



European  
Commission



# Joint Research Centre

*The European Commission's  
in-house science service*

# Annual Report 2012

Joint  
Research  
Centre

# President Barroso's visit to Ispra

## When policy meets science

On Friday 16 March 2012, the JRC and the European Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn welcomed José Manuel Barroso, President of the European Commission, to JRC's Ispra site.

The visit was an opportunity to showcase the breadth of JRC's scientific support to EU policy. President Barroso visited the spectacular European Laboratory for Structural Assessment (ELSA), the largest of its kind in Europe, which is used to test the earthquake resistance of buildings and can test structures as high as a five-storey building.

Another highlight was the visit to the Vehicle Emissions Laboratory (VELA), capable of measuring emissions from all types and sizes of vehicles, which is now also working on electric vehicles. JRC scientists also presented their work in the areas of food security and natural resources, photovoltaics, nanotechnology and nuclear security.

The President inaugurated the new European Crisis Management Laboratory (ECML), which supports the EU's interventions in areas struck by disaster around the globe. The new facility, equipped with state-of-the-art information technologies, provides a dynamic situational awareness for crisis and disaster preparedness and response on any location or event in the world.

Speaking to JRC staff, the President stressed the important role of the JRC as a bridge between policy making, science, society and economy, thanks to its close relations between so many bodies and organisations inside and outside Europe, and its relevant, high quality research.



*Hands-on testing at the JRC's Vehicle Emissions Laboratory (VELA).*

*Addressing JRC staff at Ispra.*



*Elke Anklam, Director of the JRC's Institute for Health and Consumer Protection, explains some of the research carried out in the area of nanotechnology.*



*From the left: David Wilkinson, Stephan Lechner, Laurence de Richemont, Thomas Fanghänel, Dominique Ristori, John Bensted-Smith, José Manuel Barroso, Leen Hordijk, Máire Geoghegan-Quinn, Dan Chirondajan, John Bell, Jean-Pierre Michel, Giovanni De Santi, Pieter Van Nes, Elke Anklam, Guido Schmuck, Krzysztof Maruszewski, Axel Nevens, Anne-Charlotte Bournoville.*



Visiting the JRC's European Laboratory for Structural Assessment (ELSA).



Inaugurating the European Crisis Management Laboratory.



Speaking to the press.



*"Congratulations for the tremendous and exciting work being done in the laboratories in Ispra! I am impressed by all that I saw during my visit and I can only encourage you to continue"*



Giovanni De Santi, Director of the JRC's Institute for Energy and Transport, explains the link between renewable energies and e-mobility.

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# Foreword by Máire Geoghegan-Quinn

## European Commissioner for Research, Innovation and Science

Looking back on 2012, and at the sheer magnitude of the challenges that Europe has faced, I am proud of the determination and resourcefulness shown by the Commission to enhance stability and create a climate for growth and creation of new jobs. Together with stakeholders and partners, we have taken great strides towards realising the EU's innovation potential and developing workable yet visionary structures to fund science and research in the EU over the next seven years.

Horizon 2020, the proposed EU programme for research funding for the period 2014-2020 and Innovation Union are key to ensuring that our cities, regions and Europe as a whole become powerhouses of research and innovation.

The Joint Research Centre (JRC), as the Commission's in-house science service, has a key role to play in this endeavour and I am pleased with the increased focus the JRC has put on supporting innovation-related issues, from its dedicated unit on Innovation Union, through to cross-cutting topics such as eco-industries.

its contribution to innovation and growth and its potential to address societal challenges such as climate change, food and energy security and an ageing population.

I am proud of the JRC's achievements over the last year. Needless to say, it was a particular pleasure for me to welcome President Barroso to JRC's Ispra site, where so much of this exciting work is being done. The inauguration of the European Crisis Management Laboratory was a highlight of this visit. I can also confirm that the JRC's vital contribution to global crisis management is appreciated by our international partners, as witnessed in the high level meeting with senior scientific advisers of the Carnegie Group countries, the World Bank, the UN and other major partners which I had the pleasure of hosting in Brussels on 6 December 2012.

As the Commission's in-house science service, the JRC has truly demonstrated its relevance as the trusted provider of unbiased scientific and technical support to policy, with an impressive capacity to rapidly mobilise the necessary resources to deal with emerging topics. It has amply demonstrated its quality, not least as a scientific and technical reference centre maintaining the highest analytical and technical standards and overseeing the validity of methods that ensure EU legislation is consistently applied. An example of this is the JRC's cutting edge capacity in nuclear forensics, which few research institutes can rival, as I was able to see first hand during my visit to the JRC's Institute for Transuranium Elements in Karlsruhe.

Through its strong scientific and technical expertise and impressive networking capacity, the JRC continuously contributes to innovation as a leading partner in standardisation efforts. It helps to build the predictable framework in which innovation can thrive and new technologies gain acceptance, which in 2012 was very evident in JRC's work on nanomaterials, and its efforts to further interoperability of electric vehicles and smart grids.

Written to give a short glimpse of the JRC's widespread and rich scientific activities, the Annual Report is in itself a strong argument for the central role of science in dealing with today's societal challenges.



*Commissioner Máire Geoghegan-Quinn during her visit to the JRC's Institute for Transuranium Elements.*

At the time of writing, the ongoing negotiations on the size of the EU research budget are closely followed by the science community, as it is clear that this has profound implications for the extent to which Horizon 2020 will be able to meet its aims; to promote excellent, curiosity-driven research, create industrial leadership and address today's challenges across disciplines and research fields. Now, more than ever, it is crucial to emphasise the central place of science in European society, at the heart of Europe's economy. Scientific research needs to demonstrate its relevance and quality,

# Foreword by Dominique Ristori

## JRC Director-General

In March, the Commissioner and I had the honour of welcoming President Barroso to the JRC site in Ispra. The occasion marked the inauguration of the new European Crisis Management Laboratory by the President in addition to presenting examples of JRC's scientific excellence in providing vital support to the EU policy process.

As the only Commission service carrying out direct research, the JRC plays a crucial role in providing evidence-based scientific and technical advice for European policy makers. This includes support to the Economic and Monetary Union (EMU), internal market for growth, jobs and innovation, agriculture and global food security, the low-carbon economy and resource efficiency (environment, climate change, energy, transport), public health, safety and security and nuclear safety and security. In addition, three new scientific units were created in 2012, supporting the Innovation Union, financial analysis and a team addressing water resources.

Bringing together stakeholders from across the policy arena, the JRC launched several initiatives to discuss the role of science in tackling key political challenges. This included 'Scientific support for growth, jobs and sustainability: the example of eco-industries' in May, 'Mapping scientific needs in the Arctic and Northern Areas' in October, and 'Scientific support to financial stability' which was launched via a high-level roundtable in November.

I have always emphasised the importance of strong networks and cooperation. I am glad to say that this last year has seen increased collaboration with all relevant stakeholders, including Commission services, EU Member States and their organisations as well as industry. For example, the JRC and the European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE) signed an agreement to develop closer links between the EU national academies and the EU's policy-making process. The JRC also launched its Scientific Support to the Danube Strategy, involving the National Academies of Science of related countries.

Stronger ties were developed in the international arena. For example, at the request of Commissioner Geoghegan-Quinn, the JRC organised a high-level

meeting to discuss the benefits of international cooperation to address disaster anticipation and resilience, with the participation of the Carnegie Group countries (G8+5), the World Bank and the United Nations. A joint exhibition was also organised with the Brazilian National Centre for Monitoring and Early Warning of Natural Disasters (CEMADEN) at the Rio +20 conference. In addition I am happy to highlight the cooperation arrangement signed with Israel's Ministry for Energy and Water. Such international collaboration is crucial to foster synergy in the wake of grand societal challenges faced not only by Europe but by the entire world.



*The JRC's Director-General Dominique Ristori with the President of the European Commission José Manuel Barroso.*

This report highlights some of the important achievements of the JRC in 2012; this is, however, only a glimpse of the breadth of work carried out. All of these efforts would not be possible without the dedicated work of the highly skilled and motivated JRC staff. I therefore wish to take this opportunity to thank them for their excellent work. I am confident that in 2013 the JRC will continue to play a pivotal role in providing technical and scientific support and advice to EU policy.



## Observations from the Board of Governors

In 2012, the Board of Governors, whose members are nominated by the Member States and Associated Countries, 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 March, June and November to discuss issues such as the role of JRC in Horizon 2020, the development of the 2013 Work Programme and the JRC's contributions to the European stress tests of nuclear power plants, the eco-industries and the Danube Strategy.

The Board strongly supported the proactive approach of the Director-General, Mr Dominique Ristori, to place the JRC and science-based evidence at the heart of the decision-making process within the Commission.

In reflecting on the key role of research infrastructures for state-of-the-art science and science-based policy support, the Board welcomed the JRC initiative of hosting one of the meetings of the European Strategy Forum on Research Infrastructures (ESFRI) in Ispra and supports future activities of the JRC in that context.

2012 was a critical year in terms of the budgetary negotiations in relation to Horizon 2020 and the Multi-annual Financial Framework. In this context, the Board worked actively on the issues arising for the JRC in the emerging proposal for Horizon 2020. The Board recognises the specificity of the JRC's role as the only Commission service carrying out direct research. The Board maintained its opinion that continued investment in JRC infrastructure is of great importance to maintain the quality of its work.

In strategic terms, the Board advised the JRC on the current EU priority needs for scientific support, taking into account the Europe 2020 strategy and the mid-term review of FP7 of the JRC, acting as a two-way conduit between the JRC and Member States and Associated Countries, and helping to better reflect Member State priorities in the JRC work programme 2013.

The Board welcomed the progress made by the JRC Modelling Task Force, in support of the Commission's policy priorities. The Board encourages the JRC to go further in the development of its modelling capacity and its involvement in impact assessment, as both activities raise the profile and importance of the organisation.



*The Board of Governors at a demonstration of global environmental issues using the JRC's interactive globe in Ispra, November 2012.*



*Marc Steen, Head of Unit for Cleaner Energy, showing the Techno Hall in Petten to members of the Board of Governors.*

The Board acknowledged the analysis of the JRC's National Contact Points (NCPs) Network, which recommended to maintain the NCP network and to identify further improvements in view of Horizon 2020. The Board expressed the need to motivate the NCP network in promoting the JRC.

The Board endorses the priority areas identified by the JRC for the first years of implementation of Horizon 2020 and noted with pleasure that cooperation with Member States and other key actors will be reinforced. The Board wishes to congratulate the JRC Director-General, Dominique Ristori, for improving the JRC's visibility through the many high-level initiatives undertaken throughout the year, from work on the Danube Strategy to cooperation with European Science Academies. The Director-General also launched the European Forum for Science and Industry which has the role to increase the interaction between the JRC and the real economy, as demonstrated by the important initiatives carried out during 2012.

The Board welcomes the appointments of Vladimir Šucha, Deputy Director-General, Maria Betti, Director of IES, Elke Anklam as the IRMM Director and Krzysztof Maruszewski as the IHCP Director as from 1 January 2013 and wishes them success in their new positions, and on the occasion of his retirement thanks Leen Hordijk, Principal Adviser to the JRC Director-General, for his work.

The Board endorses the present annual report and expresses its acknowledgement of the efforts of JRC management and staff in contributing to the repositioning of the JRC.

*From left to right:*

*1st row: Annette Borchsenius, José Pío Beltrán, Maria Betti, Ioan Dumitrache, Killian Halpin, Dominique Ristori, Hüseyin Güler, Pierre Decker, Ulla Engemann, Walter Mönig, David Wilkinson.*

*2nd row: Marta Cimbáková, Bogdan Van Doninck, Bruno Moor, Frank Heeb, Karel Aim, Shlomo Wald, Viktor Nedović, Arjan Xhelaj, Daniel Weselka, Tadeusz Luty, Vladimir Šucha.*

*3rd row: Toivo Räm, Andrejs Siliņš, Gheorge Duca, Atanas Kocov, Hallgrimur Jonasson, Giedrius Viliūnas, Vassilios Tsakalos, Jan Nieuwenhuis, Paolo Pereira, Paolo Venditti.*



# Financial stability

*The global financial crisis, which started in 2008, and the subsequent sovereign debt crisis in Europe, exposed the weaknesses of the global financial systems. They had a strong adverse impact on EU financial markets, notably in the Eurozone. Consequently, studying the relationship between financial stability and financial integration has become a high priority on the research agendas of central banks and academia in the EU. The financial crisis has shown clearly that financial distress in today's globally integrated financial markets can spread very quickly from one institution to another or from one financial system to another.*

*With its modelling and scientific expertise the JRC provides input in the Commission's efforts to achieve a strong and stable financial system for the EU.*



The initiative brought together high-ranking financial experts, researchers, EU policy makers and representatives from the European Central Bank, European Investment Bank, the European Banking Authority, the Bank for International Settlements and the International Organisation of Securities Commissions. European Commissioner for Internal Market and Services Michel Barnier emphasised the crucial role of scientific inputs for policymaking

The discussions identified three main areas where science needs to play a key role: preventive and monitoring measures, implementation of the proposed Banking Union and ex-ante assessment of initiatives following the Liikanen group recommendations to reform the structure of the EU banking sector.

Experts participating in the roundtable emphasised the challenges of providing scientific support to financial stability: they pointed out that modelling human emotions and behaviour is a key challenge since variables such as credibility, perceptions or expectations are difficult to measure and assess. An interdisciplinary approach taking on board sociology, psychology and political science should be used to facilitate the overall evaluation. They argued for the need for better planning of reform processes to give sufficient time for scientific analyses, and suggested that the proposed single supervisory mechanism could enhance the availability of reliable data and harmonised definitions and indicators across the EU.



*From left to right: Professor Paul Demaret, Rector of the College of Europe; Dominique Ristori, JRC Director-General; Michel Barnier, European Commissioner for Internal Market and Services; Malcolm Harbour, Chairman of the Committee on the Internal Market and Consumer Protection, European Parliament.*

## Scientific support for financial stability

The JRC launched an initiative to stimulate dialogue and foster cooperation between the scientific and policy making community working on financial stability issues with a roundtable in November, with the support of the College of Europe.

## GAP and QUEST: Modelling essential macro-economic variables

The EU Stability and Growth Pact is a rule-based framework for the coordination of national fiscal policies in the Economic and Monetary Union (EMU). Following a request from the Commission's Economic and Financial Affairs DG (DG ECFIN), the JRC has developed and maintains the estimation platform GAP which calculates output gap and potential growth. These estimates are two key elements for assessing the cyclically adjusted budget balances of EU Member States and therefore for monitoring their adherence to the Stability and Growth Pact.

In 2012, the JRC updated the GAP methodology by including EC business surveys in the estimation of the Total Factor Productivity gap. This allows for more precise estimates of the productivity cycle. The global macroeconomic model QUEST III, which is managed and developed jointly by DG ECFIN and the JRC, is the main tool used for macroeconomic policy analysis and research in the European Commission. It is also used to study the composition of a country's external financial assets and liabilities.

In 2012, QUEST III was used to illustrate possible rebalancing scenarios in Spain. The simulation results suggest that structural reforms of the labour market can help soften the negative short-term impact on growth and employment of the rebalancing process.

## SYMBOL: Providing insight into the dynamics of the banking sector

The European Commission in 2012 proposed the establishment of a "Bank Recovery and Resolution" framework to give policy makers a set of "prevention", "early intervention" and "resolution" powers. It aims to ensure that, in the case of bank failure, essential functions of a bank are preserved and that shareholders and creditors – not tax-payers – will bear the losses. This will allow authorities to address future bank failures in a rapid and effective manner.

The JRC evaluated the potential economic effects of the proposed measures by assessing the extent to which they would reduce the probability of another systemic crisis happening in the future, and – in the event of a crisis – reduce the costs to be borne by the public. The evaluation of the impact of the resolution framework was largely based on the SYMBOL (Systemic Model of Banking Originated Losses) model, developed in-house in cooperation with the Commission's Internal Market and Services DG and academia. The JRC also assessed the potential additional cost of implementing the measures, leading to a final estimate of the annual net benefits of the package of at least 0.76% of European GDP.

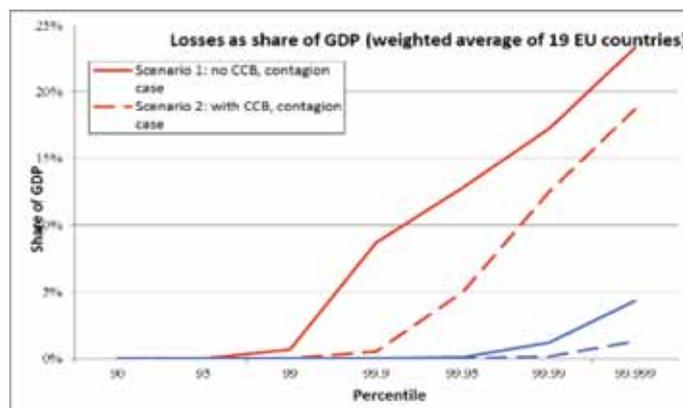
Read more:

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*, Volume 37, Issue 3, pp. 577-590. DOI: 10.1016/j.jedc.2012.09.005

Quarterly report on the euro area. Volume 11 N°3 (2012)

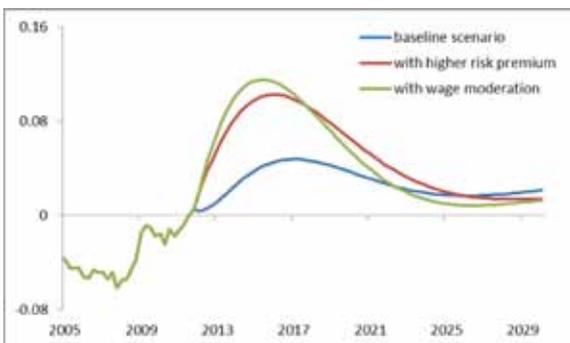
EU framework for bank recovery and resolution proposal, COM(2012)0280

Figure 2



Simulation results of the SYMBOL model. Distribution of losses (as a % of GDP) that exceed bank capital and might hit public finances under various regulatory scenarios. legend: CCB = Capital Conservation Buffer.

Figure 1



Simulation results with QUEST (1) (2) (3)  
 (1) Baseline scenario: estimated model.  
 (2) With higher risk premium: stabilising NFL to 35% of GDP.  
 (3) With wage moderation: as scenario (2) plus reduction in real wage growth by 6 pp annualised.  
 legend: NFL = Net Foreign Liabilities.

# Growth, jobs and Innovation Union



*In its efforts to generate smart, inclusive and sustainable growth and create new jobs, the European Commission has put forward a series of proposals to unleash innovation, strengthen EU competitiveness and help bring ideas to market. In 2012, the JRC used its strong networking capacity to connect science parks – gathering science and business actors – with their counterparts across Europe and set up the European Science and Industry Forum. It set up the European Science and Industry Forum to strengthen dialogue and cooperation on the science needs of industry in key sectors for European competitiveness. This dovetailed with JRC's initiatives to reinforce scientific support to eco-industry, nuclear decommissioning and oil refineries.*

*The JRC worked with its many partners to develop EU-wide construction standards to enhance safety and make it easier for construction companies to work across borders. To monitor progress and help policy makers stay on target, the JRC tracked innovation capabilities of businesses, countries and regions. It also highlighted the rapidly expanding role of eco-industries for jobs and growth.*

Read more:

*Conference report – Scientific support for growth, jobs and sustainability: the example of eco-industries:*

[http://ec.europa.eu/dgs/jrc/downloads/jrc\\_2012\\_eco\\_industry\\_report\\_en.pdf](http://ec.europa.eu/dgs/jrc/downloads/jrc_2012_eco_industry_report_en.pdf)

## Eco-industries for a sustainable future

Eco-industries produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste and eco-systems.

The Europe 2020 strategy for growth and jobs identifies environmental protection, the promotion and diffusion of eco-innovations and environmental technologies as important pillars of current and future European policy and stresses their potential for economic growth and employment.

The JRC launched an initiative on Scientific support for growth, jobs and sustainability: the example of eco-industries which emphasised the unique role eco-industries can play in Europe's economic recovery and environmentally sustainable future. The initiative was launched through a conference held in Brussels in May, which sought to identify the areas where new scientific support and new standards will be needed.

Opened by Commissioner Máire Geoghegan-Quinn, and Hannes Swoboda, President of the Group of the Progressive Alliance of Socialists and Democrats at the European Parliament, the conference welcomed high-level speakers from business, research organisations, governments and EU policy makers. They shared experiences from their fields and discussed how scientific support can boost the growth of eco-industries.



## Uniform standards for the construction sector

Construction is a crucial sector for the European economy, generating almost 10% of EU GDP and providing 20 million jobs. However, as a consequence of the financial and economic crisis and the housing bubble, building and infrastructure work fell by 16% between January 2008 and April 2012 across the European Union.

On 31 July 2012 the European Commission presented a strategy to boost the construction sector, which among other things promotes the Eurocodes, a set of European standards for the design of buildings and other civil engineering works.



*A 4-storey full scale model tested in the JRC's European Laboratory for Structural Assessment (ELSA) to study the effectiveness of seismic retrofitting of reinforced concrete frames.*

In 2010, the Eurocodes replaced national standards in the EU, ensuring more uniform safety levels for buildings and critical infrastructures. Over the years, the JRC has contributed significantly to the development of the Eurocodes and in 2012 supported their implementation, harmonisation and further development. The JRC also monitors the use of Eurocodes in Member States by developing and managing the database of the National Determined Parameters, values related to regulatory safety matters determined at a national level. It also organises training and supports the promotion of Eurocodes outside the EU.

## Measuring investment and innovation

The JRC's 9th edition of the European Union Industrial R&D Investment Scoreboard confirmed that major EU-based firms continue their R&D efforts to maintain their competitive edge. Companies increased R&D investment by 8.9% in 2011, up from 6.1% in 2010, an increase which is higher than the global average.

The European Union has set a target combining public and private research spending that should reach 3% of GDP by 2020. The increase in R&D investment by EU companies is a decisive contribution towards growth and jobs.

The JRC contributed to the Regional Innovation Scoreboard 2012, issued by the European Commission in November, which provides a comparative assessment of innovation performance across 190 regions of the European Union. The scoreboard draws attention to differences in innovation performance between and within countries. Three countries (Czech Republic, France and Portugal) have at least one region in each of the 4 broad performance groups ('innovation leaders', 'innovation followers', 'moderate innovators' and 'modest innovators') while eleven countries, including Italy, Germany, Spain and UK, span over three performance groups. This diversity calls for regional innovation support programmes tailored to meet the needs of individual regions.

The JRC also contributed to the conceptual and statistical refinement of the Global Innovation Index 2012 (GII) issued jointly by INSEAD, a leading graduate international business school, and the World Intellectual Property Organization (WIPO). The GII provides global innovation scores for 141 countries and ranks six EU countries and Switzerland among the top 10.

## Connecting European science and business

Science parks are important links in the innovation chain which help to deliver science-driven innovation to the economy. In 2012, to foster connectivity at European level between research and business, the JRC initiated cooperation with partners such as Cambridge University, the Karlsruhe Institute of Technology, the Technical University of Munich, the French science park Sophia Antipolis and the International Association of Science Parks and Areas of Innovation (IASP). In addition, thematic events were organised by the JRC to bring together researchers and businesses. These efforts will continue in 2013.

Following the request of Commissioner Geoghegan-Quinn last year, the JRC launched the setting up of the European Research and Innovation Observatory. This new service will produce data, policy information and analyses on research and innovation with the aim of providing an evidence base to the European Semester, including recommendations to the Member States in the field of research and innovation, as well as to the Innovation Union flagship and the European Research Area (ERA).

Read more:

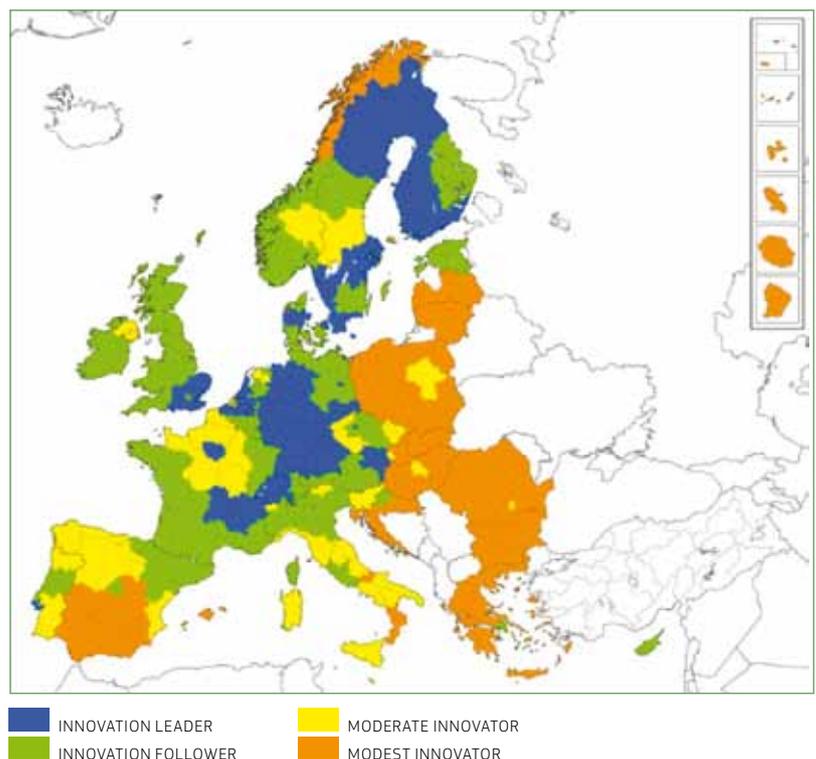
Communication of 31 July 2012 on the Strategy for the sustainable competitiveness of the construction sector and its enterprises, COM(2012)0433

Eurocodes website: <http://eurocodes.jrc.ec.europa.eu/>

The 2012 EU Industrial R&D Investment Scoreboard: <http://iri.jrc.ec.europa.eu/scoreboard12.html>

Regional Innovation Scoreboard 2012 – Methodology report

Figure 3



Regional innovation performance.

# Energy and transport for a low-carbon society

*The EU is a global leader in efforts to combat climate change and develop new energy and transport technologies that lower greenhouse gas emissions, cut energy consumption and optimise the energy fuel mix. Having built up a solid capacity in energy research over many years, the JRC works with the whole range of energy and transport related challenges, from monitoring energy trends and assessing upcoming technologies, to hands-on measurements of vehicles, buildings and equipment. In 2012, it provided valuable input to the debate on shale gas extraction, and collaborated with industry partners to enhance the ability of oil refineries to meet the specific needs of the market. It was deeply involved in the development of the EU Strategic Transport Technologies Plan.*

## Shale gas – opportunities and risks for Europe

In the last decade, production of natural gas from shale took an important step forward, thanks to technological developments allowing fracturing of the rock and release of the gas trapped in small pores and fissures. Commercial production on a large scale has started in North America, where the US now gets some 25% of their gas from shale. So far, there is no commercial shale gas extraction in Europe.



*JRC's research on the market potential and the environmental impacts of shale gas supports the Commission's efforts to develop suitable regulation for the exploration of unconventional energy sources.*

However, debate over the environmental and climate impacts from shale gas extraction and production is fierce. Opinions are divided; some Member States have adopted policies clearly in support of shale gas production, whilst others have stopped such activities. The European Parliament recently published two draft reports on shale gas, calling for its proper regulation. The European Commission in 2012 launched an Impact Assessment to find the adequate EU policy options. The JRC contributed to this debate by providing two studies, focusing on the potential market impact of unconventional gas in the EU, and the environmental and social considerations related to shale gas development in the EU.

In October 2012, the JRC organised an international workshop on 'Environmental and socio-economic issues of unconventional energy in Europe' at its Ispra site. The workshop aimed to provide a platform to exchange views and experiences on environmental and socio-economic aspects of unconventional energy sources in Europe.

## Towards a strategic transport system

In September 2012, the European Commission launched an initiative to coordinate and focus European research and innovation in transport. The aim is to speed up the deployment of new transport solutions to achieve a competitive, sustainable and user-oriented European transport system.

This strategy contained the first proposals for the Strategic Transport Technologies Plan (STTP) framework, and the JRC provided scientific support by producing two reports together with experts in the field of transport; a scientific assessment of transport technologies, and a mapping of the innovation capacities of the European transport sector.

Industry, public sector and other stakeholders involved in bringing innovative transport technologies and services to the market will be invited to participate in further development and implementation of this strategy.

Read more:

*Unconventional gas: potential market impacts in the European Union. Pearson, I. et al. (2012). JRC Scientific and Policy Reports, EUR 25305 EN*

*Shale gas for Europe – main environmental and social considerations. Kavalov, B., Pelletier, N. (2012). JRC Scientific and Technical Reports, EUR 25498 EN*

*European Parliament Report on the environmental impacts of shale gas and shale oil extraction activities, 2012, A7-0283/2012*

*European Parliament Report on industrial, energy and other aspects of shale gas and oil, 2012, A7-0284/2012*



© Marco Ansaldi/Science Photo Library

*Scientific information underpins the strategy to develop a more competitive, sustainable and user-oriented European transport system.*

The JRC will be involved in the development of roadmaps for the most critical transport areas identified in the strategy, and will develop and coordinate a new Transport Research and Innovation Monitoring and Information System (TRIMIS) for the implementation of the initiative, with the help of the experience gathered in the past through the Strategic Energy Technology Information System (SETIS).

## Making the transition to a low-carbon economy

On 6 March 2012, the JRC and the Commission's Climate Action DG jointly organised an event in Copenhagen under the auspices of the Danish Presidency of the Council of the European Union.

This initiative, 'Scientific support for the transition to a low-carbon economy', provided a forum for discussions on how scientific advice can best contribute to robust policy frameworks in the fight against climate change and the transition to a low-carbon economy. The conference was addressed by Connie Hedegaard, European Commissioner for Climate Action and Martin Lidegaard, Danish Minister for Climate, Energy and Building, as well as the the Directors-General of the JRC and Climate Action and representatives from the Danish and Swedish governments and research organisations.



*European Commissioner for Climate Action Connie Hedegaard.*

"For politicians in the 21st Century it is absolutely crucial to build public policies on a robust scientific foundation, facts and knowledge. And in order to be effective, climate policies need to have economy-wide implications", Connie Hedegaard explained.

## Improving the refining industry

Oil accounts for about 40% of global energy consumption and fuels almost all transports. It will remain a key part of the global energy mix until at least 2040. This highlights the importance of developing and improving the refinery sector as it will continue to play an important role in providing adequate supply corresponding to the energy needs of the market.

Through its expertise in the assessment of Best Available Techniques (BAT), the JRC provides an important resource by developing BAT reference documents (BREFs), such as a draft report published in March 2012 for the oil refining industry. The JRC has created links between the refinery sector, the policy making process and the scientific community. In addition, it contributes to assessing and monitoring the impacts of actual and projected demand, supply and trade in petroleum products in the EU as well as the EU's security of energy supply.



*JRC's references of Best Available Techniques (BAT) for the oil and energy sector provide underpinning information to European policies on energy security.*

*Read more:*

*Scientific assessment of strategic transport technologies. Dilara, P. et al. (2012). JRC Scientific and Technical Report, EUR 25211 EN*

*Mapping innovation in the European transport sector. Wiesenthal, T. et al. (2011). JRC Scientific and Technical Report, EUR 24771 EN*

*SETIS website: <http://setis.ec.europa.eu/>*

In October, in the framework of the European Forum for Science and Industry, a JRC initiative on Scientific support to EU refining capacity, was launched via a high-level roundtable. The initiative brought together high-ranking representatives of oil and gas companies, heads of industry associations as well as representatives from the science community and the European Commission in order to consider key challenges in an interactive discussion and to identify where scientific expertise and research should be targeted for the benefit of the EU refining industry.



# Environment and climate change



*Climate change, depletion of resources and pollution are all pressing challenges that risk leading to extensive damage to the environment and impacting on our lifestyle. The JRC provides scientific and technical support for the efforts to protect human health and the environment, in the EU and beyond, and to prevent and manage natural and man-made disasters.*

*The JRC's achievements in 2012 includes its work to help safeguard Europe's waters, measuring and limiting air pollution and emission of greenhouse gases, and developing best available techniques for industrial production. It also supported the broader EU efforts to achieve sustainable management of resources in the Arctic.*

Read more:

*A multi-criteria optimisation of scenarios for the protection of water resources in Europe: support to the EU Blueprint to safeguard Europe's waters. De Roo, A. et al. (2012). JRC Scientific and Technical Report, EUR 25552 EN*

*Evaluation of the effectiveness of natural water retention measures - support to the EU Blueprint to safeguard Europe's waters, Burek Peter, A. et al. (2012). JRC Scientific and Technical Report, EUR 25551 EN*

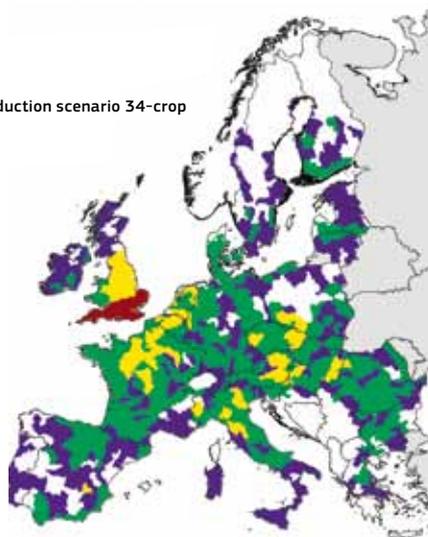
*Trends in global CO<sub>2</sub> emissions. Oliver, J.G.J. et al. (2012). JRC and PBL Netherlands Environmental Assessment Agency, DOI: 10.2788/33777*

## Water resources management

In November 2012 the European Commission launched a Blueprint to Safeguard Europe's Waters, aiming to ensure the sustainability of all activities that impact on water. In support of this Blueprint, the JRC carried out two assessments to establish optimum combinations of water-retention, water-savings and nutrient-reduction measures for continental Europe until 2030. The assessments were made using state-of-the-art land use projection and hydro-chemical modelling specifically developed by the JRC.

Figure 4

Flood damage reduction scenario 34-crop



*The brown area of this graph estimates significant flood damage reduction in terms of financial loss.*

The assessments give a unique analysis of the effects of several measures on future water availability and quality in Europe. The Commission's Blueprint specifically includes the JRC's hydro-economic model as a tool that will help water managers assess the cost-effectiveness of the measures included in river basin management plans.

A new scientific unit was created in 2012 to specifically address water resources. The work carried out includes establishing water saving strategies through model-based scenario analysis for assessing the allocation of available water. In the context of water treatment the unit carries out research on emerging chemical pollutants, works on standards for the reuse of wastewaters and evaluates innovative water treatment technologies. It also provides scientific support to water governance, by strengthening regional and international efforts for restoring water quality and managing water-related risks.

## Measuring sulphur dioxide emissions from ships in harbours

Greenhouse gases (GHG) and air pollutants have common sources such as the burning of fossil and biofuels, while land use change and GHG emissions continue to rise globally. Data from the JRC's Emission Database for Global Atmospheric Research (EDGAR) shows that man-made global emissions of CO<sub>2</sub> in 2011 reached an all-time high of nearly 34 billion tonnes. Three quarters of these CO<sub>2</sub> emissions came from fossil fuel combustion and can therefore be reduced by measures to save energy and a shift to low-carbon energy technologies.

In Europe, ships are a substantial and increasing contributor to air pollution. To verify the effectiveness of air quality legislation, JRC scientists measured key air quality parameters in Mediterranean harbours before and after the entry into force of the European low-sulphur requirements in January 2010, using an automated monitoring station on Costa Crociere cruise ships.



*Verified reduction of the levels of sulphur dioxide attests the effectiveness of the air quality legislation.*

A JRC study published in 2012 showed a strong decrease in sulphur dioxide levels which was found to be a direct consequence of the application of the EU requirements. Sulphur dioxide is one of the main air pollutants responsible for the formation of acid rain and particulate air pollution, posing risks to human health and the environment.

## Tackling near-term climate change in the Arctic

Shrinking ice cover and blackened snowy surfaces are currently reducing even further the Arctic surface reflectance which further accelerates the warming. To counter this trend, it is necessary to reduce black carbon emissions at their source, often far away from the Arctic.

The JRC contributed to a recent modelling study (Shindell et al., 2012) which identified a portfolio of measures to control emissions of short-lived pollutants and pollutant precursors (black carbon, ozone and methane) that can simultaneously mitigate climate change in the next decades and be beneficial for human health and food security. Among these measures are EURO standards on road vehicles, replacement of traditional fire places with efficient pellet stoves and reduction of agricultural waste. The measures would decrease the projected warming in the Arctic over the next decades by 65% compared to a situation where no measures were taken.

Climate change and adaptation in the Arctic were discussed at the event 'Mapping scientific needs in the Arctic and Northern Areas', jointly organised by the JRC and the Mission of Norway in October, which also addressed the sustainable management of oil and gas resources and renewable energy technologies.

## Best available techniques for iron, steel and glass

The European Commission in 2012 adopted two new implementing decisions on best available techniques (BAT) for the industries of iron and steel production and the manufacture of glass. The conclusions of the BAT are the references

used under the Industrial Emission Directive (IED) (2010/75/EU) to set emission permit conditions for industrial installations. The IED currently regulates emissions to air, water and soil of about 50 000 industrial installations across the EU; the permits are issued by the Member States.

Behind the BAT conclusions is a collaborative effort by Technical Working Groups, set up and coordinated by the JRC's European Integrated Pollution Prevention and Control Bureau (EIPPCB). This is done through a thorough, detailed and transparent exchange of techno-economic information between the European Commission, the Member States, the industries concerned, and environmental non-governmental organisations.

## Scientific support to the Danube Strategy

The JRC launched an initiative for providing scientific support to the implementation of the EU Strategy for the Danube Region (EUSDR), which was endorsed by the European Council in June 2011. The initiative focuses on four vertical priorities – environmental protection, irrigation and agricultural development, navigability, and energy production – and one horizontal aspect, European governance.

As a transversal priority, the JRC is supporting the design and implementation of research and innovation strategies for Smart Specialisation in the Danube Region, taking into account the regional assets, opportunities and the broader macro-regional dimension. Through this integrated approach, the JRC and the Danube Strategy partners will gather scientific expertise and data to help decision-makers and other stakeholders of the Danube Region to identify the policy measures needed for the implementation of the strategy.



*The JRC's work on Best Available Techniques (BAT) help reduce the air, water and soil emissions of industrial installations.*

*Read more:*

*Impact of a European directive on ship emissions on air quality in Mediterranean harbours. In ATMOSPHERIC ENVIRONMENT vol. 61 p. 661–669. Hjorth, J. et al. (2012)*

*Simultaneously mitigating near-term climate change and improving human health and food security. Shindell et al. (2012) Science vol. 335 no.6065, DOI: 10.1126/science.1210026*

*Support to the review of the thematic strategy on air pollution: JRC's contribution to the 2nd stakeholder meeting, January 2012. Borowiak, A. et al. (2012). JRC Scientific and Technical Report, EUR 25283 EN*

*Best Available Techniques (BAT) reference document for: iron and steel production: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control)*

*Best Available Techniques (BAT) reference document for: manufacture of glass: Industrial Emissions Directive 2010/75/EU:(Integrated Pollution Prevention and Control)*

*Prospective scenarios on energy efficiency and CO<sub>2</sub> emissions in the EU iron and steel industry*

# Agriculture and food security

*Modern agriculture and technological progress are essential to feed a growing world population. The JRC in 2012 assessed the impact of extreme weather events, which affected yields, shook agriculture commodity markets, and raised concerns about access to food for vulnerable communities across the globe.*

*In addition, the JRC looked at the socio-economic impact of GM crops and potential consequences of biofuel crop farming, notably in relation to climate change.*

## Researching food markets, prices and food security

The JRC's integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP) addresses a broad range of topics linked to the economic assessment of agricultural policies and food security, as well as to trade, renewable energies, environment and climate change.

In collaboration with the Commission's Agriculture and Rural Development DG, the JRC produces annual medium-term outlooks for the main agricultural commodities (i.e. cereals, oil seeds, meat, eggs, dairy and biofuels), which offers EU-wide projections of supply balance sheets (production, consumption, exports, imports, and change in stocks) for the next 10 years. This outlook constitutes the main reference scenario for ex-ante evaluations of policy impacts and contributes to the on-going impact assessment of the Common Agriculture Policy post-2013.

To take into account uncertainties in relation to key external factors such as developments of the GDP, oil prices, and crop yields, a sensitivity analysis is conducted. The JRC and the Agriculture and Rural Development DG annually gather high-level policy makers, modelling and market experts to present and discuss current projections. In 2012 experts and high officials from the United Nations' Food and Agriculture Organization (FAO), the Organisation for Economic Co-operation and Development (OECD), the World Bank and the United States attended the workshop and collaborated to outline the reasons behind observed and prospected developments.

The JRC also contributes essential research to the understanding of price volatility in agricultural markets. A report published in 2012 analysed the security of supply of nitrogen, potassium and phosphorous. All three are essential plant nutrients found in fertilizers. Currently the JRC is conducting a foresight study on global food security.

## A global reference for the socio-economic assessment of GM crops

One of the JRC's long standing objectives is to build a more objective and transparent reflection on the cultivation of genetically modified (GM) crops.

In 2012, the JRC together with the United Nations' Food and Agriculture Organization published a report that analysed the main findings from scientists worldwide active in the socio-economic assessment of GM crops. Among the conclusions was the need for more robust and independent socio-economics studies and strict science-based assessments.

To further develop science-based criteria for socio-economic analyses, the European Commission decided to set up a new technical working group – the European Socio-Economic Bureau (ESEB). Managed by the JRC, the Bureau facilitates the exchange of information between the Commission and Member States and develops consensus documents for the socio-economic analysis of specific GM crops relevant to the EU.

Read more:

NPK: Will there be enough plant nutrients to feed a world of 9 billion in 2050? Malingreau, J. et al. (2012). JRC Science and Policy Report, DOI: 10.2788/26586

<http://publications.jrc.ec.europa.eu/repository/handle/111111111/25770>

International workshop on socio-economic impacts of genetically modified crops co-organised by JRC-IPTS and FAO – Workshop proceedings. Lusser, M et al (2012). JRC Scientific and Technical Report, EUR-25265-EN



Annual medium-term forecasts for commodities provide reference to the on-going impact assessment of the Common Agriculture Policy post-2013.



More robust and independent socio-economics studies are required to assess GM crops.

## Biofuels and the indirect effects of changing land use

Increased EU demand for biofuels may have an impact on land use in both EU and non-EU countries, which could lead to significant changes in carbon stocks in soils and biomass, and related greenhouse gas emissions.

If biofuel crops are grown on uncultivated land, such as pasture or forest, this “direct land use change” will generally result in increased greenhouse gas emissions, due to loss of standing biomass, loss by oxidation of organic matter in the soil in the years after conversion, and loss of nitrogen in the organic matter released as NO<sub>2</sub>.

More frequently though, biofuel crops are planted on land previously used for food production. If the food production is displaced to previously uncultivated land, an “indirect land use change” (ILUC) takes place. The Commission has carried out a number of studies to assess these effects, and in 2012 put forward a policy proposal on how to account for ILUC in the relevant Directives.

To help assess the impact of this initiative, the JRC compared assumptions and results from several models used to estimate ILUC worldwide. It also developed a new methodology to estimate greenhouse gas emissions resulting from ILUC.

The JRC’s research, in line with other studies, shows that, in general, ethanol crops have lower ILUC impacts than oilseed/biodiesel crops. Furthermore, even if deforestation would be halted (i.e. no conversion of forests to cropland) ILUC emissions while being reduced would still be significant.

## Extreme weather affects EU 2012 cereal yields

In November 2012, the JRC’s crop monitoring activity MARS reported on the effect of seasonal weather extremes over the 2011-2012 crop growing season. The season was marked by both above and below average temperatures, dry spells combined with persistent high temperatures in south-eastern Europe and a surplus of precipitation in the British Isles. As a result of the seasonal weather extremes, the MARS Crop Monitoring in Europe bulletin forecast that total cereal yields for the EU in 2012 would be 5.7% lower than the previous year, and 2.7% lower than the 5-year average. These discrepancies are mainly due to falls in grain maize yield.

The bulletin showed that the 2011-2012 crop growing season was marked by an exceptionally dry and mild autumn and winter, followed by an extremely cold period marked by severe frosts, a dry and mild March, cold April, and hot May. While western and northern Europe experienced extreme precipitation in spring (with the UK and Ireland recording one of the most humid seasons of the past 40 years), a persistent rain deficit was recorded in much of the rest of Europe. During the summer months, central and northern Europe had a lot of rain and below-average temperatures, while southern and south-eastern Europe experienced persistent high temperatures and scarce rainfall.

Some of the negative impacts caused by the extremes in weather patterns experienced across the EU were sometimes offset by positive impacts in other areas. The result was that forecasted rye and rapeseed yields were above average, while barley, rice and sugar beet yields remained average, and grain maize, wheat, sunflower and triticale yields were forecast to be below average.

Read more:

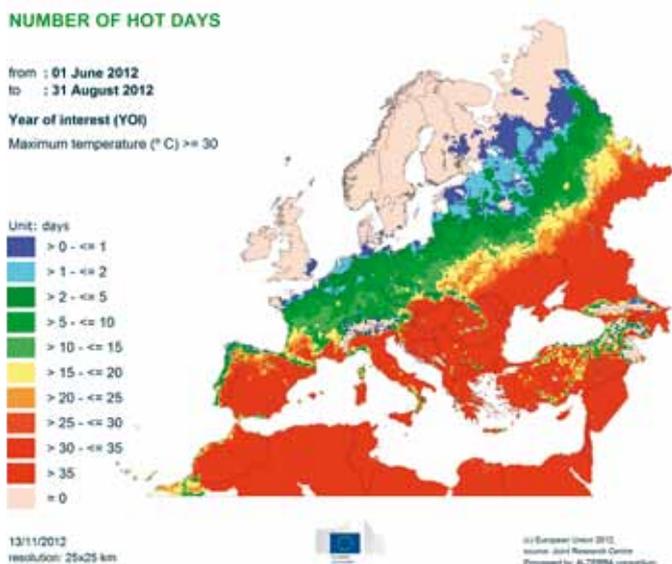
Biofuels & Bioenergy

<http://iet.jrc.ec.europa.eu/biofuels-bioenergy>

Monitoring Agricultural Resources (MARS): <http://mars.jrc.ec.europa.eu/mars>

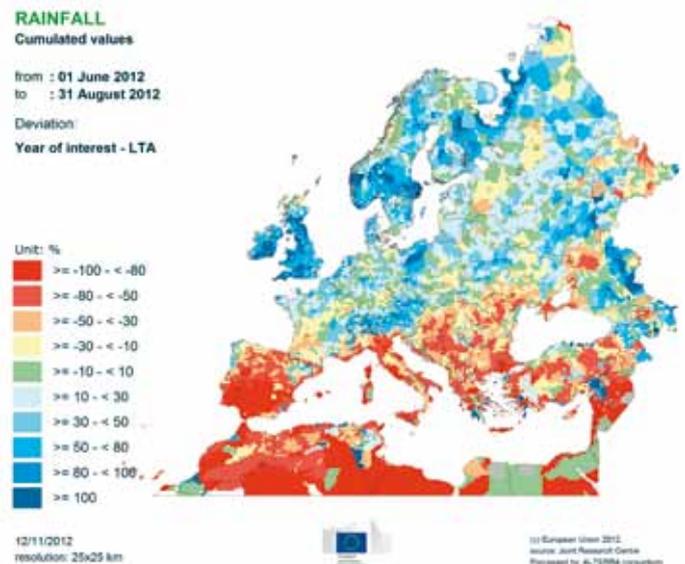
MARS Bulletins Europe: <http://mars.jrc.ec.europa.eu/mars/About-us/AGRI4CAST/MARS-Bulletins-for-Europe>

Figure 5



Number of hot days 1 June 2012 - 31 August 2012.

Figure 6



Cumulated rainfall values 1 June 2012 - 31 August 2012.

# Public health and consumer protection

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*EU legislation and initiatives complement national actions on public health and aim to ensure a high level of protection for European consumers. The JRC provides valuable support in defining and assessing the potential risks of nanomaterials, which are increasingly used in for example, cosmetic products, medical applications and in manufacturing processes.*

*In 2012, the JRC assumed a new role in relation to cancer research, building on its expertise in harmonisation of methodologies and approaches and collaborative work. In the area of food and feed safety, the JRC developed with other partners the new European standard method to detect highly toxic inorganic arsenic in animal feed.*

Read more:

*Requirements on measurements for the implementation of the European Commission definition of the term "nanomaterial".  
Linsinger, T. et al. (2012).  
JRC Reference Report,  
DOI: 10.2787/63995*

## Nanomaterials' characterisation and safety

Nanomaterials offer significant potential for innovation in many areas, such as medicine, environment protection and energy efficiency. In support of measures to enforce the labelling requirements for nanomaterial ingredients, the JRC develops and validates analytical methods for the identification, detection and characterisation of nanomaterials in food and consumer products. In addition, certified reference materials developed by the JRC are an important cornerstone in the measurement infrastructure for the reliable characterisation of nanomaterials.

To make sure that nanomaterials are safe for their intended uses, reliable safety assessment of nanomaterials still requires huge efforts to better understand the underlying toxicity mechanisms and their impact on human health and the environment.

In 2012, the JRC published a report on the challenge of measuring nanomaterials. The report "Requirements on measurements for the implementation of the European Commission definition of the term 'nanomaterial'" describes the requirements for particle size measurements of nanomaterials, discusses related generic measurement issues, reviews capabilities of the measurement methods currently available, and illustrates, with practical examples, problems that remain to be solved.

The knowledge gained from the JRC's research supports the implementation of EU legislation such as the chemical regulation (REACH) and legislation on food and cosmetic products.

## New role in cancer policy support

In 2012 the JRC embarked on two initiatives to coordinate and improve cancer control and care across the EU in cooperation with the Commission's Health and Consumers DG and stakeholders in the Member States.

Firstly, the JRC initiated the development of an EU voluntary accreditation scheme for breast cancer services which will lead to updating the EU guidelines for breast cancer care. In order to assess the state of breast cancer services, a JRC-designed survey was performed in 30 countries. The results showed that 47% of the countries do not have a certification scheme in place and those that do would welcome EU harmonisation and standardisation, which indicates that JRC could play an important role to help improve breast cancer care.

Secondly, the JRC will assume the secretariat of the European Network of Cancer Registries (ENCR), which is the gateway to over 200 cancer registries. It will establish a dynamic and harmonised cancer



*Nanoparticles-cell interaction: fluorescent microscope analysis of nanoparticles inside cells.*

information system which will help to anticipate, guide and monitor European cancer policy interventions.

In 2012, the JRC concluded a study on the effectiveness of three in-vitro assays which closely model key stages of the cancer development process, and which can be used for assessing the carcinogenic potential of chemicals. These were submitted for inclusion in the OECD Test Guidelines which can subsequently lead to international regulatory acceptance.

The JRC also carried out research on Targeted Alpha Therapy of cancer aiming at selectively destroying diseased cells while sparing surrounding healthy tissue. The JRC hosts the only facility within the EU capable of producing alpha emitters Actinium-225 and Bismuth-213 at clinically relevant levels.

### First certified reference material to monitor leukaemia

The JRC has developed a new reference material to support the monitoring of chronic myelogenous leukaemia (CML), a cancer of the white blood cells. In the EU about 9 600 new patients per year are diagnosed, and CML accounts for 70% of all childhood leukaemia cases. Currently, CML cannot be cured but it can be kept under control with specific enzyme inhibitors. Regular monitoring of the CML patient is needed to ensure optimal treatment. This is done by measuring the number of specific genetic fragments. Until now, it has been difficult to compare results from different laboratories, as no reference material for the calibration of the monitoring equipment was available.

To enhance consistency of measurements, the JRC has developed a certified reference material which helps laboratories harmonise their measurements, and will improve the treatment of the patients.

### Inorganic arsenic in animal feed: a new reference method

Arsenic is a ubiquitous element, introduced to the environment from natural sources such as volcanic activity and weathering of minerals, and from anthropogenic sources such as ore smelting, burning of coal, pesticide use and the use of growth promoters. A large variety of different naturally occurring arsenic compounds exist. The toxicity of these compounds varies widely, with inorganic arsenic being the most toxic.

A collaborative study (International Measurement Evaluation Programme IMEP-32), jointly organised by the JRC and the Technical University of Denmark, has paved the way for a new European standard method for the determination of inorganic arsenic in animal feed. Nineteen laboratories took part in the exercise, and proved that the analytical method was fit for purpose.

The method, developed by the JRC, will now be used for the official control of feeding stuffs throughout the EU.



Sample cell of dried distillers grains for spectroscopic analysis.

Read more:

IMEP-32: determination of inorganic arsenic in animal feed of marine origin: a collaborative trial report. Sloth J.J. et al. (2011). JRC, National Food Institute of the Technical University of Denmark (DTU Food) and Bioanalytik Weihenstephan, Technical University of Munich, Germany. Scientific and Technical Report, EUR 24938 EN



First ever certified reference material for monitoring of leukaemia - ERM-AD623.



# Safety and security



*In an ever more interconnected and globalised world, the need to enhance safety and security becomes increasingly important. The JRC drew on its extensive experience of early warning of natural hazards to provide alerts on droughts, floods and forest fires. Using its experience in vessel monitoring and interpretation of remotely sensed data, the JRC developed software to help combat piracy by tracking ship positions in real time, hence boosting international efforts in global security.*

*In the nuclear field, 2012 marked two decades of nuclear forensics at the JRC, and saw the further development of equipment to speed up the identification of intercepted materials. The JRC also brought together scientists and industry to share best practices in nuclear decommissioning – the delicate process through which nuclear power plants are shut down, the fissile material removed, the facility dismantled and the site environmentally restored.*

## Timely information on drought, fires and floods

Europe experienced regional extremes of droughts, fires and floods in 2012. Through its European Drought Observatory (EDO), European Forest Fire Information System (EFFIS) and European Flood Awareness System (EFAS), the JRC delivered timely information and alerts to the Monitoring and

Information Centre (MIC), managed by the Commission's Humanitarian Aid and Civil Protection DG, and to the relevant authorities in the Member States to help forecast and monitor risks related to natural hazards. In spring, the JRC provided data on rainfall deficits over Western Europe and helped manage the critical fires that broke out in southern Europe in the early fire season and the summer through the fire risk indices calculated by EFFIS.

2012 was also the year in which the operations of EFAS were outsourced under the coordination of JRC to Member State institutions as part of the Global Monitoring of Environment and Security Emergency Management Service (GMES – EMS).

## The fight against piracy off African coasts

The JRC has developed prototype software that tracks merchant ship traffic in the whole Western Indian Ocean basin for use in regional operation centres. This project, named Piracy, Maritime Awareness and Risks (PMAR), was requested by the European Parliament and overseen by the Commission's Development and Cooperation DG, EuropeAid. The system integrates data from a wide array of available data sources to give a single maritime picture. It shows estimated ship positions in real-time, with an update every 15 minutes. Historical piracy risk occurrence and ship traffic density maps are also produced.

Read more:

European Drought Observatory (EDO): <http://edo.jrc.ec.europa.eu/edov2/>

European Forest Fire Information System (EFFIS): <http://forest.jrc.ec.europa.eu/effis/>

Floods portal – European Flood Awareness System (EFAS): <http://floods.jrc.ec.europa.eu>

Blue hub – integrating maritime surveillance data <https://bluehub.jrc.ec.europa.eu>

Figure 7



*The figure shows the positions of all known vessels in the Gulf of Aden at a certain point in time, providing the so-called "maritime situational picture" of the area. Different colours represent different types of vessels, while more detailed information on each selected vessel is displayed in a white box. The dotted line behind the selected vessel shows its trajectory, linking past vessel observations (small red triangles).*

Thanks to its regional approach, PMAR complements the observations of individual countries. As well as helping to combat piracy off African coasts, the system can also be used to combat illegal fisheries and monitor migration flows. PMAR was officially presented in November at an EU workshop held in Mombasa, Kenya, which was attended by decision makers and coast guards from Western Indian Ocean countries, as well as representatives from regional organisations, the EU, the US and the International Maritime Organisation (IMO). In 2013, similar work will continue to focus on the Gulf of Guinea (West Africa), where piracy is now on the increase.

## Nuclear decommissioning initiative

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. The decommissioning market is growing strongly worldwide, creating many opportunities for high-skilled workers. The EU scientific community has a key role to play to support European industry in this field, contributing to innovation, standardisation and development of best technologies for decommissioning.

In the framework of the European Forum for Science and Industry, the JRC's scientific support for nuclear decommissioning initiative was launched through a roundtable discussion in September, which brought together high level representatives from industry and science to share best practices, identify bottlenecks and consider future prospects and priorities for European nuclear decommissioning.



*"Nuclear forensic evidence, from crime scene to the lab", demo in the EUSECTRA (Nuclear Security Training Centre) laboratories.*

## 20 years of nuclear forensics

Nuclear forensics plays a key role in nuclear security by identifying the nature and origin of intercepted materials, and provides essential information for prosecuting smugglers and improving preventive measures.

In October, the JRC's Institute for Transuranium Elements (JRC-ITU) celebrated 20 years of nuclear forensics. The anniversary brought together experts and policy makers from the European Commission, the European External Action Service (EEAS), the International Atomic Energy Agency (IAEA) as well as representatives of EU countries and public authorities from the US and Germany.

Recognised as a centre of excellence by national and international policing bodies, the JRC has developed various nuclear forensics methods. With a team on standby at all times to respond immediately to a seizure, a first analysis can be achieved within 24 hours of a sample arriving at the JRC. Moreover, the JRC maintains an extensive database of commercial nuclear materials, together with information on seized illicit materials, helping the investigators in providing hints on the origin of the material.

During 2012, the JRC also inaugurated the new Large Geometry-Secondary Ion Mass Spectrometry (LG-SIMS) laboratory for analysing nuclear material in micro-particles. With this state-of-the-art facility, JRC scientists can detect the existence of nuclear material in particle samples taken during safeguards inspections and determine their enrichment level within a few hours.

Over the year, the JRC participated in a number of cooperative projects in Russia, Ukraine, Moldova, Georgia, Azerbaijan and in South East Asia to enhance their nuclear forensics capabilities. To this end, the JRC, in cooperation with other Commission services, is currently setting up a European Nuclear Security Training Centre (EUSECTRA) that includes nuclear forensics in the training programme.



## MELISSA used to monitor movements of Costa Concordia

*With its advanced radar system MELISSA, the JRC supported the Italian authorities in monitoring the movements of the cruise ship Costa Concordia that grounded off Tuscany on 13 January 2012. MELISSA takes measurements up to 140 times a second, allowing for the detection of movements of objects with very high accuracy and resolution. Data on the ship movements were of fundamental importance to safely conduct the search and rescue operations and also for pumping out the fuel from the ship's tanks. The JRC will continue to monitor the displacements of the wreck and assist the salvage operations.*

# A science partner with a strategic global reach

*The JRC has around 200 operational cooperation agreements, establishing joint research in fields of common interest with public and private research players from around the world. These agreements allow for the sharing of infrastructure, laboratory equipment, data and materials as well as the hosting of scientists in JRC Institutes. This transfer of knowledge enables the JRC to play its role as the Commission's in-house science service; connecting scientific research and the EU policy making process. In 2012 this collaborative reach was further enhanced with the signature of several key agreements.*

The College of Europe in Bruges signed an agreement with the JRC to embark on cooperative work in the field of financial and economic analysis. Initial phases of this agreement will focus on improving the analysis for diagnosing and forecasting economic situations and the impact of macroeconomic policy decisions, as well as reinforcing the scientific support to financial analysis so as to support stronger stability in the sector.

In order to help foster closer links between the EU national academies and the EU's policy making process, an agreement was signed with the European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE). Both parties have already identified initial areas of

collaboration, which include energy, innovation, transport and mobility, education and training and the improvement of public understanding of technology and its impact on society.

The Karlsruhe Institute of Technology (KIT) and the JRC outlined cooperative activities in a number of areas including energy, nuclear safety and security, sustainable transport and electromobility, climate change, information technology and foresight studies.

An agreement was signed with Israel's Ministry for Energy and Water aiming to strengthen scientific cooperation in the fields of energy and water research. The focus in the energy field will be on clean energy, renewables, smart grids, electromobility and reducing our dependence on oil, whereas water research will primarily address desalination. With the Research Council of Norway, the JRC will cooperate on scientific and technical support to policy making processes in fields such as innovation, energy, climate change, environmental protection and marine and maritime affairs.

## International cooperation

The JRC is an active player on the global arena, gathering partners on a diverse range of scientific



Professor Paul Demaret, Rector of the College of Europe with Dominique Ristori, JRC Director-General.



Fridtjof Fossum Unander, Executive Director of the Division for Energy, Resources and the Environment of the Research Council of Norway and Dominique Ristori, JRC Director-General.

fields worldwide. For example, it is committed to fostering partnerships on improving disaster anticipation and resilience. In this context, the JRC initiated various cooperative activities with the Brazilian National Centre for Monitoring and Early Warning of Natural Disasters (CEMADEN) throughout 2012, as part of an agreement with the Brazilian Ministry of Science, Technology and Innovation (MCTI). CEMADEN scientists were hosted by the JRC to share expertise and customise JRC flood forecasting and monitoring systems for the Brazilian environment, while in July both organisations co-hosted an exhibition at the Rio +20 conference.

A collaboration agreement was signed with the US National Oceanic and Atmospheric Administration (NOAA), with the aim to encourage, develop and facilitate scientific and cooperative activities in the fields of climate, weather, oceans and coasts. Addressing similar areas, the JRC signed a collaboration agreement with South Africa's National Space Agency (SANSA), with the aim to better exploit remote sensing technologies for monitoring atmospheric, terrestrial and marine environments. The signature took place in the context of a meeting hosted by Commissioner Geoghegan-Quinn for senior officials of the European Commission, the Carnegie group countries (G8+5), the World Bank and United

Nations. The opinions expressed converged on the need for a stronger partnership to enhance science, cooperation and capacity for early warning and disaster management.

## Regional support

Some cooperative activities stretch over an entire geographical region, such as the JRC's Scientific Support to the Danube Strategy initiative. Launched in close cooperation with key scientific partners of the Danube region, the initiative focuses on four key areas: environmental protection, irrigation and agricultural development, navigability and energy production. Partners committed to the project include the Academies of Sciences of Bulgaria, Hungary, Romania, Slovakia, Austria, Bavaria, and the Academy of Sciences of the Czech Republic.

The JRC is dedicated and committed to bringing together reputable public and private organisations from around the world such that high quality results and advice are generated, covering a range of scientific fields. By creating these extensive networks the JRC and its partners are better equipped to tackle today's key societal and global challenges. 2012 saw a wealth of such agreements; this drive will continue in 2013 with further cooperation.



Jane Lubchenco, Administrator of the US National Oceanic and Atmospheric Administration (NOAA), and Dominique Ristori, JRC Director-General.



Jiří Drahoš, the President of the Czech Academy of Sciences, and Dominique Ristori, JRC Director-General.

# Facts and Figures



## Staff

The total number of staff working at the JRC at the end of 2012 was 2 822:

Total Staff	M	F	Total
<b>Core Staff</b>			
Officials	1 199	560	1 759
Temporary agents	19	7	26
<b>Visiting Staff</b>			
Trainees	20	27	47
Postgraduate grantholders	29	37	66
Post-doctoral grantholders/ senior scientists	327	205	532
Contractual agents	148	202	350
Seconded national experts	31	11	42
<b>Total</b>	<b>1 773</b>	<b>1 049</b>	<b>2 822</b>

Of the 2 822 total, 76.72% worked on scientific projects, 21.16% carried out administrative or support activities and 2.13% worked in nuclear decommissioning and waste management. The total number of staff in the JRC in 2012 is comparable to that of 2011 (2 828).

### 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.



*Some of the 230 girls who spent a day performing experiments at the JRC's IRMM laboratories.*

## Equal Opportunities

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

AD positions	M	F
Senior management positions	85 %	15 %
Middle management positions	81 %	19 %
Non-management administrative positions	78 %	22 %

At the end of 2012, women were represented in 22% of administrator (AD) posts at the JRC (versus 21% in 2011), against a Commission average of 43%. There was a significant increase in the representation of women in middle management with 50% of new appointments made to women. This increased the ratio of the JRC average in this category to 19%, up from 15% in 2011. In the senior management category, the appointment of a new woman director increased the JRC ratio to 15%.

This progress will be maintained 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 30% replacement rate of senior managers by women, annually.

## 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) relating to Framework Programme activities.

The table shows the breakdown of how the 2012 institutional budget was spent (in terms of available in commitment appropriations, EFTA is not included).

Outgoing expenses (in million Euro)	2012
Staff expenses	€ 253.16
Means of execution	€ 86.77
Operational appropriations	€ 41.43
<b>Total (rounded up)</b>	<b>€ 381.36</b>

In addition, €29.4 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 €23.50 million were received from the contributions of countries associated to the Framework Programme (FP).

### JRC earned income

The cashed income in 2012 amounted to €68.78 million. The table shows the value of contracts signed in 2012. A portion of the JRC's income comes from its participation in FP7 projects ('Indirect Actions'), from performing additional work for Commission services, and from contract work carried out for third parties such as regional authorities or industry. This work complements the tasks outlined in the JRC's work programme and is an essential tool for acquiring and transferring expertise and know-how. Two thirds of signed contracts were due to requests by Commission services for additional scientific and technical support.

Contracts signed (in million Euro)	2012
Indirect Actions of the Framework Programme (FP)	€ 17.05
Support to Commission Services	€ 55.19
Third Party work	€ 9.94
<b>Total (rounded up)</b>	<b>€ 82.18</b>

## Media

### JRC media coverage in 2011

Number of press articles	2756
Number of very positive news items in top-tier media	144
Number of countries covered	72
<b>Most reported topics</b>	
• Air & climate	280
• Sustainable transport	240
• Global security & crisis management	140
• Renewable energy	95
• Energy efficiency	90
• European Forest Fire Information System (EFFIS)	80
• Nanomaterials	80
• Maritime surveillance (JRC radar on Costa Concordia)	76
• Electromobility & smart grids	67
• Biodiversity	57
• Shale gas	50

## Publications

### JRC Publications in 2012

Books and articles in peer reviewed journals <sup>1</sup>	684
JRC Reference Reports	6
JRC Scientific and Technical Reports <sup>2</sup>	577
Contributions published in conference proceedings	167
PhD theses	9
<b>Total</b>	<b>1 443</b>

<sup>1</sup> Books, monographs with JRC editorship, article contributions to monographs, article contribution to periodicals listed in the ISI Science/Social Science Citation index, article contributions to other periodicals.

<sup>2</sup> Article contributions to conference proceedings published in a periodical listed in the ISI Science/Social Science Citation index, article contributions to conference proceedings published in other periodicals, scientific papers presented at a conference and published in books of conference proceedings (with editorship).

### 2012 guest editorials – JRC newsletter

Connie Hedegaard – European Commissioner for Climate Action  
 Julia Slingo – Chief Scientist, UK Met Office  
 Morten Østergaard – Danish Minister for Science, Innovation and Higher Education  
 Janez Potočnik – European Commissioner for Environment  
 Eleni Mavrou – Cypriot Minister of Interior

<http://ec.europa.eu/dgs/jrc/index.cfm?id=5160>



# An eventful year

**7-8 November, Brussels**  
 "Scientific seminar on natural disasters"

**8 November, Brussels**

"Scientific support to financial analysis: how can science contribute to financial stability?"



Professor Paul Demaret, Rector, College of Europe, Jonathan Faull, Director-General of Internal Market and Services, Michel Barnier, Commissioner for Internal market and Services and JRC Director-General Dominique Ristori.

**28-30 November, Portugal**  
 Information day (29 November, Lisbon) and seminars for young Portuguese researchers (28 November, Lisbon and 30 November, Porto)

**1 October, Brussels**  
 "Scientific support to EU refining capacity"  
 An initiative under the European Science and Industry Forum

**3 October, Tirana (Albania)**  
 JRC Information day

**7 October, Geel**  
 Open day at the JRC's IRMM

**6 December, Brussels**

"Improving disaster anticipation and resilience in the world" High-level meeting of Carnegie Group (G8+5) members, with the UN and World Bank



**13 December, Lefkosia**  
 JRC Conference. Cypriot Presidency of the Council of the European Union

**11 October, Brussels**

"Mapping scientific needs in the Arctic and Northern Areas"



JRC Director-General Dominique Ristori and Ambassador of Norway to the European Union, Atle Leikvoll.

**11 September, Brussels**

"Scientific support for nuclear decommissioning"  
 An initiative under the European Science & Industry



**14 September, Luxembourg**  
 JRC Information day

**26 September, Skopje (Macedonia)**  
 JRC Information day

**24-28 September, Frankfurt**

European PV Solar Energy Conference and Exhibition



JRC scientist and Chairman Dr. Arnulf Jäger Waldau presenting in the Conference Closing Session his selection of the 27th EU PVSEC Conference highlights.

**26-30 August, Davos**  
 4th International Disaster and Risk Conference

**15 February, Brussels**  
 Launch of European Forum for Science and Industry

**12-17 March, Marseille**

6th edition of the World Water Forum



The JRC showcased its activities and participated in various events and conferences.

**6 March, Copenhagen**

“Scientific Support for the Transition to a Low Carbon Economy” event under the auspices of the Danish Presidency of the European Union



European Commissioner Connie Hedegaard opening the conference.

**16 March, Ispra**

Visit by the President of the European Commission, Mr José Manuel Barroso, accompanied by Commissioner Máire Geoghegan-Quinn



Visit in Nanotechnology Laboratory.

**17 April, Karlsruhe**

Visit by Commissioner Máire Geoghegan-Quinn to the JRC’s Institute for Transuranium Elements



Commissioner Geoghegan-Quinn in ITU laboratories.

**24 April, Brussels**

“Scientific Support to the Danube Strategy: Environment protection, irrigation and agricultural development, navigability, energy production and European governance”

**15 May, Brussels**

“Scientific support for growth, jobs and sustainability: the example of eco-industries”



MEP Paul Rübig, Laurence de Richemont, member of EC President Barroso’s Cabinet, JRC Director-General Dominique Ristori, Commissioner Máire Geoghegan-Quinn and Hannes Swoboda, President of the Group of the Progressive Alliance of Socialists and Democrats in the European Parliament.

**11-15 July, Dublin**

EuroScience Open Forum (ESOF)



Commissioner Geoghegan-Quinn launches the new JRC interactive smart grids communication tool during ESOF.



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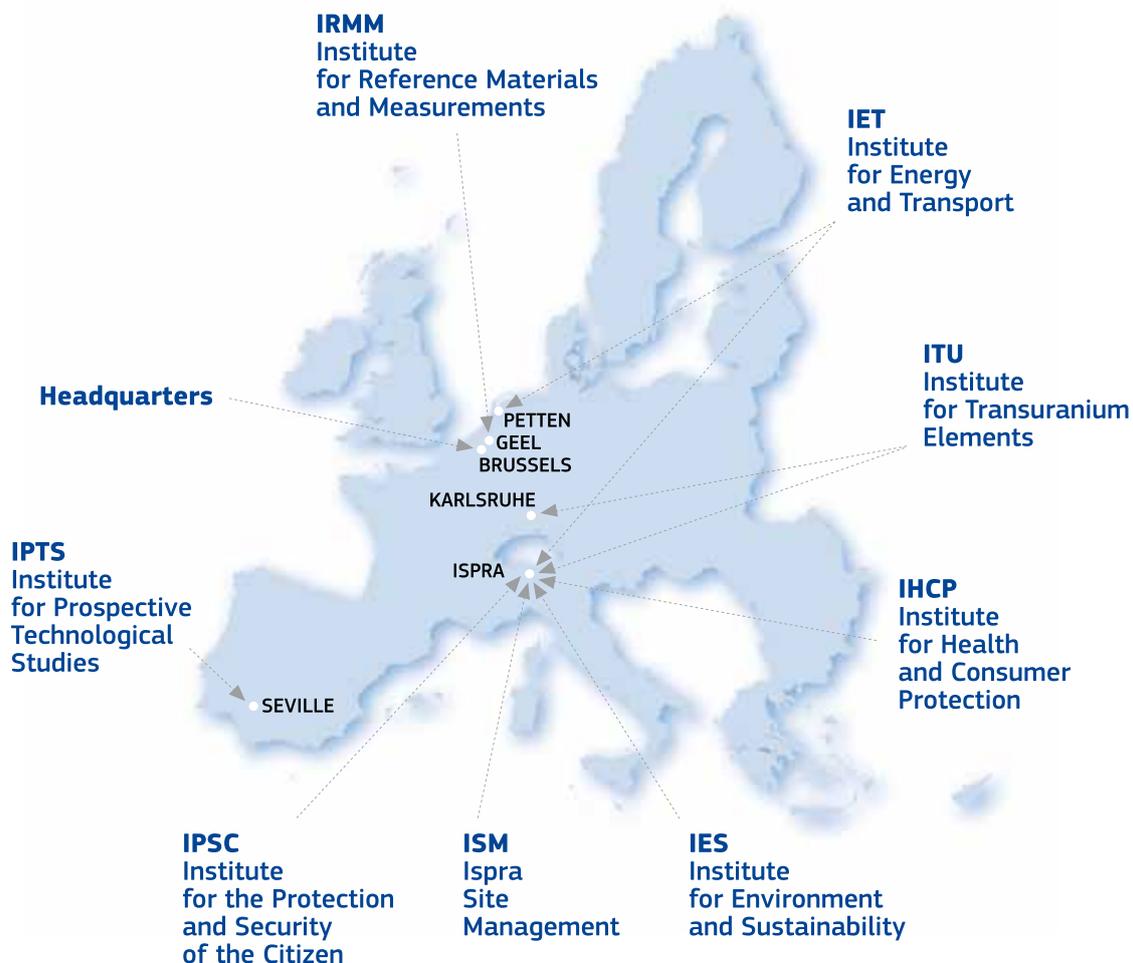
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- Established 1957
- 2822 scientific and technical personnel
- 7 scientific institutes
- 1433 publications in 2012



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#### Abstract

Report on the activities, accomplishments and resources related to the JRC's work carried out in 2012. An overview is given of the scientific achievements and activities.

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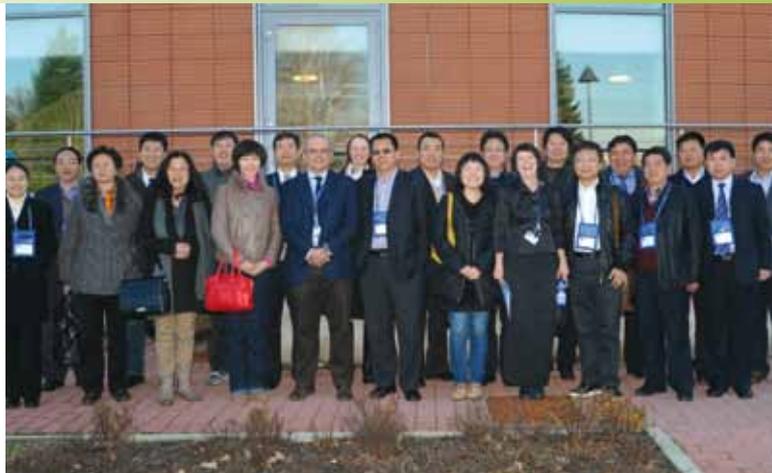
A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu/>).



*"Thank you for this wonderful visit, so well organised and so interesting. May this be a step towards closer cooperation between JRC and Portuguese research centres."*  
 Nuno Crato, Portuguese Minister for Education and Science.

*"Le Centre Commun de Recherche est un instrument emblématique de grande qualité pour l'Union européenne. Un centre de tel professionnalisme mérite d'être beaucoup plus connu et je vais continuer à le supporter et promouvoir. Le CCR est aussi un soutien incomparable pour aider l'Afrique."*  
 Louis Michel, Co-President of the ACP-EU Joint Parliamentary Assembly, Member of the European Parliament and former Commissioner for Development.

*"With many thanks for this most interesting programme of briefings and site visits. It was good to see some familiar faces and research topics, as well as some new areas of research such as crisis management and support to financial governance"*  
 Giles Chichester, Member of the European Parliament.



*"I learned a great deal about your activities and your dedication. I think strengthening our collaboration is a great opportunity and look forward to building on our visit."*  
 Dr. Jesse Goodman, Chief Scientist of the U.S. Food and Drug Administration.

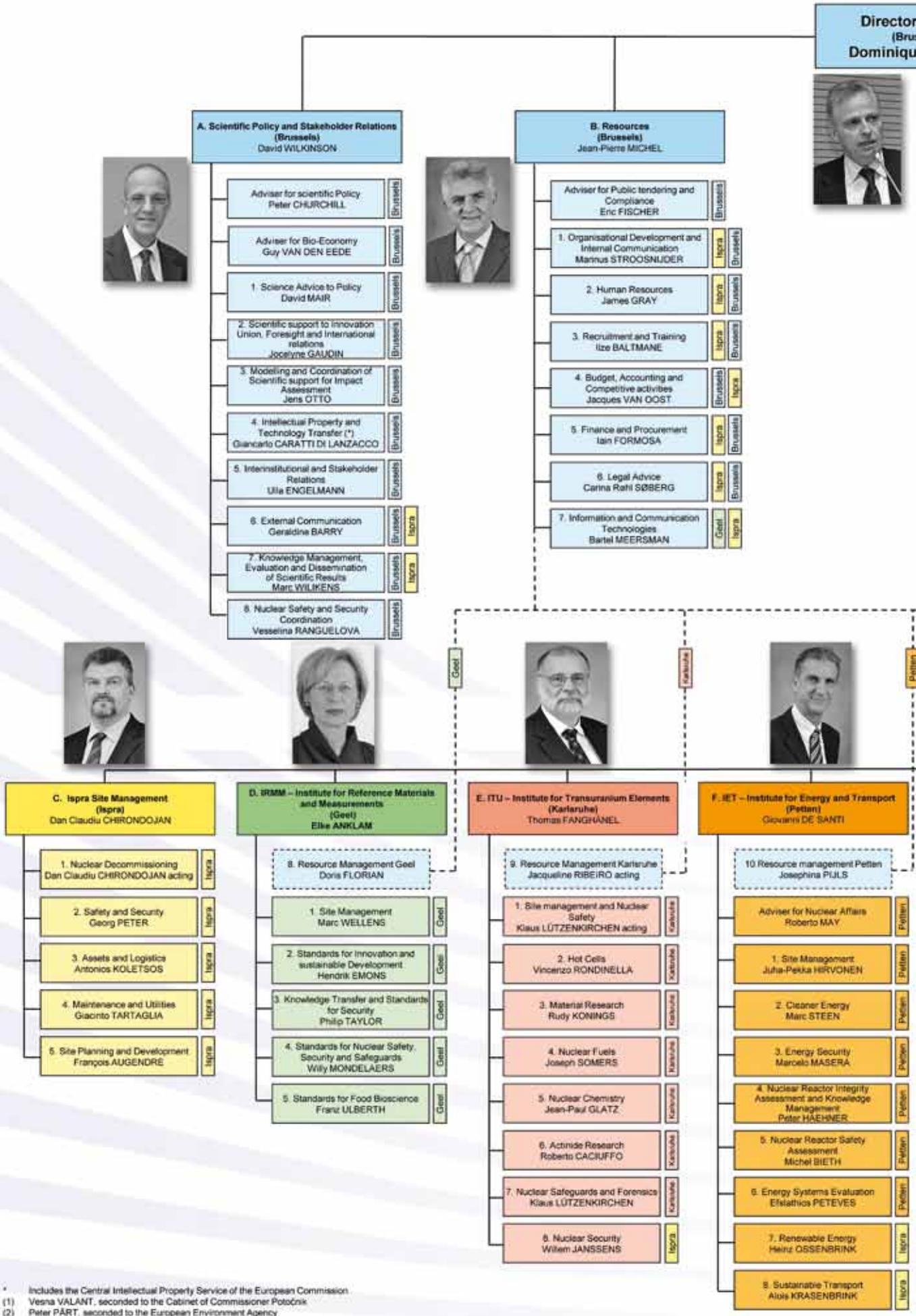
*"We thank very much the JRC for these short but intense and extremely qualified discussions. It was a very broad range of information for us, and we hope to start working together on these issues. We invite you to visit us in China!"*  
 Ms Chen Yi, Deputy Director at the Ministry of Environmental Protection of the People's Republic of China.

*"Thanks to all scientists who shared their knowledge and enthusiasm with us. I had an 'eye-opening' experience today. I'm impressed by everything I heard and saw, European policies are much more supported by scientific evidence than I ever thought. Thank you for an interesting day!"*  
 Karla Peijs, Coordinator for inland waterways, the Queen's Commissioner for the province of Zeeland in the Netherlands and former Member of the European Parliament.

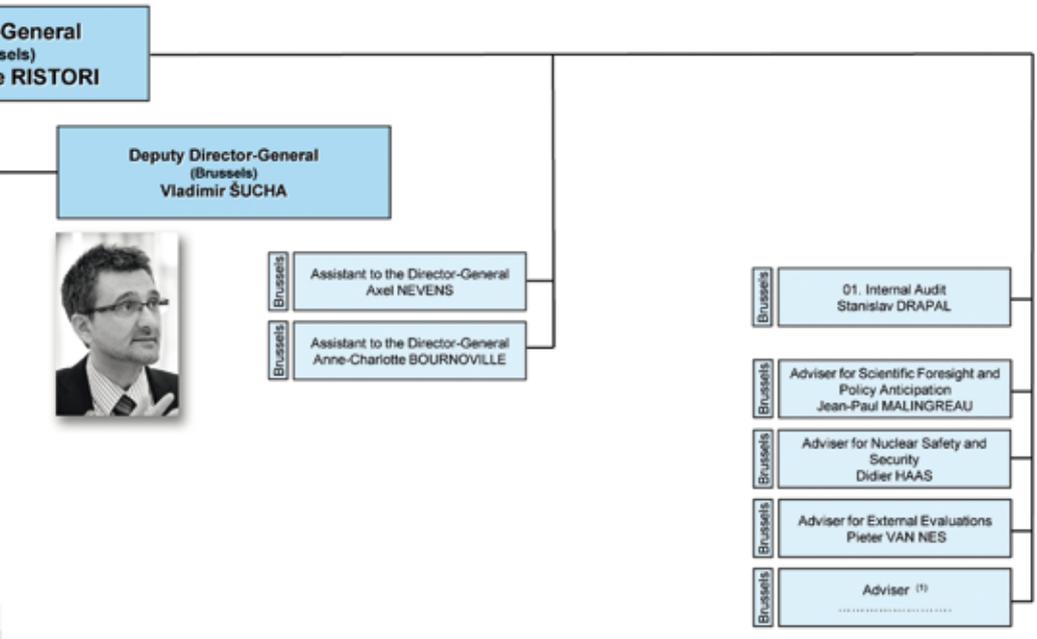
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As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

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