THEMATIC AREA 3

Nanotechnology and nanosciences, knowledge-based multifunctional materials, new production processes and devices

DRAFT WORK PROGRAMME - Draft 11 November

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3.2 Introduction

The twofold transition towards **knowledge-based society** and **sustainable development** demands new paradigms of production and consumption. There is a need to move from resource-based approaches towards more knowledge-based ones, from quantity to quality, and from mass produced single-use products to new concepts of higher added value, eco-efficient and sustainable products, processes and services.

3.3 Objectives, Structure, and Overall Approach

The primary objective of this thematic area is to promote real breakthroughs, based on scientific and technical excellence, to ensure **substantial changes** in products, processes and organisations. Incremental research for improvement of existing systems will not be supported.

The **transformation of industry** towards high-added value organisations necessitates real integrated approaches, either "vertical", combining materials sciences, nanotechnologies and production technologies, as well as other technologies based e.g. on information technologies or biotechnologies, or "horizontal", combining multi-sectoral interests. An integrated approach should cover consumption patterns so that the complete industrial cycle conforms to the societal requirement for sustainability. Particular attention will be given to the **strong presence** and **interaction** of innovative enterprises, universities and research organisations in research actions. The integration of **education** and **skills development** with research activities will play an important role in increasing European knowledge, in particular in nanosciences and new technologies and opening opportunities for industrial applications. Europe wide **networks** and **projects** are required that give research organisations access to new technologies, therefore stimulating implementation of new approaches in most industrial sectors, **in particular SME intensive sectors**. A key issue will be to integrate **competitiveness**, **innovation** and **sustainability** into consistent RTD activities.

In addition, it is expected that breakthrough research activities should help to foster dialogue with society and generate **enthusiasm** for science.

To realise the work programme the following instruments will be used: Integrated Projects (IP) Networks of Excellence (NE), specific research projects (STREP), co-ordination actions (CA), and specific support actions (SSA). The research areas described below are valid for the 2003 calls, and they specify both crucial research topics, around problems which have to be addressed urgently, and more long-term objectives for which structuring actions are to be preferred. The rationale for the selection of these topics has been based on previous work done by the Commission services on the 2002 Expressions of Interest (EoI) and on consultations with stakeholders. The EoI exercise allowed a survey to be carried out of the readiness, understanding and interest of the RTD community to submit multi-disciplinary proposals under this Priority. The EoI exercise confirmed the importance of strengthening nano science and nano technology, as well as developing knowledge-based multifunctional materials, as key factors for supporting the transition towards high-added value industries and sustainable development. The EoI exercise also showed the need to integrate research on new processes and devices supporting new concepts of sustainable production and eco-design, and ensuring security of people, health and an improved living environment

3.4. Technical content

The work programme presented below introduced each area and gives a description of the topics for which project proposals are invited. For each topic, the Work Programme specifies whether a new and/ or other instrument is to be used. IPs should be addressed through a multi-disciplinary approach and may therefore correspond to more than one topic whereas NEs usually address a single topic. As there is competition between topics, this could consequently result in some topics not being supported under the 2003 calls.

3.4.1 Nanotechnologies and nanosciences

Nanotechnologies and nanosciences represent a new approach to materials science and engineering, as well as for design of new devices and processes. Europe enjoys a strong position in the nanosciences that needs to be translated into a real competitive advantage for European industry. The objective is twofold: to promote the creation of an RTD-intensive European nanotechnology related industry, and to promote the uptake of nanotechnologies in existing industrial sectors. Research may be long-term and high risk, but will be oriented towards industrial application and/or co-ordination of efforts at EU level. An active policy of encouraging industrial companies and SMEs, including start-ups, will be pursued through the promotion of strong industry/research interactions in consortia undertaking projects with substantial critical mass. Research and development activities should also promote development of new professional skills. Whenever appropriate, societal, health, ethical and regulatory issues, and in particular metrology aspects, should be addressed.

3.4.1.1 Long-term interdisciplinary research into understanding phenomena, mastering processes and developing research tools

Expanding the generic underlying knowledge base of application-oriented nanosciences and nanotechnology, and developing leading edge research tools and techniques is vital for the future of industry.

Selected topics for 2003:

- ***Expanding knowledge in size-dependent phenomena - NE; STREP; CA***

  The objective will be to increase the basic understanding of phenomena and properties at the nano-scale with attention to possible applications. Long-term, ambitious interdisciplinary research will address, theoretically (incl. modelling) and experimentally, size-dependent phenomena, including quantum and/or mesoscopic scale phenomena.

- ***Self-organisation and self-assembling - IP; NE; STREP***

  The objective will be to achieve materials and systems with predictable composition and structure, and control of their final properties, e.g. through external fields. Interdisciplinary research may include growth, characterisation and/or functionalisation of nano-entities; positional assembly; self-replication (automatic copying); molecular replication.

- ***Molecular and bio-molecular mechanisms and engines - IP; NE; STREP***

  The objective will be to develop new concepts and technologies for further developments with substantial breakthrough potential applications. Research may address a vast variety of areas, such as molecular electronics, artificial photosynthesis and molecular motors.

3.4.1.2 Nano-biotechnologies

Europe needs to support research into the integration of biological and non-biological systems, opening new horizons in many applications, such as for processing and for medical and environmental analysis systems (see also section 3.4.4).

Selected topics for 2003:

- ***Interfaces between biological and non biological systems - IP; NE; STREP***

  The objective is to realise novel forms of integration of biological and non-biological systems at the nano-level. Research may include bio-molecular, chemical and physical modifications at the substrate surface, including patterning or growth of cells, enabling specific bioactivity/biomimetic performance and integration in devices with new potential applications. Health and environmental risks should be addressed.

3.4.1.3 Nano-metre-scale engineering techniques to create materials and components

There is an increasing need of developing novel functional and structural materials of superior performance for industry by controlling their nanostructure. This will include technologies for their production and processing.

Selected topics for 2003:

- ***Engineering techniques for nanotubes and related systems – IP; NE; STREP***

  The objective is to develop production technologies for high purity and high performance nanotubes, such as carbon nanotubes, at a commercially viable cost. RTD may integrate the applications of the nanotubes to related systems (composites, components, surface structures, wires, etc.).

Possible topics for 2004[1]:

- ***Nanostructured materials and nanopowders, jointly with 3.4.2.3***

3.4.1.4 Development of handling and control devices and instruments

It is important for Europe to develop efficient instrumentation for measurement, analysis and manufacture at the nano-scale. A guiding target for handling and controlling nanostructures should be a feature size or resolution of the order of 10 nm.

Selected topics for 2003:

- ***Handling and control instrumentation at the level of single atoms or molecules and/or < 10 nm - IP; NE; STREP; CA***

  The objective is to develop instrumentation and methods, for manipulation and manufacture at the nano-scale, supported by appropriate analysis and control, including benchmarking of efficient and cost effective instrumentation, and nano-metrology. Research at frontiers of knowledge may include the study of a variety of advanced techniques for nano-scale manufacture; the development of breakthrough technologies and methodologies exploiting the self-assembling properties of matter.

Possible topics for 2004: ***"Nanorobots"***

[1] These topics are included for information only ; they cannot be understood as a commitment for 2004.

3.4.1.5 Applications in areas such as health and medical systems, chemistry, energy, optics, food and the environment[2]

Nanosciences and nanotechnologies are fast developing domains with great potential, both in terms of improving the quality of life of all people and of creating wealth though novel knowledge-based and sustainable processes. The goal is to foster the potential nano-technologies in breakthrough applications through the integration of research developments in materials and technological devices in an industrial context. The development of new, more high performance "nano-enabled" services, products, components, devices, systems and processes still requires long term research efforts. The availability of up-to-date information and the development of realistic scenarios are key elements for elaborating possible forms and scope for the intervention of public funds. This area is clearly linked with section 3.4.4.

Selected topics in 2003:

- ***Roadmaps for nanotechnology - SSA***

  The objective is to elaborate technological roadmaps (or to co-ordinate existing work on such roadmaps at national level) in nanosciences and nanotechnologies. The outputs will have to illustrate in due detail the realistically expected developments in industrial fields such as materials, health and medical systems, or energy, and in particular for SMEs. The scale-down industrial trends in micro-systems have to be considered with particular attention. The state of the art both at international level and in Europe, applications, implications for the industrial take-up, anticipated market reactions, and potential benefits for the general public and the society as a whole should be dealt with. Both conservative and optimistic scenarios should be considered. The role of public and private funds, including venture capital, should be considered as well as the scope for possible international co-operation. An analysis of available and required infrastructures should also be included, considering in particular candidate countries.

Possible topics for 2004:

- ***Applications in the fields of energy and chemistry, with focus on catalysis***

3.4.2. Knowledge-based Multifunctional Materials

New, high knowledge-content materials, providing new functionalities and improved performance, will be critical drivers of innovation in technologies, devices and systems, benefiting sustainable development and competitiveness in sectors such as transport, energy, medicine, electronics, photonics and construction. Since these applications have a strong impact on individuals and on society as a whole, a new research culture will be required. RTD activities are expected to be high risk, inter and multidisciplinary, long term and generic, with potential benefits in material, maintenance and energy savings as well as on health, safety and the environment. Breakthroughs will come not only from the new materials developed but also from new processing and from the new approaches taken in particular using renewable raw materials. To assure Europe's strong position in emerging technology markets the various actors need to be mobilised through leading edge RTD partnerships and high-risk research.

[2] It is reminded that nanoelectronics is covered under Priority 2.

3.4.2.1. Development of fundamental knowledge

There is a pressing industrial need to better understand complex physico-chemical and biological phenomena relevant to the mastering and processing of multifunctional and eco-efficient materials providing the basis for developing novel materials with predefined physical, chemical or biological characteristics.

Selected topics for 2003:

- ***Understanding materials phenomena – NE; STREP; CA***
  Research will focus on materials phenomena offering new options for the long-term. Research projects should support high-risk activities to design and develop new structures with defined characteristics, which can lead to new industrial applications. The activities should address the understanding of properties, behaviour and synthesis of materials in order to exploit the potential use of these novel highly complex materials. Computational strategies, experimental, theoretical, simulation and modelling are key tools to be considered.

3.4.2.2. Technologies associated with the production, transformation and processing of knowledge-based multifunctional materials, and biomaterials

Industry needs the development and sustainable production of new "smart" materials with special functionalities and for building up macro-structures. These novel materials, serving multisectoral applications, should possess characteristics to be exploited under predetermined circumstances as well as enhanced bulk properties or barrier and surface characteristics for higher performance. To produce these novel materials new crosscutting technologies and processes have to be developed.

Selected topics for 2003:

- ***Mastering chemistry and creating new processing pathways for multifunctional materials - IP; NE; STREP; CA***
  The overall objective is to maintain and extend Europe's lead in chemical technologies, building on skills and respecting the environment, and also to provide benefits in other intermediary and end-user sectors. RTD objectives should include, among others, new strategies and optimisation of chemical reactivity and catalysis, development of supra-molecular and macromolecular engineering, product formulation, new solvent routes, chemistry and new synthesis routes for eco-materials.

- ***Surface and interface science and engineering - IP; NE;STREP; CA***
  The aim is to foster the strong position of European industry in areas such as smart coatings, adhesion, tribology and thin films functionality (combining several desired properties). RTD should range from the generation of fundamental knowledge, e.g. on interfaces in hybrid materials to the development of generic technologies with a broad range of applications in many industrial sectors such as packaging, automotive, aerospace, energy, building, textiles, machine tools, and instrumentation.

  Possible topics for 2004:

  - ***Biomaterials***

3.4.2.3. Engineering support for materials development:

The challenge is to bridge the gap from "knowledge production" to "knowledge use", thus overcoming EU industry's weaknesses in the integration of materials and manufacturing or processing. This will be supported by the development of new tools enabling the production of new materials in a context of sustainable development and competitiveness.

Selected topics for 2003:

- ***New materials by design - IP; NE; STREP; CA***
  The main objective is to develop novel multi-functional materials for multisectoral applications by providing new materials processing solutions and encouraging new approaches, such as "learning from nature" or materials "made to measure", using whenever appropriate the potential of nanotechnology. Emphasis should be put on developing novel materials by means of "design approaches", including prediction and modelling, on exploring new complex multi-functional properties of materials and on tailoring the materials in order to obtain a desired set of properties suitable for given applications and respecting consumer needs and perceptions. In using the potential of nanotechnology, a particular attention should be given to self-repairing materials.

- ***New knowledge-based higher performance materials for macro-applications - IP; NE, STREP, CA***
  The objective is to understand, design and develop new complex multifunctional materials in order to extend their limits in a context of sustainability. RTD will consider among others metallic- and ceramic-based materials, soft and cellular materials and polymers, renewable materials, composites and materials tailored for extreme conditions. Engineering support may include as well materials characterisation and testing, up-scaling, eco-design tools and life-cycle and product friendliness approaches.

Possible topics for 2004:

- ***Nano-structured materials and nano-powders, jointly with 3.4.1.3***

3.4.3 New Production Processes and Devices

In line with advances in nanotechnology and new materials, new production concepts need to be designed, based on breakthrough organisational, quality and technological developments, supporting new products, processes and services. The goal is to accompany the transformation of the European industry towards a more knowledge-based and added value industry and improved competitiveness and sustainability. In this perspective it is vital to provide the industrial systems of the future with the necessary tools for efficient life-cycle design, production, use and recovery, decreasing at the same time internal and external costs. Appropriate organisational models and improved knowledge management should support technological developments and innovation routes. Flagship research projects need to be carried out, highlighting the importance of collaboration between research and industry, the major outcome of which would be a framework for "manufacturing in 2010" based on improved co-ordination and integration of research efforts at European level.

3.4.3.1. Development of new processes and flexible, intelligent manufacturing systems

The challenge for Europe is to encourage industry's transition towards more knowledge-based and customised production and systems organisation and to consider production from a more holistic perspective, encompassing not only hardware and software, but also people and the way in which they learn and share knowledge. In this domain of activity, an international dimension is evident. A wide innovation range is expected in a number of industrial sectors, and particularly the traditional ones, with the final goal of increased competitiveness and increased private investment in research, in line with the objectives of the Lisbon and Barcelona Summits.

Selected Topics for 2003:

- ***New production technologies, as well as "bottom-up" production techniques, based on nanotechnology and new materials - STREP***

  To produce the materials of the future, Europe also needs also new production technologies. The objective of this area is the development of radical breakthrough production techniques, through research at the frontiers of knowledge, paving the way towards the production systems of the future, e.g. based on mass production of nano-components of very high quality, or self-controlled manufacturing operations. A significant collaboration is expected between research community and industry. There are obviously strong links with section 3.4.1.3.

- ***New and user-friendly production equipment and technologies, and their incorporation into the factory of the future - IP; NE; STREP; CA***

  The objective is to support future cost-effective, high quality, fault-tolerant, eco-friendly and more flexible manufacturing systems, including control systems and innovative robotics. Modularization and customisation as well as new design and engineering concepts (integrating new materials, micro-devices, mechatronics, automation, communicating machines) are urgently required. Quality, reliability and accuracy are increasingly needed for effective development of such systems and, in this context, metrology and pre-normative aspects could be critical issues. The objective is also the elaboration of a clear roadmap for the emergence of new manufacturing concepts, their validation and the identification of best practices. Addressing the challenge of creating knowledge-based industries, particular attention should be given to education and skill development. Emphasis should also be given to creating maximum of synergies with "EUREKA Factory".

- ***Creation of "knowledge communities" in production technologies - IP; NE; CA; SSA***

  The objective is to support dynamic organisations, inter-enterprise operability, and necessary standardisation. Incorporation of advances in virtual production, supply chain and life-cycle management, interactive decision-aid systems, development and rapid manufacturing should be addressed. The objective is also to profit from different approaches to common manufacturing problems and to promote successful technology transfer. Particular attention should be given to the world market. Emphasis should be given to creating maximum of synergies with IST, national programmes and the IMS scheme at international level.

  NB: A specific call will be launched together with Priority 2, to promote "manufacturing, products and services engineering in 2010".

- ***Support to the development of new knowledge based added value products and services in traditional less RTD intensive industries - IP dedicated to SMEs[3].***

  The objective is to promote the shift of the traditionally less RTD intensive industrial sectors to high-added-value sectors. This goal should be achieved through incorporation of emerging technologies driving new production paradigms in all phases of the complete/extended value-chain (design, production, distribution, recycling) to allow development of new knowledge-based, added value and quality products and services in traditional sectors. Addressing the challenge of creating knowledge-based industries at the 2010 horizon, particular attention should be given in the different projects to education and skill development.

3.4.3.2. Systems research and hazard control

It is important for Europe to contribute to an improved sustainability of industrial systems and a substantial and measurable reduction in environmental and health impacts, through new industrial approaches, as well as an enhancement of resource efficiency and a reduction in consumption of primary resources. Aiming at sustainable development (often implying 90% of reduction in the use of new resources) demands new paradigms not only of production but also of use and consumption. This should be based on an increased move towards more knowledge-based and life-cycle approaches. Projects should help explore new concepts, expected to support the technological and reference basis for the EU Environmental Technologies Action Plan[4].

Selected Topics for 2003:

- ***Radical changes in the "basic materials" industry (excluding steel) for cleaner, safer and more eco-efficient production - IP; STREPS***

  In support of the "production of tomorrow", the objective is to provide for the basic materials industries through the development of sustainable solutions that do not harm 'people and planet' for the whole life cycle of products, equipment and infrastructures. Industrial breakthroughs should be fostered, integrating various innovative technological approaches, in particular biotechnology-based processes, new eco- and renewable materials, eco-design, zero-waste and related control technologies. With regard to the challenge of creating knowledge-based industries at the horizon 2010, attention should be given in the different projects to education and skill development.

- ***Sustainable waste management and hazard reduction in production and manufacturing - NE; CA; SSA***

  The objective is to support life-cycle safety, and minimisation of waste, chemicals and pollution through improved integrated approaches, including bio-processes as well as environmental technologies (e.g. linked with recycling or recovery of products). Sound and human-friendly working conditions and safety aspects for prevention of accidents should also be ensured. A specific target is to create a maximum of synergy with other European, national or regional programmes, in particular due regard to needs of candidate countries. Drivers of co-ordination and support activities should obviously correspond to the IPPC (integrated pollution prevention and control) policy.

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3 See section 3.6.5

4 The Commission is ensuring an important interservice co-ordination on this matter.

Possible Topics for 2004:

- ***Support to the development of new knowledge based and sustainable processes and products/services - IP dedicated to SMEs.***

  The objective is to support European SMEs, in the development of sustainable processes and production and delivery of sustainable products/services.
  This goal should be achieved through incorporation of emerging technologies such as new materials processing technologies or through new organisational approaches. With regard to the challenge of creating knowledge-based industries at the horizon 2010, particular attention should be given to education and skill development.

- ***"Low CO_2 steel processes" - IP***

  A call could be organised in 2004 with the **Coal and Steel Research Fund**.

3.4.3.3. Optimising the life-cycle of industrial systems, products and services

Products and production should become increasingly life-cycle, quality and service oriented, in addition to the requirements of intelligence, energy, cost-effectiveness, safety and cleanliness. The key challenge is therefore to promote new industrial and consumption approaches based on eco-efficiency, which must allow the development of new concepts for products and organisational innovation.

Selected Topics for 2003:

- ***Optimisation of "production-use-consumption" interactions - NE; CA***

  A particular focus should be given on the co-ordination and integration of "design-production-use-service-end-of-life" approaches, and of new concepts of product-services based in particular on advances in new materials and industrial technologies. A topic to be examined in such networking activities is also whether the EU and national legislation helps or hinders the development of sustainable solutions. Co-ordinated research activities could also help to establish third party validation and/or certification of the sustainability performance of new products, processes and / or services. Research efforts should finally target the transformation of information into useable knowledge along the complete value chain as well as the analysis of socio-economic implications. Expected benefits are increased life-cycle quality, efficiency and upgradability of services provided to customers, citizens and society in general. Co-ordination and integration efforts will be supported to join forces and create maximum of synergies with other European, national or regional programmes.

- ***Increasing the "user awareness" - SSA***

  There will not be any sustainable development without the demand from users for sustainable solutions. In addition a growing challenge is the 'rebound effect' of increasing consumption of more eco-efficient products. Elaboration of scenarios for the future should help to identify the implications for the various systems at stake. The role of public and private initiatives should be considered as well as the international dimension. It is timely to provide information and tools to help users understanding and evaluate the sustainability impacts of proposed solutions and increased their 'responsibility'. Specific Support Actions should also help efficient benchmarking of emerging decision support systems.

3.4.4. Integration of nanotechnologies, new materials, and new production technologies for improved security and quality of life

This area has been added to the three first areas, as defined in the specific programme, due to the "integrating" challenge of the expected output and due also to the number of EoIs received on the subject. A specific target should indeed be to put materials science and advanced industrial technologies at the service of health. In this context, integration of technological developments, and in particular of the new generation of smart and hybrid materials interacting with their surrounding and related manufacturing equipment, is bringing huge potential for the development of sensors, actuators and devices, allowing a greater security and safety of people and the environment.

Selected Topics for 2003:

- ***3.4.4.1 – Systems, instruments and equipment for better diagnosis and/or surgery, including for remote operations - IP; NE; CA***

  The long-term objective is the development of remote surgically precise systems, new medical instruments and/or intelligent diagnosis equipment and systems, supporting challenges such as the development of health care for the future. A specific technical goal should be the miniaturisation of systems and instruments, including sterilisation aspects. The advances in biosensors should also be considered here.

- ***3.4.4.2 - Tissue engineering, new biomimetic and bio-hybrid systems - IP; NE; STREP; CA***

  The new developments in new materials and industrial processes for health will strongly boost treatment and healing, in fields such as artificial organs. Research should encompass the understanding, modelling and development of biomaterials through new bioreactor developments including adult stem cell research. The final goal should be the development of advanced intelligent bio-hybrid systems and their production lines. Ethical, legal and regulatory issues need to be looked at in parallel with RTD issues.

- ***3.4.4.3 - New generation of sensors, actuators and systems for safety and security of people and environment - IP; NE; STREP***

  The target is to support technological platforms for the development of novel, low cost and highly reliable sensors and actuators, in particular those based on nano or micro-technologies, in combination with signal treatment. The resulting systems will enable the real-time detection of hazards and species from various origins, to monitor quality, reliability and safety of products and systems and to provide early feedback to protect people and the environment. The long-term objective is the development of stable, multifunctional, precise, small and low-cost systems for optimised use, as well as of an efficient related metrology infrastructure.

  NB: The 2003 call under 3.4.4 will be co-ordinated with Priority 1 and Priority 2, to promote synergies and avoid overlaps.

Possible topics for 2004:

- ***Towards a human-friendly living environment: "from atoms to buildings"***
- ***Support to the development of new knowledge based added value products and services for medical applications - IP dedicated to SMEs***

3.5. Links to other research topics

Clear links exist between this Thematic Priority and Priority 2 "information society technologies", especially in the field of "manufacturing, products and services engineering in 2010" and on "micro and nanosystems". Joint and co-ordinated call(s) are organised in 2003. Clear links exist also between this Priority and activities in the support of the EU Environmental Action Plan, and therefore with Priority 6. Calls for co-ordinated actions are also organised during the first year to improve synergies with EUREKA (in the field of "the factory of the future" and "sustainable production"), and with ESF and COST in the field of new materials and nanotechnology.

3.6. Implementation plan and related issues

For 2003 there will be two main closing dates, respectively one for all new instruments (IP, NE) and one for the other instruments (STREP, CA, SSA). In addition, there will be a joint call with Priority 2, for new and other instruments (IP, NE, STREP, CA), and a dedicated call for IP for SMEs with separate closing dates.

3.6.1 New Instruments

- Integrated Projects (IP): For this priority, an integrated project should include all necessary activities to ensure radical innovation in the long term in a dynamic and effective way, in particular those related to education and skills development. The activities should also lead to a positive image of industrial research.
- Networks of Excellence (NE): For this priority, in addition to the objectives of a NE as described in the "horizontal" part of this WP, the activities of a Network of Excellence should be oriented towards long-term objectives and contribute to advancing knowledge for sustainability, competitiveness and dynamism of the EU industry. They should include activities related to education and skills development.

IP and NE should tackle integration from different but related perspectives. For IPs integration should be mainly on disciplines, technologies, activities, partnership and whenever appropriate funding sources. For NE integration refers mainly to research teams, resources and the Joint Plan of Action. Both types of project should normally comprise a set of activities implemented in a co-ordinated manner. These will include: innovation management (including transfer of knowledge, support to SMEs and spin-offs, links with venture capital), continuous evaluation of the potential impacts, co-operation at international level, benchmarking, support to standardisation and / or legislation, IPR protection, mobility of researchers, education and development of new skills, information, dialogue concerning "science and society" aspects, and whenever appropriate ethical issues.

For this Priority, the evaluation of proposals submitted under the new instruments (IP; NE) will be organised in two stages. The rationale for this is due to the specific nature of this Priority, which is multisectoral and SME intensive, in which a "bottom up" approach is encouraged. The first stage proposal should address all selection criteria. The second stage selected proposal should complement the first stage proposal with the detailed workplan for the first 18 months, clarification on budget and the consortium agreement. A review panel will interview all second stage selected proposals. The experience gained could be beneficial for the future implementation of other parts of the programme.

3.6.2 Other instruments

Three other instruments will complement the new instruments.

- Co-ordination Actions (CA): The objective is to strengthen links between different research initiatives, such as EUREKA, national, regional and Commission RTD projects. For this Priority, pilot projects would be welcome in order to explore methods of such co-ordination with EUREKA, COST and ESF activities.
- Specific Targeted Research Projects (STREP) at the frontiers of knowledge: In the scope of Priority 3, for 2003, such projects should be targeted at exploring the frontiers of knowledge and to support long term innovation and transformation of industry. The objective is to help develop innovative technologies to meet the needs of the future society. Such projects could be considered as incubators for future IPs.
- Specific Support Actions (SSA): In the scope of Priority 3 such measures might be used to help preparing future research activities. For a positive evaluation, their impact should be ensured at a broad international level. An example could be to consolidate scenarios for the future (time horizon 2010-2015) setting out development and technology road maps, not forgetting barriers to development, in support of sustainable and knowledge intensive production, in the context of international co-operation. Another example might be to look at factors for improving the interaction between researchers and public authorities, regulators or standardisation bodies.

  A specific support may be given to candidate countries, according to the needs, in the light of the results of the first 2003 calls.

3.6.3 International co-operation

Industrial research needs appropriate critical mass and benefits dramatically from an international dimension. International co-operation rules are described under the "horizontal" parts of this whole Specific Programme, which of course cover other Priorities. A specificity of Thematic Priority 3 is nevertheless the IMS (Intelligent Manufacturing Systems) scheme. IMS is a multi-lateral agreement allowing research collaboration between its member regions[5]. Actions, carried out jointly between Priorities 2 and 3, will cover:

- Support to implementation of research activities, through a European IMS secretariat, a yearly contribution to the IMS interregional secretariat and specific RTD actions,
- Support to co-ordination of international research activities,
- Benchmarking of research activities and policies in the field of IMS,
- Stimulation of knowledge communities, support to IMS enlargement, etc.,
- Support to the development of an international engineering curriculum.

3.6.4 Other Specific Actions in support of Priority 3

- Organisation of ex-post evaluation: Drawing on previous programme experience, external experts will evaluate all industrial research projects funded under this Priority to assess the impacts of the research and learn about "success" and "failure" factors.

[5] IMS regions presently encompass Europe and Norway, Switzerland, Canada, USA, Japan, Australia and Korea.

3.6.5 Implementation and Budgetary Planning

- **First Calls for 2003**

  See fiches in section 3.7.

– A **first call** (call 3.a) will be launched in December 2002, for an indicative funding of **370 M€**, opened in the fields identified in section 3.4. A budget **260 M€** indicative will be devoted to the new instruments. A budget of **110 M€** indicative will be devoted to other projects (STREP, CA, SSA). Special attention will be given to INCO activities. There will be different closing dates: (1) for the new instruments the closing date for receipt of first stage proposals is on **February 26**, 2003, 17.00, Brussels time; for the second stage proposals on **June 24**, 2003, at 17.00, Brussels time. (2) for the other instruments, the closing date for receipt of full proposals is on **April 10**, 2003, 17.00, Brussels time. Co-ordination will be ensured with Priority 2 in the field of "micro and nanosystems".

– A **second call** (call 3.b) will be launched in December 2002, jointly with **Priority 2** in the field of "manufacturing, products and service engineering in 2010". The indicative funding from Priority 3 is of **35 M€**, of which **25 M€** for the new instruments. Special attention will be given to IMS. The closing date for receipt of full proposals (other instruments) and first stage proposals (new instruments) will be **April 24**, 2003, 17.00, Brussels time; for the second stage proposals on **September 16**, 2003, at 17.00, Brussels time.

– **A third call** (call 3.c) targeting SMEs Integrated Projects will be launched in December 2002, with an indicative funding of **40 M€**. The deadline for the first stage proposals will be on **April 10**, 2003, 17.00, Brussels time, and for the second stage proposals on **September 3**, 2003, at 17.00, Brussels time.

SME can of course participate in each and every call for proposals. However, ***Integrated Projects dedicated to SMEs*** are specifically designed to encourage SMEs efforts towards research and innovation. Such Integrated Projects should be led by ***SMEs with R&D capacities***[6] with, obviously, possible participation of universities, research centres. Other industries and industrial associations can participate whenever it is either essential or highly desirable in terms of the role of SMEs in the supply chain. Proposed activities should be centred on reinforcement of the SME S&T knowledge and validation of innovative solutions within broad international as well as regional contexts. Results of such IPs should clearly be for the benefit of SMEs.

Potential participants are reminded that ***mobilisation of resources from SMEs with research capacities should be substantial.*** Activities to be carried out should benefit to the shift of less intensive RTD sectors to RTD intensive and higher added value sectors. They should lead to a positive image of industrial research. A wide range of innovation is expected in a wide range of sectors, such as textiles, building, wood, pulp and paper, leather and footwear, bio-medical, control systems, etc.

6 Consultants are NOT considered SMEs.

- **Indicative Budgetary Road map**

Budget Year	Total Budget	Adm M€	New Instruments M€	Other instruments (STREP, CA, SSA)
2003	300	15	200	90
2004	320	To be decided later		
2005	335			
2006	345			
Total	1300 (1)	xxx	xxx (2)	xxx (2)(3)

(1) of which minimum 15% for SMEs
(2) funds for INCO participants to be included in the funding of research projects
(3) including call for tenders

Table for the first calls (2003)

Instrument	New Instruments M€	Other instruments (STREP, CA, SSA)
First Call	260	110
Joint call with Priority 2	25	10
Dedicated Call for SMEs	40	

3.7. Call information

Call fiches, see following pages

Call fiche –

- Call ID: …..

- Envisaged publication date: December 2002

- Envisaged closing date: For the new Instruments:
February 26, 2003 (1st stage); June 24, 03 (2nd stage)

For the other instruments
April 10, 2003 (single stage)

- Indicative budget available: 370 M€
(of which 260 M€) for new instruments

- Restriction to participation: see standard rules

- Evaluation criteria: see standard criteria (in annex B of this workprogramme)

- Description and content of the call: see sections 3.4.1 to 3.4.4

- ***3.4.1.1- Expanding the knowledge in nanosciences - NE; STREP; CA***
- ***3.4.1.1- Self-organisation and self-assembling - IP; NE; STREP***
- ***3.4.1.1- Molecular and bio-molecular mechanisms and engines - IP; NE; STREP***
- ***3.4.1.2- Interfaces between biological and non biological entities - IP; NE; STREP***
- ***3.4.1.3- Engineering techniques for nanotubes - IP***
- ***3.4.1.4- Handling and control instrumentation at the level of single atoms or molecules and/or < 10 nm - IP; NE; STREP; CA***
- ***3.4.1.5- Roadmaps for nanotechnology- SSA***
- ***3.4.2.1- Understanding materials phenomena - NE; STREP; CA***
- ***3.4.2.2- Mastering Chemistry; creating new processing pathways for multifunctional materials IP; NE; STREP; CA***
- ***3.4.2.2- Surface science and engineering - IP; NE; STREP; CA***
- ***3.4.2.3- New materials by design - IP; NE; STREP; CA***
- ***3.4.3.1- "Hybrid" technologies, as well as "bottom-up" production techniques, based on nanotechnology and new materials - STREP***
- ***3.4.3.1- New and simplified production equipment and technologies, and their incorporation into the factory of the future - IP; NE; STREP; CA***
- ***3.4.3.2- Radical changes in the "basic materials" industry (excluding steel) for cleaner, safer and more eco-efficient production - IP; STREPS***
- ***3.4.3.2- Sustainable waste management and hazard reduction - NE; CA; SSA***
- ***3.4.3.3- Optimisation of "production-use-consumption" interactions NE; CA***
- ***3.4.3.3- Increasing the "user awareness" - SSA***
- ***3.4.4.1- Systems, instruments and equipment for better diagnosis and surgery, including systems for remote operations - IP; NE; CA***
- ***3.4.4.2- Tissue engineering, biomimetic and bio-hybrid systems - IP; NE; STREP; CA***
- **** 3.4.4.3- New generation of sensors, actuators and systems for safety and security of people and environment - IP; NE; STREP***

** The call under this area is co-ordinated with Priority 2, area "micro and nanosystems", for which 70M€ are earmarked.*

Call fiche – First Joint call between Priorities 2 and 3 :

"manufacturing, products and services engineering in 2010"

- Call ID: …

- Envisaged publication date: December 2002

- Envisaged closing date: For the new Instruments:
April 24, 2003 (1st stage); September 16, 03 (2nd stage)

For the other instruments
April 24, 2003 (single stage)

- Indicative budget available: 35 M€
(of which 25 M€ for the new instruments)

This call is organised jointly with Priority 2, "product and service engineering", for which 30 M€ are earmarked indicatively.

- Restriction to participation: see standard rules

- Evaluation criteria: see standard criteria (in annex B of this workprogramme)

- Description and content of the call:

- For Priority 3, see section 3.4.3.1 (area corresponding also to the IMS multilateral agreement - see also section 3.6.3). Focus will be given to the ***creation of "knowledge communities" in production technologies.***
- For Priority 2, see section 2.3.2.11. Focus will be given to ***"products and services engineering".***
- Instruments targeted are IP; NE; CA; SSA.

Call fiche – Dedicated call for SMEs Integrated Projects

- Call ID: …..	
- Envisaged publication date:	December 2002
- Envisaged closing date:	April 10, 2003 (1st stage); September 3, 2003 (2nd stage)
- Indicative budget available:	40 M€
- Restriction to participation:	Proposals should be clearly led by SMEs.
- Evaluation criteria:	see standard criteria for IPs (in annex B of this workprogramme)
- Description and content of the call:	see sections 3.4.3.1 and 3.6.5

The following priority area is opened to IPs for SMEs:

- ***Support to the development of new knowledge based added value products and services in traditional less RTD intensive industries – IP dedicated to SMEs.***