ABOUT COST

COST is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research at European level.

COST enables break-through scientific developments leading to new concepts and products and thereby contributes to strengthen Europe’s research and innovation capacities.

COST cooperation extends internationally.

ABOUT THIS REPORT

Released yearly, the COST report provides the reader with an overview of the completed actions within the 9 Domains of COST. The report has a closer look at the remit of the Actions and achievements.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword by the COST President</td>
<td>1</td>
</tr>
<tr>
<td>Introduction COST Office Director</td>
<td>2</td>
</tr>
<tr>
<td>COST in Numbers</td>
<td>3</td>
</tr>
<tr>
<td>Strategic Events 2011</td>
<td>4</td>
</tr>
<tr>
<td>Biomedicine and Molecular Biosciences (BMBS)</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry and Molecular Sciences and Technologies (CMST)</td>
<td>14</td>
</tr>
<tr>
<td>Earth System Science and Environmental Management (ESSEM)</td>
<td>23</td>
</tr>
<tr>
<td>Food and Agriculture (FA)</td>
<td>30</td>
</tr>
<tr>
<td>Forests, their Products and Service (FPS)</td>
<td>43</td>
</tr>
<tr>
<td>Information and Communication Technologies (ICT)</td>
<td>48</td>
</tr>
<tr>
<td>Individuals, Societies, Cultures and Health (ISCH)</td>
<td>55</td>
</tr>
<tr>
<td>Materials, Physics and Nanosciences (MPNS)</td>
<td>61</td>
</tr>
<tr>
<td>Transport and Urban Development (TUD)</td>
<td>67</td>
</tr>
<tr>
<td>Annex</td>
<td>73</td>
</tr>
</tbody>
</table>
I am proud to present to you the 2011 Annual Report of COST, the European Cooperation in Science and Technology.

2011 was a key year for COST, not only because of its 40th anniversary making it the longest running European intergovernmental framework offering a unique platform for European researchers to jointly develop their own ideas and new initiatives across all scientific disciplines, but as we came to a conclusion on important strategic reflections which we initiated after my election to the presidency the previous year.

Because of our long history, we needed to set a focus on the future and take new challenges in European research and innovation. This is what we did.

The new COST strategy “Renewing our strength, shaping our future. Strategy to achieve Vision 2020”, approved by the COST Committee of Senior Officials after its 182th meeting in May 2011, lays a solid foundation for an even better integration of researchers in Europe, maximising social and territorial inclusiveness.

We also started to prepare a new implementing structure which will effectively turn the strategy into action in a near future.

We are fully committed to the ambitions we set out for COST and look forward to a new era in science and technology-based innovation.

Dr Ángeles Rodríguez-Peña
INTRODUCTION BY THE COST OFFICE DIRECTOR

Last April I joined the COST Office as its new Director. I was looking forward to preparing the Office for future responsibilities and to turn it into a light and researchers-oriented administration, fully adapted to the needs of the European science communities, of which I had previously been active in.

As researcher, I have always pleaded for science-driven research, and when I switched to science management, I have invested myself in investigator-driven, interdisciplinary, European-minded organisations (in particular CNRS, ERC). I also strongly believe in the extraordinary diversity and creativity we have in Europe – this is our strength. So, COST is a logical step in line with my beliefs.

Therefore, my motivation is, with the support of the European Science Foundation as implementing agent of COST, to bring the administration to a new level of transparency and performance. The Leitmotiv will be simplification; the simplification of the internal organisation and its procedures. Of course, this will only be possible if it is a joint determination and built on teamwork.

I will put all my efforts to succeed in this endeavour.

Dr Monica Dietl
## COST IN NUMBERS 2011

<table>
<thead>
<tr>
<th>COST Domains</th>
<th>Finalized Actions</th>
<th>Running Actions in all COST Domains</th>
<th>Participants Countries in COST Domains</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Running Actions</td>
<td>Biomedicine and Molecular Biosciences (BMBS)</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Running Actions</td>
<td>Chemistry and Molecular Sciences and Technologies (CMST)</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Running Actions</td>
<td>Earth System Science and Environmental Management (ESSEM)</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Running Actions</td>
<td>Food and Agriculture (FA)</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Running Actions</td>
<td>Forests, their Products and Service (FPS)</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Running Actions</td>
<td>Information and Communication Technologies (ICT)</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Running Actions</td>
<td>Individuals, Societies, Cultures and Health (ISCH)</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Running Actions</td>
<td>Materials, Physics and Nanosciences (MPNS)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Running Actions</td>
<td>Transport and Urban Development (TUD)</td>
<td></td>
</tr>
</tbody>
</table>
STRATEGIC EVENTS

2011

COST Strategic Activities aim to address existing needs in specific Action-related areas or innovative or upcoming topics and may target early stage researchers, thus reflecting the COST Strategy towards increased support of early stage researchers.

They are organised by the COST Office, following initiatives from the CSO, COST Domain Committees (DC), the ESF Standing Committees (SC), the European Commission, the European Parliament etc.

22-23 February
Foresight on Future Demand for Forest-based Products and Services: Scenario Building
Strategic Workshop
Barcelona, Spain
The COST Strategic Workshop Series (SWS) on Foresight on Future Demand of Forest-based Products and Services 2010-2011 was the first European-level forum aimed at sharing the expertise of national forest foresights and the exercises carried out in certain areas, e.g. environment, rural development, agricultural research and energy sectors. The exercise also aimed to identify global trends and their impact on the forest-based sector by 2050. An online survey involving academia, public administration, interest groups and civil society organisations both within the forest sector and parallel sectors found:

- a strong belief that forests' contribution to health and human wellbeing is to be considered part of national wealth
- a strong belief in ICT solutions
- increasing globalisation expected to develop towards free trade and global markets
- differences in economic development are expected to increase between regions
- financial markets expected to be dominated by crises and uncertainty

Domains: ESSEM & FPS

3-6 April
Quantitative Nanostructure-Toxicity Relationships (QNTR)
Exploratory Workshop
The Vaeshartelt Castle (near Maastricht), The Netherlands
Domains: CMST & MPNS

22-23 June
Biofilms: Friend or Foe?
Exploratory Workshop
Berlin, Germany
Domains: CMST & FA

11-13 July
Safeguard of Cultural Heritage: A Challenge from the Past for the Europe of Tomorrow
Exploratory Workshop
Florence, Italy
Domains: MPNS

COST Events Website
### 28 August-2 September
**Natural Products Chemistry, Biology and Medicine IV**  
COST-ESF Event  
Acquafredda di Maratea, Italy  
Domain: CMST

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### 13 September
**Foresight on Future Demand for Forest-based Products and Services: Dissemination Conference**  
Strategic Workshop  
Sekocin Stary, Poland  
Outcome: Communicating syntheses on existing and new foresight studies is key (e.g. design of a foresight exercise for the European forest-based sector, through dissemination conferences, scientific articles, popular synthesis reports, online materials). Participants considered the event covered a topic of general interest among stakeholders (many presentations, publications, citations). They also made the following recommendations and observations:

- more focus on policy papers  
- mainstream media showing high interest in the topic by covering expected outcomes, also taking on alarmist approaches  
- timber industry showing low interest (competing quantitative scenarios)  
- using social networks to disseminate results, ideas.  

Domains: ESSEM & FPS

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### 18-21 October
**COST 40th Anniversary**  
Brussels, Belgium  
In 2011, COST marked a milestone in the European Research Area by celebrating its 40th anniversary with an exhibition at the European Parliament in Brussels.

The exhibition featured various COST Actions and showcased the scientific and societal impact of science and technology networking.

Máire Geoghegan-Quinn, European Commissioner for Research, Innovation and Science, highlighted areas in which the flexible, bottom-up nature of COST proved to add real value, adding: “COST identifies, supports and gives visibility to ‘pockets of excellence’ throughout Europe.” It is a marvellous way to improve Europe’s scientific excellence.

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### 26-27 September
**Smart Cities**  
Exploratory Workshop  
Paris, France  
Domains: ICT & TUD

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### 23-28 October
**Systems Chemistry III**  
COST-ESF Event  
Crete, Greece  
Domain: CMST

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### 6-11 November
**The Future Role of Bio-energy from Tree Biomass in Europe**  
COST-ESF Event  
Vienna, Austria  
Domains: ESSEM & FPS

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### 27 November-2 December
**Understanding Extreme Geohazards: The Science of the Disaster Risk Management Cycle**  
COST-ESF High-Level Research Conference  
Sant Feliu de Guixols, Spain  
Domain: ESSEM

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### 28-29 November
**Early embryonic environment as cues of epigenetics responses for sustainable food production**  
Brussels, Belgium  
Domains: BMBS & FA
The BMBS Domain covers all areas of medicine in health and diseases. It therefore includes basic, preclinical and clinical research with an emphasis on translational aspects, allowing resultant scientific results to be implemented in future medical practices and thus giving rise to meaningful health outcomes.

Domain Committee Chair
Prof. Roland Pochet

BMBS Website
The main objective of the Action was to improve the potential of cancer therapy through the development and application of innovative vectors labelled with therapeutic radionuclides for ‘targeted radionuclide therapy’. The advantage of this therapy is its limitation of the risk of radiation damage to vital body structures while delivering radiation selectively to cancer cells.

The members of this Action developed imaging probes based on the same vectors in order to facilitate therapeutic imaging of patient-specific dosimetry and to allow planning and monitoring of applied therapy.

The key successes of this Action include:
• the evaluation and selection of the best gastrin/CCK analogues for targeting different tumours expressing the CCK2 receptor, including medullary thyroid carcinoma and small cell lung cancer;
• the preparation of a database containing molecular targets with the potential for TRNT, ideal target characteristics, in vitro and in vivo models and radionuclide characteristics and availability;
• the standardisation of labelling procedures, small animal imaging studies and quality control;
• and the provision of multiple training opportunities for young researchers.

One of the most significant successes of this Action was the selection of initially 12 promising gastrin/CCK analogues for tumour targeting. One of these compounds has recently been selected for further preclinical therapy followed by clinical therapy studies.
The main objective of this Action was to increase our understanding of behavioural markers and neuronal mechanisms associated with conscious experience in human subjects and animals and to identify the clinical, societal and ethical implications of these findings. At the same time, the Action aimed to define features and computational principles underlying these processes.

Different activities conducted by the Action contributed to the emergence of a ‘consciousness community’ in Europe.

The Action has been most successful in:

- the identification of the neural markers and diagnostic schemes for altered conscious state;
- the development of novel paradigms to study consciousness;
- the development of novel technologies e.g. EEG-fMRI;
- and the understanding of the ethical and societal implications of consciousness.

The most significant scientific outcome of this Action has been the demonstration that the use of real-time fMRI can be used to elicit reports from patients diagnosed as vegetative or minimally conscious.

Resultant scientific results have shown that up to 40% of patients could be misdiagnosed as being completely unconscious while real-time fMRI analysis showed clear signs of consciousness.

fMRI – functional magnetic resonance imaging - provides high resolution, non-invasive reports of neural activity based on blood oxygen level dependent signals.
The main objective of this Action was to provide reliable breast cancer risks associated with genetic variants, through collaborative epidemiological studies. The causes of breast cancer are still unknown, but several risk factors have been identified including a positive family history, obesity, oral contraceptives and alcohol intake.

Breast cancer is a multifactorial disease. This Action examined the combined effects of multiple risk factors on the aetiology of this disease. Moreover, different activities conducted by the Action have facilitated the fruitful exchange of expertise in genotyping technologies.

The key successes of this Action include:
• providing more accurate estimations of the cancer risks conferred by BRCA1 and BRCA2;
• better understanding of the aetiology and heterogeneity of breast cancer;
• and identifying 18 new breast cancer genetic susceptibility variants accounting for 8% of familial risk of the disease.

The success of the Action is the scientific advancements made in the field of breast cancer genetics, which have laid the fundaments for future diagnosis, treatment and prevention.

The Action activities contributed to building a risk profile for breast cancer. This will have profound effects on national breast cancer screening programs, improving their efficacy by targeting mainly those women who are at demonstrable increased risk, rather than only those aged 50 or over.

Mammographic screening programs can be tailored towards those women who are most at risk for the disease. Patients will benefit from improved predictions of prognosis and response to treatment.

300.000

New cases of breast cancer are being diagnosed in the EU each year.

About 3 in 10 breast cancers are diagnosed in women before age 50.
The main objective of the Action was to gain new understanding of neuroinflammatory and neurodegenerative processes occurring in multiple sclerosis (MS) and Alzheimer’s disease (AD). Brain diseases impose an increasingly large burden on the European health as the European population ages. Neuro-inflammation and neuro-degeneration are major processes occurring in MS and AD: their thorough characterisation was therefore essential to achieving a comprehensive understanding of their associated pathology.

The Action activities facilitated the establishment of a pan-European network dedicated to unravelling the mechanisms underlying these processes.

The Action has successfully established a network involving 18 countries and over 80 active members from both neuro-inflammation (MS) and neuro-degeneration (AD) research fields. This collaboration has led to the determination that genetic risks and a primary role of inflammation are key components in the aetiology of MS.

The principle achievements of this Action have been:
- the determination that genetic risks and inflammation are key components in the aetiology of MS;
- the identification of 20 new genetic risk markers as a disease signatures in MS;
- the identification of immune system derived risk factors involved in AD;
- and the provision of multiple training opportunities for young researchers.

The results obtained by the Action members contributed to improved disease prediction and better monitoring and treatment efficacy in patients suffering from MS.

At the same time, networking efforts have increased our understanding of immune mechanisms involved in cognitive impairment and pathology of AD.

The total cost of brain disorders estimated in 2010. That burden is set to grow, mainly due to the fact that the European population is ageing.
The main objective of the Action was to promote a scientific and medical European effort in the multidisciplinary field of myelin-related pathologies in order to develop new therapeutic strategies for the largest number of patients.

The Action sought to better understand and fight diseases affecting the Central Nervous System (CNS) nerve-insulating myelin, such as inherited leukodystrophies and white matter diseases of the premature.

The key successes of this Action include:

- the organisation of a European database dedicated to leukodystrophies;
- the identification of suitable animal models for pre-clinical trials;
- the identification of OMIC strategies for biomarker discovery;
- the identification of viral vectors and cells suitable for gene and cell therapy;
- and the characterisation of common pathological pathways involved in the neurodegenerative process observed in all leukodystrophies.

A defining result of the Action is the LeukoTreat project: as a spin-off of networking activities, the dynamic and multidisciplinary expertise of Action participants obtained an FP7, (Seventh EU Framework Programme) medium scale support on the call HEALTH-2009-2 Rare neurological diseases, named ‘Therapeutic challenge in leukodystrophies: translational and ethical research towards clinical trials’ (LEUKOTREAT).

**MYELINET**

COST Action BM0604

Chair of the Action
Prof. Odile Boespflug-Tanguy (FR)

Vice Chair of the Action
Dr Anne van Evecooren (FR)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Cyprus, Denmark, France, Germany, Israel, Italy, Norway, Poland, Spain, Switzerland, United Kingdom (Total 13).

MYELINET website
MYELINET Action page on COST website
The main aim of the Action was to advance our knowledge on the pathogenesis and prevention of obesity and the specific role of adipose tissue in the development of the metabolic syndrome. This approach was driven by the hypothesis that adipose tissue is critically involved in transducing environmental and nutritional factors into endogenous signals, which mediate the pathogenesis of major metabolic disorders.

The novel secretory products and the pathophysiological role of the adipose tissue in human or animal models were investigated in both the metabolic syndrome and in type 2 diabetes. Moreover, the Action aimed to define the central regulatory role of food intake and adipocyte storage, leading to the identification of new molecular targets that may serve to control food intake and to prevent the development of the metabolic syndrome.

The Action enjoyed a number of key successes.

• the identification of novel adipokines,
• the description of chemerin as a novel player in muscle insulin resistance,
• the analysis of protective mechanisms against hyperglycaemia in vascular endothelial cells,
• the identification of distinct adipocyte precursor subpopulations,
• the comprehensive characterisation of the adipocyte secretome,
• the description of DPP4 drugs (dipeptidyl peptidase 4) as a novel link between obesity and the metabolic syndrome.

This Action has significantly contributed to the scientific and technical development and progress in the field of obesity research and its associated diseases and has promoted training and exchange of young researchers.

The Action’s results and networking activities have proven highly relevant for scientific development in this field. The sustainability of this Action is also its success; it will foster future collaborations and new projects aiming to combat metabolic disorders and its complications.
The main objective of the Action was to increase knowledge of the mathematical methods able to estimate the cortical activity and connectivity in the human brain from non-invasive neuro-electric and hemodynamic measurements.

Moreover, the Action aimed to generate a body of techniques that enable people to use the voluntary modulation of their mental activity in order to interact with electronic and robotic devices, thereby increasing the communication capabilities of people with severe motor disabilities.

The key successes of this Action include:

- the development of new methodologies to compute and summarise the pattern of cortical connectivity estimated in healthy individuals and patients;
- the development of computer interfaces applications in the domotic contexts;
- and the generation of common research proposals in FP7 and various national programmes.

The following FP7 research projects are as a direct result of the NeuroMath Action:

- FP7 RTD project called DECODER aimed at generating a device to provide communication in persons with minimal consciousness;
- FP7 RTD project called BETTER aimed at developing a leg-hortesis device driven by brain computer interface to enable paraplegic people to walk using EEG signals;
- FP7 RTD project called MINDWALK that aimed to develop a device to enable paralyzed persons to walk with the aid of several automatic devices, including Functional Electric Stimulations (FES).

A defining result of the NeuroMath Action has been its success in giving people with severe motor disabilities control over different electronic devices in a home environment just by the modulation of their mental activity.
2. CHEMISTRY AND MOLECULAR SCIENCES AND TECHNOLOGIES (CMST)

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

Domain Committee Chair
Prof. Dieter Schinzer

CMST Website
The main objective of the Action is to fabricate functional nanostructured materials and nanoscale devices for analytical, biomedical and life science applications.

The Action focused on the development of the necessary synthetic and assembly procedures; particularly on modern self-assembly processes and synthetic approaches towards novel soft functional nanostructured and bio-inspired materials. These developments require standardised analytical procedures and reference materials with well-defined structures on the nanoscale.

The relevance of this research area is reflected by the interest from Europe and abroad; almost 100 scientific groups from 28 COST countries and from 4 non-COST institutions from Australia, Egypt, Palestine and Ukraine participated in the Action. The Action has provided an important platform for the exchange between researchers in both the fundamental and applied areas.

The main achievements of the Actions have been:

- the novel synthesis of many types of nanoparticles for nanomedicine, nanocatalysis, magnetic resonance imaging;
- the development of interpenetrated functional polymer and PNIPAM microgels with fluorescent and thermoresponsive properties;
- a novel approach to metal and metal oxide nanoparticle synthesis by environmentally friendly method;
- the development of tailored microemulsion for the restoration of ancient monument and mural paintings.

Recent examples of such materials include polymeric capsules with tunable release characteristics, inorganic-organic polymer composites, functional surface coatings with catalytic properties, or lab-on-a-chip devices.

The success of this Action was extensive. It can count a number of concrete achievements arising from its collaborative work with various related industries. Colloid structures are essential building blocks for nanostructured materials (organic-inorganic, artificial bones, bio-inspired structures). An in-depth understanding of any resulting nanostructured or nanocomposite material is critical to their processes; one example would be the lifetime of products (self-healing paints for planes or for immobilization material for waste containing toxic ions).

Chair of the Action
Prof. Peter Kralchevsky (BG)

Vice Chair of the Action
Prof. Regine von Klitzing (DE)

Duration of the Action
2006-2011

Parties
Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 28). Non-COST participation from the Al-Quds University (PS), the Egyptian petroleum research institute (EPRI) (EG), the Institute of Biocolloid Chemistry (IBCC), National Academy of Sciences of Ukraine (UA) and University of South Australia (AU).

Action D43 website
D43 Action page on COST web
The objective of this Action was to allow the attainment of new innovative C-H, C-O, C-C and C-Heteroatom bond forming processes. Its primary research objective was the discovery of new, highly innovative, pre-competitive research that lays the foundation for providing new industrial products and processes with significant competitive advantages over the current state-of-the-art.

The principal objectives were:

- the identification of new catalytic reactions and methodology;
- the identification of new reaction media, supports and approaches;
- the utilisation of new methodologies in target synthesis;
- the promotion of new connectivity and ways of thinking among the catalytic community;
- the promotion of the involvement of highly motivated young co-workers in the development of this area.

The Action has successfully acted as a focus for the use of collaborative approaches to catalysis, e.g. DFT calculation/kinetics, ligand exchange, cross-screening of catalysts in additional reactions, outreach activities with other research projects and industrial stakeholders.

Over 50 Short Term Scientific Missions (STSM) took place in the duration of this Action, as well as a unique STSM Promotion Meeting (2009) and a Computational Training School (2010). These meetings have fostered essential collaboration and knowledge transfer between the younger and the more experienced generations of members.

The Action has published over 50 collaborative research papers - significantly, some of these have led to the genesis of new research areas.

The Actions has fostered important and innovative approaches to new chemistry, which will contribute to a more sustainable preparation of important functional chemicals, such as, pharmaceuticals and starting materials for new polymers.
The main objective of the Action was to increase the knowledge of the chemistry of metal-based systems for molecular imaging applications; and furthermore, to apply this knowledge to the development of metal-based imaging probes for cellular and molecular imaging applications, based on MRI (magnetic resonance imaging), PET (positron emission tomography), SPECT (single photon computed tomography) and optical imaging.

Successful clinical applications require high-specificity, high-sensitivity imaging probes - a special class of pharmaceuticals that are used in conjunction with medical imaging scanners, such as MRI (Magnetic Resonance Imaging) and ultrasound and nuclear imaging, allowing healthcare practitioners to see disease and injuries in a non-invasive way.

Thanks to a multidisciplinary approach, the Action was very successful in developing a wide range of imaging probes for Optical, Nuclear and Magnetic Resonance Imaging.

- **MRI agents:** novel, optimised chelators for GdIII and MnII complexation; novel macromolecular scaffolds; high field agents; bimodal imaging probes; new nanoparticles.
- **Optical agents:** Lanthanide luminescent probes suitable for in cellulo imaging and visualisation of cellular molecular events. Luminescent probes suitable for time resolved optical imaging. Responsive probes allowing the analysis of selected parameters (pH, pM, bioactive species) inside or outside the cell.

- **Nuclear agents:** Progress on the chemistry and evaluation of positron emitters like 89Zr, 64Cu and 68Ga. The development of a PET radionuclide generator 44Ti/44Sc, adapted to imaging of long biological processes.

The molecular imaging approach has also had a major impact on the development of new pharmaceuticals. The regulatory agencies welcome the use of surrogate or bio-markers to accelerate drug approval procedures.
The main objective of the Action D39 was to increase knowledge and understanding of the design and mechanisms of action of metallo-drugs and to use this enhanced knowledge in combination with modern genomic research to develop new classes of metallo-drugs with truly novel mechanisms of action and novel spectra of biomedical activity.

The Action successfully expanded and identified new classes of metallo-drugs as well as determined possible new biological targets. The impact of the network is shown by the impressive number of over 200 joint publications, which arose from direct collaborations both within and across the Working Groups (WG).

Furthermore, nine patents have been filed and at least one of which has been licensed for development. Two compounds encompassed within the description of this Action are currently in human clinical trials as anti-cancer drugs.

The Action has successfully contributed to the development and exploitation of this crucial biomedical field which has important benefits for the quality of life of European citizens (patient treatment and care in particular those combating cancer).

Metallo-drugs can be classed as any drugs that contain a metallic element such as silver or platinum; anti-cancer drugs are very often metallo-drugs.
The main objectives of this Action was to promote a chemical biology approach for the study of radical-based functioning and damaging processes occurring in the biological environment.

The Action aimed to improve communication and exchange among neighbouring scientific fields, such as chemistry with several domains of life sciences, specifically addressing the real barrier - specialist language and tools. Furthermore, the Action hoped to provide young researchers with a multi-faceted training experience.

This Action was highly successful. Of particular note is its research on the role of radical stress in the selective modification of amino acid residues; its studies of unsaturated lipid transformations in signaling and damaging pathways; and its work on the effects of inhibitor/preventive systems (chemical or enzymatic) for radical-based damages.

The Action can boast a number of significant achievements:

• the discovery of molecular mechanisms related to free radical stress and integrated vision;
• the implementation of purine 5', 8-cyclonucleosides as biomarkers of DNA damage;
• the development of a trans-lipid library for the recognition of endogenous radical stress and dietary intake;
• the development of molecular libraries for the recognition of radical damages and biomarker development.

Chemical reactivity and molecular libraries are the start of a multidisciplinary research context ‘from small molecules to large systems’, culminating in the biological complexity.
Excessive or insufficient angiogenesis (new blood vessel formation) is associated with many human diseases, including cancer. For effective disease intervention, an interdisciplinary research approach is essential.

The overall aim of the Action is to improve effective introduction, exploitation and improvement of modern methods for the development of new angiogenic inhibitors. The Action focused on networking of interdisciplinary oriented chemistry and biology researchers who are actively involved in rationale designing and development of small organic compounds with anti-angiogenic properties.

There are three notable successes of this Action:
1. the clarification of the main biological targets for the design of small-molecules inhibitors;
2. the design and synthesis of new inhibitors;
3. the biological evaluation of different synthesized compounds in various assays.

The Action was highly successful in developing interdisciplinary collaborations and in fostering direct involvement from industry players – a central objective of the project. These collaborations have resulted in a number of joint publications and the successful patenting of a new TK (Tyrosine Kinases) inhibitor.
Molecular structure-performance relationships at the surface of functional materials

COST Action D36

The main aim of the Action was to increase the fundamental knowledge and understanding of the chemistry occurring at surfaces and interfaces and the factors that tune it. The Action’s secondary objective was to gain advanced knowledge for modelling/predicting of the structure/composition reactivity/surface properties relationships of the materials, by means of characterisation of the bulk and surface properties under real operation conditions and for preparing materials with tuneable properties.

The cooperative and interactive nature of the Action has resulted in a number of notable successes.

- A joint experiment achieved results by performing high sensitivity low-frequency impedance measurements, which could discriminate subtle effects of intramolecular interactions. This solves a problem of supramolecular protection of reactive forms of fullerene. These derivatives will be applied in pharmacology and other fields.

- A further collaboration on total oxidation of CH4 over very active and selective Pd/TiO2-SiO2 catalysts demonstrated, for the first time that two forms of sulphate species exist. The sulphate species responsible for deactivation can be removed (reactivation) by methane at 350°C.

- Another collaboration developed novel nanocrystalline CeO2; the nanocrystalline cubic ceria was obtained at room temperature with a specific surface area of 180 to 250 m2/g and maintains its features up to 400 °C.

- Significant progress has been made on theoretical electrocatalysis at metal nanostructures (H2 evolution reaction) that provides valuable insights into the dynamics of hydrogen evolution and oxidation at nanostructured surfaces.

The significant success of this Action is a direct result of its dedication to interdisciplinary collaboration and cooperation. Novel results and breakthrough developments have had an impact on sustainable process and energy use, as well as on biocompatibility. These developments will have a significant socio-economic impact.

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Chair of the Action
Prof. Miguel Banares (ES)

Vice Chair of the Action
Prof. Robert Schoonheydt (BE)

Duration of the Action
2005-2011

Parties
Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 24).

Action D36 website

D36 Action page on COST web
The main objective of the Action is to increase the knowledge and understanding of molecular, electronic, photonic, magnetic and spintronic behaviour and to design new active chemical systems and processes that could find use in molecular devices.

The Action activity focused on:
• the design and synthesis of molecular building blocks and their organisation into molecular systems with new photonic, electronic, magnetic and spintronic behavior;
• the search for and investigations of photonic, electronic, magnetic and spintronic properties and processes ranging from a single molecule level to understanding of environmental effects, molecular cooperativity and build-up of organised molecular nano- and micro-size systems;
• the development of a consistent methodology for: quantum-chemical methods to simulate environmental effects and dynamical processes; time and space-resolved methods; laser control in condensed phase; and property evaluation.

The Action contributed to:
• the development of new approaches to solar energy harvesting: broadband photosensitisers, quantum dots, p-type semiconductors.
• advances in the area of molecular spintronics: single-molecule magnetism of lanthanide-phtalocyanines anchored to single-walled carbon nanotubes;
• the determination of rate and mechanism of ultrafast spin-changes in heavy-metal based photosensitisers.

An important result of this Action is the development of the first nano-structured thin films and nanodots of a Fe spin-crossover compounds photoswitchable at room temperature by laser pulses or chemical stimuli. This represents a great leap towards molecular photomagnetic memories and magnetochemical sensors.
The ESSEM Domain encompasses the rapidly-growing science and technology agendas relating to better understanding, observing, modelling and of the Earth system and thereby improved management of environmental conditions.

It emphasises science and technology activities 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.

Domain Committee Chair
Dr. Ipek Erzi

ESSEM Website
The main objective of the Action was to develop the tools for, and the production of, best estimates of global air-sea fluxes of climate and air pollution relevant gases, including, but not limited to CO2, dimethyl sulphide DMS, halogenated hydrocarbons, nitrous oxide, trace metals and nutrients. The Action recognised the critical importance of the air-sea interchange in the regulation of the earth’s climate; and sought to create tools that enhanced our understanding of these processes and improved our ability to monitor and predict future climate.

The participation of Early Stage Researchers (ESRs) has been instrumental to the progress of the Action. There were 19 STSMs throughout the Action’s lifetime, utilised primarily by young scientists to develop data sets, experimental methods and gas flux products. The Action has so far produced 19 publications, with 5 further publications currently at press.

The Action has made strong links to the Surface Ocean-Lower Atmosphere Study (SOLAS); SOLAS is an International Geosphere-Biosphere Programme core project dedicated to understanding the physical and biogeochemical interaction between the atmosphere and ocean, particularly those processes that interact with climate and climate change. Strong ties with SOLAS and non-COST countries (e.g., Canada, USA and Japan) have enabled access to additional expertise and a considerably wider audience.

Significant scientific breakthroughs include the establishment of databases on MarinE MethaNE and NiTrous Oxide (MEMENTO), on Halocarbons in the Ocean and Atmosphere (HalOcAt) and on Dimethyl Sulphide. One spin-off of the Action has been the IRONMAP project, which aims to collate databases of available atmospheric aerosol iron measurements. IRONMAP is funded by the Natural Environment Research Council, UK.

The final publication of COST Action 735 entitled ‘Ocean-Atmosphere Interactions of Gases and Particles’ will be published by Springer in late 2012 and will be available online to download, as open access, for the wider community to utilise.
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. This Action brings together leading European scientists to address the issue of atmospheric water vapour and its impact on climate.

The main objective of the Action was 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.

The Action addressed a range of research areas, including atmospheric monitoring, data analysis and modelling. A strong emphasis on interdisciplinary networking linked diverse scientific communities such as the upper troposphere/lower stratosphere communities together with those of the lower level water cycle and the communities of both the atmospheric dynamics and of chemistry.

This Action can boast a number of achievements.

- Substantial progress has been made in characterising and inter-comparing instruments for water vapour measurements. These include comparing active and passive ground-based remote sensing systems and their potential usage in operational networks, comparing ground-based and airborne lidar measurements of water vapour with balloon-borne and satellite measurements.
- The Action addressed water vapour measurements with GPS techniques. New datasets on upper atmosphere water vapour have been produced from the MIPAS and ODIN satellite instruments.
- There has been a substantial contribution to the GCOS Reference Upper-Air Network (GRUAN) climate observations established by the Global Climate Observing System initiative of the World Meteorological Organization (WMO). The Action has addressed the issues of quality reference and the accuracy of temperature, pressure and humidity measurements by radiosondes.

The Action established two online databases compiling: (i) literature on various water vapour measurement techniques; and (ii) inter-comparisons of cross validation tables between satellite and balloon instruments. The Action organised two very successful schools (one Summer School and one Winter School) on atmospheric water vapour and its role in the climate system. These two Schools involved 26 lecturers and trained over 120 students from nearly 30 countries.

The results of the Action are published in a special issue of the open access journal Atmospheric Chemistry and Physics (ACP), entitled ‘Water Vapour in the Climate System (WAVACS) COST Action’, available for download here.
Adequate protective and pre-emptive measures against aeroallergens require both the reliable assessment of production and release of various pollen species and the forecasting of their atmospheric dispersion. The pollen-related research is currently conducted within several scientific disciplines, countries and targeted activities; however, their coordination needed substantial improvements.

The main objective of the Action was to set up a multi-disciplinary forum for the critical review of existing information on allergenic pollen in Europe and its representation in assessment and forecasting systems. Furthermore, the Action aimed to:

• improve the coordination of on-going research;
• develop a strategy and an action plan that bridged the gaps of knowledge;
• strengthen the dialogue with end users.

The Action has included practically all stakeholder organisations and key scientists in Europe and has representatives from all main initiatives in this area. This tremendous diversity has been the main reason for its success; the multi-disciplinary forum includes meteorologists, mathematicians and physicists, biologists, botanists and aerobiologists - cooperating with practicing doctors, representatives of authorities, university professors and teachers.

The influence of the Action led to the inclusion of pollen forecasting in the GMES (Global Monitoring for Environment and Security) programme of the European Commission (EC) and the European Space Agency (ESA) at its pre-operational stage. This was a major breakthrough in terms of the initiation and development of air quality services concerning ‘pollen pollution’. Another principle focus of the Action was establishing a scientific basis for the evaluation of the human sensitivity to allergenic pollen and for computation of the concentration thresholds. The latter will be suggested as a scientific justification for the potential legislation related to the allergenic air content.

One of the key successes of this Action has been its participation in the establishment of the European Aerobiological Society - the foundation of which will ensure enduring cooperation and collaboration in research and education in this field. A further success has been the establishment, in 2009, of the EU project ‘Health Impacts of Airborne Allergen Information Network’ (HIALINE). HIALINE focuses on evaluating the effects of climate diversity and change on airborne allergen exposure. It also aims to implement an outdoor allergen early warning network.

The Action has created a state-of-the-art review, which investigates several, complex and poorly understood biological, meteorological and climatic factors, which can significantly affect the timing and strength of pollen seasons.

This review will be published as a book with Springer Publishing and contribute to an integrated coordination of pollen-related research.
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.

There are already many statistical homogenisation procedures aiding the detection and correction of these inhomogeneities. The many variations in methodology, however, can be seen as a negative factor; and only a limited number of publications inter-compare some common methods and their impact on the climate record. COST Action ES0601 stemmed from the need of a coordinated European initiative, which would produce standard methods designed to facilitate such comparisons and promote the most efficient methods of homogenisation.

The main objective of this Action was to achieve a general method for homogenising climate and environmental datasets. The objective was to create an improved synthesis of the most effective statistical procedures for detection and correction of Essential Climate Variables at different space and time scales.

The core of this Action was the benchmark experiment - the first of its kind, where a synthetic data set with known inhomogeneities was generated and distributed to 26 ‘blind’ contributors. The blind contributors did not know the original non-perturbed series; in this way, different algorithms could be applied and tested, but most homogenisation methods needed human input.

This experiment emphasised the importance of homogenisation implementation by the operator and thus, the need for training. The review article on the benchmark experiment is available to download from the open access journal of *Climate of the Past*.

One of the key deliverables of this Action was the development of the software package HOMER, which aims to combine all the best aspects of most efficient homogenisation procedures. An operational version of the software and a set of user guidelines are already available; additional technical features are envisaged.

The Action was also very successful in terms of numbers of ESRs, through 28 STSMs and the organisation of two Training Schools. The Action has so far contributed to 25 peer-reviewed articles and a large number of conference presentations.
As air pollution crosses national borders, it would be cost-effective and beneficial for society and to decision-makers if national chemical weather forecast and information systems were networked and seamless across Europe.

The main aim of this Action was to provide a forum for harmonising, standardising and benchmarking approaches and practices in data exchange and multi-model capabilities for chemical weather forecast and (near) real-time information systems in Europe. It aimed to examine existing, and to work out new, solutions for integrating the development efforts at national and international levels. Specifically, the Action aimed to serve as a platform for the information exchange between the meteorological services, environmental agencies and international initiatives.

This Action has successfully provided a forum for multi-model capabilities for chemical weather forecasting and near real-time information services in Europe. There are a number of notable successes for this Action.

- The Action has collected an extensive review on the operational air quality forecasting models on a regional and continental scale and evaluated the physical and chemical structure of these models.
- The Action highlighted the most prominent gaps of knowledge for such models and suggested priorities for future research directions.
- An extensive research network has been constructed, including collaboration and contacts with all major EU-funded projects in this field, as well as with the key institutes in Europe and worldwide.
- The Action contributed to more than 40 peer-reviewed articles as well as to numerous other publications including reports, conference abstracts etc.
- The Action has provided recommendations on best practices on the dissemination of chemical weather information towards the public and decision makers. The Action has also responded promptly to emerging research and emergency response needs, such as the Eyjafjallajökull volcanic eruption, the forest fires in the surrounds of Moscow and the Fukushima nuclear incident in Japan.

One of the most significant outcomes of this Action has been the European Chemical Weather Forecasting Portal, covering 30 regions in Europe, which includes access to a substantial number of chemical weather forecasting systems and their numerical forecasts.

This is a registered GEOSS (Group on Earth Observations) service, which is updated and enriched with new functionalities with the support of FMI (Finnish Meteorological Institute) and AUTh (Aristotle University of Thessaloniki). The portal will continue and develop through the new Action ES1004 'European framework for online integrated air quality and meteorology modelling'.

Towards a European Network on Chemical Weather Forecasting and Information Systems (ENCWF)

COST Action ES0602

Chair of the Action
Prof. Jaakko Kukkonen (FI)

Vice Chair of the Action
Prof. Konstantinos Karatzas (EL)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom (Total 21). Non-COST Institute participation from the Voeikov Main Geophysical Observatory (RU).

ENCWF website
ENCWF Action page on COST web
The main objective of the Action was the evaluation of possible impacts from climate change and variability on agriculture and the assessment of critical thresholds for various European areas. Particular attention was devoted to the quality of production, which represents the main goal of European agricultural policy, but also to the eco-environmental impacts.

Further objectives included:

- to collect and review existing agroclimatic indices and simulation models, in order to assess hazard impacts on European agricultural areas;
- to apply climate scenarios for the next few decades;
- to define a set of harmonised criteria to evaluate the impacts of climate change and variability on agriculture;
- to define warning systems guidelines.

The Action has enjoyed a number of successes.

- It has provided a better assessment of uncertainties in the applied methods such as identified by crop model comparisons and their sensitivities, opening the way for more accurate predictions in the future.
- The Action’s cross-country exchange of data and indicators could provide a new innovative way to improve crop modelling.
- The Action has been the basis for the development of many spin-off national programs involving experts participating to the Action, for example, Romania, Sweden and Bulgaria.
- The Action was extremely active in the organisation of two symposia and the publication of four books, ten reports, three proceeding and numerous peer-reviewed articles. The involvement of ESRs was promoted through 21 STSMs and two training Schools.

The results of this Action have provided estimates of future, climate change effects on crop yield and related effects on crop management in the long-medium- and short-term scales (20-50 years).

This provides a basis for an assessment of costs and benefits at the European scale and can give background for policy decisions, for example, within the reform of the Common Agricultural Policy.
The FA Domain covers all aspects of research in the field of agricultural and food sciences in its widest sense. 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 Domain naturally encompasses a very wide number of subjects and relates to a large number of areas of human activity. It 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.

Domain Committee Chair
Dr Jose Pueyo

FA website
The Action was dedicated to delivering proactive solutions to bacterial diseases on stone fruits and nuts in order to support the sustainable production of high-quality crops and to preserve the unique place these trees have in European cultural traditions. The Action covered all bacterial diseases of stone fruit and nut trees grown in the European region. In total, 16 pathogens were considered.

Specifically, the Action aimed to develop strategies to prevent the biological invasion and spread of bacterial diseases of stone fruits and nuts. These strategies were to be used for the design of integrated approaches for plant health management.

This Action can boast a number of achievements. In particular, the Action directed a lot of its work towards genomics - over eight additional bacteria were sequenced during its duration (P. ananatis, P. agglomerans, E. persiciinus, X.a.p. 2; X.a.f., all Agrobacterium sequesvar and Xa.j.). In this field, the Action was able to support essential partner-to-partner knowledge transfer and training in genomics analysis and bioinformatics. Moreover, the Action actively moved towards a practical implementation of genomics, in order to develop innovative diagnostics tools and insights into virulence and biodiversity.

The Action has also been most successful in levelling the gaps in awareness of these diseases and in providing consistent methodologies towards control options. The training course on the biosecurity pathogen Xylella fastidiosa provided the first of its kind in Europe and successfully recruited new expert partners from the host organisation MAI-B (Mediterranean Agronomic Institute Bar) and from UC Berkeley USA.

STSMs from across Europe and from South Africa, Ukraine and Australia were highly successful and more importantly, were involved in active collaborative research – guaranteeing a high level of relevance and experience to ESRs.

The Action has successfully linked laboratories for the development/ validation of diagnostic methods, forecasting modelling, plant germplasm screening and elucidating disease etiology.

In line with its original objectives, the Action has successfully created a network of scientists (e.g., bacteriologists, tree breeders, epidemiologists), industry (including grower groups) and government representatives (Plant Protection Officers) throughout Europe in order to provide a proactive response to chronic and emerging disease threats.

Chair of the Action
Dr Brion Duffy (CH)

Vice Chair of the Action
Ms Tanja Dreo (SI)

Duration of the Action
2006-2011

Parties
Austria, Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Greece, Hungary, Israel, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Spain, Switzerland, Turkey, United Kingdom (Total 24).

Non-COST Institute participation from American University of Beirut (LB), Forestry and Agricultural Biotechnology Institute (FABI) (ZA), HortResearch Ruakura Research Centre (NZ), Institute of Horticulture (UA), Landcare Research New Zealand Ltd (NZ), University of Tasmania (AU), Victorian Department of Primary industries (Vic DPI) (AU).

873 Action website
COST 873 Action website
The main aim of this Action was to stimulate innovative collaborative research towards understanding the regulatory mechanisms of abiotic stress signalling pathways leading to the production of major stress-protective plant compounds. By stimulating scientific exchange among molecular geneticists, biochemists, plant physiologists and breeders, the network program aimed to identify the key regulators of plant abiotic stress responses and their essential stress-protective end-targets.

The Action has successfully created one of the largest international networks dealing with plant abiotic stress. It is composed of 79 participants from 40 countries and has active collaborations with industrial partners like Metapontum Agrobios (Italy) and Bayer BioScience (Belgium). Several members of the Action have also registered several patents. It is hoped that these will lead to further collaborations between academia and private companies.

The Action has also been very successful concerning the dissemination of results. The four annual international workshops were attended by over 350 participants including leading scientists. Action members have attended and presented at national and international scientific events. The ca. 30 STMS were highly innovative and successful and some of them have produced joint publications. There were a number of noteworthy discoveries in this Action.

- The Action has shown that the epigenome is an essential factor controlling stress-regulated transcription. Evidence was provided for immediate and heritable effects of stress (temperature and UV-B stress) on genome stability. These discoveries are very important for designing strategies to obtain durable stress tolerance in plants.
- Novel tools have been developed to allow studying larger genomic regions - modified target genes alone or as part of a larger gene cluster can be transferred by high-frequency gap-repair into plant transformation vectors, stably maintained in Agrobacterium and transformed into plants. This novel technology promises versatile application in experiments requiring the transfer of large DNA fragments.

The Action has resulted in various studies, which are essential to identifying limitations in breeding strategies for an increased yield in many important economic crops, such as the tomato.
The Water Framework Directive (WFD) requires improvement to the quality of surface and groundwaters. This may require drastic reduction in nutrient loss from agricultural land with the related implications for the long term economic and environmental sustainability of agricultural systems.

The main objective of the Action was to undertake a scientific evaluation of the suitability and cost-effectiveness of different options for reducing nutrient loss to surface and groundwaters at the river basin scale, including their limitations in terms of applicability under different climatic, ecological and geographical conditions. More specifically, the Action concentrated on nitrogen (N) and phosphorus (P) losses.

The Action had four main objectives:
1. to localise critical source areas in catchments, where mitigation actions are most likely to be environmentally cost-effective (Working Group 1);
2. to study the influence of nutrients on ecological processes in surface waters and the influence of ecology on the choice of mitigation options (Working Group 2);
3. to evaluate for various mitigation options the cost effectiveness, implementation aspects and the influence of scale, climate and other physical factors (Working Group 3);
4. to evaluate ongoing mitigation projects in example areas across the EU (Working Group 4).

The Action’s objectives were successfully concluded. Most importantly, an overview of different categories of mitigation options and over 80 potential measures have been described. In order to disseminate this information to policy makers, watershed managers, intermediaries, innovative farmers etc., a factsheet for each measure has been compiled. Each factsheet featured a general description of the measure and information on rationale/mechanism, applicability, effectiveness including uncertainty, timeframe, environmental side effects / pollution swapping, potential for targeting, cost in terms of investments and labour needs and references.

Furthermore, the Action’s work concluded that the time needed for soil ecosystem to recover (i.e. to reduce leaching) is longer than generally expected. Recovery of an aquatic ecosystem may take even longer. This has been communicated to national and European Authorities.

The significant success of the Action was its updated understanding of the impact of a buffer zone on water quality. The Action brought together and fostered collaborations between various disciplines: hydrology, aquatic ecology, agronomy, soil biology, soil chemistry, sociology and economy.
The main objective of the Action was to establish a network of researchers to cooperate on the improvement of knowledge on fish reproduction in relation to fisheries and the enhancement of the current assessment methodology in order to promote sustainable exploitation of marine fish resources.

Furthermore, the Action investigated the causes that produce variations in stock productivity by estimating fish stock reproductive potential and incorporating this knowledge towards better practice in fishery management.

The Action has developed a set of new methodologies in order to facilitate the data collection of reproductive parameters according to stock reproductive potential, including improved methods of estimating egg production. The findings on the causes of variation in stock reproductive potential have been conclusive: it has shown that factors affecting female members of fish populations are critical to stock productivity (e.g., female age, size and weight).

Action members have created free open source fisheries software in order to improve assessment advice, reduce uncertainty and promote sustainability - sustainability that can incorporate the new findings on stock reproductive potential.

The most significant result of the Action has been the exchange of knowledge between experts of different ecosystems, providing us with a more global view of the problem, which has changed our perception on fishery management.

As a direct consequence, this Action has become a lobbying group, fighting for the awareness of the importance of stock reproductive potential to the fishing industry and fisheries managers.
The main goal of this Action was to bring the mitochondrial and nutrition research community together and build an integrated European research community aimed at understanding the interdependency between bioactive food components and the mitochondrial function.

The Action focused on:
- Strategies, methods and determination of mitochondrial requirements for specific nutrients;
- Identification of new food bioactives that affect mitochondrial function;
- Understanding how nutrients affect mitochondrial function.

The Action successfully linked the medical and nutritional scientific mitochondrial communities and improved networking. A series of seven scientific meetings created invaluable networking opportunities. In addition, 40 STSMs facilitated an exchange of knowledge and collaborative research and 5 Training Schools, focusing on ESRs, were organised.

Research integration is shown by collaborative research proposals, a large number of primary research papers and several review papers. Action members participated in 11 international meetings on topics ranging from nutrition to bioenergetics and from obesity to reproduction.

Probably the most important scientific advance is the spreading realisation that nutrition can be a significant factor in the fight against disease, including metabolic disease, cancer and mitochondrial disease. Mitochondria have also attracted the attention of the food and pharmaceutical industries. Targeting mitochondria with bioactive food components is now seen as a viable strategy to combat metabolic disease, cancer and to promote healthy aging.

Mitochondria convert nutritional energy (sugar, protein, fat and alcohol) into body energy (ATP). Mitochondria are considered to be ‘well coupled’ if they do this efficiently. With uncoupling, energy is converted into heat rather than into ATP. This is a potential strategy against overweight and obesity.

There are two ways to uncouple mitochondria, by specific nutritional or chemical compounds or by the presence of uncoupling proteins. Mitochondria of brown fat naturally have uncoupling proteins. The recent elucidation of the presence of brown fat in humans by members of the Action has opened the way to develop strategies to maintain or increase the amount of brown adipose tissue or stimulate the uncoupling function and thus improve healthy aging and combat obesity. Several members of the Action are also involved in the identification of mechanisms and chemical compounds that stimulate uncoupling.
This Action has successfully brought and applied genomics to the Triticeae and has started a strong collaborative network that is collecting the fruits of a four-year valuable cooperation.

The challenge facing us today is to increase productivity of Triticeae cereals (wheat, barley and rye) in a way that is, simultaneously, environmentally sustainable and affordable in terms of price. For science, this translates into the need to access available germplasm resources for crop improvement effectively; and to identify, for example, which genes and genetic variants of the germplasm are responsible for the yield or disease resistance traits. It is necessary to understand how these genes work together so that they can be combined.

The main objective of this Action was to coordinate, focus and strengthen national and pan-European Triticeae genomics research and to address infrastructure disparities. Genomics, the discipline studying genes, their role and properties, is beginning to make an accurate and rapid use of germplasm resources and the acceleration of breeding possible. The focus of this Action was to create such a genomics toolbox for Triticeae cereals.

Within the work of the Action, methods to rapidly characterise multiple samples genetically were developed and implemented as a scientific community and new genetic fingerprinting systems were taken into usage. These resulted in the construction of high-density genetic maps, which are highly useful for finding chromosome regions carrying useful traits for sustainability and quality.

As a key component of the toolbox, the development of physical maps for barley, rye and wheat anchored to genetic maps have been completed. This means that new generation sequencing technologies can now be applied to species with large genomes containing huge amounts of repeated sequences.

Regarding the genomics tools aimed at understanding the genes behind traits to cope with climate change, profiling methods were developed for both wheat and barley. The Action resulted in exciting new information on the effects of domestication on agronomically important candidate genes.

Collaborations within the Action led to identifying better tools and a more efficient use of existing tools and provided improved access to the various genomics resources.

The Action helped transfer knowledge from large to small research centres and bring breakthrough approaches to those researchers with less funding. The knowhow and resources for introducing genes, silencing genes and tagging genes were shared within the Action, thanks to experienced members sharing access with those peers in need of more advanced technical platforms.

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Plant proteomics in Europe (EUPP)

COST Action FA0603

Proteomics is the large-scale analysis of proteins in biological systems at a certain point in time, aims to identify all proteins present and to characterise their qualitative and quantitative modifications, for example in response to environmental changes. Although protocols have been developed to perform proteomic analysis in the human, animal and microbial life, the plant kingdom still awaits a systematic approach for proteome analysis.

The main objective of this Action was to build up expertise in plant proteomics through an integrated network of European scientists. Furthermore, the Action aimed to develop and share new tools for proteome analysis in fundamental and applied plant research areas.

These tools would generate fundamental information about plant metabolism, investigate responses to environmental constraints and assess food quality. The Action exceeded initial expectations. The Action expanded on a global scale, with more than 70 laboratories, involving more than 250 participants, with similar spin-off networking initiatives in Asia, America and Oceania.

As this Action specifically addressed a technical point (rather than a scientific issue), a review of the technical improvements is an essential indicator of the Action’s success. Concrete results include new protocols proposed to the network of European plant proteomists:

- on the analysis of membrane proteins, first site of external information detection in plant cells;
- on new methods for extraction and quantification, essential to provide clean samples and reproducible analyses;
- on reliable identification of proteins, to allow integration of proteomic data in the global response to the scientific issue raised.

A significant outcome of this Action was establishing the protocol for seed proteins extraction and identification.

Chair of the Action
Dr Jenny Renaut (LU)

Vice Chair of the Action
Prof. Lutz Eichacker (DE)

Duration of the Action
2007–2011

Parties
Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Republic of Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 26).

Non-COST Institute participation from the New Zealand Institute for Plant & Food Research (NZ).

EUPP website
EUPP Action page on COST web
Welfare of fish in European aquaculture

COST Action 867

The main objective of this Action was to improve knowledge on fish welfare and formulate a set of guidelines for a common and scientifically sound understanding of the concept of the welfare of farmed fish and construct a range of targeted operational welfare indicator protocols to be used in the industry.

This Action was particularly successful: it considerably improved knowledge on fish welfare and formulated a common set of guidelines for farmed fish.

The Action facilitated communication between ongoing initiatives at both national and international levels. Members of the Action were actively involved with representatives of the European Commission’s Directorate-General for Maritime Affairs and Fisheries.

Furthermore, the Action headed several sessions during meetings organised by the European Aquaculture Society (EAS) and was presented at the World Aquaculture Society. The Action also actively interacted with the European Food Safety Authority Panel on Animal Health and Welfare (AHAW).

Fish Farmers Association (FEAB) and the fish welfare panel of the European Food Safety Authority (EFSA).

This Action has enjoyed a pan-European participation of experts from 23 European countries highlighting the invaluable importance of welfare for fish and the need for a coordinated and collaborative research project on this issue.

The European industry now acknowledges the importance of fish welfare beyond that of health by including within the European Aquaculture Technology and Innovation Platform (EATIP) a special section dedicated to welfare as an important production factor by itself.

Chair of the Action
Prof. Anders Kiessling (NO)

Vice Chair of the Action
Prof. Marco Saroglia (IT)

Duration of the Action
2006-2011

Parties
Belgium, Cyprus, Czech Republic, Denmark, Finland, Former Yugoslav Republic of Macedonia, France, Greece, Hungary, Iceland, Ireland, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 23). Non-COST Institute participation from the Leigh Marine Laboratory, University of Auckland (NZ) and the National Centre for Marine Conservation and Resource Sustainability Australian Maritime College, University of Tasmania (AU).

Action 867 website
867 Action page on COST web
The main objective of the Action was to increase knowledge on the implementation of arbuscular mycorrhizal fungi (AM fungi) in agricultural systems, using a multidisciplinary approach. More specifically, the Action aimed to deepen research on plant breeding in order to detect the plant genes involved in mycorrhization. The ultimate aim was developing crops with an enhanced responsiveness and colonisation of AM fungi. It was expected this would lead to an enhanced use of mycorrhizal resources in agriculture and thereby increasing the sustainability of agriculture.

This Action had a number of both scientific and technical successes.

1. Novel university programmes on plant breeding at universities have begun and the interest of breeding companies has been raised.
2. New approaches for plant breeding under development and new collaborations set up with AM fungal producers.
3. Developing molecular techniques for quality assessment of mycorrhizal fungi.
4. Standards for an independent quality label have been set in collaboration with the International Mycorrhizal Society (IMS). It is hoped that this will be launched at the International Conference on Mycorrhiza in India in 2012.

The key success of this Action has been its facilitation of discussion and cooperation between scientists from different disciplines (plant breeders and soil scientists) and between scientists and companies. In fact, one large producer of mycorrhizal fungi has taken on the quality standards as established by this Action.
Combining traditional and advanced strategies for plant protection in pome fruit growing

COST Action 864

The main objective of the Action was to establish a network of plant protection specialists dedicated to gaining a deeper understanding of the major disease and pest constraints on apple and pear trees. The ultimate aim was to develop integrated and sustainable orchard systems that delivered high quality, healthy pome fruit to European consumers.

The research focused on plant-pathogen-interactions, germplasm-resources and breeding, production methods and biotechnological approaches. The Action’s main scientific highlights were:

- Complete genome sequencing of the apple and the fire blight pathogen (Erwinia amylovora);
- Elucidation of the phloridzin – the main phenolic compound in the apple plant;
- Biosynthesis, development of rapid diagnostic and source-tracking methods for fire blight;
- Identification of the first fire blight resistant gene in apples;
- Identification of molecular markers for fire blight resistance;
- Identification of several antimicrobial compounds as new protection agents against diseases in apple and pear plants;
- Policy promotion of cisgenesis as a soft approach to the genetic engineering of pome fruit trees;
- The creation of the first scab resistant Gala apple;
- Utilisation of early-flowering transgenic apple plants in speeding up the breeding process.

The network has had several important socio-economic impacts. It contributed to the preservation of biodiversity by collecting germplasm resources as important genetic diversity backups for breeding programs. The Action helped improve and simplify detection methods for the fire blight pathogen. This is expected to speed up decision-making process.

The Action also coordinated the European-wide attempts to advance procedures of genetic modification and to establish marker-free selection systems instead of using antibiotic-resistance genes.

Chair of the Action
Prof. Karl Stich (AT)

Vice Chair of the Action
Dr Brion Duffy (CH)

Duration of the Action
2006-2011

Parties
Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 25).

Action 864 website
864 Action page on COST web
Exploiting genomics to understand plant–nematode interactions

COST Action 872

The main objective of this Action was to develop a coordinated approach to exploiting genomics information that is resulting for plant parasitic nematodes and host crops. This Action aimed to coordinate research in this area ensuring that genomic information and new techniques are efficiently exploited.

EU farmers face problems from indigenous and introduced species of these parasites. The recent withdrawal of many effective nematicides – chemicals used to control nematodes – has exacerbated the issue. Some varieties of crop plants have natural resistance genes, enabling them to fight off specific pathogens. While this natural resistance offers the best route for controlling nematodes, it may not be available in commercially-viable cultivars, plants or groups of plants selected specifically for their desirable characteristics, i.e. its profitability for farmers.

There is thus an urgent need for new strategies to control nematodes and for innovative tools to facilitate plant breeding. This Action enabled substantial advances:

- Identifying nematode proteins that suppress host defences;
- Identifying the first nematode avirulence gene;
- Using the nematode Avr gene to track resistance in crops, leading to new tools for breeding and accelerating the development of resistant cultivars.

The Action made great efforts to ensure the dissemination of results to the wider nematology community and to publicise the great achievements and progress made by members.

In 2010, the European Society of Nematologists (ESN) was invited to a workshop detailing the extensive work of the Action. Over 120 delegates from the ESN attended the event in Vienna.

A scientific highlight of COST Action 872 was its major contribution to the sequencing and annotation of one of the world’s most destructive plant pathogens, the root knot nematode *Meloidogyne incognita*.

The estimated cost of damage to crops each year.

The final meeting of this Action was held in conjunction with the annual International Symposium on Crop Protection (ISCP) meeting. This allowed the work of the Action to be communicated to over 580 attendees, including industry representatives.

The Action members achieved their main goal and created a high-level international research network – whose work is now recognised across Europe. The work undertaken by this Action underpins the development of new strategies for breeding and increasing resistance, as well as targets for new, specific and environmentally-benign control strategies against plant parasitic nematodes. Its focus on ESRs ensured a legacy of expertise to continue on the work of this Action.
The main objectives of the Action were:
1. Generating a synergistic approach for the utilisation and upgrading of different biomaterials;
2. Assessing the potential of enzymes for surface functionalisation as well as the production of recombinant biopolymers with special functions;
3. and together with advanced and sustainable clean processing technologies, generate new added-value polymer products with a broad application range.

The Action successfully showed that novel highly sophisticated technologies can introduce new functionalities to the surface of polymer materials leading to smart products with applications in medicine, cosmetics, construction or technical textiles. Concrete scientific developments with market potential range from functional lignocellulose materials (antimicrobial MDF) to smart textiles, bioresponsive controlled release bandages for infected wound treatment or targeted drug delivery with folate functionalised biopolymer nano-capsules.

There were two key outcomes:
1. The development of sophisticated surface modification techniques using enzymes to specifically form cross-linkages or novel functionalities to polymer surfaces.
2. The production of recombinant functional/hybrid biopolymers was used to obtain smart renewable materials.
The FPS Domain has the mission to promote research along the whole forest-wood-chain by providing a platform for effectively coordinating nationally-funded research activities in the areas of forestry, wood technology and pulp and paper. Areas of actual research in this Domain include, for example, Forestry Research, Forests and Environment, Wood Technology, Bioenergy from Forests, to name but a few.

At a cross-sector level, the Domain addresses issues such as sustainability assessment, life-cycle analysis, tourism, public health, energy production and recycling.

Domain Committee Chair
Dr. Sjur Baardsen

FPS Website
The main objective of the Action was to promote the development of methodologies to improve forest growth models to support the sustainable management of forests. The Action aimed to enhance the quality and consistency of forest growth models to simulate the responses of forests to alternative managerial and climate scenarios.

The Action enjoyed great success and proved highly beneficial for the advancement of forest science in Europe. Forest models are essential to the support of sustainable forest management; this Action developed both new and better forest models, which will help forest managers to adapt forest management strategies to the changing environment. The implementation of sustainable forest management practices contributed greatly to the overall sustainability and international competitiveness of the European forest sector.

In addition, the Action provided a platform where model developers can continue to coordinate ongoing research in forest modelling and to exchange information, data and models. Furthermore, the Action has created important networking opportunities for further cooperation among institutions, research groups, scientists and other stakeholders, thus ensuring the continuation of this important work.

The most significant outcome of this Action is the enrichment of the future community of European Forest modellers. Knowledge transfer was particularly efficient, with a particular emphasis on early-stage researchers (ESR), short term scientific missions (STSM) and training schools. Nearly thirty STSMs have taken place during the Action’s lifetime.

Chair of the Action
Prof. Margarida Tome (PT)

Vice Chair of the Action
Prof. Godefridus M.J. (Frits) Mohren (NL)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Portugal, Serbia, Slovak Republic, Slovenia, Spain, Switzerland, United Kingdom (Total 25).

Non-COST Institute participation from the New Zealand Forest Research Institute Ltd trading as Scion (NZ), the Southern Cross University (AU) and from the State Agrarian University of Moldova (MD).

Action FP0603 website
FP0603 Action page on COST web
The main objectives of the Action were to develop environmentally sound and cost-effective biotechnical tools, and to exploit these innovations for the development of new production technologies for fibres, chemicals and bioenergy. Furthermore, the Action wished to strengthen the scientific excellence of this field and to disseminate these latest achievements to European scientists, industry and other shareholders, thereby stimulating new interdisciplinary scientific networks in Europe.

The Action contributed to the development and implementation of biorefineries, thereby aiding the member countries achieve the targets set by the European Commission for a sustainable energy supply and a bio-based economy.

Further outputs of this Action include:

- a better understanding of biotechnologies and the required processes to deconstruct the lignocellulosic raw material, to separate the fibres for pulp and paper application, or to extract interesting molecules before separating the fibres for other applications;
- a better knowledge of biomass as a source of molecules of interest, of polymers for various applications and for energy production (biofuels, bioenergy);
- the initiating and funding of several national and EU research programmes;
- the appointment of several partners as Centres of Excellence in biotechnology related fields of research.

One of the key socio-economic outcomes of the Action is the better perception of biotechnology and green chemistry as a promising technology for reducing industry environmental impacts.

The Action boosted the acceptance of biomass as a sustainable, recyclable and infinite source of molecules and of value added products to replace fossil resources.

A biorefinery is a facility where biomass feedstock is converted into a range of valuable products such as fuels and power. Lignocellulosic raw materials (wood and annual plants) are one such biomass feedstock which provides an extensive source not only for present fibre products, but also for a large number of intermediates, specialty chemicals or fuels.
This Action aimed to advance knowledge on forest-water interactions in Europe and to elaborate science-based guidelines for an improved management of forests that are predominantly designated for water production and storage.

The Action scientifically addressed the manifold aspects of managing forest–water interactions under rapidly changing environmental constraints; climate change, expected shifts in tree species composition and the ongoing change in land use.

This Action has successfully united the forest- and water-related research efforts of Europe. It has brought together experts from systems ecology, landscape ecology, basic and applied forest sciences, soil science, hydrology and biodiversity research.

A further success of this Action was the organisation of the first ever cross-Domain COST Advanced Training School on 'Forest and water stress in a changing environment: from cell to ecosystems'.

A key outcome of this Action was publishing “Forest Management and The Water Cycle – An Ecosystem-Based Approach” in the renowned Ecological Studies Springer series.

Chair of the Action
Prof. Michael Bredemeier (DE)

Vice Chair of the Action
Prof. Douglas Godbold (UK)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Israel, Italy, Lithuania, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 26).

Non-COST Institute participation from the State Agrarian University of Moldova (MD).

Forests cover ca. one-third of Europe’s land area and are the preferred sources for the generation, storage and export of drinking water for the human population.

10.81 mil. km\(^2\)

Europe’s land area.
The main objective of this Action was to provide the basic framework and knowledge required for the efficient and sustainable use of timber as a structural and building material. The focus was directed on the aspects of design, construction, assessment and maintenance of competitive and high performance timber structures.

Furthermore, the Action aimed to serve as a development platform for the European timber engineering research community, to improve their knowledge of the life-cycle performance of timber structures.

The Action had a number of objectives:

• Improving design methods, assessment techniques and maintenance policies for timber structures;
• Creating a knowledge pool for timber as a high performance material;
• Improving the competitiveness of timber and timber products;
• Increasing the use of timber in high performance structures;
• Contributing to a more efficient and sustainable use of forest resources in the European building sector;
• Providing the engineering community with a modern probability based foundation for the efficient performance-based life-cycle design and assessment of timber structures.

The Action was successful on a number of levels. All developments of our built environment that lead to a safer and more efficient utilisation of building materials have a large impact. For example, the developed failure template, which helps engineers in assessing and analysing, failed timber structures.

A second example is the innovative idea of considering moisture in timber structures as a load; this facilitates a much more consistent treatment of moisture effects in design.
The ICT Domain covers scientific and technical research in all areas of information and communication science and technologies. The ICT research area is best summarised 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.

Domain Committee Chair
Prof. Soulla Louca

ICT Website
Information and Communication Technologies (ICT)

Essentially, this Action aimed to foster the coordination of research efforts to develop the most adequate technological framework for the management of multimedia electronic healthcare records (data and images) through the Internet.

The Action’s main goal was to consolidate the most renowned research references in the field of informatics applied to Anatomic Pathology in order to develop, with the support of national and other European programs, new Pathology Technical Framework (IHE Pathology) to be taken as a new reference standard by the specialised eHealth industry as well as the entire medical community.

The overriding goals of this Action were to:
• increase European scientific leadership in the emerging Pathology Technical Framework (IHE Pathology);
• agree a methodology to establish an open, web-based European tele-consultation service based on virtual slides;
• increase the use of automation procedures in Anatomic Pathology by over 50%;
• design a central meta-search engine, virtual database containing over 3500 pathology images for joint research, teaching and observation purposes.

The Action successfully opened the path to the integration, search, access, exchange and upgrade of digital pathological images and associated reports among different hospital information systems regardless of their location.

The Action has successfully disseminated its work and results via European medical informatics and pathology meetings such as the 4th European Congress of Medical Informatics and the 10th European Congress on Telepathology in Vilnius, Lithuania in 2010.

The Action has also led to collaborations with many European digital pathology companies in the development of new products.

In line with its overall objective, the Action successfully developed a general business process in pathology to analyse and specify the requirements of integration of telepathology in routine diagnostic process, education, research and quality control activities.

Moreover, medical doctors are becoming increasingly aware of the importance of this field and more familiar with its terminology – a reflection of its increasing importance.

Telepathology Network in Europe (EURO-TELEPATH)

COST Action IC0604

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Antennas are a key constituent of all terrestrial, airborne and space based wireless multimedia, communication and sensor systems. Antenna functions are fast evolving, driven by the demanding needs of the Information Society Technologies. Traditional antenna areas still demand research and innovation efforts, as there are unforeseen and challenging problems, which need to be addressed.

Antennas and electromagnetic sensors also represent a decisive system component in areas such as Consumer Electronics, Health Care, Biology, Radio Astronomy, Earth Sciences and Earth Resources Monitoring.

There is a need to enhance cooperation for a better understanding of antenna operation in these new complex environments and for corresponding development of adequate modelling and measuring. This Action had a number of objectives:

• Assisting in the research & development of antenna systems and sensors necessary for the new ubiquitous wireless society;
• Contributing to the visibility of antenna activities in Europe and lobby for the continuation of new research projects;
• Increasing public awareness of antenna related issues.

The most important result of this Action was its ability to address the challenging requirements in such a diverse and complex field; the Action has stimulated the cooperation between recognised and emerging academic and industrial research entities.

The visibility of the field has been greatly enhanced, especially through Action members’ participation in high-level international scientific events and the support offered to training schools.

Chair of the Action
Prof. Juan R. Mosig (CH)

Vice Chair of the Action
Dr Marta Martinez Vazquez (DE)

Duration of the Action
2007-2011

Parties
Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Spain, Sweden, Switzerland, Turkey, United Kingdom (Total 27). Non-COST Institute participation from the Royal Military College of Canada (CA) and the University of Queensland, School of Information Technology and Electrical Engineering (AU).

ASSIST website
ASSIST Action page on COST web
Algorithmic Decision Theory

COST Action IC0602

The aim of this Action was to establish an international community of researchers at the edge of Decision Analysis and Computer Science. The Action’s main goal was to provide decision support in the presence of massive databases, combinatorial structures, partial and/or uncertain information and distributed, possibly interoperating, decision makers. Such problems arise in several real world decision problems such as humanitarian logistics, homeland security, epidemiology, risk assessment and management, e-government and the implementation of recommender systems.

The main objectives of the Action were to:
1. propose new algorithmic solutions for hard decision theoretic problems arising from the use of large amounts of information, the presence of uncertainty as well as of complex structures of data;
2. apply the results and concepts from decision theory to improve and advance computer science and artificial intelligence.

The Action had a successful publication record, including books, the conference proceedings and the special issues of some among the most important journals in this area.

The Action dedicated a large part of its efforts to ESRs; more than 200 ESRs attended the 5 Training Schools, with over 50 early stage researchers (ESRs) who attended the two external training schools supported by the Action. More than 2/3 of the 71 STSMs funded by the Action concerned ESRs, the result being a further strengthening of the relations within the community.

The Action was able to create further and stable funding opportunities both in North America - through the National Science Foundation (NSF) funded special focus on Algorithmic Decision Theory managed by the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), Rutgers University; and Europe - through the Groupement de Recherche Internationale (GDRI) ALGODEC project. This project was funded by several European research institutions such as the National Center for Scientific Research (CNRS), the National Fund for Scientific Research (FNRS), the National Research Fund (FNR), as well as by many European universities.

A significant outcome of this Action, in terms of community building was the establishment of the series of International Conferences on Algorithmic Decision Theory: Venice (IT) in October 2009, New Jersey (USA) in October 2011 and Brussels (Be). These conferences have established an important international forum for the community.

Chair of the Action
Prof. Alexis Tsoukias (FR)

Vice Chair of the Action
Dr Ulle Endriss (NL)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Bulgaria, Cyprus, Denmark, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom (Total 25). Non-COST Institute participation from the Council for Scientific and Industrial Research (CSIR) (ZA), DIMACS (US), NICTA (AU) and the University of Auckland (NZ).

Action IC0602 website
IC0602 Action page on COST web
Sonic Interaction Design (SID) is the exploitation of sound as one of the principal channels conveying information, meaning and aesthetic/emotional qualities in interactive contexts. The Action pro-actively contributed to the creation and consolidation of new design theories, tools and practices in this innovative and interdisciplinary domain.

The Action hoped to strengthen the links between scientists, artists and designers in the European Research Area (ERA). This Action has the potential of affecting everyday life through physical and virtual interactive objects, as today there is the possibility to design and actively control these objects’ acoustic responses so that it conveys an intended aesthetic, informational, or emotional content.

The Action boasted a number of successes.

- Training Schools contributed to creating a critical mass of young researchers that tackle new directions in sound technology, design, perception or art.
- Thematic workshops allowed experimentation in under-explored territories, such as SID for theatre.
- A large number of STSMs provided valuable results in creative experimentation, interactive sonification, evaluation of designs and development of technologies.
- The network of over one hundred SID researchers span off new scientific and artistic projects that are attracting additional funds from European and National institutions.

The major outcome of this Action was the establishment of Sonic Interaction Design (SID) as a new interdisciplinary field.

With a worldwide perspective, the Action was responsible for steering most of the research, production and dissemination initiatives in this field.
Advanced Voice Function Assessment

COST Action 2103

The main objective of this Action was to combine previously unexploited techniques with new theoretical developments to improve the assessment of voice for as many European languages as possible, while acquiring in parallel data with a view to elaborating better voice production models.

The Action had numerous objectives.

• Developing analysis algorithms that have an impact on speech processing applications and the assessment of voice disorders.

• Improving voice production models (normal and pathological conditions) based on physical processes and algorithms for speech synthesis and modification.

• Developing new instruments and devices for monitoring and evaluating occupational voice problems, as well as for investigating quality and possible improvement of voices, which are no longer produced by two vocal folds, as after oncological treatments.

• Disseminating results and raising public concern about voice disorders and voice-related quality of life, particularly in occupational voice users (voice ergonomics) and in patients with substitution voices.

The major outcome of this Action was the creation of a European network of voice experts and building a bridge between the communities of basic scientists involved in signal processing and of medical people responsible for the care and cure of patients with voice disorders.
The main objective of the Action was to increase knowledge of mobile and wireless network technologies by exploring and developing new methods, models, techniques, strategies and tools that will facilitate the implementation of next generation mobile radio communication systems and that will foster the development of the paradigms of pervasive and ambient wireless communications.

The Action successfully brought together researchers with skills on electromagnetic, communication and information theory and operational research, thus creating an enormous potential for interdisciplinary activities. The Action defined new MIMO (multiple-input and multiple-output) Over-The-Air Test Procedures to be proposed as standards.

Considering the global crisis we are currently experiencing, the participation of major industry players is very significant (featuring Nokia-Siemens, Mitsubishi, Motorola, NTT Docomo, Elektrobit and many others) and serves to highlight the importance of this Action’s work.

One of the main objectives of this Action was the support to industry: the mix of institutions participating in the Action included about 60% from academia, 15% from R&D /governmental bodies and nearly 25% from industry, which ensured the achievement of this goal.

The Action also contributed to the deployment of systems very close to completion of their standardisation phase. The Action has brought together 28 COST countries and participants from a significant number of non-COST country institutions in the United States, Japan and China, to name a few. In total, over 127 institutions have been involved in this COST Action.

This Action has also resulted in a number of EC research projects and National Research Projects being approved and funded.

‘Ubiquitous’ or ‘pervasive’ mobile or wireless communications are terms used in relation to developments in the miniaturisation of mobile wireless devices and the proliferation of always-on, everywhere communications.

The modern world is becoming increasingly interconnected as pervasive networks of mobile and wireless devices collect, process and transport information both cooperatively and autonomously.
The ISCH Domain supports the development of knowledge and insights for citizens, democratic debate and decision-making in the public, private and voluntary spheres. The scope of the domain includes, for example, the development and behaviour of individuals and groups; social, economic, political, cultural, historical and technological structures and processes and how these persist and/or change; cultural diversity and a common European future.

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

Domain Committee Chair
Dr Marc Caball

ISCH Website
The main objective of the network was to improve our understanding of the process of scientific and technological development and of the transfer of scientific and technological developments to markets and into economic development. Furthermore, the network worked on improving the collection, harmonisation and provision of micro data and will develop policy recommendation in the area of science and technology research.

The Action focused on four main areas of research:
• science, technology and knowledge creation;
• diffusion of science and technology;
• intellectual property rights;
• development of markets.

Investment in research, development and innovation is a major driver of long-term economic performance; it is therefore essential for policy-makers to have appropriate strategies for the governance, incentives and conduct of scientific research, as well as high-level information regarding the knowledge transfer between public and private entities.

The Action enjoyed several successes.
• There are numerous STRIKE members actively advising their national science and innovation policy makers; for example, the Knowledge for Growth group (K4G), established by former European Commissioner for Research, J. Potocnik, is heavily composed of STRIKE members.
• The structure of incentives for researchers in universities and research institutes: the Action assessed both the impact of these incentives on productivity in scientific research and their commercialisation activities.
A Telecommunications Economics COST Network (ECONTEL)

COST Action IS0605

The main objective of this Action was to increase and disseminate knowledge in the field of telecommunications economics, which will help business partnering drive networking services and their sustainable provisioning for consumers and enterprises.

There are a number of successful outcomes of this Action:

• The Action supported the European engineering leadership gained in mobile, broadband, digital TV and fixed communications, and selected media fields, by new sustainable business models in a fully deregulated and diversified demand framework.
• It studied business opportunities throughout the value chain, especially for enterprises, content and specialised services.
• It successfully supported customer needs, the social and the institutional value of improved communications solutions especially by helping these parties select viable technical options for their special needs.
• The Action provided guidelines and recommendations for using different types of technologies and quantifying necessary actions.

The key outcome of this Action was understanding that network management aspects under economic viewpoints are driven by provider needs; this Action provided guidelines and recommendations for utilising different types of technologies and quantifying necessary actions.

Chair of the Action
Prof. Burkhard Stiller (CH)

Vice Chair of the Action
Prof. Louis-Francois Pau (DK)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, United Kingdom (Total 22). Non-COST Institute participation from the International Telecommunications Union (ITU) and the Partners for Health NGO / National Information Learning Centre (GE).

ECONTEL website

ECONTEL Action page on COST web
The recent increase in the numbers of migrants in Europe has generated a growing volume of research on their state of health and the need to adapt care services to their needs. Scientific progress in this field, however, is held up by a lack of interdisciplinary and international collaboration.

This Action brought together an international group of experts to consolidate and review work carried out so far, identify blind spots and persistent problems and recommend ways forward. Moreover, the Action wished to gain a cross-national perspective, which would yield new insights into the causes of ill-health and further the exchange of good practices.

The Action’s three Working Groups concentrated on:

- policy (policies on migrant and minority health, asylum seekers etc.);
- state of health (monitoring, registration, categorisation, mental health, health care for children and the elderly, health promotion);
- healthcare (communication in health care, user involvement, health of new labour migrants, measurement of outcomes).

COST Action IS0603 very successfully examined the various factors that prevent migrants from accessing health services; factors relating to policies and laws, service delivery, the migrant communities themselves and wider society.

The Action produced state-of-the-art reports on the most urgent themes, on particular groups (female migrants, Roma), particular health problems (HIV/AIDS), particular health service provision (health education) and organised 33 workshops and conferences on these issues. There were a number of joint publications and training activities throughout its lifespan; these successfully disseminated the Action’s findings. They also influenced policy-makers at both the national and international level, such as the United Nations, the World Health Organisation (WHO), the International Organisation for Migration (IOM), the European Commission (EC), the Council of Europe and the Parliamentary Assembly of the Mediterranean.

One of the key outcomes of this Action was the publication of two books by Garant in Antwerp, which will further disseminate the important work of this Action:

- ‘Health inequalities and Risk Factors among migrants and ethnic minorities’
- ‘Inequalities in health care for migrants and ethnic minorities’

Two further publications are expected to be available by late 2012:

- ‘Landscapes of migrant and ethnic minority health in Europe’,
- A policy brief entitled ‘Health aspects of irregular migration and detention in Europe’.

Based on the identification of new challenges, such as the removal of existing barriers for migrants to health treatment, or the implementation of the necessary policies and legal frameworks to protect the rights of migrants, a new COST Action was submitted and approved as Action IS1103 in May 2011, entitled COST Action IS1103 ‘Adapting European health services to diversity ADAPT’.

Undocumented migrants (UDM) gain increasing attention in the EU as a vulnerable group exposed to high health risks with estimated numbers ranging from 1.9 to 3.8 million people residing in the EU in 2008 (representing 7-13% of the foreign population) or 1–4% of the total population.
A proper understanding of international law requires knowledge of the role of domestic jurisdictions. Until now, access to domestic case law has been limited: many cases are unpublished and few are translated into English. For those cases that have been available, their effects may not be fully understood without explanations about the underlying domestic legal system.

This Action aimed to provide access to domestic case law concerning international law and to enhance understanding of its relevance for domestic and international law.

Specifically, the Action aimed to:
- make available judgments of domestic courts on matters of international law, where necessary to translate these judgments and to explain the domestic legal frameworks that produced them;
- provide in-depth commentaries written by a network of legal experts;
- inform and educate stakeholders about the domestic application of international law;
- analyse the larger consequences for international law;
- disseminate the information to a wider audience.

The further development of the data gained from this Action will lead to a greater insight for national courts into the practice of foreign courts and to lead to a greater uniformity and generally quality in the administration of international justice.

The most tangible socio-economic impact of this Action concerns the projects on constitutional moments in post-conflict situations. In states emerging from conflict, International law is very often given a stronger role than pre-existing national courts in order to prevent a return to a violent past. WG2
Comparative Research into Current Trends in Public Sector Organization (CRIPO)

COST Action IS0601

Both the structure and function of the public sector is changing; specialisation within large bureaucracies has resulted in the establishment of autonomous agencies, urging stricter coordination of policy sectors and governmental levels and new ways of contract-based result control. Although governments are adapting to these trends, there remains a lack of scientific proof concerning the beneficial effects of these trends for the performance of the public sector.

The main objective of this Action was to bring together scholars on a European platform for comparative and longitudinal research, which would lead to empirical, theoretical and methodological advancements in the field. The Action also aimed to provide specific policy relevant recommendations that could guide decision-makers in their policies on the organisation of the public sector.

The Action has resulted in the development of an analytical framework and three sets of common comparative methodologies (survey, longitudinal mapping and case studies) for the study of public agencies. More than 30 research teams in 23 countries are using these tools to research and compare agencies across countries and levels. One example is the joint COBRA database (Comparative Public Organization Data Base for Research and Analysis) that integrates data on 1789 agencies in 18 countries.

Most successfully, this Action saw its research findings and recommendations being taken up by public sector officials and politicians at both the EU-level and in several countries such as Belgium, Ireland, Estonia, Netherlands, Norway, Germany, Switzerland, Romania, Sweden.

It had a significant impact upon governmental policies of agencification and the strategies of individual public agencies.

Chair of the Action
Prof. Geert Bouckaert (BE)

Vice Chair of the Action
Prof. Per Lagreid (NO)

Duration of the Action
2007-2011

Parties
Austria, Belgium, Croatia, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom (Total 23).

CRIPO website
CRIPO Action page on COST web
The MPNS Domain is home to material science, extending from conception through to production and includes characterisation, examination, evaluation, fabrication and development, to actual application and service, as well as related databases, codes, standards and inspections.

As a result, the Domain also incorporates nanomaterials and nanosciences and the nanotechnological applications thereof. It also supports exploratory basic and applied research in physics, theoretical and experimental, as a key to understanding the laws governing the behaviour of matter and energy.

Domain Committee Chair
Dr. Anthony Flambard

MPNS Website
The objective of this Action was
to establish active links between
all European laboratories working
in the field of optical manipulation
and related applications and
to foster and accelerate long-
term development of this field in
Europe. The goal was to favour
the development of advanced
apparatus for: cell manipulation;
micro-patterning and templating;
optical imaging for bio-medical
applications; and control of micro-
mechanical light-driven motors.

This Action enjoyed several
successes.
1. Development of novel
approaches to optical
manipulation.
2. Major scientific advancements
in the real-time, interactive
and arbitrary control of many
micro-particles in both 2D and
3D by optical manipulation.
3. Realisation of nano- and
micro-structures by photo-
patterning of polymeric
materials;
4. Development of advanced
apparatus for real-time
measurements of physical
parameters in microfluidics.
5. Successful implementation
of non-invasive optical tools
for manipulation and study of
biological systems.
6. Development of new methods
coupling optical manipulation
tools to nonlinear optical
microscopy and spectroscopy
of biological systems.
7. A specific success of this
Action was in dissemination
of results: four of the Action’s
workshops were organised
within the framework of
international conferences.
The dissemination activities
resulted in more than 500
publications on Action related
topics from the participating
groups and 2 special
issues being published in
international journals.

The most significant
technological impact
of this Action was the
implementation of non-
invasive tools to manipulate
biological systems. This
Action developed a new
scientific understanding and
technological advancement
in the upcoming era of
nanobiotechnology.
The lead levels can be above 85% by weight.

There were a number of major achievements during this Action:

- a ‘materials property’ atlas containing thermodynamic and thermophysical property data determined during the Action;
- the development of methods for the modelling of mechanical properties of joints, crack propagation and defect detection;
- the development of new technologies for HT soldering, e.g., Transient Liquid Bonding and nanosoldering;
- new HT soldering materials and technologies are already being applied by Action participants, for example, in the space industry (Swiss Federal Laboratories for Material Science and Technology (EMPA)).

The main objective of this Action was to increase the fundamental knowledge of crucial properties of alloys, which could offer environmentally friendly alternatives to high-lead (Pb) containing high-temperature solders. The aim was to identify promising materials with a set of suitable properties, such as melting point, wettability and surface tension, for a variety of industrial applications, for example in the aerospace and automotive industries. The Action provided a cooperative basis for the interdisciplinary research necessary to fulfil this aim.

Much research has been conducted on the formulation of new Pb-free soldering materials, not only in Europe, but also in USA and Japan. A number of promising materials, for example SnAgCu-alloys (tin, silver and copper alloys), have been developed to replace the (near-) eutectic Sn-Pb (Tin-Lead) solders for mainstream applications (~200°C), despite the fact that there is still no single ‘drop-in’ alternative for these traditional alloys. However, research has been seriously lacking into finding replacements for high-temperature, high-Pb containing alloys, where the lead levels can be above 85% by weight.

The use of lead (Pb) has been a major health concern for a number of years leading to a gradual reduction in its usage. European legislation has reduced the use of lead in consumer electronics since 2006. However, this legislation only applies to certain solder compositions, so the search continues for lead-free alternatives.
A major deliverable of the Action was the development of a thermodynamic database for the modelling of phase equilibria and thermodynamic properties in high-temperature lead-free solders, meant to enable the fast and cost-efficient development of new materials.

The database comprises of assessed thermodynamic data for unary, binary and ternary phases in relation to 18 different component elements: Ag, Al, Au, Bi, Co, Cu, Ga, Ge, Mg, Ni, P, Pb, Pd, Sb, Si, Sn, Ti and Zn chosen on the basis of their suitability in a solder material or as a component of a substrate material. Pb is included in order to be able to consider rework and repair.

This self-consistent database can be used to make complex chemical equilibrium calculations; modelling how different solder formulations may react with different substrates, thus vastly minimising the experimental effort of trying many different compositions.

An example of the use of this database for optimising solder compositions is the work of Dübendorf in Switzerland.

The group developed a low temperature joining process using a multilayer approach and the Au-Ge (Gold-Germanium) solder alloy for heated conversion surface assemblies for the 2015 BepiColombo joint space mission to Mercury conducted by the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA).
The aim of this Action was to support the development of an emerging microscopy technique, CARS (Coherent Anti-Stokes Raman Scattered) microscopy. The Action aimed to illustrate its potential by identifying important applications within the bio-, nano- and material sciences.

In CARS microscopy, images of molecular distributions in samples are formed by tuning the frequency difference of two laser beams to the resonance of the vibration of the target molecule. An enhanced, blue-shifted signal, CARS light, is then emitted from the target molecule and pixel-wise mapping of these signals form a high-resolution image of the molecular distribution.

This Action was particularly successful: its activities included a fundamental characterisation of molecular vibrations, investigations of alternative excitation schemes and the development of user-friendly technology.

During its four years, the Action:
• created a growing research field of 37 European groups originating from 16 different countries;
• increased the interaction between European groups by 24 STSMs and three workshops;
• increased the involvement of ESRs from six to 69 members thanks to the arrangement of two training schools for young scientists;
• promoted intercontinental awareness through four international conferences, the publication of a special issue of the Journal of Raman Spectroscopy, contributions to Nature and other high-impact journals;
• supported the technology development leading to the first commercial CARS microscope in 2010;
• provided advice and know-how to the food industry for their purchase and use of CARS microscopes.

In contrast to fluorescence microscopy, CARS-microscopy allows visualisation of molecules without the need for exogenous markers, thus, under close to natural conditions without interfering with the native biochemical and physical properties of the molecule.

The Action successfully acted as a hub in the development of CARS microscopy, supporting interaction and exchange between research groups and industry from a wide range of disciplines in order to make use of the collective knowledge – and in promoting the microscopy technique beyond the physics lab.
The main objective of the Action was developing new technologies for bioethanol (ethanol produced from ligno-cellulose materials) that can be used effectively in small-scale fuel cell systems of electric power output between 0.5 and 10 kW. The technologies cover low-temperature bioethanol reforming in hydrogen-selective membrane reactors and cleaning methods as well as their combinations with any type of low-temperature fuel cell.

The Action aimed to disseminate knowledge and to produce a practical design-support tool for a broader community, which would enable interaction between different actors (e.g., industrial players, researchers and specialists in many disciplines and end-users of small-scale fuel cell systems).

The Action focused on the following objectives:

1. increasing the awareness and commitment of different players and users to the bioethanol concept;
2. promoting thermodynamic studies of appropriate biophysical processes for finding new models from nature for technical solutions;
3. producing the equipment for bioethanol reforming and product gas processing and cleaning in selected small-scale fuel cell systems with acceptably low operating temperatures;
4. producing operating low-temperature fuel cells (i.e. AFC, PEMFC and SOFC), which can be attached to the technical solutions mentioned in Objective 2.

The main outcome of this Action resulted in the creation of a platform for scientific collaboration between those researchers concerned with hydrogen production and reforming and those in the area of direct ethanol and conventional low temperature fuel cells.

Experts from the different fields addressed the essential scientific and technological challenges: from sustainability to contamination problems of bioethanol to conversation in membrane reactors to fuel cells.

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Efficiency a fuel cell can obtain in conversion of a fuel into useable power (as opposed to approximately 18% efficiency for the average internal combustion engine). Bioethanol as a fuel cell is ideal, as it is a biologically derived fuel with no negative by-products; ethanol is produced from ligno-cellulose materials such as wood and various plants.
The TUD Domain fosters research coordination in the fields of transport and the built environment, which play a strategic role in the modern society and economy. It aims at fostering international research networking activities between scientists and experts dealing with transport systems and infrastructures, urban land use and development, architecture and design and civil engineering issues.

The Domain is by definition cross-sectoral and multidisciplinary, encompassing a wide range of scientific expertise within transport and land use planning, design and management activities with a special emphasis on the links between relevant policy fields as well on all aspects related to sustainable development.

Domain Committee Chair
Prof. Cristina Pronello

TUD Website
Overall, the Action was very successful in supporting the fight against car use within Europe. It has provided invaluable material issues such as the urban impact and effects of BHLS, regularity measurements, road safety concerns and public acceptance. This culminated in a set of recommendations for the implementation of a full BHLS.

The efforts of this Action focused on increasing the use of public transport in urban areas, through a better understanding of the concept of Buses with a High Level of Service (BHLS) and their implementation within existing networks. The Action aimed to increase sustainable mobility within urban areas.

This Action showed that BHLS can achieve significant increases in ridership and modal shift rates from car usage between 5% and 30%. Ridership rate increases have been as high as 150% in places such as Jokerilinja (Helsinki), where ridership saw an increase of 150% over 5 years. This data provided a calculable incitement for European stakeholders to continue the development of BHLS networks.

The Action successfully highlighted the benefits of developing new bus routes, thereby promoting and strengthening the market for these services. It provided a set of key recommendations for decision makers for implementing a full BHLS, as well as identified future main research and evaluation needs.

Some of the key recommendations include:

- Continuing the extensive deployment of BHLS lines or to develop BHLS networks;
- Providing right-of-way priority corridors for BHLS lines, as with tramways. Moreover, to adapt road traffic regulations and harmonise signage for tramway and BHLS priority;
- Improving EU bus regulation for BHLS features such as bi-articulated buses, for doors at both sides, for bicycle racks at the vehicle-front (as in USA and Canada);
- Promoting further research and evaluation of BHLS components such as economic, social, urban and environmental impacts, quality measurements, safety, specific BHLS bus market.

The bus is the primary form of public transport in Europe. The European average of the bus market share is estimated at 50-60%. Worldwide, it is 80% (Source UITP).
The main goal of this Action was to develop a Europe-wide comparative study of:
- land management regimes and land policies for urban development and regeneration;
- land management processes and tools for large urban development projects.

The Action aimed to provide an overall assessment of the performance of those regimes, policies and tools, and to propose changes or new strategies.

European cities largely differ from each other in their land ownership situation, building industry and real estate configurations, mortgage system, planning culture, policies and management tools. However, the impact of these differences on the success or otherwise of urban development is not fully understood, in spite of their utmost importance for European long-term economic growth.

The Action successfully included both local authorities and developers in site visits, meetings and workshops, providing the local host with the opportunity to spread their best practices among a wider audience in the European context. In particular, the Action has highlighted the need for specific analysis and tools in regard to the land management policies of the former eastern EU countries.

The Action was very successful in disseminating its results, in particular through five publications and seven conferences; the results of the Action were presented at the 7th Virtual Cities and Territories conference in Lisbon in November 2011.

The Action was also successful in terms of participation, increasing the number of participating countries by six during the course of the Action. Moreover, 16 ESRs were involved throughout the Action, working in parallel to the Working Groups in the form of a Junior Research Network (JRN).

The overriding success of this Action stemmed from the results of the two WGs which has shown the evident need for common and clear policies concerning urban containment. Within the context of the current economic climate, land value capturing is a key issue and the results of the Action contributed to this objective.

Chair of the Action
Prof. Maurizio Tira (IT)

Vice Chair of the Action
Prof. François Golay (CH)

Duration of the Action
2007-2011

Parties
Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Switzerland, Turkey, United Kingdom (Total 21).

Action TU0602 website
TU0602 Action page on COST web
Sustainability of Constructions: Integrated Approach to Life-time Structural Engineering

The main objective of the Action was to promote science-based developments in sustainable constructions in Europe through the collection and collaborative analysis of scientific results concerning lifetime structural engineering and especially the integration of environmental assessment methods and tools for structural engineering.

The Action has fostered the fruitful interaction between performance-based design, life-cycle assessment processes and structural engineering within the framework of sustainability. It is this level of cooperation, which has enabled the Action to achieve so much.

In terms of sustainability and the field of structural engineering as a whole, this Action hugely contributed to both.

- The Action provided science-based approaches, which can be applied to lifetime engineering.
- It assured the integration of Life Cycle Analysis or (LCA) in sustainability rating methodologies.
- It set out guidelines for performing LCA in construction projects.
- The work of this Action ensured the recognition of LCA as an integral part of structural engineering.
- It provided a methodology for the assessment of the sustainability of bridges.
- It resulted in national assessment and rating systems in several European countries, for example Portugal, Germany and the United Kingdom.

One of most significant outcomes of the Action was its impact on the field of structural engineering; many members of the Action are now considered forerunners in the field of sustainability and lifetime engineering.

These members were active in disseminating the results through conferences, publications, members of advisory panels on FP7 projects and through the development of new educational programmes in their universities, which will in turn provide an environmentally literate workforce.

Sustainable construction refers to construction projects that use life cycle assessments to value and steer decisions.
A key success of this Action was the opportunities it has provided exergy researchers to interact with building professionals and other stakeholders (e.g., planners, policy makers, standards bodies).

The Action’s efforts support the transition to affordable, reliable and clean energy sources in the built environment. This is in line with the broader EU objectives of encouraging greater use of Renewable Energy Sources (RES) in a wide range of building types and the exploitation of geothermal heat sources.


2. Two International Exergy Life Cycle Assessment and Sustainability Workshop and Symposium (ELCAS), one in 2009 and the second in 2011 (Greece) was organised by the Action in conjunction with the United Nations Environment Program (UNEP) – Society for Environmental Toxicology and Analytical Chemistry (SETAC) Life Cycle Initiative.

3. Two special issues of the Journal of Cleaner Production and the International Journal of Exergy were dedicated to low exergy analysis and the ELCAS conference.

The main objective of the Action was to broadly disseminate new knowledge and to develop practical design-support instruments that would facilitate the practical application of the exergy concept to the built environment.

Exergy is a thermodynamic concept that is useful for quantifying the mismatch between the low quality of heat required in buildings and the high quality level of electricity and fossil fuels often used in heat supply systems. Applying exergy analysis to the built environment is likely to favour systems supplying and utilising low-grade thermal energy – which would therefore support thermally neutral buildings.

The Action succeeded in defining the practical applicability of exergy analysis to the built environment and furthermore, in increasing the awareness of industrial players and their commitment to the exergy concept.

There are a number of specific achievements of this Action:


2. Two International Exergy Life Cycle Assessment and Sustainability Workshop and Symposium (ELCAS), one in 2009 and the second in 2011 (Greece) was organised by the Action in conjunction with the United Nations Environment Program (UNEP) – Society for Environmental Toxicology and Analytical Chemistry (SETAC) Life Cycle Initiative.

3. Two special issues of the Journal of Cleaner Production and the International Journal of Exergy were dedicated to low exergy analysis and the ELCAS conference.
These communities are now aware of the problems and, more importantly, the solutions that exist elsewhere and have the ability now to assess and adapt these solutions to their own particular community.

Likewise, existing civic groups have enhanced their knowledge-base in the light of what others have done in different contexts and, again, are likely to put up a more constructive opposition in the near future.

The work of this Action focused upon relevant topics of contemporary debate about growth and wealth, notably: the efficacy of economic measures to fight against the poverty, i.e. UNO general objectives to halve the number of the world’s poor by 2015; economic growth and marked consequent increasing inequalities; tasks and results of EU Cohesion and Regional Policies, etc.

The Action concentrated on the economic and political behaviour of local communities and especially on the one of Minor Deprived Urban Communities (MDUP). The aim was to help these communities in the assessment of the sustainability of successful development policies either at a theoretical stage or already implemented elsewhere:

- Setting up of economic indicators regarding deprivation in participating countries,
- Analysing planning and decision-making procedures (including public participation) in MDUP from participating countries
- EU funding opportunities or others in non-EU countries or equivalent in non-EU countries sources have been researched.
- Finally, ascertaining what can be considered good practice (and bad practice thereof) in existing development policies have, likewise, being pursued, and their transferability across participating countries assessed.

The Action targeted all levels of stakeholders: the local authorities, civic groups, the community itself; as well as professionals and researchers working on the topic of sustainable development. A measure of the success and acceptance of the work of this Action was the broad level of stakeholder participation at all Action workshops.

The Action studied MDUP in participating countries through on-site visits and by directly including local representatives in Action workshops. All results were widely disseminated via scientific publications with outstanding publishers.

These communities are now aware of the problems and, more importantly, the solutions that exist elsewhere and have the ability now to assess and adapt these solutions to their own particular community.

Likewise, existing civic groups have enhanced their knowledge-base in the light of what others have done in different contexts and, again, are likely to put up a more constructive opposition in the near future.

Chair of the Action
Prof. Paolo Ventura (IT)

Vice Chair of the Action
Dr Enrique Calderon (ES)

Duration of the Action
2006-2011

Parties
Belgium, Cyprus, Czech Republic, Finland, Greece, Hungary, Italy, Latvia, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey (Total 15).

Action_C27 website
C27 Action page on COST web
## ANNEX

### Country participation in running Actions (2011)

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Actions running per Domain

Number of preliminary proposals
(March and September 2011)