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JRC

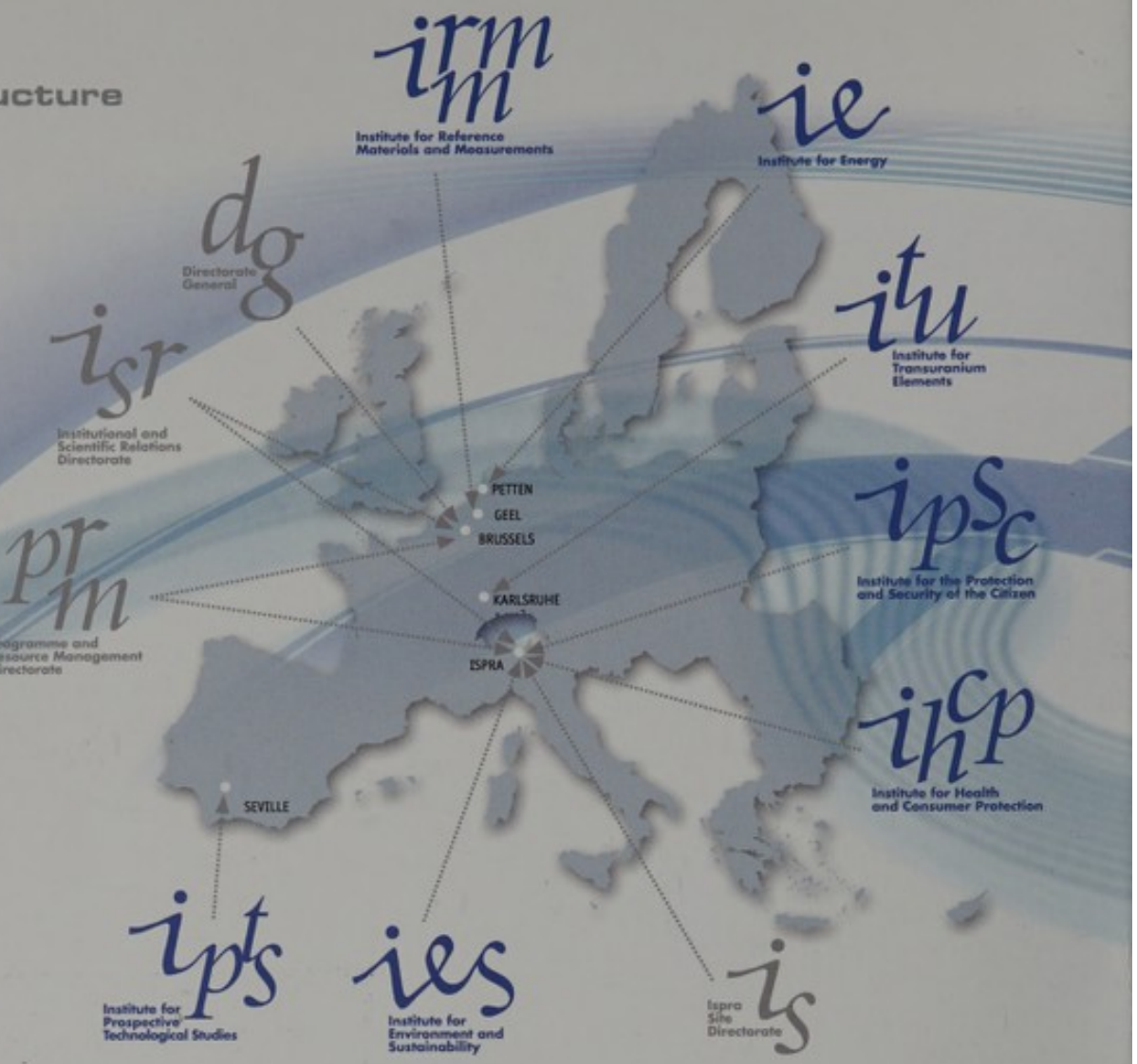
JOINT RESEARCH CENTRE
European Commission

ANNUAL REPORT 2006

JRC
EUROPEAN COMMISSION

Report EUR 22678 EN

JRC Structure



Joint Research Centre

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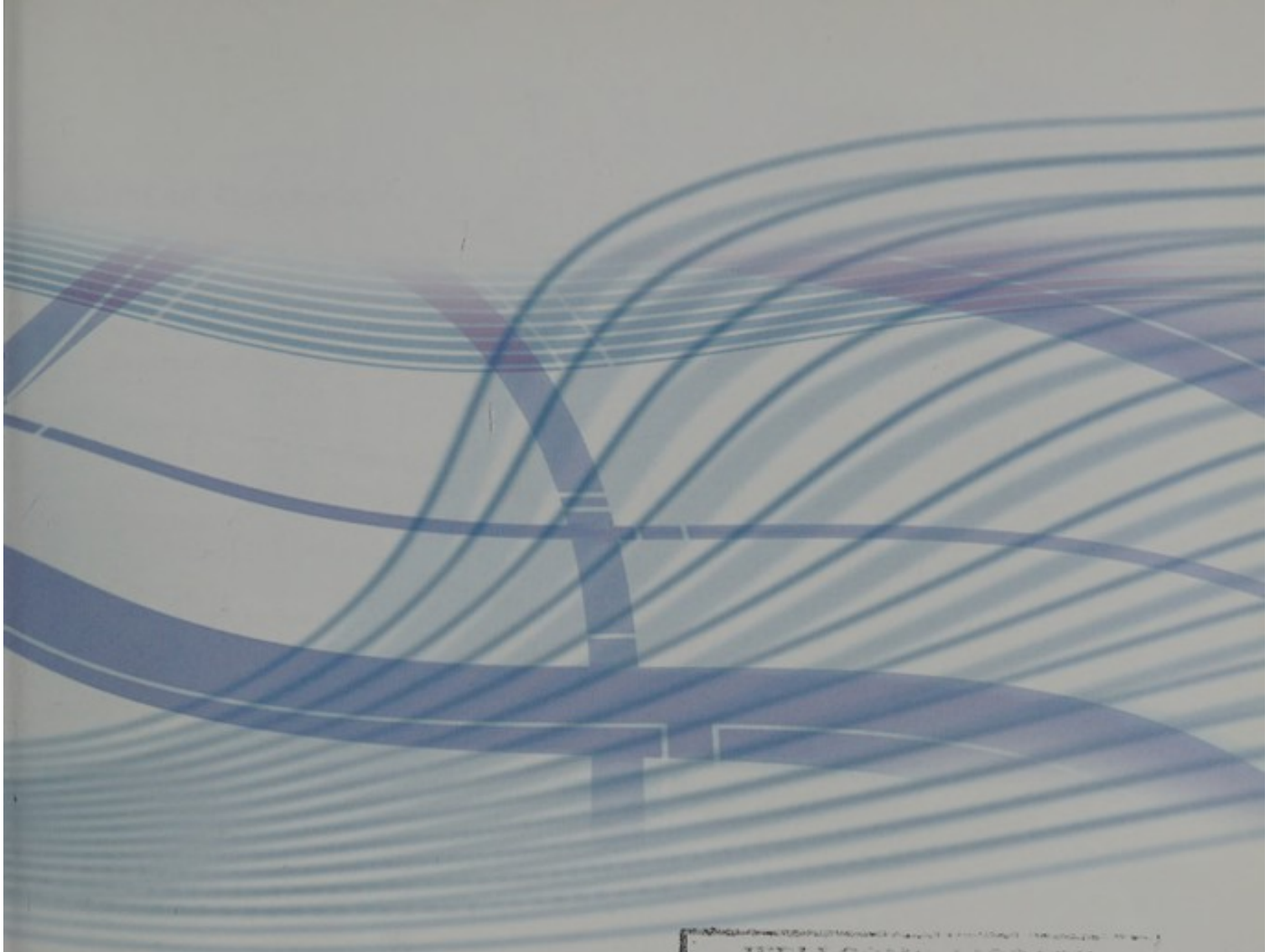
Mission

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.



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Foreword from the **Commissioner** for **Science and Research**

2006, the last year of the Sixth Framework Programme (FP6), ended with the Council and Parliament's successful adoption of the Seventh Framework Programme (FP7) for Research and Development, as well as the Specific Programmes. I consider that this is a very positive vote of confidence in research at European level. The considerable increase in funding available compared with the previous Framework Programme is a significant achievement and a great opportunity for researchers in the EU. It bears witness to the importance the Commission, the Parliament and the Member States attach to research in reaching the Lisbon targets. FP7 will provide a solid framework and financial basis for research in the EU over an extended period of time. It will also provide an important boost to basic research and scientific excellence through the European Research Council.

The smooth adoption of the Specific Programmes of the JRC is a sign of the appreciation by the Member States and the European Parliament of the work carried out by the JRC in FP6 and a confirmation of its role in FP7. The JRC should continue on its path to strengthen its scientific base and scientific excellence. For this reason, I have set a target of 15% competitive income in FP7 and in this way, the JRC will demonstrate its competitiveness on a par with other research organisations in Europe.

In 2006, the JRC continued to underpin research and work on an impressive range of policy files: from performing risk evaluation on chemicals (with the adoption of REACH) to support in detecting GM-contaminated rice, from predicting floods and fires to supporting the European energy policy. The list is long and the impact of the JRC's work is becoming more pronounced as well as recognised. I welcome the efforts to further extend scientific-technical support beyond the Commission to the European Parliament, the Council and to the Member States.

On 25 October, I visited the JRC Institute for Transuranium Elements (JRC-ITU) in Karlsruhe whose mandate it is to provide the scientific basis for protecting Europe's citizens against risks associated with the handling and storage of highly radioactive elements. No other civil laboratory in Europe offers such a broad range of analytical capabilities for nuclear material and its capabilities in basic actinide research are world class. It was especially rewarding to visit JRC-ITU in 2006, the 25th anniversary of collaboration with the International Atomic Energy Agency.

I extend my thanks to all JRC staff for their support in the adoption of FP7 and would like to encourage you to continue implementing your mission and contributing to scientific excellence and competitiveness. FP7 is a great opportunity for research and, the fact that you are continually asked to support many key policy files, makes me very optimistic about the JRC's contribution to this Framework Programme. I know I can count on you to keep up the good work.

JANEZ POTOČNIK

Commissioner Janez Potočnik at the JRC-ITU together with Roland Schenkel (Diretor General) and Thomas Fanghänel (Director JRC-ITU)

Observations from the **Board of Governors**

Board of Governors meeting in Karlsruhe, November, 2006

This report provides many examples of the impact the Joint Research Centre made in 2006 on the formulation, implementation and monitoring of EU policies, in particular those designed to protect human health, the environment and secure citizens against economic and technological risks. By way of example, the new chemicals legislation (REACH), adopted in December 2006, is largely based on the competence of the European Chemicals Bureau, which was established at the JRC over a decade ago. REACH is intended to make the European Union the most advanced region of the world in terms of regulating chemicals safety.

We are pleased to note that in 2006, the JRC continued to deliver rapid response scientific and technological (S&T) support to Commission services at times of crises, for example on the potential imports of GM-contaminated rice, the assessment of the needs for reconstruction in Lebanon and in the fight against illicit trafficking of nuclear materials.

The Board notes with satisfaction the further strengthening of the customer-driven orientation of the JRC, reflecting its mission statement. In endorsing the JRC specific programmes and Multi Annual Work Programme, the Board acknowledged the effectiveness of the arrangements for ensuring the relevance of the programmes to EU policy making. In this regard, the Board strongly encourages the JRC to continue building its scientific research base in order to underpin the continued provision of state-of-the-art S&T support.

In 2006, the Board supported a number of initiatives intended to strengthen the JRC's governance. A core value statement aiming at better profiling the organisation in terms of its fundamental principles and ethics was developed and guidelines were prepared towards upholding scientific integrity and veracity.

The Board constituted two ad hoc groups of Board members with the purpose of raising the visibility of the JRC and enhancing interaction with the Member States. The recommendations, which were agreed to by the Board and welcomed by the JRC, are now being implemented. They include the setting up of a network of National Contact Points to strengthen operational links with the scientific communities in the Member States, Associated Countries and Candidate Countries.

The Board commends the JRC management and staff on the progress made by the JRC in 2006 in fulfilling its mission while at the same time raising its scientific profile and presence in the media. We wish to record our appreciation to Commissioner Janez Potočnik for his vision and continuous support to the organisation.

FERNANDO ALDANA
Chairman of the Board

Message from the **Director General**

The key event of 2006 for JRC was undoubtedly the adoption of the Seventh Framework Programme for Research and Development and of the specific programmes. Our programmes were adopted smoothly, after approval by the Commission and the Board of Governors. This is an achievement of which we can all be proud.

In 2006, the trend continued of increasing requests from the Commission services, the Member States, the European Parliament, the Council and our partners (e.g. research bodies, universities, agencies, etc). We can largely attribute this to "living the mission statement", implementing key recommendations of the (external) five-year assessment, developing new scientific strategies and strengthening internal and external cooperation. Our change in work strategy to more strongly involving our customers and stakeholders in our governance and communicating our achievements to key stakeholders and the local and wider public, are clearly starting to pay off!

Our role as a scientific-technical reference centre continued to develop. In the 2005 annual report, I pledged to expand our role as Community Reference Laboratory (CRL) for food and feed safety topics of concern to Europe's citizens. In 2006, we opened four new CRLs to address those topics (details on page 7). We have continued to provide customer-driven scientific and technical support, and selected examples are documented in the "Support to Community Policies" section (pages 7 to 17) of this report. Highlights from the seven Institutes (pages 24 to 38) are also included as well as our contribution to enlargement, the integration of new Member States, technology transfer, press and media actions and JRC infrastructural progress. In 2006, we also continued to nurture and expand collaboration networks, promoted recruitment and exchange programmes for Europe's best scientists, its training programmes and use of JRC facilities. In line with this theme, a section of this report has again been dedicated to young scientists' awards and their innovative achievements in 2006 (pages 18-23).

2007, the first year of FP7, will be a challenging year. It will entail the fine tuning of the Specific Programmes and focusing and integrating our research activities with particular emphasis on the socio-economic aspects of our work, as requested by our customer DGs, MEPs and Commissioners. Commissioner Potočnik has set ambitious targets, including 15% competitive income and we have exciting policy files on the agenda to which we will provide support and overcome the scientific challenges required to do so. In my second year as DG (Director General), I am fully committed to continuing this development. We will start FP7 with a substantially rejuvenated senior management (further rejuvenation to be completed during 2007) – this is both an opportunity and a challenge, coming at the changeover from FP6 to FP7. I acknowledge and thank our staff as well as outgoing Directors for ensuring a smooth transition period.

Attendance at Roland Schenkel's end of year address to all staff in the JRC

Finally, I wish to thank Commissioner Potočnik for his support and guidance, the Board of Governors for their constructive advice, our customers and partners, for whom we provide S&T support, and all JRC staff for their dedication and support.

ROLAND SCHENKEL

Four new Community **Reference Laboratories** for Food Safety

In 2006, the Commission designated the JRC as Community Reference Laboratory (CRL) in four different areas, namely food contact materials, heavy metals, mycotoxins and polycyclic aromatic hydrocarbons (PAHs) in food and feed. With the establishment of the four new CRLs under its responsibility, the JRC is now managing six in total. The JRC's Institute for Reference Materials and Measurements (IRMM) has also been appointed Chair of the coordinating board of experts for monitoring water in poultry, which carries out tasks similar to those of the CRLs.

The CRLs work together with networks of National Reference Laboratories (NRLs) in the Member States. Their main tasks – developing and validating methods of analysis, producing standards, as well as organising comparative and proficiency tests – are core activities of the JRC.

CRL for Food Contact Materials

The Community Reference Laboratory for Food Contact Materials (CRL FCM) was officially inaugurated on 7 December 2006 by Robert Madelin, Director General of the Health and Consumer Protection Directorate General.

Food contact materials, which are essential in processing, transport and storage of food, must comply with EU legislation. CRL FCM will provide National Reference Laboratories with harmonised analytical methods and reference substances and materials, and will work closely with them to ensure the harmonised enforcement of EU food contact materials legislation across the EU Member States.

Official inauguration of the CRL FCM on 7 December, 2006

CRL for Heavy Metals in Feed and Food

European legislation sets maximum levels of heavy metals such as lead, mercury and cadmium, in food and feed. The task of the CRL is to facilitate the implementation of those rules by coordinating and monitoring the measurement capabilities of the national reference laboratories analysing these metals in feed and food.

CRL

CRL for Mycotoxins

About 20% of food products, mainly of plant origin, can potentially be contaminated with mycotoxins, toxic compounds naturally produced by several species of fungi. To protect the consumers, European legislation sets maximum limits for their content in food and feed. The CRL for mycotoxins in food of plant origin and animal feed has been established to facilitate the development, improvement and application of methods of analysis and sample preparation for the official control of these maximum levels.

CRL for Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) in food are formed as a result of combustion processes of organic substances. PAH contamination in food is largely related to production practices but can also be caused by contamination of the environment.

This CRL assists the national laboratories of the Member States by developing and validating methods of analysis of these compounds, and by helping harmonise official controls.

25 years and the **International Atomic Energy Agency**

For the past year, Nuclear Safeguards has been high on the political agenda with headlines such as the first test of a nuclear device by North Korea and concerns that Iran's nuclear fuel enrichment programme may not solely have energy-related aims. The International Atomic Energy Agency (IAEA) is the UN's "nuclear watchdog", responsible for applying Nuclear Safeguards throughout the world.

On 4-5 October, 2006, the JRC celebrated the 25th anniversary of the European Commission's Support Programme to the IAEA. The JRC's other main "client" in its Nuclear Safeguards work is the Commission's own Directorate General for Transport and Energy.

Nuclear Safeguards can perhaps be best described as "the first line of defence for keeping nuclear materials under control". This entails checking and ensuring that nuclear materials are used for peaceful purposes (e.g. energy, research, medical or other applications). Internationally, this is regulated by the Non-Proliferation of Nuclear Weapons Treaty (NPT), to which 188 states belong. Under the NPT, the IAEA is responsible for performing Nuclear Safeguards throughout the world. This is done routinely at over 900 facilities in 61 countries.

For the past 25 years, the JRC has delivered technical instruments and equipment to the IAEA. This includes a laboratory robot for chemical separations and plutonium inventory instruments delivered to the on-site laboratory at the Nuclear Reprocessing Plant in Rokkasho, Japan.

It has developed a novel automated system for Inspectors to verify that a complex nuclear installation is built according to the declared design. This system is based on 3D laser technologies and software and can detect changes introduced within a plant to millimeter accuracy. Since its initial deployment at the Rokkasho Reprocessing Plant in Japan, the system was successfully tested by an independent safeguards laboratory and is now used on a routine basis by the IAEA.

The JRC has analysed hundreds of "dust" samples taken from IAEA inspections across the globe for fissile material, such as highly-enriched uranium. It also has provided, and continues to provide, isotopic reference materials and conduct international measurement evaluation programmes for laboratories engaged in nuclear measurements.

Commissioner Janez Potočnik assured the JRC's continuous support to the IAEA by stating that "Work on Nuclear Safeguards is extremely important for global security. Our work with the IAEA will remain fundamental to what we do in this field. I am sure the next 25 years will be as successful as the last".

IAEA's Deputy Director General and Head of the Safeguards Department, Olli Heinonen said "the Joint Research Centre has provided us with tremendous scientific and technical support which has enabled us to perform our duties". This has had a positive impact on the safety and security, not only of the citizens of the European Union, but also for people worldwide."

Scientist analysing seized nuclear material using mass spectrometry

Route-based Risk Analysis helps **Combat Fraud** and **increase Global Security**

The JRC has developed "ConTraffic", a system based on route-risk analysis which can make a significant contribution to the fight against fraud, and increased global security. The system can identify false declarations of origin, which can be made to circumvent anti-dumping duties, and reduce smuggling of counterfeit goods, nuclear materials or weapons.

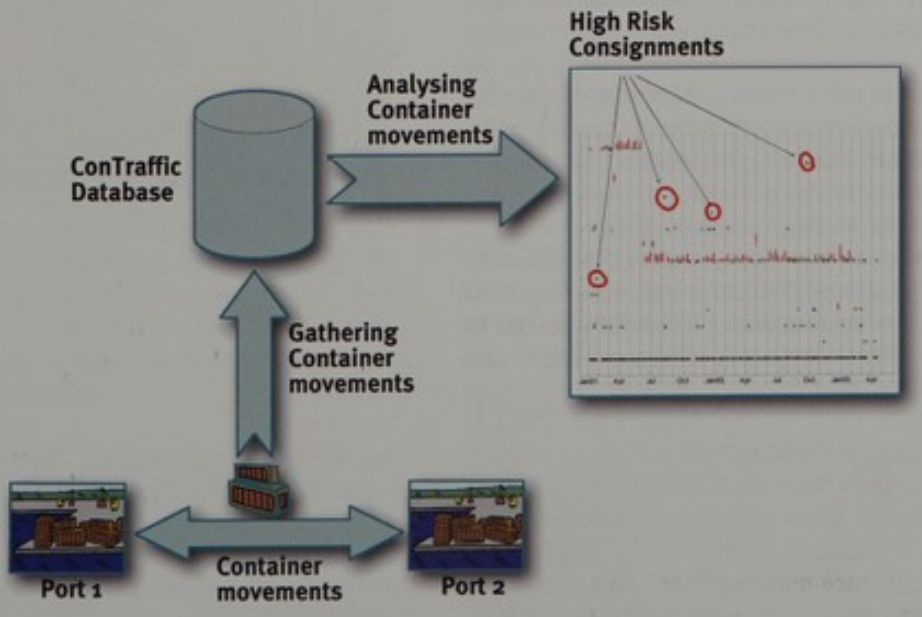
90% of the world's cargo is transported in maritime containers, but only 2% is physically inspected by customs authorities. This increases the risk of illicit activities, such as avoiding customs duties, circumventing quotas or smuggling. Therefore, a method is needed to control and monitor containerised cargo. An information-based system using risk analysis is therefore a very effective way to identify high-risk consignments and target physical checks where needed.

Risk analysis has been used by customs authorities for some years to detect suspicious cargoes. The introduction of ConTraffic means authorities can now analyse risk, based on the routes taken by the containers at a global level. The routes include the port where the container was loaded, any transit ports and the port where the container was eventually unloaded. This information is gathered from web-based open sources.

The ConTraffic database has more than 220 million records relating to more than 4.4 million containers over a period of three and a half years. It also keeps information on more than 2.6 million containers by seven leasing companies. While the database is not yet complete, it nonetheless contains enough information to allow a route-based risk analysis on a sound statistical basis.

In 2006, as part of EC-US Customs Cooperation on transatlantic supply chain security, the JRC participated in the EC-US trans-shipment pilot exercise. The EC-US Customs Cooperation is considered to be an essential instrument contributing towards combating international terrorism. The scenario prepared by the Taxation and Customs Union DG involved a significant input from ConTraffic, which was applied by the JRC's team to container shipment information delivered regularly by the US to the Commission during the exercise. The aim of the pilot exercise was to explore ways to improve the effectiveness of identifying high-risk containers destined for the USA via European ports, whose real country of origin has been concealed.

ConTraffic is currently being expanded to address the movement of security-sensitive goods. It should then be able to provide new indicators to support control operations at ports, particularly in the context of the Container Security and Proliferation Security Initiatives. Eventually it will also feed into a common set of minimum risk rules for container security in the EU.



Supporting the **"Energy Package"**

"Energy for a changing world"

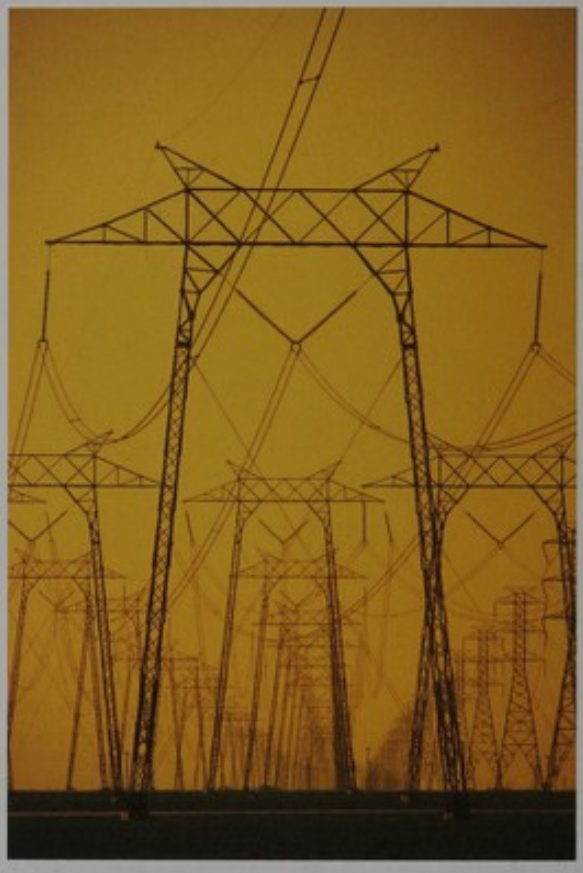
During his visit to the Energy Research Site at Petten (The Netherlands), the Energy Commissioner, Andris Piebalgs, underlined the need to act immediately to ensure a secure energy supply for Europe. Recalling that the EU currently imports 50% of its energy (rising to 70% within 25 years), the Commissioner advocated exploring all sources of energy and called for greater energy savings and efficient energy use. It is estimated that the EU could save at least 20% of its present energy consumption per year.

In 2006, the JRC provided input to the EU's energy policy documents and reacted to the growing importance of energy policy on the worldwide political agenda. It did this by increasing liaison and stepping up activities with the policy Directorates-General (DGs) of the EC and with the European Parliament. Together with at least six DGs, experts from a number of the JRC Institutes were involved in the Commission's "integrated energy and climate change package to cut emissions in the 21st century". The topics, with which the JRC was involved, included:

- an energy efficiency action plan;
- low-CO_2 fossil power generation;
- progress report on biofuels;
- a renewable energy road map;
- prioritised actions for strengthening the EU's energy infrastructure;
- a European approach to nuclear power, safety and security and
- the outline of a Strategic Energy Technology Plan for the EU.

These documents, known collectively as the Energy Package, were adopted by the Commission in January 2007. The implementation of the action plan and work on the Strategic Energy Technology Plan will be the main focus of the JRC's contributions to energy policy in 2007 and beyond.

The rise of the energy topic on the EU policy agenda has also led to the JRC playing a part in a number of energy-related European Technology Platforms (hydrogen and fuel cells, zero-emission fossil fuel power generation, electricity networks of the future, biofuels, photovoltaics). These platforms bring stakeholders (policy-makers, scientists, regulators, NGOs etc.) together to formulate and implement a strategic research agenda and associated implementation plan on energy topics deemed of crucial importance for the EU, and for which the necessary financial means may only be mobilised through public-private partnerships.



Electricity pylons in the sunset

Response to
Crises in 2006

The JRC has supported the European Commission's effort to enhance its crisis preparedness and response capability by developing a better capacity for early warning, alerting, situational awareness/ monitoring and impact assessment.

Response to Lebanon crisis and Indonesia earthquake

In reaction to the Lebanon crisis in 2006, the JRC contributed to the EU's rapid response by:

- performing an impact assessment of the oil spill which occurred following the damage to a power plant on the coast;
- performing a rapid, satellite-based, damage assessment over southern Lebanon and Beirut which was used by the EU delegation at the Donor Conference and then by the Government of Lebanon and
- providing the proposal for a Spatial Database Infrastructure comprising information related to damages, EU funded projects and their execution, in support to the Community funded reconstruction programme.

The JRC's expertise was used in 2006 to set up the Commission's portals for the Lebanon crisis and the Indonesia earthquake. These emergency platforms integrate relevant information, news and maps related to a crisis or disaster and facilitate secure information exchange within the relevant Commission services and delegations. The Indonesia earthquake portal had more than 1000 accesses per day.

Response to forest fires and flood events in 2006

In August 2006, Galicia (Spain) and northern Portugal experienced a large number of forest fires that were monitored closely through the JRC's risk forecast and rapid damage assessment tool, the European Forest Fire Information System (EFFIS). The mapping of forest fire damages was performed in near-real time and results were sent to the pertinent Spanish and Portuguese authorities and to the European Parliament.

As in previous years, Europe was hit by severe flooding in 2006. The European Flood Alert System (EFAS) monitored the snowmelt driven floods that affected mostly the Elbe and Danube river basins from March to April 2006. The national authorities in the relevant countries received early flood information more than five days in advance. In 2006, a total of 141 Early Alert Reports were issued for 20 incidents.

Damage assessement has been done using photo-interpretation of post-conflict Ikonos satellite imagery over Beirut recorded on 19 August, 2006

Response to the detection of unauthorised Genetically Modified rice

In August, the European Commission was alerted to the potential contamination of US-imported long-grain rice with a non-authorised Genetically Modified (GM) strain (LLRice 601). In response, the JRC Community Reference Laboratory for GM Food and Feed (CRL-GMFF) immediately verified the detection method for the identification of LLRice 601 and published the protocol within the same month. The protocol, used to test rice shipments, directly supports the EU emergency measures put in place as a consequence of the alert. Analyses revealed up to 20% to be contaminated in traces. The CRL-GMFF plays a key role in the validation and verification of GM detection methods in general, to assure accurate traceability and labelling of approved GM products, and to help safeguard the EU from unauthorised substances.

Rice sampling for the presence of LLRice601 in the harbour of Rotterdam

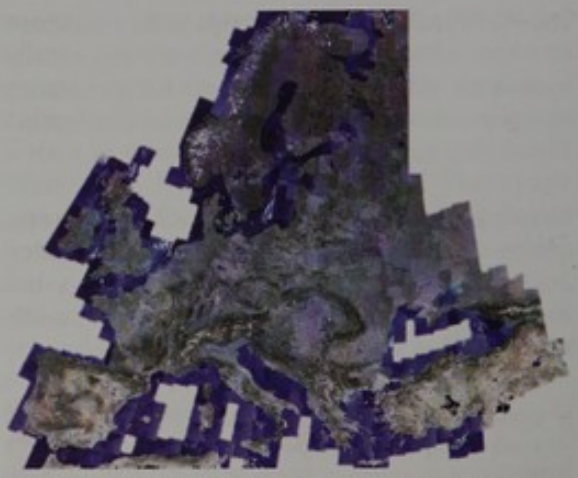
Infrastructure for **Spatial Information in Europe**

Most of the information needed to support environmental policy in Europe is strongly related to the location where natural phenomena occur. Although there have been major improvements in the availability and quality of information systems handling geographic and environmental information, there are still major barriers that make it difficult to share and use this information across national boundaries on the European level.

For this reason, in 2004 the European Commission adopted a proposal for the establishment of an Infrastructure for Spatial Information in Europe (INSPIRE). Its purpose is to enable to find data relevant to a specific environmental problem, understand their structure, content and quality across multiple languages, administrative systems, and scientific disciplines, process the data into relevant information and communicate this information to the interested parties in a timely manner. Following two years of intensive negotiations, the European Parliament and the Council found an agreement in November 2006 on the text of the Directive, which will come into force in Spring 2007.

The JRC has played a key role in the development of the INSPIRE proposal in partnership with the Environment Directorate General and the European Statistical Office, EUROSTAT. A Memorandum of Understanding among these three organisations signed in 2006 recognises the contribution of the JRC and gives it responsibility for the overall technical co-ordination of the Directive.

The JRC developed and hosts the European Geo-portal, designed to be the main entry point into geospatial information in Europe



The JRC processed the IMAGE2000 satellite image mosaic of Europe, a fundamental layer for the Infrastructure for Spatial Information in Europe (INSPIRE)

The activities undertaken by the JRC in 2006 include:

- providing scientific support to the preparation of the technical rules on data harmonisation, documentation, and the network services necessary to discover, view, and download data. This will facilitate the coherent implementation of the Directive;
- developing a prototype "European Geo-portal", an internet-based facility required by the Directive to provide a single point of entry to the environmental and geographic infrastructures maintained by the Member States and
- establishing a new organisational structure dedicated to spatial data infrastructure research and implementation, well connected with international standardisation initiatives and spatial data infrastructures in the US, Canada, and the United Nations. Strong connection with the Global Earth Observation Community is ensured by co-chairing the Architecture and Data Committee of the Global Earth Observation System of Systems (GEOSS).

2006 has been a major milestone for INSPIRE and in particular for the JRC through the recognition of its scientific and technical contribution to this key Directive. With the full implementation of INSPIRE foreseen by 2013, the European Union will be in a much stronger position to develop and monitor environmental policy based on sound scientific knowledge.

Coexistence of **Genetically Modified (GM)** and **non-GM Crops in Europe**

Coexistence refers to the ability of farmers to choose between conventional, organic or Genetically Modified (GM) crop production, in compliance with the relevant EU legislation on labelling and/or purity standards. EU regulations establish a 0.9% labelling threshold for the "adventitious" – unintended or unavoidable – presence of GM material in non-GM products. So far, EU experience with the commercial cultivation of GM crops and practical coexistence measures is limited to GM maize in some Member States.

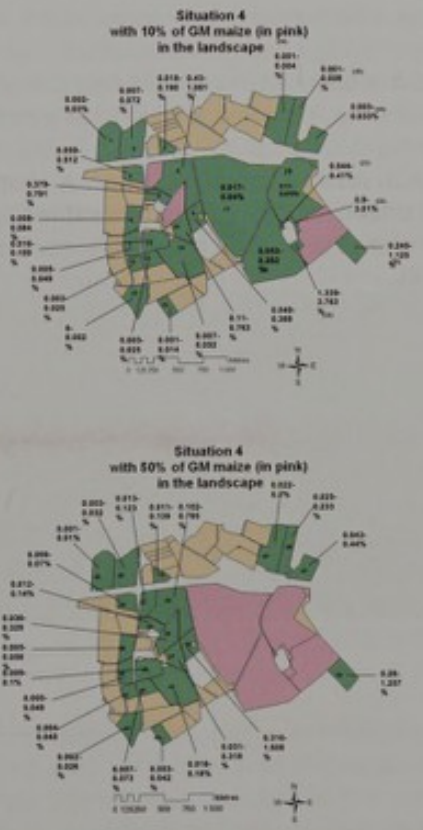
Genetically modified corncob (Bt maize)

Since agriculture does not take place in a closed environment, complete segregation cannot be guaranteed. However, the case studies carried out by the JRC conclude that, for the crops studied, the application of feasible coexistence measures could help limit final admixture in harvests to within EU labelling thresholds. This would therefore protect farmers from the possible economic consequences of accidental GM mixing. In 2003, the Commission adopted guidelines to assist Member States develop their own science-based measures for co-existence. Within this context, the JRC was requested to study how farmers could reduce the presence of GM material in non-GM harvests and to rank measures based on their cost-effectiveness.

A consortium led by the JRC selected a number of European case studies covering crop and seed production of maize, sugar-beet and cotton. The final analysis, published in 2006, led to the development of a tool allowing the estimation of adventitious admixture of GM and conventional crops in a given landscape. The methodology used takes advantage of sophisticated computer models to simulate gene flow, combined with Geographical Information Systems (GIS) data picturing European agricultural landscapes and economic analysis. This allowed the JRC to evaluate the cost-effectiveness of proposed agronomic measures to ensure coexistence.

These case studies concluded that coexistence in crop production at the 0.9% labelling threshold set by the Commission is feasible, with few or no changes in current agricultural practices for most crops. However, for maize, additional measures are necessary for some fields particularly affected by cross-pollination due to shape, size and relative position with respect to prevailing winds and distance from neighbouring GM fields. The report further details and reviews the effectiveness and feasibility of such measures.

This report has been widely disseminated to Member States during 2006 and is regarded as an important science-based reference to support future design and implementation of coexistence measures within the EU. Following the Spring 2006 Agriculture Council conclusions, the Commission has the mandate to develop, in cooperation with Member States, best practices for technical segregation measures leading to commonly accepted crop-specific recommendations.



A digital version of the agricultural landscape of the Poitou-Charentes region (France) used to study coexistence between non-GM and GM maize crops (A). Fields devoted to non-GM (green) or GM (pink) maize are shown. Gene flow models were used to produce an estimation of the adventitious presence of GM maize grains (in %) in the conventional maize harvested in each field

Nine New **Alternative Methods** for **Testing Pharmaceuticals/Chemicals**

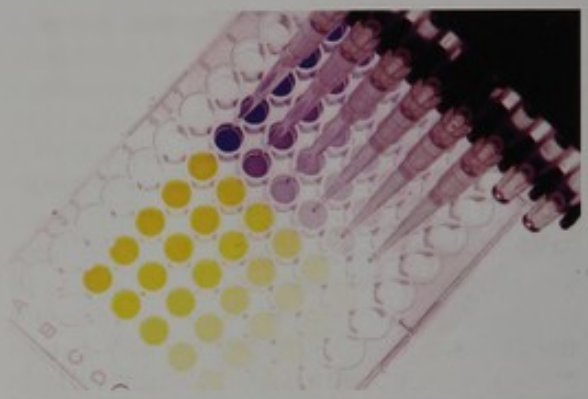
During 2006, the Scientific Advisory Committee of the European Centre for the Validation of Alternative Methods (ECVAM) endorsed the scientific validity of nine alternative testing methods. Eight of the new methods will either replace the equivalent animal-based test methods or substantially reduce the number of animals to be tested. The other method can be used as an alternative to the current regulatory *in-vitro* test.

Five of the alternative *in-vitro* test methods use human blood cells for detecting possible contamination of pharmaceuticals with fever-inducing substances. Although based on the same principle and with similar performance, each method has its own particular set of advantages which makes it preferable to a given application of the test. The principle of the methods relies on cytokines, released by the cells in case of contamination, which can be detected using biochemical techniques.

A further method provides the means of predicting the maximum tolerated dose for chemotherapeutic drugs which would otherwise require testing on dogs. Using bone marrow culture from mice and cord blood cells from humans, the method decreases the risk of an initial lethal overdose – something that cannot be identified during current preclinical testing strategies. The test has been demonstrated to provide more accurate predictions than the traditional animal-based tests.

Zebra fish (Danio rerio), used in aquatic toxicity testing – courtesy of Prof. T. Braunbeck, University of Heidelberg, Germany

The endorsement of another method is based on the validation of a model for skin corrosion and uses human cultured skin thereby replacing testing on rabbits. Another method is an *in-vitro* micronucleus test, having the potential to detect genotoxic aneugens (chemicals which induce numerical chromosome changes) which might be missed by the current mutagenicity tests. It is also less costly, easier to perform, and lends itself to automation.



Performing an Enzyme Linked Immunoassay (ELISA)

And finally, there is a reduction method which, simply by modifying the steps in the current testing strategy for acute aquatic toxicity testing, could reduce the number of fish to be tested by up to 60%.

2006 also celebrated the 15th anniversary of ECVAM and provided a landmark occasion for the public launch of the database service DB-ALM. The service provides factual information in the form of evaluated data-sheets on various aspects of advanced and alternative techniques for toxicology assessment. The database draws on more than 10 years of results and since its launch on 29 October has received more than 300 registrations.

On 18 December, the European Partnership for Alternative Approaches to Animal Testing (EPAA) organised its second annual conference entitled "Europe goes alternative – looking beyond animal testing". At the event, Commissioner Potočnik stressed the importance of the 3Rs principle which lies at the heart of the work on alternative methods. He even proposed to add 2 new "Rs" to this principle: firstly reliability and then research. He repeated his commitment to research to develop reliable alternatives so we can refine, replace and reduce animal testing in the future.

Support to Policies via **Economic Analysis**

CRELL
Centre for Research on Lifelong Learning

Internal Market

The JRC supported the revision of a Directive on Deposit Guarantee Schemes (how banks should protect customers in the event of a crisis in the banking system) with an analysis included in a Commission Communication. Published on the Internal Market and Services (MARKT) DG's official website, these results helped the Commission to negotiate with stakeholders. Similarly in May 2006, the Commission published a working document on "Clearing and Settlement" in the EU. The econometric part of the study was run by the JRC econometricians under the guidance of the Impact Assessment Steering Group chaired by DG MARKT. Based on the results, the Commission demanded industry to commit itself to improving transparency and increasing competition. The study is regularly cited by institutions (e.g. the European Central Bank) and private market participants.

Competition

The econometric work performed by the JRC formed an important part of a sector inquiry into retail banking conducted by the Competition DG. A report on payment cards was published in April 2006; a second report on current accounts was presented at a public hearing in July 2006. The final results of the inquiry were released in January 2007. Moreover, the JRC contributed to a second inquiry into business insurances, with an interim report published in January 2007.

Growth and Stability

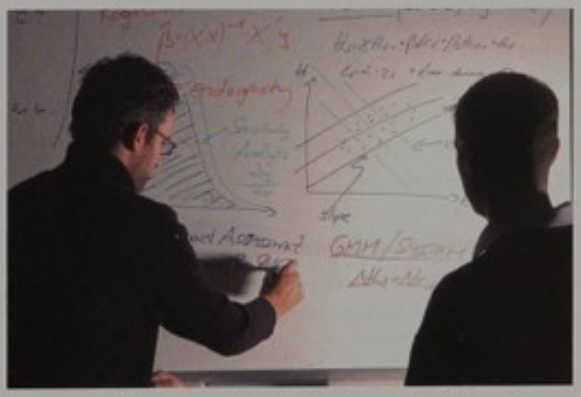
The JRC modelling work was retained by the Economic and Financial Affairs (ECFIN) DG in the EU Economy 2006 Review, which stated "The model [QUEST] is an extended version of a DSGE (Dynamic Stochastic General Equilibrium) model for the Euro area, which was developed and estimated jointly by DG ECFIN and the Joint Research Centre".

Innovation

The JRC contributed to the European Innovation Scoreboard with two reports on strengths and weaknesses of European countries in innovation also using the recent Community Innovation Survey (CIS4). The JRC contributed to the e-Business readiness index published on the annual European Spring Council 2006.

Education

JRC-CRELL (Centre for Research on Lifelong Learning based on Indicators and Benchmarks) provided input to the Education and Culture (EAC) DG for the working paper "Progress towards the Lisbon Objectives in Education and Training", May 2006, and published methodological reports on "Measuring Active Citizenship" and "Vocational Education and Training." CRELL cooperates with Commission services and international organisations (OECD and IEA) in data collections such as the European Social Survey, the EU-Labour Force Survey, the European Indicator on Language Competencies (EILC) and the European Pilot Project on learning to learn. More information is available at www.jrc.cec.eu.int/uasa.



"Econometricians at work at the JRC Ispra" - designing the sensitivity analysis for the Clearing and Settlement impact assessment

New Member States, **Candidate Countries** and **Associated Countries**

During 2006 the JRC continued its programme to consolidate the Scientific and Technical (S&T) integration of the 10 new Member States (MS10) across its activities and projects. Special attention was given to the needs of the then Acceding Countries (AC), namely Bulgaria and Romania, which joined the EU on 1 January, 2007, and Candidate Countries (CC), Croatia, Turkey and the former Yugoslav Republic of Macedonia (FYROM). The programme was also opened to the Potential Candidate Countries (PCC), namely Albania, Bosnia and Herzegovina, Montenegro and Serbia – including Kosovo.

A large audience attended the Croatian JRC Information day in Zagreb, on 20 June 2006, which was opened by Dragan Primorac, Minister of Science, Education and Sports of Croatia

The mission of the Enlargement and Integration Action (E&IA) of the JRC is to stimulate the integration of S&T organisations and researchers from the MS10, CCs, PCCs, and from countries which are associated to the Framework Research Programmes FP6, into relevant JRC activities. The E&IA uses a number of integrated instruments, such as scientific and technical collaboration, hosting temporary staff at JRC Institutes, organising workshops and training courses and disseminating information within the target countries. Highlights from 2006 include:

- Some 100 workshops and training courses on various S&T aspects of EU policies have been organised by the JRC Institutes, with the participation of over 4000 experts from ministries, authorities, research Institutes and controlling bodies coming mainly from the Enlargement countries, but also from the (old) MS and third countries. Collaboration with DG Enlargement's Technical Assistance and Information Exchange (TAIEX) unit has continued in particular in the areas of agriculture and food safety. All these workshops were also opened, on a selective basis, to experts from EU neighbouring countries in Northern Africa and Eastern Europe.
- A number of JRC Information Days were held in 2006, namely in Romania, Bulgaria and Croatia, involving some 700 participants. These, together with a visit of a high-level Turkish delegation to JRC Institutes, increased the number of networks and collaborations between ACs, CCs and the JRC. In order to trigger new partnerships with leading S&T organisations in the MS10, in 2005 the JRC developed a new instrument called "The Round Table". Directed at focusing collaboration on the priority research needs of these countries, Round Tables were organised in Hungary, Lithuania and Malta in 2006.
- The JRC fosters collaboration with the FP7 Associated Countries, notably EFTA (e.g. Switzerland and Norway, Iceland and Liechtenstein) and Israel. The visit of the State Secretary for Education and Research, Charles Kleiber, led to setting up a strategic collaboration and arranging a JRC Information Day to be held in Switzerland in 2007.
- Collaboration with the European Committee for Standardisation (CEN) continued, particularly through participation in CEN-STAR (Standardisation and Research) and including coordination of initiatives in Enlargement countries.

Petre Stanciu, Director of the Romanian Meteorological Institute INMH, and Roland Schenkel, Director General of the JRC, signing the Memorandum of Understanding between their institutions, on 11 May 2006 in Bucharest, Romania

Snapshot Examples of **Support to EU Policies**

- Developed and validated analytical methods for cocoa butter needed to implement the Chocolate Directive 2000/36/EC.
- Contributed to the draft Commission decision on the intercalibration exercise for implementing the Water Framework Directive (WFD) through securing the first common criteria (approved by experts from the Member States) on the ecological quality of surface waters.
- The European Commission adopted (in its Decisions C(2006) 2994 from 4 July and C(2006) 3469 from 7 August) eight Best Available Techniques Reference (BREF) documents which were elaborated by the JRC for issues concerning large combustion plants, emissions from storage, economic and cross-media effects, waste incineration, waste treatments industries, surface treatment of metals and plastics, organic fine chemicals and food, drink and milk.
- To support Council Regulation (EEC) No 793/93 on the risk evaluation of priority chemicals, input from the European Chemicals Bureau (ECB) led to publishing several risk assessment results and proposals for risk reducing measures in the Official Journal, including a 3rd Commission Regulation and a Commission Communication. Furthermore, at its joint meeting in February 2006, the OECD formally adopted 86 harmonised templates for summarising data in study reports related to chemical substances and their hazards.
- In support to the Fisheries and Maritime Affairs (FISH) DG, the JRC has applied an Ecosystem Health Indicator to FAO fisheries data over 50 years and in all defined FAO areas. Preliminary results have shown a continuous decline, from the 1970's, in the world marine ecosystem health and thus the need for more effective policy measures.
- A report on the release of toxic substances released from the use of toys (blast stinkers) was delivered to the Health and Consumer Protection (SANCO) DG in response to RAPEX notifications from Poland and the Czech Republic. This is an example of fast reaction from the Commission to RAPEX notifications from Member States.
- The JRC delivered a background paper for the preparation of the EU-OPEC third Ministerial Meeting (June 2006) to the Energy and Transport (TREN) DG. The paper emphasised the expected evolution of crude oil flows in the forthcoming ten years, based on current trends.
- The JRC was invited by the Government of Romania to attend the "National Exercise on Preventing and Combating Nuclear Terrorism" in May 2006. The exercise was organised by the National Commission for Nuclear Activities Control (CNCAN) and the Romanian Intelligence Agency (SRI).
- Support was provided to EuropeAid (AIDCO) DG for the Safety of Russian and Ukrainian Nuclear Power Plants. Through technical and financial assessment of tenders for equipment, input was provided to the Russian Nuclear Power Plant (NPP) of Beloyarsk, Ukrainian NPP in Khmelnitsky and the Russian NPP in Novovoronezh.
- The JRC provided scientific expertise to the European Parliament for its position on the REACH legislation and thus facilitated the successful adoption of REACH.
- Provided information on the "Impact of Clean Coal Technologies" to the European Parliament. This was on request of MEP Buzek and in collaboration with DG TREN.
- For DG SANCO, the JRC (1) evaluated three species/animal specific Polymerase Chain Reaction (PCR) methods for the detection of banned meat and bone meal in feed and (2) finalised and submitted two studies to enforce the requirements for the use of processed proteins in feed as specified in Regulation 1774/2002.
- Via DG TREN, the Dutch police asked the JRC to analyse uranium seized in The Netherlands. A number of samples of nuclear and radioactive materials were seized including depleted uranium metal, uranium oxide and thorium oxide.
- The JRC, as Community Reference Laboratory (CRL) for GM Food and Feed, validated detection methods for sugar beet H7-1 and the modified hybrid cotton line 281-24-236/3006-210-23, respectively. As required by Regulation 1829/2003, the CRL transmitted these reports to the European Food Safety Authority (EFSA) for inclusion in its Opinion to the Commission.
- Daily reporting on Avian Flu using the JRC-developed European Media Monitoring (EMM) system was used by Commission staff in DGs SANCO, External Relations (RELEX), Enlargement (ELARG), AIDCO, Development (DEV), and Environment (ENV).

Best Young Scientist

Blackburn E. (JRC-ITU). Neutron Scattering Studies of Actinide Compounds.

The actinide series plays host to a wide range of exotic chemistry and physics. As such, actinide compounds are important test beds for our understanding of modern quantum physics. However, because of the radio-toxicity of this series, such materials can only be handled at a limited number of sites around the world, of which the JRC-ITU is a prominent member.

Through close collaboration with the European neutron and X-ray scattering large facilities based in Grenoble, France, it is possible to investigate the microscopic structural and magnetic characteristics of actinide compounds directly. This affords us a unique insight into what makes these materials tick.

One recent material of interest has been UPd_2Al_3. This material has the rare property of being both magnetic and superconducting at the same time. The magnetic component is large, when compared to similar materials such as those containing cerium. This means that UPd2Al3 is perfect for studies trying to unravel the interplay between these two, often antagonistic, phenomena. Neutron scattering is sensitive to magnetic moments, and much progress has been made towards understanding the effect of the magnetic structure on the electron dynamics. (Physical Review B 74, 024406 (2006)).

By looking at these dynamics on nanosecond timescales (Physical Review Letters 97, 057002 (2006)), using the apparatus shown in the photo above, we have been able to distinguish between the two main theoretical models for the superconductivity in UPd_2Al_3, giving us an important clue in deciphering the behaviour in other materials.

1. Elizabeth Blackburn graduated in 2002 from Cambridge University with a first-class degree in natural sciences and completed her PhD in 2005 at the Université Joseph-Fourier I, Grenoble, in physics as one of the JRC-ITU grantholders. She is currently at the University of California, San Diego.

Three Best Peer-Reviewed Scientific Papers

1. Mollicone D., Eva H. D. and Achard F. (JRC-IES). Human role on Russian wild fires. Nature, 440:436-437. 2006.

This publication drew a great deal of attention from the scientific community and will perhaps lead to an opening up of a debate on the role of forest fires in future climate mitigation policies.

Satellite image (MODIS) at 1 km resolution depicting Fires along the Lena River in Eastern Siberia on 19 August 2002. Image size: around 200 km x 300 km. Boreal forests appear in green, fires in red and smoke trails in white

The paper provides estimates of the number of forest fire events across boreal Russia from 2002 to 2005. The spate of forest fires in northern Russia has coincided with climate extremes in 2002-2003, so not surprisingly anthropogenic climate change has been suggested as a cause. A detailed survey of fires in the region confirms that over 87% of the fires are "anthropogenic". This means they are directly related to what humans do in forests and are not mediated by climate.

The fact that human activity is driving over 87% of the fires in the boreal Russia region is a surprising but convincing finding.

The climate effect is currently felt more through the combination of climate anomalies with human activities than through a direct climate impact which will take longer to materialise. In the meantime, changes are taking place at a truly rapid rate. Whether climate change will exacerbate man's impact on its environment should now be the dominant question.

2. Danilo Mollicone graduated in 1996 from the University of Rome and completed his PhD in Forest Ecology from the University of Padova in 2002. He worked at the JRC from 2000 to 2005 as grant holder and research assistant. Danilo is now at the Max Planck Institute of Biogeochemistry in Jena, Germany.

3. Hugh Eva has worked as a Research Officer at the JRC since 1997. He graduated from Cranfield University and completed his PhD from the Catholic University of Louvain-la-Neuve in 1999. He specialises in the use of remotely sensed data for mapping fires and forests in tropical and boreal ecosystems.

4. Frédéric Achard graduated from Ecole Polytechnique in 1984 and completed his PhD at Toulouse University in 1989. He has worked as a Research Officer at the JRC since 1992, specialising in Earth observation techniques for forest monitoring in the Tropics and boreal Eurasia, with implications for the global carbon budget.

Collage to depict alpha-immunotherapy

2. Apostolidis C., Molinet R., Rasmussen G. and Morgenstern A. (JRC-ITU) Production of Ac-225 from Th-229 for Targeted Alpha Therapy. Anal. Chem. 77 (2005) 6288-6291.

Alpha-immunotherapy (AIT) is a novel and promising strategy for the therapy of cancer and infectious diseases. The treatment is based on the coupling of alpha-particle emitting radionuclides to target selective carrier molecules such as monoclonal antibodies or peptides (see Fig. below). Due to the high linear energy transfer of alpha particles and their short path length in human tissue (‹0,1 mm), a highly cytotoxic radiation dose can be delivered to targeted cells, while damage to surrounding healthy tissue is limited.

The alpha emitter Bi-213, available to hospitals via a radionuclide generator loaded with its mother nuclide Ac-225, is currently most applied in AIT. The authors report a process for the production of quality controlled, clinical-grade Ac-225/Bi-213 radionuclide generators. It is based on the combination of ion exchange and novel extraction chromatographic methods, complemented by radiometric and mass spectrometric quality control, and yields a product of high purity. With this process, the JRC-ITU has been the first laboratory worldwide to provide the rare isotopes Ac-225/Bi-213 in sufficient quantity and purity to hospitals and cancer research centres for pre-clinical research and clinical studies.

JRC-ITU has supplied in excess of 200 Ac-225/Bi-213 generators to partners worldwide. Close to 100 patients suffering from leukemia, Non-Hodgkin's lymphoma, malignant melanoma or brain tumours have been treated using the clinical grade Ac-255/Bi-213 prepared by JRC-ITU.

5. Alfred Morgenstern received his PhD in radiochemistry from the Technical University in Munich in 1997. Following postdoctoral studies at Florida State University in the field of plutonium chemistry, he joined the JRC in 2000 to develop actinide separation methods. Since 2003 he has been focusing his research on therapeutic applications of alpha emitting isotopes.

6. Christos Apostolidis received his PhD in metallo-organic chemistry from the University of Heidelberg in 1982. Following his postdoctoral research at the Institute for Radiochemistry of the Technical University in Munich, in 1986 Christos joined the JRC to work on nuclear waste reprocessing, analytical and coordination chemistry. He has been responsible for the alpha-immunotherapy action at JRC-ITU since 1988.

7. Roger Molinet joined the JRC in 1967 as a laboratory technician to support the development of mass spectrometric and analytical methods. For 15 years he has worked on the alpha-immunotherapy project. Roger retired in October 2004.

8. Gert Rasmussen was educated at Aarhus Technical College and Aarhus University, Denmark in instrumental analytical chemistry. He worked at the University of Southern Denmark doing research on ion-molecule reactions. Since 1989, he has worked at the JRC-ITU on analysis of nuclear materials by mass spectrometric techniques.

3. Ibarreta D., et al. Putting pharmacogenetics into practice (JRC-IPTS). Nature Biotechnology. 2006 Apr;24(4):403-10.

The paper represents the summary of studies in the field of pharmacogenetics that were carried out by JRC-IPTS in 2005 (EUR 22214). The study globally maps and evaluates major private and public sector players in the pharmacogenetics scene. Comprehensive industry activities tables demonstrate the obvious lead of the US over the EU. The study focused on identifying key barriers hindering wider implementation of pharmacogenetics technologies in clinical care.

Lack of comprehensive cost-effectiveness studies on the use of pharmacogenetics tests as part of the drug prescribing process is cited as a prime barrier to implementation of pharmacogenetics technologies in the clinical setting. To help overcome this barrier, this study has examined the cost-effectiveness of pharmacogenetics diagnostics in Germany, Ireland, The Netherlands and the United Kingdom, using two case studies: HER2 testing in breast cancer and thiopurine methyl transferase (TPMT) testing in childhood leukemia. The study concludes that for these case studies, pharmacogenetics diagnostics are definitely cost-effective.

The regulatory scene for pharmacogenetics drugs and diagnostics was examined and the lack of EU-wide harmonisation of regulations for diagnostics and drug/test co-development pinpointed as a potential hurdle in the field.

These results were instrumental in developing the specific lines of funding related to pharmacogenetics in FP7.

9. Dolores Ibarreta is a molecular biologist with a PhD in genetics. Before joining the JRC, she worked as a researcher at Georgetown University Medical Center (US). Since 1999, she has been working at IPTS on the analysis of the socio-economic impacts of new health-related biotechnologies in Europe.

Three Awards for Support to EU Policies

1. Shepherd I. (JRC-IPSC), Papatryfon I. (JRC-IPTS), Schrimpf W. (JRC-IES). Support to the EU's Emerging Maritime Policy.

A team from three JRC Institutes took part in the process leading to the release by the Commission of a Green Paper on Maritime Policy in June 2006.

Many of the issues incorporated scientific elements. The JRC chaired working groups looking at maritime and marine monitoring and related data. Analysis indicated that authorities responsible for monitoring vessel traffic would benefit from integration of separate systems for fisheries control, navigation safety and maritime security as well as shared assets such as satellite observation systems. Similarly European cooperation within many individual sectors – fisheries, pollution control, oceanography – is good, but poor communication between them leads to duplication and fragmentation of physical, chemical and biological data. This limits opportunities for the development of commercial value-added services and reduces the ability of scientists to assess threats such as the environmental impact of fishing or the global-warming induced rise in sea-level. Proposals for a more sustainable and cost-efficient system were developed.

Black sea dolphins

Finally, a JRC paper on the potential economic benefits of marine biotechnology in areas such as pharmaceuticals and food production was welcomed as a contribution towards improving the competitiveness of the EU in a dynamic knowledge-driven economy – the Lisbon goal.

Better data on ice-melting in Greenland and the Antarctic would reduce uncertainies in future sea-level rise in Europe

Diesel powered ice breaker-Kapitan Dranitsyn, 1998

10. Iain Shepherd is a graduate in physics who has been involved from the outset in the JRC's efforts to support the Common Fisheries Policy – first on technologies to monitor compliance with the rules and later to support the scientific advice needed to frame these rules.

11. Ilias Papatryfon BS, PhD has been a member of the Sustainability in Agriculture, Food and Health unit of IPTS since 2004; he is mainly involved in carrying out and coordinating research on (bio)technology assessment in support of policy development as well as on related policy analyses and impact assessments.

12. Wolfram Schrimpf has a Dipl.Ing. in mechanical engineering and a Dr.Ing. in civil engineering. He is presently involved in the execution and coordination of coastal and marine research activities, monitoring and assessment of marine ecosystems and implementation of institutional projects for policy support to the coastal and marine environment. He is an Action Leader at JRC-IES.

2. Delgado Sancho L. and Aguado-Monsonet M.A. (JRC-IPTS). Supporting the European Environmental Policy.

The European Integrated Pollution Prevention and Control Bureau (IPPC) of JRC-IPTS is a prime example of JRC support to the implementation and further development of the European environmental policy. The robustness of the Bureau stems from four elements: neutrality, transparency of the process, technical competence and stability.

2006 was an important year for the Bureau because the work programme, co-decided between the JRC and the Environment DG back in 1997, was completed. The Bureau delivered the first versions of no less than 32 BREFs (Best Available Techniques Reference Documents). When the Commission adopts BREFs they are published in the EC Official Journal and are publicly available from http://eippcb.jrc.es. These documents are the cornerstones for implementing the IPPC Directive. In 2006, the Bureau also started to broaden its focus to include the reviewing of existing BREFs.

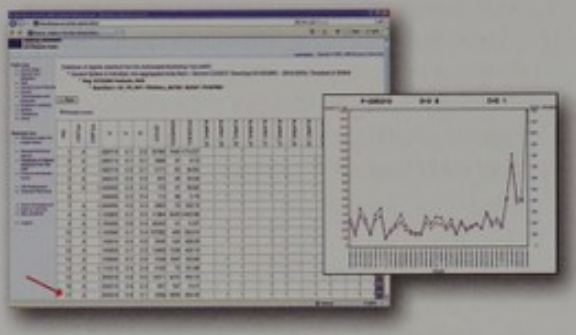
The work of the Bureau is a collective effort. For this award, the Bureau was represented by Luis Delgado Sancho, Acting Head of the Bureau, and Miquel A. Aguado-Monsonet, who has been working within the Bureau since 1999 and who is the author of two BREFs and co-author of another one.

Meeting of the Pulp and Paper BREF working group, 13-15 November, 2006

13. Luis Delgado Sancho is an agriculture engineer and economist. He has been an official in the European Commission since 1987. He has worked in the Agriculture and External Relations DGs and as Member of a Commissioner's Cabinet. Since 1999, he has been an action leader in the JRC-IPTS.

14. Miquel A. Aguado-Monsonet has a PhD in chemical engineering. He has professional experience in environment, energy and several industrial sectors. He joined the JRC in 1993 taking charge of energy-related projects, coordinating stakeholders' working groups and helping in the coordination of the European IPPC Bureau.

3. Arsenis S., Karvounaraki A., Sgarlata G. and Fayl J. (JRC-IPSC). Support to Anti-fraud Policy.



Extract from the Theseus Website

Diverse frauds against the budget of the European Community give rise to unexpected and strong increases in reported trade of the particular product and the countries of origin and destination. Depending on the trade dataset explored, the presence of such increases, called spikes, may indicate wide ranging fraud control problems such as stockpiling before EU enlargements, fraud in payment of export refunds, and deflection of trade to evade import duties or quotas in force for imports into the EU.

A statistical data mining procedure has been developed and applied for detecting spikes in trade datasets in order to scan large, appropriately compiled trade datasets, for signalling out trade flows suspicious for fraud against the Community budget. This approach has produced results that enable monitoring numerous regulations on enlargement, agriculture and customs.

While the volume of such results is drastically reduced, the results are of considerable complexity due to options made in the detection procedure. The web is perfectly suitable for the representation, storage, and dissemination of results to interested experts in the European Anti-fraud Office (OLAF), customs, control and anti-fraud agencies in the Member States. By December 2006, the website THESEUS (http://theseus.jrc.it), where results are published, was already being used by approximately 65 authorised users in 17 agencies. In 2006, the team took the opportunity to present their work to Commissioners Potočnik and Kallas and to other Director Generals.

15. Spyros Arsenis studied mathematics and statistics at Columbia University (A.B. Cum Laude 1975, M.A. 1977) and MIT (PhD, 1985). He is interested in statistical pattern recognition, statistical data mining, asymptotic and Bayesian estimation. Working at the JRC from 1990, he currently leads the JRC Institutional action on "Statistics for Anti-fraud".

16. Athina Karvounaraki studied statistics in the Athens University of Economics and Business (1991), and Computational Statistics at the University of Bath, (MSc, 1992). As of 2000, she works at the Joint Research Centre on anti-fraud projects. She applies statistical data mining methods and is author or co-author of several European Commission technical reports.

17. Giuseppe Sgarlata graduated in computer science at the University of Milano. He designed and developed databases and the websites in various Europa website projects. Since 2005, he has worked in the JRC on the design and implementation of the THESEUS website and explores database driven solutions to make it completely dynamic.

18. Jagello Gilbert Fayl studied economics and political sciences at the University of Copenhagen and Business and Administration from the Copenhagen Business School. Since 2004 he has been working in the JRC on data analysis, programming in SAS and Web publishing of results. He is interested in data mining, structuring knowledge for web-based dissemination and international trade.

Two Awards for Technical Support

1. Spruyt P. (JRC-IPSC). Support to the Post-Tsunami Assistance Package.

1. *Installing DGPS reference station in Hambantota (Sri Lanka)*
2. *Destroyed city of Banda Aceh (North Sumatra)*

On behalf of the External Relations DG and financed by the European Commission, the JRC provided hands-on support to the post-tsunami assistance package. The author was selected for the job on the basis of his expertise in land-surveying techniques, ortho-rectification of Very High Resolution (VHR) imagery and GIS. In this context, he carried out two 2-week trips in order to deliver VHR imagery and to start the ortho-rectification process together with the national authorities of both Sri Lanka and Indonesia. The main tasks during these trips were capacity building and the transfer of know-how to the local technical staff in Banda Aceh (north Sumatra) and Colombo (Sri Lanka) in:

- handling of VHR imagery IKONOS and QUICKBIRD
- processing the image data using ortho-rectification and pan-sharpening techniques
- land-surveying using Global Positioning systems high end dual frequency carrier-phase receivers for Ground Point Collection
- different aspects in Geographic Information systems.

Training of the local staff in DGPS ground point collection (Sri Lanka)

The author's work was considered as an essential contribution to helping post-tsunami reconstruction in both Sri Lanka and Indonesia.

19. Peter Spruyt was born on 1964 in Gent, Belgium and studied land-surveying at Gent Industrial-High-School. He started working for the Flemish government in 1987, joined the JRC in 1997 and today he works in the Management Support Unit at JRC-IPSC.

2. Harskamp F. (JRC-IE) Building a Tank Testing Facility for the Safety of New Energy Systems.

The JRC-IE was requested to construct a tank testing facility to evaluate the performance of hydrogen storage tanks under simulated working environments. The 180 litre tanks are subjected to 1000 cycles – filled to 340 bars within 3 minutes and emptied in less than 20 minutes – which corresponds to a normal vehicle's life time. In order to conduct such tests in a safe environment, a "Bunker" was constructed with a 1 metre composite wall (30 cm concrete, 30 cm polystyrene, 40 cm concrete) designed to contain an explosion equivalent to 50 kg TNT (Tri-nitro-toluene). A 3 metre thick layer of sand, with a layer of geo-textile every 30 cm, covers the bunker on 3 sides. The entrance to the facility is sealed by a 40,000 kg door in order to retain any potential shockwaves. The gas system also comprises a 1,500 litres buffer at 200 bars which allows the hydrogen to be re-cycled using a special compressor. The leak rate is measured by placing the tank in an aluminium tube filled with helium linked to a gas chromatograph capable of measuring hydrogen in low concentration ranges. The aluminium tube is in turn placed within a pressure vessel filled with nitrogen.

Cross section of the bunker

20. Freek Harskamp graduated from the Technical College Santpoort in The Netherlands in 1980 as a Mechanical Engineer and started working for the Royal Volker Stevin the same year. He joined the JRC in Petten in 1986 as a laboratory technician for Dr E. Lang and is currently the manager of the SYSAF (SYStems for Alternative Fuels) laboratories.

Excellence Awards Ceremony in Ispra, 2006

JRC Institute for Reference Materials and Measurements

The mission of the JRC-IRMM is to promote a common and reliable European measurement system in support of EU policies.

The JRC-IRMM has a long history in validating methods of analysis, producing measurement standards and organising comparative and proficiency tests. Today, these are the core activities in its work programme that is largely based on the needs of other Directorates-General of the Commission. This kind of expertise is also key for operating Community Reference Laboratories (CRLs). In 2004 JRC-IRMM became the CRL for feed additives' authorisation. In 2006, its mandate was extended to also cover feed additives control, and the JRC-IRMM was designated as the CRL for heavy metals in feed and food, for mycotoxins and for polycyclic aromatic hydrocarbons (PAHs). In addition, JRC-IRMM was appointed Chair of the coordinating board of experts for monitoring water in poultry, similar in function to the CRLs. In 2006, JRC-IRMM has also continued its modernisation plan to upgrade its accelerator facilities.

Besides operating the CRLs, JRC-IRMM runs many interesting research projects. These projects range from developing new reference materials for genetic testing to the analysis of semicarbazide in food and complex organic pollutants, measuring neutron cross-sections and radioactivity in the environment or studying how to distinguish organically grown crops from those grown conventionally. Common for all is the drive to create *confidence in measurements*.

JRC-IRMM runs an International Measurement Evaluation Programme (IMEP)

New reference materials for life sciences

JRC-IRMM is one of the largest reference material providers in the world. In 2006, the reference materials programme of JRC-IRMM resulted in 24 new sets of certified reference materials being released for distribution.

JRC-IRMM was the first to produce reference materials for the analysis of Genetically Modified Organisms (GMOs). Certified reference materials are needed for calibrating the methods used to quantify the GM content and for controlling the quality of measurements. Implementing EU legislation on labelling of food and feed products containing GMOs largely depends on the accuracy and reliability of those measurements. The new series released in 2006 include certified reference materials for the analysis of GM cotton, sugar beet, starch-modified potato and two for GM maize. The release of these new products has brought the number of certified GMO reference material sets to 14.

In 2006, JRC-IRMM also released its first certified reference materials for genetic testing. The three certified reference materials have been developed for the detection of G20210A mutation in the human prothrombin (Factor II) gene, and are suitable for the quality control of polymerase chain reaction (PCR) -based methods. The certification covers the sequence of the 609 *bp* human prothrombin gene fragment included in a plasmid.

Another highlight in 2006 was two new certified genomic DNA reference materials for the analysis of food-borne pathogens. These reference materials can be used as positive control materials for the detection of *Escherichia coli* O157 and *Listeria monocytogenes* by diagnostic PCR methods, or for harmonising and validating those methods.

The certified reference materials of JRC-IRMM are produced under the European Reference Materials (ERM®) label that guarantees the use of best practices in production and certification.

Studies on semicarbazide

Semicarbazide is a metabolite of nitrofurazone, an antibiotic that is banned from use within the EU. It was measured to detect illegal use of nitrofurazone until it became known that nitrofurazone is not the only source of semicarbazide in processed foods. It may also be formed by other reactions

e.g. during a hypochlorite treatment, or it may be transferred from gaskets used in jars. Semicarbazide is a weak genotoxic and carcinogenic agent but its occurrence in baby food is a considerable concern. Certain gasket materials have, however, already been phased out to avoid this problem.

When the problem was acute, JRC-IRMM and its collaborators developed sensitive methods to detect semicarbazide in different types of baby food, eggs and egg powder at levels as low as 10 ng/g. These methods were validated by interlaboratory comparisons, and in 2006 a proficiency test organised by JRC-IRMM showed that European laboratories' performance, in relation to measuring semicarbazide, is good. A validated method was used to monitor semicarbazide in 107 different baby food products produced in 11 European countries, purchased at local supermarkets in 14 Member States. Results showed that the semicarbazide content ranged from below 0,2 ng/g to 50 ng/g.

Interlaboratory comparisons

JRC-IRMM organises interlaboratory comparisons for many purposes. JRC-IRMM runs an Interlaboratory Measurement Evaluation Programme (IMEP), a Regular European Interlaboratory Measurement Evaluation Programme (REIMEP) for nuclear measurements, and an Interlaboratory Measurement Evaluation Programme for Nuclear Signatures in the environment (NUSIMEP). In 2006, JRC-IRMM was running an evaluation campaign on the analysis of sulphur in diesel, on the analysis of trace elements, polychlorinated biphenyls (PCBs) and PAHs in sewage sludge, and on measurements of isotopes of plutonium and uranium. Other interlaboratory comparisons dealt with PAHs in edible oils and primary smoke condensate, semicarbazide in baby food and in egg, and evaluation of the comparability of data collected by the JRC-IES from laboratories measuring radioactivity in the environment.

Neutron cross sections for transmutation studies and reactor calculations

Lead is an important element for studies on how to minimise highly radioactive waste. It is the coolant in Accelerator Driven Systems (ADS) and in one of the new Generation-IV systems. In 2006, the measurements of $^{206,207,208}Pb$ neutron inelastic scattering and (n,2n) cross sections were completed at JRC-IRMM. Exceptionally good energy resolution and accuracy were attained. These results, together with measurements of the neutron capture and total cross sections of ^{206}Pb of JRC-IRMM, will allow improved reactor calculations.

In 2006, JRC-IRMM investigated also the energy spectrum of neutrons emitted after fission of ^{235}U, which is the most important isotope for energy production in a reactor. The Working Party on Evaluation Cooperation of the OECD Nuclear Energy Agency requested this investigation as the accuracy of experimental data and theoretical modelling for this process is still insufficient. New measurements were started to attain a better accuracy and statistical precision. The first results have revealed discrepancies with theoretical models, and indicate an angle dependence of the spectrum overlooked so far.

JRC-IRMM is one of world's largest reference material producers

The mission of the JRC-ITU is to provide the scientific basis for the protection of the European citizen against risks associated with the handling and storage of highly radioactive elements.

Nuclear waste: spent fuel characterisation

Main progress in 2006 concerned the effects of alpha-decay damage accumulation in solid waste form. Unequivocal evidence to show that the macroscopic properties and microstructure alterations associated with accumulating radiation damage are not dependent on the decay dose rate, was obtained.

A new approach was introduced to perform source term studies on Mixed Oxide (MOX) fuel: the Knudsen cell method was used to estimate the grain boundary inventory of the fuel, in addition to traditional leaching tests. Similar parallel analyses were performed to compare the information obtained from leaching with the outcome of electrochemistry measurements. Data obtained on the secondary phases formed on corroded iron under reducing conditions, showed incorporation of actinides in the newly precipitated phases.

Nuclear waste: partitioning and transmutation

In 2006, the fabrication and characterisation of physical and thermal properties of two Molybdenum based composite nuclear fuels was successfully completed. This material will be irradiated in the Phénix reactor in France within the FUTURIX irradiation programme of the EUROTRANS integrated project. This experiment will provide essential data concerning the behaviour under irradiation of these advanced fuels.

Pyro-partitioning of actinides from fission products was demonstrated by using a high liquid level waste (HLLW) from PUREX reprocessing of uranium oxide and MOX fuels containing 600ppm of transuranium elements and 2000 ppm of fission products.

Safety of nuclear fuel

JRC-ITU secured a seat on the steering committee of the international Nuclear Fuel Industry Research Program (NFIR) project. This project investigates the high burn-up properties of uranium oxide and MOX fuel and the role of the high burn-up structure on fuel disruption during a reactor power transient. Initial investigations have already confirmed the "superplastic" behaviour of the unique microstructure.

Further progress to note was the inclusion of a model for hydrogen absorption in the TRANSURANUS fuel performance code by the cladding of a VVER (Russian-type reactor) during a loss-of-coolant accident.

In May, a workshop focusing on the application of microbeam analysis techniques to nuclear fuels was held in Karlsruhe. The event was judged a great success by both participants and organisers.

Commissioner for Science and Research J. Potočnik handling a piece of plutonium crystal in a glove box

Basic research on the actinides

JRC-ITU's position, as the European laboratory focal point for actinide materials, fundamental physics and chemistry, has been strengthened by a) the progress made in understanding the nature of the magnetic and non-magnetic correlations in strongly correlated electron systems, and b) by stimulating the access of external users to our facilities (Actinide User Laboratory, ACTINET). The thermodymamic assessment of molten salt reactor systems and innovative nuclear reactor systems of the next generation was another priority.

Two nuclear science training courses were organised, four PhD theses successfully presented, and the new edition of the Karlsruhe Nuclide Chart completed. "Preparing the Future" was addressed by the organisation of a workshop on the chemistry and physics of actinide molecular clusters in November.

JRC-ITU
Karlsruhe, Germany

Alpha-immunotherapy

The application of alpha emitters for therapy of cancer and infectious diseases was further developed in 2006. Radiochemical support along with 31 shipments of quality controlled, clinical grade Ac-225/Bi-213 were provided to hospitals and cancer research centres in Europe, USA and Australia for pre-clinical studies and clinical trials. In collaboration with the Albert Einstein College of New York, the successful targeting and killing of HIV-infected cells using a Bi-213 labelled monoclonal antibody in an animal model was reported for the first time.

Radiobiological studies in cooperation with the University of Düsseldorf led to the identification of time- and dose-dependent patterns of alpha-induced effects in a human lymphoma cell line at transcriptional level, accompanied by the functional characterisation of irradiated cells.

Visit of the JRC-ITU laboratories by H. Fenrich, Mayor of Karlsruhe, and first attempt to manage the telemanipulators for working in the hot cells

Mapping radionuclides in biological tissues

Secondary Ion Mass Spectrometry (SIMS) has been successfully applied to the mapping of Boron (10B) in brain tissues and of Technetium (99Tc) in heart tissues, in collaboration with the Istituto di Fisiologia Clinica (CNR, Pisa) and the University of Pisa. The sample preparation and its preservation during the transport from Italy to Germany was a critical step in both experiments.

The mapping of Boron helps to understand the mechanism of its absorption in the cell, contributing to the optimisation of the Boron neutron capture cancer therapy. Technetium is tested as a tracer for studying some cardiovascular pathology.

Nuclear Safeguards

In 2006, JRC-ITU's support to the IAEA focused on its On-Site Laboratory at the Rokkasho Reprocessing Plant in Japan, which is starting operation. Calibration of a measurement instrument, training of IAEA staff and development of software for a specifically developed measurement device, were performed.

The operation of the Energy and Transport (TREN) DG's on-site laboratories at the two large European reprocessing plants in Sellafield (UK) and La Hague (F) continued, taking into account the new Safeguards strategy of DG TREN.

In the area of nuclear security, support was provided to the IAEA for drafting documents related to illicit trafficking of nuclear materials. Two training courses on "response to illicit trafficking of nuclear materials" were jointly organised with the IAEA and held at JRC-ITU. At the request of a Member State, three samples of seized nuclear material were subjected to nuclear forensic investigations at JRC-ITU.

Group picture in front of the Karlsruhe castle on the occasion of the 7th European Microbeam Analysis Society (EMAS) Regional Workshop

The mission of the JRC-IE is to provide scientific and technical support for the conception, development, implementation and monitoring of Community policies related to energy.

Rising oil prices, diminishing supplies of fossil fuels and concerns about global climate change, air quality and reliable sources of energy have moved the energy topic up high on the political agenda. In the EU, this is clearly manifested by the active follow-up requested by the European Council to the Commission's March 2006 Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy.

Support to current and future reactor safety

1. Stress corrosion cracking evaluation under both current and future reactor conditions

Work in 2006 continued on the evaluation of material susceptible to stress corrosion cracking under both current and future reactor parameters. In the frame of the PERFECT project, cold worked AISI 304 stainless steel was tested under BWR (Boiling Water Reactor) conditions by means of fracture resistance measurements and constant load stress corrosion cracking tests.

AISI 316L stainless steel and WWER (Water Energy Reactor) 1000 reactor pressure vessel steel with cladding were also tested. The crack growth initiation and propagation was monitored in-situ by potential drop measurements and fracture surfaces were examined by scanning electron microscopy. The parameters crack growth rates da/dt and J-integrals were calculated to describe the conditions of the crack growth. A new improved generation of bellows based loading system was also designed and manufactured.

A new autoclave and a high-pressure loop for testing of materials in parameters of future Super Critical Water Reactors (SCWRs) were installed, and first tests evaluating coupon tests of corrosion properties of materials for SCWR internals at 600°C and 250 bar were carried out.

2. Safety of Innovative reactor designs

The final preparation and successful start of a new HTR pebble fuel irradiation test took place in the High Flux Reactor (HFR) in Petten including the related new ancillary systems. The test comprises reference fuel from former German production and newly produced Chinese fuel. The irradiation will last for approximately 2 1/2 years and the results concerning fission product release at very high burn-up will be shared within the European High Temperature Reactor Technology Network (HTR-TN).

Work has continued on the feasibility and safety analyses of innovative nuclear reactors, and has focused on the GIF concept Lead-cooled Fast Reactor. It has been shown that this type of reactor works well for different fuel cycle options such as Plutonium (Pu) burner (burning material from light water reactors and decommissioned weapons) and Pu breeder (allowing uranium reserves to be enhanced by a factor of 50).

Fuel cell stack undergoing testing in the Petten facility

Support towards the realisation of the hydrogen economy

The Fuel Cell Testing Facility conducts comprehensive testing and evaluation of Proton Exchange Fuel Cells (PEFC) stacks, components and systems under conditions that typically exist in stationary and transport applications. The facility is used to:

- characterise fuel cell performance: in 2006, tests at ambient conditions were conducted within ongoing FP6 projects particularly the CELINA (fuel CELl application IN a new configured Aircraft) STREP, while testing of a 96 kW fuel cell module was performed for a Dutch fuel cell manufacturer under a third party contract; and
- validate and benchmark fuel cell testing procedures, measurement methodologies & protocols: a test campaign was started in the frame of the IE coordinated FP6 project FCTESQA (Fuel Cell Testing, Safety & Quality Assurance) STREP involving leading laboratories from Europe, North America and Eastern Asia. The FCTEST-NET protocol was applied to a 11 kW PEFC stack to assess stack performance at various electrical load levels. Examples of the polarisation curves obtained are shown in Figures 1 and 2.

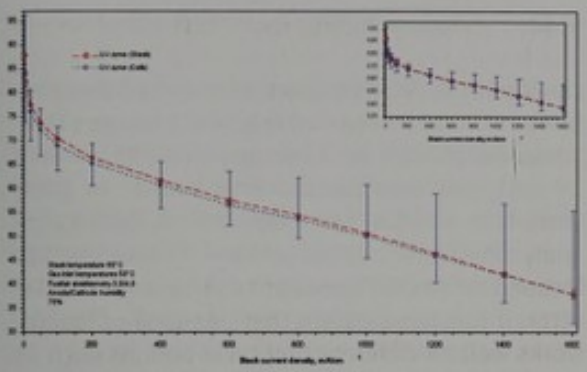


Figure 1: Polarisation curve (voltage vs. current density) of a PEFC stack of 11 kW nominal power output. The red curve represents the average stack voltage at different stack current densities while the blue one represents the sum of the individual cell voltages (see insert) as a comparison

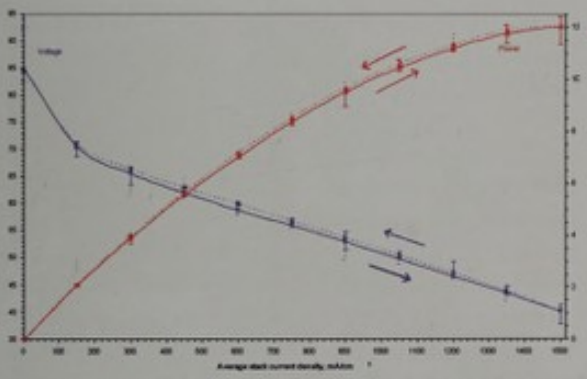


Figure 2: Polarsation curves (voltage/power vs. current density) of a PEFC stack of 11 kW nominal power output. The blue curves represent the average stack voltage during stepwise increase (solid line) and decrease (dotted line) of the stack current density while the red curves represent that of the corresponding average stack power. The error bars indicate the variations between maximum and minimum of these values

In the catalyst testing laboratory, isotopic exchange studies have been performed to investigate the temperature dependence of CO adsorption and desorption on commercial platinum-based fuel cell catalysts. In collaboration with the JRC-IRMM, steady state isotopic transient kinetic analysis measurements focusing specifically on the competitive adsorption between hydrogen and low concentrations of CO at PEFC anodes have been performed.

The action clarified the status and needs for harmonisation of global regulations, standardisation and pre-normative research from a European perspective to the Implementation Panel of the Hydrogen and Fuel Cell Technology Platform. In this context it also contributed to international bodies such as IEA Advanced Fuel Cells Annex XIX, and liaised with IEC TC105 and ISO TC 197 WG 12.

The FCTESTNET fuel cell glossary was delivered to IEC TC 105 enabling it to standardise fuel cells glossary and definition of terms. A New Work Item Proposal (NWIP) for standardisation of single cell PEMFC was also submitted to this body jointly with FCTESQA consortium members, NREL of US and NEDO of Japan. ISO requested that JRC-IE consider research work with a goal to establish fuel cell test protocols for fuel impurity and contaminant tolerance. As well as that, the institute acts as the technical interlocutor for the CEN specifically for Standardisation of Hydrogen and Fuel Cell Technology.

Furthermore, pushing the goals of the Hydrogen and Fuel Cell Technology Platform (HFP) forward was achieved via JRC-IE's role in the HFP Secretariat, the S&T inputs provided in a number of processes and most notably through its assignment to draft the Implementation Plan. This document provides a concerted description of how hydrogen and fuel cell technologies will be pursued across the EU in the next decade, and acts as an indispensable ingredient of a future Joint Technology Initiative (JTI) proposal.

By sustaining and capitalising on its catalytic role and exploiting its unique experimental facilities, the JRC-IE will continue supporting the development of H2 and FC technologies within the EU.

The H2 tank testing facility

The JRC-IPSC provides research-based, systems-oriented support to EU policies so as to protect the citizen against economic and technological risk. The Institute maintains and develops its expertise and networks in information, communication, space and engineering technologies in support of its mission. The strong cross-fertilisation between its nuclear and non-nuclear activities strengthens the expertise it can bring to the benefit of customers in both domains.

In 2006, the JRC-IPSC has further focused its activities on security research and on the fast and effective deployment of resources in response to various types of crises within and outside the EU. Significant results have been obtained in these areas and some examples are given below.

Disaster prevention and response

1.Tsunami research: new JRC tsunami model

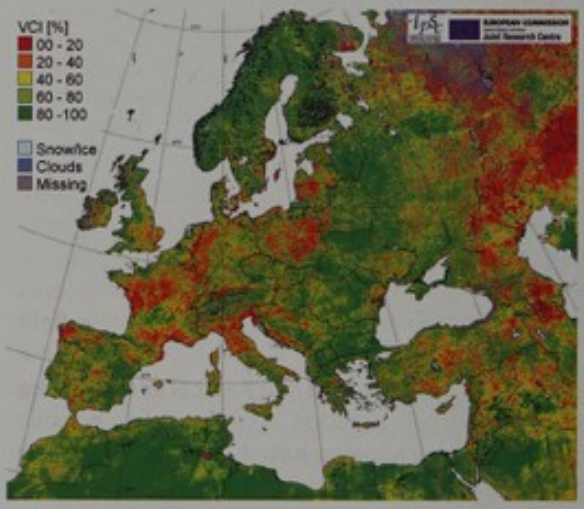
After the immediate crisis activities in response to the tsunami disaster in the Indian Ocean at the end of 2004, the JRC-IPSC has started a more systematic modelling activity of tsunami events which has resulted in the realisation of a near real-time 3D tsunami model.

Tsunami research: new JRC tsunami model

The new JRC tsunami model calculates the depth and travel time of waves propagating from underwater earthquakes. It came into operation, for the first time, for the earthquakes on 17 October 2006 (Papua New Guinea) and 20 October 2006 (Peru coasts), whereupon it automatically calculated the wave height and travel time. The integration of the model in the Global Disasters Alert and Coordination System (http://www.gdacs.org/) has improved the quality of the tsunami-related alerts by identifying more accurately the tsunami affected regions.

2. Crop yield forecasting

During 2006, JRC-IPSC monitored the crop season in the EU and forecasted a below average cereal season explained by a summer drought followed by very wet conditions during harvest in many important districts. Germany, Poland, Baltic countries, the United Kingdom and France marked strong-to-significant yield reductions. According to the reduction in yield of at least 4%, the final cereal EU production was forecasted to drop by about 15 Mt (million tonnes) compared to 2005 (average year) and to drop by 45 Mt comparing to 2004 (high level year). The forecasts were continuously updated throughout the development of the cropping season.



NDVI: Normaliseed Difference Vegetation Index. Relative Range (VCI: Vegetation Contition Index) from 21 to 31 July, 2006. Spot-vegetation

Support to the Maritime Policy

Realising that the European maritime domain is governed by a wide variety of regulations coming from a number of different authorities, in 2006 the Commission published a Green Paper on Maritime Policy addressing the needs of all stakeholders and suggesting priority areas for inter-sector and European coordination. JRC-IPSC played a major role within the Interservice Task Force that carried out this work under the auspices of the Fisheries and Maritime Affairs DG.

JRC-IPSC has also given extensive technical support to FRONTEX, the EU's agency on external borders, in the preparation of the "BORTEC" feasibility study for surveillance systems for the southern EU maritime border.

Support to the free movement of people

Interoperability of electronic passports

In 2006, JRC-IPSC organised two testing sessions aiming at assessing the interoperability of electronic passports according to the standard of the International Civil Aviation Organisation (ICAO) and EU legislation. The trial showed that although the individual components (passports and readers) are working properly, full system interoperability is still to be achieved.

Support to the free movement of goods

1. Cargo sealing in the Lithuanian corridor

Lithuania, as one of the transit countries, faces illegal downloads from trucks crossing it on their journey along the so-called "Lithuanian corridor". In order to help solve this problem, JRC-IPSC carried out a very successful field trial in June 2006 where two different types of electronic seals were tested, based on active and passive transponder-technology. The field test was instrumental in achieving a more in-depth understanding of the customs requirements and provided invaluable in-field expertise, which will be used to further refine the concept and improve the mechanical design of the sealing device. In addition, seals based on passive transponder technology have been developed and patented by JRC-IPSC.

2. A new tracking and monitoring system to protect animals during long journeys

JRC-IPSC has produced the technical specifications and a prototype tracking system to monitor the transport of live animals. National authorities and stakeholders broadly agreed upon these as a reference for Europe-wide enforcement of animal welfare. (Implementation of the navigation system according to Reg. 1/2005.)

Support to standardisation

1. Eurocodes

As a part of the JRC activities in support to the conception and adoption of the acquis communautaire, JRC-IPSC efforts are directed to pre- and co-normative research on European standards for construction, and to support the implementation, harmonisation and further development of the EN Eurocodes. JRC-IPSC is also working on the establishment of a "distributed laboratory" to link the structural engineering research sites across Europe with the objective to optimise the usage of the large facilities needed to do research in this area.

Examples of seals from the Seals and Identification Techniques Laboratory

2. Wireless communications

New and emerging technologies such as Software Defined Radio (SDR) platforms and Ultra Wide Band systems provide an efficient solution to the problem of building multimode, multi-band, multi-functional wireless devices to fulfil requirements of communication in security applications. The goal is to position the JRC-IPSC as a European Test and Evaluation Centre for wireless communications in the context of security applications.

Safety Reports in the context of the Seveso industrial installations

In the context of support to the implementation of the Seveso Directive for the control of major accident hazards, JRC-IPSC has developed guidelines for the content of safety reports and for land-use planning in the vicinity of Seveso industrial installations. These guidelines have been developed at the request to the European Parliament and in order to fulfil the Directive's obligations for greater technical support to land-use planning.

The JRC-IES adopted a new mission statement in 2006: "to provide scientific-technical support to the European Union's policies for the protection and sustainable development of the European and global environment." With the aim to make the institute better address complex issues in an integrated way, scientific units have been reorganised for global environment monitoring, transport and air quality, rural, water and ecosystem resources, spatial data infrastructures, and land management and natural hazards.

While adapting to future needs, the JRC-IES has continued in 2006 to deliver key support to the European policy-maker in different fields of action. This includes, among others, the development of information resources, such as the Environmental Marine Information System (EMIS) (http://emis.jrc.it), but also the production of a large number of reports, some of them issued jointly with the European Environment Agency (EEA). A major milestone has been the signature of the "Group of 4" Agreement between the Environment Directorate General, Eurostat, the European Environment Agency (EEA) and the JRC on the creation of European Environmental Data Centres. The JRC-IES has been given the responsibility to develop the Data Centres for Soils and Forests.

At the same time, the JRC-IES continues to strive for scientific excellence, as can be proven by a high number of publications in peer-reviewed journals, one of them in Nature (D. Mollicone, H. Eva, F. Achard: "Human role in Russian wild fires", Nature 440, pp. 436-437). The JRC-IES also took the initiative to launch the "International Journal for Spatial Data Infrastructure Research" (http://ijsdir.jrc.it) as a new forum for the geographic information community. Furthermore, the JRC-IES engaged in the training of young scientists by hosting the first training course of the Marie Curie Training Series, "Methods in Interdisciplinary Environmental Research (METIER)", organised jointly with the Partnership for European Environmental Research (PEER).

Providing answers to the policy-maker on air pollution: The Urbino Questions

In the frame of the ACCENT Network of Excellence on Atmospheric Composition Change, JRC-IES scientists facilitated the interaction between policy-makers and the atmospheric research community by editing a booklet entitled "Answers to the Urbino Questions" (http://ccu.jrc.it/Publications/Urbino_Questions.pdf). In this booklet, the research community answers, in a short, concise and understandable way, the major questions posed by policy-makers to scientists on the situation of air pollution in Europe.

From toxic emissions to health effects: Krakow Project finalised

The historic city centre of Krakow, declared a UNESCO world heritage site

In May 2006, the JRC-IES presented the results of its integrated emissions, air quality and health impacts case study in Krakow, Poland. The goal of the project, co-ordinated by the JRC-IES Transport and Air Quality Unit, was to apply an integrated methodology for the design of adequate emission abatement strategies to tackle the problems of toxic emissions, the resulting air quality and their impacts on human health. The results of the study show that domestic heating (common use of coal stoves) is the major reason for observed high Particulate Matter concentrations, having a clear correlation with respiratory diseases. The recommendations made by the JRC-IES will help to improve the quality of life of the citizens of Krakow and to protect its unique historic centre, declared a UNESCO World Heritage Site in 1978.

A key asset of the Krakow Project has been its strong participatory approach involving the local population

Support to the restoration of the Black Sea ecosystem

With the accession of Bulgaria and Romania and the ongoing accession negotiations with Turkey, the Black Sea is moving into the public gaze, as undoubtedly the most endangered marine ecosystem in Europe today. With limited levels of dissolved oxygen and little water exchange with the Mediterranean, the Black Sea is extremely vulnerable to the impact of human activities. As part of its support work to the Bucharest Convention on the Protection of the Black Sea, in June 2006 the JRC-IES carried out a measurement campaign in co-operation with the Institute of Oceanology of the Bulgarian Academy of Sciences. The campaign's main objective was to retrieve key data on the ecological health of the Black Sea marine and coastal ecosystems.

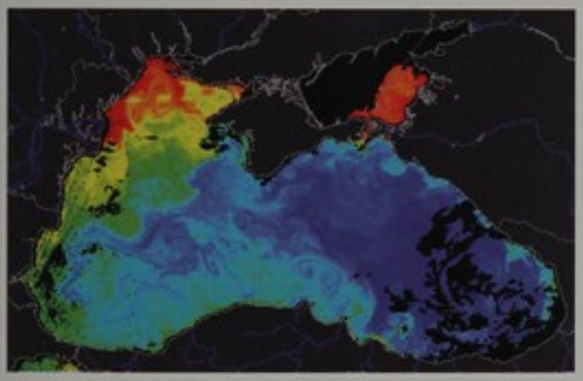


Image of Chlorophyll concentration in the Black Sea showing the impact of the Danube, Dnjestr and Don rivers

First common criteria for surface water ecological quality

A major break-through in harmonising the environmental objectives for implementing the Water Framework Directive (WFD) occurred in October 2006. The first common criteria for ecological status assessment of surface waters were approved between the Member States' experts. These criteria include ecological quality ratio values for national assessment systems for river invertebrates and common reference status and boundary values for phytoplankton (such as chlorophyll-a) for lakes as well as for coastal waters. The compilation and agreement of these criteria has been facilitated and coordinated by the JRC-IES over the last four years.

By 2015 all surface waters of the European Union shall have a good ecological quality

Largest ever photovoltaic solar energy conference

The 21st European Photovoltaic Solar Energy Conference and Exhibition held in Dresden in September 2006 ended with a record-breaking number of visitors. 2,700 scientists, industrial representatives and politicians from 95 countries and around 3,600 visitors to the parallel trade exhibition informed themselves about the latest developments in solar energy generation. The JRC-IES Renewable Energies Unit has been in charge of the technical programme of the conference which was also supported by the UNESCO and the German Federal Ministry for the Environment.

The JRC stand at the 21st European Photovoltaic Solar Energy Conference in Dresden

The mission of the JRC-IHCP is to provide scientific support for the development and implementation of EU policies related to health and consumer protection.

More specifically, the main policy foci of the Institute's work include: methodology for analysis of Genetically Modified Organisms (GMOs) in food, feed and seeds; toxicity assessment of chemicals; evaluation of methods for replacement of animal tests; and exposure/effect and risk assessment of chemicals from consumer and nanotechnology products. The Institute hosts two European Community Reference Laboratories (CRLs): a CRL on GMOs in Food and Feed and a CRL on Materials in Contact with Food.

The JRC provides scientific and technical support for issues related to health and consumer protection

Support to the Chemicals Policy

Much of the related current European legislation on chemicals will shortly be replaced with the implementation of the new REACH (Registration, Evaluation, and Authorisation of Chemicals) Regulation which was adopted by the European Council and European Parliament at the end of 2006.

The European Chemicals Bureau (ECB) of the JRC-IHCP provides scientific input to the current legislation on chemicals and technical guidance to enable industry, the new Chemicals Agency and government authorities to implement the REACH legislation. In particular, the ECB has been responsible, in close cooperation with the chemicals industry and the Organisation for Economic Co-operation and Development (OECD), for designing and managing the development of the informatics tools (REACH IT and the IUCLID 5) databases which will play a central role in implementing the legislation. The tools will be used by industry as well as the future European Chemicals Agency which will be established in Helsinki in 2007.

Alternatives to Animal Testing

The Institute's European Centre for the Validation of Alternative Methods (ECVAM) directly supports the EU Directive regarding the protection of animals used for experimental and other scientific purposes. ECVAM celebrated its 15th anniversary towards the end of 2006, and used the occasion for launching a public database service on alternative methods, DB-ALM. During 2006, ECVAM finalised the validation of nine alternative *in-vitro* methods (e.g. for skin corrosion, chemotherapeutic drugs, aquatic toxicity testing, and bacterial contamination of pharmaceuticals) that were endorsed by the ECVAM Scientific Advisory Committee. Some of these validations are important for the phasing out of animal testing for cosmetics ingredients. The importance of ECVAM's work was made highly visible at the second conference of the European Partnership for Alternative Approaches to Animal testing (EPAA) in December 2006. ECVAM also co-ordinated the toxicity test strategy development for REACH.

During 2006, the JRC-IHCP installed a robotic testing platform in ECVAM which will provide the means of increasing throughput of *in-vitro* toxicity assays.

Cell viability test

Nanotechnology

In order to facilitate its investigation into the potential toxicity of nanoparticles, the JRC-IHCP installed new state-of-the-art laboratory facilities in 2006 which will allow it to tackle the scientific impact assessment of nanoparticles on human health. In conjunction with its work in nanotechnology, the JRC-IHCP developed a novel type of immunosensor platform based on nanostructured surfaces. This delivers enhanced sensor perform-

ance and can be used to analyse cell metabolites *in-vitro*, thereby supporting the work of ECVAM. The JRC-IHCP also houses a variable-energy, multi-particle cyclotron which, as well as carrying out collaborative research into the production of therapeutic medical isotopes, is also used to develop nanoparticle tracers in support of the Institute's work in nanotechnology.

Support to the Legislation of GMOs

Although only authorised GMOs are legally allowed in the European market, preventing or even detecting the release of non-authorised GMOs is challenging. Moreover, it must be ensured that authorised GMOs are below the agreed level allowed in food and feed to be labelled GMO-free. The CRL for GMOs in Food and Feed (CRL-GMFF) provides suitable validated methods for control and enforcement processes with respect to labelling legislation within the EU. This is performed in close collaboration with its JRC sister Institute in Geel (IRMM) and a formal network of GMO expert laboratories within the European Union. The CRL-GMFF, which also supplies and distributes appropriate reference materials for practical application to the EU Member State enforcement laboratories, is accredited according to ISO 17015 and was awarded ISO 9001 certification in 2006.

In 2006, the CRL-GMFF provided support to the emergency measures resulting from the release of non-authorised GM rice into the European market (see section "Response to Crises").

DNA analysis by gel electrophoresis

Consumer Products

Selection of European wines

The Institute directly supports EC Directives in the field of textiles and other consumer products including materials in contact with food. In 2006, the JRC-IHCP provided validated methods for the quantitative analysis of certain new fibre mixtures in textiles, and measured the release of volatile organic compounds from carpets and building materials, in its specialised "indoortron" facility, mimicking real exposure conditions. The Institute provided the first results concerning the application of the "European Exposure Assessment Toolbox" on exposure assessments of chemicals released from consumer products and articles (e.g. toys, textiles). In 2006, whole genome DNA-microarrays were used to compare early events in biological responses of human cells exposed to different chemical mixtures relevant for indoor environments. The Institute also provided training on analytical methods for the European wine databank to new European Member States and officially inaugurated the CRL on Food Contact Materials in December 2006. The latter is responsible for providing national control laboratories with harmonised analytical tools, and will co-ordinate the Network of National Reference Laboratories to exchange information, build capacity and provide training.

The mission of the JRC-IPTS is to provide customer-driven support to the EU policy-making process by researching science-based responses to policy challenges that may have both a socio-economic as well as a scientific/technological dimension.

Second International Seminar on Future-Oriented Technology Analysis and FOR-LEARN Online Foresight Guide: JRC-IPTS confirms its role as international reference point for the scientific foresight community.

"Foresight" is shorthand for a set of techniques increasingly used to support policy-makers in building long-term strategies through structured and focused interaction with experts and stakeholders. Since the creation of the JRC-IPTS in 1994, foresight activities have been at the core of most of the research activities undertaken by the Institute. Today the JRC-IPTS is recognised internationally as a world reference centre in this domain.

Future Oriented Technology Analysis Conference (FTA) on 28, 29 September, 2006

In 2006, the JRC-IPTS hosted the second bi-annual International Seminar on Future-Oriented Technology Analysis (FTA). The Seminar has become the major international conference in the field of foresight and other prospective techniques. In the 2006 edition, around 160 high-level academics, practitioners and public and private sector decision makers from 35 countries and all continents participated.

2006 also saw the publication of "FOR-LEARN Online Foresight Guide", which provides a practical introduction to foresight methodologies by making use of real case examples. The tool, developed at the request of the Research DG, is recognised as a reference in the field and is used by organisations for teaching and training. More information at: http://forera.jrc.es/

Successful conclusion on the FISTERA project: a major international effort to foresight the Information Society

The thematic network "Foresight on Information Society Technologies (IST) in the European Research Area" (FISTERA), is scientifically coordinated by the JRC-IPTS. It was set up at the request of the Information Society and Media DG to contribute to a common vision and approach towards the Information Society in an enlarged Europe in 2010. FISTERA created a pan-European platform on foresight in Information Society Technologies (IST), involving up to 600 key EU and national IST policy makers and players and is a good example of a practical application of foresight methods to a specific policy field.

In 2006, FISTERA published its final report where various aspects of the future role and impact of Information and Communication Technologies are analysed (ftp://ftp.jrc.es/pub/EURdoc/eur22319en.pdf). For instance, FISTERA analysed and assessed social and environmental needs and their possible technological solutions concluding that education and learning, health applications, governmental applications, and the working environment showed the biggest potential for Information and Communication Technologies.

FISTERA also studied the potential constraints on future integration of ISTs into European society. The five biggest challenges identified were: "privacy and trust", "security and robustness", "ethical concerns", "digital divide", "infrastructure and investment gaps", "social innovation and IT literacy".

eHealth diagnosis

FISTERA has also enriched discussions around the FP7 Information Society Technologies programme and performed a strategic priority-setting exercise at the European level in IST. The "European Perspectives on Information Society" (EPIS), launched in 2006, will continue the path opened by FISTERA by running focused foresight exercises on selected areas in Information and Communication Technologies and their specific policy implications.

Climate Change Mitigation: Cost Analysis of Emission Reduction Strategies

As a basis for considering medium and longer term emission reduction strategies, the European Council asked the Commission to analyse the direct and indirect costs and the benefits of post-2012 actions to mitigate climate change, taking into account both their environmental and economic consequences.

Road flooded by a river

At the request of DG Environment, the JRC-IPTS carried out an analysis of three climate policy scenarios, exploring possible climate regimes and Greenhouse Gas (GHG) reduction targets up to the 2025 time horizon, and the corresponding implications of various countries' full or increasing participation in international climate policy agreements.

This research contributed directly to the Commission's Communication, "Winning the Battle against Global Climate Change" on Action on Climate Change Post-2012.

In 2006, the JRC-IPTS published this research in the report "Analysis of Post-2012, Climate Policy Scenarios with Limited Participation" ftp://ftp.jrc.es/pub/EURdoc/eur21758en.pdf. The economic analyses were conducted using a partial equilibrium model of the global energy market (POLES) and a multi-national macroeconomic general equilibrium model (GEM-E3).

Analysis and Economic Assessment of Food Quality Assurance Schemes in Europe

Quality Assurance Schemes (QASs) are aimed, on one hand, at differentiating food products on the market according to their intrinsic qualities, origin etc. and, on the other, at facilitating management of quality standards by different players across the economic chain, from production to retailing. While the number of QASs for food and agriculture in Europe is constantly growing, the overall volume of agricultural production covered by schemes regulated at the European level remains small. The European Parliament (EP) requested the European Commission to analyse the existing schemes and identify the different approaches that can be taken in the future to ensure that a greater share of agricultural production is covered, and that farmers producing to higher standards retain a fair share of the added value. The Agriculture and Rural Development DG, after receiving the request from the EP, asked for JRC-IPTS' assistance.

In the framework of this two-year project, completed in 2006, the JRC-IPTS conducted an analysis of the existing QAS and – in particular – the in-depth economic assessment of nine cases which showed the relevant benefits and costs for farmers, traders, processors, retailers and consumers. The analysis concluded that schemes focusing on product differentiation on the end market have to be clearly communicated to the final consumer to generate benefits for all participants in the food supply-chain. In the case of schemes securing the management of chain standards, the study shows that a concentration process is ongoing and some schemes have a considerable market power.

The results of this study will be presented at a European Commission conference on "Food Quality Certification – adding value to farm produce", to be held in 2007. More information on the project is available at: http://foodqualityschemes.jrc.es/

Certified cured ham

The Multi Annual **Work Programme**

The Multi Annual Work Programme (MAWP) of the JRC for 2007-2013 is firmly set in the context of the Commission policy agenda, as outlined in the more general Specific Programmes for FP7 (COM(2005)439 and COM(2005)444). The MAWP serves the objectives of growth, sustainable development and security through a series of actions dedicated to the development and provision of scientific and technical support to the relevant policy items. As proposed in the Specific Programmes, this will secure the best match between the JRC Agenda and the priority policy needs.

Prosperity in a knowledge intensive society is a top political priority as it includes high sustainable growth, more and better jobs, knowledge, and competitiveness. The JRC proposal comprises a spectrum of actions which serves those objectives through attention to the regulatory context, the development of measurement standards and data harmonisation and a support to key policy areas such as energy, transport, information society, chemicals and biotechnologies. A direct support to policy formulation is provided in the areas of economic, market and fiscal policies.

The sustainable management of resources is a long standing area of work of the JRC and one in which it has well established competences. The policies on which the JRC will focus are well identified; they relate to Community competences in agriculture and environment which are large areas in the work agenda of the Commission. The "environment and health" theme is emerging as a new focus of attention. Climate change remains a key feature of this portfolio.

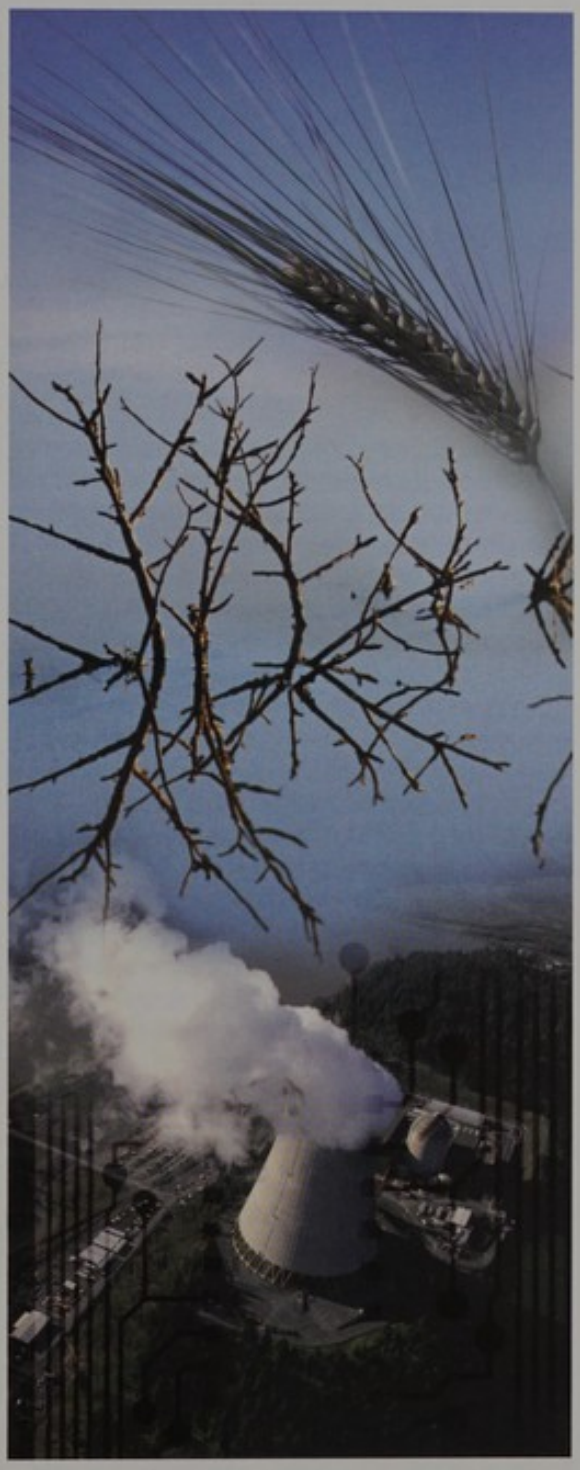
Security and freedom is a growing concern of the Union. This covers internal security where interactions between the Commission and Member States is expanding and where technical support is critical. It also includes a well established policy area where many new challenges lie ahead, including the safety of food and feed and response to disasters.

The inclusion of "Europe as a world partner" is a departure from previous research Framework Programmes in that it now explicitly identifies a new geographical scope of work. Such development serves as support to a range of external policies (in particular international trade, Community actions relevant to stability, non-proliferation and common foreign and security policy, development cooperation policy, humanitarian aid and European neighbourhood) but it also indicates a strategic positioning of the JRC on the global playing field. The global dimension is of critical relevance in future EU policies; it touches upon security issues and development cooperation.

In the EURATOM programme, the objective of the JRC is to develop and assemble knowledge, to provide crucial scientific/technical data and support for safety/security, reliability, sustainability, and control of nuclear energy, including the assessment of safety and security aspects related to innovative/future systems.

The MAWP capitalises on past investments in know-how and facilities. It is characterised by:

- flexibility in responding to the changing needs associated with the evolution of EU policies for the duration of the programme (7 years);
- a focus on issues which are important in terms of socio-economic concerns, which have a clear community dimension and strong R&D component;
- attention to the provision of quality expertise and support to other Commission services upon the emergence of new issues in crises situations;
- reinforcement of competences and facilities in new fields of investigations which are relevant to future policies and
- increased reliance on networks and partnerships with other institutions and expert groups pursuing similar objectives and interests; the JRC will also increase its role as technical coordinator of expert networks created in policy Directorates General.



The JRC's Technology Transfer Programme comprises different activities aiming at exploitation of knowledge developed at the JRC:

- intellectual Property awareness raising seminars providing information on patents, copyright issues in databases and publications, trademarks, contracts and agreements. In 2006, six such seminars were organised at the institutes for Action Leaders and newcomers;
- an entrepreneurship curriculum that seeks to prepare potential entrepreneurs at the JRC in planning, starting and running a technology-based company. In 2006, 15 scientists participated in the two three-day courses and wrote business plans intended to help them set up their own companies;
- the negotiation of licence and exploitation agreements led to the signature of 15 licence and exploitation agreements in 2006. This generated an income of € 418,760; and
- an Innovation Project Competition.

2006 marked the conclusion of the Innovation Project Competition launched in 2005. Seven successful projects from five different institutes were selected, across different fields of interest and application:

- exploitation of new developments in the treatment of tumour lesions in the liver by molecular targeted radiotherapy and auto-transplantation, JRC-IE;
- tool for assessing ecological health of a European lake, JRC-IES;
- new thermometry system for hyperthermia applications, JRC-IHCP;
- tox Finder – *in-vitro* metabonomics for neurotoxicity screening: an alternative to animal testing, JRC-IHCP;
- inSaw – Industrial Security Risk Assessment Workbench, JRC-IPSC;
- innovative radar imaging technique for early-warning of snow avalanches, JRC-IPSC;
- prototype of a calibrating radiation source for installed radiation monitors, JRC-IRMM.

The purpose of this competition was to encourage JRC researchers to create and exploit innovative products and processes, and to stimulate development of projects prior to commercialisation. The projects came from various sources: the JRC institutional work programme, participation in indirect actions, or exploratory research.

In November, the scientists involved in the innovation projects showcased the results of their work at a seminar in Ispra. The outcome of the innovation competition is positive: interest from commercial partners was raised and will lead to a number of collaboration and exploitation agreements being negotiated. Several patent applications are also under preparation.

To celebrate the results, the project participants were awarded certificates for their accomplishments by the Director of the Institute for Health and Consumer Protection.

Monotoring Avalanches in Alagna, Italy

Management of
the JRC's Infrastructures

In 2006, site development at the JRC was very much focused on the preparation and adoption of a multi-annual strategy. Following up on a request from the Board of Governors, the JRC developed a plan entitled "Priorities for JRC Infrastructure Development 2007 – 2010". Funded with about 63 M€, this strategy focuses on important new construction projects at the Geel, Karlsruhe and Ispra sites. They are all aimed at reinforcing the scientific capability of the JRC and increasing its efficiency, while contributing to the modernisation of the ageing infrastructure at these sites.

In particular, the Plan foresees the following projects:

- a new reference materials process building in Geel;
- a new facility for environmental laboratory research and a new crèche in Ispra;
- an additional controlled area facility in Karlsruhe.

In anticipation of the final adoption of the Plan by the Board of Governors, the JRC sites have already launched the planning and design work associated with the selected projects. At Ispra, in particular, a "Concours d'idées" elicited promising designs for a modern and efficient Ispra Science Zone.

2006 also saw a variety of site improvement projects, launched or completed:

- defined a strategy on energy conservation and environmental protection at the JRC-IRMM in Geel;

Ispra: winning concept of design contest showing new Science Zone

- installed a new server room in Ispra, re-launched the works on the "Auditorium" conference centre seating up to 266 people (to be completed in the fourth quarter of 2007), launched the construction of the VELA-7 laboratory and installed provisional offices for up to 85 staff;
- launched major restructuring works of the existing controlled area at the JRC-ITU in Karlsruhe, aiming to separate areas at risk of contamination (e.g. hot cells) from contamination-free areas (e.g. offices), hence reducing the need for monitoring and easing the flow of personnel and materials;
- transformed three old buildings at the JRC-IE in Petten into modern and energy-efficient technical and administrative facilities, housing mechanical workshops as well as the informatics department; and
- extended the JRC-IPTS in Seville now occupying the whole of the 2nd floor of the EXPO'92 Building, thereby alleviating the site's needs for office space, meeting rooms and videoconference facilities.

Petten: new office

Karlsruhe: measuring contamination

Again in 2006, the Exploratory Research Symposium showed that curiosity-driven and open research gives life and vitality to the JRC's work. The divergence of projects, fields, methods, together with the enthusiasm of the teams, created a forum of real research. The JRC will continue to invest in exploratory research (5-10% of its institutional budget) and the six projects presented in 2006 are as follows:

The projects

The JRC-IPTS study *(Ref. 1)* focused on the potential impacts of genome-based technologies on health care. Asthma in children was chosen as a case study and gene-screening as the technology assessed to explore the cost-effectiveness of applying an early genetic-screening to newborns and a preventive treatment to the population at risk. A Markov model consisting of six mutually exclusive disease states (healthy, mild intermittent, mild persistent, moderate persistent, severe persistent and dead) was constructed and the simulation horizon of the model was 100 years.

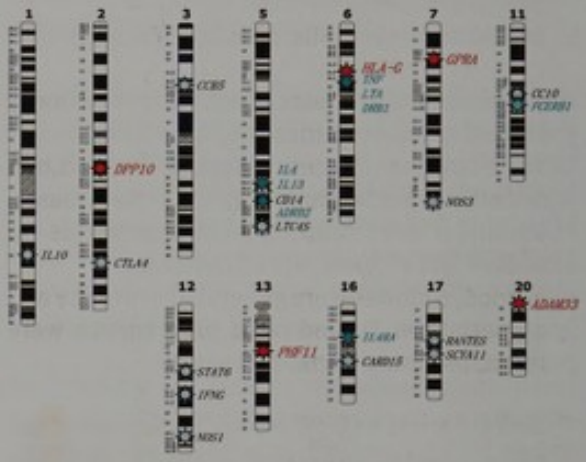
The JRC-IRMM project *(Ref. 2)* was presented in which an experimental design (farm approach), with 20 analytical methods, was selected for its efficiency in distinguishing organically vs. conventionally grown food commodities. Several analytical methods may be needed to discriminate the crops in both agricultural systems by developing multiplexed analytical tests and using multivariate statistical analysis.

The JRC-IES project *(Ref. 3)* hopes to create a research framework for producing soil maps and provide tools and guidelines for soil mappers in order to create "easy-to-interpret-and-use" soil data and improve collaboration between users of soil data.

The JRC-IE project *(Ref. 4)* on fuel cell aims to reveal the vital role of the microstructure on flow and transport, thus providing proper closure relations, such as capillary pressure-permeability-saturation, which are important for reliable fuel cell performance predictions on the basis of continuum models.

The JRC-IPSC project *(Ref. 5)* dealt with assessing the relative risks of money laundering activities in each of the Member States using composite indicators. The lack of clear definitions, differences in reporting, the lack of statistics or the unwillingness of the authorities to cooperate, are only some of the problems encountered. The team came up with methods allowing the detection of money laundering activities and the construction of a composite indicator.

The JRC-IHCP project *(Ref. 6)* supports the new EU chemical policy whereby, for ethical reasons, alternatives to animal testing must be promoted. The need for toxicity tests is evident including all stages of prenatal development posing a difficult challenge for the development of non-animal tests. The work was done on embryonic stem cell lines, which are not only pluripotent, but they provide a tool to study embryo toxicity minimising the animal use. The team genetically engineered cells to fluoresce when cell signalling controlling embryo development is active.



Modelling the impact of genome screening on health care

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4. *A. Podias, P. Moretto, G. Tsotridis, IE: Simulation of transport phenomena and physico-chemical processes within porous structures using the Lattice-Boltzmann equation method.*
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Press and Media
Relations in Figures

In 2006, the core work areas of the JRC received significant coverage in the print, audiovisual and online media. Total recorded hits were above the 2,000 mark for the first time. Global coverage was up 51% on 2005 and nearly 300% on 2004.

The result has to be seen as a combination of better targeting, well attended events, interesting press releases, one-to-one specialised sell-ins, more astute coverage searches and overall, greater attention to day-to-day media management.

Types of events included thematic press briefings and conferences, organisation of media visits, information days and Round Tables in new Member States and Candidate Countries, stands at exhibitions and conferences, open days at institutes and informal 'meet & brief' media breakfasts/lunches with senior management and scientists.

Snapshot of 2006 results compared to 2005

- 60 countries generated coverage (53 in 2005) with 18 "new" countries;
- 2057 coverage pieces were generated (1,950 print & 107 audiovisual) giving a 51% increase;
- TV coverage was up 34% and radio was up 29%;
- in 2006, 6 stories were generated every day and 2 specialised TV and radio programmes were facilitated every week.

Geographical reach of coverage generated by the JRC events series in 2006. Colour depth from orange to dark red shows the amount of coverage generated

Coverage generated in 60 Countries Worldwide

Angola, Argentina, Armenia, Australia, Austria, Bangladesh, Belarus, Brazil, Brunei, Belgium, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guatemala, Hungary, India, Indonesia, Ireland, Israel, Italy, Kazakhstan, Kuwait, Latvia, Lithuania, Luxembourg, former Yugoslav Republic of Macedonia, Malta, Mexico, Morocco, The Netherlands, New Zealand, Nigeria, Norway, Poland, Portugal, Qatar, Romania, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Turkey, Uganda, United Kingdom, United States.

JRC visibility was secured in all 25 EU Member States and Candidate and Associated Countries including Bulgaria, Romania, Croatia, Norway and Switzerland. Events held in the Presidency countries (Austria and Finland) helped to increase coverage there 6–7 fold. Modest to large increases were also recorded in Portugal (44), Belgium (39), Hungary (22) and Ireland (14).

Looking at the number of articles per country, Italy (431) remained on top with Germany (240) second and Spain (223) in third place. Growth was also noticeable in France (115) and the United Kingdom (69).

In 2007, special attention needs to be given to Poland (7) where coverage dropped and remains low. Decreases were also noted in the Czech Republic, Denmark, Greece, The Netherlands, Romania, Slovenia and Sweden. In terms of non-EU coverage snapshots, there was a marked increase in the USA (111), Australia (11), Brazil (6), China (21) and Morocco (9).

Interview on energy issues – BBC World Service

Portuguese radio broadcasts on EFFIS – Radio Renascença

Interview on BNCT on Dutch Radio – RTV-NH

Interview on Food Contact Materials on Italian Radio

Italian report on renewable energy and climate change – Rai3

Romanian report on EFAS – TVR

Belgian report on nuclear safeguards – RTBF

French documentary on JRC – TV5

Examples of TV and radio broadcasts in 2006

Core staff

The core staff of JRC (M-male, F-female) is composed of the following categories:

Core staff (end-of-year situation) 2006	M	F	Total
Officials	1138	404	1542
Temporary agents on renewable contracts	89	52	141
Temporary agents on non-renewable contracts	25	9	34
TOTAL	1252	465	1717

Of the 1,717 total, roughly 64% are working on scientific projects in support of customers, and 16% are doing administrative or support work. Some 18% are working in infrastructure, logistics and technical support and 2% are working in Nuclear Decommissioning and Waste Management.

Distribution of JRC Staff by function

Distribution of JRC Staff by function 2006	
Administrative	16%
Support and infrastructure	18%
Competitive	12%
Decommissioning	2%
Institutional S/T	52%

Commission policy for the "integration of research staff into the mainstream of the Commission's personnel policy" is reflected in an overall decrease in the number of temporary agents from 2003 (516 staff) to 2006 (175 staff) through converting a number of posts to permanent positions.

Nevertheless, a margin of flexibility of between 10% and 35% of permanent research posts will be maintained for the recruitment of specialised staff to cope with needs that have a strict time limit and to ensure a healthy flux of ideas and competencies.

Core staff distribution (end-of-year situation) 2006	M	F	Total
Institute for Reference Materials and Measurements	141	70	211
Institute for Transuranium Elements	177	49	226
Institute for Energy	122	26	148
Institute for the Protection and Security of the Citizen	195	52	247
Institute for Environment and Sustainability	197	56	253
Institute for Health and Consumer Protection	102	74	176
Institute for Prospective Technological Studies	53	23	76
DG, ISR, DPRM and ISD	265	115	380
TOTAL	1252	465	1717

Visiting staff

In addition to its core staff, the JRC has an active policy of hosting grant holders, visiting scientists, seconded national experts, auxiliaries and trainees, primarily from the Member States and Candidate Countries. Visiting scientists bring advanced skills, knowledge and expertise to help resolve current and future scientific challenges, while benefiting from the cultural diversity, multidisciplinary research domains and extensive research networks at the JRC. In order to respond to the ever increasing demands for scientific and technical support, the number of visiting staff has increased in latter years.

Visiting staff

The distribution of all staff, among JRC Institutes and Directorates is as follows:

Visiting Staff (end-of-year situation) 2006	M	F	Total
Trainees	16	15	31
Postgraduate grant holders	13	11	24
Post-doctoral grant holders	50	22	72
Visiting scientists *	0	0	0
Seconded national experts	45	20	65
Auxiliaries	34	27	61
Contractual agents	390	430	820
TOTAL	548	525	1073

* Contracts for visiting scientists have been replaced by those for contractual agents. The reason why *Visiting scientists* in 2006 appears as zero is because they are included in the *Contractual agents* category

Total staff

Staff distribution (core and visiting) 2006 (end-of-year situation)	M	F	Total
Institute for Reference Materials and Measurements	193	128	321
Institute for Transuranium Elements	220	84	304
Institute for Energy	172	54	226
Institute for the Protection and Security of the Citizen	313	121	434
Institute for Environment and Sustainability	290	157	447
Institute for Health and Consumer Protection	160	149	309
Institute for Prospective Technological Studies	101	69	170
DG, ISR, DPRM and ISD	351	228	579
TOTAL	1800	990	2790

Equal opportunities

The "JRC Equal Opportunities and Women & Science" working group was established in December 2005 with the mandate to implement the JRC Action Plan 2006-2008 for Equal Opportunities.

In 2006, the group drafted recommendations, launched a questionnaire and held a workshop aimed at improving the gender balance at management level. In 2006, the JRC appointed two new female Directors and a female Deputy Director General. It conducted a survey on the implementation of the Code of Good Practice for the replacement of women on maternity leave, proposed training actions and organised several meetings, including a presentation to all JRC management, on the Equal Opportunities JRC action plan.

Budget (budget and expenses – institutional activities)

The available credits to the JRC are subdivided into staff expenses, means of execution (maintenance of buildings and equipment, electricity, insurance, consumables etc.) and specific credits (direct scientific procurements). The credits come from the institutional budget and in 2006, the total amount committed was €310.6 million plus 4.6 million in contributions from countries in the European Economic Area.

In addition, a total amount of €19 million was made available to finance an action programme to shut down and decommission nuclear installations and manage the waste activities related to the EURATOM Treaty.

Institutional budget	availabel M€	implemented M€	consumption %
Staff expenses	211,481	211,481	100,00%
Means of execution	64,513	64,511	99,99%
Operational expenses	39,245	39,235	99,97%
TOTAL	315,239	315,227	99,99%
Decommissioning	19,000	18,993	99,96%

Supplementary credits of €14.3 million came from contributions from other countries associated to the Framework Programme.

JRC competitive activities

The table below shows the value of contracts signed and inscribed in the accounts during 2006. The quantity cashed amounted to €47.1 million.

A portion of the JRC's income comes from participation in FP6 indirect actions, performing additional work for Commission services, and contract work for third parties such as regional authorities or industry. These competitive activities complement the tasks outlined in the JRC's work programme and are seen as an essential tool for acquiring and transferring expertise and know-how.

Contracts signed (in million Euro) 2006	
Indirect actions	19,2
Competitive activities outside the Framework Program (FP)	29,4
Third party work	11,4
TOTAL	60

2006 turned out to be exceptionally successful in terms of competitive income. Competitive contracts signed amounted to 60M€ which is substantially higher than the average income generated in the three previous years of FP6 (+/- 35M€ annually). The increase is due to higher income for all categories of competitive activities: Framework Programme Indirect Actions, Third Party Work, and especially Direct Support to Customer DGs. Indeed, almost half of all competitive contracts signed are the result of requests from Commission services for additional S&T support.

At the end of the Sixth Framework Programme, the JRC's involvement in Indirect Actions turned out very positive with participation in more than 250 FP6 activities, some 50 of which were granted in 2006. Around 2/3 of these activities are collaborative projects and networks, and some 25% are coordination and support actions. A particularly high number of actions are in the fields of policy-oriented research, information society, nuclear activities, global change, and energy.

Publications registered in 2006

	1	2	3	4	TOTAL
IRMM	86	55	55	1	197
ITU	81	2	71	6	160
IE	46	36	73	1	156
IPSC	108	66	79	3	256
IES	144	87	78	4	313
IHCP	96	46	21	3	166
IPTS	51	21	6	1	79
ISD	0	1	0	2	3
	612	314	383	21	1330

1. *Monographs and articles*
2. *Technical EUR reports*
3. *Contribution published in conference proceedings*
4. *Other documents and publications*

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Ms Piedad GARCÍA de la RASILLA
in June 2006) retired on 31 January 2007

The JRC
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Left to right

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   (replaced Jean-Marie Cadiou who retired on 30 November, 2006)
2. Director IPTS, **Peter Kind**
3. Director PRM, **Megan Richards**
   (replaced acting Director Freddy Dezeure)
4. Director ITU, **Thomas Fanghänel**
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5. Director General, **Roland Schenkel**
6. Director* ISR, **Michael Francis Fahy**
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8. Director IRMM, **Alejandro Herrero-Molina**
9. Director IS, **David R. Wilkinson**
10. Director IHCP, **Elke Anklam**
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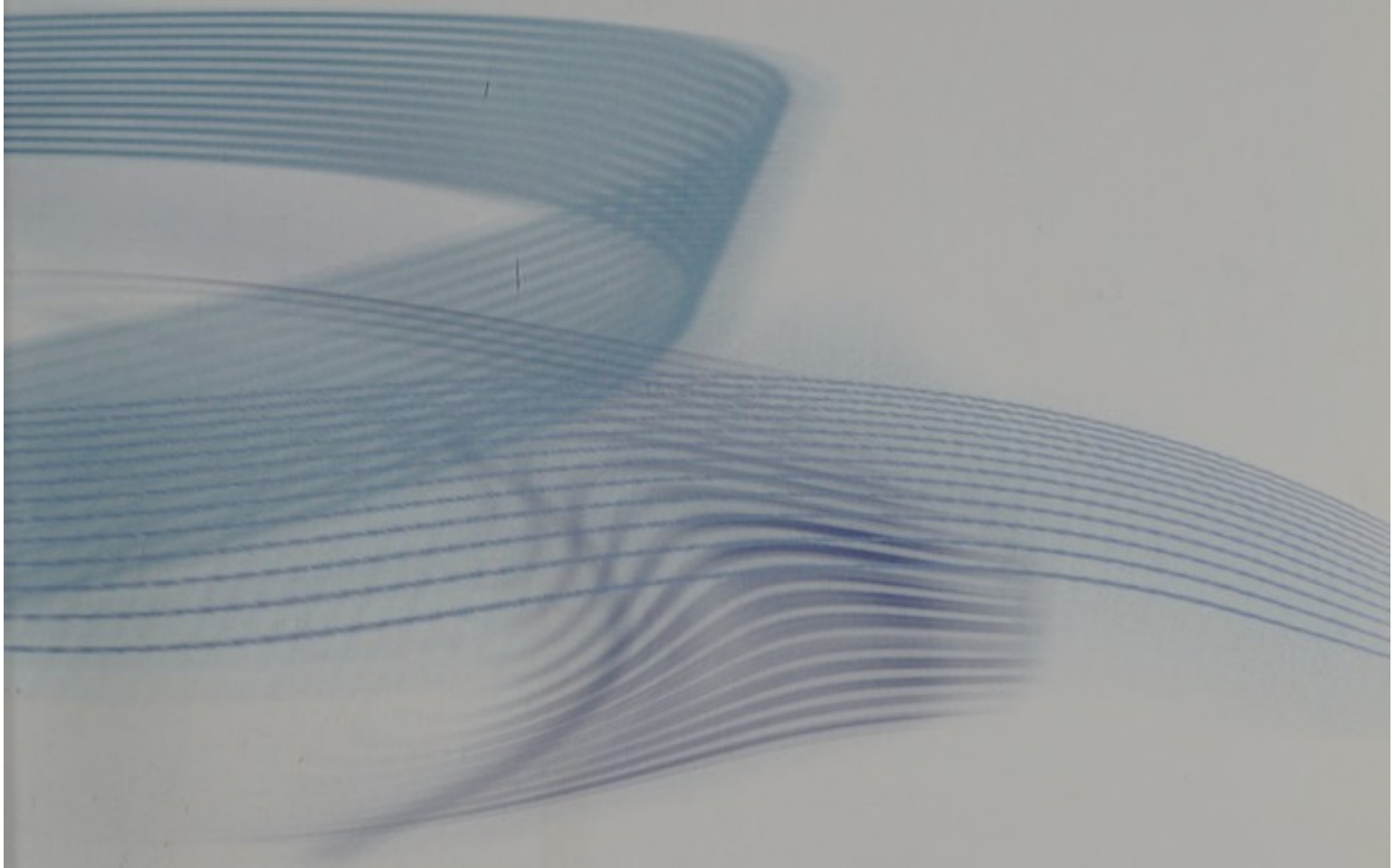
11. Director IES, **Manfred Grasserbauer**

* *Acting*



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Abstract
Report on the activities, accomplishments and resources related to the JRC work carried out in 2006. An overview is given of the mission and its implementation, the scientific activities and the relations with the outside world.

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The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

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