THE COST-ESSEM ACTIVITIES CONTRIBUTION TO THE TOPIC "EXTREME ENVERONMENTAL EVENTS"

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One of the aim of the presentation is to be given an overview of the current COST-ESSEM actions which relate to the extreme environmental events . The expectation is to be stimulated the two-way transfer between the present ESF conference and the COST activities in this area.

COST – together with EUREKA and the EU framework programmes – is one of the three pillars of joint European research initiatives.

The domain of Earth System Science and Environmental Management (COST-ESSEM) encompasses the rapidly growing science and technology agendas relating to the better understanding, observing, modelling and predicting the Earth system, and thereby improved management of environmental conditions.

A key aspect of it is to assess natural and human-induced trends hazards and impacts on Earth system functioning.

The scope of ESSEM includes the important activities:

1/Modelling and observing of Earth systems

and

2/Prediction and mitigation of hydro-meteorological and other hazards

1. The current COST-ESSEM Actions which relate directly the topic Extreme Environmental Events (5):

COST Action 731 :Quantify, reduce and use uncertainty in hydrometeorological forecast systems

COST Action 733 :Harmonisation and Applications of Weather Types Classifications for European Regions:

COST-ESSEM Action ES0901 European procedures for flood frequency estimation

COST-ESSEM Action ES0904 European Gliding Observatories Network

COST-ESSEM Action ES0905 Basic Concepts for Convection Parameterization in Weather Forecast and Climate Models

2. Which relate indirectly to the topic Extreme Environmental Events (8):

COST Action 639 Greenhouse gas budget of soil under changing climate and land use (BurnOut)

COST Action 734 Impacts of Climate Change and Variabily on European Agriculture (CLIVAGRI)

COST-ESSEM Action ES0602 Towards a European Network on Chemical Weather Forecasting and Information Systems (ENCWF)

COST-ESSEM Action ES0604 Atmospheric Water Vapour in the Climate System (WaVaCS)

COST-ESSEM Action ES0702 European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology (EG-CLIMET)

COST-ESSEM Action ES0802 Unmanned aerial systems (UAS) in atmospheric research

COST-ESSEM Action ES0803 Developing space weather products and services in Europe

COST-ESSEM Action ES0902 Pernafrost and gas hydrate related methane release in the Arctic and impact on climate change-European cooperation for long-term monitoring (PERGAMON)

COST 731 - Propagation of Uncertainty in Advanced Meteo-Hydrological Forecast Systems

Start date: 28/06/2005 End date: 31/06/2010 MC Chair Andrea M Rossa (Centro Meteorologico di Teolo, ARPA Veneto / Italy)

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.

The overall goal; Quantify, reduce and use uncertainty in hydro-meteorological forecast systems.

It will also consider their impacts on hydro-meteorological outputs from advanced forecasting systems.

Working groups:

1-Propagation of uncertainty from observing systems (radars) into NWP

2. Propagation of uncertainty from observing systems and NWP into hydrological models

3. Use of uncertainty in warnings and decision making

Results: Different statistical techniques have been developed and tested

Observational uncertainties are not significantly smaller than forecast errors!

High-resolution models tend to give better results.

Better statistical representation at coarser scales.

EU added value:

Systematic treatment of uncertainty prerequisite for use in hydrometeorological forecasting

The action provided information and training on visualization platforms of probabilistic information based on huge amounts of observational and forecast data

AND

Learnt to express uncertainty in directly usable forms, hel-ped to communicate a more complete interpretation of ensembles,

Promoted convection-permitting NWP and convective-scale radar data assimilation,

Total of individual participants 80 ;

Early Stage Researchers (ESRs) 30 ;

Female 66 ; Non-COST Countries 7

COST Countries: 24 (AU, BE, CH, CY, CZ, DE, DK, ES, FI, FR, GR, HU, IE, IL, IT, LU, NL, NO, PL, PT, RO, SE, UK)

No. of training schools 5 ; No. of joint publications 26

No. of workshops /conferences 11 ;No. of STSMs 12

- *established links to HEPEX, COPS, ERAD, PREVIEW and other FP projects*

Action 733

Harmonization and Applications of Weather Types Classifications for European Regions

Start date:: 13//09//2005 *End date:: 12//09//2010*

MC-Chaiir Ole Einar Tveito –

Norwegiian Metteorologiical Insttiittutte Oslo.

Main Objective is to achieve a general numerical method for assessing, comparing and classifying weather situations (circulation patterns) in Europe scalable to any European (sub)region with time scales between 12 h and 3 days and spatial scales of ca. 200 to 2000 km, applicable for a number of applications.

Research directions:

- *Evaluation and inter-comparison of classifications*
- *Make comparison and evaluation more coherent.*
- **Testing circulation classifications for various applications (Air quality, droughts, forest fire, climate monitoring, ...)**

Working groups

1. Inventory of existing circulation type classification methods and applications.

2. Implementation and development of circulation type classification methods

3. Comparison of selected circulation type classifications

4. Testing methods for various applications

Results

- **Annual frequency, persistence, trend ;**

- *Basic evaluation and comparison; • Climatological evaluation ; • Subjective synoptic evaluation,*

Outcome and achievements

- **Software package, for a number of** (currently 20) **circulation type classifications, is developed.**

- **Open access to the visualization application**

- First version of ranking of circulation type classifications based on various statistical and climatological scores and applications tests.

Total of individual participants 64 ;

ESRs 13 ; Female 27

COST Countries : 23

AT, BE, BG,CH, CY, CZ, DE, EE, ES, FI, FR, GR, HU, IE, IT, LU, LV, NO, PL, PT,

RO, SI, UK

No. of STSMs: 22

No. Of workshops / conferences :13

No. of joint publications : 24

ES0901 European procedures for flood frequency estimation / 29/10/2009 - 28/10/2013

Chair Dr Thomas Kjeldsen ; Nat.Env. Research Council.,UK

The main objective : to undertake a pan-European comparison and evaluation of methods for flood frequency estimation under the various climatologic and geographic conditions found in Europe, and different levels of data availability.

It is a scientific framework for assessing the ability of the evaluated methods to predict the impact of environmental change (climate change, land-use and river engineering works) on future flood frequency characteristics (flood occurrence and magnitude).

Problem statement:

– Determine the magnitude and frequency of extreme flow at any place on a river, whether data from a gauging station are available or not.

-Pan-European comparison of methods for flood frequency estimation

– Predict impact of environmental change on flood frequency characteristics

Research directions:

May be it is a first attempt at pan-European comparison of methods for frequency analysis of extreme floods.

Working Groups

1. *Datasets and inventories of existing data and methods;*
   2.Use of statistical methods for flood frequency stimation;
   3.Flood frequency estimation using rainfall-runoff methods ;
   ***4**. Flood frequency methods and envi-ronmental change ;*
   ***5.**Dissemination of results*

Total individual : 50 ESRs 5 ; Female 12 ; NonCost 1 ; STSMs 4 ;

COST Countries : 23 (AT, BE, BG, CY, CZ, DE, DK, ES, FI, FR, GR, HU, IE, IT, LT, LV, NL, NO, PL, RS, SI, SK, UK)

– *Many links to other relevant organisations (e.g. EGU, UNESCO, WMO)*

Action ES0905 Basic Concepts for Convection Parameterization in Weather Forecast and Climate Models

Start date: 01/03/2010 End date: 11/02/2014

Chair of WG. 3 Jean-François Geleyn Météo-France

The main objective of the Action is to provide clear theoretical guidance on convection parameterizations for climate and numerical weather prediction models. Both global and regional atmospheric models are concerned**.**

The Action proposes a clear pathway for more coherent and effective parameterizations by integrating existing operational schemes and new theoretical ideas.

Particular benefits will be in prediction of highly unusual extreme weather events, such as local heavy precipitation, tropical cyclone trajectories etc.

Working group 1: Mass-flux parameterization

Working group 2: Non-mass-flux parameterizations

Working group 3: High resolution limit

Working group 4: Physics and Observations

Grant Holder:

MPI für Meteorologie, Hamburg Johannes Quaas

Total of individual participants 44 ; ESRs 8 ; Female 14

COST Countries : 16 (AT, BE, CZ, DE, ES, FI, HR, HU, IL, IT, NL, PL, RO, SE, UK)

Chair : FR

Non-COST institutions:

•• Monash Uniiverrsiitty ((Austtrralliia)

• Uniiverrsiitty off Hawaii ((USA)

COST Action ES0904

EUROPEAN GLIDING OBSERVATORIES NETWORK (EGO)

The objective of the "European Gliding Observatories" is to build cooperation at the *technological*, *scientific* and *organizational levels* for an European capacity for sustained observations of the oceans with gliders.

The corresponding European Marine Observation and Data Network should be built in cooperation with the Global Monitoring for Environment and Security (GMES) initiative.

As a result of external physical forcing, internal dynamics, and biogeochemical cycles the remote effects gives rise in space and time on currents such as shifts or reversals of the ocean circulation, physical and biogeochemical properties, and marine ecosystems, that could be dramatic.

***WG1**: Support for glider deployments and data dissemination ; **WG2**: Glider vehicle, sensors, and "gliderports" infrastructures ; **WG3**: Piloting gliders and artificial intelligence ; **WG4**: Networks, links with the other observing systems and OSSEs; **WG5**: High resolution 4D oceanic measurements by gliders and process studies*

COST Countries :

BE, CY, DE, FR, EL, IS, IT, NO, PT, ES, TR, UK.

COST ACTIONS Which relate indirectly to Extreme Environmental Events

ESSEM Action 639: **Greenhouse gas budget of soils under changing climate and land use (BurnOut) (End date: Dec.2010)**

The main objective of the action is the improved understanding of the management of greenhouse gas emissions from European soils under different forms of land use and in particular disturbance regimes.

The identification of hot spots of greenhouse gas emissions from soils. *The identification of soil and site conditions that are vulnerable to GHG emissions.*

The action will deliver recommendations for a new data acquisition system.

A long-term benefit of the action improved understanding of the effect of land-use change and ecosystem disturbance on GHG emissions from soils

and therefore better guidance as to where monitoring efforts should be concentrated.

ESSEM Action 734 Impacts of Climate Change and Variability on European Agriculture: CLIVAGRI

(End date: November 2010)

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.

Particular attention is devoted to the quality of production, which represents the main goal of European agricultural policy, and to the eco-environmental impacts.

Risk maps, graphics, tables, etc. are used to provide the requested information to end-users.

The sensitivity, adaptive capacity and vulnerability of several European agriculture areas (chosen depending on climatic data availability, crop diffusion, etc.) will be evaluated to provide the users with all the information needed to adapt their strategies to current and future climatic conditions.

The collection and review of existing agroclimatic indices and simulation models to assess hazard impacts on various European agricultural areas relating to climatic conditions have been carried out.

*ESSEM Action ES0602 T*owards a European Network on Chemical Weather Forecasting and Information Systems (ENCWF) (End date: April 2011)

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

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 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.

ESSEM Action ES0604 Atmospheric Water Vapour in the Climate System (WaVaCS) (End date: Oct.2011)

This Action is needed to integrate research carried out in different areas, including: atmospheric monitoring, data analysis and modeling.

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.**

Beneficiaries of this Action include the meteorological services, space and environmental agencies and policy makers.

ESSEM Action ES0702 European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology-EG-CLIME(*End date Nov. 2012*)

The main objective of the Action is the specification, ***development*** *and demonstration of cost-effective* ***ground-based integrated profiling systems suitable for future networks*** *providing essential atmospheric observations for both climate and weather.* ***Atmospheric observing systems for GEOSS/GMES in Europe will be integrated to satisfy requirements for climate, environment and security.*** D*evelopment in data assimilation techniques and observing infrastructure will be used to evaluate and improve climate and weather forecast models, and to validate other observing systems, including satellite and aircraft.*

ESSEM Action ES0802 Unmanned Aerial Systems (UAS) in Atmospheric Research End date: June 2012)

Unmanned aerial systems (UAS) will be of large and increasing importance for environmental monitoring in the future, e.g. under the aspects of climate change and sustainable development. *The Action will coordinate ongoing and conceive future research on the development and application of UAS as a cost-efficient, trans-boundary method for the monitoring of the atmospheric boundary layer and the underlying surface of the Earth.* **These systems will help to close the recent observational gap between established ground based and satellite based measurements, and will provide relevant atmospheric data both with high temporal and spatial resolution and an unique data coverage in space and time.**

ESSEM Action ES0803 Developing Space Weather Products and Services in Europe (End date: Nov. 2012)

Space Weather originates mainly in solar activity and affects the interplanetary space and planetary magnetospheres, ionospheres and atmospheres. It can affect ground and space technological systems as well as humans in space. Extreme space weather conditions have economical consequences and may threaten safety and security of the technological infrastructures.*The goal is to form an interdisciplinary network in order to: foster the ties between European Geospace research and space technology establishments, assess the European potential in advanced Space Weather observational and modeling techniques and in reliable products and services*

ESSEM Action ES0902 Permafrost and Gas Hydrate Related Methane Release in the Arctic and Impact on Climate Change - European Cooperation for Long-term Monitoring (PERGAMON) (End date: May 2013)

The objective is to quantify the methane input from marine and terrestrial sources into the atmosphere in the Arctic region, and to evaluate the impact of Arctic methane seepage on global climate. ***The Arctic is a key area*** *in our anthropo-genically-warming world* ***as massive releases of methane currently locked up in permafrost and gas hydrates****, both on land and in marine sediments,* **could increase atmospheric concentrations of this greenhouse gas much faster than predicted.** ***The aim is to develop coherent links between the terrestrial and marine communities,*** *with a goal of establishing a long-term project.*

ESSEM Action 727 Measuring and Forecasting Atmospheric Icing Structures *(End date: September 2009)*

The word icing is used **to describe the process of ice or snow growth on a structure exposed to the atmosphere. The potential for icing of structures is an important design parameter in many sectors,** *e.g., building industry, maritime and aviation activities, and it has recently become a relevant issue also in activities related to wind energy production. Furthermore, human activities are increasingly extending to cold climate regions affected by icing problems.*

The main objective of the Action is to develop our understanding of icing (especially in-cloud icing) events and their distribution over Europe as well as to improve our potential to observe, monitor and forecast them.

ESSEM Action ES1002 Weather Intelligence for Renewable Energies (WIRE) *(End Date: November 2014)*

Due to climate change and shrinking fossil resources, the transition to more and more renewable energy shares is unavoidable. **The wind and solar energy is strongly dependent on highly variable weather processes, increased penetration rates will also lead to strong fluctuations in the electricity grid which need to be balanced. Proper and specific forecasting of 'energy weather' is a key component for this.** *The main lines of activity are: to develop dedicated post-pro-cessing algorithms coupled with weather prediction models and measurement data; and to investigate the difficult relatio-nship between the highly intermittent weather dependent po-wer production and the energy distribution towards end users.*

http://www.cost.esf.org/

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http://www.cost.esf.org/service/glossary/Action

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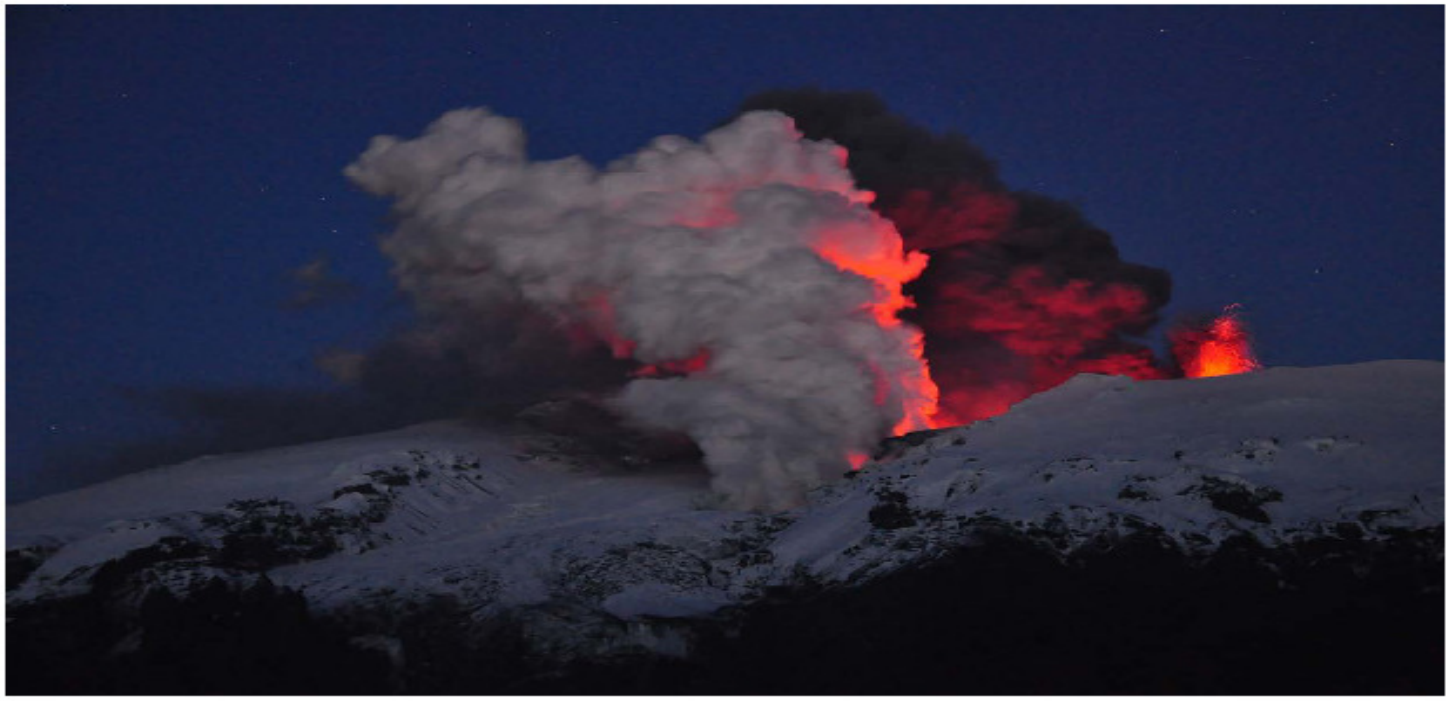
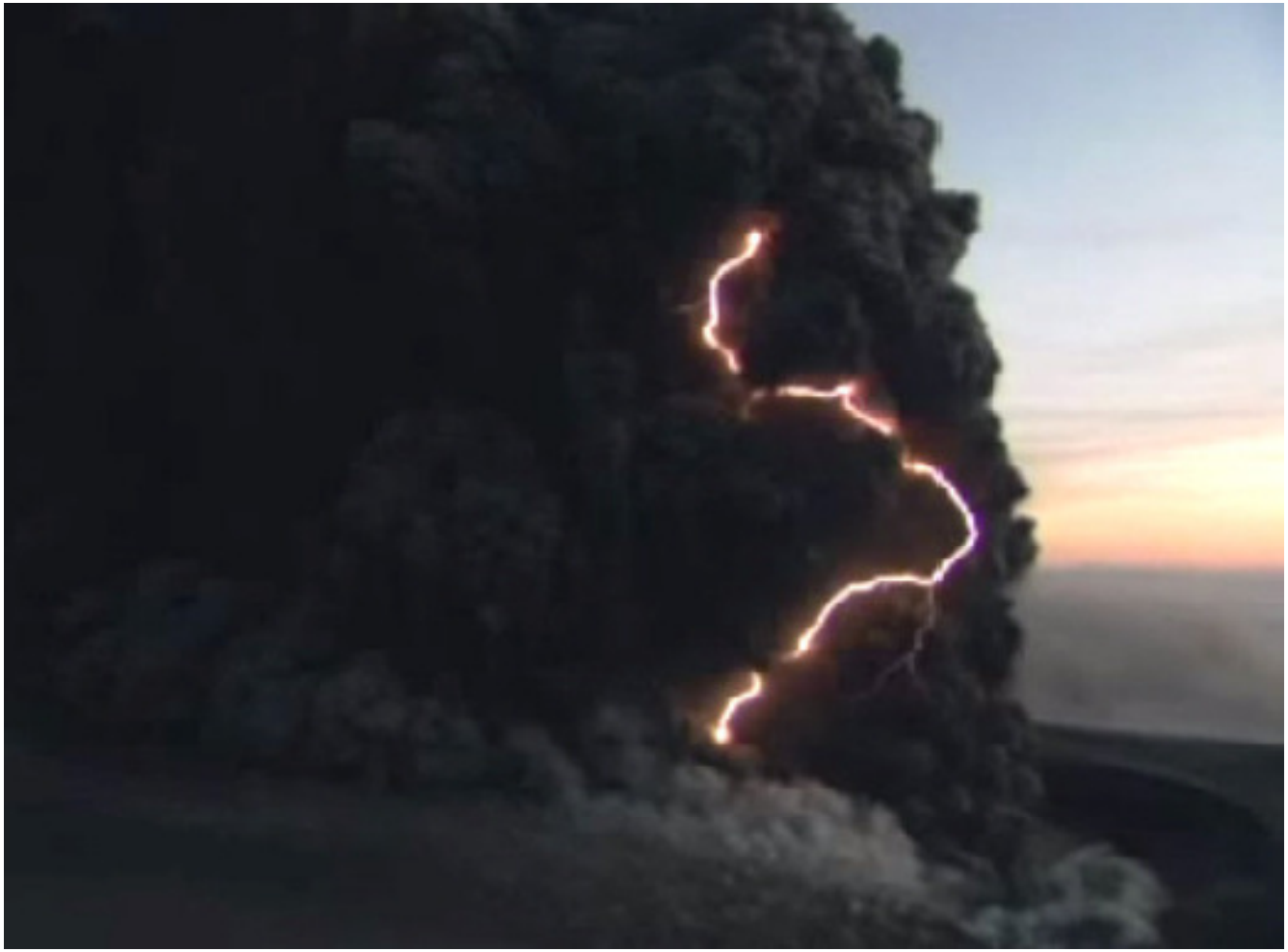
THANK YOU FOR THE ATTENTION

Phase of mixed eruption – ash production and lava flow

Veðurstofa Íslands





The international scientific community has identified five Grand Challenges that, if addressed in the next decade, will deliver knowledge to enable sustainable development, poverty eradication, and environmental protection in the face of global change.

The Grand Challenges for Earth system science,

(published Nov. 11, 2010 – International Council for Science)

are the result of broad consultation as part of a visioning process spearheaded by the International Council for Science (ICSU) in cooperation with the International Social Science Council (ISSC).

The consultation highlighted the need for research that integrates our understanding of the functioning of the Earth system—and its critical thresholds—with global environmental change and socio-economic development.

The five Grand Challenges are:

1. Forecasting—Improve the usefulness of forecasts of future environmental conditions and their consequences for people.
2. Observing—Develop, enhance and integrate the observation systems needed to manage global and regional environmental change.
3. Confining—Determine how to anticipate, recognize, avoid and manage disruptive global environmental change.
4. Responding—Determine what institutional, economic and behavioural changes can enable effective steps toward global sustainability.
5. Innovating—Encourage innovation (coupled with sound mechanisms for evaluation) in developing technological, policy and social responses to achieve global sustainability

The 'The challenges are a consensus list of the highest priorities for Earth system research and provide an overarching research framework. If we, the scientific community, successfully address these in the next decade, we will remove critical barriers impeding progress toward sustainable development,' said Dr Walt Reid, who chaired the Task Team overseeing the first step of the visioning process.

'Addressing these challenges will require new research capacity, especially the involvement of young scientists and scientists from developing countries, and a balanced mix of disciplinary and interdisciplinary research that actively involves stakeholders and decision makers,' Dr Reid continued.

7

- ***Rules and procedures for implementing COST Actions (COST doc. 4159/10) (PDF, 88 kB)***

COST Vademecum (Part A) – Pay-as-you-go System (PDF, 3 MB)

COST Vademecum (Part B) – Grant System (PDF, 1 MB)

Guidelines for Assessment, Monitoring, Evaluation and Dissemination of Results of COST Actions (COST doc. 205/08 - This document is valid up to collection 2010-1) (PDF, 767 kB)

Guidelines for Assessment, Monitoring, Evaluation and Dissemination of Results of COST Actions (COST doc. 4115/10 - This document is valid as from collection 2010-2) (PDF, 544 kB)