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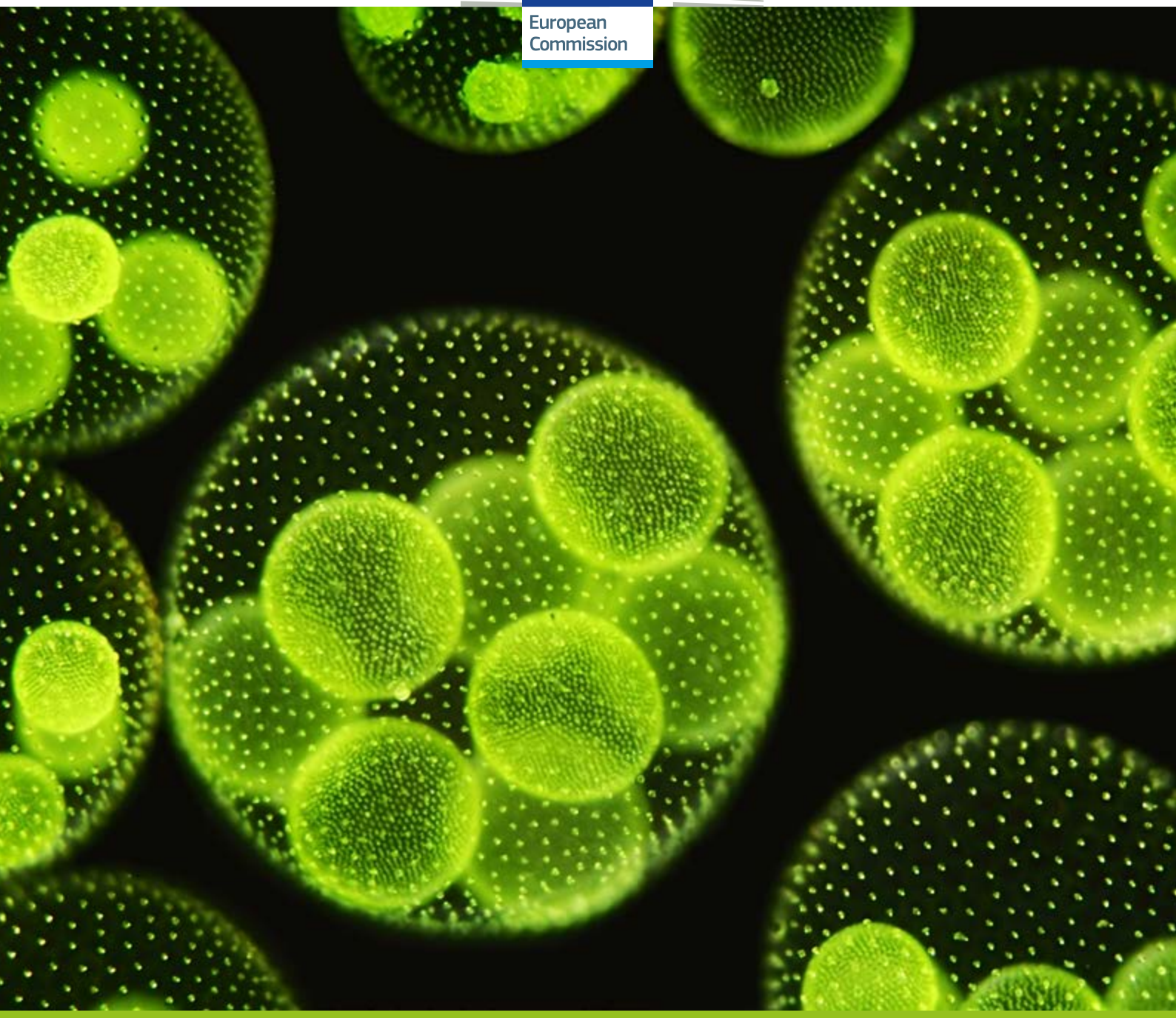
European Commission



Annual Report 2015

The European Commission's science and knowledge service

Report EUR 27501 EN

Joint Research Centre

EU Pavilion at Expo Milano 2015

Facts and figures

The Universal Exhibition Expo Milano 2015 focused on the theme of global food and nutrition challenges. It created an opportunity for the EU to showcase its work in different food related areas and help raise awareness of this important global issue. The JRC played a major role as the coordinator of the EU institutions participation at Expo.

Further information: European Union at Expo 2015 facsheet europa.eu/!jB68rJ

Over 3 000 business to business meetings

230 events related to the scientific programme, over 30 000 experts involved

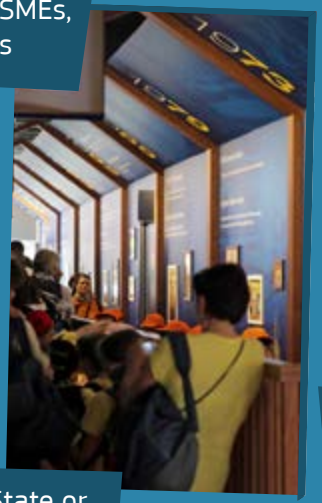
13 Commissioners and 85 MEPs

Sylvia's Lab
at the JRC's Ispra site

More than 5 000 visitors

EU Pavilion

Over 1 800 participating SMEs, clusters and organisations



40 Heads of State or Ministers

650 000 visitors

800 volunteers from 40 Countries

250 000 people reached via social media

europa.eu/expo2015

#EUExpo2015

The EU at Expo Milano 2015

Focus on food safety and security

The Universal Exhibition Expo Milano 2015 focused on the theme of global food and nutrition challenges. It created an opportunity for the EU to showcase its work in different food related areas and helped raise awareness of this important global issue. The JRC played a major role as coordinator of the EU institutions participation at Expo. The EU's dedicated scientific programme at Expo resulted in over 230 events, gathering over 30 000 experts. It finished with an international conference, during which the European Commission welcomed new recommendations on how European research and innovation can help improve food and nutrition security around the world.

Scientific Programme at Expo Milan
Steering Committee recommendations

On the occasion of Expo, the EU prompted a scientific debate on how to feed the planet. To this end, it set up the Expo 2015 EU Scientific Steering Committee, composed of 11 renowned experts and chaired by Franz Fischler. After a first discussion paper on the role of research in global food and nutrition security was published, Commissioner Navracsics launched an online consultation on how science and innovation can help the EU ensure safe, nutritious, sufficient and sustainable food globally. On 15 October, the resulting recommendations were presented at Expo. The key recommendation called on the EU to establish an international panel of experts on food and nutrition security to strengthen research efforts on this topic. Other findings included the need to raise greater awareness of food security issues among policy makers and consumers/citizens; improve collaboration between farmers, research institutions, governments and industry and stimulate innovation across the food chain - from farm to plate - through a range of funding instruments, including at EU level. The recommendations reflect input collected through the online consultation of more than 300 universities and research institutes as well as six months of work and over 200 workshops organised as part of the EU scientific programme at EXPO 2015. This advice will ensure a strong legacy from the European Commission's presence at EXPO.

Further information

New ways of providing knowledge to tackle food and nutrition security: what should the EU do?
europa.eu/!fV46Gc

European Commission launches scientific debate on how to feed the planet
europa.eu/!uF47tj

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MESSAGE BY TIBOR NAVRACSICS

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

The year 2015 was a challenging one for the European Commission – with the European sovereign debt and refugee crises just two of the major issues we had to tackle. Yet, we stayed determined to act and made ambitious proposals, notably on the Energy Union, the Digital Single Market, a Capital Markets Union and fair and efficient corporate taxation. We also presented a roadmap for deepening our Economic and Monetary Union. On the global stage, we contributed to both the United Nations Sustainable Development Goals and the Climate Change Agreement reached in Paris.

By the end of 2015, we had put the main building blocks of the ten Commission priorities in place. And our new ways of working, aimed at breaking silos and increasing transparency, have started to benefit the European Union. All these actions provide a strong foundation for the Commission to deliver in the areas that matter to citizens and where the EU can make a difference.

The Joint Research Centre has contributed to this process by providing strong scientific and technical support to the Commission's priorities. Across policy areas, the JRC's research inputs – studies, data, statistics and tools – have provided valuable insights resulting in sound evidence-based policy making. Its multi-disciplinary approach has shown how delivering integrated science advice is increasingly relevant for better regulation and the implementation of EU policies.

The European Smart Specialisation Platform on Energy and the Disaster Risk Management Knowledge Centre, both launched in 2015, are just two examples of this support. The Smart Specialisation Platform supports European regions and Member States in using Cohesion Policy funding more effectively. It also helps regions to deploy innovative low-carbon technologies. The Disaster Risk Management Knowledge Centre offers EU countries technical and scientific advice for their risk assessment methodologies. It was launched during a conference focused on the role of science in building a resilient, stable, competitive and prosperous Europe, jointly organised by the JRC and the European Political Strategy Centre.

Due to its high level of scientific expertise, the JRC is ideally placed to ensure that policy-makers have the best available evidence at their disposal when making crucial decisions that affect people's lives. The JRC hosts some of the most advanced research facilities in the world, considered as reference laboratories not only at European level, but in some areas also globally. 2015 saw the opening of the European Interoperability Laboratory for Electric Vehicles and Smart Grids – an important step towards the full deployment of electric transport, and paving the way for a more energy efficient global transport system.

The 'Science meets Parliament' event jointly organised by the JRC and the European Parliament's Science and Technology Options Assessment (STOA) Panel, and the JRC's annual lecture on 'Transitions in global land and water resilience' are two other examples of how the JRC is bringing together scientists, citizens and policy-makers to break down barriers and build mutual trust.

As the coordinator of the EU's participation in Expo Milano 2015, the JRC highlighted the importance of science in EU policy-making designed to enhance food security, improve the quality of human life and boost business innovation related to food and nutrition.

Through the interactive EU pavilion, the JRC contributed to a dialogue with citizens and engaged in discussions with over 30 000 scientific experts and policy-makers under the EU scientific programme for Expo.

The JRC's activities under the seventh framework programme were officially evaluated in 2015. The panel of experts confirmed that the JRC has evolved in parallel with the growth and needs of the EU from its original nuclear research mission to the objective of providing broad policy support today. I am delighted to note that the JRC's management has already acted upon the recommendations and is in the process of establishing a long-term strategy.

This Annual Report contains information on all these and other examples of the JRC's achievements in 2015. I look forward to further developing this interaction between science and policy in 2016.

I would like to thank everyone working in the JRC for their dedication and excellent work.

OBSERVATIONS FROM THE BOARD OF GOVERNORS

This year´s Annual Report shows how the JRC streamlined and adapted its activities according to the mission of the new Commission, in particular the Agenda for Jobs, Growth, Fairness and Democratic Change. The JRC has ambitious projects in all of the priority areas. As in previous years, the Board of Governors accompanied this evolution by discussing strategic issues and giving advice for the further development of the JRC. In addition to three plenary meetings, the Board dealt with two complex issues in more detail through ad hoc working groups.

Based on the report of an ad hoc working group, the Board gave a favorable opinion on the JRC's 2016-2017 work programme. The Board welcomed the closer links with other Commission services and the proactive approach to explore new collaborative working methods. The new knowledge and competence centres are good examples of how the JRC can contribute to overcoming silo mentality and to improving the quality of regulatory measures and other policy actions. Taking into account the expertise and strong capabilities of the JRC in the fields of disaster risk management and regional smart specialisation, the Board is confident that the two pilot knowledge centres will be a real step to better support policy making by providing relevant scientific evidence.

The Ex-post Evaluation of the JRC under the Seventh Framework Programme was finished in 2015. The Board had the opportunity to discuss the main results of the evaluation panel with its chairman, Prof. Patrick Cunningham, at the June meeting. At the November meeting the Board discussed the findings and recommendations of the independent expert panel in more detail. It noted with satisfaction the general positive assessment of the work of the JRC in the period 2007-2013. The strong recommendation of the panel - the establishment of a long term strategy before the mid-term evaluation of the Horizon 2020 Framework Programme in 2017 - is congruent with the view of the Board.

The Commission´s emphasis on knowledge management and the establishment of an EU Scientific Advice Mechanism (SAM) were further driving forces for reviewing the long-term strategy of the JRC. Director-General Vladimír Šucha launched a comprehensive in-house participatory process to develop a new long-term strategy for the coming 15 years. At his request, the Board set up an ad hoc group to coordinate the process. It is expected that the strategy will be implemented in the first half of 2016. Some elements of this strategy, such as the assessment framework for the identification of priorities, have already been tested successfully for the 2016-2017 work programme.

A strong relationship between the JRC and the Member States is still a high priority for the Board. In 2015 we saw many events across Europe where DG JRC played an important and helpful role. Whether through participation in macro-regional cooperation or in smart regional specialisation, the JRC has always contributed considerably to the success of these policies. One outstanding activity is worth mentioning: the coordination of EU participation at Expo 2015 in Milan. When the Board met in June they paid a visit to the European Union Pavilion at the Expo. The presentation of the JRC's Expo-related activities gave an impressive overview of how deeply the JRC is involved in the complex and diverse EU policies concerning food and feed production, food security, land use, health and many other current issues.

The Board endorses the present Annual Report and expresses its support and gratitude for the excellent work of the JRC management and staff.

107th meeting of the JRC Board of Governors, held in Petten (the Netherlands) on 19-20 November 2015.

JOBS, GROWTH AND INVESTMENT

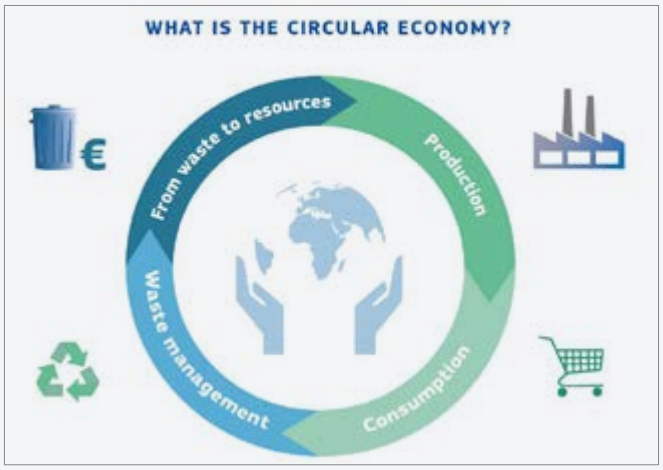
Strengthening Europe's competitiveness and stimulating investment to create more jobs is a top priority for the European Commission. Sustainable growth requires smart measures to make the best use of the available public funds to boost private investment in the real economy. In order to succeed, the Commission is focusing on improving the investment environment and strengthening fund absorption. New, sustainable and job-creating projects that will help restore Europe's competitiveness are being identified and promoted.

During 2015, in support of this endeavour, the JRC continued its work on the circular economy and carried out a series of research activities on aspects of economic policy, regional competitiveness and employability criteria. The JRC also explored the link between exports and jobs, analysed the impact of investments at country and local level, and looked at healthcare as a precondition for a productive and active population.

Supporting a circular economy

In response to some of today's key challenges, the aim of circular economy strategies is to extend the value of products and resources, whilst minimising waste generation. On 2 December 2015, the Commission published an ambitious programme in this area.

The JRC is supporting these efforts throughout the product value chain, from production to consumption, repair, remanufacturing, waste management and the use of secondary raw materials. It has, for instance, developed methods like the Product Environmental Footprint and the Resource Efficiency Assessment of Products to evaluate the environmental performance of products, goods and services. The JRC's European Platform on Life Cycle Assessment (EPLCA) provides information on the use of energy, raw materials, and the generation of emissions in production and consumption processes. In addition, the JRC has developed guidelines for a more sustainable waste management system, created indicators to monitor the environmental impact of waste management in cities, and analysed chemicals in products in order to develop toxicity-impact categories in view of facilitating recycling and the use of secondary materials. It also supports the implementation of the Ecodesign and Ecolabel initiatives.



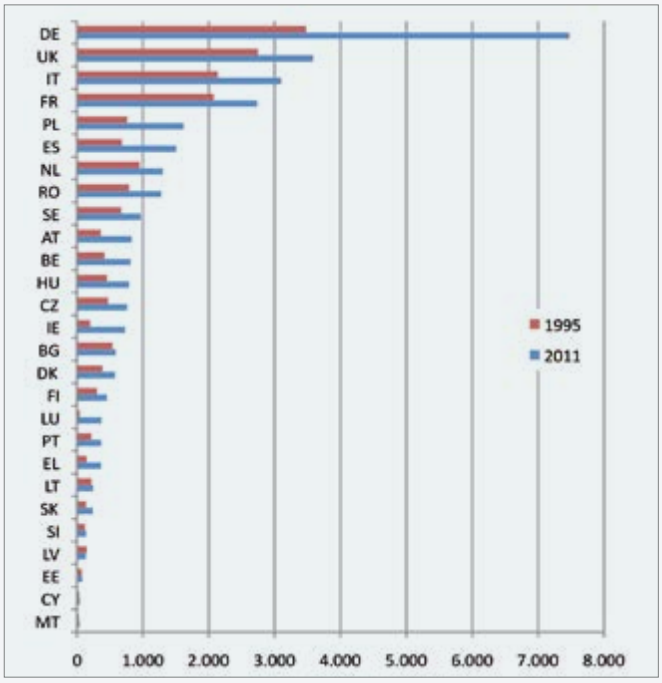
The JRC's work on food waste, raw materials and bio-based products is linked to the priority areas identified in the circular economy package as issues that require targeted action. Furthermore, the JRC provides monitoring tools, such as the Raw Materials Information System and the Bioeconomy Observatory. These aim to provide information on resources and consumption patterns in order to identify opportunities for recovering and saving materials and to find solutions to reduce the excessive waste of resources.

EU exports matter for jobs and income back home

The JRC, together with the Commission's Directorate-General for Trade, analysed the complex interactions between trade activities, the job markets and income for all EU Member States. The findings revealed that EU exports support more than 31 million jobs in the EU and almost 20 million jobs outside the Union. EU-based companies export goods and services all around the world. These exports generate jobs and income not only in the exporting countries but elsewhere, too. For instance, car makers export around the world, and many car parts are produced in other countries, supporting and generating jobs and value in those economies. EU exports are becoming increasingly important for supporting jobs in Europe and, on average, export-related jobs are better paid than the jobs in the rest of the economy.

Smart specialisation for increased competitiveness

The JRC-managed Smart Specialisation Platform (S3P) helps EU countries and regions to develop, implement and review their research and innovation strategies (RIS3). In 2015, a specific initiative on energy was launched (see 'A resilient Energy Union' section). The platform has been arranging a number of events related to strategy development, different steps of the Smart Specialisation process (e.g. monitoring, evaluation, and Entrepreneurial Discovery Process (EDP), sectorial issues such as smart specialisation in blue growth, the role of specific actors, and the role of research organisations in RIS3). The S3P has also supported interregional collaboration in macroregions notably the Danube and the Baltic Sea Region. Similarly, it has done this through direct



EU employment supported by extra-EU exports by exporting Member State, 1995 and 2011 (jobs expressed in thousands).

promotion and interaction with Interreg, a series of five programmes to stimulate cooperation between regions in the EU, and with inter regional initiatives like the Vanguard Initiative. In addition to these hands-on activities, there have been a number of publications on related topics e.g. Research and Technology Organisations and Smart Specialisation, and Monitoring Mechanisms for Smart Specialisation Strategies. In 2015, the data for Eye@RIS3 (an online database to help strategy development) was completed. Through Eye@RIS3, regions can introduce their priorities directly into the database and thus produce a realistic map of research and innovation strategy development. The resulting overview of the regions' priorities will enable others to position themselves, to find their unique niches and to seek out potential partners for collaboration. A first analysis of the data shows that the most common RIS3 priority areas in the EU are energy, health, information and communication technologies, food, advanced materials, services, tourism, sustainable innovation, advanced manufacturing systems, and the cultural and creative industries. The analysis also shows that few regions have developed similar priority combinations, but there are groupings around a number of popular categories connected to key EU objectives. While most regions have, to date, defined a wide range of smart specialisation priorities, many of these are increasingly focusing on key enabling technologies (KETs), rendering the new database also useful for implementing the EU's KETs strategy and fostering transregional cooperation.
As a pilot action, the JRC and the Directorate-General for Regional and Urban Policy (DG REGIO) supported Greek authorities in order to help entrepreneurs and authorities find out in which areas they should prioritise and further specialise if they wish to strengthen their competitive advantage. The project, carried out over a period of 15 months, put into practice concepts developed via the work of the JRC's Smart Specialisation Platform, developing a highly interactive 'hands-on' approach. Its core aim has been to enhance collaboration and engagement between the key stakeholders of the region's research and innovation system, which was a precondition to identify and exploit the region's potential for innovation based economic growth. Project impacts include building trust across communities of stakeholders, engagement of a wider number of actors in the policy making process, the implementation of a genuine 'Entrepreneurial Discovery Process' (EDP), additional support to internationalisation, and the actual implementation of those changes through concrete actions, such as calls for proposals and project selection criteria, incorporating the elements of smart specialisation and the outcome of the EDP.

Tackling macroeconomic imbalances

A key factor in assessing the sustainability of a country's external position is its capacity to finance the purchase of external goods and services through its exports. This is why an increasing amount of attention and effort is being given to the definition of suitable indicators of external competitiveness which may be used to identify potential imbalances or unsustainable long-term trends. The external position of a Member State may be affected by several factors, stemming from both the demand and the supply of the economy.

Read more

JRC work on the green and circular economy:
europa.eu/!Mj98ud

EU Exports to the world - Effects on employment and income:
europa.eu/!Un47Cp

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

The Eye@RIS3 tool:
europa.eu/!Mh64DD

Mapping innovation priorities and specialisation patterns in Europe:
europa.eu/!cm78CJ

The specialisation of EU regions in fast growing and key enabling technologies:
europa.eu/!DK36MT

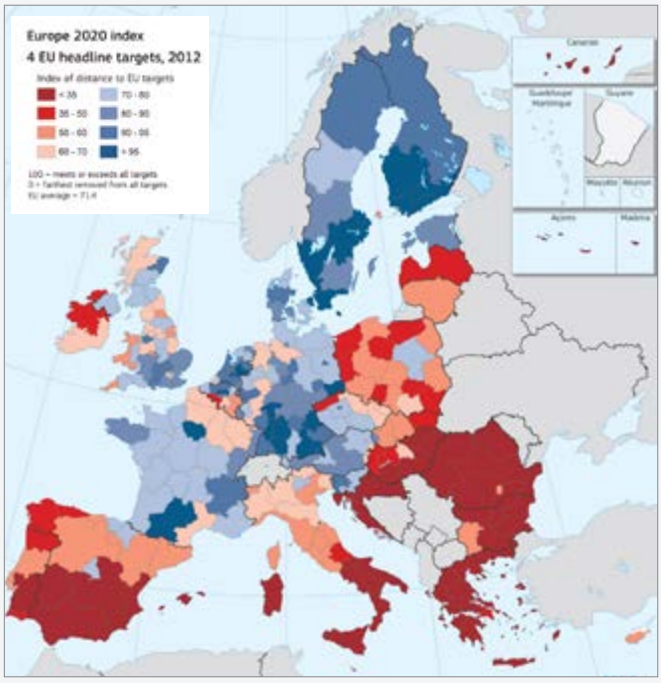
Demand being typically associated with import growth and the latter with export performance. The JRC has provided analysis on the supply side of the economy, and specifically on the ability of Member States to compete in export markets through the development of better products. In this way, it has contributed to the 'country-specific recommendations' (CSRs) for several Member States by providing the Directorate-General for Economic and Financial Affairs (DG ECFIN) with updated indices of external competitiveness.

Country-specific recommendations – assessing the impacts of tax reforms

The JRC's fiscal and modelling experts worked closely with the DG ECFIN to assess the fiscal and equity impact of tax and structural reforms undertaken by Member States. This work was instrumental in the preparation of the country-specific recommendations in the context of the European Semester, the EU's annual cycle of economic policy coordination. Among other things, the JRC looked into work-related tax incentives and their impact on individuals' disposition to work. It also applied its modelling capacities to assess recent reforms adopted by the Member States. The Commission reviewed their economic policies and measures to boost jobs and growth, focusing on three mutually reinforcing pillars: boosting investment, implementing structural reforms, and pursuing fiscal responsibility. As regards the latter, the effort is put on striking a balance between the short-term stabilisation and long-term sustainability of public finances. In particular, Member States with high deficits or debt levels need to make further efforts to fix their budgets and to make their tax systems more growth and job-friendly. The JRC is contributing to this endeavour by providing a comprehensive picture of the wide range of impacts that tax policy reforms can have on countries such as France, Germany, Romania, Lithuania and Estonia. It shows, for instance, that work-related tax incentives can have a significant effect on how much certain individuals decide to work. At least a quarter of the extra tax revenue raised by lowering work-related tax incentives tends to get lost as individuals react by working less or withdrawing altogether. The successful implementation of the 2015 country-specific recommendations will be key to supporting Europe's return to jobs and sustainable growth.

Impact assessment of EU investments and territorial policies

JRC models and tools are widely used by policy-makers to assess the impact of place-based investments and policy development. The Land Use-based Integrated Sustainable Assessment (LUISA) modelling platform enables the analysis of the evolution of European territories at different levels, from macro-regions and countries to regions and urban areas. The platform is based on a number of indicators that can provide projections up to the year 2050 and can measure the impact of economic performance (e.g. the provision of production factors such as employment, investments, energy, or the manufacturing of products and services such as food, fuels or consumer goods).



Progress of EU countries, regions and cities in respect of the 2020 targets in employment, education, poverty and innovation (source: the Europe 2020 index).

Besides socio-economic indicators the LUISA platform also includes a set of indicators which assess the impact on biodiversity and ecosystem services. Examples are crop pollination by insects, nature-based recreation in forests and mountains, or the regulation of urban air quality by urban trees and parks. Understanding better how job creation, economic growth and human well-being rely on natural capital helps decide regional investments in green infrastructure and sustainable solutions in cities (e.g. urban renewal and industrial reconversion).

In 2015, the LUISA platform contributed to establishing a knowledge base to assess the impact of energy-efficiency investments in buildings in European cities. Further JRC models, like the Regional Holistic Model (RHOMOLO), which is a macroeconomic model implemented at the regional and sectoral level for the whole EU, are used extensively to assess the impact of cohesion policy and the impact of investments made by the European Investment Bank (EIB) on growth and employment.

The JRC and the Directorate-General for Regional Policy (DG REGIO) have also developed the Europe 2020 Index, which measures the progress of EU countries, regions and cities with respect to the 2020 targets for employment, education, poverty, innovation, climate change and energy sustainability. The urban and regional dimensions reveal differences, with capital regions usually outperforming others, but also gaps among regions within a single Member State. These gaps suggest that some policies should be adapted to the particular situation of a city or a region. A new concept could be developed to turn cohesion policy into a performance-based funding scheme, with the eligibility of regions being based on their GDP and the funding determined by their performance in relation to Europe 2020 targets.

Analysing how education and skills contribute to employability

Skills are instrumental in improving individuals' employment opportunities and hence increasing countries' productivity and economic growth while ensuring social cohesion. The JRC is working closely with the Commission's Directorate-General for Education and Culture to help policy-makers and Member States to enhance the quality of education and training systems.

In 2015, JRC experts looked at how education, training, and cognitive and behavioural factors can contribute to employability. Based on surveys, the scientists investigated the influence of numeracy and literacy skills in employment, as well as the level of formal education. As expected, a higher level of skills and formal education correlates significantly with a higher market success across the EU.

Using data from a survey on education in 25 Member States, the JRC also looked into the relationship between knowledge of languages and the likelihood of finding a job. According to the study, adults who know one or more foreign languages are more likely to be employed than those who do not know any foreign language. The study proved this relationship to be true even for basic competences. In the EU-25, 34% of the population does not know a foreign language.

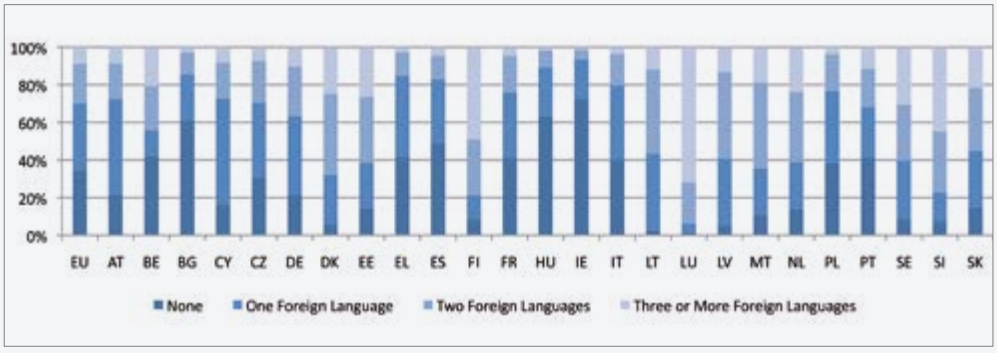
To help design policies for better competitiveness, labour productivity and job quality in the transport sector, the JRC also carried out an analysis of employability in this sector for the Commission's Directorate-General for Transport and Mobility (DG MOVE). The results show that mobile and technical staff with medium to high skills are expected to be in greater demand than staff with administrative and low skills. The main challenge will be to help staff with an existing specialisation that does not match the new requirements to adapt.

Better healthcare standards

Efficient healthcare and diagnosis help individuals to have the best chance of leading a healthy and productive life. The JRC has been active in analysing standards in health services for cancer and producing reference materials for diagnostics.

A survey on the use of ISO standards in breast cancer care services in Europe found that, in 76% of the countries examined, as little as one healthcare organisation could be accredited or holds an accredited certificate of conformity to the respective standard. This reflects the need to consider existing practices when developing a European quality assurance scheme for breast cancer services.

In collaboration with other research institutes, the JRC has developed and certified a set of six plasmid certified reference materials (CRMs) for the standardisation of chronic myeloid leukaemia treatment. JRC scientists have also characterised and certified the mass concentration of the cancer marker beta-2-microglobulin as an additional parameter in the certified reference material for proteins in human serum. In the field of autoimmune diseases, the first serum protein certified reference material important for diagnosis and monitoring conditions, such as microscopic polyangiitis and Churg-Strauss syndrome, was also released in 2015.



Number of foreign languages known in EU Member States (%). The data is based on the 2011 Adult Education Survey (AES).

Read more

Country-specific recommendations 2015:
europa.eu/!mn97xN

Land-Use-based Integrated Sustainability Assessment Modelling (LUISA):
ec.europa.eu/jrc/en/luisa

Regional Holistic Model RHOMOLO:
ec.europa.eu/jrc/en/rhomolo

The Europe 2020 Index:
europa.eu/!wy97Wg

Skills beyond education: an analysis of cognitive skill evolution and its implications for employment chances:
europa.eu/!Jb46bT

Languages and employability:
europa.eu/!xv64Kt

Report of a survey on accreditation and conformity assessment in the field of breast cancer in Europe:
europa.eu/!Pw94Gu

A RESILIENT ENERGY UNION

The EU needs to pool its resources and combine its infrastructures to make a real Energy Union, which aims to further integrate the internal energy market, while diminishing dependence on fuel and gas imports. Renewable energies and energy efficiency are also priorities for the Commission, and the JRC's work fully supports the efforts being made to make energy more secure, affordable and sustainable.

In 2015, the JRC inaugurated a new state-of-the-art laboratory dedicated to electric vehicles and smart grid interoperability. This lab will cooperate with its US partner to ensure solutions are harmonised on both sides of the Atlantic. A smart specialisation platform on energy is being developed to support EU regions in fostering innovative low-carbon solutions. JRC work has also focused on the security of gas supply, photovoltaics and the urban application of smart grids.

New lab for the interoperability of electric vehicles and smart grids

Interoperability within and between electric vehicles and the smart grid is a key issue for the deployment and full exploitation of transport electrification and modernisation of the electricity system. Under the auspices of the Transatlantic Economic Council, the JRC is working with the US Department of Energy to find harmonised solutions on both sides of the Atlantic.
A new European Interoperability Centre was inaugurated in 2015. Located at the JRC's site in Ispra (Italy), it will cooperate with a twin facility at the Argonne National Laboratory in the US. The European centre combines four state-of-the-art laboratories focusing on the energy efficiency of electric and hybrid vehicles, their interoperability with smart grids, electromagnetic compatibility, and battery testing (the latter is located in Petten, the Netherlands). It will enable the testing of system architectures, technologies and communication protocols. The resulting harmonised standards and test procedures should minimise trade and technical barriers both for the EU and the US, while promoting innovation.

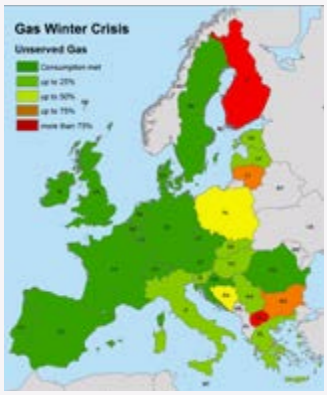
Electric and hybrid vehicles testing at JRC's vehicle emissions laboratory (VELA 8).

Smart specialisation to help EU regions develop low-carbon solutions

The European Smart Specialisation Platform on Energy, set up by the JRC, will support regions and Member States in using Cohesion Policy funding more effectively to promote sustainable, secure and affordable energy. The platform will help regions to share their expertise on energy investments and particularly on the deployment of innovative low-carbon technologies. Based on cooperation between the Directorate-General for Energy (DG ENER), Regional and Urban Policy (DG REGIO) and the JRC, the platform aims to boost economic growth in the regions by facilitating the coordination, rationalisation and implementation of the regional strategies in a collaborative setting. By supporting the optimal use of Cohesion Policy funds for sustainable energy projects, the platform will directly contribute to the European Energy Union Strategy. It also aims to better align innovation activities in the field of energy at national, regional and local level with a view to setting up a joint strategic agenda on energy priorities.

Strengthening the security of energy supply

Energy security is high on the EU political agenda and constitutes one of the five dimensions of the Energy Union. Its aim is to secure energy supply for households, transport and industry in the required form and at affordable prices, and to cope with shortages and disruptions. The JRC is using its scientific competence to help EU countries to strengthen their energy security by providing guidance and advice in implementing the relevant legislation and supporting standardisation.
The JRC was heavily involved in the stress tests concerning gas supply that were carried out in 2014, and contributed to check whether 38 European countries (EU Member States and Energy Community Contracting Parties) were able to cope with disruptions to gas supply from Russia. It has also been conducting for several years (2011 -2015) a critical review of Member States' risk assessments, preventive action plans and emergency plans regarding gas supply in support of the Directorate-General for Energy (DG ENER). On the basis of this work, the JRC has proposed to improve the way in which the ability of a given national gas infrastructure to satisfy gas demand in the case of supply disruption is calculated. The new model-based standard will take into account the physics of the gas network, and not only the basic supply and demand parameters. The JRC also proposed templates for developing risk assessments and plans at national and regional level.
As regards electricity supply, the JRC has carried out national and regional analysis, especially of the systems in Cyprus and the Baltic States. In light of the foreseen policy initiative on the security of electricity supply, the JRC has prepared infrastructure and market modelling approaches to be employed in risk and adequacy assessments. JRC research and results have fed into the on-going revision process for sectorial legislation, such as the Regulation 994/2010 on



Unserved gas levels (% of demand) in case of a complete interruption of gas flows coming from Russia (simulation for winter 2014-2015).

Security of Gas Supply and the Communication proposing a strategy on new LNG and gas storage. The JRC has also supported the evaluation of gas and electricity Projects of Common Interest (PCIs) using a detailed techno-economic methodology. These projects are crucial for guaranteeing market integration across the Member States, the best use of renewable sources, and the security of supply. Last but not least, the JRC has supported Ukraine in the area of energy security by contributing to the development of its Winter (2015 - 2016) Energy Action Plan and the Transition Plan for Ukrainian Energy independence.

Smart grids in Europe: outlook and urban application

Smart grid laboratories offer research infrastructure for technology and solution testing and development, which is necessary before the large-scale roll-out of new technologies. They are an essential enabler for the modernisation of the European grid. A new JRC report identifies trends and gaps in smart grid research and innovation.

According to the report, a smart grid laboratory needs on average an initial investment of around EUR 1 million to set up the facilities, with large projects requiring up to EUR 30 million. They mainly serve industrial customers, followed by transmission system operators, academia and governments.

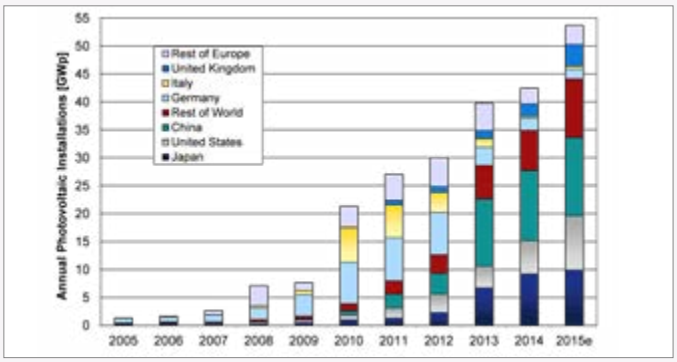
JRC scientists are also investigating whether smart grid technologies can be profitably scaled up to large cities. To this end and for the first time, the JRC – in collaboration with Rome's electricity distribution company – applied its cost-benefit analysis to a full-scale smart grid urban project. Conclusions showed a positive outlook, both from the private investors' and the societal perspective. The JRC methodology proved to be able to assess the financial and economic viability of smart grid projects and to help distribution system operators make investment decisions.

PV trends and improved measurements

Solar photovoltaic (PV) energy is the third most important renewable energy source in terms of globally installed capacity, after hydro and wind power. The rapidly expanding markets in China, Japan and the USA have more than compensated for a significant market contraction in Europe, which fell from a record 18.5 GWp in 2011 to less than 7 GWp in 2014 – a similar level is expected in 2015. However, Europe remains a leading region in the research and development of photovoltaic technologies.

The JRC organised a round-table debate with EU level and national authorities, as well as industrial and financial stakeholders, to discuss possible ways to support the recovery of the European photovoltaic industry and to retain Europe's prominent place in PV technology research. JRC studies have also highlighted the wide range of deployment conditions and market share across the EU. These issues must also be addressed if Europe is to achieve its long-term energy transition goals.

JRC scientists also demonstrated that the uncertainty in measuring power generation from a photovoltaic cell can be more than halved, thus bringing an economic benefit to manufacturers and investors alike. Photovoltaic solar panels are traded on the basis of their maximum power output. Manufacturers include a margin on this value to allow for small variations in manufacturing and measurement. The possibility to tighten this margin (typically a few per cent) brings economic benefits.



Annual photovoltaic installations from 2005 to 2015 (data sources: Solar-Power Europe, Eurobserver and JRC analysis).

Read more

Inauguration of the European Interoperability Centre for Electric Vehicles and Smart Grids:
europa.eu/!kd49FY

European Smart Specialisation Platform on Energy:
europa.eu/!bV73Nr

Probabilistic modelling of security of supply in gas networks and evaluation of new infrastructure:
sciencedirect.com/science/article/pii/S0951832015002471

Improvements in the EU gas transmission network between 2009 and 2014. Grid developments and simulation assessment to test the increased ability to cope with gas crises:
europa.eu/!WP46HP

Smart Grids Laboratories Inventory 2015:
europa.eu/!dn94yy

A Smart Grid for the city of Rome:
europa.eu/!qw84Kj

PV Status Report 2014:
europa.eu/!fd87Bc

Roundtable event 'Scientific Support to Europe's Photovoltaic Manufacturing Industry':
europa.eu/!xG36DP

Reduction of uncertainties for photovoltaic reference cells:
iopscience.iop.org/article/10.1088/0026-1394/52/5/646

FORWARD-LOOKING CLIMATE CHANGE POLICY

Climate change was a key issue for the European Union in 2015, when the EU played a key role in brokering the historic agreement in Paris, where 195 countries adopted the first ever universal, legally binding global climate deal. The EU is at the forefront of the fight against climate change and has established itself as a key player in the negotiations under the United Nations Framework Convention on Climate Change (UNFCCC).

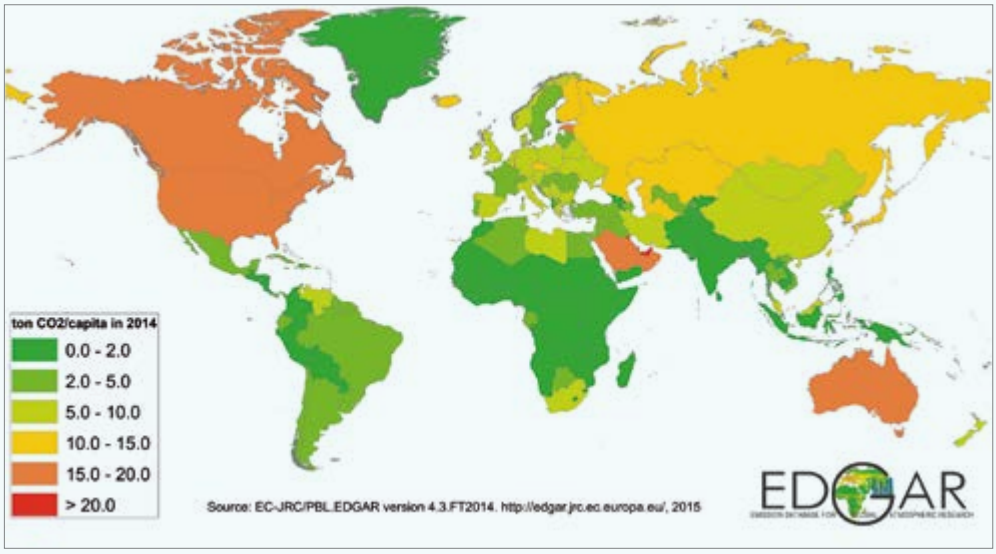
The work carried out by the JRC has been instrumental in delivering scientific evidence and technical assistance to EU policy-making. JRC studies have provided, among others, new data on global emissions and sources of urban pollution, projections of future emissions and their impact, and guidance on how to report on greenhouse gas (GHG) emissions from land use, land-use change and forestry.

Shaping EU climate policy

The EU's climate action relies on solid scientific evidence to inform its decisions. The JRC study: 'Global energy and climate outlook: Road to Paris' was used to prepare the EU's vision for a new international agreement, including its Intended Nationally Determined Contribution (INDC). The JRC estimated the consequences for the economy and the climate of a potential international agreement at COP21 in Paris. The authors concluded that global efforts to put economies on track for low-emission development, along with the integration of climate action into economic policy, can simultaneously deliver on climate goals and improved energy security and efficiency, without significantly hampering economic growth.

Global growth in CO_2 emissions almost stalled in 2014

After a decade of rapid growth in global carbon dioxide (CO_2) emissions (with an average annual rate of 4%), much smaller increases were registered in 2012 (0.8%), 2013 (1.5%) and 2014 (0.5%) respectively. In 2014, when the emissions growth was almost at a standstill, the world's economy continued to grow by 3%. Thus, the trend over the past three years has sent an encouraging signal on the decoupling of CO_2 emissions from global economic growth. Nevertheless, it is still too early to confirm a positive global trend. The EU continued to show leadership in reducing CO_2 emissions with a 5.4% decrease in 2014 compared to the previous year, and despite an overall increase of 1.4% in the GDP. The report by the JRC and the Netherlands Environmental Assessment Agency (PBL) presents the results of the Emissions Database for Global Atmospheric Research (EDGAR).



CO_2 emissions per capita in the world 2014.

Guidance for land use, land-use change and forestry emissions reporting

New accounting rules impose more stringent requirements for the reporting of GHG emissions and removals from the land use, land-use change and forestry (LULUCF) sector. The JRC analysed the preparedness of EU countries to comply with these requirements and concluded that some of them will face certain challenges. In addition to identifying recommendations and priority actions in this area, it also provided ad-hoc support to seven countries: Croatia, Estonia, Greece, Italy, Latvia, Poland and Romania, in order to improve their LULUCF monitoring, reporting and verification activities.

Measuring the impact of increased use of renewables on GHG emissions

A new JRC report has confirmed the potential of renewable energies for climate change mitigation. Results show that they represented annual GHG emission savings of 8.8% between 2009 and 2012

in the electricity, heating and cooling, and transport sectors. Nearly two-thirds of the total savings were attributed to Germany, Sweden, France, Italy and Spain. According to the report, renewable electricity accounted for the highest contribution from renewable energies to climate change mitigation in the EU in 2012, representing 64% of the emission savings, due to the high penetration of wind and solar power. Renewable heating and cooling, and renewable transport followed with 31% and 5% of the savings respectively.

Impacts of climate change

JRC work on predicting and making impact assessments of extreme weather events caused by climate change helps to tailor appropriate adaptation measures and to enhance resilience. The recent JRC study on spatial patterns of European droughts under a moderate emission scenario concluded that Southern Europe is likely to experience longer, more frequent and severe droughts in the near future (2041–2070), increasing in the period 2071–2100. Extreme weather events not only threaten lives, but also economies. In another study, the JRC analysed the potential impact of climate change on tourism in the EU and provided long-term demand projections. Estimations show that by the year 2100 the climate could lower tourism revenues by up to 0.45% of GDP per year in Mediterranean EU regions, while regions in northern Europe could gain up to 0.32% of GDP. In parallel, the study 'Ensemble flood risk assessment in Europe under high end climate scenarios' shows that by the end of the century the socio-economic impact of river floods in Europe is projected to increase by an average 220% due to climate change alone. Estimates of population annually affected by floods range between 500 000 and 640 000 in 2050, and up to 950 000 in 2080, as compared to 216 000 in the current climate.

JRC to evaluate Member States' air quality data

Although climate and air quality have been traditionally considered as different policy areas, strong synergies and some trade-offs exist between the reduction of GHG emissions and air pollutants. Revised European legislation on air quality improves rules on the collection, sampling and analyses of outdoor air pollutant data in order to prevent or at least reduce their harmful effects on human health and the environment. To this end, the JRC was mandated to organise and evaluate quality assurance programmes for national reference laboratories in this domain. Member States have until 31 December 2016 to bring into force the laws, regulations and administrative measures necessary to comply with the provisions of the new Directive. In 2015, intercomparison programmes were already being organised regularly by the JRC in collaboration with the network of national air quality reference laboratories, known as the AQUILA network.

Read more

Global energy and climate outlook: Road to Paris:
europa.eu/!bH47ky

Trends in global CO_2 emissions - 2015 report:
europa.eu/!bP47Kt

Emissions Database for Global Atmospheric Research (EDGAR):
edgar.jrc.ec.europa.eu

LULUCF MRV - Analysis and proposals for enhancing monitoring, reporting and verification of greenhouse gases from land use, land use change and forestry in the EU:
europa.eu/!Tg48wD

Renewable energy in European Union for climate change mitigation: Greenhouse gas emission savings due to renewable energy (2009-12):
europa.eu/!dw73KP

Spatial patterns of European droughts under a moderate emission scenario:
europa.eu/!Dr89uu

Time is of the essence: adaptation of tourism demand to climate change in Europe:
europa.eu/!UH79Td

Ensemble flood risk assessment in Europe under high end climate scenarios:
europa.eu/!jQ47hq

A CONNECTED DIGITAL SINGLE MARKET

A connected Digital Single Market may generate up to EUR 250 billion of additional growth in the course of the next five years. Investing time and resources to ensure interacting, borderless digital services will result in hundreds of thousands of new jobs, mainly for younger jobseekers, a vibrant knowledge-based society and social progress. The Commission's strategy is focusing on six areas that will put Europe at the forefront of this digital revolution: building trust and confidence, removing restrictions, ensuring access and connectivity, building the digital economy, promoting e-society, and investing in world-class ICT research and innovation.

Through its research activities, the JRC is addressing aspects and challenges in all the above areas. In 2015, it analysed the online services market, used behavioural sciences to improve online privacy, and carried out experiments to convert the radio spectrum into a resource for broadband mobile access. The JRC's research also showed that SMEs made the best use of European funding for ICT research.

Online services and trade: building blocks for the Digital Single Market policy

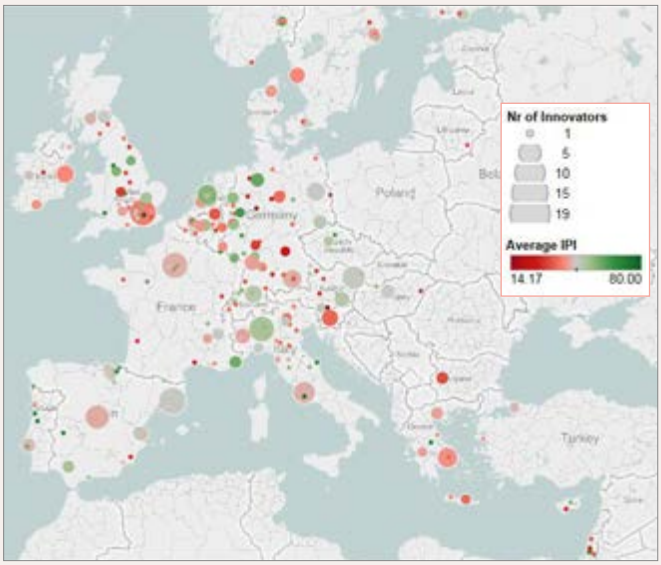
The Digital Single Market Communication was published in May 2015. In this context, the JRC provides support to policy-makers with research on a vast array of related topics such as cross-border e-commerce, online trade and services, copyright and intellectual property rights, eHealth, digital competence and data protection.

JRC research shows that the online services market is very fragmented geographically. Europeans surf mostly on US-based websites, which account for about 54% of online activity, while activity on EU-based websites accounts for 42%. Only 4% of the EU's online services activity takes place on websites from other parts of the world. A large number of highly diversified local online services websites attract relatively little traffic, while a small number of truly global giant service providers account for the bulk of all activity. Moreover, less than 1% of online suppliers actually deliver their services to all 28 Member States. In fact, two-thirds of the suppliers active in the EU cover no more than four countries.

The Commission's proposal for online consumer protection was also informed by JRC research into the economic impact of technology – the shift from offline to online shopping, and the effects of reducing barriers to online trade. European surveys combined with econometric modelling enabled an estimate to be made of the impact on both consumers and producers of removing the main perceived barriers. The impacts of cross-border e-commerce on trade costs, price competition, retail price margins and household consumption were evaluated. The research showed that shifting from offline to online retail induces considerable welfare redistribution from the retail to the manufacturing sectors, and especially to households. The results of the policy simulations revealed that additional measures to facilitate cross-border e-commerce between EU Member States could give a 0.3% boost to household consumption. EU production as measured by GDP would increase by 0.04%.

SMEs make best use of European ICT research funding

The JRC's long-standing collaboration with the Directorate-General for Communications Networks, Content and Technology (DG CNECT) has focused on improving understanding of innovation in the ICT sector. In 2015, Innovation Radar analysed research and innovation projects funded by two main European research programmes: the Seventh Framework Programme for Research and Innovation (FP7), and the Competitiveness and Innovation Framework Programme (CIP). The objective was to identify high-potential innovations and the key innovators behind them. The research also sought to elicit the most important success factors and areas of improvement. It concluded that small and medium-sized enterprises (SMEs) are the best performers in EU research programmes. They deliver 41% of the high-potential



This map presents locations of key organisations using EU research funding in delivering innovations.

innovations generated in ICT-related EU funded research and innovation projects, despite accounting for a mere 14% of the total funding. However, a greater focus on technology than on business strategies is one of the main bottlenecks when it comes to getting these innovations on to the market. In fact, reaching the market is not a smooth process for innovators: a quarter of already mature innovations have yet to be exploited. Of those innovations planned for commercialisation, only 30% have produced or will produce a market study, while a business plan is on the agenda for only 27% of the projects. The European Commission is already improving links between innovators in EU funded research projects and services that help such innovators prepare to 'reach the market'.

Using the radio spectrum for broadband mobile access

The radio spectrum is the basis of all wireless services, including 4G mobile broadband. Smartphones, tablet computers and Wi-Fi technology all depend on wireless connectivity and thus on the radio spectrum. In Europe, the total volume of services that depend on radio spectrum availability is estimated to be worth at least EUR 200 billion annually.

The JRC and Italian spectrum regulators conducted tests on a novel regulatory concept, known as Licensed Shared Access (LSA). Initial experiments showed that the LSA methodology can provide additional radio spectrum for broadband use with a throughput of up to 10 MB/s even at locations 1 km away from a very-low-power base station, where the received signal power is extremely low. In indoor environments, the throughput can be as high as 150 MB/s, allowing several simultaneous broadband users in small enterprises or homes to benefit from the new spectrum-sharing technology.

In 2016, the Commission is proposing an overhaul of EU telecoms rules, including more effective EU-level spectrum coordination. Creating the right conditions for digital networks and services to flourish is a key objective of the Commission's plan for a Digital Single Market.

Behavioural studies in support of online privacy

Long, detailed and technical privacy notices are the current answer to online privacy issues. In practice, users frequently allow websites to collect information without really knowing or understanding the conditions. To elicit alternatives, JRC scientists studied whether web design affects users' disclosure of personal data. Using behavioural sciences, a JRC study looked at how individuals react to different types of privacy notices. Specifically, the authors analysed users' reactions to the modified choice architecture (i.e. the environment in which decisions take place) of web interfaces. Tests of different designs with over 3 000 users from the UK, Italy, Germany and Poland showed that the web interface affects decisions on disclosing personal information. The study also explored differences related to country of origin, gender, education level and age. A depiction of a person's face on the website led people to reveal more personal information. In addition, this design choice and the visualisation of the user's IP or browsing history had an impact on people's awareness of a privacy notice. If confirmed, these features will be particularly relevant for habitual and instinctive online behaviour.

Read more

JRC work on digital economy:
europa.eu/!bV84fc

International trade in online services:
europa.eu/!RD87qv

Innovation Radar: Identifying innovations and innovators with high potential in ICT FP7, CIP & H2020 Projects:
europa.eu/!Cu94Qc

New project tests sharing of radio spectrum for mobile broadband:
europa.eu/!jb48nY

Nudges to privacy behaviour: exploring an alternative approach to privacy notices:
europa.eu/!MC37qY

A DEEPER AND FAIRER ECONOMIC AND MONETARY UNION

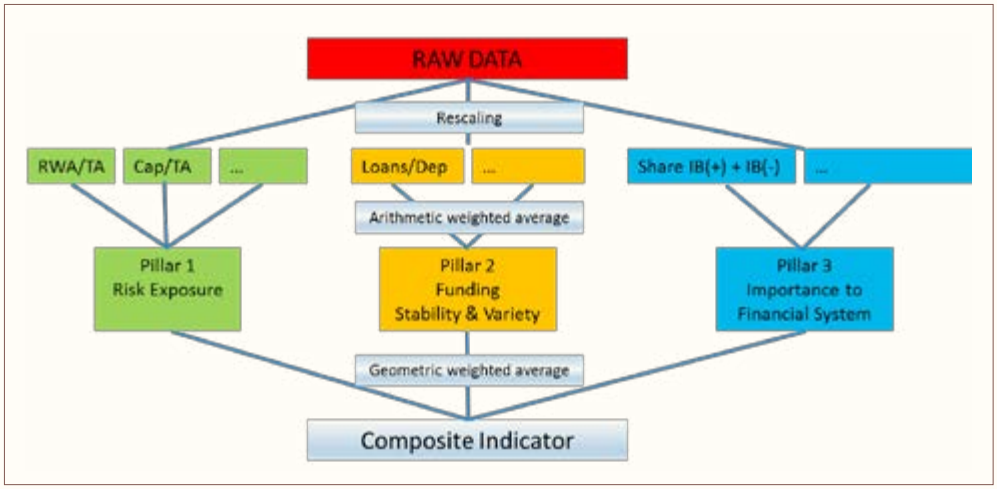
Europe needs a deeper and fairer Economic and Monetary Union (EMU) to preserve the stability of the euro and to enhance the convergence of economic, fiscal and labour market policies across the Member States. The EU is making headway with the reinforcement of economic governance and the launch of the banking union. However, large disparities in economic performance, close to 18 million unemployed and an increased risk of social exclusion demonstrate the need for further progress.

It was against this background that in 2015 the JRC provided solid scientific support for Commission initiatives towards completing the banking union and a better understanding of the impact of fiscal measures on economic and societal outcomes. The JRC also contributed to the social impact assessment of the third Greek stability programme and estimated structural deficits within the EU's economic governance framework.

Completing the banking union

The Commission set an ambitious objective to establish a banking union based on a single rulebook for the EU's financial sector. It aims to create a single supervisory and a single resolution mechanism and to set up a common European deposit insurance scheme. The JRC has been present every step of the way to provide solid scientific support in designing, testing, implementing and reviewing the policy initiatives needed to make the banking union a reality.

During 2015, the JRC provided its expertise to the Directorate-General for Financial Stability, Financial Services and Capital Markets Union (DG FISMA) for determining the rules of calculating banks' risk-based contributions to the Single Resolution Fund. With the system due to be launched in 2016, the Single Resolution Board asked the JRC to assist them further in its practical implementation. The JRC also conducted surveys and analyses of Deposit Guarantee Schemes (DGS) and supported the Commission in developing a methodology for assessing the compliance of individual schemes with the relevant legislation. Furthermore, it provided quantitative analysis of the risk-coverage and risk-sharing characteristics of national DGS versus a pan-European deposit insurance scheme. As follow-up work to the single rulebook, the JRC contributed to the ex-post preliminary review of the capital requirements legislation and its impact on bank capital structure over the period 2004-2014. In addition, it provided analyses to inform the debate on making the bail-in features of the bank recovery and resolution directive operational.



Steps to build a composite indicator from selected balance sheet data to measure individual bank risk profile.

Fair and efficient corporate taxation in the EU

The Commission has set out a corporate taxation action plan to reform the EU corporate tax framework in order to tackle tax avoidance, ensure sustainable revenues, and promote a fairer business environment, especially for SMEs. The JRC is contributing to the impact assessment of the forthcoming Commission proposal for corporate tax base harmonisation in the EU. This follows the objectives set out in the June 2015 Communication on a fair and efficient corporate tax system. In this context, the JRC will assess the economic and fiscal impact of policy options aimed at harmonising corporate tax bases as well as tackling debt bias and loss carry-forward rules.

Additional support has also been provided on specific policy issues. For instance, at the request of the Directorate-General for Taxation and Customs Union (DG TAXUD), the JRC analysed the effect of 'patent boxes' i.e. special tax regimes for intellectual property revenues, thus building on its know-how

in the area of innovation and R&D. Results show that instead of boosting research and innovation, tax breaks on profits from locally patented intellectual property have essentially been used by multinationals to lower their tax bills. Another important aspect of corporate taxation is the tendency of corporate tax systems to favour debt over equity, where JRC researchers have found that removing the debt bias could lead to substantial public finance savings due to increased financial stability.

Understanding the societal and economic impacts of fiscal policy measures

Fiscal measures, i.e. government spending and taxation, have broad implications for the overall economy and the behaviour of economic actors far beyond their direct fiscal effect. In order to support EU efforts to achieve growth-friendly fiscal consolidation with a strong emphasis on social fairness, the JRC has been at the forefront of research into the impact of tax reforms on equity and poverty and their behavioural implications.
For example, in collaboration with the Directorate-General for Economic and Financial Affairs (DG ECFIN), the JRC has assessed the poverty and equity impacts of tax reduction and in-work benefits on low-income workers as well as housing taxation. Broader support has also been provided to other DGs in the area of taxation. In addition, to support Member States in the revision of their tax structures, the JRC is developing methodologies based on the EUROMOD microsimulation model to assess the behavioural response of individuals and households to taxes and social benefit reforms. For instance, recent JRC research suggests that tax policies providing financial incentives to low-income workers can yield a double dividend both in terms of increased employment and extra tax revenues, thanks to their beneficial impact on labour supply. Finally, the JRC has simulated fiscal options for the social impact assessment of the third stability support programme for Greece, carrying out ongoing research in partnership with the Commission's Secretariat-General and DG ECFIN aimed at optimising the equity of fiscal reforms in Greece.

Reinforced economic governance

In 2015, the JRC continued to support the Commission in its assessments of the macroeconomic imbalance procedure, a key contribution to the in-depth reviews and country-specific recommendations. Results of the JRC's work on a new global multi-country model (GM) developed with the Directorate-General for Economic and Financial Affairs (DG ECFIN) fed into policy discussions on the divergent adjustment paths of the euro area and the US, and the importance of shock transmission between different regions. The GM has been used to provide content for the autumn economic forecast and simulations for the quarterly reports on the euro area.
The JRC also continued its work on estimating structural deficits within the context of the Stability and Growth Pact, participating in the Output Gap Working Group, training Commission and Member State officials on the methodology of calculating output gaps, and organising an international conference on the subject with participants from central banks, finance ministries and international organisations from all over the world.

Read more

JRC technical work supporting Commission second level legislation on risk-based contributions to the (single) resolution fund:
europa.eu/!dx66Kw

Should the tax system favour debt over equity?:
goo.gl/tL1SqR

Patent boxes design, patents location and local R&D:
europa.eu/!Jt46dR

Commission staff working document: Assessment of the social Impact of the new Stability Support Programme for Greece SWD(2015) 162 final:
europa.eu/!xW96UR

Quarterly Report of the Euro Area:
europa.eu/!Tj33Ut

European Economic Forecast – Autumn 2015:
europa.eu/!ju68nK

A DEEPER AND FAIRER INTERNAL MARKET WITH A STRENGTHENED INDUSTRIAL BASE

The EU's single market is a strong asset in times of increasing globalisation. The Union needs to build on this strength and fully exploit its potential in order for EU companies and industry to thrive in the global economy. European policy-makers are focusing on creating an environment that will reinforce a strong and high-performing industrial base. Key to this objective are investments in new technologies, an improved business environment, easier access to markets and finance - particularly for SMEs - as well as workers with the skills required by industry.

Notable was the support given by JRC in 2015 in drafting regulations for the new on-road tests for cars, analysing the competitiveness of the EU's oil-refining sector and testing the precision of Galileo signal receivers. It also contributed to the ongoing revision of nanomaterial definition and strengthened the industrial base with two new state-of-the-art technologies stemming from nuclear research.

Capping road transport emissions - new on-road tests for cars

JRC studies found that laboratory tests do not accurately capture vehicle emissions, including nitrogen oxides (NOx), under real driving conditions. The European Commission took action and focused its efforts on developing complementary on-road tests, with the intention to introduce Real-Driving Emissions (RDE) tests in the future which have to be passed by new car models before they are allowed to be placed on the EU market. The JRC has been essential in this development, by demonstrating the feasibility of on-road tests for cars with portable equipment and by leading the drafting of the technical specifications for the new RTD test procedure, based on the JRC's technical expertise and measurements.

Portable Emissions Measurement Systems (PEMS) offer a modern and innovative counterpart to check the impact of emissions from combustion engines upon the environment.

The JRC's Vehicle Emissions Laboratory (VELA) allows emission tests to be carried out on a wide variety of engines and vehicles (from motorbikes to trucks or electric cars). In 2015 important milestones were achieved with the approval of two regulatory packages by the Member States at the Technical Committee on Motor Vehicles. In both cases, the JRC was heavily involved and provided scientific support. The first package describes the test procedure and the requirements for measurement instruments. The second defines binding emission limits, their application dates and additional boundary conditions. In 2016, the JRC will lead the technical development and drafting of two additional RDE packaging focusing on the measurement of particle number emissions with portable equipment and the surveillance of vehicles already in use.

The EU petroleum-refining sector: fitness check

The JRC did a thorough analysis of the EU's oil-refining sector as part of the Commission's 'fitness check' initiative which aims to keep current legislative measures fit for purpose. The pieces of refining relevant legislation examined referred to renewable energy, energy taxation, the EU Emissions Trading System, fuel quality, clean and energy-efficient vehicles, industrial emissions, strategic oil stocks, marine fuels, energy efficiency, and air quality. The analysis shows that the legislation has delivered its objectives at the sectoral level and that the costs can be considered proportionate relative to the benefits achieved, although at an estimated total cost to the sector equivalent to 47 eurocents per barrel of processed input during the study period. The identified cost impact of the regulation on refineries primarily implies the diversion of some revenues towards regulatory compliance investments and operating costs rather than towards other investments, and operational adjustments to improve competitiveness. The more efficient refineries have been able to absorb these costs and remain profitable, but this has not been the case for some others.

Galileo: high-precision receivers ready for navigation

Galileo will provide Europe with independent and precise satellite navigation for a vast range of applications in the aviation, maritime and road sectors. It is expected to reach its full deployment in 2020 when 30 satellites will be in orbit. At the request of the Directorate-

View of the JRC's anechoic chamber with the test bed used to measure the Galileo professional receivers, showing the four Global Navigation Satellite System antennae on the tower of the European Microwave Signature Laboratory.

General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) and working with the European Global Navigation Satellite Systems Agency (GSA), the JRC conducted an extensive testing campaign of the very first Galileo receivers used in professional applications where centimetre-level positioning accuracy is needed (e.g. railways sector). Sample receivers from manufacturers in the EU, USA, Russia and Japan were tested both in the JRC's test facilities under controlled conditions and in the field. The tests showed that most of the receivers perform in line with the specifications provided, confirming that the high-precision receiver market is ready to exploit the benefits of Galileo well before the full constellation is deployed.

Defining nanomaterials

The exact definition of a nanomaterial represents the gateway to its wider production, use and safety assessment for human health and the environment. The Commission is currently reviewing its regulatory definition and the outcome is expected in 2016.
The JRC has looked into science-based options to improve the clarity and practical application of the Commission's recommendation. The JRC advice was not to change the scope of the definition concerning the origin of nanomaterials, which addresses natural, incidental and manufactured nanomaterials. It also advised that the use of size as the sole defining property of a nanoparticle, as well as the range of 1 nm to 100 nm to define a nanoscale, should be maintained. Further options to consider include a possible variation in the current 50% threshold for the particle number fraction (i.e. if more than half of the particles have one or more external dimensions between 1 nm and 100 nm then the material is a nanomaterial). Variable thresholds may allow regulators to address specific concerns, but could also confuse customers and lead to an inconsistent classification of the same material based on the field of application.

New information system on raw materials

The Raw Materials Information System (RMIS), set up by the JRC, is a comprehensive online repository of information on policies, activities, indicators and data related to the European non-energy-related raw materials sector. It supports the EU Raw Materials Initiative and the activities of the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), notably for the European Innovation Partnership (EIP) and the European Raw Materials Knowledge Base (EURMKB), and aims at tackling the pressure on valuable resources and their efficient use to benefit EU economies.

From nuclear research to indoor localisation and surgery technologies

The precision and accuracy embedded in nuclear research have resulted in innovative solutions for indoor localisation and less invasive surgeries. Over the past decade, providing accurate position information on people and objects indoors, where GPS signals are not available, has proved challenging and a large-scale commercial solution has yet to be found. Using the Sensor Tracking and Mapping (STeAM) system – a portable device built for nuclear facilities and developed in-house at the JRC – a team won an indoor localisation competition. The system uses a 3D laser scanner to acquire 10 frames per second as the user explores the environment and provides the current location. A patent application for this technology has been submitted.
Another JRC invention will soon be used by hospitals for minimally invasive robotic surgery. TELELAP ALF-X is an advanced multi-port robotic system that will provide surgeons with eye control of the camera and touch sensation during surgery. The system is built on the GENERIS software which is used to control mechanical 'arms' during work with highly radioactive material in storage areas.

Read more

Commission staff working document - Sectoral fitness check for the petroleum refining sector SWD(2015) 284 final: *europa.eu/!Wh39vk*

EU Petroleum Refining Fitness Check: Impact of EU legislation on sectoral economic performance: *europa.eu/!WV96yD*

Towards a review of the EC Recommendation for a definition of the term 'nanomaterial': Part 3: Scientific-technical evaluation of options to clarify the definition and to facilitate its implementation: *europa.eu/!wD39yJ*

Raw Materials Information System (RMIS): *rmis.jrc.ec.europa.eu*

AN AREA OF JUSTICE AND FUNDAMENTAL RIGHTS BASED ON MUTUAL TRUST

Combating discrimination and cross-border crime, such as human trafficking, smuggling and cybercrime, is a shared European responsibility that must be addressed while guaranteeing fundamental rights and values, including the protection of personal data.

The JRC's scientific work has contributed to this endeavour, for example, by analysing the available technology for automatic fingerprint identification that could be used at borders to reinforce security in the Schengen area, by developing a new method of verifying vessel positions that would help fight maritime crime, and by proposing new approaches for a quicker recognition of new drugs, which represent a real challenge for customs authorities and forensic laboratories. The JRC's long-standing expertise in analysing container data has also contributed to new legislation that will facilitate fraud investigations linked to international trade. Last but not least, the JRC has studied how children interact with digital technologies, and has developed new tools to empower and help them enjoy a safe and responsible digital life.

Towards automatic fingerprint identification for the Schengen Area

The Schengen Information System (SIS) supports external border control and law enforcement co-operation in the Schengen states. The current system provides the possibility to process biometric data related to wanted or missing persons in order to support the work of the police and border guards, although it is not yet able to identify a person on the basis of his/her fingerprints. This next step would require the implementation of what is known as an Automatic Fingerprint Identification System (AFIS).

In 2015, the JRC carried out a study for the Directorate-General for Migration and Home Affairs (DG HOME), assessing whether fingerprint identification technology is sufficiently mature to be integrated into the SIS, as legally requested. The study provides a list of recommendations to support the successful deployment and use of this technology, and concludes that it has reached sufficient levels of readiness and availability to be integrated into the SIS provided that recommendations are implemented during the roll-out and utilisation of the new functionality.

Tracking cargo containers to fight customs fraud

A new Regulation adopted in 2015 empowers EU authorities to systematically collect and use container status messages (CSM), i.e. electronic records that describe the logistics and routes followed by cargo containers. Access to such data will help customs authorities to understand the routes followed by the containers and help them in fraud detection and investigations, for example in cases of misdeclaration of the origin of imported goods or cases of smuggling fake products.

In collaboration with the European Anti-Fraud Office (OLAF), the JRC has worked extensively on how to exploit CSM data for customs anti-fraud purposes. The results of the JRC research and the scientific evidence provided by long-term pilot projects led the Commission to bring forward a legislative proposal that would enable Member States and OLAF to systematically use CSM. The technologies, know-how and experience in handling CSM data, developed by the JRC through its experimental ConTraffic platform, will be used by OLAF to efficiently implement this new legislation. Meanwhile, the JRC is continuing research into new methods to assist authorities in this area. Further uses of this data will also be explored, notably for security and safety, and real-time operations. The focus will be on data mining, new automated analysis techniques, and domain-specific visual analytics methods.

Fighting maritime crime

Maritime piracy, the trafficking of migrants and smuggling are well-known security threats at sea. The EU Maritime Security Strategy and its Action Plan recognise the key role of scientific research and innovative technologies in achieving more efficient and effective maritime security operations. The JRC is developing advanced technologies to

Analysis of global shipping container traffic based on Container Status Messages.

The JRC has developed a method to verify in real time the correctness of vessels position reported through the Automatic Identification System (AIS): blue indicates the AIS declared positions, green indicates the positions verified through radiolocation techniques.

independently verify the self-reporting systems on vessels and to help detect non-reporting ships, which might be involved in illegal activities.

In 2015, the JRC, in collaboration with the Italian Coast Guard service, developed a new method to verify whether ship positions reported by means of the automatic identification system (AIS) are correct. The AIS system, originally designed to help ships avoid collisions, is being used more and more to locate ships at sea. The JRC method enables the validation of reported data and detection of unintentionally incorrect, jammed or deliberately falsified information reported by ships. The new method is cost-effective as it only requires a generic network of AIS base stations and no additional sensors or technologies. It will be further tested in other countries and expanded to verify GSM signals in order to help detect small boats, which typically do not use the AIS.

Fast recognition of new drugs

New substances are discovered on the illicit drug market every week, which creates an enormous challenge for customs controls and forensic laboratories. JRC research work on speedy recognition of new psychoactive substances is supporting the EU's fight against illicit drugs.

In 2015, the JRC developed analytical strategies that enable faster identification and characterisation of unknown organic chemical substances, and it worked closely with a project group for CLEN (the Customs Laboratories European Network) on designer drugs and other illicit products on the implementation of these tests. The 'routine' analytical methods applied in Member States' control laboratories are generally efficient for the recognition of substances which are already known. However, the chemical identification of many unknown substances suspected to be new psychoactive drugs requires the use of more sophisticated analytical techniques such as nuclear magnetic resonance (NMR) and mass spectroscopy (MS).

These approaches have been tested in the JRC laboratories and the efficiency of the proposed analytical strategy has been successfully demonstrated on several unknown substances used as test cases. Through this activity, the JRC is supporting the Directorate-General for Taxation and Customs Union (DG TAXUD) and CLEN in establishing a harmonised approach and improved data sharing for the quick identification of chemicals by customs authorities.

Towards safer internet use by children

Children and young people are very active users of digital technology. However, even if they use smartphones, tablets and computers every day, they are not always fully aware of the risks they may encounter while being connected to the Internet, such as cyberbullying or viewing inappropriate content. Parents and teachers need practical tools to empower them to help children become smarter, responsible, and respectful digital citizens. This has been confirmed by a pilot study conducted by the JRC in 2015 which explored how young children under the age of eight and their families engage with digital technologies.

Among other findings, the study recommended that industries develop technologies specifically tailored for children including, for example, clear child-friendly warnings and quality labels.

In 2015, to help parents and teachers to actively guide children in their digital activities, the JRC developed and tested Happy Onlife, a game and toolkit which includes a quiz and other educational activities for children.

Happy Onlife is a game and set of educational activities for children and adults to learn about internet risks and opportunities. It is available online, in paper format, or as a mobile app.

Read more

Fingerprint identification technology for its implementation in the Schengen Information System II (SIS-II):
europa.eu/!gQ48Xc

ConTraffic:
contraffic.jrc.ec.europa.eu

Radiolocation and tracking of automatic identification system signals for maritime situational awareness:
europa.eu/!Nj93TH

Report on characterisation of New Psychoactive Substances:
europa.eu/!dr76Mj

Young Children (0-8) and digital technology: A qualitative exploratory study across seven countries:
europa.eu/!FU48UW

Happy Onlife:
europa.eu/!vN68qQ

A STRONGER GLOBAL ACTOR

When it comes to foreign and security policies, the European Union needs better mechanisms to anticipate events early and to swiftly identify common responses. This includes bringing together, more effectively, the different policies and tools that contribute to Europe's external action. The EU has a strong record of international cooperation. It provides development support to a large number of countries in the world and also assists them in responding to man-made or natural crises. The Sustainable Development Goals agreed by the UN in 2015 are a key milestone.

In 2015, the JRC contributed in several ways to making the EU a stronger global actor. For example, it created a new online knowledge centre to help EU countries and beyond to better manage disaster risk and, with its early-warning and monitoring systems, it supported the EU's response to several disasters as well as its efforts to achieve the new Sustainable Development Goals agreed at UN level. The JRC's expertise in nuclear safety and security also contributes to enhancing the Union's role in this area.

Minimising the risk of disasters – new knowledge centre

Between 2002 and 2012, natural disasters caused the death of more than 100 000 people annually across the world. Demographic growth, urbanisation, and increasingly interconnected economies magnify the exposure to disasters, requiring new approaches to disaster risk management. Existing knowledge must be better used and the interaction between researchers, policy-makers and end-users should be enhanced.

The new Disaster Risk Management Knowledge Centre will help make better use of available research and knowledge, strengthen networks, and develop technologies and capacities for improved crisis management.

To address these challenges, the JRC, working in close collaboration with the Directorate-General for Humanitarian Aid and Civil Protection (DG ECHO) and other Commission services, launched the Disaster Risk Management Knowledge Centre in 2015. This centre aims to help EU countries respond to emergencies while preventing and reducing the impact of disasters. By creating a network of scientists and policy-makers, the centre will facilitate access to knowledge and translate complex scientific data and analyses into usable information at all stages of disaster risk management – from prevention to recovery at all levels – local, national, European and global. This virtual centre will provide EU Member States with technical and scientific advice on their risk assessment methodologies. By promoting more systematic and reinforced science to policy interface and fostering the creation and sharing of new knowledge, it will also support the United Nations Sendai Framework for Disaster Risk Reduction.

Supporting EU disaster-response operations

The Copernicus Emergency Management Service (EMS), coordinated technically by the JRC, is one of six services offered by Copernicus – the European Union's Earth Observation Programme for global environmental monitoring, disaster management and security. The service supports all actors involved in the fields of crisis management, humanitarian aid, and disaster risk reduction, preparedness and prevention. It is based on two main components: early warning and mapping. Early warning services provide alerts related to floods, forest-fire danger predictions as well as near-real-time assessment of forest fire impacts. The mapping component provides maps and analyses based on satellite imagery before, during and after a disaster.

On 25 April 2015, for instance, seven minutes after the powerful earthquake that struck Nepal, a red alert for international assistance was issued by the UN/JRC Global Disaster Alert and Coordination System (GDACS). GDACS uses modelling tools to estimate the potential impact of natural disasters on populations at risk. As such, it is a unique system that is routinely used by many humanitarian organisations to plan relief intervention. In the days following the alert, the Copernicus EMS produced damage assessment maps and situation reports that helped to define the areas most affected in order to facilitate response efforts.

Damage-assessment map of Kathmandu produced by the Copernicus EMS after the earthquake that struck Nepal in April 2015.

UN Sustainable Development Goals and related JRC work

The 2030 agenda for sustainable development, agreed by world leaders at a United Nations (UN) summit in September 2015, is a milestone for international efforts to end poverty, fight inequality and injustice, and tackle climate change. Through its support to EU policies on development,

the JRC participates in the wider efforts to achieve the 17 goals agreed. These include ending hunger, creating conditions for affordable and clean energy, and exploring options in the fight against climate change.
To help reduce hunger and food insecurity, the JRC monitors crop growth and forecasts yields, and it is at the forefront of international scientific developments on food and nutrition security information and analysis.
It also participates in the Integrated Food Security Phase Classification (IPC) initiative, which classifies food insecurity situations. The IPC is used to prioritise aid interventions by governments, NGOs, UN agencies and international donors, such as the European Commission and USAID. In relation to affordable and clean energy, the JRC's African Renewable Energy Technology Platform (AFRETEP) brings together 43 African and 26 European countries to map the most economically viable options for rural electrification. On climate mitigation, the global index designed by the JRC in support of EU's Global Climate Change Alliance+ (GCCA+) programme will help the most vulnerable countries respond to climate change in the period up to 2020. It was presented during the UN Climate Conference, COP21, in Paris during 2015.

Increasing nuclear security with new tools and methods

The identification of uranium and plutonium is a key element of nuclear safeguards, helping to avoid the use of nuclear material for illicit activities. The new JRC capability to determine the production date of nuclear material will enhance the reliability of the systems set up by the European Atomic Energy Community (Euratom) and international safeguard authorities to verify declarations about nuclear activities.
In 2015, the JRC produced the first two uranium reference materials, IRMM-1000a and IRMM-1000b, for determining production dates. These are used to validate measurement procedures in nuclear forensics, safeguards and security, so that the 'age' of uranium samples can be determined with good precision. These reference materials are also traceable within the International System of Units (SI). Prior to their release, the JRC organised a proficiency test with selected laboratories, confirming their ability to accurately determine the production date of uranium samples.
International safeguards inspections will also benefit from the new neutron resonance densitometry (NRD) method jointly developed by the JRC and the Japan Atomic Energy Agency (JAEA). This method solves an issue that has challenged experts to date, as it allows to accurately quantify the amount of uranium and plutonium in complex materials such as debris from melted nuclear fuel from the damaged Fukushima Daiichi reactor cores.

The JRC produced the first two uranium reference materials required to validate measurement procedures in nuclear forensics, safeguards and security, so that the 'age' of uranium samples can be determined.

Towards a new generation of nuclear energy systems

The Generation IV International Forum, of which the European Atomic Energy Community (Euratom) is a member, is leading international collaborative efforts to develop next-generation nuclear energy systems that can help meet the world's future energy needs. Generation IV designs will use fuel more efficiently, reduce waste production, be economically competitive, and meet stringent standards of safety and proliferation resistance.
The JRC acts as an implementing agent for Euratom, coordinating the efforts of both the Euratom research programme and that of the EU Member States (excluding France which is an individual member of Generation IV International Forum (GIF), integrating research and development carried out by contributing national research bodies, and informing them about progress. Through its institutional research, the JRC also contributes to different topics related to the nuclear safety and security of the selected Generation IV systems, including safety and operation, thermal hydraulics, materials, fuels, nuclear data, proliferation resistance, and physical protection. JRC research results provide valuable input on various types of reactors to the European system demonstrators.

Read more

Disaster Risk Management Knowledge Centre:
drmkc.jrc.ec.europa.eu

Copernicus Emergency Management Service (EMS):
emergency.copernicus.eu

Global Disaster Alert and Coordination System (GDACS):
gdacs.org

European Flood Awareness System (EFAS):
efas.eu

Global Flood Awareness System (GloFAS):
globalfloods.eu

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

Global Wildfire: Information System:
europa.eu/!pm68Vy

Integrated Food Security Phase Classification:
ipcinfo.org

JRC early warning bulletins for food security:
europa.eu/!gd69yb

GCCA+ Index – JRC online knowledge platform:
knowsdgs.jrc.ec.europa.eu

JRC work on reference materials for nuclear safeguards:
europa.eu/!bv83Kp

JRC work on nuclear safety:
europa.eu/!fD39FD

JRC PARTNERS IN THE EU AND BEYOND

Collaboration with European and international partners is essential to enhance the JRC's capability to provide scientific evidence for informed policy-making. Through such collaboration, the JRC exchanges knowledge, maintains a high level of scientific expertise and also opens up its facilities to other research organisations.

At present, the JRC collaborates with over 1 000 organisations worldwide. In 2015, it concluded new agreements with European partners, such as the Ministry of Education and Science and the Ministry of Economics in Latvia, the Slovak Academy of Sciences, Cambridge University in the UK, as well as with international partners, such as the International Institute for Applied Systems Analysis (IIASA), the US University Corporation for Atmospheric Research (UCAR), and the Chinese Academy of Sciences' Institute of Remote Sensing and Digital Earth (CAS-RADI).

Deepening scientific collaboration with Latvia and Slovakia

In June, the JRC and the Latvian Ministries of Education and Science and Economics signed a Memorandum of Understanding in an effort to deepen their existing cooperation. One of the focus areas addresses energy, in particular the security of energy supply, as well as renewable energy, including biomass, smart grids and energy efficiency. Current cooperation already includes about 20 joint projects, networks and bilateral agreements in different research fields. During the six months of the Latvian Presidency of the Council of the European Union, the JRC actively cooperated with Latvia, in particular on topics concerning smart specialisation and standardisation.

In the same month, another Memorandum of Understanding was signed with the Slovak Academy of Sciences. This set the framework for future collaboration in the fields of energy, transport, nanotechnology, reference materials, health and environment, innovation and growth. The JRC and the Slovak Academy of Sciences have already cooperated successfully on several scientific projects under the EU's Framework Programmes for research and innovation, as well as within international scientific networks, such as the Academies of Sciences of the Danube region. Active co-operation with the Slovak Republic will continue during the Slovak Presidency of the EU, in the second half of 2016. The JRC will organise and/or participate in several joint events which will take place during this period.

20 years of radiation monitoring data exchange in Europe

On the occasion of its 20th year, the JRC's EUropean Radiological Data Exchange Platform (EURDEP) presented a new feature that enables interactive radiation maps to be produced and displayed publicly in a simple and more attractive way. These were developed following the Fukushima accident in 2011, which triggered the need for a series of improvements, such as extended radiological information regarding low radioactivity levels in the environment, as well as improved communication with the public. The JRC's EURDEP is part of the European Commission's official radiological and nuclear emergency arrangements. It facilitates the transmission of large datasets from environmental radioactivity and emergency preparedness monitoring networks in 38 European countries. EURDEP has been used as a model by the International Atomic Energy Agency (IAEA) to set up its International Radiation Monitoring Information System (IRMIS) and Exchange (IRIX). The JRC is also providing them with technical assistance. The EURDEP concept is currently being explored further to establish whether or not it could be applied in Southeast Asia.

Enhanced collaboration for better use of evidence for policy-making

In September, the JRC and the International Institute for Applied Systems Analysis (IIASA), both experienced in bridging the gaps between science and policy, decided to join forces and signed a framework arrangement to coordinate research activities in areas such as energy, transport, water, environment, climate action, disaster risk reduction, agriculture, food, the bioeconomy and citizen science. The JRC and IIASA have been working together for more than 20 years on different projects, including scientific support to the Danube Strategy. The arrangement was signed during the first JRC-IIASA summer school on evidence and policy hosted by IIASA, where scientists and policy officers working in the field of energy, including links to climate and air quality, learnt how to better use evidence for policy-making. Given the success of the initiative, both organisations agreed to continue it on an annual basis.

The JRC and the University of Cambridge (UK) decided to expand their bilateral collaboration by signing a Memorandum of Understanding aimed at developing practices in the use of evidence to inform policy-making, and increasing the number of academic exchanges and joint research projects. A pilot activity on green growth and sustainability is already being developed.

The participants, panellists, masterclass facilitators and organisers of the 1st JRC-IIASA Summer School, outside the Laxenburg Palace in Lower Austria.

The importance of science in improving the culture of evidence-informed policy-making was also stressed at the Science meets Parliaments event. This occasion brought together scientists and members of the European and national parliaments, and established the basis for greater and continued cooperation between scientists and policy-makers. Several umbrella scientific organisations also participated, including the European Academies Science Advisory Council (EASAC), the Conference of European Schools for Advanced Engineering, Education and Research (CESAER), the European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE), All European Academies (ALLEA), the Leibnitz Association and the United Nations Educational, Scientific and Cultural Organization (UNESCO). The event was organised by the JRC and the European Parliament's Science and Technology Options Assessment (STOA) panel and builds on successful experiences from similar events organised in several Member States, such as Germany, France and the United Kingdom.

International partnerships addressing global challenges

In June, the JRC signed a new arrangement with the Chinese Academy of Sciences' Institute of Remote Sensing and Digital Earth (CAS-RADI) in the areas of air quality, human settlement detection and characterisation, land and soil mapping, land cover mapping, digital earth sciences and agricultural monitoring. The parties already have a long-standing collaboration that has delivered a number of tangible outcomes, such as the development of a shared vision of Digital Earth – a participative framework to share information about the state of our planet and the complex interactions between society and the physical environment, and a set of disaster impact methodologies in the field of disaster management.

The Chinese Academy of Sciences' Institute of Remote Sensing and Digital Earth (CAS-RADI) and JRC signed a new collaborative research arrangement in Brussels.

In July, during an official trip to the United States, the JRC's Director-General Vladimír Šucha also signed a new arrangement with the American University Corporation for Atmospheric Research (UCAR), focusing on climate prediction, monitoring and the development of joint scenarios and evaluation of impacts to better inform international policy-making. Under this agreement, the JRC and UCAR also agreed to work together on air quality monitoring and alternative applications of remote-sensing instruments, as well as exploring potential cooperation in the field of vulnerability/resilience and risk assessments. The trip to the US was also an opportunity for the JRC's Director-General to speak at the European Institute, a Washington-based public-policy organisation devoted to transatlantic affairs, and to present the challenges in using scientific evidence to support policy-making. On that occasion, a number of meetings were organised to discuss ongoing and future cooperation with US policy-makers and key research partners.

JRC hosts Brazilian scientists

As of September, the JRC opened its doors to Brazilian scientists for a period of up to two years within the framework of the Brazilian Mobility Programme 'Science Without Borders'. Science and technology are core elements of EU-Brazil relations, and the arrival of the Brazilian scientists confirms the JRC's engagement towards reinforcing scientific collaboration. This opportunity stems from the 2013 cooperation arrangement between the JRC and Brazil's Ministry of Science, Technology and Innovation, which foresees strengthening cooperation, enhancing science-based support to policy-making, and boosting innovation in a wide range of fields, including disaster prevention and crisis management, climate change and the sustainable management of natural resources, energy, nanotechnologies, and ICT. The successful candidates work on projects such as forest degradation monitoring by means of remote sensing, assessing and monitoring biodiversity and alien invasive species in Brazilian protected areas, nanotoxicology, economic analysis of global agricultural markets, molecular biology for authentication of agricultural products, as well as the development of quality assurance and control tools for monitoring pollutants in water.

EX-POST EVALUATION OF THE JRC'S DIRECT ACTIONS UNDER THE SEVENTH FRAMEWORK PROGRAMMES (2007-2013)

Conducting an independent assessment of the rationale and achievements of the JRC's activities is a formal obligation following the completion of each Framework Programme for research, technology and innovation, which are the main sources of funding for the JRC's work. On this occasion, the evaluation was conducted by a panel of 12 independent external experts under the chairmanship of Professor Patrick Cunningham of Ireland's Trinity College in Dublin, who held the position of Chief Scientific Adviser to the Irish Government from 2007 to 2012.

In his foreword, the chairman emphasised the main outcome: the panel's positive conclusion on the effectiveness of the JRC as the Commission's science service in support of the European Atomic Energy Community (Euratom) and EU policies. Furthermore, the panel concluded that the JRC has a respectable scientific performance with a high standard when it comes to the scientific quality and impact of its publications. The experts based these conclusions on their direct observations and judgements of the JRC's work, complemented by related studies, analyses and surveys, which showed the quality of its science and the effectiveness of the scientific support provided by the JRC.

The panel also acknowledges the JRC's continuous evolution, which has developed from an organisation purely orientated towards nuclear research, when it was set up more than 50 years ago, into an organisation with a broad scientific policy-support mission, keeping up with the enlargement and the needs of the EU.

Besides this broadly positive assessment, the experts also provided recommendations and suggestions for the further development of the JRC under the current Framework Programme, Horizon 2020, which runs until 2020.

In their recommendations, the panel flags two issues which would mean a transformative change of the JRC, as the experts believe that it may well have reached an important point in its evolution. Thus, they have come up with strategic recommendations which, in their view, would allow the JRC to operate even more effectively.

First, they mention the need for the JRC to establish a long-term strategy before the mid-term evaluation of the Horizon 2020 Framework Programme, to be concluded in 2017. Secondly, the experts point out that as the JRC further develops its function as the Commission's scientific service, there is a need to address its governance and interaction with the scientific community in the Member States. In this context, the panel has proposed tasking a group of eminent personalities to put forward options for JRC governance, better adapted to future functions that would emerge from the long-term strategy.

The JRC has gratefully received the panel's positive assessment and has started working on the full implementation of the useful recommendations presented in the report.

Experts of the Ex-Post Evaluation.

First row (from left to right): Patrick Cunningham (Chair), Krzysztof Jan Kurzydłowski, Jozef Misak, Enric Banda, Hervé Bernard, Lena Tsipouri.

Second row (from left to right): Ruth Haug, Helena Lindberg, Diana Ürge-Vorsatz, Ralph Eichler, Marja Makarow, Peter Van Nes (Adviser to the JRC Director-General), Derek Lacey (no picture).

Read more

Ex-post Evaluation of the direct actions of the Joint Research Centre under the Seventh Framework Programmes 2007-2013: *europa.eu/!Hg96nm*

FACTS AND FIGURES (31 December 2015)

Staff

The total number of active staff working at the JRC on 31 December 2015 was 3003. Of the total, 69% worked in scientific institutes/directorates, and 31% carried out administrative or support activities in relevant directorates.

Research fellows

In addition to its core staff, the JRC proactively seeks to host researchers (grantholders and contractual agents), senior scientists, seconded national experts and trainees, primarily from the EU Member States and associated countries. They represented 52% of the JRC core research staff in 2015. Research fellows 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.

Total staff	F	M	Total
Permanent staff			
Officials	596	1207	1803
Research fellows in scientific institutes/directorates			
Trainees	21	18	39
Postgraduate and Post-doctoral grantholders	146	178	324
Contractual agents (FGIV)	159	231	390
Seconded national experts	3	29	32

Equal opportunities

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

	F
Senior management positions	27.3%
Middle management positions	16.18%
Non-management administrative positions	24.27%

As of 31 December 2015, women were represented in 23.9% administrators (AD) posts at the JRC, against a Commission average of 42.7%. The JRC will make a continuous effort in line with the Commission's objective to make the management ranks more reflective of gender diversity.

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 2015 budget was spent up to 31 December (in terms of available commitment appropriations, EFTA not included). In addition, € 27.8 million was made available spent for the programme to decommission the JRC nuclear installations, and to manage the waste activities related to the EURATOM Treaty. Additional credits of € 17.1 million were received from the contributions of countries associated to Horizon 2020.

Outgoing expenses (in million euro)	2015
Staff expenses	€ 233.3
Means of execution	€ 97.2
Operational appropriations (FP)	€ 34.7
Total	€ 365.2

JRC earned income

The cashed competitive income in 2015 amounted to € 70.3 million. The table below shows the value of contracts signed in 2015 until 31 December. 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.

Contracts signed (in million euro)	2015
Indirect actions (framework programme)	€ 7.7
Support to Commission services	€ 58.1
Third party work	€ 8.1
Total	€ 73.9

JRC in the media

JRC media coverage in 2015	
Number of press reports	2785
Number of very positive news items in top-tier media	142
Number of countries covered	80

Publications

JRC Publications in 2015	
Books and articles in peer reviewed journals[1]	987
Scientific, policy and technical reports	773
JRC contributions to policy documents	93
PhD Theses	11
Total	1864

[1] 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.

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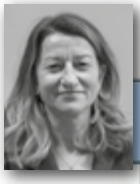

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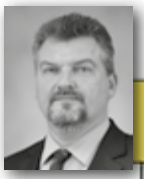

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Cover picture
Volvox *- Individual algae form spherical colonies. Joined together by strands of cytoplasm, which enable cell-to-cell communication, individual algae coordinate their flagella so that the Volvox moves in one direction. A great example of cooperation and its benefits.*

If you would like to learn more about the activities of the JRC, please contact:

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A great deal of additional information on the European Union is available on the internet.
It can be accessed through the Europa server.

EUR 27501 - JRC Annual Report 2015

Abstract
Report on the activities, accomplishments and resources related to the JRC's work carried out in 2015.
An overview is given of the scientific achievements and activities.

2015 –pp. 32 – 21.0 x 29.7 cm

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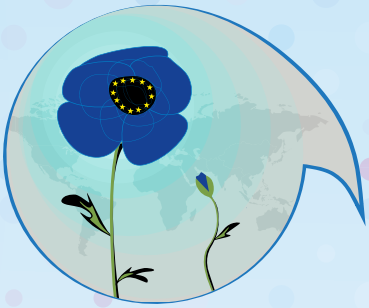

1,245 tweets exchanged during the conference

Building a resilient Europe in a globalised world

3,872,938 potential impressions made by the tweets

On 30 September 2015, the JRC together with the European Political Strategy Centre (EPSC) organised the annual event "Building a resilient Europe in a Globalised World" in Brussels. This event saw important discussion on different aspects of resilience between experts, representatives of the European Institutions and Member States, stakeholders from industry as well as academia. The conference was part of a series of JRC and EPSC events devoted to resilience. The annual conference attracted more than 400 participants and saw also the launch of the Knowledge Centre for Disaster Risk Management (DRMKC).

Review the conference and read the report:

storify.com/EU_ScienceHub

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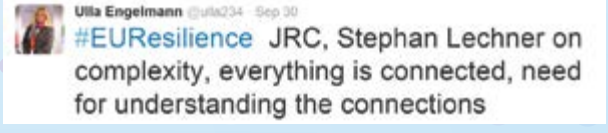
#EUResilience

the hashtag was trend number 2 in Belgium during the morning of the conference



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JRC Mission

As the science and knowledge service of the European Commission, our mission is to support EU policies with independent evidence throughout the whole policy cycle.

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