

Corrigendum to Council Decision 2006/971/EC of 19 December 2006 concerning the specific programme 'Cooperation' implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

(Official Journal of the European Union L 400 of 30 December 2006)

Decision 2006/971/EC should read as follows:

COUNCIL DECISION

of 19 December 2006

concerning the specific programme 'Cooperation' implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

(Text with EEA relevance)

(2006/971/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 166(4) thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament ⁽¹⁾,

Having regard to the opinion of the European Economic and Social Committee ⁽²⁾,

Whereas:

- (1) In accordance with Article 166(3) of the Treaty, Decision No 1982/2006/EC of the European Parliament and of the Council of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013) ⁽³⁾ (hereinafter referred to as 'the Framework Programme') is to be implemented through specific programmes that define detailed rules for their implementation, fix their duration and provide for the means deemed necessary.
- (2) The Framework Programme is structured in four types of activities: trans-national cooperation on policy-defined themes (Cooperation), investigator-driven research based on the initiative of the research community (Ideas), support of training and career development of researchers (People), and support of research capacities (Capacities). Activities under 'Cooperation' as regards indirect actions should be implemented by this specific programme.
- (3) The rules for the participation of undertakings, research centres and universities and for the dissemination of

research results, for the Framework Programme (hereinafter referred to as the rules for participation and dissemination) should apply to this specific programme.

- (4) The Framework Programme should complement the activities carried out in the Member States as well as other Community actions that are necessary for the overall strategic effort for the implementation of the Lisbon objectives, alongside in particular those on structural funds, agriculture, education, training, culture, competitiveness and innovation, industry, health, consumer protection, employment, energy, transport and environment.
- (5) Innovation and SME-related activities supported under this Framework Programme should be complementary to those undertaken under the Framework Programme for Competitiveness and Innovation which will contribute to closing the gap between research and innovation, and promote all forms of innovation.
- (6) Implementation of the Framework Programme may give rise to supplementary programmes involving the participation of certain Member States only, the participation of the Community in programmes undertaken by several Member States, or the setting up of joint undertakings or other arrangements within the meaning of Articles 168, 169 and 171 of the Treaty.

⁽¹⁾ Opinion of 30 November 2006 (not yet published in the Official Journal).

⁽²⁾ OJ C 185, 8.8.2006, p. 10.

⁽³⁾ OJ L 412, 30.12.2006, p. 1.

(7) This specific programme should provide a contribution to the European Investment Bank (EIB) for the constitution of a 'risk-sharing finance facility' in order to improve access to EIB loans.

- (8) Appropriate involvement of SMEs through concrete measures and specific actions for their benefit should be supported under this specific programme, in complementarity with other Community programmes.
- (9) As provided for under Article 170 of the Treaty, the Community has concluded a number of international agreements in the field of research and efforts should be made to strengthen international research cooperation with a view to further integrating the Community into the world-wide research community. Therefore, this specific programme should be open to the participation of countries having concluded agreements to this effect and should also be open on the project level, and on the basis of mutual benefit, to the participation of entities from third countries and of international organisations for scientific cooperation.
- (10) Research activities carried out within this programme should respect fundamental ethical principles, including those which are reflected in the Charter of Fundamental Rights of the European Union.
- (11) The implementation of the Framework Programme should contribute towards promoting sustainable development.
- (12) Sound financial management of the Framework Programme and its implementation should be ensured in the most effective and user-friendly manner possible, while ensuring legal certainty and the accessibility of the programme for all participants, in compliance with Council Regulation (EC, Euratom) No 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities ⁽¹⁾ and Commission Regulation (EC, Euratom) 2342/2002 ⁽²⁾ laying down detailed rules for the implementation of that Financial Regulation and any future amendments.
- (13) Appropriate measures — proportionate to the European Communities' financial interests — should be taken to monitor both the effectiveness of the financial support granted and the effectiveness of the utilisation of these funds in order to prevent irregularities and fraud and the necessary steps should be taken to recover funds lost, wrongly paid or incorrectly used in accordance with Council Regulation (EC, Euratom) No 2988/95 of 18 December 1995 on the protection of the European Communities' financial interests ⁽³⁾, Council Regulation (Euratom, EC) No 2185/96 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities ⁽⁴⁾ and Regulation (EC) No 1073/1999 of the European Parliament and of the Council of 25 May 1999 concerning investigations conducted by the European Anti-Fraud Office (OLAF) ⁽⁵⁾.
- (14) Since the measures necessary for the implementation of this Decision are essentially management measures, they should therefore be adopted by the management procedure provided for in Article 4 of Council Decision 1999/468/EC of 28 June 1999, laying down the procedures for the exercise of implementing powers conferred on the Commission ⁽⁶⁾. On the other hand, research involving the use of human embryos and human embryonic stem cells raises specific ethical issues, as described in Article 4 of this Decision. Moreover, RTD actions involving research under the 'Security' theme represent a new and very sensitive area, in particular with regard to potential threats and security incidents. Therefore, measures for the financing of such projects should be adopted by the regulatory procedure provided for in Article 5 of Decision 1999/468/EC.
- (15) Each thematic area should have its own budget line in the general budget of the European Communities.
- (16) In the implementation of this programme adequate attention needs to be paid to gender mainstreaming, as well as to, *inter alia*, working conditions, transparency of recruitment processes, and career development as regards the researchers recruited on projects and programmes funded under the actions of this programme, for which the Commission Recommendation of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers ⁽⁷⁾ offers a reference framework, while respecting its voluntary nature,

HAS ADOPTED THIS DECISION:

Article 1

The specific programme 'Cooperation' for Community activities in the area of research and technological development, including demonstration activities, hereinafter the 'specific programme', is hereby adopted for the period from 1 January 2007 to 31 December 2013.

Article 2

The specific programme shall support the activities for cooperation supporting the whole range of research actions carried out in trans-national cooperation in the following thematic areas:

- (a) Health;
- (b) Food, Agriculture and Fisheries, Biotechnology;
- (c) Information and communication technologies;

⁽¹⁾ OJ L 248, 16.9.2002, p. 1.

⁽²⁾ OJ L 357, 31.12.2002, p. 1. Regulation as last amended by Regulation (EC, Euratom) No 1248/2006 (OJ L 227, 19.8.2006, p. 3).

⁽³⁾ OJ L 312, 23.12.1995, p. 1.

⁽⁴⁾ OJ L 292, 15.11.1996, p. 2.

⁽⁵⁾ OJ L 136, 31.5.1999, p. 1.

⁽⁶⁾ OJ L 184, 17.7.1999, p. 23. Decision as amended by Decision 2006/512/EC (OJ L 200, 22.7.2006, p. 11).

⁽⁷⁾ OJ L 75, 22.3.2005, p. 67.

- (d) Nano-sciences, Nano-technologies, Materials and new Production Technologies;
- (e) Energy;
- (f) Environment (including climate change);
- (g) Transport (including Aeronautics);
- (h) Socio-economic Sciences and Humanities;
- (i) Space;
- (j) Security.

Any application for financing for research on human embryonic stem cells shall include, as appropriate, details of licensing and control measures that will be taken by the competent authorities of the Member States as well as details of the ethical approval(s) that will be provided.

As regards the derivation of human embryonic stem cells, institutions, organisations and researchers shall be subject to strict licensing and control in accordance with the legal framework of the Member State(s) involved.

4. The fields of research set out above shall be reviewed for the second phase of this programme (2010 to 2013) in the light of scientific advances.

Implementation of this specific programme may give rise to supplementary programmes involving the participation of certain Member States only, the participation of the Community in programmes undertaken by several Member States, or the setting up of joint undertakings or other arrangements within the meaning of Articles 168, 169 and 171 of the Treaty.

Article 5

1. The specific programme shall be implemented by means of the funding schemes established in Annex III to the Framework Programme.

2. Annex III to this specific programme sets out the arrangements for a grant to the EIB for the establishment of a risk-sharing finance facility.

3. Annex IV sets out an indicative list of possible joint technology initiatives that could be the subject of separate decisions and an indicative list of initiatives for the possible joint implementation of national research programmes that could be the subject of a separate decision on the basis of Article 169 of the Treaty.

4. The rules for participation and dissemination shall apply to this specific programme.

The objectives and the broad lines of these activities are set out in Annex I.

Article 3

In accordance with Annex II of the Framework Programme, the amount deemed necessary for the execution of the specific programme shall be EUR 32 413 million, of which less than 6 % shall be for the Commission's administrative expenditure. An indicative breakdown of this amount is given in Annex II.

Article 4

1. All the research activities carried out under the specific programme shall be carried out in compliance with fundamental ethical principles.

2. The following fields of research shall not be financed under this programme:

- research activity aiming at human cloning for reproductive purposes,
- research activity intended to modify the genetic heritage of human beings which could make such changes heritable ⁽¹⁾,
- research activities intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

3. Research on human stem cells, both adult and embryonic, may be financed, depending both on the contents of the scientific proposal and the legal framework of the Member State(s) involved.

⁽¹⁾ Research relating to cancer treatment of the gonads may be financed.

Article 6

1. The Commission shall draw up a work programme for the implementation of this specific programme, setting out in greater detail the objectives and scientific and technological priorities set out in Annex I, the funding scheme to be used for the topic on which proposals are invited, and the timetable for implementation.

2. The work programme shall take account of relevant research activities carried out by the Member States, associated countries and European and international organisations, and the achievement of European added-value as well the impact on industrial competitiveness and the relevance for other Community policies. It shall be updated where appropriate.

3. Proposals for indirect actions under the funding schemes shall be evaluated and projects shall be selected considering the criteria set out in Article 15(1a) of the rules for participation and dissemination.

4. The work programme may identify:

- (a) organisations that receive subscriptions in the form of a membership fee;
- (b) support actions for the activities of specific legal entities.

Article 7

1. The Commission shall be responsible for the implementation of the specific programme.

2. The management procedure laid down in Article 8(2) shall apply for the adoption of the following measures:

- (a) the work programme referred to in Article 6 including the funding schemes to be used, the content of the calls for proposals as well as the evaluation and selection criteria to be applied;
- (b) any adjustment to the indicative breakdown of the amount as set out in Annex II;
- (c) the approval of the funding of actions under the thematic areas (a) — (g) and (i) referred to in Article 2, where the estimated amount of the Community contribution under this programme is equal to or more than EUR 1,5 million;
- (d) the approval of the funding of actions, other than those referred to in point (c) of this paragraph and the thematic area (j) referred to in Article 2, where the estimated amount of the Community contribution under this programme is equal to or more than EUR 0,6 million;
- (e) the drawing up of the terms of reference for the evaluations provided for in Articles 7(2) and 7(3) of the Framework Programme.

3. The regulatory procedure laid down in Article 8(3) shall apply for the adoption of the following measures:

- (a) the work programme regarding the thematic area referred to in point (j) of Article 2, and the approval of the funding of actions under that thematic area;
- (b) the approval of the funding of actions involving the use of human embryos and human embryonic stem cells.

Article 8

- 1. The Commission shall be assisted by a Committee.
- 2. Where reference is made to this paragraph, Articles 4 and 7 of Decision 1999/468/EC shall apply.

The period laid down in Article 4(3) of Decision 1999/468/EC shall be set at two months.

- 3. Where reference is made to this paragraph, Articles 5 and 7 of Decision 1999/468/EC shall apply.

The period laid down for in Article 5(6) of Decision 1999/468/EC shall be set at two months.

- 4. The Commission shall regularly inform the Committee of the overall progress of the implementation of the specific programme, and shall provide it with timely information on all RTD actions proposed or funded under this programme as specified in Annex V.

- 5. The Committee shall adopt its rules of procedure.

Article 9

The Commission shall arrange for the independent monitoring, assessment and review provided for in Article 7 of the Framework Programme to be conducted concerning the activities carried out in the fields covered by the specific programme.

Article 10

This Decision shall enter into force on the third day following its publication in the *Official Journal of the European Union*.

Article 11

This Decision is addressed to the Member States.

Done at Brussels, 19 December 2006.

For the Council

The President

J. KORKEAOJA

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES, BROAD LINES OF THE THEMES AND ACTIVITIES

In this specific programme, support will be provided for trans-national cooperation at every scale across the European Union and beyond, in a number of thematic areas corresponding to major fields of the progress of knowledge and technology, where research must be supported and strengthened to address European social, economic, public health, environmental and industrial challenges.

The overarching aim is to contribute to sustainable development within the context of promoting research, the primary purpose of which is to increase knowledge, at the highest level of excellence.

The ten themes determined for Community action are the following:

- (1) Health;
- (2) Food, Agriculture and Fisheries, Biotechnology;
- (3) Information and communication technologies;
- (4) Nano-sciences, Nano-technologies, Materials and new Production Technologies;
- (5) Energy;
- (6) Environment (including climate change);
- (7) Transport (including Aeronautics);
- (8) Socio-economic Sciences and the Humanities;
- (9) Space;
- (10) Security.

Each theme is described in terms of the objective, the approach to implementation, and the activities including those involving large-scale initiatives (as set out indicatively in Annex IV), international cooperation, emerging needs and unforeseen policy needs.

The principle of sustainable development will be duly taken into account. According to the European policy of equal opportunities between women and men, set out in Articles 2 and 3 of the Treaty, the activities of the specific programme will ensure the implementation of appropriate measures to promote gender equality and the participation of women researchers. Furthermore, considerations of the ethical, social, legal and wider cultural aspects of the research to be undertaken and its potential applications, as well as socio-economic impacts of scientific and technological development and foresight, will where relevant form a part of the activities under this specific programme.

Pluridisciplinary and cross-thematic research, including joint calls

Special attention will be paid to priority scientific and technological areas which cut across themes, such as marine sciences and technologies. Pluridisciplinarity will be encouraged by joint cross-thematic approaches to research and technology subjects relevant to more than one theme. Such cross-thematic approaches will be implemented, among others, through:

- the use of joint calls between themes where a research topic is clearly relevant to the activities under each of the respective themes,
- the special emphasis within the 'emerging needs' activity for cross-disciplinary research,
- the use of external advice, including from researchers, from a broad range of disciplines and backgrounds for establishing the work programme,

- regular reporting on cross-thematic research areas as part of the overall monitoring, assessment and review of the programme,
- for policy-relevant research, ensuring coherence with Community policies.

Coordination between the themes in this specific programme and the actions under other specific programmes of the Seventh Framework Programme, such as those on research infrastructures in the 'Capacities' specific programme, will be ensured by the European Commission ⁽¹⁾.

Adaptation to evolving needs and opportunities

The continued industrial relevance of the themes, and the continued participation of industry in them, will be ensured by relying, among other sources, on the work of the various 'European technology platforms'. This specific programme, together with the contributions made by industry, will thereby contribute to the implementation of relevant Strategic Research Agendas such as those established and developed by the European technology platforms where these present genuine European added value. The broad research needs identified in available Strategic Research Agendas are already well reflected across the ten themes. European technology platforms, with possible participation of regional research-driven clusters, can play a role to facilitate and organise the participation of industry, including SMEs, in research projects relating to their specific field, including projects eligible for funding under the Framework Programme. The more detailed incorporation of their technical content will be reflected subsequently when formulating the detailed work programme for specific calls for proposals.

The continued relevance of the themes to the formulation, implementation and assessment of Community policies and regulations will also be ensured. This concerns policy areas such as those of health, safety, consumer protection, energy, the environment, development aid, fisheries, maritime affairs, agriculture, animal health and welfare, transport, education and training, information society and media, employment, social affairs, cohesion, and the establishment of an area for freedom, security and justice, along with pre-normative and co-normative research relevant to improving interoperability and the quality of standards and their implementation. In this context, platforms that bring together stakeholders with the research community to consider strategic research agendas relevant to social, environmental or other policy areas may play a role.

Under each theme, besides the activities defined, specific actions to respond to 'emerging needs' and 'unforeseen policy needs' will be implemented in an open and flexible way. The implementation of these actions will ensure a simple, coherent and coordinated approach throughout the specific programme and the funding of cross-disciplinary research cutting across or lying outside the themes.

- **Future and emerging technologies:** through specific support for research proposals aiming at identifying or further exploring new scientific and technological opportunities in a given field and/or in their combination with other relevant areas and disciplines through specific support for spontaneous research proposals, including by joint calls; to nurture novel ideas and radically new uses and to explore new options in research roadmaps in particular linked with a potential for significant breakthroughs; adequate coordination with the activities carried out under the 'Ideas' programme will be guaranteed in order to avoid overlap and ensure an optimum use of funding. This will be implemented through:
 - open, 'bottom up' research on topics identified by researchers themselves to develop new scientific and technological opportunities (Adventure actions) or to assess new discoveries or newly-observed phenomena which could indicate risks or problems to society (Insight actions),
 - initiatives focused on specific, highly challenging objectives in emerging scientific and technological fields that promise major advances and a large potential impact on economic and social developments, and may involve groups of complementary projects (Pathfinder actions).
- **Unforeseen policy needs:** to respond in a flexible way to new policy needs that arise during the course of the Framework Programme, such as unforeseen developments or events requiring a quick reaction like new epidemics, emerging concerns in food safety, natural disaster responses or actions of solidarity. This will be implemented in close relationship with the relevant Community policies. The annual work programme may be altered in the event of urgent research needs.

⁽¹⁾ With a view to facilitating the implementation of the programme, for each meeting of the programme committee as defined in the agenda, the Commission will reimburse, in accordance with its established guidelines, the expenses of one representative per Member State, as well as one expert/adviser per Member State for those agenda items where a Member State requires specific expertise.

Dissemination, knowledge transfer and broader engagement

The dissemination and transfer of knowledge is a key added-value of European research actions and measures will be taken to increase the use and impact of results by industry, policymakers and society. Dissemination will be considered an integral task under all thematic areas with appropriate restrictions for the security theme due to the confidentiality aspects of the activities, including through the funding of networking/brokerage initiatives, seminars and events, assistance by external experts and electronic information services. This will be implemented in each thematic area by means of:

- integration of dissemination and knowledge transfer actions within projects and consortia, through suitable provisions in the financing schemes and reporting requirements,
- offering targeted assistance to projects and consortia to provide them with access to the necessary skills to optimise the use of results,
- specific dissemination actions which take a proactive approach to disseminating results from across a range of projects, including those from previous Framework Programmes and other research programmes, and which target specific sectors or sets of stakeholders, with special emphasis on potential users,
- dissemination to policymakers, including standardisation bodies, to facilitate the use of policy relevant results by the appropriate bodies at international, European, national or regional levels,
- Cordis services to foster the dissemination of knowledge in a user-friendly way and the exploitation of research results,
- initiatives to foster dialogue and debate on scientific issues and research results with a broader public beyond the research community, including civil society organisation.

Coordination of dissemination and knowledge transfer across the Framework Programme will be ensured. Complementary and synergies between this programme and other Community programmes will be ensured, in particular in the field of education with the aim of promoting careers in research. Actions to support innovation will be implemented by the Competitiveness and Innovation Programme.

SME participation

The optimal participation of small and medium-sized Enterprises (SMEs) will be facilitated across the thematic areas, in particular by improved financial and administrative procedures, and more flexibility in choosing the appropriate financial scheme. Furthermore, the research needs and potential of SMEs are duly taken into account in developing the content of the thematic areas of this specific programme, and areas which are of particular interest to SMEs will be identified in the work programme. Concrete measures, including support actions to facilitate SME participation, will be taken throughout the programme in the framework of a strategy to be developed under each theme. These strategies will be accompanied by quantitative and qualitative monitoring against the objectives set. The aim will be to enable at least 15 % of the funding available under this programme to go to SMEs.

Specific actions to support research for the benefit of SMEs or SME associations are included in the 'Capacities' specific programme, and actions to promote SME participation across the Framework Programme will be funded under the Competitiveness and Innovation Programme.

Ethical aspects

During the implementation of this specific programme and in the research activities arising from it, fundamental ethical principles are to be respected. These include, *inter alia*, the principles reflected in the Charter of Fundamental Rights of the EU, including the following: protection of human dignity and human life, protection of personal data and privacy, as well as animals and the environment in accordance with Community law and the latest versions of relevant international conventions, guidelines and codes of conduct, e.g. the Helsinki Declaration, the Convention of the Council of Europe on Human Rights and Bio-medicine signed in Oviedo on 4 April 1997 and its Additional Protocols, the UN Convention on the Rights of the Child, the Universal Declaration on the human genome and human rights adopted by UNESCO, UN Biological and Toxin Weapons Convention (BTWC), International Treaty on Plant Genetic Resources for Food and Agriculture, and the relevant World Health Organisation (WHO) resolutions.

Account will also be taken of the Opinions of the European Group of Advisers on the Ethical Implications of Biotechnology (1991 to 1997) and the Opinions of the European Group on Ethics in Science and New Technologies (as from 1998).

In accordance with the principle of subsidiarity and the diversity of approaches existing in Europe, participants in research projects must conform to current legislation, regulations and ethical rules in the countries where the research will be carried out. At all events, national provisions apply and no research forbidden in any given Member State or other country will be supported by Community funding to be carried out in that Member State or country.

Where appropriate, those carrying out research projects must seek the approval of the relevant national or local ethics committees prior to the start of the RTD activities. An ethical review will also be implemented systematically by the Commission for proposals dealing with ethically sensitive issues or where ethical aspects have not been adequately addressed. In specific cases an ethical review may take place during the implementation of a project.

No funding will be granted for research activities that are prohibited in all the Member States.

The Protocol on protection and welfare of animals annexed to the Treaty requires the Community to pay full regard to the welfare requirements of animals in formulating and implementing Community policies including research. Council Directive 86/609/EEC of 24 November 1986 on the approximation of laws, regulations and administrative provisions of the Member States regarding the protection of animals used for experimental and other scientific purposes⁽¹⁾ requires that all experiments:

- be designed to avoid distress and unnecessary pain and suffering to the experimental animals,
- use the minimum number of animals,
- involve animals with the lowest degree of neurophysiological sensitivity, and
- cause the least pain, suffering, distress or lasting harm.

Altering the genetic heritage of animals and cloning of animals may be considered only if the aims are ethically justified and the conditions are such that the animals' welfare is guaranteed and the principles of biodiversity are respected.

During the implementation of this programme, scientific advances and national and international provisions will be regularly monitored by the Commission so as to take account of any developments.

Research on ethics related to scientific and technological developments will be carried out in the 'Science in society' part of the 'Capacities' specific programme.

Collaborative research

Collaborative research will constitute the bulk and the core of Community research funding. The objective is to establish, in the major fields of advancement of knowledge, excellent research projects and networks able to attract researchers and investments from Europe and the entire world, strengthening the European industrial and technological base and supporting Community policies.

This will be achieved by supporting collaborative research, which will include the active participation of industry, through the range of funding schemes: collaborative projects, networks of excellence, and coordination/support actions.

Joint technology initiatives

In a very limited number of cases, the scope of a RTD objective and the scale of the resources involved justify setting up long-term public private partnerships in the form of joint technology initiatives. These initiatives, mainly resulting from the work of European technology platforms and covering one or a small number of selected aspects of research in their field, will combine private sector investment and national and European public funding, including grant funding from the Research Framework Programme and loan finance from the European Investment Bank. Each Joint Technology Initiative will be decided individually, either on the basis of Article 171 of the Treaty (this may include the creation of a joint undertaking) or on the basis of a modification of this specific programme in accordance with Article 166(3) of the Treaty.

⁽¹⁾ OJ L 358, 18.12.1986, p. 1. Directive as amended by Directive 2003/65/EC and of the European Parliament and of the Council (OJ L 230, 16.9.2003, p. 32).

Joint technology initiatives are identified in an open and transparent way on the basis of a series of criteria including:

- inability of existing instruments to achieve the objective,
- scale of the impact on industrial competitiveness and growth,
- added-value of European-level intervention,
- the degree and clarity of definition of the objective and deliverables to be pursued,
- strength of the financial and resource commitment from industry,
- importance of the contribution to broader policy objectives including benefit to society,
- capacity to attract additional national support and leverage current or future industry funding.

The nature of the joint technology initiatives must be clearly defined, in particular with regard to matters concerning:

- financial commitments;
- duration of the commitment of the participants;
- rules for entering and exiting the contract;
- intellectual property rights.

Considering the particular scope and complexity of the joint technology initiatives, strong efforts will be made to ensure their transparent operation and that any allocation of Community funding by the joint technology initiatives will take place on the basis of the Framework Programme principles of excellence and competition.

Particular attention will be paid to the overall coherence and coordination between joint technology initiatives and national programmes and projects in the same fields ⁽¹⁾, while respecting their existing implementation procedures, as well as to ensuring that the participation in their projects is open to a wide range of participants throughout Europe, and in particular SMEs.

An indicative list of joint technology initiatives is identified in Annex IV. Further joint technology initiatives may be identified on the basis of the above criteria and be proposed during the implementation of the Seventh Framework Programme.

Coordination of non-Community research programmes

The action undertaken in this field will make use of two main tools: the ERA-NET scheme and the participation of the Community in jointly implemented national research programmes (Treaty Article 169). The action will also be used to enhance the complementarity and synergy between the Framework Programme and activities carried out in the framework of intergovernmental structures such as Eureka, EIROforum and COST. Financial support for the administration and coordination activities of COST will be provided so that COST can continue to contribute to coordination and exchanges between nationally funded research teams.

Where the actions are within the scope of one of the themes, they will be supported as an integral part of the activities under that theme. Where the actions are of a horizontal nature or not directly linked to the ten themes, they will be supported jointly across all of the relevant themes ⁽²⁾.

Where the actions are within the scope of another specific programme implementing the Seventh Framework Programme, they will be supported under that specific programme.

⁽¹⁾ In particular with the activities carried out by the intergovernmental structure Eureka. In addition, the experience gained by Eureka clusters could be relevant to joint technology initiatives in related areas.

⁽²⁾ This could include possible joint implementation of programmes in the field of Metrology.

The ERA-NET scheme will develop and strengthen the coordination of national and regional research activities by:

- providing a framework for actors implementing public research programmes to step up the coordination of their activities. This will include support for new ERA-NETs as well as for the broadening and deepening of the scope of existing ERA-NETs, e.g. by extending their partnership, as well as mutually opening their programmes. Where appropriate, ERA-NETs could be applied for programme coordination between European regions and between Member States to enable their cooperation with large-scale initiatives,
- in a limited number of cases, providing additional Community financial support for those participants that pool resources for the purpose of joint calls for proposals between their respective national and regional programmes (ERA-NET PLUS).

The participation of the Community in national research programmes jointly implemented on the basis of Article 169 is especially relevant to European cooperation on a large scale in 'variable geometry' between Member States sharing common needs and/or interests. In well identified cases, such Article 169 initiatives will be launched in areas identified in close association with the Member States, including the possible cooperation with intergovernmental programmes, on the basis of the criteria defined in the Seventh Framework Programme decision.

An indicative list of initiatives for the joint implementation of national research programmes is identified in the description in Annex IV and could be the subject of a separate decision on the basis of Article 169 of the Treaty. Further initiatives may be identified and proposed during the implementation of the Seventh Framework Programme.

International cooperation

International cooperation actions, showing European added-value and being of mutual interest, will support an international Science and Technology policy that has two interdependent objectives:

- to support and promote European competitiveness through strategic research partnerships with third countries including highly industrialised and emerging economies in science and technology by engaging the best third country scientists to work in and with Europe,
- to address specific problems that third countries face or that have a global character, on the basis of mutual interest and mutual benefit.

The international scientific cooperation policy of the Community will stress and develop cooperation to generate, share and use knowledge through equitable research partnerships taking into account the international, country, regional and socioeconomic context and knowledge base of partner countries. The strategic approach is to enhance EU competitiveness and global sustainable development through such partnerships between the EU and third countries at bilateral, regional and global levels based on mutual interest and benefit. To this end the EU's role as a global player should be also promoted through multilateral international research programmes. The international cooperation actions supported will be connected to mainstream policy issues in order to support fulfilling international commitments of the EU and contribute to sharing European values, competitiveness, socioeconomic progress, environmental protection and welfare under the umbrella of global sustainable development.

International cooperation will be implemented in this specific programme in each thematic area and across themes through:

- An enhanced participation of researchers and research institutions from all International Cooperation Partner countries and industrialised countries ⁽¹⁾ in the thematic areas, with appropriate restrictions for the security theme for all third countries other than associated countries due to the confidentiality aspects. In addition, there will be a particular emphasis to encourage third country participation in identified areas of mutual interest.
- Specific cooperation actions in each thematic area dedicated to third countries in the case of mutual interest in cooperating on particular topics to be selected on the basis of their scientific and technological level and needs. The identification of specific needs and priorities will be closely associated with relevant bilateral cooperation agreements and with ongoing multilateral and bi-regional dialogues between the EU and these countries or groups of countries. Priorities will be identified based on the particular needs, potential and level of economic development in the region or country.

⁽¹⁾ As defined in the Rules for Participation and Dissemination.

To this end, an international cooperation strategy and implementation plan will be developed with specific targeted actions within or across the themes, e.g. in health, agriculture, sanitation, water, food security, social cohesion, energy, environment, fisheries, aquaculture and natural resources, sustainable economic policy and information and communication technologies.

These actions will serve as privileged tools for implementing the cooperation between the Community and these countries. Such actions are, in particular, actions aiming at reinforcing the research capacities and cooperative capacities of candidate, neighbourhood, and developing and emerging countries. The actions will be the subject of targeted calls and particular attention will be paid to facilitating access of the relevant third countries, notably developing countries, to the actions.

These activities will be implemented in coordination with international cooperation actions under the 'People' and the 'Capacities' specific programmes. An overall strategy for International Cooperation within the Framework Programme will underpin this activity.

THEMES

1. HEALTH

Objective

Improving the health of European citizens and increasing the competitiveness and boosting the innovative capacity of European health-related industries and businesses, while addressing global health issues including emerging epidemics. Emphasis will be put on translational research (translation of basic discoveries in clinical applications including scientific validation of experimental results), the development and validation of new therapies, methods for health promotion and prevention including promotion of child health, healthy ageing, diagnostic tools and medical technologies, as well as sustainable and efficient healthcare systems.

Approach

This research will advance our understanding on how to promote good health more efficiently, to reduce the health differences across Europe, to prevent and treat major diseases and to deliver healthcare. Basic bio-medical research will be an integral part of this theme; multidisciplinary approaches are of particular importance in the health theme.

This research will help integrate the vast amount of genomics, epidemiological, biological and biotechnology data and develop key technologies for health-related industries with a view to developing knowledge and capacity for intervention. It will foster translational health research, which is essential to ensure practical benefits including the improvement of life quality from bio-medical research. It will allow Europe to contribute more effectively to international efforts combating diseases of global importance, as illustrated by the ongoing programme on 'European and Developing Countries Clinical Trials Partnership' (EDCTP) for combating HIV/AIDS, malaria and tuberculosis (Article 169) ⁽¹⁾. It will reinforce health policy-driven research at the European level and especially the comparisons of the models, systems and data of national databases. The networking of relevant databases is particularly important in this respect.

This research will help improve the competitiveness of European healthcare biotechnology and medical technology sectors, where SMEs are the main economic drivers, and pharmaceutical industries. It may include support for the European Technology Platform ⁽²⁾ on Innovative Medicines, aiming at overcoming the research bottlenecks in the drug development process. Special attention will be given to bridging the gap between research activities and exploitation by providing support for demonstrating proof of concept and clinical validation. This research will also contribute to the development of norms and standards for new advanced therapies (e.g. regenerative medicine) needed to help EU industry face worldwide competition. Global leadership in European research and innovation in the field of alternative testing strategies, in particular non-animal methods, should be ensured.

Gender aspects in research will be considered and integrated in the projects ⁽³⁾ whenever appropriate. Special attention will be given to communicating research outcomes and engaging in dialogue with civil society, in particular with patient groups, at the earliest possible stage, of new developments arising from bio-medical and genetics research. A wide dissemination and use of the results will also be assured.

⁽¹⁾ Other new important initiatives regarding the coordination of national research programmes may be supported where needed.

⁽²⁾ Strategic research agendas of other European technology platforms may be supported where they are of major importance for health-related industries.

⁽³⁾ Risk factors, biological mechanisms, causes, clinical manifestation, consequences and treatment of disease and disorders often differ between women and men. Therefore, all activities funded within this theme must reflect the possibility of such differences in their research protocols, methodologies and analysis of results.

The strategic issues, child health ⁽¹⁾ and the health of the ageing population will receive specific attention and will have to be taken into account whenever appropriate across all activities in this theme, with priorities highlighted in the work programme. Other multi-disciplinary areas will also be included. This will ensure a visible and coherent approach to these issues across the Theme, whilst avoiding duplication.

Ethical, legal and socio-economic issues will be taken into account within each of the following activities ⁽²⁾.

Activities

Biotechnology, generic tools and medical technologies for human health

This activity aims at developing and validating the necessary tools and technologies that will make possible the production of new knowledge and its translation into practical applications in the area of health and medicine.

- High-throughput research: to catalyse progress in developing new research tools for modern biology including fundamental genomics that will enhance significantly data generation and improve data and specimen (bio-banks) standardisation, acquisition and analysis. The focus will be on new technologies for: sequencing; gene expression, genotyping and phenotyping; structural and functional genomics; bio-informatics and systems biology; other 'omics'.
- Detection, diagnosis and monitoring: to develop visualisation, imaging, detection and analytical tools and technologies for bio-medical research, for prediction, diagnosis, monitoring and prognosis of diseases, and for support and guidance of therapeutic interventions. The focus will be on a multidisciplinary approach integrating areas such as: molecular and cellular biology, physiology, genetics, physics, chemistry, bio-medical engineering including nano-technologies, microsystems, devices and information technologies. Non- or minimally-invasive and quantitative methods and quality assurance aspects will be emphasised.
- Predicting suitability, safety and efficacy of therapies: to develop and validate the parameters, tools, methods and standards needed for bringing to the patient safe and effective new or improved bio-medicines ⁽³⁾. The focus will be on approaches such as pharmacogenomics, developing and validating biological markers, targeting and delivery approaches, in silico, in vitro (including alternatives to animal testing) and in vivo methods and models ⁽⁴⁾.
- Innovative therapeutic approaches and interventions: to research, consolidate and ensure further developments in advanced therapies and technologies with broad potential application. The focus will be on gene and cell therapy, regenerative medicine, transplantation, immunotherapy and vaccines, and other medicines. Related technologies, such as advanced targeted delivery systems, advanced implants and prosthetics, and non- or minimally-invasive technology-assisted interventions will also be addressed.

Translating research for human health

This activity aims to increase knowledge of biological processes and mechanisms involved in normal health and in specific disease situations, to transpose this knowledge into clinical applications including disease control and treatment, and to ensure that clinical (including epidemiological) data guide further research.

- Integrating biological data and processes: large-scale data gathering, systems biology.
 - Large-scale data gathering: to use high-throughput technologies to generate data for elucidating the function of genes and gene products and their interactions in complex networks in important biological processes. The focus will be on: genomics; proteomics, 'RNA-omics'; population genetics; comparative, structural and functional genomics.
 - Systems biology: the focus will be on multidisciplinary research that will integrate a wide variety of biological data and will develop and apply system approaches to understand and model biological processes in all relevant organisms and at all levels of organisation.

⁽¹⁾ Support will in particular be given to specific clinical studies to provide evidence for the appropriate use of off-patent products currently used off label in paediatric populations.

⁽²⁾ Specific research on ethical, legal and socioeconomic issues will be undertaken in the Theme Socioeconomic Sciences and the Humanities under the specific programme 'Cooperation', and in the specific programme 'Capacities'.

⁽³⁾ For conventional medicines (Pharmaceuticals and Bio-pharmaceuticals), these issues could be addressed by a Joint Technology Initiative on Innovative Medicines.

⁽⁴⁾ Replacement, refinement, reduction alternatives to animal usage in biomedical research.

- Research on the brain and related diseases, human development and ageing.
 - Brain and brain-related diseases: to better understand the integrated structure and dynamics of the brain, and to study brain diseases including relevant age-related illness (e.g. dementia, Parkinson's disease) and search for new therapies. The focus will be on gaining a global understanding of the brain by exploring brain functions, from molecules to cognition including neuroinformatics, and brain dysfunction, from synaptic impairment to neurodegeneration. Research will address neurological and psychiatric diseases and disorders, including regenerative and restorative therapeutic approaches.
 - Human development and ageing: use of a wide variety of methodologies and tools to better understand the process of life-long development and healthy ageing. The focus will be on the study of human and model systems, including interactions with factors such as environment, genetics, behaviour and gender.
- Translational research in major infectious diseases: to confront major threats to public health.
 - Anti-microbial drug resistance including fungal pathogens: the focus will be on combining basic research on molecular mechanisms of resistance, microbial ecology and host-pathogen interactions with clinical research towards new interventions to reduce the emergence and spread of multi-drug resistant infections.
 - HIV/AIDS, malaria and tuberculosis: the focus will be on developing new therapies, diagnostic tools, preventive tools such as vaccines and chemical transmission barriers such as HIV microbicides. Research efforts will confront the three diseases at global level, but will also address specific European aspects of the three diseases as well as Hepatitis. Preclinical and early clinical research activities will be emphasised, and where relevant (e.g. for HIV/AIDS vaccines) collaboration with global initiatives is foreseen.
 - Potentially new and re-emerging epidemics: the focus will be on confronting emerging pathogens with pandemic potential including zoonoses (e.g. SARS and highly pathogenic influenza). Where appropriate, provisions will be made for rapidly initiating collaborative research aimed at expediting development of new diagnostics, drugs and vaccines for efficient prevention, treatment, and control of infectious disease emergencies.
- Translational research in other major diseases ⁽¹⁾
 - Cancer: the focus will be on disease aetiology, new medicines and therapies; identifying and validating drug targets and biological markers that aid in the prevention, early diagnosis and treatment; and assessing the effectiveness of preventive prognostic, diagnostic and therapeutic interventions.
 - Cardiovascular disease: the focus will be on diagnosis, prevention, treatment and monitoring of heart and blood vessel diseases (including vascular aspects of stroke) using broad multidisciplinary approaches.
 - Diabetes and obesity: for the former, the focus will be on aetiologies of the different types of diabetes, and their related prevention and treatment. For the latter, the focus will be on multidisciplinary approaches including genetics, life style and epidemiology. For both diabetes and obesity, special attention will be given to juvenile diseases and factors operating in childhood.
 - Rare diseases: the focus will be on Europe-wide studies of natural history, pathophysiology and on development of preventive, diagnostic and therapeutic interventions. This sector will include rare Mendelian phenotypes of common diseases.
 - Other chronic diseases: the focus will be on non-lethal diseases with a high impact on the quality of life at old age such as functional and sensory impairment and other chronic diseases (e.g. arthritis, rheumatic and musculo-skeletal diseases and respiratory diseases including those induced by allergies).

Optimising the delivery of healthcare to European citizens

This activity aims at providing the necessary basis both for informed policy decisions on health systems and for more effective and efficient evidence-based strategies of health promotion, disease prevention, diagnosis and therapy.

⁽¹⁾ Aspects of palliative medicine and the use of active ingredients will be taken into account.

- Translating the results of clinical research outcome into clinical practice including better use of medicines, and appropriate use of behavioural and organisational interventions and new health therapies and technologies. Special attention will be given to patient safety including adverse effects of medication; to identify the best clinical practice; to understand decision making in clinical settings in primary and specialised care; and to foster applications of evidence-based medicine and patient empowerment. Focus will be on the benchmarking of strategies; investigating outcomes of different interventions including medicines, scientifically tested complementary and alternative medicines, and new health therapies and technologies, taking into consideration prescription strategies, some aspects of pharmacovigilance evidence, specificities of the patient (e.g. genetic susceptibility, age, gender and adherence) and cost benefits.
- Quality, efficiency and solidarity of healthcare systems including transitional health systems, to allow countries to learn from the experience of other health systems and their sustainability, taking into account the importance of national contexts and population characteristics (ageing, mobility, migration, education, socioeconomic status and the changing world of work, etc). Focus will be on organisational, financial and regulatory aspects of health systems (assessing the cost, efficiency and benefits of different interventions including as regards patient safety), their implementation and their outcomes in terms of effectiveness, efficiency and equity (including disadvantaged groups). Special attention will be paid to investment issues and human resources including home care strategies. The question of independence, life quality and mobility of the ageing population will be covered.
- Enhanced health promotion and disease prevention: to provide evidence for the best public health measures in terms of life styles, work and living circumstances and interventions at different levels and in different contexts. Focus will be on the wider determinants of health and how they interact at both the individual and community level (e.g. diet, stress, tobacco, alcohol and other substances, physical activity, cultural context, socio-economic and environmental factors). In particular, mental health will be addressed in a life-course perspective.

International cooperation

International cooperation is an integral part of the Theme and is of particular importance for areas addressing global health problems, such as anti-microbial resistance, HIV/AIDS, malaria, tuberculosis, neglected diseases and emerging pandemics. This may also involve priority setting in the context of international initiatives, such as the Global HIV Vaccine Enterprise. Subject to the consolidation of a long-term sustainable partnership in clinical research between Europe and Developing countries and subject to the integration of national programmes or activities from participating countries, further support may be provided to the European and Developing Countries Clinical Trials Partnership (EDCTP) in response to its achievements and future needs⁽¹⁾. The EDCTP programme will remain focused on advanced clinical testing for the development of new vaccines, microbicides and drugs against the three diseases in sub-Saharan Africa. For this purpose, the work programme may foresee a Community contribution to the EDCTP-European Economic Interest Grouping for carrying out the programme to be agreed by the Commission, including the reallocation of the Community contribution.

Specific cooperation actions will be implemented in the areas formulated through bi-regional dialogues in third Countries/Regions and international fora, as well as within the context of Millennium Development Goals. Such priority areas adapted to local needs and through partnerships may include: health policy research, health systems and healthcare service research, maternal and child health, reproductive health, control and surveillance of neglected communicable diseases and emerging unforeseen policy needs in those regions.

An annual subscription to the international Human Frontier Science Programme Organisation (HFSP) ⁽²⁾ will be made jointly with the 'Information and communication technologies' theme. This will allow EU non-G8 Member States to fully benefit from the Human Frontier Science Programme (HFSP) and provide increased visibility for European research.

Responding to emerging needs and unforeseen policy needs

Research on emerging needs will be implemented on the basis of 'bottom up' and 'focused' initiatives, in coordination with other Themes and this will include a broad and inter-disciplinary research portfolio. Support for unforeseen policy needs may address, for example living and work conditions, health impact assessment, risk assessment, statistical indicators, management and communication in the public health domain, as well as obligations under international health treaties including the Framework Convention on Tobacco Control ⁽³⁾ and the International Health Regulations ⁽⁴⁾. This will complement the health policy-driven research supported above.

⁽¹⁾ The Commission will carry out an evaluation of the EDCTP.

⁽²⁾ The European Community is a member of the HFSP Organisation (HFSP) and has funded HFSP under previous Framework Programmes.

⁽³⁾ Framework Convention on Tobacco Control, Decision 2004/513/EC.

⁽⁴⁾ International Health Regulations 2005 — Resolution 58.3 of the 58th World Health Assembly, 23 May 2005.

2. FOOD, AGRICULTURE AND FISHERIES AND BIOTECHNOLOGY

Objective

Building a European Knowledge Based Bio-Economy ⁽¹⁾ by bringing together science, industry and other stakeholders, to exploit new and emerging research opportunities that address social, environmental and economic challenges: the growing demand for safer, healthier, higher quality food and for sustainable use and production of renewable bio-resources, the increasing risk of epizootic and zoonotic diseases and food related disorders; threats to the sustainability and security of agricultural, aquaculture and fisheries production; and the increasing demand for high quality food, taking into account animal welfare and rural and coastal context and response to specific dietary needs of consumers.

Approach

This theme will strengthen the knowledge base, deliver the innovations and provide policy support for building and developing a European Knowledge Based Bio-Economy (KBBE). Research will focus on the sustainable management, production and use of biological resources, in particular through life sciences and biotechnology and the convergence with other technologies, to provide new, safer, affordable, eco-efficient and competitive products from European agriculture, fisheries, aquaculture, feed, food ⁽²⁾, health, forest based and related industries. Research will make important contributions to the implementation and formulation of Community policies and regulations and specifically address or support: the common agricultural policy; agriculture and trade issues; safety aspects of GMOs; food safety regulations; Community plant health legislation; Community animal health policy, disease control and welfare standards; environment and biodiversity; European forestry strategy; and the common fisheries policy aiming to provide sustainable development of fishing and aquaculture and the safety of seafood products. Research will also seek to develop new and existing indicators supporting analysis, development and monitoring of these policies.

Recognising the multifunctional role of agriculture, research will support the role and opportunities for rural economies to deliver sustainable development objectives.

Agro-food industries, of which 90 % are SMEs, will particularly benefit from many research activities, including targeted dissemination and technology transfer activities, in particular as regards the integration and uptake of advanced eco-efficient technologies, methodologies and processes and the development of standards. High-tech start-ups from the bio-, nano- and ICT are expected to provide important contributions to the areas of plant breeding, improved crops and plant protection, advanced detection and monitoring technologies for ensuring food safety and quality, and new industrial bio-processes.

Several European technology platforms, covering the areas of plant genomics and biotechnology, forestry and forest based industries, global animal health, farm animal breeding, food, aquaculture and industrial biotechnology, can contribute in setting common research priorities for this theme, in identifying possible future large-scale initiatives such as demonstration projects, and help ensure broad participation and integration of all stakeholders. Actions to enhance the coordination of national research programmes will be pursued wherever appropriate, in close coordination with ERA-Net projects, technology platforms and other relevant actors, such as the Standing Committee on Agricultural Research (SCAR) or any future European maritime research coordination structure.

Consideration of the social, ethical, gender, legal, environmental, economic and wider cultural aspects and potential risks and impacts (foresight) of the scientific and technological development will form a part of the activities, where relevant.

Activities

Sustainable production and management of biological resources from land, forest, and aquatic environments ⁽³⁾

- Enabling research on the key long-term drivers of sustainable production and management of biological resources (micro-organisms, plants and animals) including the exploitation of biodiversity and of novel bio-active molecules within these biological systems. Research will include 'omics' technologies, such as genomics, proteomics, metabolomics, and converging technologies, and their integration within systems biology approaches, as well as the

⁽¹⁾ The term 'bio-economy' includes all industries and economic sectors that produce, manage and otherwise exploit biological resources (and related services, supply or consumer industries), such as agriculture, food, fisheries, forestry, etc.

⁽²⁾ Food includes seafood.

⁽³⁾ Complementary research relating to sustainable management and conservation is addressed under 'Environment including climate change'. Research on other tools and technologies that support sustainable production and management will be done under the relevant themes.

development of basic tools and technologies, including bio-informatics and relevant databases, and methodologies for identifying varieties within species groups.

- Increased sustainability and competitiveness, while safeguarding consumer health, decreasing environmental impacts, and taking account of climate change, in agriculture, horticulture, forestry, fisheries and aquaculture through the development of new technologies, equipment, monitoring systems, novel plants and production systems, crop management through selected plant breeding, plant health and optimised production systems, the improvement of the scientific and technical basis of fisheries management, and a better understanding of the interaction between different systems (agriculture and forestry; fisheries and aquaculture) across a whole ecosystem approach. Research into maintenance of autochthonous ecosystems, development of bio-control agents, and micro-biological dimension of biodiversity and metagenomics will be undertaken.
- For land-based biological resources, special emphasis will be placed on low input (e.g. pesticides and fertilisers), and organic production systems, improved management of resources and novel food and feeds, and novel plants (crops and trees) with respect to their composition, resistance to stress, ecological effect, nutrient and water use efficiency, and architecture. This will be supported through research into bio-safety, co-existence and traceability of novel plants systems and products, and monitoring and assessment of impact of genetically modified crops on environment and human health as well as the possibility of their broader benefit for society.
- Plant health and crop protection will be improved through better understanding of ecology, biology of pests, diseases, weeds and other threats of phytosanitary relevance and support to controlling disease outbreaks and enhancing sustainable pest and weed management tools and techniques. Improved methods will be developed for monitoring, preservation and enhancement of soil fertility.
- For biological resources from aquatic environments, emphasis will be placed on essential biological functions, safe and environmentally friendly production systems and feeds of cultured species and on fisheries biology, dynamics of mixed fisheries, interactions between fisheries activities and the marine ecosystem and on fleet-based, regional and multiannual management systems.
- Optimised animal health, production and welfare, across agriculture, fisheries and aquaculture, *inter alia*, through:
 - the exploitation of genetic knowledge, new breeding methods, improved understanding of animal physiology and behaviour; and
 - the better understanding and control of pests, parasites and infectious animal diseases and other threats to the sustainability and security of food production, including zoonoses.

The latter will also be addressed by developing tools for monitoring, prevention and control, by underpinning and applied research on vaccines and diagnostics, studying the ecology of known or emerging infectious agents and other threats, including malicious acts, and impacts of different farming systems and climate.

New knowledge for the safe disposal of animal waste and improved management of by-products will also be developed.

- Providing the tools needed by policymakers and other actors to support the implementation of relevant strategies, policies and legislation and in particular to support the building of the European Knowledge Based Bio-Economy (KBBE) and the needs of rural and coastal development. The common fisheries policy will be supported through the development of adaptive approaches supportive to a whole ecosystem approach for the harvesting of marine resources. Research for all policies, including the common agricultural policy, will include socioeconomic studies and cost-benefit analysis, comparative investigations of different farming systems including multifunctional ones, cost-effective fisheries management systems, the rearing of non-food animals, interactions with forestry and studies to improve rural and coastal livelihoods.

Fork to farm: Food (including seafood), health and well being

- Understanding consumer behaviour and consumer preferences as a major factor in the competitiveness of the food industry and the impact of food on the health, and well-being of the European citizen. The focus will be on consumer perception and attitudes towards food, including traditional food, understanding societal and cultural trends, and identifying determinants of food choice and consumer access to food. The research will include the development of data bases on food and nutrition research.

- Understanding beneficial and harmful dietary factors as well as the specific needs and habits of population groups as a major controllable factor in the development and reduction of occurrence of diet-related diseases and disorders including obesity and allergies. This will involve the investigation of new dietary strategies, the development and application of nutrigenomics and systems biology, and the study of the interactions between nutrition, physiological and psychological functions. It could lead to reformulation of processed foods, and development of novel foods and ingredients, dietetic foods and foods with nutritional and health claims. The investigation of traditional, local, and seasonal foods and diets will also be important to highlight the impact of certain foods and diets on health, and to develop integrated food guidance.
- Optimising innovation in the European food industry through the integration of advanced technologies into traditional food production including fermented food, tailored process technologies to enhance the functionality, quality and nutritional value of food including organoleptic aspects in food production including new foodstuffs. Development and demonstration of high-tech, eco-efficient processing and packaging systems, smart control applications and more efficient valorisation and management of by-products, wastes, water and energy. New research will also develop sustainable and novel technologies for animal feed, including safe feed processing formulations, and for feed quality control.
- Assuring chemical and micro-biological safety and improving quality in the European food supply. This will include understanding the links between microbial ecology and food safety; developing methods and models addressing the integrity of the food supply chains; new detection methods, traceability and its further development, technologies and tools for risk assessment, including emerging risks, management, and communication, as well as enhancing the understanding of risk perception. This will also include science based methods for risk benchmarking in the field of food safety.
- Protecting both human health and the environment through a better understanding of the environmental impacts on and of food/feed chains. This will involve study of food contaminants and health outcomes, monitoring of environmental effects, developing enhanced tools and methods for the assessment and management of impacts on, and resistance of, food and feed chains to global changes in particular to the environment. Assuring quality and the integrity of the food chain requires new models for commodity chain analysis and total food chain management concepts, including consumer aspects.

Life sciences, biotechnology and bio-chemistry for sustainable non-food products and processes

- Strengthening the knowledge base and developing advanced technologies for terrestrial or marine bio-mass production for applications in industrial processes and in energy production. This will include plant, animal and microbial genomics and metabolomics to improve the productivity and composition of raw materials and bio-mass feedstocks for optimised conversion to high added-value products including biological resources utilisable in pharmaceutical industry and medicine, while exploiting natural or enhanced terrestrial and aquatic organisms as novel sources. This will fully incorporate life cycle analysis of bio-mass production practices, transportation, and storage and market deployment of bio-products.
- Addressing the application of industrial bio-technologies within whole crop and forest bio-mass chains to realise the full potential of the bio-refinery approach (e.g. green chemicals), including socioeconomic, agronomic, and ecological and consumer aspects. This will be enhanced by an increased understanding and control of plant and microbial metabolism at the cellular and sub-cellular level, and how this is integrated into whole system performance in the production of high value commodities deploying bio-processes with increased yield, quality and purity of conversion products, including bio-catalytic process design.
- Using or developing bio-technologies for novel and improved high quality, high added-value and renewable forest-based products and processes to increase sustainability of wood and wood production, including timber, renewable materials and bio-energy stocks.
- Addressing the potential of biotechnology to detect, monitor, prevent, treat and remove pollution.
- Maximising the economic value of waste and by-products through new and potentially energy-saving bio-processes, alone or in combination with plant systems and/or chemical catalysts.

International cooperation

International cooperation is a priority aspect for food, agriculture and biotechnology research and will be strongly encouraged throughout the entire area. Research of specific interest for developing countries and emerging economies will be supported, taking into account millennium development goals and already ongoing activities. Specific actions will be undertaken to foster cooperation with priority partner regions and countries — particularly those involved in bi-regional dialogues and bilateral S&T agreements as well as neighbourhood countries and emerging economies and developing countries.

Furthermore, multilateral cooperation will be carried out to address either challenges requiring broad international efforts, such as the dimension and complexity of systems biology in plants and micro-organisms, or to address global challenges and EU international commitments (security and safety of food and drinking water, global spread of animal diseases, equitable use of biodiversity, the restoration, in cooperation with the UN Food and Agriculture Organisation, of world fisheries to Maximum Sustainable Yield by 2015 and the influence of/on climate change).

Responding to emerging needs and unforeseen policy needs

Research on emerging needs may address, for example, the development of new concepts and technologies, such as on crisis management systems and the integrity of the food chain.

A flexible response to unforeseen policy needs will take particular account of relevant policies for building a European Knowledge Based Bio-Economy.

3. INFORMATION AND COMMUNICATION TECHNOLOGIES

Objective

Improve the competitiveness of European industry and enable Europe to master and shape the future developments of Information and communication technologies (ICT) so that the demands of its society and economy are met. ICT is at the very core of the knowledge-based society. Activities will strengthen Europe's scientific and technology base and ensure its global leadership in ICT, help drive and stimulate product, service and process innovation and creativity through ICT use and ensure that ICT progress is rapidly transformed into benefits for Europe's citizens, businesses, industry and governments. These activities will also help reduce the digital divide and social exclusion.

Approach

Information and communication technologies (ICT) play a unique, proven role in fostering innovation, creativity and competitiveness of all industry and service sectors. They are essential for addressing key societal challenges and modernising public services and they underpin progress in all science and technology fields. Europe must therefore master and shape the future developments of ICT and ensure that ICT-based services and products are taken up and used to deliver the maximum possible benefits for citizens and businesses.

These are the targets of the Community's information society policy, as highlighted in the i2010 initiative, aiming at a competitive convergent information economy in Europe, a significant rise in European investment in ICT research and innovation and a very high level of accessibility in the information society.

New ICT technologies will open up many new opportunities for higher-value products and services, many of which are in areas where Europe already enjoys industrial and technological leadership. Partnering at European level is the optimal approach to ICT investment. ICT research activity based on 'open source' development model is proving its utility as a source of innovation and increasing collaboration. More than ever before, such efforts are needed to keep pace with soaring research costs in an era of global competition, and increasingly complex and interdependent technologies.

The ICT theme prioritises strategic research around key technology pillars, ensures end-to-end integration of technologies and provides the knowledge and the means to develop a wide range of innovative ICT applications. The activities will leverage industrial and technological advance in the ICT sector and improve the competitive edge of important ICT-intensive sectors — both through innovative high-value ICT-based products and services and from new or improved organisational processes in businesses and administrations alike. The theme will also support other policies of the Community, such as health and environmental protection, by mobilising ICT to meet public and societal demands, in particular demands of people with special needs including the ageing population and the disabled.

Activities will cover collaboration and networking actions and could support joint technology initiatives ⁽¹⁾ and national programme coordination initiatives ⁽²⁾. The priorities of the activities will include topics relying, among other sources, on the work of European technology platforms. Thematic synergies will also be developed with related activities in other specific programmes.

The active participation of small and medium-sized enterprises and other small entities in the activities is essential given their role in promoting innovation. They play vital roles in the development and nurturing of new visions in ICT and their applications and in transforming them into business assets.

Activities

ICT technology pillars:

- Nano-electronics, photonics and integrated micro/nano-systems: process, device, design and testing technologies and methodologies to improve size, density, performance, energy efficiency, manufacturing and cost-effectiveness for components, systems-on-a-chip, systems-in-a-package and integrated systems; basic photonic components for wide range of applications including ultra fast components; radio frequency (RF) systems; high-performance/high-density data storage systems; very large area/highly integrated display solutions; sensing, actuating, vision and imaging devices; ultra low power systems, power components, alternative energy sources/storage; heterogeneous technologies/systems integration; smart systems; multi-functional integrated micro-nano-bio-info-systems; large-area electronics; integration in different materials/objects; interfacing with living organisms; (self-)assembly of molecules or atoms into stable structures.
- Ubiquitous and unlimited capacity communication networks: cost-effective, reconfigurable and flexible mobile and broadband network technologies, systems and architectures, including terrestrial and satellite networks and optical switching and other technologies for high speed end-to-end connectivity; convergence of different fixed, mobile, wireless and broadcasting networks and services spanning from the personal area to the regional and global area; interoperability of wired and wireless communications services and applications, management of networked resources, service reconfigurability; complex networking of ad hoc intelligent multimedia devices, sensors and microchips.
- Embedded systems, computing and control: more powerful, secure, distributed, reliable and efficient hardware/software systems that can perceive, control and adapt to their environment while optimising the use of resources; methods and tools for system modelling, analysis, design, engineering and validation to master complexity; open composable architectures and scale-free platforms, middleware and distributed operating systems to enable truly seamless collaborative and ambient intelligent environments for sensing, actuation, computing, communication, storage, and service delivery; computing architectures incorporating heterogeneous, networked and reconfigurable components including compilation, programming and run-time support, high performance systems and services; control of large-scale, distributed, uncertain systems.
- Software, grids, security and dependability: technologies, tools and methods for dynamic and trusted software, architectures and middleware systems that underpin knowledge-intensive services, including their provision as utilities; service-oriented, interoperable and scale-free infrastructures, grid-like virtualisation of resources, including domain-specific platforms, network-centric operating systems; open source software; open standards platforms and collaborative approaches for development and validation of software, services and systems; composition tools including programming languages; mastering emergent behaviours of complex systems; improving dependability and resilience of large-scale, distributed and intermittently connected systems and services; secure and trusted systems and services, including privacy-aware access control and authentication, dynamic security and trust policies, dependability and trust meta-models.
- Knowledge, cognitive and learning systems: methods and techniques to acquire, create and interpret, represent and personalise, navigate and retrieve, share and deliver knowledge, recognising the semantic relationships in content for use by humans and machines; artificial systems that perceive, interpret and evaluate information and that can cooperate, act autonomously and learn; theories and experiments that move beyond incremental advances benefiting from insights into natural cognition, in particular learning and memory, also for the purpose of advancing systems for human learning.
- Simulation, visualisation, interaction and mixed realities: tools for modelling, simulation, visualisation, interaction, virtual, augmented and mixed reality and their integration in end-to-end environments; tools for innovative design and for creativity in products, services and digital audio-visual media; more natural, intuitive and easy-to-use interfaces and new ways to interact with technology, machines, devices and other artefacts; language technology including multilingual and automatic machine translation systems.

⁽¹⁾ These could include selected aspects of research in the areas of nanoelectronics technologies, embedded computing systems.

⁽²⁾ This could include possible joint implementation of programmes in the field of ambient-assisted living.

- New perspectives in ICT drawing on other science and technology disciplines (mathematics and physics, materials, bio-technologies, life-sciences, chemistry, cognitive and social sciences, the humanities, etc.) are provided in the whole of the ICT theme. These are bringing breakthroughs that lead to innovation in ICT and to entirely new industry and service sectors. They span from miniaturisation of ICT devices to sizes compatible and interacting with living organisms (like novel ICT components and computing systems based on synthetic bio-molecular structures), to new computing and communication sciences inspired by the living world, to fully eco-compatible ICT devices inspired by natural systems, and to modelling and simulation of the living world (like simulation of human physiology across several biological levels).

Integration of technologies:

- Personal environments: integration of multimodal interfaces, sensing techniques and micro-systems, personal communication and computing devices, ICT systems embodied in personal accessories, wearable systems and implants and their connection to services and resources, placing emphasis on integrating all facets of a person's presence and identity.
- Home environments: communication, monitoring, control and assistance of the home, buildings and public spaces; seamless interoperability and use of all devices taking account of cost efficiency, affordability, usability and safety; new services and new forms of interactive digital content and services including entertainment; access to information and management of knowledge.
- Robotic systems: flexible and dependable robot systems operating in human and unstructured environments and cooperating with people; networked and cooperating robots; miniaturised robots; humanoid technologies; modular design and modelling of integrated robotic systems.
- Intelligent infrastructures: ICT tools making critical infrastructures more efficient and user-friendly, easier to adapt and maintain, more robust to usage and resistant to failures; data integration tools; ICT for systemic risk assessment, early warning and automated alerts, planning and decision support.

Applications research:

- ICT meeting societal challenges: to ensure that all European citizens can reap the maximum benefit from ICT products and services, to improve inclusiveness, seamless access and interactivity of services of public interest, and to strengthen the innovation role of public sector services, improving their efficiency and effectiveness.
- For health: personal non-obtrusive systems that enable citizens to manage their well-being such as wearable or implantable monitoring devices and autonomous systems for supporting a healthy state; emerging techniques such as molecular imaging for improved prevention and individualised medicine; health knowledge discovery, management and application in clinical practice; modelling and simulation of organ functions; micro- and nano-robotic devices for minimally invasive surgical and therapeutic applications.
- For governments at all levels: use of ICT in an interdisciplinary approach in public administrations combined with organisational change and new skills in order to deliver innovative, citizen-centric services for all; advanced ICT based research and solutions to improve democratic and participatory processes and the performance and quality of public sector services, interaction with and between administrations and governments, and support legislative and policy development processes in all stages of democracy.
- For inclusion: to empower individuals and their communities and improve equal participation of all citizens in the information society, while preventing digital divides due to disability, low skills, poverty, geographic isolation, culture, gender or age, *inter alia*, through support to assistive technology, promoting independent living, increasing e-skills, and developing products and services designed-for-all.
- For mobility: integrated ICT-based safety systems for vehicles based on open, secure and dependable architectures and interfaces; interoperable cooperative systems for efficient, safe and environment-friendly transport, based on communication between vehicles and with the transport infrastructure and integrating accurate and robust location and navigation technologies; personalised, location-aware info-mobility and multi-modal services, including intelligent service solutions for tourism.
- In support of the environment, risk management and sustainable development: risk and emergency management; smart sensor networks to improve hazard forecasting, natural resources management including systems for reduction of pollutants; increasing energy efficiency; managing human response to environmental stresses and to sustain biodiversity; alert systems and timely and reliable public safety communication; assistive technologies and support systems for operation under harsh, hazardous or risky conditions; eco-efficient and sustainable production of ICT

including electronics; advanced data and information management for environmental monitoring and risk assessment, contributing to Inspire; GMES and GEOSS.

- ICT for content, creativity and personal development:
 - novel forms of interactive, non-linear and self-adaptive content including for entertainment and for design; creativity and enriched user-experience; cross-media content customisation and delivery; combining all-digital content production and management with emerging semantic technologies; user-oriented use, access to and creation of content;
 - technology-enhanced learning systems, tools and services, adapted to different learners in different contexts; issues underlying human learning including pedagogical theories when the process is mediated by using ICT; improving people's abilities to become active learners;
 - intelligent services for access to cultural heritage in digital form; access to and use of scientific resources; tools for communities to create new cultural memory based on living heritage; methods and tools for preservation of digital content; making digital objects usable by future users whilst keeping authenticity and integrity of their original creation and context of use.
- ICT supporting businesses and industry:
 - dynamic, network-oriented business systems, including their monitoring in real time, for product and service creation and delivery; decentralised control and management of intelligent items; digital business ecosystems, in particular software solutions (also based on grids) adaptable to the needs of small- and medium-sized organisations; collaboration services for distributed context-aware workspaces; augmented group presence, group management and sharing support; knowledge sharing and interactive services;
 - manufacturing including traditional industry: networked intelligent controls for high-precision manufacturing and low-resource utilisation; wireless automation and logistics for rapid plant reconfiguration; integrated environments for modelling, simulation, optimisation, presentation and virtual production; manufacturing technologies for miniaturised ICT systems and for systems interwoven with all kinds of materials and objects.
- ICT for trust and confidence:
 - tools supporting the trust and confidence of ICT and its applications; multiple and federated identity management systems; authentication and authorisation techniques; systems meeting privacy needs deriving from new technological developments; rights and asset management; tools to protect against cyber threats, in coordination with other themes, in particular the 'Security' theme.

International cooperation

International cooperation will be encouraged in the ICT theme to address issues of common interest aiming at interoperable solutions with strategic partners with high mutual benefits, and to contribute to the spread of the information society in emerging economies and developing countries. Specific actions will be identified for the countries or regions with which Europe needs to focus collaboration, with a particular emphasis on cooperation with emerging economies and developing countries and neighbourhood countries.

A subscription will be made available jointly with theme 1 'Health' to the international Human Frontier Science Programme (HFSP) to promote interdisciplinary research and novel collaborations between scientists from different fields, and provide the possibility for non-G8 Member States to fully benefit from the programme.

Activities under this theme support the Intelligent Manufacturing Systems (IMS) scheme, which allows RTD cooperation between its member regions ⁽¹⁾.

Responding to emerging needs and unforeseen policy needs

A Future and Emerging Technologies activity will attract and foster trans-disciplinary research excellence in emerging ICT-related research domains. Focuses include: exploring the new miniaturisation and computing frontiers including for example the exploitation of quantum effects; harnessing the complexity of networked computing and communication systems

⁽¹⁾ The agreement for scientific and technical cooperation in the domains of IMS concluded between the European Community and the United States of America, Japan, Australia, Canada, Republic of Korea and the EFTA States of Norway and Switzerland.

including software; exploring new concepts of and experimenting with intelligent systems for new personalised products and services.

Research that aims at better understanding trends and impacts of ICT on society and the economy may include, for example: impacts of ICT on productivity, employment, skills and wages; ICT as a driver for innovation in public and business services; obstacles to wider and faster innovation and use of ICT; new business models and exploitation paths, in coordination with other themes where ICT will play an important role in changing the approach to production and services; usability, utility and acceptability of ICT-based solutions; privacy, security and trust of ICT infrastructures; ethical issues of ICT developments; links to ICT-related legal, regulatory and governance frameworks; analyses of ICT support to, and impact on, Community policies.

4. NANO-SCIENCES, NANO-TECHNOLOGIES, MATERIALS AND NEW PRODUCTION TECHNOLOGIES

Objective

Improve the competitiveness of European industry and generate knowledge to ensure its transformation from a resource-intensive to a knowledge-intensive industry, by generating step changes in knowledge and implementing decisive knowledge for new applications at the crossroads between different technologies and disciplines. This will benefit both new, high-tech industries and higher-value, knowledge-based traditional industries, with a special focus to the appropriate dissemination of RTD results to SMEs. These activities are primarily concerned with enabling technologies which impact all industrial sectors and many other Seventh Framework Programme themes.

Approach

To enhance its competitiveness, European industry needs radical innovations. It must concentrate its capabilities on high added-value products, related processes and technologies to meet customer requirements, as well as environmental, health and other societal expectations. Research is integral to meeting these competing challenges. The competitiveness of the industry of the future will largely depend on nano-technologies and their applications. RTD in nano-sciences and nano-technologies taken up by several areas can accelerate European industry's transformation. The EU has recognised leadership in fields such as in nano-sciences, nano-technologies, materials and production technologies which must be strengthened in order to secure and increase the EU position in a highly competitive global context. The competitiveness of more mature industries is also largely dependent on their capacity to integrate new technologies.

A key element of this theme is the effective integration of nanotechnology, materials sciences, design and new production methods so as to achieve and maximise the impacts for industrial transformation and, at the same time, supporting sustainable production and consumption. In this respect, materials with new properties are in particular important for the future competitiveness of European industry and the basis for technological progress in many areas. The theme will support industrial activities operating in synergy with other themes. Applications in all sectors and areas will be supported including materials sciences and technologies, high performance manufacturing and process technologies, nano-biotechnology and nano-electronics.

The medium-term approach is to focus on a convergence of knowledge and skills drawn from different disciplines exploiting application-driven scientific and technological synergies. In the long term the theme aims to capitalise on the enormous prospects of nano-sciences and nano-technologies for the creation of a true knowledge-based industry and economy. In both cases it will be essential to ensure uptake of the knowledge generated through effective dissemination and use of the results.

Strong contributions to industrial needs and complementarities through initiatives and funded projects will be ensured in particular through activities like the European technology platforms (e.g. in the potential areas of sustainable chemistry, energy, new manufacturing, power generation, industrial safety, nano-medicine, steel, textiles, ceramics, forest-based sector, etc) and possible support to joint technology initiatives.

The theme is particularly relevant to SMEs due to their needs and role in advancing and using technologies. Areas of particular relevance include: nano-instruments, -tools, and -devices as well as aerospace systems (due to the concentration of high-growth, knowledge-intensive SMEs in these sectors); technical textiles including their coating, (typical of a traditional sector undergoing a rapid transformation process affecting many SMEs); mechanical industries (e.g. machine tools- where European SMEs are world leaders); high added-value chemicals, as well as other sectors which involve many SMEs that will benefit from the introduction of new business models, materials and products.

Specific actions to coordinate programmes and joint activities conducted at national and regional level will be carried out through the ERA-NET and ERA-NET PLUS schemes so as to promote convergence of research programmes, and to reinforce critical mass and synergies within the European technology platforms. Industrial research will also benefit from the coordination of activities in areas such as metrology, toxicology, standards and nomenclature.

Activities

Nano-sciences and nano-technologies

The objective is to create materials and systems with pre-defined properties and behaviour, based on increased knowledge and experience with matter at the nano-scale. This will lead to a new generation of high added-value, competitive products and services with superior performance across a range of applications, while minimising any potential adverse environmental and health impacts. Interdisciplinarity, integrating theoretical and experimental approaches, will be promoted.

The focus will be:

- new knowledge of the interactions of atoms, molecules and their aggregations with both natural and artificial entities,
- the realisation of nano-structures, systems or materials using this knowledge,
- activities aiming at understanding or imitating the natural processes at nano-metric scale,
- processes for nano-fabrication, surface functionalisation, thin layers, self assembling properties,
- methods and processes for measuring and characterisation.

The research will also address the relevant instruments, tools, pilot lines and demonstration activities required for highly novel approaches to nanotechnology-based manufacturing in the most promising industrial sectors.

Moreover, the activity will focus on related challenges and the societal context and acceptance of nanotechnology. This will include research on all aspects of risk assessment (e.g. nano-toxicology and eco-toxicology), as well as safety, nomenclature, metrology and standards which are becoming increasingly important to pave the way for industrial applications. Specific actions may also be launched for establishing dedicated centres of knowledge and expertise as well as a focal point to implement the Commission's integrated and responsible approach towards nanotechnology as outlined in the associated Action Plan ⁽¹⁾.

Materials

New advanced materials and surfaces with higher knowledge content, new functionalities and improved performance are increasingly critical for industrial competitiveness and sustainable development. According to the new models of manufacturing industry, it is the materials themselves which are becoming the first step in increasing the value of products and their performance, rather than the processing steps.

Research will focus on developing new knowledge-based multifunctional surfaces and materials with tailored properties and predictable performance for new products and processes as well as for their repair. The emphasis will be on high performance multifunctional materials with a wide range of applications.

This requires the control of intrinsic properties and performance, processing and production, and taking into account potential impacts on health and the environment throughout their entire life cycle. Emphasis will be placed on new advanced materials and systems obtained using the potential of nano-technologies and bio-technologies and/or 'learning from nature', in particular higher performance nano-materials, bio-materials, hybrid materials and artificial materials with electromagnetic properties not found in nature.

⁽¹⁾ Commission Communication, Nanosciences and nanotechnologies: an action plan for Europe 2005 to 2009 — COM(2005) 243.

A multidisciplinary approach will be fostered, involving chemistry, physics, engineering sciences including computational modelling and increasingly the biological sciences. Materials characterisation, design and simulation are also essential to better understand materials phenomena, in particular the structure-property relationships at different scales; to improve materials assessment and reliability including resistance to ageing, and to extend the concept of virtual materials for materials design. The integration of nano-molecular-macro levels in chemical and materials technologies will be supported for developing new concepts and processes such as in catalysis, and process intensification and optimisation. Issues related to process development and scaling up and industrialisation of new materials will also be addressed.

New production

A new approach to manufacturing is required for the transformation of EU industry from a resource intensive to a sustainable knowledge-based industrial environment and will depend on the adoption of totally new attitudes towards the continued acquisition, deployment, protection and funding of new knowledge and its use, including towards sustainable production and consumption patterns. This entails creating the right conditions for industry to engage in continuous innovation (in industrial activities and production systems, including design, construction, devices, and services) and for developing generic production 'assets' (technologies, organisation and production facilities as well as human resources) while also meeting safety and environmental requirements.

The activities will focus on:

- the development and validation of new industrial models and strategies covering all aspects of product and process life-cycle,
- adaptive production systems that overcome existing process limitations and enable new manufacturing and processing methods,
- networked production to develop tools and methods for cooperative and value-added operations at a global scale,
- tools for the rapid transfer and integration of new technologies into the design and operation of manufacturing processes,
- the exploitation of multidisciplinary research networks and of the convergence of the nano-, micro-, bio-, geo-, info-, optical and cognitive technologies to develop new added-value hybrid technologies, products and engineering concepts and the possibility of new industries.

Particular attention should be paid to promoting activities which support the adaptation and integration of SMEs to the new needs of the supply chain as well as to giving an impulse to the creation of high tech SMEs.

Integration of technologies for industrial applications

The integration of knowledge and technologies of the three areas of research above is essential in order to speed up the transformation of European industry and its economy, while adopting a safe, socially responsible and sustainable approach.

The research will focus on new applications and novel, step-change solutions responding to major challenges, as well as to the RTD needs including those identified by the different European technology platforms. The integration of new knowledge from nano-, materials-, and production-technologies will be supported in sectoral and cross-sectoral applications such as health, food, construction and building including cultural heritage, aerospace industry, transport, energy, chemistry, environment, information and communication, textiles, clothing and footwear, forest-based industry, steel, mechanical and chemical engineering, as well as in the generic subjects of industrial safety and measurement and testing.

International cooperation

The increasingly international dimension of industrial research requires a well-coordinated approach to working with third countries. International cooperation will therefore be important across the theme.

Specific actions may include: activities with industrialised countries and those having signed a S&T cooperation agreement in the fields of the theme; specific initiatives with emerging economies and developing countries to secure their access to knowledge; dialogue with major countries on a 'code of conduct' for the responsible and safe development of nanotechnology; and the Intelligent Manufacturing Systems (IMS) scheme, which allows RTD cooperation between its member regions ⁽¹⁾. Initiatives to coordinate and exchange research data will be encouraged (such as in environmental and health safety issues for nano-technologies), paving the way for a common understanding of regulatory needs by policymakers across the world.

Responding to emerging needs and unforeseen policy needs

Research on emerging needs will be implemented notably to develop and consolidate European capabilities in specific emerging and interdisciplinary research areas with high potential for the future. Any unforeseen policy needs will be addressed in a flexible way and may, for example, relate to standardisation, to support the safe transformation towards a knowledge based industry, or to potential environmental and health impacts arising from nano-technologies.

5. ENERGY

Objective

Adapting the current energy system into a more sustainable one, less dependent on imported fuels based on a diverse mix of energy sources, in particular renewables, energy carriers and non-polluting sources; enhancing energy efficiency, including by rationalising use and storage of energy; addressing the pressing challenges of security of supply and climate change, whilst increasing the competitiveness of Europe's industries.

Approach

Current projections in the EU and worldwide show most of the crucial energy indicators (e.g. energy consumption, fossil fuel dependency, the finite nature of conventional oil and natural gas reserves, import dependency, CO₂ emissions, energy prices) to be moving away from a sustainable and reliable energy system. Energy research will facilitate reversing these trends, striking a balance between increasing the efficiency, affordability, acceptability and security of existing technologies and sources of energy, whilst simultaneously aiming at a longer-term paradigm shift in the way Europe generates and consumes energy. Energy research will thus directly contribute to the success of Community policy and, in particular, the achievement of current and future EU energy and greenhouse gas reduction targets.

Following a broad technology portfolio approach, in accordance with the conclusions of the 2000 Green Paper 'Towards a European strategy for the security of energy supply' ⁽²⁾, the 2005 Green Paper on Energy Efficiency ⁽³⁾ and the 2006 Green Paper on a European strategy for sustainable competitive and secure energy ⁽⁴⁾, research will focus on the identification and development of cost-effective technologies for a more sustainable energy economy for Europe (and world-wide), based on affordable energy costs for our citizens and industries, and allow European industry to compete successfully on the global stage. Activities will address all time horizons, separately or in combination, and embrace the whole chain from fundamental and applied research and technological development through to large-scale technology demonstration, underpinned by cross-cutting and socioeconomic research to validate research results and to provide a rational basis for policy decisions and market framework development.

Wherever possible, an integrated approach will be adopted, stimulating the necessary feedback and cooperation between the various stakeholders concerned. Integrated actions that cut across or exploit the synergies between different research areas will be encouraged.

Strengthening the competitiveness of the European energy sector, in the face of severe global competition, is an important objective of this theme, providing the capability for European industry to maintain and develop its world leadership in key energy generation and energy efficiency technologies and materials. This will require large R & D efforts and international collaboration. In particular, SMEs are important actors in the energy sector play a major role in the energy chain and will be key to promoting innovation. Their strong participation in research and demonstration activities is essential and will be actively promoted.

⁽¹⁾ The agreement for scientific and technical cooperation in the domains of IMS is between the European Community and the United States of America, Japan, Australia, Canada, Republic of Korea and the EFTA States of Norway and Switzerland.

⁽²⁾ COM(2002) 279, 29.11.2000.

⁽³⁾ COM(2005) 265.

⁽⁴⁾ COM(2006) 105.

The strategic research agendas and deployment strategies developed by European technology platforms are an important input for the research priorities in the theme. Such platforms are established on hydrogen and fuel cells and photovoltaics and the concept is being extended to bio-fuels, zero emission power generation and future electricity networks and other energy-related areas. Actions to enhance the coordination of national programmes will be pursued wherever appropriate.

Increasing efficiency throughout the energy system, from source to user, is essential and underpins the whole of the energy theme. Recognising their important contribution to future sustainable energy systems, renewables and end-use energy efficiency will be the major part of this theme. Particular attention will be paid to stimulating research, development and demonstration and promoting capacity building in this area. Synergies with the Intelligent Energy-Europe Programme component of the Competitiveness and Innovation Programme will be fully exploited in this regard. The potential for future large-scale initiatives integrating funding from various sources (e.g. JTI) will also be explored.

In order to strengthen the diffusion and use of the output of research, the dissemination of knowledge and transfer of results, including to policymakers, will be supported in all areas.

Activities

Hydrogen and fuel cells

The integrated research and deployment strategy developed by the European Hydrogen and Fuel Cell Technology Platform provides the basis for a strategic, integrated programme for transport, stationary and portable applications, aimed at providing a strong technological foundation for building a competitive EU fuel cell and hydrogen supply and equipment industry. The programme will comprise: fundamental and applied research and technological development; demonstration projects at an appropriate scale to validate research results and provide feedback for further research; cross-cutting and socioeconomic research activities including infrastructure issues to underpin sound transition strategies and provide a rational basis for policy decisions and market framework development.

The industrial applied research, demonstration and cross-cutting activities of the programme could be implemented through a Joint Technology Initiative. This strategically managed, goal-oriented action will be complemented and closely coordinated with more upstream collaborative research effort aimed at achieving breakthrough on critical materials, processes and emerging technologies.

Renewable electricity generation

Research into, development and demonstration of integrated technologies for electricity production from renewables, suited to different regional conditions where sufficient economic and technical potential can be identified, in order to provide the means to raise substantially the share of renewable electricity production in the EU. Research should increase overall conversion efficiency, cost efficiency, significantly drive down the cost of electricity production from indigenous renewable energy resources including bio-degradable fraction of waste, enhance process reliability and further reduce the environmental impact and eliminate existing obstacles. Emphasis will be on photovoltaics, wind and bio-mass including CHP. Furthermore, research will aim at realising the full potential of other renewable energy sources: geothermal, thermal solar, ocean (e.g. wave, tidal power) and hydropower.

Renewable fuel production

Research into, development and demonstration of improved fuel production systems and conversion technologies for the sustainable production and supply chains of solid, liquid and gaseous fuels from bio-mass (including bio-degradable fraction of waste). Emphasis should be on new types of bio-fuels in particular for transport and electricity as well as on new production, storage and distribution routes for existing bio-fuels, including the integrated production of energy and other added-value products through bio-refineries. Aiming to deliver 'source to user' carbon benefits, research will focus on improving energy efficiency, enhancing technology integration and use of feedstock. Issues such as feedstock logistics, pre-normative research and standardisation for safe and reliable use in transport and stationary applications will be included. To exploit the potential for renewable hydrogen production, bio-mass, renewable electricity and solar energy driven processes will be supported.

Renewables for heating and cooling

Research into, development and demonstration of a portfolio of technologies and devices including storage technologies to increase the potential of active and passive heating and cooling from renewable energy sources to contribute to sustainable energy. The aim is to achieve substantial cost reductions, increase efficiencies, further reduce environmental impacts and optimise the use of technologies in different regional conditions where sufficient economic and technical potential can be

identified. Research and demonstration should include new systems and components for industrial applications (incl. thermal seawater desalination), district and/or dedicated space heating and cooling, building integration and energy storage.

CO₂ capture and storage technologies for zero emission power generation

Fossil fuels will inevitably continue to contribute a significant share of the energy mix for decades to come. To make this option compatible with the environment, particularly as regards climate change, drastic reductions in the adverse environmental impacts of fossil fuel use are needed, aiming at highly efficient and cost-effective power and/or heat generation with near zero emissions. The research into, development and demonstration of efficient, cost effective and reliable CO₂ capture and storage technologies, in particular underground storage, are crucial across different types of CO₂ geological reservoirs, aiming at decreasing the cost of CO₂ capture and storage to less than EUR 20/tonne, with capture rates above 90 %, as well as proving the long-term stability, safety and reliability of CO₂ storage.

Clean coal technologies

Coal fuelled power plants remain the workhorse of electricity generation worldwide, but have considerable potential for further efficiency gains and emissions reductions, particularly concerning CO₂. To maintain competitiveness and contribute to the conservation of resources and the management of CO₂ emissions, the research into, development and demonstration of clean coal and other solid hydrocarbons conversion technologies will be supported, both for existing and future power plants. Conversion technologies, including chemical processes, producing secondary energy carriers (including hydrogen) and liquid and gaseous fuels will also be supported. This will significantly increase plant efficiency and reliability, minimise pollutant emissions and reduce overall costs, under various operating conditions. Looking towards future zero emission power generation, these activities will be linked to and prepare for CO₂ capture and storage technologies and co-utilisation of bio-mass.

Smart energy networks

To facilitate the transition to a more sustainable energy system, a wide-ranging R & D effort is required to increase the efficiency, flexibility, safety, reliability and quality of the European electricity and gas systems and networks notably within the context of a more integrated European energy market. For electricity networks, the goals of transforming the current electricity grids into a resilient and interactive (customers/operators) service network, controlling the real time flows and removing the obstacles to the large-scale deployment and effective integration of renewable energy sources and distributed generation (e.g. fuel cells, micro turbines, reciprocating engines), will necessitate the research, development and demonstration of key enabling technologies (e.g. innovative ICT solutions, storage technologies for RES, power electronics and superconducting devices) including the development of new control and reliability tools for electricity systems. For gas networks, the objective is to demonstrate more intelligent and efficient processes and systems for gas transport and distribution, including the effective integration of renewable energy sources and the use of bio-gas in the existing networks.

Energy efficiency and savings

The vast potential for final and primary energy consumption savings and improvements in energy efficiency ⁽¹⁾ need to be harnessed through the research into, optimisation, validation and demonstration of new concepts, optimisation of proved and new concepts and technologies for buildings, services and industry. This incorporates the combination of sustainable strategies and technologies for increased energy efficiency, the use of renewable energy and co- and poly-generation and the integration of demand management measures and devices at large scale in cities and communities, and the demonstration of minimum climate impact buildings (eco-buildings). These large-scale actions may be supported by innovative R & D addressing specific components or technologies, e.g. for poly-generation and eco-buildings (including lighting). A key aim is the optimisation of the local community energy system, balancing a significant reduction in energy demand with the most affordable and sustainable supply solution, including the use of new fuels in dedicated fleets ⁽²⁾.

⁽¹⁾ As recognised by the Green Paper on Energy Efficiency or 'Doing more for less' — COM(2005) 265, 22.6.2005.

⁽²⁾ Building upon the experience of the Concerto and Civitas initiatives supported in the Sixth Framework Programme.

Knowledge for energy policymaking

Development of tools, methods and models to assess the main economic and social issues related to energy technologies. Activities will include the building of databases and scenarios for an enlarged EU and the assessment of the impact of energy and energy-related policies on security of supply, environment, society, competitiveness of the energy industry and issues of public acceptability. Of particular importance is the impact of technological progress on Community policies. Activities will include scientific support for policy development.

International cooperation

Given the global nature of the challenges, threats and opportunities, international collaboration is an increasingly important element of energy research. Specific actions will support strategically important multi-lateral cooperation initiatives, such as the International Partnership for the Hydrogen Economy (IPHE), the Carbon Sequestration Leadership Forum (CSLF) and the Johannesburg Renewable Energy Coalition (JREC). Other specific actions will be supported, addressing issues such as the environmental consequences of energy policies, energy supply inter-dependency, technology transfer and capacity building and will engage emerging economies with significant energy needs.

International Scientific Cooperation in the field of energy will also support the aim of the EU Energy Initiative for poverty eradication and sustainable development (EUEL) launched at the World Summit on Sustainable Development (WSSD), namely to contribute to the achievement of the Millennium Development Goals (MDGs) through the provision of reliable and affordable access to sustainable energy for the poor.

Responding to emerging needs and unforeseen policy needs

Research on emerging needs will help to identify and explore new scientific and technological opportunities in the domain of energy supply, conversion use and sustainability, often in combination with other areas and disciplines, such as biotechnology and new materials and production processes. Unforeseen policy needs for which a quick reaction might be required include, for example, the developments of international climate change actions and the response to severe disruptions or instabilities in energy supply or price.

6. ENVIRONMENT (INCLUDING CLIMATE CHANGE)

Objective

Sustainable management of the environment and its resources through advancing our knowledge of the interactions between the climate, biosphere, ecosystems and human activities, and developing new technologies, tools and services, in order to address in an integrated way global environmental issues. Emphasis will be put on prediction of climate, ecological, earth and ocean systems changes, on tools and on technologies for monitoring, prevention, mitigation of and adaptation to environmental pressures and risks including on health, as well as for the sustainability of the natural and man-made environment.

Approach

Protecting the environment is essential for the quality of life of current and future generations as well as for economic growth. Given that the Earth's natural resources and the man-made environment are under pressure from growing population, urbanisation, construction, continuous expansion of the agriculture, aquaculture and fisheries, transport and energy sectors, land use as well as climate variability and warming at local, regional and global scales, the challenge facing the EU is to ensure continuous and sustainable growth while at the same time reducing negative environmental impacts. EU-wide cooperation is motivated by the facts that countries, regions and cities face common environmental problems and that critical mass is needed given the scale, scope and high level of complexity of environmental research. Such cooperation also facilitates common planning, use of connected and interoperable databases, and the development of common indicators, of assessment methodologies and of coherent and large-scale observation and forecasting systems. Furthermore international cooperation is necessary for the completion of knowledge and the promotion of better management at a global level.

Research under this topic ⁽¹⁾ will contribute to the implementation of international commitments of EU and Member States such as the United Nations Framework Convention on Climate Change, Kyoto and Montreal protocols, post-Kyoto protocol initiatives, the UN Convention on Biological Diversity, the UN Convention to Combat Desertification, the Stockholm Convention on persistent organic pollutants and the World Summit on Sustainable Development 2002, including the EU Water Initiative (as well as promoting sustainable production and consumption). It will also contribute to the Intergovernmental Panel on Climate Change, Group on the Earth Observation (GEO) initiative and take into account the

⁽¹⁾ Complementary research relating to the production and use of biological resources is addressed under the 'Food, Agriculture and Biotechnology' theme.

Millennium Ecosystem Assessment. In addition, it will support the research needs arising from existing and emerging Community legislation and policies (e.g. Natura 2000, Reach), the implementation of the Sixth Environmental Action Programme, associated thematic strategies (e.g. marine, soil strategies) and other emerging strategies (e.g. the mercury strategy), and the action plans on environmental technologies and on environment and health.

The promotion of innovative environmental technologies will contribute to achieving sustainable use of resources, to mitigating and adapting to climate change, and to protecting the ecosystems and the man-made environment. Research will also contribute to technological developments that will improve the market positioning of European enterprises, in particular of SMEs, in areas such as environmental technologies. European technology platforms, such as those on water supply and sanitation, sustainable chemistry, construction, and forestry, confirm the need for EU level action and the implementation of relevant parts of their research agendas will be supported in the activities below.

Coordination of national programmes will be reinforced by broadening and deepening the scope of existing ERA-NETs in environmental research ⁽¹⁾.

Specific attention will be paid to strengthening the dissemination of Community research outcomes — also through the exploitation of synergies with complementary funding mechanisms at Community and Member State levels — and to stimulating their uptake by relevant end-users, targeting in particular policymakers.

Where relevant, integrated concepts, tools and management strategies will be developed under the activities below. Coordination with cross-cutting issues ⁽²⁾ will be ensured. Activities will take the socioeconomic aspects of policies and technologies into account where relevant.

Activities

Climate change, pollution, and risks

Pressures on environment and climate

Integrated research on the functioning of climate and the earth and marine system, including the polar regions, is needed in order to observe and analyse how these systems evolved in the past and predict their future evolution including observations, experimental studies and advanced modelling and taking into account the anthropogenic forcing. This will enable the development of effective adaptation and mitigation measures to climate change and its impacts. Advanced climate change models from the global to the local scale will be developed and validated. These models will be applied to assess changes, potential impacts and critical thresholds (e.g. for ocean acidity). Changes in atmospheric composition and in the water cycle will be studied and risk based approaches will be developed taking into account changes in droughts, storms and floods patterns. Quantification and study of carbon and greenhouse gases (including aerosols) budget will be undertaken. Pressures on environmental quality and on climate from natural and anthropogenic pollution of the air, water and soil will be investigated as well as the interactions between the atmosphere, the stratospheric ozone layer, land surface, ice and oceans. Consideration will be given to feedback mechanisms and abrupt changes (e.g. ocean circulation), and to impacts on biodiversity and ecosystems, including the effects of sea level rise on coastal zones, and impacts on sensitive areas such as mountain regions.

Environment and health

Multidisciplinary research on interactions of environmental and climate risk factors and human health is needed to support the Environment and Health action plan and the integration of public health concerns and disease characterisation related to emerging environmental risks. Research will focus on the impact of global change (climate change, land use, globalisation) multiple exposures via different exposure routes, identification of pollution sources and new or emerging environmental stressors and vectors (e.g. indoor and outdoor environment, issues related to urban environment, air pollution, electromagnetic fields, noise and exposure to toxic substances including development of integrated risk assessment and methodologies for hazardous substances), and their potential health effects. Research will also aim at integrating research activities on human bio-monitoring regarding scientific aspects, methodologies and tools to develop a coordinated and coherent approach. It will include European cohort studies, with attention to vulnerable population groups, and methods and tools for improved risk characterisation, assessment and comparisons of risks and health impacts. Research will develop bio-markers and modelling tools taking into account combined exposures, variations in vulnerability and uncertainty. It will also deliver advanced methods and decision support tools (indicators, data bases, cost-benefit and multi-criteria analyses, health impact assessment, burden of disease and sustainability analysis) for risk analysis, validation and linkage of models and systems, and for management and communication which are supporting policy development, assessment and monitoring.

⁽¹⁾ This could include joint implementation of programmes in Baltic Sea research, and new ERA-NETs.

⁽²⁾ As regards environmental technologies, coordination with CIP is particularly important.

Natural hazards

Managing natural disasters requires a multi-risk approach, combining risk specific needs with comprehensive planning. There is a need for improved knowledge, methods and integrated framework for the assessment of hazards, vulnerability and risks. Furthermore, mapping, prevention, detection and mitigation strategies including consideration of economic and social factors need to be developed. Disasters related to climate (such as storms, droughts, forest fires, landslides, avalanches, floods and other extreme events), and geological hazards (such as earthquakes, volcanoes and tsunamis) and their impact will be studied. This research will allow the underlying processes to be better understood. It will also allow for the detection, prediction and forecasting methods to be improved on the basis of deterministic and probabilistic approaches. It will underpin the development of early warning and information and rapid response systems aiming also to reduce the vulnerability of human settlements. Societal repercussions of major natural hazards will be quantified, including impacts on ecosystems.

Sustainable management of resources

Conservation and sustainable management of natural and man-made resources and biodiversity

Research activities will be targeted to improve the knowledge basis and develop advanced models and tools needed for the sustainable management of resources and the creation of sustainable consumption patterns. This will enable the prediction of the behaviour of ecosystems and their restoration, and the mitigation of degradation and loss of important structural and functional elements of ecosystems (for biodiversity, water, soil and marine resources). Research on ecosystem modelling will take account of protection and conservation practices. Innovative approaches to develop economic activities from ecosystem services will be promoted. Integrated approaches will be developed to prevent and combat desertification, land degradation and erosion (including rational use of water), to stop biodiversity loss and to mitigate negative consequences of human interference. Research will also address sustainable use and management of forests, landscape and urban environment including post-industrialised zones addressing in particular planning, and sustainable waste management. The research will benefit from and contribute to the development of open, distributed, inter-operable data management and information systems and will underpin assessments, foresight, and services related to natural resources and their use.

Management of marine environments

Specific research is required to improve our understanding of the impacts of human activities on the ocean and seas and on the resources of the marine environment, including the pollution and eutrophication of regional seas and coastal areas. Research activities in aquatic environments including coastal, regional and deep sea ecosystems and seabed, will be carried out in order to observe, monitor and predict the behaviour of this environment and enhance understanding of the sea and the sustainable use of ocean resources. The impact of human activities on the ocean will be assessed through integrated approaches taking into account marine biodiversity, ecosystem processes and services, ocean circulation and seabed geology. Development of concepts and tools for the support of strategies for the sustainable use of the ocean and its resources will be undertaken. This will include methodologies, information systems and databases, assessment tools of policies and instruments.

Environmental technologies

Environmental technologies for observation, simulation, prevention, mitigation, adaptation, remediation and restoration of the natural and man-made environment

New or improved environmental technologies are needed to reduce the environmental impact of human activities, protect the environment and manage resources more efficiently and to develop new products, processes and services more beneficial for the environment than existing alternatives. Research will target in particular: technologies preventing or reducing environmental risks, mitigating hazards and disasters, mitigating climate change and the loss of biodiversity; technologies promoting sustainable production and consumption; technologies for managing natural resources or treating pollution more efficiently, in relation to water, soil, air, marine and other resources including urban environment and waste (including waste recycling). Cross-cutting coordination will be ensured with other related themes.

Protection, conservation and enhancement of cultural heritage, including human habitat

Technologies for the environmentally sound and sustainable management of the human environment including the built environment, urban areas, landscape, as well as for the protection, conservation and restoration of cultural heritage from environmental pollution, including environment impact assessment, models and tools for risk evaluation, advanced and non-destructive techniques for damage diagnosis, new products and methodologies for restoration, mitigation and adaptation strategies for the sustainable management of both movable and immovable cultural assets.

Technology assessment, verification and testing

Research will focus on the risk and performance assessment of technologies, including processes products and services, and the further development of related methods such as the life cycle analysis. Moreover, focus will be given to: long-term opportunities, market potential and socioeconomical aspects of environmental technologies; forest based sector technology, water supply and sanitation Platform, sustainable chemistry Platform; chemicals risk assessment focusing on intelligent testing strategies and methods for minimising animal testing, risk quantification techniques; and research support to the development of the European environmental technologies Verification and Testing system, complementing third party assessment instruments.

Earth observation and assessment tools for sustainable development

Earth and ocean observation systems and monitoring methods for the environment and sustainable development

Research activities will be devoted to the development and integration of the Global Earth Observation System of Systems (GEOSS) for environment and sustainable development issues in the framework of the GEO initiative ⁽¹⁾ to which Global Monitoring for Environment and Security (GMES) is complementary. Interoperability between observation systems, information management and data sharing, and optimisation of information for understanding, modelling and predicting environment phenomena and related human activities will be addressed. These activities will focus on natural hazards, climate change, weather, ecosystems, natural resources, water, land use, environment and health, and biodiversity (including the aspects of risk assessment, forecasting methods and assessment tools) in order to produce advances for the GEOSS societal benefit areas and contribute to GMES.

Forecasting methods and assessment tools for sustainable development taking into account differing scales of observation.

Tools are needed to quantitatively assess the environmental and research policy contribution to competitiveness and sustainable development, including assessments of market-based and regulatory approaches as well as the impacts of current trends in production and consumption patterns. Such tools will include models that consider the links between the economy, environment and society and hence beneficial and efficient strategies of adaptation and prevention. Overall assessment of the global environmental change including interaction between ecosystems and socioeconomic systems will be part of this interdisciplinary research. Research will also seek to improve existing indicators and develop new ones to assess sustainable development policy priorities, and to analyse the linkages between them, taking into account the existing set of EU sustainable development indicators. The analysis of technology, socioeconomic drivers, externalities and governance, sustainability impact assessment as well as foresight studies, will be included. Areas of application include land use and marine policies, urban development, biodiversity and the economic, political and social conflicts related to climate change.

International cooperation

Environmental problems have invariably a transboundary, regional or global dimension and international cooperation will be an important aspect in this theme. Particular areas relate to EU international commitments, such as climate change, biodiversity, desertification, water resource management and chemicals and wastes conventions as well as the Johannesburg Summit decisions on sustainable development as well as other regional conventions. Attention will also be given to relevant research actions stemming from EU environmental strategies and action plans ⁽²⁾.

Scientific and technological partnerships with developing countries and emerging economies will contribute to the Millennium Development Goals in several fields (e.g. prevention and mitigation of the impact of climate change and natural disasters, reverse the loss of environmental resources, improvement of water management, supply and sanitation, prevention and combat of desertification, sustainable production and consumption and facing the environmental challenges of urbanisation), areas where SMEs could also play a key role. Particular attention will be given to the relation between global environmental issues and the regional and local development problems relating to natural resources, biodiversity, ecosystems, land use, natural and man-made hazards and risks, climate change, environmental technologies, environment and health as well as on policy analysis tools. Cooperation with industrialised countries will enhance access to global research excellence; scientists from developing countries should be actively involved in particular regarding better scientific understanding of sustainable development aspects.

The establishment of the GEOSS for Earth observation will promote international cooperation for understanding Earth systems and sustainability issues, and coordinated data collection for scientific and policy purposes with the involvement of public and private stakeholders.

⁽¹⁾ Including financial support for the GEO secretariat.

⁽²⁾ Examples are the Killarney recommendations for Biodiversity Research Priorities for the 2010 Target (Malahide conference in 2004), the EU Action Plan on Climate Change in the Context of Development Cooperation (2004), priority actions identified by the Committee for Science and Technology of the UNCCD, EU and global strategies addressing chemicals and pesticides safe management, etc.

Responding to emerging needs and unforeseen policy needs

Research on emerging needs in this theme may address questions such as the interactions between people, ecosystems and the biosphere or new risks related to natural, man induced and technologically induced disasters.

Support to respond to unforeseen environmental policy needs could, for example, relate to sustainability impact assessments of new policies such as in environment, maritime policy, standards and regulations.

7. TRANSPORT (INCLUDING AERONAUTICS)

Objective

Based on technological and operational advances and on the European transport policy, develop integrated, safer, 'greener' and 'smarter' pan-European transport systems for the benefit of all citizens, and society and climate policy, respecting the environment and natural resources; and securing and further developing the competitiveness attained by the European industries in the global market.

Approach

The European transport system is a vital element to European economic and social prosperity. It serves key roles in the transportation of people and goods in a local, regional, national, European and international context. This theme will address some of the ongoing challenges, as recognised in the White Paper on Transport ⁽¹⁾, in improving the contributions that transport systems make to society and industrial competitiveness within an enlarged EU, whilst minimising the negative impacts and consequences of transport in relation to the environment, energy usage, security and public health.

A new integrated approach will be taken which links all transport modes, addresses the socioeconomic and technological dimensions of research and knowledge development, and encapsulates both innovation and the policy framework.

The various technology platforms set up in this field (ACARE for aeronautics and air transport, ERRAC for rail transport, ERTRAC for road transport, Waterborne for waterborne transport, hydrogen and fuel cells) have elaborated long-term visions and Strategic Research Agendas (SRA) which constitute useful inputs to the definition of this theme and complement the needs of policymakers and expectations of society. Selected aspects of the SRAs may justify setting up joint technology initiatives. ERA-NET activities present opportunities to facilitate further trans-national coordination for specific topics within the Transport sector and will be pursued wherever appropriate.

Activities of particular relevance to SMEs include efforts to ensure robust technology-driven supply chains in the various sectors; enabling SMEs to access research initiatives; and facilitating the role and start-up of high-tech SMEs, particularly in the advanced transport technologies and 'services-related' activities specific to transport as well as the development of systems and applications in satellite navigation domains.

Existing policy needs as well as the development, assessment and implementation of new policies (for example maritime policy and the implementation of the Single European Sky), will be addressed within and across the different activity lines. The work will include studies, models and tools that deal with strategic monitoring and forecasting and integrate knowledge relating to the main economic, social, safety, security and environmental issues for transport. Activities supporting cross-cutting thematic topics will focus on transport specificities, for example security aspects as an inherent requirement to the transport system; the use of alternative energy sources in transport applications; and monitoring of environmental effects of transport, including climate change; and measures to improve the economic integration. Environmental research should cover ways of reducing the adverse impact of transport and optimising traffic and should include boosting transport efficiency.

Support will also be given to dissemination and exploitation activities and impact assessments, with particular attention to the specific user needs including those of the disadvantaged and policy requirements in the transport sector.

Activities

Aeronautics and air transport

Activities will contribute to key Community policies as well as to the implementation of the ACARE Strategic Research Agenda. The quantitative objectives correspond to the 2020 time horizon of this Agenda. The scope of the research includes all aircraft, passenger travel and airside related aspects of the air transport system.

⁽¹⁾ 'European Transport Policy for 2010: time to decide' — COM(2001) 370.

- The greening of air transport: Developing technologies to reduce the environmental impact of aviation with the aim to halve the emitted carbon dioxide (CO₂), cut specific emissions of nitrogen oxides (NOx) by 80 % and halve the perceived noise. Research will focus on furthering green engine technologies including alternative fuels technology as well as improved vehicle efficiency of fixed-wing and rotary wing aircraft (including helicopters and tiltrotors), new intelligent low-weight structures, and improved aerodynamics. Issues such as improved aircraft operations at the airport (airside and landside) and air traffic management, manufacturing, maintenance, and recycling processes will be included.

- Increasing time efficiency: Realising a step-change in aviation in order to accommodate the projected growth of three times more aircraft movements by improving punctuality in all weather conditions and reducing significantly the time spent in travel-related procedures at airports while maintaining safety. Research will develop and implement an innovative Air Traffic Management (ATM) system within the context of the SESAR ⁽¹⁾ initiative, by integrating air, ground and space components, together with traffic flow management and more aircraft autonomy. Design aspects of aircraft to improve handling of passengers and cargo, novel solutions for efficient airport use and connecting air transport to the overall transport system will also be addressed. The most efficient coordination of the development of ATM systems in Europe will be ensured through the SESAR initiative ⁽²⁾.

- Ensuring customer satisfaction and safety: Introducing a quantum leap in passenger choice and schedule flexibility, whilst achieving a five-fold reduction in accident rate. New technologies will enable a wider choice of aircraft/engine configurations ranging from wide body to smaller size vehicles including rotorcraft, increased levels of automation in all the elements of the system, including the piloting. Focus will also be on improvements for passengers' comfort, well being and new services, cabin logistic systems and active and passive safety measures with special emphasis on the human element. Research will include the adaptation of airport and air traffic operations to different type of vehicles and 24-hour utilisation at acceptable community noise levels.

- Improving cost efficiency: Fostering a competitive supply chain able to halve the time-to-market, and reduce product development and operational costs, resulting in more affordable transport for the citizen. Research will focus on improvements to the whole business process, from conceptual design to product development, manufacturing and in-service operations including the integration of the supply chain. It will include improved simulation capabilities and automation, technologies and methods for the realisation of innovative and zero-maintenance, including repair and overhaul, aircraft, as well as lean aircraft, airport and air traffic management operations.

- Protection of aircraft and passengers: Preventing hostile action of any kind to incur injury, loss, damage or disruption to travellers or citizens due to the effects of aircraft misuse. Research will focus on the relevant elements of the air transport system including security measures in cabin and cockpit designs, automatic control and landing in the case of unauthorised use of aircraft, protection against external attacks, as well as security aspects of airspace management and airport operations.

- Pioneering the air transport of the future: Exploring more radical, environmentally efficient, accessible and innovative technologies that might facilitate the step change required for air transport in the second half of this century and beyond. Research will address aspects such as new propulsion and lifting concepts, new ideas for the interior space of airborne vehicles including design, new airport concepts, new methods of aircraft guidance and control, alternative methods of air transport system operation and its integration with other transport modes.

Sustainable surface transport (rail, road and waterborne)

- The greening of surface transport: Developing technologies and knowledge for reduced pollution (air including greenhouse gases, water and soil) and environmental impact on such areas as climate change, health, biodiversity and noise. Research will improve the cleanliness and energy-efficiency of power-trains (e.g. hybrid-solutions) and promote the use of alternative fuels, including hydrogen and fuel cells as mid- and long-term options, taking into account cost-efficiency and energy efficiency considerations. Activities will cover infrastructure, vehicles, vessels and component technologies, including overall system optimisation. Research in developments specific to transport will include manufacturing, construction, operations, maintenance, diagnostics, repair, inspection, dismantling, disposal, recycling, end of life strategies and interventions at sea in case of accident.

⁽¹⁾ SESAR (Single European Sky ATM Research) — European air traffic control infrastructure modernisation related to the Single European Sky implementation.

⁽²⁾ For this purpose, the establishment of a Joint Undertaking for the coordination of ATM activities is envisaged.

- Encouraging and increasing modal shift and decongesting transport corridors ⁽¹⁾. Developing and demonstrating seamless door-to-door transport for people and goods as well as technologies and systems to ensure effective intermodality, including in the context of rail and waterborne transport competitiveness. This includes activities addressing the interoperability and operational optimisation of local, regional, national and European transport networks, systems and services and their intermodal integration in an integrated approach. The activities will aim at European-wide strategies, optimised use of infrastructure including terminals and specialised networks, improved transport, traffic and information management, enhanced freight logistics, passenger intermodality and modal shift strategies to encourage energy efficient means of transport. Intelligent systems, new vehicle/vessel concepts and technologies including loading and unloading operations as well as user interfaces will be developed. Knowledge for policymaking will include infrastructure pricing and charging, assessments of Community transport policy measures and trans-European networks policy and projects.
- Ensuring sustainable urban mobility for all citizens, including the disadvantaged: Focusing on the mobility of people and goods by research on the 'next generation vehicle' and its market take-up, bringing together all elements of a clean, energy efficient, safe and intelligent road transport system. Research on new transport and mobility concepts, innovative organisational and mobility management schemes and high quality public transport will aim at ensuring access for all and high levels of intermodal integration. Innovative strategies for clean urban transport ⁽²⁾ will be developed and tested. Particular attention will be paid to non-polluting modes of transport, demand management, rationalisation of private transport, and information and communication strategies, services and infrastructures. Tools and models supporting policy development and implementation will cover transport and land use planning including the relationship with growth and employment.
- Improving safety and security: Developing technologies and intelligent systems to protect vulnerable persons such as drivers, riders, passengers, crew, and pedestrians. Advanced engineering systems and risk analysis methodologies will be developed for the design and operation of vehicles, vessels and infrastructures. Emphasis will be placed on integrative approaches linking human elements, structural integrity, preventive, passive and active safety including monitoring systems, rescue and crisis management. Safety will be considered as an inherent component of the total transport system embracing infrastructures, freight (goods and containers), transport users and operators, vehicles and vessels and measures at policy and legislative levels, including decision support and validation tools; security will be addressed wherever it is an inherent requirement to the transport system.
- Strengthening competitiveness: Improving the competitiveness of transport industries, ensuring sustainable, efficient and affordable transport services and creating new skills and job opportunities by research and developments. Technologies for advanced industrial processes will include design, manufacturing, assembly, construction and maintenance and will aim at decreasing life cycle costs and development lead-times. Emphasis will be placed on innovative and improved product and system concepts and transport services ensuring higher customer satisfaction. New production organisation including the supply chain management and distribution systems will be developed.

Support for the European global satellite navigation system (Galileo and EGNOS)

The European Global Satellite Navigation system, encompasses Galileo and EGNOS, and provides a worldwide positioning and timing infrastructure ⁽³⁾.

- Exploiting the full potential: promoting growth in the use of the services ranging from open to commercial access, safety-of-life to 'search and rescue' and public regulated service; transport management applications including freight and hazardous materials transportation; exploiting by-product services; demonstrating the benefits and efficiencies of satellite navigation.
- Providing the tools and creating the appropriate environment: ensuring safe and secure use of services, mainly through certification in key application domains; preparing and confirming the adequacy of services to new policies and legislation, including their implementation; addressing public regulated services according to the approved policy of access; developing essential digital topology, cartography, geodesy data and systems for use in navigation applications; addressing safety and security needs and requirements.
- Adapting receivers to requirements and upgrading core technologies: improving receiver performances, integrating low-power consumption and miniaturisation technologies, completing in-door navigation coverage, coupling with radio frequency identification devices, exploiting software receiver technology, combining with other functions such as telecommunication, supporting key navigation ground-based infrastructure technology to ensure robustness and flexibility.

⁽¹⁾ In view of the objective to re-establish the modal split of 1998 activities addressing one single mode will concentrate on rail and waterborne transport.

⁽²⁾ Building upon the experiences of the Civitas Initiative.

⁽³⁾ The research activities will be managed by the European GNSS Supervisory Authority.

- Supporting infrastructure evolution: preparing second generation system, adapting to evolving user demands and market forecasts, taking advantage of infrastructure internationalisation to address global markets and developing world-wide standards.

International cooperation

International cooperation is an important component of the RTD activities in this field, and will be encouraged where there are interests for industry and policy makers. Broad topic areas for specific actions will be considered where there is market attraction (for example global trade development and connecting networks and services at continental and intercontinental level); opportunities to access and acquire science and technology that is complementary to the current European knowledge and of mutual benefit; and where Europe responds to global needs (for example climate change) or contributes to international standards and global systems (for example applied logistics and satellite navigation infrastructure).

Responding to emerging needs and unforeseen policy needs

Initiatives under emerging needs will support research that responds to critical events and challenges of future transportation systems for example novel transport and vehicle concepts, automation, mobility or organisation.

Unforeseen policy needs that may require specific transport-related research could include broad societal issues such as the changes in the demographics, lifestyles and expectations of society for transport systems; as well as emerging risks or problems of high importance to European society.

8. SOCIO-ECONOMIC SCIENCES AND THE HUMANITIES

Objective

Generating an in-depth, shared understanding of complex and interrelated socio-economic challenges Europe is confronted with, such as growth, employment and competitiveness, social cohesion, social, cultural and educational challenges in an enlarged EU, sustainability, environmental challenges, demographic change, migration and integration, quality of life and global interdependence, in particular with the view of providing an improved knowledge base for policies in the fields concerned.

Approach

The research priorities address key societal, economic and cultural challenges facing Europe and the world now and in the future. The proposed research agenda constitutes a coherent approach to addressing these challenges. The development of a socio-economic and humanities knowledge base on these key challenges will make a significant contribution to promoting shared understanding across Europe and to the resolution of wider international problems. The research priorities will help improve the formulation, implementation, impact and assessment of policy including regulatory measures in many Community policy areas at the European, national, regional and local levels, and a substantial international perspective is included in most of the research.

In addition to socio-economic and socio-cultural research and foresight an emphasis will be placed on humanities research, which will provide different perspectives and make an essential contribution across the theme on, for example, the historical, cultural and philosophical aspects, including relevant language, identity and values questions.

The work could also build upon relevant national research programmes, complementing the research activities below, and taking advantage of the ERA-NET scheme and the possible use of Article 169. For certain issues, use may also be made of social platforms to discuss future research agendas; these would involve the research community and societal stakeholders.

The research will be facilitated by research infrastructures which generate new research data, including through surveys (both quantitative and qualitative), make available existing data for international comparative research, and provide access to source materials and advanced research tools as well as to the results of existing research in many fields. Some of these actions will be carried out through the Infrastructures element of the Capacities programme and others by projects under this theme. The research will rely on access to and the use of official statistics.

Specific dissemination actions targeted at particular groups and the general public will be undertaken, including workshops and conferences for researchers to exchange views with policy makers and other stakeholders, and the diffusion of results using various media.

Appropriate coordination of socio-economic and humanities research and foresight elements across the Cooperation and other specific programmes will be assured.

Activities

Growth, employment and competitiveness in a knowledge society

This will aim to develop and integrate research on the issues affecting growth, employment and competitiveness in order to provide an improved and integrated understanding of these issues for the continued development of a knowledge society. It will benefit policy and support progress towards achieving these objectives. The research will integrate the following aspects of the question:

- The changing role of knowledge throughout the economy, including the role of different types of knowledge, skills and competences on a global scale, formal and informal education and lifelong learning, and intangible goods and investment.
- Economic structures, structural change including spatial aspects such as regionalisation and internationalisation, and productivity issues, including the role of the services sector, of finance, demographics, demand and the processes of long-term change.
- Institutional and policy questions, including macroeconomic policy, labour markets, social and welfare systems, national and regional institutional contexts, and policy coherence and coordination.

Research will address important new challenges and opportunities from increased globalisation, emerging economies, relocation, and EU enlargement; as well as socio-economic stability, the role of technology and international transfer of technology, various forms of innovation and economic renewal, outsourcing and insourcing, youth and youth policy, economic and social entrepreneurship, and the economic potential of European cultural heritage and the creative sector. Employment questions will include unemployment and underemployment.

Combining economic, social and environmental objectives in a European perspective

This aims to support the societal goal of combining economic, social and environmental objectives and so improve the basis for sustainable development. The research in this activity will address two interrelated issues:

- How European socio-economic models and those outside Europe have fared in combining the objectives, the conditions under which this occurred including the role of dialogue, social partnership, sectoral transformation, institutional change and their ability to confront new challenges.
- Economic cohesion between regions and urban and regional development in an enlarged EU; and social cohesion (including inequalities, social protection and social services, taxation policies, ethnic relations and migration, education and social exclusion, and health) as well as its relation to social problems such as poverty, housing, crime, delinquency and drugs.

In addressing these issues, consideration will be given to

- the existence of trade-offs or synergies between the economic, social, environmental objectives in the world context,
- the interaction between environment ⁽¹⁾, energy and society,
- long-term sustainability,
- issues for developing countries,
- spatial aspects including urban planning, the role of cities, metropolitan and other city regions and related governance issues,
- cultural issues; and the socioeconomic impact of European policies and legislation.

The question of welfare states as a development resource, and the employment and housing of migrants and their descendants, will also be addressed.

⁽¹⁾ Global environment change will be mainly dealt in the theme environment.

Major trends in society and their implications

The aim is to understand and assess the causes and implications of particular key trends in society that have major consequences for European citizens, their quality of life and for policies, and thus to provide an underpinning for many policy areas. Empirical and theoretical research will address initially three major trends:

- Demographic change including ageing, fertility and migration. The broad societal and economic implications and issues will be addressed, including societal and economic potential of active ageing, the effects on pension systems, the challenges of migration and integration and the implications for urban development.
- Changes in the related aspects of lifestyles, families, work, consumption (including consumer protection aspects), health and quality of life including child, youth and disabilities issues and reconciliation of work and family life.
- Cultural interactions in an international perspective including traditions from different societies, diversity of populations including ethnic groups, multicultural issues, differing identities, languages and religious practices, and possible issues in this context including discrimination, racism, xenophobia and intolerance.

Gender issues, inequalities and changing values will be included. In addition, changes in criminality and crime perception will be examined, as will changes in corporate social responsibility.

Europe in the world

The aim is to understand changing interactions and interdependencies between world regions including emerging and developing regions and their implications for the regions concerned, especially for Europe, and the related issue of addressing emerging threats and risks in a world context and their connection to human rights, freedoms and well-being. The research will involve two related tracks:

- Flows of trade, finance, investment, migration and their impact; uneven development, poverty and sustainability; economic and political relations, global governance including international institutions. This will explore cultural interactions including media and religions and distinctive non-European approaches.
- Conflicts, their causes and resolution, and fostering peace; the relation between security and destabilising factors such as poverty, crime, environmental degradation, resource scarcity, uneven development, financial instability and debt; terrorism, its causes and consequences; security-related policies and perceptions of insecurity and civil-military relations.

In both, Europe's role in the world, the development of multilateralism and international law, the promotion of democracy and fundamental rights including different notions of these, and Europe as seen from outside, will be addressed.

The citizen in the European Union

In the context of the future development of the EU, the aim is to improve understanding of, first, the issues involved in achieving a sense of democratic 'ownership' and active participation by citizens as well as effective and democratic governance at all levels including innovative governance processes to enhance citizens' participation and the cooperation between public and private actors, and, second, Europe's diversities and commonalities in terms of culture, religion, institutions, law, history, languages and values. The research will address:

- Participation (including youth, minorities and gender aspects), representation, accountability and legitimacy; the European public sphere, media and democracy; various forms of governance in the EU including economic and legal governance and the role of the public and private sectors, policy processes and opportunities to shape policies; the role of civil society; citizenship and rights; the implications of enlargement; and related values of the population.
- European diversities and commonalities, including their historical origins and evolution; differences in institutions (including norms, practices, laws); cultural heritage; various visions and perspectives for European integration and enlargement including the views of the populations; identities including European identity; approaches to multiple coexisting cultures; the role of language, the arts and religions; attitudes and values.

Socioeconomic and scientific indicators

With a view to improving the use of indicators in policy, the aim is to develop a more profound understanding of their use in policy development and implementation and to propose improvements in indicators and methods for their use. The research will address:

- How indicators are used in policy objectives, policy development and implementation, in a variety of fields and from macro to micro levels, the adequacy of existing indicators and their use, techniques to analyse them and proposals for new indicators and sets of indicators.
- How evidence-based policy might be better supported by indicators and methods for their use; indicators for policy with multiple objectives, for policy coordination and for regulation; support by official statistics for such indicators.
- Use of indicators and related approaches for evaluation of research programmes including impact assessment.

Foresight activities

The aim is to provide national, regional and Community policy-makers and others with foresight knowledge for the early identification of long-term challenges and areas of common interest that can help them formulate policy. Four types of activities will be covered:

- Wide socioeconomic foresight on a limited number of key challenges and opportunities for the Community, exploring issues such as the future and implications of ageing, migration, globalisation of the production and dissemination of knowledge, changes in crime and major risks.
- More focused thematic foresight on the developments in emerging research domains or those cutting across existing domains, as well as on the future of scientific disciplines.
- Foresight on research systems and policies in Europe and elsewhere and on the future of key actors involved.
- Mutual learning and cooperation between national and/or regional foresight initiatives; cooperation between EU, third country and international foresight initiatives.

International cooperation

Given the strong international dimension of the research, international cooperation will be developed in all areas of the theme. Specific international cooperation actions will be undertaken on a number of selected subjects on a multilateral and bilateral basis identified on the basis of the needs of the partner countries as well as those of Europe.

Responding to emerging needs and unforeseen policy needs

Research on emerging needs will offer a space for researchers to identify and address research challenges not specified above. It will encourage innovative thinking about challenges facing Europe not being widely discussed up to now or other relevant combinations of issues, perspectives and disciplines. Research to respond to unforeseen policy needs will also be undertaken, in close consultation with those involved in policy.

9. SPACE**Objective**

Supporting a European Space Programme focusing on applications such as GMES with benefits for citizens and for the competitiveness of the European space industry. This will contribute to the development of a European space policy, complementing efforts by Member States and by other key players, including the European Space Agency (ESA).

Approach

In this field, the Community will contribute to the definition of common objectives based on user requirements and policy objectives; to the coordination of activities, to the avoidance of duplications, to the facilitation of interoperability and to the improvement of cost-effectiveness. It will also contribute to the definition of standards. The European space policy ⁽¹⁾ will serve the objectives of the public authorities and decision-makers while strengthening the competitiveness of the European industry. It will be implemented through a European Space Programme, and the Seventh Framework Programme will contribute to support or complement research and technological development actions provided by other stakeholders, public and private, in Europe.

Actions in this theme will support Community policy objectives, for example in the fields of agriculture, forestry, fisheries, environment, telecommunications, security, development, health, humanitarian aid, transport, science, education as well as ensuring that Europe is involved in regional and international cooperation. Space tools are also foreseen to contribute to law enforcement in some of these fields.

With particular focus on the use of existing capabilities in Europe, the activities set out in this priority aim primarily at: the exploitation of space assets for the implementation of applications, in particular GMES (Global Monitoring for Environment and Security) which together with Galileo represents the flagship of the European space policy, as well as space exploration efforts; and enabling technologies supporting the strategic role of the European Union.

Application-oriented activities are expected to be complementary to actions carried out under other themes in the 'Cooperation' specific programme (notably those carried out under 'Environment' in connection with earth observation and GEOSS, and those carried out under 'Information and communication technologies'). Thematic synergies will also be developed with related activities in other specific programmes. Complementary actions are envisaged through the Competitiveness and Innovation Framework Programme and the Education and Training Programme.

Research and technology transfer activities in the theme could be particularly appealing for SMEs developing innovative technologies, needing familiarisation with new space technology opportunities (spin-in), or developing application for their own space technologies to other markets (spin-off).

Management of certain parts of the space activities could be entrusted to existing external entities, such as ESA ⁽²⁾, and other entities and agencies at European or national level. In the case of GMES, research activities could be implemented through a Joint Technology Initiative (see Annex III).

Activities

Space-based applications at the service of the European Society

— Global monitoring for environment and security (GMES)

The objective is to develop appropriate satellite based monitoring and early warning systems, including for the safety of citizens, as unique and globally available data sources and to consolidate and stimulate evolution of their operational use. This programme will also provide support to the development of operational GMES services, which enable decision-makers to better anticipate or mitigate crisis situations and issues relating to the management of the environment and security and the handling of natural disasters, starting with 'fast-track' services on Emergency Response, Land Monitoring and Marine Services. Research activities should mainly contribute to maximise the use of GMES data collected from space-borne sources and to integrating these with data from other observation systems in complex products designed to deliver information and customised services to end-users through an efficient data integration and information management. Other satellite technologies (e.g. Communication, Navigation) will be integrated, where necessary, into the development of GMES services. Research activities should also contribute to enhance monitoring techniques and associated instrument technologies, to develop where necessary new space-based systems or improve the interoperability of existing ones, and to enable their use in (pre-)operational services responding to specific types of demand. Research should support the development of sustainable space-based and *in situ* (including ground-based and airborne) systems in particular: for land monitoring, ocean monitoring and crisis management, with frequent, high-resolution imagery for zones of high importance, including sensitive, urban and rapidly evolving zones; for risk prevention and risk management and all kinds of emergency, enhancing convergence with non-space systems.

— In the environmental domain, the demands include the acquisition of independent knowledge on the state and evolution of sustainable use of renewable resources (such as vegetation and forests), wetlands, desertification,

⁽¹⁾ 'European space policy: Preliminary Elements' — COM(2005) 208.

⁽²⁾ Within the terms of the Framework Agreement between the European Community and the European Space Agency (OJ L 261, 6.8.2004, p. 64).

land cover including snow and ice, and land use, the food supply, agricultural environment and fishing, carbon sinks and stocks; atmospheric processes and chemistry; and conditions of seas. The EC Sixth Environmental Action Plan on environmental policies monitoring climate change, air, soil and water quality will be considered.

- In the security domain demands include improving acquisition, access and exchange of data and information needed in the context of emergency relief response and management. Support is to be given for prevention/mitigation, monitoring, risk management and assessment of natural and technological hazards as well as to humanitarian aid for the purpose of proper need assessment and emergency planning in the context of natural disasters (such as forest fires, floods and earthquakes) and humanitarian crises (refugees, internally displaced persons, etc.). Support is also to be considered for the implementation of the Community policies such as the establishment of an area of freedom, security and justice, and in the domain of border surveillance.

- Security aspects (complementary to security research and to GMES activities)

The EC SPASEC Report ⁽¹⁾ underlined that space services play such a key role in the well-being of European society that protection of critical infrastructure in the space sector is a priority. This may need services and capabilities for surveillance of space based assets as well as protection for terrestrial infrastructure. The space surveillance system could for example provide information concerning the main characteristics of satellites (e.g. orbital parameters, activity status), the main characteristics of potentially threatening debris (e.g. trajectory, physical parameters) and pertinent information related to space weather and near-Earth objects. Feasibility studies and the financing of demonstration projects can be foreseen in this area.

- Applications of satellite communications

The objective is to support innovative satellite communication applications and services, seamlessly integrated in global electronic communication networks, for citizens and enterprises in application sectors encompassing civil protection, security, e-government, telemedicine, tele-education, search and rescue, tourism and leisure activities, transport including fleet management and personal navigation, agriculture, forestry and meteorology. Research emphasis will be on the development of new applications and the deployment of demonstration missions and pre-operational systems where satellite communications represent an efficient response to these needs in terms of GMES downstream services.

Exploration of space

- The objective is to provide R & D support and maximise scientific added-value through synergies with initiatives of ESA or other entities and agencies at European or national level in the field of space exploration, including related technology transfer implications, and to facilitate access by the scientific community to results/data acquired during exploration missions undertaken in the frame of the European Space Programme. Research activities will be carried out, in particular, through supporting actions, feasibility studies and pre-operational projects. Additional dimensions will have to be considered: the intrinsic international cooperation opportunities and the importance of keeping awareness and disseminating results.
- Supporting actions and feasibility studies are also envisaged as a means to better coordinate efforts for the development of space-borne telescopes and detectors as well as for data analysis in space sciences. Actions in this context will complement relevant national and international programmes (notably by ESA) and will aim at examining international cooperation opportunities.

RTD for strengthening space foundations

- Space technology

In general the objective is to support the increase of the competitiveness, cost-effectiveness and independent access of the European space technology sector at large.

In particular that objective could be met through space research and the development for long-term needs including space transportation, for example by: assessing the long-term needs; contributing to system studies taking into account the end-user requirements; contributing to upstream technology research for the next generation of space transportation and propulsion systems.

⁽¹⁾ Report of the Panel of Experts on Space and Security (March 2005).

— Space sciences

The objective is to contribute to the development of advanced technologies to be used in space sciences. Space sciences not only provide deep insights into the structure of the universe, improved understanding of Planet Earth and the Solar System, and a new approach to bio-medicine and life and physical sciences, they are also a strong driving force for new technology developments with many subsequent applications of benefit to society. The Seventh Framework Programme should complement the ongoing scientific programmes where gaps are identified and be in support of scientific activities including on-board the International Space Station (ISS). Supporting activities aiming at facilitating access to scientific data including those obtained from previous missions are also envisaged.

International cooperation

Exploitation and exploration of space are, by nature, global ventures. Effective international space cooperation will help to raise the Union's political standing in the world, strengthen its economic competitiveness and enhance its reputation for scientific excellence. Cooperation in the space sector will also support Community's external policy objectives (e.g. support for developing countries, neighbourhood countries).

In this respect, focus will be on developing an overall strategy in international space cooperation as well as an efficient coordination mechanism involving all relevant European players.

Space has to be considered a privileged sector for developing international activities, in particular in cooperation with main and emerging space powers, such as Russia, the United States, China, India, Canada, Japan, Ukraine and other countries carrying out space activities.

Efforts will be pursued to promote the use of space-based solutions in support of sustainable development and prevention of risks in the context of natural disasters and humanitarian crises, particularly in Africa. This is coherent with the global approach taken by GMES with regard to the monitoring of the environment ⁽¹⁾ and security.

To provide better opportunities for efficient collaboration and to ensure that best international expertise in the space field is integrated in the European Space Programme, specific cooperation actions will be used for bi-or multilateral projects, international and global initiatives and cooperation with emerging economies and developing countries. Activities will include assessing and monitoring of international commitments.

Responding to emerging needs and unforeseen policy needs

Research on emerging needs will enable innovative solutions to technological developments in the space research area, and possible adaptations and applications in other fields (e.g. resources management, biological processes, and new materials). Research to respond to unforeseen policy needs may address topics such as providing space based solutions in support of developing countries, developing new space-observation and communication tools and methods related to relevant Community policies and contributions to social inclusion.

10. SECURITY

Objective

To develop the technologies and knowledge for building capabilities needed to ensure the security of citizens from threats such as terrorism, natural disasters and crime, while respecting fundamental human rights including privacy; to ensure optimal and concerted use of available and evolving technologies to the benefit of civil European security, to stimulate the cooperation of providers and users for civil security solutions, improving the competitiveness of the European security industry and delivering mission-oriented research results to reduce security gaps.

⁽¹⁾ For example, the Kyoto Protocol, United Nations Convention to Combat Desertification, UN Biodiversity Convention, 2002 World Summit on Sustainable Development conclusions and 2005 G-8 Summit conclusions.

Approach

Security in Europe is a precondition of prosperity and freedom. The Security Research theme has an exclusively civil application focus and it supports the implementation of Community policies and initiatives relevant to security such as the establishment of an area of freedom, security and justice, transport, health (including the EU Health Security Programme ⁽¹⁾), civil protection (including natural and industrial disasters), energy, environment and external policies. Through this, the theme will contribute to growth and employment and the competitiveness of the European security industry. It will facilitate the various national and international actors to cooperate and coordinate in order to avoid unnecessary duplication and to explore synergies wherever possible. It will be aimed at filling capability gaps and will provide clear added-value to security needs in Europe. The respect of privacy and civil liberties will be a guiding principle throughout the theme. It will not work on any technology for lethal and/or destructive weapons.

The special requirements concerning confidentiality are to be enforced but the transparency of research findings is not to be unnecessarily restricted. In addition, areas are to be identified that permit the present transparency of research findings.

These non-defence activities at Community level will address four civil security mission areas which have been identified in response to specific challenges of high political relevance and European added-value with regard to threats and potential security incidents, and three areas of cross-cutting interest. Each mission area covers six phases which vary in time and emphasis. These six phases are: identify (incident-related), prevent (threat-related), protect (target-related), prepare (operation-related), respond (crisis-related) and recover (consequence-related); they describe what efforts to undertake in the respective phases. The first four phases refer to efforts of avoiding an incident and mitigating its potential negative impacts, the last two refer to efforts of coping with the incident situation and longer-term consequences.

For each phase of the individual mission areas, a specific group of capabilities becomes relevant which those responsible for the security of the citizens need to possess in order to effectively cope with threats and incidents. The capabilities indicate how the efforts would be undertaken and will in several cases contribute to more than one phase and/or mission area. Acquiring the capabilities is based on a combination of knowledge, technologies and organisational measures. This theme will also address ways of ensuring an effective connection between the enhanced knowledge and technologies, better use of common ICT-systems in the fields of different operations, and processes developed and their actual implementation by the various end-users, in order to achieve improvements in European security capabilities.

Research will in particular focus on filling capability gaps by developing technologies and skills required by the specific mission area and identified by a 'top-down' approach guided by a dialogue with end-users, in conformity with objectives and priorities. As end-users of the security research, public authorities, the private sector and EU citizens will be fully involved in the identification of the security research requirements to be addressed. A 'System Analysis' approach will be adopted to conduct an analysis of civil security gaps and their R & D requirements in each mission area. The activities will include the analysis of the security requirements of civil business. This identification of research requirements should be continuously an important element of research under this Theme.

This capability gap driven approach will be complemented by a 'bottom-up' approach which scopes and examines technologies in order to assess how they could be utilised to enhance European security. An important aspect is to draw on the excellence of the supply side (e.g. industry, universities, research centres) to bring forward innovative security solutions.

Research will be multidisciplinary and mission-oriented, it will range from technology and methodology development, to technology and systems integration, demonstration and validation. A multi-purpose nature of technologies is encouraged to maximise the scope for their application, and to foster cross-fertilisation and take-up of available and evolving technologies for the civil security sector. The Security Research theme will aim at preparing medium to long-term effective solutions which are sufficiently adaptable and innovative to defy relevant threats. It will also complement and integrate the technology- and more systems-oriented research relevant to civil security which is carried out in other themes.

Security research needs specific implementation rules to take into account its special nature with the aim of protecting sensitive information related to security, and to providing sufficient information on the results for the Member States and end-users.

⁽¹⁾ With the objective to improve preparedness and response to deliberate releases of biological and/or chemical agents.

Research will be focused exclusively on civil security applications. Recognising that there are areas of dual use technology relevant to both civilian and military applications, a suitable framework will be established to coordinate with the activities of the European Defence Agency (EDA). Moreover, to provide mutual information and to avoid unnecessary duplication of funding a coordination of security research with other activities at national and European level will be established.

The involvement of small and medium-sized enterprises (SMEs) in the activities is as strongly encouraged as that of authorities and organisations responsible for the security of the citizens. The longer term research agenda elaborated by the European Security Research Advisory Board (ESRAB) ⁽¹⁾ will support the definition of the content and structure of the research in this theme.

Activities

Activities will address the following mission areas:

- *Security of citizens:* Activities will concentrate on threat aspects of potential incidents of a transnational importance, such as offenders, equipment and resources used by them or as mechanisms of attack. A series of capabilities are required to cope with this mission area, many of which primarily relate to the phases 'identify', 'prevent' and 'prepare' and 'respond'. The ambition is both to avoid an incident and to mitigate its potential consequences. To build up the required capabilities with the aim of providing civil protection, including bio-security and protection against risks arising from crime and terrorist attacks, emphasis will be on issues such as: threat (e.g. Chemical, Biological, Radiological and Nuclear, CBRN) awareness (e.g. intelligence gathering, collection, exploitation, sharing; alerting), detection (e.g. hazardous substances, explosives, agents B or C, individuals or groups, suspect behaviour), identification and authentication (e.g. of persons, type and amount of substances), prevention (e.g. control of access and movements, with respect to financial resources, control of financial structures), preparedness (e.g. risk assessment; CBRN protection, control of intentionally released biological and chemical agents; assessment of levels for strategic reserves such as manpower, skills, equipment, consumables; with respect to large-scale events, etc.), neutralisation (e.g. missiles, communications, vehicles, non-destructive systems) and containment of effects of terrorist attacks and crime, law enforcement data processing.
- *Security of infrastructures and utilities:* Activities will concentrate on targets of an incident or disaster of transnational importance, examples for infrastructures include large-scale event sites, significant sites of political (e.g. parliament buildings) or symbolic (e.g. particular monuments) value and utilities being those for energy (including oil, electricity, gas), water, transport (including air, sea, land), communication (including broadcasting), financial, administrative, public health, etc. A series of capabilities are required to cope with this mission area, many of which primarily relate to the phases 'protect' but also 'prepare'. The ambition is both to avoid an incident and to mitigate its potential consequences. To build up the required capabilities, emphasis will be on issues such as: analysing, modelling and assessing vulnerabilities of physical infrastructure and its operations; securing existing and future public and private critical networked infrastructures, systems and services with respect to their physical, logical and functional side; control and alert systems to allow for quick response in case of an incident; protection against cascading effects of an incident, defining and designing criteria to build new secure infrastructures and utilities.
- *Intelligent surveillance and border security:* Activities will deal with issues relevant to all the consecutive tiers of European border security strategy, starting with visa application procedures in embassies and consular posts (first level), cross-border cooperation (second level), measures at the border crossing points at land borders, harbours and airports as well as between the border crossing points at green and blue borders (third level) and finally activities inside the European external borders (fourth level) such as exchange of information, compensatory measures, Schengen Information System (SIS), Judicial and Police, Customs and Border Guard cooperation (PCB). A series of capabilities are required to cope with this mission area, many of which primarily relate to the phases 'identify', 'prevent' and 'protect'. The ambition is both to avoid an incident and to mitigate its potential consequences.

To build up the required capabilities, emphasis will be on issues such as: enhancing the effectiveness and efficiency of all security relevant systems, equipment, tools and processes used at border crossing points (e.g. identification of accessing people, non-invasive detection of people and goods, tracking of substances, sampling, spatial recognition including data capture and analysis, etc.); improving the security of Europe's land and sea borders (e.g. through non-invasive and underwater detection of vehicles, tracking of vehicles, spatial recognition including data capture and analysis, surveillance, remote operations, etc.); maritime security; assessment and management of (illegal) migration flows. A suitable framework will be established to coordinate with the activities of the European Agency for the Management of Operational Cooperation at the External Borders.

⁽¹⁾ Established in the course of the three years, Preparatory Action for Security Research (PASR 2004 to 2006).

- *Restoring security and safety in case of crisis:* Activities will focus on technologies providing an overview of, and support for diverse emergency management operations, such as in civil protection (including natural disasters and industrial accidents), humanitarian aid and rescue tasks. A series of capabilities are required to cope with this mission area, many of which primarily relate to the phases 'prepare', 'respond' and 'recover'. The ambition is to mitigate the consequences of the incident. To build up the required capabilities, emphasis will be on issues such as: general organisational and operational preparedness to cope with security incidents (e.g. inter-organisational coordination and emergency communication, assessment of strategic reserves, strategic inventories, etc.), crisis management (e.g. integrated means of alert and management, assessment of the incident and priority requirements, integration of heterogeneous actors and resources, evacuation and isolation, neutralisation and containment of effects of terrorist attacks and crime, etc.), intervention in hostile environment, emergency humanitarian aid and the management of the consequences and cascading effects of a security incident (e.g. the functioning of the public healthcare system, business continuity, confidence building measures, restoring the disrupted or destroyed functioning of society, etc.).

The above areas will be supported by activities in the following areas of cross-cutting interest:

- *Security Systems Integration, interconnectivity and interoperability:* Activities related to intelligence, information gathering and civil security will enable and/or contribute to the performance of technology required for building up the above listed capabilities, thus focusing on cross-cutting issues such as: enhancing the interoperability and intercommunication of systems, equipment, services and processes, including law enforcement, fire fighting, civil defence and medical information infrastructures, while ensuring their reliability, protection of confidentiality and integrity of information, traceability of all transactions and their processing, etc. Activities will also address standardisation and training matters (including such with respect to cultural, human and organisational interoperability).
- *Security and society:* Activities are of a cross-cutting nature and should be conducted by interacting between natural sciences, technology and other sciences, in particular political, social and human sciences. The focus will be on targeted cultural and socioeconomic, as well as systemic risk analyses, scenario building and other research activities related to subjects such as: Security as an evolving concept (comprehensive analyses of security-related needs, in order to define the main functional requirements to address the fluctuating security landscape); interdependencies, vulnerabilities due to disasters and new threats (e.g. in the field of terrorism and organised crime); the attitude of citizens in crisis situations (e.g. perception of terrorism and crime, behaviour of crowds, public understanding of civil rights and socio-cultural forms of protection and acceptance of security (and safety) controls); preparedness and readiness of the citizen in case of terrorist attacks; issues related to communication between authorities and citizens in crisis situations; raising public awareness for threats; citizens' guidance on the internal security advisory and assistance systems in the Member States and at EU level; behavioural, psychological and other relevant analyses of terrorist offenders; ethical issues with respect to personal data protection and integrity of information. Research will also be directed into developing statistical indicators on crime to permit assessments of changes in criminality.
- *Security research coordination and structuring:* This area provides the platform for activities to coordinate and structure national, European and international security research efforts, to develop synergies between civil, security and defence research as well as to coordinate between the demand and the supply side of security research. Activities will also focus on the improvement of relevant legal conditions and procedures.

International cooperation

International cooperation in the Security Research activities will be implemented in line with internal and external aspects of Community policies. Due to the particular sensitivity of this area, international cooperation will be considered on a case-by-case basis with respect to the countries involved. Particular requirements and criteria for international cooperation may be specified in the work programme.

Specific international cooperation actions will be considered where there is mutual benefit, such as research relating to security activities of global applicability, e.g. management of large-scale disasters.

Responding to emerging needs and unforeseen policy needs

The Security Research theme is by nature and design flexible. Activities will allow the accommodation of as yet unknown future security threats including disasters, and related policy needs that may arise. This flexibility will complement the mission-oriented character of the research activities set out above.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT

The indicative breakdown is as follows:

	<i>(in EUR million)</i>
Health	6 100
Food, agriculture and fisheries, biotechnology	1 935
Information and communication technologies	9 050
Nano-sciences, nano-technologies, materials and new production technologies	3 475
Energy	2 350
Environment (including climate change)	1 890
Transport (including aeronautics)	4 160
Socio-economic sciences and the humanities	623
Space	1 430
Security	1 400
Total ⁽¹⁾ ⁽²⁾ ⁽³⁾ ⁽⁴⁾	32 413

⁽¹⁾ Including joint technology initiatives (including financial plan, etc.) and the part of the coordination and international cooperation activities to be funded within the themes.

⁽²⁾ The aim will be to enable at least 15 % of the funding of the programme to go to SMEs.

⁽³⁾ Including a contribution of up to EUR 800 million to the European Investment Bank for its Risk-Sharing Finance Facility, as referred to in Annex III. The themes will contribute on a proportional basis, except the Socioeconomic Sciences and the Humanities theme, which does not contribute to RSFF.

An amount of the order of EUR 400 million will be committed in annual instalments for the period 2007 to 2010.

⁽⁴⁾ Of which at least EUR 210 million and up to EUR 250 million for COST, subject to the mid-term evaluation. This financial support will be provided through a grant which will be paid on the basis of a grant agreement between the Commission and a legal entity designated by COST as its implementing agent and communicated to the Commission by the General Secretariat of the Council and identified in the work programme.

ANNEX III

RISK-SHARING FINANCE FACILITY

In accordance with Annex II, the Community will provide a contribution (coordination and support action) to the European Investment Bank (EIB) which will be a risk-sharing partner for the risk-sharing finance facility (RSFF). RSFF, which will be co-funded by the Community and the EIB, is aimed at fostering private sector investment across Europe in research, technological development and demonstration (RTD) as well as innovation.

The Community contribution will increase the capacity of the Bank to manage risk, thus allowing for (i) a larger volume of EIB lending and guarantee operations for a certain level of risk, and (ii) the financing of riskier European RTD actions that would not be possible without such Community support, thus helping overcome market deficiencies. It will aim at:

- adding value in areas where the market cannot provide the required funding; and
- providing catalytic effect in leveraging private investment.

The Community contribution will be committed to RSFF in line with the provisions set out in Annex II.

The EIB will lend funds raised from international financial markets and provide guarantees to its financing partners in accordance with its standard rules, regulations and procedures.

It will use this contribution on a 'first come, first served basis', as provisions and capital allocation within the Bank to cover part of the risks associated with its operations supporting eligible European RTD actions.

Based on its financial evaluation, the EIB will assess the level of financial risks and decide the value of the provision and capital allocation.

The risk assessment and grading, and the resulting decisions on provisioning and capital allocation, will follow standard procedures of the Bank, under its Structured Finance Facility, approved and monitored by its shareholders and as updated and modified from time to time. They will not be altered as a result of the Community contribution.

The risk to the Community budget is limited to the amounts paid or committed to be paid. There will be no contingent liability for the Community budget, as any remaining risk is borne by the EIB.

The Community contribution will be disbursed annually based on a multiannual plan and taking into account the evolution of demand. The annual amount will be established in the work programme, on the basis of the activity report and forecasts presented by the EIB.

The multiannual plan will be funded from each of the contributing themes and, if appropriate, adapted in accordance with the principle of proportional contributions.

The agreement to be concluded with the EIB, following close consultations with Member States, will establish terms and conditions under which the Community funds can be used as provisions and capital allocation. It will include, *inter alia*, the following terms and conditions:

- The eligibility of Community RTD actions.

Joint technology initiatives', collaborative projects, networks of excellence and research for the benefit of SMEs funded by the Community shall be automatically eligible provided their objectives fall within the scope of the contributing themes of this specific programme. Legal entities established in third countries other than Associated Countries are also eligible if they participate in the Seventh Framework Programme indirect actions and their costs are eligible for Community funding.

Other European actions (such as Eureka) shall be eligible provided they concern research, technological development or demonstration activities within the scope of the contributing themes responding to European research principles and criteria and that the borrowers or guarantee beneficiaries are legal entities established in Member States or Associated Countries.

RSFF will be offered in all Member States and associated countries in order to ensure that all legal entities, irrespective of size (including SMEs and research organisations, including universities) in all Member States, may benefit from this facility for the funding of their activities in eligible actions.

Innovation activities of a commercial nature are eligible for RSFF only via the use of the EIB's own contribution.

In accordance with the Regulation on Rules for Participation adopted pursuant to Article 167 of the Treaty, the agreement will also establish procedures for the Community to object, in duly justified cases, to the use of the Community contribution by the EIB.

- The rules for defining the share of the financial risk that will be covered by the Community contribution and the risk threshold beyond which the EIB can use the Community contribution as well as sharing of corresponding income.

The level of the Community contribution for each operation shall depend on the financial risk evaluation carried out by the EIB. The level of total provisioning and capital allocation for the majority of RSFF operations is expected to fall within the range of 15 % to 25 % of the nominal value of such operations. In no case shall the level of total provisioning and capital allocation amounts of the Community contribution exceed 50 % of the nominal loan or guarantee value. There will be risk sharing under each operation.

- The arrangements by which the Community will monitor the EIB lending and guarantee operations related to the Community contribution, including operations through the EIB financing partners.

The EIB may only use the Community contribution for operations approved between the date of entry into force of this specific programme and 31 December 2013.

Interests and incomes generated by the Community contribution during this period shall be reported annually by the EIB to the Commission, which shall inform the European Parliament and the Council. In accordance with Article 18(2) of the financial regulation, they shall be considered as assigned revenues to the RSFF and entered into the budget.

When adopting the work programme, the Commission may decide to reallocate, for the purpose of any other indirect actions of the contributing themes of this specific programme, any amount not used by RSFF and, therefore, recovered from the EIB, after the mid-term evaluation referred to in Annex II of the Framework Programme. The mid-term evaluation will include an external assessment of the impact of the RSFF.

The Commission will closely monitor the effective use of the Community Contribution, including ex-post assessments of the successful features of the action, and regularly report to the programme committee. In addition, the Commission will include main findings in this respect to the annual report on research and technological development activities which it will send to the European Parliament and the Council pursuant to Article 173 of the Treaty.

ANNEX IV

JOINT TECHNOLOGY INITIATIVES AND COORDINATION OF NON-COMMUNITY RESEARCH PROGRAMMES**Joint technology initiatives ⁽¹⁾**

The research areas for an indicative list of joint technology initiatives are identified below based on the criteria set out in Annex I. These joint technology initiatives address a diverse range of challenges. Accordingly, structures must be designed on a case-by-case basis so that they address the particular characteristics of the research area in question. In each case, a specific structure would be identified for the purpose of implementing the agreed research agenda of the joint technology initiative and bring together the necessary public and private investments and coordination of European efforts. The Community could grant an amount for the implementation of the research agenda on the basis of separate proposals. Further joint technology initiatives may be identified on the basis of the criteria specified in Annex I and be proposed during the implementation of the Seventh Framework Programme.

Innovative medicines initiative

The Innovative Medicines Joint Technology Initiative aims at increasing the competitiveness of the European Pharmaceutical sector by providing a coordinated approach to overcome the research bottlenecks in the drug development process, reducing drug development time and clinical attrition rate for new medicines. This will enable faster access to more targeted medicines and an earlier return on research investment and thus leverage more private investment for further research.

Pre-competitive research, as defined through the Strategic Research Agenda (SRA) of the Innovative Medicines Initiative will include: development of tools and methods to better predict the suitability, safety and efficacy of drugs, intelligent infrastructures for data integration and knowledge management through close cooperation between industry, academia and clinical centres at all necessary steps. It will also address education and training gaps to ensure that Europe has the skills to translate research results into benefits for the patient. Close cooperation between the European Community and the Industry and other stakeholders, such as regulatory agencies, patients, academia, clinicians, etc., will be ensured, as well as the mobilisation of public and private funds. The implementation of the SRA will be carried out via the Innovative Medicines Initiative (IMI), the appropriate public-private partnership structure to be established especially for this purpose.

Nano-electronics technologies 2020

Nano-electronics is of high strategic importance for European competitiveness because its products are key enablers for innovation in other sectors (multimedia, telecommunications, transport, health, environment, industrial processing, etc.). It requires that R & D and innovation efforts are better structured, optimised and integrated into a larger process involving all actors crucial to achieving a successful outcome in the domain.

The initiative will address the needs for silicon-based technologies throughout four technology domains: (i) the shrinking of logic and memory devices to increase performance and reduce costs, (ii) the development of value-added functions, include sensing, actuating and packaging functions, and their embedding with logic and memory to form complex System-on-Chip or System-in-Package solutions, (iii) equipment and materials, and (iv) design automation.

Embedded computing systems

Embedded computing systems — the invisible electronics and software that impart intelligence to products and processes — are of strategic importance to the competitiveness of important European industrial sectors such as automotive, avionics, consumer electronics, telecommunications, medical systems and manufacturing. Furthermore, the increasing connectivity of these devices creates potential for entirely new markets and societal applications in which Europe must be well placed to benefit from.

The Joint Technology Initiative on Embedded Computing Systems will pull together and focus the research effort, leveraging private and public investment to share the high risks and maintain a high level of ambition. The initiative will address the design, development and deployment of ubiquitous, interoperable and cost-effective, yet powerful, safe and secure electronic

⁽¹⁾ The list of proposed JTIs is solely indicative and could be adjusted in the light of future developments. Each JTI will be decided individually (see Annex I, Chapter 'Scientific and technological objectives, broad lines of the themes and activities').

and software systems. It will deliver reference designs that offer standard architectural approaches for given ranges of applications, middleware that enable seamless connectivity and interoperability, integrated design software tools and methods for rapid development and prototyping, as well as new approaches for interaction between computers and the real world.

Hydrogen and fuel cells initiative

Hydrogen and fuel cells are energy technologies that can bring about a paradigm shift in the way Europe produces and uses energy, offering massive development potential towards long-term independent sustainable energy supply and providing Europe with a crucial competitive edge. The transition to a hydrogen-oriented economy implies large research and capital investment in the creation of new industries, new supply chain structures, infrastructure and human resources.

The Joint Technology Initiative will define and execute a target-oriented European programme of industrial research, technological development and demonstration to deliver robust hydrogen and fuel cell technologies developed to the point of commercial take-off. The main themes of the JTI research agenda will be: fuel cell development for all application sectors and ranges; sustainable hydrogen supply, including production, distribution, storage and delivery; integrated, large-scale demonstration of maturing and advanced technologies in a real operational context; and, market framework preparatory activities. This will be implemented on the basis of a sound and continuously developing EU technology roadmap and business case, detailing transition strategies and long-term goals and implementation milestones.

Aeronautics and air transport

Europe must remain at the forefront of key technologies if it is to have sustainable, innovative and competitive aeronautics and air transport industries in the future. The development of green technologies is key to ensuring the competitiveness of the entire air transport sector. Innovative technologies are of paramount importance in order to maintain competitiveness in areas of increasing competitive pressure and to regain competitiveness in areas where Europe has the potential for establishing a substantial market share, such as regional transport. As an RTD-intensive industry, the existing competitiveness of the European aeronautical and air transport companies in world markets has been built on significant private research investments (typically 13 to 15 % of the turnover) over many decades. Given the specificities of the sector, new developments often depend on effective cooperation between the public and the private sector.

Certain aspects of the ACARE Strategic Research Agenda require a scale of effect and continuity of purpose which requires a Joint Technology Initiative focusing on a coherent and dedicated programme of research on advanced technologies and fostering aspects such as integration, large-scale validation, and demonstration.

In the field of Aeronautics and Air Transport, different areas would be addressed, such as environmentally friendly and cost efficient air transport system (The Green Air Transport System), and air traffic management in support of the Single European Sky policy and SESAR initiative.

Global monitoring for environment and security (GMES)

Europe needs autonomous capability based on a European standard for global monitoring. This will considerably help Europe and its industries in this area, where its competitors are investing heavily in the development of standards for global monitoring systems.

GMES has to respond to the political mandate expressed in the Council Resolution of 13 November 2001 on the launch of the initial period of global monitoring for environment and security (GMES) ⁽¹⁾ that followed the June 2001 Gothenburg Summit, the Action Plan on GMES presented in February 2004 ⁽²⁾, and its inclusion in the 'Initiative for Growth' and the 'Quick-start' list.

The future of GMES depends on significant long-term investments by both users and infrastructure providers (both public and private). For this it is essential that GMES assert its a clear and coherent image of itself, which can be easily identified by users, public authorities and industry. Independently of the specific application areas of GMES, this will involve a set of accepted standards, validation mechanisms and policies, under a single political responsibility.

To that purpose a GMES management structure in the form of a Joint Technology Initiative (JTI) could be set up to bring together all relevant players with their resources, notably user organisations at both national and European level.

⁽¹⁾ OJ C 350, 11.12.2001, p. 4.

⁽²⁾ 'Global Monitoring for Environment and Security (GMES): Establishing a GMES capacity by 2008 — (Action Plan (2004-2008)' — COM (2004) 65, 3.2.2004.

A JTI for GMES should ensure a strong coordination of GMES-related activities, including through the following functions:

- consolidation of user requirements for each application area of GMES,
- overseeing and supporting of the development of GMES operational services, associated capacities and infrastructures,
- validation of such services, where appropriate,
- development of mechanisms aiming at ensuring long-term access to data (data buying).

A GMES JTI would also be an effective vehicle to promote an active involvement of the private sector, in that it would act as a coordinating and funding agent for industry (including SMEs) and other potential contractors wishing to contribute to the implementation of GMES through the relevant competitive processes.

GMES will give Europe leadership in an area of management and use of major infrastructures, including strategic space capacities. It could also provide a basis for an efficient exploitation of finite natural resources by both public and private entities. It will, thus, help to improve productivity in many sectors which have a need for coherent and up-to-date information on available assets.

Coordination of non-Community research programmes ⁽¹⁾

An indicative list of initiatives for the joint implementation of national research programmes are identified below and could be the subject of a separate decision on the basis of Article 169 of the Treaty. Further initiatives may be identified and proposed during the implementation of the Seventh Framework Programme.

In the case of each decision, if and when adopted, a dedicated implementation structure would be set up, together with the organisational structure and appropriate governance bodies necessary for the implementation of the action. In accordance with Annex II, the Community could provide financial support to the initiatives and could participate actively in the implementation by the means which are most appropriate for the action.

Article 169 initiative in the field of Baltic Sea research

The aim will be to launch and implement a joint R & D programme integrating a number of national programmes in the field of marine science and sustainable development of the Baltic Sea. In line with a number of international, European and regional conventions dealing with the Baltic Sea, this initiative will enable the creation of a platform for synthesising and disseminating findings in the field and will create the necessary R & D to support sustainable development of the Baltic Sea.

Article 169 initiative in the field of ambient assisted living

A joint R & D programme on ambient assisted living will aim at bringing together national research efforts to address how ICT can enhance the quality of life of elderly people and extend the time they can live independently in their home environment and their surroundings. This includes for example assistance to carry out daily activities, facilitating social contacts, health and activity monitoring and enhancing safety and security. Focus will be the integration of devices, systems and services into cost-effective, reliable and trusted solutions. This initiative will aim at a large-scale European cooperation with sufficient critical mass and long-term commitment.

Article 169 initiative in the field of metrology

The aim will be to launch and implement a cohesive joint metrology R & D programme integrating a number of national programmes, which will enable Europe to respond to the growing demands for cutting-edge metrology as a tool for innovation, supporting scientific research and policy. The initiative will support, in particular, the objectives of the European National Measurement Systems delivered via the National Metrology Laboratory networks.

⁽¹⁾ The list is solely indicative and the proposed initiatives are subject of separate decisions on the basis of Article 169 (see Annex I, Chapter 'Scientific and technological objectives, broad lines of the themes and activities').

ANNEX V

INFORMATION TO BE PROVIDED BY THE COMMISSION IN ACCORDANCE WITH ARTICLE 8(4)

1. Information on individual projects, enabling the monitoring of the entire lifetime of each proposal, covering in particular:
 - submitted proposals,
 - evaluation results for each proposal,
 - grant agreements,
 - completed projects.
2. Information on the outcome of each call and project implementation, covering in particular:
 - results of each call,
 - outcome of negotiations on grant agreements,
 - project implementation, including payment data and outcome of projects.
3. Information on programme implementation, including relevant information at the level of the Framework Programme, the specific programme and each theme.

This information (in particular, on proposals, their evaluation and grant agreements) should be provided in a uniform structured electronically-readable and treatable format accessible through an IT-based information and reporting system which readily enables data analysis.
