European Commission

Annual Report 2013

Joint Research Centre

The European Commission's in-house science service

Report EUR 26372 EN

Joint Research Centre

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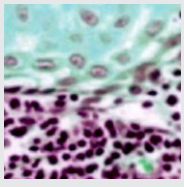
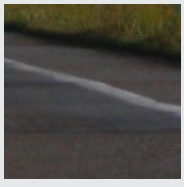
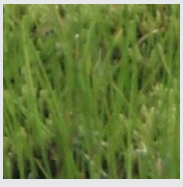
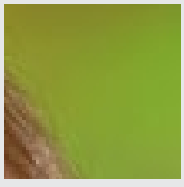








FOREWORD BY MÁIRE GEOGHEGAN-QUINN

EUROPEAN COMMISSIONER FOR RESEARCH, INNOVATION AND SCIENCE

"The JRC is giving the best scientific advice across the Commission's Directorates-General, so that all policies are based on robust science."

Commissioner Geoghegan-Quinn in the European Parliament, October 2013

I am proud to have launched Horizon 2020, the European Union's new and largest ever programme for research and innovation funding, which will support the work of researchers, universities and businesses in bringing breakthroughs and innovations for solutions to societal challenges and strengthening Europe's competitiveness. As the Commission's in-house science service, the Joint Research Centre has a key role to play in Horizon 2020, with an overall objective of providing scientific and technical support to EU policies, while flexibly responding to new policy demands.

We have committed to creating an innovation-friendly environment making it easier for great ideas to be turned into products and services that will bring our economy growth and jobs. I have witnessed this commitment in the work of the JRC's outgoing Director-General Dominique Ristori, who over the last three years has steered the JRC to provide strong scientific support to the Europe 2020 policy priorities, in particular to the Innovation Union. Under his leadership, the JRC demonstrated the key role of science in the creation of growth and jobs, through a series of high-level initiatives where the scientific community met industry and government stakeholders. These high-level events covered topics ranging from improving the efficiency of buildings, vehicles and equipment in March 2013 to how science can address the challenges of public health in November.

Underpinning policies with solid scientific evidence and sound analysis requires high quality infrastructure for science activities, quality data and appropriate analytical tools. Together with EU Commissioner for Energy Günther Oettinger, I had the pleasure of inaugurating new upgraded infrastructure of the JRC's Institute for Transuranium Elements (ITU) in Karlsruhe, in order to maintain the highest standards of safety and security. With Vice-President Maroš Šefčovič, I was proud to open a new eco-friendly and energy efficient science building at the JRC's Ispra site.

No less important, during this European Year of Citizens, I was delighted to see at first-hand the JRC's enthusiasm to communicate science to the broader public when more than ten thousand people visited JRC laboratories in Ispra during the Open Day in May. On that occasion, I had the pleasure of opening the new Visitors' Centre which will bring the work of the JRC scientists closer to stakeholders and the general public.

This ability to constantly adapt its research facilities, equipment and scientific skills base to rapidly changing and increasing demands means that more than ever, the JRC's work is appreciated by policy-makers across the European institutions. In 2013 the JRC provided reliable scientific and technical support to a wide range of policies and also to cross-cutting issues such as to standardisation, a key tenet of successful innovation.

Stronger innovation, combined with new international partnerships, help to address pressing global issues such as climate change, health, food security and poverty. The JRC's strengthened relations and networks with EU and international partners are vital for global scientific excellence in challenging areas such as environment and climate change, health, energy, transport, and natural disasters. I am confident that the JRC will maintain its commitment to world-class research and innovation, and forge ahead in new and emerging areas. I would like to acknowledge the achievements of Dominique Ristori, who has led the JRC with such distinction to its rightful place as the Commission's in-house science service. I would like to wish the new Director-General, Vladimír Šucha, every success in leading the JRC's highly-qualified and motivated scientists and staff in the coming years.

Commissioner Máire Geoghegan-Quinn with some future scientists during the Ispra Open Day 2013.

FOREWORD BY DOMINIQUE RISTORI

FORMER JRC DIRECTOR-GENERAL (December 2010 – December 2013)*

Androulla Vassiliou, European Commissioner for Education, Culture, Multilingualism and Youth, Vladimír Šucha, JRC Deputy Director-General, and Dominique Ristori, JRC Director-General during the 'Scientific support for growth and jobs: cultural and creative industries' event held in Brussels on 24 October 2013.

The Joint Research Centre has a clear purpose and responsibility as the Commission's in-house science service, the only Commission service in charge of direct research – to provide scientific support to policy. I am proud that the importance of science in finding solutions to societal and environmental challenges has been increasingly acknowledged. In his 2013 State of the Union address, President Barroso stated that the better use of science, research and innovation potential is a pre-condition for sustaining and enhancing Europe's competitiveness, growth and jobs.

In 2013 the JRC responded to a growing number of requests for scientific support to policy, from the Commission policy services related to the EU's priorities, in the framework of the EU's blueprint for smart growth - Europe 2020. We provided direct scientific support to thematic policy areas such as financial stability and the Economic and Monetary Union; single market, growth, jobs and innovation; low-carbon economy and resource efficiency; agriculture and global food security; public health, safety and security; nuclear safety and security. The increasing responsibilities of the JRC in these areas are also reflected in the first JRC Work Programme (2014-2015) within Horizon 2020.

To respond successfully to its increasing responsibilities, the JRC has taken a more multidisciplinary and cross-sectorial approach, and reinforced cooperation within the European Commission and with our key partners. We have done robust data and modelling analysis on areas such as macro-economy, finance, taxation and energy transition. We have worked on innovation policy and contributed to the development of the Research and Innovation Observatory, while providing reliable scientific and technical support to standardisation policy and legislation.

Strategic partnerships are vital for the JRC to maintain its scientific excellence. In 2013 the JRC reinforced its cooperation with its key partners such as the European Parliament, the Member States, and the science community and with industry stakeholders, in particular through our collaboration within the Science and Industry Forum; with international partners such as Brazil and the USA. The JRC and the National Institute of Standards and Technology (NIST) agreed in 2013 to broaden their current scientific co-operation to more areas related to standards and measurements, for example in the fields of environment and climate, energy, transport and security.

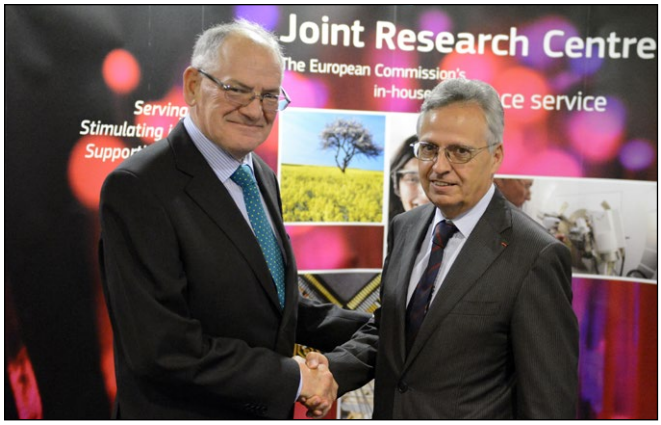
This level of scientific support we provide to policy requires a strong commitment from our dedicated staff who remain the JRC's first asset. I cannot thank them enough for their work and loyalty to the JRC's values such as excellence, in particular scientific excellence, integrity and transparency.

Science needs investments and in 2013 a special effort was made in terms of modernising JRC infrastructures and scientific equipment. This year saw the opening of solar testing facilities, administrative science buildings and the modern JRC Visitors' Centre during the Ispra Open Day which attracted more than 10 400 visitors.

This report highlights the main achievements of the JRC in 2013. The breadth of our work is vast and these are only some examples of landmark work completed or milestones of on-going, integrated scientific and technological support required for EU policies and actions. I have enjoyed my three years at the JRC immensely and now wish Vladimír Šucha, the new Director-General, every success in leading the JRC to bring science to the heart of each and every policy for the benefit of all Europeans.

*** As of 1 January 2014, Vladimír Šucha replaces Dominique Ristori as JRC Director-General**

OBSERVATIONS FROM THE BOARD OF GOVERNORS



Former chairman of the JRC Board of Governors Dr. Killian Halpin with JRC Director-General Dominique Ristori at the 100th meeting of the Board.

With the adoption of the Multiannual Financial Framework 2014-2020, Horizon 2020 and the related specific programmes for the activities of the JRC, 2013 was a particularly important year for the JRC. In a time of difficult economic circumstances and tough austerity measures for public budgets, the JRC succeeded in bringing its concept and envisaged actions through the legislative process. The Board of Governors, whose members are nominated by the Member States and Associated Countries, followed the negotiation process through an Ad hoc Group working in close contact with the JRC. The Board welcomes the final decisions which will provide a solid foundation for the coming years.

In 2013, the Board of Governors continued to provide advice to the JRC on questions related to strategic management and to endorse, when appropriate, the JRC's scientific activities. The Board met in February, June and November to discuss issues such as the JRC activities in the framework of Horizon 2020, the contribution of the JRC to the European Research Area, the JRC's scientific support to the Danube Strategy, and a wide range of thematic and strategic issues for the JRC, including the medium-term investment necessities for the JRC sites.

This year's report gives an impressive overview of recent and on-going scientific and technical support to key EU policy areas, ranging from smart grids to food security. In particular the scientific support based on system analysis and modelling plays a growing role reflecting the need of the EU to base regulations as well as funding programmes on robust empirical evidence and socio-economic models.
The contributions of the JRC to policies addressing the financial crisis and the banking union are good examples of this approach. The establishment of a European Research and Innovation Observatory and the launch of the Bioeconomy Observatory are equally important projects. In both cases, data collection and processing, together with modelling provide the Commission and Member States with valuable information. By producing the necessary information to assess and monitor EU policy commitments such as the Innovation Union flagship initiative and the implementation of the European Research Area, the JRC activities are indispensable for the Europe 2020 Strategy.
The Smart Specialisation Platform (S3P) which the JRC set up in order to give professional advice to Member States and regions is yet another good example of the JRC's close involvement in EU policies, in this case in cohesion and regional policy. The various contributions of the JRC and its proactive role in the Danube Strategy are extremely helpful in implementing this macro-regional cooperation.

The Board wants to underline its full support for the on-going initiative to modernise research

From left to right: Axel Nevens, Assistant to the Director-General, Barbara Weitgruber, Director-General for Scientific Research and International Relations, Austrian Federal Ministry of Science and Research, Dominique Ristori, JRC Director-General, Daniel Weselka, Member of the JRC Board of Governors and the Austrian Federal Ministry of Science and Research, and Ulla Engelmann, Head of Interinstitutional and Stakeholder Relations at the JRC during the visit to the Austrian Federal Ministry of Science and Research in Vienna in September 2013.

infrastructures at the JRC sites. In 2013 we saw the opening of several new facilities including a new office wing in Karlsruhe and the European Solar Test Installation (ESTI) facility in Ispra. The Board would like to express again its opinion that sufficient funding for upgrading the research infrastructure and test facilities is a precondition for the fulfilment of the JRC's mandate.

Finally, the Board wishes to record its appreciation of Dominique Ristori who in his three years as Director-General had a very positive impact in strengthening the JRC as the main provider of scientific and technical support to the EU policy-making process. Due to his engagement, devotion and his communication efforts, Dominique established an invaluable network of working relations for the JRC with public authorities as well as public and private research institutions, associations and organisations. The European Forum for Science and Industry is one such example of the outreach established under his leadership. The collaboration with institutions in the USA and other foreign countries are equally important. The Board wishes Dominique comparable success in his new position.

The Board would also like to express its warm appreciation of and gratitude to Dr. Killian Halpin, appointed to the Board in 1998 and elected chairman in 2007. Over the last six years Killian navigated the Board through an enormous variety of topics, sometimes difficult, but always interesting and with a successful outcome. With his broad experience in international cooperation, his deep understanding of research and innovation policy and his sense of humour, we will miss him.

The Board welcomes the appointment of Vladimír Šucha as JRC Director-General, looks forward to a fruitful cooperation with him and wishes him success in his new and challenging position. The Board is confident that under his new leadership the JRC will continue to gain in influence and reputation.
The Board endorses the present annual report and expresses its acknowledgement of the efforts of the JRC's management and staff to deliver valuable high-quality output both for the enlargement of our science and knowledge base and for the improvement of EU policies.

First Row: *Kurt Deketelaere, Jean-Pierre Audy (MEP), Killian Halpin, Antonio Fernando Correia de Campos (MEP), Dominique Ristori, Philipp Langer, John Perkins*
Second Row: *Ulla Engelmann, Toivo Räim, Tudor Prisecaru, Maria Betti, José Pío Beltrán, Kerstin Eliasson, Christophe Béhar, Arjan Xhelaj, Walter Mönig, Pieter van Nes*
Third Row: *Hallgrimur Jonasson, Urska Grahek, Gheorghe Duca, Tadeusz Luty, Björn Nilsson, Zdenko Franić, Atanas Kocov, Viktor Nedović, Kirsten Broch-Mathisen, Hüseyin Güler, Karel Aim, Daniel Weselka, Paulo Pereira, Vassilios Tsakalos, Vladimír Šucha*
At the back: *Luc Hendrickx, Giedrius Viliūnas, Axel Nevens*

ECONOMIC AND MONETARY UNION

Deepening the Economic and Monetary Union after the onset of the global financial crisis in 2008 remains one of the European Commission's key priorities. Science has contributed to getting closer to this goal. With its modelling expertise, economic analyses and analytical tools, the JRC provides useful means for the Commission to restore a strong and stable financial system for the EU.
In 2013, the JRC prepared quantitative analyses underpinning on-going and forthcoming Commission initiatives strengthening the stability of the EU banking sector, such as the negotiation of the EU framework for the recovery and resolution of banks in distress, the setting up of a Single Resolution Fund and a possible restructuring of the EU banking sector. Moreover, the JRC has continued monitoring fiscal imbalances for the Stability and Growth Pact.

Towards a stable banking system

Following the contribution to the impact assessment of the Commission's legislative proposal for bank recovery and resolution, the JRC continued to develop analyses throughout 2013, working in particular with the Commission's Directorate-General for Economic and Financial Affairs.
With its SYMBOL (Systemic Model of Banking Originated Losses) model developed in collaboration with Directorate-General for Internal Market and Services and experts from academia, the JRC supported the future setting-up of the Single Resolution Fund (SRF), financed by the banking sector to ensure the availability of funding support for banks under resolution. The Fund is part of the Single Resolution Mechanism for the Banking Union, proposed by the Commission in July 2013, and complements the Single Supervisory Mechanism proposal. According to this proposal, the European Central Bank will directly supervise banks in the euro area and other Member States joining the Banking Union. It is currently estimated that the Single Resolution Mechanism is pointing to a size roughly equal to EUR 55bn, which is well in line with JRC simulations.

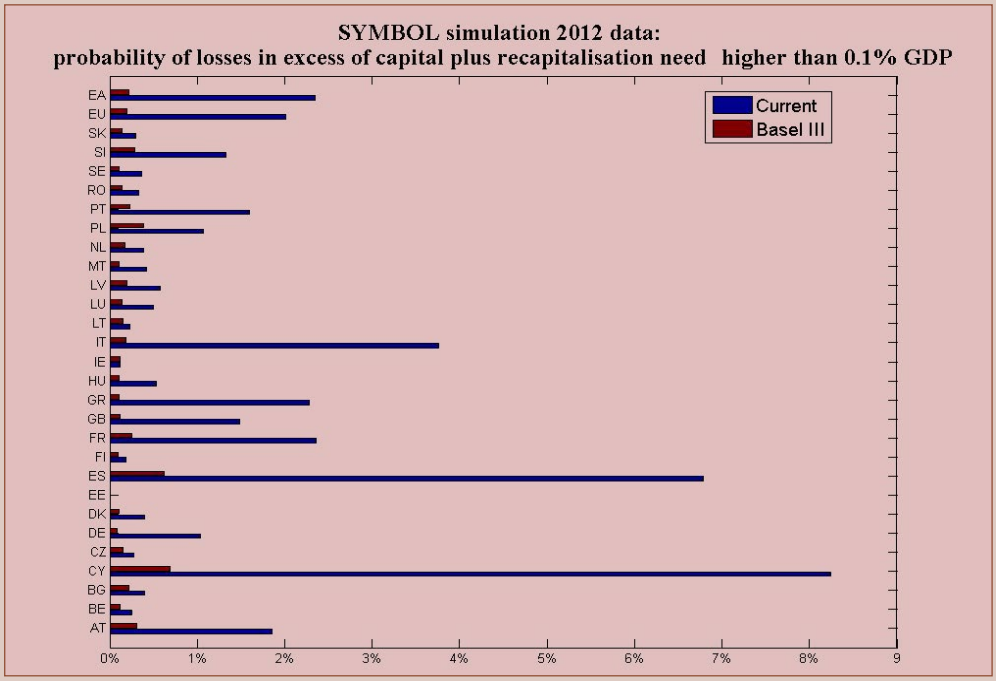


Figure 1 *Graph showing the probability of losses in excess of capital plus recapitalisation needs higher than 0.1% GDP under current and future conditions - Basel III. Basel III is a regulatory scenario already in EU law that will be fully implemented by banks in future years.*

Monitoring fiscal imbalances for the Stability and Growth Pact

The Stability and Growth Pact (SGP) is a framework for the coordination of national fiscal policies in the Economic and Monetary Union (EMU), established to safeguard sound public finances. The JRC has developed and maintains the GAP model, an estimation platform currently used by both the Commission and the Member States

Michel Barnier, European Commissioner for Internal Market and Services, Dominique Ristori, JRC Director-General, Jörg Monar Rector of the College of Europe, and Vladimír Šucha, JRC Deputy Director-General at the 'Scientific support to Financial Stability' roundtable held in Brussels on 16 December 2013.

to calculate potential growth and the output gap (the distance of economic growth to its potential). These estimates are key elements to assess the cyclically adjusted budget balances of the Member States and to monitor their compliance with the Pact. In 2013, the output gap estimates significantly improved with the use of information about capacity utilisation, the extent to which a country uses its productive capacity. The JRC has shown that the use of capacity utilisation series improves the stability of real-time output gap estimates.

Linking corporate taxation to financial stability

In 2013 the JRC conducted a study on corporate income taxation regimes, as it is crucial to understand whether and how taxation regimes can effectively play a role in reducing financial stability risks. Together with the Commission's Directorate-General for Taxation and Customs Union (DG TAXUD), the JRC examined the link between different corporate taxation regimes and banks' leverage. This was meant to evaluate whether taxation has been an important driver of banks' strategic decisions on their capital structure, and therefore in their choice between debt and equity financing. The econometric study focused on a sample of 3,000 EU banks with data spanning the period between 2001-2011. Results obtained so far will be used to create different scenarios for corporate income taxation regimes and assess, through the SYMBOL model, their implications on bank losses in financial crises and the part of bank losses that could affect the public finances.

How can science contribute to financial stability?

In cooperation with the College of Europe, the JRC organised two high-level roundtables in 2013 on scientific support to financial stability. These initiatives aim to stimulate dialogue and foster cooperation between the scientific and policy-making community. High-ranking financial experts, representatives of the scientific community, heads of industry and consumer associations, and policy-makers discussed the next steps of the Banking Union and the deepening of the Economic and Monetary Union. There is a clear need for scientific support which could, for instance, be useful in refining criteria for the selection of the banks under supervision of the Single Supervisory Mechanism (SSM). Scientific support could estimate potential costs and benefits of different options for a potential banking structural reform and enhance the understanding of the link between financial stability and financing the real economy.

Insurance for natural catastrophes

In 2013, the Commission launched a Green Paper on insurance against natural and man-made disasters to raise awareness and assess whether or not action at EU level could be appropriate to improve the market for disaster insurance. Some figures in this paper rely on the JRC study "Natural Catastrophes: Risk relevance and Insurance Coverage in the EU". This represents the first step for developing an EU database of harmonised quantitative information on natural catastrophes and proposes a methodology to analyse and compare risk and insurance practices across EU Member States.

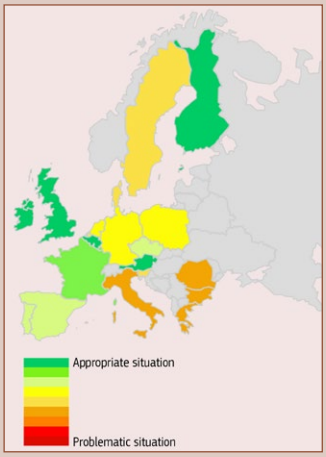


Figure 2 *Map showing storm risk levels. The map is obtained combining quantitative and qualitative information on insurance practice in EU Member States and historical data on natural catastrophes.*

Read more

JRC-developed software packages for econometric analysis (e.g. SYMBOL, GAP, ...)
http://ipsc.jrc.ec.europa.eu/?id=790

Commission proposal for a Single Resolution Mechanism
http://ec.europa.eu/internal_market/finances/banking-union/

European Economy Economic Paper no. 464
http://ec.europa.eu/economy_finance/publications/economic_paper/2012/ecp464_en.htm

The information content of capacity utilization for detrending total factor productivity. Planas C., Roeger W., and Rossi A. (2013). Journal of Economic Dynamics and Control, 37, 577-590
http://www.sciencedirect.com/science/article/pii/S0165188912001893

European Economy Economic Paper no. 420
http://ec.europa.eu/economy_finance/publications/economic_paper/2010/ecp420_en.htm

European Commission, Green Paper on the insurance of natural and man-made
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0213:FIN:EN:PDF

Natural Catastrophes: Risk relevance and Insurance Coverage in the EU. S. Maccaferri, F. Cariboni, F. Campolongo (2012)
http://publications.jrc.ec.europa.eu/repository/handle/111111111/28275

SINGLE MARKET, GROWTH, JOBS AND INNOVATION

Restoring sustainable growth will only be possible if the EU completes the Single Market, boosts competitiveness and promotes innovation in the industry and services sectors. To address the challenges and opportunities facing Europe, innovation has been placed at the core of the Europe 2020 Strategy for smart, sustainable and inclusive growth.
In 2013, the JRC provided scientific support to the EU's internal market through its work on standardisation, its support to industrial policy through foresight studies in areas such as health, food security and eco-industries. Through smart specialisation, the JRC strategically addresses economic development and targeted support to Research and Innovation (R&I) across the EU. The JRC also deepened the reflection on the ways scientific expertise and research could help policy-makers to find new sources of growth from the Single Market

Commissioner Geoghegan-Quinn opening the "Scientific support for EU growth and jobs: efficient buildings, vehicles and equipment" event, held at the Charlemagne building in Brussels on 26 March 2013.

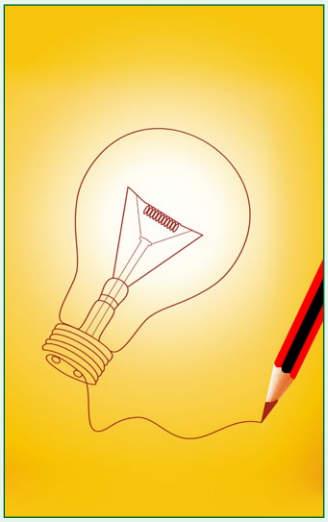
Efficient buildings, vehicles and equipment

Commissioner Geoghegan-Quinn and Hannes Swoboda, President of the Group of the Progressive Alliance of Socialist and Democrats in the European Parliament opened the JRC conference "Scientific support to EU growth and jobs: efficient buildings, vehicles and equipment" on 26 March 2013. The event gathered over four hundred stakeholders to identify together how science can help make buildings, vehicles and equipment more efficient. The key role of science in promoting technical standards and technical innovations was emphasised. The JRC addresses the challenges of efficiency in buildings, vehicles and equipment by continuing its work on standardisation which must incorporate the global dimension, and by focusing its scientific support on energy efficiency measures for existing buildings (representing 90% of total buildings in Europe) and more advanced measures such as smart meters and thermostats.

New single innovation indicator

The JRC contributed to the development of a new single innovation indicator designed to measure performance in innovation output. It measures the extent to which ideas from innovative sectors are able to reach the market, providing better jobs and making Europe more competitive. The new innovation indicator, which was presented during the European Council Summit on 24 and 25 October, aims at supporting policy-makers in removing bottlenecks that prevent innovators from translating ideas into products and services.

The JRC investigated the conceptual coherence and the statistical robustness of the indicator by using self-developed state-of-the-art statistical methodologies to perform the necessary simulations and validation tests aimed at improving the quality of the indicator. The indicator is based on the following four criteria: technological innovation as measured by patents, employment in knowledge-intensive activities as a percentage of total employment, competitiveness of knowledge-intensive goods and services, and employment in fast-growing firms of innovative sectors. According to the proposed indicator, Sweden, Germany, Ireland and Luxembourg are the EU Member States getting the most out of innovation.



The JRC delved into the potential flaws of rankings and ratings, and its new method can help developers revise their composite indicators.

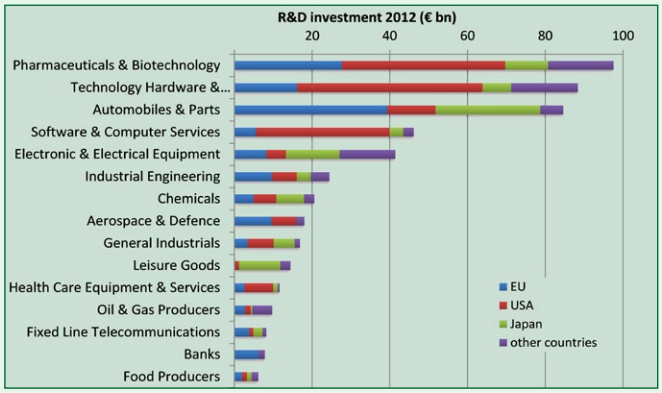


Figure 3 *R&D ranking of industrial sectors and share of main world regions for the world's top 2000 companies. 2013 saw a new edition of the EU R&D Scoreboard, which collected and analysed more data than ever: the world's top 2000 companies ranked by their investments in research and development (R&D) equivalent to about 90% of the total expenditure on R&D by businesses worldwide.*

Smart specialisation for research and innovation strategies

Smart specialisation, a strategic approach to economic development through targeted support to Research and Innovation strategies (RIS3), is the basis for Structural Fund investments in R&I. In support to the Directorate-General for Regional Policy (DG REGIO), the JRC has developed and manages the Smart Specialisation Platform (S3P) to provide professional advice to EU Member States and regions for the design of these strategies. Peer-review workshops are among its main tools to bring together regions for mutual learning and exploration of ways in which RIS3 can be developed. In 2013 the strategies of twenty-five regions and four Member States were peer-reviewed; each by approximately thirty peers and experts. As a result each region or Member State peer reviewed has received concrete recommendations on how to improve their strategies for eligibility of Structural Funds.

A European Research and Innovation Observatory

In close cooperation with the Directorate-General for Research and Innovation, the JRC further developed the Research and Innovation Observatory (RIO) project, an information system dedicated to serve the needs of the policy-makers in general, and the European Commission in particular, to monitor the research and innovation policies and activities. The Observatory will give the EU and its Member States access to reliable and timely data and analyses to ensure a step change in the understanding of research and innovation activities. The Observatory provides the necessary information to deal with the specific country by country needs in the context of assessing and monitoring EU policy commitments such as the Innovation Union flagship initiative of the Europe 2020 Strategy.

Bioeconomy Observatory

In 2013 the JRC also launched a three-year project to set up a Bioeconomy Observatory. The Bioeconomy Observatory will provide regular data and analysis for policy-makers and stakeholders to monitor the development of the bioeconomy and support the EU's recently launched strategy and action plan "Innovating for Sustainable Growth: a Bioeconomy for Europe". The monitoring activities of the Observatory address the three pillars of the EU's bioeconomy strategy: research (investment in research, innovation and skills), policy (reinforced policy interaction and stakeholder engagement) and markets (enhancement of markets and competitiveness in bioeconomy).

Scientific Support to the Internal Market

At a roundtable on "Scientific Support to the Internal Market" organised by the JRC at the initiative of Commissioner Barnier and with the support of Commissioner Geoghegan-Quinn, stakeholders called for more science in fields such as the Single Market measurement system, services standardisation, the impact of different copyright frameworks on new business models or consumer benefits from e-commerce, to mention just a few.

Read more

Smart Specialisation Platform
http://s3platform.jrc.ec.europa.eu

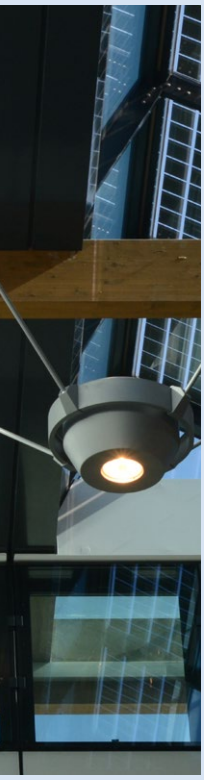
2013 EU Industrial R&D Investment Scoreboard
http://iri.jrc.ec.europa.eu/scoreboard13.html

Scientific Support to EU Growth and Jobs: efficient buildings, vehicles and equipment (26.03.2013) conference report
http://ec.europa.eu/dgs/jrc/index.cfm?id=7280&obj_id=4330&dt_code=EVN&lang=en

Communication 'Measuring innovation output in Europe: towards a new indicator'
http://ec.europa.eu/research/press/2013/pdf/indicator_of_innovation_output.pdf

Innovation Union Scoreboard 2013
http://ec.europa.eu/enterprise/policies/innovation/policy/innovation scoreboard/

The Global Innovation Index 2013
http://www.globalinnovationindex.org/



LOW-CARBON ECONOMY AND RESOURCE EFFICIENCY

The transition towards a low-carbon and resource efficient economy is one of the major challenges of the EU to develop sustainable energy and transport systems, protect the environment and mitigate climate change.
With its scientific research in energy matters and transport-related challenges, and its competences in climate investigation, the JRC supports the efforts of the Commission in addressing the challenges of resource efficiency as a global concern. In the area of maintaining a sustainable ecosystem, the JRC's achievements throughout 2013 include climate change assessments, the development of tools for biodiversity and air pollution monitoring, and experimental research on ways to integrate renewable energy sources into the power grid.

JRC Director-General Dominique Ristori with Lithuanian Prime Minister Algirdas Butkevičius during the "Scientific support to energy security in the Baltic Sea region" event held in Vilnius on 4 July 2013.

Scientific support to energy transition

There is a growing need for more flexibility of energy generation, demand and storage, a fully functional internal energy market and market integration of renewables. In this context the JRC organised a high-level conference on energy security in the Baltic Sea region in the framework of the EU Lithuanian presidency, and several roundtables on 'Energy Transition from a European perspective'. Key topics explored include capacity markets and integration of renewables, electrical transmission and distribution systems, the energy mix and energy markets.

Smart grids

With the increased use of renewable energy sources, new challenges arise for the grid infrastructure. Smart grids – intelligent electricity systems – will allow more integration of renewable energies in electricity systems, helping to ensure economically efficient and sustainable power systems. The JRC has expanded its capacity in the area of smart grids with a Smart Grid Simulation Centre, providing technical competence to support the development of standards and offering real-time simulation for evaluating the functioning of smart grids and the stability of networked physical systems.

Charging up: Safety testing of electric vehicle batteries

Electric vehicles are deemed 'green' vehicles and have a huge potential to contribute to the low-carbon transport targets, such as a 10% share of energy from renewable sources in transport by 2020. In 2013, the JRC therefore launched a project to evaluate the performance and safety of Electric Vehicle batteries. It is also developing an online Battery Safety and Information Tool (BaSIT), a communication forum for sharing information on the likely cause and consequences of battery safety events, including descriptions of the corrective actions taken and the lessons learned.

New car emissions test procedure

In Europe a laboratory test procedure based on a predefined driving cycle is used to check whether passenger car emissions comply with the regulatory standards. However, JRC research suggested that this laboratory test does not accurately capture the amount of nitrogen oxides emitted by diesel cars on the road, which is in fact substantially higher. In 2010, the Commission decided to complement the current laboratory test with a real-driving test procedure on the road.

A JRC-led working group composed of industry stakeholders and Member State representatives was established to assess the potential of two candidate procedures: emissions testing with random driving cycles in the laboratory, and on-road emissions testing with portable emissions measurement systems (PEMS). The group decided to primarily develop the PEMS-based testing technology and an extensive test campaign was conducted in 2013 in cooperation with car manufacturers and European technical services.

Modelling climate change

The JRC's Emissions Database for Global Atmospheric Research (EDGAR), a global

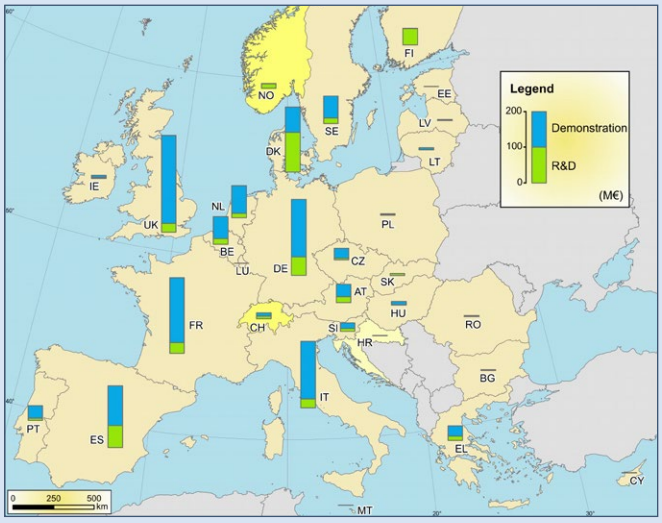


Figure 4 *Geographical distribution of RD&D investments in smart energy systems.*

dataset of past and present greenhouse gas emissions and air pollutants, was used to support common model analyses of past and future climate change drivers in preparing the United Nations Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report on Climate Change.

The JRC also co-authored the annual EU greenhouse gas (GHG) inventory report, which monitors anthropogenic GHG emissions in the Member States, helping to implement the United Nations Framework Convention on Climate Change and the Kyoto Protocol obligations. The report shows that GHG emissions in Europe fell by 3.3% in 2011, which is 18.4% below 1990-levels, the lowest level of emissions since then.

Biodiversity monitoring

With its modelling and remote sensing expertise, the JRC contributed to the establishment of the Global Biodiversity Informatics Outlook (GBIO), which aims to promote and use the latest communication technologies to share information on biodiversity at a global scale. The JRC's Digital Observatory of Protected Areas is presented as one of the tools within the GBIO to assess the status, trends and impacts of potential changes in biodiversity. Information on projects, solutions and funding sources is available to all interested parties, from policy-makers to investors, researchers and the general public.

In addition, the JRC's European Alien Species Information Network (EASIN) was chosen as the support mechanism for the European Commission Regulation to prevent and manage the rapidly growing threat to biodiversity from invasive species, proposed on 9 September 2013.

EASIN has been designed to facilitate the exploration of existing alien species information from distributed sources.

Striving to improve air quality

The JRC used its expertise and experience on air quality to contribute to the review of the air policy in general and of the Air Quality Directive in particular, in the context of the revision of the EU Thematic Strategy on Air Pollution. With its networks AQUILA (National Air Quality Reference Laboratories) and FAIRMODE (Forum for Air Quality Modelling), the JRC provided integrated assessments and analyses, evaluated emissions of greenhouse gases and air pollutants, and measured and modelled health-related atmospheric components and the ways they interact with ecosystems and climate.

Global resources and pollution indicators

The JRC published a series of indicators during 2013 on 'global resources and pollution' aimed at providing information on the use of natural resources and the emission of air pollutants around the world, in relation to production, consumption and trade activities. The investigated time frame covered the years 1995 to 2008, and the geographical scope included the EU-27 plus Brazil, China, India, Japan, Russia, the United States and the rest of the world. The 'production' indicators report on the use of resources as primary inputs (i.e. domestic extraction of materials or land cultivated) and the emissions directly generated by national economic activities. The 'consumption' or 'footprint' indicators show the resources or pollution embedded in the domestic final demand, regardless of where these resources and emissions were used or emitted. Finally, the 'trade' indicators show how resources and pollution are embodied in international trade.

Read more

Science for Energy – JRC thematic report
http://ec.europa.eu/dgs/jrc/downloads/jrc_science_for_energy_report.pdf

A complementary emissions test for light-duty vehicles: Assessing the technical feasibility of candidate procedures
http://publications.jrc.ec.europa.eu/repository/handle/111111111/27598

JRC Emissions Database for Global Atmospheric Research
http://edgar.jrc.ec.europa.eu/index.php

Annual European Union greenhouse gas inventory 1990–2011 and inventory report 2013
http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2013

GBIO website
http://www.biodiversityinformatics.org/

Digital Observatory for Protected Areas
http://dopa.jrc.ec.europa.eu/

European Alien Species Information Network
http://easin.jrc.ec.europa.eu/

Air Quality Directive
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF

EU Thematic Strategy on Air Pollution
http://europa.eu/legislation_summaries/environment/air_pollution/l28159_en.htm

AQUILA
http://ies.jrc.ec.europa.eu/aquila-homepage.html

FAIRMODE
http://fairmode.ew.eea.europa.eu/

JRC Report: Global Resources Use and Pollution, Volume 1 / Production, Consumption and Trade (1995-2008)
http://ftp.jrc.es/EURdoc/JRC71919.pdf

JRC Report: Global Resources Use and Pollution, Volume 2 / Country Factsheets (1995-2008)
http://ftp.jrc.es/EURdoc/JRC71922.pdf

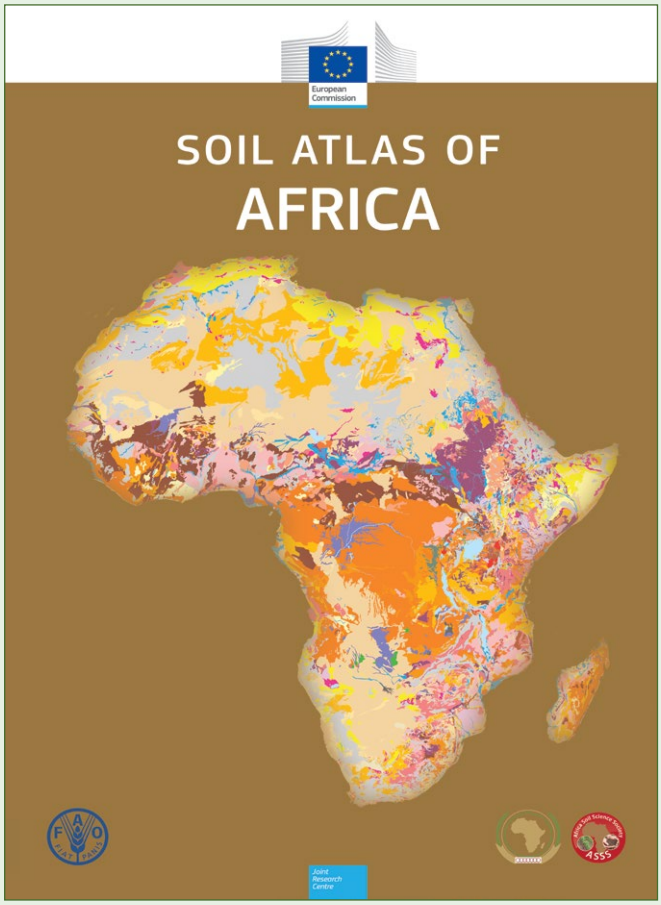
AGRICULTURE AND GLOBAL FOOD SECURITY

To meet the needs of the world's growing population and taking into account changing consumption patterns, natural resources scarcity and the impact of climate change, food production must be increased in an economically, environmentally and socially sustainable way. The JRC supports sustainable food security through its models and monitoring work of agricultural resources with timely forecasts, early assessments and scientific underpinning. Achievements in 2013 are the launch of the first soil atlas of Africa and the contribution to the UN's Food and Agriculture Organization and the Organisation for Economic Cooperation and Development's Agriculture Outlook 2013. In addition, the JRC organised several technical workshops with topics ranging from factors affecting wheat yields and an index-based insurance in developing countries, to the policy options to enhance food security in the Southern Mediterranean region.

First Soil Atlas of Africa

In April 2013, the JRC released the first ever Soil Atlas of Africa, produced in collaboration with the African Union, the United Nations' Food and Agriculture Organization, the African Soil Science Society and soil scientists from Africa and Europe. It is a unique reference document highlighting soil as a vital resource, which provides food, fodder and fuel, reduces flood risk and protects water supplies.

The Atlas shows that Africa has some of the most fertile land on the planet, but this resource is mostly fragile, and often lacks essential nutrients and organic matter. Revealing the diversity of soil across the African continent in a comprehensible and attractive way, the Atlas explains the importance of preserving this precious resource.



The Soil Atlas of Africa - the first of its kind - is a unique reference document produced by the JRC in collaboration with the African Union, the FAO, the African Soil Science Society and soil scientists from Africa and Europe.

Modelling agricultural market developments

Agricultural market outcomes depend partly on global macroeconomic conditions (e.g. Gross Domestic Product) and on crop yield fluctuations, each being characterised by a large set of uncertainties. The JRC uses a 'partial equilibrium model', to establish an outlook for the main agricultural commodity sectors 8-10 years ahead. The JRC contributed to the OECD-FAO 2013 Agriculture Outlook by applying an approach to quantify the extent to which the uncertainty affects the baseline projections of market and price developments.

The Outlook anticipates a slow-down in the medium-term expansion of world agricultural production because of limited area expansion and slower productivity growth. Agricultural trade is expected to increase, with most of the export growth coming from developing countries, and agricultural commodity prices in real terms are predicted to be held above pre-2007.

Impact of biofuels

The JRC's scientific activities on bioenergy and biofuels include research on greenhouse gas emissions savings, direct and indirect effects of land-use change (ILUC) and they address environment sustainability challenges. In 2013, the JRC contributed to the development of EU biofuel policy with several reports estimating ILUC emissions. Another report models the impact of possible biofuel policies on agricultural markets and land use with indicators for the period 2012-2022 on land use, biofuel production

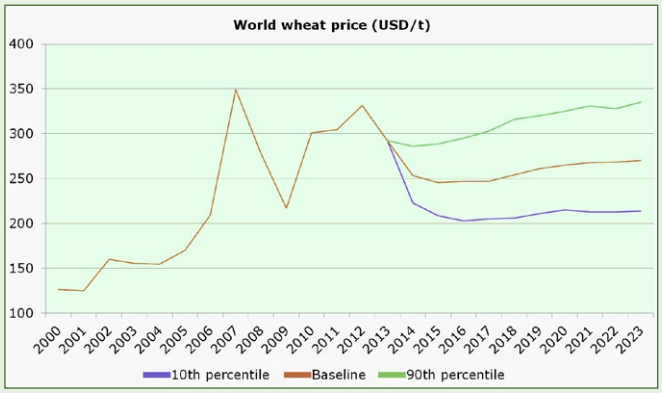


Figure 5 *Graph showing the uncertainties of projected world wheat prices until 2023, with a clear trend towards prices higher than before the 2007 peak.*

and feedstock prices for wheat, maize, sugar and vegetable oils in the EU and world markets.
If food-based biofuels in the EU were limited to 5%, world prices would remain up to 3% below the baseline, except for vegetable oils with a drop of about 7%. Under this 5% threshold, land use for potential biofuel feedstocks (cereals, oilseeds, sugar crops and palm oil) indicate a reduction compared to the baseline of 2.7 million ha worldwide (arable land in the world is 1,396 million ha - FAO data for 2011).

The impact of a no biofuel EU policy scenario on world prices might be particularly significant for vegetable oils (almost 15% decrease), but other feedstock prices (wheat, maize and sugar) would be at most 5% below the base. About 6 million hectares less (0.7% of the world's arable land dedicated to cereals, oilseeds, sugar crops and palm oil in 2020) would be harvested compared to now.

Evaluating resource-efficiency options

In the agriculture and environment framework, land-use/cover models can help to understand and interpret the complex interactions between the bio-physical and human factors that influence land use/cover dynamics. In addition, they can be used as a tool to assess environmental consequences of policies with direct or indirect spatial impacts. In 2013, LUMP (Land Use Modelling Platform) has been applied for evaluating the achievement of targets for the Resource Efficiency Roadmap, the Impact Assessment of unconventional gas extraction and for the evaluation of urban and regional policy options.

Insect pollination and agricultural productivity

Insect pollination is necessary for up to 75% of global crops that are used as human food, and 84% of European cultivated crop species. The JRC developed a method to map the availability of pollination services and potential mismatches in relation to the needs of agricultural crops.

It calculated the Relative Pollination Potential (RPP) by applying data on European land cover, land use, and climate to an RPP index model, and linking this to regional crop production statistics, in order to assess the benefits of wild pollinators and identify areas with a potential deficit in pollination. The yield of food crops, excluding cereals, pollinated by short-flight distance pollinators, such as wild bees, could fall by 25-32% if such pollination were no longer available. The JRC's findings strengthen the argument that biodiversity and ecosystem services are crucial to food security and human welfare, and must be protected.

Innovative assessment of fish stocks

The JRC developed a new model to easily assess a large number of fish stocks and process the rapidly accumulating fisheries related information under the Assessment for All (a4a) initiative, a project aiming to provide a versatile tool to assess all fish stocks harvested in most European waters. The a4a assessment tool does not require a strong expert background or modelling expertise, which opens stock assessment to a wider community. It enables the inclusion of more data, technical knowledge on fisheries, stocks or ecosystem characteristics. The a4a method thus facilitates current fish stock estimations and predicts their future status under alternative scenarios, which is essential for the sustainable and profitable management of fisheries. The a4a initiative has been developed within a broad network of stakeholders, including scientists and policy-makers from a wide range of international institutions.

Insect pollination is crucial to to ensure biodiversity, which in turn could help secure food production for future generations.

Read more

European Soil Portal – Soil Atlas of Africa
http://eusoils.jrc.ec.europa.eu/library/maps/africa_atlas/index.html

JRC Reference Report on Partial Stochastic Analysis (2013)
http://ec.europa.eu/dgs/jrc/downloads/jrc76019.pdf

OECD-FAO Agricultural Outlook (2013)
http://www.oecd.org/site/oecd-faoagriculturaloutlook/

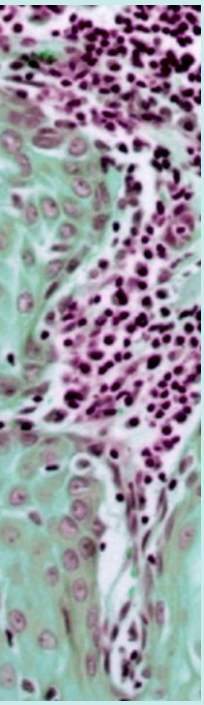
Impacts of the EU biofuel policy on agricultural markets and land use
http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=6559

Land Use Modelling Platform
http://moland.jrc.ec.europa.eu/lump/lump.htm

Linking Land Cover Data and Crop Yields for Mapping and Assessment of Pollination Services in Europe
http://www.mdpi.com/2073-445X/2/3/472

a4a assessment tool
https://fishreg.jrc.ec.europa.eu/web/a4a/code

Assessment for All (a4a) initiative
https://fishreg.jrc.ec.europa.eu/web/a4a



PUBLIC HEALTH, SAFETY AND SECURITY

Healthy citizens are the principal foundation of a prosperous European economy and society. The JRC assesses potential health risks, and develops and runs several systems to forecast and monitor natural disasters and extreme weather events.
In 2013, substantial efforts were devoted to cancer and rare diseases and how to harmonise data across Europe, in order to improve medical care in this field and to steer and monitor policy interventions. Much of the JRC's health research builds on the data collection of the JRC's European Union Reference Laboratories. In addition, in 2013 the JRC formulated technical recommendations on how to better record data on losses related to disasters and further developed innovative technologies, e.g. for detecting small boats at sea and for improving the cybersecurity of critical infrastructures.

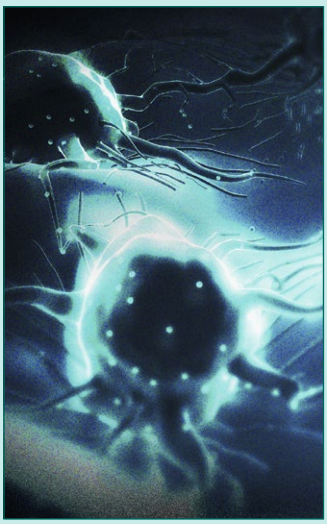
Member of the European Parliament Dagmar Roth-Behrendt and JRC Director-General Dominique Ristori at the two-day event on "Scientific support for Public Health: Existing actions, new challenges and European added values" held in Brussels on 14 and 15 November 2013.

Addressing public health challenges

In November, the JRC organised a high-level roundtable addressing the scientific challenges for public health policies. Stakeholders focused on the need for stronger cooperation and greater harmonisation at EU level in prevention, diagnosis and treatment of diseases, and the role that the JRC could play in the aggregation of data and supporting harmonisation across the European Union.

Harmonising cancer and rare disease information systems

The JRC launched the process of harmonising cancer data across Europe, in support of EU policies on cancer research and in partnership with the Commission's Directorate-General for Health and Consumers. Key cancer registry stakeholders were brought together and developed common protocols for quality checks of cancer data.
The JRC now operates the European Network of Cancer Registries (ENCR), representing over 200 cancer registries in Europe. This enables the Commission to report on cancer incidence in Europe, to steer and monitor cancer policy interventions as well as act as a reference for epidemiological research in Europe. Between 6 and 8% of the EU population, some 30 million citizens, suffer from a rare disease. To improve diagnosis and care, accurate information needs to be provided and disseminated. Linking different networks, activities and initiatives in the field of rare diseases is essential for the harmonisation of data to facilitate policy support and multidisciplinary research.



Cancer registries enable the European Commission to report on cancer incidence in Europe, to steer and monitor cancer policy interventions.

This year the JRC initiated the development of a European platform on rare diseases registration with the aim to increase the interoperability between existing rare diseases registries, to help establish new registries and to act as a hub providing access to all data collections in the field of rare diseases. This benefits the scientific community and medical professionals and leads to a better quality of life and improved medical care for rare disease patients.

Disaster anticipation and management

To reduce the risk of disasters for communities worldwide and to support coordination of emergency response, the JRC has designed a series of interactive platforms and tools which forecast or monitor the unfolding of devastating events such as floods, fires and earthquakes.
In 2013, the JRC published technical recommendations for a European approach to standardise databases on disaster losses (human casualties, economic loss, property and environment damage). Loss data are useful for implementing

On 9-10 November 2013, the Copernicus EMS started the delivery of the first damage assessment maps for the Haiyan typhoon which hit the Philippines on 8 November.

disaster risk reduction strategies in Europe and for helping to understand disaster loss trends at global level. The JRC outlined a conceptual model for utilising disaster loss data, allowing Member States to perform cost-benefit analyses of alternative approaches to improve the quality of their disaster loss databases.

In addition, the JRC is responsible for the technical coordination of Copernicus EMS, the first Emergency Management Service (EMS) to become operational in the context of the Copernicus-project, the EU's Earth observation programme. It provides authorities and humanitarian aid agencies with geospatial information derived from satellite remote sensing and complemented by available in-situ sources. During the summer of 2013 alone, Copernicus EMS delivered more than 150 mapping products to support emergency management responders dealing with floods, forest fires and other disasters that affected parts of Europe and overseas.

Detecting small boats at sea

The JRC has developed innovative methods for tracking radio frequency (RF) signals with increased precision so that small boats used for migration, smuggling or other criminal activities can be detected more easily. In 2013 these methods were ready for field testing. They give maritime authorities the means to detect and position boats based on any RF source on board (e.g. signals from the Automatic Identification System (AIS), mobile phones and satellite phones). The JRC will now develop an instrument for effective maritime surveillance of large sea tracts, in support of the Members States, called upon to take measures following the tragic events in Lampedusa in October 2013.

Assessing Critical Infrastructures

In 2013, the JRC launched innovative software to assess the cyber-security of connected critical infrastructures (CIs), such as railway systems, energy networks or power plants. The AMICI software takes into account both the virtual and the physical aspects of modern interconnected CIs. These critical infrastructures are strongly interdependent and the dependencies often work both ways. Railways, for example, depend on electrical power supply which in turn depends on ICT networks, which again depend on electric power. AMICI can capture the complexity of these interactions entirely and can fully analyse the vulnerabilities of such complex systems, in contrast to traditional methods, which rely either on pure simulation, or on experiments with real components only and can therefore only be used to test individual infrastructures but not their interactions.

With AMICI, the JRC developed a tool to assess the impact of cyber disruptions on critical infrastructures such as railway systems or energy networks.

Read more

European Network of Cancer Registries
www.encr.eu

Recording Disaster Losses: Recommendations for a European approach
http://publications.jrc.ec.europa.eu/repository/handle/111111111/29296

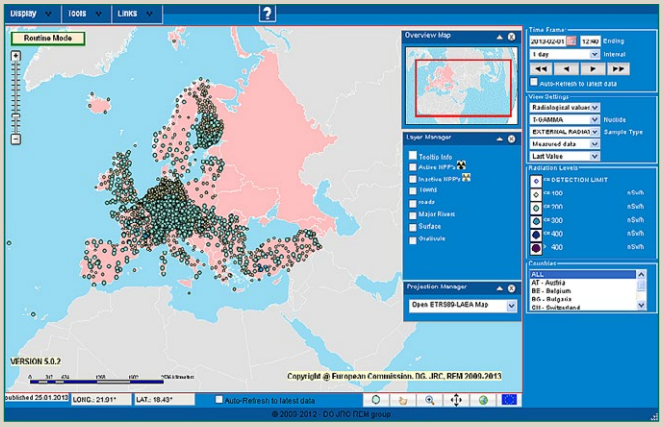
Copernicus Emergency Management Service
http://emergency.copernicus.eu/mapping/#zoom=2&lat=27.03238&lon=66.615&layers=T00000B0

AMICI website
http://ipsc.jrc.ec.europa.eu/?id=692

AMICI software
http://sourceforge.net/projects/amici/

NUCLEAR SAFETY AND SECURITY

The EU Euratom programme supports cutting-edge research, knowledge creation and preservation across its Member States on nuclear technologies. Following the Fukushima accident in 2011, the EU has reaffirmed its commitment to ensure that the highest safety standards are applied in all Member States.
The JRC provides technical and scientific support to nuclear safety, security and radiation protection EU policies, and contributes to education, training and information in the field.
The JRC supported the implementation of the chemical, biological, radiological and nuclear (CBRN) Action Plan and the CBRN Centre of Excellence initiative to mitigate, amongst others, nuclear and radiological risks. The activities included setting up a new European nuclear security centre and testing technologies for the detection and identification of nuclear and radioactive materials.
The JRC also extensively investigated ways to manage spent nuclear fuel and contributed to the new International Radiological Monitoring Information System of the International Atomic Energy Agency.



The new International Radiological Monitoring Information System (IRMIS) makes use of the JRC-developed software and technology EURDEP - European Radiological Data Exchange Platform.

From European to global radioactivity environmental monitoring

In March 2013 the International Atomic Energy Agency (IAEA) introduced a new International Radiological Monitoring Information System (IRMIS), which makes use of the JRC-developed software and technology EURDEP - European Radiological Data Exchange Platform.

EURDEP facilitates the transmission of large datasets from radioactivity environmental monitoring networks. It continuously makes data available from 37 organisations in 35 European countries, from some 4400 automatic gamma dose-rate stations on an hourly basis. In addition, air concentration data from some 100 monitoring stations is exchanged on a daily basis during an emergency, and at a lower frequency under normal conditions.

EURDEP was limited to the European area but with the integration into IAEA's system it is being globalised. The first five candidate countries (Canada, China, India, South Korea and the United States) are now exchanging their national data in this way.

Safeguards for a new gas centrifuge uranium enrichment plant

The JRC helped develop an innovative approach for the safeguards of the new gas centrifuge uranium enrichment plant (GCEP) in France, George Besse II (GBII). The JRC developed a communication system able to capture data from where uranium is fed into the plant. It can verify whether the input of uranium equals the output, as the places where the uranium is removed are connected to the input points. The data will be shared with EURATOM and IAEA in charge of safeguards implementation at the GBII site. Other JRC work on nuclear safeguards includes preventing the further spread of nuclear weapon technology or the development and assessment of instrumentation in the areas of analytical chemistry and non-destructive assay and new fuel cycles.

Reducing chemical, biological, radiological and nuclear threats

Lack of coordination and preparedness at national levels and fragmentation of responsibilities within a region can have dramatic consequences in the field of chemical, biological, radiological and nuclear (CBRN) risks.
Working with the Directorate-General for Development and Cooperation (EuropeAid), the JRC has been instrumental in the setting up and opening of the CBRN regional secretariat, providing technical support such as evaluation and quality controls, needs assessment and knowledge management. Secretariats were opened in Amman (for the Middle East), and in Tbilisi (for South East Europe, the Southern Caucasus, Moldova and Ukraine), in addition to the already operating secretariats in Manila (South East Asia) and Rabat (African Atlantic Façade). An additional four, in Gulf Cooperation Council Countries, North Africa,

Eastern and Central Africa and Central Asia are under preparation. The Secretariats facilitate information sharing, assess CBRN needs in the partner countries and implement and monitor projects in these regions. To date, there are 34 projects in the 42 partner countries in these eight regions.

EUSECTRA: new European nuclear security training centre

In 2013, the training facility part of the European nuclear security training centre (EUSECTRA) was opened at the JRC site in Karlsruhe. EUSECTRA was established within the framework of the EU-CBRN Action Plan. It instructs front-line officers, trainers and experts on how to detect and respond to illicit trafficking of nuclear or other radioactive materials. The EUSECTRA premises also include new nuclear safeguards training laboratories for nuclear inspectors from the European Commission (Euratom) and the IAEA, who have been trained for the last 20 years on a variety of techniques by the JRC.

Tracking illicit nuclear trafficking

The Illicit Trafficking Radiation Assessment Programme (ITRAP+10), carried out between 2010 and 2013, provides an independent assessment of the available radiation detection equipment on the market. The results serve as a reference for regulatory and other authorities within the Member States to identify equipment to address their particular needs, and help to ensure common standards at European level.
In addition, manufacturers received recommendations to improve the performance, reliability and user-friendliness of their equipment. ITRAP+10 was implemented jointly with the Domestic Nuclear Detection Office of the US Department of Homeland Security and the US Department of Energy. Other institutions contributed to the programme by validating and analysing the extensive data acquired during the comprehensive testing campaign. The IAEA has been fully involved since the beginning in the project.

Nuclear decommissioning

Nuclear decommissioning is the final step in the lifecycle of a nuclear installation, and includes shutdown, removal of fissile material and environmental restoration of the site. Most of the JRC's nuclear decommissioning activities are carried out at the Ispra site in Italy as it hosts most of the shutdown nuclear installations.

The JRC's progress in decommissioning as described in the 2013 Commission Communication has focused on constructing an on-site interim storage facility. At its other sites in Karlsruhe (Germany), Petten (the Netherlands) and Geel (Belgium), pre-decommissioning activities have continued for the dismantling of out-of-use equipment from past research work and for the removal off-site of obsolete nuclear fuel and other nuclear materials.

Management of spent fuel

Together with the European Academies Science Advisory Council (EASAC), the JRC produced a report on important issues for consideration when developing national programmes for the future management of spent fuel and waste generated by fuel treatment. It describes the options for spent fuel management, their present state of development and the consequences of the choices between them. The report builds on the experience of various stakeholders and integrates the conclusions of a seminar in February 2013 where international experts dealt with issues of sustainability, non-proliferation, safety, organisational and economic factors, and public involvement.

Hot cells facility for the analysis of spent fuel material.

Read more

EURDEP
http://eurdep.jrc.ec.europa.eu/

CBRN Centres of Excellence
www.cbrn-coe.eu

EUSECTRA
http://itu.jrc.ec.europa.eu/fileadmin/EUSECTRA/EUSECTRA_Toward%20a%20training%20centre.pdf

Expand Nuclear Forensics. Mayer, K. (2013). Nature 503 (461–462)
http://www.nature.com/news/security-expand-nuclear-forensics-1.14223

Communication from the Commission on the decommissioning of nuclear installations and management of radioactive waste
http://eur-lex.europa.eu/LexUriServ.do?uri=COM:2013:0743:FIN:EN:PDF

SCIENCE FOR STANDARDS AND INNOVATION

To accelerate EU growth, industry needs framework conditions that provide them with the basis upon which to invest, to innovate and to gain global market share in an increasingly competitive world. Standards are a cornerstone of these conditions and are an integral part of Horizon 2020, the EU's new Framework Programme for research and innovation. Science has a key role in supporting and accelerating the standardisation process, and is thus at the core of the JRC's work and includes pre-normative research, harmonised methodologies, certification, preparation of standards, reference measurements and materials and foresight studies on the need for standards development. The JRC's work in the area of standardisation spans from environmental monitoring to critical infrastructure protection, and from food safety to nuclear safety and security.

In 2013 the JRC organised the 19th International Conference on Radionuclide Metrology and its Applications. Radionuclide metrology plays an important role in many nuclear fields, including radionuclide production, nuclear medicine, measurement of environmental radioactivity and of radionuclides in food and drinking water, nuclear security and emergency preparedness. Participants discussed the latest technique developments related to radionuclide analysis, to exchange information on new applications of radioactivity measurements, and to encourage international cooperation in this field.

International Conference on Radionuclide Metrology and its Applications

In 2013, the JRC provided a scientific and technical basis for type-approval methods for vehicles running on a mixture of hydrogen (H_2) and compressed natural gas (CNG), in relation to their exhaust emission levels, as no methods were previously established. The emissions analyses showed that such fuel mixtures in comparison to petrol could reduce pollutant and exhaust greenhouse gas emissions significantly.

Type-approval method for hydrogen fuel blends

European reference materials, validated analytical methods and proficiency tests are essential quality assurance tools to improve the confidence in measurement results in a global market. They support Member States in implementing legislation where laboratory testing is required. In 2013, the JRC produced 24 new reference materials covering a wide range of areas, from the quality of coal analysis (to provide accurate data for evaluating environmental impact), wastewater analysis (to monitor, for example, the presence of cadmium, mercury, nickel and lead), to controlling the nutrient profile of milk powder based products and tracing metals in human hair.

Reference materials from coal to hair

In 2013, the Commission adopted probably the world's single largest data harmonisation effort for environmental information, as part of the Infrastructure for Spatial Information for Europe (INSPIRE) Directive, a major European data-sharing policy for the environment and related policy areas. It is the result of a JRC-led effort of hundreds of experts that have been working together to agree on common definitions in important policy areas such as energy, climate change, biodiversity, the marine environment, and human health.

Spatial data sharing INSPIRE

In close cooperation with the European Committee for Standardization (CEN), the JRC has successfully extended the Eurocodes' concept and methodology covering the Basic Requirements of the Construction Products Regulation in order to improve buildings' energy performance. In 2013 the JRC, in collaboration with CEN, published a report on Eurocodes Geotechnical Design, which will serve as basis for training courses on the Eurocodes in the Member States, thus facilitating their practical application. The EN Eurocodes are a series of 10 European Standards, providing a common approach for the design of buildings and other civil engineering works and construction products.

European standards for energy performance of sustainable buildings

Facilitating information exchange in the maritime sector

In view of the implementation of the Common Information Sharing Environment (CISE) for the maritime domain, the JRC contributed to the definition of a harmonised data model, semantics, and formats to exchange information between different authorities in charge of maritime surveillance in the EU.

Health-based evaluation of chemical emissions from constructions products

In 2013 the JRC published a harmonisation framework for the health-based evaluation of chemical emissions from construction products, based on the Lowest Concentration of Interest concept. This proposal, which represents a possible approach to harmonising indoor product labelling schemes in the EU has potential for wide implementation thus ensuring stronger protection of the health of European citizens.

Evaluation of gas sensors

In 2013, the JRC worked on a protocol for the evaluation of gas sensors, which are being identified as emerging measuring devices for the 'indicative measurements' regulated by the European Air Quality Directive. Compared to more classical reference measurements, gas sensors could potentially reduce the costs of air pollution monitoring.

New standard method for determination of fibre mixtures

The JRC works on harmonisation and standardisation of analytical methods to determine the presence of chemicals in textiles and to characterise new textile fibres. In 2013 the new method, validated by the JRC, for quantifying binary fibre mixtures made by melamine and cotton, or aramide fibres was published as an EN ISO standard method.

Chairing the photovoltaic technical committee within the International Electro-technical Commission, the JRC coordinated a project on new standards for multi-junction devices (which use thin layers of materials in a sandwich-like structure to better exploit the light spectrum) and for energy rating in representative climatic conditions. As coordinator of the International Quality Assurance Forum for Photovoltaics, in 2013 the JRC was also at the forefront of efforts to quantify long-term reliability issues.

Photovoltaic solar energy

A "watch list" mechanism for water emerging pollutants including a maximum of 25 substances has been developed by the JRC and is now part of the amended Environmental Quality Standards Directive under the Water Framework Directive. This will monitor and perform risk assessments on emerging pollutants in water, sediment or biota.

Water quality

In Europe, industrial emissions to air, water and soil are regulated based on the use of BATs. In 2013, the JRC published BAT reference documents (BREFs) for the tanning of hides and skins and for the production of cement, lime and magnesium oxide. The BAT conclusions are the reference that Member States have to use in order to set the permit conditions for their installations. BREFs describe production processes that can achieve a high environment protection level under economically and technically viable conditions.

"Best Available Techniques" (BAT)

In close cooperation with industry and government stakeholders and the policy Directorate-General for the Environment (DG ENV), the JRC put forward two methods for measuring the environmental performance throughout a product lifecycle: the Product Environmental Footprint (PEF) and the Organisation Environmental Footprint (OEF).

Measuring product environmental footprint (PEF)

Read more

European Air Quality Directive
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF

'Validation of analytical methods for the WFD "watch list" pilot exercise'
http://publications.jrc.ec.europa.eu/repository/handle/111111111/29211

ISO 1833-26:2013 - Mixtures of melamine and cotton or aramide fibres
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=56205

Science for Standards – JRC thematic report
http://ec.europa.eu/dgs/jrc/downloads/jrc_science_for_standards_reports.pdf

PARTNERSHIPS AND INTERNATIONAL COOPERATION

The JRC has over two hundred operational cooperation agreements and is an active player in the global arena, gathering partners working on a diverse range of scientific fields worldwide. These agreements allow sharing of infrastructure, laboratory equipment, data materials as well as transferring knowledge. It is through cooperation at different levels of governance that the JRC can fully play its role as the Commission's in-house science service. At the European level, links were strengthened with industry and other stakeholders and through concrete initiatives such as the scientific support to implement the Danube Strategy. International cooperation was reinforced through agreements signed with partners in the USA, Brazil and Africa.

When industry meets science

In 2013 the European Forum for Science and Industry, a platform for exchange on the needs of industry concerning science and innovation, explored the scientific support to financial stability, standardisation, key enabling technologies (KETs), quantum technologies, eco-industries and cultural and creative industries.

Through a series of high-level roundtables led by the JRC, the forum brings together, on a regular basis, public institutions, private companies, and other scientific networks to discuss themes of key importance for European competitiveness. It creates important links between universities, science and innovation and scientific governing bodies.

The JRC's support to the EU Danube Strategy focuses on areas such as environmental protection, irrigation, agricultural development, navigability and sustainable energy production.

Scientific support to the EU's Danube Strategy

The JRC has deepened scientific cooperation in support of the EU's Danube Strategy, which seeks to improve economic development across the region and boost growth and jobs through better policy-making and funding.

At a high-level event in Bratislava, the European Commission and the Slovakian government launched six scientific clusters on water, land and soil, bio-energy, air, data exchange & harmonisation, and smart specialisation. The JRC took up the challenge to gather the scientific support needed for the implementation of some of the priorities of the Danube strategy, regarding environmental protection, irrigation, agricultural development, navigability and sustainable energy production. In October the JRC formally launched the Danube Innovation Partnership in Romania, part of the JRC's Scientific Support to the Danube Strategy initiative.

Reinforcing transatlantic ties

To facilitate compatibility of standards across both sides of the Atlantic, the JRC and the US reinforced their cooperation through several cooperation agreements. The JRC and the National Institute of Standards and Technology (NIST) agreed in 2013 to broaden their current scientific co-operation to ten areas related to standards and measurements. Environment and climate, energy, transport and security feature high on the collaborative research agenda. Eco-industries (i.e. sectors such as air pollution management and control, waste collection and treatment) are also a shared priority for the EU and the US which call for joint actions. Scientific support is a crucial prerequisite for the development of these industries. Together, the EU and the US have the potential to lead with their examples.

Science Parks are important intermediaries in the diffusion of research results and innovations in the smart grids domain, connecting research organisations and the business community. The JRC and the International Association of Science Parks and Areas of Innovation (IASP) looked at the cooperation between science parks, local authorities and business communities, in both the EU and the US, as drivers for smart cities.

The JRC's extensive work on marine-related issues is an underpinning part of the European Commission's

The first of the twin centres to promote common standards in electric mobility and smart grids on both sides of the Atlantic was inaugurated in July 2013.

contribution to the 'Galway Statement on Atlantic Ocean Cooperation' signed on 24 May 2013 between the EU, US and Canada which agrees to better understand the Atlantic Ocean and promote the sustainable management of its resources. One element of this is the JRC's fruitful collaboration with the US National Oceanic and Atmospheric Administration (NOAA).

Electro-mobility: first EU-US interoperability centre

The first of the twin centres to promote common standards in electric mobility and smart grids on both sides of the Atlantic was inaugurated in July. It is hosted at the USA's Argonne National Laboratory and the second one will be opened at the JRC sites in Petten and Ispra in 2014. The aim is to promote a common approach between the US and the EU with regards to testing relevant electric vehicle and smart grid equipment as well as to foster global standards.
Converging standards and interoperability between smart grids – intelligent electricity systems – and electric vehicles will allow more integration of renewable energies in the electricity systems.

Scientific cooperation with Brazil

In 2013 the JRC and the Brazilian Ministry of Science, Technology and Innovation (MCTI) signed a Cooperation Arrangement to strengthen and further structure scientific and other cooperative activities in the areas of disaster prevention and crisis management; climate change and sustainable management of natural resources and ecosystem services; energy, including bioenergy and smart grids; food security; bioeconomy; information and communication technologies (ICT), as well as nanotechnologies.

The Arrangement foresees exchange of personnel and scientific information, reciprocal access to laboratories; shared use of scientific infrastructure and support of training and of joint research.

The JRC and the Brazilian Ministry of Science, Technology and Innovation (MCTI) have signed a Cooperation Arrangement in the context of the 6th EU-Brazil Summit, to strengthen and further structure scientific and other cooperative activities.

Monitoring natural resources in Africa

In 2013, 47 sub-Saharan African countries saw the successful deployment of the JRC-developed e-Station; a web service to support policy-makers and governmental agencies in their environmental monitoring of land conditions and natural resources in Africa. It offers space-based monitoring of, for example, land degradation, fire management, food security, fisheries and protected area management.

The JRC-developed e-Station, a web service to support policy-makers and governmental agencies in their environmental monitoring of land conditions and natural resources in Africa.

Read more

European Forum for Science and Industry
http://ec.europa.eu/dgs/jrc/index.cfm?id=6660

EU Strategy for the Danube Region
http://danube-region.eu/

Danube innovation partnership
http://ec.europa.eu/dgs/jrc/index.cfm?id=2470&obj_id=4620&dt_code=EVN&lang=en

e-Station
http://estation.jrc.ec.europa.eu/

REINFORCING THE JRC'S SCIENCE INFRASTRUCTURE

The JRC has invested in new infrastructure on its sites in Ispra (Italy) and Karlsruhe so that it can continue providing solid scientific evidence in the years to come, and welcoming visitors in a modern and interest-triggering environment. The new infrastructures use advanced environmentally-friendly methods and technologies. The JRC's new Visitors' Centre opened on time for the bi-annual Open Day in Ispra, an event which offered an insight in laboratories and activities to over ten thousand visitors this year.

European Commissioner for Research, Innovation and Science Máire Geoghegan-Quinn, European Commissioner for Energy Günther Oettinger, and JRC Director-General Dominique Ristori at the inauguration of the new building at the JRC's Institute for Transuranium Elements in February 2013.

The new and more environmentally-friendly and energy-efficient infrastructure will replace many unsustainable scattered buildings and lead to a 6% energy saving of the JRC site.

Upgrading JRC infrastructure in Karlsruhe

In its 50th anniversary year, the JRC's Institute for Transuranium Elements (ITU) in Karlsruhe upgraded its infrastructure in order to maintain the highest safety and security of its installations and be able to provide state-of-the-art support in the nuclear field.
The official inauguration of the new office building took place in the presence of European Commissioner Máire Geoghegan-Quinn, responsible for research, innovation and science, Günther Oettinger, EU Commissioner for Energy and German representatives from the federal ministry for education and research and from the State of Baden-Württemberg ministry for environment, climate and energy industry.
Founded in 1963 to provide scientific and technical support to the European Commission in implementing the Euratom treaty, the JRC's ITU celebrated its 50th anniversary by organising a scientific seminar and a high-level event on nuclear safety and security on 20 and 21 November.

New research facilities to support solar technologies in the EU

New facilities at the JRC's European Solar Test Installation (ESTI) in Ispra were inaugurated in June. The improved laboratories allow ESTI to assess the performance of new and improved photovoltaic (PV) devices, to perform pre-normative research and to help develop international standards. At current investment costs of less than 1500€/kW, photovoltaic technologies have a strategic importance for competitive renewable energies, and a long-term potential for increased efficiency (from the current 14% PV cells efficiency up to over 60%). Investing in new state-of-the-art technologies allows ESTI to keep pace with the rapidly evolving PV market and be able to address forthcoming standardisation issues.

MEP Vittorio Prodi, Commissioner Máire Geoghegan-Quinn, JRC Director-General Dominique Ristori (from l to r) listen to Vice-President Maroš Šefčovič at the inauguration of the new ecofriendly building in Ispra.

New eco-friendly infrastructure at JRC Ispra site

In October new laboratory and office space was inaugurated at the JRC site in Ispra in the presence of Vice-President Maroš Šefčovič and Commissioner Geoghegan-Quinn. The new and more environmentally-friendly and energy-efficient infrastructure will replace many unsustainable scattered buildings and lead to a 6% energy saving of the JRC site. Bringing together around 450 scientists in one place, the new infrastructure will also facilitate more collaborative multi-disciplinary work. This investment is a clear sign of the commitment to meet the ambitious 2020 targets that Europe has set for increased energy efficiency, increased share of renewables and reduction of greenhouse gases.

Communicating science

In addition to the refurbishment of two new buildings, 2013 saw the opening of the JRC Visitors' Centre in Ispra, also inaugurated by Commissioner Máire Geoghegan-Quinn. The friendly and unique design of the Visitors' Centre, equipped with the latest technology serving science, aims at encouraging visitors to take a deeper look at how the JRC's work contributes to EU policy-making through science and research, in areas from climate change to renewable energy, nanotechnology to global crisis monitoring, ensuring food safety and analysing society's growth and stability. Every year, the JRC Ispra site welcomes over thousands of visitors with varied interests - from students interested in earthquake engineering to politicians who want to be briefed about the JRC's role in the policy cycle. Requests for visits and initiatives are continuously rising.

Educating for the future at the Ispra Open Day in May 2013.

The new Visitors' Centre at the JRC site in Ispra, featuring the 3D Globe communication tool.

Read more

Institute for Transuranium Elements
http://itu.jrc.ec.europa.eu/

European Solar Test Installation
http://re.jrc.ec.europa.eu/esti/

FACTS AND FIGURES

Staff

The total number of staff working at the JRC at the end of 2013 was 3023.
Of the 3023 total, 77.28% worked on scientific projects, 20.70% carried out administrative or support activities and 2.02% worked in nuclear decommissioning.
The total number of staff in the JRC in 2013 has risen slightly in comparison to 2012 (2882).

Total Staff	F	M	Total
Core Staff			
Officials	591	1221	1812
Temporary agents	6	18	24
Visiting Staff			
Postgraduate grantholders	30	21	51
Post-doctoral grantholders/ senior scientists	288	415	703
Contractual agents	220	165	385
Seconded national experts	12	36	48
Total	**1147**	**1876**	**3023**

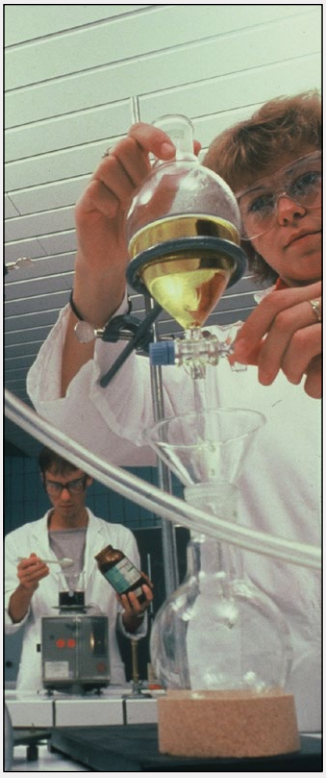
Equal Opportunities

The gender balance of staff in management and administrator posts is as follows:

	F	M
Senior management positions	18 %	82 %
Middle management positions	19 %	81 %
Non-management administrative positions	24 %	76 %

At the end of 2013, women were represented in 24% administrator (AD) posts at the JRC (versus 22% in 2012), against a Commission average of 43%. A steady increase has been observed in 2013 in the representation of women in middle management with 25% of new appointments made to women, reaching 20% (19% in 2012). No new appointments were made in 2013 in the senior management category keeping the female representation in this category at 17%.

Further progress is to be expected by striving to meet the goals set by the Commission's Equal Opportunities Strategy which foresees at least 50% of recruitment rates of women in the AD non-management and middle management positions and a 30% replacement rate of senior managers by women, annually.



Visiting staff

In addition to its core staff, the JRC proactively seeks to host researchers (grantholders), senior scientists, seconded national experts, and trainees, primarily from the Member States and Candidate Countries.
Visiting staff bring advanced skills, knowledge and expertise to help resolve current and future scientific challenges. In turn, they benefit from the cultural diversity, multidisciplinary research domains and state-of-the-art research facilities at the JRC.

JRC Publications in 2013	
Books and articles in peer reviewed journals[1]	744
JRC Reference Reports	4
JRC Scientific and Policy Reports	677
PhD theses	8
Total	**1433**

[1] *Books, article contribution to a monograph, article contribution to peer-reviewed periodicals listed in the ISI Science Citation Index Expanded and/or Social Science Citation index, article contribution to conference proceedings published in other peer-reviewed periodicals.*

Budget

The credits available to the JRC are divided into staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables, etc.) and specific expenses (direct scientific procurements) related to Framework Programme activities.

The table shows the breakdown of how the 2013 institutional budget was spent (in terms of available in commitment appropriations, EFTA not included, and as of 30 November 2013).
In addition, €30.9 million was spent on the programme to decommission the JRC nuclear installations, and to manage the waste activities related to the EURATOM Treaty.
Additional credits of €29.19 million were received from the contributions of countries associated to the Framework Programme (FP) and from competitive activities undertaken by the JRC (JRC earned income).

Outgoing expenses (in million Euro)	2013
Staff expenses	€ 249.67
Means of execution	€ 100.28
Operational appropriations (FP)	€ 43.34
Total (rounded up)	**€ 393.29**

JRC earned income

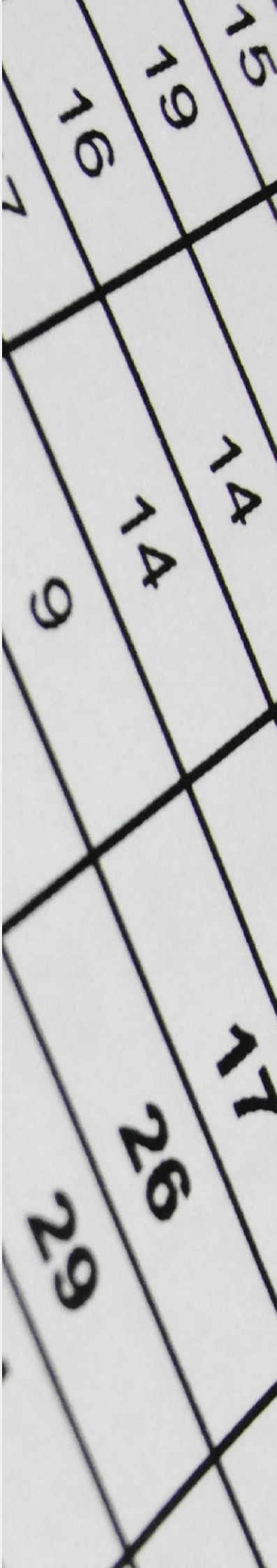
The cashed competitive income in 2013 as of 1 December 2013 amounted to €55.8 million.
The table below shows the value of contracts signed in 2013. Some of the JRC's income comes from its participation in FP7 competitive activities ('Indirect Actions'), from performing additional work for Commission services, and from contract work carried out for third parties such as regional authorities or industry. These competitive activities complement the tasks outlined in the JRC's work programme and are an essential tool for acquiring and transferring expertise and know-how.

Contracts signed (in million Euro)	2013
Indirect Actions of the Framework Programme (FP)	€ 15.65
Support to Commission Services	€ 69.70
Third Party work	€ 8.51
Total (rounded up)	**€ 93.86**

JRC media coverage in 2013	
Number of press reports	2757
Number of very positive news items in top-tier media	150
Number of countries covered	84
Most reported topics	
Air & Climate	154
Study about digital music downloads	140
Renewable energy	135
Energy efficiency	125
Biofuels	122
R&D investments scoreboard	113
Nuclear forensics (incl. EUSECTRA)	75
E-mobility & smart grids	70
EFFIS	76
Soil (including Soil Atlas Africa)	60
EXPO Milan	90

Science for growth and jobs

In 2013, the JRC organised 22 roundtables hosting discussions on the role of science to support economic growth in a wide array of domains such as the EU's internal market, financial stability, standards for industry, enabling technologies and innovative SMEs, Danube strategy, renewable energy and energy mix, energy-efficient buildings, public health, quantum technologies and cultural and creative industries. Such events gathered over 2000 participants from industry, government and the science community.



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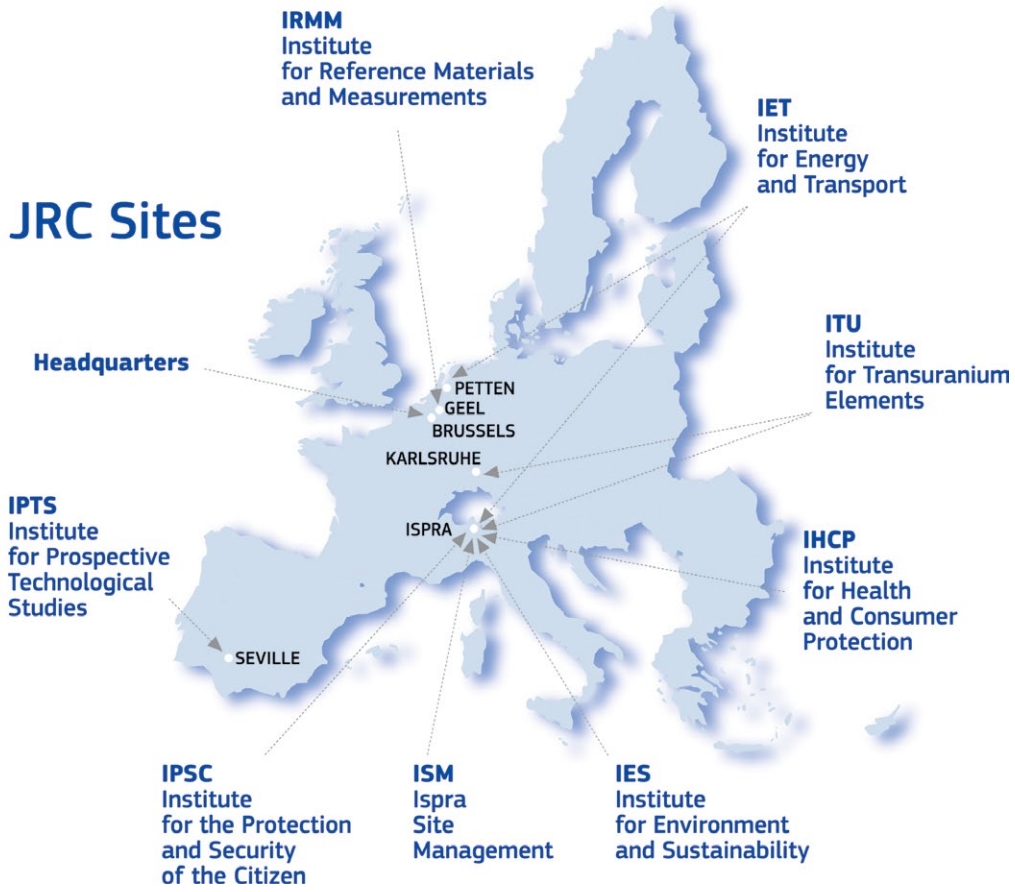
It is independent of any national, private or industry interest and provides sound and relevant scientific input to European policy-making.

- Established in 1957
- 3023 scientific and technical personnel
- 7 scientific institutes
- 1433 publications in 2013
- 1244 policy support deliverables



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Abstract

Report on the activities, accomplishments and resources related to the JRC's work carried out in 2013.
An overview is given of the scientific achievements and activities.

Website

www.jrc.ec.europa.eu

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