

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

COST Action TD1105

3rd International Workshop *EuNetAir* on New Trends and Challenges for Air Quality Control

University of Latvia - Faculty of Geography and Earth Sciences
Riga, Latvia, 26 - 27 March 2015

COST Action TD1105: Overview & Updating

Action Start date: 01/07/2012 - Action End date: 30/06/2016 Year 3: 1 July 2014 - 30 June 2015

 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Michele Penza

Function in the Action: Action Chair
ENEA - Brindisi, Italy



THIRD ACTION WORKSHOP: RIGA, Latvia

hosted at Faculty of Geography and Earth Sciences - University of Latvia
supported by Riga Technical University



AGENDA

26 March 2015 - Thursday	
09:00 - 18:00	REGISTRATION
09:30 - 10:00	Welcome Address
10:00 - 11:00	Session 1: Plenary Session
11:00 - 11:30	<i>Coffee Break</i>
11:30 - 13:00	Session 2: Oral Presentations
13:00 - 14:30	<i>Lunch</i>
14:30 - 16:00	Session 3: Oral Presentations
16:00 - 16:30	<i>Coffee Break</i>
16:30 - 18:30	Session 4: Oral Presentations
20:00 - 23:00	<i>Social Dinner</i>
27 March 2015 - Friday	
09:00 - 16:00	REGISTRATION
09:30 - 11:00	Session 5: Oral Presentations
11:00 - 11:30	<i>Coffee Break</i>
11:30 - 13:00	Session 6: Oral Presentations
13:00 - 14:30	<i>Lunch</i>
14:30 - 16:00	Session 7: Poster Presentations
16:00 - 16:30	<i>Discussion and Coffee Farewell</i>
16:30	Closure of Meeting

Outline

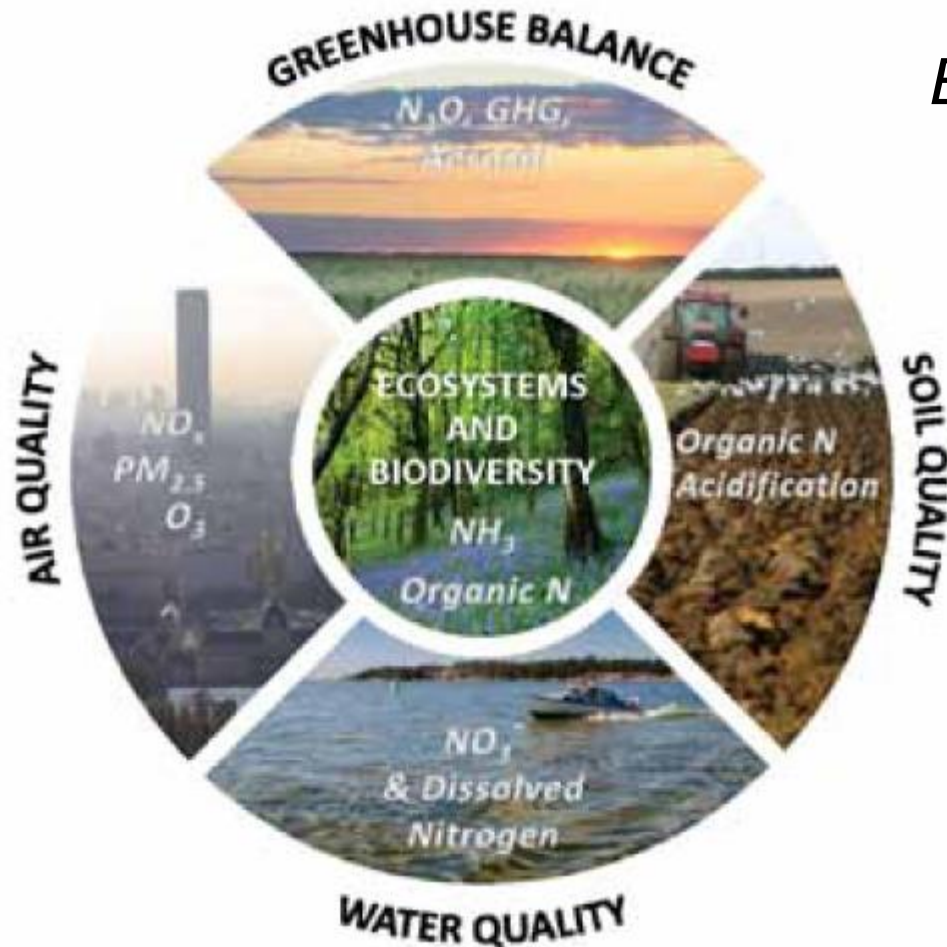


- **Background / Problem Statement:**
 - ✓ *Scientific context*
 - ✓ *Challenges addressed by the Action*
- **MoU Action's Objectives: Main and Secondary**
- **Action Research Directions:**
 - ✓ *Methodology and Innovation*
- **Working Groups**
- **Results versus Objectives: Significant Highlights**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

Scientific context: **Environmental Sustainability** (1/3)

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

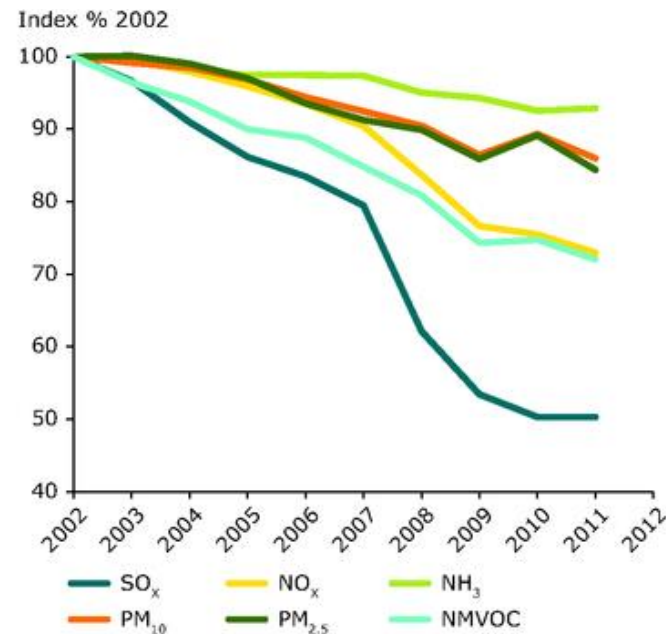
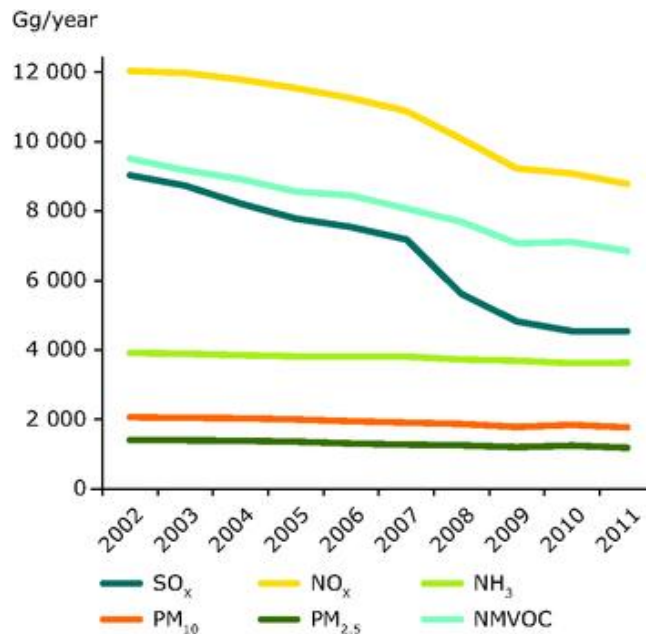
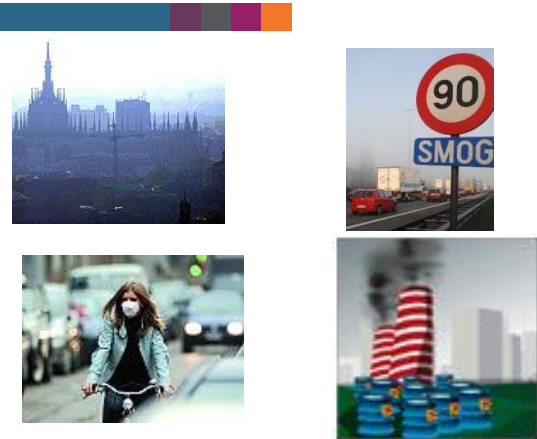
Nitrogen Pollution:

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



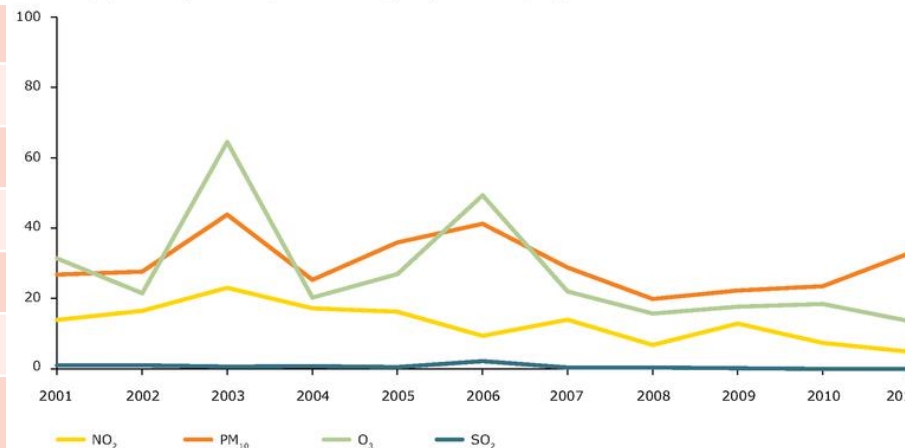
Some Environmental Emergencies:

- 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)

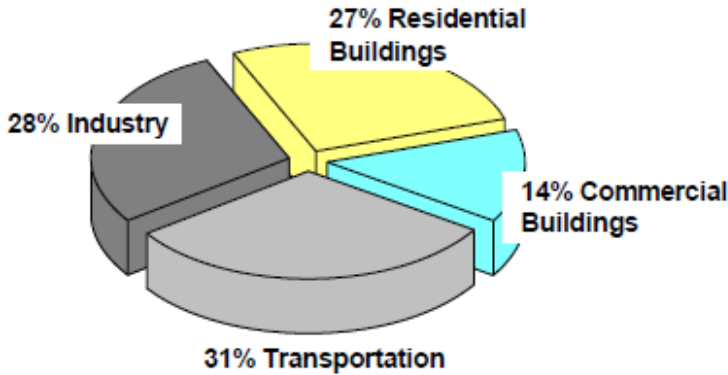
AMBIENT AIR QUALITY EU DIRECTIVE 2008/50/EC and Daughters

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



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

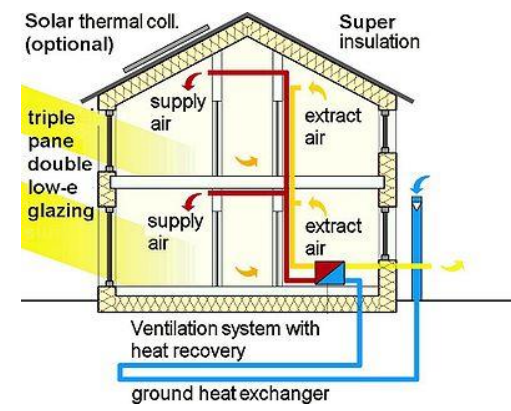
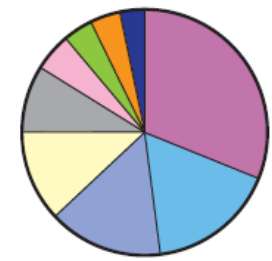
41% Primary Energy consumed in Buildings:

- 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

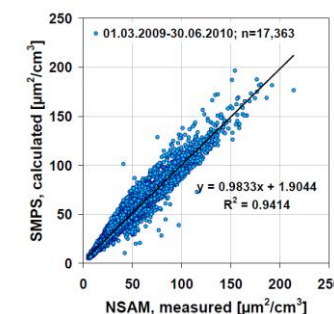
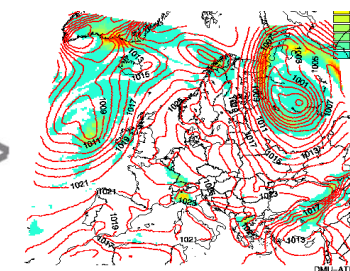
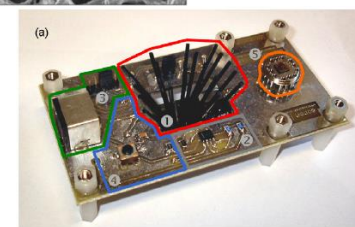
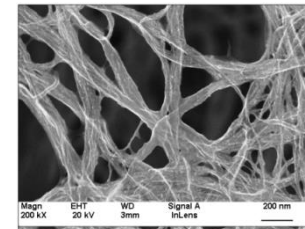
IAQ by WORLD HEALTH ORGANIZATION

Indoor Air		Typical Substances		Cure
Contamination Source	Emission Source	VOCs	Others	
• Human Being	• Breath	Acetone, Ethanol, Isoprene	demand controlled ventilation	
		CO ₂		
	• Skin Respiration & Transpiration	Humidity		
		Nonanal, Decanal, α-Pinene		
	• 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	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.

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:

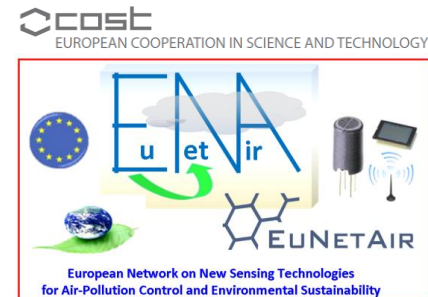
- **Workshops** on sensor materials and nanotechnologies, sensor-systems for AQC, environmental measurements, air-pollution modelling, chemical weather forecasting, distributed computing, wireless sensor networks, protocols and pre-standardisation; organization of open conferences to improve knowledge 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*:

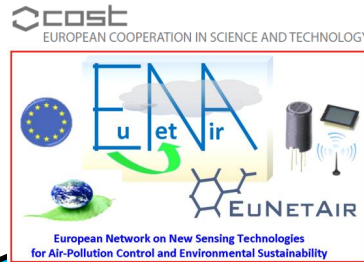
The Working Program includes multidisciplinary Research at integrated approach and trans-domain multi-scale level:

- **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**



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

www.cost.eunetair.it



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)**

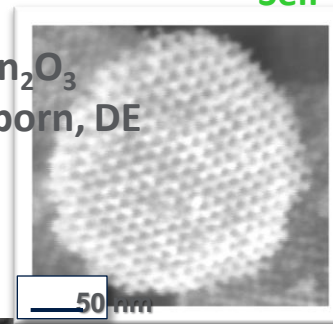
- **SIG 1: Network of Spin-offs**
- **SIG 2: Smart Sensors for Urban Air Monitoring in Cities**
- **SIG 3: Guidelines for Best Coupling Air Pollutant-Transducer**
- **SIG 4: Expert comments for the Revision of the Air Quality EU Directive**

Action Size:

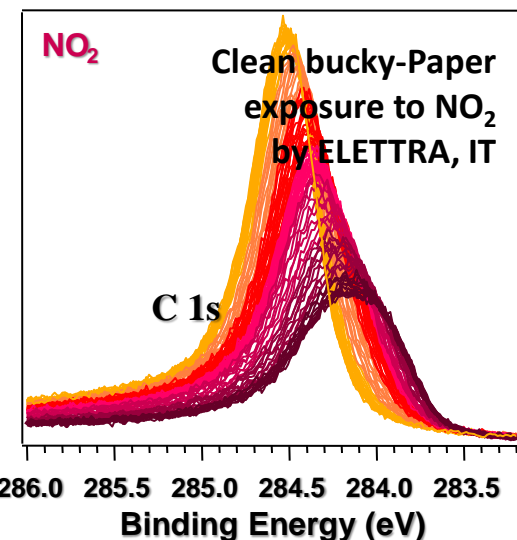
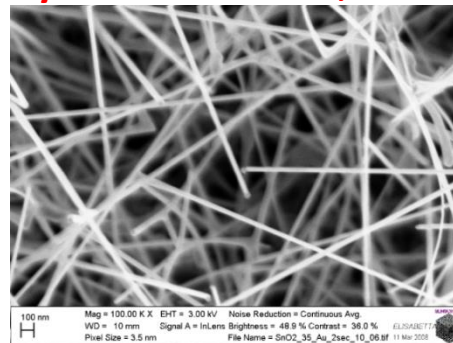
180 Experts from 80 Teams (30 Countries)



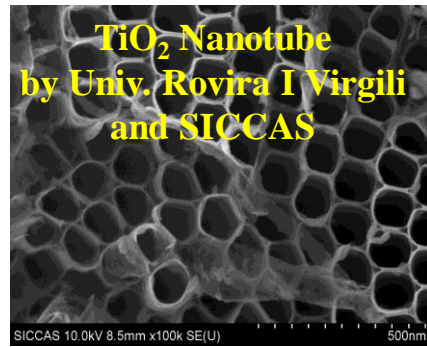
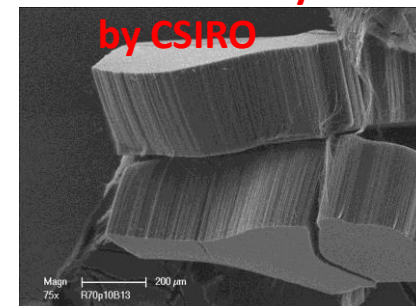
Mesoporous In₂O₃
by Univ. of Paderborn, DE



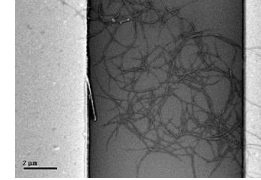
Metal oxide (SnO₂)
Nanowires nets
by Univ. of Brescia, IT



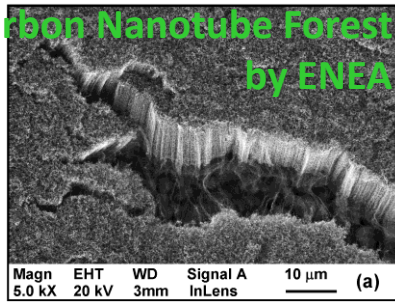
Carbon Nanotube yarns
by CSIRO



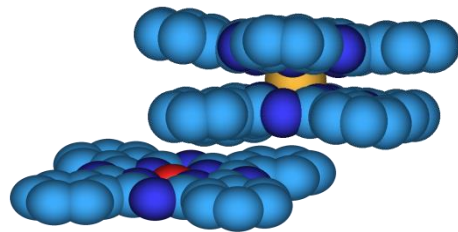
Carbon Nanotube ropes
by Ames NASA



Carbon Nanotube Forest
by ENEA



- **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.).



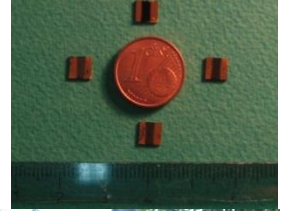
New molecular materials of polymer-macrocycles as transducers for polluting gas sensing by University of Bourgogne

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

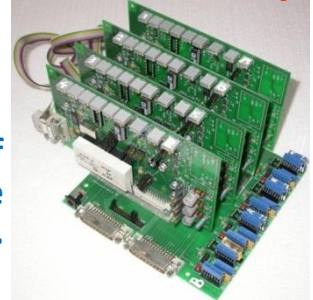
WG2 Chair: Prof. Andreas Schuetze, Saarland University, Germany

IT PATENT ENEA

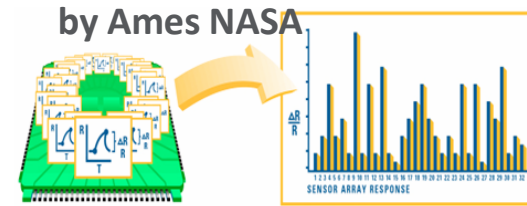
Carbon Nanotube Gas Sensors



EnviroWatch mote by Newcastle University



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

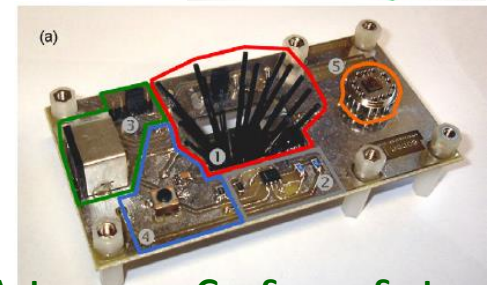


Using pattern matching algorithms, the data is converted into a unique response pattern

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

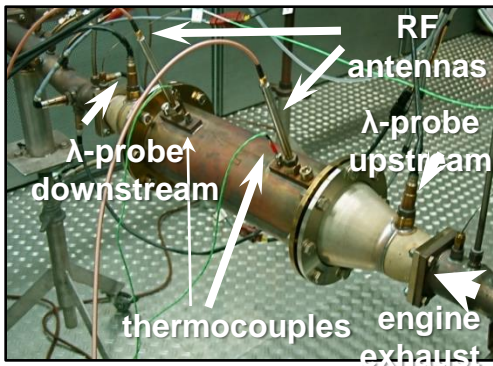


Low-ppb sensitivity for NO₂ GaN-based sensor concept



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.

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:

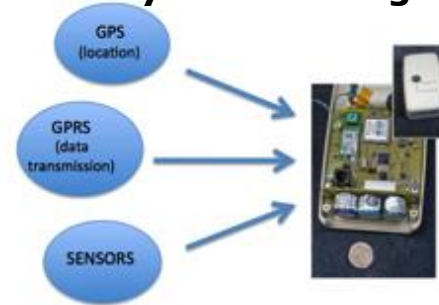
Harmonisation of environmental measurements.

by Aristotle University, EL

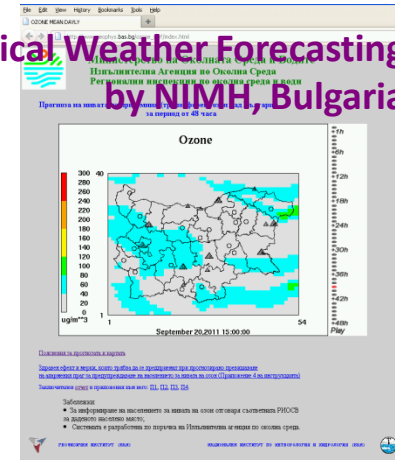


AirMerge system for Chemical Weather Models

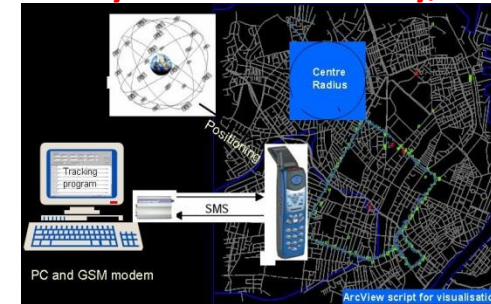
Mobile and static sensor network configurations by University of Cambridge.



Chemical Weather Forecasting by NIMH, Bulgaria



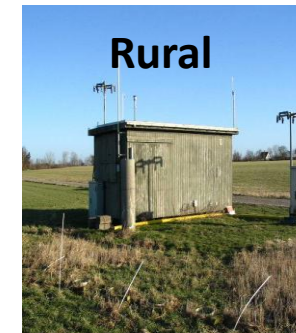
AQ Modeling: Tracking routes by Aarhus University, DK



Environmental measurements of PM and air pollution by CSIC, ES



AQ monitoring station by ARPA-PUGLIA, IT



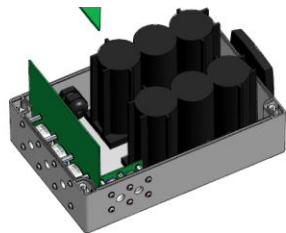
AQ monitoring station by Aarhus University, DK



AQ monitoring station by Lithuanian EPA

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

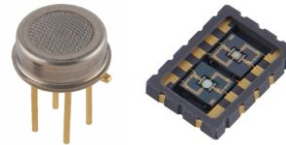
- **Sub-Working Group 4.1**:
Protocols, standards and methods for AQC by analyzers/instruments (no-sensors) technologies.
- **Sub-Working Group 4.2**:
Protocols, standards and methods for AQC by sensors (no-analyzers) technologies.
- **Sub-Working Group 4.3**:
Benchmarking of new products and market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



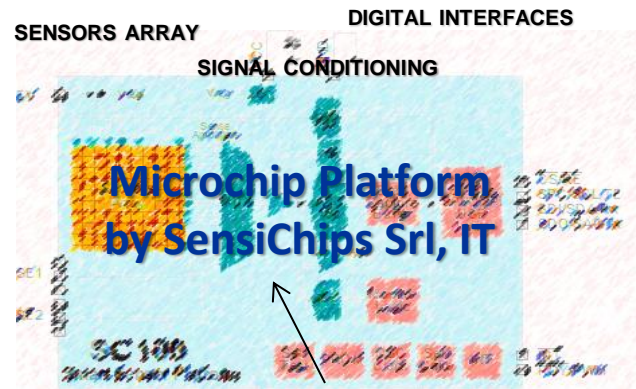
Battery-Powered Sensors by Alphasense Ltd, UK

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

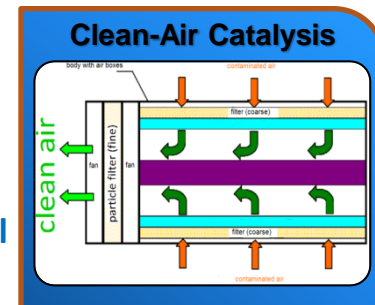
Dynamic olfactometry EN13725
by Univ. of Liege, Odometric SA,
Univ. of Bari, Lenviros srl.



**Packaged Sensors
by E2V, CH**



New precision multi-parametric analytical tool



Becker Gruppe, DE



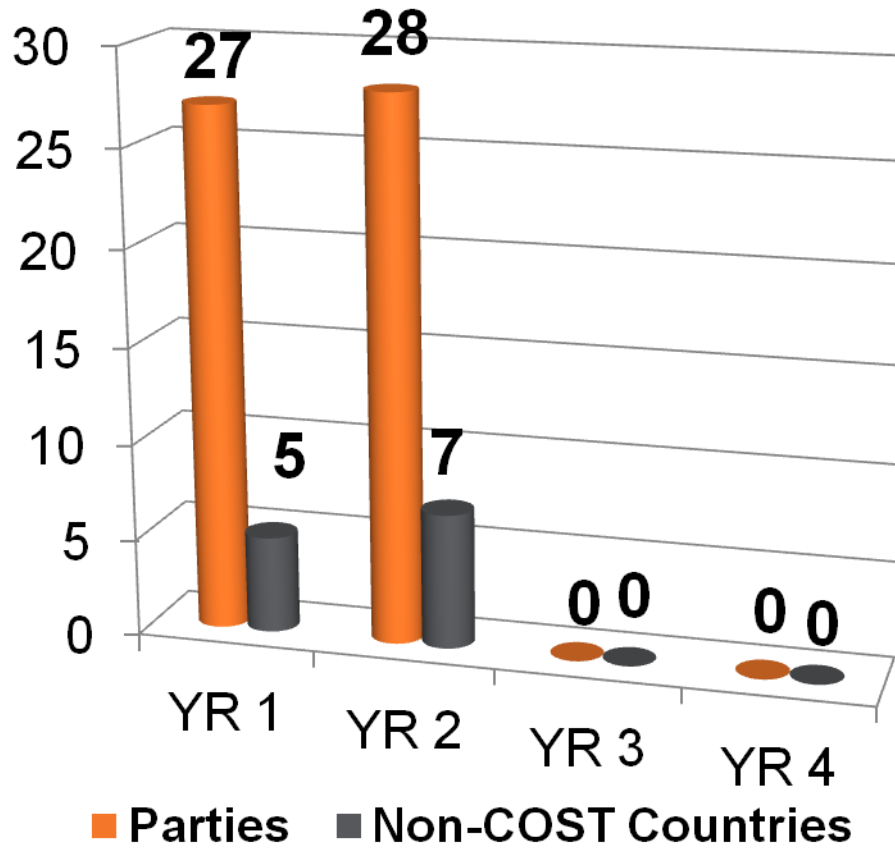
**CO₂ IR sensor for alarm
System by SenseAir AB, Sweden**

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.</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>

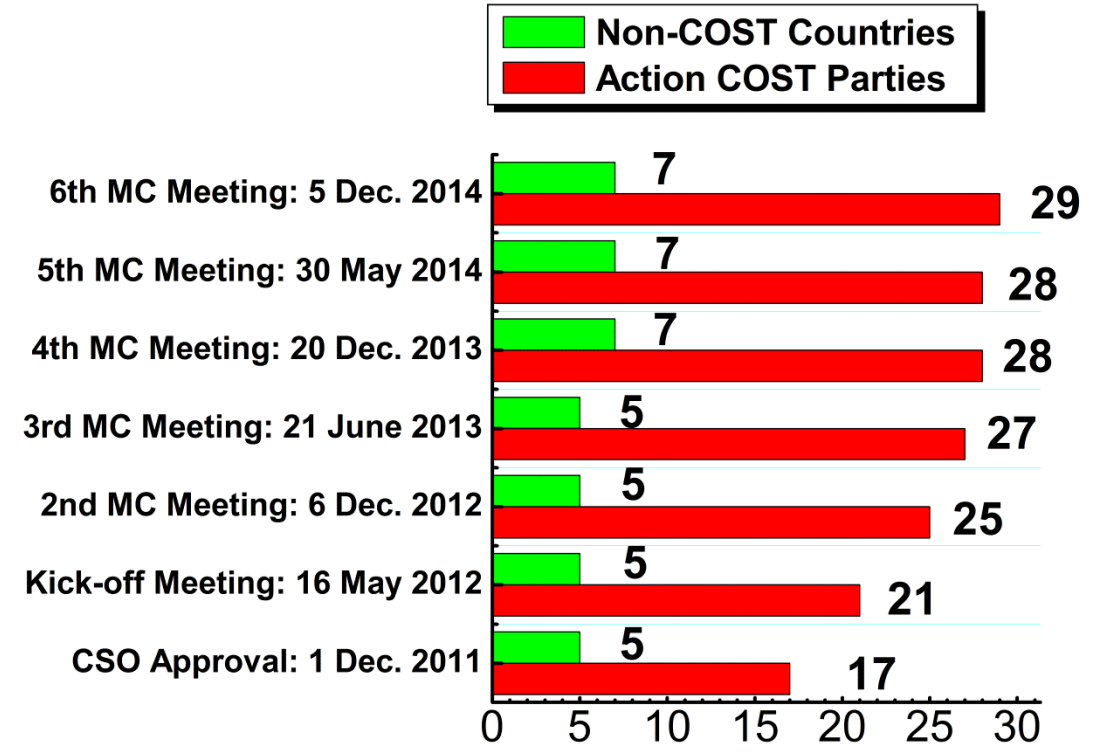
M: Milestones **D: Deliverables**

COST Action TD1105 EuNetAir: **Action Parties (30)**



Non-COST Countries: NNC + IPC

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



30 COST Countries (Parties) have already signed Memorandum of Understanding (MoU)

PARTIES: 30
already accepted MoU

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

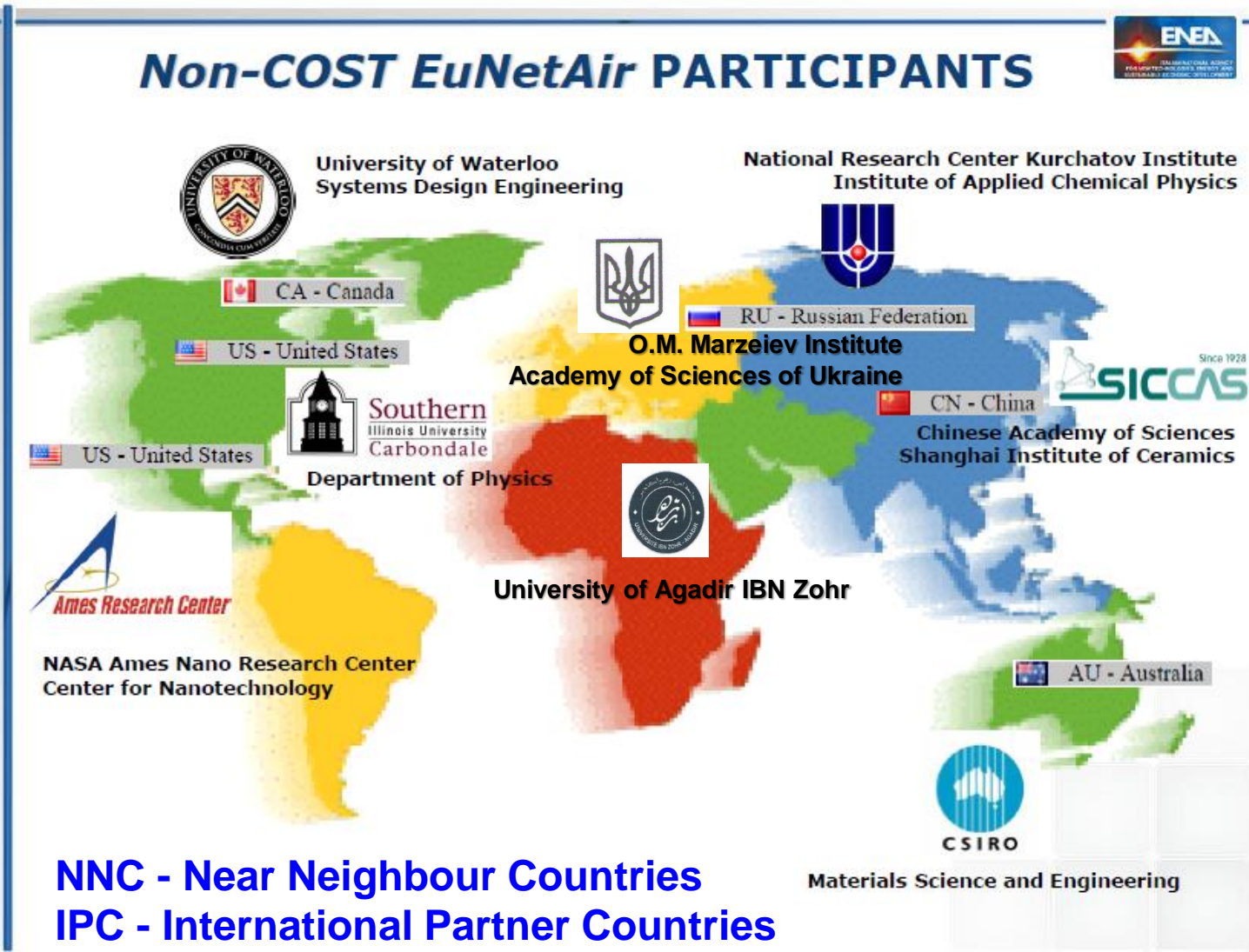


COST Action TD1105 *EuNetAir*:

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).



NNC - Near Neighbour Countries
IPC - International Partner Countries

EuNetAir: List of Experts from NNC and IPC



180 EXPERTS from **30** 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



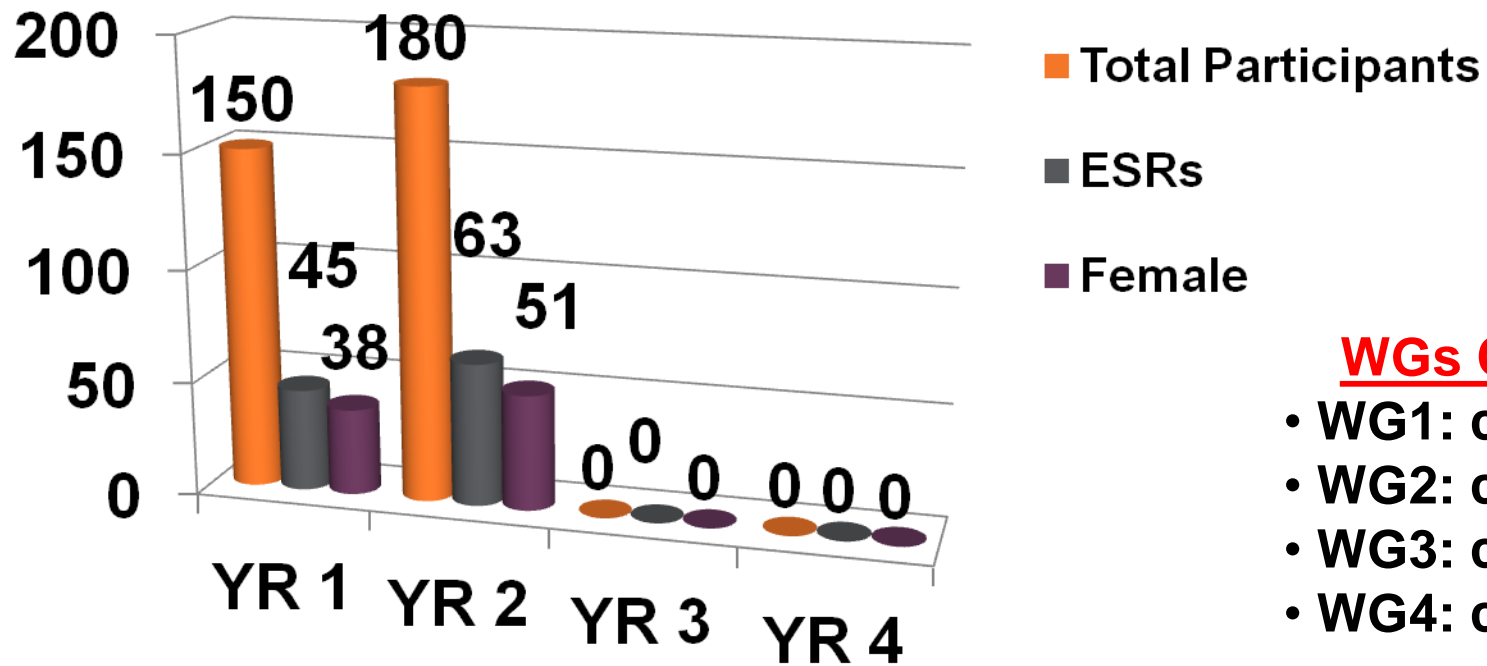
UA - Ukraine

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 3: Updating on March 2015

- Total Number of Participants: 180 (80% active)
- Early Stage Researchers (ESRs): 63 (35%)
- Females: 54 (30%)
- MC Members: 57 - Male: 39 (68%); Female: 18 (32%)
- MC Substitutes: 32 - Male: 26 (81%); Female: 6 (19%)






Action Participating Organizations (1/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
1		Austria	<ul style="list-style-type: none"> Materials Center Leoben Forschung GmbH 	
2		Belgium	<ul style="list-style-type: none"> VITO Université de Liège Odometric SA 	<ul style="list-style-type: none"> Université Catholique de Louvain
3		Bulgaria	<ul style="list-style-type: none"> National Institute of Meteorology and Hydrology - BAS Institute of Electronics - BAS 	<ul style="list-style-type: none"> Microsystems LTD
4		Croatia	<ul style="list-style-type: none"> Rudjer Boskovic Institute University of Zagreb 	
5		Czech Republic	<ul style="list-style-type: none"> Institute of Computer Sciences - Academy of Sciences of the Czech Republic J. Heyrovský Institute of Physical Chemistry - Academy of Sciences of the Czech Republic 	<ul style="list-style-type: none"> Institute of Photonics and Electronics AVCR
6		Denmark	<ul style="list-style-type: none"> Aarhus University Technical University of Denmark 	<ul style="list-style-type: none"> National Research Centre for Working Environment
7		Finland	<ul style="list-style-type: none"> University of Oulu University of Helsinki Tampere University of Technology 	









Action Participating Organizations (2/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
8		France	<ul style="list-style-type: none"> • Université de Bourgogne • Université Blaise Pascal 	<ul style="list-style-type: none"> • Ecoles des Mines de Douai • CEA-CNRS • ETHERA • NanoSense
9		Germany	<ul style="list-style-type: none"> • Saarland University • Eurice GmbH • University of Bayreuth • IUTA eV 	<ul style="list-style-type: none"> • WHO CC - Federal Environment Agency • Siemens • UST • 3S GmbH • University of Paderborn • Alfred Becker Group • MPI for Biogeochemistry • University of Stuttgart • Heidelberg University • BAM • DLR
10		Greece	<ul style="list-style-type: none"> • Aristotle University of Thessaloniki • University of Patras • ATHENA/ISI • FORTH 	<ul style="list-style-type: none"> • University of Piraeus • University of West Macedonia
11		Hungary	<ul style="list-style-type: none"> • Hungary Meteorological Service • Szechenyi Istvan University 	
12		Iceland	<ul style="list-style-type: none"> • Agricultural University of Iceland 	
13		Ireland	<ul style="list-style-type: none"> • Trinity College Dublin • University College Cork 	





Action Participating Organizations (3/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
14		Israel	<ul style="list-style-type: none"> • Technion Institute of Israel • AirBase Systems 	
15		Italy	<ul style="list-style-type: none"> • ENEA • University of Bari • University of Brescia • Sensichips srl 	<ul style="list-style-type: none"> • ARPA-Puglia • University of Trieste • ELETTRA • Lenviros srl • RED srl • NOVASIS srl • ARIANET srl • CNR, Institute of Atmospheric Science and Climate • CNR, Institute of Methodologies for Environmental Analysis • CNR, Institute of Environmental Pollutant Research
16		Latvia	<ul style="list-style-type: none"> • University of Latvia • Riga Technical University 	
17		Luxembourg	<ul style="list-style-type: none"> • Luxembourg Institute for Science and Technology - LIST 	
18		FYR of Macedonia	<ul style="list-style-type: none"> • Ministry of Environment and Physical Planning • University "St. Kliment Ohridski" 	

Action Participating Organizations (4/5)

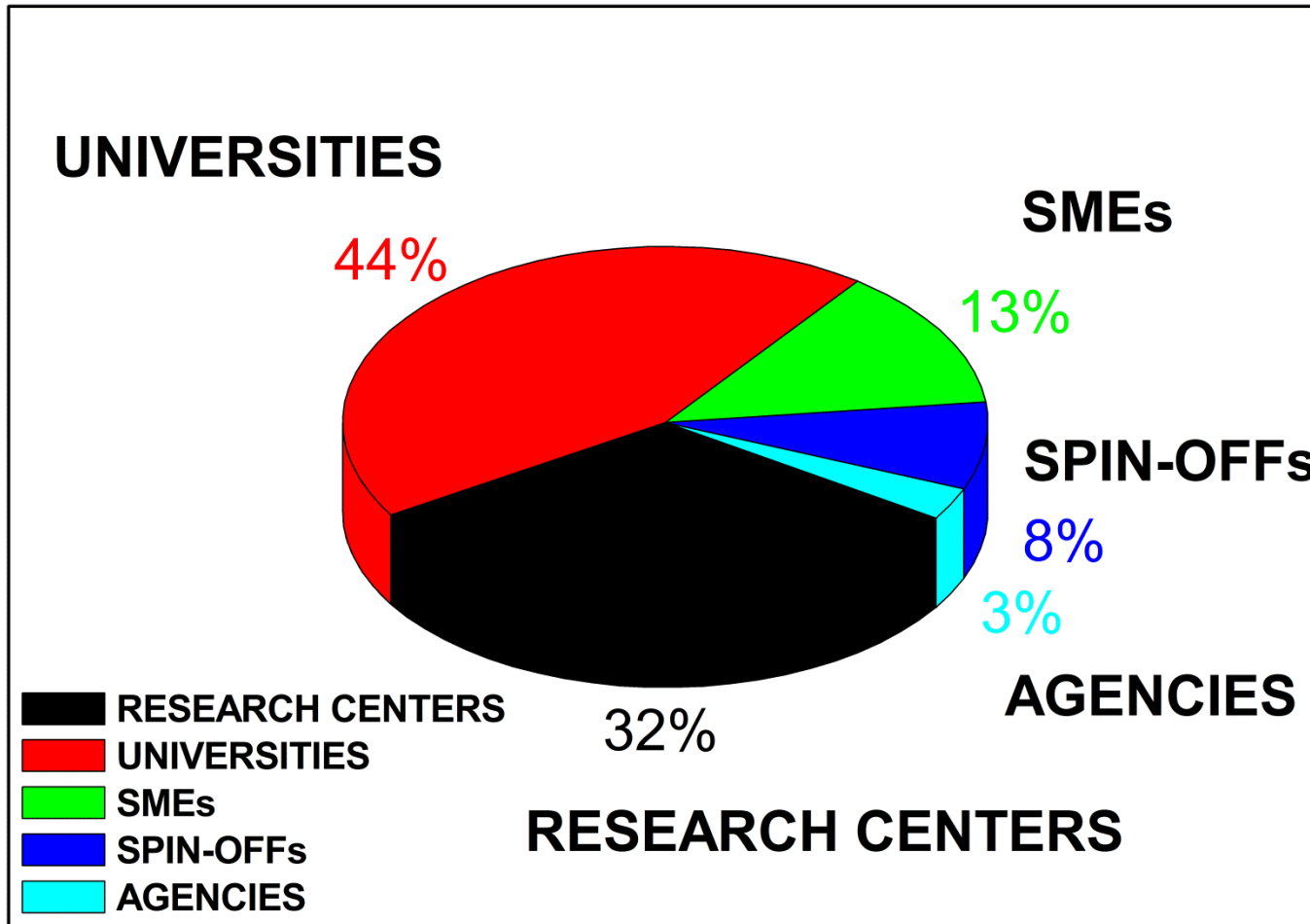
Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
19		Netherlands	<ul style="list-style-type: none"> • IMEC - Holst Centre • ECN 	
20		Norway	<ul style="list-style-type: none"> • NILU - Norwegian Institute for Air Research 	
21		Poland	<ul style="list-style-type: none"> • Silesian University of Technology • Warsaw University of Life Science 	<ul style="list-style-type: none"> • Czestochowa University of Technology
22		Portugal	<ul style="list-style-type: none"> • IDAD - Institute of Environment & Development • University of Aveiro • University of Coimbra • National Health Institute 	<ul style="list-style-type: none"> • University of Lisbon • University of Porto • LNEG - Laboratório Nacional de Energia e Geologia
23		Romania	<ul style="list-style-type: none"> • IMNR - National R&D Institute for Nonferrous and Rare Metals • SC IPA SA 	
24		Serbia	<ul style="list-style-type: none"> • Institute of Public Health of Belgrade • VINCA Institute 	
25		Slovenia	<ul style="list-style-type: none"> • University of Ljubljana • Aerosol doo 	
26		Spain	<ul style="list-style-type: none"> • IREC - Catalonia Institute for Energy Research • URV - Universitat Roviri I Virgili • UB - Universitat de Barcelona • Worldsensing SL 	<ul style="list-style-type: none"> • CSIC - IDAEA • CSIC - INM • Public Universitat de Navarra • Universidade de Santiago de Compostela

Action Participating Organizations (5/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
27		Sweden	<ul style="list-style-type: none"> • Linköping University • SenseAir AB • Chalmers University of Technology • SenSiC AB 	
28		Switzerland	<ul style="list-style-type: none"> • EPFL - Ecole Polytechnique Fédérale de Lausanne • SGX Sensortech • EMPA 	<ul style="list-style-type: none"> • ETH • EnvEve SA
29		Turkey	<ul style="list-style-type: none"> • GEBZE Institute of Technology • Middle East Technical University of Ankara • Nigde University 	<ul style="list-style-type: none"> • Bahcesehir University
30		United Kingdom	<ul style="list-style-type: none"> • Cambridge University • Alphasense Ltd • Imperial College London • University of Warwick 	<ul style="list-style-type: none"> • Manchester University • Newcastle University • Worcester University • Edinburgh University • Cambridge CMOS Sensors Ltd

Action Participation Statistics

EuNetAir COST PARTNERSHIP - March 2015



COST Parties: 30
COST Organizations: 122
UNIVERSITIES: 54
RESEARCH CENTERS: 39
SMEs: 16
SPIN-OFFs: 9
AGENCIES: 4

External Experts involved from International Organizations

International Organization	External Expert	Action Event
JRC - IES, Ispra	<i>Michele Gerboles</i>	<ul style="list-style-type: none"> • Rome, 3-5 Dec. 2012 • Barcelona, 20 June 2013 • Brescia, 10 Sept. 2014
AQUILA Network	<i>Annette Borowiak</i>	<ul style="list-style-type: none"> • Duisburg, 4-6 March 2013
European Environment Agency	<i>Valentin Foltescu</i> <i>Cristina Guerreiro (NILU)</i>	<ul style="list-style-type: none"> • Copenhagen, 3-4 Oct. 2013
US Environment Protection Agency	<i>Tim Watkins</i>	<ul style="list-style-type: none"> • Cambridge, 18-20 Dec. 2013
UNECE	<i>Wenche Aas (NILU)</i>	<ul style="list-style-type: none"> • Copenhagen, 3-4 Oct. 2013
WHO Europe	<i>Michal Krzyzanowski</i> <i>(Former Head WHO Europe Office)</i>	<ul style="list-style-type: none"> • Riga, 26-27 March 2015
MIT	<i>Marguerite Nyhan</i>	<ul style="list-style-type: none"> • Istanbul, 3-5 Dec. 2014
NASA Ames Research Center	<i>Meyya Meyyappan</i> <i>Jing Li</i>	<ul style="list-style-type: none"> • Rome, 3-5 Dec. 2012 • Lille, 26-30 May 2014
CSIRO	<i>Philip J. Martin</i>	<ul style="list-style-type: none"> • Barcelona, 20 June 2013

Country

MC Members (57): Male (70%) - Female (30%)

Austria	Dr. Anton KOCK
Belgium	Dr Jan THEUNIS; Dr Anne-Claude ROMAIN
Bulgaria	Dr Dimiter SYRAKOV; Dr Ivan NEDKOV
Croatia	Dr. Irena CIGLENECKI-JUSIC; Prof. Vedran BILAS
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 Zita FERENCZI
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
Luxembourg	Dr. Arno GUTLEB
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 BORRERO
Romania	Dr Marcel IONICA; Dr Roxana Mitoara PITICESCU
Serbia	Dr. Anka CVETKOVIC; Dr. Milena JOVASEVIC-STOJANOVIC
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 (32)

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
Hungary	Prof. Zoltan HORVATH
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	Prof. 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

MANAGEMENT COMMITTEE

Kick-off Meeting at Brussels on 16 May 2012

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

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.

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

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 on Indoor Air Quality Monitoring** at Bahcesehir University and GEBZE Institute of Technology, Istanbul (Turkey), 3 - 5 Dec. 2014.
- **4th SCIENTIFIC MEETING: WGs Meeting and 7th MC Meeting on Outdoor Air Quality Monitoring** 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.

MC/WG Meetings planned for the upcoming year

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

- **EuNetAir FOCUS GROUP: Data Analysis of Aveiro Air Quality Sensors Intercomparison** hosted at WHO Collaborating Centre for Air Quality Management and Air Pollution Control - Federal Environment Agency, Berlin (Germany), 17 April 2015. Expected Persons: 10.
- **EuNetAir FOCUS GROUP: Innovation on Environmental Sensor Technologies** hosted at Siemens AG, Munich (Germany), 29 April 2015. Expected Persons: 10.
- **EuNetAir FOCUS GROUP: ISOEN 2015 - International Symposium on Olfaction and Electronic Noses**, Dijon (France), 28 June - 1 July 2015. Expected Persons: 5 (3 Speakers + 2 Flash Presenters).

COST Session & Core-Group Meeting at *EUROSENSORS 2014*



*The 28th European Conference
on Solid-State Transducers*

**Brescia, Italy
September 7-10, 2014**



09:30 - 12:30 **Open Session COST: New Sensing Technologies for Air-Quality Monitoring**
Chairperson: Michele Penza, ENEA, Brindisi, Italy

09:30 - 10:00 **COST Action TD1105: European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability. Overview of Sensor-Systems for Air Quality Monitoring**
Michele Penza, Action Chair, ENEA, Brindisi, Italy

10:00 - 10:30 **Performance Analysis of Low-Cost Gas Sensors for Air Quality Control**
Michel Gerboles and Laurent Spinelle, JRC, EC DG ENV, Institute for Environment and Sustainability, Ispra, Italy

10:30 - 11:00

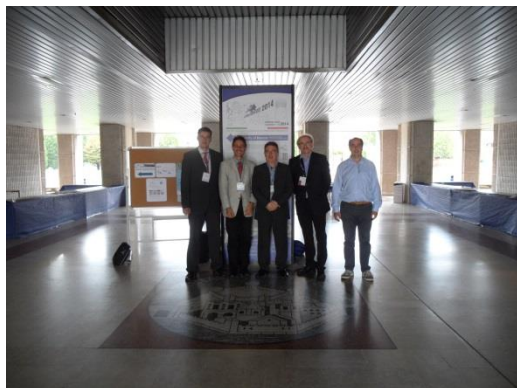
Break

11:00 - 11:20 **Gas and Particle Sensors for Air Quality Monitoring**
Anita Lloyd Spetz, Action Vice-Chair, Linköping University, Linköping, Sweden

11:20 - 11:40 **Nanostructured Metal Oxides Low-Cost Gas Sensors: Trends and Challenges**
Juan Ramon Morante, Action WG1 Leader, IREC, Barcelona, Spain

11:40 - 12:00 **Highly Sensitive and Selective VOC Detection for Indoor Air Quality Applications**
Andreas Schuetze, Action WG2 Leader, Saarland University, Saarbrücken, Germany

12:00 - 12:20 **Smart Sensors in Mobile Phones for Environmental Monitoring Applications**
Julian W. Gardner, Action MC Substitute, University of Warwick, Coventry, UK



Special Session Smart Cities Sensors at IEEE SENSORS 2014



10:00 - 11:30 **Special Session: Smart Cities Sensors**
Chairperson: Michele Penza, ENEA, Brindisi, Italy

10:00 - 10:30 **INVITED TALK: COST Action TD1105 - New Sensing Technologies for Environmental Sustainability in Smart Cities**
Michele Penza, Action Chair, ENEA, Brindisi, Italy

10:30 - 10:45 **Analysis of Efficient Dense Wireless Sensor Network Deployment in Smart City Environments**
Peio López-Iturri, Erik Aguirre, Leire Azpilicueta, Carlos Fernández-Valdivielso, Ignacio Raúl Matías, Francisco Falcone Universidad Pública de Navarra, Spain

10:45 - 11:00 **A Maker Friendly Mobile and Social Sensing Approach to Urban Air Quality Monitoring**
Luca Capezzuto², Luigi Abbamonte², Saverio De Vito¹, Ettore Massera¹, Fabrizio Formisano¹, Grazia Fattoruso¹, Girolamo Di Francia¹; ¹ Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Italy; ² Università degli Studi di Napoli Federico II, Italy

11:00 - 11:15 **vCity Map: Crowdsensing Towards Visible Cities**
Yoshito Tobe¹, Itaru Usami¹, Yusuke Kobana¹, Junji Takahashi¹, Guillaume Lopez¹, Niwat Thepvilojanapong²; ¹ Aoyama Gakuin University, Japan; ² Mie University, Japan

11:15 - 11:30 **Calibration of a Cluster of Low-Cost Sensors for the Measurement of Air Pollution in Ambient Air**
Laurent Spinelle³, Michel Gerboles³, Maria Gabriella Villani², Manuel Aleixandre¹, Fausto Bonavitacola⁴; ¹ Consejo Superior de Investigaciones Científicas, Spain; ² ENEA, Italy; ³ Joint Research Center, Italy; ⁴ Phoenix Sistemi & Automazione s.a.g.l., Switzerland

Session Numbers:

- 5 Speakers
- 150+ Participants
- 700+ Delegates

Aveiro Joint-Exercise Intercomparison & WG Meeting

13 - 27 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 Monitoring 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 (15 teams joined from 12 COST Countries) installed their microsensors side-by-side to compare performance with referenced equipment in the Air-Quality Mobile Laboratory

COST Action TD1105 *EuNetAir: Aveiro* INTERCOMPARISON

New Sensing Technologies and Modelling for Air-Pollution Monitoring



THIRD SCIENTIFIC MEETING: WG & 6th MC Meeting

New Sensing Technologies for Indoor Air-Pollution

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

Multidisciplinary Meeting:

International Experts and Coordinators of FP7 and H2020 research projects related to the IEQ Cluster



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: 15 April 2015 (to be launched soon !)

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

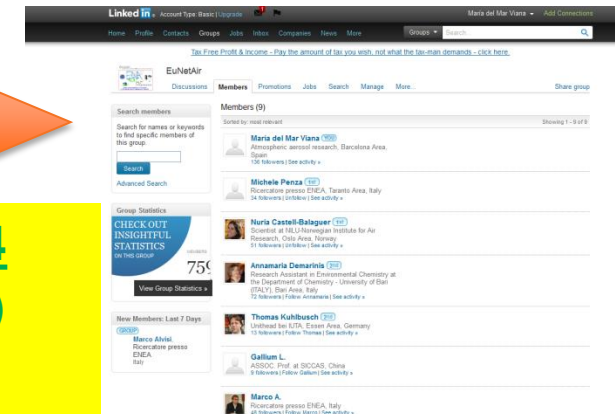
hosted by ENEA

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^o CALL for Short Exchange Visits launched on June 2014
(STSM - Short Term Scientific Mission - by 30 June 2015)

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: published on Dec. 2014 ✓

Prof. Ralf Moos, Editor-in-Chief

Dr. Daniela Schonauer-Kamin, Editorial Board Manager

- **Margurite Nyhan**, The Senseable City Lab, MIT, Boston, USA
- **Hans-Guido Muecke**, Manager at WHO CC and Federal Environment Agency
- **Oliver von Sicard**, Researcher at Siemens AG, Munich
- **Thu-Hoa Tran-Thi**, Research Director on Indoor Sensors, CEA-CNRS, France
- **Tim Watkins**, Deputy Director US EPA Air, Climate & Energy Programme, USA
- **Andrea C. Ferrari**, Chairman of Executive Board of Graphene Flagship, UK
- **Cristina Guerreiro**, Coordinator of EEA AQ Report 2012-2013, Norway
- **Meyya Meyyappan**, Chief Scientist, NASA Ames 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)**

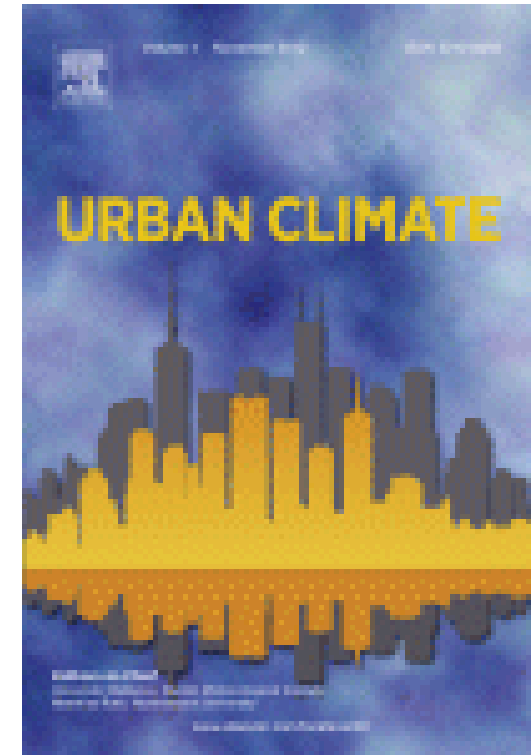
New Sensing Technologies and Methods for Air-Pollution Monitoring

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: **April 2015**



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: **February 2015 (Open Access)**

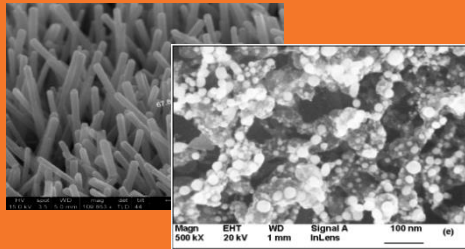


Expected Impact by Action TD1105

- **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**

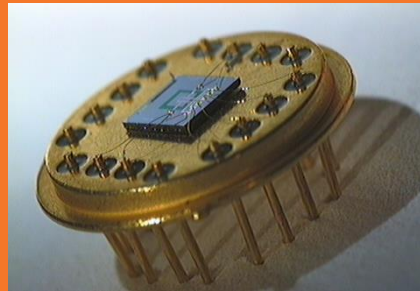
COST Action EuNetAir: CHALLENGES

MATERIALS & GAS SENSORS



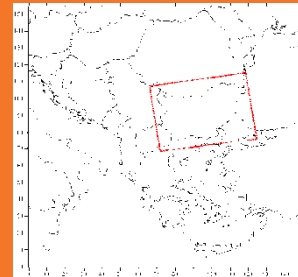
MOX by UNIBS IREC UB SICCAS
CNT by ENEA NASA URV CSIRO

AQC SENSORS & SYSTEMS



GasFET by EPFL, Switzerland

AQ MODELLING

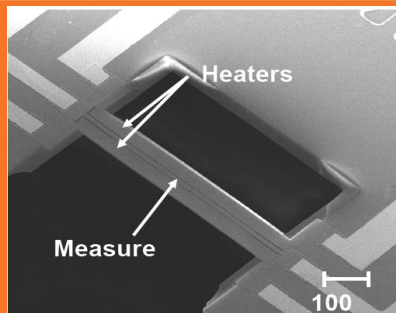


CMAQ Calculations
by NIMH, BG

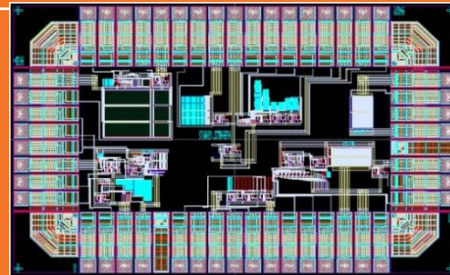
STANDARDS & PROTOCOLS



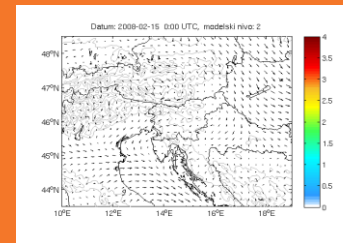
Dynamic Olfactometry (EN
13725/2003) by Univ. of Bari and
Lenviros srl, IT



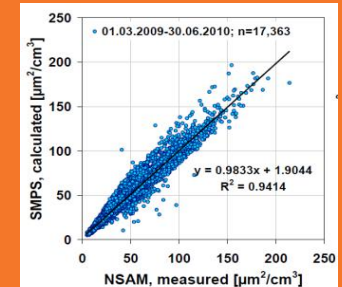
Cantilever Sensor by DTU, DK



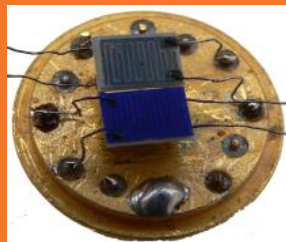
ASIC Circuit: CMOS SOI
by WARWICK & CCMOS Ltd, UK



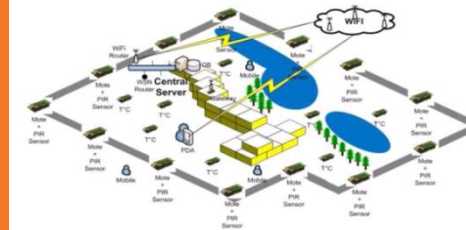
AQ Modelling dispersion in
meteorological mesoscale by
University of Ljubljana, SL



Particle Surface Area
Measurements by IUTA eV, DE



Phtalocyanine Gas Sensors
by CNRS UBP-LASMEA, FR



WIRELESS SENSORS NETWORK
by ISI, Greece



Chemical Weather Forecasting
and Information System
by Hungarian Meteo Service



HARMONISATION:
Definition of protocols and
standards for gas sensing
measurements and gas sensors

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



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Kick-off Meeting: 16 May 2012

Start of Grant: 01 July 2012

End of Grant: 30 June 2016

www.cost.eunetair.it

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

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Riga, Latvia, 26 - 27 March 2015



THANK YOU VERY MUCH FOR YOUR KIND ATTENTION !

