

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

COST Action TD1105

INTERNATIONAL WG1-WG4 MEETING on

New Sensing Technologies and Modelling for Air-Pollution Monitoring

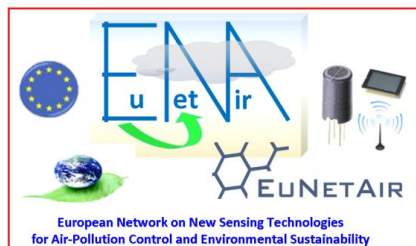
University of Aveiro, Institute for Environment and Development - IDAD

Aveiro, Portugal, 14 - 15 October 2014

Action Start date: 01/07/2012 - Action End date: 30/06/2016 - Year 3: 2014-15 (*Ongoing Action*)

COST Action TD1105: Overview & Updating

 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Michele Penza

Function in the Action: Action Chair

ENEA - Brindisi, Italy



WORKING GROUPS MEETING

New Sensing Technologies and Modelling for Air Pollution Monitoring: EuNetAir Air Quality Joint-Exercise Intercomparison

Aveiro (Portugal), 13 - 15 October 2014

Joint-Exercise Kick-off, 13 October 2014: IDAD - Institute of Environment & Development
WG Meeting, 14-15 October 2014: Environment & Planning Department Auditorium
University of Aveiro, Campus Universitário, 3810-193 Aveiro, Portugal



Meeting AGENDA

13 October 2014 - Monday	<i>(Participation limited to Joint-Exercise Members only)</i>
09:00 - 17:00	REGISTRATION
09:00 - 12:00	Group Meeting: EuNetAir AQ Joint-Exercise Intercomparison
12:00 - 13:00	<i>Lunch</i>
13:00 - 17:00	Installation of Sensors in AQ Mobile Lab in Aveiro City Centre
20:30	<i>Free Dinner</i>
14 October 2014 - Tuesday	<i>(Participation open to WG1-WG4 Members)</i>
09:00 - 18:00	REGISTRATION
09:00 - 09:30	Session 1: Welcome Address
09:30 - 11:00	Session 2: Plenary Session
11:00 - 11:30	<i>Coffee Break</i>
11:30 - 13:00	Session 3: Oral Presentations
13:00 - 14:00	<i>Light Lunch offered by COST Action organization</i>
14:00 - 15:00	Session 4: Poster Presentations
15:00 - 16:30	Session 5: Oral Presentations
16:30 - 17:00	<i>Coffee Break</i>
17:00 - 18:30	Session 6: Oral Presentations
20:30 - 23:00	<i>Social Dinner</i>
15 October 2014 - Wednesday	<i>(Participation open to WG1-WG4 Members)</i>
09:00 - 13:00	REGISTRATION
09:00 - 11:00	Session 7: Oral Presentations
11:00 - 11:30	<i>Coffee-break</i>
11:30 - 13:00	Session 8: Oral Presentations
13:00 - 14:00	<i>Light Lunch offered by COST Action organization</i>
14:00 - 16:00	Session 9: Oral Presentations
16:00 - 16:30	Session 10: Discussion and Future Plans of Action
16:30	End of the WG1-WG4 Meeting and Farewell

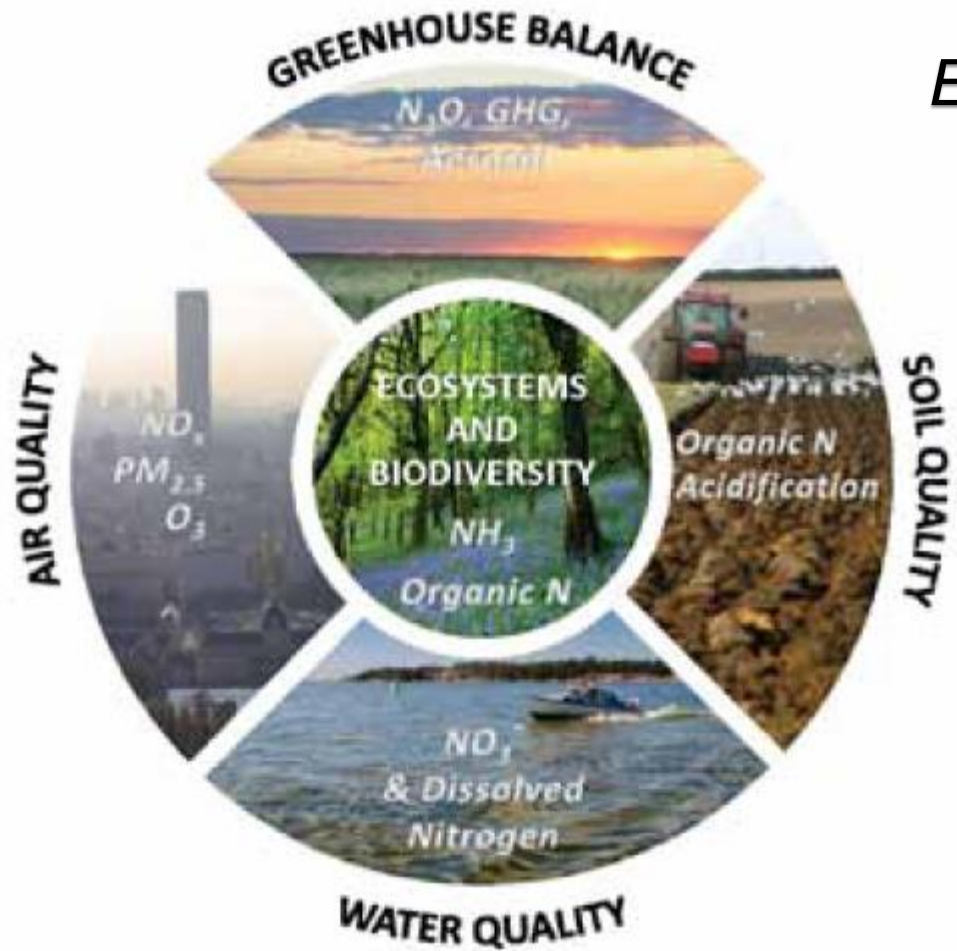
Outline



- **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**
- **Results versus Objectives: Significant Highlights**
- **Future Plans and Challenges: Expected Impact**
- **Concluding Remarks**

Nitrogen Pollution and the European Environment Implications for Air Quality Policy

EC In-Depth Report, September 2013



Excess reactive nitrogen represents a major environmental threat that is only now beginning to be fully appreciated. At a global level, humans have more than doubled the production and cycling of reactive nitrogen, leading to a plethora of impacts that interact across all global spheres: atmosphere, biosphere, hydrosphere and geosphere.

Sutton et al., 2009

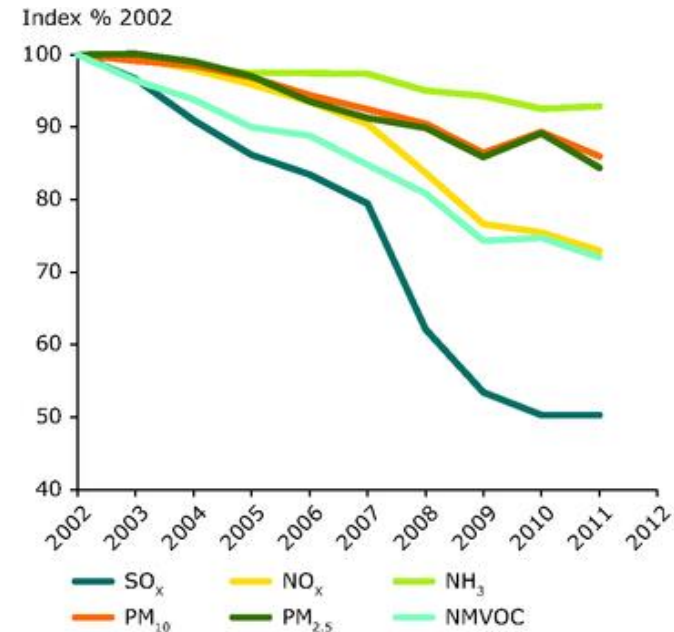
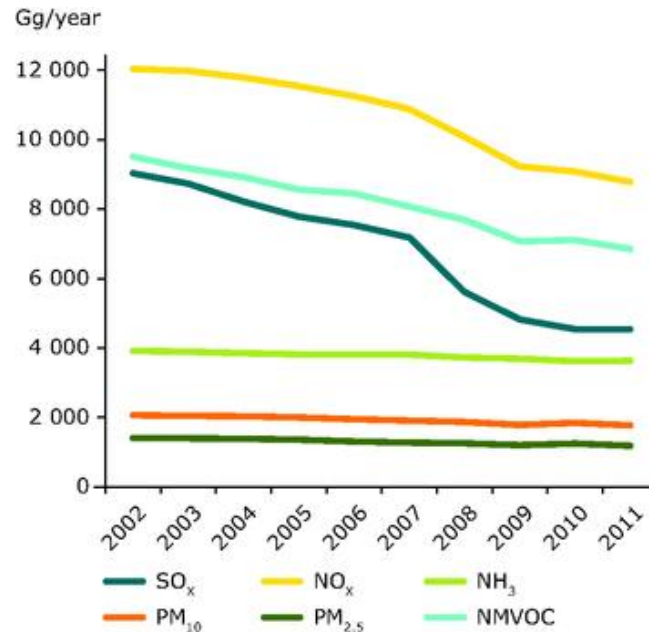
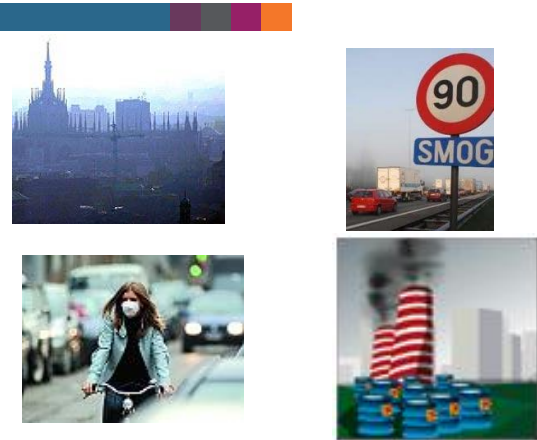
Nitrogen Pollution:

NO_x, N₂O, NH₃, NH₄, NO₂⁻, NO₃⁻, etc.

Source: Sutton and Billen, 2010

Scientific context: Air Quality Control (2/3)

European Environment Agency, EEA Report 9/2013

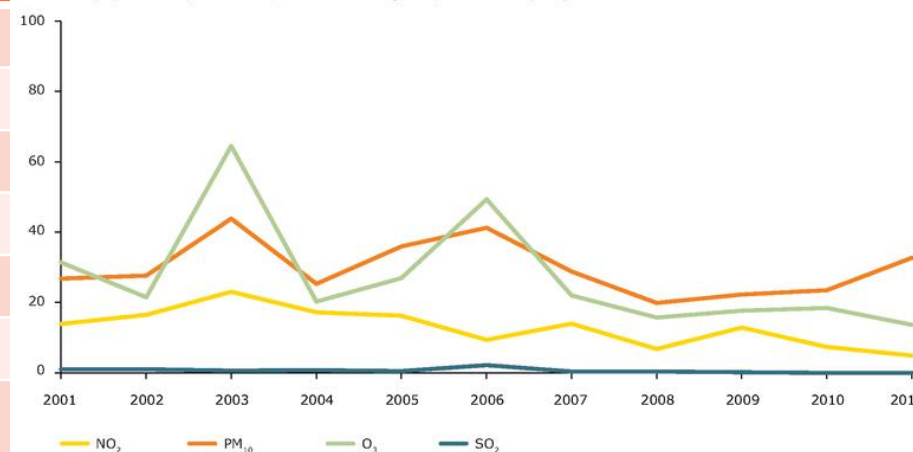


Some Environmental Emergencies:

- 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)

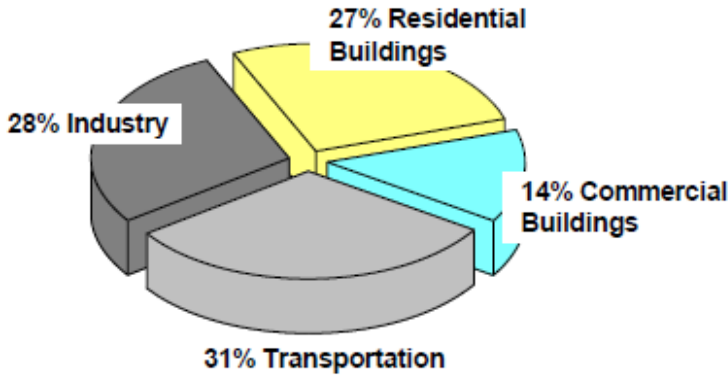
Pollutant	Limit Level
NO _x	100, 200 ppb
CO	8 ppm
SO ₂	130, 190 ppb
O ₃	120 µg/m ³
PM ₁₀	50 µg/m ³
BTEX	6 µg/m ³
PAH (BaP)	1 ng/m ³
PM _{2.5}	25 µg/m ³

% of urban population exposed to air pollution exceeding acceptable EU air quality standard



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

Scientific context: Indoor/Outdoor Energy Efficiency (3/3)



Primary energy consumption in the EU¹

¹ O. Seppanen,

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

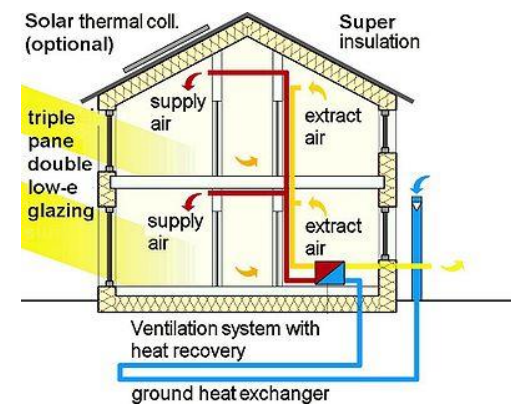
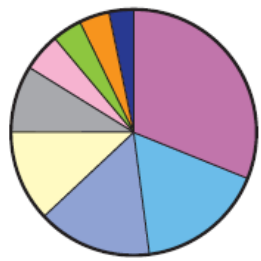
41% Primary Energy consumed in Buildings:

- 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

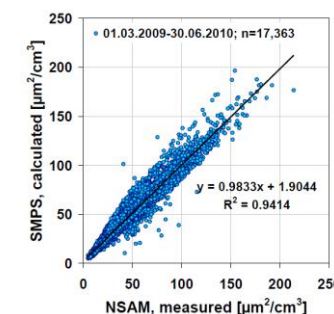
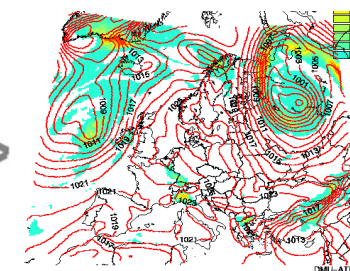
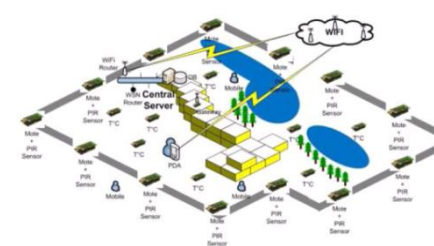
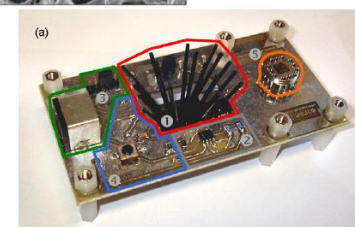
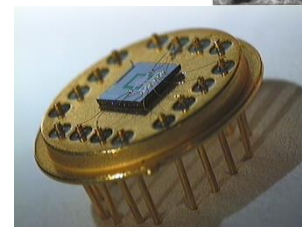
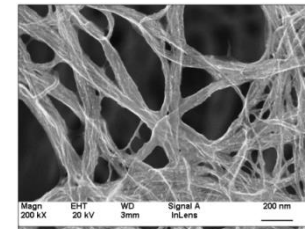
IAQ by WORLD HEALTH ORGANIZATION

Indoor Air		Typical Substances		Cure
Contamination Source	Emission Source	VOCs	Others	
• Human Being	• Breath	Acetone, Ethanol, Isoprene	Humidity	demand controlled ventilation
		CO ₂		
	• Skin Respiration & Transpiration	Nonanal, Decanal, α-Pinene		
		Humidity		
	• Flatus	Methane, Hydrogen		
	• Cosmetics	Limonene, Eucalyptol		
	• Household Supplies	Alcohols, Esters, Limonene		
		Unburnt Hydrocarbons		
CO				
CO ₂				
• Building Material • Furniture • Office Equipment • Consumer Products	• Paints, Adhesives, Solvents, Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes	Humidity	permanent 5-10% ventilation
		• PVC		
	• 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.

Action Research Directions: *Methodology* (1/3)

Cooperative Approach of COST Action TD1105:

The MoU Objectives will be successfully achieved by means of:

- The development of a **multidisciplinary network** of physicists, chemists, physico-chemists, electronics, nanotechnologists, specialists of materials, environment, metrology and management.
- The **relevance, expertise and international renown** of all involved partners.
- **Synergies** leading to work prospects and collective thought focused on the realization of *innovative sensitive materials* and *high-efficient sensing devices*. Such collective work will be *initiated during workshop* and strengthened by *early-stage researcher exchanges*.
- A **global approach** on sensing microsystems and their applications (*materials, transducers, technology, working conditions, methodologies, models, protocols*) leading to simultaneous and *synergic optimizations* of all the parameters to reach the *best performances*.

Action Research Directions: *Methodology* (2/3)

Partner Opportunities of COST Action TD1105:

MoU Objectives are accomplished to federate human and material resources:

- **To have access to at least 5 new European technological platforms:** *synthesis, characterization, design, development, experiments under gas.*
- To perform **measurement campaigns** in real conditions (indoor or outdoor, occupational and non-occupational context, industrial or urban environment) in various European towns thanks to the strong collaborations with national networks of air quality monitoring and environmental agencies (e.g., *AtMO* in France, *ARPA-PUGLIA* in Italy, *CSIC* in Spain, *NILU* in Norway, *Meteorological Services* in Hungary, etc.).
- **To contribute to a better modelling of pollutant dispersion** at the European scale (and more) by the achievements of a **large database on pollution** which will be available to environment protection engineers and researchers.
- **To react** quickly and more efficiently to **economic, social and medical needs related to air quality control**, the networking providing a wide range of technical solutions to suit to each requirement.
- To promote the pooling of scientific knowledge and skills by means of the **manpower mobility** (*Short Term Scientific Missions*) as encouraged by COST Action.

Action Research Directions: *Methodology* (3/3)

DELIVERABLES of COST Action TD1105. MoU areas of S&T cooperation include:

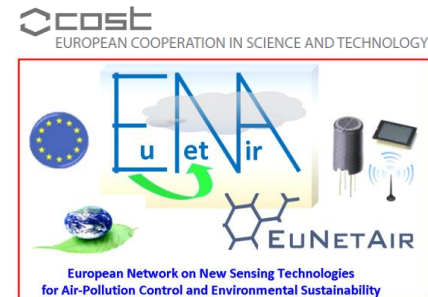
- **Workshops** on sensor materials and nanotechnologies, sensor-systems for AQC, environmental measurements, air-pollution modelling, chemical weather forecasting, distributed computing, wireless sensor networks, protocols and pre-standardisation; organization of open conferences to improve knowledge transfer and dissemination.
- **Training Schools** on sensor materials, technologies, processes, methods, modelling, forecasting, applications, environmental certification and validation, project management.
- **International ESRs exchange** and Scientists Mobility (STSMs) between partners involved in Action and Non-COST partnership at incoming/outcoming level.
- **New collaborative research actions** and research projects providing synergies between partners capabilities.
- **Participation** in Conferences, Short Courses, Mutual Publications, Reports, White Papers, Position Papers, etc.
- **Outreach** activities
- Enforcement of the **Gender Balance** agenda
- Coordinated **Dissemination** of the networking activities towards Academia, Industry and General Public.

Action Research Directions: *Innovation* (1/1)

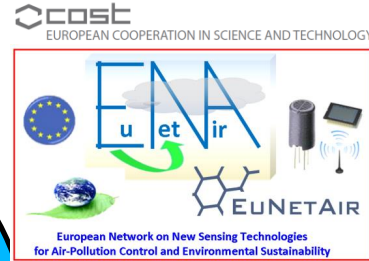
Innovation Highlights of COST Action TD1105 *EuNetAir*:

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**

WG4:
**Protocols &
Standardisation
Methods**

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

**INTERDISCIPLINARY
SPECIAL INTEREST GROUPS**

MANAGEMENT COMMITTEE:

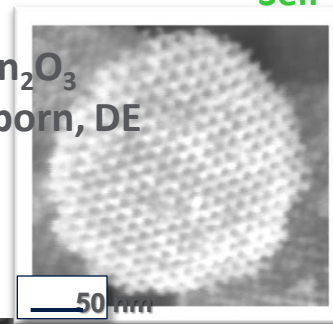
CORE-GROUP & STEERING COMMITTEE

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

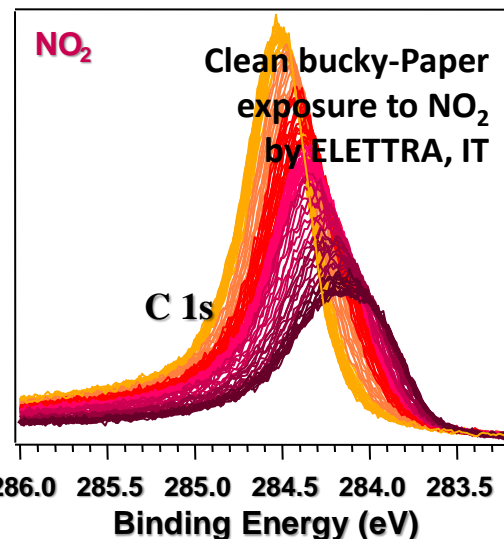
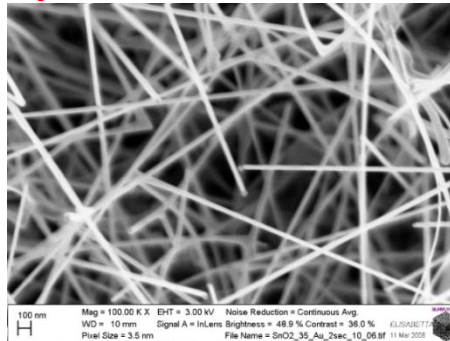
- **SIG 1: Network of Spin-offs**
- **SIG 2: Smart Sensors for Urban Air Monitoring in Cities**
- **SIG 3: Guidelines for Best Coupling Air Pollutant-Transducer**
- **SIG 4: Expert comments for the Revision of the Air Quality EU Directive**

- **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.).

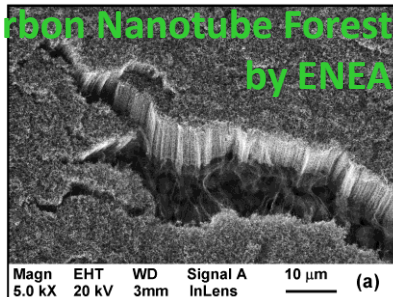
Mesoporous In₂O₃
by Univ. of Paderborn, DE



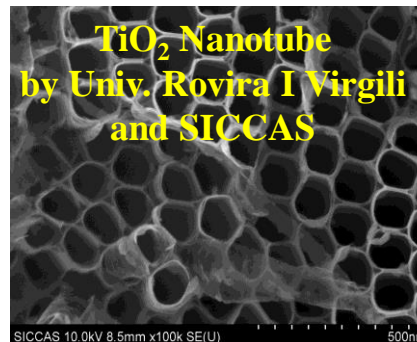
Metal oxide (SnO₂)
Nanowires nets
by Univ. of Brescia, IT



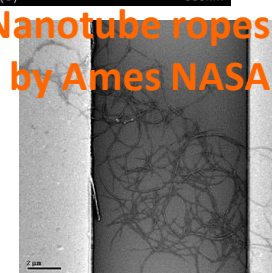
Carbon Nanotube Forest
by ENEA



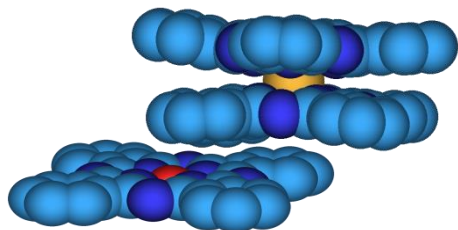
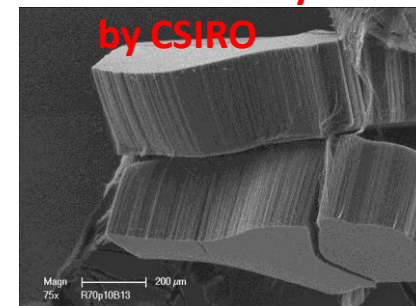
TiO₂ Nanotube
by Univ. Rovira I Virgili
and SICCAS



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)

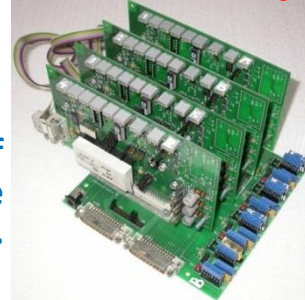
WG2 Chair: Prof. Andreas Schuetze, Saarland University, Germany

IT PATENT ENEA

Carbon Nanotube Gas Sensors



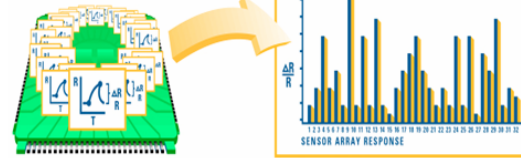
EnviroWatch mote by Newcastle University



ASIC Circuits:
CMOS, SOI CMOS, Analogue
and Digital VLSI
Smart Signal Processing

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

by Ames NASA



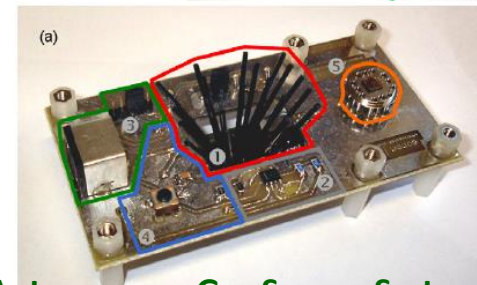
Using pattern matching algorithms, the data is converted into a unique response pattern

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



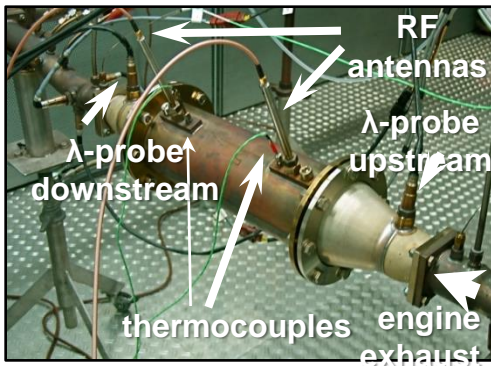
Environmental Sensor
demo by IMEC, NL

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:

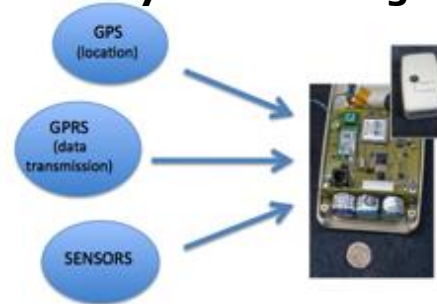
Harmonisation of environmental measurements.

by Aristotle University, EL

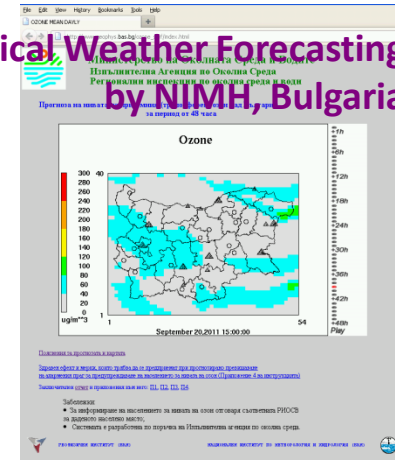


AirMerge system for Chemical Weather Models

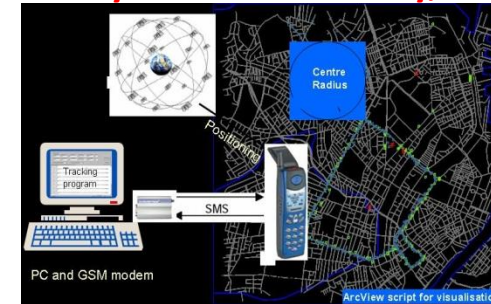
Mobile and static sensor network configurations by University of Cambridge.



Chemical Weather Forecasting by NIMH, Bulgaria



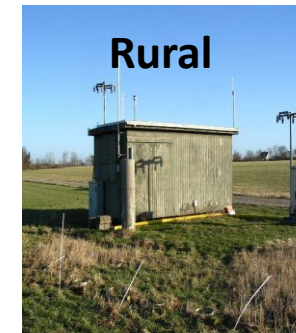
AQ Modeling: Tracking routes by Aarhus University, DK



Environmental measurements of PM and air pollution by CSIC, ES



AQ monitoring station by ARPA-PUGLIA, IT



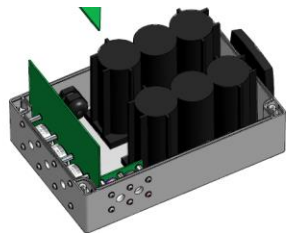
AQ monitoring station by Aarhus University, DK



AQ monitoring station by Lithuanian EPA

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

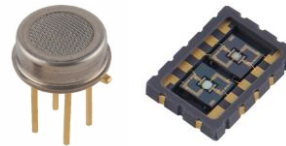
- **Sub-Working Group 4.1**:
Protocols, standards and methods for AQC by analyzers/instruments (no-sensors) technologies.
- **Sub-Working Group 4.2**:
Protocols, standards and methods for AQC by sensors (no-analyzers) technologies.
- **Sub-Working Group 4.3**:
Benchmarking of new products and market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



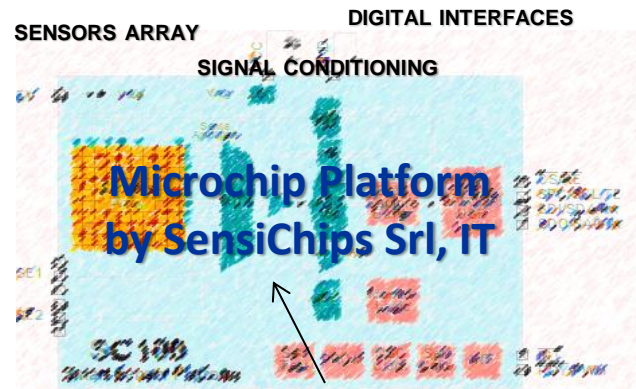
Battery-Powered Sensors by Alphasense Ltd, UK

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

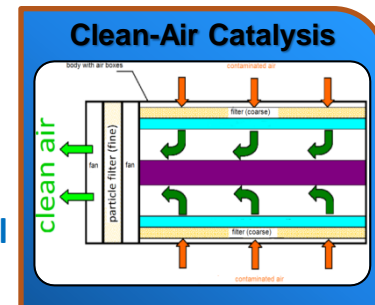
Dynamic olfactometry EN13725
by Univ. of Liege, Odometric SA,
Univ. of Bari, Lenviros srl.



**Packaged Sensors
by E2V, CH**



New precision multi-parametric analytical tool



Becker Gruppe, DE



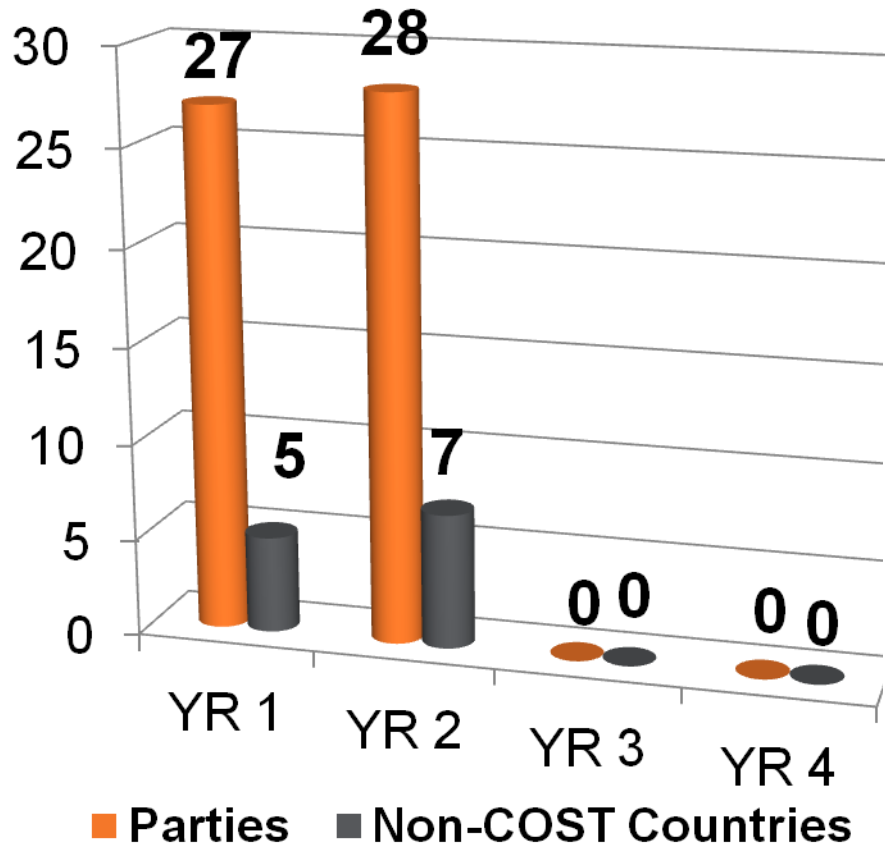
**CO₂ IR sensor for alarm
System by SenseAir AB, Sweden**

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. 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. WGs Meeting 3. 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. WGs Meeting 5. 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>

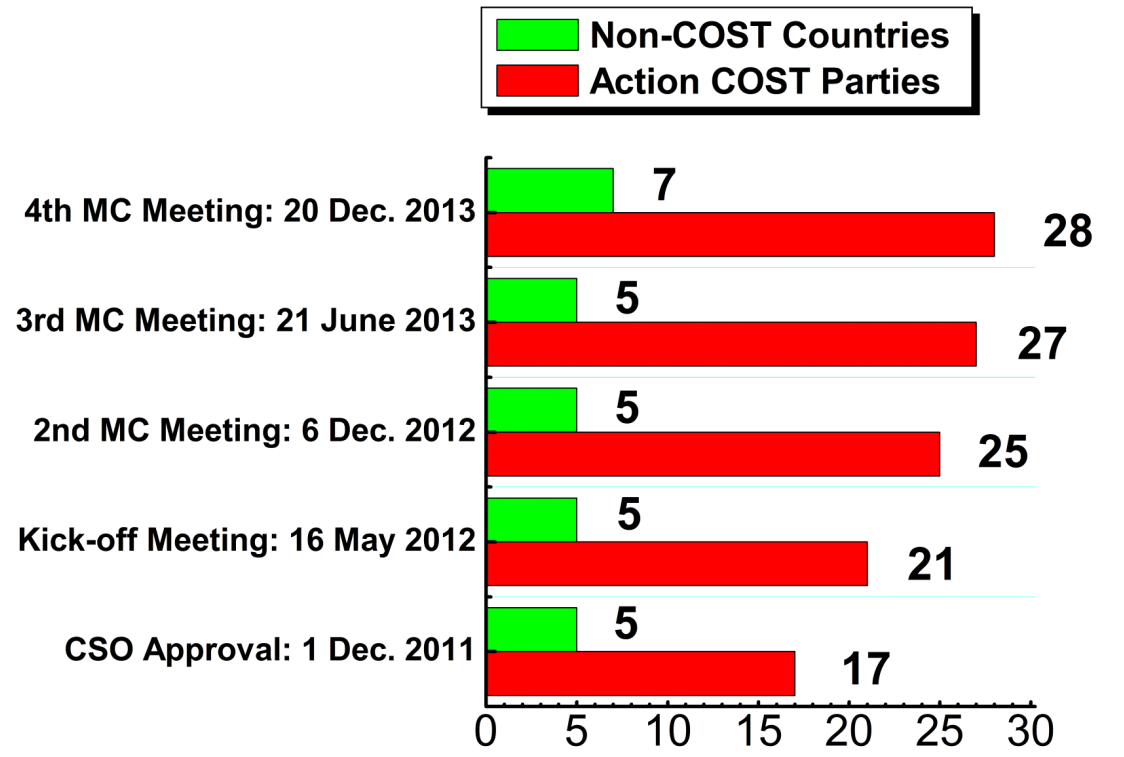
M: Milestones **D: Deliverables**

COST Action TD1105 EuNetAir: **Action Parties (28)**



Non-COST Countries: NNC + IPC

Grant Holder:
 Eurice GmbH, Saarbrücken, Germany
GH Scientific Representatives:
 Corinna Hahn, MC Member
 Juliane Rossbach, MC Substitute



COST Action TD1105 *EuNetAir*: 28 COST Countries (Parties) have already signed Memorandum of Understanding (MoU)

PARTIES:

already accepted
MoU: 28 Countries

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

COST Action *EuNetAir* PARTICIPANTS

The following logos are visible among the participants:

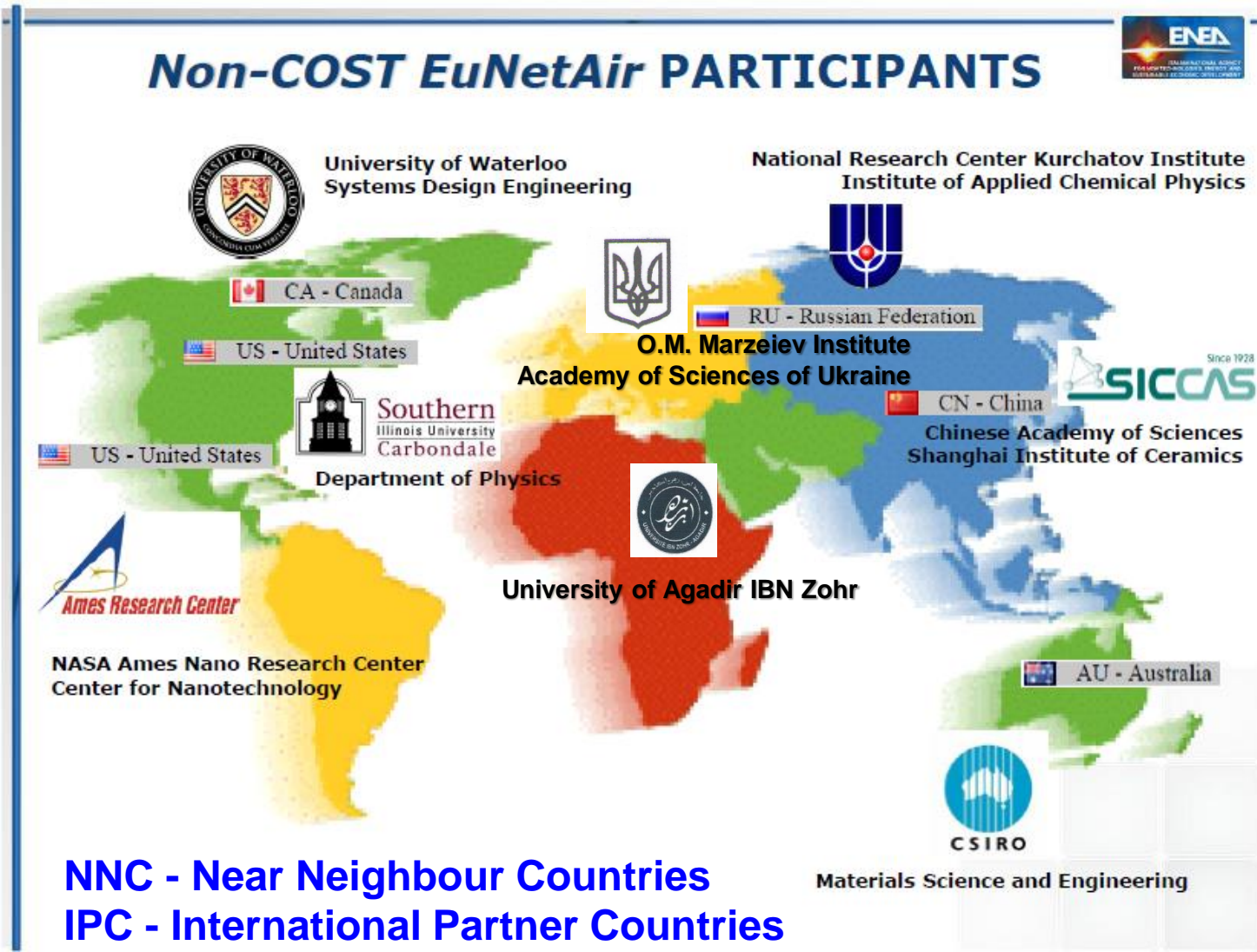
- vito
- UNIVERSITÉ DE LIÈGE
- Arion campus
- ODOMETRIC
- ICICJR
- CAMBRIDGE CMOS SENSORS
- TRINITY COLLEGE DUBLIN
- MPI-BGC
- UNIVERSITY OF LIEDER
- UNIVERSITY OF LIEDER
- ENEA
- EPFL
- e2v
- ENVEVE
- EMPA
- UNIVERSITÄT DES SAARLANDES
- FM FUNCTIONAL MATERIALS
- ethera
- UNIVERSITÄT PADERBORN
- UST
- UMWELT SENSOR TECHNIK
- BECKER GRUPPE
- 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
- UNIVERSITAT ROMA I VIRGI
- world sensing
- UNIVERSITY OF OULU
- UB
- UNIVERSITE BLAISE PASCAL
- HMS
- imec
- ENEA
- elettra
- UNIVERSITA DRII STUDI DI TRIESTE
- Dipartimento di Scienze Chimiche e Farmaceutiche
- UNIVERSITAS ST. AUGUSTINUS
- lenviros
- sensichips
- CHALMERS
- SenseAir
- SENSIC
- Clean air sensors
- Aerosol
- Linköpings universitet
- Imperial College London
- Newcastle University
- UNIVERSITY OF CAMBRIDGE
- WARWICK
- MANCHESTER 1824

COST Action TD1105 *EuNetAir*:

7 Non-COST Countries and 8 Non-COST Institutions

Non-COST Countries:
Australia, Canada, China,
Morocco, Russia, Ukraine,
USA

Non-COST Institutions:
CSIRO (Australia);
University of Waterloo
(Canada); Chinese Academy
of Sciences, Shanghai
Institute of Ceramics
(China); University of
Agadir IBN Zohr (Morocco);
National Research Center
Kurchatov Institute
(Russia); O.M. Marzeiev
Institute for Hygiene and
Medical Ecology of
Academy of Science of
Ukraine (Ukraine); Southern
Illinois University
Carbondale, NASA Ames
Research Center (USA).



EuNetAir: List of Experts from NNC and IPC



180 EXPERTS from **28** COST Countries and **7** Non-COST Countries



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 MEYYAPPAN



MA - Morocco

Dr. Radouane LEGHRIB
Dr. Houda LAHLOU



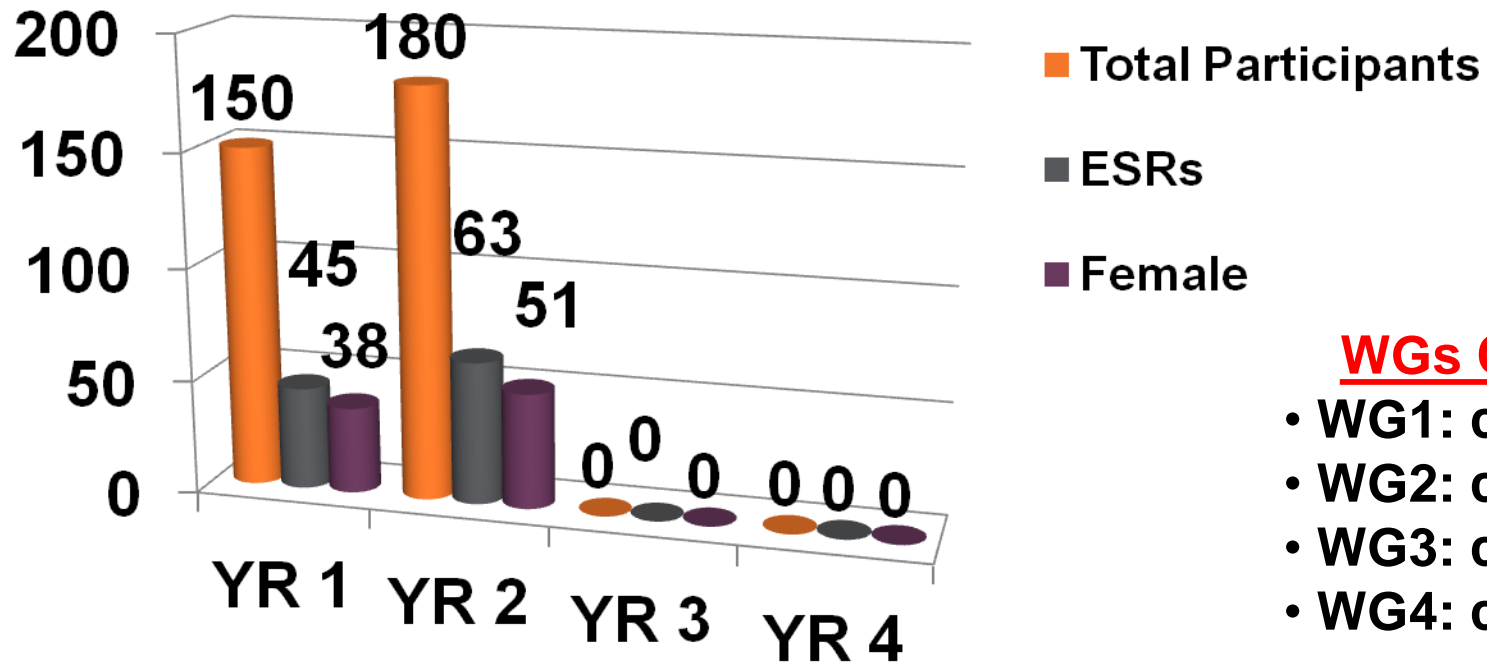
UA - Ukraine

Dr. Olena TUROS
Dr. Arina PETROSIAN
Dr. Oksana ANANYEVA
Dr. Liudmyla MYKHINA
Dr. Liliia PETRUK
Dr. Tetiana MAREMUKHA

NNC - Near Neighbour Countries

IPC - International Partner Countries

COST Action TD1105 EuNetAir: Action participants




WGs Composition:

- WG1: ca. 30 participants
- WG2: ca. 45 participants
- WG3: ca. 40 participants
- WG4: ca. 25 participants


Summary YEAR 2: 1 July 2013 - 30 June 2014

- Total Number of Participants: 180 (80% active)
- Early Stage Researchers (ESRs): 63 (35%)
- Females: 51 (28%)
- MC Members: 52 - Male: 38 (73%); Female: 14 (27%)
- MC Substitutes: 29 - Male: 24 (83%); Female: 5 (17%)


 AT - Austria	Materials Center Leoben Forschung GmbH	
 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	 MK - Republic of Macedonia Ministry of Environment and Physical Planning
 IE - Ireland	Trinity College Dublin; University College Cork	
 IL - Israel	AirBase Systems; TECHNION	 RS- Serbia Institute of Public Health of Belgrade; VINCA
 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	Linköping 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	

 AT - Austria


Dr. Anton KOCK
Dr. Stefan DEFREGGER

 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. KULHUSCH
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
Dr. Corinna HAHN

 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 LABANCZ


 IS - Iceland

Dr. Arngrimir THORLACIUS


 IE - Ireland

Dr. Francesco PILLA
Prof. John WENGER


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

 MK - Rep. of Macedonia


Dr. Igor ATANASOV
Dr. Ljupcho GROZDANOSVKI

 NL - Netherlands


Dr. Sywert BRONGERSMA
Dr. Ernie WEIJERS
Dr. Rene OTJES

 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

 IL - Israel


Dr. Liad ORTAR
Prof. Hossam HAICK

 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

 RS - Serbia

Anka CVETKOVIC
Milena JOVASEVIC-STOJANOVIC

 SI - Slovenia

Rahela ZABKAR
Grisa MOCNIK
Branko STER

 LV - Latvia

Prof. Iveta STEINBERGA

Country MC Members (54): Male (70%) - Female (30%)

Austria	Dr. Anton KOCK
Belgium	Dr Jan THEUNIS; Dr Anne-Claude ROMAIN
Bulgaria	Dr Dimiter SYRAKOV; Dr Ivan NEDKOV
Croatia (NEW Party)	Dr. Irena CIGLENECKI-JUSIC
Czech Republic	Dr. Vera KURKOVA; Dr. Zdenek ZELINGER
Denmark	Prof. Ole HERTEL
Finland	Prof. Kaarle HAMERI; Prof. Jyrki LAPPALAINEN
France	Prof. Marcel BOUVET; Prof. Jerome BRUNET
Germany	Prof. Andreas SCHUETZE; Dr Corinna HAHN
Greece	Prof. George PAPADOPOULOS; Prof. Kostas KARATZAS
Hungary	Ms Krisztina LABANCZ; Dr Zoltan JEDLINCZ
Iceland	Dr Arngrimur THORLACIUS
Ireland	Dr. Francesco PILLA; Prof. John WENGER
Israel	Dr. Liad ORTAR; Prof. Hossam HAICK
Italy	Dr Michele PENZA; Prof. G. SBERVEGLIERI; Dr. G. DE GENNARO
Latvia	Dr Iveta STEINBERGA; Dr. Gita SAKALE
Macedonia Rep.	Dr. Igor ATASANOV; Dr. Ljupcho GROZDANOVSKI
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 Mirona PITIGESCU
Serbia	Dr. Anka CVETKOVIC
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: Eurice GmbH, Saarbrucken, DE

Country MC Substitutes (31)

Austria	Dr Stefan DEFREGGER
Belgium	Dr Julien DELVA
Czech Republic	Dr. Roman NERUDA
Denmark	Dr. Lise Lotte SORENSEN
Finland	Prof. Jorma KESKINEN
France	Dr Jean SUISSE; Prof. Alain PAULY
Germany	Dr Daniela SCHONAUER-KAMIN Dr. Thomas KUHMBUSCH Dr. Juliane ROSSBACH
Greece	Prof. George KIRIKIADIS Dr. Christos KOULAMAS
Italy	Dr. Roberto SIMMARANO Dr. Marco ALVISI; Dr. Saverio DE VITO
Macedonia Rep.	Dr. Beti ANGELEVSKA
Netherlands	Dr. Rene OTJES
Poland	Prof. Jacek SZUBER
Portugal	Dr. Joao Paulo TEIXEIRA
Romania	Dr. Cristina RUSTI; Dr. Marcel Adrian IONICA
Slovenia	Dr. Andrej DOBNIKAR
Spain	Prof. Albert ROMANO-RODRIGUEZ Dr. Jordi LLOSA
Sweden	Dr Ulf THOLE; Dr. Marina VOINOVA
Switzerland	Dr Christoph HUEGLIN
Turkey	Prof. Necmettin KILINC
UK	Prof. Julian GARDNER Dr Robin NORTH; Prof. Florin UDREA

Kick-off Meeting at Brussels on 16 May 2012

Year 3: Scientific Planning of *EuNetAir* (1/2)

Meetings/Workshops/Training Schools planned for upcoming year
([Year 3: 1 July 2014 - 30 June 2015](#)):

- **WG1-WG4 Meeting** on *New Sensing Technologies for Air-Pollution Monitoring and Start of the Air Quality Joint-Exercise Intercomparison* at IDAD - University of Aveiro, Aveiro (**Portugal**), 13 - 15 Oct. 2014.
- The **3rd International Workshop of the COST Action TD1105** on *New Trends and Challenges on Air Quality Control* at University of Latvia, Riga (**Latvia**), 26 - 27 March 2015.
- The **Action 3rd International Training School** on *Atmospheric Aerosol Physics, Measurements and Sampling* at Hyytiala Station of the University of Helsinki, Helsinki (**Finland**), 2 - 8 May 2015.

MC/WG Meetings planned for the upcoming year

(Year 3: 1 July 2014 - 30 June 2015):

- **3rd SCIENTIFIC MEETING: WGs Meeting and 6th MC Meeting** at Bahcesehir University and GEBZE Institute of Technology, Istanbul (Turkey), 3 - 5 Dec. 2014.
- **4th SCIENTIFIC MEETING: WGs Meeting and 7th MC Meeting** at Linkoping University, Linkoping (Sweden), 3 - 5 June 2015.
- **Special Session EuNetAir / Core-Group Meeting** to EUROSENSORS 2014, Brescia (Italy), 7 - 10 September 2014.
- **Special Session EuNetAir / Smart Cities Sensors** to IEEE SENSORS 2014, Valencia (Spain), 2 - 5 November 2014.

Aveiro Joint-Exercise Intercomparison & WG Meeting

13 October 2014: Starting Joint-Exercise (2 weeks duration)

14 - 15 October 2014: EuNetAir WG1-WG4 Meeting

EuNetAir Air Quality Joint-Exercise Intercomparison 2014

Local Organizers: Prof. Carlos Borrego and Dr. Ana Margarida Costa (IDAD)

Air quality campaign at Aveiro (Portugal) city centre 2014



Continuous measurements: CO, benzene, NO_x, SO₂, PM₁₀, VOC
Temperature, humidity, wind velocity, wind direction, solar radiation, precipitation

COST partners (at least 8 teams joined) are invited to install their microsensors side-by-side to compare performance with referenced equipment in the Air-Quality Mobile Laboratory

THIRD SCIENTIFIC MEETING: WG & 6th MC Meeting

New Sensing Technologies for Indoor Air-Pollution

Bahcesehir University, Istanbul (Turkey), 3 - 5 December 2014

PLENARY SESSION:

EU Projects Cluster on Indoor Environments Quality and Applications

Multidisciplinary Meeting:

*International Experts and Coordinators
of FP7 and H2020 research projects
related to the IEQ Cluster
are highly expected to participate*



Local Organizers:

**Prof. Zafer Ziya Ozturk,
GEBZE, Istanbul (Turkey)**

**Prof. Ali Gungor,
Bahcesehir University,
Istanbul (Turkey)**

3rd International WORKSHOP *EuNetAir*

New Trends and Challenges for Air Quality Control

hosted by University of Latvia, **Riga** (Latvia), 26 - 27 March 2015

Local Organizer:

Prof. Iveta Steinberga,
University of Latvia,
Riga (Latvia)



3rd TRAINING SCHOOL *EuNetAir* at Hyytiala Forestry Field Station

Atmospheric Aerosol Physics, Measurements and Sampling

hosted by University of Helsinki, **Hyytiala** (Helsinki), 2 - 8 May 2015

Local Organizer:

Prof. Kaarle Hameri,
University of Helsinki,
Helsinki (Finland)



Call for Participation: 15 Trainees and 3 Trainers will be funded.
Deadline for Application: March-April 2015 (to be launched !)

FOURTH SCIENTIFIC MEETING: WG & 7th MC Meeting

hosted by Linköping University, **Linköping** (Sweden), 3 - 5 June 2015

Local Organizer:

Prof. Anita Lloyd Spetz,
Linköping University,
Linköping (Sweden)



FOCUS ON:

Outdoor Applications

OUTREACH ACTIVITIES 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

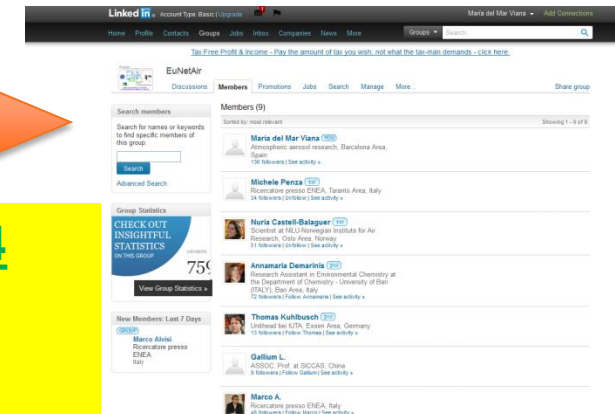
hosted by ENEA

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



3° CALL for Short Exchange Visits launched on June 2014
(STSM - Short Term Scientific Mission)

Dr. Jan Theunis, STSM Coordinator EuNetAir



EuNetAir Newsletter

COST Action TD1105 Iss. 1/Dec 2012

Opening Editorial

- Issue 1: published on Dec. 2012 ✓
- Issue 2: published on June 2013 ✓
- Issue 3: published on Dec. 2013 ✓
- Issue 4: published on June 2014 ✓
- Issue 5: planned on Dec. 2014 ✎

Prof. Ralf Moos, Editor-in-Chief

Dr. Daniela Schonauer-Kamin, Editorial Board Manager

Video/Interview at Action Webpages:

www.cost.eunetair.it - **Section VIDEO**

- **Thu-Hoa Tran-Thi**

Research Director on Indoor Sensors Applications, CEA-CNRS, France

- **Tim Watkins**

Deputy Director US EPA Air, Climate and Energy Programme, USA

- **Andrea C. Ferrari**

Chairman of Executive Board of Graphene Flagship, UK

- **Cristina Guerreiro**

Coordinator of EEA AQ Report 2012 and 2013, Norway

- **Meyya Meyyappan**

Chief Scientist at NASA Ames Nano Research Center, USA

- **Michele Penza**

Action Chair at RAI3 Italian TV Show *GeO&GeO*, Italy

Editorial Activities: WGs MEETING at EEA

New Sensing Technologies for Air-Pollution Control and Environmental Sustainability

- **Special Issue Urban Climate (Elsevier)**

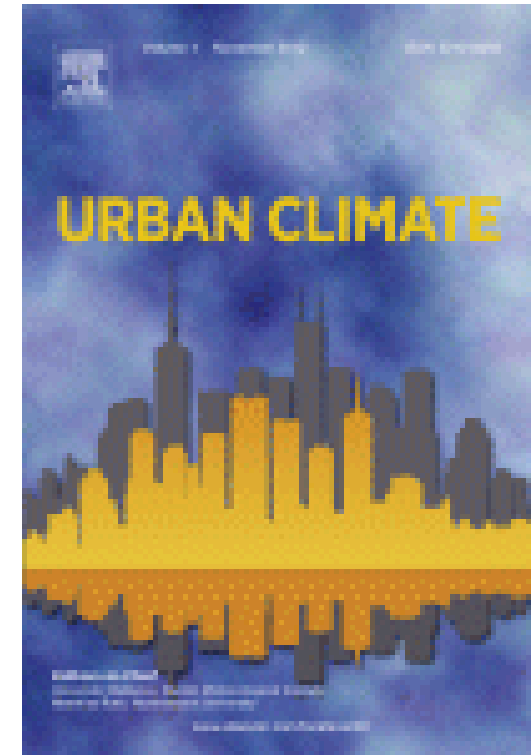
New Sensing Technologies and Methods for Air-Pollution Monitoring

Proceedings of the Action EEA Meeting open to external contributors.

Peer-review process (<http://ees.elsevier.com/uclim/>)

- **Guest Editors:**

- ✓ Michele Penza, ENEA, Italy
- ✓ Anita Lloyd Spetz, Linkoping University, Sweden
- ✓ Ole Hertel, Aarhus University, Denmark
- ✓ Ulrich Quass, IUTA eV, Germany
- Deadline for submission: 28 February 2014 (**Close**)
- Number of Submissions: **22 Manuscripts**
- Expected Publication: **Fall 2014 (Nov-Dec 2014)**



Editorial Activities: **Symposium at EMRS**

New Sensing Technologies for Air-Pollution Control and Environmental Sustainability

- **Special Issue Journal of Sensors and Sensor Systems**
(Copernicus Publications)

Advanced Functional Materials for Environmental Monitoring and Applications

Proceedings of Symposium-B EMRS Spring Meeting 2014, 26-30 May 2014, Lille (FR)

Peer-review process (www.journal-of-sensors-and-sensor-systems.net)

- **Guest Editors:**

- ✓ Michele Penza, ENEA, Italy
- ✓ Anita Lloyd Spetz, Linkoping University, Sweden
- ✓ Albert Romano-Rodriguez, Barcelona University, Spain
- ✓ Yongxiang Li, Chinese Academy of Sciences, China
- ✓ Meyya Meyyappan, NASA Ames Research Center, USA
- Deadline for submission: **31 July 2014**
- Expected Publication: ***Fall 2014 (Nov-Dec 2014)***



Expected Impact by Action TD1105

- **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

The 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

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



Contact Details

 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



CSO Approval: 01 Dec. 2011

Kick-off Meeting: 16 May 2012

Start of Grant: 01 July 2012

End of Grant: 30 June 2016

www.cost.eunetair.it

MC Chair:

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

MC Vice Chair:

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Grant Holder:

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Rapporteur ESSEM:

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Rapporteur MPNS:

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

Rapporteur CMST:

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

http://www.cost.eu/domains_actions/essem/Actions/TD1105

ACKNOWLEDGEMENTS

Aveiro, Portugal, 13 - 15 October 2014



THANK YOU VERY MUCH FOR YOUR KIND ATTENTION !

