# INFOMAR Call for Research Proposals
## 19th October 2011
## Value Added Exploitation Programme

The **IN**tegrated Mapping **FO**r the Sustainable Development of Ireland's **MA**rine **R**esource (INFOMAR) programme, is a joint venture between the Geological Survey of Ireland and the Marine Institute. The programme is a successor to the Irish National Seabed Survey (INSS) and concentrates on creating a range of integrated mapping products of the physical, chemical and biological features of the seabed in the near-shore area.

The programme is being funded by the Irish Government through the Department of Communications, Energy and Natural Resources as part of the National Development Plan, 2007 – 2013.

Included in the objectives of the INFOMAR Programme, under strand 3, Value Added Exploitation, is the objective to deliver "A programme of national and international value added research to leverage the skills, expertise and data from the INSS and INFOMAR".

To this end INFOMAR is engaging in a call for research proposals. The research call is designed largely to fund applied desk studies with an optional field work component. INFOMAR are keen to promote research and industry partnership, and encourage applied collaborative proposals, particularly in areas which may be subject to future potential commercial opportunities, growth, and/or jobs.

Public Research Organisations are entitled to 100% funding under the grant aid terms of this research call, while Industry Partners (SME's) have a limited entitlement to a maximum of 80% of eligible costs (See Appendix 2), in accordance with the EC Community Framework for State Aid For Research, Development & Innovation (2006/c 323/01).

# INFOMAR 2011 - INDICATIVE APPLIED RESEARCH TOPICS

## *a) Data Integration, Analysis & Visualisation*

### I. Satellite Remote Sensing Coastal Mapping:

INFOMAR are interested in an assessment of the value exploitable from remote sensing data in coastal mapping of near-shore bathymetry, geomorphology, and habitat.

- Methodologies for processing and integrating remote sensing data or associated products with existing INFOMAR products should be addressed, in particular where any automation of same could be developed.
- Data cost, resolution, scale, impact of turbidity, and groundtruthing should be considered.

Recommendations should be provided on progressing integration of satellite remote sensing data analysis to marine mapping.

### II. LiDAR & Aerial Photographic Coastal Mapping:

Seabed bathymetry and geomorphology information can be extracted from a combination of satellite, LiDAR and aerial photographic data. Where marine LiDAR data have been acquired by INFOMAR without backscatter information available to assess seabed character and habitat, optimising the potential from integrating additional aerial photographic and terrestrial LiDAR data is critical in mapping this land marine interface.

- Significant coastal aerial photographic data resources exist within INFOMAR, OSI, OPW and elsewhere, which could be collectively compiled and analysed for geomorphological and habitat mapping purposes. A pilot study could be done to identify technical issues, and devise methodologies, and the feasibility of a large scale study could be assessed.
- Large scale integration of terrestrial LiDAR data acquired below High Water has not yet been undertaken, and the feasibility and cost of doing so could be assessed.

Establishing methodologies, and where appropriate developing techniques and procedures to optimise efficiency of integration, interpretation, and delivery of these large scale & large volume datasets are key issues to address.

### III. Marine Geology - Shallow Stratigraphy

Large shallow seismic databases have been generated within the INSS and INFOMAR programs. A considerable amount of shallow cores have been acquired over the last 5 years and INFOMAR are interested in:

- Creation of a large-scale shallow seismic database management system using Kingdom, CodaOctopus, or equivalent geophysical interpretation software.
- Sediment core multidisciplinary analysis and shallow seismic integration.

## IV. GIS Desktop Studies

INFOMAR marine datasets are generally organized in ESRI GIS databases. INFOMAR welcome GIS desk studies or projects developing novel designs in database management tools and/or routines in a number of areas including:

- Underwater video /imagery database management and visualization.
- Coastal mapping GIS projects and sediment core analysis integration.
- Multibeam backscatter processing and GIS integration. INFOMAR Geocoder software can be made available to facilitate backscatter processing.
- Investigation of association of fish spawning & nursery grounds with INFOMAR data for resource and site management purposes.
- Investigation of development of a Marine Mapping Planning tool, taking account of the multiple inputs both physical (water depth, weather, vessel speed etc) and economic (fuel costs and consumption, personnel rates etc).
- Assessment of seabed interactive fishing activity & pressure (e.g. trawling extent), associated temporal sensitivities (peak seasons), and determination of habitat recovery. This could incorporate investigating the potential for sustainable seasonally adjusted fishing activity within SAC's where certain activities are not currently permissible year round.
- Mapping requirements that will arise from the Marine Strategy Framework Directive (MSFD) implementation (Article 8):
  a) Marine characteristics and environmental status, (Table 1 of Annex III)
  b) Pressures and impacts on environmental status (Table 2 of Annex III)

## V. 4D Data Integration

With the ongoing implementation of the Marine Strategy Framework Directive (MSFD), integration, visualisation, interpretation, and analysis of the full suite of all available spatial marine data will become critical. Assessing environmental change within the marine environment will involve studying interactions between the atmosphere, oceanography, biology, chemistry, seabed, and humans. The ability to achieve an understanding of the temporal variation of these interactions is significantly improved through the use of tools which facilitate 4D integration and visualisation of the marine environment. INFOMAR currently use GIS for data integration and 2D visualisation, Fledermaus & GeoVisionary for 3D visualisation and EonFusion for 4D analysis. INFOMAR are interested in:

- Assessment of the optimal capabilities of the INFOMAR 3D & 4D data visualisation and integration architecture in merging multidisciplinary data, identification of technical challenges therein, and developing methodologies / standards, and/or potential new products. Alternative 4D solutions (freeware or otherwise) for such studies may also be investigated.
- Establishing how these tools may best be applied in reporting on marine environmental status for the MSFD descriptors 6, 7, and 8, in particular with respect to monitoring temporal variation in seabed habitat, sediment dynamics, hydrographic conditions, and sound energy introduction to the marine environment.

### VI. Marine Data Integration / Offshore Aquaculture & Ocean Energy

The areas of Offshore Aquaculture and Ocean Energy are currently being targeted for future strategic development in Ireland. Significant technology development is required to facilitate the transition necessary to realise the future growth potential in these areas. In turn this may provide considerable market opportunity for engineering solutions and service requirements to support and manage such industries.

INFOMAR are interested in establishing how available baseline INFOMAR data can best be integrated and new products identified, with regard to optimal site selection, equipment deployment, installation, and anchoring, as well as site environmental monitoring and future management.

## *b) Tools & Technology Development*

INFOMAR are keen to optimise the data that can be routinely acquired during ongoing survey operations to maximise cost efficiency of fieldwork. The following are examples of areas of interest for potential inclusion in routine data acquisition, but requiring research support for implementation:

### I. Biodiversity Mapping

There are ongoing developments in the area of quantifying and mapping potentially exploitable marine species e.g. echosounder mapping of seaweed. INFOMAR are interested in assessing the feasibility of incorporating any such techniques into routine survey operations, and welcome proposals outlining how best this could be undertaken and/or automated to minimize post processing requirements.

### II. Vessel Mounted Imaging System

Coastal erosion and flood risk investigations are critical for the security of the significant communities and businesses sited in our coastal environment. A critical component in determining coastal exposure risk, is establishing the susceptibility of the coastal environment to erosion. This is best ascertained through direct observations, and there is potential for building a data catalogue in support of this during INFOMAR operations.

There is scope for design of a marine grade vessel deployable HD stereoscopic photographic and/or video system. It could be interfaced with vessel positioning and motion reference systems to correct for platform movement and georeference imagery. Design of an intelligent system control and management interface could manage the data, voice control the data logging, and voice tag features or erosion events observed. Stereoscopic imagery would facilitate future incorporation to 3D visualisation environments for simulated coastal transits and port entry navigation.

## III. Seabed Lander

The design of a multidisciplinary near-shore Seabed Lander for deployment at proposed infrastructural development sites for baseline sediment dynamics, oceanographic, and environmental monitoring purposes is of interest to INFOMAR. Availability of a state of the art low cost Seabed Lander would act as a research catalyst, a valuable sensor test platform augmenting the proposed Smart Bay development plans. INFOMAR equipment currently available for deployment on such a platform includes:

1. Camera equipment for monitoring sediment / species dynamics
2. Seabed scanning sonar for monitoring 3D seabed variability over time
3. ADCP & CTD oceanographic instrumentation
4. Water quality monitoring instrumentation

***Objectives may include:***

- Structural design for deployment in depths approximately between 10-50m including mooring, recovery, and equipment mounting.
- Optimisation of instrumentation payload for different applications, and configuration for data logging and power consumption.
- Test deployment and system reconfiguration.

***Applications*** include:

- Assessment of seabed sediment mobility near aquaculture sites
- Investigation of scouring around moored structures
- Data provision for several MSFD Good Environmental Status Descriptors
- Provision of temporal variation in habitat and sediment dynamics

## IV. Survey Data Integration with Navigation Systems

Scope exists for research and development in the area of marine survey systems integration. Survey efficiency could be optimised through real time analysis of survey data acquired, and interfacing that with onboard vessel navigation systems, including auto-pilot and USBL systems.

## V. Information and Communication Interface for Seabed Mapping Data

There is significant scope for developing software applications for provision of INFOMAR marine data resources to service the marine leisure, tourism, fisheries and education sectors.

INFOMAR hosts a 3D terrain model of the seabed offshore Ireland, unlike any other available worldwide. A wealth of additional marine resource data is also available external to the programme. Opportunities exist to interface these data resources for a variety of purposes including the following:

**Marine Leisure, Tourism, Fisheries, Education:**

- ***Diving:*** Interactive web-map interface promoting dive tourism integrating; INFOMAR seabed classification, habitat and wreck data, logistical information including piers, slips, tides, a photographic catalogue system with scientific interpretation of species for educational purposes.

- ***Angling / Diving / Inshore Fisheries:*** INFOMAR Seabed classification charts, wreck data & 3D bathymetric data (e.g. rock / mud sand) integrated with handheld and marine leisure grade GPS systems, or specifically designed palmtop / desktop applications.

  Useful link: http://www.anglingcharts.com

- ***Sailing / Coastal Marine Leisure Activities:*** Transition from conventional cruising guide textbooks to digital interactive marine leisure products or web-map tools for route planning, or indeed coastal and offshore racing. There is significant potential value in integrating the vast coastal marine data resources that exist including weather, tides, currents, vessel tracking, coastal infrastructure, and aerial photography.

  Useful link: http://www.visitmyharbour.com/
  http://www.coastalhelicopterview.ie/imf5104/imf.jsp?site=Helicopter

- ***Education:*** With the recent incorporation of the *Real Map of Ireland* into the educational curriculum, timing is ideal for the development and delivery of smart educational products, games and services. Focus could be on multidisciplinary, interactive, live, and scalable approaches that leverage the extensive marine data resources available, and that could be brought direct to the classroom, lecture theatre, or home.

  Useful link http://www.snh.gov.uk/__mpa/
  http://www.geoneed.org/category/archives/ireland/
  http://ngm.nationalgeographic.com/2010/10/gulf-oil-spill/gulf-life-interactive
  http://www.biorede.pt/

## *c) Cross Cutting Themes*

### I. Economic impact assessment:

INFOMAR welcome proposals on novel approaches to routinely capture and assess the realised and future potential economic benefit of each of the three strands of the INFOMAR Programme; 1) Data acquisition, 2) Data integration & exchange, and 3) Value added exploitation.

### II. Value Added Exploitation Programme Development Studies:

INFOMAR encourage proposals relating to broad-scale assessment of potential opportunities for value added exploitation of the available INFOMAR data and technical resources. Such an investigation could include the following;

- Market analyses of existing and potential INFOMAR products and services
- Identifying interface challenges between the data provider and stakeholders, and scoping solutions.
- Assessment and scoping of mechanisms to engage collaborative industry and research partnerships to develop & deliver new spin-off products and services.
- Raising public & industry awareness of value added exploitation opportunities.

## *d) Open Call*

Research or Desk Studies on topics not listed above but in general alignment with INFOMAR Programme goals:

http://www.infomar.ie/documents/INFOMAR_Proposal_Strategy.pdf

# Appendix 1 - Applied Research Call Rules

## Evaluation Criteria

All proposals received will be assessed by a panel of evaluators. Each proposal will be scored according to the following criteria;

1. Strategic context and rationale
2. Scientific and technical quality of the proposal
3. Scientific quality / track record of the proposers
4. Fit of the proposal with INFOMAR strategy and operations
5. Value for money

## Project Finance & Resourcing

- Projects which may have a fieldwork component incorporated will have a maximum budget of c. €30,000.
- Project finance will be awarded in thee staged payments; 1) at start-up, 2) after preliminary reports are issued, 3) and after final deliverables are received.
- Public Research Organisations are entitled to 100% funding under the grant aid terms of this research call, while Industry Partners have a limited entitlement to a maximum of up to 80% of eligible costs (See Appendix 2 for Industry Partner terms and allowable level of eligible costs).
- If specific INFOMAR support is required to deliver the project, this must be clearly outlined in the proposal (e.g. staff support / provision of specific software / access to INFOMAR field surveys).
- INFOMAR procurement of data or ICT resources which may arise following commencement of awarded projects, and add value to the Research Proposal outputs, will be considered case by case subject to receipt of appropriate business cases. Proposals must not be dependent on any such additional support, as it cannot be guaranteed.
- No further or follow up funding can be guaranteed beyond this call.
- **A current Tax Clearance Certificate will be required from lead partners that are awarded research grant aid, prior to issue of any grant payment.**

## Project Deliverables / Timelines

- A mid-2012 project status report must be received by July 5th 2012.
- Core work and final detailed reporting and deliverables must be completed before end calendar year 2012.
- Relevant project data (e.g. GIS databases) should be provided on DVD with the final report, by year end 2012.
- The final report should contain details on work undertaken and/or new procedures or methodologies developed, it should reference relevant material, and it should clearly present findings, results and recommendations. Images, maps and graphics should be incorporated as appropriate. A final summary of project costs must be provided as an appendix outlining project expenditure under a minimum of the following headings; staff (including day rate and days worked), consumables & materials, travel & subsistence, overheads.
- Where software development work is undertaken, outputs with source code will be made openly and freely available to Marine Institute and Geological Survey of Ireland for ongoing use, while Intellectual Property rights will be retained by the research organisation and/or industrial partner in the event that the product be commercialised.
- An editable project PowerPoint presentation and project poster should also be provided on the DVD, to facilitate INFOMAR synthesis of Value Added Research.

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**Note:** NFOMAR acknowledge that project extensions may arise, however due to budgetary constraints, any projects not issuing final deliverables within 18 months of contract award date, will forfeit final payment, and lead applicants will be excluded from future INFOMAR research calls.

## Who Can Apply

- All projects submitted must have a lead partner that is based within the Republic of Ireland. The lead partner is the signing authority and ultimately responsible for the project deliverables.
- Lead applicants & partners can be industry (SME's), public bodies, and/or research organisations.
- INFOMAR personnel may provide a monitoring or mentoring role to successful projects, but will not engage as formal partners in any proposals.

## PROPOSAL APPLICATION PROCESS

The application is a two part process. Firstly, the research proposal should be drafted and submitted. This will be scored according to the above mentioned criteria. Secondly, an INFOMAR value added programme research benefits assessment must be completed and submitted. This is for information purposes only, and it will not affect the scores assigned to proposals. INFOMAR are required to undertake a programme evaluation during the coming 12 months, and the latter part of the application phase will contribute significantly towards this. INFOMAR are also assessing the feasibility of a special publication on INFOMAR Value Added Research and need to establish if appropriate content is available.

## PART 1 – Research Proposal Submission

**Deadline: 16:00, Wed 09/11/2011**

- Digital Applications are acceptable and preferred.
- Application forms are available to download on **www.infomar.ie** and once completed, they should be sent digitally to:

  linda.grealish@marine.ie (INFOMAR Programme Administrator)
  linda.grealish@gsi.ie
  cc Koen.Verbruggen@gsi.ie (GSI Joint Programme Manager)
  cc Thomas.Furey@marine.ie (MI Joint Programme Manager)

**N.B. Successful submission of applications is subject to receipt of confirmation by email with allocation of a reference number.** In the absence of such a response, applicants should confirm receipt of submissions by telephone with Linda Grealish (below).

Linda Grealish
INFOMAR Programme Administrator
Marine Institute, Rinville, Oranmore, Galway
091 387509

- Draft Research Contracts are available for download on **www.infomar.ie**, and should be forwarded immediately to the relevant person in your organisation for review to avoid contract award delays in the event that your proposal is successful.

## PART 2 – Value Added Programme Research Benefits Assessment

**Deadline: 13:00, Wed 23/11/2011**

To assess the value of the ongoing INFOMAR research programme, and the feasibility of a special value added research publication, the following information is required to be submitted by the lead applicant of the proposal:

a) A .pdf copy of peer reviewed papers, book abstracts, or reports published by the lead applicant (and partners if available), that cite INFOMAR and/or the Irish National Seabed Survey (INSS) programmes and/or data, or that have been generated through INFOMAR support, financial or otherwise.

   Where copyright or commercial sensitivities restrict the above, or documents are submitted / under review for publication, the title, abstract, and proposed publisher or commercial client should be provided.

b) A summary of conferences / research meetings at which INFOMAR related work has been presented by the lead applicant, and a copy of the abstracts (if available). Digital copies of related research posters and presentations based on INFOMAR / INSS data analysis, or funded through INFOMAR value added funding should be provided.

c) If the lead applicant has successfully leveraged research or commercial projects or funding, through support (equipment / advice / data) from, or affiliation with the INFOMAR or INSS programmes, please provide summary details on the following;
   i. *Research projects:* (Title / Funder / Brief description of INFOMAR / INSS association). INFOMAR research contract awards should be included here.
   ii. *Commercial contracts:* (Project Title / Client / Brief description of how INFOMAR or INSS data / resources /advice was used in support of winning or undertaking the contract)
   iii. *Capital equipment funding:* (if reference in application was made to potential expansion of existing marine infrastructure, and equipment use in INFOMAR programme, please include: Equipment Title / Funder / Very brief description of context in which INFOMAR was referenced in the application)

d) General comments, statements or details are welcomed on:
   i. Ad-hoc assistance provided by INFOMAR personnel in support of lead applicant or partners ongoing research activities.
   ii. Impact of INSS and/or INFOMAR on the development or growth of the research or commercial area in which the lead applicant or partners work.

Further information or clarification if required can be obtained from Linda Grealish, details above.

# Appendix 2 – Industry Partner Grant Aid

## 1. ELIGIBILITY

**Who May Apply?**
This funding mechanism is targeted at Public Research Organisations and/or SMEs (including micro-enterprises) engaged in marine-related activity. Applications are invited from any legal entity or partnership of entities with the appropriate scientific and technical qualifications and expertise.

**Table 1:** SME Definition

| Category | No. of Employees | Annual Turnover (or annual balance sheet total) |
|---|---|---|
| Micro enterprise | < 10 | ≤ €2 million (≤€2 million) |
| Small firms | < 50 | ≤ €10 million (≤€10 million) |
| Medium firms | < 250 | ≤ €50 million (≤€43 million) |

Applications for **Individual Awards** will be accepted from individual companies (SMEs) or Research Organisations.

Applications for **Collaborative Awards** will be accepted from companies (SMEs) or Research Organisations acting in collaboration with:

1. other companies (SMEs); and/or
2. a research provider (e.g. state research institute, IT or University).

Provided they have a lead partner from the Republic of Ireland, firms located in Northern Ireland are eligible to apply as collaborative partners. They may partner with an industry partner or a research organisation.

## 2. GRANT-AID RATES & ELIGIBLE COSTS

**Grant-Aid Rates**
Funding is provided for industry partners for up to 80% of **eligible costs**, depending on:

i) the nature of the award (individual v. collaborative);
ii) the type of company (refer to Table 1 above); and
iii) the nature of the research (industrial v. experimental);

a. **Industrial research**—planned research aimed at the acquisition of new knowledge and skills for developing new (or bringing about significant improvements in existing) products, processes or services.
b. **Experimental development—**concerns the acquisition and use of existing knowledge and skills to produce plans and arrangements or designs for new products, processes or services.

Further detail on these categories of research activity is provided in **Appendix 3**

Table 2 provides an overview of maximum applicable grant-aid rates, taking into account the above criteria.

**Table 2:** Maximum grant-aid rates (aid intensity)

| Type of Company | Individual Awards | | Collaborative Awards | |
|---|---|---|---|---|
| | *Industrial research* | *Experimental development* | *Industrial research* | *Experimental development* |
| **Micro enterprise** | 70% | 45% | 80% | 60% |
| **Small firms** | 70% | 45% | 80% | 60% |
| **Medium firms** | 60% | 35% | 75% | 50% |

**N.B.** These grant-aid rates are in compliance with the EC *Framework for State Aid for Research, Development and Innovation*[1].

[1] Community Framework for State Aid for Research and Development and Innovation, Official Journal of the European Union 2006/C 323/01, Brussels, 2006

Where the collaborator in a research project is a public research institution, the maximum level of grant-aid payable to the institution is 75% of eligible costs.

The **maximum** grant-aid is:

- €100,000 for Company Awards
- €180,000 for Collaborative Awards.

The maximum grant-aid payable to any firm under these awards may not exceed 40% of annual turnover (averaged over the two years preceding the year in which the application for the grant is made).

**Eligible Costs – How can the grant be used?**
**Eligible costs** are defined as **direct** or **indirect costs** incurred in carrying out the research project. They must fulfil the following criteria:

- They must be **actual**;
- They must be **reasonable** and **wholly necessary** for the project;
- They must be incurred **during the lifetime** of the project;
- They must be **recorded** in the accounts for the project, which must be maintained during the lifetime of the project and reported on as required by the Marine Institute;
- They must **not be otherwise reasonably available** or accessible; and
- They must be **incurred solely to advance the research project**[2]**.**

The eligible **cost categories** are:

1. Staff Costs (see note below)
2. Consumables/Materials
3. Travel and Subsistence
4. Sub-contracts/external assistance (maximum 30% of project)
5. Other Specific Costs
6. Overheads (see note below)

*Staff Costs*
The staff costs of all staff (permanent and temporary) allocated to the project can be used to calculate the full cost of the project, which is then grant-aided according to the maximum level of applicable grant-aid laid out in Table 2 (above).

*Overheads*
Overheads are indirect costs and will be paid at a **maximum** rate of 30% of direct costs minus sub-contract/external assistance. Overheads must be incurred as a direct result of the research carried out under the award.

**Non-eligible Costs**
No costs other than eligible costs will be allowed. **Non-eligible costs** include the following:

- any interest, or return on capital employed;
- equipment purchase
- provisions for possible future losses or charges;
- interest owed;
- provisions for doubtful debts;
- resources made available to a Grantee free of charge;
- unnecessary or ill-considered expenses;
- marketing, sales and distribution costs for products & services;
- entertainment or hospitality expenses, except such reasonable expenses accepted as wholly and exclusively necessary for carrying out the work under the grant-aid.

[2] If items benefit both the research project and other work the costs shall be eligible only in the proportion that can be attributed as benefiting the project.

# APPENDIX 3 - Definition of Research

For the purpose of this initiative the Marine Institute has adopted the European Commission definitions of research and innovation. The following definitions extracted from the *Community Framework for State Aid for Research and Development and Innovation*[3] apply to Marine Institute funded industry research projects. In the event of any dispute, the original EC definition has precedence over the text below.

**Fundamental research (sometimes called "basic" research)** means experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any direct practical application or use in view. Fundamental research is not funded via Industry-Led Awards.

**Industrial research** means the planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of components of complex systems, which is necessary for the industrial research, notably for generic technology validation, and it excludes prototypes.

**Experimental development** means the acquiring, combining, shaping and using of existing scientific, technological, business and other relevant knowledge and skills for the purpose of producing plans and arrangements or designs for new, altered or improved products, processes or services. These may also include, for example, other activities aiming at the conceptual definition, planning and documentation of new products, processes and services.
The activities may comprise producing drafts, drawings, plans and other documentation, provided that they are not intended for commercial use.

The development of commercially usable prototypes and pilot projects is also included where the prototype is necessarily the final commercial product and where it is too expensive to produce for it to be used only for demonstration and validation purposes. In case of a subsequent commercial use of demonstration or pilot projects, any revenue generated from such use must be deducted from the eligible costs.

The experimental production and testing of products, processes and services are also eligible, provided that these cannot be used or transformed to be used in industrial applications or commercially. Experimental development does not include the routine or periodic changes made to products, production lines, manufacturing processes, existing services and other operations in progress, even if such changes may represent improvements;

[3] Community Framework for State Aid for Research and Development and Innovation, Official Journal of the European Union 2006/C 323/01, Brussels, 2006