



**European Cooperation  
in the field of Scientific  
and Technical Research  
- COST -**

**Brussels, 19 June 2006**

**Secretariat**  
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**COST 254/06**

**NOTE**

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From : JAF  
To : COST Committee of Senior Officials (CSO)  
Subject : 165th CSO meeting on 27/28 June 2006, agenda item 9  
- Domain descriptors

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The CSO at its 164th meeting on 29/30 March 2006 approved the Terms of Reference for the new COST Domain Committees<sup>1</sup>, with a draft domain descriptor annexed to each mandate.

The draft domain descriptors as set out in this document have been examined by the new Domain Committees and will be presented to the CSO on 27/28 June 2006 for approval.

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<sup>1</sup> The Terms of Reference are set out in documents COST 237/06, 238/06, 239/06, 240/06, 241/06, 242/06, 243/06, 244/06 and 245/06.

## **BIOMEDICINE AND MOLECULAR BIOSCIENCES (BMBS)<sup>2</sup>**

### **Domain descriptor**

The Domain BIOMEDICINE AND MOLECULAR BIOSCIENCES covers all areas of medicine as practiced in Europe and basic, preclinical and clinical medical research developed to materialise the “bench to bedside” concept. Research in biomedicine emphasises acquisition of knowledge of normal functions of the human body and alterations of them in the case of diseases. These functions may be conducted at the molecular and the whole body level, not excluding its integration in the environment (food, water supply, pollutants, forests, urban environment, etc.).

The following examples illustrate aspects of actual research in this Domain. The scope of the Domain is not restricted to these activities; it should be noted that networking of cutting edge specific research with a high degree of complexity and multidisciplinary is encouraged.

**Molecular Biosciences** encompass all areas of genomics, proteomics and metabolomics. They are not limited to research in humans, but may also concern research in plants, viruses, micro-organisms, and animals. Basic and applied biomolecular research is addressed, issues connected with forestry and agriculture included. The BMBS research also includes issues of genome, proteins (structures and functions), lipids, study of the Central Nervous System and neuronal connections, cognitive neuroscience, immune system, cell migration, cell dysfunctions (cancer), cellular mechanisms of diseases, contagious diseases (animals to humans transmissible diseases included), tropical diseases.

**Biomedicine and Specific Technologies:** some of the related BMBS research areas include advanced imaging and treatment techniques (basic research, diagnosis, treatment procedures), medical devices and new medicines, advanced medical research on biomaterials.

**Micro- and Nanomedicine** (including nanotechnologies), biomedicine/ molecular bioscience and pharmacology in extreme conditions (climate change, and outer space conditions).

Research in BMBS is also concerned with some crucial interdisciplinary issues in the fields such as bioinformatics, biomedical engineering, medical physics and chemistry, mathematical models in medicine. Therefore, new ideas and initiatives are welcome as well as those with high interdisciplinary elements, high degree of innovation and close links and overlaps with other domains.

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<sup>2</sup> Terms of Reference as set out in doc. COST 237/06.

## FOOD AND AGRICULTURE (FA)<sup>3</sup>

### Domain descriptor

The Domain FOOD AND AGRICULTURE covers all aspects of research in the field of agricultural and food sciences in its widest sense. This naturally encompasses a very wide number of subjects, and relates to a large number of areas of human activity. The primary aim of the Domain is to encourage networking of research in any field linked to these activities as well as the related demands and needs. The following examples illustrate aspects of actual research in this Domain. It is emphasized that they are examples, not a complete catalogue. The Domain actively seeks innovative and interesting proposals even if they may not at first sight fit neatly into a traditional category of research in food and agriculture.

**The Biological Functions of Organisms:** to advance understanding of the functions of organisms relevant to agriculture, food and nutrition, the domain will welcome proposals where fundamental science is an essential component of the topic. This will include biological science, animal science, veterinary science, plant science, microbiological science, soil science, genetics and breeding, agricultural system science or any other fundamental discipline related to food, agriculture & fisheries. Biotechnology - the use of the most recent techniques and applications that spring from their use - is also addressed.

**Human Nutrition and the Food Chain** covers the entire food chain leading to non-processed, semi-processed and processed foods and encompasses food and feed quality, food safety, functional foods, nutritional and consumer issues. It includes all the processes and techniques used in food technology that are needed to bring food to the consumer's fork.

**Agriculture as a Human Activity:** the domain addresses socio-economic aspects of food and agriculture and other relevant concerns, such as the relationships between agriculture, rural economy and rural development. Societal issues concerned with animal health (disease prevention in animals and people) and animal welfare are also included.

**Agriculture and Environment:** this relationship is also addressed by the domain. It includes issues such as sustainability, natural resources and conservation, biodiversity and genetic resources, biosafety, bioremediation, and bioenergy. Proposals may also address changes in European agriculture under the influence of major issues such as reform of the Common Agricultural Policy, global warming, world trade patterns and energy scarcity.

Since food and agriculture involve so many scientific disciplines, it is anticipated that successful proposals will vary widely in nature from closely focussed topics of a fundamental nature using the most innovative and up-to-date techniques (such as tools for genomics, proteomics and metabolomics) to multidisciplinary projects having a more holistic approach (such as new farming systems for the production of quality food).

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<sup>3</sup> Terms of Reference as set out in doc. COST 238/06.

## **CHEMISTRY AND MOLECULAR SCIENCES AND TECHNOLOGIES (CMST)<sup>4</sup>**

### **Domain Descriptor**

The Domain CHEMISTRY AND MOLECULAR SCIENCES AND TECHNOLOGIES has the mission of fostering European expertise in discovering, understanding, producing and manipulating molecular species. These research activities aim to develop experimental, theoretical and analytical tools to enhance the development of chemical transformations, reactivity and function. The CMST aims to apply such knowledge and innovation to industrial processes and production.

The following examples are illustrative of actual research within this Domain, although it is not restricted to these activities alone.

Chemistry for life: a multidisciplinary collaboration between chemists, biologists, clinicians and agronomists in the design and development of new products for pharmacy, medicine, public health, and agriculture, including a more efficient and safe food production.

Manipulating molecular matter: learn how to handle, synthesise and manipulate matter at the molecular level, understand and control its reactivity and function, develop new catalysts to control the shape, size and properties of the product molecules; move from single molecule chemistry to supra- and macromolecular chemistry, producing smart materials tailored for specific applications.

Energy production: shifting from oil, natural gas and coal consumption to more efficient ways of using combustible fuels and investigate technologies based on renewable resources, in particular sunlight.

Caring for the planet: continuous improvement of the standards of living by reducing the environmental impact of technology in order to establish a sustainable growth, develop clean technology for innovative production, ensure increasingly accurate means for quality control, mastering ground remediation, hazard control, preserving and maintaining cultural heritage.

Space understanding and exploitation: rationalising processes occurring under extreme conditions in space and interstellar media, understanding processes occurring around spacecrafts, exploiting resources of stars and planets.

New ideas and initiatives are welcome as well as those with high interdisciplinary elements and close links and overlaps with other domains.

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<sup>4</sup> Terms of Reference as set out in doc. COST 239/06.

## **EARTH SYSTEM SCIENCE AND ENVIRONMENTAL MANAGEMENT (ESSEM)<sup>5</sup>**

### **Domain descriptor**

The domain EARTH SYSTEM SCIENCE AND ENVIRONMENTAL MANAGEMENT encompasses the rapidly growing science and technology agendas relating to better understanding, observing, modelling and predicting the Earth system and thereby improved management of environmental conditions. A key aspect is to assess natural and human-induced trends, hazards and impacts on Earth system functioning and the natural resource base. This will imply improving our monitoring, analysis and warning capacities in these areas to enable effective operational forecasts and assessments of critical processes, hazards and management options at a variety of spatial and temporal scales.

The Earth System Science (ESS) aspects address the interactions within and between the major Earth compartments of the atmosphere, hydrosphere, lithosphere and biosphere, and include influences of the Sun and the near-space environment. The core of ESS is to enhance our capacity and tools to understand, observe and model these interactions within and between these various compartments, as well as their interactions with human activities. The Environmental Management aspect complements this by using the enhanced understanding in ESS to enable improved decision support in relation to environmental conditions, especially in the context of risk management. ESSEM will thus enlarge the scope of the former 'Environment' and 'Meteorology' Domains by now including stronger emphases on science and technology related to observing, modelling and predicting Earth System changes and severe hazards, by integrating various monitoring techniques and networks, and by improving natural resource management for minimising environmental degradation.

The following examples illustrate aspects of potential research and development in this Domain. The scope of the Domain is not restricted to these activities.

**Modelling and observing of Earth systems:** Based on improving our understanding of physical and biogeochemical principles through new and integrated observing and modelling capacities, this will enable predicting global and regional environmental changes.

**Prediction and mitigation of hydro-meteorological and other hazards:** This will require developing advanced modelling and warning systems integrated with upgraded in-situ, remote sensing and satellite technologies and observing networks.

The **Environmental Management** aspects will include strong emphasis on science and technology related to managing natural resources and minimising environmental degradation.

Strong interactions with international initiatives, programmes or organisations would be welcome. ESSEM is likely to have strong links with other COST Domains addressing issues where there is a strong interaction between human activities, the Earth system and environmental conditions.

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<sup>5</sup> Terms of Reference as set out in doc. COST 240/06.

## **FORESTS, THEIR PRODUCTS AND SERVICES (FPS)<sup>6</sup>**

### **Domain descriptor**

The Domain FORESTS, THEIR PRODUCTS AND SERVICES is concerned with complex and unique processes which form the basis for present and potential capacity to provide resources to satisfy human needs as well as environmental values. The FPS Domain has the mission to promote research along the whole forest-wood-chain by providing a platform for the effective coordination of nationally funded research activities in the areas of forestry, wood technology and pulp & paper.

The following examples illustrate aspects of actual research in this Domain. The scope of the Domain is not, however, restricted only to these activities.

**Forestry Research** supports activities aiming at meeting the social, economic, ecological, cultural, health-bringing and spiritual needs of present and future generations. In the light of the current international forest dialogue the DC FPS offers a forum for encouraging a scientific debate on ensuring a sustainable provision of forest products and services, such as wood and wood products, water, bio-energy, rural development, recreation and public health, habitats for wildlife, landscape diversity, carbon sinks and reservoirs.

**Forests and Environment** research activities are fostered focusing on the protection of forests against harmful effects of pollution, including air-borne pollution, fires, pests and diseases, in order to maintain their full multiple values. In this context adequate importance is attached to the provision of timely, reliable and accurate information on forests and forest ecosystems as they are essential for public understanding and knowledge-based decision-making.

**Wood Technology** sector aims at an increase of knowledge necessary for a broader use of timber, a sustainable, energy efficient and renewable resource. With the objective to enhance the competitiveness of timber, DC FPS supports research activities focusing on the improvement of wood properties, the performance of timber and its indoor and outdoor usability.

**Pulp and Paper** sector promotes research contributing to an increase in knowledge of the physical, chemical and biological characteristics of the pulps and the resulting products. High priority is placed on optimising the level of utilization of the resources and to improve both the sustainability of pulp and paper making and the competitiveness of paper products.

At a cross-sector level the DC FPS addresses issues as life-cycle analysis, tourism, energy production and recycling being of great importance for the achievement of a sustainable development. Therefore, new ideas and initiatives are welcome as well as those with high interdisciplinary elements and close links and overlaps with other domains.

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<sup>6</sup> Terms of Reference as set out in doc. COST 241/06.

## **INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)<sup>7</sup>**

### **Domain descriptor**

The Domain INFORMATION AND COMMUNICATION TECHNOLOGIES covers scientific and technical research in all areas of information and communication science and technologies. The ICT research area is best summarized as treating the processing, transmission, storage, retrieval, management, usage, and exchange of information and knowledge, with emphasis on fundamental aspects and pre-competitive technology development.

The following research areas are covered in this Domain. The scope of the Domain is not restricted to these activities.

**Information science and technologies.** The area covers all the aspects related with the foundations, design, analysis, development, and application of hardware and software systems. Related areas are foundations of computer science, software development technologies, software engineering, intelligent systems, advanced interfaces, user aspects, information management, high performance computing, and open, embedded, and distributed systems.

**Communication technologies.** Research in this area concentrates on the transfer of information from source to sink. Fundamental aspects cover physical, electromagnetic and functional modelling of all elements of information and communication systems such as terminals, antennas, transmission channels, networks, devices, components and materials. Research concerning photonic devices and the modelling and synthesis of electromagnetic meta-materials involves materials research, both in the optical and the submillimeterwave region. Here, cross-border interaction with Materials, Physical, and Nanosciences is required.

**Societal aspects of ICT.** Research in this area covers both the influence of ICT on society and the requirements imposed by society on the ICT infrastructure. Interdisciplinary cooperation with disciplines dealing with societal needs is essential for the development of this research area. Therefore, an important area for this domain is multidisciplinary research – with an ICT core – in fields like sustainable development, health, attention to the elderly and the disabled, culture, learning, bioinformatics, and many others, performed in cooperation with the corresponding COST domains.

New ideas and initiatives are welcome as well those with high interdisciplinary elements and close links and overlaps with other domains.

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<sup>7</sup> Terms of Reference as set out in doc. COST 242/06.

## **INDIVIDUALS, SOCIETIES, CULTURES & HEALTH (ISCH)<sup>8</sup>**

### **Domain descriptor**

The Domain INDIVIDUALS, SOCIETIES, CULTURES & HEALTH will promote the creation of knowledge and insights for citizens, democratic debate and decision-making in the public, private and voluntary spheres.

The following examples illustrate aspects of potential research topics in this Domain. The scope of the Domain is not restricted to these activities.

**The development and behaviour of individuals and groups:** Mind, cognition and complexity; Language development; Learning; Creativity; Socialisation; Identities and Attitudes; Gender; Vulnerability and resilience; Decision-making and risk-taking, etc.

**Social, Economic, Political, Cultural, Historical and Technological Structures and Processes,** and how these persist and/or change: Economic development; Governance and citizenship; Social cohesion; Poverty and inequality; Health and wellbeing; Public safety and security; Human impacts on the environment; War and conflict; International and inter-group relations; Risk and regulation; Institutional and organisational frameworks; management; Health systems and policies; Families and parenting; Inter-generational relations; Education and skills development; Labour markets; Work and Leisure; Welfare regimes; Demographic change and migration; Science and society, etc.

**Cultural Diversity and a Common European Future:** Languages, literatures, music and art; Regional/national histories and European history; Media and communication; Values continuity and change; People and landscapes/cityscapes; Locational and spatial variation; Cultural heritage; Cultures of food and drink; Philosophies of humans, nature, science and society; Everyday cultures, etc.

Inter-disciplinary topics linking social science/humanities perspectives with the natural, medical and engineering sciences are particularly welcomed by this Domain, provided that the social science/humanities aspect is predominant.

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<sup>8</sup> Terms of Reference as set out in doc. COST 243/06.

## **MATERIALS, PHYSICAL AND NANOSCIENCES (MPNS)<sup>9</sup>**

### **Domain descriptor**

The Domain MATERIALS, PHYSICAL AND NANOSCIENCES is home to material science, covering from conception through production, characterization, examination, evaluation, fabrication, joining to actual application and service, including related databases, codes, standards and inspections. The Domain supports exploratory basic research in physics as a key to understanding the laws governing the behaviour of matter and energy.

The following examples illustrate aspects of actual research in this Domain. The scope of the Domain is not restricted to these activities.

**New developments in industrial technology** requiring the synthesis of new materials, made possible by recent developments in physics and by the new methods derived from this knowledge.

**Technology-Driven Physics** underpins many industries and technological processes. It contributes to the synthesis of new materials and broad variety of new devices based on the progress made in areas such as optics, plasma physics or surface physics.

**Physics and the Human Condition** supporting Actions involve the relationships between physics and the environment, physics and medicine, physics and biology.

**Emerging Technologies** such as fuel cells, hydrogen, solar and bio- related sectors, which trigger innovative progress in conventional sectors such as power plants, transport, aerospace and lighting.

**Cultural Heritage:** Physics is a part of Cultural Heritage as it answers the most fundamental questions as to the structure of matter, birth of the universe and the origin of life. Therefore the Domain is also responsible for Actions in Cultural Heritage focusing on restoration and conservation of ancient architecture, built environment and artifacts.

**Multidisciplinary Research:** Domain of Materials, Physical and Nanosciences maintains active interaction with planetary sciences and social sciences on wide ranging issues such as environment, global warming and social aspects of nanotechnology. This COST domain by hosting Nanosciences provides solutions for sectors such as energy, transport, telecommunications, informatics and health.

By recognising the huge potential of Nanosciences in such different areas the Domain encourages multidisciplinary Actions and cooperates closely with the other Domains, especially with Chemistry, Health and IST. Therefore, new ideas and initiatives are welcome as well as those with high interdisciplinary elements and close links and overlaps with other domains.

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<sup>9</sup> Terms of Reference as set out in doc. COST 244/06.

## **TRANSPORT AND URBAN DEVELOPMENT (TUD)<sup>10</sup>**

### **Domain descriptor**

The Domain TRANSPORT AND URBAN DEVELOPMENT aims at fostering international research networking activities of scientists and experts dealing with transport systems and infrastructures, urban land use and development, architecture and design, and civil engineering issues. The focus is on multi- and interdisciplinary approaches and the aim is to cover both basic and applied research activities including technical and technological developments and their changeovers that are relevant to policy and decision making processes. A significant concern is devoted to activities exploring new research needs and developments.

The domain is by definition cross-sectoral and multidisciplinary, encompassing a wide range of scientific expertises within the transport and land use planning, design, and management activities with a special emphasis on the strong interrelationships among the relevant policy fields as well on all aspects related to sustainable development. The number of domain activities is complementary and should be innovative to other European programmes in the relevant fields.

The following non-exclusive examples illustrate aspects of actual research in this Domain. The scope of the Domain is not restricted to these activities.

**Sustainable transport and urban planning policy**, addressing issues of both sustainable transport and urban development. The focus is on the environmental and socio-economic impacts of transport, traffic safety, security and energy consumption, as well as modal diversion and modal re-equilibrium, intermodal solutions and interoperability among the different systems. The integrated spatial and land-use planning, environmental and transport planning and modelling will focus on recommendations for sustainable and interdisciplinary policy and planning concerning transport issues and urban development, solutions for a safer mobility of people and goods, securing living conditions, including psychological issues of these problems.

**Design of transport systems and development of urban infrastructures**, addressing issues related to transport infrastructures (building, development, maintenance, rehabilitation), the development of new technologies both for infrastructures (materials, etc.) and the vehicles (alternative fuels, etc.). and encompassing issues related to the construction and management of networks and utilities, urban safety, security and disaster management.

**Urban architecture and civil constructions: planning and design**, covering urban design and architecture, urban constructions, reconstruction and rehabilitation of structures and buildings, including cultural heritage areas, green structures as well as issues of quality of life.

**The management of the transport systems, infrastructures and urban structures**, addressing on one hand transport policies, also related to transport demand management, traffic management, market issues, people education towards more sustainable behaviours, and on the other civil engineering and construction topics, such as rehabilitation, organisation and management of the construction sector, logistics and energy use.

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<sup>10</sup> Terms of Reference as set out in doc. COST 245/06.