report was published on 24 September 2019.

Demographic scenarios

With the EU's population ageing the future EU labour force will be smaller. But it will also be more highly educated and so more likely to better adapt to changing employment conditions. The number of workers with a short post-secondary education (e.g. technical training), bachelor's and master's degrees or higher is projected to grow from 35% to almost 60%.

Increasing labour force participation, notably of women, is an effective strategy to address challenges from an ageing population. If all EU countries achieved labour force participation rates as in Sweden today (longer careers and high labour force participation of both men and women), the labour force would stabilise at about 245 million workers in 2060.

Intra-EU mobility is leading to substantial population changes within the EU. In particular, some southern and eastern Member States face severely declining populations due to a combination of low fertility and sizable emigration, especially of their young, working-age population.

The report was published on 4 June 2019.

Understanding our political nature

Behavioural and social sciences can bring new insight on political behaviour – showing how and why emotions, values, identity affect how we take decisions on political issues. We need to learn to think about how we think.

We cannot separate reasoning from emotions as they are just as essential to decision–making as logical reasoning, and as likely to enhance rationality as to subvert it. Learning to integrate and use emotions could improve decision-making and collaboration in government.

The erosion of trust in experts and in government can only be addressed by greater honesty and deliberation about interests and values. Opening evidence to public scrutiny is crucial to maintain scientific authority. Deliberative democracy and citizens' engagement can be effective response to the loss of trust in democratic institutions.

The report was published on 18 July 2019.

The Future of Road Transport

Road transport is directly linked to economic growth and employment and is an ever-growing contributor to carbon emissions, poor urban air quality and overall energy consumption.

A plethora of disruptive new technologies and social trends is entering road transport, a

sector that remained conceptually unchanged for several decades now. Vehicles' automation and connectivity, low-carbon technologies and sharing trends promise to make road transport more efficient, more accessible, more equitable and cleaner.

Nevertheless, initial evidence shows that without proper policy framework, new technologies keep a vehicle-centric approach to mobility - with the risk of hampering potential sustainability gains. Ambitious and advanced road governance is needed to avoid this caveat and invert this ongoing trend. New technologies are great enablers but a strong political will is essential. The strong social and economic implications of any change to road transport calls for new governance models to be thoroughly tested with citizens' direct involvement.

The report was published on 21 June 2019.

Future of Cities

Notwithstanding the overall trend of growing urban populations, over half of European cities will see their population decline, while almost one in three will grow by more than 10% in the next 30 years.

Cities are hubs of innovation and creativity, with high concentrations of educated people and financial means, and they can scale up solutions quickly and efficiently. New technologies will transform the way people interact, move, live, and work. These technologies will need to be interoperable, integrated, and implemented in an inclusive way to benefit the overall functioning of cities and ensure nobody is left behind.

Housing in cities will have to be rethought to create efficient, affordable, and inclusive neighbourhoods within the constraints of existing infrastructure. Key challenges include infrastructure adaptations for increased inclusiveness; housing affordability, especially for low- to moderate-income households; and building upgrade and conversion of abandoned spaces.

The report was published on 14 June 2019.

15.3 Science for policy highlights

A new boost for jobs, growth and investment

Collective and coordinated efforts at European level continue to be required 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 2019.

Promoting and disseminating Smart Specialisation as a vehicle towards sustainable, innovation-driven territorial development, assisting farmers affected by drought, improving diagnosis and treatment of rare diseases, promoting European cultural vibrancy, exploring non-power nuclear applications, tackling breast cancer treatment inequities, and highlighting critical raw materials supply challenges are just a few examples of Commission activities which the JRC backed with its expertise in 2019.

The role of Smart Specialisation in boosting growth and jobs, and in fostering green competitiveness.

Since the introduction of Smart Specialisation Strategies (S3) as an approach to optimise research and innovation investments in EU regions and Member States, the JRC has played a central role in collecting and disseminating knowledge and experiences about S3 design and implementation in the EU Member States and regions. Over 120 S3 strategies have been developed in the EU up until now, and the joint construction of strategic value chains through interregional S3 cooperation has continued in 2019, with currently 32 interregional partnerships grouped in 3 thematic platforms on agri-food, industrial modernisation and energy, aiming to boost growth and jobs in targeted areas of collaboration.

On a global scale, S3 is increasing applied across all continents, and in 2019 JRC has continued its work on developing S3 as one of the global methodologies for Science, Technology and Innovation (STI) Roadmaps for the achievement of the Sustainable Development Goals (SDGs), through a cooperation with UN DESA and the UN Inter-Agency Task Team (IATT) on the development of a global Guidebook on STI Roadmaps for SDGs and Global Pilot Programme on STI for SDGs.

Back home, the JRC is strengthening the connection between S3 and SDGs in EU Member States and Neighbourhood Regions, piloting a new methodology in Serbia, and testing different governance models for increasing collaboration across national, regional and local actors in support of green competitiveness, e.g. through increased collaboration between S3 actors and European Institute of Innovation and Technology Knowledge and Innovation Communities, as is being tested for the decarbonisation of Slovenia.

Monitoring agricultural resources to assist farmers affected by drought

With the waves of drought afflicting Europe in 2019, the European Commission stood with affected farmers by taking two decisions that added to support mechanisms already available under the Common Agricultural Policy (CAP).

Firstly, farmers were able to receive a higher percentage of their direct and rural development payments in advance. Up to 70% of their direct payments and 85% of rural development payments were made available as of mid-October to improve their cash flow situation.

Secondly, to be able to feed their animals, they were granted greater flexibility to use land that would normally not be used for production. Derogations from certain “greening” requirements were granted, notably on crop diversification and ecological focus area rules

on land lying fallow.

Those decisions were made possible thanks to the JRC contributing its data rich expert system to monitor crop conditions, which in case of need allows for rapid assessments. For instance, for the assessment of pasture conditions across Europe, Copernicus global land service products were used to assess the severity of droughts and shortages in biomass production.

The agricultural resources monitoring work utilises a range of data sources, including meteorological data and forecasts, existing maps and statistics, positional information and remotely sensed data (from satellites and aerial sources). Within the latter, the agricultural resources monitoring work has successfully developed operational techniques related to earth observation. The monitoring activities are based on expertise in crop modelling, agro-meteorology, sampling methods, environmental geo-spatial analysis, econometrics and using European and global data infrastructures.

New online platform improves rare diseases diagnostic and treatment prospects

The JRC has launched a new online knowledge-sharing platform to support better diagnosis and treatment for more than 30 million Europeans living with a rare disease.

Up until now, a vast amount of data on patients with specific conditions has been scattered across Europe in about 600 'registries' – databases that hold information on patients with specific conditions. Data is not collected EU-wide and there are no shared standards to analyse the information that is available on rare diseases. The new European Platform on Rare Diseases Registration brings this data together supporting the quality research that can enhance diagnosis and treatment outcomes - helping to improve the lives of patients and their families.

The Platform addresses the fragmentation of rare diseases data, promotes the interoperability of existing registries and helps to create new ones. It helps scientists, policymakers and patients alike make the most of data on rare diseases that have, until now, remained largely untapped. The Platform includes a registry infrastructure consisting of the European Directory of Registries, which gives an overview of each participating registry; the Central Metadata Repository, which stores all types of variables used by the registries; and a data protection tool, which makes sure patients' remains anonymous.

By providing EU standards for data collection and data sharing, the platform makes it possible to search and compare data of rare disease patients. This significant achievement will allow the creation of critical knowledge for a given disease, enabling research and supporting patients, health care providers and policy-makers.

The platform is an important asset for the European Joint Programme on Rare Diseases which aims to establish a research and innovation pipeline for rapid translation of research results into clinical applications and uptake in healthcare. Through this programme, the platform resources can be used in future research projects and disseminated to a wider community of rare disease researchers, clinicians and patients in the EU and beyond.

Second edition of the Cultural and Creative Cities Monitor launches with digital improvements

The European Commission released the second edition of its Cultural and Creative Cities Monitor, a tool designed by the JRC to benchmark and boost the creative and cultural potential of European cities, which is vital to driving economic growth and social cohesion.

After the success of the first edition in 2017, the 2019 release presented an updated portrait of Europe's cultural and creative richness in an extended sample of 190 cities in 30

countries, including Norway and Switzerland. It was accompanied by a revamped online tool, which enables cities to add their own data for more in-depth coverage and benchmarking.

This second edition notably found that on a Macro-regional performance level, Northern Europe does best. Western Europe leads on 'Cultural Vibrancy', very closely followed by both Northern and Southern Europe. Western Europe is also the top performer on 'Creative Economy', with northern Europe coming close behind. The best job creation dynamics are found, on average, in Northern and Eastern European cities. For instance, jobs in the cultural and creative sectors saw an average yearly increase of around 12% in Budapest (Hungary), Tallinn (Estonia), Vilnius (Lithuania), Krakow and Wroclaw (Poland) and Tartu (Estonia). Consistent with previous findings, leading cultural and creative cities are more prosperous: there is a positive and significant association between the Cultural and Creative Cities Index scores and the cities' income levels.

Taking the concept of mapping the cultural assets of European cities one step further, a 'Cultural Gems' app was also launched, which provides a social sharing platform for local communities to show their hidden cultural spots, and for visitors to discover cultural and creative places off the beaten track. It offers an easy-to-use interactive map focusing on culture and creativity and gamification aspects to engage users.

'Cultural gems' is free and open source: all the data contained in the app is openly reusable, aiming to provide a treasure trove of data for the cultural and creative sectors.

JRC best practices on non-power and novel applications of nuclear technology

In collaboration with the University Hospital Heidelberg and the German Cancer Research Centre, the JRC has developed a novel treatment for metastatic prostate cancer. The treatment allows selective irradiation of cancer cells with alpha particles. The alpha emitter is actinium-225, linked to a peptide showing a strong affinity for the PSMA protein, overexpressed by the prostate cancer cells.

Several tens of patients, who have failed all other conventional hormonal therapy, have been treated at the university hospital of Heidelberg and the University of Pretoria and Steve Biko Academic Hospital. The therapeutic responses observed showed a significant improvement of life, and in some cases, complete response on imaging, indicating a great potential of the therapy for treatment of metastatic prostate cancer. A remarkable response of prostate cancer cerebral metastases following this treatment has been observed in a patient who showed a remarkable resolution of cerebral and skeletal metastases and biochemical response.

With the support of the International Atomic Energy Agency, a program for transferring the techniques to Argentina, South Africa, and Australia, is running; official clinical trials will soon start in Pretoria.

The sustainability of production of the medical radioisotopes poses challenges in the medium to long term. The EU Council requested to look at the medical radionuclide supply chain and clinical use in Europe; the JRC answered launching two studies on the "Sustainable and Resilient Supply of Medical Radioisotopes in Europe". Besides, JRC participates on studies concerning novel routes for the production of radionuclides for medical applications, such as irradiation experiments, development of targets and post-irradiation treatments.

Other examples are the development of Am-241 power sources for space exploration, through a partnership with the European Space Agency. The linear accelerator facility GELINA has been used for applications as archaeology, reference materials characterisation, or combatting illicit traffic of drugs and explosives. The underground

laboratory HADES for radioactivity measurements is crucial for environmental studies such as the effect of climate change in ocean streams.

New European recommendations for breast cancer tackle disparities and inequities across Europe

On the occasion of breast cancer awareness month, in October the JRC presented new, evidence-based recommendations for breast cancer healthcare on a new, enhanced website of the European Commission Initiative on Breast Cancer (ECIBC), better tailored to persons without medical knowledge and using clear language to empower women to take informed decisions.

Recommendations include staging interventions prior to treatment, training healthcare professionals' communication skills, the optimal number of readings for radiologists in screening programmes, and inviting women to screening programmes through digital means.

Breast cancer is the most common cancer among women in the European Union. Statistics from the JRC's European Cancer Information System (ECIS) estimate more than 400 000 new cases diagnosed in 2018. Unfortunately, great disparities and inequities persist across Europe when it comes to breast cancer prevention, early-detection, care and outcomes (i.e. survival). To address this situation, the EU is spearheading many initiatives on cancer, including the ECIBC, which works to improve the quality of breast cancer screening, diagnosis and care across Europe. ECIBC informs women and guides healthcare professionals and policymakers to plan, organise, and deliver effective and accessible breast cancer services. It notably develops and provides evidence-based recommendations and guidelines in a Quality Assurance scheme to facilitate implementation by breast cancer services in EU Member States.

Not only does this help reduce the burden of cancer, it also helps address the avoidable differences in breast cancer incidence, prevalence, mortality and survival, both between and within Member States.

The new website also provides the first release of an online catalogue of trustworthy guidelines for all breast cancer processes after screening and diagnosis (i.e. treatment, rehabilitation, survivorship and follow-up, palliative and end-of-life care).

Addressing bottlenecks in supply of materials for emerging dual use technologies

The EU must address bottlenecks in the supply of materials critical to emerging technologies in Europe's defence and civil (dual-use) industries.

The authors of a JRC report focused on five dual-use technologies: advanced batteries, fuel cells, robotics, unmanned vehicles and 3D printing. They found that Europe is extremely highly dependent on imports of critical raw materials (CRMs) for these technologies as only about 1-5% of the materials come from European countries.

China already dominates global production of these CRMs. It continues to expand its dominant position in the Li-ion battery and drones supply chains, and has ambitious plans in the fields of robotics, fuel cells and 3D printing.

The report recommends that European policymakers introduce mitigation strategies across the whole supply chain as soon as possible. On CRMs specifically the authors suggest supply diversification, increased recycling volumes and the substitution of critical materials should be aggressively pursued, while stockpiling could be considered as a preventive measure in the event of a crisis.

Other recommended actions include creating an attractive investment environment for European companies; using synergies between the civil and defence sectors in order to increase interest in common research and investment opportunities; fostering international collaboration; supporting standardisation activities; and promoting cyber physical security of robotics systems.

In addition to emerging civil/military innovations, raw materials are critical to the production of the green energy and transport technologies that will help the EU achieve its climate goals.

The JRC launched a new interactive tool that shows which materials we rely on, where we get them from and when demand is likely to outstrip supply - like the rare earth metal dysprosium, that's used for the magnets in wind turbines; or cobalt, a key element in lithium-ion car batteries. The tool also gives information on tactics the EU can employ to mitigate the danger of critical materials – diversifying supply, supporting EU production, researching substitutes and promoting recycling.

READ MORE

Annual Economic Report of the EU fishing fleet in support of the Blue Economy

The 2019 Annual Economic Report on the EU Fishing Fleet shows that high levels of economic performance continue, in part due to the improvements of certain fish stocks thanks to more sustainable fishing methods and management.

https://europa.eu/!tc99pM

New online monitoring tool on Active Ageing

The JRC developed an online monitoring tool that measures the level to which older people live independent lives, participate in paid employment and social activities, and their capacity to age actively.

https://europa.eu/!Hu83VN

Measuring innovation for economic and social development

For the ninth consecutive year, the JRC provided independent statistical assessment of the Global Innovation Index (GII) calculations to guarantee the transparency and reliability of the index for both policy-makers and other stakeholders.

https://www.globalinnovationindex.org/gii-2019-report

Mapping Europe's invasive species

The JRC mapped the geographic distribution of invasive alien species (IAS) of concern to the EU. The initiative aims interalia at fostering Member States cooperation and coordination, across borders or within shared biogeographical regions.

https://europa.eu/!HQ83tc

A connected digital single market

The internet and digital technologies have a hugely 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 to tackle the various obstacles to and opportunities for digital transformation.

The JRC is supporting the Commission in shaping and implementing these initiatives which aim to ensure that Europe's economy, industry and employment take full advantage of what digitisation has to offer. Boosting digital literacy in education, fostering biometrics identification capabilities, empowering smart technologies to improve road safety, and promoting cybersecurity cooperation and innovation are just some of the many activities the JRC pursued in 2019.

Teaching and learning in the digital age: SELFIE one year on

SELFIE (Self-reflection on Effective Learning by Fostering Innovation through Educational technology) is the European Commission's free online tool that helps schools assess and improve the ways they use technology for teaching and learning. By the end of 2019, one year after its launch, nearly 500,000 students, teachers and school leaders in 45 countries had used the JRC-developed tool.

Funded through the Erasmus+ programme, SELFIE gathers – anonymously and on a voluntary basis – 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 to initiate the dialogue within the school and action plan to improve the use of digital technologies.

SELFIE is continuously being improved through user testing and gathering feedback from schools. New features include a video guide for schools on setting up and customising the tool and the possibility of comparing results to previous SELFIE exercises in the same school.

In 2020, further support and training materials will be developed, including a Massive Open Online Course for schools on SELFIE and how its results can be used by teachers to improve teaching and learning with the support of digital technologies. A version of SELFIE for work-based vocational education and training is also due to start in early 2020.

SELFIE is one of the 11 initiatives of the Digital Education Action Plan that was adopted by the Commission in January 2018 and runs until the end of 2020. The Action Plan aims at boosting digital skills in Europe and supporting the innovative use of digital technologies for teaching and learning. It is one of several Commission initiatives laying the foundations of a European Education Area.

Biometrics and the Schengen Information System – Fostering identification capabilities

Supporting the implementation of the 2018 EU's Schengen Information System (SIS) legislative reform, the Joint Research Centre presented its recommendations for the successful implementation of facial, fingermark and DNA recognition technologies while also introducing stronger data protection rules, in line with the General Data protection Reform.

The new technologies help border guards to better monitor who is crossing the EU's borders, support police and law enforcement to capture criminals and terrorists, and offer greater protection for missing children and vulnerable adults, in line with the EU's upgraded data protection rules.

The recommendations are meant to enable the already most widely used EU information system to become even more efficient, and thus make Europe a safer place for its citizens.

They also support the implementation of the framework for interoperability between EU police and judicial cooperation, asylum and migration information systems.

A study on fingermark and palmmark recognition concluded that Automatic Biometric Identification Systems (ABIS) based on that technology have matured enough to integrate the SIS as long as its recommendations are implemented.

A separate study described the current state-of-the-art for the generation and use of DNA profiles for identification purposes, including what data, metadata and format to attach to alerts on the SIS database, and the different levels of quality checks to perform before submitting DNA profiles to it.

A third study explored facial recognition technology, and the important improvements that occurred in recent years.

The authors of the three reports emphasised that the quality of the biometric data stored in the SIS database needs constant monitoring, to prevent poor quality data submitted from compromising results accuracy.

The reports will help the European Commission and the European Union Agency for the Operational Management of Large-Scale IT Systems in the Area of Freedom, Security and Justice (eu-LISA) to implement these three technologies in SIS.

The science and technology behind safer lorries

Smart tachographs are connected to the global navigation satellite system (GNSS) and allow for wireless data remote access by control authorities, making the identification of potential offenders easier. From this year, all heavy vehicles newly registered in the EU must be equipped with the device.

Speeding or sleepy drivers are among the main causes of accidents involving heavy vehicles and semi-trailers. Recording driving and rest times, as well as the ability for authorities to check vehicles without stopping them, encourages compliance with safety rules and can provide evidence for law enforcers. EU regulations require that the tachograph components are type-approved and pass security, functionality and interoperability tests. The system security of smart tachographs protects the recorded data from manipulation.

To make sure the devices can be trusted; the JRC defined the security architecture of the system. It also set up and manages the European Root Certification Authority (ERCA) and the Laboratory for Interoperability Certification (DTLab).

The ERCA generates the "secret codes" which authenticate the devices and encrypt the data. It also certifies the keys of national authorities, and manages the master keys used in equipment such as motion sensors, early detection receivers and on-board units. These keys guarantee the digital security of the tachograph data.

The DTLab is the only laboratory in Europe for interoperability certification. It tests tachographs thoroughly and certifies their ability to operate on the network, without which they cannot be sold in the EU. JRC scientists have used this laboratory also to define the smart tachograph and system security specifications that the tachograph components must satisfy.

The JRC provided comprehensive guidance on the cryptographic security mechanisms and on the tachograph components, security tests and certificates, thus allowing industry and authorities to be ready for the mandatory introduction of the smart tachographs.

European Taxonomy empowers cybersecurity cooperation and innovation

Digital technologies are ubiquitous in our daily lives. While the opportunities they enable are plenty, so are the threats. And the more our society relies on digital technology, the higher the stakes of cybersecurity.

But cybersecurity isn't a clearly defined discipline, let alone a unified scientific field, which has somewhat hampered the pace of technical change and innovation and made it more difficult to undertake controlled experiments to advance in the field.

In an effort to address this, the JRC published a study proposing the alignment of cybersecurity terminologies, definitions and domains into a coherent and comprehensive European Cybersecurity Taxonomy. This was done in the context of the Commission's Communication on the establishment of the European Cybersecurity Industrial, Technology and Research Competence Centre and the Network of National Coordination Centres.

A reference cybersecurity taxonomy is essential to categorise EU R&D cybersecurity competencies and to increase the competitiveness of the EU cybersecurity capabilities. The taxonomy proposed by the JRC supports knowledge management activities; enables effective communication among EU institutions and the cybersecurity community; facilitates future cooperation among cybersecurity stakeholders; and supports the governance of future EU cybersecurity initiatives.

The proposed taxonomy adopts a 3-dimensional approach where a knowledge domain (e.g. Cryptology) can be associated to a sector (e.g. Health) and applied in the context of a particular technology or use cases (e.g. Hardware technology).

The resulting three-dimensional taxonomy will initially be used to categorise existing EU cybersecurity competence centres (e.g., research organisations, laboratories, associations, academic institutions, groups, operational centres) according to their cybersecurity expertise in specific domains, and will also be the core of the future European Cybersecurity Atlas. It could also be used in the future to classify and analyse European projects, policy initiatives and more.

READ MORE

Contributing to roadmaps on Connected and Automated Transport

The JRC-run Transport and Research and Innovation Monitoring and Information System (TRIMIS) supported the update of a Strategic Transport Research and Innovation Agenda (STRIA) roadmaps on Cooperative, Connected and Automated Transport.

https://europa.eu/!Pp38GV

JRC tests conformity of eCall emergency response systems

The European Agency overseeing the EU Global Navigation Satellite System (GNSS) launched a testing campaign for eCall devices, inviting all device manufacturers to provide samples for conformity assessment by the JRC.

https://europa.eu/!hy47Dx

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 to slow down global warming and mitigate its effects while ensuring affordable, secure and sustainable energy for businesses and households.

In 2019, 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, helping fight NO_2 pollution and supporting the safe management of spent nuclear fuel and radioactive waste.

Supporting the European Union's global leadership in tackling climate change

To limit climate change world leaders need to know where CO_2 emissions concentrate, how over time emissions change in world regions and countries. The JRC assists the EU's global leadership in tackling climate change with providing up to date scientific information on global greenhouse gas emissions.

The EDGAR database built by the JRC constitute one of the main reference data source of greenhouse gas emissions in support to EU climate and energy policies. The database after its 2019 update comprises CO_2 emissions from 1970 up to 2018 and non-CO_2 greenhouse gas (GHG) emissions, namely CH4, N_2O and F-gases up to the year 2015. A new JRC report 'Fossil CO_2 & GHG emissions for all world countries' based on EDGAR database confirmed the EU's leading role, by showing that fossil CO_2 emissions in the EU dropped by 21.6% compared to 1990, while total GHG emissions were 1.3% lower. However, the report found that global CO_2 and non- CO_2 emissions are still increasing. Relative to 2017 emissions increased by 1.9% in 2018, which increase was mostly driven by growing emissions in India (+7.2%), Russia (+3.5%), the United States (+2.9%) and China (+1.5%).

The World Input-Output Database (WIOD) environmental accounts database, launched by the JRC in 2019 complements the EDGAR and UNFCC databases by providing information on emissions and energy use based on the country of residence of the user/emitter, and not by the country in which the emission/energy use takes place. The database shows that global CO_2 emissions grew by 43% between 2000 and 2016. The growth came mostly from emerging economies such as China, India, Indonesia and Turkey, while the largest decrease was observed in the EU, particularly in countries such as Greece, Sweden, the United Kingdom, Czechia, Italy, Portugal and Belgium.

Finally, to help policy-makers JRC-led group of forest experts has developed a new science-based approach to assess the greenhouse gas impact of human action in the forestry sector. The new approach is based on country-specific projected baselines, which will be used to measure the greenhouse gas impact of future forest activities.

Supporting the EU in leading the way in climate change negotiations

The drivers of climate change and biodiversity loss are global and are not limited by national borders. This is why it is important that the EU continues to lead international efforts and builds alliances with the like-minded parties around the world.

The JRC contributes to these efforts by supporting DG CLIMA in the context of the UN Framework Convention on Climate Change (UNFCCC). JRC performed quantitative analysis of ambition levels and economic impacts by region - these are an important part of the negotiations. These results are being presented at the relevant fora, including during the COP25.

In this context, the JRC is authoring the GECO reports that (annually) are made publicly available in advance of the COP and serve as a basis for discussion for DG CLIMA with international partners. The 2019 edition of the Global Energy and Climate Outlook (GECO)

analysed the role of electrification in global transition pathways to a low Greenhouse Gas (GHG) emissions economy. Electricity is found to be an increasingly important energy carrier in final energy consumption already in the absence of stronger climate policies than those currently in place (Reference scenario), while enhanced electrification of final energy demand is a crucial element of the 2°C temperature change scenario, paving the way to climate neutrality.

Furthermore, the JRC also delivered presentations of its results and contributions at specialised workshops, as well as in the frame of the Strategic Partnerships for the Implementation of the Paris Agreement (SPIPA). In the frame of the latter, the JRC orchestrates the dialogue with China (identified by DG CLIMA as a key actor of the international climate policy process) on a technical level on climate policy options. This dialogue led, among others, to the signature of a research cooperative research agreement between NCSC (National Center for Climate Change Strategy and International Cooperation) and the JRC.

Supporting climate change resilience and adaptation efforts

The JRC contributes to global warming adaptation efforts by assessing the impacts of climate change and equipping decision-makers with the right tools and information to prepare our societies for the upcoming changes.

A prime example of the JRC's work in this area is the PESETA projects, whereby the JRC joins forces with research groups to assess climate change impacts in the EU. In 2019 with the PESETA 4 project, the JRC has deepen our understanding of climate change impacts and adaptation. PESETA 4 estimated both physical and economic damages for five sectors, such as river floods, costal floods, human health, agriculture, and energy, as well as physical damages for another six , including forest fires, wind storms, and habitat loss.

Several JRC studies also examined climate change impact on specific areas. One report assessed the future changes in EU water resources to find that if the objectives of the Paris Agreement are not met the number of Europeans affected by water scarcity will increase from 85 to 295 million by the end of the century. On the other hand, even if the Paris limits are met Central and Northern Europe will be exposed to more severe seasonal floods, while Southern Europe will face water shortages with severe adverse effects on hydropower resources, agriculture and transport. A separate JRC study warned that extreme drought conditions that affected Central and Northern Europe in the spring and summer of 2018 could become the norm within 25 years.

According to JRC scientists, heatwaves will hit developing countries the worst. A study found that populations in developing countries will be exposed to greater levels of heatwave hazard in the 1.5°C warming scenario than populations in developed countries would be under the 2°C scenario. They stressed that heatwave risk could be significantly reduced for both developing and developed countries if global warming can be capped below 1.5°C.

The JRC also explored the climate change resilience. A study from JRC scientists has shown that compared to the 1980's, fatalities and economic loss of extreme climate events have significantly dropped. That being said, they still stressed the need for continued resilience build up efforts, as extreme climate events are ever more frequent.

The JRC offered practical help as well. By developing a new forecasting methodology, JRC experts have helped improve the precision of the Global Flood Awareness System (GloFAS) forecasts. The JRC also shared its knowledge on climate impact assessment across the globe. One example in 2019 was a training session held in Argentina for local authorities within the framework of the Global Covenant of Mayors for Climate and Energy.

Helping fight NO_2 pollution in Europe's cities

According to the World Health Organisation, air pollution is the single largest environmental health risk in Europe. In 2016, Nitrogen Dioxyde (NO_2) alone was responsible for 68,000 premature deaths within the EU. Many European cities still regularly exceed current EU limits for NO_2.

JRC scientists have compiled an Urban NO_2 Atlas with city factsheets for 30 major European cities to help designing effective air quality measures, which can reduce the NO_2 concentration within European cities. The Atlas identifies the main sources of NO_2 pollution for each city examined, helping policymakers to design actions that target them.

In the 30 European cities analysed in the report, road transport with an average of 47% contribution was the main source of NO and NO_2 pollution. The report also shows that shares of road transport in total local NO and NO_2 emissions differ considerably across Europe. In Athens and Milan over 70% of emissions comes from transport, while in Lisbon, where shipping emissions are high, road transport is only responsible for 20% of NO and NO_2 pollution. A closer look on the road transport sector shows that NO and NO_2 in cities mainly originates from the emissions of diesel vehicles. The map below shows that, except in Greece, diesel fuelled vehicles are responsible for the bulk of road transport NO and NO_2 emissions across all EU countries.

The Urban NO_2 Atlas shows that through reducing the flow of NO_2-emitting traffic, cities could lower NO_2 emissions by an average of 40%. NO_2-emitting traffic flows can be reduced by limiting the access of highly pollutant vehicles – primarily older diesel cars – to inner areas of cities. In the Atlas, JRC scientists provide a detailed account of the sources of NO_2 pollution for each of the 30 analysed European cities to help local policy-makers to target their traffic measures.

Energy poverty through the lens of EU research and innovation projects

Over 50 million people in the EU experienced energy poverty in 2018. Energy poverty means that people or households cannot afford to adequately heat their homes or use other essential energy services. The extent and seriousness of the problem have attracted significant attention, and the EU has been funding research and innovation projects to test the effectiveness of various approaches to fight energy poverty.

JRC experts analysed 31 such projects in 30 European countries (EU28 + Norway, Serbia and North-Macedonia). *Digital technologies projects* use information and communications technology (ICT to reduce energy consumption in households at risk of energy poverty, mainly in social housing complexes. *Behavioural change projects* provide tailored advice through home visits of an energy adviser or ambassador. *Financing projects* address the legal and financial barriers to improve the energy efficiency of existing buildings. *Sharing of best practices projects,* research and promote tailored solutions to address the technological, social and financial barriers hindering energy retrofit of social housing in Europe.

The study provided recommendations for future research initiatives and pilot projects. According to the authors, more projects should focus specifically on tackling energy poverty rather than treating it as secondary to meeting energy and climate targets. They also noted that future projects should cover more geographical areas and increase the participation of underrepresented countries. The target population should also be extended beyond social housing as such criteria leaves out many households in real need. Key stakeholders such as distribution system operators, utilities and technology manufacturers should also be better engaged. Success indicators such as property market-value increase, greater comfort, health or well-being should be further investigated as energy and cost savings do not fully respond to energy poverty concerns. Improving information and

consumers' engagement would also be beneficial for higher participation and uptake of lessons learnt.

Contributing to assessing the National Energy and Climate Plans submitted by the Member States

Under the Regulation on the governance of the energy union and climate action (EU)2018/1999 Member States had to submit draft national energy and climate plans (NECPs) for the period 2021-2030 to the Commission by 31 December 2018. These were analysed by the Commission with an overall assessment and country-specific recommendations published in June 2019. The National Energy and Climate Plans (NECPs) are the first ever integrated mid-term planning tools that Member States are required to prepare in view of achieving the Energy Union objectives and towards the implementation of the European Green Deal.

The JRC worked together with DG Energy on the review of the Research, Innovation and Competitiveness (RIC) and Energy Efficiency aspects of the draft NECPs. In particular, JRC carried out a compliance check, a robustness check of the data and an assessment of the assumptions made in the drafts allowing for the evaluation of targets, policies and measures.

The JRC review of the draft National Energy and Climate Plans (NECPs) helped Member States to identify shortcomings in their plans, which eventually will lead improved final NECPs. JRC contributions to the topics of research and innovation, as well as energy efficiency are included in the following communication: 'COM(2019) 285 final - United in delivering the Energy Union and Climate Action - Setting the foundations for a successful clean energy transition'. As an example, the JRC reviewed how SET Plan is translated into national objectives and measures for research and innovation. JRC inputs have been used in each of the 28 Commission Recommendations (C/2019/4401 up to C/2019/4428).

Through this work, JRC supported in providing the framework for Member States to set long-term ambitions for research and innovation as well as for energy efficiency. Also, the setting of objectives for competitiveness is an integral part of national growth strategies as strengths and areas for potential future development of the national low-carbon energy technology sectors are identified, including for decarbonizing energy and carbon-intensive industrial sectors.

Support to the Risk Preparedness Regulation in the electricity sector

The electricity sector in the Union is undergoing a profound transformation, characterised by more decentralised markets with more players, a higher proportion of energy from renewable sources and more interconnected systems. Regulation 2019/971 on risk preparedness in the electricity sector provides an EU-wide system in case of a major electricity supply crisis in this complex context, which often is not restricted to one Member State.

The Article 8 of the Regulation mentions that ENTSO-E shall develop a methodology for the identification of seasonal and short-term adequacy assessments. Article 9 requires that all national, regional and pan-European adequacy assessments shall be carried out in accordance with this methodology. JRC has the mandate to perform a critical review of (ENTSO-E) methodology. During 2019, JRC worked together with DG Energy, ENTSO-E, regional coordination centres and ACER to review the different versions of the methodology prepared by ENTSO-E.

Thanks to JRC support the methodology has improved significantly and it was developed on time. This methodology is very relevant as all Transmission System Operators, Regional coordination centres and ENTSO-E have to assess their systems with this methodology.

The latter has to be used for seasonal outlooks (six months ahead), week ahead and at least day-ahead assessments. The short-term adequacy assessments are crucial in periods of electricity crisis.

JRC helped ensure that the EU has proper methodologies to assess and continuously monitor the electricity system. The final goal is to have a resilient electricity system and to be prepared and ready to deal with potential crises.

Implementing the Directives on Spent Fuel and Radioactive Waste

Radioactive waste and/or spent fuel is a global concern to all Member States. Originating from activities ranging from medical applications to electric power generation, their radiological properties and potential hazard call for their safe management from generation to disposal.

The Council Directive 2011/70/Euratom establishes a Community framework for ensuring the responsible and safe management of spent fuel and radioactive waste and requires that Member States demonstrate that reasonable steps to ensure that radioactive waste and spent fuel is managed safely and that no undue burden is passed to future generations have been take.

To ensure the proper implementation of the Directive, JRC supports the European Commission's Directorate for Energy (DG ENER) in preparation of a comprehensive overview of the situation in the EU in the form of a Commission report to the European Parliament and the Council (adopted on 16 December 2019).

Spent fuel and radioactive waste inventory data makes part of the Commission report. This is a key information to assess whether Member States have taken reasonable steps in their national policies and programmes to avoid any undue burden on future generations. JRC is supporting DG ENER in preparation of transparent and comprehensive overview of the Union-wide inventories, including future prospects.

Since 2015 JRC is working together with IAEA and the OECD NEA to promote greater harmonization of reported data on national inventories and to reduce the overall reporting burden on the member states of these organisations. A harmonized approach will produce benefits to all stakeholders, including the public, as the information reported will become more consistent and easier to report.

As an outcome of this initiative the Spent Fuel and Radioactive Waste Information System (SRIS) has been developed in 2019 by IAEA with financial support from the European Commission.

READ MORE

iRESIST+ explores hybrid structural-plus-energy retrofitting solution

Researchers at the European Commission's Joint Research Centre are exploring novel solutions for simultaneous energy and seismic retrofitting under the iRESIST+ exploratory research programme.

https://europa.eu/!nH77tk

Women travel greener but are more concerned about reliability of new transport technologies

Transport is not gender neutral, as confirms a JRC report that looks at the role of women in transport based on data from the European Commission's Transport Research and Innovation Monitoring and Information System (TRIMIS).

https://europa.eu/!Ph66Dw

Enhancing Resilience Of Urban Ecosystems through Green Infrastructure

In the framework of the EU Biodiversity Strategy and the Green Infrastructure Strategy, EnRoute provides scientific knowledge of how urban ecosystems can support urban planning at different stages of policy and how to help policy-making for sustainable cities.

https://europa.eu/!BN98hQ

Facilitating sustainable biomass use in domestic heating in the Danube region

Biomass is a renewable alternative to fossil fuels, but a recently published JRC report reasserts the need to find balance between the benefits and possible negative impacts the increased use of biomass might have on the environment.

https://europa.eu/!GD44xJ

Upgraded research facilities to enhance nuclear safety in the EU

The JRC in Karlsruhe has been renovating and upgrading its infrastructure to improve further the safety and security of its installations and ensure that it remains a state-of-the-art facility.

https://europa.eu/!cM79JR

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. Likewise, ensuring fair taxation and the correct functioning of welfare systems is 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 2019, the JRC notably explored the relationship between trade and jobs for the EU and its Member States, supported the Eu Action Plan for Sustainable Finance, helped tracking tax mismatches of giant Web-based companies, and assessed the macroeconomic effects of EIB Group-supported operations.

Intra-European trade supports economic growth and employment

The JRC has produced a study on the employment and income impacts of intra-European trade in the EU Member States.

Following up a second edition of EU exports to the world: effects on employment, this study for intra-European trade 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. These exports include goods and services that have other EU countries as destination, independently of whether they are subsequently used to produce other goods and services for a destination outside the EU.

Amongst many interesting findings, the study established that EU exports to other EU

countries support 33 million jobs across Europe in 2014, 21% more than in 2000 and 37% of these jobs held by women. Moreover, the shares of high skilled jobs linked to such exports went up to being more than 25% since 2000 and jobs linked to services exports increased from 21% to 33% in detriment of those of manufacturing exports, which were reduced from 76% to 60%. In addition, EU exports to other EU countries generate EUR 1.9 trillion of value added in the EU.

Exports support jobs all across the EU and the numbers are increasing. Since 2000, the number of jobs supported by exports to other EU countries has increased by 5.8 million. The highest increases since 2000 have been seen in Poland (1.4 million) and Germany (1.3 million) while in terms of the employment participation over the corresponding total employment of the national economies, Bulgaria, Slovakia, Luxembourg and Czechia reported the highest increases in the same period.

These figures highlight important positive intra-European spill over effects. Intra-European exports to Germany supported 6.8 million jobs in all other EU countries, while for France it was 3.9 million and United Kingdom, 3 million. This is because firms providing goods and services along the supply chain also gain when their end-customer sells the final product abroad.

A specific JRC webpage featuring more details complemented the publication of the study.

Supporting the EU Action Plan for Sustainable Finance

Several unprecedented challenges, such as climate change and resource depletion, require that the world takes urgent action in adopting a more sustainable economic model. To support this, in March 2018, the European Commission issued an **EU Action Plan for Sustainable Finance**.

The first objective of the Action Plan is to **reorient capital flows towards a more sustainable economy**. A key action in this respect is the development of an **EU Sustainable Finance Taxonomy**, i.e. a classification of environmentally sustainable economic activities. The JRC provided key scientific advice to the Technical Expert Group (TEG) on Sustainable Finance in order to identify environmentally sustainable economic activities for climate change mitigation and adaptation and develop technical screening criteria. The JRC has now also started supporting the extension of the Taxonomy to other four environmental objectives: protection of water and marine resources, circular economy, pollution prevention and control and promotion of healthy ecosystems. The JRC also carried out an assessment of the financial impact of the EU Taxonomy on European equity and bond markets.

Another action foreseen in the Action Plan is the development of standards and labels. In this respect, the JRC is carrying out the technical analysis underpinning the development of the **EU Ecolabel for Financial Products**. The JRC also provided scientific support to the work of the TEG sub-group on the **EU Green Bond Standard**, providing a number of analyses on the pricing of green bonds, the relationship between green bond issuance and environmental performance, and use of proceeds reporting.

The second objective of the Action Plan is to **mainstream sustainability into risk management**. In this respect, the JRC is working in cooperation with the European Central Bank and the European Systemic Risk Board to advance our understanding of climate-related risks to financial stability. These studies will support decision-making with respect to the potential **incorporation of sustainability in prudential requirements** for financial institutions.

The third objective of the Action Plan relates to **fostering transparency and long-termism in financial and economic activity**. To support policymaking in this field, the

JRC is providing technical input to the European Supervisory Authorities on **environmental disclosures**, for the development of regulatory technical standards for financial market participants on sustainability reporting.

Finally, the JRC has promoted the interaction between policymakers and the scientific community on sustainable finance, organizing discussion panels and events. These included an academic conference on "Promoting Sustainable Finance", co-organized with the TEG, a Summer School on Sustainable Finance, and a joint Workshop on Banking Regulation and Sustainability with the European Banking Authority.

Tracking tax mismatches of giant Web-based companies

In recent years a widespread sentiment arose about large companies, particularly those engaging in digital services, supposedly not paying their fair share of taxes. The JRC's Fiscal Policy Analysis unit provided empirical evidence in support of related work of the Directorate General for Taxation and Customs Union.

Companies that mostly operate through the Web are rich in intangibles (e.g. patents, trademarks, copyrights and data) and more often than not they are not taxed in the jurisdictions where they perform significant economic activities. As intangibles are easily moved to other jurisdictions and often unique, applying arm's-length pricing (i.e. a method to regulate intra-firm transactions based on comparison with market prices) is hard in practice. Moreover, some business models exploit tracking technologies and big data for targeted advertising. Consumers collaborate (knowingly or not) to the creation of value for these companies, but advertising contracts can be stipulated anywhere in the world, which also generates tax mismatches.

The JRC analysed the geographical distribution of declared financial figures (profit, turnover, fixed assets, employees) for a set of very large Web-based companies and documented large mismatches between the location where economic activity occurs and where taxes are paid. The methodology developed by the JRC can be used to track such mismatches between the place of taxation and the place of economic activity, and also in order to estimate potential revenue losses compared to a benchmark scenario where none of such mismatches exist. The methodology can be used to estimate the impact of alternative policy reforms and to track changes over time as the landscape of tax rules evolves.

The JRC also used the computable general equilibrium model CORTAX, to assess the effects of alternative policy options for international tax reforms in view of the tax challenges arising from the digitalisation of the economy, which are currently being discussed by the OECD. These policy proposals envisage different formulas to apportion part of the profits made by multinational groups across jurisdictions and the possibility to impose a minimum corporate tax rate. Simulation results from CORTAX suggest a ranking of alternative reform proposals based on their predicted effects on GDP, employment, private investment, tax revenue collection and Welfare, thus providing guidance to the European institutions.

RHOMOLO-EIB model highlights the impact of investment in strategic projects

The European Fund for Strategic Investments (EFSI) is the central pillar of the Investment Plan for Europe. It tackles the post-crisis investment gap in the EU and aims to revive investment in strategic projects in all EU Member States. EFSI was launched jointly by the European Investment Bank (EIB) Group and the European Commission. Every year, policy simulations are carried out using the RHOMOLO-EIB Computable General Equilibrium (CGE) model in order to assess the macroeconomic effects of EIB Group-supported operations (both EFSI and non-EFSI) and of EFSI operations on their own.

This model is based on RHOMOLO, developed and used by the JRC for policy impact assessment, and provides sector-specific, region-specific and time-specific simulation results. It allows distinguishing between the short and long-term effects of investments and takes into account the EU territorial specificities and the spatial interlinkages of the European regions and countries. It does differ from RHOMOLO though, as it is based on loans rather than grants, which makes a difference both in terms of financial flows and in the areas of engagement.

RHOMOLO-EIB is a CGE model and as such does not provide unconditional forecasts, but rather give answers to "what if" type questions and contributes to uncovering the economic mechanisms triggered by certain public interventions such as the EFSI.

In its RHOMOLO-EIB 2019 Update, the JRC presented the result of the latest set of simulations quantifying the estimated macroeconomic impact on EU GDP and employment of all EFSI-supported operations approved as of June 13, 2019.The authors observed that EFSI is contributing significantly to job creation and growth. The EIB-JRC estimates suggest that, by 2019, it has already, created more than 1 million jobs (1.7 million by 2022), with a positive contribution to GDP of 0.9% (1.8% by 2022) over the baseline. The results of the analysis highlight the importance of investments for jobs and economic growth.

READ MORE

Multigenerational persistence of socio-economic status in the EU

In the context of the Fairness transversal project, a JRC looked policy brief explored how the transmission of socio-economic status from one generation to the next contributes to long-term inequality.

https://europa.eu/!qj77KD

Incidence and determinants of loneliness across Europe

As part of a multi-year research project to analyse different aspects of social fairness, JRC researchers have analysed the incidence and the determinants of loneliness across Europe.

https://europa.eu/!Vc68Qd

Community of Practice on Fairness

The JRC has launched a Community of Practice on Fairness to foster an informed dialogue and knowledge sharing on the multidimensional aspects of fairness amongst stakeholders from the institutions, civil society and academia.

https://europa.eu/!wQ37cf

Monitoring progress of the European Pillar of Social Rights in EU regions

The regional dimension of the Social Scoreboard for the European Pillar of Social Rights was launched, highlighting the fact that only focusing on national averages does not capture the full extent of the social challenges in the EU.

https://europa.eu/!Wu44JQ

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 2019, JRC activities contributing to strengthening the internal market included protecting consumers against dual quality foods, supporting police forces in training their explosives detection dogs; helping customs detect counterfeit tobacco products and identify new psychoactive substances, setting new standards through the revision of Best Available Techniques (BAT) Reference Documents, supporting the safety of nuclear installations and more.

Preventing consumers being misled by inconsistent food packaging-composition link

According to EU legislation, marketing a good as identical to one marketed in another Member States while that good has a significantly different composition or characteristics which cannot be justified by legitimate and objective reasons could unfairly and illegally mislead consumers.

In response to concerns about dual quality foods and the European Commission's commitment to tackle the issue, the JRC conducted a study based on a testing campaign covering 1,380 samples of 128 different food products, found on the markets of nineteen Member States. The products were selected based on Member States' suggestions, following complaints to consumer protection authorities or associations.

The study found that in the majority of cases, the composition and packaging matched: 23% of products had an identical front-of-pack and an identical composition, and 27% signalled their different composition in different EU countries with a different front-of-pack. However, 9% presented as being the same across the EU had a different composition, yet displayed an *identical* front-of-pack; and another 22% had a *similar* front-of-pack, yet a different composition. No consistent geographical pattern emerged in the use of the same or similar packaging for products with different compositions. Moreover, the difference in composition in the products tested do not necessarily constitute a difference in product quality.

Testing was based on a harmonised methodology developed by the JRC in cooperation with Member States. This methodology allows for comparable sampling, testing and data interpretation across the EU. All EU Member States were invited to collect information regarding the composition of the selected food products offered on their markets. As a first step, this analysis was based on information from the product labels and the front-of-pack appearance of the products. Further steps and research are needed to make the assessment more representative, and to better understand the link between composition and quality.

JRC and Belgian police join forces to detect explosives

JRC scientists have developed a spray that can be used to train dogs to detect TATP, an explosive often used by terrorists, including in the deadliest attacks that have shaken some EU member states in recent years.

Whether we take a flight, travel by train or attend the concert of our favourite band, the police and their dogs work behind the scenes to ensure our safety. Dogs must be trained,

but TATP is extremely dangerous to handle making it difficult to train police dogs or to test detector devices in crowded places like airports. Before this innovation, police had to train dogs at special, highly controlled training sites, which hardly replicate the real life conditions found in unpredictable environments such as airports and train stations. With this new TATP spray, which only contains a few milligrams of TATP, the dogs are now able to do effective training out in public. The JRC worked closely with the Belgian Federal Police when developing the spray. Being in direct contact with the end user allowed for very useful feedback cycles and the development of best practices.

The spray is also used to make sure that the swab detection machines called ETD (explosive trace detection) and found at security check-ins can properly identify TATP. An ETD test-kit was developed to check that detection equipment work correctly. It was originally made for the European Commission inspectors at the Directorate General for Mobility and Transport, but the kit is now used by most of the relevant authorities in EU Member States, at airports across Europe.

The JRC is currently establishing procedures to share the spray with police dog units across the EU. With the widespread use of the TATP spray, there are more and more requests for similar products containing other explosive materials. JRC scientists are currently engaging in other projects, together with the Directorate General for Migration and Home Affairs, which will target detection equipment used by law enforcement, first responders and customs officers.

Helping customs detect counterfeit tobacco products and identify new psychoactive substances

JRC Scientists have long supported customs and law enforcement authorities in their mission of combatting illicit trafficking, preventing fraud, and keeping us safe. In 2019 for instance, scientists at the JRC have developed a new test to tell where a cigarette has come from - and if the brand on the label corresponds to what is in the pack.

The test can help authorities to detect illicit tobacco products and trace trafficking routes. The new method has the advantage of speed and simplicity. The measurement itself - which uses a near infrared spectrometer - takes only a few minutes. The obtained spectra are stored in a database and further processed with machine learning software to create classification models.

The spectrum of a suspicious tobacco product can then be compared with tobacco of known provenance to decide whether it is genuine or counterfeit. If a counterfeit product is detected, information can be extracted on the geographical origin of the tobacco, which can give an indication where the illicit product may have been manufactured.

The JRC operates a dedicated laboratory facility (TOBLAB) to create chemical fingerprints, which is useful intelligence for law enforcement agencies in the EU's Member States and the European Anti-Fraud Office.

Identifying new psychoactive substances (NPS) is another area where the JRC expertise is in high demand.

NPS are narcotic or psychotropic drugs manufactured to mimic the effects of controlled drugs (cocaine, cannabis, heroine or amphetamines). They are a growing concern in the EU as they can cause considerable health problems by affecting the central nervous system of users that smoke, ingest, sniff or inject new substances on which very little is known.

The lack of scientific data and reference standards is making Customs work incredibly difficult as they face a large and diverse pool of chemical products that can be used as new psychoactive substance or even as new drug precursor.

The JRC helps the Customs Laboratories European Network (CLEN) identify unknown substances and in particular NPS, principally to facilitate the rapid identification and characterization of seized samples, but also as a repository of analytical data and molecular identification, which facilitates the interpretation of new unknown substances for future problem cases.

The JRC is also involved in the fine-tuning of on-site detection techniques that are non-contact and non-destructive to enhance the speed of the analysis and reduce the exposure of operators.

Setting standards for the waste incineration and food, drink and milk sectors

Under the leadership of the JRC experts from the European Commission, EU member states, environmental organisations and industry representations have updated EU-wide standards of the waste incineration and food, drink and milk sectors. The new EU-wide emissions, monitoring and efficiency standards will help national authorities to lower the sectors' environmental impact.

The new standards were set through the revision of the Best Available Techniques (BAT) Reference Documents. These documents are central in lowering the environmental impact of the industrial installations, as EU legislation requires about 50 000 large-scale industrial installation to hold a permit based on the use of Best Available Techniques. The JRC through its European Integrated Pollution Prevention and Control Bureau (EIPPCB) led the drafting of the new BAT conclusions.

The European food, drink and milk sector represents around 290 000 companies and more than 4 million jobs in the EU among others in the brewing, meat processing and sugar manufacturing industries. The new BAT conclusions of the sector reinforce the level of environmental protection, with particular emphasis on emissions to water and to air, and on energy and water consumption. The new standards also bring important improvements in terms of monitoring air emissions. The 2 800 existing food, drink and milk installations have 4 years to comply, whereas new installations have to comply from the start.

The waste incineration sector represents more than 500 installations and treats around 30% of the EU's municipal waste and other types of waste such as hazardous wastes or sewage sludge. The BAT conclusions include BAT-associated emission levels that have the potential, through their translation into emission limits, to drive a sizeable reduction in emissions from the sector. The new BAT conclusions also focus on maximising water savings and reducing water pollution.

New standard for small punch test supports the safety of nuclear installations and more

The small punch test is a method for estimating basic material properties such as the ultimate tensile strength (UTS) or the ductile to brittle transition temperature (DBTT) by means of small, disc-shaped specimens. During the test a ball is pushed at constant velocity through the specimen and the applied force is measured as a function of the position of the ball.

Small specimen test techniques have received much interest especially for nuclear applications because they reduce the exposure of staff to radiation, the cost of irradiation experiments and the amount of radioactive waste. The development of these began decades ago, but to date a comprehensive international standard for small punch testing was still missing.

The JRC has been at the forefront of small punch testing method and evaluation procedures since 1990. For the past few years now, the JRC has naturally taken the lead in

the development of a European test standard within the framework of CEN.

In 2019, the draft standard for "Metallic materials - Small punch test method" has now passed an important milestone by clearing the public enquiry phase with only minor, editorial comments. This means its content has been accepted by all stakeholders and the final standard will likely be published by CEN in 2020.

While the new standard provisions with regard to the test piece, the rig, and the test itself remain largely the same as in existing CEN pre-normative documents, the recommendations in the informative annexes with regard to data evaluation have in some cases been changed and extended quite significantly. The new standard also includes the definition of a standard data format to make the test results machine readable and will simplify the exchange of test data between different electronic systems and organizations.

Besides being used for nuclear applications, the small punch technique increasingly finds applications in other industries like aerospace, automotive or off-shore and for non-metallic materials like polymers or bones.

READ MORE

Protecting Pollinators – JRC contributes to the EU Pollinators Initiative

The EU Pollinators Initiative sets strategic objectives and actions to be taken by the EU and its Member States to address the decline of pollinators in the EU and contribute to global conservation efforts.

https://europa.eu/!Yn84VP

Keeping European bridges safe

A JRC report zoomed in on research and innovation in bridge maintenance, inspection and monitoring in Europe in the last quarter of a century, and sheds light on the future of bridge monitoring technologies.

https://europa.eu/!Wy46bG

Towards comparable results for the analysis of GMOs in the food chain

JRC scientists have elaborated a new measurement system to correctly report genetically modified content in food and feed products originating from or containing genetically modified organisms.

https://europa.eu/!hc36jH

Monitoring mineral oil hydrocarbons in food and food contact materials

The JRC released a guidance document on how to monitor mineral oil hydrocarbons in food and food contact materials. It covers the steps from sampling via analysis to reporting.

https://europa.eu/!WC98xf

Supporting the fight against listeriosis

The JRC just released a Certified Reference Material (CRM) to be used as quality assurance for the analysis of Listeria monocytogenes in food control laboratories.

https://europa.eu/!dF94Kx

Prioritising the fight against 20 quarantine plant pests on the EU territory

Following a new methodology, the JRC assessed a list of quarantine pests for their potential economic, social and environmental impact on EU agriculture and forestry.

https://europa.eu/!Um34bn

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, and the work now focuses on long-term solutions to equip Europe with future-proof means of managing migration responsibly and fairly.

Contributing to this Agenda, in 2019, the JRC launched its Atlas of Migration online, looked into children in migration data, co-created the new Global Transnational Mobility Dataset, and studied the specific challenges that migrants face in rural areas. The Knowledge Centre on Migration and Demography continued being the main driving force behind many of the JRC's initiatives relevant to the European Agenda on Migration.

New online Atlas of Migration

There is a lot of data out there about migration and demography, but it is often widely dispersed and quite complex. This means that citizens who want to understand the facts behind migration can have a hard time knowing where to look. It can also make it difficult for policymakers to base their migration policies on the best evidence.

A new edition of the Atlas of Migration was launched in December as an online guide through these complexities. Open to the public, the interactive platform allows users to create and download profiles for the countries or territories they are interested in. Because the data is updated every 24 hours, users can be confident that they are accessing the most up-to-date information available.

The information is made available by bringing together harmonised, validated data from 12 international sources. The Atlas provides information on 60 different indicators related to demography, migration, asylum, integration and development.

The Atlas shows how the composition of a Member State's population has changed in terms of citizens living in their own country (Nationals), citizens from different EU countries Member States (EU Mobile) and citizens from non-EU countries and territories (Non-EU). The EU population has increased from 511 million in January 2017 to 512 million in January 2018. In the same period the percentages of both EU mobile citizens and non-EU citizens have increased by 0.1%. Data for each individual EU country can be seen on the online platform.

The online Atlas is accompanied by a reference book with data on a range of migration-related fields in a format that is easy to access and to understand. This provides a snapshot of migration around the world over the last year.

Protecting children in migration

There is a wealth of available information from various sources on children in migration at EU and international level. However, data on these children is not collected in the same way and to the same extent for all EU countries.

A new report "Data on Children in Migration" brought together information and analyses available from various sources – including Eurostat and national records – to make EU-wide estimates on the numbers of child migrants.

The report finds that about 7% of children in the EU, 6.9 million, are living in a different country from their nationality.

Just under two thirds of these - 4.3 million children are nationals of a non-EU country. Of these, the largest numbers come from Syria, Morocco, Turkey, Afghanistan and Albania. From within the EU, the number is about 2.6 million, with Romanian and Polish the most common nationalities.

The report confirms that there is uneven spread of asylum applications across EU countries, with some countries receiving many more than others. The EU countries dealing with the highest numbers of child asylum applications in relation to population size are Greece, Cyprus, Germany, Malta, Luxembourg, Austria and Sweden.

At the height of the migrant crisis in 2015 and 2016, exceptionally high numbers of children applied for asylum in Hungary, Bulgaria, and Denmark. In contrast, Italy, France and Spain are found to be consistently far below the EU average in terms of the number of asylum applications received by children. The report also finds that 16 and 17 year-olds made up 75% of all unaccompanied migrant children in 2018.

By providing this information, experts aim to contribute to a more comprehensive information base to help national and EU policymakers manage migration in a way that provides children with the special care and assistance that they are afforded under EU and international law.

Global Transnational Mobility Dataset – new dataset shows global cross-border travel

Researchers of the European Commission's Knowledge Centre on Migration and Demography (KCMD) and the European University Institute's Migration Policy Centre co-created the new Global Transnational Mobility Dataset by combining data on tourism and air passengers. Due to the combination of two different data sources, the dataset is more comprehensive than all pre-existing information on worldwide cross-border mobility.

Everyone can explore the data on the KCMD's Dynamic Data Hub, with an interactive map showing travel relations between countries around the globe, while the raw data is provided to researchers upon request.

Based on the new dataset researchers from the JRC and the European University Institute found that between 2011 and 2016 cross-border mobility increased by a dramatic 25%. While for 2011 the number of estimated trips was about 2.3 billion, by 2016 it grew to 2.9 billion. The increase is due to the increased mobility of humankind, as the relative growth of world population was much below the growth of cross-border mobility.

According to the dataset, cross-border trips within world regions are the most common in Europe, followed by Asia, Americas, Africa and Oceania. In 2016, Europe on its own accounted for 1.2 billion within world region cross-border travels out of the global 2.9 billion cross-border mobility. Intraregional mobility between 2011 and 2016 grew most in Europe and Asia, while in the Americas there was only smaller growth and largely no growth in Africa and Oceania. This suggest that instead of a catch up a divergence is taking place over time.

Despite Africa’s much larger population, transnational mobility in Europe is 20 times the amount of mobility in Africa. Researchers also found a strong relation between a country’s

outgoing trips and the national level of prosperity and pointed out that this global inequality in mobility chances has important sociological implications.

Migrants in rural areas face particular challenges

Jobs on EU farms are increasingly being filled by migrants who help to cultivate some of our most common kitchen staples. But migrants who move to rural areas also face additional difficulties than people who choose to migrate to the EU and settle in towns and cities.

These findings are the result of the first EU-wide statistical analysis of migrants living in rural areas. The JRC study includes both mobile EU citizens and migrants who have come from outside the EU. While on average migrants are more present in urban areas than in rural ones, their share in some rural villages and regions can be much higher than in a city.

They do essential jobs in these rural areas, especially on farms that are in constant need of temporary work. Most of the strawberries and tomatoes reaching our table, for example, have been cultivated thanks to the work of migrants.

At the same time, the situation is often challenging for the hosting society and for the migrants, because of the temporary and often irregular nature of their work, the remoteness of the territory and the lack of equipment of rural local authorities to support migrants' integration.

The authors conclude that the presence of migrants in rural areas present challenges (such as remoteness, isolation, limited access to services) and opportunities (contrasting depopulation trends, providing labour force) for both migrants and hosting communities.

The precariousness and vulnerability - coupled with the important role played by migrants in sustaining certain types of agriculture in specific regions - means migrants in rural areas require special attention when designing integration policies.

By providing new evidence at EU level, the study also raised awareness at a critical moment of the ongoing negotiations and discussion on EU funds dedicated to the integration of migrants.

READ MORE

European section on IOM's Global Migration Data Portal

A dedicated section on migration in Europe prepared by the European Commission's Knowledge Centre on Migration and Demography has been released on IOM's Global Migration Data Portal.

https://europa.eu/!JX43MQ

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 2019 the JRC continued expanding its forest fire monitoring expertise at a global scale, explored global urbanisation trends through satellite imagery, provided training on securing public spaces from terrorist attacks, developed capabilities for early

warning of Tsunami events, investigated security risk associated with drones, and expanded international cooperation on nuclear safety with EU and neighbouring countries.

Supporting the fight against forest fires worldwide

The JRC has pioneered the development of international platforms for the assessment and monitoring of wildfires through the development of the European Forest Fire Information (EFFIS), which serves equally citizens for information and awareness, fire managers for up to date wildfire information and policy makers with the provision of science-based relevant policy data. In October 2019, EFFIS published the "Forest Fires in Europe, Middle East and North Africa 2018" report.

Based on the experience of building EFFIS and coordinating an international effort of now 43 countries in Europe, Middle East and North Africa, the JRC has embarked on the development of a Global Wildfire Information System (GWIS), which will mirror the development of EFFIS in Europe to provide insights on fire regimes globally and policy relevant information at global scale. The Emergency Response Coordinating Centre (ERCC) of the European Commission's Directorate-general for European Civil Protection and Humanitarian Aid Operations (DG ECHO), the United Nations Disaster Risk Reduction (UNDRR) offices as well as the UN Food and Agriculture Organization are its main institutional users. The JRC leads the GWIS global initiative under the Group on Earth Observations (GEO) and is supported by the US NASA and the EU Copernicus programs. GWIS has recently provided the first time national estimates on the number of fires and burnt areas and plans to establish country profiles supporting prevention and preparedness in the countries and capacity building supporting global initiatives such as the Paris Agreements and the Sendai framework agreements, contributing to the implementation of Sustainable Development Goals (SDGs).

In the context of its work in GWIS, the JRC has recently launched the Global Wildfire Database which was published in Nature Scientific Data. GWIS has already provided continuous support to EC services and Cabinets on wildfire monitoring in the Amazon and the recent fires in Australia, providing direct support to the ERCC and the Australian Government in the assessment and monitoring of, still ongoing, wildfires. The JRC is also working in support to UNDRR in the global assessment of wildfire risk, contributing to the next Global Assessment Report (GAR).

Supporting the monitoring of the SDGs with a global definition of cities and rural areas

The JRC turns satellite data into information on population and urbanisation and generates knowledge for use in decision making for European and international stakeholders. This information on sustainable urbanisation will be used to better understand our transition towards a carbon neutral Europe, and is indispensable to measure sustainable development goals, to understand disaster risk and to devise adaptation to a changing climate.

Until recently, understanding sustainable urbanisation has been a challenge for the lack of adequate data sets as well as a commonly agreed definition to rely on. When available, data on settlements and cities covered only part of the country and often the information were not comparable across countries. The JRC used artificial intelligence to extract global information on urbanisation from satellite image archives, such as the Copernicus Sentinel satellites, for international stakeholders. A consortium is currently developing a Global definition of cities, urban and rural areas. The consortium includes Eurostat, the European Commission's Directorate-General for Regional and Urban Policy (REGIO), the JRC, the Organisation for Economic Co-operation and Development, the World Bank, the United Nation's Food and Agriculture Organization and Human Settlements Programme and the International Labour Organization. The definition is co-designed by REGIO and JRC and is based entirely on the Global Human Settlement Layer datasets generated at the JRC. It will

be presented in March 2020 to the 51st UN Statistical Commission for adoption.

Preliminary analysis on global urbanisation based on this Global Definition of cities and rural areas is summarised in the JRC's Atlas of the Human Planet 2019. The atlas summarises 40 years of urbanisation worldwide (1975 – 2015) by providing 239 Country Urbanization Briefs, one for each country and territory of the World. Information and data contained in this policy report can be used to define regional policies, support external actions, guide development and cooperation aid and are a key contribution to the baseline information for the 2030 Development Agenda.

Hands-on training to protect public spaces from terrorist attacks

Urban planners, architects, counter-terrorism advisers and security officials from different European cities learnt at JRC Ispra about designing and selecting solutions for the protection of public spaces from terrorist attacks.

Recent terrorist attacks have shown a recurrent targeting of public spaces, exploiting the intrinsic vulnerabilities of so-called "soft targets" that result from their open nature and public character, e.g. pedestrian precincts, tourist sites, transport hubs, shopping malls, places of worship, outdoor markets, concert halls and city squares.

With a focus on mitigating threats from ramming vehicles and blasts, the training supported the implementation of the Action Plan for the protection of public spaces.

The training and exchange of best practice among the participants endorsed the concept of security by design – the idea of addressing security concerns and providing physical security solutions from the very beginning of the planning and design of a public space. It is part of the European Commission's efforts to actively support Member States and local authorities in their fight against the threat posed by terrorism.

The training and exchange of best practice was organised by the JRC, in cooperation with the Directorate-General for Migration and Home Affairs. It addressed the needs to establish vulnerability assessments for public spaces and to consider security and physical protection from the start of the design process of a new facility or the organisation of an event. It also looked into developing and implementing security awareness programmes and using modern technology, such as smartphone applications to facilitate communication and improve the public's reaction in case of an attack. It also explored the development of a facility or event security plan identifying the appropriate (effective, discrete, proportionate and tailor-made) measures that will not create new vulnerabilities.

Examples were given and best practices exchanged on applications in the urban layout, which will contribute to the quality of everyday life for European citizens.

Monitoring sudden sea level changes off-shore for early warning of Tsunami events

A new oceanographic buoy has been positioned off shore close to La Spezia harbour to monitor the sea level and identify Tsunami events.

The buoy has been positioned off shore the Tino Island, in the Tirrenian Sea. It is part of a collaboration effort between the JRC and the 'Istituto Superiore per la Protezione e la Ricerca Ambientale' for the sea level monitoring and the identification of Tsunami events. After a testing period of 8-9 months in the Tirrenian Sea, if the results and the data acquired are satisfactory, the buoy will be repositioned in southern areas where the Tsunami risk may be larger, the Ionian Sea or Sicily Channel.

The buoy has been instrumented by the JRC with advanced equipment that allows the

centimetric estimation of the sea level, using the differential GPS technique; the method consists in measuring the relative height between the buoy and a fixed point on the coast (base), using GPS antennas. A software onboard allows also the identification of anomalous wave signals and inform users in real time. In Italy the institution monitoring the tsunami events is the 'Istituto Nazionale di Geofisica e Vulcanologia' (INGV) but other European institutes are also interested in the off-shore measured levels.

In general the sea level is measured inside ports, on the coast. For instance the JRC developed and installed a large network of Tsunami on-shore devices (Inexpensive devices for Sea Level measurements, IDSL), distributed in the Mediterranean Sea. A new Emergency Early Warning System based on a similar IDSL network was also deployed in Indonesia in the aftermath of the December 2018 Krakatoa Tsunami, that caused more than 400 fatalities. The information from the JRC devices became part of the standard operating procedures of the BMKG, the Indonesian institution in charge of Tsunami monitoring and alerting for the whole country.

In the case of the buoy though, the advantage is to position it at 10-15 km from the coast, allowing to have an alert signal before the waves reach the coast. This technology is not new as it is in use in Japan since several years, but it is the first time that is adopted in the Mediterranean Sea.

Evaluating the security risk associated with drones

Due to their rapid technological advancements, Unmanned Aerial Systems (UAS, a.k.a. drones) can satisfy to a great extent the transport needs of the modern industry, business and consumer sectors. This means that the type of users span from military professionals to recreational users, as the number of publically available and affordable units is growing at a very high rate.

But UAS pose also certain safety and security risks as witnessed in recent events around airports. The use of UAS for malicious purposes is not a new concern, and has already been addressed by the EC in its Action Plan to support the Protection of Public Spaces. ISIS has been actively using them for investigating potential targets, carrying explosive devices and transporting weapons. UAS equipped with explosives or other malicious payloads have even been promoted by terrorist propaganda.

A recent JRC study has highlighted that explosive UAS pose a particularly high threat for mass events as well as for critical infrastructures and VIPs, as the security perimeter can be easily breached.

The recently published UAS regulation set rules and procedures for their safe operation and used this study to shape the different UAS classes. The higher the payload of a UAS the higher the potential risk and therefore the imposed safety and security measures (registration, e-identification and level of required training) depend on the drone’s maximum take-off mass (MTOM). Further work is needed to establish testing methods for assessing UAS countermeasures, including their detection, identification and interception capabilities.

International cooperation improves nuclear safety in the EU and neighbouring countries

Continuous improvement of nuclear safety and reducing the risk of nuclear accidents in the EU neighbourhood are important for ensuring the safety of EU citizens. Based on the comprehensive and transparent risk and safety assessments of nuclear facilities ("stress tests") performed inside the EU, world-class safety approaches were developed. Cooperation with EU neighbouring countries operating nuclear power reactors is vital to export the EU's good practices beyond the borders of the EU.

The JRC cooperates with the European Commission's Directorate for Energy (DG ENER) and the European Nuclear Safety Regulators Group (ENSREG) to transfer EU Nuclear Safety approaches to the neighbouring countries.

A recent example of such cooperation is the stress test exercise in Armenia. One of the principles of the stress tests is that national nuclear regulatory authorities (NRA) perform the safety evaluations of their respective nuclear installations which are then 'peer' reviewed by other experts to ensure a unified approach. JRC experts together with DG ENER and ENSREG, peer-reviewed the Armenian Stress Test National Action Plan. JRC reviewed technical aspects and visited the Armenian Nuclear Power Plant with other specialists to review the proposed safety improvements. The objective was to verify that the safety improvement measures proposed are fully in line with the stress tests recommendations.

Another example is the organisation of the *fifth IAEA International Conference on Effective Nuclear and Radiation Regulatory Systems: Working Together to Enhance Cooperation*, which took place on 4 to 7 November 2019, in The Hague, Netherlands, and was hosted by the Dutch Authority for Nuclear Safety and Radiation Protection and the JRC, as part of the cooperation with International Atomic Energy Agency (IAEA). The conference focused on the role of the global nuclear regulatory community in ensuring a high standard of nuclear and radiation safety and nuclear security.

READ MORE

New Database provides open data for over 10,000 cities worldwide

The JRC's new Urban Centres Database provides new open data for over 10 000 cities worldwide. Data analysis highlights very diverse development patterns and inequalities across cities and world regions.

https://europa.eu/!WR96qq

Science4Piece Portal now available

The Science4Peace Portal is an integrated information and geospatial data platform designed to facilitate and support policy decisions. It allows users to query, analyse and combine data on situational awareness, conflict risk indicators, and real time news feeds for early warning.

https://science4peace.jrc.ec.europa.eu

Regulatory science for nanotechnology and nanoplastics

The JRC and the Global Coalition for Regulatory Science Research (GCRSR) co-organised the Global Summit on Regulatory Science 2019, which focused on Nanotechnology and Nanoplastics.

https://europa.eu/!Qk43gG

Assessing the pressure on terrestrial, marine and coastal protected areas

The JRC launched an updated version of its Digital Observatory for Protected Areas (DOPA) Explorer, which assesses the state of and the pressure on terrestrial, marine and coastal protected areas.

https://europa.eu/!yg34ut

The number of people affected by food crises remains at alarming levels

The 2019 Global Report on Food Crises, was presented jointly by the European Union, the

Food and Agriculture Organization of the United Nations (FAO), and the UN World Food Programme (WFP) at a high level event dedicated to food & agriculture in times of crisis.

https://europa.eu/!UR63QR

Table 15.2 - 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
Implementing Decision 2019/1372 on INSPIRE monitoring and reporting The JRC acts as the overall technical co-ordinator of INSPIRE, the EU-wide system for sharing of environmental spatial information. As a member of the coordination team, JRC contributed to the writing of Implementing Decision 2019/1372 on simplifying INSPIRE monitoring and reporting, supporting better comparison of the implementation progress across Member States and allowing for national and EU-wide overviews while reducing administrative burden.
Integrating science and data of ecosystem services into policymaking The JRC's contributions to mapping and assessment of ecosystems and their services have informed the EU guidance document on integrating ecosystems and their services into decision-making (SWD(2019)305). The guidance intends to help planners, policymakers and businesses solve socio-economic challenges, while also protecting and restoring Europe's nature.
Supporting the EU policy coordination in the field of education and training JRC contributed to the Education and Training Monitor 2019 by providing estimates of the early childhood education and care indicator by socio-economic status and the most recent estimates of the learning mobility benchmark. Indeed, the Monitor is the European Commission's flagship annual publication on education and training that fuels the debate on priority themes for education and informs national education reform debates.
New innovative control solution for checks by monitoring under the common agricultural policy (CAP) The JRC developed an innovative solution to process small agricultural parcels as part of the common agricultural policy aid check based on monitoring. The small parcel solution addressed the concerns of the Member States on excessive workloads caused by the processing of small, inconclusive parcels, helping them efficiently implement the controls.
RIO Reports cited in the European Semester Country Reports JRC's Research and Innovation Observatory (RIO) provided a state-of-play and analysis of the national level R&I system and its challenges to 7 European Semester Country Reports (Belgium, Cyprus, Greece, Italy, Poland, Romania and Spain).
Commission Regulations (EU) 2019/2021-2024 on eco-design requirements for electronic displays, household dishwashers, washing machines and washer-dryers, and refrigeration appliances JRC developed the EU eco-design requirements concerning circular economy and material efficiency including on plastics parts.
Regulation (EU) 2019/1241 on the conservation of fisheries resources and the protection of marine ecosystems The JRC contributed to the revision of the fisheries technical measures to facilitate the implementation of the landing obligation and to further the ecosystem-based approach.
Food Fraud Reporter: the EU early warning system for food fraud The JRC's monthly summaries on food fraud cases published in local media around the world provides the European Commission, control authorities and investigators in Member States and companies in the food sector an early warning system that provides information about cases in other parts of the EU and beyond.

Reference materials for pancreatic disorders
The JRC released a new certified reference material containing biomarkers for disorders of the pancreas in cooperation with the International Federation of Clinical Chemistry and Laboratory Medicine. This material supports the standardisation of in vitro diagnostic tests and subsequently the comparability of results from routine clinical measurements.

Recognition of the European Platform on Rare Disease Registration
JRC has developed the European Platform on Rare Disease Registration (EU RD Platform) to address the needs of the rare disease community for harmonised collection, exchange and pooling of patients' data across Europe. New rare disease registries under the 3rd EU Health Programme (2014-2020) need to be compatible with the platform, making it a common reference in Europe.

EU strategy on green infrastructure
The JRC provided geospatial methods, data and tools to support strategic green infrastructure and ecosystem restoration. This information has been used in the preparation of a new guidance document on Green Infrastructure (SWD(2019)193) and defining criteria as well as available technical and financial support instruments that can help planners integrate natural landscape features into strategic green and blue infrastructure.

Commission General Objective 2

Indicator of market creation potential for the Innovation Radar platform
In 2016, the Commission JRC developed indicator incorporated in the Innovation Radar platform, which allows filtering out innovations with market creation potential.

Commission General Objective 3

Analysing the scenarios if gas transit through Ukraine is interrupted
The JRC provided DG Energy with simulations of the EU gas supply security ahead of winter 2019/20. This technical support then facilitated trilateral gas talks between the EU, Ukraine and Russia.

Supporting the amendment of the Correlation Regulations
The Regulations 2017/1152 and 2017/1153 define the correlation procedure towards more realistic vehicle test conditions under the new worldwide-harmonised light vehicle test procedure (WLTP) regime. In its role to monitor the application of these regulations, the JRC supported DG Climate Action to amend the legislation to further specify how CO_2 targets are to be determined particularly in hybrid vehicles. The JRC contributed to writing extended parts of the amended Regulations 2019/1839 and 2019/1840.

Support to EU Green Deal on the cost of inaction
JRC's estimated the cost of inaction in the face of climate change, including 80,000 annual deaths as a result of heatwaves and 40% less available water in southern Europe.

Review of the draft national energy and climate plans (NECPs)
The JRC supported DG Energy on the review of the research, innovation and competitiveness and energy efficiency aspects of the draft NECPs. In particular, the JRC carried out compliance and robustness checks of the data and an assessment of the assumptions made in the drafts allowing for the evaluation of targets, policies and measures. For instance, the JRC reviewed how the SET Plan is translated into national objectives and measures for R&I. The JRC's results have been used in each of the 28 Commission Recommendations (C/2019/4401 up to C/2019/4428).

Implementation of the Council Directive on the supervision and control of shipments of radioactive waste and spent fuel
The JRC has performed extensive analysis of radioactive waste and spent fuel transboundary shipments in the EU as reported in SWD(2019) 437 and COM(2019) 633. It highlights trends and challenges on imports and exports, transit of spent fuel and radioactive waste, reported refusals and failed shipments, as well as proposed actions.

Implementation of the Council Directive on responsible and safe management of spent fuel and radioactive waste
JRC performed comprehensive analyses of the spent fuel and radioactive waste management situation in the EU by assessing national programmes and reports of individual Member States. The JRC then drafted and delivered two Commission working documents on the implementation of the Directive 2011/70/EURATOM on responsible and safe management of spent fuel and radioactive waste for DG Energy (SWD(2019) 435 and 436).

Access to the JRC actinide laboratories
The JRC has opened its actinide laboratories - unique in Europe - to external users from the EU Member States, or countries associated to the Euratom Research Programme, in the frame of the JRC Open Access programme. In 2019, 3 projects allowed users coming from Czechia, Italy and Belgium carry out experiments they would not have been able to perform in their home countries.

Verification of the quality of data of radon in drinking water – implementing Articles 35 and 36 of the Euratom Treaty
On request from DG Energy and the Member States, the JRC organised a proficiency test for laboratories measuring radon in water. The exercise – involving 101 laboratories – was the biggest of its kind in the world. It enabled the laboratories involved to share best practices in minimising radon loss and should lead to reporting values that are more accurate.

Commission General Objective 4

New international standard for testing photovoltaic module performance and energy rating
The JRC led the development of the new international standard IEC 61853-3 which provides, for the first time, a harmonised approach for determining the climate specific energy rating of photovoltaic devices. The methodology was developed within an international team and made use of the JRC's photovoltaic geographical information system (PVGIS) tools and the JRC's European Solar Test Installation (ESTI).

Assessment of the Copernicus Sentinel-3 data
JRC supported the Mission Performance Centre (MPC), created by ESA and EUMETSAT, by providing in situ reference measurements for the Copernicus Sentinel 3 satellite ocean colour data products.

Commission General Objective 5

EU debt sustainability monitoring
JRC estimated the potential impact of contingent liabilities on public finances based on the SYMBOL model (Systemic Model of Banking Originated Losses) simulations for the 2018 Fiscal Sustainability Report.

Technical support to the Single Resolution Board
The JRC performed independent calculations and estimates to ensure the stability of the European banking sector.

Commission General Objective 7

Guidance material and creation of an active community for public spaces protection
The JRC has drafted and published guidance material for the protection of public spaces that have been widely distributed to local stakeholders. In collaboration with DG Migration and Home Affairs, the JRC organised a training with urban planners and local security officials from European cities. The JRC also supported the drafting of Commission's good practices document (SWD(2019) 140 final).

Contribution to the UN global study on children deprived of liberty
The JRC contributed to the UN Global Study on children deprived of liberty by coordinating the section related to children in immigration detention. The JRC contribution provides alternatives to detention using good examples from around Europe.

Commission General Objective 9

Global Human Settlement Layer supports the Group on Earth Observations and UN-Habitat
The JRC is co-leading the GEO Human Planet Initiative (global partnership of 108 member countries), which is developing a new generation of measurements and information products that provide new scientific evidence and a comprehensive understanding of humanity's effects around the globe. As part of the Atlas of the Human Planet series, the JRC provided open access to data and tools for different applications ranging from monitoring human settlements to SDG indicators at a city level. As urban areas host the majority of the global population, sustainable urban development is key in achieving SDGs.

Support to the Syria post-conflict recovery framework

The JRC is the main technical partner for the EU in the urban recovery analytical framework collaboration with the UN. The JRC is assisting the DG for European Neighbourhood Policy and Enlargement Negotiations in the damage assessment in 60 Syrian cities, providing also agricultural monitoring and conflict analysis in the most affected Syrian provinces, contributing to the analytical framework for urban recovery, and to the definition of damage per land use.

Supporting early reaction to humanitarian crisis

The JRC developed a composite indicator that identifies countries at risk of humanitarian crisis and disaster (the Index for Risk Management (INFORM) Global Risk Index (GRI)). Such contribution is fundamental for both risk reduction and sustainable development as the two monitoring frameworks provide a set of reliable indicators required to understand the disaster risk drivers and underlying risk factors. The INFORM risk analysis process and methodology has been extended to the regional and country level and adapted to many scopes and targets.

Implementing measures of the EU CBRN Action Plan

The JRC has implemented two projects that have supported the Member States to be better prepared to address CBRN threats. This included harmonised reporting to the IAEA's Incident and Trafficking Database as well as increasing Member State capabilities for conducting nuclear forensic investigations.

Advanced training for nuclear safeguard inspectors

The JRC offers its training facilities (EUSECTRA), laboratories and scientists to train inspectors in verification techniques. This enables reliable nuclear safeguards.

Enhancing capacities for early epidemical crisis response

The JRC was able to contribute its competencies in AI and expertise in risk assessment to develop the Epidemic Intelligence from Open Sources (EIOS) tool together with the WHO. The tool facilitates the early detection, verification, assessment and communication of public health risks, and is already being adopted by national governments.

Commission General Objective 10

Support to the European Parliament to fight disinformation during EP Elections 2019

The JRC developed the Media Anlayser Toolkit, a suite of new tools that was used by the EP analysts to identify candidate disinformation messages and their impact. This tool enabled the European Parliament strategic communication services to better monitor disinformation messages targeting citizens and threatening the EU's democratic foundations.

Review of the implementation of sustainability derogations and fair use policy in the context of the Roaming Regulation

JRC assisted the DG for Communications Networks, Content and Technology in the implementation phase of the Roam-like-at-home regulation (531/2012). The ad hoc surveys conducted by the JRC provided evidence to demonstrate that the abolishment of the roaming services is not only beneficial for consumers and travellers but that it is also sustainable for telecommunication operators. Such regulation constitutes an important step towards the digital single market.

Behavioural experiment on consumer's engagement feeds into Circular Economy Action Plan (COM/2019/190 final)

The JRC, based on the need of DG Justice and Consumers, helped designing a behavioural experiment on consumers' engagement in the circular economy. The experiment addresses the need for adequate labelling of products on their durability and reparability, and is in line with the Circular Economy Action Plan (COM/2019/190 final).

The impact of the Airport Charges Directive on the level of airport charges

The JRC used data on airports' published charges at the EU level and applied an econometric approach to assess whether the Airport Charges Directive had a significant effect on the level of airport charges. The results indicate that the Directive may have resulted in an approximate 10% decline in airport charges for both full service carrier and low cost carrier flights within the EU at airports with between 5 and 20 million passengers annually. The quantitative analysis undertaken by the JRC contributed to the process of gathering evidence for a better policymaking.