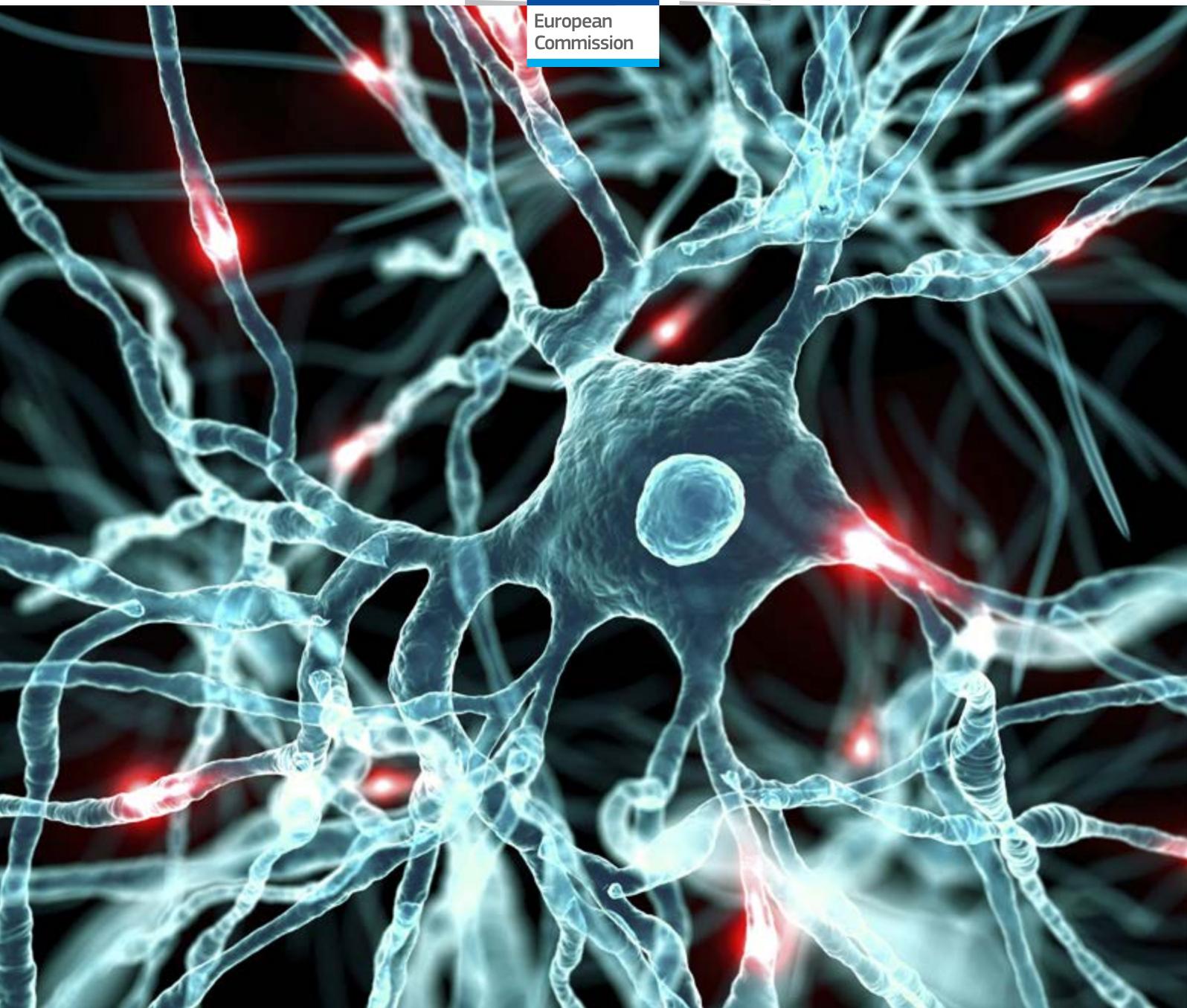




European  
Commission



Annual Report  
2014

Joint  
Research  
Centre

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



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# MESSAGE BY TIBOR NAVRACSICS

COMMISSIONER FOR EDUCATION, CULTURE, YOUTH AND SPORT,  
RESPONSIBLE FOR THE JRC



2014 was a year of transition, of change – and it marked a new start: the Juncker Commission took office with a clear mandate to tackle the big challenges that Europe is facing. That is why our political priorities include vital aims such as boosting economic growth and job creation and making the EU more democratic – bringing it closer to citizens. The new Commission is working in a new, different way. The Joint Research Centre is in a particularly strategic position – both to promote these new working methods and to benefit from them. President Jean-Claude Juncker has called on all Commissioners to work together as a strong team,

cooperating across portfolios to produce integrated, well-grounded and well-explained initiatives that have clear benefits for EU citizens. And he called on all Commission staff to overcome silo mentalities by working together on the areas where we can really make a difference. I believe that having a transversal service like the Joint Research Centre in my portfolio gives me a unique opportunity to support this silo-breaking approach by channelling its multidisciplinary scientific advice into a wide range of EU policy areas. My mandate as Commissioner very clearly requires me to ensure that the Joint Research Centre develops its capacity to

provide scientific advice to all Commissioners and their services and input into nearly all policies. It will be my pleasure to be the best ambassador for the excellent work you do in the Joint Research Centre and to ensure you get the visibility and credit you deserve. Science has become more and more important in policy making. It can help politicians to make sound policy choices, to identify innovative solutions and to become aware of impending challenges before they happen. The Joint Research Centre works in almost all policy areas, from financial stability to energy and climate policies, to safety and security. It has solid experience in

transforming scientific research into evidence to support policy making. I want to build on this expertise and make the Joint Research Centre the “scientific brain” of the Commission, so that this important capacity is fully used to the benefit of EU citizens. The Commission’s new way of working provides me with the perfect opportunity to do this. We have five challenging years ahead of us. But I am confident that we can find answers to the pressing questions Europe is facing and I firmly believe in the potential of science to improve the policy initiatives we will employ to build a stronger Europe. Let’s continue the good work.



Commissioner Tibor Navracsics addressing JRC staff during his first visit to the Ispra site (December 2014).



# MESSAGE BY VLADIMÍR ŠUCHA

JRC DIRECTOR-GENERAL

A year has passed since I took office as Director-General of DG JRC. It has been an intensive but also fascinating and rewarding year, a year of changes not only for DG JRC, but also for the Commission and for the EU. The new Commission brings new momentum to our work and provides new opportunities.

One year into my term, I am more than ever convinced about the potential of DG JRC, built on scientific excellence, strong international links and

dedicated colleagues. In 2014 there was a growing demand for scientific support from other Commission services and DG JRC will step up its efforts to continue to provide best available scientific support for EU policies.

The new setting brings about new opportunities for DG JRC and we remain committed to maintaining its reputation as one of the leading organisations in feeding scientific knowledge into policy making. To achieve this, co-operation is crucial,

and DG JRC shall continue to nourish its well-established networks with the European and global scientific community, as well as with partners in Member States, Horizon 2020 associated countries and strategic third countries. We are confident that DG JRC can play a key role in delivering the results and policies which Europe needs today in order to come out of the economic and social crisis. We embrace the challenges that this new Commission has brought about. We take this as an

opportunity to show how robust science and DG JRC experience in translating it into knowledge for policy making can contribute to creating better policies for citizens. We have set ambitious goals for the coming years to make our scientific advice yet more relevant and more focused on the political priorities.

I hope that you will enjoy reading the highlights of the excellent work done by DG JRC in the following pages.



Commissioner Tibor Navracsics with JRC Director-General and Directors.

# OBSERVATIONS FROM THE BOARD OF GOVERNORS



2014 was a year of remarkable changes: we saw the JRC operating under the leadership of a new Director-General, and, in November, a new Commission took office with a new distribution of responsibilities, newly defined priorities and new ways of operating, including the assignment of the JRC to the portfolio of the Commissioner for Education, Culture, Youth and Sports, Tibor Navracsics. The Board of Governors followed these developments in close contact with the management of the JRC and continued to provide advice on a broad range of strategic and thematic issues. The successful start of the Horizon 2020 programme was of particular importance. The JRC continues to be a highly appreciated partner in its research and development projects covering different disciplines. Beyond this, the Commission is seeking to better exploit the potential of

the JRC in strategic planning of the biannual work programmes of Horizon 2020. A number of discussions between the JRC and policy Directorate-Generals took place with the aim to define the scope, content and working methods of a new quality of strategic co-operation between the JRC and other parts of the Commission. The Board set up two ad hoc working groups, one on the role of the JRC in Horizon 2020 Indirect Actions and one on the preparation of the JRC Work Programme 2015-2016. The rationale behind is that the JRC should engage itself to a greater extent in the strategic implementation and evaluation of Horizon 2020, without excluding the option for JRC researchers to participate in Horizon 2020 projects. The Board supports this strategic approach. The dual role of the JRC – as a European research

organisation on the one hand, and as a scientific policy adviser on the other – will be even more challenging in the future. The JRC, with its knowledge and its expertise, should, as President Juncker has called for, progressively develop its role as a service supporting all Commission services. The Board is convinced that the JRC is able to meet these challenging demands. The Annual Report 2014 gives an impressive overview of the activities of the JRC along the main EU policy fields. The report also underlines the considerable value of the JRC's scientific output. According to an evaluation of the research performance of the JRC by Thomson-Reuters, it scores in many scientific areas similarly to the top 15 research organisations worldwide, and in a few areas even better. Unfortunately, the reputation of the JRC as perceived

by the public still does not adequately reflect this. The Board wishes to record its appreciation of Vladimír Šucha who in his first year as Director-General has taken important steps to strengthen both the scientific and the strategic role of the JRC. This will help to enhance the JRC's visibility and impact. Moreover, the co-operation between Vladimír Šucha and the Board has started off very well. We had fruitful and trusted interactions with him, extending much beyond the three regular meetings of the Board. The Board of Governors would like to thank former Commissioner Máire Geoghegan-Quinn for her support of the JRC during her term in office. The Board endorses the present annual report and expresses its support and gratitude for the excellent work of the JRC management and staff.



*JRC Board of Governors meeting in Vienna (June 2014).*

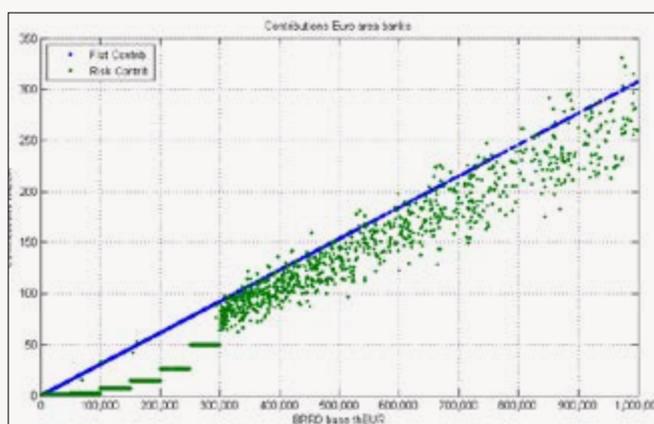
# ECONOMIC AND MONETARY UNION

*The development of the Economic and Monetary Union continued to be one of the European Commission's priorities throughout 2014, with significant progress on stabilising financial markets and introducing elements of banking reform to move the burden of cost away from the citizen. The JRC, using its expertise in modelling and analytical tools, contributed to the comprehensive review of the Commission's financial regulation agenda and to the preparation of the proposal for restructuring the EU banking sector in close collaboration with the Commission's Directorate-Generals for Economic and Financial Affairs, and for Financial Stability, Financial Services and Capital Markets Union. The JRC also continued to monitor fiscal imbalances for the Stability and Growth Pact, with a methodological upgrade utilising information on unit labour costs.*

## Assessing the Commission's banking reform agenda

In 2014, the Commission published the Economic Review of Financial Regulation Agenda, which assesses the impact of the banking regulatory framework put in place by the EU in recent years. This review included contributions from the JRC, which developed a quantitative assessment of certain legislation adopted in the EU.

JRC analysis, based on the Systemic Model of Banking Originated Losses (SYMBOL) model, estimated the benefits of introducing increased capital requirements (Capital Requirements Directive IV - CRDIV) and resolution tools for banks (Bank Recovery and Resolution Directive - BRRD), their effectiveness in reducing the probability of future crises, and their impact on society. These two directives set up a number of tools, including increased quality and level of capital to absorb shocks, resolution funds, and bail-in, which will reduce the probability of future crises and place the burden on shareholders and creditors, rather than



Comparison of contributions solely based on the size (blue dots) to contributions in line with a special treatment for small banks (green dots).

on the citizen. While bank recovery and resolution mechanisms operate at national level, the Single Resolution Mechanism (SRM) implements resolution rules for the Eurozone, as well as any other countries participating in the Banking Union. National resolution funds will be pooled into a Single Resolution Fund (SRF), for which the Commission has also adopted rules on how contributions from banks should be defined and computed. To support this approach, the JRC has conducted extensive analysis and developed quantitative assessment of alternative options for computing the contributions. The

JRC also proposed and tested a methodology to compute a risk indicator that will be applied to adjust contributions taking into account banks' risk profile.

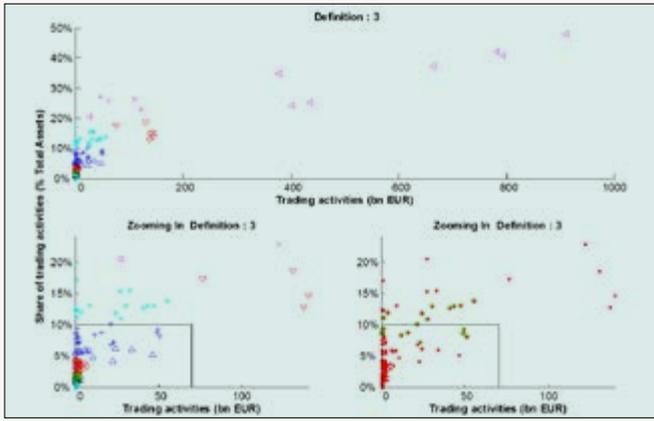
## Towards safer and simpler banks

Early in 2014, the European Commission adopted a proposal for a new regulation on structural reform of the banking sector. It complements earlier reforms as part of the comprehensive overhaul of the financial sector, in order to ensure stability and resilience to potential future crashes. The JRC's quantitative analysis and scientific inputs supported extensively the impact

assessment of this proposal. The support was developed into various streams of research, including a statistical study to set quantitative thresholds that would help identify the banks to be considered for reforms, based on their size and investment trading activities. JRC research also showed that EU banks have enjoyed an implicit subsidy from the State in recent years: creditors of large and complex banks expect government bailouts in case of need and are therefore ready to lend them money at favourable rates. The JRC study estimates that this funding advantage amounted to €65-95 billion per year in 2011 and 2012. A third study showed that existing bank regulation may lead to unintended incentives to engage more in trading activities than in traditional banking activities, including lending to firms and households. The new proposal aims to ensure that banks do not become too big to fail, to safeguard against taxpayer bailouts, and facilitate management, regulation, supervision, and resolution of banks.

## Estimating the real and potential growth of EU countries

The Stability and Growth Pact (SGP) is an EU 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 an estimation platform currently used by both the Commission and the EU countries to calculate potential growth and the output gap (the distance of actual GDP to its potential). The output gap serves to



The results of the clustering exercise for the metric chosen by the Commission to measure banks' trading levels. Top panel presents all banks; bottom left panel zooms on small banks; bottom right panel identifies banks close to the thresholds.

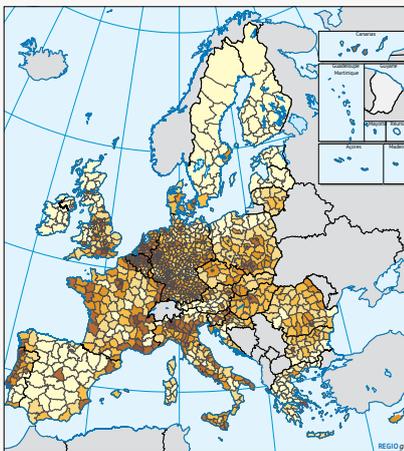
assess the cyclically adjusted budget balance which is used to monitor the Member States compliance with the Pact in order to prevent excessive public debt levels which can put economies at risk. In 2014, research at the JRC has shown that the incorporation of unit labour costs data can improve the output gap estimates in a majority of EU Member States.

### Analysing economic, social and territorial cohesion

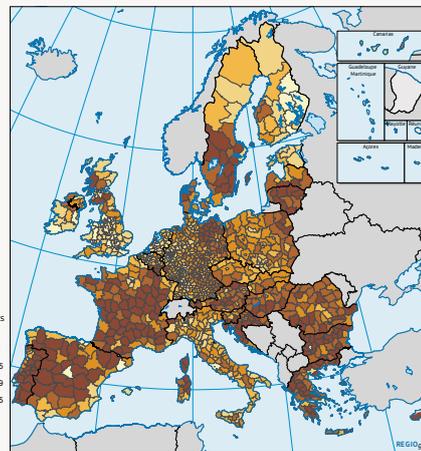
The 6<sup>th</sup> report on economic, social and territorial cohesion was released in July 2014. It examines the state of cohesion of the EU and highlights challenges faced by national, regional and local authorities in overcoming the impact of the financial

and economic crises. JRC analyses fed into the vast comparison between urban and rural development in Europe carried out by the Commission's Directorate-General for Regional and Urban Policy. For instance, JRC research showed that cities are more efficient in terms of land and resource consumption compared to rural areas. According to the report, the amount of built-up land per person in urban areas is four times lower than that in rural or peripheral areas. A land-use efficiency analysis allowed urban growth to be studied since the mid-20<sup>th</sup> century, including the creation of inner-city density profiles and impact assessments of different spatial planning options on future urbanisation

patterns. The use of renewable energies was covered as well. It has shown that vast areas within the EU – besides the southern regions – have the potential to produce electricity using solar radiation. When it came to analysing the vulnerability of cities to heat waves and river floods, JRC work identified regions that are particularly lacking in adaptation capacity. When supporting the estimation of the regional impact of cohesion policy investments in infrastructure, human capital and R&D, as well as in sustainable growth for the period 2014-2020, the JRC, in close collaboration with the Directorate-General for Regional and Urban Policy, provided economic and bio-physical models and databases, which offer a coherent overview of the options for regional and urban development in the EU. Road congestion, pollution, agglomeration, production-based and consumption-based emissions, and the use of resources are among the topics considered.



Share of built-up area in total area by region, 2012



Built-up area per head by region, 2012

The European settlements map developed with satellite imagery by the JRC's Global Human Settlement Layer (GHSL) substantiated this analysis.

### Read more

Commission staff working document – Economic Review of the Financial Regulation Agenda – SWD(2014) 158 final, May 2014: <http://europa.eu/!Bc43Pk>

Proposal for a Council implementing regulation – Rules on contributions of banks to resolution funds – COM(2014) 710 final, November 2014: <http://europa.eu/!YB73tn>

Proposal on banking structural reform: <http://europa.eu/!gm76Tr>

JRC's econometric and statistical software: <https://ec.europa.eu/jrc/en/eemc>

Sixth report on economic, social and territorial cohesion: <http://europa.eu/!Jk64MP>



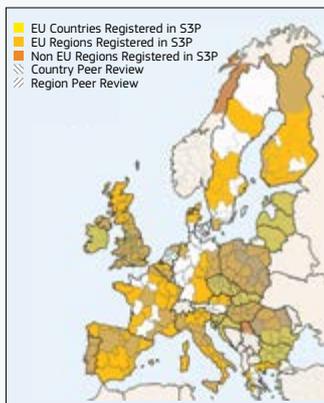
# INNOVATION, GROWTH AND JOBS

*Sustained policy efforts at all levels put European economies on firmer ground in 2014, with many of them returning to growth. However, recovery remains uneven and fragile, with efforts focusing on measures that stimulate innovation and knowledge. These efforts are essential for the growth of productivity and the creation of more jobs.*

*In 2014 the JRC measured investment in research and development of the EU's private companies. Assistance to regional economic development has continued through smart specialisation, which supports research and innovation strategies across the EU. JRC researchers have studied multidimensional poverty in function of the degree of urbanisation, as a better understanding of poverty and its distribution is key to sensible regional policies. In support of a more sustainable economy, a bioeconomy observatory was set up to monitor the health of the sector. To explore how standardisation will facilitate new production systems in a decade, JRC experts produced a foresight study on standards in 2025.*

## **S3 Platform: helping regions specialise the smart way**

In 2014, eight EU regions and one country joined the JRC-managed smart specialisation platform (S3P), bringing the total number of regions assisted in creating their research and innovation (R&I) strategies for smart specialisation to more than 150. Smart specialisation addresses R&I strategies for the economic development and enhanced competitiveness of European regions, based on



*There were 153 regions, 15 countries and 2 non-EU regions registered in the smart specialisation platform in 2014.*

their potential and strengths, and focusing policy action on a limited number of priorities. The JRC provides information, methodologies, expertise and advice to national and regional policy makers, and fosters academic debates around the concept and methodology. Inter-regional and transnational collaboration are key components of RIS3. In 2014, the platform put a particular emphasis on supporting EU macro regions such as the Danube and the Baltic Sea in using their research and innovation strategies for smart specialisation to fulfil their objectives and in connecting related priorities across borders. In October, the Stairway to Excellence (S2E) project was launched by the JRC and the Commission's Directorate-General for Regional and Urban Policy to support the countries that joined the EU since 2004 with the aim of helping them catch up to more developed regions and narrow the innovation gap.

## **R&D investment growth by EU companies below world average**

The EU industrial research and development investment scoreboard is published annually by the JRC and the Directorate-General for Research and Innovation. The 2014 edition is based on a sample of the top 2500 companies worldwide, which represents 90% of the total expenditure on R&D by businesses (2013 data). The 633 EU companies between them show an annual R&D investment growth rate of 2.6%. This is below the world average, but still above net sales and profits evolution, which decreased by 1.9% and 6.6% respectively. The EU based carmaker Volkswagen leads the world R&D ranking for the second consecutive year, with a 23% increase of R&D investment totaling €11.7billion. In fact the EU's automobile sector accounts for one quarter of the total R&D investment

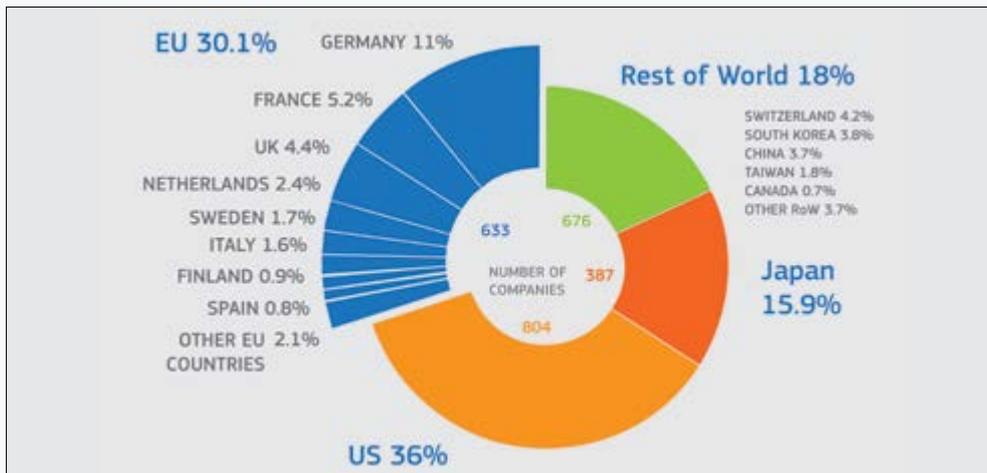
of the EU-633 Scoreboard companies. Its R&D investment continued to increase in 2013 (6.2%), reflecting mainly the good performance of automobiles companies based in Germany.

The low R&D growth of EU companies in relevant high-tech sectors such as pharmaceuticals (0.9%) and technology hardware and equipment (-5.4%) weight down the total average R&D increase of the EU sample.

Out of the top 100 companies, 31 are based in the EU, compared with 39 in the US and 17 in Japan.

## **Foresight: forward-looking to standards in 2025**

A new JRC foresight study suggests that the European standardisation system should accelerate and rely on an integrated strategy. Only in this way will it be able to keep pace with technological developments and societal challenges, stimulating innovation and fostering competition. The study, conducted with the participation of other Commission Directorate-Generals such as DG Internal Market, Industry, Entrepreneurship and SMEs or DG Research and Innovation, focuses on a 2025 scenario and identifies five priority areas: integration, which aims at having standards that can cope with converging technologies and infrastructures, and assure interoperability and interconnectivity; environmental sustainability, focused on resource efficiency, zero waste and energy neutrality; quality and performance; services, meaning that consumers' demand for high-quality services as part of any product package will need to be addressed, and 'de-risking', with standards that provide confidence towards innovative solutions and ensure protection



Regional distribution of R&D private investments (data from the 2500 top investors, which represent 90% of R&D company investment worldwide).

from potential risks to health, security, safety and privacy. The study also provides a template to identify standardisation needs so that they can be addressed earlier and in a more systematic way.

### Monitoring progress on bioeconomy and R&I

During 2014, the JRC set up two observatories in close collaboration with the Commission's Directorate-General for Research and Innovation. The new bioeconomy observatory includes statistics on investments in research, innovation and skills, mapping of policy initiatives at EU and national levels, bioeconomy profiles of EU countries and regions, and socio-economic analysis, as well as environmental sustainability data, information and assessment of bio-based value chains. An online tool allows for regular assessment on the progress and impact of the bioeconomy in Europe, understood as the sustainable production and exploitation of biological resources, which will allow the production of more from less, including waste. This observatory was foreseen by the European Bioeconomy Strategy. The research and innovation (R&I) observatory monitors national research and innovation policies. It

provides data and analysis at country and regional levels to support the development of country-specific research and innovation recommendations in the European Semester, as well as the monitoring of the Innovation Union flagship initiative and of the completion of the European Research Area (ERA). The observatory is also designing and building user-friendly dissemination tools, for example an interactive dashboard which allows comparison of progress towards the implementation of the European Research Area across EU countries.

### Looking at regional poverty from a multidimensional perspective

The JRC, in close collaboration with the Directorate-General for Regional and Urban Policy, has built a composite index (MPI-reg) that measures non-income related poverty by studying three dimensions: education, health and living standards. In order to measure poverty at the regional level, this information is combined with both data on material deprivation and living conditions, with the 'degree of urbanisation' also being taken into account. Results show that in the 24 EU countries studied, the level of non-income related

poverty ranges from 0,5% to 13-15%, with Denmark and Sweden having the lowest share of poor people (0,5%) and Latvia, Bulgaria and Romania having the largest (12,2%, 13,1% and 15,5% respectively). A moderate level of poverty (between 2% and 5%) is observed in the UK, Slovakia, Greece, Finland, Malta, Croatia and Estonia. In the most disadvantaged and moderately disadvantaged countries, the worst situation is observed in sparsely populated areas, i.e. rural areas, while the best situation occurs in densely populated areas, such as cities. In contrast however, in the top scoring countries – the most affluent ones – poverty is relatively higher in densely populated areas compared with less populated areas.

#### Read more

JRC's work on smart specialisation:  
<http://europa.eu/!hJ84qT>

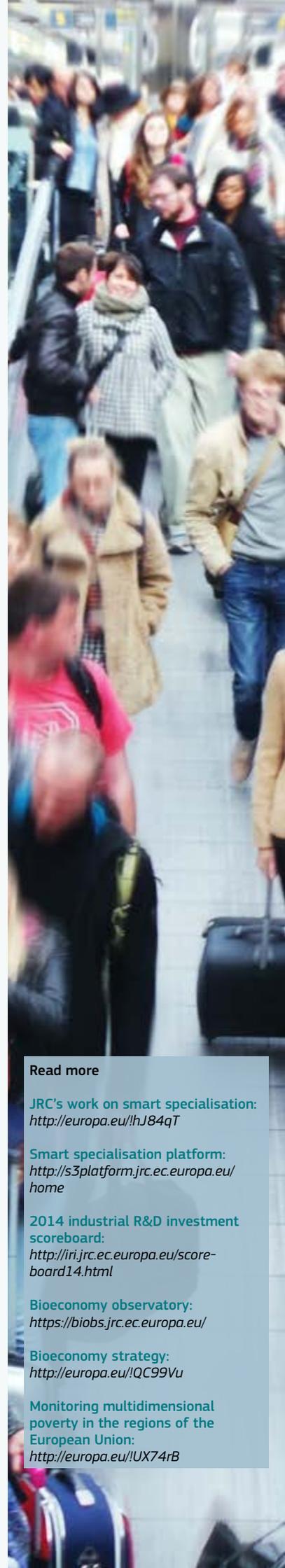
Smart specialisation platform:  
<http://s3platform.jrc.ec.europa.eu/home>

2014 industrial R&D investment scoreboard:  
<http://iri.jrc.ec.europa.eu/scoreboard14.html>

Bioeconomy observatory:  
<https://biobs.jrc.ec.europa.eu/>

Bioeconomy strategy:  
<http://europa.eu/!QC99Vu>

Monitoring multidimensional poverty in the regions of the European Union:  
<http://europa.eu/!UX74rB>



# DIGITAL AGENDA

*The Digital Agenda for Europe aims to reboot the EU's economy and help business and citizens make the most out of digital technologies. The JRC, in close co-operation with other Commission services for research and innovation, education and culture, regional policy and communications networks, content and technology, supports the Digital Agenda for Europe through its research on cybersecurity, digital economy and Information and Communication Technology (ICT) analysis, amongst other areas. In 2014, the 34 ICT hotspots in Europe were identified, as well as the digital challenges faced by schools. Other results include a study on the evolution of R&D in the ICT sector, a new prototype application to fight cybercrime and a study focused on e-health in European hospitals.*

and Culture. Regarding the challenges, the report states that integrating ICT into teacher education and addressing students' low digital competence are solvable. Creating 'authentic' learning opportunities, based on real-life experience, and blending formal and non-formal education, will be more difficult to implement in the short term and the toughest challenges include the need to improve the teaching of complex thinking and ensuring students are 'co-designers' of learning.

The study also outlines the trends and technological developments over the next five years (see graph). It concludes action is urgently needed to promote innovation in the classroom to take advantage of increased use of social media, open educational resources and the rise of data-driven learning and assessment.

## Slight increase in ICT sector employment

JRC research analyses the ICT sector and its R&D investments – both private and public – in the European Union and beyond. The 2014 report, based on the latest official data (2006–2011), found that



Most ICT activity takes place in 34 EU regions (out the 1303 analysed) located in 12 countries.

## Mapping ICT excellence in Europe

The top three ICT hotspots in Europe are Munich, London and Paris, followed by other small-size regions such as Karlsruhe or Darmstadt in Germany, Cambridge in the UK, and Leuven in Belgium. The JRC and the Commission's Directorate-General for Communication Networks, Content and Technology conducted a study which unveiled that ICT excellence is highly concentrated in a few areas, closely clustered together (see map). Out of the 1303 European regions, most ICT activity takes place

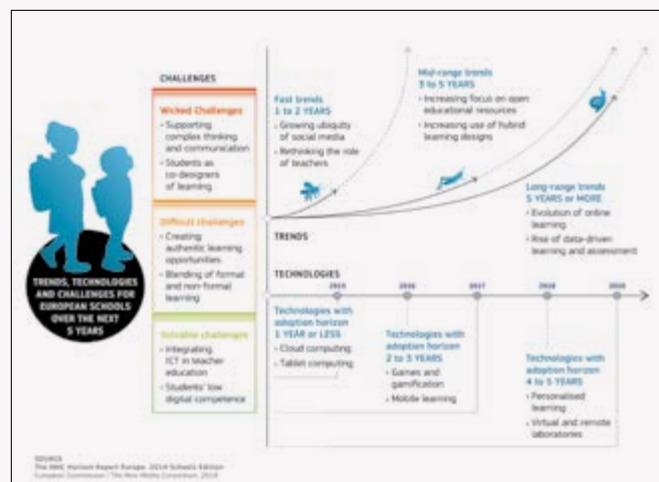
in only 34 of them, located in 12 countries. Conclusions show that excellence is linked to research and development activities, the ability to take knowledge to market (innovation), and to building an intense business activity around this innovation. This effect is also observed in places like Silicon Valley (USA), Bangalore (India) or Changzhou (China). Key ingredients to success also include access to top universities and research centres, as well as funding opportunities such as venture capital.

Performance was measured through a composite indicator

gathering 42 specific areas and looking at business activity, R&D and innovation and their intensity, internationalisation and networking. The study provides the full list of the 34 top ICT regions and the interactive atlas gathers the indicators of each EU region.

## Educational and digital challenges in EU schools

Working in close collaboration with an expert panel, the JRC and research partners looked at the challenges, trends and technological developments that are likely to have an impact on European school education systems for the Commission's Directorate-General for Education



"Horizon report Europe: 2014 schools edition" outlines key trends, challenges and technological developments that are likely to have an impact on school education systems.

the EU ICT sector has declined in terms of value added (value of output minus the value of intermediate consumption) but increased in terms of employment. On R&D progress, the business enterprise R&D expenditure (BERD) intensity – measured as the ratio of R&D expenditure compared to its value added – grew, consolidating the sector as one of the most research-intensive sectors in the EU economy, with an intensity four times greater than the average. This progress also coincides with an increase in public funding in this area.

The ICT sector continues to be highly concentrated in the five largest EU countries: Germany, United Kingdom, France, Italy and Spain. However, the Nordic countries (Sweden, Finland, and Denmark) showed their superiority in terms of public funding for research and development in this area when compared with GDP. Globally, Europe still lags behind although it is decreasing the gap. The US led the ranking of ICT sector in terms of size, whereas Asian countries (Japan, China, Korea and Taiwan) led private R&D expenditures. This research, carried out in collaboration with the Commission's Directorate-General for Communications Networks, Content and Technology, combines national statistics, company data, and technology-based indicators.

#### **Who took that picture? Fighting online child abuse**

Every single digital device leaves a unique noise pattern in the images it takes. Recent advances in image processing techniques allow the device to be traced and matched with other pictures contained in social networks, as demonstrated by the JRC. This enables identification of the camera owner and possible photographer of an image showing illegitimate content. JRC research in this area explores the usage of this sensor pattern noise (SPN) to identify perpetrators and victims of child abuse online. This almost imperceptible 'noise' pattern is left in the image by the camera sensor due to slight, random variations in light response of each sensitive element (pixel). This pattern is unique to each camera and stable over time. After exploring innovative ways of improving the matching performance of SPN through video analytics and computer vision research, the JRC has developed the first prototype application that allows performing SPN-based classification, verification and retrieval, allowing classification of images in databases according to the device used to take the picture. This research was carried out in close collaboration with the European Commission's

Directorate-General for Home Affairs in support to the global fight against child sexual abuse online and also the work of European police forces and EUROPOL's European cybercrime centre, where a test campaign of the new tool is to be launched.

#### **Nordic countries lead e-health deployment in hospitals**

According to a survey carried out by the JRC in support to the Commission's Directorate-General for Communications Networks, Content & Technology, the top performing countries for e-health deployment in hospitals are Denmark (66%), Estonia (63%), Sweden and Finland (both 62%). However, the findings confirm that the gap between these best performers and less advanced countries (mostly Eastern European countries and Greece) has narrowed from 42% in 2010 to 34% in 2013 and that medical professionals actively use e-health functionalities when available. JRC scientists analysed e-health deployment, availability and use in European hospitals dealing with short-term medical and/or surgical treatment and care (acute hospitals). The final report offers detailed country information. They found out that tele-health functionalities score the lowest both with regards to availability and usage levels. Remote monitoring of patients is available in only 9% of hospitals and the functionality to allow health professionals the electronic exchange of medical patient data with any healthcare provider in another country is deployed in only 7% of hospitals.



*JRC's work on the sensor pattern noise of digital cameras helps to identify perpetrators and victims of child abuse online.*

#### **Read more**

**Mapping the European ICT Poles of Excellence: The Atlas of ICT Activity in Europe:**

<http://europa.eu/!NK67qx>

**Interactive Atlas of ICT activity in Europe:**

<http://europa.eu/!Vm83nk>

**Horizon Report Europe – 2014 Schools Edition:**

<http://europa.eu/!VX36cu>

**PREDICT project:**

<http://europa.eu/!Rp39hp>

**Conference paper – On the usage of sensor pattern noise for picture-to-identity linking through social network accounts:**

<http://pralab.diee.unica.it/en/node/1005#>

**European Hospital Survey: Benchmarking Deployment of e-Health Services (2012–2013):**

<http://europa.eu/!yt96pH>

# ENERGY AND TRANSPORT

2014 was a breakthrough year with a new target of domestic greenhouse gas reduction of at least 40% by 2030 compared to 1990. The new 2030 policy framework aims to make the European Union's economy and energy system more competitive, secure and sustainable and also sets a target of at least 27% for renewable energy and energy savings by 2030. JRC research continued to support energy and transport policies, to ensure sustainable, safe, secure and efficient energy production, transmission, distribution and use, and foster sustainable and efficient transport in Europe. JRC scientists contributed to the impact assessment of the new energy and climate package and also published technology maps, presenting the latest state of play for energy production. Shale gas fracking was also analysed from an environmental and technological perspective and the JRC co-ordinates the new science and technology network on this area. A new model has also been developed to help policy makers identify the most cost-effective energy scenario and other studies have looked into greenhouse gas emissions of fuels and biofuels.

## Supporting the new 2030 climate and energy package

In 2014 the EU agreed to reinforce its climate and energy targets and to achieve at least a 40% reduction of greenhouse gas emissions by 2030 (compared to 1990 levels) and at least a 27% EU-wide binding target for both renewable energy and energy efficiency. The JRC significantly contributed to the new package, and in particular to the impact assessment which accompanied the Commission's proposal. JRC experts analysed, for example, the broader economic impacts of the tighter reduction targets, using GEM-E3, the JRC general equilibrium model, covering the interactions between the economy, the energy system and the environment. The JRC demonstrated, for instance, what the possible effects could be on the Gross Domestic Product (GDP): a 40% reduction of greenhouse gases emissions in 2030 without other countries taking

any action negatively impacts on the GDP range from -0.45% to -0.10% in 2030. At the same time the impact on employment ranges from -0.61% to +0.20%, depending on the choice of policy instruments, such as free allocation of permits, increasing use of auctioning in the EU's emissions trading system (ETS) sectors or taxation in the non ETS sectors.

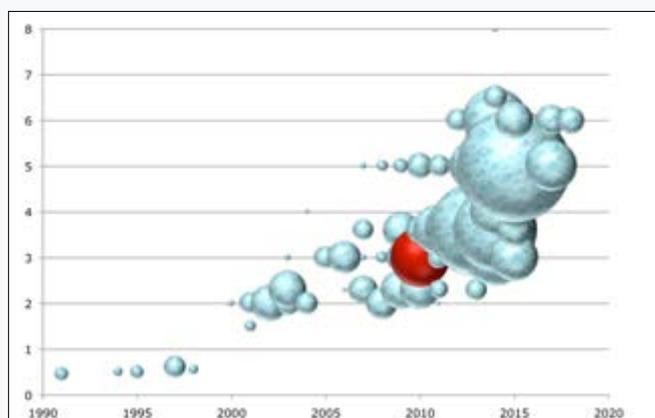
## State of the art of energy technologies

The latest JRC strategic energy technologies review, published in 2014, confirmed a steady increase of wind and solar capacities installed in Europe, whose capital costs have also significantly decreased. Onshore wind and solar photovoltaic (PV) added most generating capacity, when compared to the previous figures from 2011, with wind rising from 84 GW to 106 GW, which could cover the annual electricity consumption of a country like Spain. The study also highlighted the lack

of cost-competitiveness of several low-carbon technologies as one of the main barriers to their large-scale implementation. In addition, the review showed that new investments in conventional fossil-based technologies have also nearly stalled due to reduced electricity demand and increasing shares of variable renewables with low operating costs. Published every two years, the review now covers 22 low-carbon

## Gaining knowledge on shale gas fracking

As a result of the increasing scarcity of conventional oil reserves, industries and governments across the globe have started investing in unconventional oil sources, such as shale gas. In January 2014, the European Commission issued a recommendation on minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing in order to contribute to bringing clarity and predictability to public authorities, market operators and citizens. It was accompanied by a communication outlining the potential new opportunities and challenges stemming from shale gas extraction in Europe, as well as an impact assessment that examined the socio-economic and environmental impacts of various policy options. The JRC was actively involved in the preparation of these texts. JRC scientists contributed to the evaluation of the environmental impact of shale



The size of wind turbines installed offshore has increased with time and it is expected that they will continue to evolve. In this figure, the vertical axis represents the turbine rating in megawatts (MW) and the size of the bubble represents the amount of wind turbines (also in MW) that was installed in a given year. The red bubble corresponds to 218 turbines, each rated 3 MW, commissioned in 2010.

gas extraction on land, water and air quality, and also from an energy security point of view, assessing the shale gas resources in the EU, its impact on the region's security of supply and on natural gas pricing. Moreover, JRC scientists assessed the use of chemicals in hydraulic fracturing of shale gas reservoirs as reported under the current EU regulatory system on chemicals (REACH) and developed proposals on how the registration of such a use could be facilitated.

On the basis of this expertise, the JRC was mandated by the Commission's Directorate-Generals for Energy and for the Environment to set up and co-ordinate the European science and technology network on unconventional hydrocarbon extraction launched in July. In the first phase, the aim is to collect and analyse results from exploration projects and assess the development of technologies used to extract unconventional gas and oil. The overall objective is to provide solid support to the decision making processes and contribute to the minimisation of potential health, geological and environmental risks.

### Modelling a cost-effective energy technology mix

The JRC looked in 2014 at the EU's most cost-effective technology mix using a recently developed energy system model (JRC-EU-TIMES). It assesses the role of different energy technologies in meeting Europe's energy and climate change objectives. The scientists tested the model using a reference scenario, which takes into account the 20-20-20 policy targets and seven potential decarbonised pathways. The results indicate that innovative energy



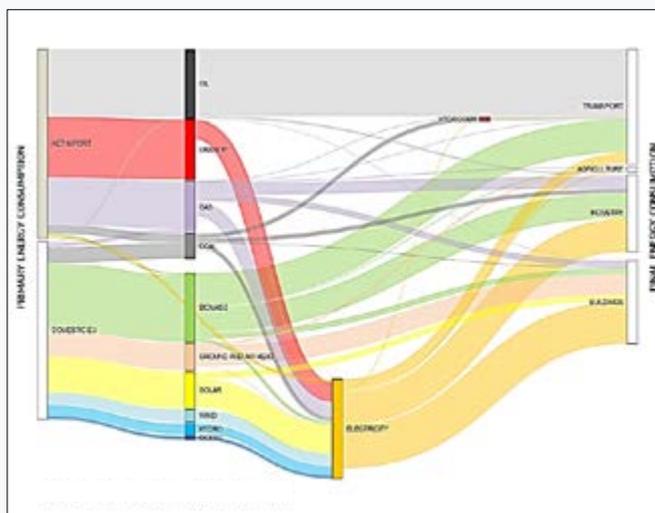
Shale gas drilling rig.

technologies can play an important role, reducing the carbon intensity of the energy system by up to 80%. Coupled with demand reductions, the energy intensity of production (energy per GDP) is also reduced by 60%. A strong requirement for the transformation into such a low-carbon society is investment in technology, especially in power generation, but also in cars, industrial production facilities and heating systems.

### Outlook for automotive fuels and powertrains

The well-to-wheel concept describes energy usage and related GHG emissions from the outset of a given fuel pathway, through its transport and delivery, until its consumption by a vehicle. In

2014, the JRC co-authored the fourth version of a report assessing the impact of future fuel and powertrain options on GHG emissions as well as energy use. The authors provide GHG emissions results for all vehicle and energy types relevant to Europe compared to a conventional vehicle baseline. It includes for the first time electric vehicle configurations, such as plug-in hybrid, range extended, battery and fuel-cell electric vehicles. The experts conclude that options exist for reducing GHG emissions from transport, but both the vehicle and energy aspects have to be taken into account, for example car efficiency and the production paths of the propulsion energy.



Major energy flows in an exemplary decarbonised EU28 in 2050, a JRC-EU-TIMES model run. Acknowledgment for d3.js and sankey diagram to Mike Bostok.

### Read more

Technology map of the European Strategic Energy Technology (SET) Plan:  
<http://europa.eu/!Dq84Qq>

European Science and Technology Network on Unconventional Hydrocarbon Extraction:  
<https://ec.europa.eu/jrc/en/uh-network>

The JRC-EU-TIMES model – Assessing the long-term role of the SET Plan Energy technologies:  
<http://europa.eu/!rk76Fm>

Well-to-Wheels (WTW) analysis of future automotive fuels and powertrains in the European context:  
<http://europa.eu/!ug98Gn>



# ENVIRONMENT AND CLIMATE CHANGE

*The EU has some of the world's highest environmental standards and has established itself as a world leader in combating and managing climate change. Environment policy helps to protect the EU's natural capital, encourages the greening of business and contributes to safeguarding the health and well-being of people. Climate change remains also high on the agenda, as proven by the EU's decision to set at 40% the target for reduction of greenhouse gas emissions (GHG) by 2030. The JRC provides continuous support to these challenging endeavours and in particular in 2014 an important study unveiling the costs of climate change was published. Assistance was also provided to the Ecolabel scheme and other initiatives that contribute to the greening of the EU economy. There is therefore a very close collaboration with the European Commission's services dealing with climate action, statistics, enterprise and industry, health and consumers, agriculture, development and co-operation, maritime affairs and fisheries, research and innovation, environment and energy as well as with the European Environment Agency. Last but not least, a new soil atlas of Latin America and the Caribbean was published.*

The results also confirm the geographically unbalanced distribution of climate change related damages, with southern Europe bearing most of the economic losses.

## Greening Europe's markets

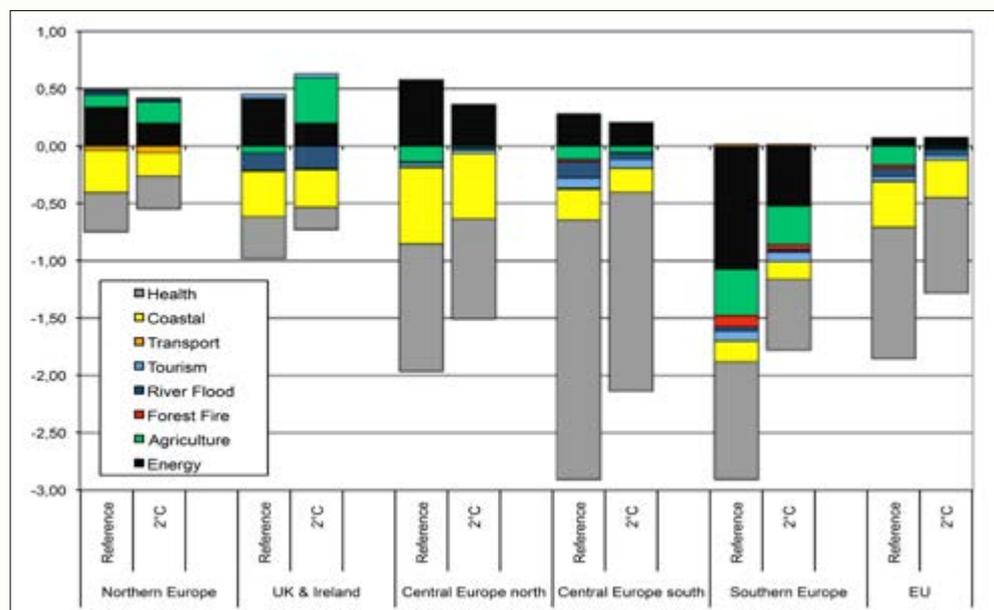
The JRC plays a central role in several well-known initiatives that aim at greening Europe's products and production systems as well as in bringing consistency between its product-related policies. For instance, in 2014 the European Commission adopted two revised frameworks to cap the industrial emissions from the production of pulp, paper and board and from the refining of mineral oil and gas. The Best Available Techniques (BAT) conclusions, as they are formally known, are the technical basis for national authorities in EU countries to set permit conditions for producers in this field and cap emissions to air, water and soil (as stipulated by the Industrial Emissions Directive). They cover both the technology used and the way the installation is designed, built, maintained, operated

## Quantifying the effects of climate change in Europe

If no further action is taken and global temperature increases by 3.5°C, climate damage in the EU could amount to at least €190 billion, a net welfare loss of 1.8% of its current GDP. Several weather-related extremes could roughly double their average frequency. As a consequence, heat-related deaths could reach about 200 000, the cost of river flood damages could exceed €10 billion and 8 000 km<sup>2</sup> of forests and natural areas could burn in southern Europe. The number of people affected by droughts could increase by a factor of seven, and coastal damage, due to sea-level rise, could more than triple. These are just some of the findings of a 2014 report by the JRC which analysed the impacts of climate change in several sectors. Premature mortality accounts for

more than half of the overall welfare losses (€120 billion), followed by impacts on coasts (€42 billion) and agriculture (€18 billion). These economic assessments are based on scenarios where the climate expected by the end of the

century (2080s) occurs in the current population and economic landscape. However, if future population and economic growth projections were taken into account, the negative effects would multiply.



Welfare losses due to climate change in Europe in 2080 in the reference (+3.5°C) and +2°C scenarios (measured in percentage of GDP).

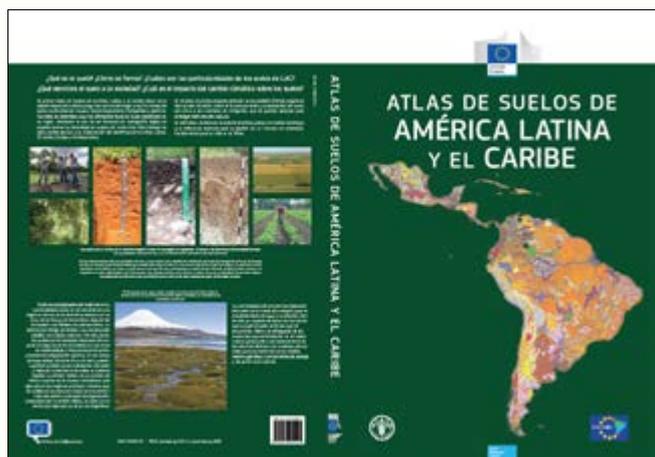
and decommissioned and aim at achieving a high degree of protection of the environment under economically and technically viable solutions. Under the Ecolabel scheme, five new sets of specifications were adopted for heating systems, bed mattresses, paints and varnishes, textiles and absorbent hygiene products. All of them belong to the priority group of products consumed in Europe according to the potential to reduce environmental impacts. The Ecolabel criteria are based on scientific data considering the whole life cycle of products, promoting environmental excellence. To do so is the responsibility of the JRC, which produces the technical, economic and environmental analysis and develops a proposal of product specifications achievable by the 10-20% best performing products on the market. This proposal is then discussed and agreed with stakeholders so that it meets the needs of both, consumers and industry. In addition, the JRC supports the EU's Environmental Technology Verification (ETV) pilot programme. It offers a verification procedure for cutting-edge environmental technologies that can assess and confirm their claimed environmental added value. This way, it accelerates their acceptance and diffusion. The pilot programme covers energy technologies, water treatment and monitoring, materials, waste and resources. The JRC provides scientific and technical support in particular to the technical working groups and manages the central registry of verification statements. In the context of the EU Initiative on 'building the single market for green products', the JRC is providing support to further increase robustness, quality and consistency of the

environmental footprint of products and organisations. Currently, product category and sector specific rules are being developed by 25 pilot projects with strong industry participation. The JRC leads the work on intermediate paper products, olive oil, and in the copper-producing sector.

### Sharing knowledge to protect our marine environment

In October 2014, the JRC launched the Marine Strategy Framework Directive (MSFD) competence centre to help EU countries achieve 'good environmental status' of their marine waters, as requested by the directive. It acts as a science-policy interface, facilitating co-operation, information exchange and dissemination. It is supported by a web interface that constitutes a platform on which to share knowledge and scientific expertise on methods and modelling tools, and provides access to guidance, assessments and reviews. The web interface will act as a single entry point for policy-

review activities, including the current review of the criteria and methodological standards for good environmental standards, which are key to achieving the MSFD goal. It will also provide useful modelling tools for the assessment of MSFD descriptors and serve as a knowledge broker, bridging the science-policy divide by feeding the implementation and adaptation process with relevant knowledge from the scientific community. This centre is the result of close collaboration between the European Commission, the European Environment Agency, EU Member States, Regional Sea Conventions (RSCs), the International Council for the Exploration of the Sea (ICES) and the European research community.



### Soil atlas of Latin America and the Caribbean

In 2014 the JRC published the soil atlas of Latin America and the Caribbean, which emphasises the complex relationship between climate and land use, and underlines the role of soil in food security. More than half of the 576 million hectares of arable land of Latin America are estimated to be affected by degradation processes, notably in South America and Mesoamerica. The main causes are change in land use (especially deforestation), over-exploitation, climate change and social inequality. The atlas presents a number of strategies for soil preservation and conservation.

### Read more

Climate impacts in Europe. The JRC PESETA II project: <http://europa.eu!kc84HF>

JRC's work on sustainable production – best available techniques: <http://europa.eu!yJ44wR>

Best available techniques for pulp, paper and board (Commission Implementing Decision 2014/687/EU): <http://europa.eu!CV87BD>

Overview on the environmental footprint pilots: <http://europa.eu!gB46jV>

EU Ecolabel scheme: <http://ec.europa.eu/environment/ecolabel>

Pilot programme on environmental technology verification: <http://iet.jrc.ec.europa.eu/etv>

Marine strategy framework directive competence centre (MCC): <http://mcc.jrc.ec.europa.eu>

Soil atlas of Latin America and the Caribbean: <http://europa.eu!wM89KY>



# AGRICULTURE AND GLOBAL FOOD SECURITY

Over the past number of years, tackling the issue of global food security has become a major challenge for countries in both the developed and developing world. Through its research in the areas of agricultural monitoring, the sustainable use of natural resources, innovation in farming and analysis of European and world markets, the JRC supports European and international organisations as they try to meet the growing demand for food. In 2014, the JRC contributed to the *Agricultural Outlook of the Organisation for Economic Cooperation and Development (OECD)* and the *UN's Food and Agriculture Organization (FAO)*. It continued its support to the EU's *Common Fisheries Policy*, as well as its usual research on crop yield forecasting.

In its role as co-ordinator of scientific advice to the Commission's advisory body, the Scientific, Technical and Economic Committee for Fisheries (STECF), the JRC contributed to the Commission's 2014 annual report on the European fishing fleet to support of the EU's fisheries policy. Using data submitted by the Member States, the JRC calculated technical, economic and biological indicators relevant to realising the balance between capacity and opportunity. The indicators used relate to the sustainable and viable operation of fishing fleets, such as whether fleets rely on stocks fished above MSY levels or stocks that are at risk, and whether they are economically sustainable, underutilised, or inactive. Results show some progress towards maintaining this balance, with some further work to be done to ensure that stocks are managed to achieve the MSY.

## Understanding agricultural markets

Understanding agricultural markets and their volatility is crucial to achieving food security, as well as a stable economic future for Europe and the rest of the world. Using an approach known as 'partial stochastic analysis', JRC scientists carry out multiple simulations which quantify the implications for the market outlook of uncertainty about future values of key market drivers like exchange rates, inflation, economic growth, energy prices and yields for the major agricultural commod-

ities (arable crops, milk, etc.) in regions of interest across the world. This analysis is vital for the development of stable policies as it provides information on the risk factors associated to these markets such as production volumes, commodity prices and trade flows. For the second year in a row, this uncertainties analysis has contributed to the OECD-FAO *Agricultural Outlook 2014-2023*. According to the outlook, the price of major crops internationally has dropped and will continue to do so for the next one or two years,

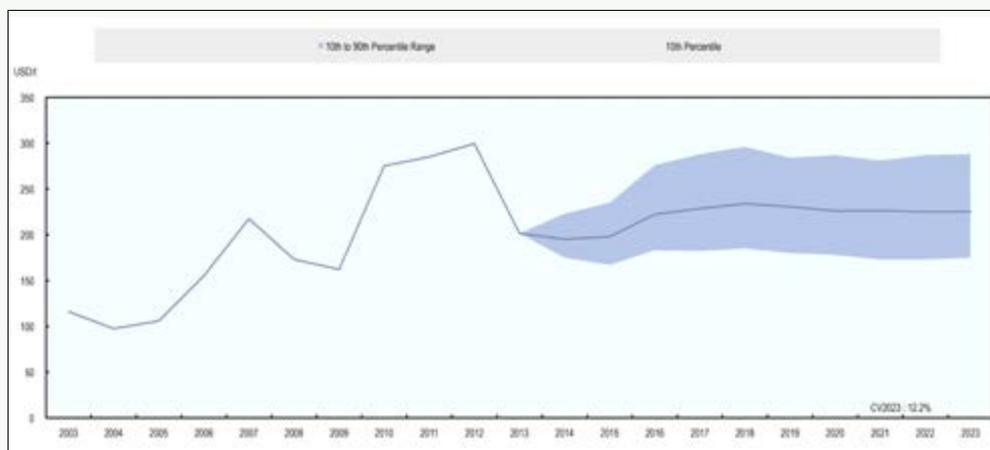
largely due to a bumper crop in 2013/2014. Contrastingly meat, dairy and fish prices are expected to rise.

## Towards sustainable fishing

The reform of the common fisheries policy obliges EU countries to achieve a balance between the fishing capacity of their fleets and their fishing opportunities, helping to achieve Maximum Sustainable Yield (MSY), which in turn ensures that fishing remains sustainable in the long term: environmentally, socially and economically.

## Precision agriculture: benefits and challenges

Precision agriculture is a whole-farm management approach using information technologies, satellite positioning (GNSS) data, remote sensing and proximal data gathering. The benefits to be obtained include increased yields and profitability (mainly for arable farmers), increased animal welfare, and improvement of various aspects of environmental management. The JRC conducted a study for the European Parliament on this topic and found that precision agriculture can play a substantial role in meeting the increasing demand for food while ensuring sustainable use of natural resources and the environment. However, the size and



Evolution of coarse grain (maize, barley and sorghum) prices in the world markets from the historical period 2003-2013 and the projection period 2014-2023, and the plausible range of values which prices might take, when the uncertainties are taken into account.



JRC contributions to the Commission's annual report on fishing fleet help in the progress towards sustainable fishing.

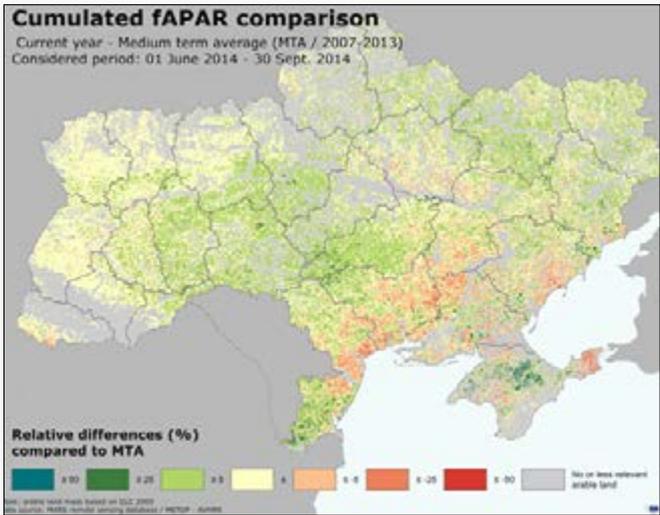
diversity of farm structures make its adoption in Europe challenging, according to the study. The report proposes recommendations such as awareness-raising and information campaigns among farmers, the provision of appropriate guidelines, and an EU 'precision farming calculator' tool which would bring decision-support value to farmers and advisers. This should be accompanied by research and development studies to assess, for instance, the impact of precision agriculture on the environmental footprint beyond the farm level. Finally, the roles of the farm advisory services and the European innovation partnership (established to help EU countries share knowledge and expertise in implementing the CAP) could be fostered.

**Extending crop yield forecasts**

To support EU policies on agriculture and neighbouring countries, JRC scientists have improved the Monitoring Agricultural Resources (MARS) crop yield forecasting system for the EU's eastern neighbours, and extended it to Libya and Egypt in North Africa. Improvements were

introduced to the crop growth simulation models as well as to quantitative crop yield forecasting based on remote sensing information for Turkey, Ukraine, Kazakhstan, Belarus and Russia as well as for Morocco, Algeria and Tunisia. The prototype bulletins, obtained through different tools and systems, will be further implemented in the pre-operational workflow in order to improve JRC's forecasting capabilities. The MARS crop yield forecasting system was developed by the JRC in 1992 to provide timely forecasts of crop production. It monitors crop vegetation growth

(cereal, oil seed crops, protein crops, sugar beet, potatoes, pastures, rice), including the short-term effects of meteorological events on crop production. Results of the yield monitoring activities are synthesised in the MARS bulletins, published regularly throughout the growing seasons.



Summer crops display average to good conditions in north-western and north-eastern regions. In marked contrast, for southern crop areas the cumulated biomass shows negative anomalies compared to the average time series, showing the impact of high temperatures and rain scarcity.



**Read more**

OECD-FAO agricultural outlook 2014-2023:  
<http://www.oecd.org/site/oecd-faoagriculturaloutlook>

European Commission's 2014 fishing report:  
<http://europa.eu/!UU43mh>

Precision agriculture: an opportunity for EU farmers – potential support with the CAP 2014 – 2020:  
<http://europa.eu/!uw87nP>

JRC's work on crop yield forecasting:  
<http://europa.eu/!cX87Rf>



# SECURITY AND DISASTER RISK REDUCTION

*Natural hazards and extreme weather events are now common place across the globe, many as a result of the planet's changing climate. As well as fighting climate change, much is being done in terms of damage control, limitation, prevention, and prediction when it comes to major disasters. The JRC continues its ethos of collaboration with European and international organisations on initiatives like the Global Flood Partnership, as well as sharing its unique facilities in areas like seismic-resilience to reduce the damaging effects of earthquakes. In the area of illicit transportation of goods, 2014 saw the development of new technology, building on the JRC's existing knowledge in the field of maritime security and surveillance.*

## Fighting floods across the globe

With an increasing number of extreme weather events year on year across Europe and indeed the world, research on how to better predict flood risk and manage flood disaster impacts is hugely important. In March 2014, the JRC together with the Dartmouth Flood Observatory of the University of Colorado launched the Global Flood Partnership,

which it will lead to extend hydro-meteorological information and early warning systems across the globe. This international forum brings together scientists, service providers (satellite and weather), national flood and emergency management organisations and donors in order to develop a global flood observational and modelling infrastructure. It will provide flood forecasting and

monitoring tools and services to complement national capabilities.

## Combating illicit shipping activities

Ninety per cent of the world's cargo is transported by sea in maritime containers, but only 2% is physically inspected by customs authorities, leaving the door wide open to illicit activities. This is where the ConTraffic system comes in. Developed

by the JRC together with the Directorate-General for Taxation and Customs Union and the European Antifraud Office (OLAF), the prototype system employs deep-web data mining, semantic data integration, artificial intelligence and statistical analysis techniques to create a historical data warehouse of container itineraries. Two pilot projects involving various EU countries got underway; the first is concerned with systematic cross-checks of the declared origin of goods inside import declarations to detect customs fraud, and the second analyses pre-arrival data and aims to develop risk indicators for the safety and security of containerised cargo entering, exiting or passing through Europe. The JRC is also working on a new concept of 'intelligent' containers made of composite materials, equipped with electronic sensors and capable of communicating their environmental, structural or security status wirelessly at any time. In 2014, the JRC's work on manufacturing and calibration of fibre-reinforced structural components fitted with polymeric self-energised piezo-sensors has shown that it is possible to detect and wirelessly transmit relevant mechanical and thermal alarms. Triggering alarm diagnostic electronics and alarm percolation through ad-hoc networks are currently being developed.



European Flood Awareness System alerts during the Balkan floods of 2014. The JRC also provided flood extent maps of the affected areas through the Copernicus Emergency Management Service.

## Realising the risk of humanitarian crises and disasters – INFORM

Most humanitarian crises can be predicted to some extent. While they cannot always be prevented, the suffering they cause can often be greatly reduced. In 2014 the JRC, together with the Inter-Agency Standing Committee Task Team for Preparedness and Resilience and



JRC's research helps enhancing containers' security.

other international organisations developed the Index for Risk Management (INFORM): a new tool to understand and measure the risk of a humanitarian crisis. INFORM is a composite index combining 50 indicators into three dimensions of risk: hazards (events that could occur) and exposure to them; vulnerability (the susceptibility of communities to those hazards); and the lack of coping capacity (lack of resources that can alleviate the impact). The purpose of INFORM is to provide an open, transparent, consensus-based methodology for analysing crisis risk at global, national or regional level. It covers 191 countries and can be used to prioritise countries by risk, decide how to prepare and reduce risk, and monitor risk trends. All the results and data used are freely available online.

### New developments in seismic-resilient design

A significant part of existing buildings in Europe were built before the 1960s and are characterised by a high seismic vulnerability. Within the context of the SERIES (Seismic Engineering Research Infrastructures for European Synergies) project, the JRC opened the doors of its European Laboratory for Structural Assessment (ELSA) for transnational access to its reaction wall facility to evaluate the performance of buildings in case of an earthquake.

In 2014 one of the hosted projects completed a test campaign aiming at validating a new concept to design earthquake resilient buildings. This method proposes to incorporate at the design and construction stage removable dissipative members to enhance the re-centring capability of the structure. This would help significantly reducing the cost and time to repair a structure damaged by an earthquake. The data gathered during the test will allow the calibration of numerical models, thus facilitating the preparation of European design guidelines for the proposed methodology.

### Securing Galileo – Europe's own satellite navigation system

A long-term European ambition to put in place its own satellite navigation system in orbit is coming to reality now. Six satellites of the constellation have already been launched and 20 others will be placed in orbit in the next two years.



Experimental mock-up of a building in front of the JRC's reaction wall.

Since 2011, the JRC has been working with the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs to ensure that technical conditions for the European Satellite Navigation System are robust and free from interference with other satellite navigation systems and ground-based communications services.

To ensure market readiness for the navigation system services, the JRC has tested professional receivers for their technical performance. It has been found that the manufacturers are ready to exploit the unique features of this system while achieving a high level of conformance. The JRC also supports DG Internal Market, Industry, Entrepreneurship and SMEs in questions related to securing and licensing the intellectual property rights needed for implementing the Galileo programme. In 2014, the Commission faced a particular challenge when two of the satellites were launched into non-nominal orbits. The JRC carried out extensive simulation studies on technical options to still use these satellites without compromising the overall system performance. The results supported the Commission and the European Space Agency in their decision process.



### Read more

Global Flood Awareness System (GLOFAS):  
<http://www.globalfloods.eu>

JRC's container traffic monitoring system (ConTraffic):  
<http://europa.eu/!uq96Jf>

Index for Risk Management (INFORM):  
[www.inform-index.org](http://www.inform-index.org)

European Laboratory for Structural Assessment:  
<http://europa.eu/!Uf98gg>

Global Flood Partnership:  
<http://portal.gdacs.org/Global-Flood-Partnership>

# HEALTH AND CONSUMER PROTECTION

*Life expectancy is increasing by 2.5 years each decade in the EU. However, poor lifestyle choices and unhealthy diets are among the key risk factors behind chronic and age-related diseases. Promoting health is essential, not only for the well-being of the individual, but also for the creation of a smart, sustainable and inclusive economy. Effective EU policies are needed in order to counter the effects of a gradually ageing population, new health risks and increasing costs of medical treatment.*

*In 2014, the JRC supported the European Commission's health strategy with a number of new studies on diets, providing useful data for policy development. Substantial efforts were also made in the area of cancer prevention, control and care. During the Ebola outbreak in 2014, the JRC's medical information system (MediSys) was used to track the spread of the disease. In the area of chemical safety, a new JRC report promotes alternatives to animal testing in the assessment of chemical products. These activities were achieved in close collaboration with the Commission's Directorate-General for Health and Food Safety.*

how much attention they give to dietary prevention. The report aims to promote a stronger inclusion of diet in cancer prevention plans throughout Europe and promotes diets as cost-effective measures to cut health-care costs.

Another JRC report provides an overview of breast cancer services in the 25 countries that voluntarily participated in the study. It includes information on healthcare and breast cancer care, cancer screening, safety and quality, accreditation and certification schemes and competence requirements for professionals. This represents a major step towards the development of a European quality assurance scheme for breast cancer services, which is part of the European Commission initiative on breast cancer, co-ordinated by the JRC.

In addition, the JRC and the European Network of Cancer Registries (ENCR) launched a new series of fact sheets as part of the effort to achieve a harmonised EU-wide information system on cancer. So far, three different types of cancer (colo-recto, prostate and lung) have been covered. They provide information on incidence rates, gender patterns and on trends over the last decades in Europe. These indicators are essential to guide policy and improve EU programmes dedicated to prevention, control and care of cancer.

## MediSys – Surveillance of the Ebola outbreak

Through its medical information system MediSys, the JRC helped to enhance epidemic intelligence throughout the Ebola outbreak in 2014. It first identified reports on an unknown disease in Guinea on 14 March 2014 and further

## Towards tomorrow's healthy society

In 2014, the JRC provided new scientific evidence to strengthen policy measures to support healthy diets. A new foresight study unveils future research needs that should be implemented in this area if Europe is to move towards a healthy society. It looked at the factors influencing the dietary habits of EU citizens, ranging from lifestyle to economic situation, and described potential future scenarios linked to citizens' health under possible future policy options.

Another JRC study assessed the role of nutrients in promoting healthy ageing. The study provides information on the prevention and treatment of age-related diseases, with a focus on under-nutrition in elderly people, as a result of many complex factors comprising cognitive, functional and physiological decline. It aims at raising awareness of diet as a key contributor to healthy ageing.



*Determinants of active and healthy ageing*

A step forward was also made in the fight against childhood obesity, thanks to a JRC report that assessed school food policies in Europe. The study maps for the first time the voluntary and compulsory guidelines in place for schools in the 28 EU countries, Norway and Switzerland. It provides an overview of the regulatory situation in the EU

as well as a basis for assessing the impact of school food policies on childhood obesity.

## Supporting cancer prevention

A new report reviews the national measures aimed at the prevention of cancer in all EU Member States, Iceland, Norway, Switzerland and Turkey, in view of assessing

reports about deaths caused by 'viral haemorrhagic fever' reported four days later in the same country. Since then, the system has been used to track Ebola-related news around the world. A page dedicated to the outbreak is available online, listing all articles.

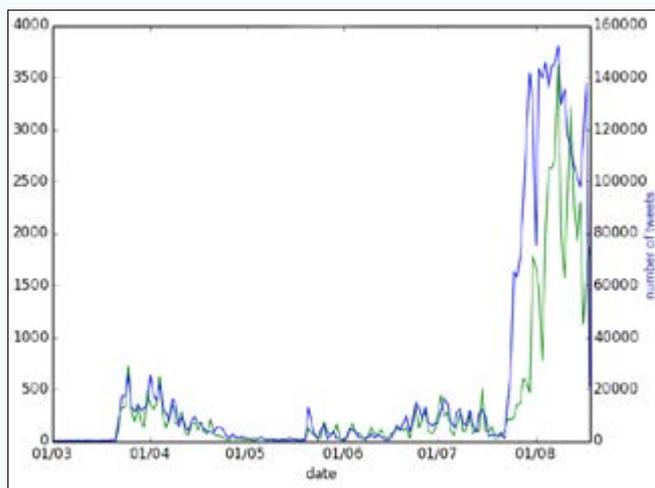
MediSys identifies potential threats to public health by tracking news alerts on the Internet and using statistical modelling techniques to identify topics that are suddenly reported on web news. When it detects a sudden increase of reports related to a given topic, it sends automatic alerts to the registered users, which today includes hundreds of European and international organisations.

The World Health Organization (WHO) uses its own local application of MediSys. The system's data feed into the WHO's Hazard Detection and Risk Assessment System (HDRAS), also developed by the JRC. It helps the early identification of internationally spreading diseases and proved to be very useful for the WHO's response to the Ebola outbreak.

### Alternative methods for chemical safety

The European Commission promotes the application of the '3Rs' principle in the assessment of chemical safety, which stands for replacement, reduction and refinement of animal testing. In 2014, the JRC produced a report for the European Chemicals Agency (ECHA) gathering the alternative methods that are not necessarily included in legal requirements but are still useful for assessing the toxicological properties of chemicals.

It reviews the current scientific status of these methods with respect to a range of human



A screenshot from MediSys showing the number of news reports on Ebola from 1 March until 17 April. The system clearly identifies a peak in mid-March corresponding to the first reports from Guinea, as well as a surge at the end of July when the deteriorating situation in Guinea, Liberia and Sierra Leone was widely discussed in the news media.

health impacts, including skin and eye irritation, carcinogenicity and effects on human development and fertility. It provides a valuable resource for companies that produce

and market chemicals, including chemicals in consumer products, as well as for regulatory bodies and non-governmental organisations.



High throughput robotic system to accelerate new toxicology testing based on cell systems.

### Read more

**Foresight study – Tomorrow's healthy society. Research priorities for foods and diets:**  
<http://europa.eu/!TM83qX>

**The role of nutrition in active and healthy ageing:**  
<http://europa.eu/!tV94Dw>

**Mapping of national school food policies across the EU28 plus Norway and Switzerland:**  
<http://europa.eu/!Tq84uU>

**Mapping dietary prevention of cancer in the EU28: European national cancer plans and their coverage of dietary prevention of cancer:**  
<http://europa.eu/!FR87XV>

**European survey on the organisation of breast cancer care services:**  
<http://europa.eu/!MW89yu>

**European network of cancer registries – cancer factsheets:**  
<http://www.enrcr.eu/index.php/publications/factsheets>

**MediSys:**  
<http://medisys.newsbrief.eu>

**Alternative methods for regulatory toxicology – a state-of-the-art review:**  
<http://europa.eu/!DU89UM>

# NUCLEAR SAFETY AND SECURITY

*The Euratom treaty foresees a clear role for the EU in ensuring the safe, secure and sustainable use of nuclear energy across Europe and helping the EU countries meet the highest standards of nuclear safety, security and non-proliferation. In this context, the JRC has continuously provided both direct research and policy support, and complements Member States' efforts in training and education in the nuclear field.*

*In 2014, the JRC set up a high-level meeting to share nuclear security culture best practices in the run up to the nuclear security summit held in The Hague. It also embarked on the second phase of a project that will improve radiation detection against illicit trafficking, and developed tools to support nuclear safeguards and non-proliferation. JRC experts also investigated the safety of interim storage of spent nuclear fuel and contributed to nuclear safety by supporting new design rules and environmental reliability of components.*

programme for the IAEA, for which the JRC is responsible. The scientific and technical support to IAEA includes analysis of nuclear materials, analysis of environmental particle samples, provision of reference/quality control material, development of dedicated safeguards instruments, as well as tools for the open source information collection, including trade analysis. The JRC is also a member of IAEA's Network of Analytical Laboratories. In recent years, six technologies developed by the JRC have been used worldwide by IAEA safeguards as certified IAEA techniques (also known as 'category A' equipment).

## Enhancing a global nuclear security culture

Nuclear security summits and IAEA international conferences are initiatives to strengthen co-operation in nuclear security. Following the Seoul summit in 2012, international leaders encouraged countries to share best practices and build national capabilities, including through bilateral and multilateral co-operation, recognising that investment in human capacity building is fundamental to promoting and sustaining a strong nuclear security culture. In this context, a high level meeting was organised by the EU on 20 March 2014 in Amsterdam, in which the JRC played a key role. It focused on lessons learnt as well as on future initiatives and means to strengthen nuclear security worldwide. More than 100 representatives from around 40 countries (including the United States, Japan, Republic of Korea, Canada and from the EU) and several international organisations (such as the IAEA and United Nations) took part, in the run-up to the Nuclear Security Summit



*JRC Director General, Vladimír Šucha, welcomes participants to the high-level meeting.*

held on 24 and 25 March in The Hague. International collaboration is crucial in this area and the EU carries out a wide range of international initiatives. Working in close collaboration with the Commission's Directorate-General for Energy, the JRC is one of the key pillars of the EU's technical expertise in the field of nuclear safeguards and the combat of illicit trafficking of radioactive and nuclear materials. It has also developed training programmes for European and third countries for first responders and experts in the field of safeguards, nuclear detection, forensics and response.

## Scientific and technical support to international nuclear safeguards

The international community working in the field of nuclear non-proliferation gathered in Vienna in October for the symposium on international safeguards: linking strategy, implementation and people. The aim of the event, which is held every four years and hosted by the International Atomic Energy Agency (IAEA), was to assess the technical progress in the field of nuclear safeguards implementation. The European Union has an important role in the field of nuclear non-proliferation and operates a large support

## Safer borders: improving radiation detection against illicit trafficking

The JRC, together with the Commission's Directorate-General for Migration and Home Affairs, launched in 2014 the second phase of the Illicit Trafficking Radiation Detection Assessment Programme (ITRAP+10), which focuses on testing mobile equipment and investigating the integration of radiological, nuclear and explosives detection techniques. By organising a proficiency test, phase II takes a step towards the establishment of a network of accredited laboratories in the EU, able to certify radiation detection equipment against international or European standards. The project will provide valuable information on radiation detection and identification instruments, which are essential for customs controls at borders and harbours, and for the screening of passengers and cargo at airports. Manufacturers will also gain insights that may allow them to improve their equipment. During phase I

(2009-2013), the JRC tested 65 detection instruments commercially available in Europe. Some of them were also tested in the U.S. to assure comparability. Results showed that none of these instruments fully passed all the tests. This stressed the need to stimulate the improvement of the equipment by giving feedback to manufacturers, as well as the need to provide active input to standardisation organisations in order to simplify and clarify existing standards. The lessons learned during the first phase will also be used to improve the standards.

#### **Safety assessment of spent nuclear fuel interim storage**

A JRC co-authored scientific article examined the evolution of components of spent nuclear fuel by comparing actual spent fuel with lab results obtained on fuel analogues in a simulated, accelerated timescale. Such comparisons help make safety assessments of the alterations that occur in conditions of prolonged storage of spent fuel while waiting for its final disposal in a geological repository. Most of the trends observed were found to be comparable with characteristics of actual spent fuel. The study also pointed to stabilised conditions of most macroscopic property changes for a simulated timescale corresponding to spent fuel after decades or centuries of storage. However, further studies are being carried out in the area of lattice swelling. Ongoing programmes are also addressing the retrievability of spent fuel after extended storage and its behaviour under accident conditions.

#### **Supporting non-proliferation: new technique and reference material**

A promising new safeguards tool for plutonium analysis was developed in 2014 by the JRC and the Radiation and Nuclear Safety Authority of Finland (STUK). It measures relative amounts of plutonium isotopes, in particular to distinguish the fissile plutonium-239 from non-fissile plutonium isotopes, such as plutonium-240. This is essential information for the identification of weapon-grade plutonium in the context of non-proliferation of nuclear weapons. This novel technique measures the isotopic composition of radioactive samples with a silicon drift detector for conversion electrons. It is regarded as a complementary tool to alpha particle spectrometry, which is commonly used for nuclear inspection in safeguards laboratories. Also in 2014, the JRC released a new reference material of highly enriched uranium-233 and plutonium-242. Precise and accurate isotopic analyses are needed in nuclear safeguards for two major elements of the nuclear fuel cycle, uranium and plutonium. The new reference material IRMM-046c represents a useful quality control tool for nuclear inspectors and nuclear laboratories within the nuclear safety and security framework.

#### **Nuclear safety: advances in design rules and environmental reliability of components**

The JRC, together with European partners, assesses the integrity of nuclear components exposed to harsh environment and develops methodologies for this purpose. For light-water reactors stress corrosion cracking is a key long-term degradation mech-

anism. In an Euratom Seventh Framework Programme (FP7) project, susceptibility tests for this type of cracking of various austenitic stainless steels were performed up to 550 °C. One of the objectives was to verify whether super-critical water could be used as an accelerator to simulate this type of incident in nuclear power plants under laboratory conditions. To this end, crack growth rate tests were conducted under both sub- and super-critical conditions, which allows for a better understanding of stress corrosion cracking, which in turn can be used to predict this phenomenon in different environments. Fast reactors, which are now being designed in Europe, will be exposed to higher radiation damage and temperatures than light-water reactors and the JRC has been involved in the revision of their design rules. If stresses and temperatures are sufficiently low, thermal creep does not need to be considered, something that simplifies design. To this end, As a consequence the JRC has developed 'negligible creep' curves in order to facilitate the optimal design of high temperature components.



*The stress corrosion tests were performed by a bellows-based loading system developed by the JRC.*

#### **Read more**

Event on international co-operation to enhance a worldwide nuclear security culture:  
<http://europa.eu/!HX44PG>

JRC's work on nuclear safeguards and security:  
<http://europa.eu/!jQ63Jr>

JRC thematic report – Science for nuclear safety and security:  
<http://europa.eu/!Cv86jK>



# PARTNERSHIPS AND INTERNATIONAL CO-OPERATION

*Collaboration with external organisations and partner countries within and beyond the EU is essential for carrying out the JRC's work programme. Sharing competence and acquiring new knowledge to maintain a high quality of scientific findings benefits both the JRC and its collaboration partners in addressing key societal challenges. Over the years, the JRC's network of co-operation has reached more than 1 000 partners worldwide and includes around 200 operational collaboration agreements.*

## **Collaboration agreement with Greece**

In April 2014, the JRC and the Greek General Secretariat for Research and Technology signed an agreement on research co-operation in fields of mutual interest. It aims to establish a basis for co-operation in energy, maritime affairs, food, health environment and security. Christos Vasilakos, Greek Secretary General for Research and Technology and Vladimír Šucha, JRC Director-General, signed the agreement during an information day on the JRC's work, hosted by Demokritos, the National Centre for Scientific Research. A follow-up technical meeting co-organised with the Centre

for Research and Technology-Hellas (CERTH) was held in October in Thessaloniki. Under the motto 'Sustainable growth: using local advantages to meet global challenges', CERTH and JRC researchers discussed their scientific work in areas of energy, transport and environment and examined possibilities for joint activities between the JRC and research centres supervised by the Greek General Secretariat for Research and Technology.

## **Cyprus – strengthened research links**

The official signing ceremony of a Memorandum of Understanding (MoU) between the JRC and the Cyprus Institute

was hosted in July 2014 in Brussels, marking further strengthening of the collaboration of the JRC with Cyprus. The MoU specifies advancing science, technology and innovation in fields of mutual interest including environment, climate change, energy, water and technological advances and standardisation in cultural heritage preservation.

## **European Forum for Science and Industry bolsters ties with Member States**

Managed by the JRC in co-operation with other services of the European Commission, the European Forum for Science and Industry (EFSI) provides a platform for exchange of information on scientific and innovation needs of industries, and strengthens the co-operation between the two communities to support Europe's competitiveness and economic recovery. EFSI brings together more than 1 000 members from public institutions, private companies, the scientific community, associations and industrial networks.

As of 2014, the JRC has sought to enhance the benefits of information and knowledge sharing among the Forum's members and

organise its roundtables and conferences across Europe, thus supporting the dialogue with Member States and helping them to better integrate within the European Research Area, create synergies with national strategies and pursue smart specialisation. The first event held in a Member State took place in June 2014 in Bratislava, co-organised with the Ministry of Education, Science, Research and Sport of the Slovak Republic. The event had a specific focus on two thematic areas identified as priorities by the Slovak government: sustainable transport, fuels and technologies, and nuclear safety and decommissioning.

## **Support to enlargement and integration**

The JRC Enlargement and Integration Action (E&IA) initiative provides scientific and technical support to enlargement countries and helps them in the transposition of EU laws to national legislations. In 2014, the E&IA Initiative committed €1.75 million to support a total of 55 workshops and trainings. The selection of the activities was made on the basis of criteria such as adherence to JRC key orientations and work programme, and adherence to target countries priorities; and selection criteria taking into consideration quality, topics, regional approach and budget. As a general principle, apart from the workshops and training courses, the organisation of such activities in the target countries has been encouraged in order to increase the number of participants.

## **Scientific bridge between the JRC and CELAC countries**

The publication of the Soil Atlas of Latin America and the Caribbean at the begin-



*Official signing ceremony of a Memorandum of Understanding between the JRC and the Cyprus Institute.*



*CELAC representatives with the JRC Director-General, Vladimír Šucha, and Commissioner Tibor Navrácsics, who is responsible for the JRC.*

ning of 2014 highlighted the dynamic scientific collaboration between the JRC and the Community of Latin America and the Caribbean States (CELAC). Joint work and knowledge sharing between the JRC and the CELAC already include fields such as water resource management, agricultural monitoring, disaster risk reduction, nanotechnologies, forestry, bioeconomy and Earth Observation applications. With the aim to further develop the collaboration, Vladimír Šucha, JRC Director-General, launched a strategic dialogue with the CELAC countries ambassadors on the occasion of a meeting held in July 2014 in Brussels. The event gathered 24 countries and allowed to make better known the JRC activities in the region, as well as identify new collaboration opportunities of mutual interest. A visit of CELAC Ambassadors and diplomats to the JRC facilities in Ispra at the end of 2014, stimulated further discussions on how to foster scientific co-operation, putting science and technology at the service of citizens.

#### **Extended co-operation with CERN**

The European Organization for Nuclear Research (CERN) and the JRC signed a Letter of Intent in July 2014 to extend joint cooperation to

data and publication management, medical applications and energy efficiency. More specifically, the two organisations have agreed to explore possibilities of collaboration in areas such as IT platforms for studying innovation and technological development based on ‘collaboration spotting’ and the European Media Monitoring (EMM – aggregation and analysis of reports from news portals worldwide in 60 languages) as well as big data. Possible co-operation also includes: medical radioisotope production; material science; energy, including renewables, transport and energy efficiency; innovative detector technologies and their applications; and education and training.

#### **Addressing chemical, biological, radiological and nuclear threats around the globe**

The JRC works alongside the Commission’s Directorate-General for International Cooperation and Development to address chemical, biological, radiological and nuclear (CBRN) risk mitigation covering 48 different partner countries in eight regions across the world. After four regional secretariats opened in 2013, one more also opened in 2014 in Abu Dhabi for the Gulf Cooperation Council countries. The JRC supports partner

countries in compiling their needs assessment through an in-house developed Needs Assessment Questionnaire (NAQ). Ten more countries have completed the NAQ in 2014 (Myanmar, the former Yugoslav Republic of Macedonia, Kenya, Gabon, Democratic Republic of the Congo, Albania, Iraq, Côte d’Ivoire, the Philippines and Uganda). This exercise serves to formulate national action plans and to develop tailored CBRN projects needed to address CBRN risks with the support and guidance of JRC experts.

#### **Pursuing interoperability of geospatial data on environment**

In May 2014, the JRC and the Open Geospatial Consortium (OGC) agreed to collaborate on understanding and resolving scientific challenges in the field of interoperability of geospatial data, services and systems. The JRC and OGC will also support the improvement and development of geospatial standards, raise awareness of open standards and their relevance to European policies and flagship initiatives such as the Digital Agenda for Europe and INSPIRE. INSPIRE envisages the creation of an EU spatial data infrastructure sharing environmental spatial information among public sector organisations with the aim to assist cross-border policy making. The JRC manages the technical co-ordination of the initiative.



#### **Read more**

**European Forum for Science and Industry:**  
<https://ec.europa.eu/jrc/en/efsi>

**JRC’s enlargement and integration action:**  
<http://europa.eu/!NW49Gk>

**CBRN Centres of Excellence:**  
<http://www.cbrn-coe.eu/Home.aspx>

# MAPPING THE EXCELLENCE OF JRC SCIENTIFIC PUBLICATIONS

The JRC has analysed its scientific publications in order to identify and map areas of excellence. This exercise was carried out during 2014 for the 2009-2013 period, when the JRC produced nearly 5000 scientific publications, of which roughly two thirds are articles. The analyses focused on revealing their scientific impact as well as the excellence of their co-authors.

## Scientific impact

This bibliometric study analyses and benchmarks the JRC's scientific impact against top scientific institutions as well as against the world average in 17 main scientific areas and 81 subdomains. Regarding scientific impact, the findings show that annually, between 40% and 50% of the

JRC publications are among the top 25% most cited, and up to 3% of them among the top 1% most cited. While the JRC's publications are often comparatively low in absolute numbers, the JRC competes with the best in the world in many scientific areas when looking at citations in size-independent metrics (see

table below). In most of the scientific areas covered, the JRC's performance is equal to, or better than, the world average. Not only this, but in many scientific areas, the JRC scores similarly to the range of the top 15 organisations (see graph overleaf) and for a few scientific areas the JRC has even better values.

Main categories of scientific areas listed in decreasing order of the number of citations they received during 2009-2013	Size-independent metrics				
	Citations per publication	Share of Cited publications	Field-weighted citation impact	Publications in the top 10% of the most-cited publications	Publications in the top 10% of the most-cited journals
Environmental Science	+++	+	++++	++++	++
Earth & Planetary Sciences	++++	++	++++	++++	+++
Physics & Astronomy	+	=	++	=	++
Agriculture & Biological Sciences	+++	+	++++	++++	++++
Engineering	++++	++	++++	++++	++++
Chemistry	=	+	=	=	++
Energy	+++	++	++++	++	+++
Material Science	++	+	++++	-	++++
Pharmacology, Toxicology & Pharmaceutics	++++	++	+++	++++	+
Biochemistry, Genetics & Molecular Biology	+	+	++	++	++
Medicine	+++	++	++++	++++	=
Computer Science	++	+	++	++++	++
Social Sciences	++++	++	++++	++++	+++
Chemical Engineering	+	+	++	+	=
Mathematics	++	+	++	++++	+++
Economics, Econometrics & Finance	+++	++	++++	++++	=
Business, Management & Accounting	++++	+++	++++	++++	+++

**Legend:**

- JRC value lower than world average value by -10 to -30%
- = JRC value equal to JRC world average value (+/- 10%)
- JRC value higher than world average value by
  - + 10-30%
  - ++ 30-70%
  - +++ 70-100%
  - ++++ 100-150%
  - +++++ >150%

Comparison of JRC publications' impact with the world average in the 17 categories of scientific areas covered. Source: JRC Excellence Mapping Vol.1, 2014.

## Scientific collaborations

This mapping exercise also provided the first elements of evidence regarding collaborations, providing answers to questions such as how co-authoring institutions rank compared to other institutions in the world and whether the JRC collaborates with the 'best' institutions. Out of the 5 000 publications published over the 2009-2013 period, 71% of them have been co-authored with more than 1 300 institutions worldwide. Out of these, around 900 are academic institutions, for which a deeper analysis was carried out. Results showed that the JRC co-authored publications with 87% of the universities ranked among the top-100 and that over one third of them are also among the top 15 in the world in terms of numbers of citations. Last but not least, the JRC has formal agreements with almost half of the universities in the top 100 rankings.

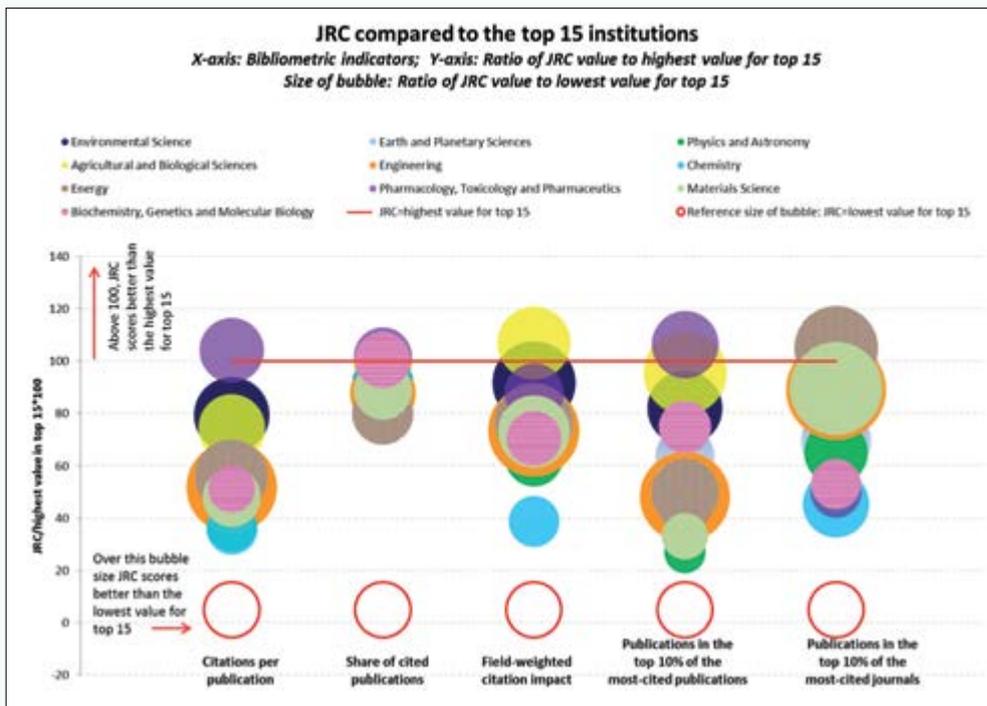
## Methodology

Data have been extracted from the largest abstract and citation database of peer-reviewed literature in the world: the Elsevier's Scopus® database and have been analysed using the SciVal® tool.

There are 27 main scientific categories that are widely used internationally and which cover more than 300 scientific areas.

The excellence mapping exercise focused on 17 main categories, where the JRC published more than one hundred publications.

This analysis allows the comparison and benchmarking of JRC scientific performance by scientific area. In order to benchmark the JRC's



Benchmarking the JRC's citation statistics for the five size-independent indicators against the lowest and highest value of the top 15 organisations in the JRC's ten main scientific areas in terms of publications.  
Source: JRC Excellence Mapping Vol.1, 2014.

scientific impact, five size-independent citations indicators were used (see table on previous page). In addition to the world's average, the JRC is also benchmarked against the top 15 organisations having the largest number of citations in a given scientific area. For the collaboration analysis, scientific publications co-authored by JRC researchers and universities ranking among the top 100 in at least one of the three most widely recognised world-wide rankings ('Times Higher Education Ranking', 'QS World University Ranking', 'Academic Ranking of World Universities') were considered.

### Thomson Reuters study

A complementary exercise was also carried out by Thomson Reuters for the JRC. It covered the 7th Framework Programme (FP7) period, from 2007 to 2013. The report provided answers to a set of questions as provided by the JRC with the objective to measure the quantity and

quality of the JRC research during the FP7. Methods included bibliometric analysis, benchmarking, topic clustering, patent analysis, identification of research fronts and social media analysis. A set of world-class peer institutions were selected to benchmark the JRC in several scientific areas. Where comparable, the results of both studies are coherent.

Read more

JRC evaluation reports:  
<https://ec.europa.eu/jrc/en/page/reference-documents>

Thomson Reuters report:  
<http://europa.eu/!Fk77RU>



# FACTS AND FIGURES

## STAFF

The total number of staff working at the JRC on 31 December 2014 was 3055. Of the total 3055, 77% worked on scientific projects, 21% carried out administrative or support activities and 2% worked in nuclear decommissioning.

Total Staff	F	M	Total
<b>Core Staff</b>			
Officials	583	1197	1780
Temporary agents	6	17	23
<b>Visiting Staff</b>			
Trainees	30	24	54
Postgraduate grantholders	26	15	41
Post-doctoral grantholders/ senior scientists	223	307	530
Contractual agents	325	260	585
Seconded national experts	9	33	42
<b>Total</b>	<b>1202</b>	<b>1853</b>	<b>3055</b>

## Equal opportunities

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

	F	M
Senior management positions	20 %	80 %
Middle management positions	18 %	82 %
Non-management administrative positions	24 %	76 %

As of 31 December 2014, women were represented in 24% administrators (AD) posts at the JRC (same percentage as in 2013), against a Commission average of 43.7%. The JRC will make a continuous effort in line with the Commission's objective to make the management ranks more reflective of gender diversity.

## Visiting staff

In addition to its core staff, the JRC proactively seeks to host researchers (grant-holders and contractual agents), senior scientists, seconded national experts and trainees, primarily from the EU Member States and associated countries. They represented more than 40% of the JRC staff in 2014.

Visiting staff bring advanced skills, knowledge and expertise to help



resolve current and future scientific challenges. In turn, they benefit from the science for policy experience, the multidisciplinary research domains and state-of-the-art facilities at the JRC.

## BUDGET

The JRC is funded by the EU's Framework Programme for research and innovation, Horizon 2020, and the Euratom research and training programme (for its nuclear work). Further income is generated by the JRC through additional work for Commission services and contract work for third parties.

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 the research and innovation framework programme activities (the current being Horizon 2020).

The table shows the breakdown of how the 2014 budget was spent (in terms of available commitment appropriations, EFTA not included). In addition, €27 million was made available to finance the programme to decommission the JRC nuclear installations, and to manage the waste activities related to the Euratom Treaty. Additional credits of €13.6 million were received from the contributions of countries associated to Horizon 2020.

Outgoing expenses (in million Euro)	2014
Staff expenses	€ 245.88
Means of execution	€ 84.49
Operational appropriations (FP)	€ 43.92
<b>Total (rounded up)</b>	<b>€ 374.29</b>

Contracts signed (in million euro)	2014
Indirect actions ( Framework Programme)	€ 7.8
Support to Commission services	€ 56.9
Third party work	€ 8.1
<b>Total</b>	<b>€72.8</b>



### JRC earned income

The cashed competitive income in 2014 amounted to €69.3 million. The table above shows the value of contracts signed in 2014. Some of the JRC's income comes from its participation in Framework Programmes 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. These activities complement the tasks outlined in the JRC's work programme and are an essential tool for acquiring and transferring expertise and know-how.

### PUBLICATIONS

As revealed by a bibliometric study, while the JRC's publications are often comparatively low in absolute numbers, they compete with the best in the world in many scientific areas when looking at citations in size-independent metrics. In most of the scientific areas covered, the JRC's performance is equal to, or better than, the world average. In 2014, the JRC published more than 1300 publications, including articles in peer reviewed journals, reports and policy documents.

JRC Publications in 2014	
Books and articles in peer reviewed journals <sup>1</sup>	689
Scientific, policy and technical reports	615
JRC contributions to policy documents	58
PhD theses	8
<b>Total</b>	<b>1370</b>

<sup>1</sup> Books, monographs with JRC editorship, 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 other periodicals.

### JRC IN THE MEDIA

JRC media coverage in 2014	
Number of press reports	2611
Number of very positive news items in top-tier media	140
Number of countries covered	78



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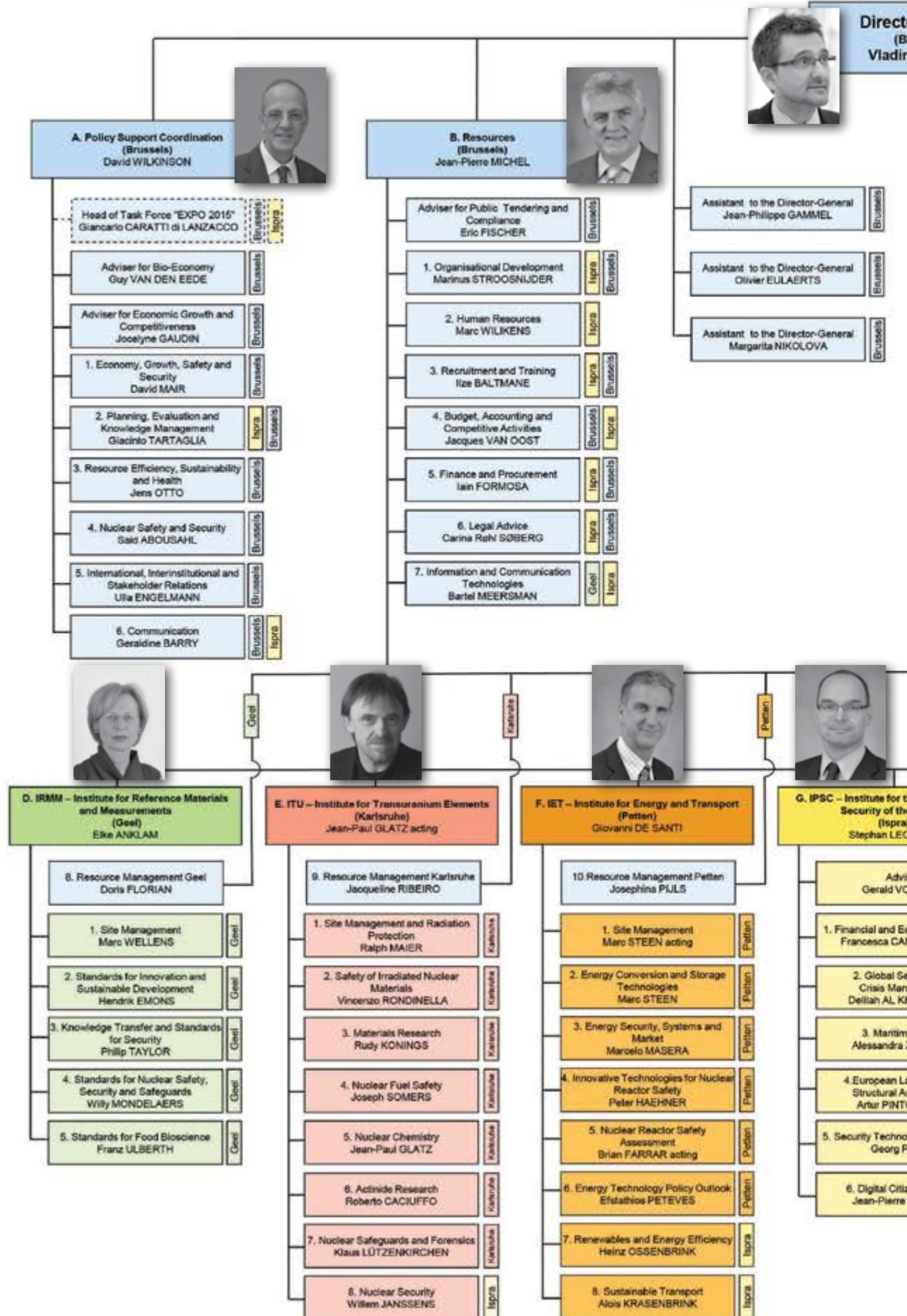
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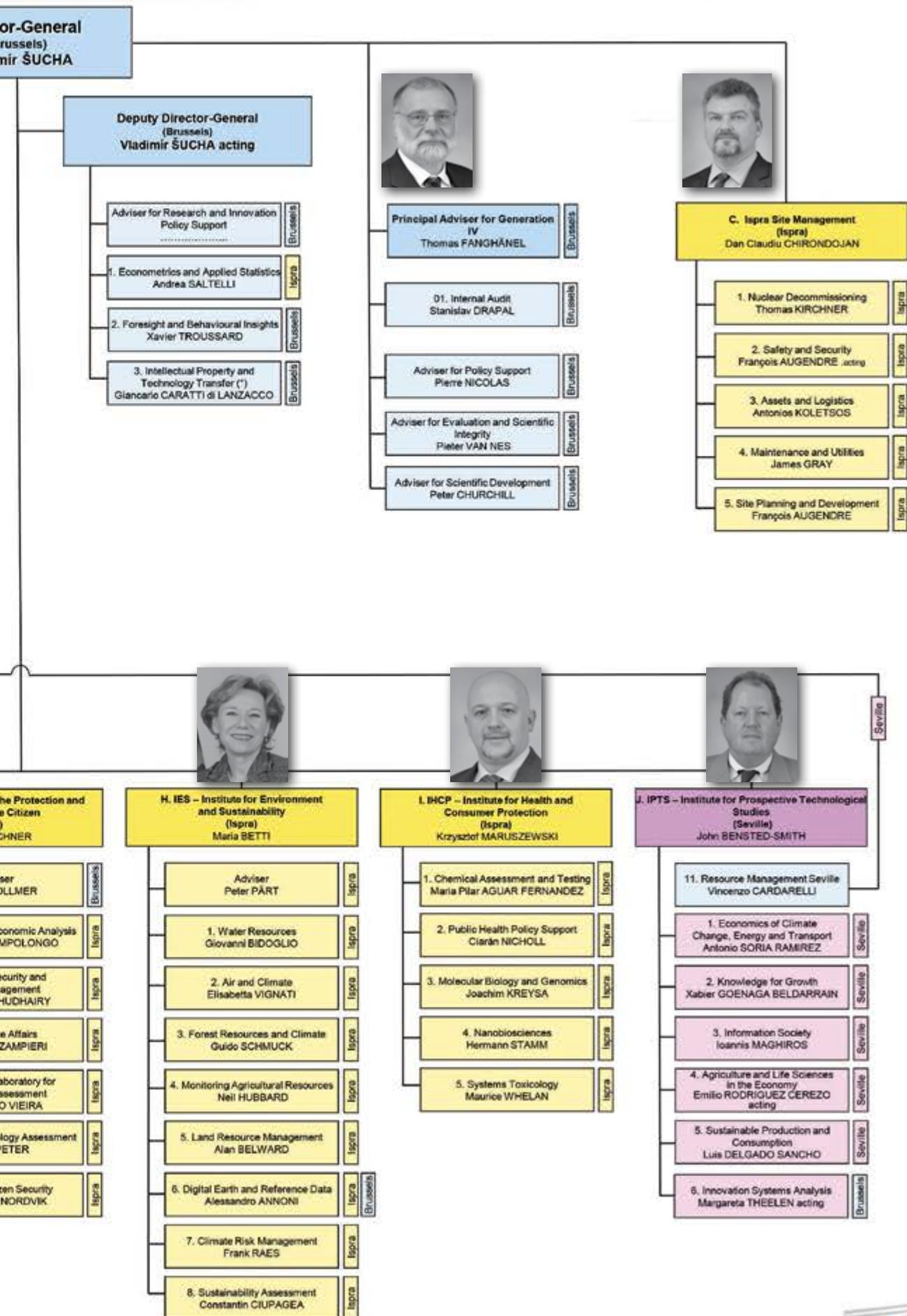
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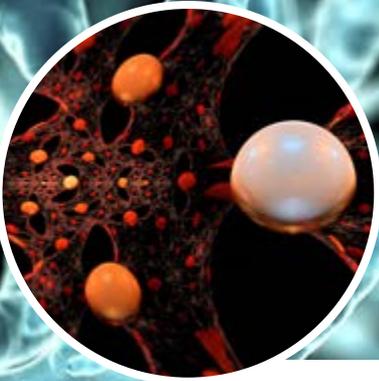
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#### Abstract

Report on the activities, accomplishments and resources related to the JRC's work carried out in 2014. An overview is given of the scientific achievements and activities.



**NANOhub** • A database and information platform hosting nano-specific information and methodologies.



**EURDEP** • The European Radiological Data Exchange Platform Public Map displays radiological monitoring data from most European countries in near real-time.



**GLOFAS** • Global Flood Awareness System coupling state-of-the-art weather forecasts with a hydrological model.

# SCIENTIFIC TOOLS & DATABASES

The range of work carried out at the JRC also includes the compilation of a large number of databases in addition to the development of software and modelling tools. These are some examples of databases and scientific tools developed or managed by the JRC.

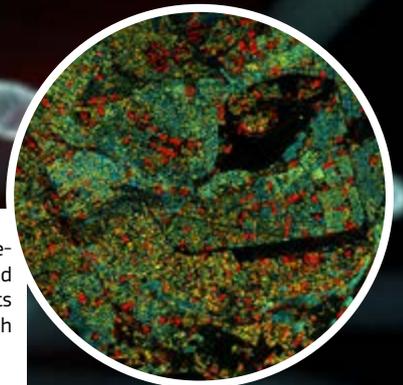
In 2014, the JRC launched the “Science Hub”, a new communication portal giving access to the latest JRC news, reports, and publications. The Hub also gives access to all the scientific tools and databases developed by the JRC. It is a new window for stakeholders to know more about the work of the JRC science areas, its research topics and cross cutting activities. It also shows the different laboratories, networks and bureaus of the JRC.



<https://ec.europa.eu/jrc>



EU\_ScienceHub



**GHSL** • Global Human Settlement Layer maps, analyses and monitors human settlements and urbanisations through remotely sensed imagery.

## JRC Mission

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.

**Serving society**  
**Stimulating innovation**  
**Supporting legislation**

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