Ex-post Evaluation Joint Research Centre Direct Actions in the 6th Framework Programmes 2002-2006

Final Report

September 2008

JRC
EUROPEAN COMMISSION

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CHAIRMAN'S INTRODUCTION

This final report forms the Ex-post Evaluation of the Joint Research Centre (JRC) Direct Actions of the 6th Framework Programmes for the period 2002-2006. The evaluation was carried out between February and June 2008 by a Panel with international experts from different disciplines. The report presents general observations from the evaluation (Chapter 1), detailed commentary on the JRC's achievements in the 11 Priorities in the JRC Work Programme (Chapter 2) and the JRC's challenges for the future (Chapter 3). As Chair of the Panel, I summarised the findings and recommendations of our evaluation in the executive summary of this report.

It was an honour to chair this Evaluation Panel and a privilege to work with such distinguished and committed colleagues. Their objective and perceptive judgments form the basis of this report and it was satisfying to see that we all agreed on the conclusions and recommendations contained in it.

The Panel was clear in its appreciation of the JRC's achievements in realising its mission, and acknowledged its place as a service within the Commission, which is crucial for this purpose.

It became evident during the Panel's work that the JRC today is not only instrumental in supporting the policy development in the Commission but also in responding to crisis situations threatening the security of European citizens. The JRC has undergone a major transformation over the last 10 years, consolidating its position as an indispensable source of knowledge and expertise in support of the political agenda of the EU. The Panel generally believe that the organisation can only advance now by introducing some step changes in its strategic positioning and its operation.

Our observations throughout the report are designed to help the JRC in preparing such changes. They are aimed at strengthening JRC's capability to deliver a service to the Commission, but without compromise to the JRC's future scientific vitality or integrity. A clear position within the Commission and an overall corporate strategy with a five-year time horizon are important prerequisites for this next step.

On behalf of the Panel I wish to record our gratitude to the staff of the JRC and particularly to Dr Pieter van Nes and Ms Sarah Morgan, for their support and assistance throughout. We also wish to express our appreciation for the substantial amount of work that was undertaken so willingly by Dr Roland Schenkel, the Director General of the JRC, and his colleagues who provided us with the information necessary for the evaluation. I wish to place on record my personal gratitude to Professor Jussi Huttunen for his willingness to undertake a very substantial amount of work as my Vice Chairman, and for dispensing this so effectively and efficiently.

David King

EXECUTIVE SUMMARY

This report presents the Ex-post Evaluation of Joint Research Centre (JRC) Direct Actions of the 6th Framework Programmes (FP6) for the period 2002-2006. It is divided into a backward-looking section with the achievements of the JRC in FP6 and a forward-looking section with an analysis of challenges for the JRC in the future. The recommendations have been drawn up with the objective to strengthen the capability of the JRC to deliver a service to the Commission without compromising scientific vitality or integrity.

The Multi-Annual Work Programme of the Joint Research Centre during FP6 was based on customer needs and on a push for integration of its Institutes' competencies and facilities, around thematic priorities. Simultaneously, the JRC strived to increase its networking activities across Europe and internationally, to enhance the training of European researchers and to help Candidate Countries in the last steps of the EU accession process.

ACHIEVEMENTS UNDER THE 6TH FRAMEWORK PROGRAMMES

In ten years of working with its new mission the JRC evolved into a reliable source for scientific and technical support to EU policies. It successfully achieved the main goals set for its work under the 6th Framework Programmes through a clear customer-orientation, robust policy support and underpinning research. The standing of the JRC inside the Commission is of crucial importance for these achievements.

The JRC has accepted and implemented the recommendations of the Five-Year Assessment in 2003. During the review period the JRC has shown the capacity to set priorities by reorienting small parts of its work and discontinuing certain activities that have become less relevant. Nevertheless, within areas like food, health, foresight, environment, public security, the Panel indicated topics during the Institute visits and in the detailed commentary of the final report where the JRC needs to analyse its position seriously and make sure that it can generate the critical mass needed to be effective in those fields.

The Panel observed that the JRC has reinforced its networking activities across Europe and internationally, that it has enhanced the training of European researchers, that it has assisted the New Member States with the transfer of the total body of EU legislation, regulations, directives and standards *(the acquis communautaire)* and that it delivers well-respected international services in several areas of competence.

A detailed assessment of the work carried out during the 6th Framework Programme convinced the Panel of the good, very good and sometimes excellent quality of the delivered science and policy support. The full report of the evaluation presents a "detailed commentary" on the various priority areas. An important observation, however, is that it is difficult to make a thorough evaluation of all the different themes and competences in one single exercise.

So far the JRC has significantly changed the structure of its Work Programme with every new Framework Programme, whereas the basic elements of its

work broadly stayed the same. The Panel was unable to find a convincing explanation for this practice.

For the benefit of the JRC and notably for its corporate positioning, planning and evaluation activities, it is recommended to develop a Work Programme structure that reflects the core activities of the JRC. Adaptations to changing political priorities have to be accommodated in substructures.

CHALLENGES FOR THE JOINT RESEARCH CENTRE IN THE FUTURE

Strategic Positioning

Since the introduction of its new customer-oriented mission the JRC has shown continuous improvement thanks to internal control on the mission alignment of the work. This has produced a step change in the performance of the JRC which is today certainly satisfactory. In this regard, however, the Panel felt that the organisation is reaching a performance ceiling and that it needs another step change to advance to a higher level.

For this next step change the JRC needs a fully fledged corporate strategy, building on an assessment of its current tasks and competencies and an analysis of the needs with a five-year time horizon. Such a strategy would provide the necessary reference for making the difficult choices in setting priorities in the Work Programme.

The Panel recommends that the JRC and its Institutes should establish a rolling five-year strategy, formulate a vision with clear goals, analyse its assets making a proper representation of policy support areas and competencies, and adopt criteria for accepting or not accepting tasks and apply them rigorously.

The vision needs to distinguish three distinct types of activity in the JRC

(i) The largest element: a collection of S&T policy support activities driven by a few big and several small and more irregular policy customers.

(ii) The Euratom commitment: a stable element within the JRC. It is, however, more dedicated to Treaty implementation than to policy support. It is arranged through a Euratom Framework Programme and a dedicated Work Programme Unit in the organisational structure.

(iii) Reference Materials and Measurements: also a stable element in the programme based on the JRC's expertise in this field.

It should bring the science and policy-support dimensions inseparably together and for this purpose the role of exploratory research in the JRC would be clarified.

The Panel recommends that the JRC should thoroughly re-evaluate the position and management of exploratory research and revisit the functions and the roles of the JRC Scientific Committee and Institute Scientific Committees so as to produce uniform procedures for the Institute Committees.

The Panel was somewhat surprised to see that the JRC mainly operates in a reactive "policy support" mode. It has the position, the knowledge base and the human resources to play a proactive "policy advice" role, in which it should, in a timely manner, draw the attention of policy makers to upcoming issues and indeed to become more involved in the early, agenda-setting part of the policy-making process.

In the Panel's view the European Commission would benefit from receiving proactive unbiased scientific advice from the JRC, identifying future problems, opportunities and needs of our societies, picking up signals from the scientific community and using horizon scanning procedures based on the current state of knowledge from science, technology and the social sciences.

The Panel urges the President and the Commission to enable the JRC, with its links to university knowledge generation in the EU and worldwide, to exercise a proactive policy advice function. To function properly this would need, for example, the creation of an "Office for the Chief Scientific Adviser to the Commission" within the Commission Services, with a high-profile Chief Scientific Adviser responsible directly to the President and the Commission.

Human Resources

Given the vital role that human resources play in the JRC's ability to achieve its mission, strategic importance must be given to the recruitment of the best possible candidates and to their continued career development once recruited. Strategic resource management must reach beyond the recruitment phase of the new staff members and follow them throughout their career as permanent members of staff or during their stay as a member of the visiting staff.

The Panel is fully aware of the Staff Regulations for Officials of the European Communities and the Conditions of Employment of other Servants of the European Communities; but the Panel believes that the following improvements are feasible and necessary for the JRC in this field:

- More competitions for staff with an S&T profile that give the highest priority to specific competence. Currently the Commission still places too much emphasis on administrative knowledge even in these S&T competitions.

- Enough posts for the JRC to recruit top talent on six-year temporary contracts for which the selection is made by the JRC.

- An increased use and selection of grant holders (PhD, post docs and visiting scientists) for the JRC.

- The creation of possibilities for the JRC to develop a career path for scientists within the constraints of the Commission rules, e.g. by creating Senior Scientist positions parallel to the system for administrative managers.

The Panel recommends that the Commission should grant improvements allowing the JRC to adapt hiring procedures and career management schemes in keeping with the skills required.

PhD students have a revitalising effect on an organisation. The JRC provides a training ground for PhD students and in areas where there are demands for skills in Europe not met elsewhere (e.g. nuclear, reference materials, environment) the opportunities offered are very good. Some parts of the research programme are critically dependent on the work and availability of graduate students. This training policy has to be continued, but its implementation can be improved.

The Panel recommends that the JRC should develop a quality assurance system for graduate training with the aim of continually attracting talented students.

Modernising the Organisation

Modernisation is key in a constant strive towards efficiency and effectiveness. The JRC needs a structured approach towards constantly modernising the organisation, paying attention in particular to infrastructure, management, organisation, and knowledge management.

In the wake of the Five-Year Assessment the JRC started building up mechanisms for coordination of the activities within the organisation. Further integration of the thematic and methodological competencies of the JRC is possible. The principal role of the vertical, "hierarchical" structures is to maintain these competencies. However, much of the actual work should occur in horizontal actions and programmes put together in a flexible way, backed by adequate financial resources according to the needs of the customers and research questions.

The Panel recommends that the JRC should continue building up efficient mechanisms for the coordination of the activities within the organisation. The mechanisms should be need and competence driven, and correspond to the trends adopted by the most successful research-based policy-support organisations in the world.

While much of the work over the past four years has already resulted in measurable improvements in the ICT system of the JRC, several strategic goals have not yet been fully achieved. JRC publications hold a wealth of knowledge that should be easily accessible to the external public; the only acceptable exception to open publication is an issue of EU or national security. In view of the large number of JRC researchers and the fluctuation of the temporary staff the organisation needs to use the most advanced Knowledge Management facilities.

The Panel recommends that all information exchange functions in the JRC, including the publications database PUBSY, should be upgraded. Contemporary knowledge management tools and methods to improve awareness should be used. These should include knowledge mapping tools.

The owner of large research facilities and infrastructure has to commit financial and human resources to something that may not necessarily be useful in the longer run. It also reduces the owner's flexibility. In the long run simpler laboratories bring a higher cost-benefit ratio.

The Panel recommends that the JRC should start a continuous process for making a detailed short, medium and long-term assessment of the status of its research facilities and infrastructure with the aim to further enhance its efficiency and effectiveness. This should be part of an overall strategy.

CLOSING REMARKS

The current evaluation allowed a high-level assessment of the JRC activities, but an assessment of the detailed policy support and the quality of scientific work would require more study of the JRC products and real interaction with its customers and stakeholders. More specialised evaluations would provide a better feed back to analyse the key competence areas and benchmark their success in research and policy support.

The Panel recommends that, in addition to the legally obligated high-level FP evaluations, the JRC should organise smaller, competence or sector-oriented external evaluations of its work. This will improve the positioning of the JRC in the relevant field.

These more specialised evaluations should also be used to assess the internal administrative and reporting processes in the JRC and to validate the "quality assurance framework for scientific and technical documents" and its implementation mechanism adopted by the JRC after the Five-Year Assessment of 2003.

1 OVERVIEW OF THE EVALUATION

1.1 The Panel's Approach

The objective of the Ex-post Evaluation of Joint Research Centre (JRC) Direct Actions of the 6th Framework Programmes (FP6) is to provide an independent assessment of the JRC activities in FP6 to the European Commission, the Council and the European Parliament, Member States, other stakeholders and the general public. The Panel's terms of reference and working method are described in detail in Annex 1.

The evaluation assessed the JRC's work according to the structure of the Multi-Annual Work Programme (MAWP) for FP6 categorizing the activities by 11 Priorities in four Core Areas of Research. The approach was similar to that used in the Five-Year Assessment in 2003 chaired by Professor David Fisk and emphasised an integrated approach to the JRC as an organisation rather than assessing the performance of individual Institutes.

Special attention was paid to the quality of research activities, as well as to the quality of implementation and management, and achievement of the objectives set. These results are related to the budget spent, the impact of the JRC activities and to customer satisfaction.

Expert groups, selected from the Panel, met with the Director and staff of every Institute on site. The membership of these expert groups purposefully overlapped. The Vice Chairman of the Panel participated in all visits to ensure a consistent approach across the different Institutes and across the 11 Priorities of the JRC's Work Programme. On the basis of the site visits and parallel desk studies of the background material provided by the JRC, one or two Panel Members prepared a thematic summary report for the activities in each of the 11 Priorities.

The Panel first met in Brussels on 26 February 2008 to agree on a distribution of tasks and the visiting schemes. It had its final plenary meeting on 22-23 June 2008 in Brussels, where it discussed the findings for each of the 11 Priorities, scrutinised the italicised text of the report that contains the conclusions and agreed on the recommendations.

1.2 Evaluation of the JRC in the Context of the 6th Framework Programmes

The Multi-Annual Work Programme (MAWP) of the JRC was developed on the basis of the 6th Framework Programme of the European Community for Research, Technological Development and Demonstration Activities and of the 6th Framework Programme of the European Atomic Energy Community for Research and Training Activities.

The MAWP was elaborated through extensive consultations with the JRC High-Level Users Group, the JRC Board of Governors and the Commission and was organised into four Core Areas: Food, chemical products and health; Environment and sustainability; Nuclear activities and Horizontal activities. The Core Areas were further divided into a total of eight thematic and three horizontal Priorities.

The MAWP was detailed into annual Work Programmes which specified Actions undertaken by the JRC for each year and allocated their resources. All Actions were reviewed annually in order to monitor progress against the objectives described in the MAWP and to determine needs for resources in the following year. The adjustments thus proposed were discussed with the High-Level User Group and the Board of Governors before implementation.

The Panel's evaluation was at the level of the MAWP. The 11 Priorities formed the basis for the Panel's work. Occasionally, the Panel gave its opinion on the results of individual JRC Actions. The Panel's detailed findings on the 11 Priorities are described in Chapter 2.

The Panel was impressed by the quality and volume of the work produced by the JRC during the period under evaluation. In general the objectives that were set in the MAWP 2003-2006 have been achieved. The Panel was also pleased to note that the planning of the work has shown a certain dynamics. In some cases when an Action did not fulfil its objectives or when they turned out to be obsolete, the resources were reallocated for the benefit of other activities with different objectives.

It is inevitable that the scientific impact of the JRC varies across the Priorities depending on the availability of appropriate facilities, infrastructure and expertise. The Panel noted with satisfaction that the JRC was able to produce important new information even in areas outside its core competence. In such cases the success was often based on collaboration and networking with universities and research institutes within the EU and beyond.

The JRC has in many ways succeeded in achieving the goals set in the 6th Framework Programmes 2002-2006. Much of the research that the Panel reviewed in the JRC is of good quality and has been used for the Commission and for customers outside the Commission. The international standing of the JRC reflects the contributions that have been made by competent staff using the unique position of the JRC.

The Panel acknowledges the success of the Director General and his staff in building a JRC that on the whole delivers robust scientific-technical support to policy makers in the European Commission and in the Member States.

The Panel noticed that during FP6 and now in FP7 the JRC has shown the capacity to reorient small parts of its work by sun setting activities that became of less relevance. Nevertheless, within areas like food, health, foresight, environment, public security, the Panel indicated topics during the Institute visits and in the detailed commentary of the final report where the JRC needs to analyse its position seriously and make sure that it can generate the critical mass needed to be effective in those fields.

The effectiveness of the JRC will be further increased if attention is paid to bringing down "silo walls" in the organisation for instance through internal seminars or thematic workshops.

1.3 Scientific Output and Policy Support

The scientific output and the relevance of the work in different Priority Areas are reviewed in Chapter 2. Overall, the Panel's impression of the scientific performance of the JRC during the MAWP 2003-2006 is good and its work plays a role in policy development in the European Union. The Panel was pleased to observe that the number of publications in peer-reviewed journals has continuously increased and several JRC reports have been published in leading general and specialty periodicals.

Although the primary objective of this evaluation has been to assess Direct Actions of the JRC under FP6, the Panel has seen other work carried out by the JRC for the Directorates General (DGs) of the Commission and as a participant in Indirect Actions of the Framework Programmes. The JRC target is that the volume of this work is around 15% of the total workload, but the percentage varies from one Institute to the other. The overall impression of the Panel is that the balance between the various activities is reasonable, and that the JRC has been able to fulfil the needs of different customers in a satisfactory way.

The ultimate goal of the JRC is to deliver robust scientific and technical support to policy makers based on a strategic dialogue with customers and stakeholders and an appropriate research basis. The support activities of the JRC are manifold and range from the implementation of EU legislation via monitoring and verification services, performing prospective studies and modelling, to scenario building and a broad variety of analyses. The JRC may also provide operational support, for example in anticipating environmental disasters and providing assistance in crisis management.

The main customers of the JRC are the other Directorates General of the Commission. They use the scientific support and advice in the preparation, implementation and monitoring of various EU policies. The JRC also carries out studies for and provides information to the European Parliament and the EU Council Secretariat thus providing scientific and technical support also to other EU institutions. The JRC provides support to authorities in the Member States in areas where it has a special competence or is mandated to do so by EU policies.

The Panel noted that the JRC has a good record in supporting EU policies. The JRC's activities cover the complete policy cycle, from the anticipation of policy needs, via the assessment of policy options and their impacts, through to the monitoring and implementation of policies with in practice a stronger presence in the latter part of the cycle.

In addition to the direct support, the JRC also has strong links with regulatory and advisory bodies both within and outside the EU. It cooperates with relevant EU agencies, for example through exchanging data and information and the development of informatics tools, and carries out work for, or in cooperation with, international organisations, such as the International Atomic Energy Agency (IAEA), the Organisation for Economic Co-operation and Development (OECD), the United Nations (UN) and the European Space Agency (ESA).

The Panel has seen good networking of the JRC not only with its main customers in the Commission but also with EU agencies and other European organisations as well as with universities and research institutes in the Member States. The

JRC has an outstanding role in establishing, leading and participating in a wide range of collaborative projects and expert networks in Europe and beyond. The JRC has also been successful in delivering an international service in areas of its expertise.

The work of the JRC plays a role in policy development in the European Union and has a scientific standing that is appropriate to fulfil its mission. Quality assurance systems are in place to assist in generating good quality performance of the JRC in knowledge production and knowledge synthesis.

The JRC has a good record in supporting European policies. Its activities cover much of the policy cycle: assessment of policy options and their impacts, and monitoring and contributing to the implementation of policies, but there is an emphasis on the latter part of the cycle. The JRC understands the policy process and the type of support required. Nevertheless, the Panel is in favour of a stronger role for the JRC in the early, anticipatory part of the policy cycle and formulates relevant recommendations later on in the report (section 3.1.3).

The JRC has succeeded in establishing and leading (and participating in) a wide range of collaborative research projects and expert networks in Europe and elsewhere. The JRC has also been successful in delivering an international service in areas of its expertise.

1.4 Meeting the Needs of Users

The JRC meets the demands of its policy customers either from its own resources or, where its in-house knowledge is not sufficient, by hiring external experts or subcontracting certain elements of the work. The knowledge synthesis activities rely on external knowledge and the collating of work from other individuals or organisations. This enables the JRC to operate with excellence and authority also in areas where it is not necessarily at the forefront of research.

The major users of the research output of the JRC are the Commission and its Directorates General (DGs). The Panel noted close ties and an active collaboration between the customer DGs and the JRC. The demand for JRC policy support and advice has been rising as shown for instance by additional work commissioned by the other DGs. It also became obvious that the value and impact of the JRC's policy support increased substantially during the review period. The positive development is the result of a number of factors, like the quality and relevance of the research and policy support and the active work of the Director General of the JRC and his staff in creating close, flexible and productive collaboration with the DGs.

Since the start of FP6 the JRC has developed a formal typology to monitor the output and quality of different categories of services and products for planning, monitoring and evaluation purposes. A first step in counting deliverables was made in 2006 and was used to underpin budgetary planning in 2007. The data shows a wide range of deliverables in support of European policies. They range from policy support documents, validated methods, reference materials, scientific papers and training courses, to test and measurements as well as databases used by the scientific community and policy makers.

The JRC implements Total Quality Management following the model of the European Foundation for Quality Management (EFQM). Within this framework a "customer satisfaction survey" is carried out regularly in order to assess the quality of the support provided to its customers and their degree of satisfaction. The main conclusion of the 2005 and the 2008 report was that the strengths and the added value of the JRC were in the scientific quality of its products and services. The relevance of its products and results also appears highly satisfactory. However, the ability of the JRC to manage a project does not always live up to the user's expectations. The overall performance of a project, which combines these three aspects, is assessed positively.

The Panel noted the good results of the JRC customer surveys, but this does not exclude less satisfactory performance in the service. Careful attention should, therefore, be paid to feed-back from individual customers, and any problem should be reported and analysed immediately. The relevant level of the analysis of potential problems is that of projects, rather than the level of the JRC Institute, and even less the level of the JRC as a whole.

The Panel was particularly pleased to note that the requirement of delivering consistent and high-quality results has led the JRC to pursue a quality management approach, where needed backed up by external certification and accreditation.

The JRC has over the recent past substantially reinforced its ability to provide scientific and technical policy support to the EU institutions. The JRC is credible as a competent and independent service and research body that understands the policy process and the type of support required. The demand for JRC policy support and advice has been rising as shown for instance by additional work commissioned by the other DGs.

From the bi-annual customer surveys, the Panel concludes that the JRC should pay special attention to management abilities in coordinating and operating projects. The relevant level of the analysis of potential problems is that of projects, rather than the Institute or the JRC corporate level.

1.5 Response of the JRC to the Five-Year Assessment[1] in 2003

A Panel of experts under the chairmanship of Professor David Fisk carried out in 2003 an independent external evaluation of the direct research activities of the JRC, a formal requirement both under the Framework Programmes and as part of the Commission's evaluation practice.

The Panel presented in a comprehensive Five-Year Assessment report a focussed set of recommendations to strengthen the JRC's ability to deliver services to the Commission. There were 11 general recommendations to reinforce the organisation of the JRC, its functioning, quality management and its infrastructure (laboratory and informatics environment) and 11 recommendations for the JRC Work Programme under FP6 (one for each Priority area with as a bottom line to seek integration in the Work Programme and across Institutes).

The JRC accepted all recommendations and has elaborated a number of actions to implement a follow-up to the various recommendations. The Panel noted

[1] Further on in this report referred to as the "Fisk Report"

with satisfaction that the JRC has enacted all recommendations, while the implementation of two recommendations requiring long-term commitments is still ongoing. The main effects of the achieved follow-up actions are specified in the relevant paragraphs of this document and further recommendations are presented if deemed necessary.

The JRC has accepted and implemented the recommendations presented in the final report of the Five-Year Assessment of the JRC 2003. These actions have resulted in an improved ability of the JRC to deliver its services to its customers.

2 Detailed commentary

The subsections of this chapter deal with the 11 Priorities under the four Core Areas in the JRC's Multi-Annual Work Programme. It gives a mixture of the Panel experts' impressions during the Institute visits and their analysis of the achievements based on Action reporting.

In assessing the achievements in the different Priority areas, the Panel often felt that the specific Priority did not include all relevant Actions or that some of the Actions covered would have been better placed under a different Priority. Therefore a certain inhomogeneity in the level of observations for the different themes was unavoidable and the findings are presented as a "detailed commentary" rather than as a full assessment.

The Panel noticed that the current Work Programme structure with Policy Themes and Agendas under FP7 differs significantly from the one with Core Areas and Priorities under FP6. Indeed, so far the JRC has significantly changed the structure of its Work Programme with every new Framework Programme, whereas the basic elements of its work broadly stayed the same. The Panel was unable to find a convincing explanation for this practice. A more stable structure would give the JRC a more recognisable work portfolio.

Whereas Chapter 3 will address the challenges ahead and thus contains the main recommendations of this evaluation report, the analysis of the development of the Work Programme over the years led the Panel to the following statement about the work programme structure.

For the benefit of the JRC and notably for its corporate positioning, planning and evaluation activities, it is recommended to develop a Work Programme structure that reflects the core activities of the JRC. Adaptations to changing political priorities have to be accommodated in substructures.

2.1 Core Area 1: Food, Chemical Products and Health

2.1.1 Priority 1 - The Food Chain

This Priority supports policies for consumer protection with regard to the food chain including safety, quality, authenticity, health, and nutritional and socio-economic aspects. The JRC Work Programme during FP6 grouped six Actions under the "Food Chain" Priority. They are carried out in the IRMM, IPSC and IPTS. Food-related activities in IHCP were not part of this Priority.

The Actions in this Priority show a clear identification the customer: for most of them it is the Commission, in particular its Health and Consumers DG, Agriculture and Rural Development DG and Eurostat, the Statistical Office of the European Communities. International standardisation bodies[2] are also significant beneficiaries of the JRC's work in food and feed.

As regards the implementation of one specific recommendation[3] of the "Fisk Report", the Panel acknowledges that the IRMM is developing a new microbiology (Level 3) laboratory and that it has produced certified microbiological reference materials and developed immunological methods.

[2] Like the International Organisation for Standardisation (ISO), the European Committee for Standardisation (CEN), the Codex Alimentarius Commission for food standards)

[3] "While endorsing the chemical science underpinning the Priority Area for Food, future expertise needs to include microbiological and immunological issues to reflect likely future developments"

The Panel believes the JRC should analyse the international situation and open the door for more leadership, based on competence in reference materials and measurements. In this respect the position of IRMM has been discussed in relation to CEN.

The JRC's food-and-feed related Actions are spread over five different Priorities and four Institutes (IRMM, IPSC, IHCP, and IPTS); several activities under Priority 1.2 "Biotechnology" or under Priority 1.3 "Safety of Chemicals" could as well have been arranged under "Food Chain", and at least five "horizontal" Actions (Core Area 4) partially support or complement the work done for the Food Chain.

Although it would have been meaningful to bring more coherence in the food-related activities from a programmatic point of view, the fact is that the various Actions in the "Food Chain" Priority have been carried out in an effective manner and with success giving the JRC a strong position.

Until now almost the whole of the Work Programme has been related to analytical methods relevant for food legislation. However, horizontal activities are important where no unique scientific research areas can be formed (e.g. in the case of nanotechnology). For IHCP horizontal thinking and working is particularly important. More research than routine work and introduction of horizontal topics such as "nutrition and health" could sharpen the picture in this area. Nanotechnology and biotechnology should lead these activities within JRC and use their knowledge for further international competence building. Biomedical testing methods have a high political priority, but future political and public thinking has to be observed continuously.

The Panel believes that the JRC should consider the following targets:

- Complete the actual system of analytical work considering hygienic and immunological issues as well as future developments in genetically modified organisms (GMOs) and safety aspects of nanotechnology.

- Define positive criteria for foods relating to quality as a whole including nutritional, sensorial and ecological aspects. They already play a certain role in food legislation now.

- Evaluate agricultural, feed, and food production systems (e.g. functional foods) based on techno-economic models to establish clear pictures on safety, quality, and health aspects. IHCP could take over the leading role in this integrated area.

More programmatic coherence in the food related activities would be good, but the various Actions in the "Food Chain" Priority have been carried out effectively which has put the JRC in a strong position.

The Panel supports a stronger role for the JRC in international actions (standardisation bodies) commensurate with the scientific importance and competence of the work in this field. The Panel recommends paying additional attention to food quality in horizon scanning and proactive thinking.

2.1.2 Priority 2 - Biotechnology

This Priority is based on the EU strategy recognising that biotechnology is a major contributor to the competitive and dynamic knowledge based economy in the EU. The Community intends to ensure that legislation concerning biotechnology, in particular concerning GMOs, is enforced uniformly and effectively across the EU. In addition, future policy developments will rely on high-quality assessments of the impact of technological developments on our economies and societies, and on early identification of newly emerging issues requiring policy responses. The main aim is to support implementation of GM legislation and to develop methods to assess risks as well as evaluate long-term impact of GMOs and other uses of biotechnology. Main customers of services in this area are the Health and Consumers DG and the Environment DG.

The JRC is recognised as the world leader in the GMO field of setting standards for GMO detection and in GMO certified reference materials (CRMs) which are essential tools for GMO quantification (bio-metrology) in the context of GM labelling of feed and food.

The JRC has close relations with the European Food Safety Authority (EFSA) and with the European Network of GMO Laboratories (ENGL). It also participates in multiple EU projects, contributing control samples and CRMs, reference detection methods and expertise with designing new protocols for standardisation and reference measurements. Through the ENGL, there is a very active distribution of materials and methodologies as well as a provision of training on site or within the JRC for national laboratories. Training material is distributed free through the respective websites. Furthermore, the ENGL acts as an interface for interaction with the USA, Japan, and others, with the EU serving as the world leader on GMO standards.

A consortium led by the JRC has developed a tool to estimate levels of adventitious admixture of GM and conventional crops in a given landscape. The methodology allows an analysis of the cost-effectiveness of agronomic measures to ensure coexistence.

While the focus of IHCP activities is on the core function as Community Reference Laboratory for GMOs (CRL-GMO), IRMM is largely concerned with the large scale production and distribution of GMO certified reference materials for GMO quantification for which they received international accreditations. While these activities are essentially complementary, there seems to be some overlap in objectives and deliverables such as for example the development of methods for quantitative GMO analysis and provision of controls. There is visibly an exchange of materials (e.g. CRMs and methodology) between the two units in the JRC working on GMOs, but both would benefit from a more systematic communication and exchange of information.

IPTS made a contribution to biotechnology foresight, concerning model simulations and expert opinions on the co-existence of GM and non-GM crops in European agriculture. IHCP supported this work by monitoring GMOs in the field.

The Biotechnology Priority is providing solid reference materials and detection methods for GMOs needed for the uniform and effective implemen-

tation of the EU legislation, and as such has achieved most of the objectives set in the Work Programme.

GMOs are perceived negatively by the public worldwide irrespective of the guaranteed quality control of GM food and feed. The JRC is advised to use its expert leadership in this field to actively contribute to engaging with the general public and politicians.

2.1.3 Priority 3 - Safety of Chemicals

The chemical industry forms a large and highly important economic sector of the European Union. For the tens of thousands of chemicals in commerce, a harmonised EU legislation must be in place ensuring a high level of protection for workers, consumers, and the environment against dangerous chemicals whilst allowing less regulated markets for the other chemical compounds.

Safety of chemicals has been a core activity of JRC for over 15 years. Without the solid and thorough work of the JRC scientists now grouped together at IHCP, there would not be a sound European policy on the effect of chemicals on humans and the environment. Since its inception, the European Chemical Bureau (ECB) has been seen as the key partner for policy development and for R&D. It has been at the forefront for classification and labelling, and paved the way for an unbiased discussion on risk assessment and toxicology of chemicals and consumer goods.

Recently, the new regulation with the Registration, Evaluation, Authorisation and Restriction of Chemical substances (REACH) entered into force and legislation became fully operational on 1 June 2008. It will have far reaching implications on the chemical industry and the way in which the EU deals with the question of safety of chemicals. Together with the chemical industry and the Organisation for Economic Co-operation and Development (OECD) the JRC had a leading role in the development of the informatics tools for REACH, the so-called REACH-IT system that will be at the heart of the operations of the European Chemicals Agency (ECHA). This concerned scientific aspects, such as data structure and the content of the web portal as well as technical issues such as how to put databases together worldwide and how to achieve global access free of charge. The JRC's website for the implementation of REACH has become one of the most visited sites of chemical information, both in Europe and abroad.

With the successful launch of REACH and the transfer of a number of activities to the European Chemicals Agency, the JRC has reached a most important objective within FP6. It has to be complimented for all the preparatory work which finally allowed a relatively smooth start for REACH. The Panel is convinced that without the science-based integrated approach used by the JRC such a major piece of work could not have been achieved in the restricted time window budgeted. The set-up and the launching of REACH could be used as a showcase of how scientific information, technical and economic feasibilities, business interests, and the needs and concerns of all stakeholders can be woven successfully into a legal framework.

The assessment of risks and hazards is at the core of identifying chemicals that are potentially not safe for humans and the environment. The outcome

from this topic will allow the IHCP to base its judgments on scientifically sound data and methods harmonised between Member States and different regulatory frameworks. In the integrated exposure assessment and modelling (EXPO-model) special emphasis is given to chemicals in consumer products from food packaging, via appliances to furniture under conditions of daily use. Work under this topic is clearly a task of JRC. The advances in risk and hazard assessment, in computational toxicology, and exposure modelling are good and here the JRC fills a gap which no other organisation can or would do.

As regards the analytical possibilities in risk assessment, the JRC would benefit from IHCP and IES joining forces. The "Indoortron" is one of the research facilities that triggered the Panel's general recommendation in section 3.3.3 to regularly analyse the status of big infrastructures in the JRC. Several of these infrastructures give the impression of being under-used and their maintenance ties up resources. Individual experiments may be better out-sourced to other European institutes.

The European Centre for the Validation of Alternative Methods (ECVAM) has been active for over 15 years. It is supported by computational toxicology which makes advances in the field of quantitative structure-activity relationships (QSARs). A QSAR database is now available containing estimates for the properties of over 160.000 chemicals. This database and ECVAM are the basis for making in silico assessments and reducing the need for animal testing. The design, construction, and maintenance of such a database need major scientific input. Its validation service, and the maintenance and management of the database are extremely important for the EU. The JRC is well equipped and staffed to do this work which is of utmost benefit to all Member States, the chemical and pharmaceutical industry, as well as NGOs and the academic world. The JRC shows leadership in this all so important but often neglected field.

Testing of the safety and the effects of chemicals is still done independently in each scientific and application sector. Interpretation of test results from different approaches is difficult if not entirely impossible. Therefore, it is timely that the IHCP has started an effort to integrate the different testing targets and the appropriate methods into one toolbox in order to obtain a truly (molecular) mechanistic understanding of the effects of stressors on individuals and populations. To reach this goal it is pertinent to integrate physicochemical (e.g. membrane permeability), chemical (e.g. QSARs), and biological methods. The results of such an integrated approach will allow sound policy support through its comprehensive information.

The Panel welcomes this effort towards integrated testing strategies for risk assessments and stresses that a special effort is needed to bring the different expertise and disciplines together; the total will be more than the sum of the individual components. Time must be allowed for the creation of a leading team from members of different Institutes. To avoid pitfalls, proven parameters of success from past experience of integrated projects, particularly also from outside of the JRC, must be incorporated into the project design and management.

With REACH and the European Chemicals Agency in place, the JRC should focus more on integrated approaches in the assessment of risks and hazards by chemicals to humans and the environment.

To keep up with the newest knowledge developments, particularly in the molecular biology field, the JRC must connect even more strongly with leading institutions worldwide. The JRC Institutes should take this window of opportunity to optimise their respective roles, fuse activities where opportune, and create a sharper profile in complementary areas.

2.1.4 Priority 4 - Contributions to Health

This Priority is based on the Community health strategy and intends to underpin and support policy development at Community level by focusing on improving health information and knowledge, responding rapidly to health threats and addressing health determinants. The Actions in this area are diverse and based on specific competencies existing in several Institutes. They range from health effects of environmental exposure to treatment of cancer.

The general impression is that the Priority has achieved many of the objectives set in the MAWP, but at the same time, that the impact on European policies or on the work of the Commission Services seems to be small. However, several Actions included in other Priorities (food chain, biotechnology, safety of chemicals, protection of the European environment) have directly or indirectly contributed to the health of European citizens. Therefore, the overall impact of the JRC on issues related to the health of European citizens has been significant.

Two Actions in this Priority aimed at the development of new approaches to cancer treatment based on nuclear methodology. The Neutron Capture Therapy is used mainly for treatment of brain tumours and can only be performed at nuclear research reactors. The clinical significance of the therapy is still uncertain, but it is obvious that even if the treatment turns out to be effective, the number of patients that can undergo this treatment will remain small. The Panel encourages the JRC to carry out its intentions to phase out the project as the methodology seems to be fully developed and other institutions may continue the clinical studies.

The JRC has, in close collaboration with the university hospitals worldwide, made its facilities and expertise in handling highly radioactive alpha-nuclides available to develop and test suitable alpha-emitting immune-conjugates for cancer treatment. The initial results are promising and the method could be applied to the treatment of several cancer types and infectious diseases. The technical expertise of the JRC is critical for the development of the therapy, a reason to continue providing support to the work on alpha-immunotherapy, cell toxicity and cancer therapy.

The volume of health technology assessment has decreased during the transition from FP6 to FP7 along with a changing focus from technology assessment to modelling and policy analysis. The remaining work focuses on the impact of new technologies, particularly genetic technologies, on health and health systems. The Panel believes that the research groups for this work are below a critical mass, making contributions to the European policies that are not very significant. The Panel noted that there are other sectors in health research where the JRC could support the Commission Services and the health policy of the Member States. An area with growing importance which might benefit from improved European networking and collaboration is health technology assessment.

The majority of the inputs of the IHCP have contributed to health in Europe but only two of the Actions have formally been included in the Health Priority (Cyclotron Applications in Health and Environment; Human Exposure to Environmental Stressors and Health Effects). Although the Institute has generally been successful in achieving its objectives, it is clearly at a crossroad. Potential "future topics" were put forward, but building up new expertise for instance in "nutrition and health" would require significant resources, and should be dealt with in the context of a corporate strategy.

The Panel noted that there has not been enough collaboration within the JRC in this area of health research, and there appeared to be only a little cross fertilization between the Institutes and between the individual Actions working on health issues. One obvious explanation is the heterogeneity of the thematic area.

Some of the Actions in the Health Priority have operated below the critical mass during FP6. Much of the work has not been in the main stream of the parent Institutes, or in fact, in the main stream of the JRC. On the positive side, the scientists working in this Priority have been strong in networking with academia, i.e. universities, research institutes and hospitals in Member States and elsewhere.

The Fisk Report noted that there is an absolute need to coordinate the topics to be addressed with a more realistic and pragmatic overall health strategy for the JRC. In FP7 the position of health research has become a crosscutting discipline across several Policy Themes of the Work Programme without visible structure. Therefore, the JRC should start to establish a clear vision of what position it wants to give to health research in its Work Programme.

The Health Priority has achieved many of the objectives set in the Work Programme, but the impact on European policies and on the work of the Commission Services has not been large. On the other hand, the Actions included in several other Priorities are directly or indirectly related to the health of European citizens. Hence, the overall impact of the JRC on issues related to the health of European citizens has been significant.

The JRC should now start to establish a clear vision of what position it wants to give to health research in its Work Programme.

2.2 Core Area 2: Environment and Sustainability

2.2.1 Priority 5 - Protection of the European Environment

This Priority focused on air, soil and water quality, the sustainable management of land and water resources, the environmental aspects of products throughout their life cycle and impacts associated with the management of waste. The activities support a broad range of policies laid down in the Sixth Environment Action Programme and fit the EC Strategy on Sustainable Development. For this purpose the JRC develops and tests advice and scenarios for regional, EU and global policies and data sets. The Commission is the biggest customer of the JRC's work, but the Member States are also beneficiaries. New Member States have been direct customers and

the networking of the JRC with their Institutes has been especially effective during the accession process.

The availability of massive environmental data with global coverage has become more common today; environmental data sets covering the whole of Europe have a clear added value for the EU. The JRC plays a key role in the collection and management of this kind of data for the region.

The JRC connects operational activities such as warning of forest fires, flood and droughts forecasting, or calibration exercises for the water framework directive, with quality in science and logistics. This has proved to be beneficial to the Commission and other customers of the JRC in the Member States. It is important that the JRC continues to integrate and harmonise all environmental data available in the various JRC Institutes.

The JRC has been building on results achieved on global change monitoring and research in large national and European institutes by inter-comparing and integrating these into services for its customers. This role has become increasingly organised and institutionalised. In this respect the Panel would encourage the JRC to investigate the possibility of creating for the EU and its institutions a focal point on global issues as a European counterpart to regional or global initiatives. The focal point should reside within the JRC and could serve as an integrating body for European trans-boundary issues that are handled by international initiatives, projects and programmes, like for example the Global Environment Facility (GEF) of the United Nations Development Programme (UNDP).

With the Commission's mandate to represent the European Union in the United Nations (UN), the JRC participates in several of the environment-related UN committees successfully achieving the integration of various issues across the different committees.

The JRC gradually developed tools for integrative assessment of scenario impacts. Customer response is positive and a few of these tools have already been integrated in the Global Monitoring for Environment and Security (GMES) initiative.

External collaboration is good and the Panel recognised improvements in the JRC's internal communications, but these seem not to be efficient. Establishing dedicated task forces was signalled as a possible solution to strengthen corporate identity and to react to new policy needs in a timely way; a temporary instrument, which could avoid calls for major reorganisations and which could be supported by small organisational readjustments.

There is a joint work programme with the European Environment Agency (EEA) covering task distribution and exchange of personnel, which avoids duplication of work. The Panel welcomes and encourages the continuation of this development which could be used as a JRC model for cooperation with other EU agencies.

The Panel acknowledged the flexibility and pragmatism regarding decisions about Actions in this area. Environment Actions that fall below the critical mass are phased out and a new Action is only initiated if there is a good chance of success. The latter is usually linked with the existence of sufficient

interest in Member States, or to becoming part or being part of an EU Regulation.

The JRC's role in the field of environment may not be correctly or fully perceived within the scientific community of Europe. It is not well known that the JRC often serves as a lens, focusing activities in Member States incorporating work of many cooperating organisations. It would be worthwhile to seek improvements including building stronger links to universities.

The laboratory facilities for this Priority have improved since earlier assessments. The Panel's opinion is unanimously positive with regard to keeping and developing these laboratories in the future to avoid loss of expertise. The Panel would also stimulate an internal discussion on the right balance between competitive and institutional funding for this area and perhaps for other areas too.

The level of interest from external users for using JRC databases is very high. At the level of resource allocation meeting this growing demand should not compromise maintaining scientific competence. Although the JRC has the knowledge and the capacity to meet this demand, there is a need to establish more dedicated capacities in this field and to harness them into a coherent framework. At the same time the JRC should strengthen efforts to integrate the available databases, knowledge and software into the development of impact assessment and scenario models and reinforce the socio-economic components in these.

Despite JRC's policies for open access to its environmental databases and requests for data and some models, these are sometimes restrictive for users due to the fact that Member States do not allow the JRC to give third-party access to data that concern their territory. This problem would need to be solved at EU level.

The Panel acknowledges the progress made in the quality and the orientation of the work in this Priority Area since the Fisk Report. The JRC plays an important role in the collection and management of global and European environmental data. The level of interest from external users for using the various JRC databases is very high.

There is scope to strengthen efforts to integrate the available databases, knowledge and software into the development of impact assessment and scenario models and reinforce the socio-economic components. At the same time the JRC should work on a structured integration and harmonisation of all environmental data available in the various JRC Institutes.

The Panel encourages the JRC to investigate the possibility of creating within the JRC a European focal point on global issues as a European counterpart to regional or global initiatives. The focal point could also serve as an integrating body for European trans-boundary issues handled by international initiatives, projects and programmes for the EU and its Institutions.

The Panel believes that the JRC should strengthen research for its general knowledge base and the available databases in the areas of information for ecological security and durable development, monitoring and understanding

of nature and extent of disasters, the impact of global warming, desertification, erosion and deforestation.

2.2.2 Priority 6 - Global Change

It is clear that the title Global Change covers a very large number of fields and that the JRC cannot possibly make an impact in all of them. The JRC's most valuable role is that of coordinator collecting, harmonising and integrating regional, EU and global data sets related to levels and emissions of greenhouse gases and conventional air pollution such as aerosols and tropospheric ozone. The role might also be looked upon as a focal point and a useful player because of the data collections covering regions and climatic zones in large parts of Europe. The JRC is well-positioned to fulfil these roles in a regional and global context.

The main customers are found within EU institutions, but there is also a host of important international users of JRC results and reports in this field. Amongst them are a series of UN bodies like the Food and Agriculture Organisation (FAO), the World Meteorological Organisation (WMO), the World Health Organisation (WHO), and the Intergovernmental Panel on Climate Change (IPCC), but also international bodies like the International Geosphere-Biosphere Programme (IGBP), or the US National Aeronautics and Space Administration (NASA).

The JRC has developed unique competence in the area of greenhouse gas emission and sinks in the forestry and agriculture sector. It has refocused much of its environmental studies and work on natural hazards, and integrated expertise already available in areas of land resources and water quality management which are closely linked to global change and therefore important areas for the JRC to cover.

The work done is quite effective and the planning and progress of the different activities have resulted in a large quantity of deliverables in terms of case studies, risk maps, analysis of climate-change scenarios. The quality of the output is in general satisfactory, but the impact of many of the products is more difficult to assess. Top quality products are to be found in peer-review scientific publications, reporting results from the JRC's own research.

There is cooperation, contact and networking with the major players worldwide and the JRC has close collaborations regarding climate change and related ongoing and/or expected effects on the environment and society with some of the most outstanding institutions. The links with the 12 New Member States are good and experts and young scientists from these countries have been hired into the ongoing work at the Institutes.

Some "Global Change" Actions have been closed since they came below the critical mass. This capacity to reorient work programmes and staff when necessary has a positive effect on the work in this area.

There seems to be a need for more and improved links with global initiatives for data collection. JRC results are disseminated on a regular basis and are to some extent available also for users outside of the formal customer list.

Most of the work in this Priority is reactive. The Panel is inclined to promote a change of attitude in terms of allocating more time and funding to do more

proactive work to anticipate short, medium and long-term orientations for the Commission.

The Panel found that the management of the various databases might require an increase in number of staff working on the matter. As it now stands, with the many requests for data, the whole effort is critically dependent on too few people; if they were to leave all work around the relevant database would be in jeopardy.

With its high level of scientific development in the area, its networks, computer facilities, and databases and the internationally recognised standing of its scientists, the JRC can offer interesting and instructive opportunities for global-change scientists.

Some important and evident changes have been introduced for this area in FP7. The JRC's role in global forest monitoring has been sharpened. The work is now done in close cooperation with the FAO and supports new policy options for including deforestation in Post Kyoto carbon trading options.

In coordination with the Development DG, the External Relations DG and EuropAid, the JRC has decided to establish an "Africa, Caribbean and Pacific (ACP) Observatory for Sustainable Development". The work on the ACP Observatory now combines expertise in natural resource management, desertification and climate change (in the IES), with renewable energies (in the IE) food security, sustainable indicators and humanitarian aid issues (in the IPSC) to provide a unique portal to JRC expertise for the Commission DGs, for the EU delegations and for ACP partners, especially the African Union.

The socio-economic component in the work is in the process of being reinforced in order to respond to requests from the Environment DG to develop cross-sectoral impact assessment scenario models. This is a timely development and there may be scope for establishing a dedicated capability in this field.

The Panel would like to promote a change of attitudes in terms of allocating more time and funding to do more proactive work to anticipate short, medium and long-term orientations for the Commission in the field of environment and sustainability.

The Panel found that an increase in staff may be necessary for the management of the various databases. There are many requests for data and the whole process relies too much on relatively few people. Currently, if staff members leave, all work around the relevant database would be in jeopardy.

The JRC can offer interesting opportunities for global-change scientists through its networks, computer facilities, and databases, and the internationally recognised standing of its scientists in this field.

2.2.3 Priority 7 - Energy

In the course of FP6 the work of the JRC for the Priority "Energy" has been guided by the Green Paper on the Security of Energy Supply. Consequently the JRC has concentrated its efforts on providing scientific and technical support to the Commission for the implementation of actions for the sustainability and

security of energy supply and energy technologies. Based on the above, the work for this Priority covers two integrated scientific areas:

- The Sustainable Energy Technologies Reference and Information System;
- Renewable Energies and Advanced Energy Conversion Technologies.

It is noted that the JRC has made substantial progress in the organisation and execution of its energy research in the past five years. The facilities have been upgraded, relations with customers (DGs and other EU organisations) have been intensified and the internal coordination improved. The JRC is well positioned to fulfil its obligations in this Priority Area. In this respect the JRC completely fulfilled its objectives and its duties towards the EU customers.

Integration of activities in the field of energy has been recommended in the Fisk Report. Under FP6 JRC internal coordination and cooperation in the Priority Area remained weak, but the effects of a stronger integration are visible now in the activities under FP7. This integration process in the field of energy research has to be continued.

The demarcation of activities and cooperation with regard to nuclear research at the JRC will require attention in the coming period, as nuclear energy will form part of any low-carbon energy mix for the future.

The area of energy research is vast and the two integrated scientific areas are already beyond the grasp of one organisation. The intensification and expansion of the energy policy of the EU will require even more technical and scientific support. This will require flexibility at the JRC in the energy area, possibly a strengthening of its capabilities in this area and certainly increased networking. It will be challenging to realise this. More horizontal task forces and more modelling may also be necessary.

Increased attention to the capabilities for system integration in the energy area may be helpful in the future. The combination of technical developments, social changes, environmental concerns, safety issues and politics will determine the future energy policy and consequently the energy research agenda.

To prepare for the policy support required in future the JRC will need a vision for the energy activities going beyond the duration of a Framework Programme. This should enable the JRC to establish its strategy in this area and to set priorities regarding research topics, facilities and organisation.

The JRC can play an important role in the future with the expansion of the EU energy policy. This will need increased technical and scientific abilities that are well within its remit. However, for this to happen, its networking activities in this field must be reinforced.

The energy policy for the future and consequently the energy research agenda will be determined by the combination of technical developments, social changes, environmental concerns, safety issues and politics. Hence, more system integration in the energy area will be required.

The JRC will have to set priorities regarding research topics and develop a vision for energy activities going beyond the duration of a Framework Programme. Nuclear energy will form part of any low-carbon energy mix for the future. Therefore, the vision will also need to clarify the demarcation of energy-related and Euratom activities.

2.3 Core Area 3: Euratom

2.3.1 Priority 8 - Nuclear Safety and Security

The nuclear activities under this Priority represent 25-30% of all activities in the JRC in terms of resources. They are carried out in four Institutes: ITU, IE, IPSC and IRMM. Whilst ITU is fully devoted to nuclear research, the three other Institutes are only partly active in this area, approximately 60% for IE and less than 30% for IPSC and IRMM (including neutron data measurements which were outside the nuclear area in FP6).

The ITU acts as Priority Area Coordinator of all nuclear activities. The Panel was generally impressed by the quality of the Actions conducted in the Institutes and by the commitment of their staff.

The position of the JRC in the nuclear area is mainly related to existing facilities and the associated team competences. The hot cells in Karlsruhe, the High Flux Reactor (HFR) in Petten and the accelerator Gelina in Geel are efficient facilities absolutely necessary for the European nuclear research programme (Euratom FP and national programmes). They are partly used for work related to commercial activities but they are essential mainly for basic research and knowledge improvement in fields of great importance for nuclear safety and security, such as physical and chemical data, materials behaviour, fuel cycle and waste management.

ITU is a front runner in topics like nuclear fuel and the fuel cycle, with a main focus on actinides. The competence of ITU teams is absolutely necessary for the Commission expertise in nuclear safety and waste management. The Member States are also relying on the ITU for first priority actions in the field of nuclear fuel and fuel cycle development. IE has a long tradition of expertise in nuclear material science and is willing to develop a wider expertise in nuclear energy, in particular in nuclear safety. The JRC has lost most of its expertise in reactor safety (formerly in Ispra) and it is still too early to see if the Clearinghouse Project will bring back sufficient knowledge for IE to be a main player in this field. IPSC is leader in nuclear security in the EU, well in line to support Euratom Treaty requirements and the EU obligation to the International Atomic Energy Agency (IAEA). IRMM is the main European laboratory for nuclear reference materials and neutron data measurements.

In general, the Panel considers that a good equilibrium has been found to satisfy most of the needs. The training of young scientist is of high quality and has to be kept at that level. The share of competitive work is reasonable. Contacts with the Commission Services, in particular the Energy and Transport DG and the Research DG, seem to be sufficient.

The specific recommendation in the Fisk Report for the nuclear area was taken into account in all four Institutes, but the rigidity of staffing procedures remains an issue for this area. The suggestions in the report for solving the problems with HFR operation in IE has been followed with success.

The coordination between the Institutes seems to be satisfactory: there is a Priority Area Coordinator (ITU) and the key competences among the various Institutes are well defined. Integrated projects have proved to be very effective not only in the complex assessment, but also in training and knowledge dissemination. In the nuclear area this approach may be the best solution for the JRC.

The networking and cooperation with institutes in the Member States is already important, in particular through Indirect Actions in the FP, but there is still room for increasing it and making it more efficient. The JRC also participates in worldwide projects like the Generation IV International Forum (GIF), the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), and the Global Nuclear Energy Partnership (GNEP), which is part of the Advanced Energy Initiative of the United States of America.

The Panel has noted the effort made by the Institute Directors to phase out Actions that have become less important in order to adapt to new priorities. However, there is still the risk of dispersion of the limited amount of resources and the absence of a long-term vision on the evolution of the various nuclear activities was noticed. For instance the IE claims that the percentage of nuclear activities will go down, whilst at the same time it wants to keep the expertise on nuclear materials and increase its capability on nuclear safety.

The Panel was surprised by the number of open staff positions at the ITU; a situation which can jeopardise the programme priorities and the effort made by the staff to satisfy demands.

The Priority "Nuclear Safety and Security" used around one quarter of the total resources from the Framework Programme for the JRC. With nuclear renaissance, the demand on this area is likely to grow, but the JRC also has a policy not to increase the overall capacity. There are various options to respond to a growing demand and the JRC may want to work on for instance mobilising more expertise through networking and enhancing cooperation with institutes in Member States.

The Panel was impressed by the commitment of the staff and by the quality of the Actions in the Priority "Nuclear safety and security". The JRC teams are well integrated in most of the European nuclear research networks and often have a role of leader or coordinator in their field of competence.

The Panel emphasises the importance of setting priorities in the list of Actions and the necessity of stopping projects that have become less important. It acknowledges the effort taken by the Institute Directors to select Actions to be stopped in order to adapt the resources to new priorities. In this respect the area would benefit from a corporate strategy.

The reinforcement of the EU energy policy is likely to be accompanied by an increased demand for scientific and technical support in the area of nuclear safety and security. A reinforcement of the JRC capabilities in this area may also be required.

2.4 Core Area 4: Horizontal Priorities

2.4.1 Priority 9 - Technology Foresight

Foresight and economic modelling are important elements of informed policies. They are increasingly used worldwide and hence supported within research institutes, government departments, NGOs and companies. In Europe their positioning within the Commission at the JRC appears to be a reasonable solution, unique at a global level. Foresight activities are expected to expand further in the near future.

The IPTS has an explicit focus on foresight, has grown rapidly, and is building an international reputation for many of its activities. It is clearly customer driven, developing strategic relations mainly with its customers in the Commission. It is successful in policy support and advice but it appears less successful in pursuing excellence in research, because it does not publish all its results in scientific literature, partly due to a lack of resources and sometimes due to the confidential character of the information used, which forbids publication in open literature. The IPTS strengths are in policy fields of agriculture, information society, research and growth, and competitiveness and sustainability. An effort to expand in health is under way but as yet with limited success.

In IPSC the Econometrics and statistical support Unit runs Actions in the Priority "Foresight". The Unit has expanded rapidly and developed significant tools serving important topics of current policies (such as the Lisbon Strategy, Lifelong Learning, Knowledge Society) in areas that are likely to expand in the future. It has developed good skills and part of its work has received important international recognition. It is often benchmarked as excellent.

Synergies between the two geographically dislocated units are limited. There is now more cooperation than in the past, further improving over time, in the form of common workshops, conference attendance, but there is no systematic planning to achieve synergies in curricula and results. There is no "Foresight" Priority Area Coordinator.

Foresight work is much in demand. IPTS receives more requests for support than it can handle. It could satisfy more requests if it had more senior scientists and permanent positions. The shortage in permanent staff is mitigated by the existence of a network of young researchers that will become the nucleus of successful foresight exercises in their home countries when they go back.

The Panel noticed that the administrative position of the Econometrics and statistical support Unit within the IPSC presents a weakness. Indeed, its work is only marginally linked with the IPSC programme and it is remote from colleagues in IPTS in Spain.

Effective policy support requires the possibility of making a good trade-off between strategy and opportunity. Opportunity is reflected in the share of contract research, while strategy is reflected in the number of areas and requests that an Institute refuses to engage into. The impression is that the IPTS is focusing more on strategy; whereas the Unit in the IPSC, further away from the core activities of the mother Institute seems more

opportunity than strategy driven. It is obvious that the whole area would benefit from a corporate strategy that includes a foresight strategy to which the various players can then align the strategy of their Institute or Unit.

Foresight activities and economic modelling increasingly contribute to informed policy making. They are used and hence supported within research institutes, government departments, NGOs and companies worldwide. In Europe their positioning within the Commission at the JRC appears to be a reasonable solution, unique at a global level.

Cooperation aiming at complementarities and synergies between the foresight teams in Seville and Ispra is crucial and a dedicated effort to achieve this is needed.

Foresight in the JRC needs further examination. The foresight and modelling activities need more visibility. Publication of results in scientific literature would improve visibility as well as quality of research.

The Panel suggests that there should be more proactive foresight in Institutes other than the IPTS and this could be supported by knowledge transfer within the JRC. The organisation would benefit from a corporate strategy that includes a foresight element to which the various players can then align the strategy of their Institute or Unit.

2.4.2 Priority 10 - Reference Materials and Measurements

The JRC work on reference materials and measurements at the IRMM provides a cornerstone for the development of a common European measurement system. The overall aim of the Priority is to support the further development of the metrological measurement infrastructure in the Member States, Candidate Countries and Third Countries of special significance to the EU, such as in the Mediterranean region. The scientific work carried out under this horizontal priority is the basis for providing sound advice to Commission Services where applicable to EU legislation and practice.

The international community has seen a great many producers of reference materials, not all of them with equal trust worthiness. It is therefore a great asset for measurement science in Europe to have a JRC Institute of high scientific standing and reliability that deals with all matters of general interest in this area and at the same time also produces a good number of reference materials itself. The multitude and complexity of different measuring tasks means that only a relatively small selection can be offered and continuously serviced. In this context the initiative of the last years to cooperate closer with other organisations in Europe and around the world is highly welcome.

There is an increasing need for the production, storage and distribution of reference materials worldwide. This is accompanied by the requirement for the dissemination of practices, methods and procedures for these reference materials to the appropriate authorities in Member States. This is met mainly by educational means and this gives the JRC a certain touch of an “education and training” establishment.

Some streamlining of the operations would be accomplished by reducing activities that directly address field and routine laboratories or academic institutions. These activities are currently mainly concentrated in the areas of education and round robin studies for routine laboratories. Cooperation in the development of measurement procedures and reference materials is, however, of the utmost importance.

This Priority is a well-balanced effort to support the measurement infrastructure of Europe. It is complemented by similar but not identical efforts in Member States, thereby creating a network of quality laboratories and a notion of reliability regarding results from measurements. The past development of the IRMM through branching out into the food and biology area is appreciated and should be reinforced. Overall the programme can be seen as being highly effective and useful to the laboratory community at large.

An important aspect of this field is that there is no firm rule on which to decide the reference material that is the most relevant to be produced. Therefore, it is not surprising that in practice this decision depends on the in-house measurement and production capabilities and the available cooperative partners. With this in mind it could be regarded a good policy to loosely couple the function of reference laboratory with that of reference material production.

The reference materials and measurements area is strongly rooted in the IRMM. This work merits a special position in a long-term vision and an overall strategy for the JRC.

This Priority represents a well-balanced effort in support of Europe's measurement infrastructure, complementary to efforts in Member States. Together this creates a network of quality laboratories and a notion of reliability regarding the results from measurements. The branching of the reference materials and measurements work into the food and biology area is appreciated and should be enforced.

Some streamlining of the operations could occur by reducing activities that directly address field and routine laboratories or academic institutions. These activities are currently concentrated in the areas of education and round robin studies for routine laboratories. Cooperation in the development of measurement procedures and reference materials is, however, of utmost importance.

2.4.3 Priority 11 - Public Security and Anti-Fraud

In the area of Public Security the JRC provides scientific and technical support by contributing to the development of a European framework for forecasting, assessing, managing and reducing technological and natural risk and enhancing public security. It also supports the implementation of the EU policies on safety and security of transport systems through technology and risk analysis applied to vehicles, maritime vessels, infrastructures and human factors.

In the area of Antifraud the JRC provides scientific and technical support to Commission Services concerned with disbursement of large amounts of European taxpayer's money or monitoring compliance with Communities policies. Anti-fraud actions are and will remain an essential part of the work process of the EU.

In both areas the JRC showed convincing records of supporting Actions for several Commission Services. Work for this Priority shows a dedicated customer orientation with a relatively high portion of competitive income (20%) as a side effect.

Using advanced information technologies combined with data fusion techniques, JRC created extremely good results, for instance in analysing world wide container traffic or in providing data about crop fields or terrorism alerts.

The situation is somewhat different for public security in the areas of modelling, simulation and testing. Here, the JRC is in competition with the full spectrum of national laboratories and research organisations in the Member States. The Panel believes that it would be useful, as part of an overall strategy process, to make an inventory of issues in which the JRC either takes a unique position or where it cooperates with the leading laboratories in Europe.

Fields where JRC might and should have the lead on a European scale are for example initiatives and support for European construction codes and risk and hazard and vulnerability analysis. In fact, there is a long list of topics, where the IPSC is in a unique position to generate and promote European standards to make our infrastructure more resistant against technological and natural hazards.

Since FP6 the JRC is orienting itself more and more to customers and the European science community, which is seen as highly positive. Still, focussing the work in the areas of "security" and in "antifraud" remains an important task. A corporate strategy should make clear that the JRC can create advanced information technology methods and tools for all sorts of monitoring tasks, implement them and then hand them over to the DGs or to other organisations to apply these tools.

Specific rules and criteria for research at JRC would help to develop a clear profile and a unique position in the European science community and help to continue the very positive development made in the transition from FP6 to FP7 in the area of public security and anti-fraud.

The JRC has delivered excellent results in almost all Actions of this Priority Area and demonstrated an outstanding way of how it can support the Commission.

The Panel strongly commends the process of concentration on a defined portfolio with selected topics from public security and anti-fraud. This process should take into account the mission of the JRC to provide scientific support to the European decision makers on the basis of its own robust and sound scientific work.

2.5 Support to EU Enlargement Policy and Integration of New Member States

Support from the JRC to the EU Enlargement Policy and towards the integration of the New Member States has consisted of different instruments promoting networking, mobility and integration of organisations, researchers and experts from the 12 New Member States, the three Candidate Countries, the

Potential Candidate Countries and, on a selective basis, the countries of the European Neighbourhood Policy. In 2006 parts of the Action were extended to the Associated Countries.

The work programme of the Enlargement Action has been defined after consultation of EU policy documents and in collaboration with National Contact Points and Scientific Attachés. In compliance with the JRC mission, the Action has focused on scientific and technical aspects of EU legislations for which the JRC has competence, e.g. in fields such as environment, food safety, chemical safety and nuclear safety.

The principal instruments included:

- workshops and training courses involving altogether 4000 experts of the New Member States;
- projects addressing specific needs from the countries which are relevant to the enlargement projects;
- open calls for researchers and experts from the New Member States to work in the JRC for short periods, typically two years;
- information events in the New Member States often in collaboration with the Research DG.

The Panel was pleased to note that the Enlargement Action has achieved high impact and recognition from the recipient countries. Thanks to the many information events, awareness about the opportunities to collaborate with the JRC has been raised significantly in all target countries. The Action has led to the development of a network of JRC National Contact Points which under FP7 was then extended to old Member States on the suggestion of the JRC Board of Governors.

The JRC has supported EU Enlargement Policy and Integration of New Member States through joint workshops and training courses, projects addressing the specific needs from the countries, opportunities to work in the JRC and information events. These activities and the associated networking and collaboration with the authorities, researchers and managers in the participating countries have had a noticeable impact and have received significant political recognition from the recipient countries.

2.6 Promotion of the European Research Area

The European Research Area (ERA) is one of the core elements of the renewed Lisbon Strategy for Growth and Jobs[4]. As such ERA has become a key reference for research policy in Europe and the Panel considers that the JRC is well positioned (and hence expected) to actively contribute to the processes that will lead to the successful realisation of ERA. This can be made both through its involvement in research itself as well as through its support to the management of the ERA.

Regarding the former, the mission and the resources of the JRC do not allow it to play a significant role in terms of research results; however it can still

[4] COM(2007) 161 final, Green Paper The European Research Area: New Perspectives

play a catalytic role in certain areas. The Technology Platforms constitute an important example, where the JRC can support the European Commission's participation in the existing or future mirror groups. In selected cases, where an Institute has the capabilities, it should be encouraged to participate directly in the relevant Technology Platform.

Regarding ERA management support, the JRC has already been involved through work on the Lisbon monitoring (at the IPSC) and the explicit ERA monitoring procedure commissioned by the Research DG (ERAWATCH) as well as specific tools developed to underpin policies, the most prominent of which is the EU Industrial R&D scoreboard. During FP6 and beyond the JRC has supported EU policy makers and other stakeholders in the implementation of their various Action Plans to increase investment in research to 3% of GDP (Barcelona target) as well as the "Open Method of Coordination" process by disseminating detailed information on national research policy mixes and thematic priorities. The support continues in FP7.

The Panel considers that the JRC has already contributed to the ERA but its contributions can be made more explicit in the future, for instance through the involvement in the Technology Platforms or mirror groups established in connection with these platforms.

As regards the management support to the ERA, the JRC Institutes should not only just continue their current activities; it is one of the areas where the JRC can be more proactive. Active cooperation of the IPTS and the statistical support unit of the IPSC could produce significant synergies in this respect.

3 CHALLENGES FOR THE FUTURE

The observations discussed throughout this report made clear to the Panel that the JRC has continuously improved its performance over recent years. For those of the Panel who have followed the work of the JRC since the mid-1990s the JRC has shown continuous improvement. Thanks to the introduction of the new mission about 10 years ago, the organisation effectively moved a step upwards in its customer orientation. This was further enhanced by the systematic and structured contacts with Commission Services since then and the internal control on the mission alignment of the work and the link with the customers.

Today the performance of the JRC has certainly reached a satisfactory level, but the Panel unanimously felt that the organisation is reaching a performance ceiling and that it needs another step change to advance to a higher level.

This chapter about the challenges for the future presents observations and recommendations to give guidance to the JRC to further advance its valuable work in supporting the European policies. The Panel thinks that with the proposed arrangements the JRC will be able to take another significant step forward in making its services to the European Union better, more effective and more efficient.

The challenges and recommendations presented in this chapter concern (i) the positioning of the JRC with a strategic framework, a corporate strategy and a position within the Commission that facilitates a maximum use of the JRC's knowledge base and competences, (ii) taking care of the most important asset of the JRC: its human capital, and (iii) the need to keep modernising the infra-structure and the JRC organisation.

3.1 Strategic Positioning

3.1.1 Arrangements for the Development of a Corporate Strategy

Since 1998 the Joint Research Centre positioned itself with a mission statement that focuses activities on customer-driven scientific and technical support for the conception, development, implementation and monitoring of Community policies. In 2006, following recommendations in the Fisk Report the JRC adopted a value statement referring to respect for scientific integrity, giving the JRC's policy support the necessary credibility in the interplay between different levels of governance in the EU and across national, scientific and political cultures. At the same time the JRC introduced its new motto "Robust Science for Policy Making" to show its commitment to achieve the best quality in its work for its customers and stakeholders.

This year the JRC published "Portrait of the Joint Research Centre: What can we do with and for you" as a result of a reflection process that was carried out to identify those areas where the JRC has the greatest added-value over what exists in the Member States and where the focus of the European policy needs will be in the future. The document also presents the profiles of the seven JRC Institutes within their areas of specialisation and is intended to be

a tool for the customers and stakeholders to understand the services the JRC can provide.

All these elements have provided the JRC with a strategic framework to position itself, but in the Panel's view now it is time to add a new crucial element, i.e. an overall corporate strategy, which spells out current and future tasks, competencies of the organisation and medium- and long-term needs for JRC support. Such a strategy would provide a reference for setting priorities and making the difficult choices between activities that are worthy of support.

The strategy work should relate scientific opportunities to user needs both within the Commission and in the Member States in regard to the entire JRC as well as to the Institutes. This implies that the corporate strategy takes account of the Institutes' competencies and potential in a bottom-up approach, whilst the corporate strategy provides a top-down reference for the Institutes to set their priorities in the annual Work Programme.

In the Panel's view the corporate strategy will contain:

- the assets of the organisation in terms of competencies, staff, infrastructure and laboratories;
- a vision describing where the JRC should be in five years with an eye for where it could be in 25 years from now, in terms of its assets, its position in the EU and where relevant also in the international arena;
- strategic objectives that follow from the vision;
- a medium term plan for maintaining the critical competencies of the JRC (e.g. facilities, equipment, knowledge management, staff policy).

The Panel recommends that for this purpose the JRC should introduce a strategy process for which the minimum characteristics are:

- clarity and transparency in the formulation of policy and strategy based upon scientific opportunity and policy needs;
- satisfactory mechanisms through which the objectives and needs of the customers are given due weight in the process of strategic planning;
- robust mechanisms for prioritisation and determining which activities merit new or increased investment and which should be reduced or discontinued to achieve an appropriate balance in the research portfolio;
- arrangements ensuring that investment is fully maximised through collaborations and partnerships nationally and internationally.

The Panel believes that a corporate strategy can be formulated once the mechanisms and the process for planning have been established. The experience is that there are many ways to do this wrongly and very few to do it right. Above all, it takes time to do it well. Once the process is established it should be repeated every year.

It will take time to develop the strategy process well and the mission will play an essential role in it. It successfully focused the JRC on customer-driven scientific and technical support for the conception, development, and implementation and monitoring of EU policies. Nevertheless, the Panel noticed a different articulation of this support in on the one hand the Euratom and the reference materials and measurement tasks based on a high degree of skills and expertise and on the other hand the variety of tasks in the context of scientific and technical support in close contact with the EU policy makers.

The JRC's nuclear activities are rooted in the Euratom Treaty and without contesting their "policy relevance" the Panel preferred to look at them as "Treaty implementation" rather than as "policy support" tasks. The goals and character of these activities are distinctively different from what is usually seen as policy support and in practice they form a part of the technological effort of the European Union to safely exploit nuclear energy (cf. section 2.3.1).

Aware that the original objectives of Euratom are reviving and are re-appearing on the political agenda, the Panel believes that the JRC could give a more articulated treatment and presentation of its Euratom activities.

The Panel had similar considerations for the JRC's work on reference materials and measurements. These activities are highly regarded as a balanced effort to support the measurement infrastructure of Europe, very complementary to efforts in Member States. The Fisk Report identified this work as an area in need of a policy client. Although certain references and measurements are directly used in EU legislation, this Panel believes that there is scope for not forcing all these activities under the denominator of support to policies.

Therefore the vision and the medium and long-term planning of the JRC will benefit from distinguishing three distinct types of activity in the JRC:

(i) The largest element: a collection of S&T policy support activities driven by a few big and several small and more irregular policy customers.

(ii) The Euratom commitment: a stable element within the JRC. It is, however, more dedicated to Treaty implementation than to policy support. It is arranged through a Euratom Framework Programme and a dedicated Work Programme Unit in the organisational structure.

(iii) Reference Materials and Measurements: also a stable element in the programme based on the JRC's expertise in this field.

The Panel recommends that the JRC and its Institutes should establish a rolling five-year strategy, formulate a vision with clear goals, analyse its assets making a proper representation of policy support areas and competencies, and adopt criteria for accepting or not accepting tasks and apply them rigorously.

A clear vision would distinguish the support work that is carried out in close consultation with the policy customer, the Euratom task, and the reference materials and measurements task. This will benefit the strategic description of the JRC and facilitate its medium and long-term planning.

3.1.2 Combining Scientific Work and Policy Support

The balance between oriented basic research[5] and policy support varies from one Institute to the other. This is not unexpected in view of the different challenges and working environments of the seven Institutes. A crucial question for the JRC is how to keep an optimal balance between its targets. Clearer guidelines and design are needed to balance the multifaceted target of exploratory research, oriented basic research and research-based policy support for the Commission and other clients.

During the site visits and in the various presentations the Panel noted that research and policy support are often difficult to reconcile in day-to-day work. There is, in fact, often only a weak link between the scientific work and the policy support. PhD students and other visiting scientists carry out much of the scientific work in the JRC. The knowledge that is accumulated in the research projects is often not transferred to JRC knowledge, as the PhD students have fixed-term contracts and they leave JRC after they have finished their project. The Panel considers it essential that the JRC develops a concept in which its scientific work is in harmony with its mission to deliver policy support; at present it seems to the Panel that the two are often unnecessarily disconnected.

The Panel noted with satisfaction that the JRC stresses the importance of high-quality research as part of its Work Programme, and has, during the last years, allocated 6% of the institutional budget to exploratory research. The Panel considers this allocation as a valuable investment in the future as it will make the JRC an attractive work place both for young and senior scientists and will help in creating methods and competencies needed to respond to future challenges. The Panel wishes to emphasise that although research is one important starting point, the results become truly valuable only when they have been disseminated and implemented in European policies.

Following the recommendation of the Fisk Report the JRC designated the Director General as internal customer for exploratory research to address the problems of the area, but without the desired effect. During the Institute visits the Panel learnt that there are often not enough proposals for exploratory research, despite the positive decisions made at the corporate level. The scheme is not attractive enough. Unit Heads and Action Leaders consider the preparation of a proposal and the subsequent work as an additional burden to young scientists. Because of this conflict of interest at the Unit level which is strongest in case of scarce personnel resources, no proposal is submitted.

In day-to-day work the scientists give priority to satisfying external customers above satisfying an internal client who can only take remote interest in the results of the exploratory research. The question is whether the Institute Director may be able to exercise the same weight as an external client. Being close to the work of the scientist a Director may take direct interest in the outcome of the exploratory research. In the light of the experiences since 2003 the Panel recommends that the position and management of exploratory research in the JRC is thoroughly re-evaluated, ideally as a part of the formulation of the corporate strategy.

The Panel noted that excellence is not sufficiently supported with incentives, despite the existence of the awards which should be maintained but be given

[5] The OECD definition of oriented basic research is: "Research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognised or expected current or future problems or possibilities"

more means to be implemented; this needs to be clarified at corporate level. Introducing citation indicators more systematically is useful with proper attention to methodology in using them. The Panel wishes to emphasise that high-quality research should be recognised based on publications in "diamond" journals, citations and patents, not only on publications in Science and Nature.

The JRC has a Scientific Committee at the level of the entire organisation while each Institute has its own Scientific Committee. The roles and functions of the JRC Scientific Committee and the Institute Scientific Committees should be revisited. One way forward would be to establish thematic scientific committees with high-level external experts at the JRC. This would correspond to the normal practice in internationally recognised research institutes.

With its function of providing scientific support and advice to policy making, the JRC positions itself close to "regulatory science", the emphasis being on monitoring, evaluation, screening and meta-analysis. Nevertheless, the JRC also needs traditional academic science not only for its credibility as a research organisation and partner but particularly to build up competencies for the future. The JRC needs to bring the science and policy-support dimensions inseparably together in its overall thinking and development.

The Panel is aware that the JRC is occasionally involved in tasks and subjects that are an issue of EU or national security. For those tasks there is an exception, but for all other science-related tasks the Panel's principle is that peer-review is a key to quality control also for JRC scientific publications.

Following the Fisk Report the JRC has introduced an internal "quality assurance framework for scientific and technical documents". Convinced of the high importance of this framework the Panel recommends that an external ad-hoc Committee be set up to validate this quality-assurance framework and its implementation mechanism.

The Panel recommends that the JRC should thoroughly re-evaluate the position and management of exploratory research as it is an indispensable part of the research portfolio of the JRC and an investment in the future. It should also revisit the functions and the roles of the JRC Scientific Committee and the Institute Scientific Committees so as to produce uniform procedures for the Institute Committees.

3.1.3 From (reactive) Policy Support to (proactive) Policy Advice

The mission of the JRC to provide policy support leaves open whether this should be carried out in a reactive way, largely responding to the needs of the policy makers, or in a proactive way, drawing the attention of policy makers to upcoming issues and becoming more involved in the early, agenda-setting part of the policy cycle.

The Panel notices that currently the JRC works closely together with the policy makers, rarely taking the role of an adviser, but rather as an institutional and instrumental part of policy making. This more reactive attitude is a natural consequence of the fact that policy makers in the Commission prepare the political agenda and they are not really expecting scientific colleagues to do

that through (unsolicited) advice. The management and the Board of Governors of the JRC are comfortably operating in a reactive mode, waiting for political decisions and subsequently giving the scientific and technical support that is requested. Nevertheless, the Panel believes that the European Commission would benefit from receiving proactive, unbiased scientific advice from the knowledge base of the JRC.

It is the strong view of the Panel, that the JRC has the position and the resources to play an important role in identifying future problems, opportunities and needs of our societies, picking up signals from the scientific community and using horizon scanning procedures based on the current state of knowledge from science, technology and the social sciences.

Since the current organisation of the Commission leaves little room to fulfil this function, the Panel sends a message to the President of the Commission pushing for the creation of favourable circumstances for the JRC to exercise this policy advice function, for instance by the creation of an intermediary in the Commission equivalent to an office of a government's chief scientist. Together with high-quality exploratory research, close collaboration with the research institutes and universities of the Member States and various horizon scanning activities, the setting up of such an office would be an important step for the JRC to provide proactive policy advice.

The Panel would like to see the JRC playing an important role in identifying the future problems and needs of the society, feeding this information into the policy making process.

To achieve this important objective the JRC would need a mechanism to break through the classical pattern in which the scientific arm of the Commission is not expected to act as a policy adviser which can proactively intervene in policy processes.

The Panel urges the President and the Commission to enable the JRC, with its links to university knowledge generation in the EU and worldwide, to exercise a proactive policy advice function. To function properly this would need, for example, the creation of an "Office for the Chief Scientific Adviser to the Commission" within the Commission Services, with a high-profile Chief Scientific Adviser responsible directly to the President and the Commission.

3.2 Human Capital

3.2.1 Emphasis on Human Resources

The pursuit of JRC objectives would not be possible without an experienced and highly committed staff. This preoccupation is embedded in all JRC activities as they include the development of a knowledge base, skills and facilities to properly conduct their work. The JRC strives for excellence in all fields in which it might be called to offer scientific support and advice. Given the vital role that human resources play in the JRC's ability to achieve its mission, strategic importance must be given to the recruitment of the best possible candidates and to their continued career development once recruited.

During the Institute visits the Panel consistently heard about difficulties encountered in recruitment of both the permanent staff (about 65%) and non-permanent staff (about 35%). The Panel understands that the JRC has to use the recruitment system of the European Commission, which is approved by all EU Member States. It is also aware that this system is not comparable to hiring procedures in place in the private sector, leading research institutes or top universities which can be focused, flexible, and fast in order to win world class scientists in competitive situations.

The Panel noted that the JRC has taken several steps to ensure that the best possible people can be recruited within the current recruitment procedures. The JRC has negotiated derogation with regard to the staff rotation principle in order to maintain specific expertise. New systems have been put in place to track and steer the different steps of the recruitment of core staff. The roles and tasks of every actor in the recruitment process have been documented, and the recruitment procedures have been harmonised across the JRC. A similar effort has been made for the recruitment of non-core staff.

The Panel is aware that the Commission's recruitment system has certain flexibilities and recommends the JRC does its utmost to make maximum use of the possibilities in the system. Indeed at least a part of the "problems" in human resource management reported in the Institute visits arises from the fact that the staff are not fully informed of the rules and regulations of the system and the procedures. Effective communication of the rules and procedures to staff at all levels of the organisation is one way of mitigating problems in this area.

The Panel believes that the Commission should grant the JRC adapted hiring procedures for scientists and engineers. It also emphasises that strategic resource management must reach beyond the recruitment phase of the new staff members and follow them throughout their career as permanent members of staff or during their stay as a member of the visiting staff.

According to the Panel feasible improvements in this field are:

- More competitions for staff with an S&T profile that give the highest priority to specific competence. Currently the Commission still places too much emphasis on administrative knowledge even in these S&T competitions.

- Enough posts for the JRC to recruit top talent on six-year temporary contracts for which the selection is made by the JRC.

- An increased use and selection of grant holders (PhD, post docs and visiting scientists) for the JRC.

- The creation of possibilities for the JRC to develop a career path for scientists within the constraints of the Commission rules, e.g. by creating senior scientist positions parallel to the system for administrative managers.

Human resources policy and management in the JRC must ensure competent and committed staff in the future. For this purpose it must reach beyond the recruitment phase and follow the new members of the staff throughout their career.

Some of the difficulties with recruitment of new and high-level talent can be solved by more communication and effective implementation of the rules and procedures for recruitment to exploit the possibilities that the system offers to a maximum.

The Panel recommends that the Commission should grant improvements allowing the JRC to adapt hiring procedures and career management schemes in keeping with the skills required.

3.2.2 Training European Scientists: Revitalising the JRC

The Panel noted with satisfaction that the JRC is a good training ground for PhD students in its fields of expertise. In fact, with the current practice, parts of the research programme are critically dependent on the work and availability of graduate students. Although the students interviewed by the Panel generally appreciated the JRC as the host institution for their studies, it became clear that the organisation does not have a system that would guarantee the quality of training under all circumstances.

The Panel has been very impressed by the enthusiasm of these young people and recommends a continuation of this policy. Given the key role of PhD students in the research programme, the Panel recommends that the JRC develops the quality assurance system of graduate training with the aim of remaining attractive for talented students in the future. Such a system should include for example the following features:

- establishment of a committee which would be charged with the responsibility for ensuring that the overall training programmes and environment properly meet the needs of graduate students;
- definition of the minimum requirement of formal studies for all graduate students;
- building of mechanisms through which the graduate students would be effectively linked to all laboratories that could help them in their work; and
- an option of designating a support group to the interested graduate students.

Top level individuals need a creative intellectual environment. This is also instrumental for attracting other great minds and promising young people. Such environments can best be created through strong links with top institutions in Europe and abroad. The JRC should partner with the best European universities and strive to found common professorships. Such strong links will almost automatically introduce vigorous quality control.

The Panel was pleased to note the increasing level of collaboration between the JRC and the universities and it wishes to see these links evolve in the future. The JRC has a number of particular qualities and features which could make it a highly attractive partner. Its infrastructure is top-rate. Its role at the interface between direct public interest, policy, science and engineering creates areas and niches of activities which are unique. Such activities are

extremely interesting for students and rarely take place in universities or research organisations. Teaming up in a non-bureaucratic way with the best in Europe will be profitable for all involved.

In most of the research establishments around the world, the specialists are either obliged or encouraged to devote part of their time to teaching. This is intended both to facilitate the transfer of knowledge to the next generation and to keep the researchers in contact with academia and with young people. The Panel observed that this objective has not fully been appreciated by the JRC which has a policy of limiting the possibility for researchers to teach for reasons which have not been clearly stated. The Panel believes that there is scope for the JRC management to reconsider this policy.

The JRC provides a good training ground for PhD students, who have a revitalising effect on the organisation. In areas where there are skills needs in Europe (e.g. nuclear, reference material, environment) the opportunities offered are very good.

Parts of the research programme are critically dependent on the work and availability of graduate students.

Given the key role of PhD students in the research programme, the Panel recommends that the JRC develop a quality assurance system for graduate training with the aim of continually attracting talented students.

3.3 Modernising the Organisation

3.3.1 Integration and Synergy

During the past 10 years the JRC has undergone a number of significant changes following the implementation of its new mission. Three Institutes have been merged into two Institutes in 2001 thereby reducing the number of Institutes in Ispra from four to three and the total of the JRC from eight to seven. The whole structure of the JRC activities has been reorganised.

To carry out the tasks assigned to the JRC, "Pillars of Competence" were developed. The purpose of these was threefold. Firstly, these pillars corresponded to well-recognised priority areas for European policy makers. Secondly, the already existing core competencies were emphasised and resources focused. Thirdly, the Work Programmes of the JRC became increasingly integrated, with input from several Institutes concentrating on one issue.

During the following years, this focus on policy priority areas was confirmed. The Work Programme, the pillar structure, and the integration were further developed in response to the changing needs of policy makers and led to today's structure comprising the three vertical core areas and complemented by three horizontal core areas.

Integration of activities within the JRC was addressed both in FP5 (clusters, integrated scientific areas around horizontal issues) and in FP6 (thematic roundtables with strategic documents). The round table discussions addressing

the need for more integration have been essential in preparing the FP7 proposal, the Specific Programmes and JRC Multi-Annual Work Programme.

Despite the efforts of the JRC management the integration of a number of thematic Priority Areas has not yet been fully realised. Experiences from the work of Priority Area Coordinators are mixed. In some areas the objectives, i.e. overall integration, strategic vision and creation of synergies, have been partially achieved, while in other areas the progress has been modest at its best. All in all, the Institutes and their units work too often as "silos" with insufficient integration and collaboration with the other parts of the organisation.

The Panel has seen examples with a potential for more synergy. The two most obvious ones are: the Community Reference Laboratories which are spread over two sites and the econometric and statistical support unit in IPSC with the foresight work in IPTS. The JRC could promote synergy by, administratively, joining these dislocated entities.

More in general the Panel took the view that further integration of the thematic (e.g. environment, energy, security) and methodological competencies is one of the most important steps in improving the efficiency of the JRC. The principal role of the vertical, "hierarchical" structures is to maintain these competencies while the actual work should occur in horizontal actions and programmes put together according to the needs of the customers and pertinent research questions. The integrated approach helps in anticipating future needs and will enhance the quality of the work and completeness of the response.

During the evaluation the Panel was made aware of efforts within the JRC to develop more efficient mechanisms for the integration of the competencies. The Panel welcomes this and notes that the mechanisms to be developed should be need and competence driven, and correspond to the trends adopted by other research-based policy-support organisations in the world.

The Panel observed that the Institutes and their units work too often as "silos" with insufficient integration and collaboration with the other parts of the organisation.

Further integration of the thematic and methodological competencies is one of the important steps in improving the efficiency of the JRC. The principal role of the vertical, "hierarchical" structures is to maintain these competencies while the actual work should occur in horizontal actions and programmes put together according to the needs of the customers and research questions in a flexible way backed by adequate financial resources.

The Panel recommends that the JRC should continue building up efficient mechanisms for the coordination of the activities within the organisation. The mechanisms should be need and competence driven, and correspond to the trends adopted by the most successful research-based policy-support organisations in the world.

3.3.2 Improving Knowledge Management

The JRC has carefully followed the recommendations of the Fisk Report concerning its ICT (Information and Communications Technologies) systems

and its knowledge management. Recent developments have substantially improved the state-of-the-art in ICT infrastructures (see also section 3.3.3).

The relevance of JRC reports and handling of the JRC "quality mark" have significantly improved:

- The publication policy now implements a document status and classification scheme, a procedure enabling quality assurance and the publications repository (PUBSY). PUBSY is currently used as a digital publications archive, enabling access to classified JRC publications, and is a useful means for statistical analysis of the JRC publication record.

- Further improvement plans include the development of a Project Browser in 2008 to provide a single access portal to the JRC Actions and the external JRC collaborations. As such, it will provide a corporate memory of past and current projects searchable along both policy themes and research themes.

The Panel noticed that by restricting open access to JRC publications a wealth of knowledge remains largely unexplored by the external public; this issue needs to be urgently addressed. The current PUBSY functions could be complemented with more advanced knowledge management facilities. In order for the planned Project Browser to be successful, a common taxonomy of research themes needs to be applied consistently for tagging the JRC Actions and JRC publications. A comprehensive map of JRC competencies like a "who-is-who" or "who-does-what" directory should be established, enabling JRC managers and researcher a better overview of JRC competencies.

Handling of intellectual property rights (IPR) is an important element in the management of the JRC's knowledge and technology transfer to JRC stakeholders/customers as much of the JRC's work relies on acquiring, transforming and disseminating data. Furthermore, interesting results and technologies have been developed as a by-product of the JRC's Work Programme in response to policy needs, and have also been stimulated by yearly awards for cutting-edge exploratory research and an annual Innovation Project Competition. The ability of the JRC to manage the process of IP creation and exploitation has been facilitated by its mandate to manage the Communities' (EC and Euratom) IPR portfolio. In line with this mandate, the JRC and the Commission's Publication Office (OPOCE) are negotiating with publishing houses to retain copyright on scientific publications.

The Panel has addressed specifically two knowledge management and networked organisation aspects: firstly, extending JRC processes towards external research organisations, and secondly, internal collaboration processes between units and Institutes of the JRC. The respective project managers manage the interaction of JRC Institutes with other research organisations through more than 1000 collaboration agreements in a relatively ad hoc manner. Formal business processes are not yet defined to support networked organisation mechanisms. This aspect should be considered in the future.

The JRC is a networked, geographically spread organisation, with a conventional hierarchical management structure. The collaboration between the Institutes and units of JRC is fostered by Priority Area Coordinators, which is very time consuming, as it is mostly performed through travelling and personal

meetings. The coordination remains at the management level, with insufficient knowledge transfer to the researchers.

There is still insufficient awareness of other units' activities. To avoid work repetition and suboptimal use of resources and in order to overcome communication barriers, the JRC is advised to use contemporary knowledge management tools and awareness growing methods, including those being developed in the emerging Web 2.0 research community.

The Panel has seen significant results of the systematic efforts to improve the ICT infrastructures.

The Panel observed that the restricted access to JRC publications leaves a wealth of knowledge largely unexplored by external scientists; the issue of open access needs to be urgently addressed. The Panel believes that the only acceptable exception to open publication is an issue of EU or national security.

The Panel recommends that all information exchange functions in the JRC, including the publications database PUBSY, should be upgraded. Contemporary knowledge management tools and methods to improve awareness should be used. These should include knowledge mapping tools.

3.3.3 Maintaining a Modern Infrastructure

During visits to the various laboratories the Panel made acquaintance with many elements of the JRC's test facilities and research infrastructure. The general character of this evaluation exercise had no scope for assessing whether these installations are effective or whether they are used efficiently. Whereas the Panel has seen several examples of unique first class facilities with a clear user community, there are also installations which the Panel believes are unique but under-exploited, or comparable to facilities existing elsewhere in Europe.

Large research facilities and infrastructure may become a burden to the owners as they have to commit financial and human resources to something that is not sure to be useful in the long-run. Such facilities also reduce an organisation's flexibility. Simpler labs in the long-run bring a higher cost-benefit ratio. With the aim of further enhancing its efficiency and effectiveness and as part of an overall strategy, the JRC should start a continuous process for making a detailed short, medium and long-term assessment of the status of its research facilities and infrastructure. Such assessment will also be useful input to the work of the European Strategy Forum of Research Infrastructures (ESFRI).

The Panel was pleased to note that the JRC has substantially invested in ICT infrastructure as suggested by the Fisk Report. The JRC has over the last four years developed and implemented a strategy to deploy new and emerging information and communication technologies to support internal collaboration between the JRC Institutes and units. The external research collaboration has recently much advanced through an improved ICT infrastructure, for example the GÉANT network, the backbone which connects Europe's national research and education networks at gigabit speeds. The Panel observed that whereas the use of the GÉANT network is available to the majority of JRC researchers,

it should be extended to the Petten and Seville sites and in Ispra all research buildings should have high-capacity access to it in order to fully exploit its capabilities. This further improvement would remove a barrier to more open, efficient and effective collaborative research between geographically dispersed JRC research teams, as well as a barrier to more effective collaborative work with other EU project partners.

Because the JRC is spread over different sites, virtual mechanisms are in many circumstances effective for meetings, collaboration and information change. During 2007 and 2008 several new tools have been deployed for this purpose including videoconferencing, web-conferencing and video streaming. A common JRC Intranet Platform provides advantages of a harmonised approach for corporate identity, information structure and information presentation.

The Panel noted with satisfaction that the modernisation and rationalisation of the Ispra site is proceeding according to the plan and that renovation of old buildings also goes on at other sites. Once completed the impact on efficiency, the working environment and reduction of the running costs will be substantial.

Much of the work over the past four years has already resulted in measurable improvements in the ICT infrastructure. Several strategic goals have not yet been fully reached and the JRC has to resolve this in the near future.

The Panel recommends that the JRC should start a continuous process for making a detailed short, medium and long-term assessment of the status of its research facilities and infrastructure with the aim to further enhance its efficiency and effectiveness. This should be part of an overall strategy.

4 Concluding remarks

The task of the Panel was to evaluate the work and achievements of the JRC during FP6, to report on the results in the JRC Specific Programmes and to relate these results and the budget spent to the impact of the JRC activities. Thus, the focus of the evaluation was on the Priorities of the Work Programme under FP6 rather than on individual Institutes and their performance. Nevertheless, during the process the discussions between the Panel experts and the Institute representatives tended to focus more on the performance and challenges of the Institutes.

Looking back on the task, the uniqueness of the JRC and the multifaceted Work Programme with an entwined structure made the current evaluation an interesting challenge. Soon it became clear that the current evaluation allowed a very good high-level assessment of the JRC activities, but that an assessment of the detailed policy support and the quality of scientific work would require more study of the JRC products and more in-depth interviews with staff, customers and other stakeholders.

The Panel would have liked to analyse certain of its impressions such as whether the JRC is not playing a too modest role, or whether it is possibly diversifying too much in a certain field. It would also have liked to learn finer details about internal systems for planning, reporting, monitoring and about the internal evaluation; it spotted that there is scope for streamlining processes, procedures and reporting systems accompanied by a reduction of "paperwork". To substantiate these ideas and to formulate useful recommendations would need another exercise probably at least of the current size.

Therefore the Panel believes that the JRC should organise smaller, competence or sector-oriented external evaluations of its work including the administrative part of it, also in view of recommendations from earlier evaluations to make sure that it does not overload the organisation with (internal) review procedures. This could benefit the JRC for its positioning in the relevant field and benchmark its success.

The current evaluation allowed a high-level assessment of the JRC activities, but a more profound assessment of the policy support and the quality of scientific work would require more time to study the products of the JRC and to interact with its customers and stakeholders.

The Panel recommends that, in addition to the legally obligated high-level Framework Programme evaluations, the JRC should organise smaller, competence or sector-oriented external evaluations of its work. This will improve the positioning of the JRC in the relevant field.

These more specialised evaluations should also be used to assess the internal administrative and reporting processes in the JRC and to validate the "quality assurance framework for scientific and technical documents" and its implementation mechanism adopted by the JRC after the Five-Year Assessment of 2003.

The JRC should ensure that these targeted evaluations do not lead to "over evaluation".

Glossary

ACP	Africa, Caribbean and Pacific
CEN [1]	European Committee for Standardisation
CRL	Community Reference Laboratory
CRM	Certified Reference Material
DG	Directorate-General
EC	European Community
ECB	European Chemicals Bureau
CHA	European Chemicals Agency
CVAM	European Centre for the Validation of Alternative Methods
EEA	European Environment Agency
EFQM	European Foundation for Quality Management
EFSA	European Food Safety Authority
ENGL	European Network of GMO Laboratories
ERA	European Research Area
ESA	European Space Agency
ESFRI	European Strategy Forum of Research Infrastructures
EU	European Union
FAO	Food and Agriculture Organisation
FP	Framework Programme
FP5	5th Framework Programme
FP6	6th Framework Programme
FP7	7th Framework Programme
GDP	Gross Domestic Product
GÉANT	Multi-gigabit data communications network reserved specifically for research and education use
GEF	Global Environment Facility (of the United Nations Development Programme)
GIF	Generation IV International Forum
GMES	Global Monitoring for Environment and Security
GM	Genetically Modified
GMO	Genetically Modified Organism
GNEP	Global Nuclear Energy Partnership
HFR	High Flux Reactor
IAEA	International Atomic Energy Agency
ICT	Information and Communications Technologies
IE	JRC Institute for Energy
IES	JRC Institute for Environment and Sustainability
IGBP	International Geosphere-Biosphere Programme
IHCP	JRC Institute for Health and Consumer Protection
INPRO	International Project on Innovative Nuclear Reactors and Fuel Cycles
IP	Intellectual Property
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
IPSC	JRC Institute for the Protection and the Security of the Citizen
IPTS	JRC Institute for Prospective Technological Studies
IRMM	JRC Institute for Reference Materials and Measurements
ITU	JRC Institute for Transuranium Elements
JRC	Joint Research Centre
MAWP	Multi-Annual Work Programme
NASA	US National Aeronautics and Space Administration
NGO	Non-Governmental Organisation

[1] CEN is the acronym for the French 'Comité Européen de Normalisation'

OECD	Organisation for Economic Co-operation and Development
OPOCE [2]	Office for Official Publications of the European Communities
PhD	Doctor of Philosophy
PUBSY	JRC Publications Repository
QSAR	Quantitative Structure-Activity Relationship
R&D	Research & Development
REACH	Registration, Evaluation, Authorisation and Restriction of Chemical substances
S&T	Science & Technology
UN	United Nations
UNDP	United Nations Development Programme
USA	United States of America
WHO	World Health Organisation
WMO	World Meteorological Organisation
WTO	World Trade Organisation

[2] OPOCE is the acronym for the French 'Office des Publications Officielles des Communautés Européennes'

ANNEX I

TERMS OF REFERENCE

EX-POST EVALUATION OF JRC DIRECT ACTIONS IN THE 6TH FRAMEWORK PROGRAMMES (FP6) 2002-2006

1 Background

In 1998 the Joint Research Centre (JRC) received its mission "to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union 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".

The JRC carries out the majority of its activities as "direct actions" under the EC and the EURATOM Framework Programmes for Research and Technology Development, with the budget provided to it for those purposes. With its expertise, the JRC generated additional, so-called competitive income, equivalent to ~12% of its total budget.

Its customer-driven direct research actions under the 6th Framework Programmes (FP6) are implemented by means of a multi-annual work programme addressing four core areas:

1. Food, chemical products and health

2. Environment and sustainability

3. Nuclear activities

4. Horizontal activities (technology foresight; reference materials and measurements; public security and antifraud).

Although the FP6 legal bases did not specifically require an ex-post evaluation of the JRC's direct actions, it is clear from the FP7 decisions that an ex-post evaluation will be necessary as a pre-requisite to the mid-term reviews of those framework programmes[1]. For this reason, the JRC will organise an external ex-post evaluation of its direct research activities in FP6 (2002 – 2006), in conformity with Commission evaluation standards and guidelines.[2] This is the same approach that will be followed by the other research DGs.

The JRC Board of Governors will be consulted on the ex-post evaluation process and the follow up of its recommendations as foreseen in the Commission decision of 1996[3].

2 Objective and expected use of the evaluation

The main objective of the FP6 Ex-post Evaluation is to provide independent feedback to the budgetary and legislative authorities, other stakeholders and the general public on the JRC activities in FP6. The evaluation will report on the results in the JRC Specific Programmes and relate these results and the budget spent (i.e. effectiveness and efficiency)

[1] Decision No 1982/2006/EC of the European Parliament and of the Council of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013) OJ L 412/1 30.12.06: Article 7.2. "No later than 2010, the Commission shall carry out, with the assistance of external experts, an evidence-based interim evaluation of this Framework Programme and its specific programmes building upon the ex-post evaluation of the 6th Framework Programme. This evaluation shall cover the quality of the research activities under way, as well as the quality of implementation and management, and progress towards the objectives set." (emphasis added; same text for Euratom)

[2] "Evaluating EU Activities - A practical guide for the Commission services" (July 2004) – DG Budget.

[3] Article 2(vii), fifth indent of the Commission Decision of 10 April 1996 on the reorganization of the Joint Research Centre specifies that the Board of Governors shall "deal in particular with ...- evaluation of the latter [implementation of research activities] by 'visiting groups' composed of independent experts and the follow up of their recommendations".

to the impact of the JRC activities. Particular attention will be paid to the follow-up of the conclusions of the 5-Year Assessment carried out mid-term of FP6.

The evaluation should offer a transparent look at the work and the achievements of the JRC during FP6,

- informing JRC budgetary and legislative authorities and stakeholders (European Institutions, policy makers, Member States and their representatives via the JRC's Board of Governors) on the performance of the organisation and the use of the budget;
- providing the JRC management with recommendations for a continued improvement of its science-based policy support;
- assisting the JRC senior management with the detailed orientations during FP7.

3 Scope

Activities to be evaluated

The evaluation will focus on the direct actions conducted by the Joint Research Centre in the context of the specific programmes of research, technological development and demonstration under FP6.

In the assessment of the work the Panel should take into consideration relevant work carried out by the JRC (i) for Commission DGs (Administrative Arrangements), (ii) for customers outside the Commission (Third Party Work), and (iii) as a participant in Indirect Actions.

Evaluation questions

General questions:

- To what extent were the objectives achieved and were they achieved in accordance with principles of economy, effectiveness and efficiency?
- To what extent did the achieved support have impact for the customers and the related policies?
- To what extent was the scientific work of the JRC of an appropriate quality and delivered in due time?

Specific questions:

- What is the JRC contribution to the overall progress in scientific fields covered by its Multi-Annual Work Programme?
- To what extent has the JRC successfully incorporated external know how to deliver on its mission?
- To what extent are there scientific areas in the Multi-Annual Work Programme where the JRC is below a critical threshold to be considered as the scientific reference?
- To what extent has the JRC anticipated new scientific developments in its competence areas that became relevant to policy making?
- To what extent has the JRC reacted to developments in its competence areas that made certain activities of less relevance for policy making?
- To what extent were the objectives formulated/ defined in line with users' needs?
- To what extent did the JRC provide (Community) added value compared to possible alternative options?

Particular attention shall be paid to the results of the previous evaluation of JRC activities:

- To which degree has the JRC implemented recommendations of "The Five-Year Assessment of the JRC 1999 - 2003"?

4 Method of work

Overall approach

The evaluation will be carried out by a Panel of 12-15 independent high-level experts on the basis of an analysis of available data and information on the JRC, impressions from JRC presentations in the different core areas and impressions from visits to JRC institutes, interviews with JRC staff and a hearing with internal users of JRC scientific policy support

services. Sub-panels will be formed to deal with the assessment of the performance in the different core areas and their components.

The Panel

The JRC Director General will select the Panel and its Chairperson from a list of independent external experts, in close consultation with the Board of Governors. In composing the Panel, attention will be paid to a balanced representation from the point of view of expertise in thematic areas of the JRC activities, affiliation to academic or regulatory scientific organisation, affiliation to governmental, non-governmental and private sector organisations, geographical spread and equal gender opportunity. The Panel members will be nominated through letters of appointment.

Logistics and secretarial support

The Evaluation Unit organises and supports the work of the Panel, providing all necessary documents and arranging the meetings with representatives of the JRC and other Commission staff.

The JRC will make a scientific secretary available to the Panel to accompany the visits, take notes of the interviews, summarise the findings of the Panel's visits to the JRC sites, and assist the expert Panel in establishing the final report.

Details on available data and information

Available data and written information consists of

- the baseline requirements against which the assessment will be made (Specific Programmes, Multi-Annual Work Programme),
- intermediate reports on progress (e.g. Annual Reports, Annual Activity Reports, results of User Surveys),
- factual information (e.g. staff tables, budget implementation) provided by the JRC, and
- Publication data from the PUBSY corporate data base.

A non-exhaustive list of reference documents is given in Annex 2.

The experts will receive the relevant documentation before the kick-off meeting of the evaluation.

ANNEX II

MAIN REFERENCE DOCUMENTS

FOR THE EX-POST EVALUATION PANEL OF JRC DIRECT ACTIONS IN FP6

Background documents

The Council Decisions for the 6th Framework Programmes (EC and Euratom) (Decision N° 1513/2002/EC and Decision N° 2002/668/Euratom)

The Council Decisions for the JRC Specific Programmes (2002-2006) (Decision N° 2002/836/EC and Decision N° 2002/838/Euratom)

The JRC Multi-Annual Work Programme (2003-2006)

The JRC Annual Work Programmes for 2003, 2004 and 2005

The JRC Annual Work Programme for 2006 (compiled as Technical Annexes of the JRC Annual Management Plan 2006)

The JRC Annual Reports of 2003, 2004, 2005 and 2006

Relevant reports

The Five-Year Assessment of the Joint Research Centre (1999-2003)

Follow-up to the Five-Year Assessment of the Joint Research Centre (update September 2007)

JRC Robust Science for Policy Making: A guideline towards integrity and veracity in scientific support and advice, JRC document CA(06)55

Survey, evaluation and benchmarking of the satisfaction of the users of the Joint Research Centre (JRC), Final Report 2005

JRC Customer Satisfaction Survey with results and benchmarking February - Draft Final Report 2008

A compilation of "Success Stories" of the Joint Research Centre during the 6th Framework Programme

Document "Facts and Figures for the Ex-post FP6 Evaluation Panel"

"Portrait of the Joint Research Centre: What can we do with and for you", JRC brochure 2008

ANNEX III

FACTS AND FIGURES OF THE JOINT RESEARCH CENTRE

1 The Joint Research Centre

1.1 The mission of the JRC

The mission of the JRC is "to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of European Union 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."

The activities of the JRC are multifaceted and range from supporting the implementation of Community legislation via monitoring and verification services, performing prospective studies and modelling, through to scenario building and a broad variety of supporting statistical analyses. All these activities are undertaken in relation to the various parts of the EU policy cycle (anticipation, formulation, implementation, monitoring and evaluation of EU policies).

The JRC keeps abreast of the scientific and technological developments through its own research activities, participation in international research consortia and via cooperative efforts in networks with public and private organisations in the Member States.

1.2 JRC customers and stakeholders

The JRC has a broad range of customers and stakeholders, largely in the public domain.

Primary customers of the JRC are the policy makers in the Directorates General of the European Commission. They use the scientific support and advice in the preparation, implementation and monitoring of various Community policies. The EU Council Secretariat and the European Parliament also benefit from the JRC's work.

Other customers are in the Member States where the JRC provides support to national authorities and organisations responsible for the implementation and monitoring of EU policy.

The JRC also carries out work for, or in cooperation with many of the EU Agencies (e.g. EEA, EFSA, ECA, EUSC)[1] as well as international organisations such as IAEA, OECD, EIB, UN, ESA, EUMETSAT.[2]

The JRC is a networked organisation with many partners in joint policy support and research activities; it cooperates with more than 1000 partner organisations across Europe and world wide. These partners are other research organisations, regulatory authorities, national or regional authorities, control laboratories, universities, industrial companies and industry associations.

1.3 Organisational structure of the JRC

The JRC carries out its work in seven Institutes located in Belgium (Geel), Germany (Karlsruhe), Italy (Ispra), Spain (Seville) and The Netherlands (Petten). They have competences in different areas of research-based policy support (Table 1).

Three "horizontal" Directorates in Brussels and Ispra provide the necessary management support services (Directorate for Resource Management, Directorate for Programmes and Stakeholders Relations and the Ispra Site Directorate).

[1] European Environment Agency, European Food Safety Agency, European Chemicals Agency, EU Satellite Centre.

[2] International Atomic Energy Agency, Organisation for Economic Development, European Investment Bank, United Nations, European Space Agency, European Organisation for the Exploitation of Meteorological Satellites.

Table 1. The seven Institutes of the JRC

INSTITUTE FOR....	FOCUS OF RESEARCH-BASED POLICY SUPPORT	COUNTRY
Energy (IE)	Support to energy policies for secure, sustainable and efficient energy production, distribution and use. Present and future, nuclear reactor safety.	The Netherlands
Environment and Sustainability (IES)	Research-based support for the development and implementation of European environment policies. Pivotal fields of activity include climate change, natural hazards, transport and air quality, sustainable use of natural resources, renewable energies and environmental monitoring and information systems.'	Italy
Health & Consumer Protection (IHCP)	Support to the chemicals legislation; analysis and quantification of GMOs in food and feed (support of health and consumer protection policies); validation of alternative methods (support of chemicals and cosmetics legislations); risk analysis of release of chemicals from consumer products, and of nanomaterials.	Italy
Prospective Technological Studies (IPTS)	Techno-economic analysis to support EU policy-making, focussed on competitiveness and sustainability, know-ledge for growth, information society, agriculture and life sciences.	Spain
Protection & Security of the Citizen (IPSC)	Systems-oriented support to protect the citizen against economic, technological and security risks. Non-proliferation and nuclear safeguards.	Italy
Reference Materials and Measurements (IRMM)	A common measurement system in support of EU policies, i.e. for environment, trade, agriculture, health, food and consumer protection. Nuclear measurements.	Belgium
Transuranium Elements (ITU)	Effective safety and safeguards system for the nuclear fuel cycle. Fundamental research into physics and chemistry of relevant radioactive elements.	Germany

1.4 Governance and management of the JRC

In 1996 the Commission reorganised the JRC through Decision 96/282[3] and revised relations with the Member States and the role of the Board of Governors. As an official organ of the JRC the Board is composed of high level representatives of the Member States and associated countries and plays an important role in the governance structure of the organisation. It gives its opinion on strategy and high level organisational matters, notably in the appointment of senior managers in the JRC.

The JRC also has supporting consultative structures to establish its Work Programme and to organise relations with major customers and stakeholders.

The most important body is the JRC High-level Users Group with representatives from customer Directorates General inside the Commission. This group expresses needs for support which the JRC includes in its Work Programme where possible and its members help to anticipate and propose proactively how and in which policy fields the JRC can provide additional support to policy makers (horizon scanning)

[3] Commission Decision 96/282/Euratom of 10 April 1996 on the reorganization of the Joint Research Centre.

There is also a European Parliament-JRC Interface Working Group to inform key stakeholders in the Parliament of the JRC's activities and to understand the Parliament's position on policy issues.

As regards the overall management planning, programming and review in the JRC, it is important to realise that the JRC is part of the Commission. Its activities are part of the Strategic Planning Policy of the Commission, which applies a system of "Activity Based Management" since its administrative reform of 2002. This system sets the framework for resource allocation, objective setting and reporting also for the JRC through an "Activity Statement" for the "Preliminary Draft Budget", an "Annual Management Plan" and an "Annual Activity Report".

1.5 Resources of the JRC

Most of the JRC's resources are allocated through the European Communities' Framework Programme for Research. During FP6 these resources amounted up to an average of around € 300 million per year. They include contributions from the European Free Trade Association (EFTA) countries[4], from the 10 new Member States[5] which entered the Union during FP6, as well as from the Associated Countries[6].

In addition to these appropriations, the JRC receives a special budget of around € 25 million per year from outside the Framework Programme to finance an action programme to reduce and dispose of historical nuclear liabilities. They result from activities in the past, carried out on JRC sites and concern the decommissioning of plants that have been shut down. These activities are not part of the JRC Work Programme under the Framework Programme.

These two budgetary resources are voted by the European Council and the European Parliament and their total is referred to as the JRC's "Institutional Budget".

Using its specific competences the JRC generates external revenues on top of this Institutional Budget, e.g. through additional work for Commission services and contract work for third parties such as regional authorities or industry, and as a participant in Indirect Actions of the Framework Programme by teaming up in consortia and expert networks. During FP6 the JRC generated additional, so-called competitive (as opposed to institutional) income, equivalent to ~12 % of its total budget.

These competitive activities complement the tasks outlined in the JRC's own work programme and are seen as an essential tool for acquiring and transferring expertise and know-how. They also allow the JRC to be firmly integrated in the European research landscape (cf. sections 6.1 and 6.2 for more data on the JRC's budget).

1.6 The Work Programme of the JRC

The JRC Work Programme incorporates priorities from the Framework Programme and needs expressed in the Commission High-level Users Group (cf. section 1.4).

The work is implemented through "actions", whereby an action is similar to a project (i.e. one specific task of investigation), but actions typically encompass more than one project. During the 6th Framework Programme the JRC Work Programme counted roughly 100 scientific actions (cf. below in section 2.3).

An integrated review cycle is in place to monitor and review the execution of the actions at different organisational levels:

- Quarterly reviews at the level of scientific units in the Institutes
- Six-monthly reviews at the level of the Institutes
- An annual review at corporate level, the so-called Periodic Action Review, explained below.

To facilitate these reviews, scientific staff enters data concerning objectives, deliverables, impact and other performance indicators into a corporate Science Knowledge Management data base (SKM).

Since the beginning of FP6, the JRC introduced a corporate-wide Periodic Action Review, using the information collected in SKM to make an indicator-based peers' assessment of the EU policy support impact and the scientific output of each individual action in the JRC Work Programme.

Impact of policy support is assessed using a set of indicators that covers the broad range of categories of expected impacts. Scientific output is assessed

[4] Switzerland, Norway, Iceland (contribution through the European Economic Area agreement).

[5] Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia.

[6] Bulgaria, Israel, Romania, Turkey.

using publication count indicators, as well as indicators related to filed patents and participation in Indirect Actions of the Framework Programme. As an evolving process, the methodology is revised annually.

PAR provides a traceable internal assessment on the strengths and weaknesses of all JRC scientific actions on a yearly basis. Results appreciate the various components of an action in a differentiated way and verify the maturity of an action.

1.7 A quality approach

The need to deliver consistent and high-quality results has led the JRC to pursue a quality management approach, where necessary backed up by external certification and accreditation (ISO 9001, ISO/IEC 17025, ISO 14000, OHSAS 18001, ISO Guide 34 and ISO Guide 43). This rigorous quality approach also facilitates being recognized as a reliable provider when the JRC is on the market to self-finance a part of its operations.

In 1999, the JRC adopted the EFQM (European Foundation for Quality Management) excellence model as a tool for assessment and review for the whole organisation. Staff and customer satisfaction surveys are regularly carried out as part of this process.

As a next step in its quality approach the JRC decided in 2008 to develop a quality management system at corporate level compliant with the ISO 9001:2000 provisions.

The JRC is committed to maintaining a high level of safety and security on its premises.

Following the last major external evaluation the JRC also adopted a value statement according to which "The JRC aims to operate to the highest standards of quality, efficiency and integrity with respect to the society as a whole, to its customers and to its own staff." It underlines the JRC's efforts to provide robust scientific support and advice. The statement also stresses that the JRC has a high regard for its staff and considers it as its most valuable asset.

During FP6 the JRC made a special effort to ensure a high standard of integrity in its work. For this purpose the Management and the Board of Governors endorsed a document[7] entitled: "Robust Science for Policy-making: A guideline towards integrity and veracity in scientific support and advice", which should help the JRC to provide support and advice that is objective, sound in logic and based on scientific evidence.

2 The JRC in the 6th Framework Programme (FP6)

2.1 The Multi Annual Work Programme in FP6

Under the 6th Framework Programme (EC) for RTD and the 6th Framework Programme of the European Atomic Energy Community (EURATOM), the JRC's Multi-Annual Work Programme was organised into four core areas:

- Core Area 1: Food, Chemical Products and Health
- Core Area 2: Environment and Sustainability
- Core Area 3: Nuclear Activities
- Core Area 4: Horizontal Activities.

The full structure of the JRC's Work Programme in FP6 is presented on the next page in Table 2.

The objectives during FP6 are laid down in the legal texts of the Framework Programmes, the JRC's Multi-Annual Work Programme and the Specific Programmes (EC and EURATOM). These higher level objectives have been formulated in a general way, so as to have some leeway to adapt objectives at the action (project) level to changing priorities.

2.2 The objectives of the Work Programme executed under FP6

The objectives[8] of the JRC's Multi-Annual Work Programme, organised into the four Core Areas mentioned above, further sub-divided into 11 Priorities (themselves sub-divided into 32 Integrated Scientific Areas) are given in the Multi-Annual Work Programme 2003-2006 document.

[7] JRC Robust Science for Policy Making: A guideline towards integrity and veracity in scientific support and advice, see Annex II reference documents

[8] It is to be noted that these objectives have not been written under the current guidelines from the Commission's ABM system to use SMART (Specific, Measurable, Achievable, Realistic, Time-based) objectives. A positive effect from the introduction of ABM only becomes noticeable in FP7, where the JRC is making dedicated efforts to set SMART objectives.

Table 2. Structure of the JRC's Work Programme in FP6 with Core Areas, subdivided into Priorities which in turn are subdivided into Integrated Scientific Areas (ISA)

Core area 1. Food, Chemical Products and Health
- Priority 1.1 Food chain
  - ISA 1.1.1: Safety and quality of food and feed
  - ISA 1.1.2: Food chain: from agriculture to consumer protection
- Priority 1.2 Biotechnology
  - ISA 1.2.1: GMOs in food, feed, seeds and the environment
- Priority 1.3 Safety of chemicals
  - ISA 1.3.1: Assessment of chemicals and exposure
  - ISA 1.3.2: Alternative methods to animal testing
- Priority 1.4 Contributions to health
  - ISA 1.4.1: Technologies for biomedical applications
  - ISA 1.4.2: Health and environment

Core area 2. Environme3nt and Sustainability
- Priority 2.1 Protection of the European environment
  - ISA 2.1.1: Air quality and environmental radioactivity
  - ISA 2.1.2: Water quality and aquatic ecosystems
  - ISA 2.1.3: Soils and waste management
  - ISA 2.1.4: Land resources
  - ISA 2.1.5: Integration of sustainability into other policy areas
- Priority 2.2 Global change
  - ISA 2.2.1: Climate change, the Kyoto protocol and beyond
  - ISA 2.2.2: Monitoring and assessing ecosystem sustainability
- Priority 2.3 Energy
  - ISA 2.3.1: The Sustainable Energy Technologies Reference & Information System
  - ISA 2.3.2: Renewable energies and advanced energy conversion technologies

Core area 3. The EURATOM Programme
- Priority 3.1 Nuclear safety and security
  - ISA 3.1.1: Management of spent fuel and of radioactive waste
  - ISA 3.1.2: Nuclear Security (safeguards and non proliferation)
  - ISA 3.1.3: Reactor and nuclear fuel safety
  - ISA 3.1.4: Radiation monitoring
  - ISA 3.1.5: Basic actinide research

Core area 4. Horizontal Activities
- Priority 4.1 Technology foresight
  - ISA 4.1.1: Technology foresight in other JRC priorities
  - ISA 4.1.2: Cross-cutting techno-economic foresight
  - ISA 4.1.3: Statistical methods for analysis of economic indicators
- Priority 4.2 Reference materials and measurements
  - ISA 4.2.1: Reference materials and methods in other JRC priorities
  - ISA 4.2.2: BCR and industrial certified reference materials
  - ISA 4.2.3: Metrology in chemistry and radionuclide metrology
  - ISA 4.2.4: Metrology in physics: neutron data measurements
- Priority 4.3 Public security and antifraud
  - ISA 4.3.1: Antifraud and monitoring compliance with EU Regulations in selected policies
  - ISA 4.3.2: Support to cyber security
  - ISA 4.3.3: Technological and natural risks
  - ISA 4.3.4: Contribution to Commission objectives in humanitarian aid and assistance

2.3 Programme implementation via the Institutes

The Work Programme is implemented through a number of actions distributed over the seven institutes of the JRC. Although some actions finished and others started in the course of FP6, the number of actions fluctuated marginally between 93 and 100. Table 3 shows their distribution over the JRC Institutes in 2006.

3 Changes in the JRC Work Programme from FP5 to FP6

The evolution of the thematic structure and instruments of the JRC Work Programmes from the 5th to the 6th Framework Programme can be summarised as follows:

At the outset of the Multi-Annual Work Programme 1999-2002 (in FP5), the main work areas of the JRC were formulated in broad terms based on policy themes:

- Serving the Citizen
- Enhancing Sustainability
- Underpinning European Competitiveness
- Euratom Work Programme

And two complementary horizontal elements:

- Measurements, standards and testing
- Techno-economic intelligence

Around the year 2000 during FP5 the Work Programme structure changed from the previous policy themes to scientific fields corresponding to well-recognised priority areas for European policy-makers:

- Safety of Food and Chemicals
- Environment
- Dependability of Information Systems and Services
- Nuclear Safety and Safeguards

And two additional horizontal activities:

- Forward looking insights into modern technology trends and socio-economic issues
- Networking with other RTD actors in the EU to produce science and technology standard references

Table 3. Distribution of JRC actions by Institute, Core Area and Priority in 2006

CORE AREA	Food, chemical products and hea				Environment and sustainability			EURATOM	Horizontal activities		
Priority	Food	Biotech	Chemicals	Health	Environment	Global Change	Energy	Nuclear	Foresight	Reference materials	Security Antifraud
IRMM	3							2		9	
IHCP		3	8	2						2	1
IPTS	1				2	1	1		7		
IES				1[9]	12	4	2				1
IE				1			4	5			
IPSC	2							2	2		19
ITU				1				6			

[9] Action started in 2005 (does not appear in the Multi-Annual Work Programme 2003-2006).

In the 6th Framework Programme the Work Programme synthesised the policy themes and scientific fields into the four Core Areas shown in details in Table 2:

- Food, Chemical Products and Health
- Environment and Sustainability
- Nuclear Safety and Security
- Horizontal Activities (Reference materials and measurements, technology foresight, public security and anti-fraud)

4 JRC's Five-Year Assessment: FP5 and FP6 early review

In October 2003 a Panel of experts under the chairmanship of Professor David Fisk started an independent external evaluation of the direct research activities of the Joint Research Centre, a formal requirement both under the Framework Programmes and as part of the Commission's evaluation policy. The Panel published its findings in a comprehensive Five-Year Assessment report with a set of recommendations to the JRC.

In the preface to the report Professor Fisk wrote that "[...] this is not the time to heap further radical recommendations on the JRC" and accordingly the Panel presented a focussed set of recommendations to strengthen the JRC's capability to deliver services to the Commission, i.e. eleven general recommendations to reinforce the organisation of the JRC, its functioning, quality management and its infrastructure (laboratory and informatics environment) and eleven recommendations for the JRC's Work Programme under FP6, i.e. one for each Priority with as a bottom line to seek integration in the work programme across institutes.

The JRC accepted all recommendations and implemented their follow-up. A detailed summary is given in a separate document that lists all actions that have been undertaken since the evaluation10. Major improvements include the set up of a classification and archiving system for the JRC's scientific and technical publications, milestone management, enhancement and management of integration, and various modernisations e.g. improvement of the infrastructure on the Ispra site, investment in new IT structures, risk management, and the strengthening of a security culture.

5 The JRC in FP7

2008 is the second year of the 7th Framework Programme (FP7). The preparations of FP7 started in 2005 when the EU adopted the new EU Financial Perspectives11 (2007-2013) that embraced a new political project for the Union. Through this project, the Union concentrates its action over the seven year-period on three main priorities:

- Integrating the single market into the broader objective of sustainable growth, mobilising economic, social, and environmental policies to that end. The goals under this priority are competitiveness, cohesion and the preservation and management of natural resources.
- Giving more substance to the concept of European citizenship by completing the area of freedom, justice, security and access to basic public goods and services.
- Establishing a coherent role for Europe as a global player – inspired by its core values – in assuming its regional responsibilities, promoting sustainable development and contributing to civilian and strategic security.

In response to these new political priorities, the structure of the JRC programme evolved from the four FP6 "Core Areas" articulated around thematic fields, to five FP7 "Policy Themes" reflecting the general EU policy concerns (cf. Table 4):

- In general terms, "Prosperity in a Knowledge Intensive Society" includes growth, employment, knowledge, and competitiveness. The JRC focuses here on the regulatory context, the development of standards and data harmonisation; and support to policy areas such as energy, transport, information, chemicals and biotechnologies. Direct support to policy formulation is provided in the areas of economic, market and fiscal policies.
- The "Solidarity and the Responsible Management of Resources" is a long-standing priority for the JRC, particularly in areas of agriculture and environment. The environment and health theme

has emerged as a new focus of attention while climate change remains a key feature.

- "Security and Freedom" is an area of growing concern for the Union as well as for the JRC which focuses on providing technical support on internal security issues where interactions between the European Commission and Member States are expanding. Activities continue in well established policy areas where many new challenges lay ahead, including the safety of food and feed and response to disasters.

- "Europe as a World Partner" involves the JRC supporting a range of external policies (such as international trade/anti-fraud, Community action relevant to stability, non-proliferation and common foreign and security policy; development cooperation policy and humanitarian aid; European neighbourhood policy). This global dimension is of critical relevance to future EU policies, touching upon security issues and development cooperation.

- The "EURATOM Programme" entails developing and assembling knowledge, providing 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.

Table 4. Structure of the JRC's Work Programme in FP7

Policy Theme 1. Prosperity in a Knowledge Intensive Society

- Agenda 1.1 Competitiveness and innovation
  - 1.1.1 Reference materials
  - 1.1.2 Econometrics
  - 1.1.3 Indicators and intelligence for a knowledge society
  - 1.1.4 Clean technology assessment
  - 1.1.5 Chemicals
  - 1.1.6 Data harmonization
- Agenda 1.2 European Research Area
- Agenda 1.3 Energy and transport
  - 1.3.1 Energy
  - 1.3.2 Transport
- Agenda 1.4 Information society
- Agenda 1.5 Life Sciences and biotechnology

Policy Theme 2. Solidarity and the Responsible Management of Resources

- Agenda 2.1 Agriculture, rural development, and fisheries
  - 2.1.1 Agriculture and rural development
  - 2.1.2 Fisheries and maritime policy and marine environment
- Agenda 2.2 Natural resources
- Agenda 2.3 Environment and health
- Agenda 2.4 Climate change

Policy Theme 3. Security and Freedom

- Agenda 3.1 Internal security
- Agenda 3.2 Disasters and response
- Agenda 3.3 Food and feed safety and quality

Policy Theme 4. Europe as a World Partner

- Agenda 4.1 Global security
- Agenda 4.2 Development cooperation

Policy Theme 5. The EURATOM Programme

- Agenda 5.1 Nuclear waste management and environmental impact
  - 5.1.1 Spent fuel characterisation, storage and disposal
  - 5.1.2 Partitioning, transmutation and conditioning
  - 5.1.3 Basic actinide research
  - 5.1.4 Nuclear data
  - 5.1.5 Medical applications from nuclear research
  - 5.1.6 Measurement of radioactivity in the environment
  - 5.1.7 Knowledge management, training and education
- Agenda 5.2 Nuclear safety
  - 5.2.1 Safety of nuclear installations
  - 5.2.2 Nuclear fuel safety in power reactors operating in the EU
  - 5.2.3 Safe operation of advanced nuclear energy system
- Agenda 5.3 Nuclear security
  - 5.3.1 Nuclear safeguards, additional protocol and combating illicit trafficking
  - 5.3.2 Open source information collection on non proliferation

6 The JRC in figures: selected trends (2003-2006)

This chapter provides data on the JRC's financial and staff resources for FP6. The different sections present a series of tables and graphs concerning the budget, the competitive income, the staff and the publications.

6.1 The JRC Budget

The major part of the JRC's Institutional Budget is made available through the Framework Programmes for Research (cf. section 1.5).

For the period 2003-2006 the contribution through FP6 was €1171 million. This includes the contributions from the European Free Trade Association countries as well as supplementary credits (~€29 million from 2003-2006) from contributions from the New Member States which joined the Union during FP6 as well as from Associated Countries.

In addition the Institutional Budget also contains a contribution for decommissioning activities related to the Euratom Treaty (cf. section 1.5), i.e. €99 million from 2003-2006. This part of the Institutional Budget is outside the Framework Programme and is not considered in any further detail here.

6.1.1 The JRC Framework Programme Budget executed during 2003-2006

In the budgetary execution the JRC splits its Framework Programme budget into the following three categories:

- Staff expenses
- Means of execution, e.g. expenses for maintenance of buildings and equipment, electricity, insurances, consumables
- Operational expenses, i.e. expenses for scientific work, e.g. laboratory equipment, consumables.

Using this division, Table 5 presents the evolution of the JRC's FP6 budget.

6.1.2 Budget spent in the Core Areas and Priorities in FP6

In the legal texts of the Framework Programme it is foreseen that the Framework Programme budget also covers some JRC activities for general interest (such as the technology transfer and innovation promotion and the management of the Communities intellectual property rights) and for staff expenses for decommissioning general services. These marginal expenses amounted to €30 million for the 4 year period of FP6.

Therefore out of the €1171 million, the JRC spent €1141 million on work in the Core Areas of the Work Programme.

The distribution of this €1141 million per Core Area, Priority and Institute in FP6 is presented in Table 6.

6.2 Competitive income

Competitive income is generated through work under contractual arrangement. Table 7 shows the value of contracts signed and inscribed in the four years of FP6 for the three types of contracts:

- JRC's participations in FP6 Indirect Actions

Table 5. JRC Framework Programme Budget (round figures in millions of euros)

	2003	2004	2005	2006	Total
Staff expenses	170	200	202	212	784
Means of execution	54	57	64	64	239
Operational expenses	35	37	37	39	148
Total	**259**	**294**	**303**	**315**	**1171**

Table 6. FP6 Budget spent according to Core Areas, Priorities and Institutes (Budget volume in millions of euros)

Core Area / Priority	1				2			3	4			
	Food	Biotech	Chemicals	Health	Environ-ment	Global change	Energy	Nuclear	Foresight	Reference materials	Security Antifraud	Total
IRMM	47.0	9.6		4.8	6.3			18.2		70.6		156.5
IHCP		28.0	97.6	20.2						21.4	9.4	176.6
IPTS	6.9	0.4		3.7	16.8	3.6	3.7		24.4		2.9	62.4
IES				1.4	162.8	50.0	23.8				14.2	252.2
IE				5.4			45.1	64.1			0.7	115.3
IPSC	15.9							48.4	11.0		144.2	219.5
ITU				9.1				149.4				158.5
Total	69.8	38.0	97.6	44.6	185.9	53.6	72.6	280.1	35.4	92.0	171.4	1141

- Direct support to Commission services outside the Framework Programme
- Work for third parties such as industry or regional authorities

6.3 Staff

6.3.1 General evolution of staff

The JRC staff charts distinguish core staff and visiting staff.

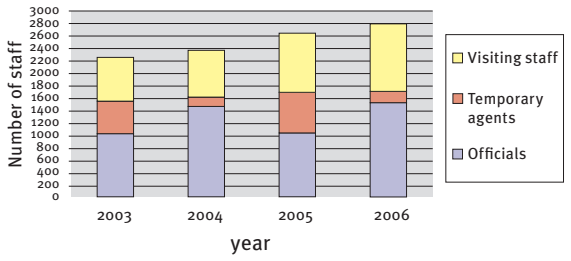
- Core staff is statutory staff subject to the European Communities Staff Regulations and is divided into officials and temporary agents (on renewable or non-renewable contracts).
- Visiting staff, in increasing number these last years, are distributed among various categories: trainees, postgraduate and post-doctoral grant holders, visiting scientists, seconded national experts, auxiliaries and contractual agents.

The annual evolution of officials, temporary agents and visiting staff (expressed in numbers) during FP6 is presented in Figure 1 (end-of-year situations).

Table 7. Competitive income during FP6 (in millions of euros)

Contracts signed during FP6	**2003**	**2004**	**2005**	**2006**	**Total**
Indirect Actions	4.1	16.7	18.2	19.2	58.2
Support to Commission Services outside the FP	17.3	21.8	11.1	29.4	79.6
Third Party Work	4.5	6.4	5.3	11.4	27.6
Total (contracts signed)	25.9	44.9	34.6	60.0	165.4
Cashed Income from Competitive Activities	30.1	28.3	35.5	47.1	141.0

Figure 1. Evolution of JRC staff 2003-2006



JRC staff is financed through the institutional budget and partially through competitive income. Between 2003 and 2006 the "competitive" staff increased roughly from 180 to 300.

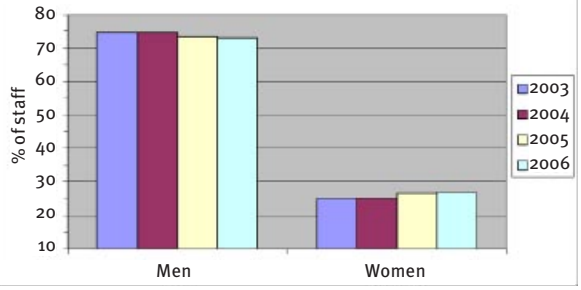
The strong increase of officials from 2003 to 2004 is due to a Commission wide change in staff policy. Amongst other things, this reform restricted the use of temporary agents and regularised the position of long-standing temporary agents by appointing them as officials.

6.3.2 Gender balance evolution

The general gender balance evolution during FP6 (expressed in percent) for the core staff of the JRC is displayed in Figure 2 (end-of-year situations).

During FP6 more women were employed, slightly shifting the gender balance. As yet, this positive development is less pronounced for management positions: women account for 11.3 % of unit heads. However, whereas all senior management posts (Director General, Deputy Director General and 10 Directors) were filled by men during most of FP6, three women were appointed to the senior management in 2006.

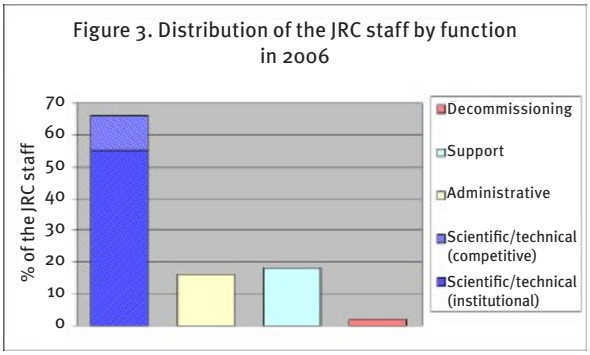
Figure 2. Gender balance evolution 2003-2006



6.3.3 Staff distribution by function

Figure 3 displays the 2006 total JRC staff distribution by function of four major categories:

Figure 3. Distribution of the JRC staff by function in 2006



- Scientific/technical staff works directly on scientific projects in support to customers (distinguishing staff working on tasks from the institutional Work Programme and staff working on "competitive" tasks).
- Administrative staff provides non technical support such as finances and accounting, contract management, staff management, evaluation.
- Support staff works in e.g. infrastructure, maintenance, logistics, and workshops.
- Decommissioning staff is engaged in the decommissioning of nuclear plants that have been shut down and wastes from such plants (cf. section 1.5)

6.4 JRC output in FP6

The JRC has a broad variety of activities to fulfil its mission in support of EU policies. The kinds of output and the related deliverables are highly diverse and recently the JRC formalised different categories for planning, monitoring and evaluation purposes as in Table 8.

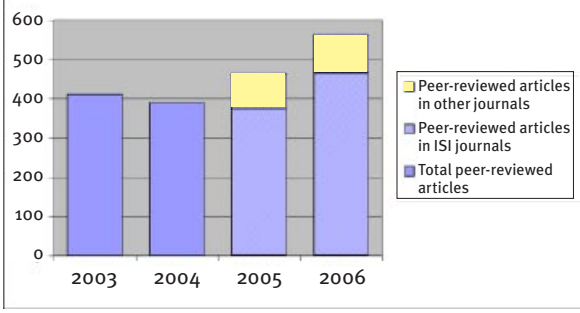
Table 8. Categories of output formalised and introduced in 2007

Reference materials	Policy support documents
Scientific publications	Validated methods
Models and updates	Tests and measurements
Training courses provided	Databases and websites
Technical systems	Patents and licences
Guidelines and reference documents	

The elements in these different categories are not easily comparable and plain counting is usually only applied in the category of "scientific publications" and for "patents and licences".

The annual count of peer-reviewed scientific articles published during FP6 is represented in Figure 4 with the detail that since 2005 JRC publication data can distinguish publications in peer-reviewed journals listed in the ISI Journal Citation Reports (JCR) and article contributions to other peer-reviewed periodicals.

Figure 4. Number of peer-reviewed articles



It is worth noting that these publications are evenly distributed over the four Core Areas covered by the JRC Work Programme.

As regards the other formalised categories of deliverables in the Table 8 the JRC is step by step putting in place a system to make such count possible for planning, monitoring and evaluation purposes.

During FP6 the deliverables have been recorded in a qualitative, free-text format in the corporate SKM data base (cf. also section 1.6). A first step in counting deliverables was made on the output produced in the last year of FP6 (2006) and was used to underpin budgetary demands in 2007.

In these counts all different categories of output have been aggregated as a function of the five policy themes of FP7. Tables 9a, b, c, d, give the results for non-nuclear activities and Tables 10a, b, c for the nuclear activities.

Table 9a. Number of products and services in 2006 counted as function of agendas in the policy theme "Prosperity in a knowledge intensive society"

Data harmonization	25
Econometrics	51
Energy and transports	160
European Research Area	13
Indicators of knowledge society	32
Information society	19
Life sciences and biotechnology	79
Reference materials	32
Chemicals	34
Clean technology assessment	24

Table 9b. Number of products and services in 2006 counted as function of agendas in the policy theme "Solidarity and the responsible management of resources"

Rural development & agriculture	158
Fisheries, maritime policy and marine environment	33
Natural resources	79
Environment & health	31
Climate change	54

Table 9c. Number of products and services in 2006 counted as function of agendas in the policy theme "Security and freedom"

Internal security	73
Disasters and response	88
Food and feed safety and quality	70

Table 9d. Number of products and services in 2006 counted as function of agendas in the policy theme "Europe as a world partner"

Global security	28
Development cooperation	110

Table 10a. Number of products and services in 2006 counted as function of agendas in the policy theme "Nuclear waste management and environmental impact"

Spent fuel characterisation, storage and disposal	6
Partitioning, transmutation and conditioning	4
Basic actinide research	3
Nuclear data	25
Medical applications from nuclear research	6
Measurement of radioactivity in the environment	21

Table 10b. Number of products and services in 2006 counted as function of agendas in the policy theme "Nuclear safety"

Safety of nuclear installations	7
Nuclear fuel safety in power reactors op. in EU	1
Safe operation of advanced nuclear energy systems	2

Table 10c. Number of products and services in 2006 counted as function of agendas in the policy theme "Nuclear security"

Nuclear safeguards, additional protocol and combating illicit trafficking	39

ANNEX IV

MEMBERS OF THE EXPERT PANEL FOR THE EX-POST EVALUATION OF JRC DIRECT ACTIONS IN FP6

Chairman
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Former Chief Scientific Adviser to HM Government.

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