

## **ANNEX 1: STATEMENT OF THE RESOURCES DIRECTOR**

*“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 <sup>31</sup>, I have reported my advice and recommendations to the Director-General/Head of Service on the overall state of internal control in the DG/service.*

*I hereby certify that the information provided in Parts 2 and 3.1 of the present AAR and in its annexes 2 to 5 is, to the best of my knowledge, accurate and exhaustive.”*

J.-P. Michel  
Director of Resource Management

Signed

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<sup>31</sup> SEC(2003)59 of 21.01.2003.

## ANNEX 2: HUMAN AND FINANCIAL RESOURCES BY ABB ACTIVITY

### Human Resources by activity - Execution 2010

Code ABB Activity	ABB Activity	Human Resources by ABB activity		
		Establishment Plan posts	External Personnel	Total
5305	Directly financed research operational appropriations – FP7 2007-2013 – EC	817	606	1423
5306	Directly financed research operational appropriations – FP7 2007-2013 - Euratom	272	202	474
5307	Completion of previous framework programmes and other activities	0	0	0
5308	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	41	9	50
5380	Administrative expenditure of Direct research policy area	673	202	875
	Total	<b>1803</b>	<b>1019</b>	<b>2822</b>

#### Notes:

The figures in the column "External Personnel" include Grant holders, Seconded National Experts, Contract Agents and Trainees.

The JRC does not use decentralised administrative appropriations. This kind of expenditure is covered under Budget Line 10 01 05 Support for operations of the Direct Research Policy area.

#### Assumptions:

The following assumptions have been taken to derive the figures requested by DG BUDG:

- 1) The table is built based on an estimation upon the approved 2010 declarations (JRC TAS2 System data). TAS2 declarations are not fully closed at the time of writing.
- 2) Human Resources figures of December 2010 have been considered as the target value for the calculations, since the table is requested in view of APB 2012.

## Financial Resources by activity - Execution 2010

Code ABB Activity	ABB Activity	Commitments made (*)	Payments made (*)
5305	Directly financed research operational appropriations – FP7 2007-2013 – EC	35.045.275,61	32.735.054,92
5306	Directly financed research operational appropriations – FP7 2007-2013 - Euratom	11.108.227,75	11.215.455,52
5307	Completion of previous framework programmes and other activities	24.630.307,33	27.348.051,74
5308	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	28.930.240,77	21.948.453,61
5380	Administrative expenditure of Direct research policy area	361.950.203,17	344.944.719,11
	Total	<b>461.664.254,63</b>	<b>438.191.734,90</b>

### Notes:

(\*) Including all credit types: voted budgetary appropriations, EFTA contribution, internal assigned revenue of the year, internal assigned revenue carried over, external assigned revenue (including the participation of CEEC countries) and JRC external assigned revenue (article 161 FR).

**ANNEX 3: DRAFT ANNUAL ACCOUNTS AND FINANCIAL REPORTS<sup>32</sup>**

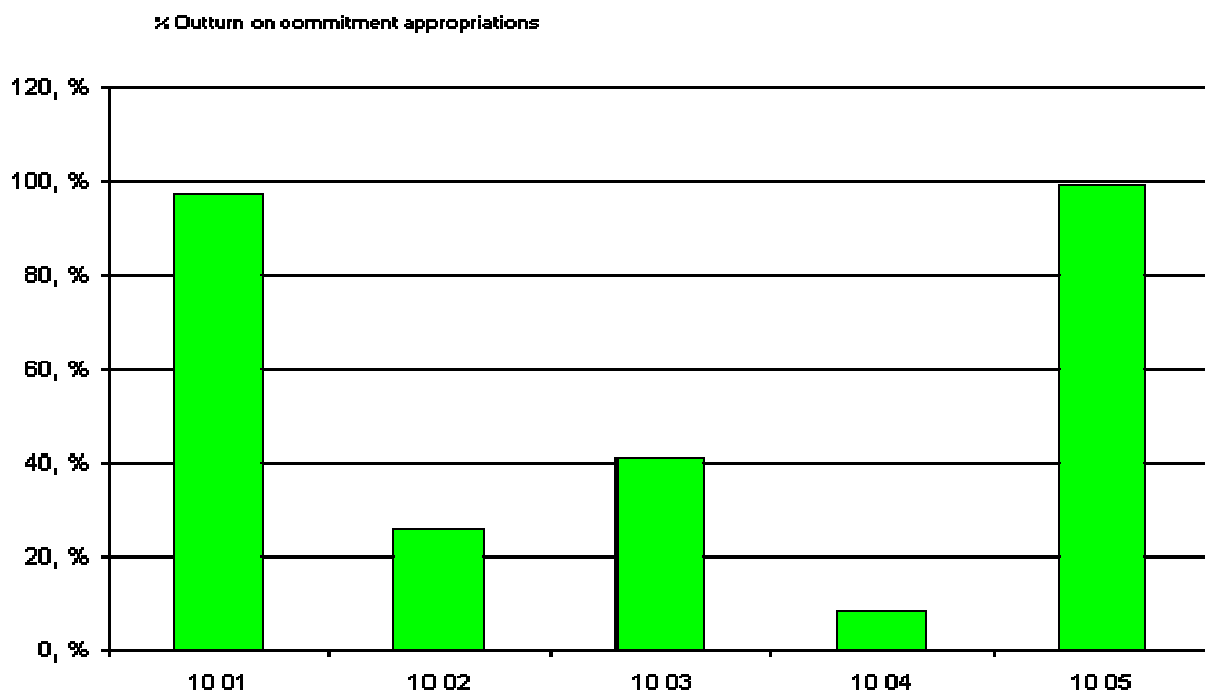
<b>Overview Annex 3</b>
<b>Table 1: Commitments</b>
<b>Table 2: Payments</b>
<b>Table 3: Commitments to be settled</b>
<b>Table 4: Balance Sheet</b>
<b>Table 5: Economic Outturn Account</b>
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<sup>32</sup> Data extracted on 29/03/2011.

<b>TABLE 1: OUTTURN ON COMMITMENT APPROPRIATIONS IN 2010 (in Mio €)</b>				
<b>Chapter</b>		<b>Commitment appropriations authorised *</b>	<b>Commitments made</b>	<b>%</b>
		<b>1</b>	<b>2</b>	<b>3 = 2/1</b>
<b>Title 10 : Direct research</b>				
10 01	Administrative expenditure of 'Direct research' policy area	373,03	361,95	97,03 %
10 02	Directly financed research operational appropriations FP7 (2007 to 2013) EC	135,25	35,05	25,91 %
10 03	Directly financed research operational appropriations FP7 (2007 to 2011) Euratom	26,84	11,11	41,39 %
10 04	Completion of previous framework programmes and other activities	282,85	24,63	8,71 %
10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	29,21	28,93	99,04 %
<b>Total Title 10</b>		<b>847,19</b>	<b>461,66</b>	<b>54,49 %</b>
<b>Total DG JRC</b>		<b>847,19</b>	<b>461,66</b>	<b>54,49 %</b>

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

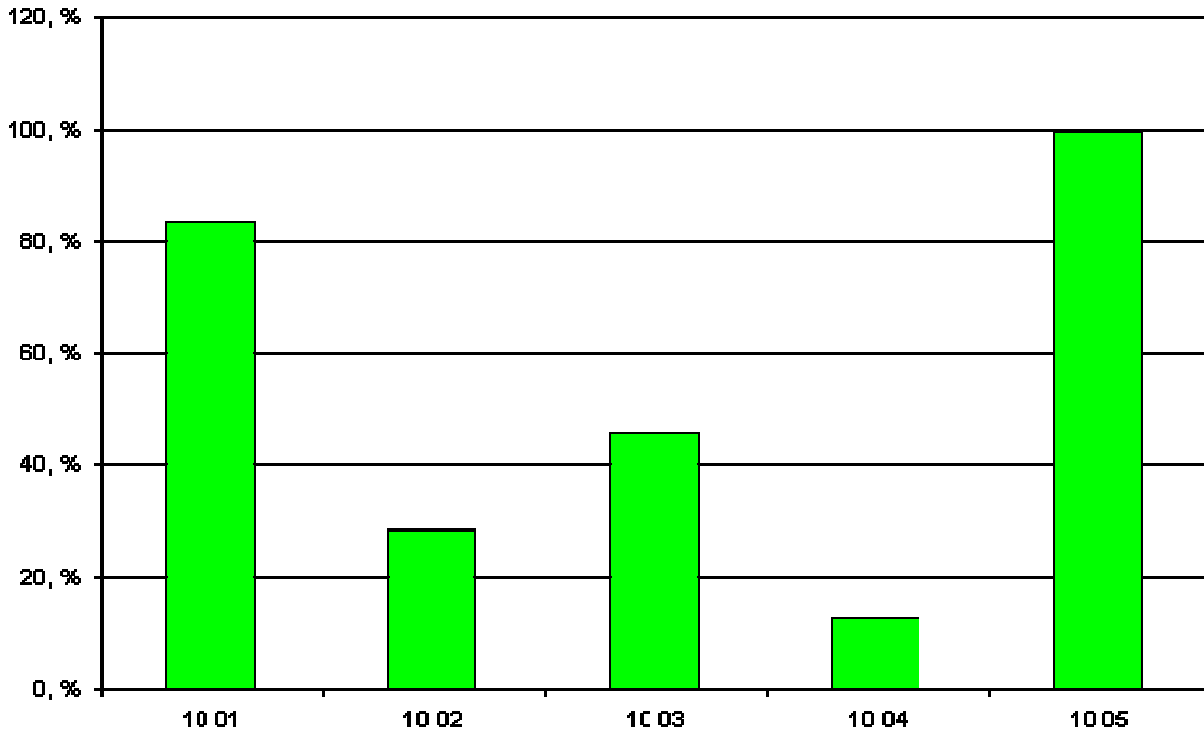


**TABLE 2: OUTTURN ON PAYMENT APPROPRIATIONS IN 2010 (in Mio €)**

Chapter		Payment appropriations authorised *	Payments made	%
		1	2	3 = 2/1
<b>Title 10 : Direct research</b>				
10 01	Administrative expenditure of 'Direct research' policy area	413,84	344,94	83,35 %
10 02	Directly financed research operational appropriations FP7 (2007 to 2013) EC	116,01	32,74	28,22 %
10 03	Directly financed research operational appropriations FP7 (2007 to 2011) Euratom	24,61	11,22	45,57 %
10 04	Completion of previous framework programmes and other activities	212,85	27,35	12,85 %
10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	22,03	21,95	99,63 %
<b>Total Title 10</b>		789,34	438,19	55,51 %
<b>Total DG JRC</b>		789,34	438,19	55,51 %

\* 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).

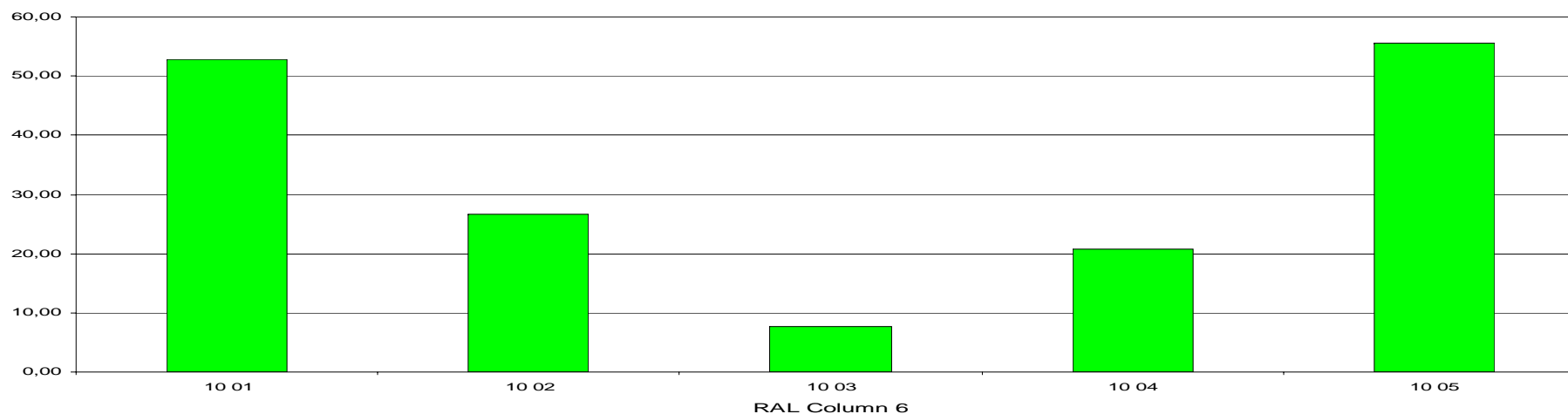
**% Outturn on payment appropriations**



**TABLE 3 : BREAKDOWN OF COMMITMENTS TO BE SETTLED AT 31/12/2010 (in Mio €)**

Chapter	2010 Commitments to be settled				Commitments to be settled from financial years previous to 2010	Total of Commitments to be settled at end of financial year 2010 (incl. corrections)	Total of Commitments to be settled at end of financial year 2009 (incl. corrections)	
	Commitments 2010	Payments 2010	RAL 2010	% to be settled				
	1	2	3=1-2	4=1-2//1	5	6=3+5	7	
<b>Title 10 : Direct research</b>								
10 01	Administrative expenditure of 'Direct research' policy area	360,95	309,88	51,07	14,15 %	1,71	52,78	45,69
10 02	Directly financed research operational appropriations FP7 (2007 to 2013) EC	35,05	14,03	21,02	59,97 %	5,68	26,70	26,61
10 03	Directly financed research operational appropriations FP7 (2007 to 2011) Euratom	11,11	5,19	5,92	53,28 %	1,76	7,67	8,17
10 04	Completion of previous framework programmes and other activities	24,63	12,91	11,72	47,60 %	8,97	20,70	24,99
10 05	Historical liabilities resulting from nuclear activities carried out by the Joint Research Centre pursuant to the Euratom Treaty	28,93	6,32	22,61	78,15 %	32,90	55,51	52,17
<b>Total Title 10</b>		460,67	348,33	112,34	24,39 %	51,02	163,36	157,63
<b>Total DG JRC</b>		460,67	348,33	112,34	24,39 %	51,02	<b>163,36</b>	157,63

Breakdown of Commitments remaining to be settled (in Mio EUR)



**TABLE 4 : BALANCE SHEET JRC<sup>33</sup>**

<b>BALANCE SHEET</b>	<b>2010</b>	<b>2009</b>
A.I. NON CURRENT ASSETS	119.360.048,23	102.783.870,91
A.I.1. Intangible Assets	1.804.301,90	2.196.272,04
A.I.2. Property, plant and equipment	113.838.704,50	100.335.340,28
A.I.5. LT Pre-Financing	3.697.103,33	233.810,90
A.I.6. LT Receivables	19.938,50	18.447,69
A.II. CURRENT ASSETS	89.591.590,40	79.952.725,07
A.II.1. Inventories	64.284.438,73	62.468.608,20
A.II.2. Short-term Pre-Financing	3.438.497,60	935.991,72
A.II.3. Short-term Receivables	21.749.782,80	16.368.960,04
A.II.5. Cash and Cash Equivalents	118.871,27	179.165,11
<b>ASSETS</b>	<b>208.951.638,63</b>	<b>182.736.595,98</b>
P.II. NON CURRENT LIABILITIES	-908.294.361,01	-909.692.610,26
P.II.2. Long-term provisions	-908.290.517,99	-909.688.767,24
P.II.4. Other long-term Liabilities	-3.843,02	-3.843,02
P.III. CURRENT LIABILITIES	-46.752.798,97	-48.262.036,75
P.III.2. Short-term provisions	-21.657.478,41	-22.360.129,69
P.III.4. Accounts Payable	-25.095.320,56	-25.901.907,06
<b>LIABILITIES</b>	<b>-955.047.159,98</b>	<b>-957.954.647,01</b>
<b>NET ASSETS (ASSETS less LIABILITIES)</b>	<b>-746.095.521,35</b>	<b>-775.218.051,03</b>
P.I.2. Accumulated Surplus / Deficit	504.388.167,84	504.388.167,84
Non-allocated central (surplus)/deficit*	241.707.353,51	270.829.883,19
<b>TOTAL</b>	<b>0,00</b>	<b>0,00</b>

\* This figure is a balancing amount presented here so as to reflect the fact that the accumulated result of the Commission is not attributed to each DG

It should be noted that the balance sheet and economic outturn account presented in Annex 3 to this Annual Activity Report, represent only the (contingent) assets, (contingent) 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 economic outturn account 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.

<sup>33</sup> This table has been produced by the JRC according to its accounting records, since the table produced by the Commission standard reporting tool does not take into account the JRC specificities.

<b>TABLE 5 : ECONOMIC OUTTURN ACCOUNT JRC<sup>34</sup></b>		
<b>ECONOMIC OUTTURN ACCOUNT</b>	<b>2010</b>	<b>2009</b>
II.1 SURPLUS/ DEF. FROM OPERATING ACTIVIT	128.493.320,35	64.603.094,52
II.1.1. OPERATING REVENUES	-79.117.214,37	-170.565.197,20
II.1.1.1. Other operating revenue	-79.117.214,37	-170.565.197,20
II.1.2. OPERATING EXPENSES	207.610.534,72	235.168.291,72
II.1.2.1. Administrative Expenses	122.430.791,35	91.713.034,33
II.1.2.2. Operating Expenses	85.179.743,37	143.455.257,39
II.2. SURPLUS/DEF. NON OPERATING ACTIVIT	-26.146,30	1.484,64
II.2. FINANCIAL OPERATIONS	-26.146,30	1.484,64
II.2.1. Financial revenue	-29.971,69	-6.339,47
II.2.2. Financial expenses	3.825,39	7.824,11
V. SAP/PS Accounts	0,00	0,00
V. SAP/PS Accounts	0,00	0,00
V. SAP/PS Accounts	0,00	0,00
<b>ECONOMIC OUTTURN ACCOUNT</b>	<b>128.467.174,05</b>	<b>64.604.579,16</b>

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<sup>34</sup> This table has been produced by the JRC according to its accounting records, since the table produced by the Commission standard reporting tool does not take into account the JRC specificities.

**TABLE 6: AVERAGE PAYMENT TIME LIMITS FOR 2010 - DG JRC**

<b>Legal Times</b>							
<b>Maximum Payment Time (Days)</b>	<b>Total Number of Payments</b>	<b>Nbr of Payments within Time Limit</b>	<b>Percentage</b>	<b>Average Payment Times (Days)</b>	<b>Nbr of Late Payments</b>	<b>Percentage</b>	<b>Average Payment Times (Days)</b>
16	1				1	100,00 %	43,00
23	1	1	100,00 %	7,00			
25	1	1	100,00 %	7,00			
30	33215	31934	96,14 %	15,09	1281	3,86 %	40,32
31	4	4	100,00 %	18,25			
34	2	2	100,00 %	29,50			
42	1	1	100,00 %	16,00			
45	2282	2270	99,47 %	17,58	12	0,53 %	91,75
50	2	2	100,00 %	45,00			
60	434	424	97,70 %	20,54	10	2,30 %	74,30

<b>Total Number of Payments</b>	<b>35943</b>	<b>34639</b>	<b>96,37 %</b>		<b>1304</b>	<b>3,63 %</b>	
<b>Average Payment Time</b>	<b>16,26</b>			<b>15,32</b>			<b>41,05</b>

<b>Target Times</b>							
<b>Target Payment Time (Days)</b>	<b>Total Number of Payments</b>	<b>Nbr of Payments within Target Time</b>	<b>Percentage</b>	<b>Average Payment Times (Days)</b>	<b>Nbr of Late Payments</b>	<b>Percentage</b>	<b>Average Payment Times (Days)</b>
16	1				1	100,00 %	43,00
20	3	3	100,00 %	15,00			
23	1	1	100,00 %	7,00			
25	1	1	100,00 %	7,00			
30	35937	34353	95,59 %	15,15	1584	4,41 %	40,29

<b>Total Number of Payments</b>	<b>35943</b>	<b>34358</b>	<b>95,59 %</b>		<b>1585</b>	<b>4,41 %</b>	
<b>Average Payment Time</b>	<b>16,26</b>			<b>15,15</b>			<b>40,29</b>

<b>Suspensions</b>							
<b>Average Report Approval Suspension Days</b>	<b>Average Payment Suspension Days</b>	<b>Number of Suspended Payments</b>	<b>% of Total Number</b>	<b>Total Number of Payments</b>	<b>Amount of Suspended Payments</b>	<b>% of Total Amount</b>	<b>Total Paid Amount</b>
0	39	2511	6,99 %	35943	3.045.420,39	4,21 %	72.367.511,80

<b>Late Interest paid in 2010</b>			
<b>DG</b>	<b>GL Account</b>	<b>Description</b>	<b>Amount (Eur)</b>

**TABLE 7 : SITUATION ON REVENUE AND INCOME IN 2010**

TABLE 7 : SITUATION ON REVENUE AND INCOME IN 2010								
		Revenue and income recognized			Revenue and income cashed from		Outstanding	
	Chapter	Current year RO	Carried over RO	Total	Current Year RO	Carried over RO	Total	balance
		1	2	3=1+2	4	5	6=4+5	7=3-6
<b>Title 4: REVENUE ACCRUING FROM PERSONS WORKING WITH THE INSTITUTIONS AND OTHER UNION BODIES</b>								
40	MISCELLANEOUS TAXES AND DEDUCTIONS	17.300.580,28	0,00	17.300.580,28	17.300.580,28	0,00	17.300.580,28	0,00
41	CONTRIBUTIONS TO THE PENSION SCHEME	18.131.664,58	0,00	18.131.664,58	18.131.664,58	0,00	18.131.664,58	0,00
	<b>Total Title 4</b>	<b>35.432.244,86</b>	<b>0,00</b>	<b>35.432.244,86</b>	<b>35.432.244,86</b>	<b>0,00</b>	<b>35.432.244,86</b>	<b>0,00</b>
<b>Title 6: CONTRIBUTIONS AND REFUNDS IN CONNECTION WITH COMMUNITY/EU AGREEMENTS AND PROGRAMMES</b>								
62	REVENUE FROM SERVICES RENDERED AGAINST PAYMENT	73.315.490,65	4.513.362,78	77.828.853,43	68.387.437,21	3.581.704,47	71.969.141,68	5.859.711,75
66	OTHER CONTRIBUTIONS AND REFUNDS	1.276.968,11	44.315,87	1.321.283,98	1.050.536,90	29.055,30	1.079.592,20	241.691,78
	<b>Total Title 6</b>	<b>74.592.458,76</b>	<b>4.557.678,65</b>	<b>79.150.137,41</b>	<b>69.437.974,11</b>	<b>3.610.759,77</b>	<b>73.048.733,88</b>	<b>6.101.403,53</b>
<b>Title 9: MISCELLANEOUS REVENUE</b>								
90	MISCELLANEOUS REVENUE	-1.491.771,60	0,00	-1.491.771,60	-1.491.771,60	0,00	-1.491.771,60	0,00
	<b>Total Title 9</b>	<b>-1.491.771,60</b>	<b>0,00</b>	<b>-1.491.771,60</b>	<b>-1.491.771,60</b>	<b>0,00</b>	<b>-1.491.771,60</b>	<b>0,00</b>
	<b>Total DG JRC</b>	<b>108.532.932,02</b>	<b>4.557.678,65</b>	<b>113.090.610,67</b>	<b>103.378.447,37</b>	<b>3.610.759,77</b>	<b>106.989.207,14</b>	<b>6.101.403,53</b>

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

RECOVERY ORDERS ISSUED IN 2010	Nbr error / irregularity		TOTALS	
	Year of Origin (commitment)	Nbr	RO Amount	Nbr
2007	1	459,60	1	459,60
2008	1	27.500,00	1	27.500,00
2009	6	41.260,81	6	41.260,81
2010	25	35.817,59	25	35.817,59
No Link	81	149.508,05	81	149.508,05
	<b>114</b>	<b>254.546,05</b>	<b>114</b>	<b>254.546,05</b>

EXPENSES	Nbr		Amount	
	INCOME LINES IN INVOICES	0		

NON ELIGIBLE AMOUNT IN COST CLAIMS	Nbr		Non-Eligible Amount	
		0		

CREDIT NOTES	No error / irregularity	
	Nbr	Credit Note Amount
	1286	-7.119.400,63

**TABLE 9: AGEING BALANCE OF RECOVERY ORDERS AT 31/12/2010 FOR JRC**

Year of Origin	Number at 01/01/2010	Number at 31/12/2010	Evolution	Open Amount (EUR) at 01/01/2010	Open Amount (EUR) at 31/12/2010	Evolution
1997	3	3	0,00 %	39.155,17	39.155,17	0,00 %
2000	2	2	0,00 %	19.780,00	19.780,00	0,00 %
2002	2	2	0,00 %	31.476,11	31.476,11	0,00 %
2005	1	1	0,00 %	63.037,07	63.037,07	0,00 %
2006	6	6	0,00 %	42.281,53	42.281,53	0,00 %
2007	4	4	0,00 %	103.400,28	103.400,28	0,00 %
2008	5	5	0,00 %	228.000,62	228.000,62	0,00 %
2009	147	15	-89,80 %	4.103.167,66	492.407,89	-88,00 %
2010		124			16.438.972,82	
Totals	170	162	-4,71 %	4.630.298,44	17.458.511,49	277,05 %

**TABLE 10 : RECOVERY ORDER WAIVERS IN 2010 >= EUR 100.000**

Waiver Central Key	Linked RO Central Key	RO Accepted Amount (Eur)	LE Account Group	Commission Decision	Comments
<b>Total DG JRC</b>					

<b>Number of RO waivers</b>	<b>0</b>
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<i>Justifications:</i>
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**No data to be reported**

**No data to be reported**

**TABLE 11 : CENSUS OF NEGOTIATED PROCEDURES - DG JRC - YEAR 2010**

<b>Contracts &gt; EUR 60.000</b>		
<b>Negotiated Procedure Legal base</b>	<b>Number of Procedures</b>	<b>Amount (EUR)</b>
Art. 126 1a	2	1.450.030,00
Art. 126 1b	14	37.100.712,21
Art. 126 1c	2	558.711,39
Art. 126 1e	1	132.977,46
Art. 126 1g i	5	1.627.551,46
Art. 127 1a	8	26.132.719,44
<b>Total</b>	<b>32</b>	<b>67.002.701,96</b>

<b>External Action Contracts &gt; EUR 10.000</b>		
<b>Negotiated Procedure Legal base</b>	<b>Number of Procedures</b>	<b>Amount (EUR)</b>
Art. 242 1f	1	50.000,00
Art. 244 1a	1	20.000,00
Art. 244 1b	1	71.074,00
Art. 244 1d	1	23.000,50
<b>Total</b>	<b>4</b>	<b>164.074,50</b>

<b>TABLE 12 : SUMMARY OF PROCEDURES OF DG JRC EXCLUDING BUILDING CONTRACTS</b>				
<b>Internal procedures &gt; €60,000</b>	<b>2009</b>		<b>2010</b>	
<b>Contract Class</b>	<b>Count</b>	<b>Amount (€)</b>	<b>Count</b>	<b>Amount (€)</b>
Service	67	55.834.835,07	92	157.800.278,73
Supply	42	23.490.843,37	59	73.920.385,29
Works	8	10.544.024,72	11	32.230.295,95
Building			1	404.632,88
<b>TOTAL</b>	<b>116</b>	<b>89.869.703,16</b>	<b>162</b>	<b>264.355.592,85</b>

<b>Procedure Type</b>	<b>Count</b>	<b>Amount (€)</b>	<b>Count</b>	<b>Amount (€)</b>
Negotiated Procedure after publication of a contract notice Art. 127 IR	1	3.000.000,00	8	49.421.704,52
Negotiated Procedure with at least one candidate (Art 129.3 IR)	8	8.194.514,31		
Negotiated Procedure without publication of a contract notice Art. 126 IR	8	8.008.616,95	22	62.061.319,60
Open Procedure (Art. 122.2 IR)	66	36.552.648,89	114	116.186.849,91
Restricted Procedure(Art. 122.2 IR)	12	23.143.988,05	7	35.285.625,73
Service-International Restricted Procedure with four to eight tenderers after prior pub. (Art. 241.1&2 IR)			1	249.750,00
Service - Negotiated Procedure with a single offer (Art. 242 IR)	2	696.000,00		
Works - International Restricted Procedure after publication of a contract notice (Art. 245.1 IR)	1	7.750.000,00		
Negotiated Procedure with at least five candidates (Art. 129.1 IR)	1	213.696,00	1	66.000,00
Direct Agreement	3	650.360,34		
Restricted Procedure involving a call for expressions of interest (AMI) (Art. 128 IR)	13	1.534.878,62	9	1.084.343,09
No Procedure was used	1	125.000,00		
<b>TOTAL</b>	<b>116</b>	<b>89.869.703,16</b>	<b>162</b>	<b>264.355.592,85</b>

<b>External procedures &gt; €10,000</b>	<b>2010</b>	
<b>Contract Class</b>	<b>Count</b>	<b>Amount (€)</b>
Service	1	20.000,00
<b>TOTAL</b>	<b>1</b>	<b>20.000,00</b>

<b>Procedure Type</b>	<b>Count</b>	<b>Amount (€)</b>
Negotiated Procedure with at least three candidates (Art. 129.2 IR)	1	20.000,00
<b>TOTAL</b>	<b>1</b>	<b>20.000,00</b>

**TABLE 13 : BUILDING CONTRACTS**

<b>Total number of contracts :</b>	<b>0</b>
<b>Total amount :</b>	

<b>Legal base</b>	<b>Contract Number</b>	<b>Contractor Name</b>	<b>Description</b>	<b>Amount (€)</b>
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**No data to be reported**

**TABLE 14 : CONTRACTS DECLARED SECRET**

<b>Total Number of Contracts :</b>	<b>0</b>
<b>Total amount :</b>	

<b>Legal base</b>	<b>Contract Number</b>	<b>Contractor Name</b>	<b>Type of contract</b>	<b>Description</b>	<b>Amount (€)</b>
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**No data to be reported**

## **ANNEX 4: MATERIALITY CRITERIA**

The JRC's materiality threshold is set to be at 2% of the budget of the activity concerned. To determine the materiality of weaknesses in the organisation, the results of the controls and systems described below have been considered. In all cases the 2% threshold is not met.

### **Exception Reporting All Transactions**

Exceptions cover all aspects of the JRC's activities and account for 0.27% of the number of transactions and 1.7% of the sub-set of commitments. Only one of the exceptions was associated with a minor but direct material loss because the exception meant that additional interest had to be paid to a supplier. It should be noted that exceptions were generally justified in the interest of the service and occasionally exceptional procedures are invoked to make efficiency gains.

### **Ex-Post Control result**

The material error estimated with the JRC payments is at 0.02% considering a sample of 100 payments representing almost 8% of the value of the sample's population<sup>35</sup>. Out of fifty procurement files checked, only one material error was noted in which money was lost. This error was associated with a loss equivalent to less than 10% of the contract value. The material error rate associated with these controls can thus be estimated at 0.12%. The total material error rate associated with payment and procurement activities is estimated at 0.14%.

Errors associated with procedural lapses and formal errors e.g. missing documents and justifications are not considered as material whilst it is recognised that they do expose the organisation to additional risks. No systematic errors or weaknesses in the JRC's control system were observed.

### **Ex-ante Checks on Accuracy of Accounts (Payments)**

The accounting checks revealed only 1.43% of sampled transactions contained errors. Virtually all of the errors were corrected bringing the error rate down to 0.08%. The sample tested by the accountant covered 85% of the total value of all payments made in 2010.

### **Feedback from the Public Procurement Advisory Group (PPAG)**

There were a high degree of favourable opinions issued by the PPAG. 114 files were assessed by the PPAG representing contracts worth approximately EUR 183 million. Five opinions (relating to three negative opinions and two withdrawn files) were however overruled by the sub-delegated authorising officer. These overrulings represent 3,8% of the number of large value contracts (worth > EUR 500 000 ). The large value contracts represent 91 % of the total value of procurements related to files presented to the PPAG in 2010 (sampled as well as non-sampled sheets), and thus the overrulings correspond to around 3,5% of such procurements. In deciding to go against the opinion of the PPAG, authorising officers are alerted to the risks associated with the procurement procedure and required to take mitigating measures. The overruling does not directly imply losses in terms of materiality or contract value.

### **Assurance Declarations from the Authorising Officers**

Assurance statements have been provided by all authorising officers currently in active service and no critical issues were highlighted by them.

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<sup>35</sup> Excluded: Payments done by the Paymaster's Office in Ispra (PMO6) (mainly related to salaries and business travel); Salary payments done by the JRC to non-statutory staff; Incomplete and negative payments; and "Hors Budget" Payments i.e. payments made to consolidate accounting data.

## **Internal Control Systems**

The JRC has recognised that it is not fully compliant with the baseline requirements of the Internal Control Standards. There are three standards where the JRC is only partially compliant. These standards are associated with 1) the management of sensitive functions, 2) document management weaknesses and 3) information systems and data management weaknesses. Essentially, the weaknesses either result in increased risks that must be managed by the organisation or reduced efficiency. In any case they are not directly associated with material losses.

## **Audit Results**

- The Internal Control reviews provide a good level of perceived implementation of control systems;
- Out of 37 recommendations issued by the Internal Audit Capability, none were critical.
- There are no red flag issues remaining from specific or DAS reports from the European Court of Auditors and none were identified in 2010.

## **Achievement of objectives of the scientific work programme**

The achievement of objectives was checked in a three step process: 1) The monitoring of the achievement of objectives revealed that 3% of scientific objectives were not met. 2) At the level of the JRC's annual internal evaluation, the Periodic Action Review (PAR), the state of correspondence between declared and reported achieved objectives was checked and confirmed through a peer-review process. 3) A further investigation by the JRC's evaluation function of all of the non-achieved objectives has led to the conclusion that no material losses have occurred.

The non-achievement of objectives was flagged in case at least one out of several of the deliverables related to an objective was not produced. These cases include cancellation of a deliverable at the request of the client, non-availability of staff (e.g. in case of delayed recruitment), reorganisation of a scientific action in consultation with the client, delayed or cancelled scientific publications.

## ANNEX 5: INTERNAL CONTROL TEMPLATES FOR BUDGET IMPLEMENTATION

### Part 1: Procurement

<b>ICT N° 1: Procurement</b>											
<b>Management mode:</b>  <i>Direct centralised management mode</i>	<table border="1"> <caption>Procurement Management Modes</caption> <thead> <tr> <th>Mode</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Open</td> <td>66%</td> </tr> <tr> <td>Negotiated</td> <td>19%</td> </tr> <tr> <td>Restricted</td> <td>9%</td> </tr> <tr> <td>Restricted (CEI)</td> <td>6%</td> </tr> </tbody> </table>	Mode	Percentage	Open	66%	Negotiated	19%	Restricted	9%	Restricted (CEI)	6%
Mode		Percentage									
Open	66%										
Negotiated	19%										
Restricted	9%										
Restricted (CEI)	6%										
<b>Key figures:</b>  There were around 170 large value (> 60,000 €) contract tenders valued at approximately EUR 190 million.  29% of the files subject to the scrutiny of the PPAG were awarded by negotiated procedure.											
<b>Management and control systems : stages and main actors</b> <ul style="list-style-type: none"> <li>• <i>Preventive actions are implemented with the aim of reinforcing sound financial management, enhancing open and transparent procurement procedures, promoting accountability and integrity of financial and operational actors as well as the reporting of irregularities by staff (including measures ensuring effective protection of whistle-blowers), and improving internal controls;</i></li> <li>• <i>Every contract undergoes an independent check by the financial verifier to ensure inter alia the correct application of procurement rules;</i></li> <li>• <i>An advisory body (PPAG) offers support for the correct application of tendering procedures. This body must be consulted with regard to procurement files for high value contracts (&gt; EUR 500 000) and all negotiated procedure contracts worth &gt; EUR 60 000, and other contracts above EUR 60 000 that are selected at random. After scrutinising the files, the PPAG advises the AOS on whether to proceed with a contract award;</i></li> <li>• <i>A JRC RSN on Procurement Matters, involving procurement staff from all different Institutes and Directorates, fosters harmonisation in the area of procurement across the JRC, assist in the process of developing corporate guidance and in addressing risks and detected weaknesses.</i></li> <li>• <i>Members of evaluation committees are asked to sign a document reminding them of their obligation to declare any potential conflict of interest;</i></li> <li>• <i>Physical protection of the offers submitted is ensured (locked room and segregation between original and copies).</i></li> </ul>											

<p><b>Selection process</b> (of contractors), including <b>preventive</b> measures</p>	<ul style="list-style-type: none"> <li>• According to the JRC Policy for Dealing with Sensitive Functions, financial actors involved with the selection of contractors are considered potential sensitive functions and subject to a mandatory risk assessment.</li> <li>• Before a contract is signed, contractors must show that they are not in one of the situations of exclusion specified in the Financial Regulation (e.g. bankruptcy, failure to pay tax or social security contributions). Before each transaction is authorised, staff are automatically alerted if the Commission is aware of this or any similar problem (Early Warning System);</li> <li>• Multi-annual and framework contracts entailing the use of open tendering procedures are used when possible in order to avoid multiple small orders.</li> </ul>
<p><b>Communication and information</b> measures to improve the quality of financial management and provision of supporting data by beneficiaries, contractors and intermediaries</p>	<ul style="list-style-type: none"> <li>• Transparency measures: calls for tender are published in the Official Journal and on the JRC Call For Tender Website . Adequate communication is also provided to unsuccessful tenderers and access to documents in tender procedures is provided upon request and in conformity with the applicable rules.;</li> <li>• A computerised accounting system is used to record the contracts and the transactions related to them (ABAC). Invoices and other such payment requests are linked to the relative specific contracts, orders and other legal commitments. They are scanned and stored in the JRC's own financial management software;</li> <li>• Technical training in procurement as well as information campaigns and workshops on ethics and integrity are given to all staff involved in the procurement process. All staff members involved in financial management have the responsibility to alert their Director-General, the Secretary-General or OLAF if they suspect any irregular, illegal or criminal activity.</li> </ul>
<p><b>Detective and corrective controls:</b></p> <p>Checks and monitoring during the initial phases and the final phases of the contract</p>	<ul style="list-style-type: none"> <li>• Financial circuits: Every financial transaction requires at least two people to be involved (the "four eyes" principle). One person must initiate the transaction and a second person must verify it. In order to process payments, two staff must agree that the operational aspects (service delivery or supply) respect the agreement prior to payment authorisation;</li> <li>• Each person inputting, verifying and authorising financial data has been nominated by an authorising officer to carry out the task. Authorising officers have the necessary skills or experience to carry out their task effectively.</li> </ul>
<p><b>Preventive and corrective controls and audit:</b></p> <p>Desk reviews, on-the-spot audits carried out either ex-ante or ex-post.</p>	<ul style="list-style-type: none"> <li>• The JRC's PPAG is in place to offer procurement advice on large value contracts (&gt; EUR 500 000), all negotiated contracts with a value &gt; EUR 60 000 and other contracts with values &gt; EUR 60 000 that are selected at random (see above);</li> <li>• A randomly selected sample of transactions (payments, commitments) is independently reviewed at the end of each financial year in an ex-post control. The results of the review are to correct systems weaknesses;</li> <li>• The JRC is subject to the controls performed by the European Court of Auditors as well as the European Commission's Internal Audit Service;</li> <li>• The JRC's own Internal Audit Capability (IAC) performs regular reviews of JRC systems. The annual work programme of the IAC is based in part on a risk assessment.</li> </ul>
<p><b>Feedback which enables control activities to be optimised</b></p> <p>Any deviations from normal procedures are noted and recorded in an exceptions register. These exceptions are reviewed and improvement actions developed. Similarly, the results of the ex-post control exercise are developed to improve systems where appropriate linked to the procurement procedure.</p> <p>Finally the JRC has documented the procurement process within its ISO 9000 quality management process. This means that the process undergoes regular audits and reviews aiming at optimising the process itself.</p>	

<p><b>Verification that processes are working as designed</b></p>	<ul style="list-style-type: none"> <li>• <i>A risk assessment exercise is run to highlight key issues to ensure that mitigating action is taken;</i></li> <li>• <i>Self-assessment of the implementation of internal control systems is performed on an annual basis with respect to compliance with internal control standards;</i></li> <li>• <i>The JRC ISO 9001 certified process procurement for low and high value contracts is subject to regular update.</i></li> <li>• <i>An ex-post evaluation of a randomly selected sample of payments and their relative contracts and procurement procedures is performed each year.</i></li> </ul>
<p><b>Monitoring of performance</b> of independent bodies, third party auditors, externally contracted auditors</p>	<ul style="list-style-type: none"> <li>• <i>In 2009 the IAS concluded an audit into procurement in the JRC to assess the adequacy of the design and effective application of the Internal Control Standard on risk management and governance processes related to procurement. The audit concluded that there were no critical issues to be addressed and that the internal control system in place provides reasonable assurance regarding the achievement of the business objectives set up for the procurement preparation process.</i></li> </ul> <p><i>The exceptions were related to four very important issues related to the Decommissioning activities, and some Planning, Monitoring and Control aspects of procurement. These have been addressed in an action plan (being implemented).</i></p>
<p><b>High level management reporting</b> (e.g. to the Director-General and its role in monitoring problem issues)</p>	<ul style="list-style-type: none"> <li>• <i>A management scoreboard covering the results of the PPAG is reviewed by the JRC Directors;</i></li> <li>• <i>The results of the PPAG, exceptions and ex-post controls are communicated to the DG and to relevant hierarchy.</i></li> </ul>

## Part 2: Competitive activities

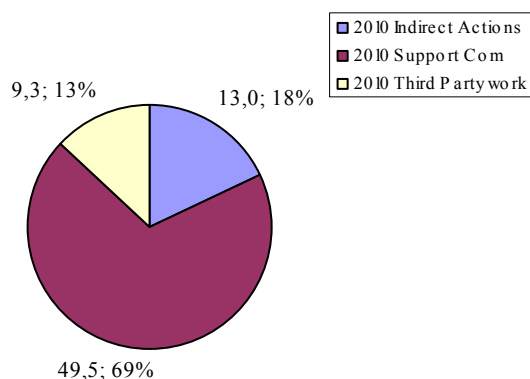
### ICT N° 2: Managing Income from Competitive Actions

**Management mode:**  
Direct centralised

**Key figures:**

- 247 competitive contracts were signed in 2010.
- EUR 62,5 million of competitive income was cashed in 2010.
- Other Commission services are the main source of income.
- 52 financial statements were certified by the Internal Audit Unit. Of these 41 were certified financial statements concerning final reporting periods.

Income in Million €



#### Management and control systems: stages and main actors

The Institute Director may approve a project proposal only after a risk assessment has been completed. Projects must be complementary to institutional (work programme) projects and ABM activities.

The JRC has appointed a process owner for managing and supervising its competitive activities. This process owner issues governing principles and procedures and contributes to harmonise the activity.

A network has been established and meetings are regularly organised (three times a year) to gather the competitive officers from the different Institutes. This network also contributes to streamlining the activity.

Staff time charged to the project is recorded and approved by the line manager. Associated cost statements are checked and approved by the Internal Audit Unit prior to submission.

All Administrative Arrangements with other Commission services follow standard formats governing the correct application of IPR ownership and use. For TPW the standard clause foresees that the paying party owns results (reviewed on a case-by-case basis). In indirect actions the JRC is the owner of the results it generates. Legal advice and training is available to help ensure that there is no unwitting loss of intellectual property rights via consortium agreements.

<p><b>Selection process</b> (of projects and partners) including <b>preventive</b> measures</p>	<ul style="list-style-type: none"> <li>• <i>All competitive activities are associated with the JRC Work Programme. Prior to submitting a bid to participate in an indirect action, a check on compliance with the Work Programme is performed;</i></li> <li>• <i>Entering into an Administrative Arrangement with a Commission service or a contract with a third party is either the responsibility of the Director or the Director-General (if two or more JRC Institutes are involved);</i></li> <li>• <i>Upon approval of a competitive project, a forecast of the associated milestones and income is prepared for monitoring purposes.</i></li> </ul>
<p><b>Communication and information</b> measures to improve the quality of financial management and provision of supporting data</p>	<ul style="list-style-type: none"> <li>• <i>All income generated is reported in the JRC's general accounts;</i></li> <li>• <i>A summary of all competitive activity is included in the JRC Annual Report, which is accessible on the JRC's website and disseminated to stakeholders;</i></li> <li>• <i>Information on the budget linked to competitive work by Research Action is included in the monthly management report;</i></li> <li>• <i>Central systems are used to record the contracts (JIPSY), staff time dedicated to the projects (TAS2) and the transactions related to them (ABAC).</i></li> </ul>
<p><b>Detective and corrective controls:</b></p> <p>Checks and monitoring during the initial phases and the final/ closure phases of the projects</p>	<ul style="list-style-type: none"> <li>• <i>Goods and services are not ordered until the associated competitive projects are approved and resource availability checked (in case of joint funding);</i></li> <li>• <i>Instructions for the calculation of overhead costs for JRC competitive activities in FP7 were issued in 2008 and are in line with generally accepted accounting principles. For JRC participation in indirect actions, the provisions of the Rules for Participation are applied. The instructions and guidelines for establishing and issuing financial statements are developed centrally for elaboration and control by the Institutes;</i></li> <li>• <i>Cost claims issued by the JRC in indirect actions are made in respect of the same Framework Programme rules applicable to all beneficiaries. To ensure accurate invoicing all staff involved in projects formally declares the time dedicated to the project; and all purchases are directly charged to the project;</i></li> <li>• <i>All income and expenses for competitive activities are managed in the regular financial system (ABAC) and according to the JRC financial circuits, involving a segregation of duties between the initiating and verifying functions.</i></li> </ul>

<p><b>Preventive and corrective controls and audit:</b></p> <p>Desk reviews, on-the-spot audits carried out either <i>ex-ante</i> or <i>ex post</i>.</p>	<ul style="list-style-type: none"> <li>• <i>The JRC is subject to controls carried out by the European Court of Auditors as well as the European Commission's Internal Audit Service;</i></li> <li>• <i>In recent years different audits of the JRC Internal Audit Unit have specifically targeted the management of competitive activities. For indirect actions, the JRC is subject to the external controls that may be commissioned by the funding DGs. Such an audit was conducted by DG Research in 2009. The findings have led to the JRC issuing cost statements linked to the actual salaries of its staff (see below).</i></li> </ul>
<p><b>Feedback which enables control activities to be optimised</b></p> <p><i>In 2010 a major part of the JRC's procedures and processes were subject to ISO 9001 certification, including the competitive activity management process.</i></p>	
<p><b>Verification that processes are working as designed</b></p>	<ul style="list-style-type: none"> <li>• <i>The JRC is obliged to have its cost statements for indirect actions certified by auditing entities. To this end, the JRC Internal Audit Unit controls and issues certificates on these actions. In 2010, 52 Audit certificates were delivered;</i></li> <li>• <i>A risk assessment exercise is performed to highlight key problems related to all JRC activities and to help ensure that mitigating action is taken;</i></li> <li>• <i>Self-assessment of the implementation of internal control systems is performed on an annual basis with respect to compliance with internal control standards.</i></li> </ul>
<p><b>Monitoring of performance</b> of independent bodies, third party auditors, externally contracted auditors</p>	<ul style="list-style-type: none"> <li>• <i>The audit of three JRC participations in FP6 indirect actions resulted in a number of recommendations in order to improve the systems of internal control relevant to the JRC's participation in such contracts. The auditors recommended that the time recording system used by the JRC for staff cost billing should be improved and traceability of the figures used to calculate the average personnel costs should be enhanced. The JRC has switched to a method involving the calculation of actual staff costs and has introduced a new time accounting system (TAS2).</i></li> </ul>
<p><b>High level management reporting</b> (e.g. to the Director-General and its role in monitoring problem issues)</p>	<p><i>A management scoreboard is reviewed by the JRC Directors on a monthly basis. The scoreboard includes:</i></p> <ul style="list-style-type: none"> <li>• <i>Details of budget implementation by activity (including associated competitive work);</i></li> <li>• <i>An indicator on the cashed income linked to the competitive activities.</i></li> </ul>

**ANNEX 6: VOID; NOT APPLICABLE (IMPLEMENTATION THROUGH NATIONAL OR INTERNATIONAL PUBLIC-SECTOR BODIES AND BODIES GOVERNED BY PRIVATE LAW WITH A PUBLIC SECTOR MISSION)**

**ANNEX 7:VOID; NOT APPLICABLE (AAR(S) OF EXECUTIVE AGENCY/IES).**

## **ANNEX 8: OVERVIEW OF JRC POLICY SUPPORT ACHIEVEMENTS**

### **1. Response to crises in 2010**

#### *Haiti earthquake: assessing damage in support to relief and reconstruction efforts*

In the aftermath of the earthquake in Haiti on 12 January 2010, the JRC supported the Commission's external relations services in coordinating a response from the EU by issuing early-warning alerts and delivering updated situation maps throughout the critical emergency phase. Eighteen minutes after the first shock on 12 January 2010, the Global Disaster Alert and Coordination System (GDACS) issued a red alert to 8500 users - mainly aid and first response organisations — which mobilised the interventions of the EU's Civil Protection Mechanism, as well as those of the United Nations emergency relief and humanitarian agencies such as the Office for the Coordination of Humanitarian Affairs and the World Food Programme.

Within days of the earthquake, the JRC produced a preliminary damage estimate for south-western Haiti, including Port-au-Prince, based on the analysis of high resolution satellite data from before and after the earthquake. This first analysis allowed a prioritisation of the most affected areas. The preliminary damage analysis found that more than 4 000 physical structures were destroyed or damaged in Haiti's densely populated capital Port-au-Prince. About 2 000 residential buildings were identified as partially or totally collapsed and the same number of buildings showed severe damage. The analysis also showed that a number of critical infrastructures, such as government buildings, educational structures and hospitals, had collapsed or were severely damaged.

These damage figures were subsequently revised by the JRC in collaboration with its key international partners, the World Bank and the United Nations Operational Satellite Applications Programme (UNOSAT), with in-depth analyses of images with even higher resolution. The revised assessments indicated that the damages visible in these new, better-resolution datasets were higher by a factor ranging between 5 and 10 compared with the first satellite-based rapid damage assessment. This reassessment, complemented by field-based damage surveys for the housing and infrastructure sector, constituted an important input to the Post-Disaster Needs Assessment and Recovery Framework that was carried out jointly by the government of Haiti, the World Bank, the United Nations, the European Commission (including experts from the JRC) and the EU represented by experts from its Member States.

The result of this process was a comprehensive damage and loss assessment of the impact of the Haiti earthquake and related recovery and reconstruction needs, which was presented at the International Donors' Conference that was held in New York in March 2010.

#### *Supporting EU and international efforts to help Pakistan*

The severe Pakistan floods in 2010 killed almost 2 000 people, affected about 20 million people and caused extensive damage to agricultural lands, property and infrastructure.

In close cooperation with the EU Member States and the international community, the European Commission assisted the Pakistani authorities and the population by providing expert humanitarian relief and rescue support and by contributing to the Post-Disaster Needs Assessment under the lead of the United Nations and the World Bank/Asian Development Bank. Representing the European Commission, the JRC contributed to the process by helping with the organisation of the analytical work of the Pakistani Space and Upper Atmosphere Research Commission (SUPARCO) and assisted in product quality assessment, thereby facilitating the delivery of robust damage analyses and statistics into the Post-Disaster Needs Assessment plan for recovery and reconstruction that was presented at the ensuing International Donors' Conference.

The JRC also provided geospatial information support to the European Commission's Monitoring and Information Centre (MIC), providing an insight into the most affected districts and the extent of affected societal functions (e.g. population, infrastructure and agricultural land). The support was based on openly available data from the Pakistani authorities, as well as in-house flood extent analysis and other analyses provided by JRC partners, based on satellite data.

### *Water scarcity and droughts — a major concern for many areas in Europe and worldwide*

JRC work on developing the European Drought Observatory (EDO<sup>36</sup>) aroused interest among specialist communities on a European and world scale. The EU Member States' Water Scarcity and Drought Expert Network, established under the Water Framework Directive, decided to support the further development and maintenance of the system<sup>37</sup>.

At a meeting on natural hazards' databases at the European Environment Agency in Copenhagen, the potential of EDO was explained, and interest in a database of historical droughts discussed. Later in 2010, the JRC's EDO experts were invited to participate in a consultation meeting on the proposed global Integrated Drought Management Programme, organised by the World Meteorological Organization (WMO) and the Global Water Partnership in Geneva. There, the JRC's EDO was presented to participants from various UN organisations, as well as institutions and ministries from North America, Africa and Australia. Drought-related experiences (e.g. monitoring, assessment, forecasting and management) were exchanged, drought impacts discussed, and a first concept paper on the Integrated Drought Management Programme elaborated. The JRC is now part of a core group revising and extending this note, to be presented to the WMO Council for approval.

Together with the US National Drought Mitigation Centre and Australian initiatives, EDO has further been recognised by the Global Earth Observation System of Systems (GEOSS) community as a cornerstone for the development of a Global Drought Monitoring Initiative and the JRC's EDO team is involved in related developments.

## **2. Policy anticipation**

### *Desertification: JRC-IES nominated UNCCD Regional Reference Centre*

In 2010, the United Nations Convention to Combat Desertification (UNCCD) established 15 reference centres worldwide based on their recognised experience in desertification and land degradation issues.

These reference centres support the UNCCD<sup>38</sup> to implement country reporting guidelines and participate in the development activities of new indicator-based monitoring and assessment of desertification at regional, sub-regional and national levels.

The JRC's Institute for Environment and Sustainability (JRC-IES) was nominated as one of these reference centres. It provides assistance to the countries of the UNCCD's regional annexes for the Mediterranean, central and eastern Europe and other affected parties (e.g. Canada, Israel, Russia and the United States), covering the largest constituency worldwide.

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<sup>36</sup> <http://edo.jrc.ec.europa.eu/>

<sup>37</sup> COM(2007)414 final: Addressing the challenge of water scarcity and droughts in the European Union.

<sup>38</sup> Ten-year strategic plan and framework to enhance the implementation of the Convention (2008–18), Document ICCD/COP(8)/10/Add.2, 9 July 2007.

The JRC gave two training sessions in Brussels in June 2010: one on the new indicator-based reporting system, was attended by 48 participants representing UNCCD national focal points from 21 countries; the other training session had 25 participants from 11 donor countries, representatives of the Global Mechanism and the coordinator of the Performance Review and Assessment of Implementation System (PRAIS) project<sup>39</sup>. PRAIS coordinates activities of all reference centres on behalf of the UNCCD Secretariat.

### *Outlook for agricultural markets*

Each year, the European Commission publishes medium-term projections for the main EU agricultural markets (cereals, oilseeds, meat, eggs and dairy as well as biofuels) and income.

The 2010–20 market outlooks constitute the main reference scenario (baseline) for further ex-ante evaluations of policy impacts and feeds into the ongoing Common Agriculture Policy post-2013 impact assessment process<sup>40</sup>. The projections are based on market statistics, results of economic models, and market expert judgements, all being subject to specific assumptions regarding further development of macro-economic conditions, agricultural and trade policy environment, the path of technological change and the functioning of international markets.

The publication of the market outlook involved joint efforts by the JRC and the Directorate-General for Agriculture and Rural Development. The JRC worked in particular on the modelling background and baseline projections as well as quantification of main areas of uncertainty, such as yields, oil price and GDP growth.

The complete report ‘Prospects for agricultural markets and income 2010-2020’ can be found at [http://ec.europa.eu/agriculture/publi/caprep/prospects2010/index\\_en.htm](http://ec.europa.eu/agriculture/publi/caprep/prospects2010/index_en.htm).

### *Energy security: smarter power grids needed*

Developing and remodelling electricity grids is an essential step in the pursuit of the EU’s competitiveness, sustainability and security of energy supply objectives for 2020 and beyond. Power grids need to become more interconnected and smarter by seamlessly integrating a wide range of users, including renewable energy sources, storage technologies and electric vehicles.

The JRC has identified and analysed the vulnerabilities of Member States’ electricity transmission systems, in line with the Directive on critical European infrastructures. Based on this, the JRC has implemented a European-wide electricity grid model. The model includes more than 10 000 elements (nodes and lines) of Europe’s transmission grid and can be used to run static and dynamic analyses via advanced power simulation tools based on MATLAB and NEPLAN platforms and associated models.

### *Working towards more sustainable fisheries in the Mediterranean*

The Mediterranean Regulation<sup>41</sup> aims to ensure the sustainable exploitation of fisheries resources and requires Member States to implement fisheries management plans on the basis of scientific advice. In 2010, the European Commission’s Scientific, Technical and Economic Committee for Fisheries (STECF) concluded that about 85 % of the exploited fish and shellfish stocks assessed in the Mediterranean were overexploited and thus unable to produce high yields in a long-term perspective.

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<sup>39</sup> <http://www.unccd.int/prais/>

<sup>40</sup> COM(2010) 672 final: ‘The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future’.

<sup>41</sup> Council Regulation (EC) No 1967/2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94.

Thanks to more reliable and complete data sets assembled by the JRC on fish stocks, fishing effort and landings, as well as JRC expert contributions to the STECF, the previous estimate of the state of overexploitation of resources was revised upwards from a less critical status (54 % overfished) to an aggravated status (85 % overfished). Following this scientific advice, the Commission decided to take a tougher stance towards Member States involved in these fisheries.

In addition, thanks largely to the JRC's contributions, both the number and the reliability of analytical assessments for Mediterranean fish stocks have significantly increased and are now available to support sound scientific advice.

### *New reference material production facility at JRC-IRMM*

A new scientific and technical facility to develop measurement standards<sup>42</sup> was officially inaugurated at the JRC in Geel, Belgium, on 23 November 2010. The Minister-President of the Belgian Region Flanders, Kris Peeters, and the European Commission's Director-General for Enterprise and Industry, Heinz Zourek, performed the ceremonial ribbon cutting.

The reference materials developed and produced in the new facility will provide laboratories around the world with benchmarks to deliver accurate and traceable measurement results, notably in emerging areas such as molecular biosciences and personalised medicine.

The building features a flexible production hall and special laboratories which bring together processing and measurement equipment in an innovative set-up. It also provides the European Commission with an in-house laboratory for the safe handling of pathogenic biomaterials.

## **3. Policy formulation**

### *The JRC supports the Euro-VI Heavy Duty Directive*

The JRC made significant contributions to the drafting of the new Euro VI Regulation which aims to limit emissions from heavy duty vehicles. This Regulation implements and amends EC Regulation No 595/2009<sup>43</sup>.

The work performed in 2010 enabled the adoption of the draft regulation by the Technical Committee for motor vehicles, established by the Directorate-General for Enterprise and Industry, thus moving the new Euro VI emission standards one step closer to final approval.

The JRC's independent role was essential: since 2004, JRC scientists developed, in collaboration with industry and the Member States, the technical aspects of the procedure to check the in-use emissions of heavy duty vehicles using Portable Emission Measurement Systems. The JRC results are now laid down in Annex II 'Conformity of in-service engines or vehicles'.

For the first time, in-use emission testing is introduced in European emissions control legislation, which represents a major breakthrough.

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<sup>42</sup> Directive 98/79/EC of the EP and of the Council on *in vitro* diagnostic medical devices; Directive 2000/60/EC of the EP and of the Council establishing a framework for the Community action in the field of water policy; Commission Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs.

<sup>43</sup> Regulation (EC) No 595/2009 of the EP and of the Council on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information.

## *A global INSPIREd information society*

With INSPIRE (Infrastructure for Spatial Information in Europe<sup>11</sup>) the European Union has embarked on the largest data harmonisation effort worldwide in the area of environmental information. The JRC is the technical and scientific coordinator of INSPIRE and has taken the lead in establishing interoperability between data and services of the 27 Member States, by developing and testing technical specifications and organising the consensus-building with the stakeholder communities. With the adoption of Regulations (1088/2010 and 1089/2010), the JRC and its customer Directorate-General for the Environment reached a major milestone in the access to and harmonisation of data required for environmental policy making and assessment. In 2010, Member States implemented the INSPIRE Metadata Regulation<sup>44</sup>, by making available the metadata of thousands of geospatial resources - thus enabling them to be discovered and evaluated by data users. JRC has played a major role in drafting all above-mentioned legal acts, written after intensive networking and stakeholder contributions.

## *Indirect land use change from biofuels*

Within the JRC's Thematic Programme on Biofuels, a topical report was published in August 2010<sup>45</sup>. It uses a new methodology to estimate changes in global greenhouse gas (GHG) emissions from soil and biomass as a result of land being converted to biofuels production. The report was discussed at a stakeholders' conference held in Brussels in October 2010, attended by farmers' associations, industry and political as well as environmental groups from all over the world. It received wide press coverage and had notable political impact by underpinning the Commission report of December 2010 on indirect land-use change from biofuels and bioliquids. This achievement was possible, in part due to a JRC Scientific Reference Report, published in early 2010, which defined the background guidelines for the calculation of land carbon stocks in the biofuels sustainability scheme<sup>46</sup>.

## *Bisphenol-A and baby bottles — challenges and perspectives*

The JRC's work on plastics used for infant feeding bottles was initiated to support the Directorate-General for Health and Consumers (DG SANCO) in devising appropriate measures to respond to the growing concern regarding the potential health hazards caused by exposure of babies to Bisphenol-A (BPA) via leaching from polycarbonate bottles.

In 2010, the JRC published a review study to clarify uncertainties about exposure from polycarbonate baby bottles and the adverse health effects of BPA at low doses. The report provided the European Food Safety Authority (EFSA) and DG SANCO with an overview of the scientific issues, summarising the risk assessment activities and latest scientific information carried out so far.

In parallel, the JRC investigated the influence of test conditions on release of BPA from polycarbonates, using a method validated at EU level by the JRC-hosted European Reference Laboratory for Food Contact Materials. The Commission recently amended the Directive<sup>47</sup> on plastics for food contact materials to prohibit the manufacture of infant feeding bottles with BPA from 1 March 2011. A complete substitution towards

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<sup>44</sup> Commission Regulation (EC) No 1205/2008 implementing Directive 2007/2/EC of the EP and of the Council as regards metadata.

<sup>45</sup> EUR 24483, *Biofuels: a New Methodology to Estimate GHG Emissions Due to Global Land Use Change*, available for download at [http://re.jrc.ec.europa.eu/bf-tp/html/documents\\_main.htm](http://re.jrc.ec.europa.eu/bf-tp/html/documents_main.htm)

<sup>46</sup> EUR 24573, see Reference Reports under <http://ies.jrc.ec.europa.eu/documentation/scientific-publications.html>, underpinning Commission Decision on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC (2010/335/EU).

<sup>47</sup> Commission Directive 2002/72/EC relating to plastic materials and articles intended to come into contact with foodstuffs

BPA-free polycarbonate substitutes will ensue. The results of an EU monitoring study on release from other plastics, carried out by the JRC, will be therefore highly instrumental for a full risk assessment of these materials, helping both EFSA and DG SANCO to safeguard consumer protection.

### *JRC support to the Marine Strategy Framework Directive — good environmental status for the European seas*

The JRC supports the development of the EU integrated maritime policy. One key area of its work in 2009 and 2010 was related to the Marine Strategy Framework Directive that aims to achieve good environmental status of the EU marine waters by 2020 and to protect the resource base upon which maritime-related economic and social activities depend. The JRC has provided scientific support for defining environmental objectives and developed, in collaboration with the International Council for the Exploration of the Sea (ICES), methodologies to monitor them. The work included the overall coordination of the process, co-chairing and scientific-technical support to several marine strategy task groups of independent experts. The JRC contributed to the work on biodiversity and alien species, chemicals in the environment, marine litter, eutrophication, and the health of exploited fish and shellfish stocks. In the framework of this project, 11 reports were published in 2010. The work has ultimately fed into the Commission Decision on criteria and methodological standards on good environmental status of marine waters<sup>48</sup> where direct reference to the work of the JRC is made.

### *End of waste*

Five years of scientific support from the JRC to the Directorate-General for the Environment have now led to the formulation of a first Commission Regulation on end-of-waste criteria. The criteria define the requirements that iron/steel and aluminium scrap have to fulfil in order to cease to be waste, a new policy mechanism introduced by the Waste Framework Directive<sup>49</sup>. The objective of end-of-waste criteria is to remove the administrative burdens of waste legislation for safe and high-quality waste materials.

The JRC has developed the scope and methodological approach of end-of-waste criteria, and in the last two years it has brought this methodological effort into life with practical applications to recycled materials such as metals, glass, and paper. The studies prepared by the JRC are the result of intense consultation rounds with experts, and consist of thorough techno-economic-environmental assessments that help verify when a recyclable waste material is safe for the environment, is of high quality and so merits to be released from the waste regime.

### *Size matters: towards a definition of nanomaterials for regulatory purposes / Public consultation on nanomaterial definition*

Despite the growing use of engineered nanomaterials in consumer products and innovative technological applications, there is at present no widely accepted definition of the term ‘nanomaterial’ that is suitable as a basis for legislation on their safe use.

The EP asked to introduce a definition of nanomaterials in EU legislation and called on the Commission to promote the adoption of a harmonised definition at the international level. In July 2010, the JRC published a

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<sup>48</sup> Commission Decision on criteria and methodological standards on good environmental status of marine waters (notified under Document C(2010) 5956) (2010/477/EU).

<sup>49</sup> Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain directives.

Reference Report entitled ‘Considerations on a definition of nanomaterial for regulatory purposes, which provides guidance on the preparation and contents of such a definition.

The report discusses possible elements of a comprehensive, science-based definition aiming at reducing ambiguity and confusion for regulators, industry and the general public. It recommends that the specific term ‘particulate nanomaterial’ should be employed in legislation to avoid inconsistencies with other definitions and that size should be used as the only defining property.

The report has attracted considerable attention in the debate on nanomaterial regulation among stakeholders such as industrial associations and policy makers, and in particular in the context of the public consultation launched in October 2010 on a definition drafted by the European Commission.

### *Validation of methods to characterise nanoparticles*

Nanomaterials are increasingly discussed in the European regulatory arena<sup>50</sup>. This is due to concerns about potential effects of nanomaterials, in particular nanoparticles, on human health and the environment. The only property currently used to classify particles as nanoparticles is their size. A variety of techniques exists to analyse the size and size distribution of nanoparticles. However, there is a general lack of full validation reports and suitable reference materials with properly assigned values traceable to the International System of Units.

The JRC performed an in-house validation study of two standard particle-sizing methods to assess their suitability for use with nanoparticles suspended in an aqueous solution: Dynamic Light Scattering (DLS) and Centrifugal Liquid Sedimentation (CLS). Performance characteristics were assessed using a non-certified reference material (IRMM-304) produced by the JRC. Both the DLS and the CLS methods were proved to be robust and suitable for measuring the size of dilute suspensions of monodisperse silica nanoparticles in the particle size range of about 25 nm to 75 nm, and the corresponding measurement uncertainties were estimated.

Particle sizing techniques were also investigated in an interlaboratory comparison organised by the JRC. Overall, 38 laboratories from four different continents participated with different methods. CLS, DLS, small-angle X-ray scattering (SAXS) and electron microscopy provided sufficiently reproducible particle size results to proceed with reference material certification studies.

### *Contributing to the ‘Innovation Union’*

October 2010 saw the publication of the Commission Communication entitled ‘Innovation Union: Transforming Europe through Research and Innovation’. This announced the launch of a flagship initiative to stimulate jobs and growth via policies aimed at overcoming obstacles which prevent innovative ideas from reaching the market. Focusing in particular on the resolution of major societal challenges, the ‘Innovation Union’ initiative contains a broad range of policy proposals designed to optimise the governance and performance of research and innovation systems in the EU, underpinning the overall targets of the Europe 2020 Strategy. A JRC expert was on the task force responsible for preparing the ‘Innovation Union’ Communication and the JRC also had overall responsibility for coordinating and preparing ‘A rationale for action’, the accompanying Commission staff working document that presented the evidence for the proposed policy options.

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<sup>50</sup> Regulatory aspects of nanomaterials COM(2008)366; European Parliament resolution on regulatory aspects of nanomaterials (2008/2208(INI)); Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products.

### *Helping achieve a more resilient banking sector*

In response to the financial crisis, in the summer of 2010, the Basel Committee on Banking Supervision has approved a revision of the banks' capital regulation, known as Basel III, with the goal of promoting a more resilient banking sector, a prompter to absorb financial shocks.

In cooperation with researchers from the Directorate-General for the Internal Market and Services and experts from academia, the JRC developed the statistical model SYMBOL (Systemic Model of Banking Originated Losses), which estimates the probability and the magnitude of any new potential crisis hitting the banking system. SYMBOL has been used to assess the macro-economic impact of Basel III via a cost-benefit analysis.

Results of the analysis will be used to formulate the new EU Directive on capital requirements ('CRD IV')<sup>51</sup> which is aimed at transposing Basel III to the EU Member States.

### *Analysing the future competitiveness of the EU ICT sector in emerging technologies*

The JRC and the Directorate-General for Enterprise and Industry launched a series of studies to analyse the prospects for success of European Information and Communication Technology (ICT) industries in the face of technological and market innovation<sup>52</sup>.

These studies explored areas where it is particularly important for the EU ICT industry to be competitive: online and mobile video games software, Web 2.0, displays (organic light emitting diodes — OLEDs, and e-paper), radio frequency identification, robotics, and embedded software in the automotive sector.

Each of the studies illustrates that European companies are actively present in emerging and disruptive ICTs and are supplying the market with relevant products and services. Nevertheless, the studies also show that the creation and growth of high-tech companies is still very complex and difficult in Europe, and too many innovative economic opportunities seem to escape European initiatives and ownership.

More information at: <http://is.jrc.ec.europa.eu/pages/ISG/COMPLETE.html>

### *Towards the second generation of the Eurocodes*

The adoption of common European standards for construction (Eurocodes) have approached the final stage of national implementation as Member States are moving from their national construction codes to the Eurocodes: from 2010, all new public buildings and other civil engineering structures in the EU should be constructed with similar levels of structural safety.

The pre-normative research performed at the JRC's European Laboratory for Structural Assessment (ELSA) has significantly contributed to the development of the Eurocodes to their present stage, especially Eurocode 8, which covers the design of all civil engineering structures in seismic zones.

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<sup>51</sup> Capital Requirements Directive ('CRD IV'), comprising Directive 2006/48/EC of the European Parliament and of the Council relating to the taking up and pursuit of the business of credit institutions, and Directive 2006/49/EC of the European Parliament and of the Council on the capital adequacy of investment firms and credit institutions.

<sup>52</sup> Commission Staff Working Document (SEC (2010) 627): Europe's Digital Competitiveness report; SEC (2010) 1276: Commission Staff Working Document, European Competitiveness Report 2010. Accompanying document to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, An integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Front Stage COM(2010) 614.

The JRC provides support<sup>53</sup> to the implementation of the Eurocodes by developing informatics tools and producing policy support documents, fostering training and promotion of the Eurocodes within Europe and outside and by facilitating further harmonisation. The JRC is also concerned with extending the Eurocodes to additional fields of structural design, such as glass structures, and incorporating in construction standards the emerging demands of modern societies, such as sustainability. Based on the work of the Mandate Working Group coordinated by the JRC, in 2010 the European Commission issued a new mandate to the European Committee for Standardisation (CEN) for the second generation of Eurocodes which will further facilitate implementation at national level and support market developments, innovation and research in the European construction sector.

#### **4. Policy adoption**

##### *Supporting the ‘Seveso III’ Directive on the control of major accident hazards*

On 21 December 2010, the Commission adopted a new proposal for a Directive on the control of major accident hazards, the so-called ‘Seveso III’ Directive<sup>54</sup>. The JRC developed, together with Member States’ experts and in coordination with the Directorate-General for the Environment, the methodology and scientifically sound options to align Seveso categories with the new classification of dangerous substances; it also analysed the safety impact of these options. For the first time, the scope of the Directive, i.e. the obligations of the industrial installations, is based on the hazard potential of the dangerous substances and activities, as analysed in the JRC report. Furthermore, a number of new requirements are based on the JRC’s work, such as the requirement to address natural hazards as causes of accidents and the requirement to formally include a review of past accidents in the assessment — e.g. from eMARS<sup>55</sup> — with the same substances or processes and to explicitly evaluate specific measures to prevent similar accidents.

#### **5. Policy implementation**

##### *International standards to measure mycotoxins in infant food*

Two analytical methods developed by the JRC to determine the levels of mycotoxins in infant food were adopted by the European Committee for Standardization (CEN) in 2010. Mycotoxins are toxic contaminants produced by fungi. These toxins can enter the food chain as a result of crops infected by fungi, either by being directly consumed by humans, or by being used as feed for animals.

Infants and young children are more vulnerable than adults to many toxic substances, due to the fact that they have a relatively high intake of certain foodstuffs compared to their body weight. For this reason, European legislation<sup>56</sup> has set lower maximum limits for toxins in certain foods intended for infants and young children. The analytical methods developed by the JRC are for measuring zearalenone and aflatoxin B1 in cereal products for infants and young children (EN 15850 and EN 15851 respectively).

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<sup>53</sup> Council Directive 89/106/EEC on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products.

<sup>54</sup> COM (2010) 0781 - Proposal for a Directive of The European Parliament and of the Council on control of major-accident hazards involving dangerous substances.

<sup>55</sup> The Major Accident Reporting System eMARS is a database of ‘major accidents’ reported under the Seveso Directive, hosted by the Organisation for Economic Co-operation and Development (OECD) and the United Nations Economic Commission for Europe (UNECE), and managed by the JRC’s Major Accident Hazards Bureau (MAHB).

<sup>56</sup> Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs.

### *Measuring heavy metals in seafood*

A study<sup>57</sup> by the JRC benchmarked the abilities of laboratories around the world to determine heavy metals (arsenic, cadmium, lead, mercury, methylmercury and inorganic arsenic) in seafood. The outcome of the exercise was generally positive, with 80 % to 96 % of laboratories reporting satisfactory measurement results, depending on the heavy metal considered.

In contrast to the results of a previous study of arsenic in rice, the values reported for inorganic arsenic showed a large spread, indicating that the composition of the sample (in this case, seafood), has a major influence on the analytical determination of inorganic arsenic. This is a crucial consideration for legislators, when specifying a maximum level of inorganic arsenic in seafood<sup>58</sup>.

The study was organised in support of the European Cooperation for Accreditation (EA), the Asia Pacific Laboratory Accreditation Cooperation (APLAC) and the national reference laboratories associated with the EU Reference Laboratory for Heavy Metals in Feed and Food.

### *Initiatives for reducing energy consumption in buildings*

‘GreenLight’ and ‘GreenBuilding’ are two voluntary programmes managed by the JRC that invite private and public organisations to reduce their energy consumption<sup>59</sup>.

The GreenLight programme, started in 2000, has recruited 644 European partners. By replacing old-fashioned lighting with modern, low-energy lamps, and by controlling the use of lighting, they have in total reduced their energy consumption by 241 GWh/year.

The GreenBuilding programme, started in 2005, promotes improved energy efficiency in buildings through measures such as thermal insulation, efficient heating and cooling, intelligent control systems, and PV panels. GreenBuilding has gathered over 280 partners with 360 buildings which save an estimated 304 GWh/year in primary energy (e.g. electricity, natural gas and heating oil), which corresponds to an average saving of 41 %.

The JRC monitors and assesses the programmes’ participants and publishes regular reports on the energy savings achieved and energy technologies used.

### *EU leading the way in newly installed solar cells*

The ninth edition of the annual ‘Photovoltaic Status Report’ provides policy makers and industry with an overview of the current activities regarding research, manufacturing and market implementation. The report highlights Europe’s continued leading position for newly installed photovoltaic cells, and accounts for three quarters of new solar systems worldwide, with a peak capacity of 5.8 GW.

The production of photovoltaic cells increased worldwide to 11.5 GW in 2009 (56 % up from 2008). In the EU, it remained at 2 GW (1.9 GW in 2008). A special feature is a shift in the market from a supply-driven to a demand-driven logic. The resulting over-capacity has caused a dramatic price reduction of almost 50 % over two years. This has resulted in an average selling price of modules of less than EUR 1.5 per Watt.

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<sup>57</sup> IMEP-30: Total arsenic, cadmium, lead, and mercury, as well as methylmercury and inorganic arsenic in seafood - Interlaboratory Comparison Report.

<sup>58</sup> Commission Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs.

<sup>59</sup> Commission Regulation (EC) No 244/2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps.

The report, based on a survey of more than 300 companies, is a key reference document and was cited more than 1 000 times in Alpha Galileo, the science news service for the EU. The information provided in the report supports the European Directive on the promotion of the use of energy from renewable sources<sup>60</sup>.

### *Implementing Europe's energy technology policy — the role of SETIS*

The JRC coordinates and operates the Commission's Strategic Energy Technology Information System (SETIS), which supports the implementation of the European Strategic Energy Technology Plan (SET-Plan)<sup>61</sup>. SETIS enabled the kick-off of the European Industrial Initiatives for the development of low-carbon energy technologies by developing the associated implementation plans. This was achieved in collaboration with public and private stakeholders, identifying the priorities and the necessary activities to be undertaken for the rapid implementation of SET-Plan.

Furthermore, SETIS established a protocol for monitoring and reviewing the progress of SET-Plan, and proposed key performance indicators and analytical procedures for their calculation. SETIS initiated the mapping of European projects with SET-Plan relevance, essential for joint programming between the Member States and the Commission for implementing SET-Plan. The SETIS website was further developed and offers online tools for the assessment of energy technologies.

### *Biofuels sustainability: JRC methodology for calculating greenhouse gas emissions from land use changes.*

Increased EU demand for biofuels could have an impact on land use in both EU and non-EU countries, leading to significant changes in carbon stocks in soils and biomass, and subsequent changes in greenhouse gas emissions. This issue is widely discussed, in particular due to the high uncertainties in the calculations of the overall impact of these emissions.

In support of this debate, the JRC first developed a guidance document\* for assessing carbon stock changes in soils and biomass due to the cultivation of biofuel crops. Following this guidance, a new methodology for estimating changes in greenhouse gas emissions from soil and above- and below-ground biomass resulting from global land use changes was developed and referred to in COM(2010) 811\*\*. The Renewable Energy Directive\*\*\* sets an ambitious target of 10 % share of renewable energy in the transport sector.

### *Life cycle assessment — Methodological guidelines launched*

The main set of documents of the International Life Cycle Data (ILCD) handbook was officially launched on 12 March 2010 in the Berlaymont building in Brussels. This handbook provides detailed guidelines on how to conduct a Life Cycle Assessment (LCA):

- general guide for LCA: 'detailed guidance', 'provisions and action steps' and 'review schemes';
- specific guide for life cycle inventory 'data sets' and their 'reviewer qualification';
- framework and requirements for life cycle impact assessment models and indicators;

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<sup>60</sup> Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources.

<sup>61</sup> COM(2007) 723 final: Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: 'A European Strategic Energy Technology Plan (SET-PLAN) — Towards a low carbon future'.

- analysis of existing environmental impact assessment methodologies for use in LCA.

LCA helps quantify the emissions, resources consumed and the pressures on the environment and human health that can be attributed to a product<sup>62</sup>. The handbook, developed by the JRC in cooperation with the Directorate-General for the Environment, is in line with international standards and was established through a series of extensive public and stakeholder consultations.

### *Nuclear forensic support to Member States*

The JRC's work in nuclear forensics plays a very important role in nuclear security in Europe<sup>63</sup>.

In 2010 nuclear forensics support to EU Member States was provided in four cases. Each of the cases consisted of multiple items of scrap metal contaminated with uranium. Three incidents occurred in the Netherlands and one in Finland. The scrap metal shipments were coming both from inside and outside the EU. The detailed nuclear forensic analysis included isotopic composition analysis of uranium, impurity measurements, production date determination and microstructure analysis. In these four cases, the uranium found in the scrap metal proved to be a mixture of components of different enrichment including natural uranium, low enriched uranium and highly enriched uranium. The complex analytical data, together with information about the incidents themselves, allowed in most of the cases the origin of the material to be traced, which is of paramount importance for stopping further dumping of radioactively contaminated scrap metal from the nuclear facilities in question.

### *Nuclear safety (Clearinghouse): learning from others*

For Nuclear Power Plants (NPPs), a worldwide collective experience of more than 14 000 operating reactor-years has been accumulated to-date. Enhancing the use of this collective experience in the EU to improve nuclear safety<sup>64</sup> is the objective of the 'European Clearinghouse on Operational Experience for NPPs'. Members of the European Clearinghouse include nuclear safety authorities from all the 15 EU Member States having NPPs, Switzerland, and several EU technical support organisations and representatives from the nuclear industry and international organisations. The Clearinghouse's activities in 2010 focused on lessons learned from nuclear fuel related events in NPPs, maintenance issues and electrical transients. In answer to the nuclear renaissance, a topical report on events caused by anomalies during the construction and commissioning of new NPPs has been issued. This report led to recommendations in various fields: management of temporary devices, quality assurance, welding, labelling, task interfaces, and management of non-conformances.

### *Euratom on-site laboratories at Sellafield and La Hague: 10 years of operation*

To account for nuclear material in the reprocessing plants of Sellafield (UK) and La Hague (France), the European Commission, represented by the Directorate-General for Energy (DG ENER), has installed two on-site laboratories<sup>65</sup>. Both laboratories are operated by the JRC and they offer the Euratom safeguards inspectors

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<sup>62</sup> COM(2008) 397 final: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the sustainable consumption and production and sustainable industrial policy action plan.

<sup>63</sup> Council Decision 2010/212/CFSP relating to the position of the European Union for the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons.

<sup>64</sup> Council Directive 2009/71/EURATOM establishing a Community framework for the nuclear safety of nuclear installations.

<sup>65</sup> Commission communication to the European Parliament and to the Council concerning a Commission decision on the implementation of on-site laboratories for verification analysis of safeguards samples at reprocessing plants (SEC(92) 515 final).

an independent analytical capacity of the highest quality and provide sample results within a short time. The JRC and DG ENER celebrated the 10th anniversary of the laboratories on 15 June 2010 with a symposium at Karlsruhe palace. The on-site laboratory in Sellafield went into operation in October 1999, the on-site laboratory in La Hague in June 2000. Presentations provided an overview of the history and evolution of the on-site laboratories and of the role of safeguards in Europe.

The laboratories have become a key factor for the accurate accountancy verification of nuclear materials with 1 044 samples processed in 2010 and a total throughput of over 9 000 samples since going into operation. The concept of an on-site laboratory, which is based on the operational experience of these two European laboratories, was also adopted by the International Atomic Energy Agency (IAEA), Vienna, and the Japanese safeguards authority for the Rokkasho reprocessing plant in Japan.

### *Towards a European nuclear security training centre*

The Nuclear Security Summit in April 2010 highlighted the threat of nuclear terrorism and emphasised the need for preventive measures. Next to appropriate technical equipment, trained personnel are of key importance for increasing nuclear security. The EU CBRN Action Plan to strengthen chemical, biological, radiological and nuclear security<sup>66</sup>, which was approved by the Council on 30 November 2009, acknowledges the need for specific training in nuclear security, in particular for law enforcement officers.

The JRC, in consultation with Member States, carried out a feasibility study for establishing a nuclear security training centre which clearly identified the added value of practical training involving nuclear material. As a consequence, the JRC was tasked by the Directorate-General for Home Affairs to implement a European Nuclear Security Training Centre (EUSECTRA).

The overarching goal of EUSECTRA is to improve Member States' capabilities to address the threats associated with illicit incidents involving nuclear or other radioactive materials. The training centre will complement national training efforts by providing hands-on training to front-line officers and their management as well as national trainers and other experts in the field, using real nuclear materials. EUSECTRA will thus be playing a major role in the fight against illicit trafficking of nuclear and radioactive materials in the EU.

### *Determining the source of plutonium contamination*

A JRC paper published in February 2010 documented a significant advancement in the 'fingerprinting' of plutonium contamination, giving nuclear safeguards authorities more information on how nuclear material was produced and helping to identify sources of environmental contamination.

Using a technique known as Thermal Ionisation Mass Spectrometry (TIMS), the researchers measured the ratio of plutonium isotopes with unprecedented accuracy in reference samples obtained from the International Atomic Energy Agency (IAEA) and the US National Institute of Standards and Technology (NIST, USA), and also on soil and moss samples collected from the site of the Chernobyl accident. The researchers published data with considerably low uncertainties not only for the isotope ratio of  $^{240}\text{Pu}/^{239}\text{Pu}$ , but also — for the first time — for the ratios of  $^{241}\text{Pu}/^{239}\text{Pu}$  and  $^{242}\text{Pu}/^{239}\text{Pu}$ . The results confirmed the suitability of the measurement technique, and the researchers could identify with confidence whether the environmental contamination originated from reactor-grade or weapons-grade plutonium. The published work represents a

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<sup>66</sup> COM(2009) 273 final: Communication from the Commission to the European Parliament and the Council on strengthening chemical, biological, radiological and nuclear security in the European Union – an EU CBRN Action Plan.

further advance in environmental sample analysis to strengthen the effectiveness of nuclear safeguards in line with global nuclear non-proliferation objectives<sup>67</sup>.

### *Robust methods for GMO detection ready at hand*

The ‘Compendium of Reference Methods for GMO analysis’, a reference report published by the JRC in 2010, lists 79 GMO detection methods which were validated according to international standards. This compendium, developed jointly by the EU Reference Laboratory for Genetically Modified Food and Feed (hosted by the JRC) and the European Network of GMO Laboratories (ENGL), presents the technical state-of-the-art in GMO detection methods.

This work supports the implementation of the Regulation on official food and feed controls<sup>68</sup>, which foresees that the European reference laboratories are responsible for providing national reference laboratories with details of analytical methods, including reference methods. Each method is described in a user-friendly way, facilitating the implementation of GMO legislation by official control bodies in the Member States and therefore ensuring effective control of food and feed in Europe.

### *Safety of the feed-food chain — a priority for European consumers*

More than 1 000 feed additives are currently authorised in Europe but according to European legislation<sup>69</sup> they need to be re-evaluated. It is the task of the EU Reference Laboratory for Feed Additives hosted by the JRC to check the appropriateness of analytical methods which are required to monitor the correct use of these substances. The deadline for submitting applications for the re-evaluation of additives currently on the market was November 2010. The EU Reference Laboratory for Feed Additives in Geel was tasked with checking the documentation submitted by the applicants. In total, about 440 applications need to be evaluated, a task which will take several years. The completion of this evaluation, which is carried out in close cooperation with other Commission services and the European Food Safety Authority, will be a further milestone in safeguarding the safety of the feed–food chain in Europe.

### *Alternative methods to animal testing*

The year 2010 was a landmark in the history of the European Centre for the Validation of Alternative Methods (ECVAM). The revised Directive for the protection of animals used for scientific purposes<sup>70</sup> established ECVAM as EU Reference Laboratory for the validation of alternative methods to animal testing. The assessment of the robustness, reliability and predictive capacity of the alternative methods includes independent peer review of validation study reports. In 2010, ECVAM re-modelled its advisory structure, appointing 15 external experts to serve as a standing independent peer review body, complemented by separate networks of stakeholders and regulators.

ECVAM also carries out, on request of the Directorate-General for Health and Consumers, a review of the current status of alternative non-animal methods for the safety testing of cosmetics for human use, in view of the upcoming 2013 marketing ban of cosmetics tested on animals. The report is prepared in cooperation with scientists proposed by Member State competent authorities, animal welfare organisations and the cosmetics industry, and it included a public consultation phase.

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<sup>67</sup> COM(2009) 143 final; Communication from the Commission to the Council and the European Parliament on nuclear non-proliferation.

<sup>68</sup> Regulation (EC) No 882/2004 of the European Parliament and of the Council on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules.

<sup>69</sup> Regulation (EC) No 1831/2003 of the European Parliament and of the Council on additives for use in animal nutrition.

<sup>70</sup> Directive 2010/63/EU of the European Parliament and of the Council on the protection of animals used for scientific purposes.

## 6. Policy evaluation

### *Supporting regional cohesion in Europe*

Cohesion policy<sup>71</sup> has had a proven effect in helping the European Union's regions to develop, but it will face some new challenges in years ahead. These are the findings in the European Commission's latest report on economic and social cohesion, published every three years. This fifth cohesion report uses some of the first results of simulations performed by the JRC with the prototype system of regional models (RHOMOLO) to illustrate the possible impact of EU support.

The Commission's fifth report on economic, social and territorial cohesion — 'Investing in Europe's future' - recognises the need to use models in line with empirical evidence for examining the effects of cohesion policy. The results and prospects are positive and a new arrangement between the JRC and the Directorate-General for Regional Policy was signed in December 2010. The objective is for the JRC to take over the validation of the model, develop it further and use it to evaluate the impact of various scenarios in support of the cohesion policy.

### *The Digital Observatory for Protected Areas (DOPA) presentation at Nagoya*

The 10th Conference of the Parties (COP10) of the UN Convention for Biological Diversity (CBD)<sup>72</sup> held in Japan, October 2010, led to the adoption of the Nagoya Protocol, binding 193 parties<sup>73</sup>, once ratified. It established targets to prevent biodiversity loss through 20 specific goals, including a call for increasing protected areas from 10 % of the world's terrestrial areas and inland water areas to 17 %, and from 1 % of coastal and marine areas as biodiversity protection zones to 10 %. One example of the support to biodiversity policy was that JRC scientists organised a side event in Nagoya about their Digital Observatory for Protected Areas (DOPA - <http://dopa.jrc.ec.europa.eu/>) in collaboration with the United Nations Environment Programme - World Conservation Monitoring Centre, the Global Biodiversity Information Facility, BirdLife International and the Royal Society for the Protection of Birds.

DOPA is designed to assess the state of and pressure on protected areas on a global scale. It aims to become the backbone information system of the European Commission on the matter and will help to prioritise protected areas in developing countries according to their biodiversity and the pressures to which they are exposed. This supports decision-making and fund allocation processes. The side event was one of few that was webcast by the organisers and reported about in the CBD's newsletter.

## 7. Highlights from the JRC's thematic areas

### 7.1 Towards an open and competitive economy

Contributing to the goals of the Europe 2020 Strategy by providing integrated socio-economic and policy support to macro-and micro-economic policies, the structural reform agenda, employment, the education and skills agenda, the digital agenda and the Innovation Union.

### *The EU Industrial R&D Investment Scoreboard*

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<sup>71</sup> SEC(2010) 1348 final: Conclusions of the fifth report on economic, social and territorial cohesion: the future of cohesion policy; COM(2011) 17 final: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Regional Policy Contributing to Sustainable Growth in Europe 2020.

<sup>72</sup> UNEP/CBD/COP/10/27: report of the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity <http://www.cbd.int/cop10/>; <http://www.iisd.ca/biodiv/cop10/enbots/29octe.html>; <http://webcast.cop10.go.jp/player.asp?id=2918&type=ondemand>

<sup>73</sup> All Nagoya resolutions adopted are under: <http://www.cbd.int/cop10/doc/>

The 2010 EU Industrial R&D Investment Scoreboard presents information on the top 1 000 EU companies and 1 000 non-EU companies investing in R & D in their latest reporting year. The scoreboard includes data on R&D investment along with other economic and financial indicators taken from the companies' latest published accounts, i.e. the 2009 fiscal year accounts. The global economic and financial crisis that started in 2008 and hit companies worldwide is fully reflected in the company accounts used for the 2010 scoreboard.

The report examines the performance of individual companies among the top R&D investors, and analyses the main indicators of the company data aggregated by industrial sectors and world regions respectively, with comparisons between the EU companies and their main competitors. It also includes a supplementary analysis of the characterisation of the scoreboard companies according to their age of foundation and how it correlates with their R&D. The European Commission's 2010 'EU Industrial R&D Investment Scoreboard' shows that R&D investment by top EU companies fell by 2.6 % in 2009, even though sales and profits fell much more, by 10.1 % and 21.0% respectively. The fall in R&D investment by leading players in the US, at 5.1 %, was twice as sharp as in the EU, but the worldwide reduction was lower, at 1.9 %. Japanese firms maintained their level of investment.

### *Creativity in schools: a survey of teachers in Europe*

Understanding teachers' perception of creativity and their current teaching practices is essential for developing policies on creativity and innovation for education in Europe. A JRC study<sup>74</sup> examines how teachers perceive, understand and foster creativity through their teaching and through the use of Information and Communication Technology (ICT). This analysis is part of a bigger study on 'Creativity and innovation in education and training in the EU-27'.

Teachers' opinions were collected through an online survey, gathering data from 32 countries and at distinct school levels. Although not representative, teachers' positive opinions on creativity in education are much stronger than their practices. While teachers claim to foster many skills that are connected to creativity, traditional teaching and assessment methods, and resources, are still predominant. Teachers also agree that ICT has improved their teaching and that it could be used to enhance creativity, but usage of ICT remains largely related to more traditional technologies.

### *The state of the electronic identity market (eID): technologies, stakeholders, infrastructure, services and policies*

Empowering citizens to be active and confident in the new digital society, which must deliver sustainable economic and social benefits, is of prime importance to Europe. Therefore the creation of an e-authentication scheme that is encompassing, interoperable and based on open standards is crucial — one that reduces EU business and public sector costs and barriers to the provision and take-up of identity-based services, and one that empowers citizens to take and expect responsibility in the digital domain.

The study 'The State of the Electronic Identity Market (eID): Technologies, Infrastructure, Services and Policies' asserts that the market for eID products and services is fragmented, far from efficient and lacks viable business models. Services based on mobile authentication and identity management have not yet realised their huge potential value. This study<sup>75</sup> provides exploratory evidence of the potential of eID for the Single Digital Market. A clear understanding of this market is crucial for Digital Agenda policies on identification and authentication, e-signature and interoperability.

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<sup>74</sup> <http://is.jrc.ec.europa.eu/pages/EAP/iceac.html>

<sup>75</sup> Study accessible at: <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=3739>

## *Prospective insights on R&D in ICT (PREDICT)*

The *PREDICT* project<sup>76</sup> analyses R&D investments in the EU Information and Communication Technology (ICT) sector. Results are presented in annual reports jointly published by the JRC and the Directorate-General for the Information Society and Media. PREDICT supports directly the ICT R&D and innovation policy of the European Commission and has become a unique source of information on ICT R&D investments in the EU and its main global competitors. PREDICT relies on the latest available official statistics delivered by Member States, Eurostat and the Organisation for Economic Co-operation and Development (OECD). It combines, in a unique way, three complementary perspectives: national statistics (covering both private and public R&D expenditures), company data, and technology-based indicators such as patents. Each annual report also includes a specific thematic analysis. In 2010, it focused on the internationalisation of ICT R&D. According to the latest PREDICT report Europe's Information and Communication Technologies (ICT) sector, accounting for just 4.8 % of GDP, leads the way in private research and development (R&D) in the EU, with 25 % of total investment and 32 % of researchers working in the private sector in 2007.

## *Analysing robustness of universities' rankings*

A paper<sup>77</sup> published by the JRC on research policy in October 2010 calls into the question the use made by media and social actors of popular world university rankings such as the Academic Ranking of World Universities (ARWU) of Shanghai Jiao Tong University and the UK's Times Higher Education Supplement (THES). These rankings are routinely taken at face value, and thus are politically influential. Still, they are sensitive to both the conceptual framework and the modelling choices made in their construction. A robustness analysis tested what inference can be drawn based on these measures. The JRC concludes that, while university-level and country-level statistical inferences are very fragile, the inference on macro-regions is more robust. In other words, these rankings are good to ring the alarm on the poor performances of continental Europe versus the United States, and to identify the excellence of the best British universities, but cannot be used to pick winners among individual countries in continental Europe.

## 7.2 Development of a low carbon society

Addressing energy, transport, clean production technologies and consumption patterns, issues that will be pivotal to the progressive transition of the EU towards a low carbon society. The ever-increasing demand for policy support in this area has been demonstrated by many success stories in 2010, including the JRC methodology for calculating GHG emissions from land use changes (which has made a key contribution to the biofuels sustainability debate), energy efficiency initiatives such as 'GreenLight' and 'GreenBuilding', and the continued principal role of the energy information system SETIS in the implementation of Europe's energy technology policy (refer to page 22 for more details).

## *Photovoltaic standards*

*Standards* for emerging technologies such as photovoltaic cells are crucial to cementing the gains of innovation and to ensuring an open and transparent market. The JRC's European Solar Test Installation (ESTI) continues to be a leading force in the development of international standards in this area, and is also chairing the International Electro-Technical Commission (IEC) Technical Committee 82.

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<sup>76</sup> <http://is.jrc.ec.europa.eu/pages/ISG/PREDICT.html>

<sup>77</sup> Michaela Saisana, Béatrice d'Hombres and Andrea Saltelli. Rickety numbers: Volatility of university rankings and policy implications. Research Policy, 2011, Vol. 40 No. 1, pp. 165-177.

The new IEC 60904-4 standard sets requirements for ensuring calibration traceability to the International System of Units (SI) and contains methods developed at ESTI and previously published in scientific journals. December 2010 saw the final approval of IEC-61853-part 1, which sets a basis for implementing energy rating methods for photovoltaic modules. ESTI staff provided significant input, in particular simplification of the testing matrix, to ensure the standard is relevant for industrial applications. The development of an energy rating system that can provide an indication of power output in operation, as opposed to peak power under idealised conditions, is a long-awaited development of particular interest to end-users.

### *A tool for pan-European optimisation of a CO<sub>2</sub> capture and storage infrastructure*

Fossil fuels will, in the short- to medium-term, remain the main source for electricity generation in Europe, despite the significant ongoing efforts to promote renewable energy technologies. CO<sub>2</sub> Capture and Storage (CCS) is considered one of the most promising technological options for reducing CO<sub>2</sub> emissions. It offers a bridge from the fossil-fuel-dependent economy towards a carbon-free future. Large-scale deployment of CCS in Europe will require the development of a new infrastructure most likely consisting of a network of pipelines and — to a lesser extent — shipping routes.

The JRC has developed a tool — InfraCCS — that can describe the likely extent and cost of such a network at the European scale for the period 2015-50. The tool contains a number of methodological innovations which allow it to compute the optimal minimum-cost network when investments are coordinated at European level. The InfraCCS tool has been used to provide input for the Commission Communication ‘Energy infrastructure priorities for 2020 and beyond: A blueprint for an integrated European energy network’ (COM(2010) 677). In the scenario used for this purpose, the size of the optimal network grows steadily until 2030, to 8 800 km, requiring around EUR 9 billion of cumulative investment, followed by a step change towards 2050, and leading to a total investment of around EUR 29 billion.

### *Major ICT companies join JRC ‘Codes of conduct’ initiative to reduce electricity consumption*

The JRC manages voluntary codes of conduct for ICT companies to reduce energy consumption in both their premises and products. On 28 September 2010 in Brussels at the ‘ICT 2010 — Digitally Driven’ event, another 16 large ICT firms agreed to reduce electricity consumption of their broadband equipment and data centres by joining the codes of conduct. This should reduce their electricity consumption, in many cases by 50 %. In total, 36 of Europe’s biggest ICT companies already apply the codes of conduct.

### *Assessing indirect land use emissions*

The JRC biofuels experts have continued to play a key role in the global biofuels sustainability discussion. They provided reports on the assessment of Indirect Land Use (ILUC) which were required by both the EP and the Council for the implementation of the Renewable Energy Directive.

The reports are a major contribution to the debate on how to estimate emissions from ILUC, when food crops are diverted to biofuels or bioenergy. The studies show that ILUC is a critical component in assessing the impact of biofuels production on the release of GHG. They demonstrate the need to calculate both direct and indirect land use change to determine if there is a net gain (in terms of greenhouse gas emission reduction) in diverting food crops, or the land that produces them, to biocrops.

### *Ensuring Europe’s energy supply*

The identification and characterisation of gas transmission system vulnerabilities required from Member States for the implementation of the Directive on critical European infrastructures is an essential input to addressing the security of energy supply for Europe. The JRC has developed the GEMFLOW and SynerGEE models which can be used to model gas flows in the event of a major gas supply disruption.

### *Emission legislation for alternative fuels*

The JRC is actively involved with all main stakeholders in developing the future Euro VI emission standards for passenger cars. The JRC is addressing one of the main concerns related to the introduction of bioethanol blended with petrol as fuel, namely the impact of ethanol on evaporative emissions. The work conducted by the JRC, based on a multi-annual study conducted in the Vehicle Emission Laboratory (VELA) has shown that evaporative emissions from European passenger cars will increase due to several reasons of which the main are: the increased vapour pressure of the fuel due to ethanol addition; ethanol is harder to purge from the carbon canister trapping the vapours generated in the tank than normal hydrocarbons; the increased fuel permeation through the fuel system (tank and fuel line) which is made from plastic material.

Issues and possible solutions related to the work were presented in November at a workshop organised by the Directorate-General for Enterprise and Industry (DG ENTR) 'Future approach on emission legislation'. The JRC also suggested possible modifications to the current legislative certification procedure for evaporative emissions. Following up on the proposal, DG ENTR has set up an ad-hoc working group (within the Motor Vehicle Emission Group) which will be coordinated by the JRC to conduct a cost/benefit analysis of the new measures suggested and to develop a revised certification procedure for Euro VI.

### 7.3 Sustainable management of natural resources

Addressing issues related to the sustainable management and use of strategic resources such as food, water, air, minerals, energy and land.

#### *Quality Assurance for Land Parcel Identification Systems*

With 'direct aid'-payments of nearly EUR 44 billion in 2010 for managing agricultural land, the EU's Common Agricultural Policy (CAP) is a very significant policy instrument. The JRC supported it by, inter alia, standardising the quality assessment on the data collected on farmers' fields, i.e. the Land Parcel Identification Systems (LPIS) of Member States. Member States use such geographical information systems to administer and control direct aids, aiming at unique location of land and accurate, up-to-date quantification of its agricultural area. Today the 45 LPIS across the EU hold more than 135 million detailed land parcels, annually declared by some 8 million farmers in the EU; inaccurate records result in proportional errors in payments to farmers. Directorate-General for Agriculture and Rural Development audits had revealed weaknesses e.g., inclusion of land not eligible for aid. The JRC elaborated the quality elements essential for LPIS to perform its role<sup>78</sup>, e.g. total eligible area recorded extent of incorrect records, effects of Member State procedures, etc. As a direct outcome of the JRC's research and proposals on the LPIS quality assurance strategy, a new methodology was included in the CAP regulations (20 January 2010<sup>79</sup>); the JRC controls the sampling, applying industry-standard sampling plans in order to collect objective data, whilst Member States inspect the sample. LPIS quality is now assured using enhanced and harmonised procedures, based on Remote Sensing data also provided by the Commission. The JRC actively supported Member States during 2010, the first year of implementation, by offering detailed documentation, technology and know-how transfer, access to satellite imagery and providing sampling instructions.

#### *European Atlas of Soil Biodiversity*

The biodiversity within our soils plays a vital role in agriculture and in the water and carbon cycle. The JRC produced the first European Atlas of Soil Biodiversity<sup>80</sup>, a visually stunning publication of 128 pages, using striking photographs, informative texts and maps to explain and illustrate the great diversity of life in the soils across Europe. It also highlights areas within Europe where soil biodiversity is most at risk of decline - notably parts of the UK, the Benelux countries and northern France, although there are areas of high risk also

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<sup>78</sup> Official technical guidance by the JRC is on: [http://marswiki.jrc.ec.europa.eu/wikicap/index.php/GAMMA\\_0](http://marswiki.jrc.ec.europa.eu/wikicap/index.php/GAMMA_0)

<sup>79</sup> Art. 6.2 in Commission Regulation 2009R1122: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2009R1122:20100303:EN:PDF>, mostly based on Technical Note JRC59479, April 2010: 'LPIS quality inspection, EU requirements and methodology'

<sup>80</sup> Download from [http://eussoils.jrc.ec.europa.eu/library/maps/biodiversity\\_atlas/index.html](http://eussoils.jrc.ec.europa.eu/library/maps/biodiversity_atlas/index.html)

in several other Member States. For this map, potential threats to soil biodiversity were selected and ranked in an expert evaluation organised by the Soil Biodiversity Working Group, established by the JRC. Multiple pressure factors were included in the calculation of this new indicator map of potential threats, including land use change, habitat disruption, intensive human exploitation, invasive species, soil compaction, erosion and pollution. The atlas provides a comprehensive source of information for researchers, policy makers and teachers, attracting 4 000 downloads from the JRC soil website. It was launched at the conference ‘Soil, Climate Change and Biodiversity – Where do we stand?’ on 23–24 September 2010 and at a press conference in Brussels<sup>81</sup>.

### *Getting the most out of space-borne data: JRC-IES chairs new Climate Working Group*

The Committee on Earth Observation Satellites (CEOS), established in 1984 by the then G7, deals with activities required for proper international coordination of civilian Earth observation programmes and the optimum use of their data. Currently, 50 members and associate members, delegated by space agencies, national and international organisations participate. The 24th CEOS Plenary, held on 12–13 October 2010, accepted the proposal for the full establishment of a dedicated CEOS Working Group on Climate (WGClimate). JRC scientist M. Dowell was nominated as the chair of this group with John Bates (The National Oceanic and Atmospheric Administration) as vice-chair. WG Climate is set to ensure improved coordination among CEOS agencies in the production of fundamental climate data records and essential climate variables in response to the needs of the Global Climate Observing System (GCOS), and ultimately the United Nations Framework Convention on Climate Change (UNFCCC). It thus contributes to the review of compliance of satellite missions and products with the GCOS climate monitoring principles and with the ‘Guideline for the Generation of Datasets and Products meeting GCOS Requirements’.

### *Verification of European methane emissions based on atmospheric monitoring and inverse modelling*

Atmospheric methane (CH<sub>4</sub>) is the second most important anthropogenic greenhouse gas (GHG) after CO<sub>2</sub>. Atmospheric concentrations of CH<sub>4</sub> are about 2.5 times higher than preindustrial levels. Man-made CH<sub>4</sub> emissions come mainly from agriculture (ruminants, rice cultivation), landfills, but also coal mining, and oil and gas production. The most important natural source of CH<sub>4</sub> is wetlands. The estimations of the CH<sub>4</sub> emissions that are based on statistical data have large uncertainties, notably in relation to the emission factors. For instance, CH<sub>4</sub> emissions from wetlands show very large variability in space and time, which make estimates of total emissions very uncertain. Nevertheless the so-called bottom-up methods, based on statistics using activity data and emission factors are commonly used. However, emissions can also be estimated top-down, using atmospheric concentration measurements combined with inverse models. These can trace back the observed atmospheric GHG concentrations to the origin of the emissions. The JRC developed a sophisticated inverse modelling system for atmospheric CH<sub>4</sub> and N<sub>2</sub>O, based on a global three-dimensional atmospheric transport model and advanced optimisation techniques. In 2010, it has been applied to estimate the European CH<sub>4</sub> emissions over the period 2001–2006, using atmospheric observations from European and global surface monitoring stations. For global inverse modelling, also satellite data are used, such as the SCIAMACHY<sup>82</sup> instrument onboard the European environment research satellite ENVISAT. To further improve the top-down emission estimates, long-term, high-quality atmospheric measurements are indispensable. An integrated European monitoring network is currently prepared by the new European research infrastructure project ICOS (Integrated Carbon Observations System), involving also the JRC.

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<sup>81</sup> Press release: <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/1165&format=HTML&aged=0&language=EN&guiLanguage=en>

<sup>82</sup> SCIAMACHY = Scanning Imaging Absorption Spectrometer for Atmospheric Chartography

#### 7.4 Safety of food and consumer products

Contributing to the development of European legislation on safety of food and feed, and on other new consumer products.

This work serves a wide range of policy areas such as food and feed safety and quality including Genetically Modified Organisms (GMOs), safety of chemicals used in consumer products including nanomaterials, health and environmental aspects, and nutrition. The work focus is on the provision of appropriate evidence-based quality assurance tools to support standardisation across Europe and worldwide. This comprises the provision of validated methodology for chemical, molecular biological and toxicological analysis of food, chemicals and consumer products.

The year 2010 was successful in terms of consolidating our expertise in present and emerging areas and we initiated new cooperations with our national and international partners.

##### *Scientific policy support: the example of nanotechnology*

EU legislation provides European citizens with a high degree of assurance concerning the safety of food and consumer products available on the European market. Legislation, however, requires periodic revision to take into account the uptake of new technologies and the results from new scientific findings. Potential safety concerns regarding manufactured nanomaterials provide one contemporary example where existing legislation may need revising.

Nanostructured materials offer a range of benefits over traditional materials and enable the development of innovative applications and products. For European industry to capitalise in the best sense from nanotechnologies, it is essential that the EU has a well-considered regulatory framework. Important issues relate to the safe practices in the manufacturing process, health of consumers, and protection of the environment. In 2010, activities continued to lay the groundwork for a harmonised and evidence-based risk assessment in nanotechnology. One major milestone which attracted the attention of many stakeholders was the publication of a JRC Reference Report setting out the basis for discussion on a definition of nanomaterials (refer to page 18 for more details).

A further output has been the establishment of the first European repository of nanomaterials with a representative range of 25 different types of reference nanomaterials containing thousands of samples for each type. By making these samples widely available, the JRC enables the accurate comparison of harmonised data obtained in different test laboratories worldwide. Such data are of critical importance to regulatory bodies.

##### *Enhanced international collaboration*

With today's globalisation of markets, food safety and consumer protection are no longer domestic issues, but need to be addressed in an international context; 2010 was also a year of enhanced international cooperation in this area. In June 2010, the JRC launched an EU–China partnership with the Chinese Academy of Inspection and Quarantine. The partnership will support risk management measures as well as improve consumer protection through integrated approaches in the areas of nanotechnology and alternative methods to animal testing.

In October 2010, the JRC signed a collaboration agreement with the National Centre for Computational Toxicology (NCCT) of the US Environmental Protection Agency (EPA). The collaboration will facilitate the exchange of research materials and results useful for the development of integrated methods for predicting chemical toxicity. The NCCT, through its involvement in the US ToxCast programme, is generating toxicological profiles of hundreds of reference chemicals using a comprehensive array of automated high-throughput screening assays. This endeavour fits well with the expertise available in the JRC and with its

efforts to focus on the design and evaluation of integrated testing strategies for predicting chemical toxicity and thereby reducing the number of animal studies.

### *Towards new horizons: computational toxicology, endocrine disruptors and nutrition*

In 2010, strong focus was given to the development and harmonisation of integrated testing strategies which use a growing number of complementary scientific disciplines (e.g. computational chemistry, in-vitro toxicology, biophysical modelling, metabonomics, and systems biology) to provide more quantitative and robust tools for risk assessment. In this regard, the JRC successfully completed a computational toxicology study in support of the European Food Safety Authority (EFSA) on pesticides by estimating whether the metabolites of the pesticides left on crops might be more toxic than the pesticide itself. Predictions were based on structural relationships thereby avoiding further animal testing than that which was already required for the associated plant protection products themselves.

In 2010, the JRC also began consolidating its activities in the area of nutrition science and launched a bimonthly newsletter, Nutrition Research Highlights. The newsletter, which features recent nutrition research highlights with relevance to current societal debates and policies, is published on the website of the JRC's Institute for Health and Consumer Protection.

### 7.5 Nuclear safety and security

Providing independent and reliable scientific and technological assessment on nuclear safety of present and future generations of nuclear reactors, on the safety of the nuclear fuel cycle, and nuclear safeguards, non-proliferation and nuclear security issues.

#### *Inhibited nuclear fuel corrosion in a final repository*

The worldwide scientific consensus is that deep geological repositories provide the most promising solution for effective long-term isolation of spent fuel and that safe geological disposal is feasible. However, there are still open questions in the understanding of processes and the systems' performance that need to be addressed in order to reduce uncertainties. In this context, the JRC is studying the stability of spent fuel under repository conditions. Experiments carried out at the JRC have demonstrated that hydrogen (H<sub>2</sub>) produced by anaerobic corrosion of the cast iron in deep underground repositories of Europe's most advanced nuclear waste repository concepts developed in Sweden and in Finland greatly enhances the stability of the spent fuel matrix against oxidation caused by radiolysis and, as a consequence, drastically reduces the mobility of radionuclides. This result has a major impact on the performance assessment of a waste repository for spent nuclear fuel.

#### *Electronic structure of elemental curium studied by photoemission*

Understanding the electronic structure of actinides is the backbone of nuclear energy technological applications. Curium, sitting in the middle of the actinide series, is a key element on which to test the predictions of advanced theoretical models. The electronic structure of curium metal has been investigated by valence-band and 4f core-level photoemission spectroscopy using a high purity <sup>248</sup>Cm sample prepared at Oak Ridge National Laboratory, USA. The results obtained are in good agreement with atomic multi-electronic calculations and complete the study of the electronic structure of the actinide elements providing the basis for the global understanding of their relevant properties.

#### *New assessment of the melting behaviour of plutonium dioxide (PuO<sub>2</sub>)*

The melting temperature of PuO<sub>2</sub> is a fundamental material property highly relevant for nuclear fuel technology. It is likely that the accepted melting temperature of PuO<sub>2</sub> is underestimated significantly due to

the limitations of traditional measurement methods. The JRC has developed a new experimental approach: fast laser heating combined with containerless (self crucible) conditions and controlled atmosphere. The scientists of the JRC's Institute for Transuranium Elements (JRC-ITU) have now convincingly demonstrated that the true melting temperature of pure uncontaminated PuO<sub>2</sub> is  $3017 \pm 28$  K, is exceeding the generally accepted value by about 350 degrees, as published in *Materials Today* in 2010 (13-11 (2010), pp. 52–55). The study shows the high potential of the new experimental approach, which is now applied to the analysis of the melting behaviour of the UO<sub>2</sub>-PuO<sub>2</sub> system, a research subject of great relevance to the safety analysis of nuclear plants.

### *Experimental demonstration of a closed nuclear fuel cycle*

Long-term waste management solutions and closing the nuclear fuel cycle are key technology challenges to maintain and improve the safety level and competitiveness of advanced/sustainable (Generation IV) reactor concepts and related fuel cycles. The METAPHIX programme, devoted to the study of fast reactor metal fuel containing minor actinides and conducted at the JRC in collaboration with international partners (Commissariat à l'Énergie Atomique et aux Énergies Alternatives, France, and Central Research Institute of Electric Power Industry — CRIEPI, Japan), is currently the only project worldwide providing an experimental demonstration of all the steps of a closed fuel cycle. U-Pu-Zr-based fast reactor metal fuel containing minor actinides and reproducing the possible output of pyrometallurgical reprocessing of light water reactor spent fuel were fabricated at JRC-ITU, irradiated in the PHÉNIX reactor (with burn-up levels of ~2.5, ~7.0, and ~10.0 at. %) and post-irradiation examination and pyrometallurgical reprocessing. All investigations on the low and medium burn-up confirm that the presence of minor actinides in the fuel did not cause significant anomalies in terms of fuel behaviour during irradiation compared with conventional U-Pu-Zr fuels, marking a milestone towards achieving the goals for the development of Generation IV reactors.

### *High-resolution measurements of the <sup>241</sup>Am(n,2n) reaction cross-section*

<sup>241</sup>AmO<sub>2</sub> samples were irradiated at the 7-MV Van de Graaff accelerator at the JRC's Institute for Reference Materials and Measurements (JRC-IRMM) in Geel, Belgium, to investigate the <sup>241</sup>Am(n,2n) reaction cross-section<sup>83</sup>. Below 15 MeV, the present results are in agreement with data obtained earlier, whereas measurements above 15 MeV allowed experimental investigation to be performed for the first time.

The data are required to reliably predict the behaviour of reactor cores in both present and future fission reactors and to investigate the possible transmutation of long-lived radioactive waste. The present data were disseminated through the EXFOR database and are included in the latest release of the European (JEFF-3.1.1) and United States evaluated data files (ENDF/B-VII.1).

### *Improved decay data for <sup>177</sup>Lu*

An accurate knowledge of selected nuclear decay data is critical to a wide range of fields such as radiopharmaceutical production, radiotherapy and diagnostics, safeguards investigations, environmental monitoring, theoretical physics and radioactive waste disposal. In 2010, JRC-IRMM published measurement results for the half-life of <sup>177</sup>Lu, which is an emerging radionuclide for medical therapy. The physical half-life of the radionuclide is an important feature, because it should match with the rates of biological uptake and clearance of the radiopharmaceutical to maximise the dose delivered to target tissue and minimise the burden

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<sup>83</sup> C. Sage et al., *Physical Review C* 81, 064604 (2010)

on normal tissue. It was shown that four out of seven data published in literature were systematically too high and should be discarded.

### *R&D support for implementation of European Sustainable Nuclear Industrial Initiative: safety assessment of innovative reactor systems*

The JRC plays a leading role in the R&D needed for the safety assessment of next generation nuclear fission (Generation IV) energy systems. In 2010, the JRC contributed to the adaptation and interpretation of the International Atomic Energy Agency's nuclear safety standards in view of needs identified for fast neutron reactors and high temperature gas cooled reactors. Using state-of-the-art computational tools in the fields of Monte Carlo neutronics, thermal hydraulics, fluid dynamics, as well as safety assessment, the JRC's Institute for Energy (JRC-IE) carried out performance assessment, optimisation of core characteristics and accident analyses in the framework of the European collaborative project on the 'Sodium-cooled fast reactor' (CP-ESFR) and analyses of steam-generator tube leakages in the framework of the 'European lead-cooled fast reactor' project (ELSY LFR).

### 7.6 Security and crisis management

Contributing to the development of new technological approaches to enhance the security of the citizen, including support to crisis management.

### *Global Early Alerting and Reporting pilot platform for chemical, biological, radiological, nuclear and pandemic influenza threats*

The Global Early Alerting and Reporting (EAR) platform for health security threats was released by the JRC in 2010 for intensive testing by the project partners.

The EAR platform builds upon the existing early threats' detection and crisis information management systems, such as the JRC's Medical Information System (MedISys)<sup>84</sup> and the Health Emergency and Diseases Information System (HEDIS) respectively, establishing a common web-based platform that serves to enhance global situation awareness, common threat assessment and alerting, and information sharing in order to improve the early identification of intentional and unintentional threats to public health, thus in turn improving early action measures.

This initiative was established within the framework of the international partnership between the Ministries of Health of the G7 countries and Mexico, the European Commission (represented by the Directorate-General for Health and Consumers and the JRC) and the World Health Organization under the Global Health Security Initiative (GHSI).

### *Radio frequencies for new and faster wireless services*

The EU's first radio spectrum policy programme 2011-15<sup>85</sup> recognises the strategic role of the JRC in the standardisation process through laboratory-based measurements. The proposal includes steps towards efficient spectrum management and availability of adequate spectrum for wireless broadband as a key action in the Digital Agenda for Europe. Access to the radio spectrum is essential for a huge range of activities from telephony to transport applications, and is crucial to ensure that EU citizens can enjoy the benefits of new digital communications services and fast broadband connections. As a limited natural resource, the radio spectrum needs to be used efficiently while avoiding harmful interference using new techniques such as

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<sup>84</sup> <http://medusa.jrc.it/>

<sup>85</sup> COM(2010) 471 final of 20.09.2010

cognitive radio. The JRC scientists carried out experimental measurements on radio frequency interference in the European Microwave Signature Laboratory (EMSL) to validate simulation results proposed by Member States at the European Conference of Postal and Telecommunications Administrations.

### *North Sea fish population: fishing pause during WWII provides unique insights*

JRC scientists led an international study<sup>86</sup> examining the collateral effects of the six-year closure of the North Sea during World War II on migratory fish species. Understanding how commercial fishing pressures, management regimes and environmental changes interact with the ecology of fish populations is a key question for fisheries science. The question becomes more difficult to answer using recent time-series data since fishing pressure has been ubiquitous over recent decades. Results of the study showed that fish responded rapidly and positively to the sharp reductions in harvesting rates between 1939 and 1946, and the numbers of older fish in the population reacted earlier, and in much greater proportion, than their younger counterparts in a kind of age-dependent wave. The authors conclude that protected areas are useful in the conservation of migratory species in temperate areas, that older fish benefit fastest and in greater proportion, and also that increases in the spawning stock may not lead immediately to enhanced numbers of younger fish.

### *Cyber Europe 2010: The JRC supports the first pan-European cyber security exercise*

Europe's cyber security experts put their skills to the test in the first-ever pan-European exercise held in November 2010. At Cyber Europe 2010, experts tried to counter simulated attempts by hackers to paralyse critical online services in several EU Member States. The event was organised by EU Member States with support from the European Network Security Agency (ENISA) and the JRC. The scale and coordination requirements for conducting exercises with many Member States are high, especially in the case of distributed exercises. In this exercise, the JRC provided scientific and technical support including the communication and coordination tools that made the exchange of hundreds of simulated events possible. Cyber Europe 2010 enhanced Member States' understanding of how cyber incidents are handled and it tested communication links and procedures.

### *Completion of the conformity tests on first generation electronic passports*

In June 2009, the new EU legislation on the electronic passport came into force<sup>87</sup>. The Regulation harmonises the security features (including biometrics) for the passports issued by Member States. Interoperability of passports and reading systems worldwide is based on the fact that the same technical specifications, issued by the International Civil Aviation Association (ICAO), are used. It was therefore necessary first to assess through testing and validation that passports conform to the specifications, and secondly that they can interoperate with different reading devices. The JRC's Identification and Biometrics Testing Laboratory played a fundamental role in testing prototype passports and readers during the phase that preceded the entry into force of the regulation. Following that, the Directorate-General for Home Affairs (DG HOME) asked the laboratory to test a set of official passports issued by EU Member States to verify their conformity to the specifications. In addition to standard test suites, the laboratory developed in-house a specific test suite and executed, for each passport, over 400 individual tests. The final report and the tests results were delivered to DG HOME in July 2010.

### *“Transparent Aid”: a global view on development and humanitarian projects*

With the creation of the European External Action Service (EEAS), the Lisbon Treaty reinforces coordination in the area of external relations. The ‘Transparent Aid’ project (TR-AID) is supporting the mandate of the

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<sup>86</sup> An unintended experiment in fisheries science: a marine area protected by war results in Mexican waves in fish numbers-at-age. Beare, D., Hölker, F., Engelhard, G. H., McKenzie, E. and Reid, D. G. (2010). *Naturwissenschaften*, Volume 97, Number 9, 797-808.

<sup>87</sup> Council Regulation (EC) No 2252/2004 of 13 December 2004 on standards for security features and biometrics in passports and travel documents issued by Member States.

Union and the Member States to coordinate their development policies and underpin the aid effectiveness agenda by specifically making data on development and humanitarian aid available from a single platform.

The new advanced search facilities implemented in TR-AID in 2010 allow users to view data, textually and graphically, on development and humanitarian projects financed by the Organisation for Economic Co-operation and Development (OECD), the United Nations Office for Coordination of Humanitarian Affairs (OCHA), selected Member States and the European Commission. The ground work for automating the EU Donor Atlas and Donor Matrix has been completed.

### 7.7 Reference materials and measurements

Maintaining a strong reference role in the area of standards and reference measurements.

#### *Twenty-four new reference materials*

A total of 24 new reference materials were released by the JRC's Institute for Reference Materials and Measurements (JRC-IRMM) during 2010, in areas such as food safety and quality (including GMOs), environmental monitoring, engineered materials and clinical testing.

In the field of environmental monitoring, three new certified reference materials are now available for water quality testing. These materials serve as a tailored, quality control tool for laboratories involved in the mandatory monitoring of the priority substances set out in the Water Framework Directive (2000/60/EC), and in response to the Groundwater Daughter Directive adopted in 2006 (2006/118/EC) for the assessment of the chemical balance in groundwater. Furthermore, reference materials for the testing of grass and soil for trace elements and for a fish oil for environmental monitoring of the levels of polychlorinated biphenyls (PCBs) were released.

In addition, two new Certified Reference Materials (CRMs) for the quality control of measurements of fine dust in ambient air were finalised. The monitoring of air quality is required by the European Air Quality Directives (2008/50/EC and 2004/107/EC). The new CRMs were developed to match the requirements of European legislation, in particular regarding the type of matrix (including the particle size) and the type and content of certified analytes.

In the area of clinical chemistry, JRC-IRMM released a reference material certified for cystatin C (ERM-DA471/IFCC). Cystatin C in human plasma is used as a marker of the proper functioning of kidneys, and can be used for testing children, the elderly, patients with low muscle mass, and persons in the early stages of kidney problems. Cystatin C is also used as a marker for cardiovascular risk and pre-eclampsia.

In the field of food safety and quality, three materials for food composition were added to the CRM catalogue. These materials help to ensure the correctness of the nutritional information on food labels. Other new materials include a material for testing of aflatoxins (very potent liver carcinogens) in feedstuff and one for chloramphenicol – an antibiotic used illegally as a growth promoter in pork muscle. These materials help to keep food sold in the European Union free from those substances. Furthermore, one set of materials for quality control of measurements for genetically modified cotton was issued.

In the field of engineered materials, a series of reference materials for the quality control of instruments for testing the impact toughness of steel was released. The use of these materials is mandatory under European legislation that makes direct reference to the international standard ISO-148 (e.g. Construction Products Directive 89/106/EEC for the stability of buildings and the Pressure Equipment Directive 97/23/EC for the stability of pressure vessels).

#### *Genetically Modified Organisms (GMOs)*

Legislation in the European Union requires food and feed products containing more than 0.9 % GMOs to be labelled, provided that the GMO has been approved for the European market.

In 2010, JRC-IRMM released a new series of GMO reference materials for the event T304-40 cotton (ERM-BF429) consisting of three different mass fraction levels of T304-40 cotton seeds powder with a nominal value of 0, 10 and 100 g/kg.

The genetically modified cotton (*Gossypium hirsutum*) event T304-40 is designed to control lepidopteran pests of cotton. The material was prepared according to ISO Guide 34 by gravimetrically mixing GM and non-GM cotton seed powders. The resulting GM ratios were confirmed by real-time polymerase chain reaction (qPCR) analysis after DNA extraction from the powder mixtures.

The JCR-IRMM supported the European Union Reference Laboratory for GM Food and Feed (EURL-GMFF), by providing 140 certified reference materials containing various concentrations of 98140 maize, T304-40 and GHB 119 cotton and RoundupReady soya. The CRMs are needed to maintain the ISO/IEC 17025 accreditation of EURL-GMFF.

### *New developments in nanotechnology*

In 2010, important steps forward were made in the field of metrology at the nanoscale. The JRC-IRMM has achieved ISO/IEC 17025 accreditation for the measurement of the size of nanoparticles by dynamic light scattering and centrifugal liquid sedimentation. The accreditation by the Belgian accreditation body BELAC confirms the proficiency of the Reference Materials Unit to measure sizes of nanoparticles. This external recognition for these measurements is the first in the JRC and among the first worldwide. It will make results obtained at JRC-IRMM accepted worldwide, and is invaluable for the further research activities in the field of nanotechnology.

The JRC also contributed to an important ISO technical specification defining key terms in the field (ISO/TS 80004-1:2010). This specification subdivides the term ‘nanomaterials’ into ‘nano-objects’ and ‘nanostructured materials’, and defines ‘nanoscale’ (size range from approximately 1 nm to 100 nm), nanotechnology, nanoscience and other terms. The publication of this ISO document is intended to facilitate communication between stakeholders in the field.

### *International conference: ‘The Future of Reference Materials — Science and Innovation’*

Following the official inauguration of a new reference material production building, an international scientific conference entitled ‘The Future of Reference Materials — Science and Innovation’ took place on 23–25 November 2010. The conference was held under the auspices of the Belgian Presidency of the Council of the European Union, and in the framework of the 50<sup>th</sup> anniversary of JRC-IRMM.

Over 130 participants from 26 countries around the world participated in the conference, which mapped out the current and upcoming measurement and testing needs for which challenging demands on reference materials are envisaged. Forward-looking contributions addressing the scientific and technological demands for the design, preparation and certification of such measurement standards were presented. The symposium covered a broad range of emerging scientific areas, from the ‘omics’ to functional materials as well as nanotechnology.

## 8. Selected horizontal activities

### 8.1 Intellectual property and technology transfer

Since 2001, the JRC has been responsible for managing the Intellectual Property Rights (IPRs) of the European Union, a task which includes the protection and exploitation of Commission-related IPRs. Throughout 2010, the JRC provided IPR assistance to many Commission services, focusing on training and awareness-raising on the importance of protecting IPRs.

IPR support to Commission services expanded in 2010, in particular to include new initiatives in the field of research and development, such as the development of framework conditions for Joint Programming for the aspects of IPR and dissemination of results, the ITER nuclear fusion programme and the International Science and Technology Center (ISTC) in Russia, the Science & Technology Centre (STCU) in Ukraine and selected Joint Technology Initiatives.

Of particular relevance was the support that the JRC has continued to give to the European global navigation satellite programmes managed by the Directorate-General for Enterprise and Industry. In preparation for the Galileo open-signal service planned for 2014, the JRC contributed to successful negotiations with European and US industry and drafted the IPR licence agreement. It has also contributed to the Global Navigation Satellite Systems (GNSS) procurement service contract, the regulation of use for the European Geostationary Navigation Overlay Service (EGNOS) and the co-existence agreement with the European Space Agency (ESA).

As a contribution to the implementation of the ‘Innovation Union’, the JRC, together with the Directorate-General for Research and Innovation, organised a stakeholder seminar in the field of knowledge transfer in Varese and Ispra under the aegis of the Belgian Presidency of the EU. Suggestions for practical follow-ups of the ‘Innovation Union’ communication as well as interesting new ideas for discussion came up during the highly interactive debates at the various technical sessions.

In 2010, the JRC launched an Innovative Projects competition which attracted considerable interest. Twenty-two applications were received, among which 12 projects were selected for funding. The winning projects came from five JRC Institutes and two of the selected projects are related to nuclear activities. Moreover, the JRC organised the ‘Speed dating’ event at the European Science Open Forum (ESOF) 2010 conference in co-operation with the Torino Chamber of Commerce and the Piemonte Regional Chamber of Commerce in the framework of the Enterprise Europe Network, of which the JRC is a partner. The goal of the meeting was to foster collaborative research between science and industry. Around 240 people, of whom around 140 representatives were from European private companies, participated in the event.

An example of a recent JRC licence is the patented SESAMONET (Secure and Safe Mobility Network) technology to the Italian association of the visually impaired<sup>88</sup>. This technology uses RFID (Radio Frequency Identification) microchips embedded in the ground to guide a visually impaired person through a predefined area. A testing path was installed and validated in the Polyclinic Gemelli in Rome in September and the JRC is negotiating with interested organisations from other EU countries.

### 8.2 JRC Reference Reports

JRC Reference Reports establish the current state of scientific knowledge in specific areas of research and aim to serve as a reference for scientists and policy makers alike. Although aimed at academics, civil servants,

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<sup>88</sup> Unione Italiana dei Ciechi e degli Ipovedenti – ONLUS (<http://www.uiciechi.it/>)

decision-makers, and practitioners in public administrations and private business, they are also intended to be accessible to interested non-specialists and the media.

### *Considerations on a definition of nanomaterial for regulatory purposes*

Nanomaterials are now used in many innovative technological applications and products, including a wide range of consumer goods. Yet, a widely accepted definition on which to base legislation is missing. Therefore, this work aims to discuss issues related to a definition of the term ‘nanomaterial’. It recommends that the specific term ‘particulate nanomaterial’ should be employed in EU legislation and that size should be used as the only defining property. The report also emphasises that the adoption of a definition will entail policy choices and political decisions, and it will have to be broadly applicable in EU legislation, be clear and unambiguous and in line with other approaches worldwide.

### *Compendium of reference methods for GMO analysis*

This report lists 79 reference methods for GMO analysis which have been validated according to international standards. The compendium, developed jointly by the European Union Reference Laboratory for Genetically Modified Food and Feed and the European Network of GMO Laboratories (ENGL), presents the technical state of the art in DNA-based GMO detection methods.

Each method is described in a user-friendly way, facilitating the implementation of GMO legislation by official control bodies. They will be used by EU Member States to organise official controls on GMOs.

### *Regulating air emissions from ships — the state of the art on methodologies, technologies and policy options*

Maritime transport causes about 4 % of global manmade CO<sub>2</sub> emissions, affecting air quality and contributing to climate change and human health problems. Although shipping is the most environmentally-friendly mode of transport with regard to greenhouse gas emissions it is estimated that, if no action is taken, these emissions will increase by 150–200 % by 2050.

This report provides the first comprehensive overview of methodologies for estimating air emissions from shipping, describes technological solutions and proposes policy options for reducing carbon emissions and air pollution in this sector. Analytical tools for an environmental strategy to regulate air emissions from ships integrated into an international framework are provided, taking into account all the pillars relating to the sustainable development of transport.

### *Background guide for the calculation of land carbon stocks in the biofuels sustainability scheme*

Renewable energy from biofuels should come from sustainable sources and deliver high greenhouse gas (GHG) savings. Land use changes for biofuel production can lead to changes in carbon stocks in soils and biomass and consequent changes in GHG emissions.

This Guide covers the calculation of land carbon stock changes and above- and below-ground vegetation due to land conversion for biofuel production in support of Directive 2009/28/EC. Economic operators are also supported to calculate the impact of land conversion on GHG emissions by using actual values for the carbon stocks associated with the reference land use and the land use after conversion. Therefore, this report contributes to ensure that European biofuels come from sustainable sources and meet the highest environmental standards.

### *Impacts of the EU biofuel target on agricultural markets and land use: a comparative modelling assessment*

The Renewable Energy Directive (2009/28/EC) requires that 20% of the EU's energy needs should be provided from renewable sources by 2020, and includes a target for the transport sector of 10% from biofuels.

This report analyses and discusses the agro-economic impacts of EU biofuel policies on agricultural production, trade and land use within and outside the EU up to 2020. Three agro-economic models, AGLINK-COSIMO, ESIM and CAPRI, are used in this study. They are able to identify policy impacts on supply and demand, trade flows, domestic and world markets, and give a consistent global picture of indirect land use change impacts triggered by price signals transmitted via market interactions.

## **ANNEX 9: GLOSSARY**

AAR – Annual Activity Report  
ABB – Activity Based Budget  
AMP – Annual Management Plan  
CEN – Comité Européen de Normalisation (European committee for standardisation)  
CENELEC - Comité Européen de Normalisation Électrotechnique (European Committee for Electrotechnical Standardisation)  
CRMs – Certified Reference Materials  
DPO – Data Protection Officer  
EDPS – European Data Protection Supervisor  
ERA – European Research Area  
ESOF – European Science Open Forum  
FP – Framework Programme  
GHG – Green House Gases  
GMO – Genetically Modified Organisms  
IAC – Internal Audit Capability  
IAEA – International Atomic Energy Agency  
IAS – Internal Audit Service  
ISO – International Organisation for Standardisation  
MAWP – Multi-annual Work Programme  
MP – Management plan  
MSU – Management Support Unit  
PPAG – Public Procurement Advisory Group  
PSN – Programme Support Network  
PUBSY – Publication system of the JRC  
OECD – Organisation for Economic Co-operation and Development  
QM – Quality Management  
RSN – Resources Support Network

### JRC Institutes:

IE – Institute for Energy  
IES – Institute for Environment and Sustainability  
IHCP – Institute for Health and Consumer Protection  
IPSC – Institute for the Protection and Security of Citizens  
IPTS – Institute for Prospective Technological Studies  
IRMM – Institute for Reference Materials and Measurements  
ITU – Institute for Transuranium elements