

ipsc

**Institute for the Protection
and Security of the Citizen**



ANNUAL REPORT 2008

The Institute for the Protection and Security of the Citizen

Contact details

Via E. Fermi, 2749
21027 Ispra (VA) Italy
Tel.: +39 0332 78 9511
+39 0332 78 9947
Fax: +39 0332 78 9943
e-mail: ipsc@jrc.it
<http://ipsc.jrc.ec.europa.eu>

IPSC Mission

The mission of the IPSC is to provide research results and to support EU policy-makers in their effort towards global security and towards protection of European citizens from accidents, deliberate attacks, fraud and illegal actions against EU policies.

ANNUAL REPORT
2008

ipsc

JRC

Institute for the Protection
and Security of the Citizen

POLICY AREA

1. PROSPERITY IN A KNOWLEDGE INTENSIVE SOCIETY

POLICY AREA

2. SOLIDARITY AND THE RESPONSIBLE MANAGEMENT OF RESOURCES

POLICY AREA

3. SECURITY AND FREEDOM

European Commission

Joint Research Centre
Institute for the Protection and Security of the Citizen

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POLICY AREA

4. EUROPE AS A WORLD PARTNER

POLICY AREA

5. EURATOM

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* The IPSC Annual Report is structured according to the JRC Multiannual Workprogramme 2007-2013, composed by "Policy areas" and "Agendas". The present report covers only those agendas under which IPSC's actions are carried out.

Message from the Director

Dear Reader,

In 2008, the Institute for the Protection and the Security of the Citizen (IPSC) again proved its strong position in providing robust scientific results for European policy making. Beyond the valuable research work that fed into the policy process on a regular basis, IPSC scientists directly contributed with their expertise to urgent political processes in response to several crises: in the worldwide financial crisis the IPSC work on financial deposit guarantee schemes supported the setting up of new European guarantee limits for savings; during the Caucasus conflict the damage assessment capabilities of IPSC researchers were deployed and after the Chinese Wen Chuan Earthquake IPSC's experience both in structural engineering and in satellite imagery analysis supported the EU and international efforts to react to the disaster.

From direct field experience as above, IPSC scientists successfully fed back the acquired knowledge into the research process and start collaborations as e.g. with the Chinese Academy of Science in 2008. The fact that security and protection are essential to many political files (e.g. nuclear energy, transport, agricultural controls, maritime surveillance, wireless communications and financial markets control) intensifies the challenge, but the Institute mastered it well and received a very good judgement in the FP6 ex-post assessment of the JRC. This review was performed in 2008 by an independent and international expert panel under the chairmanship of Sir David King, former Chief Technology Advisor to the UK government, and proves that IPSC is on the right road.

For 2009, the challenge clearly lies in maintaining the performance at a high level, although the replacement of leaving staff stayed behind the expectations. A solid IPSC contribution to the development of a new JRC strategy will also be one of the more important tasks for 2009.

I wish you an informative read.

Stephan Lechner



Work structure

The JRC's activities are mainly financed as “direct actions” by the Framework Programme for Research and Technological Development and the Framework Programme of the European Atomic Energy Community (EURATOM). The JRC can also participate in projects funded as “indirect actions” of the above mentioned Framework Programmes*.

The Seventh Framework Programme (FP7) covers the period 2007-2013, while the EURATOM Framework Programme covers the period 2007-2011.

The current work of the JRC is based on the Multiannual Workprogramme 2007-2013, which is organised into five policy areas:

1. Prosperity in a Knowledge Intensive Society
2. Solidarity and the Responsible Management of Resources
3. Security and Freedom
4. Europe as a World Partner
5. the EURATOM Programme

Each policy area is in turn divided into “agendas” and “sub-agendas”. Each sub-agenda is carried out by means of one or more “actions” across the seven JRC institutes.

This report presents the main achievements and future challenges of the actions carried out in 2008 at the Institute for the Protection and Security of the Citizen, according to the thematic structure of the JRC Multiannual Workprogramme 2007-2013.

In 2008, the JRC-IPSC's workprogramme comprised 31 actions, distributed over all the 5 policy areas.

EEMC . QSI . FINECON . CID
STATIND . ECCAIRS . VATDIS . CRELL

1
Prosperity in a Knowledge
Intensive Society

GEOCAP . MASURE
FISHREG . AGRI4CAST

2
Solidarity and the Responsible
Management of Resources

ARTTS . PVACS . BorSec . MonCoTraf . SITAFS
SCNI . ITesT . SAFECONSTRUCTION . MAHB . EMM

3
Security and Freedom

FOODSEC . ISFEREA
CriTech

4
Europe as a World Partner

NUMAMET . VERTEC . NuTraSeal
PhyMod . AMENUS . TENS

5
EURATOM

* See also the chapter 'IPSC in figures'.



1

Prosperity in a Knowledge Intensive Society



A key objective of the FP7 is to maximize the leverage of investments in research to stimulate the competitiveness of the European economy. The JRC's FP7 portfolio will include a broad range of items which contribute to this overarching objective. Elements such as fostering research and innovation, developing a culture of excellence, establishing standards, improving market transparency, setting up of appropriate regulatory context, anticipating critical issues affecting society and designing sustainable management practices in a broad range of economic activities fall into that category of activities which feed the knowledge society.

The activities of the JRC undertaken in the five policy agendas described in Policy Area 1 cover critical areas of the Union's life and contain potential developments which will affect the citizen for years to come. R&D support to the knowledge society must keep pace with those developments. The JRC research agenda will adapt to the changing context driven by the political evolution of the Union itself, by an ever increasing globalisation of the economy, by continuous and sometimes unpredictable impacts of new technologies and by a growing concern for health and security.



1.1 Competitiveness and Innovation*

Econometrics

This Agenda addresses the growing demand for the development of Commission in-house capacity to operate advanced econometric modelling and sensitivity analyses in a wide range of policy fields. Priority has been given to the financial, internal market and fiscal policies, as well as education policy. A focus on the development, evaluation and use of composite indicators is maintained as these indicators experience recurring acceptance problems at the EC service level and in Member States. Associated with this agenda is an activity responding to the emerging demand for a better understanding of the relationship between the needs of the knowledge society and the provision of education. Of particular relevance is the common evaluation of the efficiency of investments in education in Member States.

Indicators and intelligence for the knowledge society

This area covers a range of research and monitoring activities dedicated to the Lisbon Agenda in terms of indicators and scoreboards, demographics of skilled manpower, as well as process and conditions for stimulating technological innovation and e-business of enterprises. It provides guidance on the development of research policy items, on the Lisbon agenda, on stimulating the knowledge society objectives, and on improving employment in advanced and innovative sectors of the European economy.

Data harmonization

The competitiveness of European economy also benefits from increased access to harmonised information and interoperable services related to the reporting on items of community policy relevance. The JRC will contribute to the data and information management for Global Monitoring for Environment and Security initiative (GMES) including the procurement of community satellite data sets for a broad range of uses.

EEMC, FINECON, QSI,
STATIND, CRELL, CID

1.3 Energy and Transport

Sustainable transport relates to environment quality, mobility, competitiveness, single market and innovation. The JRC will follow safety issues related to air transport and will develop methods and supporting technologies for assessing vulnerability of transport systems to unintended and malintended acts.

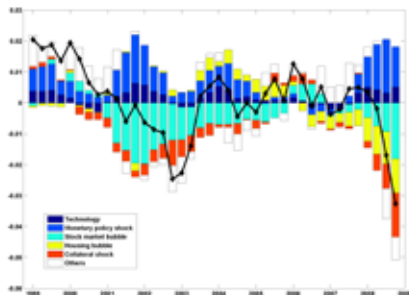
ECCAIRS, VATDIS

* Only those agendas of JRC Multiannual Work Programme involving IPSC's actions are mentioned.



CONTACT

Riccardo Girardi
 Tel. +39 0332 785639
 e-mail: riccardo.girardi@jrc.ec.europa.eu
 website: <http://eemc.jrc.ec.europa.eu>



Analysis of the determinants of economic recession.

Euro Area Economy Modelling Centre (EEMC)

The European Union since its birth represents one of the most advanced examples of international policy co-operation, but in recent years the pace of integration has increased considerably. The Single Currency was adopted in 2000, the European Central Bank was founded and most of EU countries moved to a monetary union. Monetary policy is decided at EU12 level and fiscal policies are co-ordinated through the ECOFIN committee following the rules of the Stability and Growth Pact.

The present recession is putting serious stress on Member States' finances. Consistent resources have been devoted to stabilizing financial markets. A significant amount of monetary reserves have been released on the market by Central Banks and troubled financial firms have been bailed out by Member States' governments. These operations managed to save international financial markets from collapse, but they did not manage to prevent the ongoing downturn, a major economic recession since World War II.

To mitigate the effects of the recession and mainly to try to reduce its length, Member States' governments are preparing fiscal stimulus plans.

The success of fiscal measures strongly depends on a correct analysis of its effects on the real economy. Such analyses require adequate economic research as well as up-to-date monitoring tools. The contribution to the production of these analyses and tools is within the scope of the Euro-area Economy Modelling Centre.

The activities of the EEMC focus on providing methodological and technical support to EU macroeconomic policy coordination tasks. With its expertise in econometrics, statistics, time series analysis JRC-IPSC supports the Commission and Member States bodies with three main areas of activity:

1. Macroeconomic models estimation and model screening.
2. Short-term economic analysis, with focus on output gap and the Non-Inflation-Accelerating-Rate of Unemployment (NAIRU).
3. Econometric training.

Major 2008 achievements

QUEST III. The European Commission macroeconomic model

A new version of the standard Macroeconomic model of the Commission (QUEST) was jointly developed by the Directorate-General for Economic and Financial Affairs (DG ECFIN) and JRC-IPSC. The model was described in the joint JRC - DG ECFIN paper: 'QUEST III. A Multi-Country Business Cycle and Growth Model European Economy'*. QUEST III is the main economic policy simulation tool of the Commission. It is used to assess alternative policy scenarios and provides the information to establish the official Commission position during Economic and Financial (ECOFIN) Council meetings.

A QUEST III version, including a real estate investment sector and credit constraint households, was timely developed to provide insight to the current economic recession; the model is being used to simulate the welfare effect of the crisis that will be reported in the European Economic Review 2008.

* *Journal of Economic Modelling* 26 (2009) 222-233

Training in macroeconomic modelling

The third Course of Global Sensitivity Analysis for Macroeconomic Models was held in Ispra on April 21-22. The course was attended by 30 participants mainly from Member States' Central Banks and Ministries of Finance, but it also attracted officers from the central banks of Canada, Indonesia and Brasil. The course gave an introductory to the sensitivity analysis methodologies developed at EEMC and coded in DYNARE 4.0 MatLab Tool Box, the state of art modelling environment of macroeconomic modelling. Between April 15 and 30, the routines were downloaded from the EEMC site by 157 registered users, mainly from the organisations of the participants.

Methodologies for structural reforms

Since January 2007, EEMC is part of the Commission representative to the Council - Economic Policy Committee meeting of the Lisbon Methodology Working Group. The scope of the working group, formed by the Commission, the European Central Bank and the Member States' representatives of Economic Ministries, is to coordinate the development of appraisal methodologies for structural reforms. EEMC was invited because of its competencies in macroeconomic modelling. In 2008 EEMC contributed to 4 meetings and prepared the report "Economic Policy Committee, Working Group on Lisbon Methodologies, a Model Comparison Exercise".

Challenges for 2009 and beyond

EEMC will continue its methodological support to DG ECFIN and the Economic Policy Committee. The challenges for the near future will be the development of adequate algorithms to handle the estimation of large scale macroeconomic models.

For 2009 there are two main challenges:

- EEMC should finalize a parallel computing platform that will allow the running of large scale macroeconomic models on EEMC cluster computer. The platform will be accessible for registered user (other Commission services, Member States' Ministries of Economic and Finance).
- The QUESTIII 'real estate' model will be extended and developed into a dedicated environment to analyse the relation between fiscal stimulus policies and the length of the ongoing recession.

In 2009 EEMC will form part of the new action FINEPRO (Analytic Methods for Financial and Economic Protection).



ECOFIN Council Meeting.

GLOSSARY

DG ECFIN Directorate-General for Economic and Financial Affairs

ECOFIN Economic and Financial Council

QUEST Dynamic Stochastic General Equilibrium model - the standard Macroeconomic model of the Commission

NAIRU Non-Inflation-Accelerating-Rate of Unemployment

CONTACT

Jessica Cariboni
 Tel. +39 0332 789372
 e-mail: jessica.cariboni@jrc.ec.europa.eu
 website: <http://farmweb.jrc.ec.europa.eu/esaf/>



Deposit guarantee schemes play a key role in maintaining confidence into the banking sector and avoiding bank runs.

Financial Econometrics for a Single Market and Competitiveness Policies (FINECON)

The Single European Market stands for 'free movement' of people, goods, services and capital, which means the possibility for EU citizens to live, work, and do business throughout the EU as well as to enjoy a wide choice of competitively priced goods and services. Since its inception in 1993 the Single Market has opened up economic and working opportunities that have transformed the lives of hundreds of millions of Europeans. Now the goal is to consolidate the progress towards the Single European Market and to remove the barriers that still prevent citizens and business from fully enjoying the benefits of the Single Market. Achieving a Single Market and ensuring an EU market where competition is not distorted are among the key objectives of the European Commission, time and again reconfirmed within the Lisbon process and its periodic revision.

With its expertise in financial modelling and econometrics, FINECON develops research and quantitative studies in support to EU policy-makers in the areas of consumers' protection, single market safety, and enhanced transparency.

Major 2008 achievements

In 2008 FINECON focused on two main projects, both in support to the Directorate-General for Internal Market and Services (DG MARKT): Deposit Guarantee Schemes and Solvency II.

Deposit Guarantee Schemes

Deposit Guarantee Schemes are a key element of the financial safety net ensuring that, if a bank fails, depositors will be able to recover at least part of their money. This increases confidence into the banking sector and avoids bank runs leading to severe economic consequences. The functioning of Deposit Guarantee Schemes is regulated in the EU by the Directive 94/19/EC.

A revision of this Directive has been ongoing for the last few years and FINECON has been supporting this process by providing a number of technical studies*.

In the first half of 2008, following a work-plan jointly agreed between DG MARKT and JRC-IPSC, FINECON delivered two technical studies: "Investigating the Efficiency of EU Deposit Guarantee Schemes", and "Risk-based contributions in EU Deposit Guarantee Schemes". Both reports are downloadable from DG MARKT web site.

The first report investigates the financial resources available to schemes and assesses the robustness of schemes in all Member States (with the exception of Germany) and Norway based on their funding arrangements. The research tests several scenarios, based on data obtained from real-life banking crises which occurred in the past, and compares the impact of each scenario with the available resources of schemes. Results reveal that most schemes would be capable of dealing with a mid-size bank failure.

The second report focuses on one of the self-regulatory issues identified by the European Commission Communication on Deposit Guarantee Schemes of November 2006: the voluntary introduction of risk-based contributions in EU schemes. The report describes the risk-based models and monitoring systems applied across the Member States, highlights the fundamental principles under-

* Publicly available on DG Internal Market and Services web site: http://ec.europa.eu/internal_market/bank/guarantee/index_en.htm

lying risk determination, and provides a technical description of the mathematical tools employed, including numerical examples of each method.

In September 2008 the financial crisis prompted EU policymakers to accelerate the revision process of the Directive, and, upon an urgent request of DG MARKT, JRC had to deliver in a few weeks an 'ad hoc' study on the impact of raising the minimum level of coverage in the EU from €20,000 to €100,000, within one year, and initially to €50,000 in the intervening period.

As a 'quick response to the crisis', the European Commission released an amendment of the Directive on Deposit Guarantee Schemes in October 2008. The amendment is largely based on JRC-IPSC work, including the 3 quantitative studies delivered during 2008.

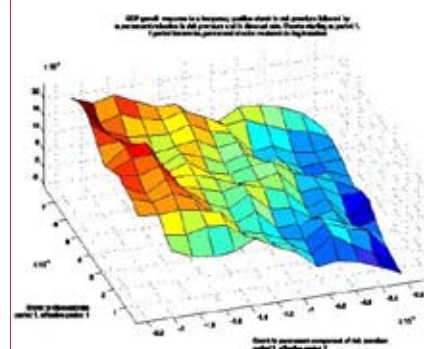
Solvency II

Solvency II aims to guarantee that insurance undertakings are financially safe and can withstand adverse events, in order to protect policyholders and the security of the economic system as a whole. At the request of DG MARKT, FINECON worked on the impact assessment analysis of Solvency II. In 2008 the action delivered a technical note on the sensitivity analysis of QUEST, the dynamic stochastic general equilibrium model that is used by the European Commission to gauge the status of the EU economy, looking at possible changes in risk-premium and discount rate. This preliminary report will be extended to cover possible macro-economic consequences of the introduction of the new Solvency II Directive.

Challenges for 2009 and beyond

The main scientific challenges for 2009 are those concerned with the modelling of credit risk contributions for deposit protection schemes and on modeling the macro-economic impact assessment of Solvency II. Concerning the risk-contribution models, the Commission expects JRC-IPSC to deliver model proposals that are at the same time easy to implement by the national schemes, while reliable and accurate in terms of the produced outcomes. Concerning Solvency II, the challenge will be on the quantification of the macro-economic consequences of Solvency II implementation.

In 2009 FINENCON will be included in the action FINEPRO (Analytic Methods for Financial and Economic Protection).



Solvency II project: Gross Domestic Product (GDP) reaction to shocks in risk premia. The aim of the impact assessment is to investigate the stability of the insurance sector under new legislation.

GLOSSARY

GDP Gross Domestic Product

DG MARKT Directorate-General for Internal Market and Services

CONTACT

Ângela Guimarães Pereira
 Tel. +39 0332 785340
 e-mail: angela.pereira@jrc.ec.europa.eu
 website: <http://kam.jrc.it>

Quality of Scientific Information in the EU Policy Processes (QSI)

Policy development at the European Union has to be developed based on robust knowledge. In particular, when scientific advice is needed, we have to ensure its quality. That is to say, that not only it should be of high scientific quality and reliability but it also has to be robust from the society point of view.

In this project we develop, test and deploy guidelines and tools for quality assessment of policy relevant scientific information. The areas of policy where we have operated so far are: water governance, climate change, sustainability, health and education. Such guidelines and tools focus on the one hand on the management and expression of uncertainty and on the other hand, on the communication of complex and sensitive issues in contexts of policy making and societal engagement in policy making. This encompasses the development of tools based on new Information and Communication Technologies (ICT) to foster public dialogue on policy relevant science.

In 2008, QSI's research endeavors of the previous years have yielded continuing recognition and opportunities for deployment and networking both in several policy making arenas and directly within society initiatives.

Major 2008 achievements

Fostering Public Engagement in Policy making

Be Involved! It is not just a slogan for citizenry to get engaged with policy making processes, but also an *e-participation* tool developed by JRC-IPSC. The *e-participation* concept implies the use of ICT that can facilitate the implementation of public engagement in decision and policy making. This platform was launched late in 2007 and since then has gathered enormous attention from researchers around the world. Collaborative tools beyond conversation have been developed, such as StickyNotes (to help to organize ideas, a sort of mind mapping) and the multi-criteria evaluation tool based on pair-wise comparison.

Public Information and Policy Support Portal

This portal has been developed within the ACCENT Network of Excellence, which is a network of atmosphere scientists. During this year the so called Gothenburg questions from policy makers to atmosphere researchers has been launched: <http://kam.jrc.it/blog/accent>

Governance under conditions of complexity and uncertainty: emerging technologies

QSI deployed the group's expertise in uncertainty expression and public involvement to assess developments in the governance of emerging technologies (nano- and converging technologies). The work led to the insight that tensions and contradictions in current public policy initiatives for emerging technologies are caused as new policy objectives of anticipating impacts, integrating social concerns and enhancing democratic debate do not fit easily with a sequential model of technological innovation, in which different functions (research and its programming and funding, techno-economic innovation policy, risk management, communication to the public) are conceived and implemented separately.

Dealing with those tensions asks for more structural changes in the research-innovation-regulation spectrum: uncertainty assessment and public dialogue should not be seen as an 'add-on' to existing processes of knowledge creation and technology deployment, but rather as an integral part of them.

**b-involved**

The b-involved platform (<http://b-involved.jrc.it>) is a free non-intrusive Internet based platform that allows a small group of people to meet, at a virtual round table, and discuss a pre-defined subject or topic. It is particularly useful when public debates take place among participants that live far away from each others.

Knowledge Quality Assurance Methodologies

mobGAS™ – Knowing your contribution to Climate Change

During 2008 more than 10,000 downloads of this mobile application were carried out. Late 2007 QSI launched a new application to support the EC efforts on raising awareness of individual contributions to the emissions of Greenhouse Gases (GHG) and therefore to the broader problematic of climate change. It is called mobGAS™! It is a software application for mobile phones, allowing users to have easy and fast access to their personal GHG at any time of the day. The importance of the individual action to fight climate change is well entrenched in the policies of the EU as for instance demonstrated by the setting up of the campaign, “You Control Climate Change” launched by President José Manuel Barroso and Environment Commissioner Stavros Dimas in 2006.

ICT for Lifelong Learning

The action was involved in the activities of the European “Advisory Board of the European Indicator of Language Competence” and the support of the Directorate-General for Education and Culture (DG EAC) in reviewing tenders for carrying out a large-scale survey on Foreign Language skills of pupils in European school education. Furthermore, research activities contributed to the work programme of CRELL, the Centre for Research on Lifelong Learning, i.e. concerning the investigation of potentials to the integration of computer technologies in skills assessment. An international expert workshop was carried out in Iceland, discussing the challenges posed and procedures of how to move forward from traditional paper-and-pencil testing to computer-based testing.

2008 key outreach moments

- Hungary and Portugal hosted the 5th and 6th editions of Knowledge Assessment Methodology (KAM) Fall School where around 50 participants were trained in the area of policy related knowledge. The KAM schools present state-of-the-art tools and methods to assess policy related knowledge in decision-making processes.
- Communication of Science to Non-Scientists, 3rd edition 3-day course, under the ACCENT Network of Excellence.

Challenges for 2009 and beyond

In 2009 this action will form part of the action SIPA (Statistical Indicators for Policy Assessment).

mobGAS™

mobGAS™ [<http://mobgas.jrc.ec.europa.eu>] aims to make the connection between daily activities and the emissions of GHG and when possible suggest changes to improve individual performances. The project is the result of years of research at the JRC-IPSC and built upon previous experiences such as VGAS© [<http://kam.jrc.it/vgas>].



European Indicator of Language Competence

It dates back to the Barcelona European Council decision of March 2002 which called for the establishment of a linguistic competence indicator. The purpose is to provide hard data for analysis and comparisons which are needed by Member States in order to reflect and (if needed) adjust their approach to foreign language teaching and learning.

GLOSSARY

ACCENT Atmospheric Composition Change – Network of Excellence

DG EAC Directorate-General for Education and Culture

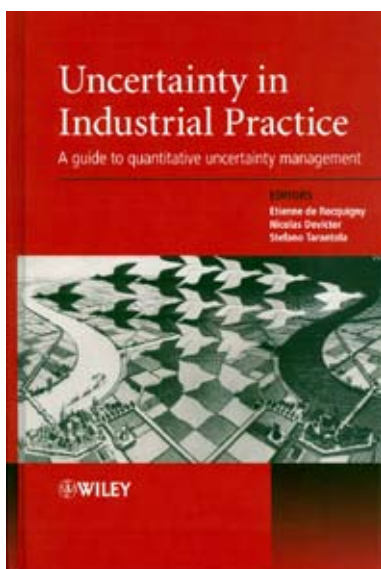
GHG Greenhouse Gases

ICT Information and Communication Technologies

KAM Knowledge Assessment Methodologies

CONTACT

Michela Nardo
 Tel. +39 0332 785968
 e-mail: michela.nardo@jrc.ec.europa.eu
 websites:
<http://sensitivity-analysis.ec.europa.eu>
<http://simlab.jrc.ec.europa.eu>
<http://statind.jrc.ec.europa.eu>



In 2008 STATIND staff co-authored and co-edited the book Uncertainty in Industrial Practice, published by John Wiley.

Development and Assessment of Statistical Indicators for EU Policies (STATIND)

The action contributes to the conception, development and assessment of statistical indicators needed to benchmark progress of Member States in a variety of policy fields connected to the Lisbon agenda, specifically innovation, internal market, product market reforms, high-tech trade.

The action has great methodological expertise in both composite indicators and sensitivity analysis. Composite indicators are increasingly used by European and National policy makers and media to evaluate the relative performance of countries, regions, or cities in various fields and to assess their progress over time based on the policies there undertaken. Sensitivity analysis is used to check the robustness of the message supplied by the indicators, as a sort of pedigree for the indicators, and is a tool to improve their quality.

Major 2008 achievements

Support to Enterprise and Industry policy

In 2008 the action continued the collaboration with the Directorate-General for Enterprise and Industry (DG ENTR) by offering its expertise in the development of indicators in the fields of innovation and e-business readiness. In particular the action.

Support to Enterprise and Industry policy

In 2007 STATIND continued the collaboration with the Directorate General for Enterprise and Industry (DG ENTR) by offering its expertise in the development of indicators in the fields of innovation and e-business readiness. In particular:

- Delivered a methodological report on the calculation of growth rates of composite indicators for the analysis of the country progress over time in technological innovation.
- Prepared the European Innovation Scoreboard with the Maastricht Economic and social Research and training centre on Innovation and Technology (MERIT), which was presented at a press conference by Vice President Verheugen in February.
- Developed an interactive tool to visualise data on the Summary Innovation Index, which was published on the web-site of the European Innovation Scoreboard. This tool provides an interactive benchmarking of national innovation performance for the EU27 Member States and other benchmark countries*.
- Carried out the evaluation of the European e-business index, delivering to DG ENTR a report on the 2008 e-business readiness composite indicators, calculated from the Eurostat Enterprise Survey 2007

Support to Commission's Secretariat General

The action contributed to the Annual Management Plan (AMP) of the European Commission. A report analysing the ongoing evaluation and planning exercise (2008) of the European Commission was produced after a request made by the Secretariat General in the context of the consultation on the JRC annual work programme 2008. This exercise was entrusted to methodologists from both this action and the IPTS institute. In June, the action presented the analytic work on the AMP process at the meeting of the Activity Based Management / Strategic Planning and Programming Network where all Commission services were represented.

* <http://www.proinno-europe.eu/index.cfm?fuseaction=page.display&topicID=364&parentID=51>

Support to micro-economic reforms

In April the action delivered the final report of the MICREF project (micro-economic reforms) to the Directorate-General for Economic and Financial Affairs (DG ECFIN) and DG ENTR. The report provided an overview of reforms enacted by the EU Member States in the years 2004-2006 and an exploratory analysis of the characterisation of product market reforms. The report provided input to a presentation of DG ECFIN to the Lisbon Working Group on Methodology (LIME) in June 2008. The inventory of microeconomic reforms was launched in July on the public web-site of DG ECFIN.

Support to internal market policies

Upon request of the Directorate-General for Internal Market and Services (DG MARKT), the action completed a methodology document describing the procedure to develop an indicator on cost of capital to reflect the investment funding costs for non-financial corporations across all EU Member States. The indicator covers loans, corporate bonds and listed equity. The review of the methodology involved also DG ECFIN, DG ENTR, Eurostat and the European Central Bank.

Support to Foreign Trade policy

Eurostat asked the action to revise the foreign trade nomenclatures on high-technology goods. The current nomenclature on high-technology products stems from a report prepared by the Organisation for Economic Co-operation and Development (OECD) in 1997. In the past years high-tech sectors have evolved and the current aggregations have partially lost their relevance.

The results of the current research indicate that the classification of industries by R&D and technology intensiveness are stable and that a better approach to analyse trade using foreign trade statistics is possible. The research is ongoing in 2009 and will culminate in a final review of the nomenclature for high-technology trade. When the revised nomenclature is available, more reliable indicators of high-tech trade will be calculated within the European Statistical System and this would enable Eurostat to put the revised nomenclature into production.

The action also evaluated indicators of high-tech and medium-high tech trade for Europe, China, US and Japan as requested by the Directorates-General for Trade (DG TRADE) and for Research (DG RTD).

Research

Research in sensitivity analysis was carried out world-wide in collaboration with universities and research centres. STATIND published 9 papers in peer-reviewed journals, 2 books on uncertainty and sensitivity analysis, 1 special issue of Reliability Engineering and System Safety devoted to sensitivity analysis. The action organised the fifth summer school on sensitivity analysis held in San Servolo (Venice).

Dissemination of the activity on composite indicators was made through an Enlargement workshop organised in Bratislava on October 20-21 and a training course to Commission officials held at Eurostat on October 28-29.

Challenges for 2009 and beyond

STATIND's challenges for the next years are to maintain the high standard in peer-reviewed publications while supporting timely and effectively the Commission services.

In 2009 STATIND will form part of the new action SIPA (Statistical Indicators for Policy Assessment).

GLOSSARY

- AMP** Annual Management Plan
- DG ECFIN** Directorate-General for Economic and Financial Affairs
- DG ENTR** Directorate-General for Enterprise and Industry
- DG MARKT** Directorate-General for Internal Market and Services
- DG RTD** Directorate-General for Research
- DG TRADE** Directorate-General for Trade
- LIME** Lisbon Working Group on Methodology
- MERIT** Maastricht Economic and social Research and training centre on Innovation and Technology
- MICREF** Project: micro-economic reforms
- OECD** Organisation for Economic Co-operation and Development

CONTACT

Michela Nardo
 Tel. +39 0332 785968
 e-mail: michela.nardo@jrc.ec.europa.eu
 website: <http://crell.jrc.ec.europa.eu/>

Centre for Research on Education and Life-Long Learning (CRELL)

Recently, the European Union has confirmed that social cohesion (together with growth and employment) is a strategic objective of the revisited Lisbon Agenda. This approach is based on a larger concept of human security, which focuses on security for people rather than territories. This concept deals with sustainable human development, social and economic development and a restructured system of global institutions able to capture the potential peace dividend and improve citizen protection and economic security. Within this framework, CRELL develops indicator-based assessment methods and tools to monitor education and training systems. CRELL projects span from education management to the analysis of outputs and outcomes of education and training systems.

Furthermore, CRELL carries out original research on indicators' building. For any policy field, in order to evaluate and monitor progress, indicators are fundamental instruments. They allow the addressing of policy challenges by identifying and applying best available practices. Aggregated indices serve as a strong signal to policy makers, politicians or the general public at the phases of problem recognition and problem identification. Robustness and defensibility are therefore necessary ingredients for these indices. CRELL develops the methodological tools and offers practical guidelines to build composite indicators and evaluate their robustness to methodological and conceptual assumptions.

Major 2008 achievements

In support to the Commission services, CRELL carried out the following activities:

Progress towards the Lisbon objectives in education and training Indicators and Benchmarks

CRELL co-authored the 2008 edition of the Commission Staff Working Document: Progress towards the Lisbon objectives in education and training – Indicators and Benchmarks. This is the only publication of the Commission dealing with indicators in education and training and constitutes the main official document produced by the Directorate-General for Education and Culture (DG EAC) each year*.

Composite indicator on creativity

CRELL is creating a composite indicator on creativity (2009 is the year of creativity). This will be the first official index at the European level and a first step towards a possible European survey on creativity.

Support to DG EAC

CRELL supported DG EAC with technical expertise in 10 expert groups, task forces and international surveys, among others:

- The survey organised by the Organisation for Economic Co-operation and Development (OECD) on Teachers, Trainers and Learning (TALIS)
- DG EAC Expert Group on Languages (forthcoming survey)
- Eurostat's Task Force on Labour Force Survey 2009
- DG EAC's expert group on Adult Skills

For what concerns scientific research, the main CRELL achievements in 2008 are:

* http://ec.europa.eu/education/policies/2010/doc/progresso8/report_en.pdf

Key publications

CRELL has an established record of publication in peer reviewed journals. In addition, CRELL published a special issue of the European Education Research Journal (Vol. 7 n. 3) on Social Justice, Research and European Policy: defining and measuring key competencies in education.

Indicators on active citizenship

CRELL created two composite indicators on active citizenship and civic competencies in order to measure the characteristics of civic participation in Europe. Both of them received international recognition and media coverage. CRELL also collaborated with OECD, national authorities, and academia by assessing the robustness of a number of composite indicators (e.g. OECD - Product Market Regulation, Bertelsmann-European Lifelong Learning Indicator, and Yale and Columbia-Environmental Performance Index).

University ranking

CRELL contributed to the debate on the University Ranking issue by publishing a report that aims at quantifying how much university rankings depend on the methodology and at revealing whether the Shanghai ranking serves the purposes it is used for, and if its immediate European alternative, the British THES, can do better. The CRELL report* was cited in the French journal *Le Monde* and websites related to education**.

Knowledge Economy: measures and drivers

CRELL published the report on the “Knowledge Economy: measures and drivers” in support to the Directorate-General for Research (DG RTD) through an FP 7 project (KEI). The report focused on the analysis and the robustness assessment of the conceptual framework for measuring knowledge economy developed by the Maastricht Economic and social Research and training centre on Innovation and Technology (MERIT).

Challenges for 2009 and beyond

Learning is understood from a lifelong and life-wide perspective taking into account formal, non-formal and informal learning including formal education, adult learning, vocational education and training, community and workplace learning. In 2009 and within this broad vision of learning, CRELL will continue to provide support to the European Commission (DG EAC) in the field of monitoring education and training systems. By using its expertise in social sciences, economic modelling and quantitative analysis, the action will perform research in the area of social indicators (participation, lifelong learning and economics of education).

In 2009 CRELL will be part of the action SIPA (Statistical Indicators for Policy Assessment). CRELL will continue to perform methodological research on composite indicators, including robustness analysis, weighting, standardisation and aggregation methods and to disseminate the results through conferences, seminars, workshops and peer-reviewed papers.



*CRELL published together with the OECD the Handbook for constructing composite indicators: Methodology and User Guide***, which has become a world reference for constructing and assessing composite indicators and ranking systems.*

GLOSSARY

DG EAC Directorate-General for Education and Culture

DG RTD Directorate-General for Research

MERIT Maastricht Economic and social Research and training centre on Innovation and Technology

OECD Organisation for Economic Co-operation and Development

TALIS Teachers, Trainers and Learning

* <http://crell.jrc.ec.europa.eu/Publications/CRELL%20Research%20Papers/EUR23487.pdf>

** Global Higher Education: <http://globalhighered.wordpress.com/>

Le Monde: http://www.lemonde.fr/cgi-bin/ACHATS/acheter.cgi?offre=ARCHIVES&type_item=ART_ARCH_30&objet_id=1058810&clef=ARC-TRK-NC_01

EUROSAFAIRE: <http://www.eurosaire.prd.fr/7pc/bibliotheque/consulter.php?id=1013>

University World News: <http://www.universityworldnews.com/article.php?story=20081127151829247>

*** http://www.oecd.org/LongAbstract/0,2546,en_2649_34257_35231682_119684_1_1_1,00.html

CID

CONTACT

Pär Åstrand
 Tel. +39 0332 786215
 e-mail: par-johan.astrand@jrc.ec.europa.eu
 websites: <http://mars.jrc.ec.europa.eu/mars/About-us/CID>
<http://cidportal.jrc.ec.europa.eu/home/>



Fig. 1: GeoEye-1, a park in Ljubljana, Slovenia [© Telespazio (2008)]. GeoEye1 has resolution 0.41-meter in PAN, 1.65-meter MSP. The image shows the panmerged product.

GeoEye1 - launched Sept. 6, 2008

This is at present the world's highest resolution civil earth-imaging satellite (see Fig 1, Fig 2). The sensor has been benchmarked to qualify the EU Common Agricultural Policy (CAP), Control with Remote Sensing of area-based subsidies programme for the 2009 years Campaign by the CID Action.

GEOEYE-1 SPECIFICATIONS	
Spatial Resolution	
Panchromatic Sensor	0.41 meters x 0.41 meters
Multispectral Sensor	1.65 meters x 1.65 meters
Spectral Range	450-800 nm 450-510 nm (blue) 510-580 nm (green) 655-690 nm (red) 780-820 nm (near IR)
Swath Width	15.2 km
Off-Nadir Imaging	Up to 60 degrees
Dynamic Range	11 bits per pixel
Mission Life Expected	> 10 years
Revisit Time	Less than 3 days
Orbital Altitude	681 km
Nodal Crossing	10:30 a.m.

Fig. 2: GeoEye1 specifications

Community Image Data Portal (CID)

The Community Image Data portal (CID) action was created at the start of the 7th Framework Programme. The action is a result of the long term experience in image data management and in image data applications built up at the JRC, which serves a series of purposes: to coordinate efficient image procurement, quality access, efficient preparation and storage of data, ensuring a better use, a more efficient re-use, and to encourage the use of imagery in new areas. The long term experience also serves to give input to an efficient collaboration with external partners (e.g. ESA, GEO/GEOSS, industry, image providers,) and towards the initiative Global Monitoring for Environment and Security (GMES).

The action aims to place itself as the centre of gravity of satellite (and aerial) remote sensing data management within the JRC, the European Institutions' Services, and other defined stakeholders as a Spatial Data Infrastructure (SDI). Being of horizontal character providing data to many actions through the JRC (clients), sharing web data services with the initiatives Infrastructure for Spatial Information in the European Community (INSPIRE) and Co-evolution and Self organisation in Dynamical Networks (COSIN), the CID action is logically mostly applications oriented with strength in conception, implementation, and operations giving research-based support and operational support. A healthy balance towards science is however maintained through benchmark studies of new satellite remote sensing sensors, through data servicing and architecture engineering, and through indepth studies on image data policy.

Major 2008 achievements

The CID portal opening

The CID portal is a Web portal to search and access remotely sensed data and derived products hosted at the JRC (currently loaded volume: 15 TB). It was presented and opened to the public in July 2008, with its relevant INSPIRE (discovery, view, and download), OGC (Open Geospatial Consortium) compliant services implemented at: <http://cidportal.jrc.ec.europa.eu/imagearchive/>. Discovery and preview is (openly) accessible to the public. Specific web services and download is limited to authorised users in accordance with Licensing Terms & Conditions. Staff of Institutions of the European Union can be granted full access to most of the archive data after registration [fig. 3].

Satellite image acquisition

The satellite image acquisition for the EU Common Agricultural Policy (CAP), Control with Remote Sensing of area-based subsidies programme 2008, was managed successfully. A sub-delegated budget of 6.5 M € from the Directorate-General Agriculture and Rural Development (DG AGRI) was used to programme approx. 300 control zones, enabling control of nearly 350.000 EU 27 farmers in 2008. This is the 6th consecutive year that the Very High Resolution sensors (Ikonos, Quickbird, Eros, Formosat, and SPOT supermode) participate successfully together with the High Resolution sensors (SPOT, IRS, Landsat, and DMC) to fulfil the programme. The total area programmed with Very High Resolution (VHR) data was a record high 170.000 km², acquired to a 94% success rate despite adverse weather conditions over Europe during spring and summer.

GENESI-DR (Ground European Network for Earth Science Interoperations - Digital Repositories)

The CID action managed to fulfill its obligations in the GENESI DR FP7 project*. The project concerns providing harmonized access to multiple, distributed European Earth Science data repositories and integrating distributed computing infrastructures for Earth Observation science users. JRC-IPSC is contributing to

* INFRASTRUCTURES-2007-1, Capacity Programme, INFRA-2007-1.2.1 Scientific Digital Repositories totalling 4.4.M € grant, lead by ESA.

the project through the CID action (main JRC partner), and the action “Information Support for Effective and Rapid External Action” (ISFEREA). The project is considered of importance for CID also to profile itself towards the main digital repositories in the EU (ESA, CNES, DLR, and KSAT etc.)

Satellite Remote Sensing Data Framework Contracts and Image data Policy

Framework Contracts (approx. 9 M €/year threshold) were signed in 2006 with 10 different Image providers, in order to obtain efficient data purchasing through the EC Services. All necessary extensions were made in 2007. CID is continuing to harmonise issues of data policy detailing image licensing conditions in these contracts, which in parallel led to a deliverable to GMES on future Image Data Policy, where the perspective of achieving an optimal use of satellite remote sensing data for a GMES user is given.

Challenges for 2009 and beyond

Demonstrate the portal efficiency at JRC-IPSC level in order to show success to other JRC users and other stakeholders. This necessarily means also the continued loading of image data of the Monitoring Agricultural Resources Unit and other relevant actions in JRC-IPSC, and move further towards outside JRC-IPSC (e.g. Thematic Programme Africa). It is planned to double the loaded volume of data from 15 to 30 TB by end 2009.

The **next version of the CID portal** will be further developed in terms of functionality, services, and architecture. This shall include enhancements such as capacity of further sensors pre-processing (semi-automated orthorectification), and investigation of new services such as OGC Web Processing Services (WPS) being set up within the GENESI DR project.

To **increase the VHR satellite image acquisition** (feasibility, planning, programming, acquisition, ordering, delivery and invoicing) for the CAP Control with Remote Sensing programme to a requested nearly 300 control zones, covering 190.000 km². To increase image acquisition services to include further actions through the JRC (clients), and in general in this domain be able to continuously scientifically benchmark new VHR and HR sensors on hand or to be launched e.g. GeoEye1, Kompsat2, Cartosat2, WorldView2, Pleiades, RapidEye, and CosmoSkyMed etc. [see explanatory box on GeoEye1].

Satellite Remote Sensing Data Framework Contracts and Image data Policy.

Framework contracts (approx. 9 M €/year threshold) were signed in 2006 with 10 different Image providers. During 2009 a new invitation to tender will be launched to cover the period 2010-2014. CID is continuing to harmonise issues of data policy within the image licensing conditions in these contracts, which has a goal not only to serve data efficiently to the EC Services, but also play an important role in giving contribution to data and service sharing to initiatives such as GMES, GEO-GEOSS etc.

CID portal

The CID Portal is a Web portal to search and access Remote Sensing data and derived products hosted at JRC. Search and preview is open to the public. Access to the image data is limited to authorised and registered users [<http://cidportal.jrc.ec.europa.eu/imagearchive/main/>]. At present some 20 Actions within the JRC deal with and/or have data archives which call for interoperability, security, and data curation. The 1st release of the CID portal was launched in July 2008. This release consists of a Front End including data access/dissemination functionality with adequate authentication and cataloguing systems allowing for selective, secure access to data in the portal through discovery, view, browse, and download; and a back end consisting of underlying IT infrastructure including data loading and data preparation routines, image and image metadata storage, running in High Availability mode. The front end adheres to rules for data harmonisation, metadata, and data specifications defined by, amongst others, INSPIRE standards.



Fig. 3: the CID portal

GLOSSARY

- CAP** Common Agricultural Policy
- COSIN** Co-evolution and Self organisation in Dynamical Networks
- DG AGRI** Directorate-General Agriculture and Rural Development
- GEO-GEOSS** Group of Earth Observation - The Global Earth Observation System of Systems
- GMES** Global Monitoring for Environment and Security
- INSPIRE** Infrastructure for Spatial Information in the European Community
- OGC** Open Geospatial Consortium
- SDI** Spatial Data Infrastructure
- VHR** Very High Resolution

ECCAIRS

CONTACT

Wietse Post
 Tel. +39 0332 789896
 e-mail: wietse.post@jrc.ec.europa.eu
 website: <http://eccairsportal.jrc.ec.europa.eu>



The new ECCAIRS logo, illustrating the new multimodal approach.

European Centre for Collection and Assessment of Multimodal Transport Safety Data (ECCAIRS)

Maintaining a safe transport system in a fast growing public transport sector is a challenge. To avoid a growing number of fatalities and to reduce the risk of environmental and economic damage the accident rate in public transport must be reduced. This requires understanding of the causes that lead to transport incidents and accidents, which often share similar patterns of events and causes amongst different transport modes.

The JRC-IPSC supports the preparation and implementation of the Commission's inter-modal transport policy by giving support in the domain of public transport safety to EU policy-makers (Directorate-General for Energy and Transport - DG TREN - of the European Commission) as well as policy-implementers (European Transport Agencies and National Competent Authorities). ECCAIRS provides these organisations with tools and services that allow them to plan, implement, monitor and evaluate EU policies, which helps to guarantee an acceptable level of safety in European wide public transport.

By the end of the 7th Framework Programme (2013) ECCAIRS will have produced a multimodal public transport safety network providing tools and services to EU policy makers, national competent authorities and the three transport agencies.

During 2008 the focus of the activity was on starting up the integration of aviation safety information at European level, on expanding the ECCAIRS horizon to include the maritime and railways transport modes and on facilitating the co-operation between the ECCAIRS stakeholders.

Major 2008 achievements

Integration of aviation safety data

The regulation (EC) No 1321/2007 requires Member States to integrate the aviation safety data they collect nationally following Directive 2003/42/EC. The JRC-IPSC implements this integration of ECCAIRS data at European level by running a Data Integration Network for ECCAIRS Repositories (DINER). This network is based on in-house developed software and uses the Internet as a transport medium. The JRC-IPSC organised two DINER courses in which 14 organisations were trained. At the end of 2008 the feasibility of the DINER network was proven since 8 Member States were automatically integrating their data into the EU database located in Ispra. During a meeting in November the remaining States, given the demonstrated functionality, agreed to join this integration process in the shortest possible time.

Expanding into other public transport domains

The success of ECCAIRS in the aviation sector generated interest from two other transport domains: maritime and railways. A joint study with the European Maritime Safety Agency in Lisbon (EMSA) resulted in a functional prototype of a maritime version of ECCAIRS, which was positively evaluated by a group of Member States. As a result, EMSA decided to implement during 2009 their European Marine Casualty Information Platform (EMCIP) on top of ECCAIRS. Following the positive co-operation with EMSA, the European Railways Agency in Valenciennes (ERA), considers ECCAIRS as a platform for implementing their future European accident and incident database. A first prototype, based on ERA's current taxonomy, was delivered at the end of the year. The multimodal

International recognition

During a meeting in Montreal at the headquarters of the International Civil Aviation Organization (ICAO) from 13 to 18 October 2008, safety experts from all over the world recommended ECCAIRS, a tool developed by JRC-IPSC for collecting, sharing and analysing aviation safety information, for operating occurrence databases in all ICAO's Member States. Implementing ECCAIRS at an international level will reinforce the Accident Reports data flow as required by Annex 13 of the Convention on International Civil Aviation and it will increase the exchange of information among the States in the interest of aviation safety.

capability of ECCAIRS is possible because of a redesign of its IT architecture. ECCAIRS is now constructed as a transport mode independent 'ECCAIRS Common Framework' on top of which specific extensions can be deployed. This approach minimizes development time for new extensions (even outside the transport domain if required), guarantees a long application continuity to end-users and offers significant savings for multimodal organisations by streamlining the IT and support requirements.

Facilitating co-operation

At the end of 2007 the ECCAIRS aviation web portal was launched and reached a total of about 180 registered initial users by December 2007. The portal is the co-operative platform by which ECCAIRS end-users all over the world exchange ideas, download software, file problem reports and change proposals. During 2008 the functionality was improved and extended with an electronic voting system for Change Proposals, a European registration system for data dissemination requests (DADIS), a developer forum and an optimised email service. As a result of these improvements the number of registered users grew to 450, about one third of which are non-European States many of which are using the ECCAIRS Reporting System. This international usage is the result of a formal adoption of ECCAIRS by the International Civil Aviation Organization (ICAO) in November 2008.

Challenges for 2009 and beyond

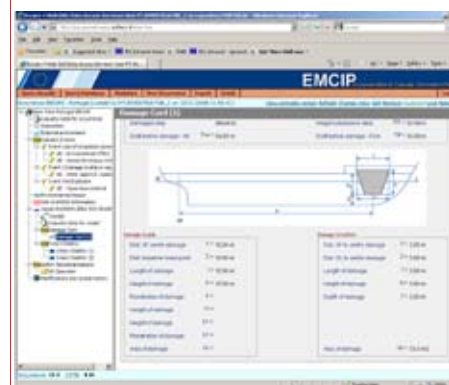
Now that ECCAIRS has become a world wide de-facto standard in aviation and is starting to be deployed in the European maritime domain, the challenge for 2009 will be to successfully complete the joint feasibility study with the European Railways Agency so that ECCAIRS will also become the standard reporting platform for the railways sector.

In addition, now that the collection mechanism and networks are getting in place, our efforts will become more and more focused on improving the quality and usage of the collected and integrated information. This work will involve a qualitative comparison of the three taxonomies being used in the different sectors, an inventory of best analysis practices in each of the transport domains, the development of analysis tools and interfaces and the development of new guiding data entry tools to improve the quality of the collected data.

While the above two areas, which will start in 2009, are key for ECCAIRS' long term success, the continued support of our customers by providing new software releases where required, by transferring our competence where needed and by supporting collaborative tools, remains the foundation for a success also in the short and middle term.

Multimodal ECCAIRS

The support for multimodal transport safety in ECCAIRS is focused on sharing the data collection, integration and analysis tools. As a result of the particular requirements of each transport sector, there are different 'extensions' to the standard ECCAIRS, which support each particular transport sector. As more and more national authorities and investigation bodies take a multimodal approach, a single tool to collect and analyse information is cost efficient and facilitates a global multimodal transport safety analysis.



ECCAIRS-EMCIP Reporting System prototype for EMSA.

GLOSSARY

DADIS European registration system for data dissemination requests

DINER Data Integration Network for ECCAIRS Repositories

EMCIP European Marine Casualty Information Platform

EMSA European Maritime Safety Agency in Lisbon

ERA European Railways Agency in Valenciennes

ICAO International Civil Aviation Organization

CONTACT

Jean-Pierre Nordvik
 Tel. +39 0332 78 5021
 e-mail: jean-pierre.nordvik@jrc.ec.europa.eu

Vulnerability Assessment in Transport Distribution Systems (VATDIS)

The VATDIS action focuses on the review and development of methods for the identification, protection and security assessment of Critical Infrastructures with respect, primarily, to the threat posed by terrorism. These methods include analysis of the threat itself, development of scenarios relating these threats to the vulnerabilities of the infrastructures, assessment of the consequences of the attacks, and development of protection measures. Methodological developments are supported by specific studies related to the threat associated with the surface transport of dangerous substances, how this type of transport can be misused in terrorist actions and the impact of these actions, and how on-board communication and spatial geo-reference equipment can support real-time traceability, alarm management and rapid emergency response.

Major 2008 achievements

Towards the identification of European Critical Infrastructures

The European Programme for Critical Infrastructure Protection, adopted by the Commission in December 2006, recognises that the security and economy of the European Union as well as the well-being of its citizens depend on certain infrastructure and the services they provide. The disruption of such infrastructure could mean the loss of lives, the loss of property and a collapse of public confidence in the EU. In 2008, the EU Council adopted a new Directive* to identify and protect these European Critical Infrastructures (ECI), which if they fail, would impact significantly on the Member States. The JRC-IPSC contributed decisively to the development of the criteria and of the guidelines that will be used by Member States (MSs) to identify these ECI – developments which were required for the Directive to be adopted. The activity consisted of analysis of measures for criticality and consequence assessment of failure of infrastructure on inter-dependent infrastructures and on society in terms of casualties, economic and public effects. It entailed intense collaboration with Member States to build unanimous technical and political consensus. Five major workshops were organized and attended by MSs experts to review the results of the JRC-IPSC and build consensus amongst MSs on these sensitive and confidential matters. The process contributed to the establishment of a common procedure for the identification and designation of ECI and of a common approach to the assessment of the needs to improve their protection. This work received a 2008 JRC Excellency Award in the EU-Policy support category.

A Gas pipeline model to support Critical European Energy Infrastructure Assessment

Building on previous work undertaken within the JRC, a methodology was developed to help identify elements of a network that may be considered to be critical. A gas pipeline network model using open-source data for the Czech Republic, Slovakia and Hungary was successfully assembled. The model consists of (a) a Geographical Information System (GIS) to provide a background capability of mapping pipelines and facilities and (b) a powerful hydraulic simulation engine of the gas flowing in the system including the capability to include system components such as compressor stations, storage fields and pipeline furniture. For all three countries the components of the trans-national transmission pipeline network and the national high-pressure network have been introduced into the model, but only generic details of items such as compressor stations and storage fields have been used. The model was demonstrated to the countries gas network operators. The model was used to illustrate a process that will assist in



Participants at one of the five workshops of European Critical Infrastructure Protection Experts which were organized by the JRC-IPSC in 2008 to develop with Member States the criteria and guidelines for the application of the Directive on the identification of European Critical Infrastructures (Kranjska Gora (SI), 17-18.09.2008, workshop jointly organized with the Slovenian Ministry of Defence).

* 2008/114/EC, 08.12.2008)

identifying the major factors in an ex-ante cross-border consequence assessment of the disruption of a potential European critical infrastructure.

European Root Certification Authority and Laboratory for Interoperability Certification

As of 1 May 2006, a new control device for road vehicles, called a digital tachograph, became mandatory on newly registered trucks. The digital tachograph is an electronic recording device used to record and store data on driving times, breaks and rest periods of drivers. The security of the digital tachograph system, and the authenticity and integrity of electronic data recorded and stored, is dependent upon a range of technical, physical and procedural measures to resist attacks. In this respect, VATDIS is managing two major services of the Digital Tachograph (DT): the European Root Certification Authority, which oversees the DT cryptographic key management infrastructure, and the Laboratory for Interoperability Certification*. On the basis of a study carried out by VATDIS on the known and theoretical threats to the overall security of the DT system, new measures aimed at detecting and preventing abuses of the DT as well as allowing the installation of adaptors on light vehicles were adopted by the Commission**. In view of the mandatory introduction by June 2010 of the DT in non-EU contracting parties to the AETR (European Agreement Concerning the Work of Crews of Vehicle Engaged in International Road Transport), the JRC-IPSC was recognized by the United Nations Economic Commission for Europe as the AETR Authority for root certification and for interoperability certification.

Challenges for 2009 and beyond

With the introduction of Directive 2008/114/EC, Member States have now two years to identify and designate their European Critical Infrastructures. The action will continue to provide its technical and scientific expertise to assist Member States in this process, in particular in the application of the criteria and of the guidelines of the Directive. A key scientific challenge will be to study the interdependencies existing between infrastructures in key societal sectors such as transport, energy and ICT, and of the consequences and cascading effects that one or many infrastructure failures can have on the other sectors.

The action will also study new operational solutions to reduce the vulnerability of the DT to illicit manipulations and to maintain the IT security of the DT to the requested legal requirement. It is expected that this work will contribute to the design of an open in-vehicle platform for the deployment of Intelligent Transport Systems (ITS) for road transport as put forward by the Commission Action Plan for the deployment of ITS in Europe Com(2008)886.

In 2009 this action will be renamed CI-Trans (Critical Infrastructures in Transport and Distribution Systems).



Illustration of the model of transmission of gas over a number of European Countries used to identify critical elements of the gas infrastructure and assess the cross-border consequences of their failures. Figures indicate input/output pressures at compressor stations and country borders. Thumbnails display the compressor stations found on Google Earth to verify the location and characteristics of GIS numerical gas model.

GLOSSARY

AETR European Agreement Concerning the Work of Crews of Vehicle Engaged in International Road Transport

DT Digital Tachograph

ECI European Critical Infrastructures

GIS Geographical Information System

ITS Intelligent Transport Systems

MSs Member States

* <http://dta.jrc.ec.europa.eu/>

** OJ L21 of 24/01.2009 Com. Directive 2009/4/EC, Com. Regulation 68/2009, and Com. Rec. 2009/60

2



Solidarity and the Responsible Management of Resources

Sustainable management of our natural resources and the environment is an ever increasing challenge for the Union. It is a key component of the sustainable development objectives included in the European Union Treaty. Knowledge and technology are essential in this context as they provide potential solutions to the difficult sustainable equation which aims at an equilibrium between economic growth and social and environmental sustainability.

The fields of agriculture and rural development present specific challenges because they are at the core of production, socioeconomic and environmental systems which need to be balanced to the satisfaction of a broad range of stakeholders in a difficult global context. The Agenda proposed by the JRC will focus on an integration of those various dimensions at Community level.

The Fisheries policy, the Marine Strategy and the emerging EU Maritime policy provide the background for the JRC agenda of work in the area of marine ecosystems and resources. The current situation in this sector presents critical sustainable development issues in terms of reconciling production objectives with depletion of resources, social aspects and environmental quality. The JRC provides technical and scientific support to this growing agenda which is likely to significantly evolve during the period covered by the programme .

2.1 Rural development, agriculture and fisheries

Geo-CAP, AGRI4CAST,
FISHREG, MASURE

Agriculture and rural development

Agriculture and rural development has been a central theme in several JRC framework programmes. Actions included in the 2007-2013 multiannual work programme will further develop the capacity to provide technical support to the implementation and control of the Common Agricultural policy (CAP), and to contribute to the development of integrated services for monitoring new requirements resulting from the CAP. In addition to the support to regulatory items (control, monitoring) the objective will be expanded to cover crop forecasts as well as medium/long term commodity market prospects. Strategic techno-economic analyses of production systems at the farming system level will also be developed. Methodological aspects related to implementation of the new EU agricultural statistical system will be studied.

Fisheries, Maritime policy and Marine environment

The context is provided by the existing fisheries policy, the Marine Strategy and the emerging Maritime Policy. The latter will propose concrete steps towards the integration of Lisbon based objectives and sustainable management of ecosystems. Currently the focus is on monitoring fishery activities and providing support to Marine Conventions and scientific committees. Links also exist with the Security Agenda in terms of monitoring illegal activities taking place at sea. As in other policy agendas the JRC will dedicate specific efforts to the provision of geospatial information tools for better taking into account the diversity of the European geographical situation.



CONTACT

Simon Kay
 Tel. +39 0332 789702
 e-mail: simon.kay@jrc.ec.europa.eu
 website: <http://mars.jrc.ec.europa.eu/mars/About-us/GeoCAP>



Example of Ortho rectified Imagery used to check and measure agricultural parcel areas.

Raw imagery does not show features in their correct locations due to displacements caused by the tilt of the sensor and terrain relief. Terrain displacement can be hundreds of meters for some instruments. Orthorectification is, therefore, a mandatory processing step to remove these distorting effects. Without orthorectification it would not be possible to make direct and accurate measurements of distances, angles, positions, and areas.

Geo-Information Management and Control Methods (GeoCAP)

The Common Agricultural Policy (CAP) is the EU's most significant policy instrument in financial terms, impacting agricultural practices, environmental and rural sustainability, and the economic livelihood of rural areas. Although the importance of 2nd Pillar payments is increasing, direct aid payments under the 1st Pillar still make up the largest single component — nearly €36 billion in 2008 — of the EU annual budget. A major CAP goal is the responsible and sustainable use of rural resources, which includes the correct management and control of these direct payments by Member States and Commission services.

The GeoCAP action addresses new information needs for European Policies related to Agriculture and Regional Development, such as Cross Compliance, Farm Advisory System, food quality and agri-product origin traceability (through the parcel identifier). In 2008, the reformed CAP underwent a “Health Check”, to assess where the 2003 legislation can be fine-tuned and to pave the way for the future design and priorities of the CAP.

The action follows up future developments in geomatics techniques, and supports land administration (cadastre) and multipurpose large scale mapping approaches; common specifications, standard measurement and data management tools. It validates methods to reinforce the consistency of land parcel identification and measurement across the Union and in Candidate Countries. Researches are undertaken towards the development of a European-wide geodatabase, and the testing and implementation of INSPIRE principles, in support of Rural Development.

Major 2008 achievements

Guidelines for Best Practice and Quality Checking of Ortho Imagery - toward a common approach

For 10 years GeoCAP's guidelines on orthimagery have served as an international reference for the remote sensing community for large scale agricultural subsidies management systems (usually using images with 0.5m-10m pixel size) and in a number of cases for large scale mapping or cadastre applications (using Very High spatial Resolution images 0.5m or better).

Ortho-rectification – transforming images into metric maps - is a necessary process to remove, from raw imagery, effects of distortion and relief displacement so that ground features are displayed in their true planimetric correct position.

A major revision of the guidelines was initiated in order to consolidate the information that was introduced during the last five years. Following the conclusions of meetings with internal and external experts, the revised document has a more process-based structure and focuses on the core and common aspects of the photogrammetric process. The new information introduced provides clearer instructions to the image data users' community on: image resolution and radiometry, digital airborne sensors, data fusion, mosaicking and data compression.

A paper on this study was presented in the summit of the International Society for Digital Earth in Potsdam (Germany) and the new document was published at the end of the year.

Introduction of Wiki-based consultation system for CAP guidance

GeoCAP provides technical and methodological support on the control of the CAP subsidies to EU Member States. This assistance covers a broad range of issues such as: implementation of on-the-spot controls; implementation of the Land Parcel Identification System (LPIS); quality control of orthoimagery or area measurement using GPS.

There was a substantial knowledge archive collected in the action and organised in different technical guidelines, recommendations, specifications and working documents, for which access needed to be optimized and presented in well-structured, “subject-oriented”, manner through a simple and user-friendly interface. To address this need, GeoCAP has implemented a process of review, reorganisation and consolidation of the available documentation using collaborative tools based on Wiki-technology.

At the beginning of 2008, the system, called WikiCAP, was made available online to authorized users (with restricted access) for review. After some further adaptation, it was officially announced and approved by the CAP Direct Payment Management Committee. Very positive feedback was given to this system which allows users to directly contribute in real time to the documentation on the control of CAP subsidies.

Guidelines for measuring the area of vineyard parcels

At the request of the Directorate-General for Agriculture and Rural Development (DG AGRI), GeoCAP was asked to elaborate guidelines to measure vineyard parcel areas in the context of the new wine legislation [Regulations (EC) No 479/2008 and 555/2008 on the common organisation of the market in wine] to ensure a common approach throughout all Member States.

Four of the support measures are paid on an area basis: the single payment scheme on the one hand, and the restructuring and conversion, green harvesting and grubbing-up measures on the other hand. In contrast with the Single Payment Scheme, the very high premiums granted for restructuring, conversion and grubbing-up measures (6000 to 12000 €/ha for restructuring and conversion and from 1400 to 15 000 €/ha for grubbing-up) justify specific control procedures.

The guidelines describe the possible methods and tools to be used for measuring the vineyard area, as defined by the regulation, whether the parcels fall in the general case or in the many possible exceptions characterizing this crop (e.g. single rows, individual plants, mixed cropping, holes, terraces). The guidelines have been presented by both DG AGRI and the JRC to the Member States in the Common Market Management Committee and formally accepted at the end of 2008.

Challenges for 2009 and beyond

2009 will be the first year of the CAP ‘health check’ reforms, and will be supported by the action through the definition, development and testing of extensive, standardized and sustainable control methods in a variety of agriculture-related areas. Research will be undertaken towards the development of a European-wide geo-database, and the testing and implementation of INSPIRE principles, in support of Rural Development. Scientifically based input to the Common Agriculture Policy and to Commission policies related to agriculture (i.e. environment, renewable energy, climate change effects of agricultural systems such as livestock production) will be given, with respect to cost-effectiveness, impact, and uptake of whole farm traceability and information management.

Welcome to WikiCAP

This site brings together the consolidated reference to be used for on the spot checks, linked to the “check” button, supporting the management and control of data collected for CAP direct payments. This means that today, most of the information you will see is derived from the existing services based in our archives offline.

Getting the information you need

Below you can find links to top-level subjects:

- On the spot checks: control methods used for the on the spot (OTS) checks may use a variety of tools:
 - CoRS: Main start page for Control with Remote Sensing - note that this is a direct link to the CoRS website
 - QGIS: QGIS is the other main tool used for OTS checks - click here to go directly to this page
 - LPIS: These pages start you on the process of creating and maintaining Land Parcel Identification System
 - Cross Compliance: Main page for the implementation, management and monitoring/control of Cross Compliance
- Other ways to get into the information presented in these pages:
- Glossary: this page should try and keep track of the most relevant technical terms and TLA's used in the system
 - Description of Terms: Description of the most common terms used
 - Multilingual Vocabulary: A multilingual vocabulary of terms used in Control with Remote Sensing

Snapshot of the main page of the WikiCAP website

WikiCAP is a Wiki-based Knowledge Management system set-up by GeoCAP to provide technical support and regulatory reference information on the control of agriculture subsidies in the EU to users such as National Administrations and Commission Directorates.



Example of specific case of vineyard – parcel on terraces.

Apart from the general case of regularly planted and homogeneous vineyard parcels, adapted measurement rules had to be defined to take into account the peculiarity of cases such as: single row, individual vine plants, inclusions and holes and terraces.

GLOSSARY

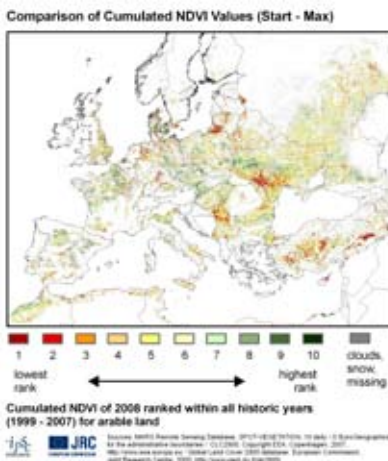
- API** Agricultural Policy Instruments
- CAP** Common Agricultural Policy
- DCM** Development of Control Methods
- DG AGRI** Directorate-General for Agriculture and Rural Development
- GeoInf** Geo-Information Management
- INSPIRE** Infrastructure for Spatial Information in the European Community
- LPIS** Land Parcel Identification System

CONTACT

Bettina Baruth
 Tel. +39 0332 786752
 e-mail: bettina.baruth@jrc.ec.europa.eu
 website: <http://mars.jrc.ec.europa.eu/mars/About-us/AGRI4CAST>



The MARS Crop monitoring Bulletin Europe is issued 6 times a year containing crop yield forecasts for the major European crops, and agro-meteorological as well as remote sensing analysis.



Crop monitoring product from the MARS Remote Sensing infrastructure with the ranked cumulated NDVI for arable land for the cropping season 2008. A high rank indicates good vegetation conditions, and low rank low biomass accumulation.

Crop Production Forecasts and Climate Change Impact (AGRI4CAST)

The action focuses on the European Commission Crop Yield Forecasting System aiming at providing accurate and timely crop yield forecasts and crop production biomass. Since 1992 AGRI4CAST has been developing and running a Crop Forecasting System at Pan-European level. This system monitors crop vegetation growth (cereal, oil seed crops, protein crops, sugar beet, potatoes, pastures, rice) and includes the short-term effects of meteorological events on crop production. The mandate is given through a regulation* stating its maintenance, operational run and analysis.

The system is made by remote sensing and meteorological observations, agro-meteorological modelling (Crop Growth Monitoring System, CGMS) and statistical analysis tools.

During the 7th Framework programme 2007-2013, the action will put a clear emphasis on the impact of climate change on agricultural systems. As a consequence, the Crop Yield Forecasting System will be adapted in order to run on climatic scenarios at different levels (from 10 days to 100 years) to improve the crop yield forecasts but also to generate climate change impact scenario on farming systems.

AGRI4CAST is the repository of techniques developed using remote sensing and area frame sampling at European level to estimate crop areas.

Major 2008 achievements

European Crop monitoring

The agricultural campaign throughout Europe was closely followed by our crop forecasts and regular weather updates provided to DG Agriculture and Rural Development (DG AGRI) and the Member States as well as being accessible to the public through the internet. The crops forecasted in the European Bulletin are wheat, barley, maize, sunflower rapeseed, sugar beet and potato. Dedicated bulletins are issued for pastures and rice. The international focus of the crop monitoring activities beyond the European Member States plays an important role and was further consolidated with the signature of Collaboration Agreements with partner institutions in Argentina, Morocco and Ukraine.

Asian Rice monitoring

For China and India quantitative rice yield forecasts at province, respectively state levels have been issued. This adds two new Crop Yield forecasting bulletins to the existing ones (MARS, European rice bulletin, MARS crop yield forecast for Europe, MARS European pasture bulletin). They are issued twice a year. Crop growth simulation, agro-meteorological analysis, yield forecasts and remote sensing analysis are all done in-house.

Crop models and components

AGRI4CAST develops and makes available software tools in cooperation with other public institutions. Emphasis is placed in the production of software components to simulate cropping systems. Software components are discrete software units which are reusable by third parties in custom developed applications. The software made available is grouped as Plant modelling, Agro-meteorology, and Other. In 2008 JRC-IPSC released a first version of the Crop Modelling Library, which is a

* EC regulation 78/2008 of 21 January 2008 on the measures to be undertaken by the Commission in 2008-2013 making use of the remote sensing applications developed within the framework of the common agricultural policy

new platform for simulating crops growth. It implements a multi-model approach for crops growth, aiming at providing the user with a set of modelling solutions to be run in parallel or individually according to the specific needs/situation.

Study on agricultural insurances

The study focused on the assessment of index tools for agricultural insurances. Index insurances basically differ from traditional agricultural insurances in that they do not refer to the actual farm losses, but to the losses evaluated from an index. This index can be, for example, some area yield or revenue, some meteorological or agro-meteorological parameter or a satellite imagery parameter. The analysis considered the coherence with the World Trade Organisation (WTO) agreements and the effectiveness to deal with the risk of substantial income reduction of farmers. The analysis covered all 27 Member States of the European Union.

Best practices for crop area estimation with Remote Sensing

General assessments have been made of existing approaches for the use of remote sensing for land cover area estimation, and in particular for agricultural statistics. The assessment activity led in 2008 to the coordination of a best practices document for crop area estimation with Remote Sensing and recommendations for policy makers by the GEO-GEOSS community of practice on Earth Observation in the framework of the workshop 'Crop Area Estimates with Remote Sensing' organised by JRC-IPSC and the the Global Earth Observation System of Systems (GEOSS).

Climate change impact on agriculture and risk assessment

The strong biophysical modelling expertise in combination with the unique meteo-infrastructure made the AGRI4CAST action an ideal partner for the Panel on Plant Health of the European Food Safety Agency (EFSA) to assess infection risks. The action work formed a substantial part of the scientific opinion on establishment risk of the Citrus Black Spot disease*.

Challenges for 2009 and beyond

AGRI4CAST will ensure the continuation of the applied activities as outlined by Council Regulation 78/2008 with pan-European crop monitoring and related crop yield forecasts. This comprises also the scientific development of new improvements related to the MARS Crop Yield Forecasting System. Simulation capacities in terms of models and components hosted and developed within the model library will be extended and a software platform will be built allowing to be plugged in models and to let them run on JRC-IPSC's databases, thus also enlarging the potential use of the information outside the MARS Crop Yield Forecasting System.

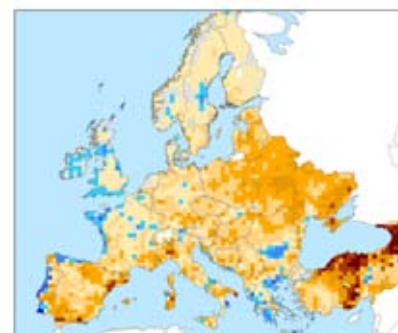
For what concerns the scientific activities on climate change impact on agriculture, agricultural production systems will be simulated under current and future weather conditions to assess the impact of weather scenarios and explore the hypothesis of adaption, in order to support the EC policy agenda on Climate Change asking for sector orientated adaptation strategies. To do so the models will be adapted to account for climate change particularities and additional components will be developed (MARS model library).

AGRI4CAST will continue scientific and technical support to the LUCAS survey project (Land Use/Land Cover Area Frame Survey) and run test pilot approaches for crop area estimates using area frame sampling and/or remote sensing information.

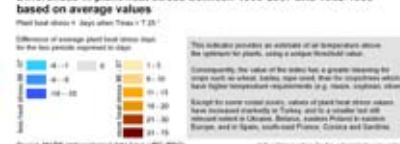
Trends in observed weather data 1996-2007 versus 1982-1993



Plant heat stress



Differences in plant heat stress between 1996-2007 and 1982-1993 based on average values



Comparison between occurred plant heat stress between 1996-2007 and 1982-1993. Except for some coastal zones values of plant heat stress have increased markedly in the last ten years. It has been calculated using ClimIndices, one of the software components developed at AGRI4CAST. ClimIndices offers routines to calculate weather indicators from multi-year series of daily weather data and is made publically available.

GLOSSARY

- CGMS** Crop Growth Monitoring System
- DG AGRI** DG Agriculture and Rural Development
- EFSA** European Food Safety Agency
- GEO** Group on Earth Observations
- GEOSS** The Global Earth Observation System of Systems
- LUCAS** Land Use/Land Cover Area Frame Survey
- NDVI** Normalised Difference Vegetation Index
- WTO** World Trade Organisation

* EFSA Journal (2008) 925, 1-108

CONTACT

Thomas Barbas and Hendrik Doerner
 Tel: +39 0332 789512 / 789343
 e-mail: thomas.barbas@ec.europa.eu
 and hendrik.doerner@jrc.ec.europa.eu
 website: <http://fish.jrc.ec.europa.eu>



Cod (Gadus morhua), one of the major commercial fish species in Europe. Cod specific genetic markers have been established for population structure analysis, origin assignment and traceability. Cod is also one of the species subject to research of the FP7 project FishPopTrace (<https://fishpoptrace.jrc.ec.europa.eu>), in which the FISHREG action is involved.

Photo courtesy of C. Martin (IFREMER, France)

Scientific and Technical Support to the Common Fisheries Policy (FISHREG)

The action FISHREG aims at providing scientific and technological support to the Directorate-General for Fisheries and Maritime Affairs (DG MARE) in the framework of the Common Fisheries Policy (CFP). Other customers include national fisheries management authorities under Community authority, Fisheries Monitoring Centres (FMCs) and Regional Fisheries Organisations (RFOs). FISHREG has organized its work under the two activity clusters “Fisheries Management” and “Fisheries Control and Enforcement”. In addition, FISHREG intends to contribute to the EU Integrated Maritime Policy (IMP), including its environmental pillar, the Marine Strategy Framework Directive.

Major 2008 achievements

Fisheries Management

FISHREG supported DG MARE in the conception of the new Data Collection Framework (DCF) e.g. by providing and arranging for scientific advice, which will be implemented in 2009, and in their work towards a seamless merging of DCR (Data Collection Regulation) data with the data collection programme of the General Fisheries Commission for the Mediterranean of the Food and Agriculture Organization of the United Nations (FAO/GFCM). Furthermore, FISHREG contributed to the collaboration between GFCM and EU by actively taking part in the discussions of the GFCM sub-group on Socio Economics issues (SCESS). Finally, FISHREG frequently supported DG MARE by providing qualitative and quantitative assessments of fleet specific parameters based on Member States’ data provisions in 2008, i.e. recent trends in catch composition including discards and fishing effort at differing levels of aggregation. There were also additional reviews undertaken of information provided directly by Member States to DG MARE.

With respect to the scientific advice process, FISHREG assured the Secretariat for the Commission’s own Scientific, Technical and Economic Committee for Fisheries (STECF). STECF managed to deliver opinions on all questions within the agreed timeframe. In 2008, FISHREG further increased its scientific input into the work of the STECF and its Working Groups (e.g. STECF Working Groups on the Mediterranean I - IV, two STECF Working Groups on the assessments of fishing effort schemes).

In 2008 FISHREG managed 6 formal calls for data in the framework of the DCR: 2 Fisheries Economics, 2 for the Mediterranean, 1 for the assessment of the fishing effort regime and 1 of Discards data. This work included mainly pre-processing of the data, use and further development of a modern web-based platform to upload Member State data, and various data analyses.

Fisheries Control and Enforcement

In 2008, FISHREG consolidated experience with its custom-developed Vessel Detection System (VDS) using satellite data (SAR radar images) and successfully applied it over a number of fisheries monitoring campaigns in collaboration with national FMCs. One successful example: in the NEAFC (North East Atlantic Fisheries Commission) Redfish fishery area, a VDS campaign was organised from May to June in close cooperation with the Icelandic Coast Guard. The main purpose of the campaign was to further explore how VDS can support aircraft surveillance in this area to detect and identify Illegal, Unregulated and Unreported (IUU) vessels and to detect illegal transshipment or supply activity.

The Council regulation (EC) No 1966/2006 of 21 December 2006 foresees operational use of satellites where cost/benefit can be proven from 1 January 2009. FISHREG analysed the costs and benefits of VDS in relation to air surveillance enforcement means, to assess the situations in which it is cost-effective to use VDS in combination with traditional means of control. As a general conclusion, it can be stated that, in all cases studied, there is an added benefit of using VDS in conjunction with air patrolling.

Under the remit of informing DG MARE about technologies with potential for monitoring, control & surveillance (MCS) and traceability in the fisheries sector, FISHREG organized an expert workshop on the potential and applicability of new technologies based on biotechnology, molecular biology, genetics, chemistry and forensics for fisheries control and traceability. Finally, FISHREG organized a joint workshop on VMS (Vessel Monitoring System) and ERS (Electronic Reporting System) Best Practices for the EU FMCs and a training course in Sampling Techniques for DG MARE Fisheries Inspectors in 2008.

Research

FISHREG staff published eight peer-reviewed papers in scientific journals and three book chapters in 2008 ranging from fisheries management to fisheries genetics. FISHREG staff was involved in the FP6 projects CEDER (Catch, effort and discard estimates in real time) and CEVIS (Cost-benefit for fisheries management) which were finalized in 2008. FISHREG did research in assessing cost-benefit for fisheries enforcement through FP6 project COBECOS. Finally, FISHREG is involved in the FP7 project FishPopTrace which started in March 2008. FishPopTrace analyses the genetic structure of fish populations and develops end-user tools for fish (product) traceability*.

Challenges for 2009 and beyond

The next reform of the CFP will aim at long term sustainability, aligning CFP with the Marine Strategy (marine environment management) and regional management, rights-based management to provide incentives to industry to act responsibly, including coastal community sustainability at the local level. This will lead to a further increase in demand for high quality scientific advice, high quality data, good bio-economic modelling capacity, socio-economic impact assessments, and more effective controls to encourage compliance (at sea, during landings, but also at the market, import and transport levels). The action FISHREG addresses many of these priorities either directly or indirectly providing its customers with tools and services that allow them to plan, implement, monitor and evaluate fisheries management and enforcement policies. FISHREG will also provide services for preparatory actions for the EU Integrated Maritime Policy (IMP), including its environmental pillar, the Marine Strategy Framework Directive.

GLOSSARY

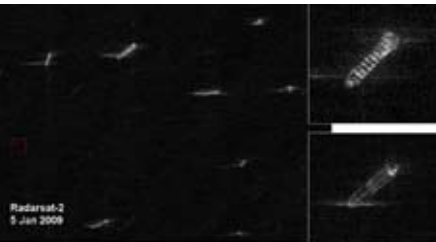
CFP	Common Fisheries Policy
DCF	Data Collection Framework
DG MARE	Directorate-General for Fisheries and Maritime Affairs
ERS	Electronic Reporting System
FAO/GFCM	Food and Agriculture Organization of the United Nations/ General Fisheries Commission for the Mediterranean
FMCs	Fisheries Monitoring Centres
IMP	Integrated Maritime Policy
IUU	Illegal, Unregulated and Unreported
MCS	monitoring, control & surveillance
NEAFC	North East Atlantic Fisheries Commission
RFOs	Regional Fisheries Organisations
SEISS	Socio Economics issues
STECF	Scientific, Technical and Economic Committee for Fisheries
VDS	Vessel Detection System
VMS	Vessel Monitoring System

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

MASURE

CONTACT

Guido Ferraro di Silvi e Castiglione
 Tel. +39 0332 789488
 e-mail: guido.ferraro@jrc.ec.europa.eu
 website: <http://masure.jrc.ec.europa.eu>



Satellite radar imagery are used by JRC to detect ships. JRC focusses its attention also on the possibility to classify the type and/or the size of the ships (images on the left side).

© RADARSAT-2 MacDonald, Dettwiler and Associates Ltd, 2009 - All Rights Reserved; RADARSAT is an official mark of the Canadian Space Agency.

Maritime Surveillance (MASURE)

The action on Maritime Surveillance (MASURE) started in 2007 and covers a number of different activities related to monitoring maritime traffic, maritime pollution, container traffic, and port security. The boundless nature of the sea requires regional, European and global approaches, not national ones. MASURE focuses its attention mainly on maritime surveillance concepts and systems with an emphasis on emerging technologies of satellite earth observation, new developments in IT (data mining), and risk assessment methodologies. MASURE aims to develop and provide the technical and scientific expertise that is essential for the policy makers to put these complex technological tools to their advantage. By nature, the action is related to all EU pillars, as maritime surveillance implies applications for many Community policies, policing, security and defence. The action fits within the objectives of the Global Monitoring for Environment and Security initiative (GMES).

The main objectives of the action are:

- To address maritime surveillance using an integrated approach, building a platform where different sources (from satellite data to local data) can be merged and compared and new surveillance technologies and concepts can be tried out, for the benefit of different European-level users.
- To further develop the Contraffic System, a facility developed at JRC-IPSC in collaboration with the European Antifraud Office (OLAF) that provides means for collection and analysis of data related to container movements, primarily for customs intelligence purposes.
- To support the Directorate General for Energy and Transport (DG TREN) in producing guidelines (minimum standards, performance specifications, best practices) for efficient application of the new port security regime*.

Major 2008 achievements

Maritime surveillance technologies

Following completion of the BORTEC report by FRONTEX, the European Agency for the Management of Operational Cooperation at the External Borders, (with a significant JRC-IPSC contribution), the European Patrols Network (EPN) project is on its way to be implemented providing operational coordination of maritime border patrols of the southern EU Member States. MASURE has continued to support this project with technological inputs on maritime surveillance, and has carried out a trial with satellite surveillance for the related Frontex-coordinated Joint Operation "Hermes". Likewise, the action has provided technical background to the preparatory phase of the EUROSUR (European Border Surveillance System) study, funded by the Directorate-General for Justice, Freedom and Security (DG JLS), which will begin in 2009 and is related to the design of national surveillance systems, communications networks and pre-frontier intelligence.

Significant support was provided to the Directorate-General for Maritime Affairs and Fisheries (DG MARE) regarding the implementation of the EU integrated maritime policy. In particular, MASURE wrote a technical document on maritime surveillance systems published under DG MARE's Maritime Policy Actions, and helped DG MARE in the preparation, evaluation and launch of a project on the use and of collection of AIS (Automatic Identification System) by satellite.

Support to maritime surveillance campaigns

In view of the important role of the Navy in maritime surveillance also for civilian applications, MASURE remained in close contact with the European Defence Agency (EDA) and their PT MARSUR (Project Team Maritime Surveillance) that aims to address prominent shortfalls in maritime surveillance capabilities of EU

* ISPS Code, Regulation 725/2004

Navies. A campaign using satellite imagery in the Baltic Sea was developed in collaboration with the Finnish Navy.

In addition, the global dimension of surveillance was addressed by campaigns outside EU waters: one in the Exclusive Economic Zones of the countries in the western Indian Ocean, concentrating on Mauritius and related to fisheries; one in the Caribbean related to narcotics; and a small one in the South Atlantic Ocean related to marine life.

Monitoring containers traffic

For what concerns container traffic monitoring and risk analysis, MASURE significantly raised the level of the data quality in its repositories through the successful application of a common codification for container transport events and port locations across different carriers. This made feasible the prototyping of new applications for EU customs, related to the analysis of past container movements. Moreover, a new portal of the system was developed and enriched with new applications for identifying the origin of a container, providing up to date statistical analysis per carrier and estimating time statistical figures per carrier for a given set of ports. In addition, the action opened new avenues for developing the ConTraffic system through the establishment of a Memorandum of Understanding with the government of Singapore aiming at the security of the Port of Singapore. Finally, in collaboration with OLAF, the action explored the feasibility of introducing governmental data sources for ConTraffic, specifically related to cross-border container traffic along the entire Eastern European border. A new system has been developed for this purpose allowing the customs to upload cross-border data to Contraffic data warehouse. A new Contraffic module has been developed for integrating the data into the existing database for further analysis. Further development has been planned for 2009 that includes, among others, the development of a notification mechanism that will inform the customs for abnormal event

Challenges for 2009 and beyond

In its new integrated maritime policy for the EU, the Commission is advocating further integration of maritime surveillance systems among its priorities. The JRC-IPSC aspires to continue to support that goal by active involvement in the assessment and piloting of surveillance systems at a supra-national level, such as satellite-based systems, and by research and development in interoperability and data fusion. It will do so in the cooperative setting of several projects under the Framework Programme for Research and in close contact with relevant EU Directorates-General and Agencies.

In 2009, the MASURE Action will be split in 2 different actions: VESPO (Vessel Surveillance and PORT Security) and CONTRAFFIC (Monitoring CONTAINER TRAFFIC).



The new CONTRAFFIC portal.

GLOSSARY

- AIS** Automatic Identification System used by ships and vessels
- EPN** European Patrols Network
- EUROSUR** European Border Surveillance System
- FRONTEX** European Agency for the Management of Operational Cooperation at the External Borders
- GMES** Global Monitoring for Environment and Security initiative
- DG JLS** Directorate-General for Justice, Freedom and Security
- DG MARE** Directorate-General for Maritime Affairs and Fisheries
- DG TREN** Directorate General for Energy and Transport
- EDA** European Defence Agency
- OLAF** European Anti-fraud Office
- PT MARSUR** Project Team Maritime Surveillance
- SAR** Synthetic Aperture Radar

3

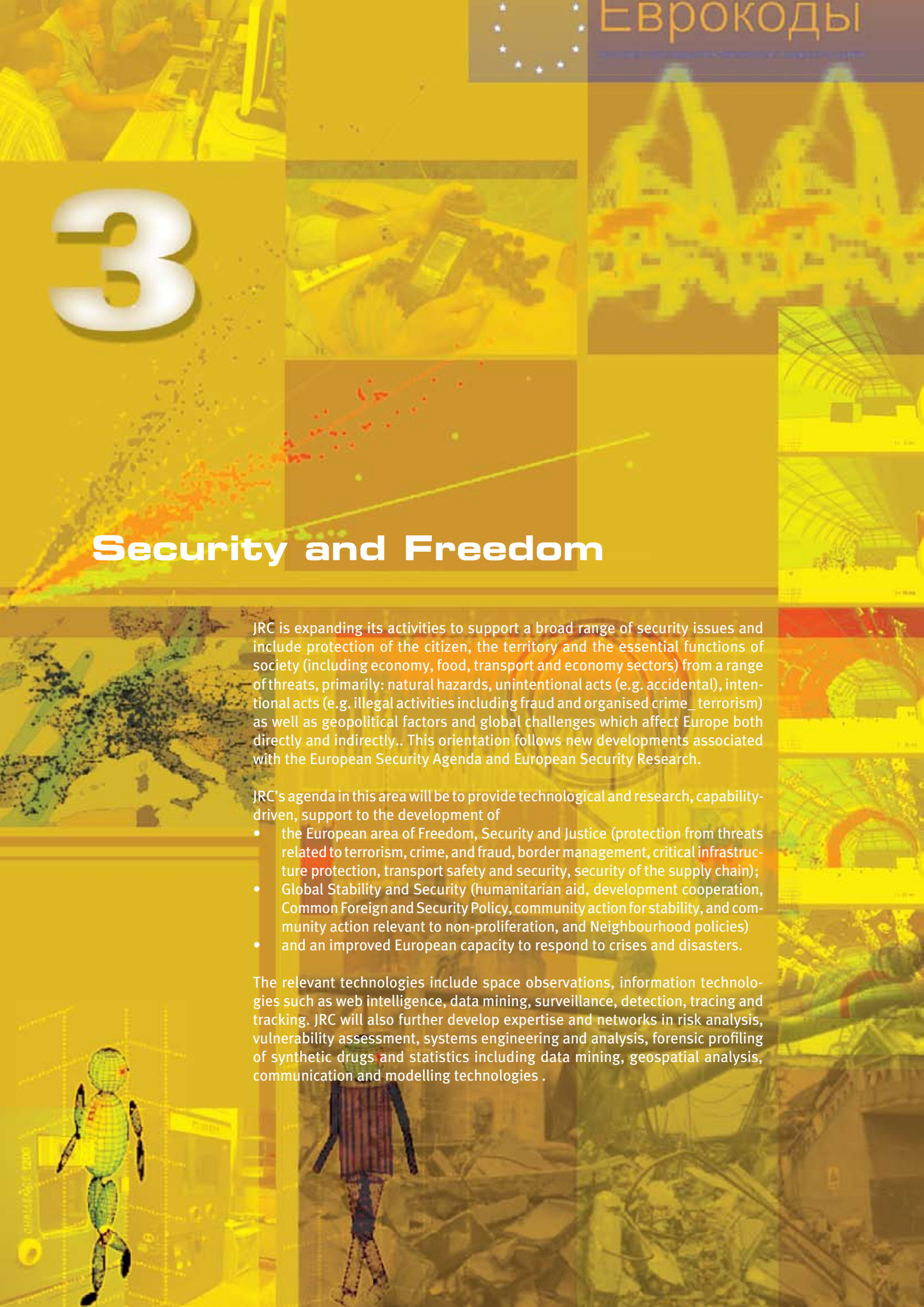
Security and Freedom

JRC is expanding its activities to support a broad range of security issues and include protection of the citizen, the territory and the essential functions of society (including economy, food, transport and economy sectors) from a range of threats, primarily: natural hazards, unintentional acts (e.g. accidental), intentional acts (e.g. illegal activities including fraud and organised crime_terrorism) as well as geopolitical factors and global challenges which affect Europe both directly and indirectly.. This orientation follows new developments associated with the European Security Agenda and European Security Research.

JRC's agenda in this area will be to provide technological and research, capability-driven, support to the development of

- the European area of Freedom, Security and Justice (protection from threats related to terrorism, crime, and fraud, border management, critical infrastructure protection, transport safety and security, security of the supply chain);
- Global Stability and Security (humanitarian aid, development cooperation, Common Foreign and Security Policy, community action for stability, and community action relevant to non-proliferation, and Neighbourhood policies)
- and an improved European capacity to respond to crises and disasters.

The relevant technologies include space observations, information technologies such as web intelligence, data mining, surveillance, detection, tracing and tracking. JRC will also further develop expertise and networks in risk analysis, vulnerability assessment, systems engineering and analysis, forensic profiling of synthetic drugs and statistics including data mining, geospatial analysis, communication and modelling technologies .



3.1 Internal Security

The focus of this part of the JRC agenda is to develop and apply information technologies and system analysis approaches to the fight against fraud, organised crime including money laundering, and illicit trafficking. Attention will be devoted to technological and methodological developments as well as analysis studies in support to the protection of critical infrastructure in key sectors at the European level (e.g. information systems, financial systems, industrial plants, public buildings, key sites and monuments, transport and distribution systems and infrastructures such as electricity and gas/oil), to the security of the supply chain, to integrated border management (including migration), to transport safety and security, as well as to the establishment of counterterrorism measures. The agenda will address prevention, preparedness and risk management in several actions where relevant. Provision of support to the EU Crisis room structure (ARGUS) is also foreseen.

BORSEC, ARTTS, ITeST,
PVACS, EMM, SCNI, SITAFS

3.2 Disasters and Response

Actions will be dedicated to the development of better capacity to prevent, forecast and deal with natural and technological disasters. The portfolio includes systems dedicated to early warning, alert, monitoring and damage assessment. Modelling is given specific attention with respect to the occurrence of natural events such as floods and drought, for example in support of the Flood Action Programme. The reporting on and drawing lessons from natural and technological disasters will be maintained as key feature of progress in this area. The Action items are geared towards the provision of direct support to the Community civil protection mechanisms and to interventions by the Solidarity Fund. They are also linked to the development of services of the Global Monitoring for the Environment and Security (GMES) initiative.

MAHB, SAFECONSTRUCTION

3.3 Food and Feed Safety and Quality

This agenda focuses on the scientific and technical support to the development, implementation and monitoring of EU policies and legislation on food and feed safety and quality. Of particular importance is Regulation (EC) No 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. It identifies risk analysis as a fundamental component of food safety policy, establishes that the food chain as a whole must be taken into consideration and that products must be traceable at all stages of the food chain.

MonCoTraf

A major part of the work of the JRC in this area will be carried out in support to Regulation (EC) No 882/2004 on official controls performed to ensure the verification of compliance with food and feed law, animal health and animal welfare rules. This regulation integrates controls at all stages of production and emphasises the importance of reference materials and the quality of analytical results. Actions of the JRC will be in line with the Fork to Farm concept which takes into account consumers' demands and their feedback right along the food chain.

BORSEC

CONTACT

Jan Loeschner
 Tel: +39 0332 785242
 e-mail: jan.loeschner@jrc.ec.europa.eu
 website: <http://serac.jrc.ec.europa.eu/borsec>



Passport reader conformity test carried out the first time in Ispra.



Conformity tests carried out by the BORSEC action during the epassport EAC Conformity & Interoperability tests in Prague, on 7-12 September 2008.

Border Security (BORSEC)

Border security plays a key role in the context of the strategy towards a more coherent and efficient security policy across the EU. It is a key part of the central security strategy. In common with other crucial European coordination actions it is of considerable complexity at legal, technical and organisational levels.

The BORSEC action supported crucial European endeavours by technical advice and support, as well as by conceptual studies to explore new approaches to integrated border management and related issues. For selected areas of high strategic impact, such as biometric testing and electronic identification, BORSEC cooperates with other stakeholders to close existing technological gaps.

European projects related to Border Security are:

- The implementation of the EU regulation on electronic passports* based on which the “Article 6 Committee” has elaborated the detailed technical specifications** to which all Member States implementations have to be compliant. A further subcommittee called the Brussels Interoperability Group (BIG) addresses the interoperability problems of those implementations.
- The introduction of biometric identifiers in the new electronic passports and residence permits.
- The development of a coherent European Border Management strategy for which purpose the FRONTEX agency has been set up.

The action addressed concerns of the European citizens with respect to the increased complexity of the digital world to which border security technology adds an important new dimension.

Major 2008 achievements

Achievements towards interoperability of electronic passports with fingerprints

In support to the BIG, the action organised 3 meetings and co-organised 2 passport test events to foster interoperability of electronic passports of the EU Member States. The BIG acts as the focal point for resolving all technical issues that arise from the development, implementation and application of the electronic passports, including a Certificate Policy for control of access to the information stored in an e-passport.

The action carried out the 6th Extended Access Control (EAC) interoperability test workshop on the 26th and 27th of June 2008 in Ispra. The aim of the test was to evaluate the interoperability of implementations based on the EAC version 1.11. Tests executed were:

- conformity tests of ePassport chips;
- conformity tests of passport readers;
- conformity tests of inspection systems;
- and the crossover test of passports and inspection systems.

The action co-organised an ePassports EAC Conformity & Interoperability Tests in Prague, September 7th-12th 2008. This event welcomed more than 500 delegates from all over the world (more than 35 countries) and was attended by European and world specialists in the field, suppliers and state organisations representatives responsible for e-passports issuing, technical infrastructure implementation and preparation of electronic passports border control.

* Council Regulation (EC) No 2252/2004
 ** C(2005) 409 final

Tests were divided into 3 parts: Conformity test, Crossover test and EAC PKI test. More than 1400 ePassports have been tested and 35 world specialists have spoken at the conference about electronic travel documents, including the fields of security, data protection, cryptography and interoperability. Furthermore, the event included an exhibition of technical equipment and services and meetings of the European Commission scientific committees*.

AAAS Session on Border Security – What is at stake?

The session organised and moderated by BORSEC at the meeting of the American Association for the Advancement of Science (AAAS) addressed how science and technology can be leveraged to find a solution to current threats of democratic societies without producing invincible threats to social values. In doing so, the symposium helped to spell out not only state of the art but also a vision for the future: the grand challenges for biometrics in border security, privacy and identity management.

The talks in the session compared and contrasted European approaches on the use of biometrics in border control with respect to those adopted in the USA. Their effectiveness on security and privacy were debated and it seems that neither approach is uniquely better than the other.

Challenges for 2009 and beyond

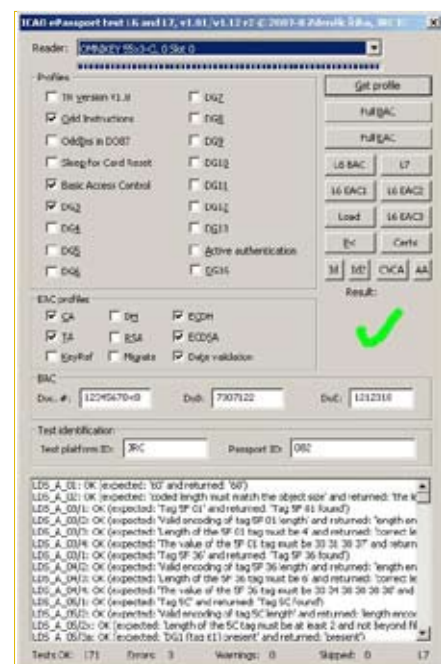
Verification of the identity of persons (e.g. at the border as part of the border crossing procedure) is only one particular element in a more comprehensive control process, and currently it is exclusively static and uses only a reduced set of the possible technologies. Application areas requiring identification, verification and authentication are expanding from persons to processes and infrastructures, including hardware and components, and addressing additional objectives for verification and authentication, moving from static environments to flexible and mobile ones.

To respond to these trends, the action will refocus intensifying work on electronic identification in the context of borders and access control. The JRC is the unique research institution in Europe that could provide unbiased advice in the proper usage of these new technologies, with due consideration of their ethical implications, thus contributing in a responsible way to improve the security for citizen, public administration and society.

The main focus will be the preparation of the technical contributions ensuring security for future applications in electronic identification with respect to verification and authentication of persons, processes and hardware (e.g. sensors), applicable in static and flexible (mobile) environments including critical infrastructures. This will provide substantial contributions and valuable input for political decisions, as guidance / support for policy makers, industry and public administrations, to improve existing applications and installations, and will become a central, important building block for upcoming solutions.

The main interest is in cross-border and European-wide challenges. Accordingly, the action will initiate European-wide networks of competence, motivating and inviting partners from research, industry and user communities to participate.

In 2009 this action will be renamed PRIMA (Passport, Identity Management and Access Control).



Screen shot of JRC Test Tool *itest* after successful testing of an electronic passport according to the *Rf Protocol And Application Test Standard For E-Passport - Part 3: Tests for Application Protocol and Logical Data Structure, Version: 1.01 (Feb 20, 2007)* and the “*Advanced Security Mechanisms for Machine Readable Travel Documents – Extended Access Control (EAC): Tests For Security Implementation*”. Version 1.12 of October 3, 2008

GLOSSARY

- AAAS** American Association for the Advancement of Science
- EAC** Extended Access Control
- BIG** Brussels Interoperability Group
- FRONTEX** European Agency for the Management of Operational Cooperation at the External Borders
- PKI** Public Key Infrastructure
- STABORSEC** Standardisation for Border Security project

* See: <http://www.e-passports2008.org/>

ARTTS

CONTACT

Franco Oliveri
 Tel. +39 0332 789320
 e-mail: franco.oliveri@jrc.ec.europa.eu
 website: <http://serac.jrc.ec.europa.eu>

Advanced Radar and Telecommunication Techniques for Security (ARTTS)

The action ARTTS builds on a solid and well recognised scientific background in Radio Frequency and Microwave measurements to provide independent expertise in radar and wireless communication technologies. The focus is to respond to new security threats and improve the management of security events, providing solutions usable in the short term.

Particular emphasis is given to the investigation of emerging technologies and their technology performance and feasibility assessment against real and rapidly changing scenarios defined through a constant relationship with end users and a systematic collection and analysis of their needs.

Key element of the action's activities is the operation of relevant and unique experimental facilities, which enables the design and execution of reference test and evaluation to support the policy making process, standardising bodies, regulators, industrial partners as well as the scientific community. Such experimental facilities also allow an effective and reliable validation of the demonstrators designed to verify the theoretical conclusions of the studies of the action.

In this context, the Radio Spectrum Policy area has a particular relevance and the action plays an important role in the experimental assessment of electromagnetic interference and on the impact of new wireless communications technologies and services.

Major 2008 achievements

Studies and experimental activities on landslides and avalanches

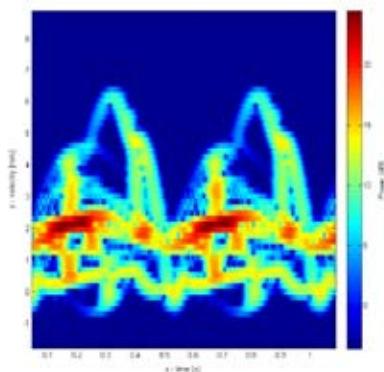
During 2008, JRC-IPSC was responsible for the provision of displacement maps of the Stromboli volcano (Italy) with the LISA (Linear Synthetic Aperture high-resolution radar) equipment. The LISA instrument is the core sensor of the monitoring network on the volcano since the beginning of 2003. Displacement maps of the area with sub-millimetre accuracy are delivered in real time to the Italian Civil Protection Department in Rome, updated every 10 min.

Furthermore, the LISA equipment was deployed in the Ski resort of Alagna (Italy) where a measurement campaign was carried out to assess whether this type of equipment could be used to provide early warning on snow avalanche. These studies produced a number of high profile publications in the IEEE Transactions on Geoscience and Remote Sensing and a doctoral thesis.

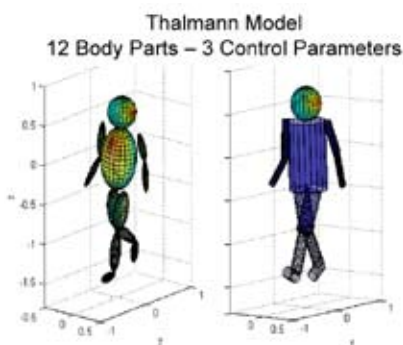
Support to the standardisation activities on Reconfigurable Radio Systems (RRS) for Public Safety with European Telecommunications Standards Institute (ETSI)

During emergency crises or during their routine activities, public safety organisations use wireless communications to coordinate their actions and to be effective in performing their tasks. Wireless communication is therefore a key factor for the successful execution of any organised operation.

In 2008, the JRC-IPSC worked on an emerging wireless communication paradigm called Reconfigurable Radio Systems (RRS). RRS can remove the interoperability barriers by improving the communication capability for Public Safety organizations.



Human walking spectrogram



Human walking model

The ARTTS action, together with the support of a number of ETSI members, promoted the creation of a Public Safety working group in the Technical Committee (TC) for Reconfigurable Radio Systems (RRS).

ARTTS developed prototypes which were validated against conventional public safety communications radio terminals. The research results were published in proceedings of international conferences.

Collaboration with FRONTEX on Secure Border Communications (SeBoCom)

Border Security Forces of European countries face wireless communications interoperability and security problems: upon a mandate from FRONTEX - European Agency for the Management of Operational Cooperation at the External Borders - the action organised a Workshop on Secure Border Communications for Border Security Forces in Ispra and produced and published a report integrating the results of the workshop with internal studies and with the data collected from the participants at the FRONTEX Joint Operations.

Fostering international collaboration and supporting the standardisation activities on Ultra Wide Band communications

In the context of the research on wireless interference and spectrum policy, JRC-IPSC organised in Ispra the WALTER workshop, to support the introduction, evaluation and testing of Ultra Wide Band (UWB) technology in Europe, with attendees from Europe, USA and China.

The workshop had a number of important outcomes including:

- Strengthening the cooperation between ETSI and WiMedia for UWB standardisation.
- Reinforcing the collaboration between the National Telecommunications and Information Administration (NTIA), the National Institute of Standards and Technology (NIST) and JRC-IPSC for UWB measurements and testing.

The results of the workshop were included in the ETSI draft technical report "TR 102 763".

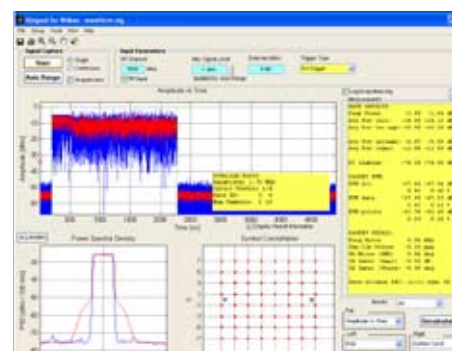
Challenges for 2009 and beyond

The action will continue strengthening its core competencies and capabilities in the field of radar and radio-communications test and validation.

The action will work on the following main areas:

- **UltraWideBand:** the JRC-IPSC will conduct the measurement campaigns to evaluate the introduction of the UWB Detect And Avoid (DAA) mitigation technique to support the regulatory and standardisation process. In this area the action will also carry out an exploratory project on Body Area Network with the aim of providing key health information to first responders working under severe stress.
- **MIMO (Multi Input Multi Output) Antennas:** ARTTS will design and implement a MIMO based Imaging Radar and will assess its performance in view of its possible use in surveillance applications.
- **Human Walking Computer Models:** to support the activity of first responders in a hostile environment, the action will further develop the studies on "through the wall people monitoring", focusing on Human Walking Computer Models.
- **Radio Frequency Threats:** our society heavily relies on radio communication that are prone to a number of threats; the action will investigate the present and future threats to the communications infrastructure, will assess the risks and the possible countermeasures and will provide a number of reports to the Directorate-General for Justice, Freedom and Security (DG JLS).

In 2009 the action ARTTS will be renamed CORSA (Radar sensors network for Security Applications), reflecting the refocusing of the action on more application-oriented activities in the field of security.



wimax-UWB-interference

GLOSSARY

- DAA** Detect and Avoid
- DG JLS** Directorate-General for Justice, Freedom and Security
- ETSI** European Telecommunications Standards Institute
- LISA** Linear Synthetic Aperture high-resolution radar
- FRONTEX** European Agency for the Management of Operational Cooperation at the External Borders
- MIMO** Multi Input Multi Output
- NIST** the National Institute of Standards and Technology
- NTIA** National Telecommunications and Information Administration
- RRS** Reconfigurable Radio Systems
- UWB** UltraWideBand
- WALTER** Wireless Alliances for Testing Experiment and Research

CONTACT

Marco Sironi
 Tel. +39 0332 785754
 e-mail: marco.sironi@jrc.ec.europa.eu
 website: <http://silab.jrc.it>



Active RFID seal (patent pending).



Passive RFID seals fabricated for the Smart and Secure Trade Lanes (SSTL) pilot project.



Reader for RFID passive seals

Integration and Testing of Supply Chain Security Technologies (ITeST)

ITest is focused on the development and validation, with respect to interoperability, performance and conformance to standards, of methodologies and equipment for the security of the supply chain.

Employing stable and mature wireless technologies (such as Radio Frequency Identification - RFID, GSM, GPS), ITest adds intelligence to security devices, yielding more self-sufficient and feature-rich products.

This addition of intelligence enables the design of a more general and comprehensive approach to supply chain security, and serves as a basis for producing general guidelines and best practice rules in supply chain management.

ITest is, on the one side, policy support oriented towards new legislations and standards and on the other side it is developing different applications integrating intelligent seals (based on active and passive transponder technology) and other sensors in order to implement a fully intelligent system able to monitor and track over the internet or GSM network the status and the position of containers, but also of objects and people.

Major 2008 achievements

Container Security and Standards

ITest supported the cooperation between the European Commission (Directorate-General for Taxation and Customs Union - DG TAXUD) and the Customs Authorities of China, the Netherlands and the United Kingdom by supplying know-how and technologies in the framework of the Smart and Secure Trade Lanes (SSTL) pilot project. The JRC-IPSC organised a workshop in Ispra in May 2008, where potential sealing solutions were presented by industrial companies. An agreement was reached for the use of the electronic sealing systems based on active and passive Radio Frequency Identification (RFID) technology developed by the JRC-IPSC in the pilot project.

A delegation of customs operators was trained on the use of JRC-IPSC sealing technology during a seminar hosted in Ispra in September 2008.

On request of DG TAXUD, ITest participated in the Customs Seals Working Group (CSWG) for the definition of interoperability standards in cargo security devices. Comments made by JRC-IPSC on the draft ISO 17712 "Freight containers – mechanical seals", mainly related to tampering issues triggered a lot of positive reactions. It is foreseen to create a reference test and vulnerability assessment laboratory in Ispra to run physical and tamper evidence tests on mechanical seals.

An experimental test bed to control the loading of containers is under preparation at the Sealing and Identification Laboratory (SILab). Several tests will be carried out to demonstrate the possibility of loading goods assuring their traceability and avoiding mistakes. The final aim is to demonstrate that a better control of goods will dramatically increase security, will decrease the possibility of mistakes and will also result in lower costs in terms of logistics and personnel.

Innovative technologies for assisting disabled people

SESAMONET (Secure and Safe Mobility Network) is a guidance system for visually impaired people. It relies on a path of RFID transponders embedded in the

pavement, read by a special RFID-enabled walking cane. The transponder data collected are processed to give localisation and environmental information directly to the user's mobile phone.

SESAMONET in 2008 has evolved from being a stand-alone proof of principle to a modular guidance system ready to be integrated in wider social inclusion projects. It now has the interfaces to exchange data with existing infrastructures such as smart public transportation systems, wireless on-demand services, domotic technologies, etc. In addition, by mapping the RFID transponders which form the electronic path, the system can provide the geographical positioning of the visually impaired user and send, in case of danger, a help request message using the GSM network. The message is sent to both pre-authorised people and a central server, which processes the information and localises the user.

The system was presented at the inter-ministerial e-Inclusion conference held in Vienna in November 2008. A trial path was set up inside the conference area. The indoor guidance capabilities of the system and the other relevant features were fully demonstrated to the participants.

ITest received various expressions of interest in the system and in the possibility of adopting it in the European Union in order to improve independence and quality of life of visually impaired people.

ITest won the JRC innovation project competition and received special funding to prepare SESAMONET for industrialisation. SESAMONET was also awarded the first prize at the LIUC University in Castellanza (Italy), in April 2008 during the conference "La convergenza Università-Impresa sui sistemi RFID".

Challenges for 2009 and beyond

The work carried out in 2008 in conjunction with DG TAXUD, the Customs agencies of China, the United Kingdom and the Netherlands and the contributions to the Customs Seals Working Group will be finalised and will yield a common ground to support the drafting of an international standard for supply chain security. The development of a European reference test laboratory for vulnerability and physical test on seals is a huge challenge.

Our goal is to contribute to the discussion bringing EU-based expertise and technology, thus giving technical support to policy makers.

The future orientation of the Container Security and Standards project will be defined involving all the stakeholders (DG TAXUD, Italian Customs Agency). By the end of 2009 we expect to have the test trial fully operational and ready to carry out tests as indicated by the users.

The implementation through outsourcing of a number of pilot projects in different conditions is the main future goal of the SESAMONET project. The aim is to develop a significant model able to integrate different solutions for the assistance to visual disabilities. In this context, the integration with satellite based navigation systems and communication infrastructures to enable on-demand, context-sensitive data download services, represents a fundamental objective.

In 2009 this action will be renamed CI- Supply Chain (Tracing Technologies in the Supply Chain).



Experimental test bed to control the loading of containers



Smart and Secure Trade Lanes (SSTL) pilot project

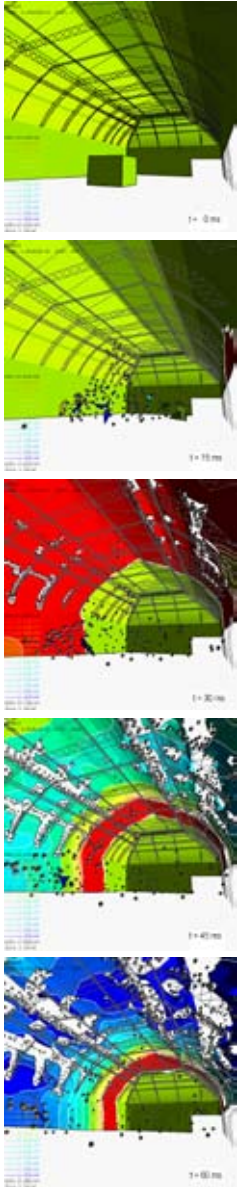
GLOSSARY

- CSWG** Customs Seals Working Group
- DG TAXUD** Directorate-General for Taxation and Customs Union
- GPS** Global Positioning System
- GSM** Global System for Mobile Communications
- RFID** Radio Frequency Identification
- SESAMONET** Secure and Safe Mobility Network
- SILab** Sealing and Identification Laboratory at JRC-IPSC in Ispra
- SSTL** Smart and Secure Trade Lanes

PVACS

CONTACT

George Solomos
 tel. +39 0332 789916
 e-mail: george.solomos@jrc.ec.europa.eu
 website: <http://elsa.jrc.ec.europa.eu>



Numerical simulation results of the response of a typical train station structure to a bomb explosion taking place near a booth. The disintegration of the booth, the blast wave evolution for 60 ms and the damage (fragmentation) of the glass tiles of the truss-roof are observed.

Physical Vulnerability Assessment of Critical Structures (PVACS)

PVACS deals with the risk mitigation of structures under intentional attacks or accidents involving explosions and other extreme abnormal loads. Vulnerability assessment methodologies are developed in order to quantify the effects of such loads to critical structures and to their occupants. The rationale is that if adequate provisions have been taken in the design, it is possible that catastrophic consequences will be contained and major disasters avoided. The approach followed for the individual structures is based on computational structural mechanics and is aided by laboratory experiments. Such basic information is a prerequisite for the next-level analysis, which entails a comprehensive vulnerability assessment of larger building complexes and transport and energy infrastructures of networked systems.

Major 2008 achievements

Vulnerability of rail stations and rolling stock

Rail transport has a distinctly open-architecture and widely-dispersed assets, which make it vulnerable to terrorist attacks. The events in Madrid and London have put considerable pressure to enhance security in this important public transport area, and increased station space surveillance and technologies for the detection of explosives have been introduced. However, apart from these prevention measures, it is worth investigating into techniques of passive physical protection and mitigation of the effects of the explosions through proper architectural and structural design.

These are the aspects examined in the project RAILPROTECT “Innovative Technologies for Safer and More Secure Land Mass Transport Infrastructures under Terrorist Attacks”. The project started in support of the transport security policies of the Directorate-General for Energy and Transport (DG TREN) and concerns both station infrastructures and rolling stocks. The results are expected to contribute to alleviating the vulnerability of Europe’s passenger land transport infrastructures, and to provide assurances to the European public that the level of security and safety in the land mass transport has been upgraded (as done rigorously for air and maritime transport).

Bringing together and interacting with the major European rail transport stakeholders and end-users have been considered a prerequisite of this activity, and the project has been developed along their perceived needs. Two workshops and several meetings were organised for this purpose.

Considerable effort was dedicated in 2008 into adapting and developing the numerical simulation techniques and applying them for the assessment of the structural vulnerability of specific construction types encountered in the rail transport. This work was carried out within the structural analysis code EUROPLEXUS. As agreed with the collaborating partners, a station in Paris was selected for case studies and two areas of this station and a subway coach have been successfully mapped using the 3D laser scanning technique “JRC-RECONSTRUCTOR”. These geometric data were further elaborated and became the required geometrical models for the structural calculations.

Several scenarios were run with regard to (a) the quantity of explosive charge, (b) its position and (c) the details and refinement of the geometrical model.

Problems inherent to simulating explosion effects in closed spaces were systematically tackled. The complex pressure wave propagation patterns, due to multiple reflections, shadowing and tunnelling effects, were efficiently and reliably obtained in each case. The efficiency of Europlexus to simulate the process of the detonation of a solid TNT explosive was tested. For reducing the computational effort and costs, other approaches, like the compressed air-bubble and the load-time function models, were also explored and implemented.

Areas of high risk for the occupants, with respect to injuries potentially induced to humans due to blast wave effects and flying debris, were identified for several explosion scenarios. In this context, models for the debris generation and projection, based on element erosion techniques, were also been and implemented in the code. Particular attention was attached to the modelling of the fragmentation (shards) of glass. Human risk contour-maps are also produced concerning eardrum rupture and death due to skull fracture, whole body impact or lung damage by employing appropriate probit functions and following the determination of the wave overpressure and impulse at a point.

Physical vulnerability in energy networked systems

Mathematical methods were developed for the vulnerability analysis of networked critical infrastructures, whose nodes represent physical structures subject to threat and damage. This type of work has been particularly advanced within the EU project MANMADE “Diagnosing vulnerability, emergent phenomena, and volatility in man-made networks”.

An interesting application of these techniques has been realized in the technical support provided (in the CriTech action) to the scenario-building exercise for the third EU Emergency and Crisis Coordination Arrangements Exercise (CCAEXo8), successfully conducted in Brussels on 23/09/2008. In the accompanying technical report a comprehensive analysis was carried out on the potential effects on the EU High-Voltage grid system due to twin storms traversing Europe from the South West to the Scandinavian Peninsula. The evaluation of the potential repercussions was done by studying how certain topological features, indicative of the grid vulnerability, are changed by the physical damage and elimination of specific substations and transmission lines. Such serious emergencies or crises, simultaneously affecting several Member States, could require an exceptional response at EU level. The CCA exactly provides Member States’ Permanent Representatives in Brussels with a platform for exchanging information and coordinating actions. Clearly this type of exercises relies heavily on credible and well-documented scenarios.

Challenges for 2009 and beyond

For the years ahead PVACS will try to extend its expertise on physical vulnerability assessment by entering into the problem of progressive structural collapse and by contributing to the relevant standardisation needs. The completion of the upgrading of the Large Hopkinson Bar facility and the availability of other innovative dynamic testing apparatuses will be essential.



Overview of the twin storms path and the EU electricity network for the scenario building exercise.

GLOSSARY

CCAEXo8 Emergency and Crisis Coordination Arrangements Exercise

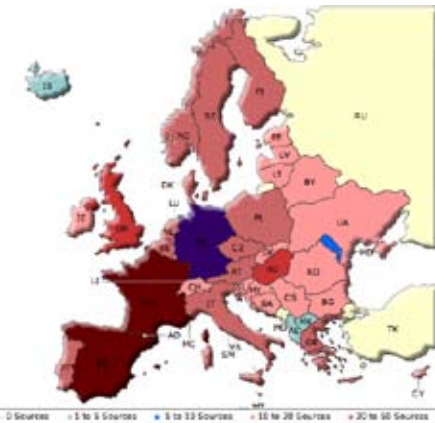
DG TREN Directorate-General for Energy and Transport

TNT Trinitrotoluene

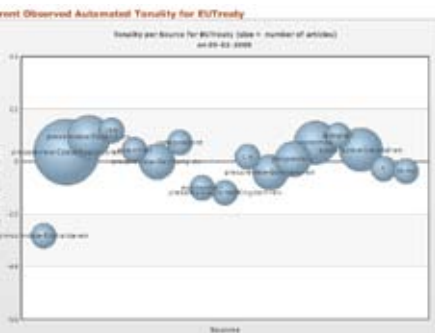
EMM

CONTACT

Erik van der Goot
 Tel. +39 0332 78 5900
 e-mail: erik.van-der-goot@jrc.ec.europa.eu
 website: <http://emm.jrc.it/overview.html>



Number of media sources monitored per Country.



Automatically derived Tonality / Sentiment ('positive' vs. 'negative') of media reporting on the EU Treaty for various sources

EMM NewsBrief Facts 2008

- 24/7 coverage of 2.200 news web sites world wide
- 80.000 new articles/day
- 25.000 distinct visitors/day on press.jrc.it
- 1.500.000 hits/day on press.jrc.it
- 12.000 e-mails sent/day to subscribers on-line since July 2002

Web Mining and Intelligence (EMM)

The main objective of this action is to provide scientific support to EU policies concerned with crisis management, counter-terrorism, organised crime and media monitoring. The action addresses this objective by means of the application of computer science and computational linguistics, specifically in the domain of Internet technologies, and information extraction and analysis in a multilingual environment, to massive data sets, including open source.

This is achieved through the development and maintenance of a number of systems and services, operated either by the action or at client sites. Information is gathered in real time and transformed using a range of techniques like classification, text mining, automated machine learning and statistical analysis that form the scientific backbone of this action. Integrating such techniques allows the automated extraction of information from text data, such as what is the text about, who is mentioned in the text, where in the world it is occurring and to a certain extent what is being done.

Major 2008 achievements

Multilingual Media Monitoring

In 2008 the European Media Monitor (EMM) was enhanced significantly to better deal with ideograph based languages like Chinese and Japanese and with other types of languages, specifically Arabic, and by extension Farsi. Special techniques were developed and software implemented to deal with various properties of these languages. Many more Chinese sources and category definitions were added. Chinese and Arabic were added to the language selection list and a complete Arabic user interface was created, correctly handling the right to left display issues. Many categories were enhanced with Arabic keywords. A license was obtained for Arabic and Chinese Statistical Machine Translation software which was integrated in the information processing chain. As a result, English translation of the title and description of both Chinese and Arabic articles are now available.

Near Real Time Violent Event and Disaster Detection

The system that detects in near real time violent events and disasters was extended to cover more event types and in more languages. A notable effort was put into language independent morphology definition for Roman languages. Following a number of requests, the system has now been extended to cover humanitarian disasters, judicial trials and socio economic events such as strikes. The languages supported by the system have been extended from English to French, Italian, Spanish and Russian. Future work will continue to refine and extend the event types as well as increase the language support.

Media Impact

Research into media impact, e.g. "who is talking about what and how" has been the subject of a number of research activities in the past. Finally, this research has started to stir interest in our user community such that in the second half of 2008 effort was invested into the development of application based prototypes. These prototypes showcased research work applied to real data sets and demonstrated how a number of statistical techniques can be employed to show: media impact of a given topic and how it is reported in member states in order to develop a traditional media impact report; category based topic clustering to identify the evolution of subjects in a constrained domain of discourse; source based temporal tonality detection to view swings in sentiment; event based topic tracking to view how events are reported within a specific context and how the media and entities are perceived.

OSINT Suite

The Open Source Intelligence Suite (OSINT) is being re-designed to incorporate more of the processing elements found in the EMM processing chain. The aim is to bring the full power of the EMM processing chain to the user desktop in a single package. This development has led to the fusion of 2 overlapping techniques for entity recognition which will result in a better entity recognition system in both EMM and OSINT.

Medical Information Aggregation and Health Early Warning

The Medical Information System MediSys is a concrete example of the application of EMM technology to rapidly identify threats to public health using information from the internet. In 2008 many categories were enhanced with Chinese and Arabic sources and keywords following the technical improvements of the underlying monitoring engine. The Arabic category definitions were mainly supplied by the Canadian Global Public Health Intelligence Network, which is using MediSys to monitor the Arabic language new feeds processed by it. The Chinese support was particularly important for the monitoring of the Chinese media during the 2008 Olympic Games and has already led to interest from Chinese health authorities.

Rapid News System (RNS)

RNS is a multi-user collaborative document management and content management system used as an editorial platform to manually select articles harvested and classified by EMM in order to produce a news brief or to notify interested parties by e-mail or SMS. The news brief can then be published on-line or as a pdf document and sent by e-mail. The system is in daily use by the Directorate-General for Communication (DG COMM) to produce EMM Panorama, and by the Directorate-General for Agriculture and Rural Development (DG AGRI), the Directorate-General for Energy and Transport (DG TREN) and the European Maritime Safety Agency to produce in-house newsletters. New users acquired in 2008 are the Fundamental Rights Agency, and the TEN-T Executive Agency.

Major developments in 2008 include enhancement of editing functionalities, XML export function of the newsletter, implementation of the Flash module and generation of RSS feeds and added publishing capabilities.

Continental Early Warning System (CEWS)

In July 2008, a technical arrangement was put into place between the JRC-IPSC and the African Union (AU) in order to allow the AU to develop, deploy and operate the Continental Early Warning System (CEWS).

Challenges for 2009 and beyond

Challenges for 2009 will include the further development of a blog monitoring system, both for OSINT purposes as well as public opinion mining. An entity specific semantic based sentiment detection system will be developed to better track shifts in perception of entities in the news. Automatic summarisation of multi document texts will allow the generation of mobile handset based products with higher information content. The action will also face the challenge of applying this research in the ever changing world of the Internet, and adapt to new technologies as they emerge.

In 2009 this action will be renamed OPTIMA (Open Source Text Information Mining and Analysis).

Europe Media Monitor (EMM)

The main product of this action that has been enhanced significantly in 2008 is EMM, a Media Monitoring system. It monitors news media sources on the World Wide Web from all around the world in multiple languages, classifies the news, analyses the news using information extraction techniques, aggregates the information, provides notifications depending on their content and provides visual presentation of the information found. The fact that this system monitors, in real time, 80.000 new news articles per day from 2200 news web-sites world-wide in 42 different languages makes the system unique. The system forms the backbone of a number of applications developed by the action in support to EU policies concerned with crisis management, counter-terrorism, organised crime and media monitoring.

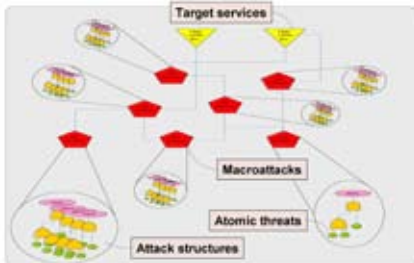
GLOSSARY

- AU** African Union
- CEWS** Continental Early Warning System
- DG AGRI** Directorate-General for Agriculture and Rural Development
- DG COMM** Directorate-General for Communication
- DG TREN** Directorate-General for Energy and Transport
- EMM** European Media Monitor
- MediSys** Medical Information System
- OSINT** Open Source Intelligence Suite
- RNS** Rapid News System
- RSS** Really Simple Syndication
- XML** Extensible Markup Language

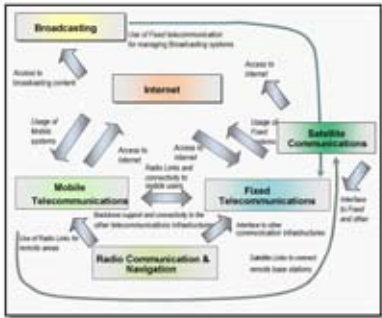
SCNI

CONTACT

Marcelo Masera
 Tel: +39 0332 78 9238
 e-mail: marcelo.masera@ec.europa.eu
 website: <http://scni.jrc.it>



Modelling of threats and attacks.



Interdependencies in Information infrastructures

Security of Critical Networked Infrastructures (SCNI)

The action SCNI aims at providing policy support and performing research on the security of networked infrastructures, including information systems, communication networks, and industrial control systems. Its main objective is the development of knowledge, methods and tools for supporting the relevant European policies, as for instance in the determination of criteria for the identification and designation of European Critical Infrastructures.

The main interest is on cross-border and European-wide problems, making reference to the European Programme for Critical Infrastructure Protection.

The action concentrates on the cyber aspects of infrastructures and their interdependencies, and studies their vulnerabilities (at the technological and system levels), the potential malicious threats that might affect them, the related detrimental attacks, and the countermeasures that can be put in place for securing those systems.

It also studies the gathering, exchange and generation of security-relevant data, with emphasis on design of security experiments and security metrics, and the handling and analysis of security experimental data.

The focus is on providing policy makers and the stakeholders of critical infrastructures with information and instruments for a better understanding of the risks, for the qualitative and quantitative evaluation of the security issues, for the determination of the security condition of systems.

Major 2008 achievements

Security of SCADA systems

SCNI has advanced in the implementation of an innovative laboratory for the execution of security experiments of SCADA systems. In this lab, SCNI is studying, trying and measuring the vulnerabilities, potential threats and attacks, and countermeasures of typical control systems applications. The work during 2008 was focused on the ModBUS protocol and applications in the power sector. The studies progressed towards the proposal of new secure definitions of that protocol, with an approach that can be generalised to others.

The complete architecture comprises: a simulator of the physical system being controlled (in this case a power station), a simulator of the field elements of a typical industrial installation, a simulator of the engineering and office elements of companies operating typical industrial systems, a simulator of cyberattacks, an observation system (with the aim of measuring all relevant data happening during the experiment), a simulation manager, archives of security information, and a security analysis system for processing the results.

Simulator of malware

SCNI developed MAISim – Mobile Agent Malware Simulator – a mobile agent framework that addressed one of the most important problems related to the simulation of attacks against information systems i.e. the lack of adequate tools for reproducing malicious software (malware). The framework can be deployed on any networked information system and aims at simulating the behaviour of each instance of malware independently. The MAISim Toolkit provides multiple classes of agents and diverse behavioural and migration/replication patterns

to be used for implementation of various types of malware (viruses, worms, malicious mobile code).

A secure network for sensitive information exchange

SCNI developed SecNet-IE, an IT platform for the exchange of sensitive information in the field of Critical Infrastructures. The platform, which combines hardware and software solutions, workflows and an implementation of the “Traffic Light” protocol, answers two interrelated issues: 1) it supports the trust relationships among all participants, and 2) it implements a well-defined set of rules for the management of information. Trust is based upon subjective judgements, but can be fostered by a clear, prescribed and assurable information flow rules. The current implementation shows the following characteristics: a decentralized data and control model, by-design avoidance of single points of failure, flexibility to fit in a wide variety of operational environments, multi-lingual operation, clear semantics of messages (message metadata becomes paramount), effective message translation, and very strong security characteristics.

Challenges for 2009 and beyond

SCNI will extend its approach to experimental security of IT-based systems, with the development of a laboratory dedicated to the stability and security of the Internet. It will be dedicated in a first version to the study of the Internet protocols.

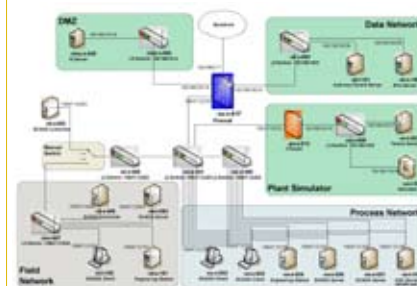
The work on industrial cybersecurity will continue with the analysis of further SCADA protocols, the study of targeted threats, and the design of dedicated Intrusion Detection Systems and more advanced protocols.

SCNI will continue with the development of malware simulators, aiming at supporting security experiments in the Internet and SCADA laboratories.

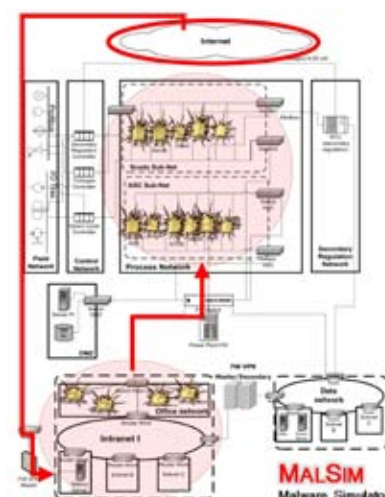
The work on information exchanges will be completed with a more systematic analysis of the terminologies and ontologies used for the description of security concepts and events, in a multi-language and multi-disciplinary environment, such as the one characterising the European Critical Infrastructure.

Moreover, SCNI intends to develop capabilities for the representation and visual analysis of infrastructures and their security characteristics based on Geographical Information Systems. A key objective is the use of modelling and simulation of security scenarios for the support of policy makers.

A strategic undertaking in 2009 will be the organisation of a Task Force for studying the setting up of a European Reference Network for Critical Infrastructure Protection (ERN-CIP). This is done under an Administrative Arrangement for the Directorate-General for Justice, Freedom and Security (DG JLS). The Task Force will be composed of staff from JRC and DG JLS, together with six seconded national experts detached to the JRC. The final aim is to propose a coordinated set of laboratories where to carry out security experiments – taking into consideration the needs and existing capabilities of Member States and Critical Infrastructure operators.



SCADA laboratory layout.



Simulation of Zero-Day Virus Attack

GLOSSARY

DG JLS Directorate-General for Justice, Freedom and Security

ERN-CIP European Reference Network for Critical Infrastructure Protection

MAISim Mobile Agent Malware Simulator

SCADA Supervisory Control and Data Acquisition systems

CONTACT

Spyros Arsenis
 Tel. +39 0332 785357
 e-mail: spyros.arsenis@jrc.ec.europa.eu
 website: <http://theseus.jrc.it>

Statistics and Information Technologies for Anti-Fraud and Security (SITAFS)

The action Statistics and Information Technology for Anti-Fraud and Security (SITAFS) was formed in mid-2007 by bringing together two pools of expertise in statistics and computer science in order to address selected issues in anti-fraud and international security.

Pertaining to the protection of the budget of the Community (and the EU Member States), the action has given particular attention to customs fraud, by developing and applying innovative statistical methods on data on trade imports into the Community. The action has also used detailed imports and exports data in a pilot exercise conducted in collaboration with services in three Member States in order to detect trade-based money laundering.

Whereas trade data are carefully monitored and reported, despite the very large amounts dedicated to external assistance*, currently, there is no infrastructure for storing detailed data on development and humanitarian aid projects so as to allow data sharing by the major donors in order to eliminate duplication of efforts, and enhance transparency in aid. The TR-AID system addresses these challenges. It collects information about aid projects from different sources in different formats, maps this information into one format, stores the information into a data base, allows rapid searches and presents search results in a user-friendly manner.

As of 2008, the action also supports the Directorate-General for External Relations (DG-RELEX) in the optimal use of the data submitted by the participants of the Kimberley Process Certification Scheme (KPCS) to guarantee compliance to this important international agreement between governments, the diamond industry and civil society in order to suppress the trade of “conflict” diamonds.

Major 2008 achievements

Statistics for anti-fraud

The forward search for the detection of price outliers in trade data was applied. This method starts from a small subset of the data, and fits subsets of increasing size while monitoring the process of adding new observations by plots diagnosing the presence of outliers. The method was adapted to the detection of mixtures of different regressions that may exist in the data set under study. [figure 1]

The method was implemented in MATLAB® oriented towards research purposes, for rapid prototyping of extensions and new methods, and to facilitate the adoption of our inferential approach in the wider scientific community. Implementation in SAS® was also advanced.

Customs agencies in three EU Member States provided in 2008 anonymised dis-aggregated import/export data for a systematic scanning for statistically significant high or low prices reported by importers and exporters. Price outliers were detected in imports into the three EU Member States and were then prioritised by risk analysis considerations, the transfer of “black money” into the Community economy. The work was submitted to the customs services owning the data and presented to a meeting of the EU-Financial Intelligence Units platform organized by the Directorate-General for the Internal Market and Services (DG-MARKT) as well as the 2008 Annual meeting of the Society for Risk Analysis (SRA) held in Boston, USA.

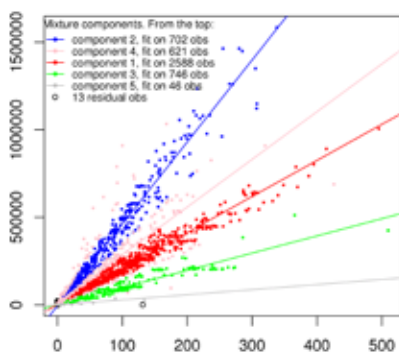


Fig. 1: Numerous mixtures of regression models in for value against quantity in imports of mobile phones in one of the Member States

* The European Community and the Member States provide 70% of the development aid in the world (approximately 46b€)

Transparency in aid

In 2008, the TR-AID system made solid technical progress in providing a new interface design for users [figure 2] and data summary pages and completed the integration of the Hibernate framework for less code to maintain and faster database access. With these improvements TR-AID is making the achievement of its objectives a realistic possibility. For this reason, the project in 2008 attracted major attention and support from Commission services including the European Anti-Fraud Office (OLAF), the EuropeAid Co-operation Office (AIDCO) and the Directorates-General for Humanitarian Aid (ECHO) and for Development (DG DEV), the willingness of international data owners such as the Organisation for Economic Co-operation and Development (OECD) and the United Nations Office for the Co-ordination of Humanitarian Affairs (UN OCHA), who have agreed to provide data to TR-AID, as well as strong interest from the EU Member States to provide data.

Statistics for the Kimberley Process Certification Scheme

A technical report to redevelop the methodology currently used by the Working Group on Statistics (WGS) of the Kimberley Process Certification Scheme (KPCS) was submitted upon the request by DG RELEX and presented to the WGS and other KP participants during the plenary meeting of the KPCS in New Delhi, in November 2008. The proposal includes examples of patterns relevant to non-compliance to the KPCS detected by statistical procedures established and used by SITAFS, as well as demonstrations of how to reconcile data submitted by different participants and visualize the aggregate statistics published in the rough diamonds KP website. The chair of the WGS in briefing the plenary meeting of the KP mentioned the submitted report as a “solid paper from the European Commission” and suggested that the KP-WGS focuses on the two topics of re-development of the methodology to be used and the data reconciliation as the priority topics for the WGS in the coming year.

Challenges for 2009 and beyond

Statistics for anti-fraud

The forward search approach to the estimation of mixtures produces clusters tentatively, with unassigned residual observations. A confirmatory part of the analysis is needed (i) to test if the residual observations must be allocated to a mixture component or if they must be finally declared outliers, and (ii) to confirm the tentative allocation of the other observations or to reassign wrongly allocated observations to a different mixture component. The confirmatory techniques for regression and the forward search approach to the multivariate context will be integrated in our MATLAB® toolbox and SAS® libraries.

Transparency in aid

The biggest challenge for TR-AID is getting agreement from all EU Member States and major international donors to share their data. In 2009, TR-AID will enrich its data repository with more data sources from major donors to allow querying and analysis of the data for a variety of users.

Statistics for the KPCS

The challenge for statistics for the KPCS is to implement a methodology based on statistical inference and alternative to the one presently used and have the KPCS community convinced that it is more efficient and effective in detecting deviations from the KP rules and regulations. .



Fig. 2: New Interface for TR-AID users

GLOSSARY

AIDCO	EuropeAid Co-operation Office
DG DEV	Directorate-General for Development
DG MARKT	Directorate-General for the Internal Market and Services
DG RELEX	Directorate-General for External Relations
ECHO	Directorate-General for Humanitarian Aid
KPCS	Kimberley Process Certification Scheme
OECD	Organisation for Economic Co-operation and Development
OLAF	European Anti-Fraud Office
SRA	Society for Risk Analysis
UN OCHA	United Nations Office for the Co-ordination of Humanitarian Affairs
WGS	Working Group on Statistics of the Kimberley Process Certification Scheme

CONTACT

Michalis Christou
 Tel. +39 0332 78 9516
 e-mail: michalis.christou@jrc.ec.europa.eu
 website: <http://mahbsrv.jrc.ec.europa.eu>

MAHB

The Major Accident Hazards Bureau (MAHB) provides research-based scientific support to the European Community on the formulation, implementation and monitoring of EU policies for the control of major accident hazards, chiefly the Seveso II Directive. The DG ENV and the Seveso Competent Authorities rely on MAHB for receiving guidance for the implementation of the legislation. MAHB has also an instrumental role in managing the European accidents database, analysing trends in accident occurrence, and identifying and disseminating lessons learned in order to prevent recurrence of similar events.



Percentage (%) of human/organisational failures leading to major accidents (MARS database)



Breakdown of technical failures leading to major accidents (MARS database)

Learning from chemical accidents: Breakdown of technical and organisational/human failures leading to major accidents. Analysis of the data in the eMARS database.

Risk Analysis for Industrial Accidents and Natural Disasters (MAHB)

This action deals with the safety and security of industrial installations, addressing the protection of the citizen from accidental and intentional threats related to the operation of chemical industrial facilities.

Major 2008 achievements

Accident Analysis and Lessons Learned

A number of obligations put on the Commission by the Seveso Directive* are being fulfilled through activities entrusted to MAHB. Such key activities are the Major Accident Reporting System (MARS) and the Seveso Plants Information Retrieval System (SPIRS), which are both maintained and managed by MAHB.

MARS is the reference major accidents database worldwide. It contains the accident reports submitted by the EU Member States in the context of the Seveso Directive and from OECD countries according to a voluntary scheme. In 2008, the new online system eMARS** was developed based on the longstanding experience of MAHB in accident reporting and evaluation as well as extensive preparatory work in consultation with Member States. In December 2008, the European Commission adopted a decision*** establishing a new major accident report form for use by national authorities, which is part of eMARS. The new system marks an important step forward in improving the quality of accident reporting and in facilitating the dissemination of lessons learned, in turn helping to prevent the occurrence of similar accidents in the future. Safety practitioners such as operators, plant designers, operators and analysts, national authorities and the Seveso inspector community should significantly benefit from the improved efficiency of the eMARS system.

In parallel, the SPIRS system, presently containing data on about 8500 establishments from the EU and EEA countries, also managed successfully by MAHB, provides the Commission and the Member States with useful insights on the profile of industrial hazards.

Guidelines on Land-Use Planning

The consistent and efficient implementation of the legislation is ensured through guidelines and common databases, which are developed by MAHB in close collaboration with the Member States and the industry. Addressing the issue of Land-Use Planning around hazardous sites, MAHB prepared in 2008 a report on "Overview of Roadmaps for land-use planning (LUP) in selected Member States". The document, which is part of the overall scientific support on LUP as requested by the Parliament and the Amendment Directive, provides good practice in LUP and explains the background behind and requirements necessary for the success of each LUP system.

Support to the network of inspectors on Risk management and Human Factors

MAHB, in agreement with the Directorate-General for the Environment (DG ENV), manages a network of inspectors from the Member States, who jointly analyse case studies, exchange experience and good practices and define recommendations on crucial issues of risk assessment and inspection policies. In 2008, MAHB organised two such case-studies/visits in Germany and Portugal, it managed a dedicated web site for the Seveso inspectors, prepared and analysed a questionnaire on Human Factors in the chemical industry and

* Directive 96/82/EC on the control of major accident hazards involving dangerous substances, OJ L 10, 14.1.97

** <http://emars.jrc.ec.europa.eu>

*** Commission Decision C(2008) 7530 of 2 December 2008, published in OJ

developed three recommendation documents in the context of the Seveso Inspections Series*.

Protection of Seveso plants

Due to the presence of dangerous substances and their importance for the national economy, Seveso plants are often considered as critical installations and need to be protected not only from accidental but also from intentional causes of accidents, including terrorist acts. MAHB participated in the SECURE-SITE research project, funded by the Directorate-General for Justice, Freedom and Security (DG JLS), focusing on the analysis of methodologies, regulatory framework and protection measures for the security of those Seveso plants regarded as Critical Installations. This research compares the existing and new protection frameworks and develops guidelines for a European vulnerability assessment method.

Natech disasters (Natural event triggered technological disasters)

The research of MAHB in this area focuses on the development of methodologies for assessment and management of natech risks and the development of a database of past natech events for analysing these disasters and drawing lessons on how initiating natural events escalate into accidents. Highlights of 2008 include the systematic analysis of accidents initiated by tsunami's, lightning's and storms, a facts-finding field trip in China following the catastrophic earthquake in Sichuan, collecting data on the damage of chemical/industrial plants, and the publication of a Special Issue of the Natural Hazards Journal devoted to natech risks.

Disaster Risk Reduction

In September 2008 the JRC-IPSC in collaboration with IIASA (International Institute for Advanced System Analysis) and the University of Kyoto, organised the 8th JRC-IIASA-DPRI Workshop on Integrated Disaster Risk Management, with experts from Europe, Asia and Africa. This year's theme was "Integration and Multi-disciplinarity", while special emphasis was given to the development and dissemination of the Disaster risk Reduction Hyperbase (DRH). In support to this initiative the action is acting as the reference point for Europe/Africa and has created the DRH-Europe/Africa node**. Further collection of measures, tailoring to the needs of the African users and strengthening the collaboration with institutions of the African Union is foreseen for the near future.

Integration, enlargement and international activities

A series of activities were carried out in collaboration with institutions from New Member States and Candidate Countries (NMS&CC), such as an extensive training on Seveso issues provided to the Turkish authorities, the collaboration with the Lithuanian authorities on risk assessment and the development of a Flexible Risk Management Framework for the developing countries in the context of the UNEP programme.

Challenges for 2009 and beyond

Future challenges include the assessment of major accident potential of industrial substances and activities, the development of a complete suite for assessment and management of all hazards, improvement of consistency in risk assessments, and use of lessons learnt from past accidents for building resilience in chemical facilities. The further population and dissemination of the DRH-Europe/Africa hyperbase and in particular its use in the African continent is also one of the challenges for the near future.

In 2009 the action will be renamed CI-Chem (Major Hazards and Protection of Chemical Infrastructures).



Natech accident: Damage in a fertilizer plant as a result of the Wenchuan earthquake in China.

What are Natech disasters?

Natural disasters can trigger technological accidents with severe consequences to the population and/or the environment, due to the release of hazardous materials processed or stored on site. These so-called Natech accidents deserve particular attention, as they can cause multiple hazardous-material releases.

GLOSSARY

DG ENV Directorate-General for the Environment

DG JLS Directorate-General for Justice, Freedom and Security

DRH Disaster risk Reduction Hyperbase

EEA European Economic Area

IIASA International Institute for Advanced System Analysis

LUP Land-use planning

MARS Major Accident Reporting System

NMS&CC New Member States and Candidate Countries

OECD Organisation for Economic Co-operation and Development

SPIRS Seveso Plants Information Retrieval System

UNEP United Nations Environmental Programme

* "Necessary Measures for Preventing Major Accidents at Petroleum Storage Depots", "Improving major hazard control at petroleum oil refineries", and "Enforcement of Seveso II: An analysis of compliance drivers and barriers in five industrial sectors"

** <http://drh-europe.jrc.it>

CONTACT

Artur Pinto
Tel.: +39 0332 789294
email: artur.pinto@jrc.ec.europa.eu
website: <http://elsa.jrc.ec.europa.eu>



EU-Russia Workshop on the Eurocodes in Moscow (October 2008)



Composite bridge beams being installed on site (Madrid)

Promotion of the Eurocodes outside the EU

The JRC-IPSC together with DG ENTR organised a EU-Russia Workshop on the Eurocodes in Moscow, which had the support of TAIEX and the cooperation of CEN-TC250. The EU-Russia dialogue on construction has been launched based on the conclusions for the needs for cooperation in standardisation, which were agreed at the Workshop. Also, the strategy and work plan for coordinated promotion of the Eurocodes in third countries, published by the JRC-IPSC, serves as a basis for the Commission support to the future actions of CEN, Member States and Industry.

Research in Support of Risk Analysis in Construction and Construction Products (SAFECONSTRUCTION)

The activities in support to the uptake of innovation and to standardisation for construction require considerable resources and a continuous commitment of the Commission, Member States and Industry*. Furthermore, a solid platform (research infrastructures and experts) is required to respond to the emerging policies, namely those concerned with Protection against natural and man-made hazards, Innovation, Competitiveness and Sustainability. The staff and experimental facilities of the European Laboratory for Structural Assessment (ELSA) that are unique in Europe, make it an ideal platform for European researchers and Industry to carry out large scale experimental tests, to develop new research approaches, design methodologies and innovative techniques, as demonstrated by the unique reference tests completed by the JRC-IPSC in support to European standards.

In 2008 SAFECONSTRUCTION addressed policy, technical and scientific issues in the following areas:

- Implementation, Promotion, Harmonization and Further Development of the Eurocodes (with emphasis on training, promotion outside of EU and strategies for future developments) and also contribution to ISO standards;
- New developments in the experimental field (e.g. improved testing methods for stain-rate dependent materials and wireless/video based field measuring systems) and transfer of knowledge;
- Unique experimental tests on full-scale composite bridge beams, research on modular construction and technical advice to SMEs;
- Seismic Safety of Nuclear Power Plants (NPPs) with an implementation agreement signed with the International Atomic Energy Agency (IAEA).

Major 2008 achievements

Support to the European policies and standardisation for construction

SAFECONSTRUCTION is one of the main stakeholders in delineating the standardisation support needed to achieve lead market for sustainable construction. Together with the Directorate-General for Enterprise and Industry (DG ENTR), specific Technical Committees of the European Committee for Standardisation (CEN) and European experts, the JRC-IPSC is involved in the definition of consistent approach in standardisation to tackle the different dimensions of sustainable development in construction (e.g. effective protection of the environment, health, prudent use of natural resources and energy efficiency).

A 'White Paper' on the future developments of the Eurocodes, including procedures and research needs has been jointly prepared by CEN/TC250 and the JRC-IPSC. It constitutes the basis for a framework mandate from the Commission to CEN for further development of European Standards, considering aspects of robustness (security related), new materials (innovation), sustainability and energy efficiency.

Testing and development of composite material structures

Starting from small-scale demonstration projects in the preceding framework programmes, ELSA has played an important role in motivating civil engineering companies to consider the use of these materials in primary load-bearing structural components of large structures. The initial exploratory work culminated

* See Commission Recommendation, 2003/887/EC

in the installation of Europe's longest vehicular carbon fibre bridge. ELSA was commissioned to test a section of a new motorway bridge manufactured from composite materials. The bridge was installed on the four-lane M111 highway in Madrid, making full use of these materials' light weight and design adaptability. The full-scale tests revealed that the serviceability and ultimate capacity loads (263 tons) provided greater-than-expected safety margins, pointing the way to even more optimal designs.

Technical advice was provided to SMEs involved in the composite materials sector (e.g. to a European SME involved in the composite materials sector regarding a low-cost housing building system to alleviate housing problems in the Republic of South Africa, as requested from the Commissioner Cabinet).

Wenchuan (China) earthquake field mission

The JRC-IPSC organised jointly with the Earthquake Engineering Field Investigation Team a post-earthquake field reconnaissance mission to the area affected by the MW 7.9 Wenchuan, China earthquake of 12 May 2008 that left 69,227 people dead and 5 million people homeless with a total estimated loss of 80 billion euro. The team visited more than 20 cities surveying the damage to buildings, lifelines and geotechnical failures aiming at collecting data and observations leading to improvements of the methods for design and retrofitting, and to assist the phase of reconstruction.

In addition, the action maintained collaboration with EU delegations in South America advising on technical issues related to post-earthquake reconstruction and is also contributing to the JRC Task-Force on Natural Disasters.

Challenges for 2009 and beyond

The challenge for the construction sector is to mitigate the natural and man-made hazards, while increasing sustainability, fostering the competitiveness of the European Industry and removing technical barriers to trade in the EU-enlarged and global markets. Along this line, the research and experimental capabilities of ELSA should serve as European platform for studying and testing not only new materials and technologies, but also the effects of environmental and man-made hazards such as impact, explosion, seismic and fire loads. Furthermore, more explicit performance based engineering is required including life-cycle cost analyses.

The action will provide support to the evolution of engineering practices, design methodologies and standards for the reassessment of existing NPPs against the effects of strong earthquakes. Synergic to this activity is also the FP7 Integrated Project IRIS (Integrated European Industrial Risk Reduction System).

The new Construction Products Regulation (CPR)* proposes a new basic requirement on Environmental Sustainability of construction products and works, which requires extension of scope of the European standards. In cooperation with other JRC Institutes, the action will contribute the extension of scope and interoperability of the European Standards for construction to include energy economy and sustainability. There is also the goal to support the implementation of CPR with interpretative documents and recommendations.



Bridge-beam at ELSA just after failure.



Wenchuan earthquake - Collapsed motorway bridge along the Min river in Ying Xiu Town middle school in Ying Xiu Town.

Follow-up of the field mission to the Wenchuan (China) earthquake

The participation of the JRC-IPSC to post-earthquake field missions is framed into strengthening the role of the Commission through its Delegations in providing assistance and support to affected countries in the aftermath of earthquake disasters. The field mission to the Wenchuan earthquake area led to a series of contacts between the JRC and two Chinese institutions for setting up collaboration agreements for improving Chinese experimental research capabilities and exchanging best practice in earthquake resistant design.

GLOSSARY

- CEN** European Committee for Standardisation
- CPR** Construction Products Regulation
- DG ENTR** Directorate-General for Enterprise and Industry
- ELSA** European Laboratory for Structural Assessment at JRC-IPSC in Ispra (IT)
- IAEA** International Atomic Energy Agency
- ISO** International Organisation for Standardisation
- NPPs** Nuclear Power Plants
- SME** Small and Medium Enterprises
- TAIEX** Technical Assistance and Information Exchange Instrument

* COM (2008) 311

MonCoTraF

CONTACT

Gianluca Fiore
Tel. +39 0332 786710
e-mail gianluca.fiore@jrc.ec.europa.eu
website: <http://eid.jrc.it>

Animal welfare in long journeys

Regulation 1/2005 on animal welfare in long journeys establishes that in all new trucks in operation from 1.1.2007 a Navigation System has to be installed. The System must register all relevant data concerning the conditions of transportation (location of the vehicle, temperatures of transportation, etc.)



Climatic chambers for environmental testing at TEMPEST laboratory.

ISO/IEC 17025

It is the main standard used by testing and calibration laboratories. There are many commonalities with the ISO 9000 standard, but ISO/IEC 17025 adds in the concept of competence to the equation, and it applies directly to those organizations that produce testing and calibration results. Laboratories use ISO/IEC 17025 to implement a quality system aimed at improving their ability to consistently produce valid results.

Monitoring, Control and Traceability in the Food Chain (MonCoTraF)

The European farming and food processing system is considered a relevant critical infrastructure of the EU member states. Therefore, the key task of the MonCoTraF action is to ensure customers with technical collaboration, advice and support in the field of traceability of livestock and products.

Traceability of livestock and animal products are elements linked together to more efficiently fight sanitary frauds and ensure food safety. The crisis on TSEs and Foot and Mouth Disease in Europe have demonstrated that in order to ensure safe food, a reliable traceability system is the key point to be developed and established. One of the most common weakness in the EC Member States where such crisis have developed was, in fact, the absence of safe instruments to trace in due time possibly contaminated animals and products. In this context, JRC-IPSC has developed research projects, where modern technologies (RFID, DNA, etc.) have been explored to allow the establishment of new traceability technique able to deliver safe information about the origin, the processing and the storage of meat.

In terms of technical support to the EU member states, JRC-IPSC provides also the service of a specialized RFID test laboratory for the assessment of Radio Frequency Identification (RFID) devices, and for standardising test procedures. The laboratory, accredited according to ISO 17025 standard, is officially recognised as an ICAR (International Committee for Animal Recording) test centre and it is playing a key role in the ISO working groups concerning the technical aspects of animal electronic identification.

Major 2008 achievements

Monitoring of Animal Welfare Conditions in Long Journeys

In the context of the technical collaboration with the Directorate-General for Health and Consumers (DG SANCO) a study was completed for the smooth implementation of Council Regulation 1/2005 (Animal welfare in long journeys). The study was aimed at providing the EU member states with a Navigation System able to constantly monitor the traceability of transported animals and the animal welfare conditions in long journeys.

The study has enabled JRC-IPSC to finalise the Navigation System Technical Specifications. The Navigation System prototype – tested in real life conditions in 2008 - has demonstrated its capability to collect and transmit data from commercial animal transportations to a dedicated website, enabling the responsible bodies to take appropriate actions, if necessary. In addition, a parallel study on the average temperature transportation in Europe was carried out (STAT project). The study is aimed at providing DG SANCO with a sound technical assessment of the average temperature of the transportation of the main farmed animal species along the commercial routes in the peak seasons, and it will allow the relevant DGs and the EU member states to adopt/amend the present EU legal provisions, taking into account the real transport conditions.

ISO 17025 accreditation of the RFID Laboratory

JRC-IPSC has completed the procedure to ensure the laboratory accreditation according to ISO 17025. The accreditation allows the laboratory to play the role of RFID Reference Centre and to provide the other RFID Laboratories of the EU member states with a technical support service. In the meantime, manufacturers have already requested to have their equipments tested according to the new

testing procedure and new ISO environment, and some member states have formally requested the JRC to consider the possibility to play the role of national reference laboratory for them.

Automation of the data collection in the animal diseases eradication programme

In the context of a joint project with the ASL of Varese (Italy), JRC-IPSC has completed the design of an automated system able to recover the animal identification code from RFID tagged animals and to use the information to feed a double stream: on the one hand, a on-farm data collection system (which will update the local ASL database on the animal inventory) and on the other hand the sample reception in the laboratory. Both systems can be considered a practical demonstration of the feasibility of the integration of RFID/EID into more complex information system where the data collection/processing operations will be much safer and much easier. In 2008 the system was regularly implemented in the official field activities for the data collection in the eradication campaign for animal diseases for the whole Varese province. The next step is the integration of the data collection system in the Laboratory Network.

Technical Support of the EU member states authorities and Commission Directorates-General in the field of electronic identification of animals

In 2008 a number of technical collaborations were implemented:

- The continuation of the impact assessment of the implementation of Regulation 21/2004 on the electronic identification of small ruminants;
- A scientific project with the Ministry of Agriculture of Cyprus with a multi-faceted study aimed at integrating the electronic identification (EID) into a JRC-IPSC prototype of automated segregation system to prevent animals from scrapie eradication programme to enter the food chain.

Challenges for 2009 and beyond

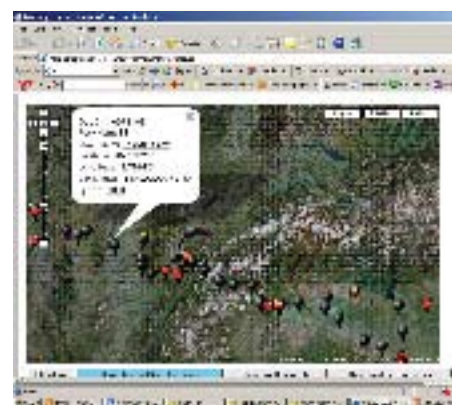
One of the major challenges from 2009 onwards will be the establishment of a European RFID Laboratory network. The network will be composed of the National Testing Laboratories of the EU member states, coordinated by the JRC-IPSC. The network will contribute to ensure the testing of RFID devices before they are marketed, as well as the monitoring of the quality of the RFID devices available in the EU market.

The assessment of the animal welfare indicators will be one of the future fields of development, with the aim to establish the necessary correlation between environmental/behavioral parameters and the welfare of the animals.

Furthermore, the use of EID in the farming/processing system shall be further explored, with the aim to integrate EID into more complex systems.

Finally, mathematic modeling for rapid response in case of diseases outbreaks are going to be developed, aimed at providing the responsible bodies with a practical tool to identify where to take actions first, if necessary.

In 2009 the action will be renamed CI Animals&Food – Monitoring, Control and Traceability in the Food Chain.



Screenshot of the tracking system at a web application visualizing the data transmitted from a truck transporting animals (each point represents a data block transmitted during the journey).



The feasibility study concerning the extension of RFID to live piglets confirmed that the approach followed by JRC-IPSC (tagging procedure/location of transponder) is appropriate and it allows the best retention rate and reading.

GLOSSARY

- ASL** Azienda Sanitaria Locale
DG SANCO Directorate-General for Health and Consumers
DNA Deoxyribonucleic acid
EID Electronic Identification
ICAR International Committee for Animal Recording
RFID Radio Frequency Identification
TSEs Transmissible spongiform encephalopathies

4

Europe as a World Partner

The JRC portfolio of Actions under this policy theme aims at providing support to two policy areas in the external relations of the Union: global security and development cooperation. The first area of work concerns the development of systems and technologies which provide information, analyses, management tools and data sets in the context of crisis management and security.

The second area of work concerns development cooperation where the JRC will provide information and tools for planning, monitoring and assessing development programmes. The focus will be on the establishment of satellite based monitoring systems which will maintain an intelligent watch on the conditions of resources and environment under growing human pressure.

Furthermore, common elements of the JRC actions foreseen in the Agendas 4.1 and 4.2 will contribute to the Africa Caribbean and Pacific ACP Observatory for Sustainable Development. The purpose of the Observatory is to provide relevant, reliable, ready-to-use and updated information to the EC services and to the beneficiary countries and regions in order to improve the decisionmaking processes. Whilst addressing all ACP countries, the African continent will be the focus in the initial phase. The ACP Observatory will support three main domains: sustainable management of natural resources, food security and crisis response/monitoring for security.

4.1 Global Security

The focus of this part of the JRC agenda is to develop and apply information technologies, Geospatial (including remote sensing) analysis techniques, and system analysis approaches to provide support to policies and actions in which the Community has competence and fully participates, particularly in: crisis management (including disaster risk reduction, conflict prevention, crisis preparedness, international crisis response and recovery/reconstruction) and, in addressing global challenges such as pandemics, non-proliferation, terrorism, and illicit trafficking. Some activities will be developed in support to the development of GMES services, in particular in the fields of emergency response and security.

CriTech, ISFEREA

4.2 Development Cooperation

Actions in this Agenda aim at developing products usable by partner countries, which will be involved in the definition of Specific requirements. Links will be maintained with other EC funded activities and international programmes.

MARS-FOOD



CONTACT

Alessandro Annunziato
 Tel. +39 0332 789519
 e-mail:
 alessandro.annunziato@jrc.ec.europa.eu
 websites: <http://www.gdacs.org>
<http://globesec.jrc.ec.europa.eu>

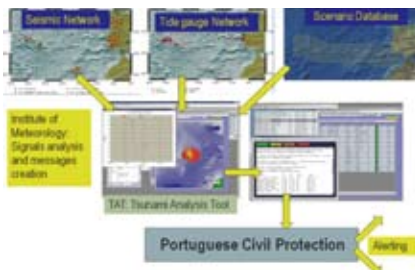


Fig. 1: Schematic view of the Portuguese Tsunami Early Warning System.

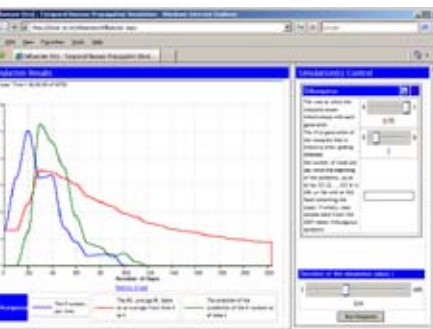


Fig. 2: Estimation of the reproductive number (R) over the 2007 Italian chikungunya epidemic curve. The blue line represents the evolution of R in time (after analysing the complete epidemic) and the green line represents the evolution of the R number as it would be predicted on day t . Given the uncertainty introduced by the predictive method, the results are similar but somewhat offset in time. The red line is the R_0 taken as the average of the R as of time t .

Crisis Monitoring and Response Technologies (CriTech)

The aim of the CRITECH action is to provide scientific support to EU policies concerned with crisis management (from humanitarian, natural disasters and public health crises to conflict and political crises).

The action's current-to-medium policy focus is to provide scientific and technical support to:

- Community contributions to International crisis response and global disaster risk reduction initiatives: focusing on early warning systems and Information Management Systems for Decision-Making in Crisis Management.
- Community contribution to enhanced public health crisis preparedness and response: focusing on modelling systems and Information Management Systems for Collaborative Decision-Making in Crisis Management.
- The emergency cells and situation centres of the EU's institutions and international organisations, such as the United Nations' Office for the Coordination of Humanitarian Affairs (UN OCHA), the United Nations' Department of Peacekeeping Operations (UNDPKO) and the African Union.

Major 2008 achievements

Support to Portugal for the establishment of the National Tsunami Early Warning System

The JRC-IPSC is supporting the Instituto de Meteorologia of Portugal to develop the national Tsunami Early Warning System as part of the global tsunami warning system of the North East Atlantic and Mediterranean Tsunami Warning System (NEAMTWS) and the Intergovernmental Oceanographic Commission of the United Nations Educational Scientific and Cultural Organization (IOC-UNESCO).

The Tsunami Warning System (TWS) includes three main components (Fig. 1): seismic detection, tsunami detection/analysis and the issue of warnings/alerts. The key elements are the definition of the tsunami scenarios, tsunami detection, and tsunami protocol message generation. The system will also be able to predict tsunami potential impact, wave-heights and arrival times at pre-defined locations along the coast.

The Tsunami Analysis Tool (TAT) is being developed at the JRC-IPSC to assist operators in deciding if a tsunami has been generated or not, in case of a large enough seismic event. The decision is based on the comparison between pre-calculated scenarios and online sea level measurements. The TAT tsunami scenario database, developed by the JRC-IPSC, comprises 136,000 worldwide scenarios events computed every 0.5 degrees and for magnitudes between 6.5 and 9.5, every 0.25. Once a scenario is identified, the programme uses the calculated values to automatically generate the alerting messages that will be sent to the relevant authorities or for further processing.

Flood Detection System

In 2007, CRITECH implemented a novel methodology to detect worldwide floods, using a technique, based on the analysis of passive microwave satellite data, developed by Dartmouth Flood Observatory (DFO, USA).

In 2008, CRITECH extended this methodology into a system of full global coverage, effectively producing near-real time flood maps. Support for multiple sensors and data providers reduces the time from acquisition to product to three hours. Extension to full coverage allows CRITECH to monitor any place around

the world for flood events (at least 10km removed from coast lines) and obtain current and historical time series of the flood magnitude.

In addition, flood maps with a resolution of 10x10 km² can be produced daily for any area in the world. The system was successfully tested for the disastrous 2008 floods on the Brahmaputra in India.

Infectious disease epidemiology

In 2008, a series of activities associated with the epidemiology of infectious diseases resulted in the improvement of the JRC-IPSC's operational tools for crisis management during emerging health threats and in the production of research results related to the inactivation of influenza A viruses in the environment, their transmission modes and the relative importance of these modes with respect to control measures.

There has been further development of a user friendly software system DESMOS, which is embedded in the JRC-IPSC's public health threats information system HEDIS to study the impact of infectious diseases outbreaks and associated control strategies. New modelling approaches were added, especially those related to the estimation of the basic reproduction number of an outbreak which represents a measure for the transmission potential of the disease. CRITECH implemented a statistical approach where, once the chain of transmission has been traced in a single isolated outbreak, the information of the transmission network provides some idea of the distribution of generation times for that disease.

Web-based collaborative crisis management portals

CRITECH develops and tests web-based platforms for solving real time crisis management requirements such as dynamic exchange of data and information, collaborative tools and others, such as mapping tools.

An example of these applications is the KREIOS platform. KREIOS is a web-based platform that allows critical organisations involved in international crisis management (e.g. NATO, UNDPKO, Council Secretariat's EU Joint SitCen and DG RELEX) to exchange unique information on world crisis areas. KREIOS was used during the 2008 Georgia conflict by various organisations to exchange unique information.

In 2008, CRITECH received several requests by organisations to have access to the technology underpinning the collaborative crisis management platforms it has been developing. An example is the EU Joint Situation Centre of the European Council that requested the development of all their intranet and internet information management systems based on the portal technology developed by the JRC-IPSC.

Challenges for 2009 and beyond

In the framework of tsunami modelling, the future challenge will be the development of a more sophisticated model for the crustal deformation that will lead to the calculation of more realistic scenarios, and thus the development of a new set of pre-calculated scenarios. In addition, CRITECH will focus on the development of the interface for a device for Tsunami alerting system that has been developed by JRC-IPSC and for which a patent application has been filed in 2008. The aim with regard to the Global Flood Detection System is to upgrade it from a research tool to an operational and reliable approach for alerting the humanitarian community.

Understanding the transmission of infectious diseases is of enormous importance for the development and implementation of adequate control strategies in public health. Our goal is the development of a theoretical framework, which, in combination with better experimental data, will enable us to better understand the transmission of respiratory infectious diseases to evaluate the effects of associated control strategies, and to assess the relative importance of transmission modes. Our long term goal is to develop modelling approaches for other emerging and re-emerging infectious diseases.

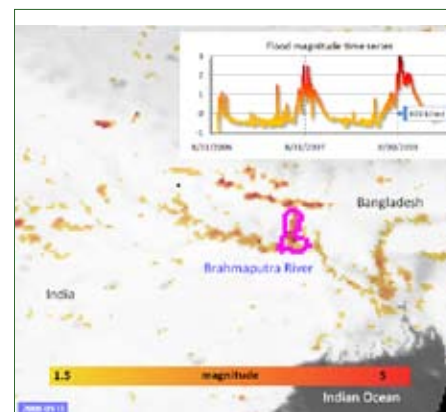


Fig. 3: The satellite-based flood monitoring system allows the detection and near-real time mapping of major floods. The example shows the 2008 floods of the Brahmaputra in India.

GLOSSARY

- DG RELEX** Directorate-General for External Relations
- DFO** Dartmouth Flood Observatory, USA
- ECHO** Directorate-General for Humanitarian Aid
- FRONTEX** European Agency for the Management of Operational Cooperation at the External Borders
- IOC-UNESCO** Intergovernmental Oceanographic Commission, United Nations Educational Scientific and Cultural Organization
- KREIOS** Situation Centres Portal System
- NATO** North Atlantic Treaty Organization
- NEAMTWS** North East Atlantic and Mediterranean Tsunami Warning System
- TAT** Tsunami Analysis Tool
- TWS** Tsunami Warning System
- UN OCHA** United Nations' Office for the Coordination of Humanitarian Affairs
- UN DPKO** United Nations' Department of Peacekeeping Operations

CONTACT

Martino Pesaresi
 Tel. +39 0332 789524
 e-mail: martino.pesaresi@jrc.ec.europa.eu
 website: <http://isferea.jrc.ec.europa.eu/>

Information Support for Effective and Rapid External Action (ISFEREA)

The ISFEREA action provides scientific support to EU external relations policies, specifically those concerned with global stability and crisis management. ISFEREA focuses on disaster reduction, conflict prevention, crisis response and support to post-crisis rehabilitation and reconstruction. The action also cooperates with specific international partners of the DG RELEX family such as the United Nations' agencies.

The action develops, validates and applies innovative and robust techniques and system analysis approaches for the processing, interpretation, and analysis of geo-spatial data as well as other relevant data including socio-economic and political. Computer-enhanced visual interpretation, automatic feature extraction and image understanding are the key technologies composing the scientific core competences of the action. Information extracted from satellite data are then fused with other data sources in order to build end-user products and analysis by geo-spatial modelling and cartographic representation.

Major 2008 achievements

Image Processing and Information Extraction Methods

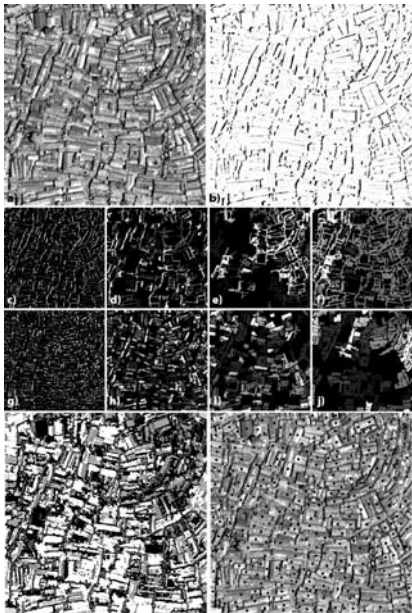
The main results regarded automatic extraction of building parameters from satellite images. ISFEREA developed, tested and validated methods for height derivation of buildings and man-made structures from several sources, namely: satellite and airborne Very High Resolution (VHR) and Synthetic Aperture Radar (SAR) imagery. Human settlements' detection and analysis have been widely developed. First, studying the urban post-conflict change classification performance by spectral and structural features in a support vector machine; secondly, defining and testing a robust built-up area presence index by anisotropic rotation-invariant textural measure; thirdly, improving detection and characterisation of urban objects from VHR optical image data. This helped to develop a methodology to quantify built-up structures from optical VHR imagery. Further investigation was conducted on quantitative and qualitative validation of digital surface models. A very practical result is the estimation of velocity and direction of moving targets using a single optical VHR satellite image. On the basis of a single image, the process is remarkably simple, fast, effective and inexpensive. A specific study addressed double bounce scattering mechanism of buildings in polarimetric VHR SAR data.

Earth observation (EO) applications

Using both standard and in-house image processing and information extraction methods, ISFEREA performed actual global applications. Main 2008 applications are the following.

- Location of slum dwellers using earth observation and geo-information technologies were conducted in collaboration with the UN Habitat and the involvement of the World Bank and relevant Commission services and Delegations.
- Development of an object-oriented classification model using VHR satellite imagery for detecting diamond mining activity, in order to help monitor regularly the compliance requirements of the Kimberley Process in sanctioned countries.
- Textural analysis of coca plantations using remotely sensed data with 1 metre resolution.

Automatic extraction of information from VHR satellite data for analysis of slums. Kibera settlement in Nairobi, Kenya. Extraction of information related the built-up structures using mathematical morphology approach. a) the original data sample of 250x250 meters, 0.6m spatial resolution, panchromatic sensor of QuickBird® satellite. © Digital Globe 2007; b) built-up "shadows" from residual of closing by reconstruction; from c) to do f) closing derivatives of morphological profile (DMP) for increasing scale; from g) to j) opening derivatives of the morphological profile for increasing scale; k) segmentation of the image by the "morphological characteristic" or maximum of the DMP; l) example of automatic counting of built-up structures (centroid as black dot in the image) using multi-scale image morphological features.



Geographic Information Modelling

Geographic information modelling techniques have been applied in order to derive and estimate additional information, in particular with respect to human settlements, location and population density estimation. A case study was performed. Monitoring urban growth and its impact on the environment played an important role, with the applied case of Sana'a, Yemen. Modelling was also used to assess disaster risk of building stock. Specific research regarded collaborative geospatial processing and visualization for situation assessment and super-overlay deployment in grid-enabled image processing.

Policy support

*Instrument for Stability (Crisis Management)**. ISFEREA successfully completed the Sudan Mapping project which aimed to establish a geo-spatial infrastructure for Peace and Security by providing support to the UN Department for Field Support (UN DFS) in mapping an important part of Darfur. More than 100 image map sheets were delivered to the UN DFS GIS office in Al Fasher (Darfur) in April 2008 and then distributed to the UNAMID peacekeepers.

*Implementation of the Kimberley Process Certification Scheme in the EC***. ISFEREA contributed to the Monitoring Working Group including the production of a report on a sanctioned country for the UN Security Council.

Post Crisis Needs Assessment (PCNA) and Instrument for Stability (Crisis Management). ISFEREA provided support to the Ministry of Science and Technology and the Chinese Academy of Science regarding the Wen Chuan Earthquake. Following the events that took place in Georgia, ISFEREA, with the European Union Satellite Centre (EUSC), carried out detailed damage analysis (reports, maps, statistics) which formed part of briefings for European Commission President Barroso and High Representative Javier Solana for the EU Summit. In Haiti, ISFEREA provided a first technical contribution to PCNA and produced a report.

Support to the Global Monitoring for Environment and Security (GMES) programme. Within GMES, ISFEREA was invited by the Directorate General for Enterprise and Industry (DG ENTR) to coordinate the External Action Working Group, whose role is to identify with other stakeholders in the European Commission and the Council the security policy areas where GMES can provide added value.

Challenges for 2009 and beyond

There are two main types of technical challenges ISFEREA will address in 2009: the first one concerns the fast evolution of satellite data sources and the second one is related to the usability of the final product. ISFEREA will address the need to improve the techniques available for data interpretation, which will need to take into account: the increase in the level of detail from the new generation of VHR satellite data, data complexity which leads to an instability of the classical inferential models, and high computational requirements. Geo-information layers produced for describing human settlements and fragile communities in urban environments, population risk assessments and damage and reconstruction assessments all need to be harmonised. Furthermore, GMES products and services concerned with crisis response (and especially post-crisis damage assessment) should be validated through an established and agreed protocol with relevant partners. Finally, the feasibility of global products (e.g. urban environments) derived from new generation satellite data should be demonstrated.



Haiti was heavily affected and reported important damages during the 2008 hurricane season in the Caribbean. The city of Gonaives (300.000 inhabitants, second largest city after the capital Port-au-Prince) was literally flooded with waters reaching more than 2m of height. A huge quantity of mud was deposited because floodwaters were not flowing to the sea. The entire city was totally paralysed for several weeks. Several houses were destroyed by mud flows and deposits. The satellite image taken after the floods (right) shows the extent of the mud deposits. ISFEREA carried out a post-disaster needs assessment, including satellite data analysis and field visit in coordination with the European Commission, the United Nations and the World Bank.

GLOSSARY

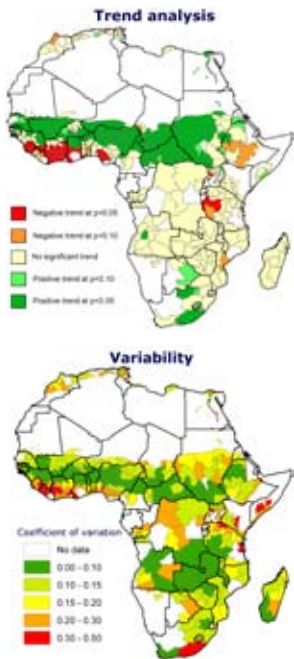
AIDCO	EuropeAid Cooperation Office
DG ENTR	Directorate General for Enterprise and Industry
DG RELEX	Directorate-General for External Relations
EUSC	European Union Satellite Centre
GMES	Global Monitoring for Environment and Security
GMOSS	Global Monitoring for Security and Stability
GIS	Geo Information System
PCNA	Post Crisis Needs Assessment
UNAMID	African Union/United Nations Hybrid operation in Darfur
SAR	Synthetic Aperture Radar
UN DFS	UN Department for Field Support
VHR	Very High Resolution

* Council Regs EC 1717/2006.

** Council Regulation 2368/2008

CONTACT

Olivier Leo
 Tel. +39 0332 789474
 e-mail: olivier.leo@jrc.ec.europa.eu
 website: <http://mars.jrc.ec.europa.eu/mars/About-us/FOODSEC>



The maps are based on the cumulated NDVI over the season extracted from NDVI time series (1981-2006). CumNDVI was aggregated at sub-national units using a mask of cropped areas. CumNDVI is related to net primary productivity and thus for agriculture linked to yield. Negative trends indicate decreasing yields, while high variation suggests frequent deficit production. Red areas in one or both maps may thus be of concern for food security



Field ploughing in South Ethiopia

Food Security Assessment (FOODSEC)

Food Security is a key issue for stability and sustainable development in the world. In the first Millennium Development Goal, the objective is to reduce by half the number of people suffering from hunger before 2015. The Food and Agriculture Organization (FAO) currently estimates that more than 900 million people are chronically food in-secure in the world.

The European Commission is a leading international donor in Food Security, in particular through the Food Security and Food Aid budget line that since 1996 provides on average 500 M Euro/ year. In 1996, the Council Regulation N° 1292 has established the EC Food Security Policy. In 2007, the Food Security Thematic Program (FSTP) was defined as a complementary instrument to ensure coherence in the approach to food security.

To deliver Food Aid and non-Food responses appropriately, the Directorate-General for External Relations (DG RELEX) and the EuropeAid Cooperation Office (AIDCO) need timely information and objective assessments of the requirements obtained independently of national or commercial interest. Since 2001, FOODSEC has developed a crop monitoring and yield assessment system in various parts of the world: South America, Russia and Central Asia, Mediterranean Basin and East Africa. The system, based on remote sensing data and agro-meteorological models, took benefit from 20 years of MARS project experience in Europe. In 2006, an Administrative Arrangement was signed for three years between AIDCO and JRC-IPSC to strengthen national food security information system in the Horn of Africa.

Major 2008 achievements

FOODSEC crop monitoring bulletins

2008 was marked by “soaring food prices“ which did not spare the countries regularly monitored by FOODSEC and more generally puts agriculture back on top of the development agenda.

More than 30 regional and national bulletins were published by FOODSEC in 2008:

- dedicated reports were issued at the request of the Directorate-General for Development (DG DEV) and due to the drought in East Africa. The reports monitored the short crop seasons in Eritrea, Somalia, Ethiopia and Kenya
- new bulletins on North Korea were published, the country was stricken by an acute food security crisis due to high prices and the poor harvest in 2007,
- crop monitoring in South America was reactivated in 2008, four bulletins were published

Capacity building and transfer of know-how is part of FOODSEC’s mandate, training activities to reinforce national crop monitoring systems took place this year in South Sudan, in collaboration with the Famine Early Warning System (FEWSNET), and in Somalia.

During 2008, MODIS satellite data and new rainfall estimates based on METEOSAT satellite were integrated into the FOODSEC crop monitoring system. Near real time data from synoptic stations are now also regularly acquired over Africa.

To support the scientific developments and to reinforce the monitoring activities, several international workshops and experts consultations were organised

AIDCO Administrative Arrangement

Under the Administrative Arrangement signed by AIDCO in 2006, FOODSEC reinforced its activities in the vulnerability assessment domain. The participation and the support to the Integrated Food Security Phase Classification (IPC) process led by FAO is one of the key activities. The IPC is an innovative tool for food security analysis and response. FOODSEC represents the JRC in this multi-agency partnership and is also involved in the decision making process regarding the global governance of the initiative.

In 2008, two scientific studies were carried out: an assessment of post harvest losses in Sub Saharan Africa and a cereals availability study in Ethiopia:

- The post harvest losses study, led by the UK Natural Resources Institute (NRI), was very successful and the final report will be issued in early 2009. The project allowed the development of an information system capable of generating figures of post harvest losses for cereals by country and province for Southern and Eastern Africa. Several consultative meetings were held in Africa to strengthen the regional research networks. The study identified the various factors in play and demonstrated the importance of these losses (up to 30% of production), which are becoming a key target to improve agriculture productivity and food security. Follow-ups to this activity are presently being discussed with FAO, AIDCO and other players such as the United Nations Industrial Development Organization (UNIDO);
- The Cereals Availability Study was completed in December 2008, by a final conference organized in Addis Ababa by JRC-IPSC, the International Food Policy Research Institute (IFPRI) and Ethiopian research institutions, to present the study results to the stakeholders, government representatives, EU Delegations, international donors and UN organisations (World Bank, DFID, FAO, WFP). The study brought new insight to understand better livelihood consumption and market behaviour in Ethiopia, crucial issues in a context of soaring price and food crisis. Another main achievement was the development of an economic spatial equilibrium model (publication in 2009).

At the end of 2008, FOODSEC staff were involved as EU Observers in UN Missions for Crop and Food Supply Assessment (CFSAM, South Sudan and Ethiopia), or for Emergency Food Security Assessment Mission (EFSA, Ethiopia). A field assessment tour in Ethiopia was also organised in collaboration with experts from the US Department of Agriculture to assess 2008 crop production.

Scientific research to support the crop monitoring activities has been the subject of different presentations in international workshops and conferences, such as: climate change impact on crop phenology and production, evaluation of rainfall estimates, remote sensing time series analysis, trends in agricultural production based on remote sensing.

Challenges for 2009 and beyond

In 2009, FOODSEC will face new challenges with the geographic extension of its activities and the development of monitoring systems at sub-Saharan Africa level. The signature of a new administrative arrangement with AIDCO should support these developments. The action will also be fully involved in the new JRC thematic programme for the African, Caribbean and Pacific Group of States (ACP) and into the GMES for Africa initiative. The problem with area estimates will be addressed in China, Kazakhstan and Tanzania through the newly signed GEOLAND 2 project. Research activities will focus on the impact of climate change on crop production and on the liaison between crop monitoring and vulnerability information



Sorghum field in South Wolo, Ethiopia



Maize Water Satisfaction Index Value during the second decade of Sept. 2008

GLOSSARY

- ACP** African, Caribbean and Pacific Group of States
- AIDCO** Europe Aid Co-Operation Office
- CIRAD** Centre de coopération Internationale en Recherche Agronomique pour le Développement
- CFSAM** Crop and Food Supply Assessment Mission (UN FAO Mission)
- DFID** UK Department for International Development
- DG DEV** Directorate-General for Development
- DG RELEX** Directorate-General for External Relations
- EFSA** Emergency Food Security Assessment (UN WFP mission)
- FAO** Food and Agriculture Organization
- FEWNET** Famine Early Warning System (of United States Agency for International Development)
- FSTP** Food Security Thematic Program
- GEOSS** Global Earth Observation System of Systems
- IFPRI** International Food Policy Research Institute
- ILRI** International Livestock Research Institute
- IPC** Integrated food security Phase Classification
- LIRAM** Livestock and Rangeland monitoring systems
- NDVI** Normalised Difference Vegetation Index
- NRI** Natural Resources Institute (UK)
- UNIDO** United Nations Industrial Development Organization
- WFP** World Food Program




5



EURATOM

The nuclear activities of the JRC, implemented under the Euratom Multiannual Work Programme, so called “Direct Actions”, aim to satisfy the R&D obligations of the Euratom Treaty 1 and to support both Commission and Member States in the field of safeguards and non-proliferation, waste management, safety of nuclear installation and fuel cycle, radioactivity in the environment and radiation protection.



The objective of the programme is to develop and assemble knowledge on nuclear energy production, its safety and reliability, its sustainability and control, its threats and challenges and its future exploitation potential, including safety and security of innovative/future reactor systems.



5.3 Nuclear Security*

Although the JRC has over 30 years experience in supporting the Euratom and Non-Proliferation Treaties, technical innovations and improvements are continued to be required to implement the evolving safeguards policy. The Additional Protocol aims to assure the absence of undeclared nuclear operations. Its implementation requires a number of techniques different from those involved in verifying nuclear material accountancy. It requires an overall description of a country's nuclear activities, provisions for more extensive site declarations and more varied inspection requirements.

The detection and the identification of illegally transported or stored nuclear material constitute a major line of defence against the illicit trafficking. Nuclear forensic science provides clues on the origin of the seized material. Establishing appropriate response plans for handling cases of detection remains an important issue.

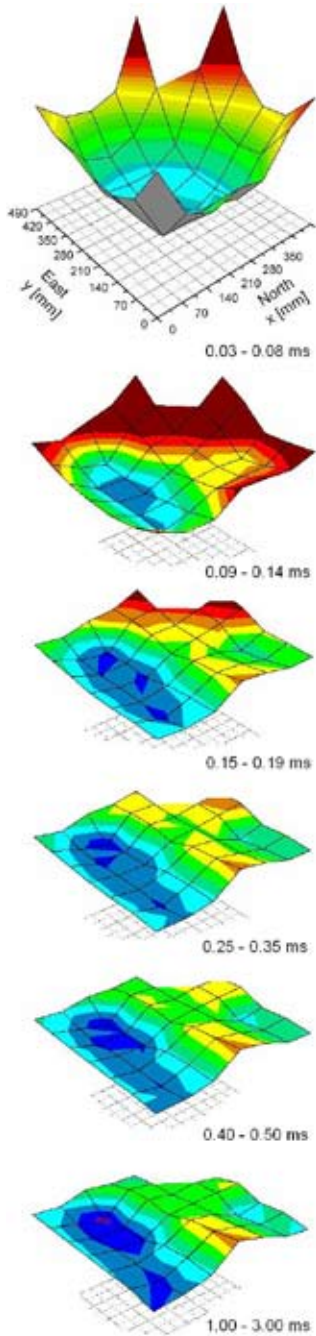
NUMAMET, VERTEC, AMENUS,
NuTraSeal, PhyMod

* Only those agendas of JRC Multiannual Work Programme involving IPSC's actions are mentioned.



CONTACT

Reinhard Berndt
 Tel. +39 0332 785317
 e-mail: reinhard.berndt@jrc.ec.europa.eu
 website: <http://nuclearsafeguards.jrc.it>



The evolution of the thermal neutron flux in the horizontal mid-plane of the PUNITA sample cavity

Nuclear Materials Measurement Methods (NUMAMET)

The action NUClear Material measurement METHODS, NUMAMET, performs research on new methods for the detection of nuclear, fissile, material such as Uranium (U) and Plutonium (Pu) but also special chemical compounds, such as explosives. It delivers support to the European Commission and the International Atomic Energy Agency (IAEA) with respect to development and implementation of measurement methods for nuclear safeguards and nuclear security. This includes training of nuclear material inspectors of EURATOM, the IAEA and national authorities. The experimental work is accompanied by modelling of measurements.

Major 2008 achievements

Pulsed Neutron Interrogation Test Assembly (PUNITA)

PUNITA is a versatile experimental facility intended for research in Non-Destructive Assay (NDA) methods for nuclear safeguards and security applications. PUNITA incorporates a 14-MeV neutron generator and a large graphite mantle surrounding the sample cavity. A sample placed in the cavity of volume $50 \times 50 \times 80 \text{ cm}^3$ [Figure 1] is irradiated first by fast neutrons from the generator and later by thermal neutrons returning from the graphite walls. Since the neutron generator is working in pulsed mode various types of neutron interactions are induced in the sample, and the decay radiation in form of neutrons and photons are detected and analysed in different time windows following each neutron pulse.

Earlier work on the characterisation of the interrogating neutron flux in PUNITA was recently complemented with the investigation of the dynamics of the flux in time and space. Figure 2 shows the thermal neutron flux as function of time in the horizontal mid-plane of the sample cavity. Initially the thermal flux is clearly highest near the graphite walls and the neutron generator, and a few hundred microseconds later the flux is highest in the centre while maintaining some spatial structure caused by the geometry of the cavity.

In parallel to the characterisation of the neutron flux in PUNITA, the experimental work for the research applications was advanced. This included the investigation of two scintillation detectors for gamma radiation in the MeV range, and the identification of various samples through analysis of gamma spectra resulting from the neutron capture reaction. The results were presented in peer-reviewed papers, conference contributions, and two M.Sc. theses.

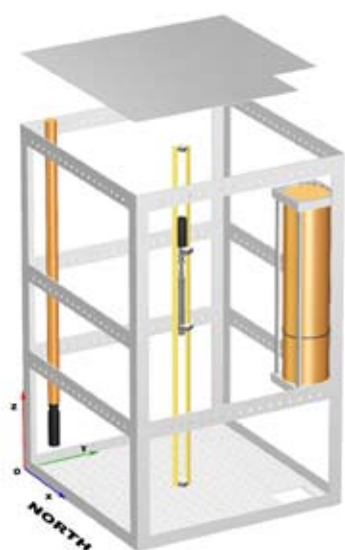
Support to the IAEA

The NUMAMET action provided scientific support to the IAEA in the form of a study dedicated to the "State-of-the-art NDA methods applicable to UF₆ cylinders". Large containers containing 2 or 12 tons of UF₆ have to be supervised continuously. The overview of established methods deals a lot with their physical limitations: in particular it is not possible to "see" the central region of the drums. In our study a new approach is proposed to observe the fissile isotope ²³⁵U in the whole volume. It may be expected that the IAEA will ask for our support also for the next steps to implement the new approach.

Specialised training for IAEA and EURATOM inspectors

Nuclear material inspectors of the IAEA supervise worldwide nuclear material and their colleagues of EURATOM follow this task in the EU. They apply nuclear radiation measurements to directly verify the presence of the declared uranium and plutonium. JRC-IPSC's Performance Laboratory (PERLA) is one of the very

few laboratories worldwide where there are qualified staff, nuclear material and measurement equipment to train inspectors. A particular effort but also success was the organisation of two high level courses which were held for experienced inspectors. The two week Advanced Course on Non-Destructive Assay covered all nuclear measurement methods for the qualitative and quantitative verification of both U and Pu. The newly arranged course Pu Diversion Detection was from the beginning foreseen as a Common IAEA-EURATOM course. Other than the courses on single instruments or methods the task for the trainees was to perform - in small groups - a primary inventory verification of a model of a whole nuclear installation. In this demanding course, all the elements of a safeguards system had to be brought together, from the development of an inspection strategy based on a statistics model of the installation over the application of nuclear measurements, the checking of the bookkeeping of the operator, the checking of seal etc. to the interaction with an operator and the application of observations following the scheme of Additional Protocol Agreements. The mixed EURATOM-IAEA succeeded with their tasks.



The sample cavity of the PUNITA experimental facility also containing the pulsed neutron generator (cylinder on right hand corner).

Challenges for 2009 and beyond

A new challenge for the coming years will be the contribution to direct application of nuclear security. International programmes, such as the US homeland security and the European Instrument for Stability, foresee the supervision of transport ways with radiation detection devices of many different types and fields of application. After the test of industrial detection devices about eight years ago, the next development step has to be considered and now modern measurement systems with new capabilities have to be tested: spectrometric devices. This class of instruments should be capable to decide automatically if an radiation alarm is due to a well-known source, like from medical treatment of people or from naturally occurring radioactivity or if there is a potentially dangerous case detected. Such instruments have to be tested to allow authorities to decide on investments for such new equipment on a solid basis.



IAEA inspectors in the Advanced NDA Course.



Common IAEA-EURATOM inspector group in the Pu Diversion detection course

GLOSSARY

- IAEA** International Atomic Energy Agency
- PERLA** Performance Laboratory at JRC-IPSC in Ispra
- Pu** Plutonium
- PUNITA** Pulsed Neutron Interrogation Test Assembly at JRC-IPSC in Ispra
- NDA** Non-Destructive Assay
- U** Uranium

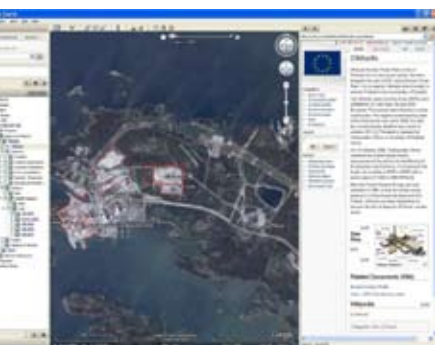
VERTEC

CONTACT

João G. M. Gonçalves
 Tel. +39 0332 789416
 e-mail: joao.goncalves@jrc.ec.europa.eu
 website: <http://nuclearsafeguards.jrc.it>



L2IS – Laser Item Identification system



Geographical front-end of the treaty monitoring platform providing integrated access to all available spatial and non-spatial information related to a given facility

Verification Technologies and Methodologies for Nuclear Safeguards (VERTEC)

VERTEC designs, develops, integrates and pilot tests applications of emerging information and communication technologies to cope with present and future challenges in the evolving scenarios of EURATOM Treaty Safeguards and the Additional Protocol to the Non-Proliferation Treaty. It supports the implementation of a new Commission recommendation on Nuclear Material Accountancy and Control Systems and related audits of such systems. VERTEC activities include inspectors' training in relevant fields.

Major 2008 achievements

Safeguards at Gas-Centrifuge Enrichment Plant

Gas Centrifuge Enrichment Plants (GCEPs) are at the forefront of attention by Safeguards and Non-Proliferation authorities. VERTEC developed for the International Atomic Energy Agency (IAEA) a contactless, remote monitoring verification system (L2IS – Laser Item Identification system) capable of uniquely identifying (i.e., authenticating) UF6 drums. Designed to be completely autonomous and requiring no intervention by the plant operator, a pilot L2IS system is now installed at an enrichment plant safeguarded by the IAEA. Its operational go-ahead is expected for March 2009.

Safeguards for Geological Repositories

VERTEC joined IAEA's ASTOR expert group on 'Safeguards for Geological Repositories' in 2006. After 2007's technical experiment in modelling Finland's Onkalo tunnels (in close collaboration with STUK), it became clear that 3D technologies had a role for providing an accurate description of the premises as well as for future site verification. Since then, the IAEA's ASTOR group recommended 3D laser scanning for Design Information Verification of Geological Repositories. This is a significant contribution, by means of a methodology, instrumentation and related analysis software, to safeguarding a new type of nuclear installation as final geological repositories.

Nuclear Security Emergency Response

The Commissariat à l'Énergie Atomique (CEA) is involved in France's Security Emergency Response for Radiological and Nuclear threats. CEA acknowledged that VERTEC's 3D technologies can be instrumental for the development of security emergency equipment and proposed a VERTEC-CEA collaborative research project. This project is one of the actions included in the cooperation agreement on security research between CEA and JRC, signed in January 2009.

Audit based Methodology for Safeguards

During 2008, VERTEC continued its support to the Directorate-General for Energy and Transport (DG TREN) in the field of accountancy of nuclear material under the EURATOM Treaty, namely for DG TREN to audit the systems of nuclear materials accountancy and control (NMAC) in EU facilities. The work included an intense collaboration in formulating and drafting a new Commission Recommendation on the implementation of NMAC systems by nuclear operators. The draft recommendation was distributed internally to the Commission in September 2008 for inter-service consultation. In collaboration with DG TREN staff, VERTEC provided a seminar for EURATOM inspectors. The seminar introduced inspectors to the draft Commission recommendation and discussed how it might be used for elaborating an audit inspection.

Assessing Nuclear Material Accountancy Balance Closure

During 2008 the assessment of nuclear material accountancy balance function was the object of a special study to upgrade the statistical testing methods that could be used. VERTEC elaborated statistical test methods to give facility management and control authorities a new way of assessing a balance while taking account of hold-up and uncorrected measurement bias as possible explanations of material balances. Upon request, VERTEC provided a training course for DG-TREN: "Material Balance Testing and Assessment of the Facility Implementation".

Safeguards Review Station

In recent years, in close collaboration with DG TREN, VERTEC has done research and development work for improving the efficiency of reviewing surveillance image streams. Discussions with the IAEA are progressing in view of the possibility to include the developed algorithms as part of their novel Next Generation Surveillance System camera reviewing software. Furthermore, a new research line on image summarisation has been initiated.

Information Management Tools for Treaty Monitoring

VERTEC finalized the developments of the 'Site Information Tool for European Safeguards', a geographic information system for the management and analysis of Safeguards-related information at DG TREN. The system is now in operation at DG TREN.

Furthermore, the LIMES platform ('Land and Sea Integrated Monitoring for European Security') was successfully demonstrated at a user workshop attended by more than 20 participants including IAEA, DG TREN and EUSC. Within the LIMES project, VERTEC led the developments of the integrated platform to support image analysts in the verification of treaty compliance based on satellite imagery and other spatial and non-spatial information.

Integrated Remote Operation and Monitoring

VERTEC developed a first prototype version of the Safeguards Simulation Tool (SST) - a virtual reality application for designing robust safeguards surveillance systems. With the SST, being at Safeguards headquarters, the nuclear inspector can design and evaluate a surveillance system by selecting and locating virtual equipment in a modeled plant environment. The plant behaviour is simulated by animations to assess the robustness of the design.

Challenges for 2009 and beyond

There is a constant need to 'stay ahead of the game' in all security application areas, including Nuclear Safeguards. The evolution of Information and Communication Technologies is a major driving factor for better and/or improved equipment and tools. This constant evolution is based on new/improved sensory devices and tools, including data and information processing, analysis and management. Often, improved tools are the result of data fusion and clever integration of information from different sources, resolutions and time frames. VERTEC's vision is that Information and Communication Technologies, in their widest sense, will play an ever increasing and strategic roles in the design of future Safeguards and Security instrumentation and monitoring equipment, as well as in data processing, analysis, visualisation and management. Targeted research, technology selection and system's Integration are key factors for the successful implementation of future Safeguards approaches.

In 2009 this action will be renamed NUVER (Nuclear Facilities Verification).



3D model of Onkalo tunnels



Safeguards Simulation Tool - Analysis of blind surveillance areas (from 2 cameras)

GLOSSARY

CEA Commissariat à l'Énergie Atomique

DG TREN Directorate-General for Energy and Transport

EUSC European Union Satellite Centre

GCEPs Gas Centrifuge Enrichment Plants

IAEA International Atomic Energy Agency

LIMES Land and Sea Integrated Monitoring for European Security

L2IS Laser Item Identification system

NMAC Nuclear materials accountancy and control

SST Safeguards Simulation Tool

UF6 Uranium hexafluoride

AMENUS

CONTACT

Giacomo G.M. Cojazzi
Tel +39 0332 785085
e-mail: giacomo.cojazzi@jrc.ec.europa.eu
website: <http://nuclearsafeguards.jrc.it>

What is Generation IV International Forum (GIF)?

The Generation IV International Forum is a framework chartered in 2001 for international co-operation in research for a future generation of nuclear energy systems on which 9 founding countries agreed. GIF was joined by Switzerland in 2002 and by Euratom in 2003 and, more recently, by China and Russia at the end of 2006.

The GIF overall objective is to support research and development, within a time frame from 15 to 20 years, of concepts for one or more Generation IV Systems that will provide competitively priced and reliable supply of energy to the countries where such systems may be deployed, while satisfactorily addressing economics, nuclear safety, waste, proliferation and public perception concerns.

Assessment Methodologies for Nuclear Security (AMENUS)

There is an overall trend to increase the use of systems analysis techniques, derived from the safety, in the security domain. The AMENUS action contributes to the development of methodologies, software tools and probabilistic methods for the evaluation of Nuclear Safeguards Effectiveness, Proliferation Resistance of existing and advanced nuclear energy systems including related fuel cycles and research reactors.

Motivated by the EU Council Regulation setting a “Community regime for the control of exports of dual use items and technology”*, the project on trade analysis has progressed with the identification of trade data sources and assessing their possible use to inform verification activities carried out by the International Atomic Energy Agency (IAEA). Open source information and technical knowledge of the fuel cycle are used, on customer demand, for compiling Nuclear Country and regional profiles as well as for characterizing emerging proliferation threats.

Networking is an essential asset in a knowledge growing society. JRC-IPSC was among the founders of the European Safeguards Research and Development Association (ESARDA) and of the European Safety Reliability and Data Association (ESReDA). The action contributes and supports both associations.

Major 2008 achievements

Proliferation Resistance and Physical Protection Methodologies and Studies

This activity is mainly related to supporting the Euratom participation in the Generation IV International Forum (GIF)** and to contribute to the IAEA International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)***. AMENUS contributes actively to the GIF Working Group on “Proliferation Resistance and Physical Protection” (PR&PP) and to the INPRO project on Proliferation Resistance Acquisition and Diversion Analysis (PRADA). In 2008, the appendixes of the Revision 5 of the PR&PP methodology were made available on the GIF web site**** and a two-year case study, started in 2007, was completed. The study analysed the response of an entire hypothetical nuclear energy system, named Example Sodium Fast Reactor (ESFR), to different proliferation (diversion, misuse, and breakout) and theft strategies, and considered different design variations of the ESFR: figure 1 presents in a compact way the possible way for covertly producing Pu.

Safeguards by Design and Systems Analysis for Nuclear Security

“Safeguards by design” is a new emerging topic. In a nutshell, new facilities will have to be designed taking into account safeguards requirement since early design stages: this will pave the way to more effective and efficient safeguards. In 2008 an activity on safeguards by design was activated by IAEA with the Member States support programmes to the Agency. The work on systems analysis applied to security and on the JRC proprietary tool for Fault Tree analysis ASTRA code (figure 2)*****, especially developed for safety and security applications, was continued with extended testing and investigations on large trees.

Trade Analysis and Export Control

As part of a European Commission Support Programme Task to the IAEA, a survey of world trade data from the open source was conducted (figure 3). A catalogue was produced to cover services offering data on trade. The survey was motivated by the hypothesis that trade databases may be useful to support IAEA verification activities. Trade data may indeed provide insights to assist the



Fig. 1: Pathway Identification for covert Pu Production in ESFR NES

* 1334/2000 and amendments

** <http://www.gen-4.org/>

*** www.iaea.org/INPRO/

**** <http://www.gen-4.org/Technology/horizontal/proliferation.htm>

***** http://ec.europa.eu/dgs/jrc/downloads/jrc_tp2690_astra.pdf

verification of additional protocol and nuclear material transfer declarations, as well as to give indications of possible undeclared activities. This hypothesis is being confirmed by positive results obtained by testing these new sources of information on sample cases provided by the IAEA and carried out jointly by IAEA staff and JRC researchers.

Open Source Information Collection and Analysis and Non Proliferation Studies

Daily news on nuclear security issues are regularly monitored by using the European Media Monitor tool. A special category of keywords, named JRC-Safeguards is defined and maintained, thus allowing timely identification of relevant issues and trigger of alerts. New studies were initiated, such as a study on the US–India civilian nuclear deal. As a product of a modelling activity on enrichment centrifuges installations, estimates of Iran enrichment capability were made in collaboration with the action PHMOD. Some of the preliminary results were presented in an interview published in the Nature on-line journal*.

ESARDA & Networking

JRC-IPSC continued to provide the general secretariat to ESARDA including the maintenance of the on-line knowledge repository where all the symposia proceedings and other relevant documents can be fully accessed**. In 2008 a focussed effort was done to streamline the publications of the ESARDA Bulletin and three new issues of the Bulletin were produced in 2008, including a special issue dedicated to Proliferation Resistance.

The support to ESReDA also continued, with the publication of the Seminars Proceedings which are issued both in paper form and as CD-ROMs. The whole collection of old ESReDA proceedings was digitalised and will be made available on the ESReDA web site*** during the course of 2009.

Challenges for 2009 and beyond

Proliferation resistance analysis of future nuclear energy systems will remain a topic for future work. The PR&PP group of GIF will strengthen its collaboration with the Systems Steering Committees of the generation IV nuclear energy systems. White papers on the PR&PP issues will be issued for each GEN IV design and this will trigger new studies. In addition, the emerging topic of safeguards by design will be also an area of future work.

On the side of trade analysis in support to IAEA verification activities, the work will continue and expand and a software prototype tool will be developed and delivered to the Agency in 2009 to support trade analysis and the identification of relevant codes for the queries in trade databases. An event on export control will be organised jointly with US Department of Energy and European Union member states. The need to set up a European network of technical experts on dual use issues will be identified.

The work on country profiles and non-proliferation studies will continue exploiting synergies and tools developed within the JRC and tailoring them to the needs of non-proliferation assessments. The Council of the European Union adopted in late 2008 the action plan “New lines for action by the European Union in combating the proliferation of weapons of mass destruction and their delivery systems” (ST 17172/08); this document will trigger a number of initiatives relevant to JRC work including the activity on non-proliferation studies.

In 2009 this action will be renamed IANUS (Information Analysis for Nuclear Security).



Fig. 2: JRC ASTRA-3 code for fault tree analysis for safety and security applications



Fig. 3: Countries covered by services on trade transactions. For each country the number of years data is shown

GLOSSARY

ESARDA European Safeguards Research and Development Association

ESFR Example Sodium Fast Reactor
ESReDA European Safety Reliability and Data Association

GIF Generation IV International Forum

IAEA International Atomic Energy Agency

INPRO International Project on Innovative Nuclear Reactors and Fuel Cycles

NES Nuclear Energy System

PRADA Proliferation Resistance Acquisition and Diversion Analysis

PR&PP Proliferation Resistance and Physical Protection

* Nature news, published on line 12 February 2008 | Nature 451, 750-751 (2008)

** <http://esarda2.jrc.it/>

*** <http://www.esreda.org/>

NuTraSeal

CONTACT

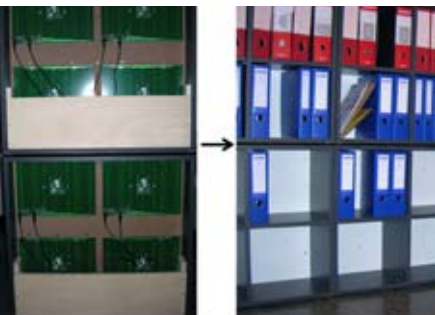
Marco Sironi
 Tel. +39 0332 785754
 e-mail: marco.sironi@jrc.ec.europa.eu
 website: <http://silab.jrc.it/>



Tagged folder, RFID sticker tags, tagged paper sheets



Management of classified documents (bookshelf, tagged folders, database, tagged sheets, tags, scanner with reading RFID antenna, document tray with RFID antenna)



Bookshelf with RFID antennas on the back, front view with tagged folders

Development and Validation of Nuclear Traceability and Sealing Systems (NuTraSeal)

The Nuclear Safeguards programme calls for robust and durable sealing systems that allows tracing and tracking, monitoring, identification and verification, over a period of several years, for containers used in underwater storage of fissile materials or for transportation of nuclear fuel. The sealing system shall be radiation resistant and particularly reliable even in very harsh environmental conditions.

NuTraSeal, in the framework of the Euratom Treaty, provides technical support to the Directorate General for Energy and Transport (DG TREN) and to the International Atomic Energy Agency (IAEA) in the form of research development and deployment of sealing and identification equipment and of environmental and electromagnetic testing of inspector equipment in the SILab and TEMPEST laboratories.

The specific tasks are agreed with the customer in the framework of the JRC-DG TREN co-operation agreement and of the EC Support Programme (SP-1) with the IAEA.

Major 2008 achievements

Ultrasonic Bolt Seals

The IAEA has used ARC seals manufactured by the Atomic Energy of Canada Ltd. to seal underwater storage of spent nuclear fuel bundles in CANDU reactors located at the Cernavoda power generation facilities in Romania. After a nearly twenty-year service life, the ARC seal is no longer easily supportable. Within the framework of the European Commission Support Programme, the IAEA asked the JRC-IPSC to develop a new CANDU sealing system. JRC-IPSC spent considerable effort in developing the design of the new sealing system and the first JRC CANDU Seals (JCS) were placed in the spent fuel pond in June 2006. The IAEA decided to replace the existing ARC seals with JCS seals. Every spent fuel bundle stack is sealed with two seals, and in 2008 half of them were replaced with JCS seals. Early in 2008, the newly developed sealing systems for dry and underwater storage applications (hundred bolt seals and two reading systems) were sent to the USA at Sandia National Lab for an external independent vulnerability assessment.

In parallel, JRC-IPSC produced a full operational sealing system and started installing seals in Cernavoda obtaining very promising results. The success of this application drove IAEA to classify JCS seals in category A to enable them for full operational use.

The IAEA requested an additional set of seals for Cernavoda I to complete the replacement of the Canadian ARC seals. A second operational system with associated installation tools was requested for Cernavoda II.

An intense work was carried out to complete a vulnerability assessment of the sealing system and to upgrade the data acquisition system and the ultrasonic board interface.

A permanent support to inspectors in Vienna and Cernavoda is given improving both the mechanical and software aspects of the seals and the reading system. Several training sessions at JRC-IPSC and on the nuclear facilities were organised for the inspectors.

The task focused also on the development of new applications requested by the IAEA for both dry and underwater storages in Lithuania, Pakistan and Kazakhstan.

System for managing classified documents

Radio Frequency Identification (RFID) technology has been applied for setting up a demonstration system for confidential document management. Folders and classified documents are tagged with RFID labels and the related information is stored in a database. RFID technology allows to periodically perform an inventory of the secure library and to exactly know the document history (who had access to the document, which operation has been performed on it and by whom, etc.). The implemented demonstration consists of a small-scale secure library, in which it is possible to continuously monitor which documents are inside the secure area and to signal in real time when a document is taken away. According to the planning, a proof of principle demo was presented to DG TREN in June, which provided further inputs for the implementation of an operating prototype by end of 2009.

Challenges for 2009 and beyond

Ultrasonic seals will be more and more requested by IAEA because of their very good performances and reliability in highly radiated environments. The target is to extend the sealing system used in Cernavoda to other CANDU reactors, for example in Pakistan or Canada. The success of the JCS drives the design of new sealing systems for dry storage applications.

IAEA requested the JRC-IPSC to become a vulnerability assessment laboratory to assess their new equipment.

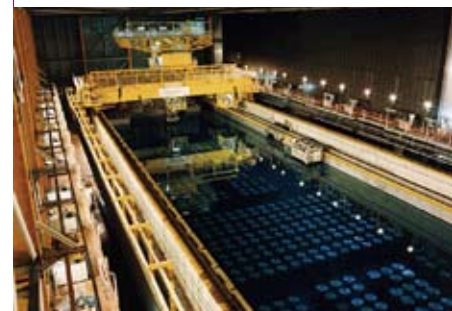
On the basis of the proof of principle, a prototype of RFID system integrated with security technology to monitor accesses to classified document will be implemented in Luxemburg. This system will reflect the normal procedures currently used by DG TREN for accessing classified documents. It will also demonstrate extensions that can be added to the actual procedures or some adaptations for other end-users.



JRC CANDU sealing system (seal, reading head and acquisition system)



Last generation of sealing system for dry storage applications (seal, reading head & acquisition system)



*Spent fuel pond in Sellafield
© Sellafield Ltd*

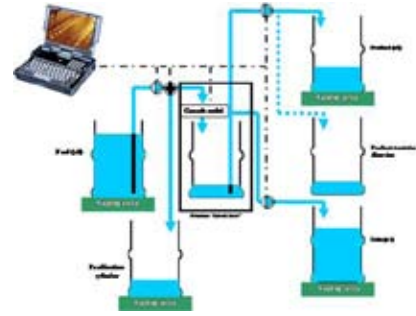
GLOSSARY

- ARC** AECL Random Coil (AECL: Atomic Energy of Canada Ltd)
- CANDU** CANada Deuterium Uranium is a registered trademark of the Atomic Energy of Canada Ltd
- DG TREN** Directorate General for Energy and Transport
- IAEA** International Atomic Energy Agency
- JCS** JRC CANDU seals
- RFID** Radio Frequency Identification
- SILab** Sealing and Identification Laboratory at JRC-IPSC
- TEMPEST** Thermal, Electro-Magnetic, Physical Equipment Stress Testing Laboratory at JRC-IPSC

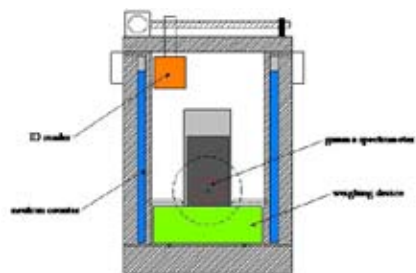
PhyMod

CONTACT

Paolo Peerani
 Tel. +39 0332 785625
 e-mail: paolo.peerani@jrc.ec.europa.eu
 website: <http://npns.jrc.ec.europa.eu>



Test-bed facility for testing load cell monitoring in GCEP



Combined measurement station (weighing scale, neutron counter, gamma spectrometer, laser identification) for PuO_2 samples laboratory.

Unattended safeguards of a PuO_2 store

At the request of DG TREN, PHYMOD performed a feasibility study for unattended safeguards of a PuO_2 storage. Currently, the access of the main part of the store is only authorised in the presence of an inspector of DG TREN who has then to dedicate his/her time to watch the operations in the facility and to perform the measurements of a fraction of the samples with the EURATOM instrumentation. This study led, among other developments, to the design of a combined measuring system which will identify the number engraved on the container lid, weigh the container and perform neutron and gamma measurements of the nuclear material.

Physical Modelling and Analysis of Instruments and Systems (PhyMod)

JRC-IPSC has developed methods (based on Monte Carlo techniques) to simulate the behaviour of Non-Destructive Assay (NDA) instruments used in nuclear safeguards. The simulation technique has become a valid and valuable tool to replace measurement every time the experiment is impossible. The first application of modelling in the field of safeguards has been the calibration of NDA instruments, but recently an important new application avenue has been developed to describe nuclear installations and plants in connection to process monitoring techniques.

The Tank Measurement (TAME) laboratory at the JRC-IPSC developed the software tool DAI – Data Analysis and Interpretation - that continuously monitors nuclear material flow through a reprocessing plant based on syntactic pattern recognition analysis. This process monitoring tool aims at a verification of the consistency and coherency of plant operation with safeguards requirements, and so at near real time accountancy. This allows timely comparison of the operational reports of the facility and the inspector's observations.

Concerning the new applications on nuclear security, PhyMod is focussing in the field of detection and activities cover the improvement of metrology (through better discrimination of real and innocent alarms), testing and qualification of detection equipment and training.

Major 2008 achievements

Process monitoring in reprocessing plants

In the last two years, JRC-IPSC has implemented the DAI software at THORP in Sellafield in order to enhance the process monitoring of the facility performed by the Directorate-General for Energy and Transport (DG TREN) inspectorate. Fine tuning of the parameterisation and integration of other automatically acquired information were done to complete the monitoring of the process. Support is also given in the framework of the EC support programme to the International Atomic Energy Agency (IAEA) for the configuration of the SMS system at Rokkasho (Japan). Training is also part of the support given to DG TREN and IAEA inspectors.

Process monitoring in Gas Centrifuge Enrichment Plants (GCEP) facilities

JRC-IPSC proposed two non-intrusive systems which might potentially reveal diversions or undeclared activities in a GCEP. The first one, Real Time Mass Evaluation (RTMES) is based on the mass balancing between weights recorded by the load cells at the input of the cascade hall (feeds) and the ones recorded at the output (products and tails). The second system, Mass Slope Continuous survey (MSCS), is based on the follow-up of the slopes, of the feeds, products and tails. Some changes of those slopes might indicate a diversion of nuclear material or illegal activities such as the production of uranium at enrichment higher than declared. A test bed facility has been designed and is been implemented for the testing of the pertinence of RTMES and MSCS (see figure).

Neutron counting

The studies and developments of novel electronics for neutron coincidence and multiplicity counting has continued in collaboration with some international partners, such as the Los Alamos National Laboratories (USA), the Institut de Radioprotection et Sureté Nucleaire (France) and the Institute of Isotopes (Hungary). The scope of this common project was to assess the performances of new digital-based acquisition systems for neutron multiplicity counting intended to replace in the medium term the

traditional analogue electronics based on shift register modules. Different technical solutions were tested and validated and more will be further tested in 2009.

In parallel, the software for time-stamped pulse train analysis has been performed within the framework of an international benchmark exercise, organised by the European Safeguards Research and Development Association (ESARDA).

Concerning Monte Carlo simulations, models were developed to reproduce:

- the fuel measurement station of the Guinevere project in Belgium for Euratom verifications
- the dry storage for spent fuel under construction in Lithuania to analyse the feasibility of monitoring with neutron slabs the movements of casks

Development has started towards a fully automated modelling of fuel configuration on the Sellafield MOX fabrication plant, allowing the acquisition of the plant declaration, the automatic construction of the Monte Carlo model of the fuel and detector, the simulation run with direct comparison with the measurement.

Training on Complementary Access

The second Workshop on Additional Protocol (AP) was organised by JRC-IPSC in March. During this workshop, which has become a permanent training scheme for the IAEA, several Complementary Access exercises were simulated in some of the nuclear facilities: ESSOR spent fuel pond, Ispra-1 reactor, ADECO hot cells and ETHEL laboratory. The goal was to test and improve the investigative and observation skills of nuclear inspectors in the detection of undeclared activities. To do that a modified AP site declaration was prepared with deliberate missing or wrong information. The inspectors were challenged to discover the inconsistencies and the possible indicators of clandestine nuclear activities.

Nuclear Security

Under an Administrative Arrangement with the Directorate-General for Justice, Freedom and Security (DG JLS), JRC-IPSC performed a study on “Survey of Radiological Preparedness to nuclear/radiological threat in EU Member States”. The final report issued to DG JLS contains an overview of the legal issues connected with binding international treaties, of the existing legislative measures, of the practical implementation of detection countermeasures and response capabilities. The recommendations of the report were used as feed to the CBRN (chemical, biological, radiological, and nuclear) Task Force with the mandate to help DG JLS to draft its “CBRN package” policy.

Challenges for 2009 and beyond

Following the recommendations of the “Survey of Radiological Preparedness to nuclear/radiological threat in EU Member States”, JRC-IPSC has been mandated by DG JLS to set-up two projects:

- establishment of a (Nuclear) Security Training Centre (SeTraC)
- development of test procedures for detection equipment certification

The SeTraC will be developed in collaboration between two JRC institutes IPSC and ITU and will cover awareness, detection, response and forensic investigation for illicit trafficking of nuclear/radiological material.

The ITRAP+10 project will aim at developing and testing certification procedures to assess the performances of commercial equipment used for detection of Radioactive/Nuclear materials and to verify their conformity to international standards.

In 2009 this action will be renamed NUSIM (Nuclear Fuel Cycle Simulations).



Instruments and procedures for nuclear security.

GLOSSARY

- ADECO** Atelier DEmantelement COmbustibles
- AP** Additional Protocol
- CBRN** chemical, biological, radiological, and nuclear
- DAI** Data Analysis and Interpretation
- DG JLS** Directorate-General for Justice, Freedom and Security
- DG TREN** Directorate-General for Energy and Transport
- ESARDA** European Safeguards Research and Development Association
- ESSOR** ESSai ORgel
- ETHEL** European Tritium Handling Laboratory
- GCEP** Gas Centrifuge Enrichment Plants
- IAEA** International Atomic Energy Agency
- ITRAP+10** Illicit Trafficking Radiation Assessment Programme
- MSCS** Mass Slope Continuous survey
- NDA** Non-Destructive Assay
- PERLA** Performance Laboratory at JRC-IPSC in Ispra (IT)
- RTMES** Real Time Mass Evaluation
- SeTraC** Security Training Centre
- TAME** Tank Measurement Laboratory at JRC-IPSC in Ispra (IT)

CONTACT

Pascal Daures
 Tel. +39 0332 785852
 e-mail: pascal.daures@ec.europa.eu
 website: <http://npns.jrc.ec.europa.eu>

Training and Education in Nuclear Safeguards and Security (TENS)

JRC-IPSC has a long experience in the provision of training in the nuclear safeguards, dedicated in priority to the inspectors of the Directorate-General for Energy and Transport (DG TREN) and the International Atomic Energy Agency (IAEA). Based on the available experience and tackling the internationally acknowledged needs, the new action TENS extended the activity towards education on the one side and training on nuclear security on the other.

Major 2008 achievements

4th ESARDA Course on Nuclear Safeguards and Non-Proliferation

This fourth session of the course on nuclear safeguards and non-proliferation organised by the European Safeguards Research and Development Association (ESARDA) was followed by 67 participants with mixed background:

- mixture young professionals – university students
- mixture of student education in law and in engineering

This increased success of the course led the organisers to adopt a numerus clausus of 60 trainees for the future sessions in order to keep the quality of the course high. The syllabus of the course, that provides 3 ECTS (European Credit Transfer System) credits for the students, has been reviewed and finalised and will be available for the next course that will take place on March 30 – April 3, 2009.

The Nuclear Security Training Centre - SeTraC

In 2008, the Administrative Arrangement with the Directorate-General for Justice, Freedom and Security (DG JLS) was signed to create a pilot training session in Ispra dedicated to front-line officers (police, customs, border guards) in charge of the detection of and response to cases of illicit trafficking of nuclear and other radioactive materials. This activity is the first step in setting up a nuclear Security Training Centre (SeTraC) that will be created with the support of the Second Line of Defence programme (SLD) of the US Department of Energy (DoE). The SeTraC will provide training in detection and response for front-line officers, experts and trainers of the services involved in the EU and abroad. SLD and the IAEA will use the facility for their own training needs recognising the value of the JRC training capabilities.

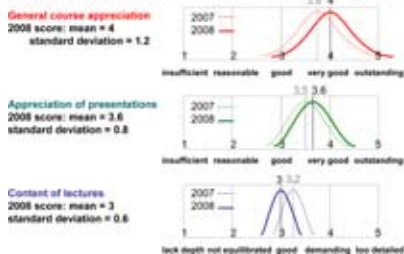
Collaboration with the European Nuclear Education Network (ENEN)

JRC-IPSC supported the 2nd ENEN PhD event that took place in Interlaken (Switzerland) during the International Youth Nuclear Congress on September 23, 2008. The ENEN PhD Event has been organized since 2007 with the objective to provide an opportunity for PhD students to present their work in an international forum and foster good relationship between students and professionals in the field.

A Memorandum of Understanding (MoU) between the JRC and ENEN is being discussed in order to strengthen their collaboration in nuclear education.

Education: Academic course: 4th ESARDA Course 2008

Appraisal of students: Quantification from 54/67 returned questionnaires



Challenges for 2009 and beyond

In 2009, the TENS Action will be integrated into the new action Nuclear Fuel Cycle Simulation (NUSIM).

A new ESARDA course on nuclear safeguards and non-proliferation is planned on March 30 – April 3, 2009. The numerus clausus has been reached before the deadline for registration and more than 20 participants have been refused thus confirming the success of the course on the one side and questioning the opportunity to organise a second annual session in another location on the other side.

The main effort will be deployed for the set-up of the Nuclear Security Training Centre (SeTraC) and the provision of the pilot training session for front line officers of the EU. Necessary equipment will be purchased and training material finalised with the support of the US Second Line of Defence program.

Jointly with the IAEA and SLD, a common training syllabus will be developed to provide joint training sessions in the countries where support programme to counteract the trafficking of nuclear and other radioactive materials are provided by the three organisations. This common approach has been successfully tested during a pilot training session that took place in Ukraine in August 2008.



The nuclear Security Training Centre (SeTraC)

The SeTraC will be used to train law enforcement officers, first responders, experts and managers to be prepared and react to illicit trafficking of nuclear/radioactive material. It will train officers both from the European Union and from non European countries. The centre will be equipped with all the kind of equipment normally deployed at border/security controls and will profit from the nuclear and radioactive material inventory of the PERLA laboratory giving the unique opportunity to organize hands-on training with real nuclear material. The US-Department of Energy and the IAEA will be partners of SeTraC and provide support in the form of equipment, trainers and didactic material.

GLOSSARY

DG JLS Directorate-General for Justice, Freedom and Security

DG TREN Directorate-General for Energy and Transport

ECTS European Credit Transfer System

ENEN European Nuclear Education Network

ESARDA European Safeguards Research and Development Association

IAEA International Atomic Energy Agency

US DoE United States Department of Energy

Exploratory Research Projects

The IPSC exploratory research programme has the aim to provide IPSC's scientific staff with the opportunity and the means to carry out research in new and innovative fields related to IPSC's mission. This research, which can last a maximum of 2 years, is not necessarily focused towards responding to the customer DG needs, more to anticipate technical/scientific needs of emerging EU policy issues and produce tangible results that could lead to future activities to be included in the mainstream of the institutional work programme. The IPSC Scientific Committee has adopted an open attitude and encourages proposals from all thematic areas of IPSC.

In 2008 seven projects were carried out. They ranged from improving security at airports to analysing the effects of aids on the well-being in developing countries.

3-D Urban Structure information from Very High Resolution InSAR imagery

In the domain of emergency response to natural disasters and man-made conflict events, rapid situation assessment is crucial for initiating effective emergency response actions. Remote sensing satellites, such as optical and Synthetic Aperture Radar (SAR) sensors, can provide important information due to their capability to map extended areas of interest in a fast and censorship free manner. Future use of very high resolution (VHR) SAR is expected to become an important complimentary methodology to urban characterisation based on high and very high resolution optical imagery.

This project had the objective of exploring the information content of VHR SAR imagery of 3-D urban structures and to assess the potential and the added value of VHR SAR for urban applications.

Towards secure airport: advanced trusted traveller paradigm using adaptive multi-modal biometrics

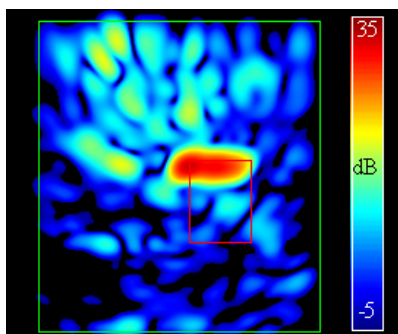
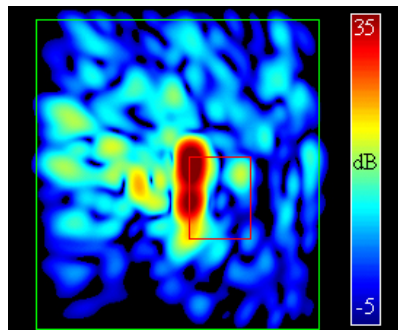
Security of air travel is a major concern for the citizens where airports play a pivotal role. Airports are piloting the idea of Trusted Traveller, where scheme members receive prior security vetting, and are passed through preferential lanes thus accelerating their progress towards the boarding gate. Current schemes based on a single biometric such as finger, face or iris, are restrictive and need to include multi-biometrics.

The objectives of this project were therefore:

- 1 To develop a formal concept of a secure airport and define an advanced trusted traveller (ATT) paradigm based on adaptive multimodal biometrics;
- 2 To investigate the requirements of a cross-border technical infrastructure for multimodal biometrics for air travel process;
- 3 To identify usability issues, including those of the disabled, regarding biometrics based ePassport and trusted traveller cards.

A low-cost portable kit for gathering near real-time information in post disaster scenarios

In disaster management and relief operations retrieving timely and relevant maps and information of affected areas is still an issue. Very High Resolution Satellite imagery has become a precious source to be used in this scenario, but, it is not always possible to collect data at any time and position desired because of returning time of satellite and meteorological conditions. Unmanned Aerial Vehicles (UAVs) have been used in the military sector for quite a long time but only recently, thanks to the miniaturisation of digital sensors and the advances in the field of GPS navigation, mini-UAVs mount an imaging and navigation system on board.



Example dB-power images from EMSL experiment. The green frame indicates the ground plate area, while the red frame identifies the model position.



Registered Traveller Prototype: Multi-modal Biometric Enrolment

The research project objective was to perform a feasibility study of a portable kit for data collection and analysis to be used directly in field campaigns, in order to support relief operations and decision making.

Quantifying the impact of the almost complete cessation of commercial fishing in the North Sea during World War II

Understanding the mechanisms via which commercial fishing pressures, management regimes and environmental changes interact with the ecology of wild fish populations is a key question for fisheries management science. An unintended 'experiment' in fisheries science did occur in the North Sea during World War II (WWII) when commercial fishing almost ceased because fishing vessel movements were restricted due to the dangers and the fact that many fishermen were called up, and their vessels requisitioned for war service. This gives us the opportunity to split potential environmental drivers (temperature, salinity) from those due to commercial fishing.

The objective of this project, therefore, was to re-examine the fisheries and environmental data collected either side of WWII and use them to make predictions about what might happen to fish stocks if fishing capacity and effort can be reduced, which is an objective of the Common Fisheries Policy.

The effects of aid allocation rules on the well-being of the poor in developing countries

Over the last decade, two developments characterised the world of international aid to poor countries. On the policy-making side, for the first time in history, the recipient and donor communities agreed upon a set of shared priorities and adopted indicators to measure progress towards them: the Millennium Development Goals (MDGs). On the research side, academia and the donor community engaged a debate on the conditions under which aid can be most effective in enhancing prosperity.

This exploratory research project aimed at assessing if economic growth is sufficient to assure progress towards the MDGs and the conditions under which development aid best contributes to reaching them.

Bubbling study and clogging anticipation making use of a specially designed tank

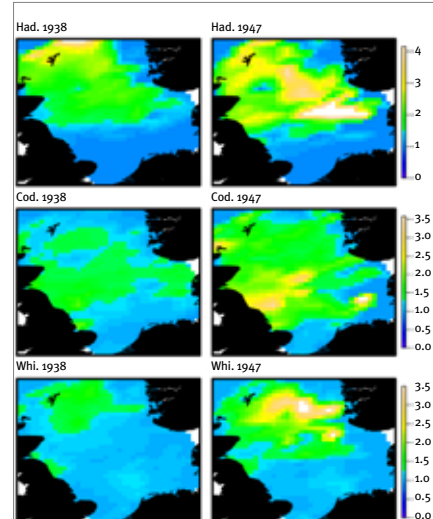
Bubbling systems or pneumaticators are commonly used in chemical and radio-chemical process industries such as reprocessing plants to determine accurately the height, volume and density of solutions in process tanks. These results are used for process control by the operator but also by Safeguards bodies to perform nuclear material accountancy and control. This study aimed at verifying experimentally the impact of differences in some characteristics such as the density, dip tube immersing depth, surface tension on the accuracy of the measurements by visualising the bubble dynamics. In addition, this allows to follow up the status-of-health of the dip tubes immersed in the solution

Crop yield loss estimation based on precipitation runoff

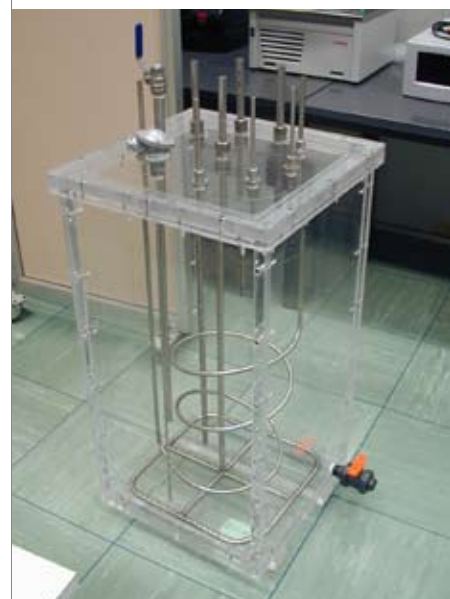
The main objective of the project was to evaluate the potential effect of surface runoff on crop yield. In specific, the linkage between the Crop Growth Monitoring System (CGMS) and surface runoff model was to be investigated.

Currently, although precipitation runoff modelling is used in environmental studies, it is not used in crop yield forecasting. The intention of the project was to bridge this chasm by exploring a technique to incorporate precipitation runoff modelling into crop yield forecasting.

A full description of the IPSC 2008 Exploratory Research Projects is available on line at <http://ipsc.jrc.ec.europa.eu/publications.php?id=2>



Landings (total kgs) of haddock, cod and whiting caught per hour by the commercial steam trawler fleet in the North Sea before (1938) and after (1947) World War II.



General view of the BuSCA vessel.

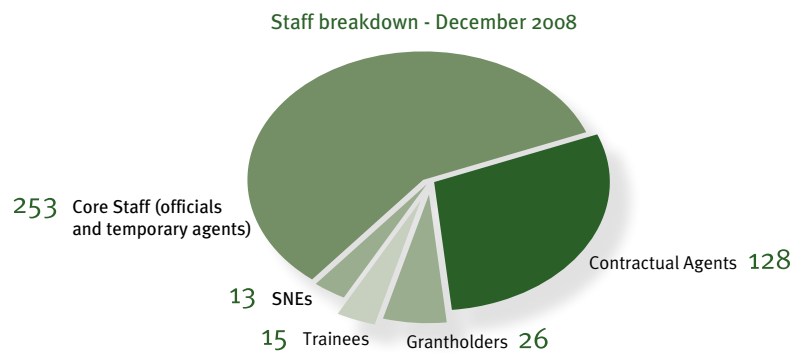
FIGURES

STAFF

JRC-IPSC in figures

Staff

As of 31 December 2008 JRC-IPSC employs 435 staff of which 253 are European Commission officials and temporary agents, the others being contractual agents (128), grantholders (26), Seconded National Experts (13) and trainees (15). Women represent 25% of the total staff figures. Of the 435 total, roughly 85% staff members are working on scientific projects in support to customers and 15 % staff members are doing administrative or support work.

**Publications**

Research carried out in IPSC is reported in scientific publications, such as scientific journals, conference proceedings and scientific and technical reports.

The full list of IPSC publications in 2008 is available on <http://ipsc.jrc.ec.europa.eu/publications.php>

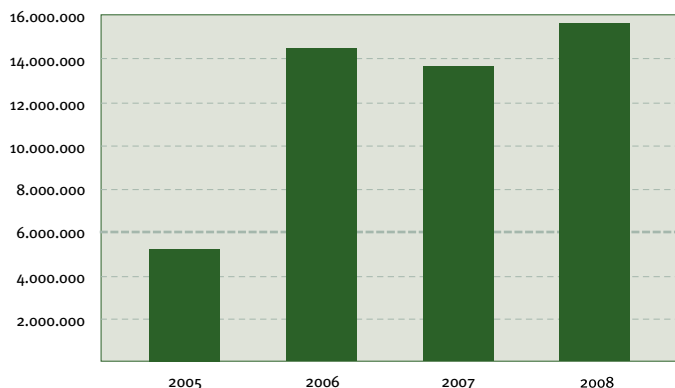
Category	2008 IPSC publications
Monographs and articles	129
JRC Scientific and Technical Reports	136
Contributions published in Conference Proceedings	86
Special Publications (e.g. PhD theses, maps)	3
TOTAL	354

PUBLICATIONS

JRC-IPSC competitive activities

A part of the Institute's budget is competitive income from work performed in support to Directorates General of the Commission (SCO), income from participation in EU Framework Programme (Indirect Actions, IND) or from work performed for third parties (TPW). In 2008 JRC-IPSC has cashed 15,5 million euro exceeding the targets set by more than 30% for the third year in a row.

IPSC COMP cashed in 2005, 2006, 2007 and 2008 (in EURO)

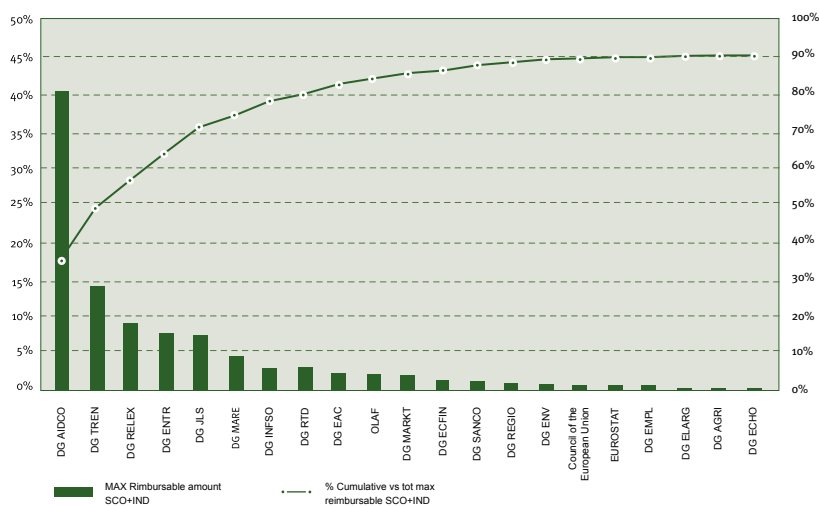


In total 80 new competitive projects were started in 2008, representing a total value of 23,394 millions of euros.

The EU Framework Programme for Research and Technological Development (FP7) started in January 2007. During the year 30 proposals were submitted as partner in Indirect Actions, the biggest proportion in calls within "Security" and "Information and Communication Technologies".

Here below the 2008 income by customer in support to Directorates General of the Commission (SCO), and from participation in EU Framework Programme (Indirect Actions, IND):

Generated Competitive income by EU clients and accumulated % of clients contribution in 2008



Due to its expertise information and communication technologies, combined with experience in Nuclear Safeguards, the institute cooperates with many different services of the European Commission with competitive activities, as shown by the above bar chart. As it can be seen the range of IPSC partners is quite broad and well distributed in the different areas of competence of the EC.

More information on IPSC competitive activities is available at <http://ipsc.jrc.ec.europa.eu/activities.php?id=2>

JRC-IPSC organigramme



IPSC Director
Stephan Lechner



Global Security and
Crisis Management
Delilah Al-Khudhairy



Monitoring
Agricultural Resources
Jacques Delincé



Maritime Affairs
Thomas Barbas



European Laboratory
for Structural Assessment
Michel Gérardin



Security Technologies
Assessment
Alois Sieber



Traceability and
Vulnerability Assessment
Thomas Hartung



Nuclear Security
Willem Janssens



Econometrics and
Applied Statistics
Andrea Saltelli



Management
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European Commission

**EUR 23746 EN –Joint Research Centre, Institute for the Protection and Security of the Citizen
Title: Institute for the Protection and Security of the Citizen - Annual Report 2008**

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Abstract

The annual report of the Institute for the Protection and Security of the Citizen highlights the major achievements and resources related to its work during 2007. An overview is given of IPSC mission and its implementation, the scientific activities and the relations with the outside world.

The mission of the Joint Research Centre 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 Joint Research Centre 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.

