Domain: EARTH SYSTEM SCIENCE AND ENVIRONMENTAL MANAGEMENT (ESSEM)

The Domain of 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.

Action 637: Metals and related substances in drinking water

2006 - 2010
Chair: Mr Colin HAYES (UK)

The **main objective** of the Action is to stimulate better control of metals and related substances in drinking water and to minimise environmental impacts.

More information can be obtained through the website:
http://www.meteau.org

or by contacting the Chair of the Action:
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Action 638: Investigating and managing the impacts of marine sand and gravel extraction and use

2006 - 2010
Chair: Ms Victoria COLE (UK)

The Action **aims** at bringing together and adding value to the disparate national and European research initiatives to create a unified, clear position to feed into Europan marine policy. This Action will erase the 'grey' areas which exist in marine research and policy and work to disseminate collaborated European research results to assist future national and marine policy objectives.

More information can be obtained by contacting the Chair of the Action:
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Action 639: Greenhouse gas budget of soils under changing climate and land use (BurnOut)

2006 - 2010
Chair: Dr. Robert JANDL (AT)

The Action focuses on an improved understanding of the management of greenhouse gas emissions from European soils under different forms of land use and in particular disturbance regimes.

More information can be obtained through the website:
http://bfw.ac.at/rz/bfwcms.web?dok=5906

or by contacting the Chair of the Action:
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Action 729: Assessing and Managing Nitrogen Fluxes in the Atmosphere-Biosphere System in Europe

2005 - 2010
Chair: Dr Jan Willem ERISMAN (NL)

The **main objective** of the Action is to advance the understanding and quantification of atmosphere-biosphere nitrogen fluxes in Europe in relation to the main economic sectors. The Action will build a scientific basis for strategies to reduce the environmental impacts of nitrogen.

More information can be obtained through the website:
http://www.cost729.org/

or by contacting the Chair of the Action:
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Action 731: Propagation of Uncertainty in Advanced Meteo-Hydrological Forecast Systems

2005 - 2010
Chair: Dr Andrea ROSSA (IT)

The **main objective** of the Action is to address issues associated with the quality and uncertainty of meteorological observations from remote sensing and other potentially valuable instrumentation. It will also consider their impacts on hydro-meteorological outputs from advanced forecasting systems.

More information can be obtained by contacting the Chair of the Action:
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Action 733: Harmonisation and Applications of Weather Types Classifications for European Regions

2005 - 2010
Chair: Mr Ole Einar TVEITO (NO)

The **main objective** of the Action is to achieve a general numerical method for assessing,comparing and classifying typical weather situations in the European regions.

More information can be obtained through the website:
http://www.cost733.org

or by contacting the Chair of the Action:
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Action 734: Impacts of Climate Change and Variability on European Agriculture (CLIVAGRI)

2006 - 2010
Chair: Pr Simone ORLANDINI (IT)

The **main objective** of the Action is the evaluation of possible impacts from climate change and variability on agriculture and the assessment of critical thresholds for various European areas.

More information can be obtained through the website:
http://www.cost734.eu

or by contacting the Chair of the Action:
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Action 735: Tools for assessing global air-sea fluxes of climate and air pollution relevant gases

2006 - 2011
Chair: Dr. Jeffrey HARE (UK)

The action aims at developing the tools for, and the production of, best estimates of global air-sea fluxes of compounds relevant to climate and air pollution.

More information can be obtained by contacting the Chair of the Action:

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Action ES0601: Advances in homogenisation methods of climate series: an integrated approach (HOME)

2007 - 2011 Chair: Dr. Olivier MESTRE

Long instrumental climate records are the basis of climate research. However, these series are usually affected by inhomogeneities (artificial shifts), due to changes in the measurement conditions (relocations, instrumentation and others). As the artificial shifts often have the same magnitude as the climate signal, such as long-term variations, trends or cycles, a direct analysis of the raw data series can lead to wrong conclusions about climate change. In order to deal with this crucial problem many statistical homogenisation procedures have been developed for detection and correction of these inhomogeneities. At present only a limited number of publications intercompare some common methods and their impact on the climate record. The large number of different methods could be seen as a weakness in the science and is a challenge for the climatological community to address. There is therefore a need for a coordinated European initiative in order to produce standard methods designed to facilitate such comparisons and promote the most efficient methods of homogenisation. The Action's main objective is to achieve a general method for homogenising climate and environmental datasets. The method will be derived from the most adapted statistical procedures for detection and correction of varying parameters at different space and time scales.

More information can be obtained by contacting the Chair of the Action:
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Action ES0602: Towards a European Network on Chemical Weather Forecasting and Information Systems (ENCWF)

2007 - 2011 Chair: Professor Jaakko KUKKONEN

Air quality is a key element for the well-being and quality of life of European citizens. It is regulated by EU legislation, which requires monitoring and assessment of air pollution (using modelling tools where there is no observational data), informing the public on air quality, forecasting the potential exceedances, implementation of short term action plans and air quality management to attain specific limit and target values. As air pollution crosses national borders, it would be cost-effective and beneficial for citizens and society and decision-makers that national chemical weather forecast and information systems would be networked and seamless across Europe. This Action will provide a forum for harmonizing, standardising and benchmarking approaches and practices in data exchange and multi-model capabilities for air quality forecast and (near) real-time information systems in Europe. It will examine existing and work out new solutions for integrating the development efforts at national and international levels. This Action will not develop or create the whole system, but rather support and complement ongoing initiatives (e.g., in the framework of GMES - Global Monitoring for Environment and Security) towards the same goals. In particular, it will serve as a platform for the information exchange between the meteorological services, environmental agencies, and international initiatives.

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Action ES0603: Assessment of production, release, distribution and health impact of allergenic pollen in Europe (EUPOL)

2007 - 2011 Chair:

Diseases due to aeroallergens are among major causes of a growing rate of morbidity and demand for healthcare. The overall prevalence of seasonal allergic rhinitis in Europe is about 15% and increasing. Adequate protective and pre-emptive measures

require both the reliable assessment of production and release of various pollen species, and the forecasting of their atmospheric dispersion. The World Health Organization has therefore recommended new studies in the area. The pollen-related research is currently conducted within several scientific disciplines, countries and targeted activities; however, their coordination could be substantially improved. Several poorly understood complex biological, meteorological and climatic factors can significantly affect the timing and strength of pollen seasons. Their proper investigation requires an integrated approach. The proposed concerted Action will establish a multi-disciplinary forum for (i) the critical review of existing information and its use in current assessment systems, and finding out the gaps of knowledge; (ii) the improved co-ordination of on-going research; (iii) the development of a strategy and an action plan that aim to bridge the gaps of knowledge; (iv) strengthening the dialogue with end users. Specific research directions will be: Pollen Production and Release; Pollen Transport, Transformation and Interaction; Applications and collaboration with End Users.

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Action ES0604: Atmospheric Water Vapour in the Climate System (WaVaCS)

2007 - 2011 Chair:

The proposed Action brings together leading European scientists to address the issue of atmospheric water vapour and its impact on climate. This Action is needed to integrate research carried out in different areas, including: atmospheric monitoring, data analysis and modelling. It brings together expertise that is both unique and timely. In order to make significant progress in the field of water vapour and climate, it is necessary to integrate knowledge acquired from research based on different methodologies. To achieve this, the Action is structured into 4 working groups which together aim to increase knowledge on observations, theory, and data assimilation in the context of water vapour and climate. The objective is to offer to the scientific community and the broader Earth Observation community an integrative approach to understanding the processes controlling the atmospheric water vapour distribution, in particular those elements linking water vapour and climate. Beneficiaries of this Action include the meteorological services, space agencies, environmental agencies and policy makers. The specific task of this Action is to promote knowledge dissemination activities at various levels through scientific missions, thematic training schools, support toward conference participation, and special issues in world-class scientific journals.

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