



COST

European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

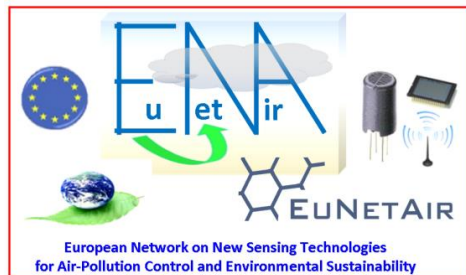
COST Action TD1105

Special Session in AirMonTech, Duisburg, 4-6 March 2013

**Environmental Case Studies from Mediterranean,
Central and Eastern Europe**

Action Start date: 16/05/2012 - Action End date: 15/05/2016

 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Michele Penza

Chair of COST Action TD1105

ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development / Brindisi, ITALY



Outline



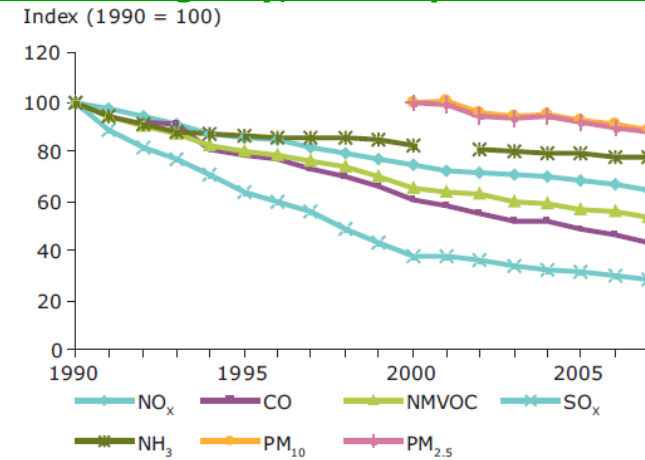
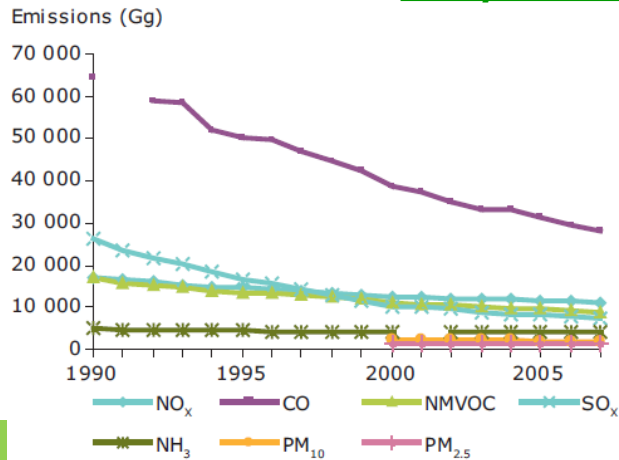
- **Background / Problem Statement:**
 - ✓ *Scientific context*
 - ✓ *Challenges addressed by the Action*
- **MoU Action's Objectives: Main and Secondary**
- **Action Research Directions:**
 - ✓ *Methodology and Innovation*
- **Working Groups**
- **Future Plans and Challenges: Expected Impact**
- **Concluding Remarks**

Scientific context: Air Quality Control (1/2)



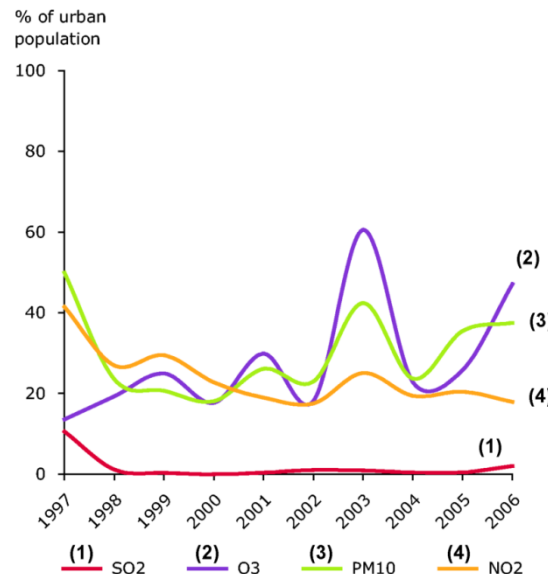
Figure ES1 EU-27 emission trends in absolute (Gg) and relative terms for NO_x, CO, NMVOCs, SO_x and NH₃ between 1990 and 2007 (index year 1990 = 100), and for PM₁₀ and PM_{2.5} between 2000–2007 (index year 2000 = 100)

European Environment Agency, EEA Report 8/2009



Some Environmental Emergencies:

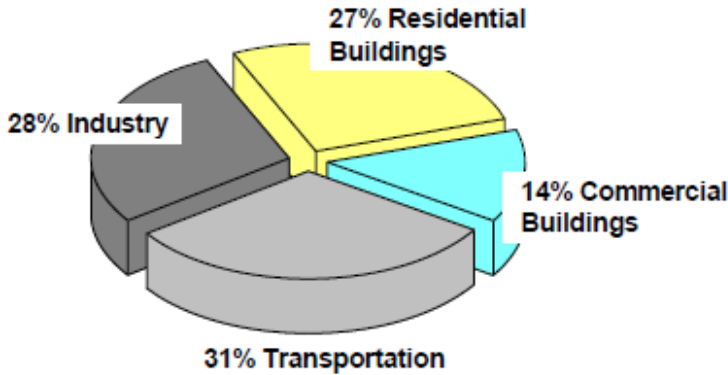
- 1930 - Meuse Valley (Belgium)
- 1952 - Great London Smog (UK)
- 1954 - Los Angeles (USA)
- 1984 - Bhopal (India)
- 2005 - Teheran (Iran)
- 2006 - Hong Kong (China)
- 2008 - Shanghai, Peking (China)
- 2012 - Taranto (Italy)



| Pollutant | Limit Level |
|-------------------|-----------------------|
| NO _x | 100, 200 ppb |
| CO | 8 ppm |
| SO ₂ | 130, 190 ppb |
| O ₃ | 120 µg/m ³ |
| PM ₁₀ | 50 µg/m ³ |
| BTEX | 6 µg/m ³ |
| PAH (BaP) | 1 ng/m ³ |
| PM _{2.5} | - |

AMBIENT AIR QUALITY
EU DIRECTIVE 2008/50/EC and Daughters

Scientific context: Indoor/Outdoor Energy Efficiency (2/2)



Primary energy consumption in the EU¹

¹ O. Seppanen,

11th Conference on Indoor Air Quality
2008, Copenhagen, Denmark

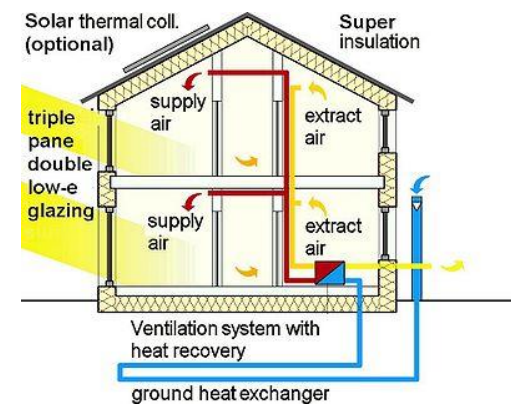
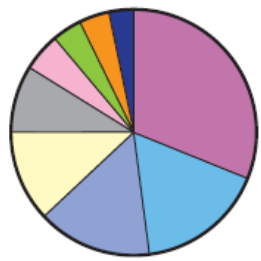
41% Primary Energy consumed in Buildings:

- 2/3 in Residential Buildings
- 1/3 in Commercial Buildings

Energy Performance of Buildings EU Directive
EPBD 2010/31/EC

Figure 2 – Total Energy Consumption by End Use
Adapted from E Source, 2006

- Ventilation 4%
- Refrigeration 3%
- Space Heating 31%
- Water Heating 17%
- Cooling 15%
- Lighting 12%
- Other 9%
- Cooking 5%
- Office Equipment 4%



Source: Environmental Protection Agency's National Action Plan for Energy Efficiency Sector Collaborative on Energy Efficiency Hotel Energy Use Profile

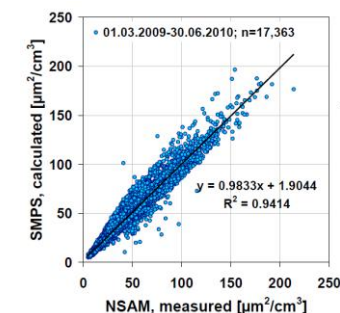
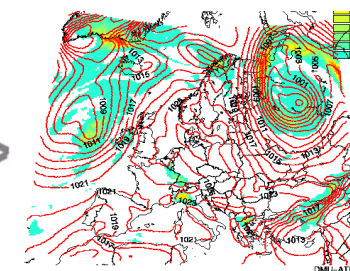
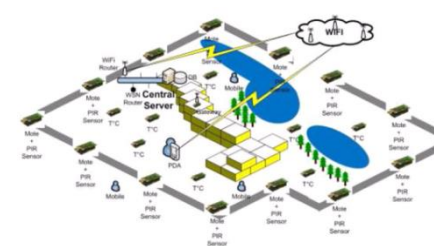
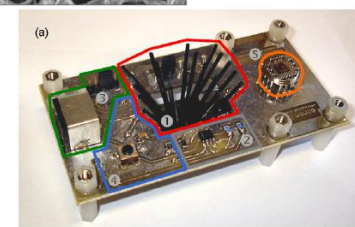
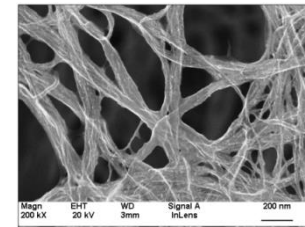
IAQ by WORLD HEALTH ORGANIZATION

| Indoor Air | | Typical Substances | | Cure | |
|---|--|--|-------------------------|-------------------------------|-----------------|
| Contamination Source | Emission Source | VOCs | Others | | |
| • Human Being | • Breath | Acetone, Ethanol, Isoprene | CO ₂ | demand controlled ventilation | |
| | | Humidity | | | |
| | • Skin Respiration & Transpiration | Nonanal, Decanal, α-Pinene | Humidity | | |
| | | Methane, Hydrogen | | | |
| | • Flatus | Limonene, Eucalyptol | Unburnt Hydrocarbons | | |
| | • Cosmetics | Alcohols, Esters, Limonene | | | |
| | • Household Supplies | • Combustion (Engines, Appliances, Tobacco Smoke) | CO | | CO ₂ |
| | | | CO ₂ | | |
| Humidity | | | | | |
| • Building Material • Furniture • Office Equipment • Consumer Products | • Paints, Adhesives, Solvents, Carpets | Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes | | permanent 5-10% ventilation | |
| | | • PVC | Toluene, Xylene, Decane | | |
| | • Printers, Copiers, Computers | Benzene, Styrene, Phenole | | | |

Table 1 – Typical Indoor Air Contaminants (VOCs and others)

Challenges addressed by Action TD1105 (1/1)

- **Nanomaterials for AQC sensors**
- **Low-cost Gas Sensors**
- **Low-power Sensor-Systems**
- **Wireless Technology (*Environmental Sensors Network*)**
- **Air Quality Modelling**
- **Environmental Measurements**
- **Standards and Protocols**



Action's Objectives (1/3)

MoU Main Objectives of COST Action TD1105:

- To establish a *Pan-European multidisciplinary R&D platform* on new sensing paradigm for Air Quality Control (AQC) contributing to sustainable development, green-economy and social welfare.
- To create *collaborative research teams* in the ERA on the new sensing technologies for AQC in an integrated approach to avoid fragmentation of the research efforts.
- To train *Early Stage Researchers (ESRs)* and new young scientists in the field for supporting competitiveness of European industry by qualified human potential.
- To promote *gender balance* and involvement of ESRs in AQC.
- To disseminate *R&D results on AQC* towards *industry community* and policy makers as well as general public and high schools.

Action's Objectives (2/3)

MoU Secondary Objectives of COST Action TD1105:

- To provide a *platform between scientists* in the field of materials, nanotechnology and sensor-systems and other scientists such as environmental protection engineers, public agencies managers, stakeholders, decision-makers, aiming to improve best practices in AQC and explore the potential role of new generation of low-cost sensing devices.
- To investigate *sensing mechanisms* of functional nano-materials for gas measurement and identification of the best available nano-materials, providing concepts and harmonising pre-standardised methods; based on available datasets from partners.
- To assess *degradation rates and lifetime* of sensor elements in defined environmental conditions and evaluate interactions of sensitive materials with outdoor/indoor pollutants; based on datasets from ongoing and historical field deployments of low-cost sensors.
- To investigate *the best available technology* for sensor deployment, communication, power supply and data storage, analysis and display.

Action's Objectives (3/3)

MoU Secondary Objectives of COST Action TD1105:

- To monitor real-world environmental conditions with *experimental campaigns* to assess composition of *indoor air* (buildings: house and office) and *outdoor air* (urban areas and industrial sites) and to investigate how such data can be utilised in air pollution modelling.
- To approach *standardisation of methods* for air quality measurements, e.g. harmonisation of test procedures, chemical analysers, post processing, protocols, etc..
- To disseminate *knowledge* on functional materials and sensor-systems for AQC; to aid better focusing of Europe's resources by coordinated efforts in AQC and environmental sustainability to strengthen Europe's competitiveness and scientific excellence improving capacity building and networking to tackle global challenges in a big market in the mid-long term.

COST Action EuNetAir: Some National Research Projects

Nat. Res. Project:
NDIR-GAS SENSORS
Sector: ENV TECH, ICT
Lead Partner: CCMOS Ltd
Country: UK

Nat. Res. Project: SMART-GAS
Sector: ENV TECH
Lead Partner: SenseAir
Country: Sweden

Nat. Res. Projects: SMS-Nase, DFG
Sector: MATERIALS, AOC SENSORS
Lead Partner: ...

Nat. Res. Project: NANOSENSORS
Sector: MATERIALS, GAS SENSORS
Lead Partner: C - CN Academy of Science
Country: China

Nat. Res. Project: SNAQ-Heard
Sector: ...
Lead Partner: ... Cambridge
Country: UK

Nat. Res. Project: ... EFFICY
Sector: ...
Lead Partner: ...
Country: Germany

Nat. Res. Projects: RF-SENS, INTEGROSENS
Sector: ENV, GAS SENSORS, CONTROL
Lead Partner: University of Bayreuth
Country: Germany

Nat. Res. Project: SMART SENSOR
Sector: MATERIALS, GAS SENSOR
Lead Partner: NRC - Kurchatov Institute
Country: Russian Federation

Nat. Res. Project: HTS&M
Sector: Materials, NanoDev
Lead Partner: IMEC
Country: Netherlands

Nat. Res. Projects: VOC-IDS (EraNet), IGFL
Sector: ENV, SECURITY, ICT
Lead Partner: LMT-Saarland University
Country: Germany

Nat. Res. Project: CAPBTX
Sector: GAS SENSORS, ENV
Lead Partner: ...
Country: ...

Nat. Res. Project: CABTURES
Sector: NANO, SENSORS
Lead Partner: EPFL
Country: Switzerland

Nat. Res. Projects: IDEA, MOBILE SENSING
Sector: ENV, ICT
Lead Partner: VITO
Country: Belgium

Nat. Res. Project: SMART NANOSENSORS
Sectors: CNT NANOSENSORS FOR SPACE, COMMERCIAL/INDUSTRIAL APPLICATIONS
Lead Partner: NASA Ames Research Center
Country: USA

Nat. Res. Project: NAVACS, N...
Sector: NANO, GAS SENSORS
Lead Partner: IREC
Country: Spain

Nat. Res. Project: VALTEC, TEC
Sector: NANO, GAS SENSORS
Lead Partner: UB, IREC
Country: ...

Nat. Res. Projects: FC Aeth, Air Pollution
Sector: ENV TECHNOL
Lead Partner: Aerosol 2.0
Country: Slovenia

Nat. Res. Project: InTechFun
Sector: MATERIALS, SENSORS
Lead Partner: SUT
Country: Poland

Nat. Res. Projects: VAMOS, CARIATI
Sector: ENV
Lead Partner: CSIC
Country: Spain

Nat. Res. Projects: VOC&ODOR, SIMPA
Sector: ENV
Lead Partner: UNIBA
Country: Italy

Nat. Res. Projects: SIMS, RES...
Sector: ICT, Materials, Env
Lead Partner: ENEA
Country: Italy

Nat. Res. Projects: ...
Sector: ...
Lead Partner: ...
Country: Italy

Nat. Res. Projects: NOVANA, ARCTIC
Sector: ...
Lead Partner: Aarhus University
Country: Denmark

Nat. Res. Projects: FIRB, NANOTHER, CARIPLO
Sector: NANOMATERIALS, GAS SENSORS, ENERGY
Lead Partner: UNIBS; ...
Country: Italy

Nat. Res. Projects: EXOTHERMO
Sector: MATERIALS, GAS SENSORS, ENERGY
Lead Partner: FORTH; ...
Country: Greece

Nat. Res. Projects: CWFIS, SFO
Sector: ENV, AQ Modelling
Lead Partner: NIMH
Country: Bulgaria

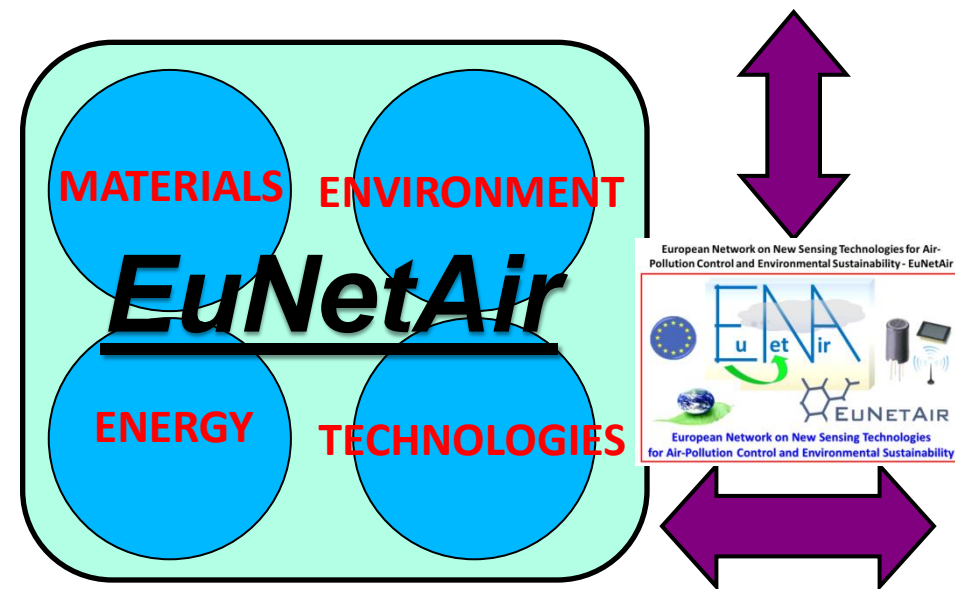
COST Action EuNetAir

COST Action EuNetAir

COST Action EuNetAir: **INNOVATION** (1/2)

Complementarity with other COST Actions:

- ES0602 Chemical Weather Forecasting and Information Systems
- MP0701 Composites with Novel Functional and Structural Properties by Nanoscale Materials
- MP0901 Designing Novel Materials for Nanodevices: From Theory to Practice
- TU0902 Integrated Assessment Technologies to Support the Sustainable Development of Urban Areas



RELATED FP6-FP7 PROJECTS:

- NANOS4, NMP
- S3, EU-RUSSIA COOPERATION
- ORAMA, NMP
- NANO2HYBRIDS, NMP
- AIRMONTECH, ENV
- AQUILA, ENV
- OFFICAIR, ENV
- CITI-SENSE, ENV
- GOSPEL, Network of Excellence in Artificial Olfaction
- FLEXSMELL, PEOPLE Marie-Curie Action

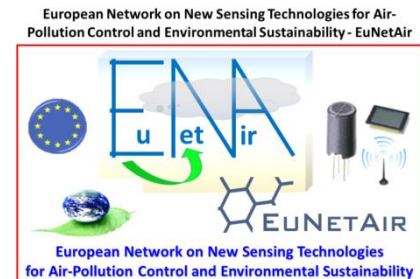
INNOVATION of ACTION:

Integrated approach on AQC for **environmental sustainability** by cooperative networking of multidisciplinary research on **nanomaterials**, **gas sensing technologies**, **wireless sensor technologies and networks**, **environmental measurements**, **ambient intelligence**, **air quality modelling**, **chemical weather forecasting**, **harmonisation of measurements**, **protocols**, **methods, standards and procedures** for **commercialisation of low-cost AQC sensors**.

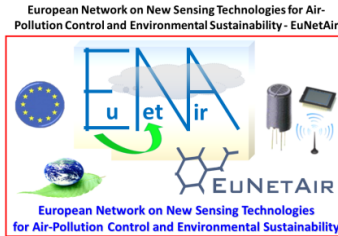
Innovation Highlights of COST Action TD1105 *EuNetAir*:

The Working Program includes multidisciplinary Research at integrated approach and trans-domain multi-scale level:

- Nanomaterials for low-cost AQC sensors
- Improved gas sensor systems and low-power sensing microdevices
- Wireless sensor networks and distributed intelligence
- Air-quality modelling and chemical weather forecasting
- New protocols, standards and methods for AQC sensors
- Harmonisation of environmental measurements
- Guidelines for AQC systems and transducers
- Environmental sustainability and energy efficiency



Action TD1105 *EuNetAir*: Working Groups (1/5)



WG1:
**Sensor Materials
&
Nanotechnologies**

WG2:
**Sensors, Devices
& Systems for AQC**

**INTERDISCIPLINARY
SPECIAL INTEREST GROUPS**

WG4:
**Protocols &
Standardisation
Methods**

WG3:
**Env. Measurements
&
Air Pollution Modelling**

MANAGEMENT COMMITTEE:

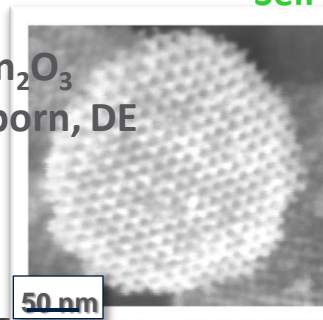
CORE-GROUP & STEERING COMMITTEE

- *Editorial Board*
- *Dissemination*
- *Training Schools*
- *Gender Balance*
- *Early Stage Researchers (ESR)*
- *Short-Term Scientific Mission (STSM)*
- *Intellectual Property Rights (IPR)*
- *Local Organizing Committee (LOC)*

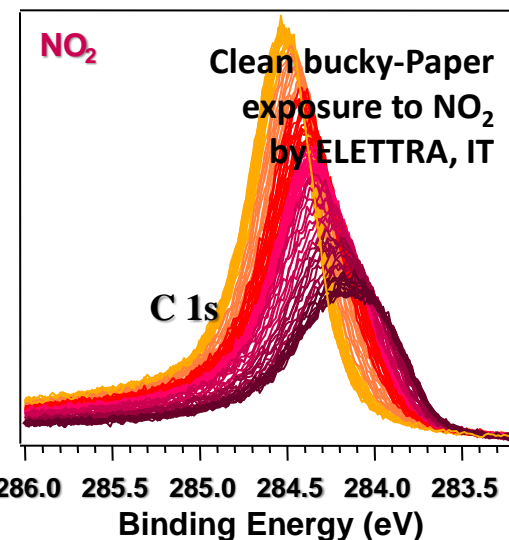
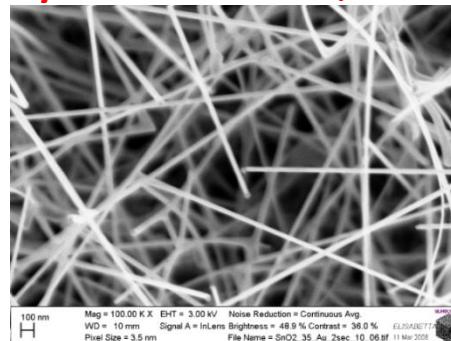
- **SIG 1: Network of Spin-offs**
- **SIG 2: Smart Sensors for Urban Air Monitoring in Cities**
- **SIG 3: Guidelines for Best Coupling Air Pollutant-Transducer**
- **SIG 4: Expert comments for the Revision of the Air Quality EU Directive**

- **Sub-Working Group 1.1:**
Metal oxides nanostructures for AQC gas sensors.
- **Sub-Working Group 1.2:**
Carbon nanomaterials for AQC gas sensors.
- **Sub-Working Group 1.3:**
Emerging sensor materials (organic/inorganic, hybrid, nanocomposites, polymers, functional, etc.).

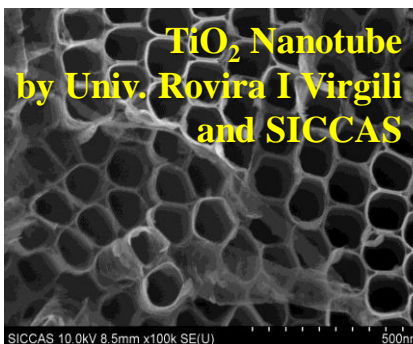
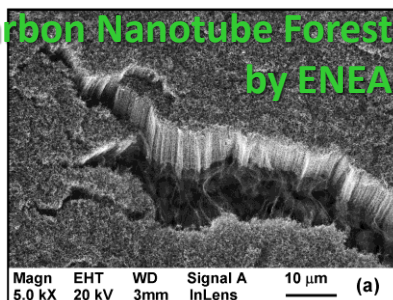
Mesoporous In₂O₃
by Univ. of Paderborn, DE



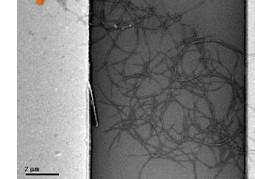
Metal oxide (SnO₂)
Nanowires nets
by Univ. of Brescia, IT



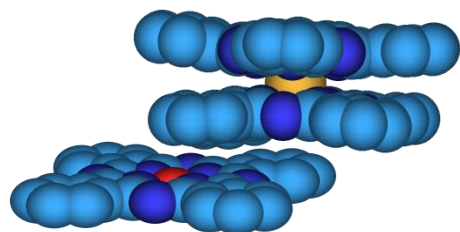
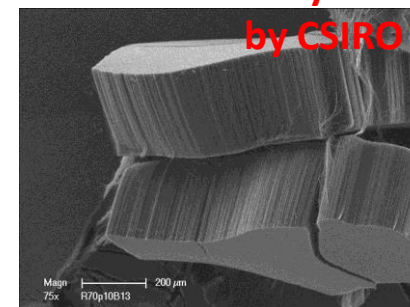
Carbon Nanotube Forest
by ENEA



Carbon Nanotube ropes
by Ames NASA



Carbon Nanotube yarns
by CSIRO



New molecular materials of polymer-macrocycles as transducers for polluting gas sensing by University of Bourgogne

TD1105 *EuNetAir* **WG2**: Sensors, Devices and Systems for AQC (3/5)

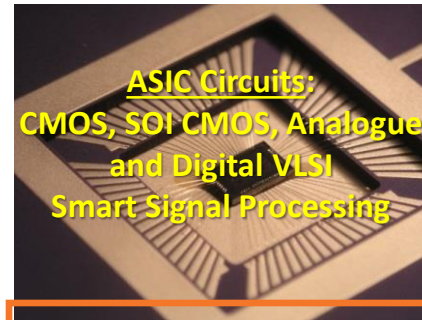
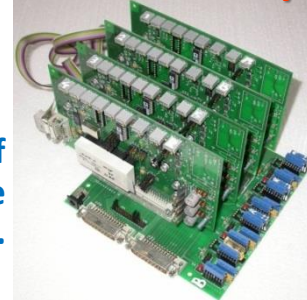
WG2 Chair: Prof. Andreas Schuetze, Saarland University, Germany

IT PATENT ENEA

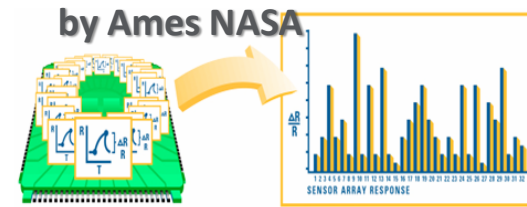
Carbon Nanotube Gas Sensors



EnviroWatch mote by Newcastle University



Warwick University in collaboration with Cambridge University, EPFL, PennState.

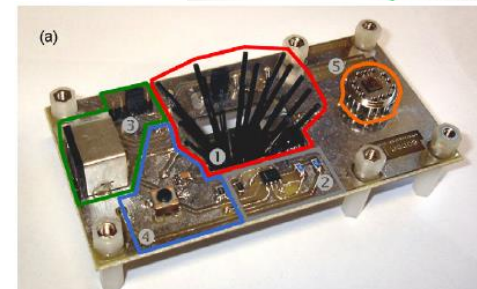


Using pattern matching algorithms, the data is converted into a unique response pattern

A versatile platform for the efficient development of gas detection systems based on automatic device adaptation by University of Saarland.

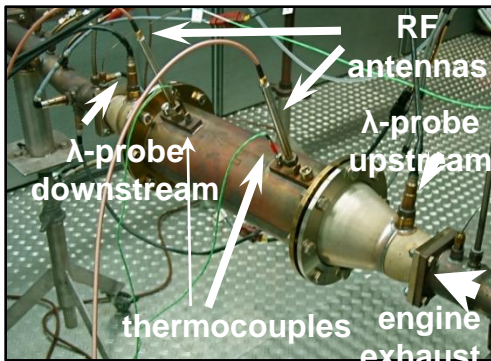


Low-ppb sensitivity for NO₂ GaN-based sensor concept



Autonomous Gas Sensor System by IREC and Univ. of Barcelona

- **Sub-Working Group 2.1:**
Gas sensors and new transducers.
- **Sub-Working Group 2.2:**
Portable gas sensor-systems.
- **Sub-Working Group 2.3:**
Wireless technology and AQC sensors network.
- **Sub-Working Group 2.4:**
Intelligence algorithms and distributed computing for networked AQC gas sensors.



Direct status measurement of automotive catalysts by radio-frequency technique by University of Bayreuth, DE.

ERATION IN SCIENCE AND TECHNOLOGY

Sub-Working Group 3.1:

Environmental measurements at laboratory and in field air-quality stations.

Sub-Working Group 3.2:

Air-quality modelling and chemical weather forecasting.

Sub-Working Group 3.3:

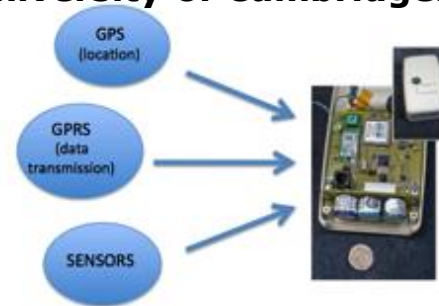
Harmonisation of environmental measurements.

by Aristotle University, EL

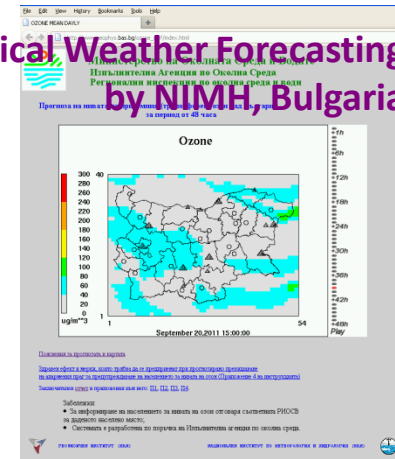


AirMerge system for Chemical Weather Models

Mobile and static sensor network configurations by University of Cambridge.



Chemical Weather Forecasting by NIMH, Bulgaria



AQ Modeling: Tracking routes by Aarhus University, DK



Environmental measurements of PM and air pollution by CSIC, ES

AQ monitoring station by ARPA-PUGLIA, IT

AQ monitoring station by Aarhus University, DK

AQ monitoring station by Lithuanian EPA

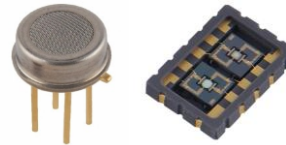
WG4 Chair: Prof. Ingrid Bryntse, SenseAir AB, Sweden

- **Sub-Working Group 4.1**:
Protocols, standards and methods for AQC by analyzers/instruments (no-sensors) technologies.
- **Sub-Working Group 4.2**:
Protocols, standards and methods for AQC by sensors (no-analyzers) technologies.
- **Sub-Working Group 4.3**:
Benchmarking of new products and market of commercial AQC sensors.

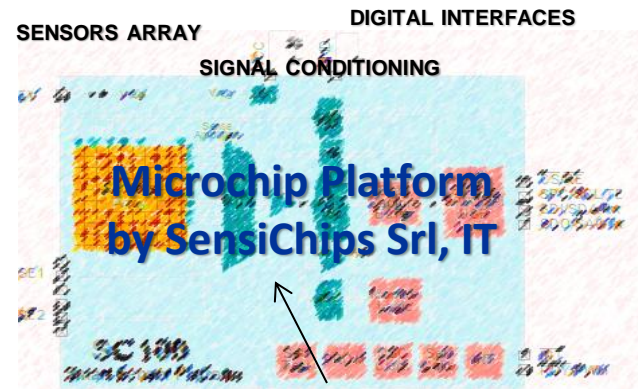
European Directive 2008/50/EC: Ambient Air Quality
EU standard EN 13725/2003: Dynamic Olfactometry

Protocols and Standardised Methods for Gas Sensors
Guidelines of Best Transducers applied to specific gases

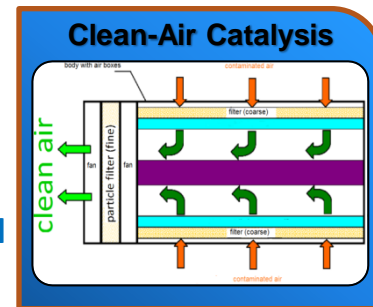
Dynamic olfactometry EN13725
by Univ. of Liege, Odometric SA,
Univ. of Bari, Lenviros srl.



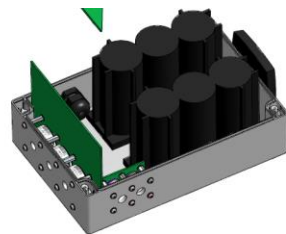
Packaged Sensors
by **SGX-Sensortech, CH**



New precision multi-parametric analytical tool



Becker Gruppe, DE

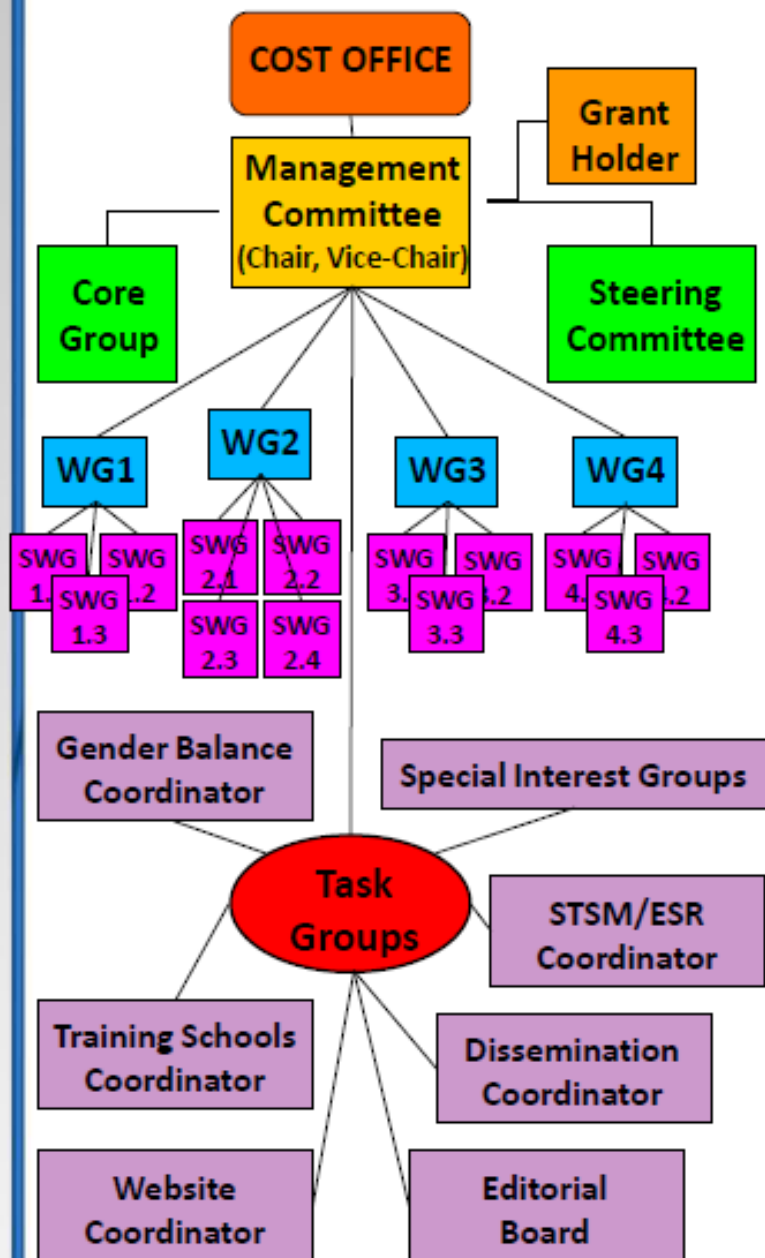


Battery-Powered Sensors by Alphasense Ltd, UK



CO₂ IR sensor for alarm System by SenseAir AB, Sweden

COST Action EuNetAir: COORDINATION AND ORGANIZATION



MANAGEMENT COMMITTEE

2 Representatives of participating Countries

Steering Committee:

- ✓ Action Monitoring
- ✓ Milestones settings
- ✓ Prepare MC meetings
- ✓ Management of IPR issues

Core Group:

- ✓ Prepare Documents for MC
- ✓ Prepare MC meetings
- ✓ Executive tasks in Action

- Meet every 6 months
- S&T exchange
- Cooperation
- Researcher mobility (STSM)
- Budget management
- Report to COST Office
- Organize Workshops/Conferences
- Organize Training Schools
- Promote Gender Balance
- Action Results Dissemination
- Evaluation plans

CORE GROUP

Action Chair
Action Vice Chair
Secretary

WGs Coordinator

- Organize WG meetings
- Coordination
- Monitoring
- Promote joint-activities
- Report to MC and SG

STSM/ESR Coordinator

- STSM/ESR agenda
- Training agenda

Gender Coordinator

- Gender agenda
- Care for gender balance

Dissemination Coordinator

- Dissemination activities
- Action Website
- Local Organizing Committee

NETWORKING

- Special Interest Groups (SIGs)
- Network of spin-offs
- International Experts
- Keynote Speakers

COST Action TD1105 ROADMAP (2012-2016)

| YEAR | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 |
|------|--|--|--|--|
| 1 | <p><u>M</u>: Kick-Off Meeting. MC Meeting 1.</p> <p><u>D</u>: MC setup and Action Workplan established</p> | <p><u>M</u>: Editorial Board for Leaflet, Brochure, Newsletter. Action website setup.</p> <p><u>D</u>: Definition of WGs and WGs Workplans</p> | <p><u>M</u>: MC Meeting 2.</p> <p>WGs Meeting 1.</p> <p><u>D</u>: Scientific activities, ESR/STSM program, Dissemination</p> | <p><u>M</u>: Workshop 1. Training School 1.</p> <p>State-of-Art on AQC.</p> <p><u>D</u>: Evaluation and Activity Report. Scientific strategies</p> |
| 2 | <p><u>M</u>: MC Meeting 3. WGs Meeting 2. Update Action website.</p> <p><u>D</u>: Scientific activities. Liason with EU Programs</p> | <p><u>M</u>: Editorial Board meeting. ESR/STSM.</p> <p><u>D</u>: Dissemination. Newsletter. Reporting</p> | <p><u>M</u>: MC Meeting 4.</p> <p>WGs Meeting 3.</p> <p>Workshop 2. Training School 2.</p> <p><u>D</u>: S&T strategies</p> | <p><u>M</u>: International Conference 1. Edit. Board. ESR/STSM.</p> <p><u>D</u>: Dissemination. Reporting</p> |
| 3 | <p><u>M</u>: MC Meeting 5. WGs Meeting 4.</p> <p><u>D</u>: Dissemination. Strategies & Activities</p> | <p><u>M</u>: Edit. Board: State-of-art AQC. ESR/STSM</p> <p><u>D</u>: Dissemination. Strategies. Reporting</p> | <p><u>M</u>: MC Meeting 6.</p> <p>WGs Meeting 5.</p> <p>Workshop 3. Training School 3.</p> <p><u>D</u>: S&T strategies</p> | <p><u>M</u>: Edit. Board: Newsletter. ESR/STSM</p> <p><u>D</u>: Dissemination. Reporting</p> |
| 4 | <p><u>M</u>: . MC Meeting 7. WGs Meeting 6.</p> <p><u>D</u>: S&T strategies. Link to EU programs, Industry</p> | <p><u>M</u>: Workshop 4. Training School 4.</p> <p><u>D</u>: Dissemination. ESR/STSM. S&T strategic activity.</p> | <p><u>M</u>: WGs Meeting 7.</p> <p><u>D</u>: S&T strategies and activities. ESR/STSM. Dissemination</p> | <p><u>M</u>: International Conference 2. MC Meeting 8.</p> <p><u>D</u>: Final Evaluation. Reporting</p> |

M: Milestones **D: Deliverables**

First Period TD1105 WORKPLAN (1 July 2012 - 30 June 2013)

| YEAR 1 | MILESTONES | DELIVERABLES |
|--|---|--|
| <p>Year 1 from 07/2012 to 06/2013</p> | <p><u>Quarter 1: July 2012 - September 2012</u> Kick-off Meeting. MC setup. Action Workplan established. MC Meeting 1.</p> | <p><u>Quarter 1: July 2012 - September 2012</u> MC setup Action Workplan established.</p> |
| | <p><u>Quarter 2: October 2012 - December 2012</u> Action website setup. Start-up of Editorial Board for Leaflet, Brochure, Newsletter.</p> | <p><u>Quarter 2: October 2012 - December 2012</u> Definition of WGs and WGs Workplans. <i>Newsletter: Issue 1. Leaflet/Brochure: Release 1.</i></p> |
| | <p><u>Quarter 3: January 2013 - March 2013</u> MC Meeting 2. WGs Meeting 1. Scientific activities.</p> | <p><u>Quarter 3: January 2013 - March 2013</u> Publication of the List of EuNetAir Action R&D <i>Infrastructures</i> and main <i>Facilities</i>. Scientific Activities. ESR/STSM Report and Dissemination.</p> |
| | <p><u>Quarter 4: April 2013 - June 2013</u> Scientific strategies: State-of-art on AQC. Training School organization. Workshop organization.</p> | <p><u>Quarter 4: April 2013 - June 2013</u> Action website fully operational with publication of <i>Curricula</i> of partners. <i>Newsletter: Issue 2.</i> <i>State-of-Art on AQC tech: Release 1.</i> <i>Training School 1. Workshop 1. Annual Report.</i></p> |

COST Action: EuNetAir PARTICIPANTS



| | |
|--|--|
|  BE - Belgium | VITO, Université de Liège, Odometric S.A. |
|  BG - Bulgaria | National Institute of Meteorology and Hydrology - BAS; Institute of Electronics - BAS |
|  CH - Switzerland | Ecole Polytechnique Fédérale de Lausanne; e2v Microsensors S.A.; EnvEve S.A.; EMPA |
|  CZ - Czech Republic | Academy of Sciences of the Czech Republic |
|  DE - Germany | Institute of Energy and Environmental Technology; Saarland University; MPI for Biogeochemistry Univ. of Bayreuth; Univ. of Paderborn; Univ. Applied Sci. Ostwestfalen-Lippe; UST; Alfred Becker; 3S |
|  DK - Denmark | Aarhus University; Technical University of Denmark - DTU |
|  EL - Greece | Aristotle University; FORTH; Athena/ISI; University of Piraeus |
|  ES - Spain | Catalonia Institute for Energy Research - IREC; Spanish National Research Council - CSIC; University Rovira i Virgili; University of Barcelona, Worldsensing S.L. |
|  FI - Finland | University of Oulu; University of Helsinki; Tampere University of Technology |
|  FR - France | University of Bourgogne; University Blaise Pascal; Ecole des Mines de Douai; CEA-CNRS; ETHERA |
|  HU - Hungary | Hungarian Meteorological Service |
|  IS - Iceland | Agricultural University of Iceland |
|  IE - Ireland | Trinity College Dublin |
|  IL - Israel | AirBase Systems |
|  IT - Italy | ENEA; ELETTRA; Univ. of Bari; Univ. of Brescia; Univ. of Trieste; Lenviros; Sensichips, ARPA-Puglia |
|  LV - Latvia | University of Latvia |
|  NL - Netherlands | IMEC - Holst Centre; ECN |
|  NO - Norway | NILU - Norwegian Institute for Air Research |
|  PL - Poland | Silesian University of Technology; Warsaw University of Life Science |
|  PT - Portugal | Univ of Coimbra; Instit. of Environment & Development; National Health Institute; Univ of Lisbon |
|  RO - Romania | National R&D Institute for Nonferrous and Rare Metals; SC IPA SA - Research & Development |
|  SE - Sweden | Linkoping University; Chalmers University of Technology; SenSiC AB; SenseAir AB |
|  SI - Slovenia | University of Ljubljana; Aerosol d.o.o. |
|  UK - United Kingdom | Imperial College London; Newcastle University; University of Manchester; Cambridge; University of Warwick; University of Edinburgh; Cambridge CMOS Sensors; Alphasense |
|  TR - Turkey | GEBZE Institute of Technology; Middle East Technical University of Ankara |

COST Action TD1105 *EuNetAir*: 25 COST Countries (Parties) have already signed Memorandum of Understanding (MoU)

PARTIES

already accepted MoU: 25 Countries

Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom.

COST Action EuNetAir PARTICIPANTS

Logos of participating organizations and institutions include: vito, Université de Liège, Arlon campus, ODOMETRIC, CAMBRIDGE CMOS SENSORS, TRINITY COLLEGE DUBLIN, MPI-BGC, ENEA, TAMPERE UNIVERSITY OF TECHNOLOGY, ECN, NILU, idad, AirBase, LATVIJAS UNIVERSITATE, FM FUNCTIONAL MATERIALS, UNIVERSITÄT DES SAARLANDES, UNIVERSITÄT PADERBORN, BECKER B GRUPPE, UST UMWELT SENSOR TECHNIK, 3S Gas sensing solutions, AARHUS UNIVERSITET, DTU, Aristotle University Thessaloniki, FORTH, I.S.I. Industrial Systems Institute, IREC, MINISTERIO DE CIENCIA E INNOVACION, CSIC, UNIVERSITAT DE BARCELONA, world sensing, UNIVERSITY of OULU, UB, HMS, imec, ENEA, elettra, Dipartimento di Scienze Chimiche e Farmaceutiche, UNIVERSTAS STUDIORUM BRUNAE, lenviros, sensichips, Uiverza v Ljubljani, CHALMERS, SenseAir, SenSiC AB, Aerosol, Linköpings universitet, Imperial College London, Newcastle University, UNIVERSITY OF CAMBRIDGE, WARWICK, MANCHESTER 1824.

COST Action TD1105 *EuNetAir*: 5 Non-COST Countries and 7 Non-COST Institutions

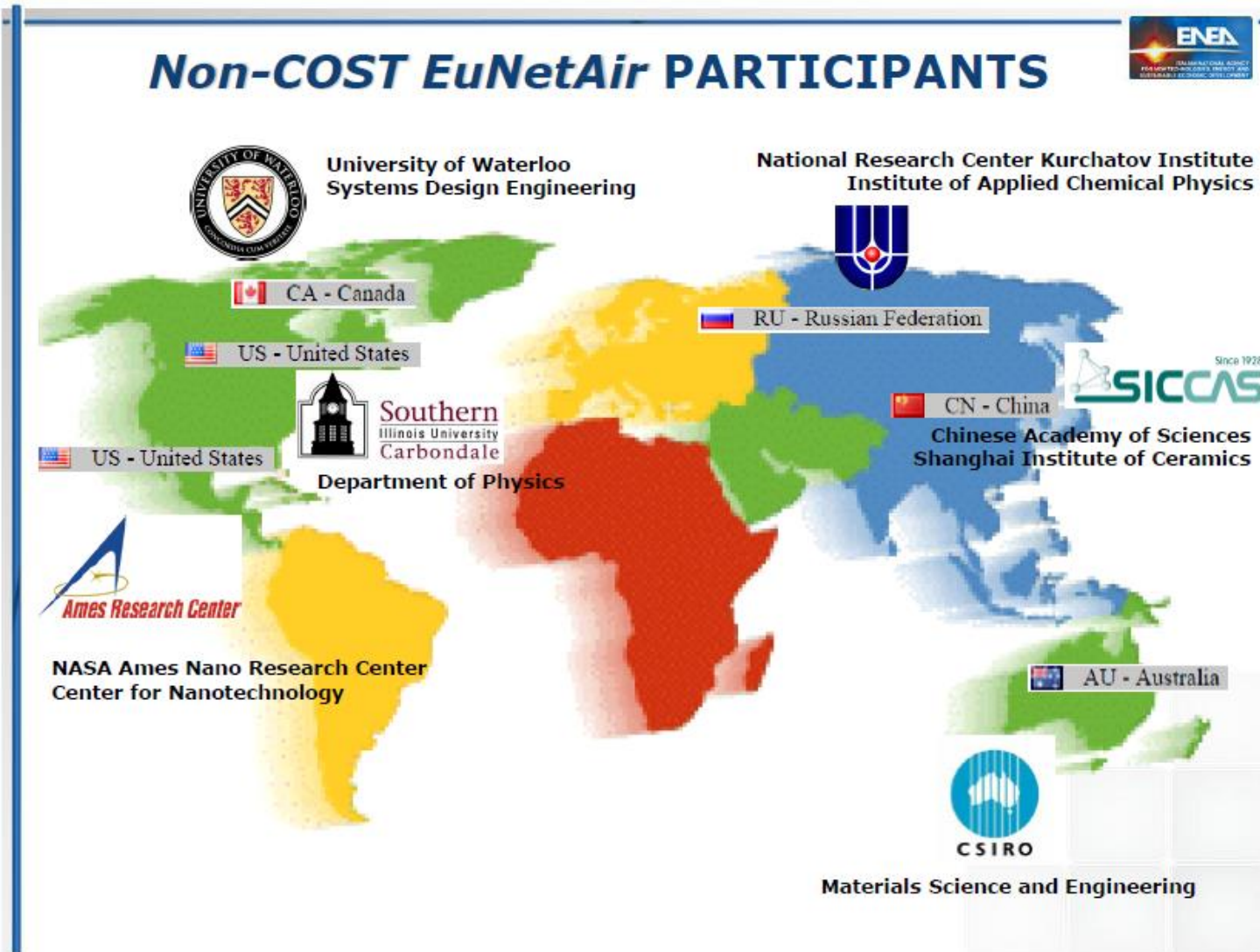
Non-COST Countries:

Australia, Canada,
China, Russia, USA

Non-COST Institutions:

CSIRO (Australia*);
University of Waterloo
(Canada); Chinese Academy
of Sciences, Shanghai
Institute of Ceramics
(China); National Research
Center Kurchatov Institute
(Russia); Southern Illinois
University Carbondale,
NASA Ames Research
Center (USA).

* *Reciprocal Agreement
Country.*



COST Action EuNetAir: List of Experts

(* Reciprocal Agreement)



Total of Experts: 118 from **25** COST Countries and **5** Non-COST Countries

BE - Belgium

Prof. Anne-Claude ROMAIN
Dr. Jan THEUNIS
Dr. Julien DELVA

BG - Bulgaria

Dr. Dimiter SYRAKOV
Dr. Ivan NEDKOV

CH - Switzerland

Dr. Danick BRIAND
Dr. Marco BRINI
Dr. Christine ALEPEE
Dr. Nicolas MOSER
Dr. Christoph HUEGLIN

CZ - Czech Republic

Dr. Vera KURKOVA
Dr. Roman NERUDA
Dr. Zdenek ZELINGER

DE - Germany

Dr. Thomas A. J. KUHNBUSCH
Dr. Ulrich QUASS
Prof. Andreas SCHUETZE
Dr. Tilman SAUERWALD
Prof. Ralf MOOS
Dr. Daniela SCHONAUER-KAMIN
Dr. Thorsten WAGNER
Dr. Olaf KIESEWETTER
Dr. Thorsten CONRAD
Dr. Thomas BECKER
Prof. Wrenger Burkhard
Dr. Jost Valentin Lavric

DK - Denmark

Prof. Ole HERTEL
Dr. Lise Lotte SORENSEN
Prof. Anja BOISEN
Dr. Silvan SCHMID

EL - Greece

Prof. Kostas KARATZAS
Prof. George KIRIAKIDIS
Dr. Christos KOULAMAS
Prof. George PAPAPOPOULOS
Prof. Tatiana TAMBOURATZIS

ES - Spain

Prof. Juan Ramon MORANTE
Dr. Francisco HERNANDEZ
Dr. Xavier QUEROL
Dr. Mar VIANA
Prof. Eduard LLOBET
Dr. Radu IONESCU
Prof. Albert ROMANO
Dr. Juan Daniel PRADES
Dr. Jordi LLOSA

FI - Finland

Prof. Heli JANTUNEN
Prof. Jyrki LAPPALAINEN
Dr. Jari JUUTI
Prof. Kaarle HAMERI
Prof. Jorma KESKINEN

FR - France

Prof. Marcel BOUVET
Prof. Jerome BRUNET
Prof. Alain PAULY
Dr. Jean SUISSE
Dr. Amadou NDYAE
Dr. Thu-Hoa THRAN-THI
Dr. Philippe KARPE
Prof. Jerome ROSSIGNOL
Prof. Nadine LOCOGE

HU - Hungary

Dr. Zita FERENCZI
Dr. Krisztina LABANCS

IS - Iceland

Dr. Arngrimur THORLACIUS

IE - Ireland

Dr. Francesco PILLA

IL - Israel

Dr. Liad ORTAR

IT - Italy

Dr. Michele PENZA
Dr. Marco ALVISI
Dr. Saverio DE VITO
Dr. Andrea GOLDONI
Dr. Magda BRATTOLI
Dr. Annamaria DEMARINIS
Dr. Gianluigi DE GENNARO
Dr. Luigi BARBIERI
Prof. Giorgio ASSENNATO
Dr. Roberto SIMMARANO
Prof. Giorgio SBERVEGLIERI

LV - Latvia

Prof. Iveta STEINBERGA

NL - Netherlands

Dr. Sywert BRONGERSMA
Dr. Ernie WEIJERS

PL - Poland

Dr. Monika KWOKA
Prof. Stanislaw GAWRONSKI
Prof. Jacek SZUBER

PT - Portugal

Prof. Bernadete RIBEIRO
Prof. Carlos BORREGO
Dr. Joao Paulo TEIXEIRA
Prof. Cristina MAGUAS
Dr. Miguel COUTINHO
Dr. Ana Margarida COSTA

SE - Sweden

Prof. Anita LLOYD SPETZ
Dr. Marina VOINOVA
Dr. Mike ANDERSSON
Dr. Donatella PUGLISI
Dr. Ulf THOLE
Prof. Ingrid BRYNTSE

SI - Slovenia

Prof. Rahela ZABKAR
Dr. Grisa MOCNIK
Prof. Branko STER

UK - United Kingdom

Prof. Julian GARDNER
Prof. Roderic JONES
Prof. Krishna PERSAUD
Prof. John POLAK
Dr. Robin NORTH
Dr. Jeff NEASHAM
Dr. Fabio GALATIOTO
Prof. Florin UDREA
Dr. John SAFFELL
Prof. John LEE

NO - Norway

Dr. Nuria Castell-BALAGUER
Dr. Philippe SCHNEIDER

RO - Romania

Dr. Roxana Mioara PITICESCU
Dr. Marcel IONICA
Dr. Cristina RUSTI
Dr. Radu Adrian IONICA

TR - Turkey

Prof. Zafer Ziya OZTURK
Prof. Mehmet Fatih DANISMAN

AU - Australia

* Dr. Phil MARTIN

CA - Canada

Prof. John YEOW

CN - China

Dr. Yongxiang LI
Dr. Zhifu LIU

RU - Russian Federation

Dr. Alexey VASILIEV

US - United States

Prof. Andrei KOLMAKOV
Dr. Meyya MEYAPPAN

Country MC Members (45): Male (73%) - Female (27%)

| | |
|----------------|--|
| Belgium | Dr Jan THEUNIS; Dr Anne-Claude ROMAIN |
| Bulgaria | Dr Dimiter SYRAKOV; Dr Ivan NEDKOV |
| Czech Republic | Dr. Vera KURKOVA |
| Denmark | Prof. Ole HERTEL |
| Finland | Prof. Kaarle HAMERI; Prof. Jyrki LAPPALAINEN |
| France | Prof. Marcel BOUVET; Prof. Jerome BRUNET |
| Germany | Prof. Andreas SCHUETZE; Dr Thorsten CONRAD |
| Greece | Prof. George PAPAPOULOS; Prof. Kostas KARATZAS |
| Hungary | Ms Krisztina LABANCZ; Dr Zita FERENCZI |
| Iceland | Dr Arngrimur THORLACIUS |
| Ireland | Dr. Francesco PILLA |
| Israel | Dr. Liad ORTAR |
| Italy | Dr Michele PENZA; Prof. G. SBERVEGLIERI; Dr. G. DE GENNARO |
| Latvia | Dr Iveta STEINBERGA |
| Netherlands | Dr Sywert BRONGERSMA; Dr. Ernie WEIJERS |
| Norway | Dr Nuria CASTELL BALAGUER; Dr. Philipp SCHENEIDER |
| Poland | Dr Monika KWOKA; Prof. Janislaw GAWRONSKI |
| Portugal | Prof. Bernadete RIBEIRO; Prof. Carlos BORREGO |
| Romania | Dr Marcel IONICA; Dr Roxana Mioara PITICESCU |
| Slovenia | Dr Grisa MOCNIK; Dr Rahela ZABKAR |
| Spain | Prof. Juan Ramon MORANTE; Prof. Eduard LLOBET VALERO |
| Sweden | Prof. Anita LLOYD SPETZ; Prof. Ingrid BRYNTSE |
| Switzerland | Dr Danick BRIAND; Dr. Nicolas MOSER |
| United Kingdom | Dr John SAFFELL; Prof. Roderic JONES |
| Turkey | Prof. Zafer ZIYA OZTURK; Prof. Mehmet Fatih DANISMAN |

MC Chair: Michele Penza, ENEA, IT

MC Vice Chair: Anita Lloyd Spetz, Linkoping University, SE

Grant Holder: University of Bari, IT

Kick-off Meeting at Brussels on 16 May 2012

Country MC Substitutes (26)

| | |
|----------------|--|
| Belgium | Dr Julien DELVA |
| Czech Republic | Dr. Roman NERUDA |
| Denmark | Dr. Lise Lotte SORENSEN |
| Finland | Prof. Jorma KESKINEN |
| France | Dr. Jean SUSSI Prof. Alain PAULY |
| Germany | Dr. Daniela SCHONAUER-KAMIN Dr. Thomas KUHNBUSCH |
| Greece | Prof. George KIRIKIADIS Dr. Roberto SIMMARANO |
| Italy | Dr. Marco ALVISI Dr. Saverio DE VITO |
| Poland | Prof. Jacek SZUBER |
| Portugal | Dr. Joao Paulo TEIXEIRA |
| Romania | Dr. Cristina RUSTI Dr. Marcel Adrian IONICA |
| Slovenia | Prof. Andrej DOBNIKAR |
| Spain | Prof. Albert ROMANO-RODRIGUEZ Dr. Jordi LLOSA |
| Sweden | Dr UIF THOLE Dr. Marina VOINOVA |
| Switzerland | Dr Christoph HUEGLIN |
| UK | Prof. Julian GARDNER Dr Robin NORTH Prof. Florin UDREA |

MANAGEMENT

COMMITTEE

COST ACTION TD1105 DISSEMINATION EVENTS



IMCS 2012
The 14th International Meeting on Chemical Sensors
 May 20 - 23, 2012, Nürnberg/Nuremberg



Special Session: Chemical Sensors and New Technologies for Air-Pollution Control

COST Action TD1105 EuNetAir

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability

IMCS 2012 - The 14th International Meeting on Chemical Sensors, May 20-23, 2012 - Nuremberg, Germany



SGS 2012

VIII International Workshop on Semiconductor Gas Sensors

September 11 - 15, 2012, Cracow, Poland



3th Intelligent Systems for Quality of Life information Services Workshop (ISQL 2012)

8th AIAI Conference, September 27- 30, 2012, Halkidiki, Greece



TCM 2012

The 4th International Symposium on Transparent Conductive Materials
October 21- 26, 2012, Hersonissos, Crete, Greece



COST ACTION TD1105 EVENTS



COST ACTION TD1105 *EuNetAir*

Kick-off Meeting of Action Management Committee

COST Office, 16 May 2012, Brussels (BE)

COST ACTION TD1105 *EuNetAir*

First Meeting and 2nd Management Committee and Working Groups

ENEA Headquarters, 4-6 December 2012, Rome (IT)

COST ACTION TD1105 *EuNetAir*

WG3-WG4 Meeting joined to AirMonTech project

Fraunhofer Inhaus Zentrum, 4-6 March 2013, Duisburg (DE)

COST ACTION TD1105 *EuNetAir*

Third Meeting of Action Management Committee,

Action Workshop (TBC) and Training School

Transducers-2013, 14-21 June 2013, Barcelona (ES)

Expected Impact by Action TD1105

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir

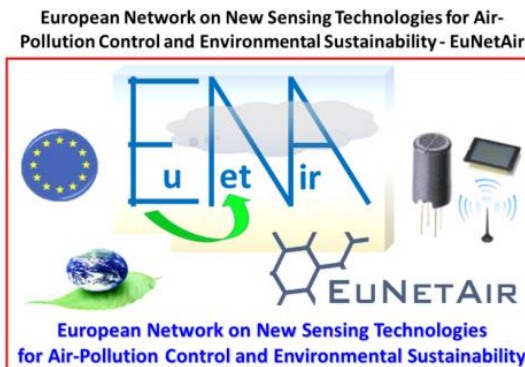


- **European Leadership on AQC Science & Technology**
- **Development of Green-Economy**
- **Support to Sustainable Development**
- **Support to Monitoring System of Clean Air for Europe**
- **Fostering Research & Innovation on New Sensing Technologies for Environmental Monitoring**

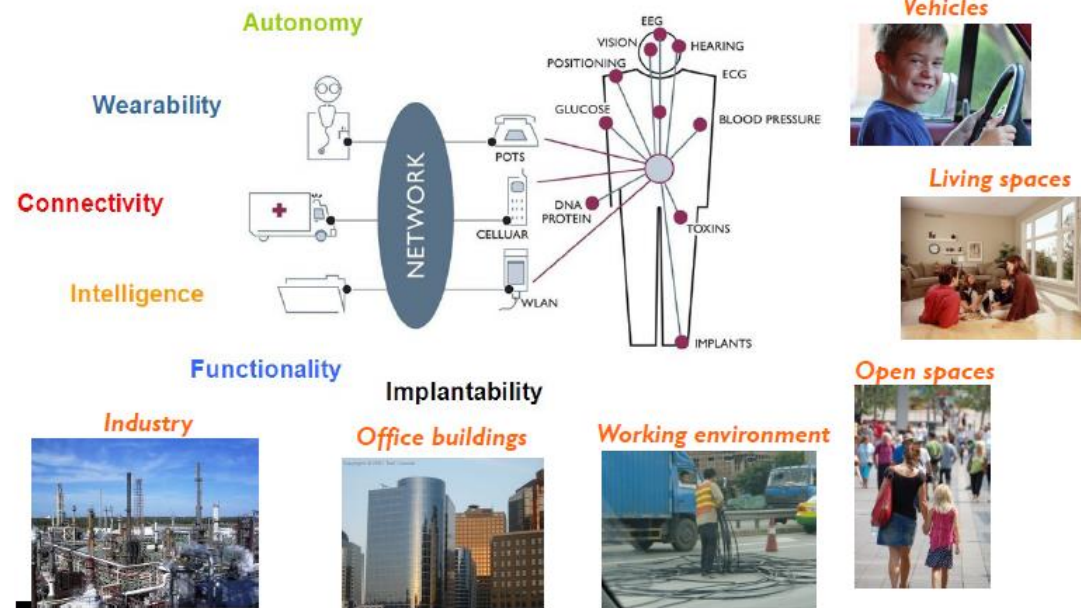
CONCLUSIONS

COST Action TD1105 *EuNetAir* is proposed to solve problems in the area of:

- Air Quality Control
- Environmental Sustainability
- Indoor/Outdoor Energy Efficiency
- Climate Change Monitoring
- Health Effects of Air-Pollution



From *Body Area Network* to *Personal Area Network*



ACKNOWLEDGEMENTS

***KICK-OFF MEETING of Action TD1105
at Brussels on 16 May 2012***

TD1105 MANAGEMENT COMMITTEE



Link of COST Action TD1105 EuNetAir:

MC Chair:

Dr. Michele Penza, ENEA, IT
michele.penza@enea.it

MC Vice Chair:

Prof. Anita Lloyd Spetz
Linköping University, SE
spetz@ifm.liu.se

Grant Holder:

University of Bari, IT
gianluigi.degennaro@uniba.it

Scientific Secretary:

Dr. Annamaria Demarinis Loiotile
annamaria.demarinis@uniba.it

Science Officer:

Dr. Deniz Karaca
deniz.karaca@cost.eu

**Administrative
Officer:**

Dr. Kent Hung
kent.hung@cost.eu

Rapporteur ESSEM:

Prof. Kostantinos Kourtidis (GR)
kourtidi@env.duth.gr

Rapporteur MPNS:

Prof. Joaquim Manuel Vieira (PT)
jvieira@cv.ua.pt

Rapporteur CMST:

Prof. Antonio Lagana (IT)
lagana05@gmail.com

UPDATING AND BREAKING NEWS from Action TD1105

COST Action TD1105 - EuNetAir

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir

Action website:

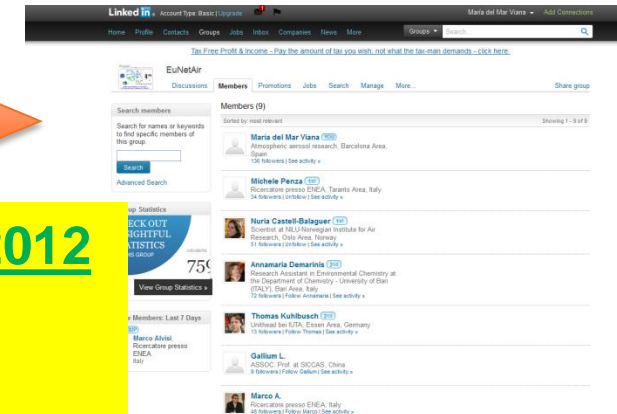
www.cost.eunetair.it

hosted by ENEA

Dr. Marco Alvisi, *Webmaster Coordinator*

Sebastiano Dipinto, Valerio Pfister, Gianfranco Zingarelli, *Webmaster Team*

Social Scientific ESRs Network (SSEN) by LinkedIn
Moderator(s): Mar Viana, Mariacruz Minguillon



CALL for Short Exchange Visits launched on 20 Nov. 2012
(STSM - Short Term Scientific Mission)

Dr. Jan Theunis, STSM Coordinator EuNetAir



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY
EuNetAir Newsletter

COST Action TD1105 Iss. 1/Dec 2012

Opening Editorial

Issue 1: finished and published - Dec. 2012 ✓

Issue 2: planned on April - June 2013

Prof. Ralf Moos, *Editor-in-Chief*

Dr. Daniela Schonauer-Kamin, *Editorial Board Manager*

NOLOGY

COST Action WG3-WG4 Meeting on Wednesday March 6



Wednesday, 6 March 2013

Action TD1105 Working Groups and Special Interest Groups Meetings

University Duisburg-Essen, Gerhard-Mercator-Haus, Lotharstr. 57, D-47057 Duisburg, Germany

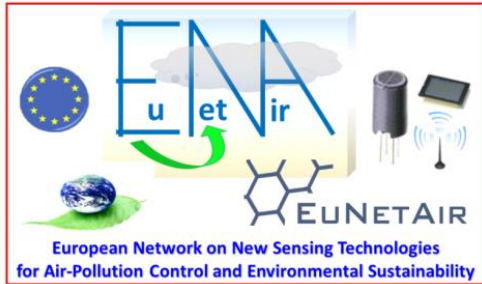
| 6 March 2013 - Wednesday | COST Action TD1105 EuNetAir WG3-WG4 Meeting |
|---------------------------------|---|
| 09:00 - 13:00 | <i>REGISTRATION</i> |
| 09:00 - 16:00 | Action WG3-WG4 Joint MEETING |
| 09:00 - 11:00 | Action WG3 Session chaired by WG3 Leader |
| 11:00 - 11:30 | <i>Coffee-break</i> |
| 11:30 - 13:00 | Action WG4 Session chaired by WG4 Leader |
| 13:00 - 14:00 | <i>Lunch</i> |
| 14:00 - 16:00 | Joint WG3-WG4 Discussions with Presenters from inside/outside Action |
| 16:00 | <i>End of the COST Action WG3-WG4 Meeting</i> |

ALL AirMonTech participants are kindly invited to join to Open Meeting of the COST Action TD1105 *EuNetAir* as guest

No meeting Registration is necessary !

Timeline of Air-Pollution EU Policy

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir



Research Map and
FP 8 Recommendations
In view of DG ENV and AQD 2018

Harmonisation
through
Data Base

Recommendation for
Revision of AQD

Start of FP8
Revision of AQD

Revision of AQD

THANK YOU VERY MUCH FOR YOUR KIND ATTENTION!

2010

2012

2013

2018

2013: Year of Air

declared by European Environment Agency and EC

EU Thematic Strategy on Air Pollution

<http://ec.europa.eu/environment/air/quality/index.htm>

Consultation by EC DG ENV from

Citizens and Experts

Deadline for Consultation: April 03, 2013

Winner of 'Imaginair' youth prize

