

# ESSEM - Earth System Science and Environmental Management

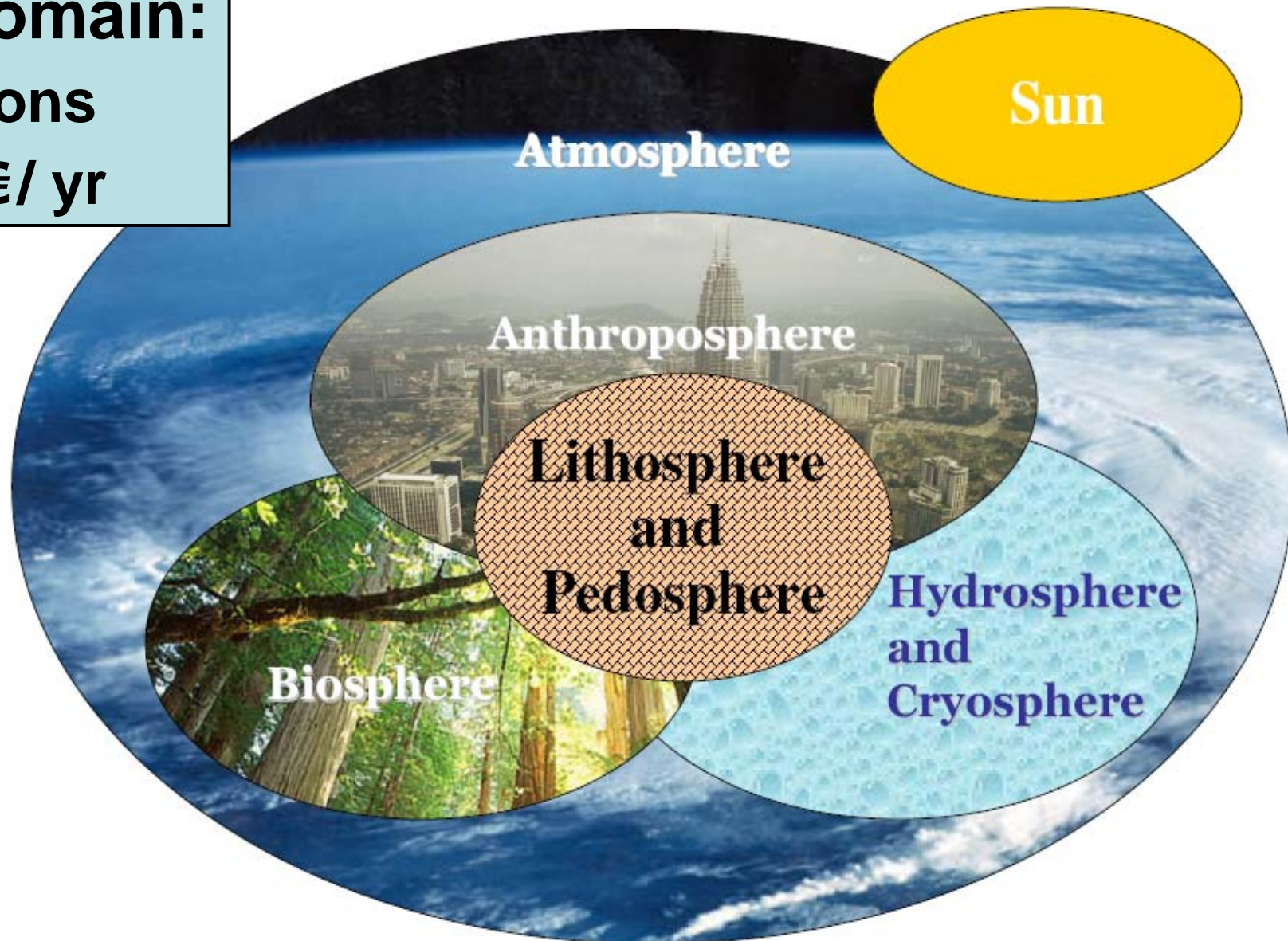
**Sylvain Joffre**  
Chair of ESSEM DC



# ESSEM Domain:

28 Actions

~2,3 M€/ yr



# COST-725: Establishing a European Phenological Data Platform for Climatological Applications

Action's work was recognised by IPCC !



=> Evidence of Climate Changes in Europe

IPCC, AR4, WG II report, chapter 1 - page 113: Box 1.3. "Phenological responses to climate in Europe: the COST725 project".

Chapter 1 Assessment of observed changes and responses in natural and managed systems

**Box 1.3. Phenological responses to climate in Europe: the COST725 project**

The COST725 meta-analysis project used a very large phenological network of more than 125,000 observational series of various phases in 542 plant and 19 animal species in 21 European countries, for the period 1971 to 2000. The time-series were systematically (re-)analysed for trends in order to track and quantify phenological responses to changing climate. The advantage of this study is its inclusion of multiple verified nationally reported trends at single sites and/or for selected species, which individually may be biased towards predominant reporting of climate-change-induced impacts. Overall, the phenology of the species (254 national series) was responsive to temperature of the preceding month, with spring/summer phases advancing on average by 2.5 days/°C and leaf colouring/fall being delayed by 1.0 day/°C.

The aggregation of more than 100,000 trends revealed a clear signal across Europe of changing spring phenology with 78% of leaf unfolding and flowering records advancing (31% significantly (sig.)) and only 22% delayed (3% sig.) (Figure 1.6). Fruit ripening was mostly advanced (75% advancing, 25% sig.; 25% delayed, 3% sig.). The signal in farmers' activities was generally smaller (57% advancing, 13% sig.; 43% delayed, 6% sig.). Autumn trends (leaf colouring/fall) were not as strong. Spring and summer exhibited a clear advance by 2.5 days/decade in Europe, mean autumn trends were close to zero, but suggested more of a delay when the average trend per country was examined (1.3 days/decade).

The patterns of observed changes in spring (leafing, flowering and animal phases) were spatially consistent and matched measured national warming across 19 European countries (correlation = -0.69,  $P < 0.001$ ); thus the phenological evidence quantitatively mirrors regional climate warming. The COST725 results assessed the possible lack of evidence at a continental scale as 20%, since about 80% of spring/summer phases were found to be advancing. The findings strongly support previous studies in Europe, confirming them as free from bias towards reporting global climate change impacts (Menzel et al., 2006b).

**Figure 1.6.** Frequency distributions of trends in phenology (in days/year) over 1971 to 2000 for 542 plant species in 21 European countries. From Menzel et al. (2006b).

# Success story: COST-725

- 725's Phenological Database now **operational** under ECSN (EUMETNET European Climate Support Network).
- 725's recommendations into WMO Guidelines for Climate monitoring => Phenology now **recognised as a proxy for climate!**
- 725's coordinator now leads **GEO task US-09-03d** for building Global Phenology Data (UIC) => **GEOSS**

INDIVIDUAL CHARACTERISTICS  
genes, age

- Weather and climate play an important role in plant development

BIOSPHERE  
diseases, pests,  
competition



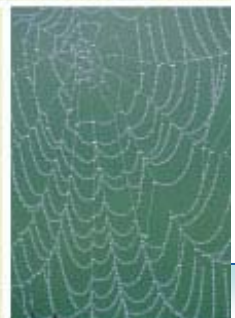
ATMOSPHERE  
Weather (current and last season), climate, light, pollutants

SOIL  
temperature, nutrients,  
water, flora & fauna

# 729 : Assessing and managing Nitrogen fluxes in the atmosphere-biosphere system in Europe

N is essential for life but:

- Excess N contributes to most environmental issues and cascades through the environment.
- Multi: source/actor, pollutant, receptor, effect, problem, .....
- Challenge: to optimize its availability while minimizing its impacts.
- Multi-disciplinary research necessary to address the food/fuel issues; Different processes, scales, inter-linkages, etc.



# 729: Significant Outcomes and High Impact

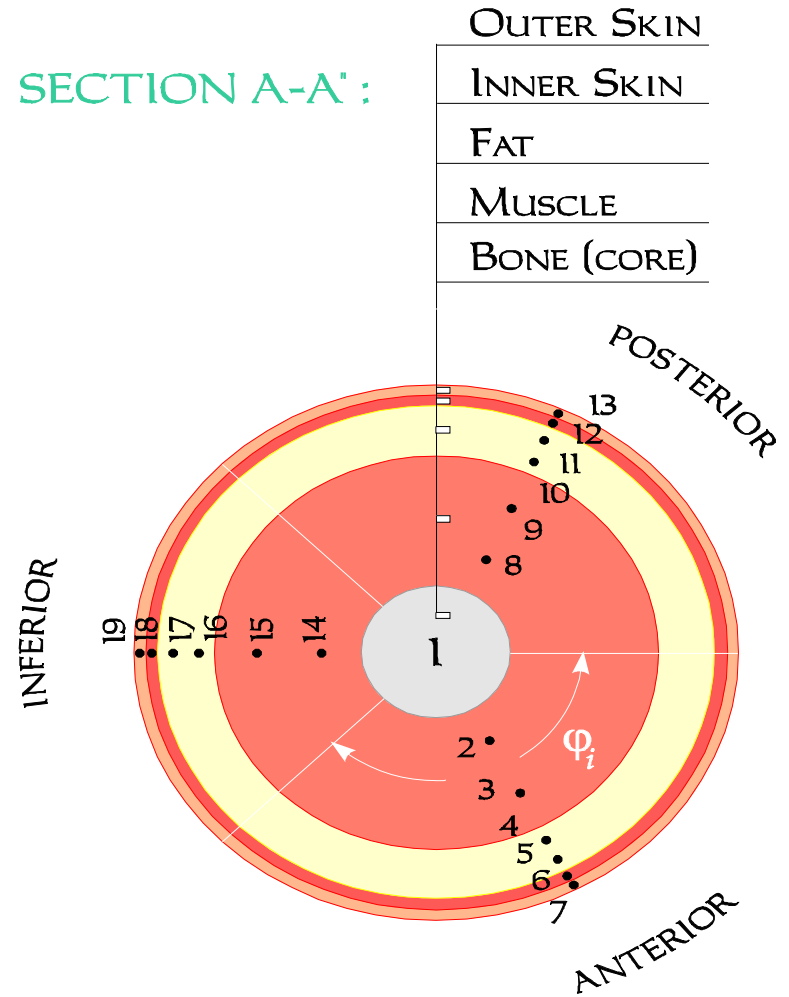
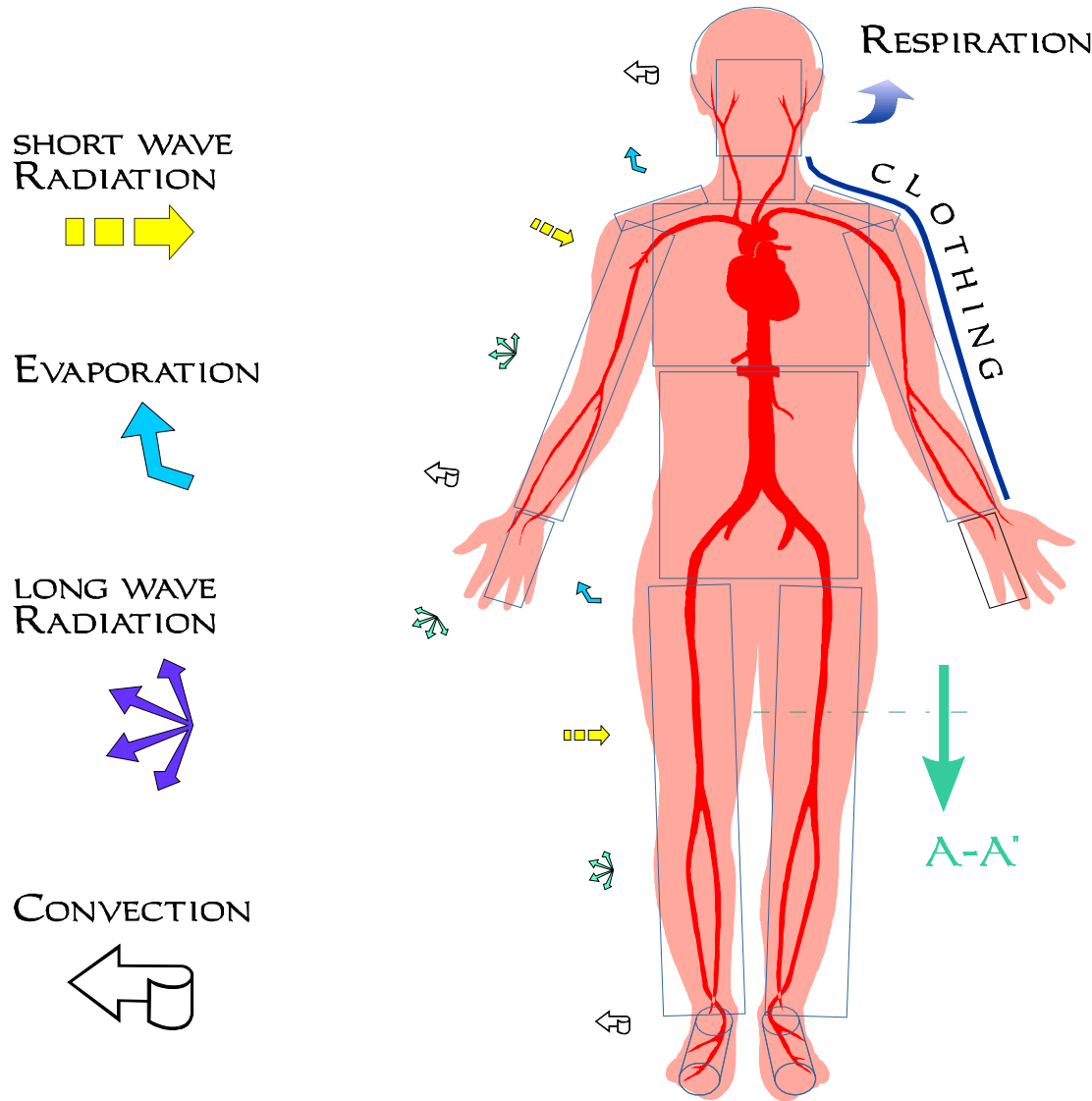
- European Nitrogen Assessment (Launch planned for Spring 2011, Cambridge University Press?)
  - Process of scientific & policy synthesis that provides a major review of the role of excess nitrogen on environmental problems (1st time in Europe), involving a large number of European scientists + policy makers
  - COST influenced through workshops, Background documents, Preparation of ENA chapter, External review.
- Task Force on Reactive Nitrogen under CLRAP (UN-ECE, Geneva)
- Critical levels for ammonia
- Interactions Nitrogen ↔ biodiversity ↔ Natura 2000
- Advise to the US EPA Scientific Advisory Board
- *Science* and *Nature* publications
- Interaction and cooperation with FP7 IP NitroEurope and ESF Programme NinE
- Well known in the nitrogen community
  - => Invitation to COP15 in Copenhagen: Side event on options for including N-management in climate policy development.

# COST-637 : Metals and related substances in drinking water

- Influencing the review of the EU Drinking Water Directive (with JRC)
  - Risk assessment & management wrt. metal leaching from domestic pipe-work systems
  - Common (and correct) basis for compliance assessment.
- Influencing the implementation of the UN/WHO Protocol on Water and Health
  - Prepared guidance on sampling and monitoring of lead in drinking water
- Highlighted regulatory problems for lead in drinking water, both in Europe and North America => **25% of EU population at risk !!**
- Best Practice Guides to be published by the International Water Association (IWA) in 2010 and 2011 => to help resolve a wide range of technical and regulatory problems
- Action Network about to become a Specialist Group within the IWA.
  - Created a research community + Enhanced inclusion of young scientists
  - Stimulated research at the European scale
  - Improved dissemination of existing and emerging knowledge.

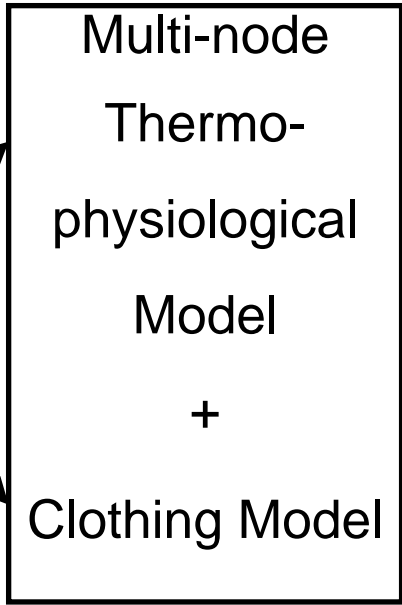
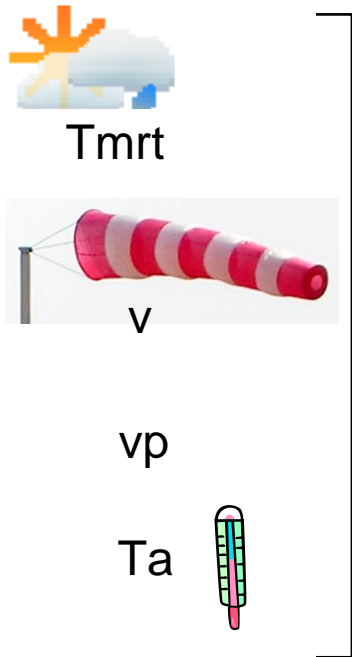


# Multi-node model of thermo-regulation

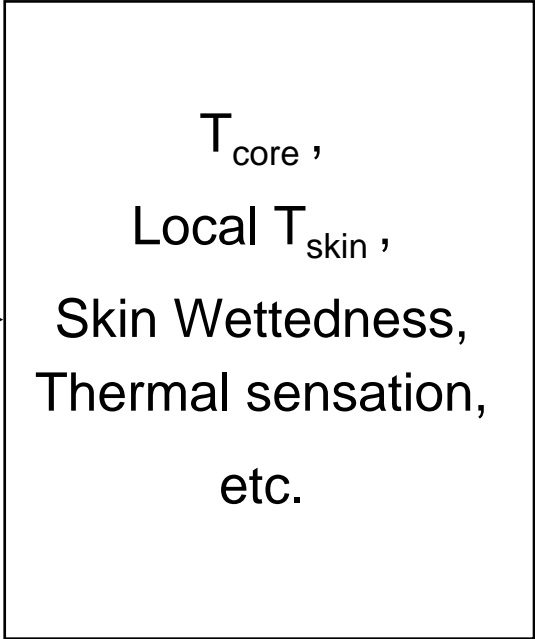


# The UTCI model

## Weather data



## Average human response



**Single index UTCI**

# 730: Universal Thermal Climate Index UTCI

- ❑ More than 100 Indexes developed by isolated scientists and based on simple principles/single discipline => at last came along 730 !
- ❑ COST-730 allowed pooling multidisciplinary experts from biometeorology, physiology and the application community (e.g., thermal comfort modelling for health or clothes industry) + world-wide experts.
- ❑ Potential Impact of UTCI on society, citizens, and economy: heat wave warnings
- ❑ =>
  - UTCI based on contemporary science.
  - UTCI standardizes applications and makes research results comparable.
  - UTCI is internationally recognized.
  - WMO guidelines on UTCI is in progress.
  - Assessment of thermal hardship (burden) at all UN duty stations using UTCI (Chair invited for a 3 hrs presentation at UN in NY).
  - COST-730 put the topic on the research agenda + UTCI can lead to spin off research across the world.
  - Creation of CEN and ISO standards and guidelines.

## Most promising future subjects

- Supporting European and international Programmes (IPCC, WMO, WHO, GEO, GMES, ESSP,...):** Sustaining, integrating and harmonising European and global networks for monitoring the changing Earth System and its compartments (land, waters, atmosphere, cryosphere, biodiversity)
  - => To provide warning systems or early-detection indicators, e.g., geohazards, health-AQ, biodiversity loss, nitrogen and phosphorous cycling.
- Supporting adaptation & mitigation for regional or local authorities and decision makers:** developing technologies and tools for quantifying and forecasting emissions (GHGs, pollutants) for early-warning systems of pollution/degradation (soil, water, air) in the general context of natural resources competition and city development and for assessing the impacts of environmental policies.
- Contributing to the development of systems for Renewable Energy** production, the modelling of water and energy production scenarios and their impact on the environment.

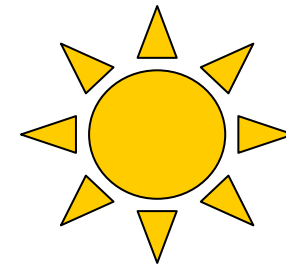
# Some reflections on ESSEM in the new COST (1/2)

- **Merging of TC-Meteo + TC-Environment**
  - => Suspicions + Concern as to different modus operandi
- **Driving vision & momentum: **Creating a ESSEM spirit / ethos****
  1. Harmonisation of modus operandi: reporting, Rapporteurs, etc.
  2. Harmonisation of appraisal about what is a COST Action:
    - Concrete objectives, aiming at real impacts, work programme leveraging added value from national projects (no discussion club)
  3. Building added-value by combining forces => **win - win**
    - Meteorology has long tradition with comprehensive international networking and harmonisation => for the benefit of environmental sciences
    - Integrating meteorology into environmental research: atmosphere as the permeating medium relating local and larger scales at all time scales.

## Some reflections on ESSEM in the new COST (2/2)

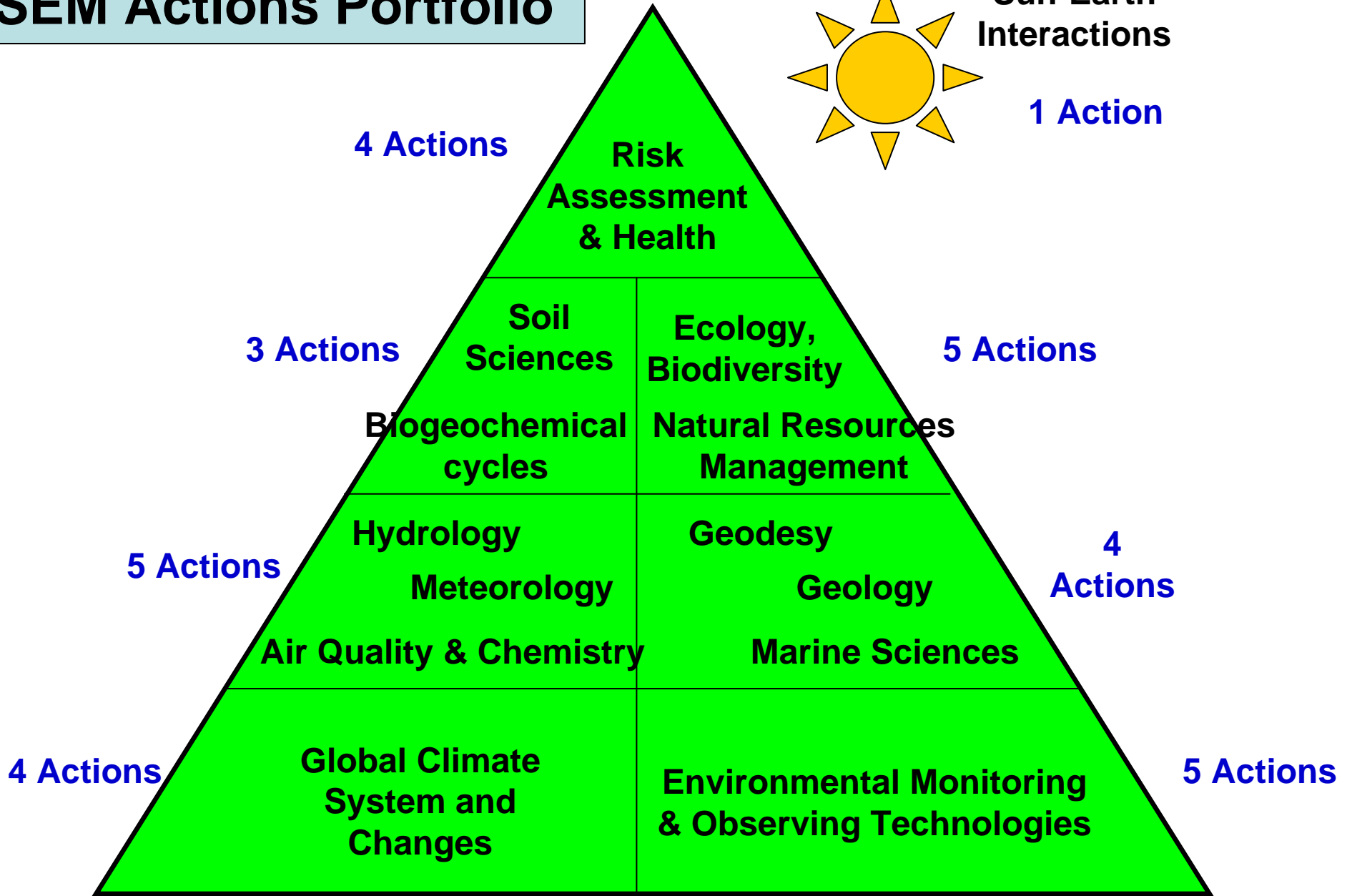
- In 2010: **an ESSEM spirit exists** with a vision for impactful, efficient and successful Actions
- Quality of pre-proposals increased tremendously:
  - 2006: **75%** of pre-proposals out of scope for COST !
  - 2010: less than **25%** of pre-proposals out of scope
- Many new selected ESSEM Actions have a multidisciplinary approach
- Strong engagement of (i.e. attraction to): WMO, EUMETNET, GEO/GEOSS, GMES (DG-ENT), ESA with COST-ESSEM
- Instrumentation Industry Association HMEI follows and participates to Actions.
- Balanced portfolio of Actions.

# ESSEM Actions Portfolio



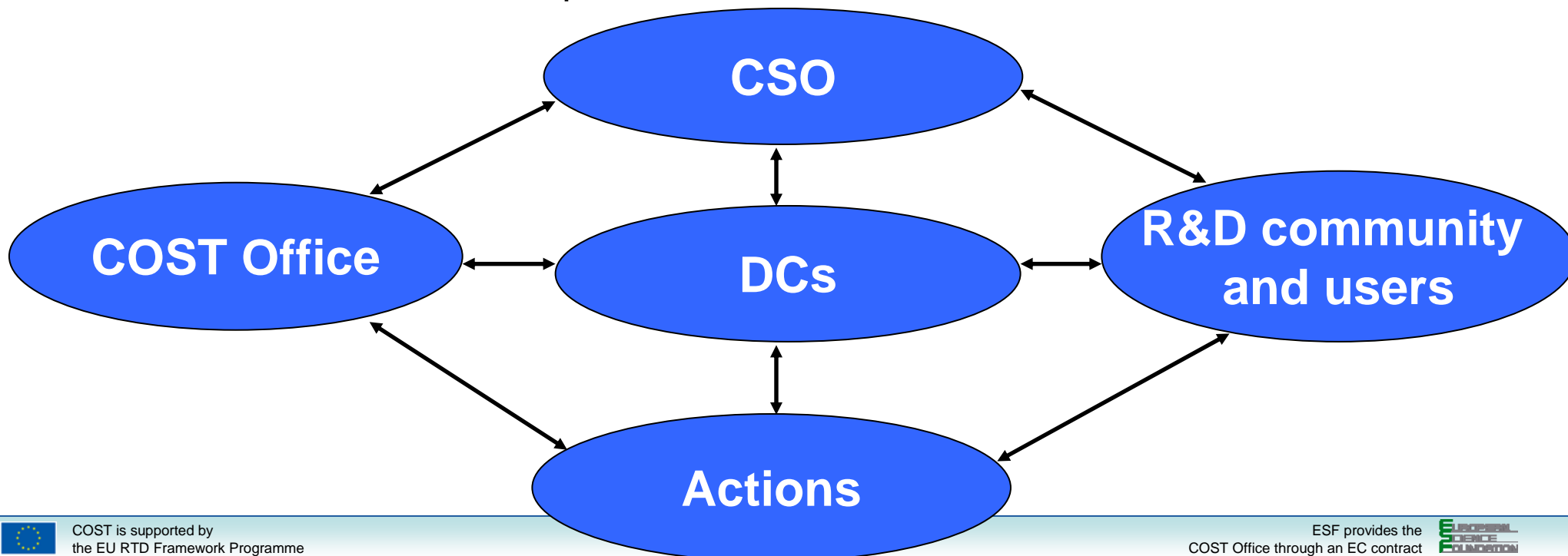
**Sun-Earth Interactions**

**1 Action**

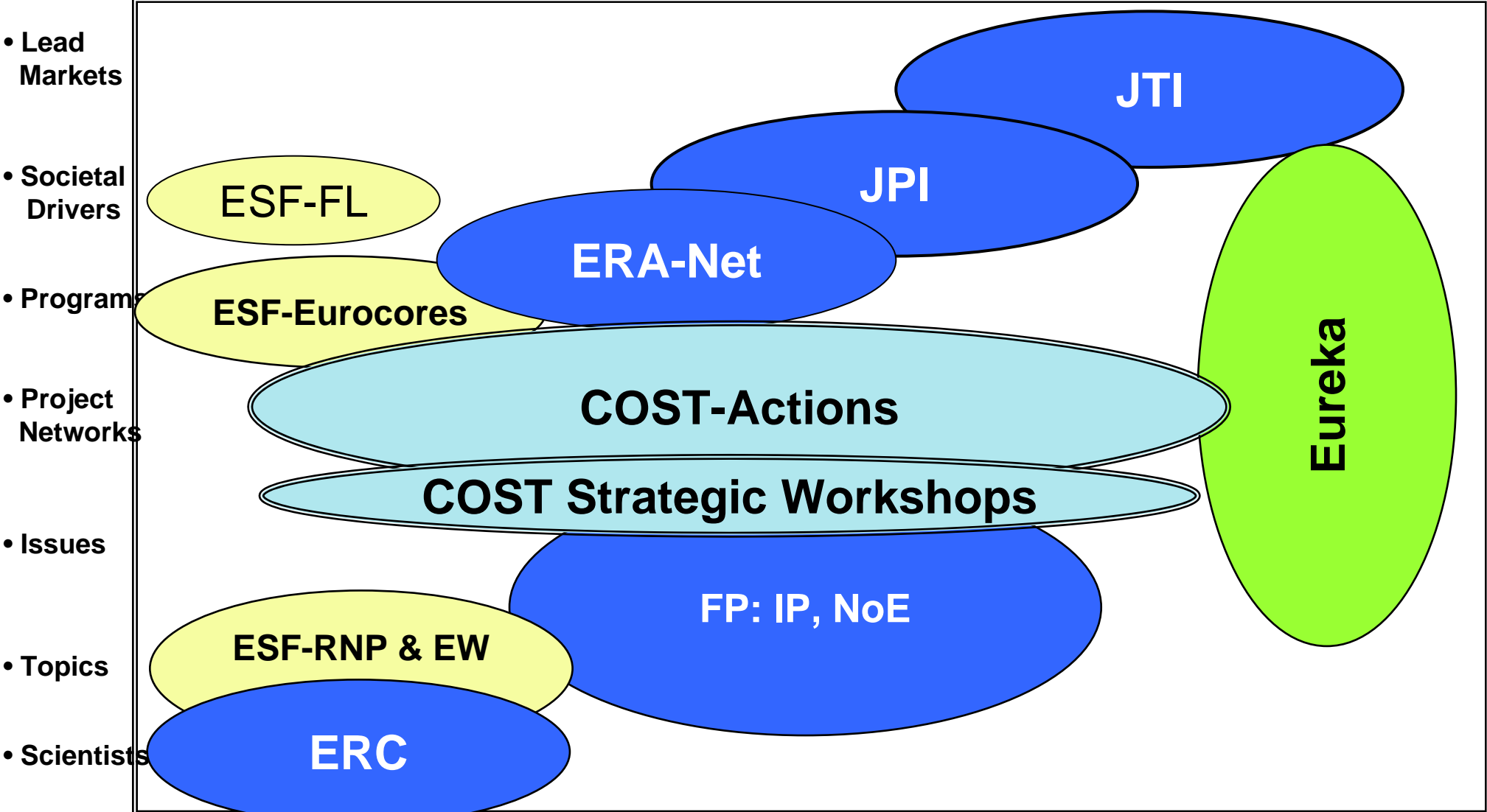


# Independent COST necessary !

- >90% of public R&D in Europe through governmental funding
- COST ownership in Member States => intergovernmental framework
- COST leverages added-value from national R&D investments
- COST contributes to European S&T quality, competitiveness and welfare
- Holistic interactions CSO – DCs – COST Office – Actions - National Networks  
All dedicated to COST quality, relevance, impact and efficiency.
- COST as a full actor and partner in the ERA => COA



# COST's strategic role: European R&D Schemes arranged according to Basic vs. Applied research and Hierarchy of Integration

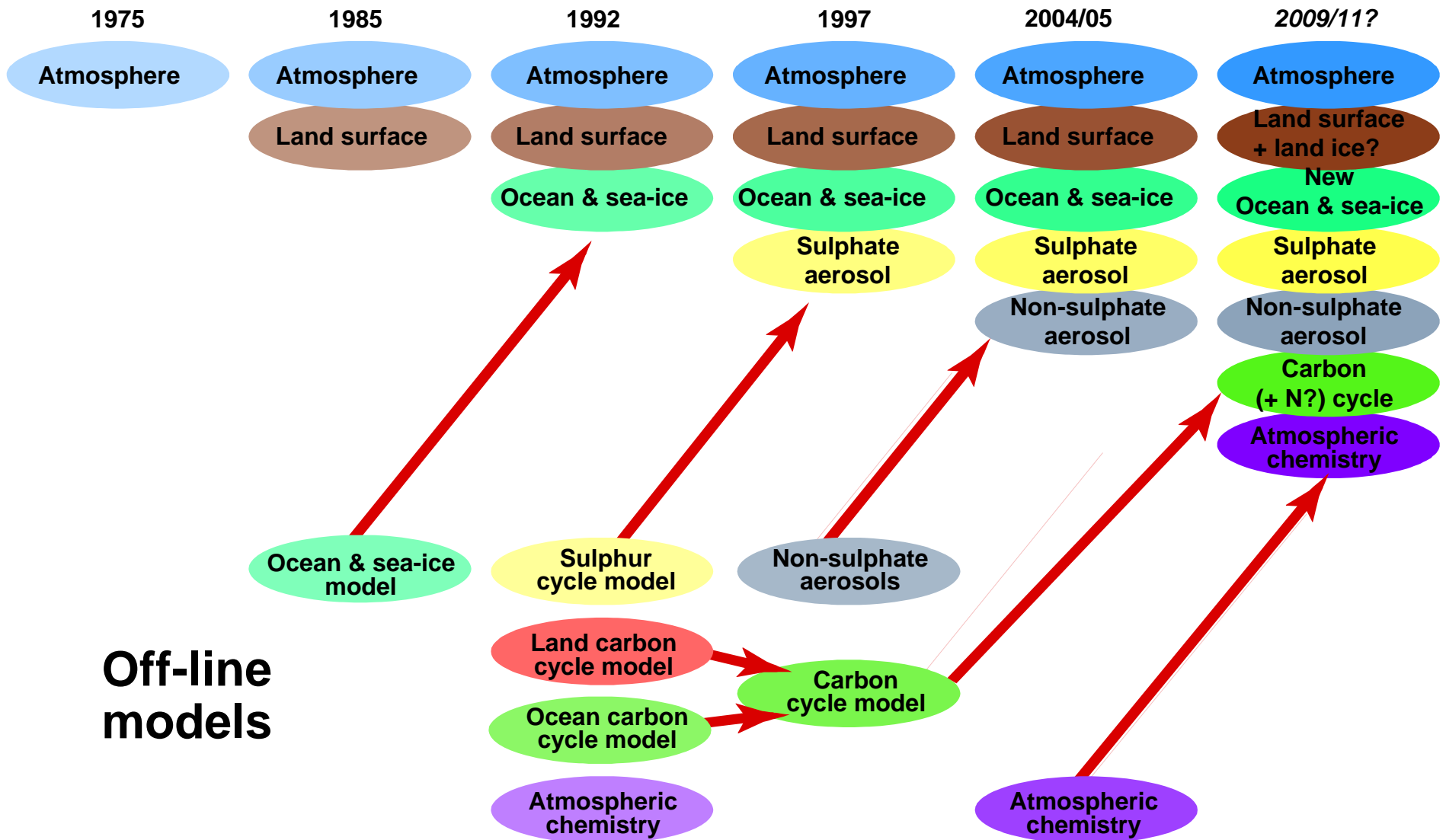


Basic Academic Research    Applied R&D    Societal Applications    Markets



**Thank you,  
Long live COST !**

# EVOLUTION OF EARTH SYSTEM MODELLING



# ESSEM Domain – Indicative Thematic Areas

- Air, Soil and Water Pollution
- Biodiversity
- Climate Changes
- Geology, geophysics, seismology
- Hazards Forecasting & Detection
- Hydrology
- Instrumentation & Network Technologies
- Meteorology
- Oceanography
- Operational Capacities (weather, sea, space, land, water, disasters)
- Soil processes & Land Degradation

