European Commission

2017
Annual Activity Report

Joint Research Centre
- Annexes -

Joint Research Centre

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ANNEX 1: Statement of the Internal Control Coordinator[1]

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

I hereby certify that the information provided in Section 2 of the present AAR and in its annexes is, to the best of my knowledge, accurate and complete."

Brussels, 22 March 2018

Signed

Delilah Al-Khudhairy

[1] In the JRC, the Director in charge of the Strategy and Work Programme Coordination is entrusted with the function of Internal Control Coordinator and reports directly to the Director-General.

[2] Communication to the Commission: Clarification of the responsibilities of the key actors in the domain of internal audit and internal control in the Commission; SEC(2003)59 of 21.01.2003.

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

2.2.1 Human Resources

Objective: The DG deploys effectively its resources in support of the delivery of the Commission's priorities and core business, has a competent and engaged workforce, which is driven by an effective and gender-balanced management and which can deploy its full potential within supportive and healthy working conditions.			
Indicator 1: Percentage of female representation in JRC middle management **Source of data:** SEC(2017) 505 (annex 1) dated 17 November 2017			
Baseline (01/05/2017)	Target (01/11/2019)		Latest known results (01/11/2017)
18 % 12 female middle managers out of 68 in total	53 % 8 female middle managers out of 15 in total		14 % 9 female middle managers out of 66 in total
Main outputs in 2017:			
Description	Indicator	Target	Latest known results
1.In order to increase the female representation in the JRC's middle management, the following outputs were planned:			
1a.Continuous encouragement for women to apply, wherever possible, to JRC Unit Head vacancies that arise	1a. Percentage of applications from internal female staff to published Unit Head vacancies	1a. 40 % of internal female staff applying for published Unit Head vacancies	1a. 16.7 %, 7 applications from internal female staff to published JRC Unit Head vacancies.
1b. Close monitoring of upcoming HoU vacancies, whether through retirement,	1b. Percentage of female staff selected to published Unit Head vacancies	1b.For vacancies appearing in 2017 ensure a minimum of 35 % female candidates selected	1b. 100 %, 1 female staff selected/appointed on a JRC Unit Head post The current pool of JRC female staff as potential internal candidates for middle management posts is only 15 % of the total AD8-AD14

resignation or mobility and evaluation of the current JRC female talent pool in respect to the vacancies			population in JRC non-management positions. For the JRC it is a challenge to augment the pool of female candidates eligible for middle management positions. The JRC has a high percentage of senior male staff with permanent contracts and had a low inflow of new permanent staff due to the Commission's staff reduction/redeployment programme running from 2013 to 2017. Based on SEC(2017) 528 final, no further taxation will be applied in 2018.
1c. Full evaluation of the pilot talent management programme which took place in 2016 and develop a new programme	1c.i. Number of participants to the new talent management programme 1c.ii. Participants' evaluation of the talent management programme	1c.i-ii. Positive feedback from participants to the talent management programme for female AD staff	1c.i-ii. 42 out of 61 female AD staff who applied to the call for the JRC Talent Management Programme for female AD staff successfully completed the programme's closing workshop on 21 March 2017 as part of the JRC Management Meeting. The JRC Talent Management Programme for female AD staff which consisted of 3 workshops received very positive feedback from participants. The majority of the participants confirmed that the programme helped them to make a decision on whether or not to pursue a JRC middle management position in the future. Participants also indicated that they would recommend the programme to other JRC colleagues.
	1.c.iii. Percentage of applications for Deputy Unit Head/Unit Head positions	1c.iii. 25% of participants applying for Deputy Unit Head/Unit Head positions by end of 2017	1c.iii. 21 out of the 42 participants (50 %) of the JRC Talent Management Programme for female AD staff have applied to JRC Deputy Unit Head/Unit Head positions in 2017.
	1.c.iv. Continuation of the female talent network via self-established networking and support from the HR experts. Currently a vibrant network on the	1.c.iv. 30% of members of the network contribute and share with the network on the online platform	1c.iv. In 2017, an alumni-group of the JRC Talent Management Programme for female AD staff (core group of 10 women) set up the corporate network called LEAD@Comm. The network has more than 200 members, including members from the JRC Talent Management Programme for female AD staff. LEAD@Comm provides its members with a community of support, leadership, talent development an

	Connected online platform where experiences are being shared and peer support given		advancement in their professional lives by means of organisation of events and through the online platform. The network's presence on the Connected online platform is recent and to be able to measure contributions more time is needed to collect the data. The development of the new programme is reported under point 2.b.i. For 2017, 3 female AD JRC staff were pre-selected by the JRC in December 2017 to participate in the EC Programme to Develop Female Talent (start 01/2018).
Indicator 2: Staff engagement index **Source of data:** EC Staff Satisfaction Survey			
Baseline (31/12/2016)	Target (31/12/2020)		Latest known results (31/12/2016)
62 %	68 %		62 %
Main outputs in 2017:			
Description	Indicator	Target	Latest known results
2. In order to increase **staff engagement** the following main outputs are planned: 2a.Competence development and talent management within the context of the JRC change agenda and the EC's HR strategic agenda as a whole	2a.i. JRC indicators/ outcome of the EC's Staff Satisfaction Survey 2016 2a.ii. Outcome of specific targeted JRC staff engagement surveys	2a.i. JRC Staff engagement in Staff Satisfaction Surveys to remain above the EC average (which was the case for the JRC in the SSS 2016) with continuous improvement 2a.ii. Nine action plans (one per JRC Directorate) following the 2016 Staff Satisfaction survey and the specific	2.a.i-ii. In the 2016 Staff Satisfaction Survey, JRC Staff engagement was above the EC average. Nevertheless, the results of the Staff Satisfaction Survey were followed up rigorously including by the Director General. Following his call for action, 10 working/reflection groups were created. 6 geographic groups for the respective sites and 4 thematic groups to follow the most problematic issues identified in the Staff Satisfaction Survey. The thematic groups worked on a number of topics and a dedicated space was created on the Connected online platform, where the reports of the groups have been published as well as the follow-up action plan including regular updates on its implementation. JRC managers committed individually and collectively to be a role model for JRC organisational values

		targeted JRC staff engagement surveys to be developed and carried out at Unit/team level.	(inclusiveness, integrity, accountability, openness and innovation) and to lead by example. To empower staff mobility, a dedicated Working Group for improvement of the JRC's planning and strategic approach has, through the JRC Staff Mobility Package, set up modalities to encourage staff mobility in all categories in the form of short term mobility/temporary exchanges and longer term mobility/job reassignments within and outside the JRC. The JRC Mobility Space, published on the Connected online platform, provides a toolkit of mobility opportunities available to JRC staff. Individual Career Guidance and support is provided by the HR.AMC.8 serving the JRC. Two way communication has been addressed at senior/middle management level, well-being and physical working environment actions are being implemented continuously A specific JRC Staff Engagement Survey will be released during the first semester 2018.
2b. Building on the 2016 talent management programme for female AD staff (as mentioned in output 1b above) and its extension to a larger population.	2b.i. Design, adoption and roll out of a new inclusive JRC talent management umbrella programme. 2b.ii. Gender balance in all categories of staff	2b.i. Positive feedback from participants to the new inclusive JRC talent management umbrella programme 2b.ii. Continuous improvement in gender balance	2b.i.-c In 2017, 3 female AD JRC staff members were pre-selected by the JRC to participate in the EC Programme to Develop Female Talent which started in January 2018. A follow-up inclusive Talent Management Programme for AD and AST has been designed and proposed to the JRC HR BC and has been already presented to the JRC senior management in February 2018.
2c. Implementation of the talent management, leadership and mobility programmes covering diversity, competencies	2c. Participants' evaluation of the talent management, leadership and mobility programmes	2c. Positive feedback from participants to the talent management, leadership and mobility programmes	

and geographical dimensions			
2d. Translation of the Commission's Diversity Strategy 2016-2019 into a JRC Action Plan (dealing with gender and disability)	2d. Regular monitoring of the implementation of the specific JRC Action Plan translating the Commission's Diversity Strategy 2016-2019	2d. Monitored throughout the year	2d. To implement the new Commission's Diversity and Inclusion Strategy, C(2017)5300 dated 19/07/2017, a specific JRC Action Plan - JRC Strategy Implementation; Gender Balance Strategic Paper - was issued in October 2017. Also previously, diversity and inclusion related aspects such as attracting, developing and retaining a balanced workforce have been translated and monitored in the JRC.
2e. Leadership development i.e. continuing to build upon the skills of the managers to be able to manage increasingly complex issues and a wider variety of skills sets at the same time being able to lead in modern and authentic manner.	2e.i. Number of specific leadership development indicators	2e. Positive feedback from participants to the leadership development programme	2e.i. In addition, to the JRC Talent Management Programme for female AD (as described under heading 1.) and in addition to the EUSA offer, dedicated trainings for JRC managers were organised. 1 workshop for newly appointed JRC Unit Heads and JRC Deputy Unit Heads, 2 networking workshops for JRC Unit Heads including 2 1-day TED Talk Trainings for JRC Unit Heads; Furthermore, staff, especially senior management, follows also dedicated training sessions in Brussels or Ispra.
	2e.ii. Introduction of 360 degree evaluation of JRC managers	2e.ii.50 % of JRC managers to agree to evaluation by end of 2017	2e.ii. 360° Feedback Survey: 73 JRC middle and senior managers took part in the exercise. They all received a feedback report and a 2-hours debriefing session with a certified external coach to discuss their development plan. An action plan for the implementation of the development plan will be in place in 2018.
2f. As part of the JRC 2030 Strategy and its Knowledge Management key pillar, provision of skills to staff through training courses to interact more effectively with	2f.i. Number of specific training courses linked to the JRC Knowledge Management key pillar	2f. Positive feedback from participants to the specific training courses	2f.i. The JRC Knowledge Management strategy will be fully implemented in 2018. In 2017, the 'Introduction to the role of JRC in EU Decision making' has been organised.
	2f.ii. Participants' evaluation to specific training courses		2f.ii. The satisfaction rate for the course 'JRC Role in EU Decision Making' was 83 %.

policy makers 2g. Comprehensive staff induction, recognition and exit schemes	2g.i. Elaborated JRC uniform strategy for staff induction 2g.ii. Reduction of time-period for new staff to be able to perform in their jobs.	2g.i & 2g.ii. Positive feedback on induction training programme	2g.i & 2g.ii Induction trainings were given at all JRC sites as well as on ethics & integrity, document management, Connected online platform, health & safety, coping with change etc. The overall satisfaction rate for such courses was 80.5 %.
	2g.iii. JRC Annual Awards and local events recognising staff achievements, including promotion on the Connected online platform.	2g.iii. Number of recognition awards given throughout the year	2g.iii. Award and recognition actions: 3 events. JRC Annual Awards for Excellence 2017: 16 awards were given in 7 different categories (scientific excellence, technical development and/or innovation, young scientist, policy impact, excellence in administration and celebrating collaboration) during a formal event with the JRC Director-General and the Commissioner in July 2017. On the Connected@JRC online platform there is continuous recognition of JRC achievements.
	2g.iv. Number of staff accepting exit interviews	2g.iv. Rolled out exit interviews based on learnings from the 2016 pilot 2g.v. reach 50 % of the leavers throughout 2017.	2g.iv-v. The JRC Exit Interview Questionnaire is ready for implementation and will be monitored by the JRC HR BC.
2h. Alumni network to continue to grow	2h. Proportion of ex-JRC staff to join alumni network	2h. 50 % of ex-JRC staff to join alumni network	2h. At the end of 2017, the JRC Alumni Network counted 343 registered members corresponding to an increase of 31.42 % in 2017.

Indicator 3: Percentage of staff who feel that the Commission cares about their well-being **Source of data:** EC Staff Satisfaction Survey 2016		
Baseline (31/12/2016)	Target (31/12/2020)	Latest known results (31/12/2016)
63 %	50 %	63 %

Main outputs in 2017:			
Description	Indicator	Target	Latest known results
3. In the context of the JRC's	3a. Number of Training and awareness-	3. At least once throughout the year:	3. In all JRC sites: HR.AMC.8 serving the JRC has mapped the social policy offer in all

implementation of the **'fit@work' Commission Programme** for 2017, the main outputs will be training and awareness-raising activities.	raising activities carried out to promote a fit@work culture in all JRC sites 3b. Number of nutrition awareness actions in the canteens, social and cultural activities, specific training programmes and ergonomic actions in all JRC locations 3c. Number of events promoting the role of the medical services and the social support to staff in all JRC locations 3d. Results from surveys carried out as a means to get staff opinion on ongoing actions on the needs and suggestions for future initiatives	- Promote physical activities in each JRC site - Promote leisure activities in each JRC site - Promote physical and mental health in each JRC site - Promote good worklife balance in each JRC site - Inform staff of the supportive working conditions available and ensure that the JRC line managers are aware to such a high degree that the policies on supportive working conditions are being applied in a consistent manner.	JRC sites. The results were made public to all staff. VéloMai 2017: During the whole month of May 2017, colleagues across the Commission competed in teams or individually challenging each other for the highest number of rides, the main objective being to promote the use of the bicycle as a healthy - and sustainable - mode of transport to commute to work (EMAS). The JRC staff participated actively with awards for best performers in Karlsruhe and Ispra. One of the positive outcomes from this initiative was the mapping of service bike locations on sites. The European week of sport took place in all JRC sites in the period 23-30 September 2017. In addition, a number of awareness raising actions including trainings, sport activities and lunchtime sessions on personal development and well-being were offered at all JRC sites. **The role of the Safety and Security unit (JRC.R.I.5):** Competent staff in the Safety and Security unit, logistics agents and the Medical Service at the JRC Ispra site actively contribute to risk management in relation to workspace and office ergonomics. Office ergonomics is covered in the mandatory training course 'Safety - Risks in the office', obligatory for staff with office duties and about 15 safety officers and safety technicians have been trained to becoming Office Ergonomics Consultants. During the October 2017 Safety Week, 'Basics on Ergonomics' training was provided. In accordance with the European Safety Week's main theme 'Healthy Workplaces for all Ages', this topic was also on the agenda during the Safety Week. **The role of the Ispra Medical Service (HR.D.5):** Health advice was given during periodic visits (1.931 in 2017). Campaigns and seminars: diabetes prevention, cardio-vascular disease

			prevention, seasonal influenza vaccination 2017 (265), seasonal depression and early detection of cancer; at the occasion of the 'European Safety Week' organised by the JRC in October 2017, the Psychosocial Group gave a presentation on aging at work and on digital burn-out and technostress; on-site ergonomics visits. **The role of Office for Infrastructure and Logistics (OIB.OS.3, Social Infrastructures Ispra):** Healthy food campaign in the JRC Ispra canteen in cooperation with the JRC Ispra Cancer Support Group. The Canteen organised two nutrition awareness days proposing specific diet menus linked to cancer prevention The new Clubhouse opened in 2016 contributed to the social integration of JRC Ispra based staff and their families. The Clubhouse with its conference rooms, social areas and sport facilities enhances opportunities for physical activities and the improvement of physical and mental health. The daily attendance of the Clubhouse is on average 475 persons. JRC Ispra site childcare services **-** Crèche and Garderie - directly contribute to staff work-life balance permitting staff to entrust their children by giving the possibility to better cope with private life and work-related challenges. In Karlsruhe, Petten, Geel and Seville childcare facilities are made available in cooperation with local service providers. **At the Geel site**, a cafeteria is available for staff and former staff with their families. The quality and health of the food served is regularly monitored by the CAFCOM committee. A wide range of facilities for staff and their families as well clubs for a variety of leisure activities ranging from sports, cultural and gastronomic character are available. NUCLEA Clubs from the Belgian Nuclear Centre SCK/CEN offer additional facilities and possibilities to meet people from neighbouring companies.

			At the Karlsruhe site, a canteen is provided by the Karlsruhe Institute for Technology (KIT) and a cafeteria is operated by an external company and managed by a working group in the frame of COPAS (no quantitative/qualitative assessment is accessible for the JRC). Courses for leisure, sports and culture are supported by COPAS. Initiatives facilitating social integration of staff and their families as for example are offered. A fitness room accessible for statutory staff managed by the fitness club/COPAS and 2 silence rooms are available. **At the Petten site,** the canteen is shared by other companies on site, such as ECN, NRG. The quality and health of the food served is regularly monitored by Dutch authorities. A fitness room on site is available for staff. A Club House located in Bergen may be used by all staff; sports facilities are available.. The JRC Ispra site **childcare services** (Crèche and Garderie) directly contribute to staff work-life balance permitting staff to entrust their children by giving the possibility to better cope with private life and work-related challenges. In Karlsruhe, Petten, Geel and Seville childcare facilities are made available in cooperation with local service providers. 3d. In relation to Learning and Development: **Staff Learning Needs Analysis 2017** (through EU Survey) Action plan agreed - Information on the **EC's supportive working conditions** available; ensuring that JRC line managers are aware to a high degree that the policy on supportive working conditions are being applied in a consistent manner on all JRC sites; HR.AMC.8 implementation will start first quarter 2018 and monitoring will be done by JRC HR BC.

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: Degree of compliance with the Document Management e-Domec policy rules and ICS 11 requirements **Source of data:** ARES/NOMCOM, SG, DIGIT, JRC DMO			
Baseline (2016)	Target (2020)		Latest known results (2017)
53.23 %	90 %		58.58 %
Main outputs in 2017:			
Description	Indicator	Target	Latest known results
Rules promoting 'Commission' as default visibility for files created by JRC	Revision of applicable work instruction	100 % Q1 2017	Applicable work instruction has been reviewed on 04/07/2017
	% of JRC files shared and made reusable by the Commission.	60 % Q4 2017	19.76 % of JRC files are shared at Commission level; 43.30 % at JRC level. This represents a good achievement for JRC, especially when compared to other DGs' results, but more progress is expected. As a result more focus will be given during 2018 with respect to sharing of files.
Fully reviewed filing plan by appointed and trained document management correspondent in all JRC lead departments ('chef de file').	Implementation of the JRC Document Management Correspondent (DMCO) terms of reference	End of June 2017	JRC Document Management Correspondent (DMCO) terms of reference has been implemented
	Regular monitoring of filing plans as per Terms of reference	100 % monitoring of filing plans & related reporting.	5 % achieved
	Number of JRC DM document management training courses	One training session per JRC site	100 %; all sites covered

HAN Integration of JRC IT tools supporting core business (JPB, PUBSY) and collaborative platforms (SharePoint, Connected online platform).	JRC undertakes the necessary steps once the adoption of integration projects is given by EC Central Services.	End 2017	PUBSY has been integrated with HAN Steps are taken for JPB and for collaborative platforms.

2.2.4 External communication activities

Objective: Citizens perceive that the EU is working to improve their lives and engage with the EU. They feel that their concerns are taken into consideration in European decision making and they know about their rights in the EU.			
Indicator 1: Percentage of EU citizens having a positive image of the EU **Source of data:** Standard Eurobarometer (DG COMM budget)			
Baseline (2014)	Target (2020)		Latest known results (2017)
Total 'Positive': 39 % 'Neutral': 37 % Total 'Negative': 22 %	Positive image of the EU ≥ 50 %		40 % 'Positive' 37 % 'Neutral' 21 % 'Negative'
Indicator 2: Articles in the media - Total number of articles in the media **Source of data:** JRC internal indicator			
Baseline (2015)	Target (2020)		Latest known results (2017)
2770	Time series disrupted due to change in monitoring in 2016; long-term target not available.		4 159
Indicator 3a: Access to JRC websites - Number of page views on the JRC website **Indicator 3b. Access to JRC websites - Number of visits to the JRC website** **Source of data:** JRC internal indicator			
Baseline (2015)	Target (2020)		Latest known results (2017)
3a. 7.7 million 3b. 2.8 million	Time series will be disrupted due to further integration into Europa site and focus on social media actions – this indicator may need to be reviewed.		3a. 3.2 million 3b. 1.4 million
Main outputs in 2017:			
Description	Indicator	Target	Latest known results
Organisation of stakeholder events 'Science meets Parliaments' and Science Meets Regions (some involving	Number of 'Science meets Parliaments'- events organised Number of 'Science Meets Regions'- events organised	1 1	1 Events organised in Saxony (DE), Murcia (ES), Bratislava (SK) and Gabrovo (BG)

Commissioner Navracsics)	Number of social media mentions, social media interactions, etc.	Indicator to be tested in the course of 2017	564 mentions #EUsci4PARL
Euronews Science Reports on timely issues related to JRC research in the service of EU citizens and policy making	Number of Reports produced and broadcast by Euronews Number of youtube views, nr of visitors, nr of social media mentions	4 Indicator to be tested in the course of 2017	3 No metrics data on Euronews available
Production of key publications such as: 1 JRC Annual Report, 1 JRC Annual Conference Report and distribution to targeted stakeholders	Timely delivery of the reports; number of downloads	Q1-Q4; indicator was to be tested in the course of 2017	'2016 Annual Report'; 462 unique downloads '60 stories for the 60th anniversary'; 545 unique downloads 'JRC Services to Member States'; no metrics available yet
Knowledge-Based Communication: Further implement performant web presence, use of social media and virtual tours	Degree of operability	Operational Q2 2017	The digital communication at the JRC ensured in 2017: 1) coordination and harmonisation of JRC web presence to reflect a coherent view of JRC's vision and activities; 2) integration of contents and adherence to corporate standard; 3) creating web-presence for knowledge and competence centres and communities; 4) curated and expanded the JRC reach via social media (Twitter: > 5 million impressions; > 80 000 engagements; increase from 9 886 (2016) to 17 000

			(2017) followers; one of the fastest growing presences of all EU social media accounts listed under the interest of research and innovation. Facebook: > 3 million impressions; 28 000 engagements; 9 000 followers. Average reach 2 500 people per post; an exceptional reach of 18 300 people with recruitment campaign video providing an overview of the JRC and calling on post-doctoral researchers. LinkedIn: > 3.5 million impressions; 40 000 engagements; LinkedIn remains the most successful platform in terms of followers with 21 808 (15 841 in 2016) & average 8000 people reached per post. YouTube: 91 000 views; number of subscribers doubled from 666 to 1 116.)

JRC committed EUR 1.9 million to external communication actions: producing publications, organising events and a exhibition for JRC's 60th anniversary, running of the JRC Visitor Centre (Ispra site), and maintaining and further developing digital communications (the EU Science Hub at Europa site and the social media actions).

Annual communication spending (based on estimated commitments):			
Baseline(2016)	Target (2017)	Total amount spent	Total of FTEs working on external communication
N/A	EUR 1.9 million	EUR 1.9 million	6.5 (statutory); 13.5 (total)

2.2.5 Infrastructure

a. Infrastructure development

Objective: **Infrastructure development: Harmonise the approach to infrastructure development across the JRC.** **Energy conservation: Drive energy efficiency gains.** **Operational efficiency: Increase efficiency of site-related facilities and services.**		
Indicator 1a: Surface area calculations **Definition: Surface area of new buildings delivered and buildings demolished and refurbished in line with Directive 2012/27/EU** **Source of data:** JRC internal indicator and Directive 2012/27/EU		
Baseline	Interim Milestone	Target
2017 data: On JRC sites (Brussels excluded), there are 214 954 sqm of buildings not compliant to the energy standards. New buildings delivered: 0 sqm Buildings demolished: 267 sqm Buildings refurbished: 3 408 sqm (1.6 % of total surface as defined in Directive 2012/27/EU article 5)[3]	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. 2017 result is below the target and could be seen as very poor. However, it should be noted that major investments (namely Wing M in Karlsruhe and Building 102 in Ispra) are currently under construction and will generate a significant jump ahead in energy efficiency when delivered (both in 2020).

[3]

JRC site	Surface not compliant with energy standards	New buildings	Demolitions	Refurbishments with % according to 2012/27/EU	
Geel	29 423	0	0	0	0.0 %
Ispra	125 443	0	267	3 308	2.6 %
Karlsruhe	31 637	0	0	0	0.0 %
Petten	20871	100	0	100	0.5 %
Seville	7 580	0	0	0	0.0 %
Total	**214 954**	**0**	**267**	**3 408**	1.6 %

Main outputs in 2017			
Description	Indicator	Target	Latest known results
At global level, JRC refurbished 3 408 sqm to current standards in energy efficiency.	3 408 sqm	3 %	1.6 %
In **Ispra**, the refurbishment of building 18 'Central Workshop', 58c 'Auditorium' and 77r 'AMS Greenhouse'.	3 308 sqm	3 %	2.6 %
In **Karlsruhe,** 31,657 sqm of older existing buildings (Wing A-B-D-E-F-G-H) are out of the range of the national minimal standards in terms of energy efficiency on the basis of article 5 of the Directive 2012/27/EU. 9498 sqm of more recent buildings are compliant (Wing NCO in 2013: 7927 m2, Wing R+S in 2015: 1571 m2).	0 sqm	3 %	0 %
In **Petten**, 2017 saw the extension of an energy efficient A+ (NL Energy Performance Rating minimum required under 2015 Building Regulations) new Smart Grid Showcase Laboratory building 311 by a platform of 100 sqm.	100 sqm	3 %	0.5 %
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	
2017 data: In **Ispra**, there are not yet any 'Nearly zero-energy building' already built. However the project for building 102 currently in construction is compliant with this classification. In **Geel**, two buildings are in compliance with the latest Belgian regulations.	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	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 **Karlsruhe** there is no 'Nearly zero-energy building' foreseen for the next years. In **Petten**, there is no 'Nearly zero-energy building' already built. However, the project for the construction of building 315 (New Reception Building) currently put on hold would be compliant with this classification. In **Seville**, there are not yet any 'Nearly zero-energy building' already built; a preliminary study on the JRC Seville site constraints and alternatives, submitted to the JRC Management, describes an option compliant with this classification.	characteristics.		
Main outputs in 2017			
Description	Indicator	Target	Latest known results
In **Ispra**, the construction of building 102 has started. Final delivery is expected for January 2020.	10 500 sqm	Nearly-zero Energy building	Construction started in April 2017 for final delivery in 2020. When in use, this building will contribute to a reduction of roughly 4.5 % of the total energy consumption of Ispra site, after demolition or shutdown of 10 smaller obsolete buildings.
In **Petten**, the project for the construction of building 315 has been put on hold.	1 200 sqm		Construction will not start in 2018.
In **Karlsruhe**, the new laboratory building Wing M in the range of national minimal standards in terms of energy	6 440 sqm		Construction ongoing. Delivery foreseen in 2020.

efficiency is under construction.			

b. Decommissioning

Objective: Implement the Decommissioning & Waste Management Programme (see progress indicators in Annex 13)			
Main outputs in 2017 (Main outputs for 2017 for the four relevant JRC sites by site can be found in Annex 13):			
Description	Indicator	Target	Latest known results
Finalisation of review of budget and strategy	Documents available	Q2	All documents finalised
Start of preparation of Communication from the Commission To the Council and the European Parliament, Decommissioning of Nuclear Installations and Management of Radioactive Waste: Management of Nuclear Liabilities arising out of the Activities of the Joint Research Centre (JRC) carried out under the Euratom Treaty COM(2017)	Draft document available	Q4	Process launched (under political validation)

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

Objective: Operation of the high-flux reactor			
Main outputs in 2017:			
Description	Indicator	Target	Latest known results
High Flux Reactor (HFR): HFR report 2014-2015	Report and Staff Working Document (SWD)	Q2	Q1-Q2 of 2018 due to late submission of the information from the Netherlands

ANNEX 3: Annual accounts and financial reports

Annex 3 Financial Reports - DG JRC - Financial Year 2017

TABLE 1: OUTTURN ON COMMITMENT APPROPRIATIONS IN 2017 (in Mio €)					
			Commitment appropriations authorised	Commitments made	%
			1	2	3=2/1
Title 05 Agriculture and rural development					
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.13623640	9.12995786	99.93 %
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.07011000	2.05593860	99.32 %
Total Title 05			11.20634640	11.18589646	99.82%
Title 10 Direct research					
10	10 01	Administrative expenditure of the 'Direct research' policy area	448.53609152	403.68153907	90.00 %
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	112.11535592	34.61907142	30.88 %
	10 03	Euratom Programme - Direct actions	25.94947676	11.45722239	44.15 %
	10 04	Other activities of the Joint Research Centre	359.09210183	36.76667024	10.24 %
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	29.37279851	29.36091794	99.96 %
Total Title 10			975.06582454	515.88542106	52.91%
Title 29 Statistics					
29	29 02	The European statistical programme	0.30000000	0.19981820	66.61 %
Total Title 29			0.30000000	0.19981820	66.61%
Total DG JRC			986.57217094	527.27113572	53.44 %

** 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).*

According to the new rules of DG BUDG for annex 3, this year, the outturn on commitment appropriations includes only the amounts for which the Fund Management Centre Authorising DG is the JRC.
The amounts of title 10 for which the Fund Management Centre Authorising DG is not the JRC are reported in the annex 3 of the corresponding Authorising DGs.

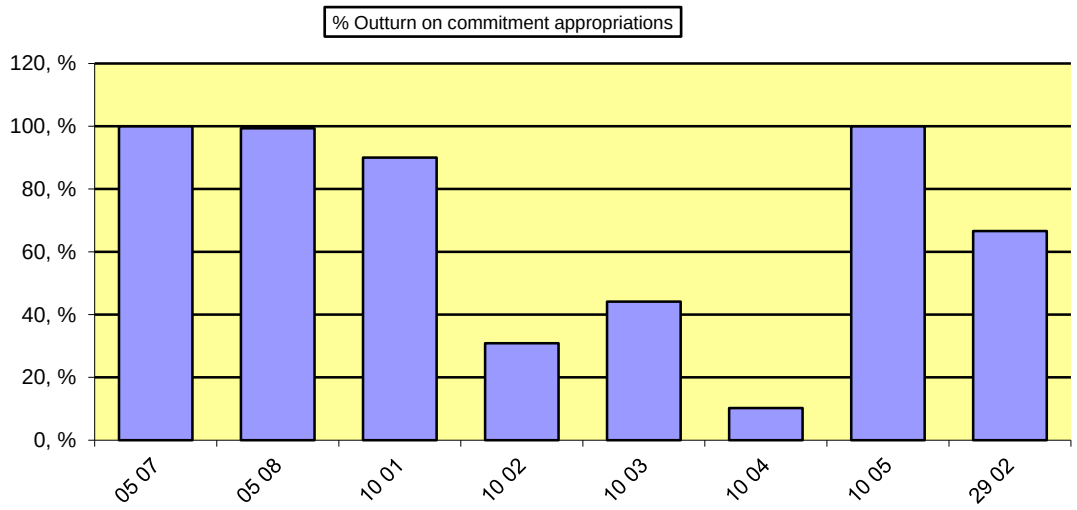

TABLE 2: OUTTURN ON PAYMENT APPROPRIATIONS IN 2017 (in Mio €)					
Chapter			Payment appropriations authorised *	Payments made	%
			1	2	3=2/1
Title 05 Agriculture and rural development					
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.00123640	8.98222681	99.79 %
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.15983100	1.97532044	91.46 %
Total Title 05			11.16106740	10.95754725	98.18%
Title 10 Direct research					
10	10 01	Administrative expenditure of the 'Direct research' policy area	234.58169324	101.74458865	43.37 %
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	105.31656744	29.14925296	27.68 %
	10 03	Euratom Programme - Direct actions	23.33991677	11.02013145	47.22 %
	10 04	Other activities of the Joint Research Centre	264.20666709	32.56344552	12.32 %
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	25.06782851	25.06506364	99.99 %
Total Title 10			652.51267305	199.54248222	30.58%
Title 29 Statistics					
29	29 02	The European statistical programme	0.17438320	0.17089320	98.00 %
Total Title 29			0.17438320	0.17089320	98.00%
	Total DG JRC		663.84812365	210.67092267	31.73 %

** 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).*

According to the new rules of DG BUDG for annex 3, this year, the outturn on payment appropriations includes only the amounts for which the Fund Management Centre Authorising DG is the JRC.
The amounts of title 10 for which the Fund Management Centre Authorising DG is not the JRC are reported in the annex 3 of the corresponding Authorising DGs.

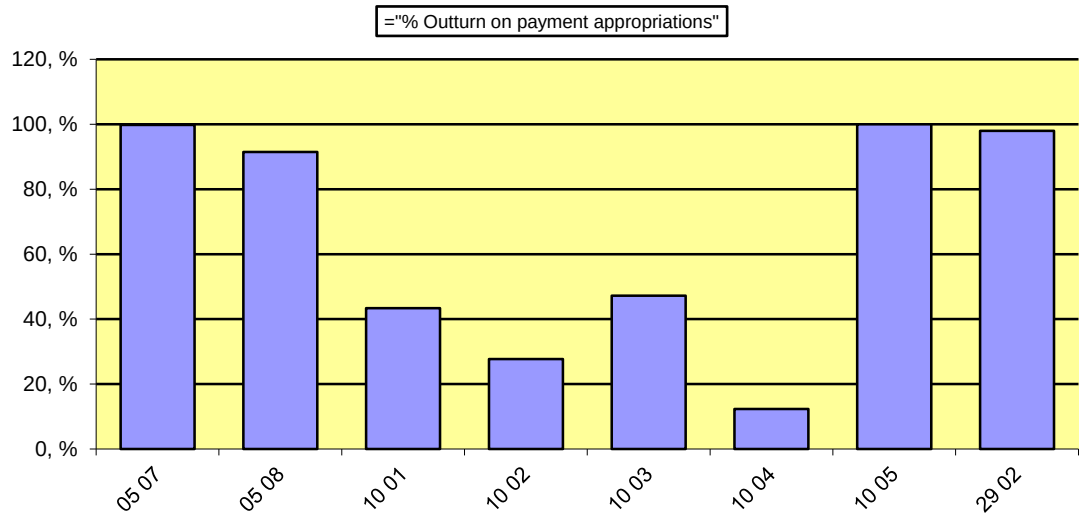

TABLE 3 : BREAKDOWN OF COMMITMENTS TO BE SETTLED AT 31/12/2017 (in Mio €)									
Chapter			2017 Commitments to be settled				Commitments to be settled from financial years previous to 2017	Total of commitments to be settled at end of financial year 2017	Total of commitments to be settled at end of financial year 2016
			Commitments 2017	Payments 2017	RAL 2017	% to be settled			
			1	2	3=1-2	4=1-2/1	5	6=3+5	7
Title 05 : Agriculture and rural development									
05	05 07	Audit of agricultural expenditure financed by the European Agricultural Guarantee Fund (EAGF)	9.12995786	7.91	1.21539572	13.31 %	0.01	1.22	1.08
	05 08	Policy strategy and coordination of the 'Agriculture and rural development' policy area	2.0559386	0.00	2.0559386	100.00 %	0.35	2.41	2.33
Total Title 05			11.18589646	7.91	3.27133432	29.25%	0.35946398	3.6307983	3.4175611
Title 10 : Direct research									
10	10 01	Administrative expenditure of the 'Direct research' policy area	403.6792601	337.21	66.46490021	16.46 %	24.03	90.50	80.15
	10 02	Horizon 2020 - Direct actions of the Joint Research Centre (JRC) in support of Union policies	34.61907142	9.94	24.67854319	71.29 %	8.82	33.50	30.37
	10 03	Euratom Programme - Direct actions	11.45722239	4.15	7.30892387	63.79 %	3.08	10.39	10.73
	10 04	Other activities of the Joint Research Centre	36.76667024	19.61	17.15413192	46.66 %	3.92	21.08	19.89
	10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	29.36091794	4.69	24.66811956	84.02 %	31.42	56.08	52.85
Total Title 10			515.8831421	375.61	140.2746188	27.19%	71.2662465	211.540865	193.981
Title 29 : Statistics									
29	29 02	The European statistical programme	0.1998182	0.17	0.028925	14.48 %	0.00	0.03	0.00
Total Title 29			0.1998182	0.17	0.028925	14.48%	0.00	0.028925	0.00
	Total DG JRC		527.2688567	383.69	143.5748781	27.23 %	71.6257105	215.200588	197.39856

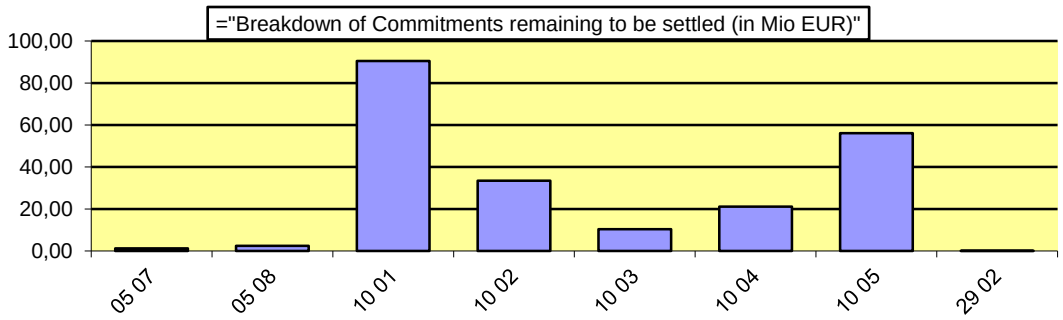

TABLE 4 : BALANCE SHEET JRC		
BALANCE SHEET	**2017**	**2016**
A.I. NON CURRENT ASSETS	202,771,680.86	213,861,206.29
A.I.1. Intangible Assets	1,690,236.35	1,947,950.43
A.I.2. Property, Plant and Equipment	201,063,571.77	211,895,383.12
A.I.5. Non-Current Pre-Financing		-
A.I.6. Non-Cur Exch Receiv & Non-Ex Recoverab	17,872.74	17,872.74
A.II. CURRENT ASSETS	(873,017,940.43)	(729,100,119.54)
A.II.2. Current Pre-Financing	7,375,158.36	3,473,658.72
A.II.3. Curr Exch Receiv &Non-Ex Recoverables	(925,289,504.70)	(786,813,079.18)
A.II.4. Inventories	44,683,226.01	54,120,231.01
A.II.6. Cash and Cash Equivalents	213,179.90	119,069.91
ASSETS	**(670,246,259.57)**	**(515,238,913.25)**
P.I. NON CURRENT LIABILITIES	(1,904,010,572.16)	(1,086,664,832.05)
P.I.2. Non-Current Provisions	(1,904,006,729.14)	(1,086,660,989.03)
P.I.3. Non-Current Financial Liabilities	(3,843.02)	(3,843.02)
P.II. CURRENT LIABILITIES	(33,873,642.17)	(28,094,860.44)
P.II.2. Current Provisions	(30,288,272.54)	(27,240,857.47)
P.II.3. Current Financial Liabilities	-	
P.II.4. Current Payables	(3,576,394.41)	(845,157.84)
P.II.5. Current Accrued Charges &Defrd Income	(8,975.22)	(8,845.13)
LIABILITIES	**(1,937,884,214.33)**	**(1,114,759,692.49)**
NET ASSETS (ASSETS less LIABILITIES)	**(2,608,130,473.90)**	**(1,629,998,605.74)**
P.III.2. Accumulated Surplus/Deficit	4,175,210,777	4,009,747,651
Non-allocated central (surplus)/deficit*	(1,567,080,303.58)	(2,379,749,045.37)
TOTAL	**0**	**0**

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 JRC

STATEMENT OF FINANCIAL PERFORMANCE	2017	2016
II.1 REVENUES	(100,022,078.25)	(93,844,717.74)
II.1.1. NON-EXCHANGE REVENUES	(19,735.06)	(176,741.96)
II.1.1.5. RECOVERY OF EXPENSES	(7,466.40)	(176,741.96)
II.1.1.6. OTHER NON-EXCHANGE REVENUES	(12,268.66)	-
II.1.2. EXCHANGE REVENUES	(100,002,343.19)	(93,667,975.78)
II.1.2.1. FINANCIAL INCOME	14,550.96	(12,583.45)
II.1.2.2. OTHER EXCHANGE REVENUE	(100,016,894.15)	(93,655,392.33)
II.2. EXPENSES	1,072,644,907.83	259,307,844.11
II.2. EXPENSES	1,072,644,907.83	259,307,844.11
II.2.10.OTHER EXPENSES	965,971,795.55	169,025,221.23
II.2.2. EXP IMPLEM BY COMMISS&EX.AGENC. (DM)	102,375,576.61	73,419,522.47
II.2.6. STAFF AND PENSION COSTS	4,280,056.69	16,847,774.26
II.2.8. FINANCE COSTS	17,478.98	15,326.15
STATEMENT OF FINANCIAL PERFORMANCE	**972,622,829.58**	**165,463,126.37**

Explanatory Note:
The increase of II.2.10 Other Expenses is due to the impact on the Economic Outturn of the change of the estimation of the decommissioning provision. 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.

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 5bis : OFF BALANCE SHEET JRC		
OFF BALANCE	**2017**	**2016**
OB.1. Contingent Assets	20,235,360.73	16,296,189.64
GR for performance	15,328,637.66	15,008,970.44
GR for pre-financing	4,906,723.07	1,287,219.20
OB.2. Contingent Liabilities	(3,012,578.00)	(2,800,000.00)
OB.2.7. CL Amounts relating to legal cases	(3,012,578.00)	(2,800,000.00)
OB.3. Other Significant Disclosures	(49,592,019.49)	(3,345,677.05)
OB.3.2. Comm against app. not yet consumed	-	-
OB.3.3.7.Other contractual commitments	(49,197,466.93)	(2,924,721.37)
OB.3.5. Operating lease commitments	(394,552.56)	(420,955.68)
OB.4. Balancing Accounts	32,369,236.76	(10,150,512.59)
OB.4. Balancing Accounts	32,369,236.76	(10,150,512.59)
OFF BALANCE	(0.00)	(0.00)

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

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 2017 - DG JRC

Legal Times							
Maximum Payment Time (Days)	**Total Number of Payments**	**Nbr of Payments within Time Limit**	**Percentage**	**Average Payment Times (Days)**	**Nbr of Late Payments**	**Percentage**	**Average Payment Times (Days)**
30	21295	19697	92.50 %	16.41823628	1598	7.50 %	42.9605757
40	1				1	100.00 %	43
45	67	66	98.51 %	17.33333333	1	1.49 %	213
50	2	2	100.00 %	13.5			
60	328	318	96.95 %	28.05031447	10	3.05 %	72.5
90	16	16	100.00 %	32.375			

Total Number of Payments	**21709**	**20099**	**92.58 %**		**1610**	**7.42 %**	
Average Net Payment Time	**18.59279561**			**16.61769242**			**43.24968944**
Average Gross Payment Time	**21.14809526**			**18.97164038**			**48.31863354**

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	41	1354	6.24 %	21709	16,647,693	7.17 %	232,275,405

Late Interest paid in 2017			
DG	**GL Account**	**Description**	**Amount (Eur)**
JRC	65010000	Interest expense on late payment of charges	52.00
JRC	65010100	Interest on late payment of charges New FR	8 988.84
			9 040.84

TABLE 7 : SITUATION ON REVENUE AND INCOME IN 2017								
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	24,813,206.94	0.00	24,813,206.94	24,813,206.94	0.00	24,813,206.94	0.00
41	CONTRIBUTIONS TO THE PENSION SCHEME	21,759,477.97	0.00	21,759,477.97	21,759,477.97	0.00	21,759,477.97	0.00
57	OTHER CONTRIBUTIONS AND REFUNDS IN CONNECTION WITH THE ADMINISTRATIVE OPERATION OF THE INSTITUTION	694.10	0.00	694.10	694.10	0.00	694.10	0.00
60	CONTRIBUTIONS TO UNION PROGRAMMES	4,962.68	0.00	4,962.68	0.00	0.00	0.00	4,962.68
62	REVENUE FROM SERVICES RENDERED AGAINST PAYMENT	102,314,343.54	5,388,519.55	107,702,863.09	97,512,613.94	5,092,823.15	102,605,437.09	5,097,426.00
66	OTHER CONTRIBUTIONS AND REFUNDS	1,941,075.68	205,240.21	2,146,315.89	1,907,070.02	115,398.32	2,022,468.34	123,847.55
Total DG JRC		**150,833,760.91**	**5,593,759.76**	**156,427,520.67**	**145,993,062.97**	**5,208,221.47**	**151,201,284.44**	**5,226,236.23**

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

INCOME BUDGET RECOVERY ORDERS ISSUED IN 2017	Error		Irregularity		Total undue payments recovered		Total transactions in recovery context(incl. non-qualified)		% Qualified/Total RC	
Year of Origin (commitment)	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount	Nbr	RO Amount
2013							1	4,962.68		
2014							1	10,817.84		
2016	1	432.03			**1**	**432.03**	6	13,692.64	16.67%	3.16%
2017	1	349.86	1	1,533.34	**2**	**1,883.20**	24	24,610.52	8.33%	7.65%
No Link	4	13,684.02			**4**	**13,684.02**	34	201,071.45	11.76%	6.81%
Sub-Total	**6**	**14,465.91**	**1**	**1,533.34**	**7**	**15,999.25**	**66**	**255,155.13**	**10.61%**	**6.27%**

EXPENSES BUDGET	Error		Irregularity		OLAF Notified		Total undue payments recovered		Total transactions in recovery context(incl. non-qualified)		% Qualified/Total RC	
	Nbr	Amount	Nbr	Amount	Nbr	Amount	Nbr	Amount	Nbr	Amount	Nbr	Amount
INCOME LINES IN INVOICES												
NON ELIGIBLE IN COST CLAIMS												
CREDIT NOTES			1	420			**1**	**420**	1072	8,289,880.46	0.09%	0.01%
Sub-Total			**1**	**420**			**1**	**420**	**1072**	**8,289,880.46**	**0.09%**	**0.01%**

GRAND TOTAL	**6**	**14,465.91**	**2**	**1,953.34**			**8**	**16,419.25**	**1138**	**8,545,035.59**	**0.70%**	**0.19%**

TABLE 9: AGEING BALANCE OF RECOVERY ORDERS AT 31/12/2017 FOR JRC						
	Number at 01/01/2017	Number at 31/12/2017	Evolution	Open Amount (Eur) at 01/01/2017	Open Amount (Eur) at 31/12/2017	Evolution
2010	1	1	0.00 %	945.00	945.00	0.00 %
2013	1		-100.00 %	17,082.00		-100.00 %
2014	1	1	0.00 %	15,000.00	7,500.00	-50.00 %
2015	3	2	-33.33 %	135,157.82	67,114.60	-50.34 %
2016	54	8	-85.19 %	11,779,841.58	6,484,092.15	-44.96 %
2017		66			10,111,528.61	
	60	78	30.00 %	11,948,026.40	16,671,180.36	39.53 %

TABLE 10 : RECOVERY ORDER WAIVERS IN 2017 >= EUR 100.000						
	Waiver Central Key	Linked RO Central Key	RO Accepted Amount (Eur)	LE Account Group	Commission Decision	Comments

Total DG JRC	

Number of RO waivers	

TABLE 11 : CENSUS OF NEGOTIATED PROCEDURES - DG JRC - 2017

Internal Procedures > € 60,000

Negotiated Procedure Legal base	Number of Procedures	Amount (€)
Art. 134.1(a)	4	1,047,880
Art. 134.1(b)	21	4,567,517
Art. 134.1(c)	1	253,280.50
Art. 134.1(e)	1	123,500.00
Art. 134.1(f) (i)	1	148,343.08
Art. 134.1 (i)	1	175,000.00
Art. 135(1)(a) RAP, Art. 135(4) RAP	4	2,850,000.00
Art. 135(1)(b)(iii) RAP	1	2,000,000.00
Total	**34**	**11,165,521**

Additional comments

The information presented in the above table is based on the information from the JRC's financial management tool – JIPSY.

The JRC is a scientific driven organisation where the need for reliability and reproducibility of results are paramount. Whereas every effort is made to ensure that competition is available it is clear that for maintenance or upgrades of complex scientific instruments and to ensure a reference environment this may not always be an option. In such cases the JRC applies a case by case analysis that is independently legally verified, analysed by the JRC's PPAG and fully documented and available for ex-post supervisory controls. Given such control measures the JRC is confident that such cases merit the legal bases.

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

External Procedures > € 20,000

Procedure Legal base	Number of Procedures	Amount (€)
(Ext. act) Supply - Local open procedure with prior publication (Art. 267.1(b)(i) RAP)	1	42,000.00
(Ext. act) Supply - Competitive Negotiated Procedure with at least three candidates without pub. (Art. 267.1(b)(ii) & 2 RAP)	1	93,900.00
Total	**2**	**135,900.00**

Internal Procedures > € 60,000

Procedure Legal base	Number of Procedures	Amount (€)
Competitive procedure with negotiation (Art. 135 RAP)	1	2,000,000
Negotiated Procedure after publication of a contract notice (Art. 135 RAP)	4	2,850,000
Exceptional Negotiated Procedure without publication of a contract notice (Art. 134 RAP)	29	6,315,521
Negotiated Procedure with at least five candidates below Directive thresholds (Art. 136a RAP)	48	6,165,801
Call for expressions of interest - List of vendors (Art. 136.1(b) RAP)	1	65,153
Open Procedure (Art. 104(1) (a) FR)	81	73,612,773
Restricted Procedure (Art. 104(1) (b) FR)	14	40,133,616
Restricted Procedure (Art. 127.2 RAP)	1	16,558,339
Total	**179**	**147,701,203**

Additional Comments:

The information presented in the above table is based on the information from the JRC's financial management tool – JIPSY.

TABLE 13 : BUILDING CONTRACTS

Total number of contracts :	
Total amount :	

Legal base	Contract Number	Contractor Name	Description	Amount (€)

No data to be reported

TABLE 14 : CONTRACTS DECLARED SECRET

Total Number of Contracts :	**1**
Total amount :	**175,000.00**

Legal base	Contract Number	Contractor Name	Type of contract	Description	Amount (€)
134(1)(i)	C932975	NUCLEAR RESEARCH AND CONSULTANCY GROUP (NRG)	Direct	Disposal/storage fissile pin 3357	175,000.00

ANNEX 4: Materiality criteria

The objectives of the internal control system are defined in the Financial Regulation (cf. Art. 32). The Authorising Officer by Delegation (AOD) needs to define specific management targets and, in particular, needs to have objective criteria **for determining which weaknesses** should be subject to a formal reservation to his/her declaration.

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

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

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

In **qualitative** terms, when assessing the significance of any weaknesses, the JRC takes the following factors taken 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, in order to make a judgment on the significance of a weakness, the JRC **quantifies** the potential financial impact ('monetary value of the identified problem'/'amount considered erroneous'/'the amount considered at risk') in monetary terms.

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

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

The voted budget in commitments managed directly by the JRC each year is around EUR 401 Million. Around 59% of the budget is dedicated to staff costs. The remainder is dedicated to site and infrastructure management and to operational expenses e.g. purchasing equipment. In line with the guidelines annexed to Communication to the Commission, COM 28 of 21 January 2003, the JRC considers that any material loss exceeding 2 % of the authorised payments of the reporting year would cause the AOD to 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 standards are implemented effectively. Should one control standard not be sufficiently well implemented, or should there be a serious error in the application of any of the control standards, or any critical issue reported by OLAF, a reservation would be made.

The JRC is periodically audited by the IAS and the ECA. Should a critical recommendation or the combined effect of a number of recommendations rated 'very important' be issued by one of these bodies, a reservation would be issued if the recommendation had led to a significant loss of funds or caused lasting damage to reputation. In any case if the JRC did or could not address a critical recommendation or the combined effect of a number of recommendations rated 'very important' appropriately, or for which there is a significant delay in the implementation of the action plan, a reservation would be made.

ANNEX 5: Internal Control Template(s) for budget implementation (ICTs)

ICT No 1: 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	Estimated coverage frequency and depth	Estimated costs and benefits of controls	Control 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	**Costs:** Estimation of cost of operational and financial staff involved **Benefits:** Rejection of unjustified purchases, avoidance of litigation and compliance with Financial Regulation and Procurement rules	Cost of control on procurement / Total contract value Cost of control on procurement / number of procedures closed during the year
	Note to AO(S)D on justification (economic, operation) for launching a procurement process	**Coverage:** 100 % of the forecast procurements		
	Preparation of detailed procurement planning and regular follow-up via PPMT	**Coverage:** 100 % of the forecast procurements > EUR 15 000		
	Continuous monitoring during the call for tender procedure for successful award of the contract and close monitoring of contract execution.	**Coverage:** All key procurement procedures having significant impact on the objectives of the DG		

B - Needs assessment & definition of needs

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

Main risks	Mitigating controls	Estimated coverage frequency and depth	Estimated costs and benefits of controls	Control indicators
The best offer/s are not submitted due to inadequate market analysis and / or poorly defined technical specifications	Financial circuit (OVA and or AOS approval and supervision of specifications)	**Coverage:** 100 % of the specifications are scrutinised **Depth:** determined by the amount and/or the impact on the objectives of the JRC if it goes wrong	**Costs:** Estimation of cost of operational and financial staff involved **Benefits:** limit the risk of litigation, limit the risk of cancellation of a tender and compliance with Financial Regulation and Procurement rules	Cost of control on procurement / Total contract value Cost of control on procurement / number of procedures closed during the year
	Additional controls namely by procurement staff above the financial threshold of EUR 15 000	**Coverage:** 100 % of procedures > EUR 15 000		
	Public Procurement Advisory Group (PPAG) - ex-ante control	**Coverage:** Threshold (100 % ≥ EUR 500 000 and 100 % of negotiated > EUR 60 000) and random sampling (others > EUR 60 000 < EUR 500 000) **Depth:** depends on the sensitivity. Risk based approach focused in particular on the selection criteria		

C – Selection of the offer & evaluation

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

Main risks	Mitigating controls	Estimated coverage frequency and depth	Estimated Costs and benefits of controls	Control 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	**Costs**: Estimation of cost of operational and financial staff involved **Benefits:** limit the risk of litigation and fraud, and compliance with Financial Regulation and Procurement rules	Cost of control on procurement / Total contract value Cost of control on procurement / number of procedures closed during the year
	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	**Costs**: Estimation of cost of operational and financial staff involved **Benefits:** avoid contracting with 'excluded' suppliers that would not be able to fulfil the contract requirements	
	Exclusion criteria documented	**Coverage:** 100 % checked **Depth:** required documents		

Main risks	Mitigating controls	Estimated coverage frequency and depth	Estimated Costs and benefits of controls	Control indicators
		provided are consistent		
	Public Procurement Advisory Group ex-ante control	**Coverage:** Threshold (100 % ≥ EUR 500 000 and 100 % of negotiated > EUR 60 000) and random sampling (others > EUR 60 000 < EUR 500 000) **Depth:** depends on the sensitivity Risk based approach focused in particular on the selection criteria		
	Early Detection and Exclusion System (EDES)	**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	Estimated costs and benefits of controls	Control 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	**Costs:** Estimation of cost of operational and financial staff involved **Benefits:** Detect error before payment, sound financial management and respect of contractual	Cost of control on the financial circuit / number of financial transactions Cost of control on the financial circuit / value of payment

Main risks	Mitigating controls	Estimated coverage frequency and depth	Estimated costs and benefits of controls	Control indicators
			provisions	executed [4]
Amount paid is disconnected from the quality and the timing of the deliverables	Conform to the fact	**Coverage**: 100 % of transactions	**Costs:** Estimation of cost of operational and financial staff involved **Benefits:** avoid paying undue amounts	
	Financial circuit: all steps financial and operational	**Coverage**: 100 % controlled **Depth:** check of all required documents in the contract		
	Signature at higher senior management level for amounts > EUR 134 000	**Coverage**: 100 % of transactions > EUR 134 000 **Depth:** The depth depends on the risk criteria		
	Sensitive functions	**Coverage**: AOSDs and OIAs mainly		
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	**Costs:** Estimation of cost of operational and financial staff involved **Benefits:** Sound financial management and respect of contractual provisions	JRC Payments in time (in %) - According to the applicable financial regulation version

[4] 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	Estimated costs and benefits of controls	Control 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)	**Costs:** estimation of cost of staff involved mainly linked to ex-post controls **Benefits:** Irregular payments detected, issues are followed and addressed and improvement of processes and procedures	Detected error rate from ex-post controls: value of error(s) / total value of payments checked Costs ex post controls / Total value of transactions checked by ex-post Costs ex post controls / total number of transactions checked by ex-post
	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		

Main risks	Mitigating controls	Estimated coverage frequency and depth	Estimated costs and benefits of controls	Control indicators
		weakness in the procedures (procurement and financial transactions)		

ICT No 2: Managing Income from Contractual Actions

This ICT 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	Estimated costs and benefits of controls	Control 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	**Costs:** Estimated time taken by responsible scientist and management to prepare and review risk assessment against project proposal value. **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.	Cost of control on contractual project proposals / Total contractual project forecast value Cost of control on contractual project proposals / Number of proposals selected during the year
	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	**Costs:** Estimated time taken by each actor in the management review procedure. **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.	Total cost of control of management review / Total project forecast value of Support to Commission contracts

Main risks	Mitigating controls	Estimated coverage frequency and depth	Estimated costs and benefits of controls	Control indicators
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.	**Costs:** Estimated time taken by financial officers to request and monitor TPW up-front payment against project value **Benefit**: reduced risk from third party default	Cost of control for up-front payment / Project value of all TPW contracts Rate of default (if any) on TPW contracts
Financial loss due to underestimation of cost of deliverables	Approval of Cost Evaluation Form by Head of Unit.	**Coverage:** 100 % (All cost evaluation forms authorised by the Unit Head)	**Costs:** Estimated time for Unit head to approve the project proposal cost evaluation. **Benefit:** Reduced risk of financial loss due to overspending on contractual contracts	Cost of control / Value of cost evaluation form

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	Estimated costs and benefits of controls	Control 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).	**Cost:** Estimated time taken for the contractual financial officers to verify all contracts. **Benefit:** The JRC is not exposed to any additional liability	Cost of control / Total value of contracts signed Total cost of controls / number of contracts signed
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	**Cost**: Estimated time of staff involved, (FIA; FVA & AOS). **Benefit**: Elimination of errors on FOR, respect of financial circuits.	Cost of control / Total value of FORs signed Cost of control / number of FORs

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	Estimated costs and benefits of controls	Control 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	**Cost:** Time taken by, FIA, FVA and AOS to verify ROs against the total value of ROs issued. **Benefit:** Correct billing of customers, sound financial management and respect of contractual provisions.	Total cost of controls / Total value of recovery orders
	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	**Cost:** Total cost of audits. **Benefit:** reduced risk of errors for contracts with a reimbursable value > EUR 325 000, system improvements and compliance with FP provisions.	Costs of audits / Total value of contractual projects audited
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	**Costs: Cost**: Estimated time of staff involved, (FIA; FVA & AOS). **Benefits:** Sound financial management and respect of contractual provisions	JRC contractual cashing (in %) **-** up to 15 % of the institutional budget

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

N/A

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

N/A

ANNEX 8: Decentralised agencies (if applicable)

N/A

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

No used in Annex 3 MP2017	Title	Reason [1]	Scope [2]	Type[3]	Associated DGs	Costs (EUR)	Comments[4]	Reference[5]
I. Evaluations finalised or cancelled in 2016								
a. Evaluations finalised in 2017								
	Interim Evaluation of the Direct Actions under the Euratom Research and Training Programme (2014 - 2018)	L	The direct actions of the JRC under the Research and Training Programme of the European Atomic Energy Community (2014-2018)	O		50000		http://data.europa.eu/doi/10.2760/402387
	JRC Implementation Review 2017: In the context of the interim evaluation of the Horizon 2020 Programme	O	The direct actions of the JRC in the context of H2020 interim evaluation	O		35000		http://data.europa.eu/doi/10.2760/459053
	The European Commission's Science and Knowledge Service Joint Research Centre: Evaluation of its relations with industry	O	JRC direct actions	O		45000	The main objectives of this exercise are: - to assess the relevance of the JRC's activities for the European Industry, and - to assess the extent to which there is scope for the JRC to work more closely with industry, whilst maintaining is independence and neutrality while providing support to EU-policies.	http://data.europa.eu/doi/10.2760/325330
	JRC Productivity and Impact Evaluation (PRIME)	O	JRC direct actions under Horizon 2020/EURATOM	O		N/A	To provide regular evaluation-based input to the SPP cycle and JRC senior management strategic decision making	Available in Commission internal document management system

	Continuous review of the progress of the JRC decommissioning and waste management programme	O	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty (ABB 10 05)	O		300000	To evaluate the JRC decommissioning and waste management programme	Available in Commission internal document management system
	Ex-ante assessment of JRC projects	O	JRC direct actions under Horizon 2020/EURATOM	O		N/A	Optimisation of work programme definition	Available in Commission internal document management system
b. Evaluations cancelled in 2017								
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
II. Other studies finalised or cancelled in 2017								
a. Other studies finalised in 2017								
Directorate C-1	Assessing eco-innovation technologies for CO_2 reduction of Light Duty vehicles	O	CO_2 emissions from cars and vans	O	CLIMA	20000	The process of assessing 'eco-innovations' application	Available in Commission internal document management system
Directorate C-2	Supporting the definition of post-2020 CO_2 targets for light duty vehicles in Europe	O	CO_2 emissions from cars and vans	O	CLIMA	14000	Calculate the average CO_2 emissions under WLTP conditions of the new vehicles registered in Europe in 2015	https://publications.europa.eu/en/publication-detail/-/publication/7ac4d4cb-b9f7-11e7-a7f8-01aa75ed71a1/language-en/format-PDF/source-66297860
Directorate C-3	Supporting the definition of a verification method for the outputs of VECTO	O	CO_2 emissions from heavy duty vehicles	O	CLIMA	14000	To support the JRC in the validation of the methodology developed for verifying the accuracy of the results produced by VECTO	https://publications.europa.eu/en/publication-detail/-/publication/328945c8-ae3b-11e7-837e-01aa75ed71a1/language-en/format-PDF/source-66297889

Directorate C-4	Stated preference survey for car choices	O	Low emission mobility	O		60000	Discrete Choice Model structure for the choice component of the JRC Powertrain Technology Transition Market Agent Model (PTTMAM)	https://publications.europa.eu/en/publication-detail/-/publication/5aa5b657-f4ef-11e7-be11-01aa75ed71a1/language-en/format-PDF/source-65012928
Directorate C-5	Study on the long term (2050) projections of techno-economic performance of large-scale heating and cooling technologies in the EU	O	Energy efficiency (heating and cooling)	O		75000	Detailed data and projections related to current and future techno-economic performance of large-scale heating and cooling technologies	Available in Commission internal document management system
Directorate C-7	Developments of improvements to the inputs of the Dispa-SET model (1)	O	Energy efficiency (heating and cooling)	O		15000	MEERI-PAS to provide estimations of technical parameters of European thermal power plants; and development of heat production profiles for CHP plants (case study: Poland)	Available in Commission internal document management system
Directorate D-1	Assessment of the effectiveness of EFA measures through literature meta-analysis	O	Scientific evaluation of the Common Agricultural Policy Ecological Focus Areas impacts on biodiversity and ecosystem services	O		55000		Available in Commission internal document management system
Directorate D-2	Maintenance of the carbon calculator, assessment of farm level tools capabilities (through test case), their principles and standards, their possible usage in future CAP	O	Feasibility test to measure environmental farm performance	O		68000		Available in Commission internal document management system
Directorate C-1	Demand Response Model for Adequacy	O	JRC support to the internal energy market and electricity market design	O		90000	Methodological insight of relevance for measuring Generation Adequacy	Available in Commission internal document management system

Directorate C-2	Gas transmission network risk assessment technical support	O	JRC support to the internal energy market	O		95000	To subcontract local technical support organisations to perform analysis and data consultation tasks to perform risk assessment of gas transmission network	Available in Commission internal document management system
Directorate C-3	Power transmission network risk assessment technical support	O	JRC support to the internal energy market	O		95000	To subcontract local technical support organisations to perform analysis and data consultation tasks to perform risk assessment of power transmission network	Available in Commission internal document management system
Directorate C-5	Case study applying Dispa-SET on the Western Balkans (Uni Zagreb)	O	JRC support to the internal energy market and to Western Balkans	O		15000	Uni Zagreb to build a small Dispa-Set model model for the Western Balkans non-EU states.	Available in Commission internal document management system
Directorate C-6	Renewable energy assumptions for the Western Balkans (EIHP Zagreb)	O	JRC support to the internal energy market and to Western Balkans	O		10000	EIHP to provide report on national RES-E plans across the Western Balkans	Available in Commission internal document management system
Directorate C-7	Report and dataset on energy scenarios for South Eastern Europe (IENE)	O	Energy system modelling	O		15000	IENE to provide report on energy scenarios for South Eastern Europe including energy balances	Available in Commission internal document management system
Directorate C-8	Assessment report on modelling assumptions (A.Kochov)	O	Energy system modelling	O		10000	A. Kochov, University of SS Cryl and Methodius to review Western Balkans assumptions in JRC-EU-TIMES	Available in Commission internal document management system
Directorate C-9	Flexibility parameters for thermal power plants	O	Support to the internal energy market	O		15000	Study on flexibility parameters of thermal power plants (coal, gas nuclear) such as: minimum part load, part load efficiencies, start-up times etc.	Available in Commission internal document management system
Directorate C-11	Study for country wide economic impacts and framework conditions for potential unconventional gas and oil extraction in the EU. Country study: POLAND and GERMANY	O	Assessment of unconventional hydrocarbons potential in the EU	O		55000	Study for country wide economic impacts and framework conditions for potential unconventional gas and oil extraction in the EU. Country study: POLAND and GERMANY	Available in Commission internal document management system

Directorate C-12	Detailed Level Market Design of the Hellenic Forward, Day-Ahead and Intraday Markets and respective Market Codes. General high-level advice on the IT specs for Forward Market, Day-Ahead Market and Intra-Day Market.	O	Electricity market design in Greece	O	SRSS	135000		Available in Commission internal document management system
Directorate C-13	Detailed Level Market Design of the Hellenic Balancing Market and respective Market Code. High-level advice on IT Functional Design Specifications	O	Electricity market design in Greece	O	SRSS	135000		Available in Commission internal document management system
Directorate C-14	Study on potential market power mitigation measures for the Hellenic electricity market.	O	Electricity market design in Greece	O	SRSS	35000		Available in Commission internal document management system
Directorate C-20	Particle emissions from tyres	O	JRC support to vehicle emissions policy	O		45000	To investigate the characteristics of particles as a function of the 'durability' of the tyres	JRC109134
Directorate C-21	ILUC Modelling using GLOBIOM	O	To assess indirect land-use change emissions of bio-based alternative aviation fuels	O		60000		Finalised, not yet registered.
Directorate D-2	Agro-economic study	O	Spatialisation of FADN farms for the IFM-CAP model	O	AGRI	65000	Methodological study to calculate probability of crop shares location from administrative NUTS data	JRC107846
	A population genetic study on Mediterranean blue shark for stock identification and conservation (MedBlueSGen)	O	Support to the Common Fisheries Policy	O	MARE	50000		Available in Commission internal document management system

	Ex-ante assessment of air quality in EUSALP and EUSAIR macro-regions	O	JRC support to macro-regions	O	REGIO	25000	Integrated assessment of air quality to identify priority actions at the macro-regional level	https://publications.europa.eu/en/publication-detail/-/publication/a6a20d5b-c438-11e7-9b01-01aa75ed71a1/language-en (EUR 28788)
b. Other studies cancelled in 2017								
Directorate E-1	Information Security Requirements and Identification of Suitable Architectural Solutions for Common Information Environment (CISE) for Maritime Surveillance	O	To analyse the needs and requirement for the security aspects of the infrastructure and for the Access Rights Management in a decentralised, technology neutral environment for the exchange of information among AU Authorities.	O	MARE	50000	Because of changes in parallel activities, the study was deemed to be no more needed in 2017.	
Directorate C-15	Study on the potential for establishing a Clearing House and a Credit House for the Hellenic electricity market.	O		O		40000	The Hellenic authorities decided to create a power exchange, thus, the above deliverable is no longer needed.	
Directorate C-16	Study on key design parameters in the auction-based capacity mechanism.	O		O		25000	It's highly unlikely that an auction will take place in 2018 as the Hellenic electricity transmission and system operators will not have the ICT infrastructure ready.	
Directorate C-17	Study on the auction documents for the auction-based capacity mechanism.	O		O		25000	It's highly unlikely that an auction will take place in 2018 as the Hellenic electricity transmission and system operators will not have the ICT infrastructure ready.	
Directorate C-4	Ocean Energy DB Update						Incorrectly included on the list	

Directorate C-18	PMP sub-23nm Interlaboratory Correlation Exercise						Incorrectly included on the list	

[1] Reason why the evaluation/other study was carried out, please align with Annex 3 of the MP 2016. The individual symbols used have the following meaning: L - legal act, LMFF - legal base of MFF instrument, FR - financial regulation, REFIT, REFIT/L, CWP - 'evaluate first', O - other (please specify in Comments)

[2] specify what programme/regulatory measure/initiative/policy area etc. has been covered

[3] FC – fitness check, E – expenditure programme/measure, R – regulatory measure (not recognised as a FC), C – communication activity, I – internal Commission activity, O – other – please specify in the Comments

[4] Allows to provide any comments related to the item (in particular changes compared to the planning). When relevant, the reasons for cancelling evaluations/ other studies also needs to be explained in this column.

[5] For evaluations the references should be 1) number of its Evaluation Staff Working Document and number of the SWD's executive summary; 2) link to the supportive study of the SWD in EU bookshop. For other studies the references should be the link to EU bookshop or other reference where the 'other study' is published via different point.

ANNEX 10: Specific annexes related to 'Financial Management'

1. Credits cross-sub-delegated

- **Cross-sub-delegations received**

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

Table A10-1. Cross sub-delegations received.

DG/Service	Associated budget in 2017[5] *(C1 commitment accepted) In EUR 1 000s*	Nature of service managed by the JRC
DG AGRI	0	Assigned to Directorate D for the Union participation at the World Exposition 2015 - 'Feeding the Planet - Energy for Life' in Milan.
DG CLIMA	0	Assigned to Directorate D for the Pilot Project 'Making efficient use of EU climate finance: using roads as an early performance indicator for REDD+ projects' and for project 'LUCAS samples – Analysis'.
DG DEVCO	0	Assigned to Directorate D for the Project 'NEPAD African Network of Centres of Excellence on Water Sciences and Technology (II phase)'
DG DEVCO	1 000	Assigned to Directorate E and Directorate I for the Project Gestion du programme African Peace Facility (APF) – 4eme phase de cooperation avec AU – Continental Early Warning System (AU CEWS)
DG DIGIT	1 833	Assigned to Directorate B for Action 1.17 'Reusable INSPIRE Reference Platform', Action 2.13 'EULF' and Action 10 'ELISE'.
DG ENER	472	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 the project 'LUCAS samples – Analysis'.
DG GROW	18 169	Assigned to Directorate D and Directorate E for the programme 'Copernicus'.

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

DG MARE	n.a.(*)	Assigned to Directorate D to enter into legal commitments in the context of production of scientific advice by the Scientific, Technical and Economic Committee for Fisheries (STECF). (*)This sub-delegation is limited to the signature of legal commitments, no budgetary sub-delegation was given. The JRC organises the committee meetings including the expert invitations. Payments are executed by DG MARE and the PMO. The IR (art 4.1) specifically allows for the AOSD to be different in case of provisional commitments. In this case, both the commitments on the global envelope and on the operational line are provisional commitments.
DG NEAR	87	Assigned to Directorate A for the 'TAC – Travel Accommodation and Conference facility for Western Balkans and Turkey'.
DG RTD	0	Assigned to Directorate B for the project 'Research and Innovation Observatory'.

- **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 A10-2: Cross Sub-Delegations given

DG/Service	Associated Budget in 2017 *(C1 commitment accepted) In EUR 1 000s*	Nature of Service managed by the Other Services
DG ESTAT	38	Contribution of the JRC to the purchase and annual update of geographic database

- **Co-delegations**

The JRC has put in place horizontal co-delegations[6] (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'

- 05 07 01 02 'Monitoring and preventive measures — Direct payments by the Union'

- 05 08 03 00 'Restructuring of systems for agricultural surveys'

[6] 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)

- 29 02 01 'Providing quality statistical information'

Table A10.3: Horizontal co-delegations given.

DG/Service	Associated budget in 2017 *(C1 commitment accepted) In EUR 1 000s*	Nature of the Co-Delegated Service
DG AGRI[7]	9 130	Control with Remote Sensing Programme - Acquisition of satellite imagery under the 2017 Control with Remote Sensing (CwRS) work programme and their free of charge supply to the MS.
DG AGRI	2 070	AGRI4CAST project – Implementation of the Operational MARS Crop Yield Forecasting System, The project results in the production of monthly MARS Bulletins, bi-weekly briefings on agro-meteorological conditions to AGRI, and additional ad-hoc analyses upon request.
DG BUDG	93	Contribution to DG BUDG Services related to ABAC.
DG DIGIT	1 458	Contribution to DG DIGIT IT services foreseen in the MoUs.
DG DGT	59	Contribution of the JRC to DGT Translation Services.
DG ESTAT	0.3	Improved data quality of the 2018 LUCAS Survey due to careful preparation.
DG HR	969	Contribution to the cost of activities managed by DG.HR.AMC8 (stagiares and grant holders salaries and administration, training and recruitment).
DG HR	267	The JRC social costs in Ispra managed by the Medical Services.
DG HR	400	Contribution to the cost of the Medical Services in the sites.
OIB	438	Contribution to the Ispra costs related to canteen & cafeteria, childcare and lodging managed by OIB.
PO	310	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'.

[7] The two co-delegations with DG AGRI are Horizontal Co-Delegation type I (Art. 3.2 of the Internal Rules) for which the Fund Management Centre in ABAC is 'JRC' and as a result appear in Tables 1 to 3 of Annex 3 even though the budget title is DG AGRI's (i.e. 05) and not JRC (i.e. 10).

Table A10-4. Vertical co-delegations given.

DG/Service	Associated budget in 2017 *(C1 commitment accepted)* *In EUR 1 000s*	Nature of co-delegated service
DG HR	0	Payments of Interim staff in Brussels
PMO	0	Payments of core and contractual staff expenditure

2. Expenditure operations

The JRC carries out its expenditure operations through procurement operations. An internal control template (ICT) 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 2017. Due to the nature of its operations, the JRC has a higher than normal proportion of negotiated contracts.

Management mode: Direct centralised

Key figures:

- There were 191 large value (> EUR 60 000) contract tenders valued at approximately EUR 141 million[8]
- 18 % of the files were awarded through negotiated procedure.

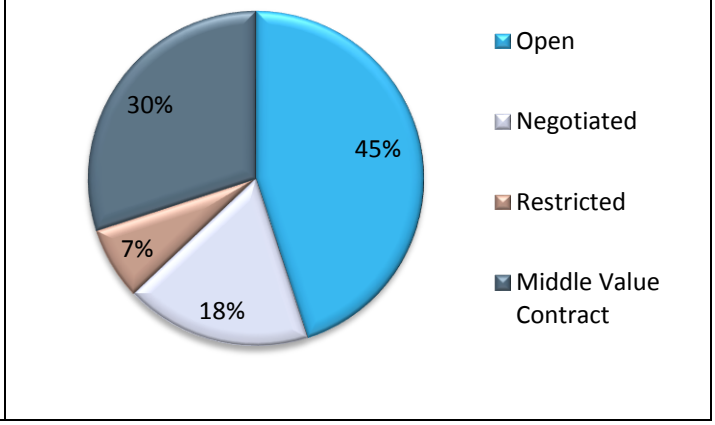

Figure A10.5. Procurement procedures (> EUR 60 000) carried out in 2017.

3. Revenue operations

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

- The Council Resolution of 29 June 1988 introduced the concept of competitive activities (currently called contractual activities) performed by the JRC for third parties and in support of the Commission. It clearly differentiated between the JRC's institutional task of executing specific research programmes and its work for 'other Commission services and for third parties'.
- The Council Decision of 3 May 1989 formalises the concept of the JRC performing third party and support to the Commission activities and clearly indicates that this will be 'against payment'.

[8] The amount of EUR 141 Million is higher than the annual budget because the associated contracts run over several years.

- 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 A10.6 depicts the contractual contracts signed during 2017, the type and their value.

Management mode: Direct centralised

Key figures:

- 276 new forecast of revenue for contractual contracts were signed in 2017 with a value of EUR 116 million
- EUR 87.6 million of contractual income was cashed in 2017
- Support to Commission services are the main source of contractual income

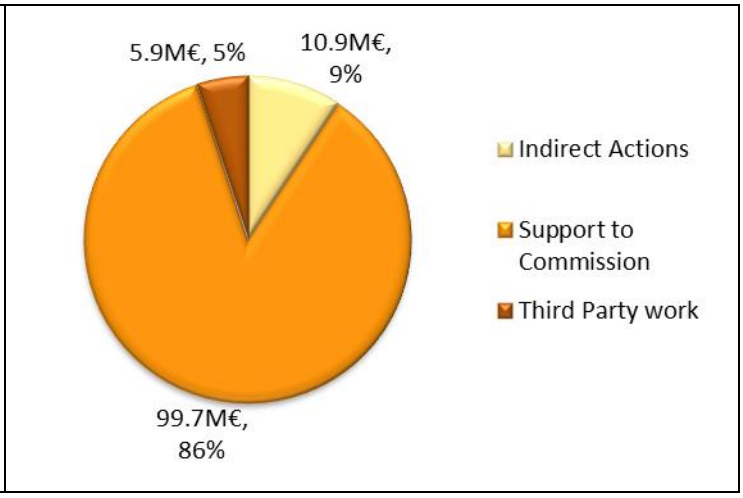

Figure A10.6. Contractual income generated by the JRC in 2017.

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

4. JRC Financial Circuits and Segregation of Duties[9]

Basic principles

- **Four eyes principle/Segregation of duties**: before an operation is authorised, all aspects of this operation (both operational and financial) have to be verified by at least one member of staff other than the one(s) who initiated the operation. Therefore, the initiating and verifying function on one side, and the initiating and authorising function on the other side, can never be combined (Art. 66.5 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. 66.5 FR).

- **Single signature**: except in well-defined cases (as defined in Art. 97 RAP) the budgetary and legal commitment relating to the same transaction has to be signed by the same authorising officer.

Basic circuits

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

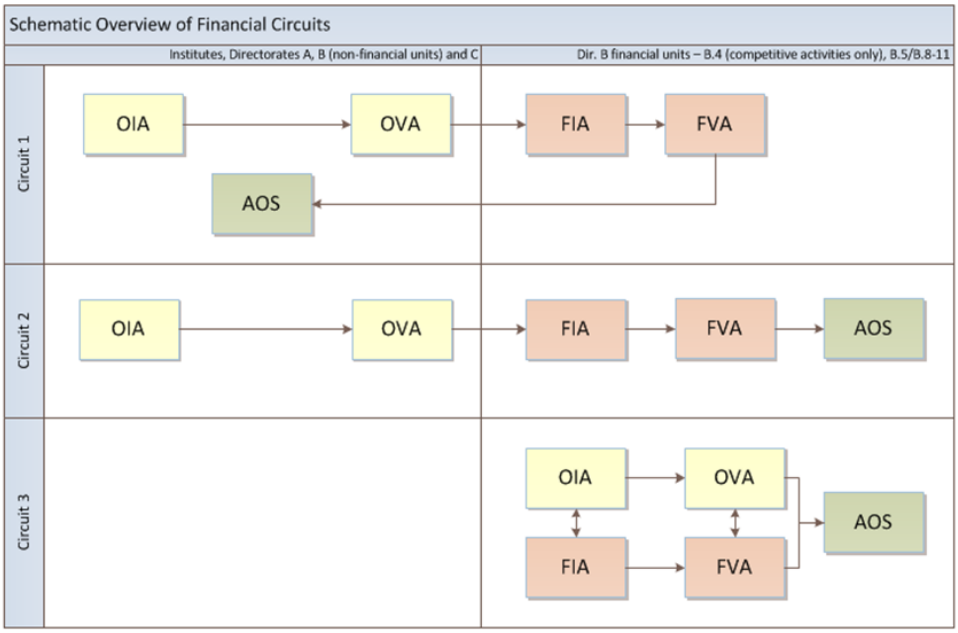

Figure A10-7. Schematic overview of Financial Circuits

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

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

- scientific activities.
- site management such as infrastructure and maintenance.
- decommissioning activities.
- centrally managed operations (< EUR 134 000), such as training, informatics, communication etc.
- income-generating transactions (Forecasts of Revenue, Recovery Orders).

In case of transactions < EUR 134 000 managed by the Directorates involving two or more actions from the same Directorate, the AOS will be the Head of the Unit in which the OIA is placed. The other Unit Heads are to be appropriately involved in the workflow.

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 managed within the Resources Directorate for an amount ≥ EUR 134 000 (in these cases the AOS is the Resources Director).
- Activities involving more than one Directorate, where OIA and OVA are situated in Directorates other than the Resources Directorate.
- Low-risk transactions (e.g. validation of payment orders for reimbursement of candidates/experts).
- Mass upload for payments (applied for Grant holder and trainee salary payments, reimbursements of candidates or experts). The workflow can represent a variation to circuit 2 in the sense that the OVA function can be carried out in the financial unit.

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

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

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

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

In 2017, the JRC financial circuits were revised in order to simplify the workflows and reflect the new organisational structure put in place in July 2016. The new version of financial circuits has entered into force in January 2018.

5. Reporting on Financial Management outputs for the year

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

Objective 1: Effective and reliable internal control system giving the necessary guarantees concerning the legality and the regularity of the underlying transactions		
Indicator 1: Estimated error rate **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)
0.5 % - Average error rate (AER)	Below the JRC's materiality criteria of 2 % per year until 2020.	0.5 % - Average error rate (AER) The JRC's detected error rate for 2017 is 0 % which confirms the positive the trend of the past years and indicating that there are no issues concerning the JRC's legality and regularity of the underlying transactions. Nonetheless, to estimate the AER the JRC took a most conservative and prudent approach and estimated it to be at 0.5 %.
Indicator 2: Estimated overall amount at risk for the year for the entire budget under JRC responsibility **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)[10]
EUR 1.03 million	Amount at risk below the JRC's materiality criteria of 2 % of the total budget per year until 2020.	EUR 0.93 million – despite the fact that the JRC's detected error rate is 0 % it has estimated its average error rate to be 0.5 % which is a more conservative and prudent approach.
Indicator 3: Estimated future corrections **Source of data:** DG BUDG and Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)[11]
EUR 0.04 million	100 % recoveries and correction of specific errors	EUR 0.1 million
Indicator 4: Proportion of exceptions **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)

[10] 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.

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

0.28 %	< 1 % of transactions per year	0.22 % The exceptions and non-compliance events amount to 0.22 % 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 2017 with 29 155 transactions and most of them were payments: 21 618.
Indicator 5: Quality of procurement procedures submitted to the PPAG **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)
96 %	Target of ≥ 95 % per year	95 % In 2017, 83 files were screened by the PPAG, representing a value of approximately EUR 126 Million. In the vast majority of cases, 79 files (95 %), 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 2017:

In 2017 the JRC has produced various initiatives in the area of finance and procurement operations to ensure that has in place an effective and reliable internal control system which gives the necessary guarantees concerning the legality and the regularity of underlying transactions.

A new procurement training series was designed and rolled-out specifically for operational staff to cover most frequent issues. The design of further trainings specifically for OIAs on Expenditure Lifecycle and Purchase orders is ongoing and will be offered in 2018. Awareness raising was pursued through two Finance and Procurement Network meetings, sharing knowledge and best practices amongst JRC financial staff. It was reinforced by the creation of an Operational Procurement Network involving mainly technical and scientific staff in two meetings at three months interval to address also and directly procurement issues from their perspective.

As part of a JRC simplification campaign carried out during 2017, the Finance and Procurement simplification plan reached a total of 44 actions, of which 10 were not followed up since not feasible, 14 were almost completed and a further 20 are in progress. The areas addressed were: reducing the sheer number of financial transactions, increasing the flexibility of the financial circuits to better match Commission practice and the geographical distribution of the JRC, simplifying and/or clarifying historical practices and document templates, reducing the dispersion of OIAs to better concentrate operational procurement know-how, identifying innovative procurement methods and introducing the electronic signature of contracts.

The various simplification actions undertaken during the course of the year start having an impact on the cost of JRC controls, for example:

- eliminating a redundancy in certified correct workflows of invoices (paper and electronic) which is estimated to save about 1 000 workflows per year
- increasing authorisation ceilings for deputy and unit head AOSs in the revised 2018 financial circuits ensures that several hundreds of transactions per year are

authorised closer to operational initiation and verification, hence more efficiently than through e.g. deputisation or actors further up in hierarchy, who are less aware of the financial files.

The **Public Procurement Management Tool (PPMT)** was enhanced with new functionalities extending the support in the pre-award process. The workflow support was replaced with a new workflow engine fully embedded in PPMT. Support for multiple ARES job users is now enabled together with several smaller enhancements like the improved integration with eNotices making use of the European Commission Authentication System (ECAS). PPMT has been interfaced with the Commission's new Legal Commitment Kernel in ABAC - procedures encoded in PPMT are now automatically transferred to ABAC. Specific support for encoding purchases below EUR 15 000 in the PPMT Request module is provided. The PPMT Request screens have been adapted and simplified to guide the user in the purchasing process for very low value contracts. A new award decision workflow has been developed and will be used for all purchases. After a few pilots the new PPMT support for very low value purchases will be rolled out to all JRC sites in 2018. PPMT was recognised as the corporate pre-award back-office procurement tool, part of the new eProcurement target architecture. PPMT Request module was adopted by EEAS and it is used now in more than 160 delegations across the world.

The **eProcurement project** is part of the SEDIA (Single Electronic Data Interchange Area) programme, SEDIA will ensure a one-stop-shop and single entry point for third parties participating in grants and procurement procedures. Data should be entered in the system or submitted by third parties 'only once' and can be reused in the whole process, by contracting authorities in the grants and procurement.

In March 2017 the JRC was appointed as the Business Domain Owner (BDO) of the eProcurement project mainly thanks to its strong expertise in procurement (being the DG with the highest number of procurement procedures per year under Title V of the FR) and with its recognised experience in acquiring a full spectrum of deliverables. The overall objective of the eProcurement project is to arrive at a complete business-and-IT solution by which the process for handling procurement information will be fully automated and integrated, limiting to a strict minimum the manual input of data, and promoting the alignment and reuse of such data along the different processes. The eProcurement project covers the entire eProcurement value chain (end-to end eProcurement) split into five distinct business processes: preparation, publication, submission and evaluation, contract management and asset management, and logistics. The project is primarily business-driven aiming at business process simplification, harmonisation and automation. Since taking up its role as BDO, the JRC has worked toward setting up a proper governance structure for this project appointing the business process owners (BPOs)[12] for the 5 business processes. In addition, the JRC prepared a detailed project charter in agreement with the BPOs and DG Informatics (as main system supplier), which was also endorsed by the Grants and Procurement Steering Board (GPSB).

In its role as BDO the JRC coordinated the activities of the BPOs to ensure coherence in the business process definition and provided support for the business analysis and the business process harmonisation activities which will continue also in 2018 and in the years ahead. The JRC has also set up the project communication online platform on Connected which it also manages. In 2018 the project aims to deliver amongst others the roll-out of the compliance track modules, e-submission and e-invoicing, as well as the elaboration of the details of the architecture of the target business and IT solution especially for the post-award phase and in particular the clarification of the boundaries between eProcurement and the new ABAC modernisation project (SAP4HANA). Since taking up this role the JRC has worked very closely with all concerned partners, particularly DG for Budget, DIGIT, DG RTD, BPOs and REA, providing immediate and tangible added value to the project.

[12] JRC, DG GROW, DG BUDG and OIB

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 2016	Target 2017		Latest known results 2017
Yes	Yes		Yes – To reach this conclusion the JRC analysed the evolution of the efficiency and cost-effectiveness indicators from 2016 to 2017, and took into account also the results obtained since 2014. The overall cost of control indicator is slightly above the target set of <6 %. However the result achieved for the different stages of Procurement is less than the target set for 2017 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 (31/12/2016)**	**Target 2017**	**Latest known results (31/12/2017)**[13]
1 – Overall cost of control (%)	6.56 %	<6 %	6.28 %
1(a) – Cost of controls of the procurement stage up to selection of the offer and evaluation	2.11 %	<4 %	3.21 %
1(b) – Cost of controls of the financial transaction	3.71 %	<4 %	3.7 %
1(c) – Cost of supervisory measures (ex-post controls)	0.34 %	<0.4 %	0.3 %
Indicator 2: Conclusion reached on cost effectiveness of controls – Area 'Contractual Income' **Source of data:** Internal			
Baseline 2016	Target 2017		Latest known results 2017
Yes	Yes		Yes - To reach this conclusion the JRC analysed the evolution

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

			of the efficiency and cost-effectiveness indicators from 2015 to 2017, and took into account also the results obtained in 2014.
Indicator	Baseline (31/12/2016)	Target 2017	Latest known results (31/12/2017)[14]
1 – Overall cost of control (%)	0.3 %	$\leq$ 0.3 %	0.22 %

Indicator 3: Implementation of Internal Control Standards in the JRC **Source of data:** Internal		
Baseline (31/12/2016)	Interim milestone (2017)	Latest known results (31/12/2017)
3.4	3.4	3.3 The indicator's numerical value represents the weighted average of the results of the survey that was carried out in 2017 to assess the staff perception of the degree of implementation of the Internal Control Standards in the JRC and to appraise if the internal control systems are effective. The 2017 value of 3.3 is slightly lower than the target set and the 2016's value of 3.4. Nevertheless, this evidences a rather stable situation with respect to staff perception of the degree of implementation of the internal control standards in the JRC when considering that awareness-raising activities and trainings were put on hold in view of the revised ICF. Considering also the detected error rate of 0% in the last 2 years, this evidences that the ICSs in the JRC have been implemented effectively. The trend for this indicator since 2014 is given in the Executive Summary (b) KPI 5
Indicator 4: Timeliness of payments **Source of data:** Internal		
Baseline (31/12/2016)	Target	Latest known results (31/12/2017)
93.3 %	Target of $\geq$ 95 % per year	93 % A lower value than the target and a minor decrease compared to the average of the last 2 years of 94% 2016 which is partially attributed to some problems which the JRC faced during the course of 2017 as a result of the introduction of the Expert Management Internal (EMI) tool which is used for paying fee paid experts. In the meantime these problems have been solved. Constant efforts are made to ensure that the vast majority of the payments are made within the legal time limits.
Indicator 5: Contractual income **Source of data:** Internal		
Baseline (31/12/2016)	Target (2020)	Latest known results (31/12/2017)

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

24.11 %	15 %	23.51 % The contractual cashing indicator (as a percentage of the institutional budget[15]) has decreased from 24.11 % of last year to 23.51 %, which remains significantly higher than the target of 15% and clearly evidencing the efficiency of the controls performed.

Objective 3: Minimisation of the risk of fraud through application of effective anti-fraud measures, integrated in all activities of the JRC, based on the JRC's anti-fraud strategy (AFS) aimed at the prevention, detection and reparation of fraud.		
Indicator 1: Updated anti-fraud strategy of the JRC, elaborated on the basis of the methodology provided by OLAF. **Source of data:** Internal		
Baseline	Target	Latest known results 2017
December 2013[16]	Update every 3 years, as set out in the AFS	In 2017, the JRC's anti-fraud strategy and its action plan were updated in order to contribute to the Commission's anti-fraud strategy update and take into account the latest OLAF's methodological guidance in this respect.
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 (31/12/2017)
- All staff – 4.15 - Management – 4.57 - Staff (other than management) - 3.91	Ethical climate rating 4.5 on a scale 1 (disagree) to 5 (agree)	- All staff – 3.97 - Management – 4.45 - Staff (other than management) -3.75 Compared to 2016, the results show a slight decrease in the anti-fraud awareness which is expected to increase in 2018 as a result of the revised ICF training courses and increased awareness-raising coming from the updated AFS.
Indicator 3: Regular monitoring of the implementation of the anti-fraud strategy and reporting on its result to management. **Source of data:** Internal		
Baseline (31/12/2016)	Target (2020)	Latest known results (31/12/2017)
Monitored regularly throughout the year and formal reporting at least once per year	Twice per year	Monitored throughout the year and formal reporting at least once per year

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

[16] Year of first launch

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

N/A

ANNEX 12: Performance tables

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 [17]		
Baseline (2012)	**Target** (2020) Europe 2020 target	**Latest known results** (2016)
2.01 %	3 %	2.03 %
Impact indicator 2: Employment rate population aged 20-64 **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020) Europe 2020 target	**Latest known results** (2016)
69.2 %	At least 75 %	71.1 %
Impact indicator 6: GDP growth **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020)	**Latest known results** (2016)
1.8 %	Increase	2.0 %
Impact indicator 9: Resource productivity: Gross Domestic Product (GDP, €) over Domestic Material Consumption (DMC, kg) **Explanation:** The indicator focuses on the sustainability of growth and jobs. **Source of the data:** Eurostat		
Baseline (2010 - Eurostat estimate)	**Target** (2020)	**Latest known results** (2016)
1.8 €/kg (EU-28)	Increase	2.1 €/kg (EU-28)
Completed evaluations: Horizon 2020 Interim Evaluation (2017, H2020 programme)		

[17] 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.

Specific objectives 1.1 to 1.9 (contributing to H2020 Specific Objective 17):	Related to spending programme: H2020
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 and fisheries (Specific objective 1.5) Health and food safety (Specific objective 1.6) Regional policy (Specific objective 1.7) Research, science and innovation (Specific objective 1.8) Transport (Specific objective 1.9) Employment, social affairs, skills and labour mobility	

Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[18] 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** (2017)
88 %	> 88 %	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	87 %

Result indicator 2: Weighted average of overall customer satisfaction

Source of data: JRC internal indicator

Baseline (2017)[19]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results**
N/A	N/A	N/A	N/A

Completed evaluations: JRC Implementation Review 2017: In the context of the interim evaluation of the Horizon 2020 Programme (2017; JRC direct actions in H2020); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)

[18] 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.

[19] New indicator. Pilot test was run in 2017. The time series data is being collected to derive a baseline and a target value.

Main outputs in 2017:			
Policy–related outputs/Main expenditure outputs[20]			
Description	Indicator	Target date	Latest known results (situation on 31/12/2017)
Outputs in the area of 'Agriculture and rural development'	Policy related outputs	Throughout 2017	70
Outputs in the area of 'Education, culture, youth and sport'	Policy related outputs	Throughout 2017	13
Outputs in the area of 'Environment'	Policy related outputs	Throughout 2017	125
Outputs in the area of 'Maritime affairs and fisheries'	Policy related outputs	Throughout 2017	49
Outputs in the area of 'Health and food safety'	Policy related outputs	Throughout 2017	51
Outputs in the area of 'Regional policy'	Policy related outputs	Throughout 2017	43
Outputs in the area of 'Research, science and innovation'	Policy related outputs	Throughout 2017	60
Outputs in the area of 'Transport'	Policy related outputs	Throughout 2017	33
Outputs in the area of 'Employment, social affairs, skills and labour mobility'	Policy related outputs	Throughout 2017	18
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)			**462**

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** (2016 prox estimates by EEA)
80.2 %	At least 20 % reduction (index ≤ 80)	77.4 %

[20] 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.

<table>
<tr><td colspan="5">Impact indicator (12): Share of renewable energy in gross final energy consumption
Source of the data: Eurostat</td></tr>
<tr><td rowspan="2">Baseline
(2013)</td><td colspan="2">Interim Milestone</td><td rowspan="2">Target
(2020)
Europe 2020 target</td><td rowspan="2">Latest known results
(2016)</td></tr>
<tr><td>(2015/ 2016)</td><td>(2017/ 2018)</td></tr>
<tr><td>15 %</td><td>13.6 %</td><td>15.9 %</td><td>20 %</td><td>17.0 %</td></tr>
<tr><td colspan="5">Impact indicator (13): Increase in energy efficiency – Primary energy consumption
Source of the data: Eurostat</td></tr>
<tr><td>Baseline
(2013)</td><td colspan="2">Target
(2020)
Europe 2020 target</td><td colspan="2">Latest known results
(2016)</td></tr>
<tr><td>1 569.1 million tonnes of oil equivalent (Mtoe)</td><td colspan="2">20 % increase in energy efficiency

(No more than 1 483 Mtoe of primary energy consumption)</td><td colspan="2">1 542.7 million tonnes of oil equivalent (Mtoe)</td></tr>
<tr><td colspan="5">Impact indicator (14): Increase in energy efficiency – Final energy consumption
Source of the data: Eurostat</td></tr>
<tr><td>Baseline
(2013)</td><td colspan="2">Target
(2020)
Europe 2020 target</td><td colspan="2">Latest known results
(2016)</td></tr>
<tr><td>1 106.2 million tonnes of oil equivalent (Mtoe)</td><td colspan="2">20 % increase in energy efficiency

(No more than 1 086 Mtoe of final energy consumption)</td><td colspan="2">1 107.7 million tonnes of oil equivalent (Mtoe)</td></tr>
<tr><td colspan="5">Completed evaluations: Horizon 2020 Interim Evaluation (2017, H2020 programme); Interim evaluation of the Euratom Research and Training Programme 2014-2018 (2016-2017, Euratom programme); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)</td></tr>
<tr><td colspan="4">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, secure and sustainable use of the nuclear energy</td><td>Related to spending programmes: H2020 and Euratom</td></tr>
<tr><td colspan="5">Result indicator: Proportion of achieved planned policy deliverables - Number of planned policy deliverables achieved[21] 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;</td></tr>
</table>

[21] 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.

PUBSY/JPB)			
Baseline (2015)	**Interim Milestone** (2017)	**Target**	**Latest known results** (2017)
77 %	> 77 %	Indicator introduced in 2016. Long-term target not set; data and time series are being assessed.	83 %
Result indicator 2: Weighted average of overall customer satisfaction **Source of data:** JRC internal indicator			
Baseline (2017)[22]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2017)
N/A	N/A	N/A	N/A
Completed evaluations: JRC Implementation Review 2017: In the context of the interim evaluation of the Horizon 2020 Programme (2017; JRC direct actions under H2020 programme); Interim Evaluation of the Direct Actions under the Euratom Research and Training Programme, 2014-2018 (2016-2017; JRC direct actions under Euratom programme); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)			

Main outputs in 2017:			
Policy–related outputs/ Main expenditure outputs			
Description	Indicator	Target date	Latest known results (situation on 31/12/2017)
Outputs in the area of 'Climate Action'	Policy related outputs	Throughout 2017	54
Outputs in the area of 'Energy'	Policy related outputs	Throughout 2017	114
Outputs in the area of 'Safe, secure and sustainable use of the nuclear energy'	Policy related outputs	Throughout 2017	203
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)			**371**

[22] New indicator. Pilot test was run in 2017. The time series data is being collected to derive a baseline and a target value.

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** (2016)
17.1 %	20 %	17.4 %
Impact indicator (17): Intra-EU trade in goods (% of GDP) **Source of the data:** Eurostat		
Baseline (2014)	**Target** (2020)	**Latest known results** (2015)
20.8 %	Increase	20.3 %
Completed evaluations: Horizon 2020 Interim Evaluation (2017, H2020 programme)		
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 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[23] 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** (2017)
85 %	> 85 %	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)[24]	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2017)
N/A	N/A	N/A	N/A
Completed evaluations: JRC Implementation Review 2017: In the context of the interim			

[23] 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.

[24] New indicator. Pilot test was run in 2017. The time series data is being collected to derive a baseline and a target value.

evaluation of the Horizon 2020 Programme (2017; JRC direct actions under H2020 programme); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)

Main outputs in 2017:			
Policy–related outputs/Main expenditure outputs[20]			
Description	Indicator	Target date	Latest known results (situation on 31/12/2017)
Outputs in the area of 'Internal market, industry, entrepreneurship and SMEs'	Policy related outputs	Throughout 2017	195
Outputs in the area of 'Customs policy and the fight against fraud'	Policy related outputs	Throughout 2017	12
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)			**207**

General objective 9: Europe as a stronger global actor			
Impact indicator (32): GDP per capita (current prices-PPS) as % of EU level in countries that are candidates or potential candidates for EU accession **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 November 2016 to take into account data revisions)	**Interim milestone**	**Target** (2030) UN Sustainable Development Goals	**Latest known results** (Computed on country level data from 2016 or before, drawing on World Bank data for the poverty rates, and UN Population Division data for the weights; extracted in November 2017)
17.0 % (including the graduated countries - Partnership countries for which bilateral assistance is phased out) 28.4 % (excluding the graduated countries) For the calculation of the baseline beneficiary countries under the Development Cooperation Instrument and	Rolling On course for 2030 based on annual progress report prepared by UN Secretary General.	0 %	15.1 % (including the graduated countries - Partnership countries for which bilateral assistance is phased out) 26.7 % (excluding the graduated countries)

European Development Fund have been taken into account. Beneficiaries under the European Neighbourhood Instrument and EU - Greenland Partnership Instrument have been excluded.			

Completed evaluations: Horizon 2020 Interim Evaluation (2017, H2020 programme); Interim evaluation of the Euratom Research and Training Programme 2014-2018 (2016-2017, Euratom programme)

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

Baseline (2015)	**Interim Milestone** (2017)	**Target**	**Latest known results** (2017)
72 %	> 72 %	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

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

Completed evaluations: JRC Implementation Review 2017: In the context of the interim evaluation of the Horizon 2020 Programme (2017; JRC direct actions under H2020 programme); Interim Evaluation of the Direct Actions under the Euratom Research and Training Programme, 2014-2018 (2016-2017; JRC direct actions under Euratom programme); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)

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

[26] New indicator. Pilot test was run in 2017. The time series data is being collected to derive a baseline and a target value.

Main outputs in 2017:			
Policy–related outputs/Main expenditure outputs[20]			
Description	Indicator	Target date	Latest known results (situation on 31/12/2017)
Outputs in the area of 'Global safety and security'	Policy related outputs	Throughout 2017	104
Outputs in the area of 'International cooperation and development'	Policy related outputs	Throughout 2017	56
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)			**160**

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

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

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

Impact indicator: Not applicable, given the diversity of activities. Indicators are available on output level, in the MP 2017.

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

Completed evaluations: JRC Implementation Review 2017: In the context of the interim evaluation of the Horizon 2020 Programme (2017; JRC direct actions under H2020 programme); Interim Evaluation of the Direct Actions under the Euratom Research and Training Programme, 2014-2018 (2016-2017; JRC direct actions under Euratom programme); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)

Main outputs in 2017:			
Policy–related outputs/Main expenditure outputs[20]			
Description	Indicator	Target date	Latest known results (2017)
Work programme coordination	Work Programme process and procedures updated and aligned with 2030 strategy Work Programme 2018-2019 adopted by College without negative opinion	March 2017 December 2017	All procedures related to the planning are updated and aligned with the strategy No negative opinions through inter-service consultation, adoption expected mid-February 2018
Coordination of relations with Commission services	Successful DG bilateral meetings Relevant policy support reflected in JRC Work Programme & Memoranda of Understanding Strengthened JRC role in better regulation initiatives High quality input into inter-service consultations & meeting High quality briefings, concept notes, policy briefs	Throughout the year	14 Work Programme assessed for expected policy impact; 2 new MoUs with policy DGs Participation in about 50 upstream meetings, JRC included for MFF programmes; support on data for monitoring and evaluation; support on quantification Replies to 1029 inter-service consultations; 247 with comments 124 briefing requests handled (through BASIS)
Coordination of inter-institutional, international relations and outreach: a. Strengthened dialogue with inter-institutional partners, EU Member States, H2020 Associated Countries and international partners	a.1 2017 'Science Meets Parliaments' and 'Science Meets Regions' events a.2 Information sessions reflecting the JRC's work involving the Council's Research Working Party (RWP) and other Council groups	Throughout the year	a.1 Events were organised in Saxony (DE), Murcia (ES), Bratislava (SI) and Gabrovo (BG), touching on topics like water management, energy, climate change, education, foresight and future trends, and smart specialisation. a.2 For RWP on EURATOM; for the Space Working Party (SWP) on Copernicus; for the Horizontal Working Party on Cyber Issues; for the Ad Hoc Working Party on European Deposits Insurance Scheme on the

			risk-based contributions to EDIS; and for the Customs Cooperation Working Party on the laboratory facility for tobacco analysis TOBLAB.
	a.3 Meetings of JRC with Member States and H2020 Associated Countries. Thematic (expert) events organised and promoted. Joint reports with stakeholders published and promoted.		a.3 About 80 events took place at the Ispra Site involving guests representing different target groups (scientists, young scientists, public authorities, institutions, politicians, students, general public) and geographical levels (EU, Member States, regions, as well as from third Countries).
	a.4 Signing of new collaboration arrangements (World Bank Group, Chinese Academy of Sciences, Japan AIST) and organisation of steering group meetings (NOAA, MCTI, etc.).		a.4 Agreement with the Chinese Academy of Sciences signed at the 2017 EU-China Summit; agreement setting up a formal cooperation framework with the Japanese Institute for Advanced Industrial Science and Technology (AIST); renewal of agreements with the US National Oceanic and Atmospheric Administration (NOAA) and the South African Space Agency (SANSA); and others. Several projects where JRC is a partner received funding under the EU-Brazil Sector Dialogue support scheme.
b. Structured relations with policy and scientific stakeholder organisations (academies, universities, umbrella organisations, +…)	b1. Successful implementation of the Strategic Partnership Framework according to Scoreboard indicators	Throughout the year	b.1 Revision of the package introducing a new approach for implementing the new Strategic Partnership Framework; identification of JRC's strategic partnerships for 2018-2019
	b2. Round-tables with EIT and Knowledge Innovation Communities (KICs)		b.2 JRC-Climate KIC policy dialogue event; preparation of an overarching strategic agreement with Climate-KIC; meeting with KIC

			InnoEnergy and Digital KIC on Innovation Camps and S3
c. JRC involvement at relevant, major international/global events	c1. Concept notes on the JRC participation at High level events are approved and JRC relations and cooperation with the organisers are strengthened.	Throughout the year	c.1 8 sessions accepted for ESOF 2018 and 5 for AAAS 2017
	c2. JRC work is showcased at major international/global events (participation of JRC speakers; sessions and side events (co-) organised by JRC; JRC involvement in event steering committees)		c.2 JRC work presented in 35 such events
d. Effective JRC governance and impactful outreach	d.1 JRC Weekly Briefing (internal) and other regular (external) products for stakeholders e.g. monthly 'Science & Policy briefing'	Throughout the year	d.1 41 JRC Weekly Briefings; 11 Science & Policy Newsletters
	d.2 Citizen questions timely answered via JRC helpdesk to Europe Direct Research Enquiry Service		d.2 9 questions were handled
	d.3 Board of Governors organisation and coordination milestones: • 3 Plenary Board of Governors meetings per year • Assisting the coordination of the Board's Ad-hoc groups meetings		d.3 All meetings were organised (3 plenary meetings and 4 ad-hoc groups meetings)
e. Opening of JRC physical Research Infrastructures to external users	e.1 Successful implementation of the strategy for open access through its adoption on a pilot basis by ELSA, NanoBiotech Lab, Actinide User Lab, and EUFRAT Laboratories	Throughout the year	e.1 The framework for external users' access to JRC research infrastructures adopted and calls for the ELSA facilities (Reaction Wall and HopLab), Nanobiotechnology Lab and EUFRAT facilities (nuclear/ accelerators) published. The calls for the Actinide User Lab (Actuslab) will be opened in 2018.

	e.2 Annual activity report		e.2 The annual activity report is postponed to end of 2018, when a full cycle of the open access calls will be completed for the Nanobiotechnology calls.
f. Linking research and innovation with standardisation as part of the Joint Initiative on Standardisation			f. JRC held the kick-off meeting of Action 2 under its responsibility and updated the description of work.
g. Generation IV (Nuclear Reactors) International Forum (GIF): 4 System Arrangements for (Sodium-cooled Fast Reactor (SFR), Very High Temperature Reactor (VHTR), Gas-cooled Fast Reactor (GFR), Super Critical Water Reactor (SCWR)	g. Commission decision		g. All four System Arrangements were signed in March 2017.
Scientific development With a view to pursue excellence in research and extensive interaction with research institutions as the basis for credible and robust scientific-technical policy support: 1) Gradually raise the percentage of exploratory research, through the management of	Indicator 1: Percentage of exploratory research staff within the JRC (exploratory staff includes: staff working on exploratory research projects (ER), staff recruited for the Centre for Advanced Studies, grant holders in category 20 (PhD students) and new PhD students recruited under collaborative doctoral partnerships (CDPs) Indicator 2: Percentage of exploratory research projects on emerging, policy relevant areas under JRC's multiannual work programme	Target 1: 2.0 % Target 2: 15 %	1) Exploratory research has been executed under the ER Programme and the Center for Advanced Studies. No new PhD students were yet recruited under the CDP scheme. Overall, 2.2 % of the scientific staff was involved in exploratory research. 2) The percentage of projects related to the 14 emerging policy relevant areas identified by the JRC Megatrend hub was 25 %, including activities addressing emerging issues of societal

the exploratory research programme, hosting specific exploratory projects on topics novel to the JRC and managing a new scheme for collaborative doctoral partnerships 2) Gradually build up competences in emerging, policy relevant areas through excellent research			importance.
Coordination of the management cycle and of Quality Assurance a. Coordination of the Annual Activity Report Process b. Annual evaluation of the JRC Work Programme (JRC Productivity and Impact Review, PRIME) c. Coordination of ex-ante assessment for WP 2016-17 d. Coordination of the Management Plan Process e. Coordination of the JRC indicator system (MP, AAR, TdB) f. Excellence Mapping to feed in mandatory mid-	a. JRC Annual Activity Report 2016 b. JRC Productivity and Impact Report 2016 including a mapping of JRC outputs and impacts c. Ex-ante assessment report d. JRC Management Plan 2018 e. Up-to-date, consistent and relevant indicator system f. JRC Excellence Mapping Report 2017	Q1 Q2 Q3 Q4 Throughout the year Q3	a.-e. Delivered timely. f. JRC Excellence Mapping Report 2017 was cancelled; replaced by 'The research performance of the European Commission's Science and Knowledge Service, Joint Research Centre (2007-2015) - A bibliometric analysis'.

term evaluation of JRC			
Outputs related to knowledge management			
Output	Indicator	Target	Latest known results (2017)
Introductory training for JRC staff in evidence-informed policy	Number of JRC staff trained on two-day course	50	Three pilot 'Evidence & Policy' courses have taken place. Some 50 JRC scientists and knowledge managers were trained and contributed to the improvement of the course curricula.
Management of Connected online platform spaces for all European Semester teams, in line with the Commission's decision to put in place far reaching organisational reforms to break silos, and enhance collaboration across traditional boundaries and deliver change	Satisfaction of 'Semester'- staff	Improvement of feedback compared to previous cycle	Evaluation questionnaires were distributed to the users at the end of the first 2017 cycle, replies were gathered from 22 team coordinators and 199 members. The majority believed that this will be part of daily working life in the Commission in five years' time, although the technology has significantly held users back in the first year and must be upgraded.
Connected country-knowledge spaces for harvesting best available inputs in terms of country-specific data, information and knowledge	No of country-knowledge spaces	10 Member States	Country spaces created for all 28 Members States
Knowledge Management Methodology and Knowledge Sharing	a. Facilitate creation of Communities of Practise (CoP) and Knowledge Centres b. Roll-out of Connected@Commission on line platform	a. 2 CoPs launched by end 2017 b. Team established and 5 cross-DG processes	a. 2 CoPs launched b. Connected on line platform rolled out to 1 DG (DG Internal Market,

	c. Implementation of Commission-wide one-stop-shop for knowledge d. Complete JRC Knowledge Mapping based on data sources and skills development tool e. Horizon Scanning: follow-up on definition of methodology, processes and strategic business intelligence courses	implemented by end 2017 c. Operational January 2017 d. System in place and tested for the 8 KM units and the CoP migration by end 2017 e. Process in place by March 2017	Industry, Entrepreneurship and SMEs) and 3 processes (coaching, library, communication) + 3 Cross-DG CoPs (migration, ICT & health, fairness) c. Operational January 2017 d. JRC KM mapping still in progress e. Process piloted. On the Connected online platform, a space was set up & it is running; evaluation report (October 2017)
Access to Knowledge Resources	PUBSY simplification strategy	Adopted and implemented by end 2017	Strategy adopted in May 2017, almost completely implemented
Knowledge Based Communication	Roll-out of JRC-wide events calendar	Operational January 2017	JRC strategic events planner deployed on Connected online platform and regularly in use

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	Related to spending programmes: H2020 and Euratom

Strategic Plan)			
Result indicator 1: Proportion of peer-reviewed publications in the top 10 % most cited journals[27] – 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[28])			
Baseline (2015)	**Interim Milestone** (2018)	**Target** (2020)	**Latest known results** (2017)
36 %	> 36 %	> 36 %	38 %
Result indicator 2: Proportion of JRC scientific publications published in peer-reviewed journals and proceedings – Number of peer-reviewed publications / total number of scientific publications (i.e. Pubsy category 2.x 'Scientific output') **Source of data:** JRC internal indicator (based on JRC own records with internal review process)			
Baseline (2015)	**Interim Milestone** (2018)	**Target** (2020)	**Latest known results** (2017)
65 %	> 65 %[9]	> 65 %	67 %
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 with internal review process)			
Baseline (2013)	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2017)
73.5 % 2015: 71.5 %	72 ± 3 %	72 ± 3 %	79 %
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 with internal review process)			
Baseline (2013)	**Interim Milestone** (2017)	**Target** (2020)	**Latest known results** (2017)
24 % 2015: 24.3 %	24 ± 3 %	24 ± 3 %	27 %
Completed evaluations: JRC Implementation Review 2017: In the context of the interim evaluation of the Horizon 2020 Programme (2017; JRC direct actions under H2020 programme); Interim Evaluation of the Direct Actions under the Euratom Research and Training Programme, 2014-2018 (2016-2017; JRC direct actions under Euratom programme); JRC Productivity and Impact Evaluation (PRIME) 2016 (2017; JRC activities)			

[27] This indicator has been introduced following a recommendation of the 2015 audit on the JRC SPP cycle activities.

[28] Abstract and citation database of peer-reviewed literature (Elsevier publishing company)

Main outputs in 2017:			
Policy–related outputs/Main expenditure outputs[20]			
Description	Indicator	Target date	Latest known results (situation on 09/02/2018)
Publication of scientific results in peer reviewed journals	Peer-reviewed publications listed in SCI-e and SSCI	Throughout 2017 Target value > 680	636[29]

[29] Control with external references database returns 703 peer-reviewed articles for 2017 (Scopus; February 2018)

ANNEX 13: Indicators and outputs related to decommissioning

Objective:
Implement the Decommissioning & Waste Management Programme

Brief description:

The decommissioning activity aims to progressively dismantle the JRC's nuclear installations, either already obsolete (with no foreseen further use) or 'future liabilities' (still in use). It also intends to treat 'historical' waste (i.e. waste accumulated in the past) and waste arising from the dismantling operations. In 1999, the Commission decided to launch a programme to meet this objective. By this choice, the Commission shifted to the practice adopted by most EU Member States, preferring to start the decommissioning immediately after shutdown of the installations rather than deferring decommissioning in the hope that decreasing radiological activity would reduce the financial burden. The programme started in 1999 and is based on the assumption, made for budgetary planning reasons, that the decommissioning of the last nuclear installation and the final disposal of historical wastes will be achieved around 2035. The updated Strategy and Budget (2017) takes into consideration all JRC nuclear installations, including those still in operation and a new facility currently under construction (Karlsruhe site). Accordingly, a new timeline has been defined for the four affected sites up to 2060.

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 2017

Description	Intermediate target (end of 2017)	Final target	Latest known result
1) Decommissioning and waste management activities at **Ispra site**			
Management of Nuclear Material and High Level Waste (HLW) up to its Intermediate Storage	Provide grounds to evaluate the reprocessing alternative	Evacuation of HLW ready (2022)	Result of feasibility study for possible reprocessing available
Construction of waste treatment facility (grouting facility (GF))	Start building seismic upgrade; award contract for supply of electromechanical equipment	GF in operation (beginning 2019)	Major civil works almost completed (building 41 C seismic upgrade)
Qualification and supply of final waste package (FWP) containers	Obtain letter of comfort from Sogin	FWP 1st production batch ready for use (in 2019)	Procurement of IP2 containers for FWP planned
Radioactive waste characterisation and super-compaction	Waiting for approval of 'Piano Operativo' by Safety Authorities	Perform 1st three campaigns on historical waste by 2022	File ('Piano Operativo') for characterisation and supercompaction under approval by Safety Authorities

Evacuation of high level waste from 'LCSR' facility (fuel remnants and activated material)	Waiting for TSA commissioning	Fuel remnants transferred to ESSOR hot cells (in 2018 after TSA commissioning	No activity, waiting for TSA commissioning
Temporary storage area (TSA) for nuclear materials	Perform transport of material during 'Hot Test' of TSA	TSA formally in operation (in 2018)	'Hot Tests' ongoing
Decommissioning of obsolete 'FARO' nuclear facility and management of associated waste	'Clearance' of waste procedures under elaboration and review with Safety Authorities	'Cleared' waste evacuated and project closed (2018)	Launch revision of 'Clearance' procedures through renewed contract
Decommissioning of obsolete 'STRRL' nuclear facility (excluding the tank farm facility (TF))	Waiting for STRRL license conversion	STRRL facility (ph. 1 excluding TF) 100 % decommissioned by 2023	STRRL license conversion still pending
2) Pre-decommissioning and waste management activities at **Karlsruhe site**			
Dismantling obsolete equipment (glove boxes)	71 % (+ 4) glove boxes dismantled	100 % of legacy glove boxes dismantled (date not defined)	72% (+0) of glove boxes dismantled; 8 glove boxes decontaminated, but not yet dismantled
Residual contribution to German waste repository (residual budget as updated by German Authorities in 2014)	46 % of budget committed	100 % of the budget committed (in 2023)	55% of budget committed
Reduce inventory of commercial spent fuel on which characterisation studies have been completed in our hot cells	Transport Phillisburg spent fuel batch back to owner	No commercial spent fuel batches on which characterisation has been completed left in hot cell	Qualification of welding process for encapsulation of spent fuel batches ongoing
Defining and implementing ways to reduce inventories and liabilities related to legacy irradiated and nuclear material	Results of feasibility study available	100% of obsolete irradiated and nuclear materials removed	Results of feasibility study available
Increase output of the clearance process	Re-assessment of current process	Minimized liabilities, maximised use of clearance disposal path	Current process analysed, room for improvement identified, measures to increase workforce taken

Disposal of historical low level waste packages	Improve process for repackaging and characterisation of historical waste	Repackage, characterise and dispose of 100% of historical waste	Process for repackaging and characterisation of historical waste improved
3) Pre-decommissioning and waste management activities at **Geel site**			
Evacuation of nuclear material	Signature of contract for removal of nuclear material	100 % of identified materials evacuated	Sorting, classification and conditioning of additional nuclear material identified for future evacuation
Dismantling/ evacuation obsolete VDG equipment	Ongoing evacuation and clearance	100 % of obsolete equipment is evacuated	Ongoing evacuation and clearance
Dismantling / disposal of obsolete glove boxes	Identification of obsolete glove boxes and start of dismantling	100% of glove boxes disposed of	18 glove boxes identified and emptied
Decommissioning of central effluent collection tank and pipes	Modification of licence file	100% of equipment disposed of	Modification file approved by Safety Authorities
4) Pre-decommissioning and waste management activities at **Petten site**			
Transport and decontamination of steel waste for recycling; recovery of concentrated radioactive slag and transport of excessively activated steel samples and slag to Dutch storage facility	Steel samples sent with NRG waste to Siempelkamp (Krefeld)	Steel decontaminated and recycled; activated steel and slag sent to Dutch storage facility	Transports performed
Optimisation study, transport and disposal of JRC legacy waste (un-irradiated experimental fuel) to COVRA	Execution of combined transport	All material evacuated	Finalisation of feasibility study for combined transport
Preparation of strategy for High Flux Reactor (HFR) decommissioning	Clarity about options for JRC to best prepare for HFR decommissioning	Decommissioning of HFR (date not defined)	Roadmap for development of strategy prepared
Update of HFR decommissioning cost estimation (legal requirement, every 5 years) and decommissioning plan	Results and report available by end 2017 to be sent to Dutch regulator	2017 Update of HFR decommissioning cost estimation and decommissioning plan (Next update in 2022)	HFR decommissioning cost estimation and decommissioning plan updated (2017 Update)

ANNEX 14. JRC Core Indicators

Management information need	Indicators	Definition	Target (year)	Value 2017	Comments
Perspective 1: Outputs & impact					
Impact of policy support					
SP General Objectives *SPP Key performance indicator 1*	Policy support impact	Number of occurrences of tangible specific impacts on European policies resulting from technical and scientific policy support provided by the JRC	388 (2017) 402 (2020)	387	
Scientific productivity					
SP Specific Objective 11 *SPP Key performance indicator 2*	Proportion of peer-reviewed publications in the top 10 % most cited journals	Number of peer-reviewed publications in the top 10% most cited journals listed in Scopus (SJR) / total number of peer-reviewed publications in journals listed in Scopus	> 36 % (2020)	38 %	
SP Specific objective 11	Proportion of JRC scientific publications published in peer-reviewed journals and proceedings	Proportion of JRC scientific publications published in peer-reviewed journals and proceedings / total number of 'scientific outputs' (Pubsy categories 2.x)	> 65 % (2020)	67 %	
MP Specific objective 11	Peer-reviewed publications listed in SCI-e and SSCI	Number of peer-reviewed publications listed in SCI-e and SSCI	> 680 (2017) 666 (2020)	636	

Management information need	Indicators	Definition	Target (year)	Value 2017	Comments
Achievement of policy related objectives and deliverables					
SP: Specific objectives 1.1 to 1.9 *Specific objectives 3.1 to 3.3* *Specific objectives 4.1 to 4.3* *Specific objectives 9.1 to 9.3*	Proportion of achieved planned policy deliverables	Number of planned policy deliverables achieved in year N / total number of policy deliverables planned for year N	> 82 % (2017)	89 %	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			New indicator. Pilot test was run in 2017. The time series data is being collected to derive a baseline and a target value.
Scientific collaboration and networking					
SP Specific objective 11	Peer-reviewed publications co-authored with non-JRC authors	Number of peer-reviewed publications in high impact journals co-authored with non-JRC authors/total number of peer-reviewed publications high impact journals	72 ± 3 % (2020)	79 %	
SP Specific objective 11 *SPP Key performance indicator 3*	International collaborations	Number of peer-reviewed publications high impact journals co-authored with organisations from countries outside ERA/total number of peer-reviewed publications high impact journals	24 ± 3 % (2020)	27 %	
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	1624 (2017)	1481	

Management information need	Indicators	Definition	Target (year)	Value 2017	Comments
Public visibility					
Part 2.E	Articles in the media	Total number of articles in the media		4159	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		3.2 million	The statistical tool used to monitor this indicator changed as from 01/01/2017. Results are not comparable. Previous targets should be discarded.
		Number of visits to the JRC website		1.4 million	
Perspective 2: Organisational management					
Financial Management					
Part 2.B - Objective 1 (Indicator 5)	Quality of procurement procedures submitted to the PPAG	Proportion of positive opinions of the Public Procurement Advisory Group (PPAG)	≥ 95 % (2018)	95 %	
Payments					
Part 2.B - Objective 2 (Indicator 4)	Timeliness of payments	Proportion of payments done within legal time limits	≥ 95 % (2017)	93 %	
Internal Control					
Part 2.B Objective 2 (Indicator 3) SPP Key performance indicator 5	Implementation of Internal Control Standards in the JRC	Average of scores obtained from the annual survey on the implementation of Internal Control	3.4 (2017) 3.6 (2020)	3.3	The indicator's numerical value represents the average of scores, ranging between 1 ('Fully disagree') and 5 ('Fully agree')

Management information need	Indicators	Definition	Target (year)	Value 2017	Comments
Income from additional activities					
Part 2.B, Objective 2 (Indicator 5)	Contractual income	Annual cashed income from activities outside Institutional budget (% of the Institutional budget)	15 %	23 %	
Perspective 3: Working environment					
Equal opportunities					
SP Part 2.A (Indicator 1)	Percentage of female representation in middle management	Number of women/(Number of women + men) in middle management positions	35 % (2019)	14 %	35 % by 2019 for the JRC as defined in SEC(2015)336

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

This annex contains parts of the JRC Annual Report 2017[30] which gives an overview of JRC's scientific achievements and activities as well as of corporate initiatives.

Table 15-1 contains short descriptions of cases where JRC's work has policy-impact by incorporation of scientific and technical knowledge into policy proposals or related to the support of the implementation of EU policies. The total number of such cases, identified through JRC's internal productivity and impact evaluation, constitutes the value for the key performance/result indicator 1 'policy support impact'.

These examples relate to all JRC's scientific activities.

A new boost for jobs, growth and investment

Collective and coordinated efforts at the European level continue to be needed to put Europe on the path to renewed economic prosperity. As the first of the ten Juncker priorities, the Commission work in this area covers a variety of policies, a number of which the JRC contributed to in 2017.

Bringing concrete evidence of the potential of cultural and creative sectors, supporting the simplification of the Common Agricultural Policy, tackling important knowledge needs on environmental questions and the circular economy, contributing to maritime and fisheries priorities, promoting good health and food safety are all examples of Commission activities that the JRC backed this year with its expertise.

Cultural and Creative Cities Monitor identifies strengths and opportunities across Europe

The very first edition of the Cultural and Creative Cities Monitor covers 168 cities in 30 European countries and measures cultural and creative performance, capturing the positive effects on jobs, growth, and well-being. The monitor helps policy makers in the cultural sectors to identify local strengths and learn from comparable cities.

As an interactive online platform, it was built around three key indices: the cultural vibrancy, the creative economy and the enabling environment of a city. These are measured through 29 indicators, which include things like the number of museums and concert halls, patent applications in information and communication technologies, and the level of trust people have towards other citizens in their city.

The monitor shows that the 'ideal' cultural and creative city in Europe would have the cultural venues of Cork (Ireland); the knowledge-based jobs of Paris (France); the innovation of Eindhoven (Netherlands); the new jobs in creative sectors of Umeå (Sweden); the education of Leuven (Belgium); the tolerance and trust of Glasgow (UK); the international connections of Utrecht (Netherlands); and the quality of governance of Copenhagen (Denmark).

The monitor helps placing culture and creativity at the heart of the European policy agenda. Economic and other data from Eurostat and Eurobarometer indicate that leading cultural cities perform better than their counterparts with similar populations.

[30] Bellan, E., Toth, G., Mccafferty, E., Kennedy, P., Kreysa, J. and Al Khudhairy, D., editor(s), Triollet, R., JRC Annual Report 2017, EUR 29171 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-81581-2 (online); doi:10.2760/94129 (online); JRC111359.

Europe's fight against cancer: waging battle with leading research

In 2017, the JRC sought to address the prevailing breast cancer information gap, publishing an interactive online European map with information on screening, diagnosis, treatment and follow-up care for 35 countries. These Europe-wide snapshots form part of efforts to support the EU and Member States in securing equal access to high quality care across the continent. The factsheets highlight the progress of each country in implementing the evidence based guidelines provided by the European Commission Initiative on Breast Cancer (ECIBC).

Each country's profile indicates the number of breast cancer diagnoses and deaths per 100,000 of population, alongside the EU average. The level of participation in screening procedures is also detailed, as well as quality assurance schemes in place and health expenditure as a percentage of GDP.

Breast cancer is the most common type of cancer in Europe, with a growing number of diagnoses. The good news is that countries like Portugal and Malta have a relatively high survival rate, even though the cost of care is relatively low. Germany and Austria have similar rates of survival but a higher cost of treatment.

Also in the fight against cancer, JRC scientists and the University Hospital Heidelberg presented research describing the results of the first in-human study of Targeted Alpha Therapy (TAT) of metastatic castration-resistant prostate cancer in 42 patients. For more than two decades, scientists at the JRC's Karlsruhe site have been developing TAT, which has been successfully used to treat different cancers.

The research won the 2017 Marie Curie Award of the European Association of Nuclear Medicine. The prestigious award recognised it as the best study out of 2058 contributions. This is the third time that a study co-authored by JRC authors Alfred Morgenstern and Frank Bruchertseifer has received the accolade.

A new scientific yardstick for the early diagnosis of Alzheimer's disease

In 2017, the JRC successfully developed a certified reference material (CRM) to support the early detection of Alzheimer's disease. The CRM will serve to calibrate tools to detect levels of amyloid-β 1-42, a biomarker for Alzheimer's disease which is found in cerebrospinal fluid. Reliable measurements support earlier and more accurate diagnoses, and could bring forth the development of new drugs for treatment.

The JRC produced the reference material in close cooperation with the International Federation of Clinical Chemistry and Laboratory Medicine, with support from the Alzheimer's Association. The CRM is an important step to one day containing the disease.

Research focusing on the very early stages of Alzheimer's disease is important, as clinical results have shown that a combination of biomarkers amyloid-β 1-42, tau and phospho-tau have a promising potential for early diagnosis. Levels of these markers in the cerebrospinal fluid begin to change up to 10 years before the first symptoms of the disease occur.

Procurement of food for health: halting the rise of childhood obesity

Nutritious diets and the promotion of healthy lifestyles are vital to the positive development of children and adolescents. In the EU, 15% of children and youth are considered overweight and 5% are obese.

In 2017, the European Commission and the Maltese Presidency introduced a resource to support public procurement authorities for Member State schools to design contracts that ensure healthy food is provided to pupils across the EU. Based on JRC recommendations from a 2014 mapping of national school food policies, a report entitled 'Public

procurement of food for health: technical report on the school setting' provided support to the EU High Level Group on Nutrition and Physical Activity and offered technical guidance on translating school food standards into adequate procurement contract language.

The report covers key food groups including fruit & vegetables, meat, dairy products, cakes, saturated fat, salt, carbohydrates, sugar, micronutrients and vitamins. It also includes specifications for food preparation and catering services in general, and could pave the way for similar publications in other settings, including elderly homes, hospitals, work canteens and prisons.

The Maltese Presidency also collaborated with DG SANTE to provide the European Commission with an overview of the EU Action Plan on Childhood Obesity (2014-2020), promoting further work for a healthy lifestyle starting from childhood.

Towards water sustainability: Urban Water Atlas for Europe

In April 2017, the European Commission published the Urban Water Atlas for Europe. This ground-breaking publication is a collaborative work between the JRC and four other European scientific institutes. The publication shows how different water management choices - and factors such as waste management, climate change and our food preferences - impact the long-term sustainability of water use in our cities.

The new atlas informs citizens, local authorities and experts about the vital role of water in European cities. It highlights good practices and cutting-edge developments towards water sustainability. Detailed factsheets present the state of water management in more than 40 European cities and regions, together with a number of examples from further afield.

The work was funded by Horizon 2020, the EU's research and innovation programme Launch of the Atlas coincided with the meeting of ministers in charge of water management from the 43 members of the Union for the Mediterranean, hosted by the Maltese Government in Valetta.

The atlas comes with two online tools that can help cities manage water more sustainably. The City Blueprint is an interactive tool that supports strategic decision-making. The City Amberprint is a tool for assessing a city's progress towards becoming smart and sustainable.

Supporting fishing and maritime policy in the Mediterranean Sea

JRC work in the field provides warnings about pressures that might push the ecosystem and fish-stocks beyond the point of no return. The JRC analysed the Scientific, Technical and Economic Committee for Fisheries' (STECF) Mediterranean stock assessment data, and found that 93% of assessed fish stocks are over-exploited.

An estimated 10 000 to 12 000 marine species inhabit the Mediterranean Sea. This extraordinary biodiversity is also threatened by pollution and climate change, the habitat and its fish stocks are in decline. The bigger the fish - such as sharks and rays - the more susceptible they are to increasing dangers, including overfishing and slow maturity. Over the past 50 years, 41% of marine mammals and 34% of the total fish population have been lost.

In order to help sustainability, a maritime surveillance tool the "Search for Unidentified Marine Objects (SUMO)" has been released. The JRC developed, tested and validated the software for SUMO, which automatically scans large numbers of satellite images for the presence of ships. The results can be cross-checked with other maritime data to identify suspicious vessels. It is instrumental in helping to fight illegal oil dumping and illegal fishing.

The efforts of the JRC, in cooperation with other scientific organisations around the world, contribute to the positive economic trends outlined in the 2017 Annual Economic Report on the EU Fishing Fleet. The fleet registered record-high net profits of EUR 798 million in 2015, and estimates for 2016 and 2017 point towards further profits. Nevertheless, the report also confirms that economic performance stagnates where fleets depend on stocks which are still subject to overfishing. For example, the small-scale coastal fleets operating in the Mediterranean and Black Sea are prone to poor economic performance.

Tracking invasive alien species by smartphone

Alien species are animals and plants introduced by accident or deliberately into a natural environment where they would not normally be found. A small proportion of these become invasive, with significant negative consequences for their new environment, thereby causing millions of euros worth of damage every year.

Member States work to prevent their introduction by using early detection mechanisms for new appearances and adopting measures for those which are already widespread.

To support these efforts, the JRC has published the first ever 'baseline distribution of invasive alien species of Union concern', and launched a dedicated smartphone app to help monitor the animals and plants concerned. 37 invasive alien species have been prioritised to be dealt with at the level of EU territory and the app contains detailed information and photos of each of these.

Anyone can download it for free and use it to spot these animals or plants in the environment. Through their phones' GPS systems they can send information about species' locations, including photos, via the app. Data collected by citizen will enrich the maps included in the app. The data generated can also feed into the respective national surveillance systems throughout the EU.

Plenty of information is already available regarding alien species in Europe, but it is generally scattered across many different information systems and databases in various data formats. The JRC has created the European Alien Species Information Network (EASIN) to address this issue. EASIN is the official information system that supports implementation by the European Commission and the EU Member States of EU Regulation 1143/2014 on Invasive Alien Species.

Identifying and eliminating marine and riverine litter from the ecosystem

Marine and riverine litter is a threat not only to the ecosystem, but also to the economy and to human well-being. JRC research highlights the harmful direct and indirect impacts of litter in waterways and oceans, and provides recommendations to EU Member States on how to monitor and identify sources of litter that reach the sea.

Records show that both marine and riverine litter is dominated by plastic items. These can be transported by currents over long distances, and are found throughout the environment, even in remote areas and the deep sea. Millions of animals that live in the oceans are mutilated and killed by marine litter every year. Wildlife becomes entangled in or ingests the litter, both potentially leading to fatal outcomes (in 80 % of reported cases entanglement leads to death.). Marine litter also has important implications for human welfare, through losses to economic sectors including tourism, fisheries, navigation and energy.

An understanding of how much litter enters the seas from different rivers can help plan how to address the problem. However, harmonised methodologies are needed in order to provide quantitative data for comparable assessments. The Marine Strategy Framework Directive (MSFD) recognises that marine litter must be dealt with. The MSFD Technical Group on Marine Litter has published a report on 'Riverine Litter Monitoring – Options and Recommendations'. The JRC used these findings in its own project when establishing a

pan-European monitoring network. TG Marine Litter provides evidence-based policy advice for the Member States. It has Europe-wide expertise, and is co-chaired by the JRC.

The real value of nature's water purification ecosystem

Water for drinking, home and public use - as well as for agriculture and industry - is provided for free by Mother Nature or, as scientists and policymakers put it, by ecosystem services. A study led by the JRC in 2017 puts the benefits of this 'free' service at €16 billion a year at the European level, a conservative estimate in terms of actual consumption by economic sectors and households.

The study examines in-stream nitrogen retention to gain a more holistic picture of the actual value of water ecosystems. Nitrogen is the leading cause of water pollution in Europe, with more than 50 million tonnes entering European river basins from 1985-2005. Rivers 'purify' the water by retaining much of the nitrogen that flows into them.

The full value of this water purification service in Europe is worth up to €31 billion per year. However, for almost all European countries, in-stream nitrogen retention occurs at unsustainable levels, and river ecosystems are progressively degrading as a result of nitrogen pressure.

The authors of the study provided in 2017 the first ever economic evaluation of ecosystems' water purification across Europe, based on the System of Environmental Economic Accounting – Experimental Ecosystem Accounts (SEEA-EEA). SEEA-EEA is an experimental tool developed by the European Commission and other major global institutions. Ecosystem accounting aims to monitor the capacity of the natural environment to sustainably deliver its multiple services.

Science for an evolved Common Agricultural Policy

The JRC's scientific insight helps policymakers understand the scope and impacts of potential efforts to ensure that the CAP is fit for today's world: a policy that is focused on meeting the challenges of a fair standard of living for farmers, preserving the environment and tackling climate change - as outlined in the Commission's November 2017 communication on the 'Future of Food and Farming'.

JRC-Scientists applied three exploratory scenarios to characterise future visions for the CAP up to 2030. The 'no-CAP' scenario - removing all budgetary support to farmers - could lead to a strong decline in farming income by 2030, job losses and a return for the EU as being a net importer of agricultural products. The study emphasises that whatever policy choices are made, smaller farms are likely to be more heavily impacted by changes to regulations and subsidies.

The study also considers (i) an 'Income and Environment' scenario: maintaining the CAP budget at its current level with stricter environmental rules, which could result in an overall higher income (with some job losses) while avoiding an increase in GHG emissions; and a (ii) 'Liberalisation & Productivity' scenario: a strong reduction in subsidies and a shift to productivity-increasing measures and further trade liberalisation, which could lead to a drop in farming income, job losses and agricultural production.

The analysis of the various options made use of the JRC's iMAP platform models MAGNET, CAPRI and IFM-CAP in an integrated manner, covering spatial scales from the global right down to individual farm level.

Improving the transparency and reliability of international and domestic economic analyses

Reliable data is vital for high-quality, research-based policy support. In 2017, a team of

colleagues working cross-Directorate within the JRC produced a significant contribution to improving the quality of data supplied to the EU-Global Trade Analysis Project (GTAP).

The GTAP is a global network of 15000 researchers and policymakers in 170 countries conducting quantitative analysis of international policy issues. The centre piece of GTAP is a global data base on trade, production, consumption and intermediate use of commodities and services.

The so called GTAP Input-Output database is widely used in the analysis of agricultural policies, energy and climate issues as well as the water/energy/land nexus. It also constitutes a key input for JRC models like the GEM-E3 and MAGNET models. As such it supports the Impact Assessments of a number of the European Commission's Directorates-General, including Climate Action, Agriculture and Rural Development, Energy, Environment, Trade, or Regional and Urban Policy to name a few.

This calls for consistently linking the GTAP database with official national statistics and making sure that the GTAP database has enough statistical quality to address such policy analyses. To achieve this, the JRC team of the EU-GTAP Project, developed a new conversion method for the whole European Union (EU) that guarantees that the EU data supplied to the GTAP database complies with the latest statistical standards (European System of Accounts – ESA2010) and is consistent with Eurostat official statistics (for the year 2010) and recommendations for the estimation of missing data.

The increased quality of the EU data in the GTAP database greatly contributed to improving the transparency and reliability of international and domestic economic analyses carried out at the JRC. This work also allowed the European Commission to be in compliance with Court of Auditors' recommendations from the 2014 audit.

The Air Quality Atlas for Europe

The JRC's 2017 Air Quality Atlas for Europe screens the emission sources responsible for the levels of 'particulate matter' (PM) in Europe's largest cities. The term refers to fine solid or liquid particles, such as dust, smoke, soot, condensing vapours and soil particles. PM2.5 – particulates with a diameter smaller than 2.5 μm, can reduce life expectancy. As a result of poor air quality in the EU every year, about 400,000 citizens die prematurely - 10 times more than the deaths caused by road traffic accidents.

The Air Quality Atlas also provides information on the type and location of the main emission sources leading to the formation of particulate matter in the air. It describes 150 European cities with a population density above 1,500/km^2. The pollution of many of these cities exceeds the air pollutants levels recommended by the EU and the World Health Organisation.

The cities with the highest particulate pollution in Europe are located in Southern Poland, the Italian Po Valley and Bulgaria. Transport emissions contribute heavily to PM2.5 levels in cities like Madrid (where 39 % of PM2.5 comes from transport), Luxembourg City (30 %) and Paris (29 %). Although agricultural activities take place mostly outside cities, emissions from these activities do contribute to fine particulate matter concentration in many European cities, with the highest levels from this source being found in Germany and the Czech Republic. Industry is a major air polluter in some of the eastern countries as well as in the western part of Germany.

Finding alternatives to animal testing in preventing skin allergy

The JRC's EU Reference Laboratory for Alternatives to Animal Testing (EURL ECVAM) continued leading in its field in 2017 with the publication of research recommendations promoting the scientific and regulatory acceptance of non-animal tests to evaluate skin allergy. This included two new skin sensitisation tests and defined approaches based on the integration of different kinds of non-animal data.

The new defined approaches for skin sensitisation testing have comparable performance to the standard animal Local Lymph Node Assay (LLNA) test, which is used for identifying potential skin allergens. In addition, they can provide useful information to distinguish between strong and weak sensitisers. In the light of this, the EURL ECVAM recommends that the defined approaches are used instead of LLNA test data where applicable and adequate.

The EURL ECVAM assesses international standards in the characterisation of chemicals that have the potential to cause allergic reactions to the skin. Among its achievements since being formally established in 2011, the laboratory can be credited with the development and recommendation of the first three non-animal in vitro methods, adopted by the OECD. The EURL ECVAM also led the development of international guidance on reporting harmonisation.

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 slowing down global warming and mitigating its effects while ensuring affordable, secure and sustainable energy for businesses and households.

In 2017, the JRC's contributions to climate change policy focused on mitigation efforts, notably on economic and climate modelling/assessments, monitoring and analysing emissions from different sources (transport, agriculture, etc.), looking into alternative fuels, and assessing climate change impacts (economic and non-economic), vulnerability, resilience, and adaptation options. On energy specifically, the JRC contributed to carrying out security, safety, risk and techno-economic assessments of the EU's energy supply, assessing the development of energy infrastructure and energy markets in the EU, and supporting the implementation of renewable energy and energy efficiency legislation.

Realising the climate change mitigation potential of forests

Forests play a key role to play in meeting the objectives of the Paris Climate Agreement, in which 187 countries submitted their Intended Nationally Determined Contributions (INDCs) to global greenhouse gas (GHG) mitigation actions. In the past, Land Use, Land Use Change and Forestry (LULUCF) has often been treated as a secondary way of reducing net GHG emissions in United Nations Framework Convention on Climate Change (UNFCCC) negotiations, largely due to complexity and a lack of trust in the data. However, the Paris Climate Agreement of 2015 was a game changer. In 2017 JRC research estimated that when the INDCs are fully implemented, the LULUCF sector will shift from being a net source of emissions to a net absorber of CO_2 by 2030.

The research also notes that developing countries, in particular, expect the LULUCF sector to contribute to meeting their emissions reduction targets. However, due to varying interpretations, some discrepancy between country reports and scientific assessments lead to a confusion which hinders the ability to measure progress towards the 'below 2°C' target. There is a vital need to reconcile these differences.

SJRC scientists therefore call for credible data to track the real mitigation potential of forests, which they estimate could be as high as contributing around 25 % of total INDCs emissions reduction globally through conserving and enhancing forests' CO_2 absorption capacity, forests have the potential to contribute about 25 % of total INDCs emissions reduction globally.

Evidence that a clean and green planet is both possible and affordable

In November 2017, JRC scientists attended the 23rd Conference of the Parties (COP23) to the United Nations Framework Convention on Climate Change, and presented the 2017 Global Energy and Climate Outlook (GECO) report. According to the GECO, a cleaner, greener planet is achievable and feasible. Limiting global warming below the critical 2°C level set out in the Paris Climate Agreement can, in fact, serve economic growth.

The report finds that if the appropriate measures are taken globally to reach the GHG trajectory set out in the Paris Climate Agreement, about 1.5 million lives could be saved annually across the world by 2050. Moving from fossil fuels to sustainable energy could reduce the number of air pollution-related illnesses such as asthma and bronchitis by 15-40% annually, and increase crop yields by 2.5-6.6 % - thus reducing healthcare costs and the number of people unable to work because of respiratory illness, and potentially increasing agricultural revenue.

The GECO report also confirms that reaching the below 2°C target would require speeding up the decoupling of emissions from economic growth. From 2020 onwards, decarbonisation efforts must intensify, and from 2015 to 2050 energy intensity should decrease by an average of 5.8% per year. It is also vital to phase out coal and reduce the use of oil and gas, and to electrify the final energy demand, from 18 % in 2015 to 35 % in 2050.

The JRC and the Netherlands Environmental Assessment Agency also confirmed that carbon dioxide emissions have stalled for the third year in a row. The report is based on the JRC's Emissions Database for Global Atmospheric Research (EDGAR), which is unique in both its space and time coverage, and in its completeness and consistency in tracking the emissions of multiple pollutants: monitoring the main GHGs, air pollutants and aerosols.

The dangerous arrival of climate anomalies in Europe and across the world

The JRC studied the relative importance of heat stress and drought on wheat yields, through developing a new Combined Stress Index in order to better understand the effects of concurrent stress events. They found that heat stress, drought and water excess are the root causes of about 40% of annual changes in wheat yields.

Flood risks and economic damages under different global warming scenarios, with 1.5°C, 2°C, and 4°C increases compared to pre-industrial levels have also been studied. If average global temperature rises by 4°C, the flood risk for countries with more than 70 % of the global population will increase by more than 500%. By the end of this century, weather-related disasters could regularly affect around two-thirds of the European population. The JRC concluded that if no measures are taken, this could result in a 50-fold increase in fatalities.

These findings shed light on the expected burden of climate change on societies across different regions of Europe. Even the most optimistic warming scenario of 1.5°C would lead to a doubling of the global flood risk. JRC call for adaptation plans to be implemented to keep the flood risk rates at or below current levels.

The JRC also analysed the interaction between humidity and heat and found that if global temperatures rise by 4°C, new super heatwaves of 55°C may regularly impact many parts of the world, including Europe. The combination of heatwaves amplified by high humidity could create dangerous scenarios in which the human body is hindered from cooling down through sweating. The study utilises the Apparent Heat Wave Index (AHWI), a composite index for humidity and heat developed by the JRC's Competence Centre on Composite Indicators and Scoreboards.

If global temperature increases by up to 2°C above pre-industrial levels, the combined effect of heat and humidity will likely exceed 40°C every year in many parts of the world. Europe will have up to a 30% probability of having such strong annual heatwaves. Rising temperatures and climate change could expose some 350 million Europeans to harmful extremes every year.

Tracking progress towards completing the Energy Union

The JRC provided scientific evidence for several reports forming the basis of the European Commission's second State of the Energy Union Package and the 3rd State of the Energy Union Report. In terms of GHG emissions, energy efficiency and renewable energy, the EU is on track to reach its 2020 targets.

Through the methodologies applied by the JRC with the Strategic Energy Technologies Information System (SETIS), key performance indicators measured progress in research and innovation in the EU as a whole and for each Member State.

These methodologies are fully transparent, with regards to both data and methodology. This allows stakeholders to review both the methodology used and the outcome, and also triggers feedback to the JRC that would lead to the further improvement of data collection, processing and evaluation mechanisms.

Growth potential of renewables: ocean, wind, and solar energy in Europe

Evidence analysed by the JRC shows that the move towards renewable energies is already helping long-term efforts on climate change mitigation. The EU is on track to achieve its 2020 GHG emissions reduction target, thanks in part to changes in its energy mix. JRC analyses finalised in 2017 found that in 2015 the use of renewables in the EU resulted in estimated savings of 751 million tonnes of CO_2 equivalent (Mt CO_2-eq). Total EU emissions would otherwise have been almost 15 % higher. Emissions from public power and heating systems are estimated to have recorded the largest falls — 40 % in all — from the rollout of renewables in the electricity and heating/cooling sectors. Looking further ahead, the trend towards decarbonising the energy system (which averaged 9 % per year from 2009 to 2015) must be maintained and supported. Indeed leadership in renewables is a key EU policy goal. The JRC analyses the developments across a range of the most relevant technologies.

The JRC Wind Energy Status Report 2016 also presents the EU as a global leader. Wind energy production supplies 140 Gigawatts (GW) to the EU's power grid, representing about a third of the world's total generated wind power. In total wind energy production China is ahead of Europe, but not all of it is connected to the electricity grid. The EU is at the forefront of offshore capacity, with about 90 % of the newly finished projects in the world.

The JRC PV Status Report 2017 highlighted the fact that the compound annual growth rate (CAGR) of solar PV manufacturing over the last 15 years was over 40 %, thus making PV one of the fastest growing industries at present. In 2016 138.5 GW of new renewable power capacity was installed and solar power accounted for over 56 % of this capacity. This record installation of new renewable power capacity was made possible by the significant reductions in renewable energy system prices, especially solar PV.

In the area of solar power, the JRC runs the popular Photovoltaic Geographical Information System software for solar capacity analysis, enhanced by the first publicly available European solar power generation dataset. The JRC also developed the European Meteorological derived High resolution renewable energy source (EMHIRES-PV), which captures geographical information on solar energy fluctuation, providing the interested citizen with an idea of the solar energy that can be harvested in a given location.

Also published in 2017, the JRC Ocean Energy Status Report 2016 describes Europe as

the global leader in the development of tidal stream and wave energy technologies. The publication analyses tidal energy, wave energy and ocean thermal energy, which are at different stages of technical and commercial development.

2017 saw the kick off of the SET Plan temporary working groups (TWGs). These TWGs draft Implementation plans (IP) that contain concrete R&I activities, and propose relevant funding opportunities for their realization. The JRC leads the TWGs on Batteries & e-Mobility and on Renewable Fuels & Bioenergy. The Implementation plan associated with the workings of TWG on Renewable Fuels & Bioenergy is expected to be endorsed by the Steering Group during the first half of 2018.

The JRC leading role in the development and introduction of international standards for renewable energies, in particular Photovoltaic Solar Electricity, resulted in the publication of three new IEC-CENELEC standards in 2017. These were in the area of new materials concepts for PV Solar Electricity dealing with multi-junction PV to anticipate the growing industry trend.

Supporting standardisation on natural gas quality

In 2017, the JRC provided scientific support to the European Committee for Standardisation (CEN) Working Group 'Pre-normative study of H-gas quality parameters', which was launched in 2016.

The work relates to the Commission's mandate to CEN for standardisation in the field of gas qualities, which was approved in 2008 and requested the development of a defining standard for gas quality parameters for high-calorific gas (H-gas).

The Working Group operates under the CEN's Sector Forum Gas (SFGas) - a platform aimed at facilitating the exchange of information between different stakeholders, coordinating and identifying the standardisation needs in the field of gas. It is composed of national standardisation bodies, experts from related CEN technical committees and (European) organisations/experts of related sectors such as gas producers (natural gas, biomethane, other renewables...), shippers/traders, operators (grid, storage and Liquid Natural Gas), appliance manufacturers (domestic/industrial) and the European Commission, the Agency for the Cooperation of Energy Regulators (ACER) and the European Network of Transmission System Operators for Gas (ENTSOG).

To support the development of technical scenarios with a robust knowledge base, the group launched a task force to map national and sectoral standards in relation to the Wobbe Index (range, rate of change) and related gas quality parameters in Europe. The task force began by conducting a survey to collect gas quality information from a variety of representative end use points, across several European regions. The results of the survey were presented at a joint CEN/ENTSOG workshop in September.

The main effort until now has been drafting, publishing and analysing several surveys, as agreed with the experts of the Working Group, and processing and analysing collected gas quality data. This work is ongoing and the final report due by May 2019 will contain recommendations and conclusions for the revision of specific quality standards for the Wobbe index and other identified subjects.

Providing the basis for a competitive and sustainable European car industry

In November 2017, the Commission introduced the second Mobility Package, seeking to reconcile the ambition of world-leading environmental standards with increasing the competitiveness of our car manufacturing industry to secure jobs and growth. The package is also designed to offer a new deal for consumers, helping to restore citizens' trust and ensure that future mobility is clean and affordable to all. A key pillar of the second Mobility Package was the Commission proposal for new CO_2 targets for cars in 2025 and 2030. Evidence provided by the JRC and using the JRC's DIONE modelling

software on new technologies, governance structures and the impact of policy options, formed the basis of the final package and in particular for the CO_2 target proposals.

A challenge for the definition of post-2020 CO_2 targets was the shift to the newer World-wide harmonised Light duty Test Procedure (WLTP), replacing the aging New European Driving Cycle (NEDC) based system, which had been criticised for producing large differences between declared CO_2 values and real-world emissions. This shift created a lack of an official baseline CO_2 level to build the new targets upon. The JRC developed CO2MPAS to correlate CO_2 emissions from both test procedures and to derive the missing baseline CO_2 level for the new test procedure. Results have shown that the new tests were able to detect an average of 1.21 times more CO_2 from standard internal combustion passenger cars (and 1.33 times more for hybrid cars) than the traditional NEDC method.

The results of these JRC studies highlight the need to complement current lab-based certification procedures with additional instruments, such as a fleet-wide fuel consumption monitoring system and advanced tools for customised vehicle information. A first proposal to set up a fleet wide monitoring scheme to calculate in a correct and systematic way and to keep under control the gap between certified and real-world CO_2 emissions has been introduced in the Mobility Package (representing a substantial innovation in the vehicles' emissions legislation). Concerning the vehicle information, the JRC's Green-Driving Tool has been indicated in the Mobility Package as a first step in this direction.

In addition to the new laboratory based WLTP test procedure, a new vehicle emission certification procedure based on on-road measurements has entered into force since September 2017, with the objective of checking real driving emissions (RDE) of new models of light duty vehicles. The JRC has contributed with experimental data and expertise in drafting the RDE legislative 'packages' that will close the gap between pollutant emissions measured in laboratory environment and real world emissions. The introduction of the WLTP together with the RDE in the type-approval of light-duty vehicles is strategically important because the same approach has been chosen by the Chinese Government. This brings European car manufacturers in a forefront position in the car market worldwide.

With ambitious environmental targets, demand for lithium-ion batteries suitable for application in e-mobility and in stationary energy storage is also likely to increase. In 2017, JRC researchers analysed EU competitiveness in advanced Li-ion batteries for e-mobility and stationary storage applications, identifying the investment required to 'pull down costs along the learning curve' and reach a target battery pack cost that will work both for citizens and industry.

The 2nd Mobility Package also proposes measures to boost investment in alternative fuel infrastructure. The JRC conducted a thorough analysis of the coherence of Member States' own assessments of the current state and future development of the alternative fuels market in the transport sector, the ambition of national targets and objectives and the measures proposed to reach them.

Smart Grid Projects Outlook 2017

This rolling review, carried out on a periodical basis by the JRC - in tight cooperation with the Directorate-General for Energy - builds upon the previous two smart grid project inventorying exercises published since 2011. It presents the latest analyses and insights from the most comprehensive database of smart grid projects across the EU.

This study goes hand in hand with brand new interactive visualisation tools allowing the user to generate customisable maps, graphs and charts to track progress on smart grid projects realised in the 28 EU Member States, Switzerland and Norway.

The current edition of the survey includes a total of 950 smart grid projects, launched from 2002 up until today, amounting to €5 billion investment. Strong differences exist between Member States in the number of projects and the overall level and pace of investment. Private investment is clearly the most important source of financing of smart grid projects, but European and national funding play an important role in leveraging private finance and incentivising investment. Distribution system operators (DSOs) are the stakeholders with the highest investment, but non-traditional actors such as public institutions and other emerging stakeholders are steadily increasing their investment in the field. The domains with highest investment are smart network management, demand-side management and integration of distributed generation and storage, together accounting for around 80 % of the total investment. Many projects however address several domains at the same time to investigate and test the systemic integration of different solutions.

Electricity supply security and resilience

Electricity security, which has to do with the power system's capability to deliver energy to the users, represents a crucial concern for decision making at all levels and occupies a prominent place in most of the EU's energy policy action areas.

In particular, the proposal for a regulation on risk-preparedness in the electricity sector has been published within the broader Clean Energy package. The goal of the proposed regulation is to provide an EU-wide system in case of a major electricity supply crisis, which often is not restricted to one Member State.

Against this background, in 2017 the JRC produced several studies assessing diverse facets of electricity security.

A study on power grid recovery after impact from natural hazard reported on the performance of the power grid during 16 earthquakes, 15 space weather events and 20 floods. The study provided a number of recommendations related to policy, hazard mitigation and emergency management to reduce the risks of natural hazards to electric infrastructure and to improve crisis management in the aftermath of a natural disaster.

Another study characterised electricity security via features at the cross-roads of policy and science. It reviewed the electricity security modelling and assessment approaches across sectors, proposed elements for a novel electricity security decision-analytic framework for the EU, and contextualised the proposed framework in EU’s Energy Union grid design initiatives.

Ad-hoc analyses were also produced to support the definition of the power system risk preparedness regulation proposal. By putting forward EU-wide rules to follow in case of crises, the Commission proposal is intended to bolster regional cooperation and assistance among Member States.

OpenECHO portal sheds light on unconventional hydrocarbon activities in Europe

Unconventional hydrocarbons are sources of oil and gas which require methods for extraction which are not normally necessary in the conventional extraction of hydrocarbons, e.g. horizontal drilling or hydraulic fracturing.

The Conference 'TransAtlantic Knowledge Sharing on Unconventional Hydrocarbons: Resources, Risks, Impact and Research Needs' was held on 20-21 June 2017 in Amsterdam (NL). On the occasion, the JRC-led European Science and Technology Network on Unconventional Hydrocarbon Extraction launched the European Unconventional Hydrocarbon Portal (Open ECHO). It is an information portal developed by the European Commission which provides an overview on unconventional hydrocarbons activities in Europe. The Portal allows a wide range of users, from citizens

to Member States' authorities, energy experts or scientists, to retrieve from single source custom information about hydrocarbons. The key elements of the portal are three unique and innovative tools.

The European Atlas of Unconventional Hydrocarbons Resources is an interactive information and data sharing web map application that renders on maps location of unconventional hydrocarbons basins together with resource assessment. The resulting maps can be overlaid on top of background information about environment risk, socio-economic, industrial activity or policy indicators.

The European Database of Unconventional Hydrocarbons Wells, still under development, provides an EU-wide inventory of planned and existing unconventional oil and gas wells.. It gathers in one place a wealth of site-specific information on administrative, operational, geological, environmental and risks aspects. It enhances the overall level of transparency and enables close monitoring of environmental impacts of the unconventional hydrocarbons exploration or production activities.

The Impact Analysis Tool (Energy Market) allows users to browse and display modelling results for economic impacts of unconventional hydrocarbons resources on global energy markets and implications for Europe's future energy markets. The modelling explores quantitatively the potential development of unconventional resources at global scale, and its possible impacts on energy markets through a scenario analysis.

JRC improves non-destructive assay techniques for radioactive waste characterisation

Nuclear decommissioning is an integral part of the life cycle of nuclear power plants, and a crucial factor in public acceptance of nuclear power generation. The end of the operational life of the first generation of nuclear power plants must be succeeded by an effective nuclear decommissioning process and a sustainable management of the radioactive and nuclear waste. Significant reductions in the substantial cost for decommissioning of more than one hundred nuclear facilities in Europe can be achieved by development and implementation of new and more effective assay techniques.

JRC participates in a MetroDecom project that takes newly developed technologies and methodologies one step further by demonstrating their implementation and performance in real decommissioning situations. The JRC has put into operation a full-scale clearance measurement station and conducted measurement campaigns on both simulated waste and real waste containers originating from its own the decommissioning activities; the 'Free Release Measurement Facility' device used in the measurement campaign was hosted at the Ispra site Interim Storage Facility (ISF) where a total of 80 waste packages where characterised. In addition, the JRC investigated a new method for reducing neutron background variations in waste drum monitors and demonstrated the feasibility to significantly improve detecting low levels of radioactivity.

A connected digital single market

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

The JRC is supporting the Commission in shaping and implementing these initiatives aimed at ensuring that Europe’s economy, industry and employment take full advantage of what digitisation offers, breaking down barriers to cross-border online activity, supporting e-infrastructure development and designing rules/guidelines which match the

pace of technological evolution.

Protecting children and adults online

The European Commission promotes safer internet through the Better Internet for Kids Strategy. JRC scientists have created an educational game, Happy Onlife, to assist with the safe use of information and communication technologies. A set of resources are used to raise awareness about online safety risks which may seriously affect a child's life, such as privacy and cyberbullying.

The game comes in two formats. The paper version is currently available in English and Italian, and the digital version is available in five EU languages: English, French, Italian, Dutch and Spanish. Happy Onlife also went mobile in 2017, with availability for iOS, Android and Windows smartphones, and its source code is publicly available. Interested parties may develop and improve it, according to their own needs.

In a similar theme the JRC published a new report, 'Internet of Toys: Safety, Security, Privacy', where scientists invite parents to learn about the functions, security measures and privacy settings of internet connected toys that have been manufactured for children. Parents are advised to focus on the quality of play by observing their children and playing alongside them.

Adults who purchase online goods could be offered help thanks to another JRC study that showed that gentle website 'nudges' could be the key to avoiding unwanted or mistaken purchases. The JRC conducted an experiment with 626 participants to learn how they react to different kinds of online warning messages when purchasing online products. Messages aimed at the customer's emotions, combined with an emoticon (a sad face), were found to be the most effective in preventing a participant from misguided online purchases.

A comprehensive global analysis of ICT industries

The JRC report 'Prospective Insights in ICT and R&D' provides the most complete world-wide analysis available on the Information and Communication Technology industries. It focuses on 40 advanced and emerging economies, including the EU28 plus Norway, Switzerland, Russia, and nine other major economies. It contributes to the Commission's annual 'Europe's Digital Progress' report.

The analysis finds that although the EU is making steady progress through the Digital Single Market strategy, the gap between top performing countries like Finland, and less well performing ones, like Romania, is too large. With 5.7 million people employed in ICT in 2014, the EU ranked third in the world in terms of value added to the economy. Its rank was challenged by the spectacular progression of China, which was second only to the US. At the global level, close to 25 % of total business expenditure in Research & Development originates from the ICT sector. At the EU level it is 16 %.

From 1995-2014 the ICT sector of the 40 economies studied has tripled in terms of value added. In 2014 the US had the largest ICT sector, followed by China, while the EU ranked third with a size of € 546.2 billion. The weight of the ICT sector in the total EU economy reached 3.9 %, behind China and India (4.7 %), the US (5.3 %) and Japan (5.4 %), while in Taiwan it reached 15.9 % in 2014. Within the sector, employment in ICT services grew in all 40 countries, except Russia. However, employment in ICT manufacturing decreased in the majority of countries, except in India, China, Brazil and Taiwan.

Promoting energy efficiency with the Code of Conduct for Data Centres Awards

In June 2017 ENGIE, SKY, and Facebook won the EU Code of Conduct Award for Energy Efficiency in Data Centres. The Code of Conduct is a voluntary and independent initiative

for data centres in the EU. Managed by the JRC, it measures energy efficiency in terms of Power Usage Effectiveness (PUE), where the ideal value is 1 PUE. Since the start of the programme in 2008, 354 data centres have requested to join the scheme.

The Code of Conduct for Data Centres was created in response to increasing energy consumption in the commercial sector. Energy efficiency measures, including raising awareness of data centre operators and owners, are designed to encourage best practices in the reduction of energy consumption.

Participating companies use a combination of energy saving technologies to increase their power usage effectiveness, including airflow solutions, innovative cooling solutions and rainwater harvesting. Companies also make general commitments to monitor power and energy consumption, adopt management practices, switch off components not needed, and reduce energy consumption where possible.

The winning data centres have been selected from 25 participants who applied for the Code of Conduct programme between May 2016 and April 2017. SKY won for its data centre 'Ajax 1' in the UK, with a PUE of 1.25. ENGIE Services Zuid in the Netherlands achieved a PUE of 1.28. Facebook's data centre in Sweden managed a PUE of 1.1.

Leveraging the digital transformation: strategies of leading R&D investors

The digital revolution encompasses a large segment of the socio-economic sphere. It originally affected those companies which operated in ICT-related sectors, but now most economies and societies are intertwined through digitalisation. A joint JRC-OECD report reflects this, finding that the largest industrial R&D investors drive the development of digital technologies. They own about 75 % of global ICT-related patents, while only 25 % of them operate in the ICT sector.

The publication, launched at the JRC site in Seville during the 6th European Conference on Corporate R&D and Innovation (CONCORDI 2017), assesses the technologies introduced by major R&D investors in various markets, the digital technologies that pervade different sectors and the strategies that top investors follow to obtain returns from their investments.

The study finds that investing in innovation and knowledge creation brings definite returns, including through intellectual property (IP) rights. Evidence suggests that digital technologies are a pillar of investors' overall strategy, as nearly half of IP5 patent applications filed in 2012-2014 are ICT related. Companies in the computer and electronics industry are the most reliant on IP rights.

Scientific contributions presented at the CONCORDI conference show that the EU needs to increase the pace of its industrial modernisation. New technology-based sectors should be fostered in order to address the challenge of creating better jobs and generating the value needed to sustain more inclusive societies. The EU also needs to increase the role of high-tech sectors in the economy.

Helping schools make the most of digital technologies

In 2017 the European Commission launched the trial version of SELFIE, which stands for Self-reflection on Effective Learning by Fostering Innovation through Educational Technology. SELFIE is based on the Digitally-Competent Educational Organisations framework, developed by the JRC and the Directorate General for Education, Youth, Sport and Culture. Schools from 14 countries have been using SELFIE in an initial pilot phase, ahead of its 2018 introduction in interested schools in Europe.

The meaningful integration of digital technologies can improve learning and teaching; however, the mere presence of digital technologies does not guarantee better learning outcomes. The practical application of SELFIE involves multi-dimensional learning, which

includes curricula, teaching practices, school strategies, and student experience. The generated data is anonymous and the answers provide useful material for schools to assess their strengths and weaknesses.

The purpose of SELFIE is to create development in all schools, whether digitally advanced or not, in support of EU policy goals to improve digital skills and learning capacity. In recognising that digital-age learning promotes both a top-down and bottom-up approach, SELFIE, supports the needs of all members of the school community. It can be customised for each school and involves everyone, from leaders and teachers to the students themselves.

New Smart Tachograph paves the way for improved road safety

JRC scientists have prepared the specifications for the new smart tachograph, which monitors and records the driving and resting times of professional drivers. From 2019, all heavy vehicles must be equipped with this improved version of the currently existing digital tachograph. 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.

Speeding or sleepy drivers are among the main causes of accidents involving heavy vehicles and semi-trailers. Recording driving and rest times 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.

The JRC led the preparation of Certified Protection Profiles expressing the security requirements on the Smart Tachograph components. It provided also additional products to support the introduction of smart tachographs, including a sample cryptographic material and a cryptographic material generating tool.

Contributing to strong cybersecurity for the EU

Cybersecurity is critical to both our prosperity and our security. As our daily lives and economies become increasingly dependent on digital technologies, we become more and more exposed. In September 2017, the Commission adopted an important new cybersecurity package, which builds upon existing instruments and presents new initiatives to further improve EU cyber resilience and response.

In 2017, JRC work on cybersecurity has informed the preparation of the Cybersecurity Package, in particular the proposal of an EU framework on the security certification of ICT products and service, and the establishment of the position of the Commission on the challenge of encryption in criminal investigation.

Ongoing work to facilitate implementation of the package includes mapping the EU cybersecurity capacity, instrumental for the launch in 2018 of a Pilot Network of Competence Centres and the set-up of an EU Research and Competence Centre.

The JRC also actively contributed to the deployment of cybersecurity solutions in several industrial/service sectors: in energy, on cybersecurity requirements for smart grids; in transport on the security of data communication between vehicles and infrastructures and on the security of the digital tachographs; for eGovernment services, on the use of Digital Ledger Technologies for taxation and customs applications; in the Digital Single Market, on fostering the exploitation of digital identities.

Support to law-enforcement authorities and Europol is consolidating with JRC research on digital forensic techniques and smart-home/Internet-of-Things test-beds for lawful collection of digital evidences, and on biometric identification techniques and systems for

criminal identification.

Significant policy support was underpinned by JRC research on emerging threats to network/software security and on the development of mitigation and protection measures (e.g., ePrivacy revision, zero-day vulnerability), as well as by JRC initiatives on cyber-alertness raising and education (e.g., Internet of Toys, Happy Onlife edutainment toolkit).

A deeper and fairer economic and monetary union

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

In 2017 the JRC modelled and carried out socioeconomic analyses to improve macroeconomic, budgetary, structural, and financial developments policies in the EU. It also engaged in quantitative analyses for the development of the capital markets union and completion of the banking union. It provided modelling and economic analyses too, in support of fiscal policies, in particular on corporate taxation.

Supporting the Capital Markets Union mid-term review

The JRC provided technical support to the mid-term review assessing progress in the Capital Markets Union Action Plan. A real Capital Markets Union should strengthen the capacity of EU capital markets to provide the necessary funds to firms, foster long term investment in infrastructures and facilitate cross-border investments.

JRC scientists estimated the degree of EU integration in the equity and bond markets, and found evidence of recovery following the financial crisis. JRC also identified significant home bias in financial investments, i.e. an overwhelming percentage of national financial products in investment portfolios, but again on a downward trend since 2011. Additionally the lack of diversification for cross-border investments prevents the international capital markets from sufficiently cushioning the negative effects of the sovereign crisis by sharing risks across the EU countries.

Nevertheless, the study does find that the financial integrations of EU capital markets are on a steady recovery. Insight is provided by the JRC Financial and Economic Analysis team, based on estimated econometric models and indices. The analysis builds on a tailor made database called 'finflows' that is developed in cooperation with the Directorate-General for Economic and Financial Affairs.

A Community of Practice bringing financial scientists and policymakers together

The JRC launched a Community of Practice (CoP) in Financial Research to bring scientists and law makers together. 19 European universities and associations attended the opening event with academic experts and policy makers. The aim of the CoP is to strengthen the relationship between scientists and European policy makers and to promote research and collaboration on topics linked to Commission’s priorities, such as financial stability and capital markets integration.

The CoP provides assurance that research results will reach the relevant policy makers. The work informs the strategy of the Commission to build a Capital Markets Union and to

guarantee that financial stability and banking sector resilience are maintained through the Banking Union.

The opening event centred on current policy priorities and related research opportunities such as the European Deposit Insurance Scheme, OECD work on productivity, insolvency regimes and financial distortions, and the interaction between monetary policy and financial stability.

JRC model deciphers drivers of GDP growth in European Semester forecasts

In 2017 as in previous years, the JRC deployed its Global Multi-country (GM) model to understand the drivers of euro-area GDP growth within the official economic forecasts that the Commission publishes every Spring and Autumn rounds.

The GM model is a macro-economic model jointly developed by the JRC and the Directorate-General for Economic and Financial Affairs to perform forecasting, medium term projections and spill over analysis in sync with the EU's annual cycle of economic surveillance procedures, known as the European Semester. It notably allows uncovering the factors driving the behaviour of the observed macroeconomic time series, and so to interpret the forecast data and find out which macroeconomic factors explain the deviation of the GDP growth forecast from its trend.

In the Spring 2017 Forecast, the GM model showed that demand-side factors dominate in explaining the real forecast GDP growth for 2017. Particularly, it showed that the surge of domestic households and firms' confidence result in higher consumption and investment, respectively. On the contrary, supply-side factors, such as productivity or labour and goods markets conditions, have a negative yet smaller impact. Finally, world demand and trade factors have a mild positive contribution to 2017 GDP growth in the euro-area.

In the Autumn 2017 Forecast, the GM model highlighted that consumption continues to be one of the most decisive positive factors for 2018 forecast real GDP growth, suggesting household attitudes towards consumption and saving normalising to pre-crisis standards. Additional drivers relevant for 2018 forecast growth relate to labour market and monetary policy. Regarding the former, the main factor consists of an increase of employment due to sluggish real wage growth, whereas the latter is mostly due to the long lasting effects of pre-2018 policy decisions, which kept low levels of interest rates.

In-depth analysis of tax and social benefits reforms for the European Semester

The Directorates-General for Economic and Financial Affairs, for Employment, Social Affairs and Inclusion, and for Taxation and Customs Union asked the JRC to provide tax and social benefits modelling for the 2017 European semester. Its analyses, essentially based on the EUROMOD microsimulation model, were used extensively and referred to in 15 country reports, which provide the technical underpinning for the country-specific recommendations published in May.

The ex-ante and ex-post assessment of reforms was performed in terms of their impact on fiscal revenues as well as on inequality and poverty. An important innovation this year was the possibility to combine the analysis performed with EUROMOD with those from the QUEST model building on a joint project of the JRC and the Directorate-General for Economic and Financial Affairs. This allowed to take into account the macroeconomic feedback of reforms and significantly enriched the analysis and policy recommendations that could be derived from it. The impact of reforms on labour supply and employment attracted specific interest independently of whether such reforms affected work incentives directly (e.g. social security contributions, in-work benefit or personal income taxation) or indirectly (housing taxation or VAT). The analysis of simultaneous tax reforms (e.g. combined social security and VAT reforms) aimed at reducing the distortionary effect of tax systems (especially for employment) also gained importance.

The simulation of such broad policy reforms could be done thanks to the extension of the EUROMOD model to consumption taxes developed by the JRC over the past three years.

Supporting new EU corporate tax proposals with the latest evidence

The JRC's scientific input supports the delivery of a growth-friendly and fair corporate tax system. In 2017, the JRC's macroeconomic analysis and Impact Assessments have helped the Commission to thoroughly reconsider the current taxation of companies in the single market. The evaluations suggest that a fairer and more efficient tax system could be introduced - which may even improve GDP growth and welfare in the EU.

The JRC gave a comprehensive analysis of the Common Consolidated Corporate Tax Base (CCCTB) proposal for a single set of rules for private companies to calculate their taxable profits, as well as providing an assessment of recently exposed tax avoidance practices. Proposals for policies that would reduce the debt bias in corporate tax rules, such as the introduction of an allowance for Growth and Investment (AGI) were also investigated.

Analysing the macroeconomic impact of the proposals required the use of state-of-the-art quantitative modelling techniques. The analysis relied on CORTAX, which is an applied equilibrium model covering all EU Member States. The JRC adapted the model to carry out the analysis of the Common Corporate Tax Base (CCTB) and CCCTB proposals with the latest data.

Technical Support to Greece in the context of the Third Stabilisation Programme

Within the frame of the Third Memorandum of Understanding with Greece, the JRC has been collaborating with the European Commission's Structural Reform Support Service (SRSS) since its inception in 2015 for the assessment of the third Greek stabilisation programme.

In 2017 a JRC researcher has been detached for one year to the Greek Ministry of Finance in order to provide technical assistance in the context of the discussions it holds with the European Commission, the European Central bank and the International Monetary Fund. This support has allowed the Greek authorities to access new modelling capacity, particularly the EU-wide microsimulation model EUROMOD, in order to analyse the fiscal and equity impact of foreseen tax and social benefits reforms. The JRC also provided the Greek Ministry of with training and technical assistance on the management and use of micro-data shared by the Greek tax authority for tax simulation purposes.

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 2017, JRC's activities contributing to strengthening the internal market included standardisation, reference measurements and (nano-)materials; support for industrial sectors to enhance their environmental efficiency, energy performance, climate resilience, GHG emissions reductions; material efficiency and circular economy; advanced manufacturing and key enabling technologies; SMEs and innovative companies, and industrial competitiveness.

Stairway to Excellence: supporting regional innovation for all Member States

The Stairway to Excellence Project expanded in 2017 to cover new areas like energy, bio-economy, health, aviation and agri-food and support all regions and stakeholders in all EU Member States. It enables them to access Horizon 2020, the EU's research and innovation programme, and make the most of the European Structural and Investment Funds. The project is managed by the JRC and the Directorate-General for Regional and Urban Policy, on behalf of the European Parliament.

Broadening the programme provides regions, industry and organisations with tailor-made support in research and innovation. Academia, business and authorities collaborate to better use resources to foster innovation, economic growth, and social cohesion. It enables dialogue and generates opportunities between key stakeholders with common priorities.

Research carried out by the JRC fosters this collaboration: it includes country-based quantitative reports and qualitative analyses. The Stairway to Excellence Country Reports address the issue of bottlenecks affecting the optimal use and combination of key research and innovation funds. Under the Smart Specialisation Platform the JRC has also developed the 'R&I Regional Viewer' to review planned research-related investments.

From its launch in October 2014, the Stairway to Excellence Project covered the 13 Member States that joined the EU during or after 2004, engaging over 1000 stakeholders in various events. It has now expanded both its geography and its focus, covering new areas like energy, bio-economy, health, aviation and agri-food.

Research and Innovation Observatory monitors development across the EU

The JRC published the 2016 edition of the European Commission's Research and Innovation Observatory reports, assessing the development of research and innovation systems at the level of each EU country and identifying important tasks ahead. According to the 2017 reports, industry collaboration and commercialisation of public research results remain a major challenge for R&I systems in many EU countries, but the demand for human resources is increasingly a central point of R&I policies.

The reports aim to feed into the EU policy process and provide a tool that supports policy learning in the Member States. The 2017 edition has been streamlined to provide the most relevant information on national R&I systems, such as the main policy developments in 2016 (with a special focus on smart specialisation), the economic context and research and development trends, including investment figures.

The report also finds evidence that European R&I systems are focusing more and more on strengthening the innovation output of SMEs and domestic companies, fostering entrepreneurship and targeting interventions to companies in new knowledge-intensive sectors and young innovative companies with potential for high growth. At the same time, increases of public and private funding of R&I remain critical for innovators.

MARS Explorer: the EU-wide crop and weather monitoring e-service

The JRC has developed a new Monitoring Agriculture with Remote Sensing (MARS) Explorer e-service. The MARS Explorer enables web users worldwide to observe weather and crop conditions across the whole of the EU. Its predecessor, the MARS Crop Monitoring Bulletins, still provide benefit to thousands of individuals and organisations, through monthly updates on weather conditions and crop yield forecasts. With the new and advanced e-service, users now have access to a much larger set of data, updated more frequently.

The new Explorer e-service provides rapid access to high-resolution maps and graphs that are updated three times per month. Weather data is based on observations from

several thousand meteorological stations across Europe. Simulations using a computer model give information on crops. Indicators include average, minimum and maximum temperatures, climatic water balance, moisture and rainfall levels.

Users can also follow the progress of a wide range of crops across the EU, including winter wheat, spring barley, grain maize, sunflowers, potatoes, rye, sugar beet and oilseed rape.

The JRC's crop forecasting activities support the EU Common Agricultural Policy by providing scientifically relevant, independent and timely evidence. The e-service was launched to mark the 25th anniversary of the MARS Crop Monitoring Bulletins, celebrated in 2017 in Brussels.

New EU environmental standards for large farms, combustion and chemical plants

New standards on resources and emissions will help national authorities across the EU to lower the environmental impacts of around 20,000 large poultry and pig farms, around 3,500 large combustion plants and around 3,200 installations that produce Large Volume Organic Chemicals (LVOC). The new guidelines come from the review of the Best Available Techniques (BAT) Reference Document for the intensive rearing of poultry and pigs, and from similar reference documents regarding large combustion plants and chemical plants.

Each of these stem from JRC-led reviews of old reference documents, with conclusions published in the Official Journal of the EU over the course of 2017. Regarding large combustion plants, the BAT conclusions were voted favourably by Member States with a qualified majority. The JRC led the drafting of the BAT resolutions for large farms through its European Integrated Pollution Prevention and Control Bureau, and in collaboration with the Commission and environmental NGOs.

For the first time at the EU level, the BAT conclusions set limits on the ammonia pollution to air from animal housing. The conclusions provide a technical basis for national authorities in EU countries to set permit conditions for large poultry or pig farms, which will minimise environmental impacts and support the implementation of several environmental Directives. According to the European Environment Agency, agriculture is responsible for 94 % of ammonia emissions and excessive levels of ammonia are linked to negative effects on rivers and lakes, forests and crops.

As well as tightening existing limits for certain pollutants from large combustion plants, the BAT conclusions also set new limits on emissions to air for chemicals like mercury. While the main aim of the LVOC BAT conclusions is to reduce emissions from chemical processes, other environmental issues - like energy efficiency, resource efficiency, wastes and residues - are also covered.

The latest research on clean and intelligent transport

The transport and mobility sector is undergoing a number of technological, economic and social transformations, at an accelerating pace. The Commission aims to turn these challenges into opportunities through the adoption in 2017 of its long-term strategy: 'Europe on the Move'. The aim is to pursue clean, safe, connected and automated mobility - developed and produced in Europe - through targeted legislation, infrastructure investment, research and innovation.

As part of these efforts, the JRC helped to create a methodology used in guidance given to help Member States to evaluate if cars have been fitted with defeat devices – the illegal motor vehicle software or hardware which interferes with emissions controls under real-world driving conditions, even if the vehicle passes standard emissions testing. EU countries have the obligation to check the compliance of in-use cars and identify these

illegal devices through targeted emission tests.

The gradual development of connected and automated transport is another component of the 'Europe on the Move' strategy, along with the objectives related to clean and safe mobility. In 2017, the JRC launched the Transport Research and Innovation Monitoring and Information System (TRIMIS), a platform which maps and analyses research trends and capacities across Europe's transport sector. TRIMIS supports transport policy makers and researchers by monitoring the implementation of the Commission's Strategic Transport Research and Innovation Agenda and by helping to identify innovations with the greatest promise for the future. Thus it aids policy makers to focus on areas where public intervention can create the highest added value.

In addition, the JRC explored the potential impact of connected and automated vehicles (CAVs), as well as intelligent systems that could revolutionise transport as we know it. The report clearly highlights the potentially beneficial impacts of CAVs in terms of reducing road accidents, traffic, pollution and energy use, while also increasing productivity, comfort and accessibility. However, AV technology still is in its infancy and requires significant oversight to prevent unintended negative consequences such as uncontrolled congestion peaks that could potentially compromise its benefits.

Advancing Europe towards the circular economy

Addressing the ever increasing demands for resources requires transition towards an advanced circular economy, based on maintaining the value of all materials and resources as long as possible. This transition creates local jobs, growth, and opportunities for social integration while enhancing competitiveness. It also helps the EU to achieve its climate and energy objectives while supporting its commitments on sustainability.

The circular economy is supported by JRC research programmes on energy, raw materials use , eco-fertilisers, and water reuse in agriculture.

In 2017, the European Commission laid out its vision for turning waste into energy as part of the Circular Economy Action Plan. This vision is underpinned by JRC research, which finds that although only around 1.5% of the EU's total final energy consumption was provided by energy recovered from waste in 2014, the efficiency of waste-based energy generation could be increased by more than 25% using technologies available today. The JRC also contributed to creating standards on material efficiency for energy-related products under the Ecodesign Directive.

Another example, the JRC report ‘End of Waste work on Compost and Digestates’ is a building block of a new approach to fertiliser production, outlining conditions and technical requirements to transform biodegradable waste into valuable fertilising material

In November 2017 the JRC launched the Raw Materials Information System, a central knowledge hub that includes the Raw Materials Scoreboard and provides an overview of challenges and opportunities along the entire raw materials value chain. The Scoreboard is an initiative of the European Innovation Partnership on Raw Materials and is a benchmark for progress towards a circular economy. It was developed by the JRC in collaboration with DG GROW.

Food colour regulations in the EU and the US: the benefits of closer cooperation

Food ingredients tend to be strictly regulated globally. However, as rules often vary between countries and regions, exporters often need to reformulate products for their intended marketplace. One example is the significant discrepancy between EU and US regulation on food colouring. These differences increase costs and can be a barrier to commerce.

Restrictions for use are set for over 600 different food colouring combinations in the EU, while there are few regulatory maximum limits set in the US. However, the US does not allow adding colour at all in over 200 foods, while only few food categories are entirely excluded in the EU. However, there is a common trend towards colours from natural sources in the EU and the US, which is expected to gradually reduce the need for reformulation of products for the export market on both continents.

The JRC teamed up with the University of Stuttgart to compare food colour regulations between these two large trading partners. They assessed existing sets of rules to explore the challenges exporters of processed foods are confronted with. The study confirmed that closer cooperation between regulators would be beneficial for consumers, businesses and regulators alike.

Assessing control proficiency in fipronil detection

In the wake of the 2017 fipronil crisis, many consumers were concerned that the banned insecticide could be present in their food. The JRC organised a proficiency test which confirmed that the overwhelming majority of European control laboratories can accurately detect levels of fipronil in products bound for human consumption. The EU has established a maximum limit of 0.005 mg fipronil for each kg of eggs.

85 laboratories in Europe participated to the proficiency test. They were sent sets of samples and given two weeks to report back on their results. These were compared by the JRC against the independent reference values. It was found that almost all laboratories were able to establish the amount of fipronil and its main degradation product, fipronil sulfone, in the test materials. They correctly determined which of the provided test samples would be non-compliant according to the levels set in EU legislation.

To further support laboratories in assessing the quality of their test results, the JRC is currently preparing a Certified Reference Material (CRM), based on fipronil and fipronil sulfone contaminated eggs.

Towards a new policy for migration

Migration is amongst the biggest political, social, and demographic challenges the EU faces. 2015 saw unprecedented numbers of asylum-seekers entering the EU, testing the limits of solidarity among Member States. In response to the crisis, the Commission adopted a European Agenda on Migration, outlining immediate measures and steps to better manage migration in the medium and long term. These include reducing the incentives of irregular migration with a focus on addressing the root causes; border management; strengthening the Common European Asylum System; and developing a new policy on legal migration.

Contributing to this Agenda, in 2017, the JRC developed – in the context of the Knowledge Centre on Migration and Demography – unique and innovative instruments to access information and data about migration, notably the Migration Data Catalogue and Dynamic Data Hub, Migration Profiles for key third countries and Maps of migrant communities in EU cities.

Research and knowledge management on demography and migration dynamics

In June 2016 the European Commission set up a new Knowledge Centre on Migration and Demography. One year on, the Centre has made progress and provided EU policymakers with valuable instruments to access information and data about migration. The Centre's daily activities are run by the JRC, with its work jointly steered by the main Commission services responsible for migration policies.

At its inception, researchers working for the Knowledge Centre created an inventory of international and EU-wide data that already existed on migration. They launched the first two data platforms which bring together this wealth of data in one place. The Migration Data Catalogue is an inventory of around 130 existing datasets linked to demography and migration, made available by institutions including the Commission and administrations of some Member States.

The Dynamic Data Hub is a web-based application that builds on the Data Catalogue and provides interactive direct access to support the European Agenda on Migration. It covers timely information, including migration flows and socio-economic data such as population growth, GDP, labour force and World Development Indicators. It offers a direct entry point to deepen understanding of trends and their impacts on the EU. The Hub gathers official statistics and estimates from international organisations, including Eurostat, the UN Refugee Agency and OECD.

The Knowledge Centre has created a new generation of Migration Profiles, providing up-to-date and context-specific information and analysis of key third countries of origin and transit of migrants to Europe. In order to better anticipate future migratory trends, Migration Inclination Indexes will be created and issued by the end of 2018. They will provide reliable information on the root causes, incentives and determinants of migration. The aim is to help quantify the relevance of the different drivers of migration towards Europe and the effects of migration-related policies.

Mentoring refugee scientists

A pilot programme was initiated in 2017 to welcome refugee scientists for a week-long training programme at the JRC. Through this programme, scientists had a chance to be introduced to the European research environment, build up necessary work experience and meet vital contacts to find European jobs in their area of expertise.

The scheme harmonises well with the efforts of the EU, NGOs, academia and European researchers to connect with refugee scientists and share professional experiences. In March 2017, scientists at Ispra welcomed a food technology scientist from Syria, a chemist from Ethiopia and an environmental scientist from Ethiopia, who spent a week at the site to learn more about the JRC's work on consumer product safety and land resources. Earlier in the month, scientists from Syria and Iraq attended similar training programmes at JRC sites in Geel, Belgium, and Petten, The Netherlands.

The participants left with new ideas and encouragement to continue their scientific careers in Europe. They urged the JRC to continue with the mentoring programmes to reach out towards other refugee scientists and researchers. The JRC is currently looking at how a broader and more permanent programme could be established.

A unique migration dataset to support integration

In October, the JRC unveiled a unique dataset that maps the diverse migrant communities living in the EU, at the level of individual neighbourhoods. The maps provide new insights to support policymakers in developing systems to help migrants integrate in their host countries.

The data allows researchers to calculate the concentration, diversity and segregation of migrants from different countries and compare these indicators within and across cities. Initial findings show a general correlation between how segregated a migrant community is and the geographical and linguistic distance between their countries of origin and destination. For example, Chinese and Filipino communities in Europe are likely to be highly clustered and segregated from their host communities.

The data has the potential to inform a wide range of policy areas, including social services, education, housing and employment. To maximise this potential, the JRC

launched a data challenge inviting researchers worldwide to propose research projects connecting the dataset with their area of expertise. An event is planned for the second half of 2018 in Brussels to present the results of the best papers to EU policy makers and local authorities.

The dataset is designed to support the Commission's aim to facilitate evidence based migrant integration policies, as part of the action plan on the integration of third-country nationals and the urban agenda for the EU.

Vocational training and data security to help migrants integrate

At the start of 2017, JRC published a report which found that migrants are still systematically lagging behind their native peers across the EU in terms of acquired skills and education. While performance varies a lot across groups and EU Member States, the study notes that second-generation migrants and first-generation migrants who arrived before the age of 15 perform better overall than the rest of first-generation migrants, sometimes nearly as well as their native counterparts. This shows the key role that education – including vocational training – can play in a successful integration process.

The study also found that, employment rates among low-skilled migrants are higher than among low-skilled natives, which suggests that greater efforts on vocational and work-based training for migrants could help them to make progress in their careers. However, a significant share of migrant human capital remains underused. Migrants with higher levels of skills have lower employment rates than natives.

Integration is also served through data security and authentic, machine readable travel documents. This includes ID cards, passports or European driving licenses issued by various Member States. In September 2017, the Commission held conformity and interoperability tests for documents with embedded chips, which found failure in only 0.86% of cases. However, improvements are still possible and the Directorate-General for Migration and Home Affairs, with support from the JRC, continued its work in 2017 on developing inspection system guidelines to ensure the protection of data stored on the chips embedded in these documents.

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.

To enhance the EU’s and its partners’ resilience in this changing global environment, the JRC has undertaken a number of new initiatives to assist Commission services, with the monitoring and implementation of the 2030 agenda for sustainable development and its Sustainable Development Goals and Targets (SDGs). The JRC is addressing in particular the areas of food security and nutrition, environment and biodiversity, resource efficiency and sustainable production and consumption, climate, energy, and urban development.

Science for sustainable, affordable energy in sub-Saharan Africa

Access to sustainable and affordable energy remains problematic throughout sub-Saharan Africa. In Burkina Faso, only 3.06 % of people in rural areas have access to modern energy sources. A JRC report maps the least costly options for electrification of the country's rural areas, providing a blueprint to transform the energy sector of this country with a population of about 18 million people.

Since 2016, the energy sector in Burkina Faso has been orienting itself towards more

sustainable and cost-efficient electricity supply. However, the amount of energy currently produced in the country is far below the demand for its large population, and the country is heavily dependent on imports for its electricity.

The JRC's input utilises a spatial analysis tool to assess potential pathways towards a sustainable rural electrification plan which could be applied in Burkina Faso. It was developed in collaboration with other organisations, including the Energy Ministry of Burkina Faso, and within the framework of the national action plans of the UN's Sustainable Energy for All initiative. It notably highlights the substantial solar power potential, and encourages the deployment of renewable energy by the government and investors. Findings also indicate that up to 65 % of non-electrified settlements could be served by decentralised technologies.

The JRC supported the expansion of the Covenant of Mayors Initiative to Sub-Saharan Africa and other parts of the world. The JRC also provided data that maps - for the first time – the estimated hydro power potential for the whole of sub-Saharan Africa, with river flow information derived from the Global Streamflow Characteristics Dataset (GSCD) and the LISFLOOD simulation model for Africa

Supporting resilience, prevention and mitigation of disasters

In May, the JRC's Disaster Risk Management Knowledge Centre launched its flagship report on science for disaster risk management, a cooperative work of 273 scientists from 26 countries and 172 organisations, with inputs from 11 Commission services. The report presents the state-of-the-art in the field and contributes to the Science and Technology Roadmap of the Sendai Framework for Disaster Risk Reduction.

Early in 2017, the JRC presented the 'Atlas of the Human Planet 2017' at the UN Global Platform for Disaster Risk Reduction. The atlas is a comprehensive study of human exposure to natural hazards. It covers six major natural hazards: earthquakes, volcanoes, tsunamis, tropical cyclone winds, tropical cyclone storm surge and floods.

The study highlights that global exposure to these hazards has doubled between 1975 and 2015, mostly due to urbanisation. Flooding is the most common of the hazards studied in Europe, with Germany having the highest number of people exposed to floods. Additionally, over 170 million Europeans are potentially exposed to earthquakes – with over 80% of people in Italy, Romania, and Greece at risk.

The JRC also analysed areas in which science and knowledge can be further integrated into evidence based disaster risk management policy. They have identified areas for potential improvement, such as public-private partnerships for risk sharing, which - when addressed - can save more lives and minimise damage from disasters.

The JRC has also developed a number of disaster management and mitigation instruments, including a flood forecasting methodology integrated in the Copernicus European Flood Awareness System, a handbook that supports the EU and third countries to reduce impacts of industrial accidents, a stress test framework for non-nuclear critical infrastructure, such as telecommunication, and a Global Wildfire Information System to monitor wildfires.

A new early warning system to mitigate droughts and food crises

In 2017 the JRC developed an early warning system, named 'Anomaly Hot Spots of Agricultural Production', which was launched during the European Development Days in June. The system produces monthly reports identifying countries in need of aid interventions or adaptation to their rural development programmes. The system covers 80 countries, and is based mainly on Earth observation through the Copernicus programme, plus meteorological models. It can issue further automatic warnings every ten days at province level, and make crop monitoring indicators available to technical

experts. Through this system, early warning of food production issues in food insecure countries can be provided to the main international coordination mechanisms, such as the Integrated Food Security Phase Classification.

Methodologies developed by the JRC also contributed to the 2017 Global Report on Food Crises. Compiling this report required the integration of several measurement methodologies and an innovative collaboration between several major international organisations, such as the US Agency for International Development. According to the report, during 2016 around 108 million people in the world were severely food insecure, a sharp increase on the 80 million observed in 2015. Conflicts are the driving factors in nine of the 10 worst humanitarian crises, underscoring the strong link between peace and food security.

A new indicator of connectivity between natural protected areas

The JRC has developed an indicator for the measurement of progress towards meeting the UN connectivity target for ecoregions and protected areas. Connectivity in this case refers to the possibility of animal species, and of the genes and seeds that they carry, to move from one protected area, such as a Natura 2000 site or national park, to another. This is essential for the conservation of biodiversity and for supporting long-term human well-being.

In 2010, the parties to the UN Convention on Biological Diversity adopted a Strategic Plan for Biodiversity, which includes twenty Aichi Biodiversity Targets. Under Aichi Target 11, the international community agrees that by 2020 at least 17% of terrestrial areas will be conserved through well-connected systems of protected areas. Currently, about one third of the world's ecoregions meet the target. The JRC's Protected Connected (ProtConn) indicator quantifies the percentage of land covered by protected and connected areas. It differentiates categories, such as transboundary land through which movement between protected locations may occur. The JRC has assessed the connectivity of protected areas for all terrestrial ecoregions in the world. The detailed results are available from the Digital Observatory for Protected Areas. The indicator will be further developed to cover land at a national level in 2018.

Science for the African Union-European Union Partnership

The JRC has cooperated with academic and administrative bodies in Africa for more than 30 years. Its satellite imagery, instruments and research have served the African people across the continent, by forecasting crop yields, carrying out environmental research, providing data when disasters strike, and highlighting demography and migration issues. This wealth of knowledge was described in the JRC flagship report 'Science for the AU-EU Partnership', which was presented at the 5th AU-EU Summit in Abidjan, Côte d'Ivoire, in November 2017.

It is estimated that by 2050, one in four people will live in Africa, whilst temperatures in some parts of Africa may increase by up to 6°C, despite the fact that its GHG emissions of 4 tonnes per person a year are much lower than the global average of 7.3 tonnes. To cope with these challenges, Africa needs to tap into its natural and human potential, including its considerable hydropower and solar power sources, and its young, increasingly urbanised and increasingly computer literate population.

Urbanisation brings challenges; however, if managed well, it contributes to sustainable growth. The Global Human Settlement Layer, supported by the JRC and the Directorate-General for Regional and Urban Policy, is the most complete, free and open dataset to quantify and understand the issues of human movement. Around half of Africa's population is located within 100 km of the coast, and most do not have access to good quality transport. The JRC's Global Map of Accessibility highlights these remote areas by showing overland travel time to cities that have more than 50 000 inhabitants.

Africa remains the continent most at risk of disasters and humanitarian crises. The combination of conflicts and natural hazards often causes complex and prolonged emergencies. Over the past 40 years, over 400 million people in Africa have been affected by droughts, and 68 million by floods. Undernourishment is still a serious concern, despite the fact that about 20 African states have already achieved the Millennium Development Goal of hunger alleviation.

The scope of the flagship report reflects the evidence collected and the scientific work conducted by the JRC together with its partners in Africa and around the world. The report aims to support and inform an evidence-based dialogue and further engagement with Africa's policymaking and scientific communities, and thus further strengthen, with a solid knowledge base, the renewed AU-EU Partnership.

Protecting our critical infrastructure against extreme space weather events

Extreme space weather has a global footprint and the potential to damage critical infrastructure on the ground and in space. A JRC study identifies the gaps in reducing risks linked to space weather and makes recommendations for policy, industry and science on how to close these gaps.

Solar radiation storms affect ground- and space-based communications, including the GPS network. They are also a threat to critical infrastructure, including satellites, rail transport and power grid operations. The impact of severe space weather can cross national borders, which means that a crisis in one country can affect the infrastructure in the neighbouring countries. The storms are caused by the emission of magnetised solar plasma, which interacts with the magnetosphere of the Earth. However, storm forecasting is hampered by a limited understanding of the release of plasma from the solar corona.

The JRC study calls for a pan-European vulnerability assessment of the power grid to be carried out to identify critical issues and transboundary effects in case of extreme space weather. Infrastructure operators should also assess whether their systems could be indirectly vulnerable to space weather, for instance due to dependencies on timing and positioning information provided by the Global Navigation Satellite System (GNSS). In addition, better communication between science and industry could provide reliable information to operators for timely decision making.

The study also advises that the roles and responsibilities of key players in Europe should be better defined and suggested that coordinated strategic investments for improving the scientific know-how in this area could be explored.

Technical Reachback Capabilities

Reachback capability is understood as the availability of on-line technical expertise for interpretation of measured nuclear spectra and assessments of imminent danger, in case of illicit trafficking of nuclear and/or radioactive materials.

In March 2017, together with the Global Initiative for Combating Nuclear Terrorism (GICNT) and the European Reference Network for Critical Infrastructure Protection (ERN-CIP), the JRC organised an international workshop focusing on the need for enhancing both national and international Technical Reachback capabilities and the role and responsibilities of expert support.

The workshop brought together more than 60 experts from 25 countries, and representatives from the European Commission (EC) and the International Atomic Energy Agency (IAEA). Three common reachback challenges were looked at: information sharing, alarm adjudication, and detection technology. The impact of new technology on nuclear security detection architectures was also discussed. A real-time detection demonstration simulating a complex nuclear security event was organised, which focused

on core components of alarm adjudication and information exchange between front-line officers, a national reachback centre, and an advanced centralised reachback centre located in Paris.

A list of concrete post-workshop activities was generated to pave the way for further development of European nuclear security capabilities and more broadly for the security of chemical, biological, radiological, nuclear, and explosive (CBRNE) materials.

Nuclear forensics: the clash of cultures

In 2017 JRC hosted three international events on Nuclear Forensics in its Karlsruhe site.

Crime scene management is the responsibility of law enforcement, but when nuclear or other radioactive material are present, the potential hazards associated with handling them require that evidence collection and analysis follow special protocols. The requirements and ways of thinking of analytical experts differ from those of law enforcement, which makes presenting nuclear forensic evidence needs in court challenging. To help address this issue, an international experts meeting on presenting nuclear forensic evidence in court was organised by the JRC and open to participants of the GICNT event and to ITWG attendees. More than 60 participants illuminated the 'clash of cultures' when scientists and lawyers meet in court.

A workshop of the Nuclear Forensics Working Group of the Global Initiative to Combat Nuclear Terrorism (GICNT) gathered 35 participants discussing challenges related to expert witness testimony.

The JRC also hosted the 22nd annual meeting of the Nuclear Forensics International Technical Working Group (ITWG). More than 100 nuclear forensics practitioners from nuclear measurement laboratories, nuclear regulators and law enforcement discussed priorities in nuclear forensics research and development, exchanged their latest methodological developments, reported on progress in conducting exercises, on real incidents and in developing guidelines.

JRC support to the implementation of the EU Dual-use export control Regulation

JRC provides technical and analytical support to the harmonised implementation of the EU Dual-use Regulation. For example, it provides assistance to EU export control authorities through the EU Pool of Experts on dual-use export controls, operated and contributed by the JRC in collaboration with national experts, as well as support to the definition of guidelines for harmonised implementation of export controls in EU, and contribution to the dual-use export control policy review in collaboration with other relevant JRC activities dedicated to trade flow and open source analyses. The JRC also conducts research on current issues related to export control law and implementation, intangible transfers of technology, dual-use research, cloud computing, and more detailed advice to other bodies within the European Commission.

Since 2013 the Commission provides a yearly report to the European Parliament and the Council, to inform about the implementation of the EU Dual-use Regulation. JRC contributed to the 2017 report by collecting key export control data, including the estimation of extra-EU trade flows of dual-use items. It derived figures about export licenses authorised or denied by EU the Member States, analysing the annual transactions and more than 1600 denials of export licenses issued over the last four years. It also assisted in correlating dual-use export codes with the customs harmonised codes and combined nomenclature, key instrument for exporters and customs helping them to identify dual-use relevance.

Table 15-1. Examples of tangible impact of JRC activities in 2017. These are cases where JRC's work has policy-impact by incorporation of scientific and technical knowledge into policy proposals or related to the support of the implementation of EU policies. Source: JRC own records; annual internal well-established peer evaluation process using a documented method with pre-set criteria (Productivity and Impact Evaluation (PRIME)).

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
Examples of tangible impact of JRC activities related to the Commission General Objectives 1, 3, 4 and 9			
1 & 3	Opening of EC Atmospheric Observatory	For over three decades, the JRC has participated in the European Monitoring and Evaluation Programme (EMEP), which underpins the Convention on Long-Range Transboundary Air Pollution under the United Nations Economic Commission for Europe. The JRC's new air quality monitoring station in Ispra (IT) supports the implementation of the EMEP programme. The Atmospheric Observatory is one of just two active EMEP stations in Italy and it is one of the most advanced research-driven stations within the EMEP programme. It provides essential observations on air pollutants and greenhouse gases. The observations from the station also provide solid data which is used to assess the effectiveness and impact of European policies on the atmosphere.	Implementation, monitoring, evaluation of EU policy
1	Urban PM25 Atlas in European Cities	Each year, over 400 000 citizens die prematurely in the EU as a result of poor air quality. The JRC produced an Air Quality Atlas for PM2.5 to support local and regional authorities in abating air pollution, contributing to the Covenant of Mayors initiative. It provides information on the geographical and sectorial sources of air pollution for the 150 biggest cities in Europe and helps cities in optimising their measures in terms of both air quality and climate change.	Implementation, monitoring, evaluation of EU policy
1	Commission Implementing Decision (EU) 2017/1442 establishing best available techniques (BAT) conclusions, under the IED Directive (2010/75/EU), for large combustion plants	On behalf of DG Environment and supported by a Technical Working Group of about 290 experts, the JRC carried out the review of the BREF for large combustion plants (LCP) and drafted the Annex of the relevant Implementing Decision (EU) 2017/1442 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU, for large combustion plants. The LCP BAT conclusions set the mandatory environmental standards for the EU large combustion plants with respect to emissions to air, water and land. Member States' competent authorities must use the LCP BAT conclusions to set or to update permit conditions and ensure compliance with the Industrial Emissions Directive. JRC has also reviewed the BREFS for production of large volume organic chemicals and intensive rearing of poultry and pigs, resulting in Commission Implementing Decisions (EU) 2017/2117 and 2017/302.	Implementation, monitoring, evaluation of EU policy

[31] JRC classification: 1) Anticipation, conception, adoption of EU policy; 2) Implementation, monitoring, evaluation of EU policy; 3) Ad-hoc support (including crisis management); 4) EU and global standardisation and international harmonisation; 5) Support to specific countries/regions and international bodies (other than standardisation or crisis support).

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
1	Provision of scientific advice on fishing opportunities as basis for catch and quota setting for 2018 under the Common Fisheries Policy	Under Article 50 of the Common Fisheries Policy (Regulation (EU) No 1380/2013), the Commission is obliged to report annually to the European Parliament and the Council on the progress on achieving Maximum Sustainable Yield and on the status of fish stocks. An expert group of the Scientific, Technical and Economic Committee for Fisheries (STECF), which is managed by the JRC, provided the scientific advice on the state of fish stocks when proposing catch limits and quotas for the next year.	Implementation, monitoring, evaluation of EU policy
1	EU green public procurement criteria for textiles products and services, for paints, varnishes and road marking and for furniture	The JRC together with an ad-hoc working group of representatives from Member States, industry and NGOs established for this purpose analysed the environmental impacts of textiles along their life cycle and developed Green Public Procurement (GPP) criteria which help public authorities to take these impacts into consideration when commissioning new textiles. These criteria were incorporated in the SWD (2017) 231 'EU Green Public Procurement Criteria for Textiles Products and Services'. Similarly, JRC-developed criteria for paints, varnishes and road marking furniture were taken up in SWD (2017) 484 and SWD (2017) 283.	Implementation, monitoring, evaluation of EU policy
1	Adoption of new international standards for skin sensitisation testing based on non-animal methods	Assessment of the skin sensitisation potential of chemicals using non-animal methods is a requirement within European legislation aiming at the protection of human health and the environment (e.g. REACH Regulation no. 1907/2006 and Cosmetics Product Regulation no. 1223/2009). On behalf of DG Environment, the JRC has been leading at the OECD the adoption of the first three test guidelines on non-animal methods for skin sensitisation, validated by JRC's EURL ECVAM and peer reviewed by its Scientific Advisory Committee (ESAC). The OECD Test Guidelines describe internationally agreed test methods for determining the safety of chemicals. They are covered by Mutual Acceptance of Data by OECD Member Countries, which avoids duplication of testing, saving costs and the lives of millions of animals. EU legislation for the safety assessment of chemicals refers to the OECD Test Guidelines. The OECD is also the default route to take up new test methods into the EU Regulation No 440/2008.	EU and global standardisation and international harmonisation
1	European Cancer Information System (ECIS) web-application released to a community of 160 European cancer registries	Cancer registries are the most effective way of obtaining data on the burden and patterns of cancer. Following an invitation from DG Health and Consumers, the JRC with the European Network of Cancer Registries (ENCR) set up the European Cancer Information System (ECIS). In 2017, the pilot version of ECIS web-application was released to the community of 160 cancer registries. This JRC-developed application will: (i) ensure comprehensive and standardised cancer data from all Member States; (ii) monitor trends across European states and regions; (iii) illustrate effects of health policies; (iv) help identify best practices; (v) support epidemiological and clinical research; and (vi) inform and educate citizens. To date, 121 cancer registries from 29 European countries have contributed data to ECIS, and others are in the process of preparing their data sets to meet the quality criteria. ECIS contains >1.7 billion harmonised data records deriving from >30 million cancer cases and is expected to grow at the rate of >170 million records per year.	EU and global standardisation and international harmonisation
1	Republic of Ireland uses JRC report on public procurement of foods to inform their Nutrition Standards for School Food in Ireland	Provision of healthful school meals has long been on the agenda of various stakeholders involved in the battle against (childhood) obesity, but the translation of school food standards into adequate procurement contract language presented a major obstacle on that path. The JRC has produced a technical report to support Member States in translating their national school food standards into food procurement specifications. The report includes a range of options, including nutrition and food standards that can be adapted to Member States' own context. The Nutrition Standards for School Food in Ireland invited JRC to provide advice.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
1	Assessing the quality of official control laboratories monitoring fipronil in egg products	In agreement with DG Health and Consumers and following a request from the Belgian Government, the JRC organised a proficiency test to assess the competence of Official Control Laboratories (OCLs) and National Reference Laboratories (NRLs) in the EU Member States in detecting the insecticide fipronil in eggs around the regulated maximum residue level. 85 NRLs and OCLs from 22 EU Member States, Norway, Serbia and Albania participated on short notice. The vast majority of the participants reported satisfactory results, confirming the analytical capability of most of the participating official control laboratories to protect the safety of food with respect to this insecticide.	Ad-hoc support (including crisis management)

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
1	Contribution to the 7th Cohesion Report	JRC has contributed to drafting the 7th Cohesion Report and provided analysis and modelling with its LUISA modelling platform and the RHOMOLO model of urban and regional development, widely used in the evaluation of impacts of Cohesion policies. The JRC Flagship report 'European Territorial Trends - Facts and Prospects for Cities and Regions' 2017 edition, referenced in the Cohesion Report, also contributes to the impact assessment of proposals for the post-2020 Multi-annual Financial Framework.	Implementation, monitoring, evaluation of EU policy
1	Support better innovation-led policy making at local level through innovation camps	Innovation camps are a participative instrument aimed at ensuring broad involvement of local stakeholders in policy decisions. The JRC has led the development of methodology for such camps. The camps organised in Greece, Belgium and Serbia generated policy options for the identification and implementation of smart specialisation national or regional priorities.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
1 & 4	References to the JRC stairway to Excellence (S2E) project in 2017 Commission Communication 'Strengthening Innovation in Europe's Regions: Strategies for resilient, inclusive and sustainable growth'	On request of DG Regional and Urban Policy the JRC led the implementation EP pilot actions and one preparatory action, providing targeted support to Member States. The Stairway to Excellence project contributed to Commission communication 'Strengthening Innovation in Europe's Regions: Strategies for resilient, inclusive and sustainable growth' (COM(2017) 376 final). It helps closing the innovation gap between the EU regions by supporting the implementation of smart specialisation strategies by developing and exploiting the complementarities between cohesion policy, Horizon 2020 and other EU funding programmes.	Anticipation, conception, adoption of EU policy
1	Support and participation in the European Semester & RIO Reports in the Policy Support Facility	The European Semester process is an annual cycle of macro-economic policy coordination where R&I plays a key role as an indicator and predictor of growth in EU Member States. The JRC provided RIO Country Reports 2016 to other Commission departments to be used for their contribution to the European Semester Country Reports. 8 country desks of JRC directly participate in the European Semester country teams. In addition, the Policy Support Facility provides best practice, independent high-level expertise and guidance at the request of Member States and Associated Countries through peer reviews, mutual learning exercises and specific support to countries. The Policy Support Facility responds to the strong need of more customer-oriented services to support evidence-based policy making.	Implementation, monitoring, evaluation of EU policy
1	Developing the Cultural and Creative Cities Monitor - A policy tool for raising vibrant, attractive and resilient urban areas	The JRC has designed and developed a Cultural and Creative Cities Monitor, an interactive online tool to help understand strengths and development opportunities in 168 cities in Europe. The Cultural and Creative Cities Monitor will support more targeted investments and learning from best practices, aiming to contribute to (i) the EU strategy 'Promoting cultural and creative sectors for growth and jobs' (COM(2012) 537 final) by supporting the mapping and mobilisation of the cultural and creative resources of a given territory; (ii) Smart Specialisation Strategies by embracing a broader concept of innovation building competitiveness through design and creative industries; and (iii) the 'Urban Agenda for the EU' (May 2016) which encourages the production of reliable data for evidence-based urban policy making as well as for providing tailor-made solutions to major challenges.	Anticipation, conception, adoption of EU policy
1	Support to the Commission's European Pillar of Social Rights through the Social Scoreboard online tool	Building a fairer Europe and strengthening its social dimension is a key priority for this Commission. The European Pillar of Social Rights is accompanied by a 'social scoreboard' which monitors the implementation of the Pillar by tracking trends and performances across EU countries in 12 areas and feeds into the European Semester of economic policy coordination. Upon request of the Cabinet of President Juncker, the JRC provided methodological expertise for the development of the indicator framework for the Social Scoreboard (93 indicators grouped in 12 main policy areas), assessed its statistical coherence, developed an online visualisation tool and drafted the key findings stemming from the Social Scoreboard. The scoreboard also serves to assess progress towards a social 'triple A' for the EU as a whole.	Implementation, monitoring, evaluation of EU policy

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
1	Interoperability certification of Digital Tachograph equipment	The JRC hosts a laboratory appointed by the Commission to perform interoperability certifications as required by the regulation EU 165/2014 (DTLab). Interoperability certifications ensure that equipment type-approved in the EU and the UN-AETR (Accord Européen sur les Transports Routiers of the United Nation - Economic Commission for Europe) countries can operate with equipment type-approved in other countries. The JRC is in charge of the interoperability certification of the components of the Digital Tachograph system. In 2017, JRC performed interoperability certifications for 5 manufacturers from the EU and non-EU AETR countries. JRC has also performed preliminary testing of new products prior to the certification process, useful for manufacturers that are developing new products.	Implementation, monitoring, evaluation of EU policy
3	Support to the 2nd State of the Energy Union Report	The JRC collects, consolidates and validates information on public R&I investments in low-carbon energy technologies. It carries out quantitative analysis of patents in low-carbon energy technologies and collects information on corporate R&I spending and produces estimates of private R&I investments in low-carbon energy technologies relevant to the Energy Union priorities. Based on this work, the JRC drafted the section on research and innovation of the Commission Staff Working Document 'Monitoring progress towards the Energy Union objectives – key indicators' (SWD(2017) 32 final), part of the Second Report on the State of the Energy Union (COM(217) 53 final). JRC has contributed also to the third Report on the State of the Energy Union' (COM(2017) 688 final).	Anticipation, conception, adoption of EU policy
3	Support to the implementation of the European Energy Technology Policy through the Strategic Energy Technology Plan (SET Plan)	Assigned by the Commission in the frame of SET Plan, the JRC manages and operates the SET Plan information system (SETIS). SETIS measures progress and provides support for the effective implementation of the 5th dimension of the Energy Union and the SET Plan actions. Through SETIS the JRC plays a vital role in coordinating and implementing the European Commission's Energy Union Research and Innovation (R&I) strategy.	Implementation, monitoring, evaluation of EU policy
3	Contributions to International Energy Agency and EurObserv'ER literature on monitoring low-carbon energy R&I	Based on the JRC work on R&I indicators in support of the Energy Union and the in-house methodology for monitoring R&I in low carbon energy technologies, the JRC contributed by (i) data on corporate R&I spending on low-carbon energy technologies in the global context to the International Energy Agency's 'Tracking Clean Energy Progress 2017' report; (ii) data on public R&D and data on patents and specialization in the European context to the EurObserv'ER project in support of DG Energy. These data contribute to informed decision-making and ensure that the views of the EU are put forward at international fora.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
3	Support to the Energy package: Clean energy of all Europeans	JRC work on production costs from energy-intensive industries in the EU and third countries contributed to Commission Staff Working Document on 'Energy prices and costs in Europe' (SWD(2016) 420 final).	Anticipation, conception, adoption of EU policy
3	Contribution to the Blue Growth Strategy	JRC supplies the Commission with techno-economic assessments of low-carbon energy technologies such as geothermal, ocean, wind including market information on a regular basis. The work of the JRC e.g., its 'Wind Energy Status Report: 2016 Edition' has been used as background information in the Commission's 'Report on the Blue Growth Strategy - Towards more sustainable growth and jobs in the blue economy' (SWD(2017) 128 final).	Anticipation, conception, adoption of EU policy
3 & 4	Contribution to the Circular Economy Monitoring Framework – indicator on patents	JRC developed an indicator on patent statistics providing insight to the technological progress and innovative technologies related to recycling and secondary raw materials in the EU as a part of the Monitoring Framework on Circular Economy. This indicator is one of the 10 indicators selected for monitoring the EU progress towards a Circular Economy (Commission's Communication COM(2018) 29 final on a monitoring framework for the circular economy, and Staff Working Document SWD(2018) 17 final), in particular in the competitiveness and innovation areas.	Implementation, monitoring, evaluation of EU policy

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
3	Analytical service - scope and operation of nuclear material analyses for internal and external customers	JRC provides analyses of nuclear material and environmental samples for IAEA and DG Energy, which contribute to the assurance that the legal duties under the Euratom Treaty and their commitments to the Non-Proliferation Treaty are complied with. Nuclear safeguards aims at deterring the proliferation of nuclear weapons by detecting early the misuse of nuclear material or technology, and by providing credible assurances that States are honouring their safeguards obligations.	Implementation, monitoring, evaluation of EU policy
3	Ad-hoc JRC support following abnormal environmental radioactivity detection by European monitoring networks	In 2017, several cases of abnormal radioactivity concentration in the EU atmosphere appeared. JRC-operated EURDEP/ECURIE monitoring systems were activated to inform the Commission about the situation. JRC also provided reports comprising modelling of the phenomenon and providing guidance to monitoring laboratories. Information was used by the competent DGs.	Ad-hoc support (including crisis management)
3	Dissemination of nuclear power plants operating experience through nuclear safety authorities	The JRC-operated Clearinghouse performs topical studies with an in-depth review of event reports issued by nuclear power plants. These reports identify the lessons to be learned to prevent the recurrence of similar safety issues. JRC also reviews draft reports that regulatory bodies in Europe must contribute to the international database of operating experience, run by IAEA. In 2017, two 5-day training sessions were organised for staff of nuclear safety regulatory bodies that help spreading best practices to establish higher nuclear safety standards in the EU. All Clearinghouse actions support nuclear regulators in improving their regulatory framework.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
4	Verification and monitoring of progress in photovoltaics deployment in Europe and Africa through harmonised measurements	The European Solar Test Installation (ESTI) of the JRC performs calibration of photovoltaic (PV) devices under its ISO/IEC 17025 accreditation according to standards of the International Electrotechnical Commission (IEC) and issues calibration certificates. The calibrated PV devices are used in clients' own laboratories as reference devices to measure the electrical performance of other PV devices. This has a direct impact on the harmonisation with peer laboratories in Europe via European Metrology laboratories' Euramet network. The JRC also acts as the reference laboratory for many research centres and universities supporting and validating results under H2020 projects, and performs validation for industry and large-scale projects such as the photovoltaic developments in Burkina Faso, funded partly by the Commission, where the JRC verified the power of the photovoltaic modules assuring the quality of the Commission investment.	EU and global standardisation and international harmonisation
4	Support to the development of the second generation (2G) of the Eurocodes	The JRC supports the standardisation through the second generation 2G Eurocodes, as requested in Commission Mandate M/515 to CEN. This standardisation process is very important for completing the single market in the European construction sector and for boosting the competitive advantage of the European construction industry. JRC provides data on request by CEN/TC250 facilitating further statistical analysis by the CEN subcommittees and project teams. The JRC also performed an analysis of the national decisions on implementation of the informative annexes of the Eurocodes, providing direct input to CEN/TC250 on the regulatory approach of the different Member States.	EU and global standardisation and international harmonisation
4	Certified reference material for the measurement of impact toughness of steel	Directive 1997/23/EC on pressure equipment and Directive 1989/106/EC on construction materials prescribe the use of standardised tests for impact toughness by e.g. ISO 148. This standard requires the use of certified reference materials which JRC provides. In 2017, JRC released one certified reference material of Charpy test pieces and distributed about 1000 units of certified reference materials for impact toughness. The certified reference materials for impact toughness are essential tools for ensuring the quality of steel and therefore the safety of constructions (e.g., bridges, pressure vessels such as fire extinguishers etc.) made of it.	Implementation, monitoring, evaluation of EU policy

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
4	Harmonised accreditation and market surveillance, also for European Reference materials producers	The JRC played a major role in the development of the International Organization for Standardization (ISO) standard ISO 17034:2016 on the general requirements for the competence of reference material producers, published in 2016. In 2017, it was recognised as a harmonised standard under EU harmonisation legislation. This was followed by the European Accreditation (EA) approval for accreditation in the EU. The ISO 17034 harmonises the requirements for reference material producers world-wide, allowing EU to participate on equal footing to the international market. EU citizens benefit through improved quality control of analytical measurements, applied in areas such as in-vitro diagnostics, environmental monitoring, food/feed safety and control as well as industrial applications and engineering.	EU and global standardisation and international harmonisation
4	A note on the Infringement procedure – Implementation of Directive 2011/7/EU on combating late payment in commercial transactions	In the context of an infringement case, the Competence Centre on Microeconomic Evaluation (CC-ME) of JRC has provided support to the case handlers regarding the interpretation of statistical data provided by the national authorities.	Implementation, monitoring, evaluation of EU policy
4	Contribution to the Commission flagship report '2017 SMEs Performance Review' on the Small Business Act for Europe	'2017 SMEs Performance Review' is one of the main tools the Commission uses to monitor on an annual basis and assess countries' progress in implementing the Small Business Act for Europe (SBA), which relates to Small and Medium Enterprises (SMEs). The SBA Review aims at integrating EU 2020 strategy targets into the SBA, as most of Europe 2020 Flagship Initiatives would help SMEs achieving sustainable growth. The JRC contributed to the indicator framework (9 dimensions; 77 indicators) underpinning the monitoring of the Small Business Act for Europe: major improvements to the methodological approach adopted to combine the indicators into 9 dimensions, visual presentation of the data, literature reviews, econometric analysis and cluster analysis.	Implementation, monitoring, evaluation of EU policy
1 & 4	Certified reference materials helping early diagnosis of Alzheimer's disease	The JRC released a new certified reference material for early detection of Alzheimer's disease to help standardising the measurement of the biomarker Aβ42. The material serves to calibrate diagnostic tools for more accurate diagnosis and may facilitate the development of new drugs to fight the disease that, together with other forms of dementia, is estimated to cost EUR 167.5 billion per year in the EU.	Implementation, monitoring, evaluation of EU policy
4	Critical Raw Materials List (COM/2017/0490 final)	List of Raw Materials identified as Critical is published every 3 years. These are raw materials that have a high importance to the EU economy but have a high risk of supply disruption. The JRC conducted an analysis of factors that could influence raw material criticality. The JRC output was used to revise the methodology required for the development of the List of Critical Raw Materials and to produce the list published as COM/2017/0490 final.	Anticipation, conception, adoption of EU policy
4	In situ reference measurements in support of Copernicus Sentinel-3	The JRC has contributed to the assessment of the Copernicus Sentinel 3 satellite ocean colour data by providing standardised in situ reference measurements for the validation of satellite data products in European regions of major economic, social and scientific interest. The JRC is one of the few world-wide institutions that since the launch of Sentinel-3 in 2016 has ensured the production and real time access to in situ validation data from several European sites. Data are delivered to space agencies (e.g., European Space Agency (ESA), European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), and US National Aeronautics and Space administration (NASA)). This work helps maximise the return on investment for EU Copernicus satellite ocean colour missions and ensure the independent assessment of satellite data products, in view of their application in environmental and climate change investigations.	EU and global standardisation and international harmonisation

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
4 & 9	Copernicus Emergency Management Service provided a record number of maps to ECHO and Member States in support of EU disaster risk management policies	Within the framework of the EU Copernicus Programme, on-demand emergency mapping services are provided to authorised users (e.g. civil protection authorities of European Member States and Copernicus participating states) and to other users from international organisations (e.g. United Nations) or other countries. Emergency response maps (reference, disaster extent and damage assessment maps) are produced in average ca. 48h after the user request using satellite imagery. Also existing cooperation agreements with the European Commission facilitate access to the service (e.g. U.S., Australia). Since April 2012 the service was activated 261 times out of which 69 were during 2017. The service was activated for major disasters in and outside Europe like the series of hurricanes which hit Central America and the Mexican earthquakes.	Implementation, monitoring, evaluation of EU policy
4 & 9	Support to the European Emergency Response Coordination Centre (ERCC) on drought, floods and forest fires impact monitoring	The European and Global early warning and monitoring tools for droughts (EDO & GDO), floods (EFAS & GloFAS), as well as forest fires (EFFIS & GWIS) are used by the Emergency Response and Coordination Centre at DG ECHO on a daily basis to have an overview of ongoing and upcoming large natural disasters. At the same time they help JRC Staff to respond quickly to specific ad-hoc requests from ERCC and the humanitarian aid sectors of DG ECHO on information concerning droughts, floods and forest fires and their impacts.	Ad-hoc support (including crisis management)
4	Support to material flow visualizations and indicators of the 2018 EU Monitoring Framework for the Circular Economy	The concept of the circular economy aims at maintaining the value of products, materials, and resources in the economy for as long as possible, and minimise waste generation. One of the prerequisites for better monitoring materials across the whole life-cycle is a good understanding of material stocks and flows. In support of DG Internal Market, Industry, Entrepreneurship and SMEs, and building on JRC activities for the preparation of the Raw Material Scoreboard 2016 and 2018, JRC developed material flow visualizations and quantitative indicators, which were incorporated into the 2018 EU Monitoring Framework for the Circular Economy (COM(2018) 29 final) and Staff Working Document (SWD(2018) 17 final). The material flow visualizations and indicators included in the 2018 EU Monitoring Framework for the Circular Economy are likely to define how progress toward increased material circularity can be measured for the years to come.	Anticipation, conception, adoption of EU policy
4	Support to OLAF and Member States' customs authorities on the implementation of new customs anti-fraud tools established by Regulation (EU) No 2015/1525	The availability of a ConTraffic system and the JRC expertise on Container Status Messages (CSM) facilitated the timely implementation of the new CSM directory as foreseen by the Regulation. In particular, the study of data quality and compliance conducted by JRC in 2017 identified several issues helping OLAF improve the quality of the data and the Member States understand the value of the directory for customs anti-fraud investigations. The support of JRC for the IT system that manages the CSM directory continued in 2017. In 2017, the CSM directory had more than 1200 users from Member States authorities accessing its on-line services on a daily basis. The JRC support to OLAF and Member States' customs authorities had also impact on the identification of suspicious imports which may prove to be cases of customs fraud related to mis-declaration of origin. Through the usage of the improved ConTraffic-SAD Analysis system, prototyped by JRC in 2017, 11 million import declarations sent by 9 Member States were analysed. This led to OLAF identifying 101 signals of potential fraud cases for an estimated value of at least EUR 1.3 million.	Implementation, monitoring, evaluation of EU policy
4 & 7	Supporting the fight against illicit activities in the area of tobacco	It is estimated that cigarette smuggling costs the European Union and Member States national budgets at least EUR 10 billion per year in lost customs and tax revenue. The European Commission's Communication 'Stepping up the fight against cigarette smuggling and other forms of illicit trade in tobacco products' (COM(2013) 324 final) highlights the need to improve the understanding of the geographical origin of illegal tobacco consignments based on the technical analysis of samples from products seized in the Member States. With the support provided to Member States and OLAF the JRC has enabled classifying more than 400 million cigarettes as contraband or counterfeit, corresponding to tax losses of more than EUR 80 million, supporting in this way the European Commission in the fight against illicit tobacco products (progress report from the Commission to the Council and the European Parliament (COM(2017) 235 final), on Communication COM(2013) 234 final).	Implementation, monitoring, evaluation of EU policy

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9	Support to EU policies related to the prevention, fighting and response to wildfires	JRC's European Forest Fire Information System (EFFIS) provides comprehensive monitoring of forest fires (wildfires). 2017 was the worst year ever for wildfires in Europe, with over one million hectares of natural areas burnt by wildfires and over 100 people killed, mainly in Portugal and Spain. EFFIS provided continuous support and information to the countries affected and to the European Commission services in charge of policies regarding wildfires. EFFIS is also the source of information of the EC when replying to questions regarding wildfires by the European Parliament and one of the components of the Copernicus Emergency Management Services, managed by JRC. EFFIS registered nearly 200 000 visits by national administrations and citizens in Europe and worldwide.	Implementation, monitoring, evaluation of EU policy
9	Support to UN CBD	The Digital Observatory for Protected Areas (DOPA) developed by the JRC provides the EU contribution to the UN Convention on Biological Diversity (CBD) with key information on Sustainable Development Goals 14 & 15 and is critical for the UN Conference of the Parties of the CBD. The support of the DOPA to the CBD can thus have an impact on international agreements and decisions.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
9	Support to programming and fund allocation of the EU response to food crises and response coordination at the global level	The European Union, WFP and FAO coordinate needs assessment to increase the impact of humanitarian and resilience responses through the preparation of the 'Global Report on Food Crises'. JRC represented the EU in the Technical Committee responsible of the publication. The JRC team was responsible for the methodology development and the estimation of the number of people affected by food crises. The report provides a global picture of food crises in a period where several countries were affected by extreme weather events (droughts, cyclones, floods) and armed conflicts. The report was politically endorsed by the UN Secretary General and the EU High Representative for Foreign Affairs. It provides concrete means to foster response coordination among the main actors in the food security area, namely EU and USA (through USAID) on the donors side, the UN agencies (WFP, FAO and UNICEF) and regional organisations on the implementation side. Within the Commission, the report is used as a reference for fund allocation to respond to food crises.	Implementation, monitoring, evaluation of EU policy
9	Provide scientific and statistical expertise to the monitoring team on the resumption of rough diamond trade in the Central African Republic	The JRC is one of the experts in the team assessing whether zones and shipments can be declared compliant in line with the minimum Kimberley Process requirements and based on available and sufficient documentation. The analyses of the JRC contribute to a balanced decision by the Central African Republic monitoring team, the authority mandated by the Kimberley Process Plenary, taking into account both the urgent need for resources and possible threats for the integrity of the Kimberley Process itself. In 2016, four zones were declared compliant and in 2017, a fifth zone has been declared compliant and the stockpile has been audited by external auditors resulting in increased revenues. According to the UN, state presence in compliant zones is more stable thanks to the positive effect of legal trade in rough diamonds.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
9	Building capacity in the EU to reduce the risks of natural-hazard impacts on industry	Based upon direct government requests from Bulgaria and France, and from Czech Republic, Spain and UK through the support service of the Disaster Risk Management Knowledge Centre (DRMKC), the JRC organised three training events on the use of its RAPID-N tool for rapid natural-hazard triggered technological accidents (Natech) risk assessment and mapping in 2017. Through these training exercises, the JRC supported Member States in the frame of the Union Civil Protection Mechanism (Decision 1313/2013/EU) and assisted them in the implementation of the requirements of the Seveso III Directive (2012/18/EU) which explicitly requires Member States to assess and reduce the risks of natural-hazard impacts on hazardous industry with a major-accident potential. Since there are hardly any methodologies and tools available for this purpose, the training helped countries in strengthening their chemical accident prevention and preparedness programmes to increase industrial safety from a Natech perspective.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)

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9	Identifying gaps in understanding space-weather impacts on critical infrastructure and supporting policy action	The European Space Strategy (COM(2016) 705) proposes to protect space- and ground-based critical infrastructure from space weather through extending the Space Surveillance and Tracking (SST) Framework. Stakeholders in the EU increasingly understand the risks associated with extreme space weather and its potentially catastrophic impacts on modern critical infrastructure. This is now also reflected in a Commission Staff Working Document (SWD (2017) 176) for which the JRC provided a section about space-weather threats. In addition, the JRC in collaboration with external partners has identified gaps in prevention, preparedness and response specific for different infrastructure sectors. It has also developed stakeholder-specific recommendations on which steps to take to improve the protection of infrastructures and of the population that would be affected by their disruption. The JRC report on space weather & rail systems is currently the basis for discussion among US stakeholders for improving the resilience of the US rail network to extreme space weather.	Anticipation, conception, adoption of EU policy
9	Analysis of seized nuclear material	JRC performed nuclear forensic analysis upon request of the Moldovan radiation safety authority NARNRA. The results and the report issued enabled them to draw conclusions on the potential origin and intended use of the material. This information is essential for supporting the investigations and the prosecution of illicit possession and movement of nuclear material.	Ad-hoc support (including crisis management)
9	Provision of key data and analyses on the implementation of the EU Regulation for dual-use trade controls	Dual-use trade controls provisions set by Regulation No 428/2009 are implemented by EU national licensing authorities. There is a need to verify the consistent and effective application of export controls across Member States. Since 2013 the Commission provides a yearly report to the European Parliament and the Council, to inform about the implementation of the Regulation. JRC contributed to the report published in 2017 (COM(2017) 679 final) by a) collecting key export control data, b) including the estimation of extra-EU trade flows of dual-use items, and c) deriving figures about export licenses authorised or denied by EU Member States. This work contributes to increased transparency in the implementation of export controls in the EU and to improving operators' compliance and their capacity to implement controls.	Implementation, monitoring, evaluation of EU policy
Examples of tangible impact of JRC activities related to the General Commission Objectives 2, 5, 6, 7 and 8			
2	Contribution to Staff Working Document on the European Digital Progress Report 2017	The SWD 'Europe's Digital Progress Report 2017' (part 6/62) is mostly based data in JRC's 2017 PREDICT Key Facts Report and 2017 PREDICT Dataset. The data and analysis published allow monitoring progress and policy impact. It also allows benchmarking EU and countries performance in essential technological domains. PREDICT data covers ICT as for the value added, employment, productivity, business enterprise R&D expenditure (BERD), R&D personnel, and public funding of R&D in ICT.	Anticipation, conception, adoption of EU policy
2	Contribution to the Employment and Social Developments in Europe (ESDE) Review 2016	The ESDE Review looks into the impact of previous social and employment policies, but also sets markers for future actions. Chapter 4 focuses on analysing the impact of ICT development in employment and uses JRC's data on ICT value added and productivity. It assesses the contribution of the ICT sector to GDP in the EU and Member States' economies and discusses the positive effect that ICT investment has on productivity.	Implementation, monitoring, evaluation of EU policy
2	Improving cyber-security of young children	JRC coordinated a team of JRC scientists and international experts that studied and reported on the safety, security, privacy and societal questions emerging from the rise of the Internet of Toys. It also coordinated the 'Young Children (0-8) and Digital technologies' research conducted in 21 European Countries with the support 31 Universities or research centres and more than 60 researchers across Europe. The contributions of JRC were used to inform policy-makers of a need of policy framework concerning the IoToys and to support the implementation and evaluation of COM(2012) 196 final 'Better Internet for Kids' and COM(2015) 192 final 'Digital Single Market'.	Anticipation, conception, adoption of EU policy

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
2	Support to the EC Scientific Advice Mechanism on Cyber-Security	The Scientific Advice Mechanism High Level Group of scientific advisors (SAM HLG) set up by the Commission (Decision C(2015) 6946) contributes to the quality of EU legislation, in line with the Better Regulation agenda. The JRC supported the SAM HLG in the preparation of the 'Advice on Cyber-security' by outlining major challenges, weaknesses and opportunities in the cyber-security domain, by identifying key scientists and by supporting the drafting of the advice issued in March 2017. The Joint Communication to the European Parliament and the Council 'Resilience, Deterrence and Defence: building strong cybersecurity for the EU' (JOIN(2017) 450 final), was substantiated by scientific advice of the SAM HLG.	Anticipation, conception, adoption of EU policy
5	Support to the Single Resolution Board 2017	The Single Resolution Fund is a key element of the new resolution framework put in place after the 2007 banking crisis. The results of the calculations by JRC have been used by the Single Resolution Board to cross-check their own estimates of banks' contributions to the Single Resolution Fund. This activity therefore represents a tangible contribution of JRC to ensuring the stability of the European Banking sector, and the smooth running of the new resolution framework.	Implementation, monitoring, evaluation of EU policy
5	Review of the calculation of risk-based contributions to resolution funds	The results of the analysis carried out by the JRC provide the quantitative background for the Commission Staff Working Document 'Appropriateness of the Risk Adjustment Multiplier for the Calculation of Contributions to Resolution Financing Arrangements' (SWD(2017) 111 final). JRC gave preliminary evidence that the risk adjustment multiplier works as intended.	Implementation, monitoring, evaluation of EU policy
5	Quantitative analyses for BREXIT	The Task Force for the Preparation and Conduct of the Negotiations with the United Kingdom under Article 50 TEU (TF BREXIT) asked the JRC to develop quantitative analyses to assess the linkages of the UK in the financial sector with the rest of the world, and in particular with the EU27. The analyses contributed to assessing the EC position during the BREXIT negotiations.	Anticipation, conception, adoption of EU policy
5	DG ECFIN Economic Brief, Personal Income Taxation in Austria, 2017	JRC simulations supported Commission policy recommendations.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)
5	The ESM stability support programme; Greece, First and second review, Background report	JRC provided policy analysis and recommendations for Greece stability programme.	Anticipation, conception, adoption of EU policy
7	Knowledge base for ECHA proposal on restriction of certain substances in tattoo inks and permanent make-up	In 2015, the Commission requested ECHA to prepare a proposal to restrict the use of substances with CMR properties (carcinogen, mutagen, reprotoxic) and skin sensitizers in tattoo inks. A JRC study provided sound evidence regarding statistics on tattoos related data and ink market, surveys on used inks and their chemical composition, health effects and risks linked to tattoos and permanent make-up procedures, information of risks perception, communication, data gaps and research needs. The JRC findings were used as basis of the proposal for restricting selected substances in tattoo inks (REACH Annex XV dossier) published in 2017.	Anticipation, conception, adoption of EU policy
7	Enabling the forensic investigation of radioactively contaminated evidence	JRC has developed techniques and tools for examining radioactively contaminated evidence. These technical solutions enable the forensic community to safely examine evidence which is contaminated with radioactive material, giving EU Member States a response and evidence methodology at hand which significantly increases their preparedness for responding to a nuclear security event (dirty bomb, radiological poisoning of a VIP, terrorist attack on radioactive material during transport, etc.). The methods were validated through cooperative exercises with the Swedish Police and the Netherlands Forensic Institute.	Support to specific countries/regions and international bodies (other than standardisation or crisis support)

Commission General Objective(s) No	Title	Description of the impact	Category of the impact[31]
7	Improve the protection of critical infrastructures in Europe and globally	The JRC participates in several activities towards the development of tools, methodologies and best practices for the improvement of protection and resilience of critical infrastructures to improve the resilience of critical infrastructures in Europe and globally. JRC contributed to 'Overview of Natural and Man-made Disaster Risks the European Union may face' (SWD(2017) 176 final). JRC-developed GRRASP tool is used by stakeholders; for instance the Lombardy region is using this tool to analyse scenarios of infrastructure disruptions.	Implementation, monitoring, evaluation of EU policy
8	Operation of the root certification authority (Country Signing Certificate Authority) for the EU laissez passer and further development of the security infrastructure	The JRC operates the two certification authorities which are required to implement the mandatory security measures for the European Union Laissez Passer. The operation of this infrastructure is a requirement for the issuance of WU LP conforming to the requirement set out in EU Council Regulation (EU) No 1417/2013 of 17 December 2013 laying down the form of the laissez-passer issued by the European Union replaced the old hand-written documents with the new LP.	Implementation, monitoring, evaluation of EU policy
8	Helping to integrate migrants into EU cities	Several EU initiatives are calling for action at local level to promote the integration of migrants. To target such actions, it is fundamental to build indicators on the concentration of migrants at local level. JRC established in 2017 a unique data set on the distribution of migrants in cities of 8 EU Member States. The data set has an unprecedented high resolution of 100m x 100m which for the first time enables comparing segregation and concentration of migrants at specific neighbourhoods. 23 research projects worldwide are now working on this unique JRC dataset to find evidence for their theoretical work. This work has also resulted in a contribution to an upcoming OECD report on the territorial aspects of migration.	Implementation, monitoring, evaluation of EU policy
8	KCMD Migration Data Catalogue and Dynamic Data Hub	The Migration Data Catalogue includes descriptions of about 130 datasets of relevance to the study of migration, demography and related topics. There is no other place where all relevant datasets for the cross-cutting topic of migration are listed. The Dynamic Data Hub provides quick and easy access to a large number of consolidated datasets from different sources. These tools contribute to channelling existing knowledge relevant to migration to policy-makers and the public at large. The Data Hub' dedicated data repository on children in migration is mentioned in the Communication on the Protection of Children in Migration (COM(2017)211) and these tools will be included as the regional contribution to the IOM GMDAC Global Migration Data Portal. In2017, the Data Catalogue site counted over 40 000 user accesses.	Implementation, monitoring, evaluation of EU policy
8	Guidance on the common monitoring and evaluation framework of the Asylum, Migration and Integration Fund (AMIF) and the Internal Security Fund (ISF)	JRC contributed to the 'Guidance on the common monitoring and evaluation framework of the Asylum, Migration and Integration Fund (AMIF) and the Internal Security Fund (ISF)' issued by DG Migration and Home Affairs. The guidance has been used for both the mid-term and ex-post evaluation.	Implementation, monitoring, evaluation of EU policy