

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

COST Action TD1105

WGs & MC Meeting

New Sensing Technologies for Indoor Air Pollution Monitoring and Environmental Measurements

organized and hosted by Bulgarian Academy of Sciences
Sofia, Bulgaria, 16 - 18 December 2015

Action Start date: 01/07/2012 - Action End date: 15/11/2016 - Year 4: 2015-16 (*Extended Action*)

Overview and Plans

 **COST**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



Michele Penza

Function in the Action: Action Chair

ENEA - Brindisi, Italy

michele.penza@enea.it



FIFTH SCIENTIFIC MEETING

Working Groups and Management Committee

organized by Bulgarian Academy of Sciences
Institute of Electronics and National Institute for Meteorology and Hydrology
Sofia (Bulgaria), 16 - 18 December 2015

hosted at Bulgarian Academy of Sciences - Conference Hall
11 November Street, 1 - 1000 Sofia, Bulgaria



**BULGARIAN
ACADEMY
of SCIENCES**
— 1869 —



cost
EUROPEAN COOPERATION IN SCIENCE

Meeting AGENDA

16 Dec. 2015 - Wednesday	
08:30 - 18:00	REGISTRATION
09:00 - 09:30	WELCOME SESSION
09:30 - 11:00	PLENARY SESSION 1: Invited Talks
11:00 - 11:30	<i>Coffee-Break</i>
11:30 - 13:00	PLENARY SESSION 2: Invited Talks
13:00 - 14:30	<i>Lunch</i>
14:30 - 16:30	WG1-WG2 Meeting WG3-WG4 Meeting
16:30 - 17:00	<i>Coffee-Break</i>
17:00 - 18:30	WG1-WG2 Meeting WG3-WG4 Meeting
18:30	<i>Gathering of Day</i>
18:30 - 19:30	<i>Welcome Party</i>
17 Dec. 2015 - Thursday	
09:00 - 18:00	REGISTRATION
09:00 - 09:30	Wrap-Up and Inputs from Action TD1105
09:30 - 10:30	KEYNOTE SESSION
10:30 - 11:00	<i>Coffee-Break</i>
11:00 - 12:30	SIG SESSIONS: SIG1-SIG4 Meeting
12:30 - 14:00	<i>Lunch</i>
14:00 - 15:00	ROUNDTABLE: Which Future for AQ Sensors?
15:00 - 16:00	POSTER SESSION
16:00 - 16:30	<i>Coffee-Break</i>
16:30 - 18:00	Action WGs/SIGs GENERAL ASSEMBLY
18:00	CONCLUSIONS
19:30	<i>Social Dinner</i>
18 Dec. 2015 - Friday	
09:30 - 13:00	8th MANAGEMENT COMMITTEE MEETING
13:00 - 14:00	<i>Lunch</i>
14:30	Meeting Closing

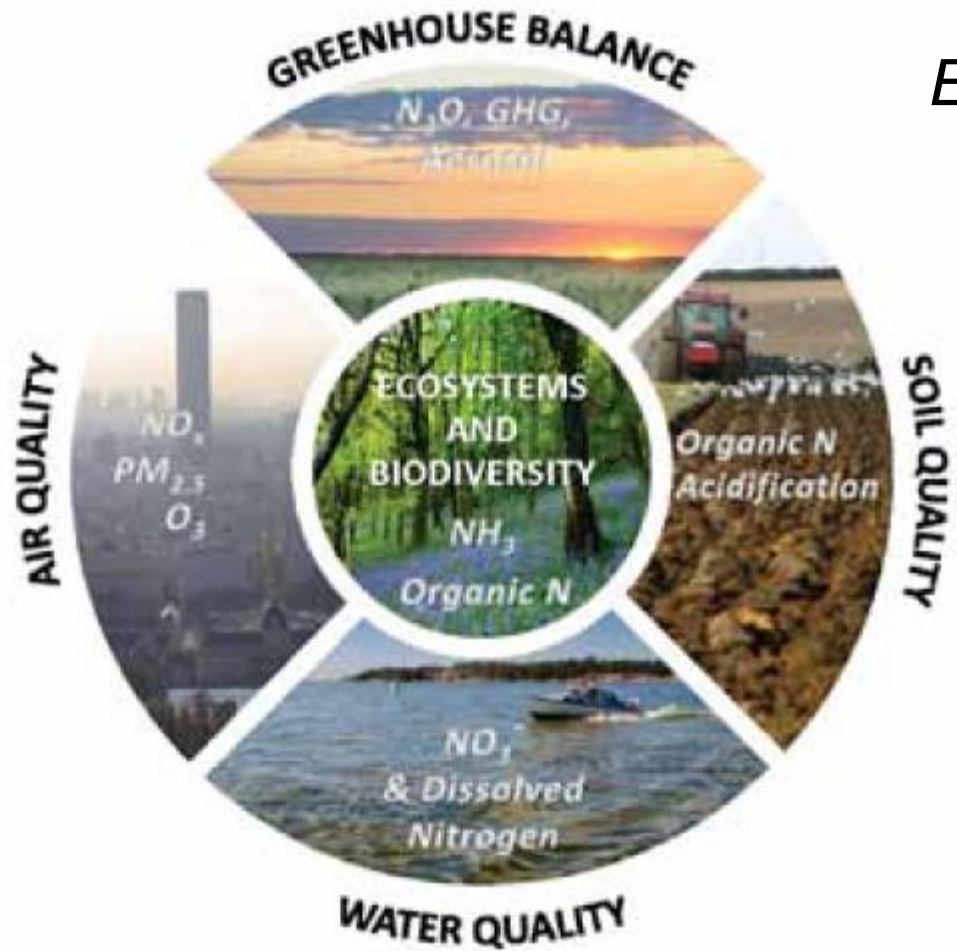
Outline



- **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

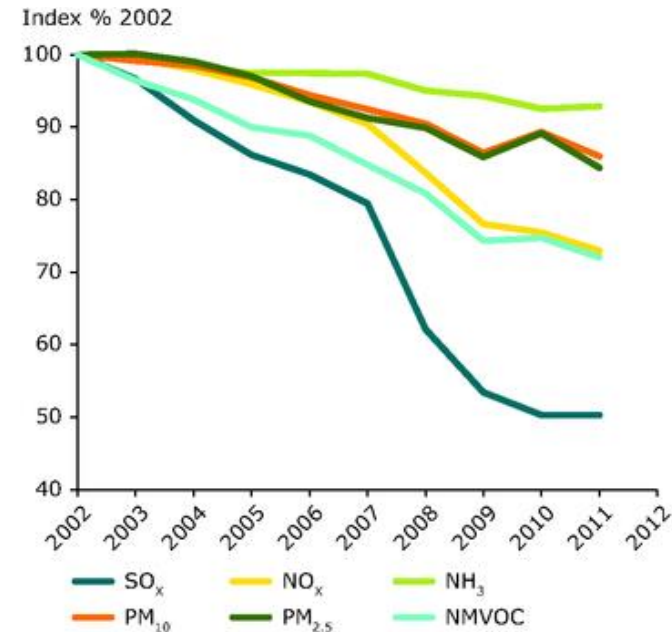
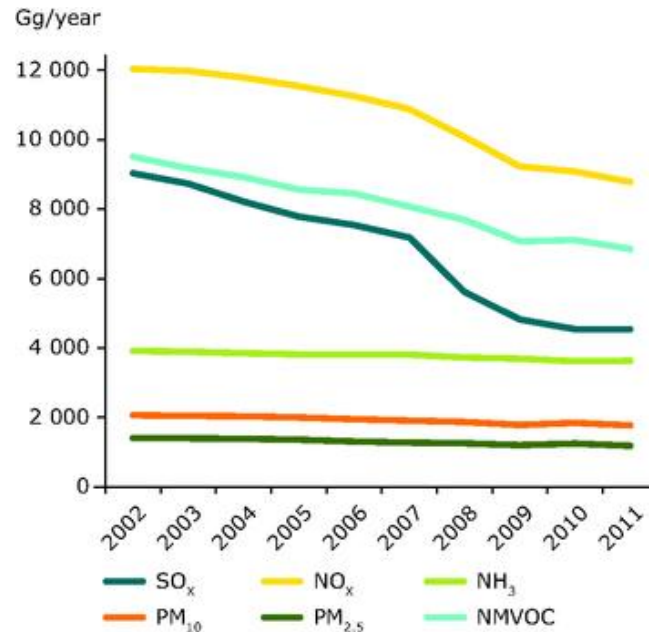
Nitrogen Pollution:

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

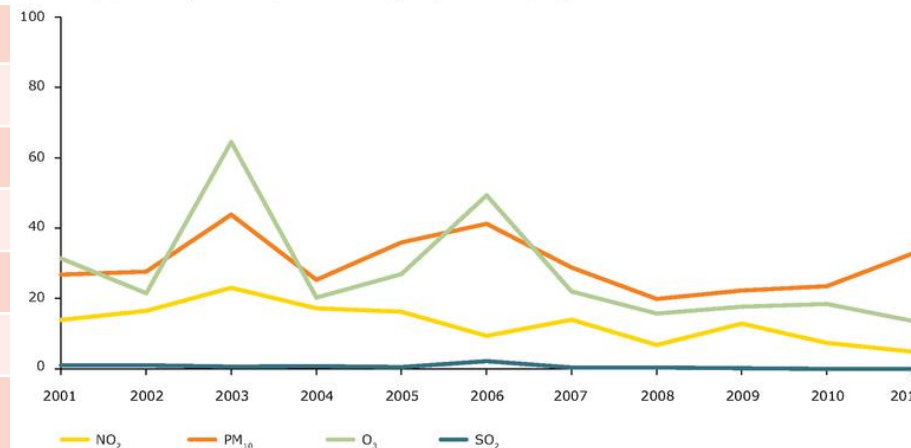


Some Environmental Emergencies:

- 1930 - Meuse Valley (Belgium)
- 1952 - Great London Smog (UK)
- 1954 - Los Angeles (USA)
- 1984 - Bhopal (India)
- 2005 - Teheran (Iran)
- 2006 - Hong Kong
- 2008, 2015 - Shanghai, Peking, CN
- 2012 - Taranto (Italy)

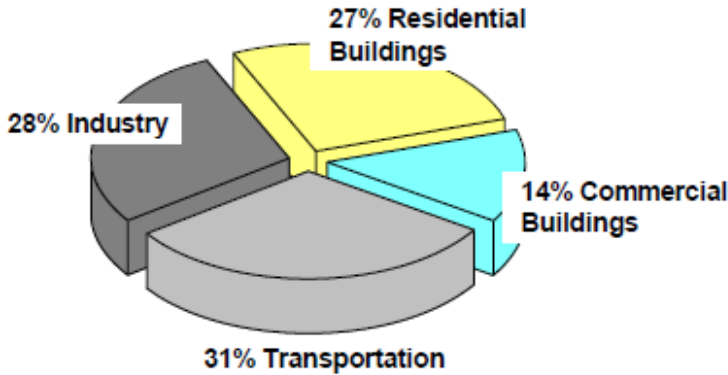
Pollutant	Limit Level
NO _x	100, 200 ppb
CO	8 ppm
SO ₂	130, 190 ppb
O ₃	120 µg/m ³
PM ₁₀	50 µg/m ³
BTEX	6 µg/m ³
PAH (BaP)	1 ng/m ³
PM _{2.5}	25 µg/m ³

% 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

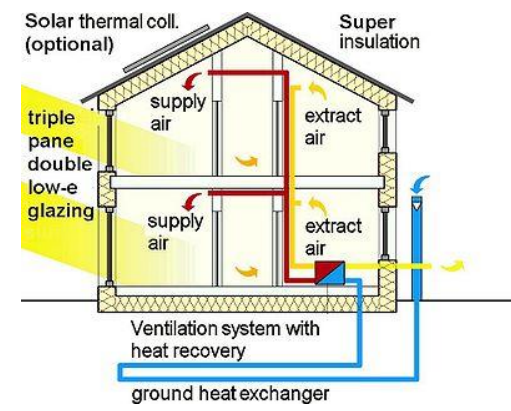
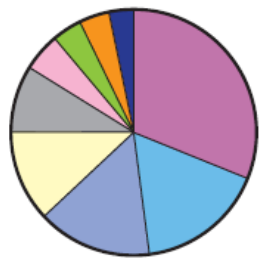
41% Primary Energy consumed in Buildings:

- 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

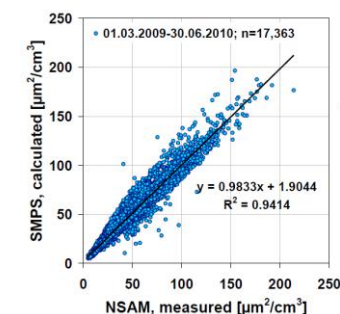
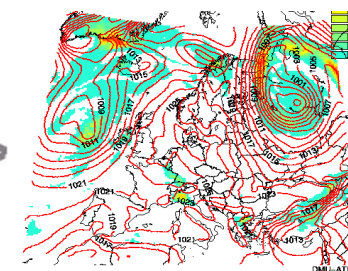
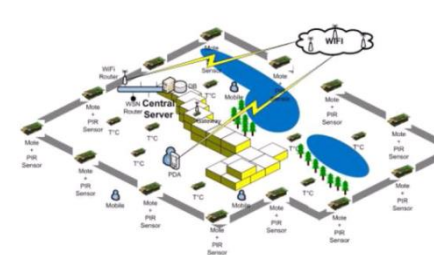
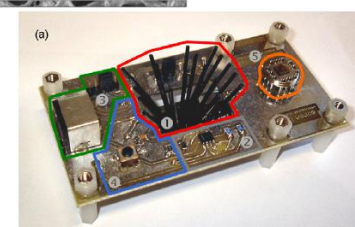
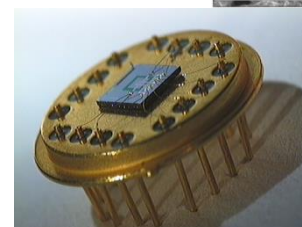
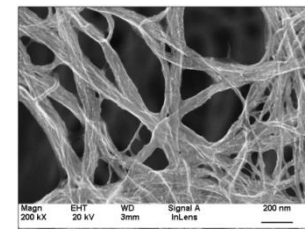
IAQ by WORLD HEALTH ORGANIZATION

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

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

Challenges addressed by Action TD1105 (1/1)

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



Action's Objectives (1/3)

MoU Main Objectives of COST Action TD1105:

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

Action's Objectives (2/3)

MoU Secondary Objectives of COST Action TD1105:

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

Action's Objectives (3/3)

MoU Secondary Objectives of COST Action TD1105:

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

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:

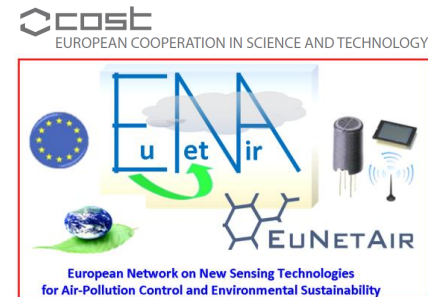
- **Workshops** on sensor materials and nanotechnologies, sensor-systems for AQC, environmental measurements, air-pollution modelling, chemical weather forecasting, distributed computing, wireless sensor networks, protocols and pre-standardisation; organization of open conferences to improve knowledge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

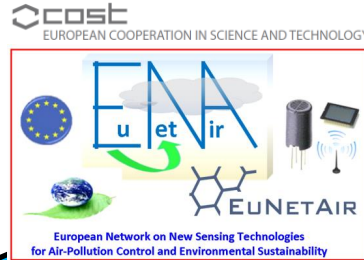
The Working Program includes multidisciplinary Research at integrated approach and trans-domain multi-scale level:

- **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)*

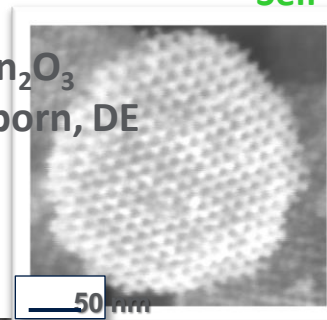
- **SIG 1:** *Network of Spin-offs*
- **SIG 2:** *Smart Sensors for Urban Air Monitoring in Cities*
- **SIG 3:** *Guidelines for Best Coupling Air Pollutant-Transducer*
- **SIG 4:** *Expert comments for the Revision of the Air Quality EU Directive*

Action (2012-2016) Size:

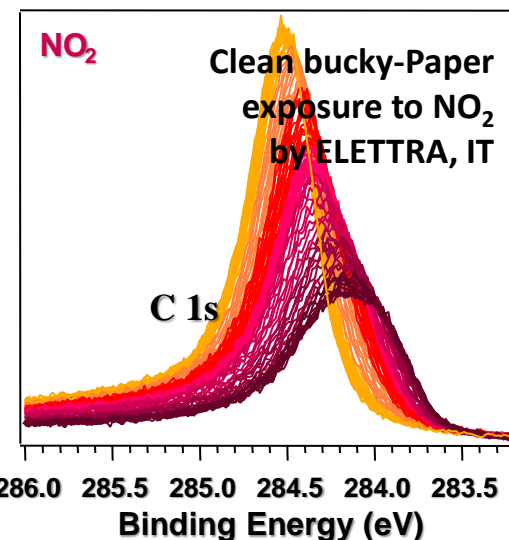
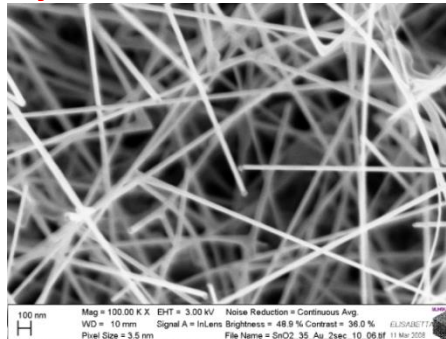
200 Experts from 120 Teams - 31 Countries

- **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.).

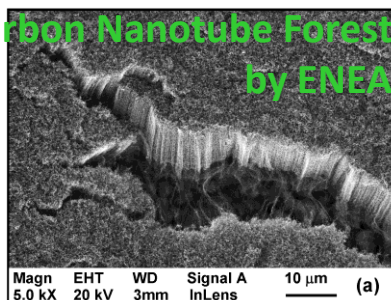
Mesoporous In₂O₃
by Univ. of Paderborn, DE



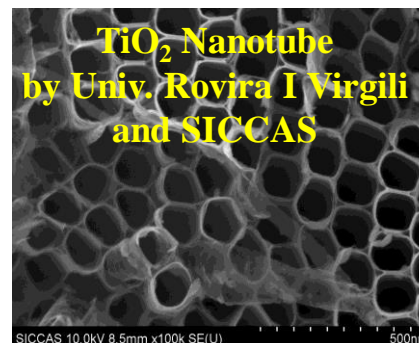
Metal oxide (SnO₂)
Nanowires nets
by Univ. of Brescia, IT



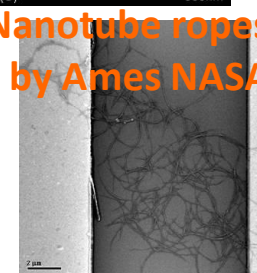
Carbon Nanotube Forest
by ENEA



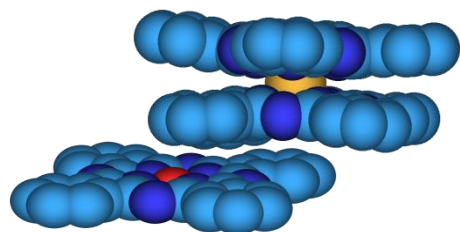
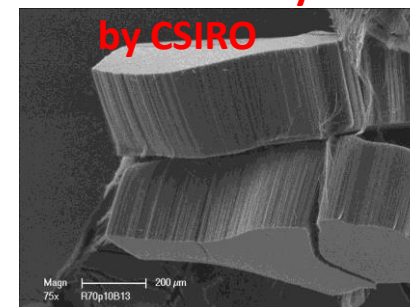
TiO₂ Nanotube
by Univ. Rovira I Virgili
and SICCAS



Carbon Nanotube ropes
by Ames NASA



Carbon Nanotube yarns
by CSIRO



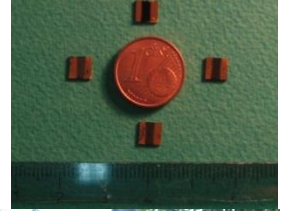
New molecular materials of polymer-macrocycles as transducers for polluting gas sensing by University of Bourgogne

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

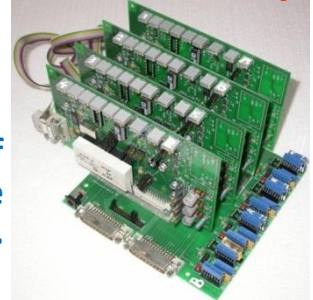
WG2 Chair: Prof. Andreas Schuetze, Saarland University, Germany

IT PATENT ENEA

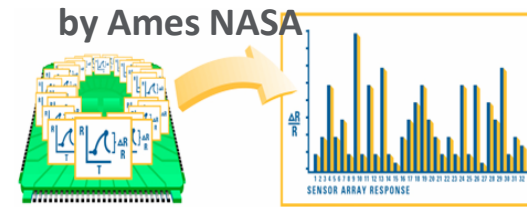
Carbon Nanotube Gas Sensors



EnviroWatch mote by Newcastle University



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

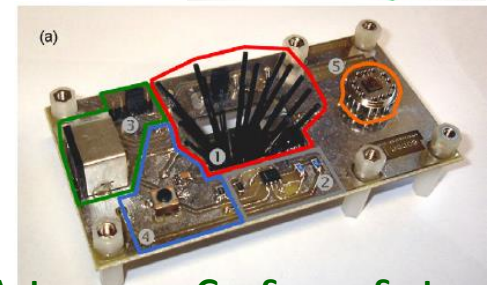


Using pattern matching algorithms, the data is converted into a unique response pattern

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

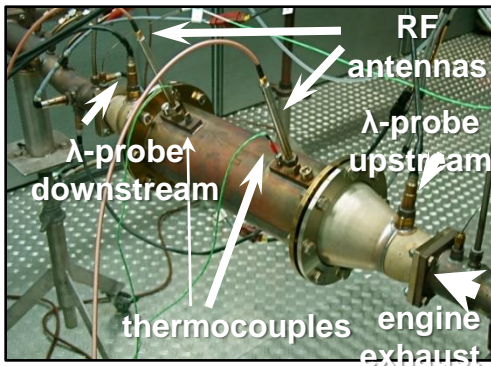


Low-ppb sensitivity for NO₂ GaN-based sensor concept



Autonomous Gas Sensor System by IREC and Univ. of Barcelona

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



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

ERATION IN SCIENCE AND TECHNOLOGY

Sub-Working Group 3.1:

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

Sub-Working Group 3.2:

Air-quality modelling and chemical weather forecasting.

Sub-Working Group 3.3:

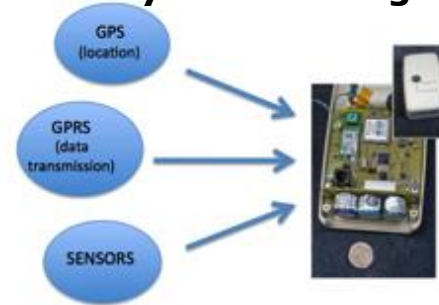
Harmonisation of environmental measurements.

by Aristotle University, EL

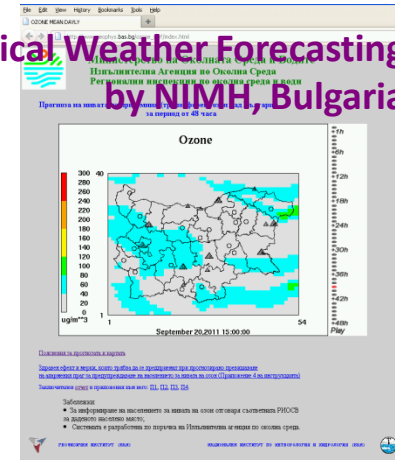


AirMerge system for Chemical Weather Models

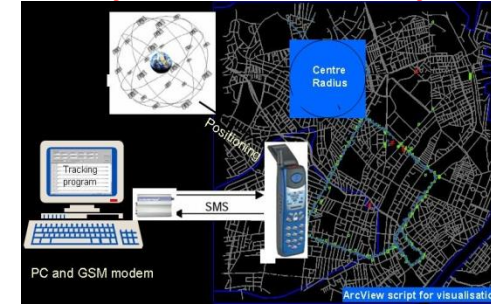
Mobile and static sensor network configurations by University of Cambridge.



Chemical Weather Forecasting by NIMH, Bulgaria



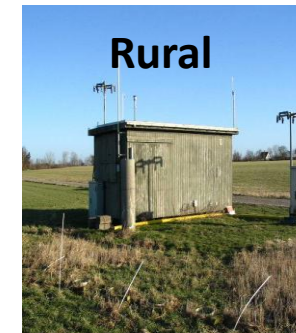
AQ Modeling: Tracking routes by Aarhus University, DK



Environmental measurements of PM and air pollution by CSIC, ES



AQ monitoring station by ARPA-PUGLIA, IT



AQ monitoring station by Aarhus University, DK



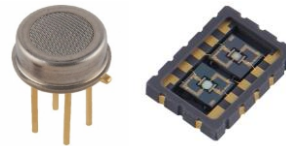
AQ monitoring station by Lithuanian EPA

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

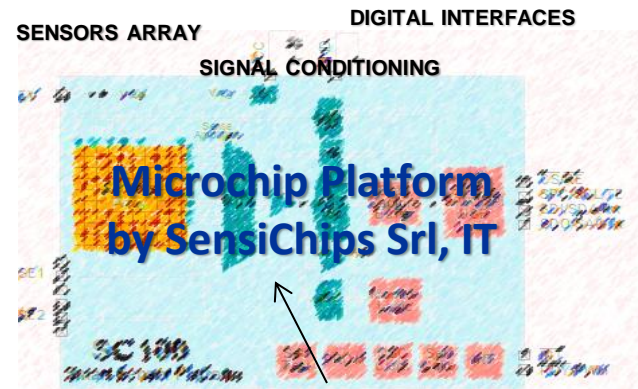
European Directive 2008/50/EC: Ambient Air Quality
EU standard EN 13725/2003: Dynamic Olfactometry

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

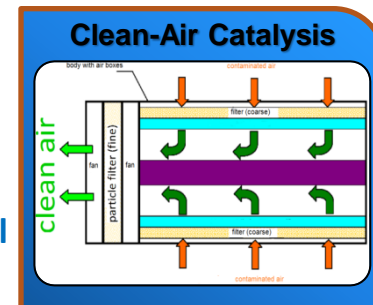
Dynamic olfactometry EN13725
by Univ. of Liege, Odometric SA,
Univ. of Bari, Lenviros srl.



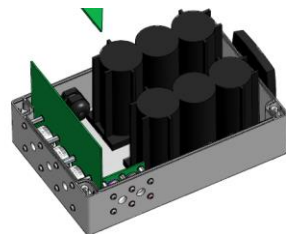
Packaged Sensors
by E2V, CH



New precision multi-parametric analytical tool



Becker Gruppe, DE



Battery-Powered Sensors by Alphasense Ltd, UK



CO₂ IR sensor for alarm System by SenseAir AB, Sweden

COST Action 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 (31)**

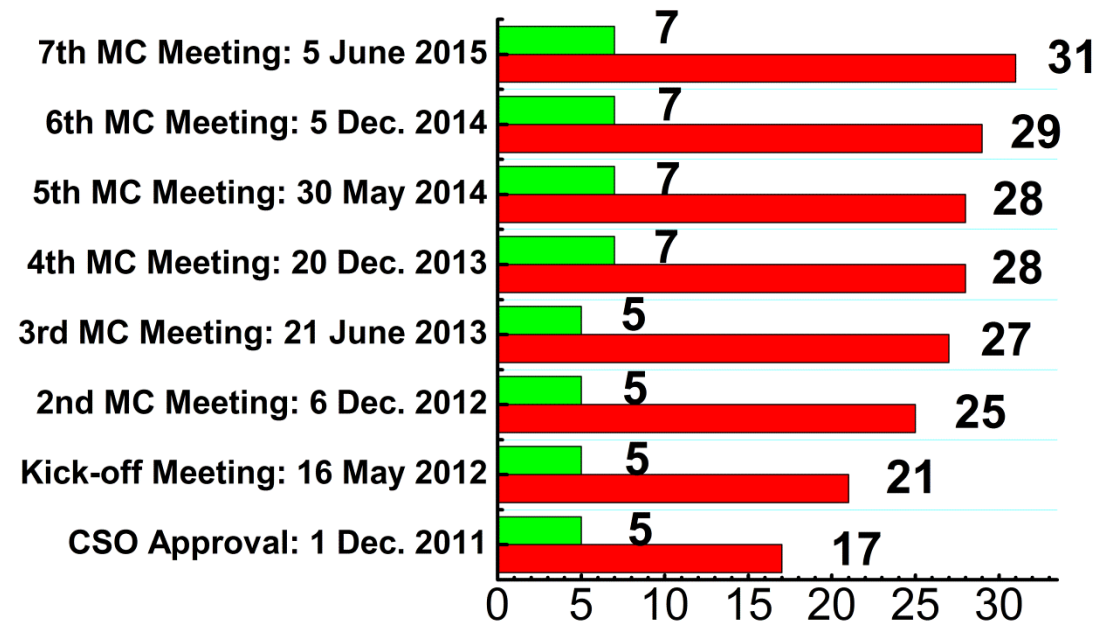
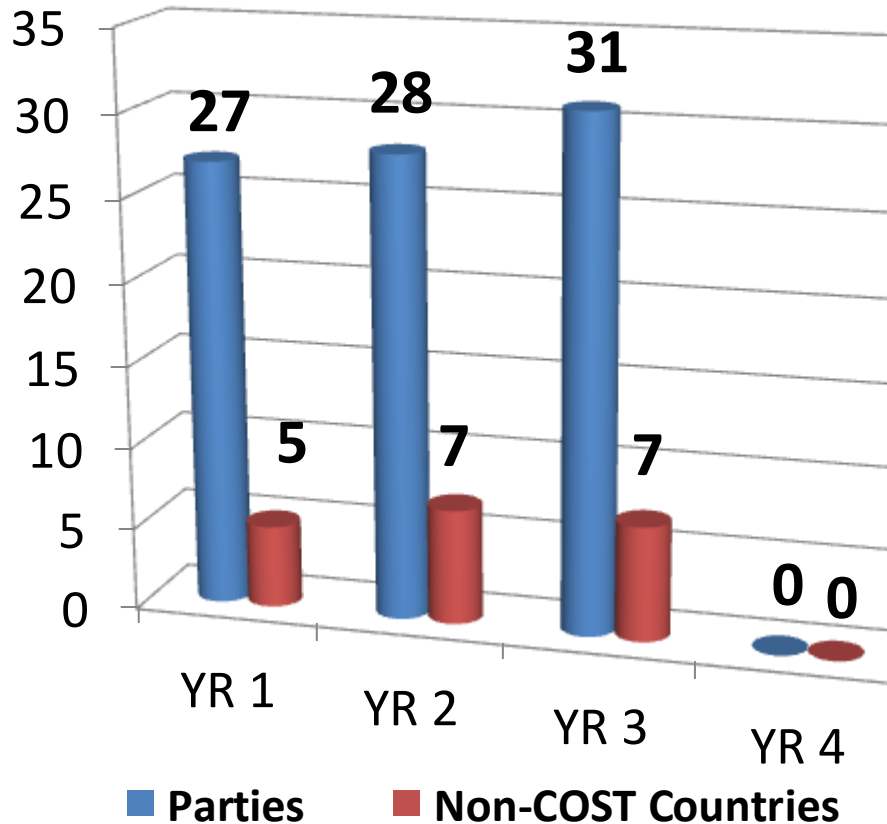
Grant Holder:

Eurice GmbH, Saarbrücken, Germany

GH Scientific Representatives:

Corinna Hahn, MC Member

Juliane Rossbach, MC Substitute



Non-COST Countries: NNC + IPC

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

PARTIES: 31

already accepted MoU

Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, 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

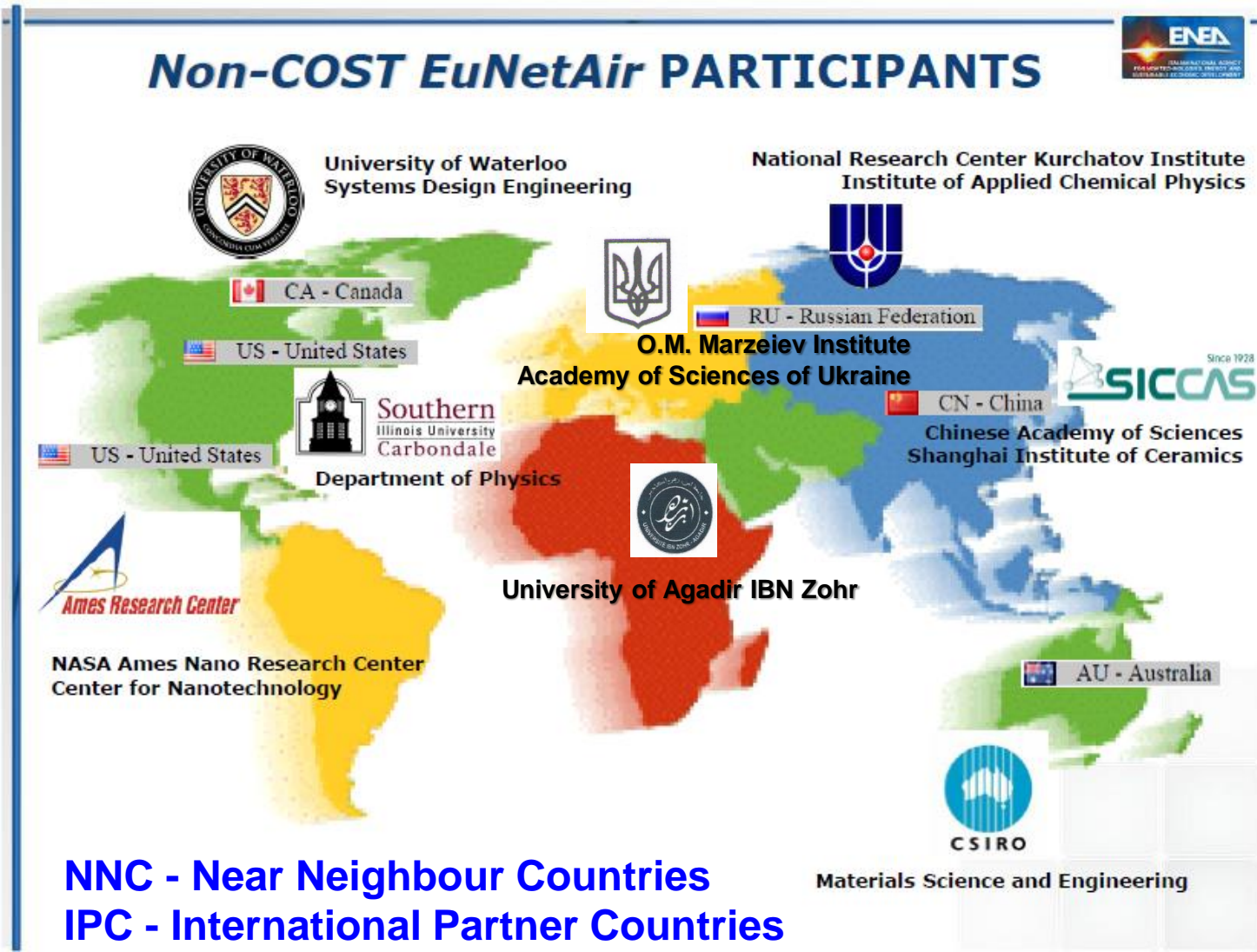


COST Action TD1105 *EuNetAir*:

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 **31** 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



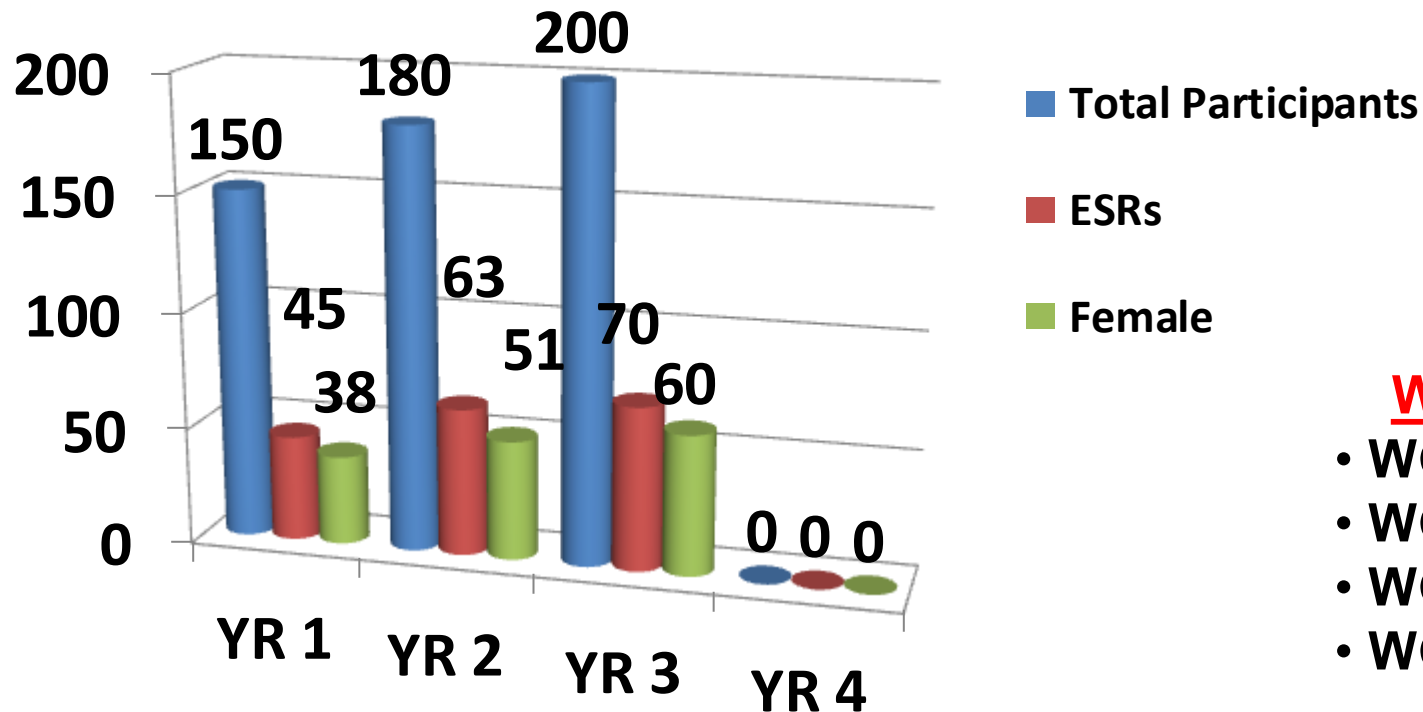
UA - Ukraine

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 Dec. 2015

- Total Number of Participants: 200 (80% active)
- Early Stage Researchers (ESRs): 70 (35%)
- Females: 60 (30%)
- MC Members: 58 - Male: 40 (69%); Female: 18 (31%)
- MC Substitutes: 33 - Male: 26 (79%); Female: 7 (21%)






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		Estonia	<ul style="list-style-type: none"> University of Tartu 	

Action Participating Organizations (2/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
8		Finland	<ul style="list-style-type: none"> • University of Oulu • University of Helsinki • Tampere University of Technology 	
9		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
10		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
11		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
12		Hungary	<ul style="list-style-type: none"> • Hungary Meteorological Service • Szechenyi Istvan University 	
13		Iceland	<ul style="list-style-type: none"> • Agricultural University of Iceland 	






Action Participating Organizations (3/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
14		Ireland	<ul style="list-style-type: none"> • Trinity College Dublin • University College Cork 	
15		Israel	<ul style="list-style-type: none"> • Technion Institute of Israel • AirBase Systems 	
16		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 • NOVAVIS srl • ARIANET srl • CNR, Institute of Atmospheric Science and Climate • CNR, Institute of Methodologies for Environmental Analysis • CNR, Institute of Environmental Pollutant Research
17		Latvia	<ul style="list-style-type: none"> • University of Latvia • Riga Technical University 	
18		Luxembourg	<ul style="list-style-type: none"> • Luxembourg Institute for Science and Technology - LIST 	

Action Participating Organizations (4/5)

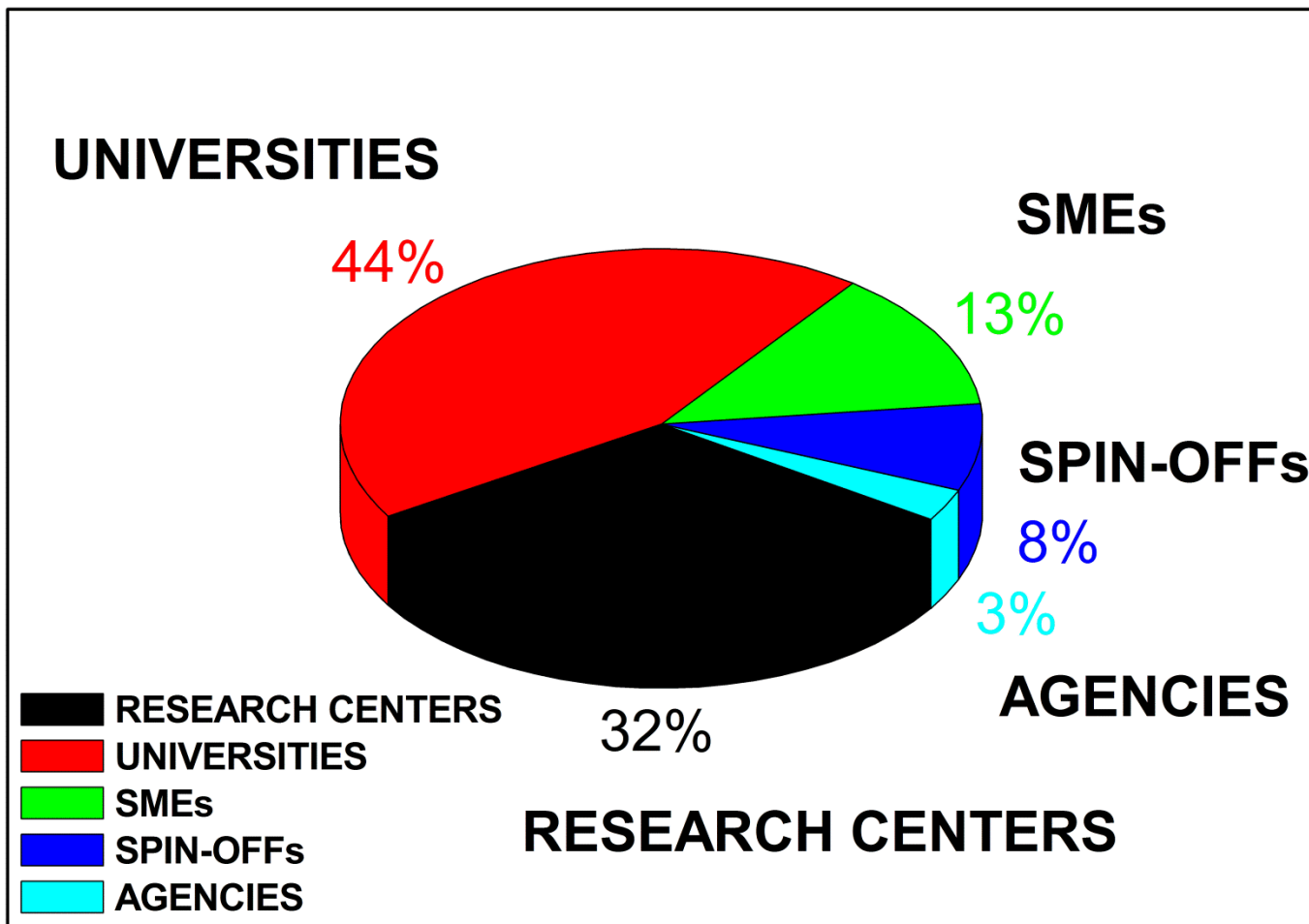
Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
19		FYR of Macedonia	<ul style="list-style-type: none"> Ministry of Environment and Physical Planning University "St. Kliment Ohridski" 	
20		Netherlands	<ul style="list-style-type: none"> IMEC - Holst Centre ECN 	
21		Norway	<ul style="list-style-type: none"> NILU - Norwegian Institute for Air Research 	
22		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
23		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
24		Romania	<ul style="list-style-type: none"> IMNR - National R&D Institute for Nonferrous and Rare Metals SC IPA SA 	
25		Serbia	<ul style="list-style-type: none"> Institute of Public Health of Belgrade VINCA Institute 	
26		Slovenia	<ul style="list-style-type: none"> University of Ljubljana Aerosol doo 	

Action Participating Organizations (5/5)

Pos.	Flag	Country	Action MC Organizations	Action WG Organizations
27		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
28		Sweden	<ul style="list-style-type: none"> • Linköping University • SenseAir AB • Chalmers University of Technology • SenSiC AB 	
29		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
30		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
31		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 Dec. 2015



COST Parties: 31
COST Organizations: 123
UNIVERSITIES: 55
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 Linkoping, 3-5 June 2015
AQUILA Network	<i>Annette Borowiak</i>	<ul style="list-style-type: none"> Duisburg, 4-6 March 2013
European Environment Agency (EEA)	<i>Valentin Foltescu</i> <i>Cristina Guerreiro (NILU)</i>	<ul style="list-style-type: none"> Copenhagen, 3-4 Oct. 2013
US Environment Protection Agency (EPA)	<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, USA	<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, Australia	<i>Philip J. Martin</i>	<ul style="list-style-type: none"> Barcelona, 20 June 2013
QUT, Australia	<i>Zorane Ristovski</i>	<ul style="list-style-type: none"> Belgrade, 13-14 Oct. 2015

Country

MC Members (58): Male (69%) - Female (31%)

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
Estonia	Prof. Raivo Jaaniso
Finland	Prof. Kaarle HAMERI; Prof. Jyrki LAPPALAINEN
France	Prof. Marcel BOUVET; Prof. Jerome BRUNET
Germany	Prof. Andreas SCHUETZE; Dr Corinna HAHN
Greece	Prof. George PAPAPOPOULOS; 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 BORREGO
Romania	Dr Marcel IONICA; Dr Roxana Mioara 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

**Kick-off Meeting
Brussels
16 May 2012**

**MANAGEMENT
COMMITTEE**

MC Chair: Michele Penza, ENEA, IT

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

Grant Holder: Eurice GmbH, Saarbrucken, DE

Country

MC Substitutes (33)

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 Dr. Daniela SCHONAUER-KAMIN
Germany	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 Dr. Ana Margarida COSTA
Romania	Dr. Cristina RUSTI; Dr. Marcel Adrian IONICA
Slovenia	Prof. Andrej DOBNIKAR
Spain	Prof. Albert ROMANO-RODRIGUEZ Dr. Jordi LLOSA
Sweden	Dr Mike ANDERSSON; Dr. Marina VOINOVA
Switzerland	Dr Christoph HUEGLIN
Turkey	Prof. Necmettin KILINC
UK	Prof. Julian GARDNER Dr Robin NORTH; Prof. Florin UDREA

Year 4: Scientific Planning of *EuNetAir* (1/2)

Meetings/Workshops/Training Schools planned for upcoming year
(Year 4: 1 July 2015 - 15 May 2016): EXTENSION: 15 Nov. 2016

- **WG1-WG4 Meeting** on *Air Quality Monitoring and Calibration: Horizons in Sensing Technologies, Methods and Modelling - Start of the 2nd EuNetAir Air Quality Joint-Exercise Intercomparison* organized by the VINCA Institute, Belgrade (**Serbia**), 13 - 14 Oct. 2015. Local organizer: Dr. Milena Jovasevic-Stojanovic, VINCA and Anka Cvetkovic, Public Health Institute of Belgrade
- The **4th International Workshop of the COST Action TD1105** on *Innovations and Challenges for Air Quality Control Sensors* at FFG (National AT COST Office), Wien (**Austria**), 25 - 26 February 2016. Local organizer: Dr. Anton Kock, MCL
- The **Action 4th International Training School** on *Modelling, Methods and Technologies for Air Quality Control* at Emdrup Campus in Copenhagen, by Aarhus University (**Denmark**), 19 - 22 April 2016. Local organizer: Prof. Ole Hertel, Aarhus University. Trainees: 13-15 expected. Trainers: 3-4 expected.

Year 4: Scientific Planning of *EuNetAir* (2/2)

MC/WG Meetings planned for the upcoming year

(Year 4: 1 July 2015 - 15 May 2016): EXTENSION: 15 Nov. 2016

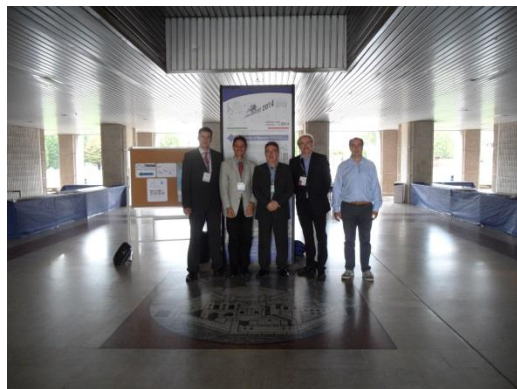
- **5th SCIENTIFIC MEETING: WGs Meeting and 8th MC Meeting on New Sensing Technologies for Indoor Air Pollution Monitoring and Environmental Measurements** at Bulgarian Academy of Sciences, Sofia (**Bulgaria**), 16 - 18 Dec. 2015. Local organizers: Prof. Ivan Nedkov and Prof. Dimiter Syrakov, BAS
- **6th SCIENTIFIC MEETING: WGs Meeting and 9th MC Meeting on New Sensing Technologies for Outdoor Air Quality Monitoring** at Czech Academy of Sciences, Prague (**Czech Republic**), 5 - 7 October 2016. Local Organizers: Prof. Zdenek Zelinger, Dr. Vera Kurkova, Dr. Roman Neruda, CAS
- **Special Session EuNetAir / Core-Group Meeting** to **EUROSENSORS 2015**, Freiburg (**Germany**), 6 - 10 September 2015

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

CAMBRIDGE
CMOS
SENSORS



Cambridge, UK



Kjeller, NO



Delsbo, SE



Cambridge, UK

Eindhoven, NL



Saarbr., DE



SIEMENS

Warwickshire, UK



Mol, BE



Louvain, BE

Petten, NL



Munich, DE



Leoben, AT



Corcelles, CH



Aveiro, PT



Barcelona, ES



Brindisi, IT



Thessaloniki, EL



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)

Participation:

- **60+ Participants**
- **21 COST Countries**

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:

Dr. Iveta Steinberga
University of Latvia
Riga (Latvia)

Local Co-Organizer:

Dr. Gita Sakale
Riga Technical University
Riga (Latvia)

Participation:

- 50+ Participants
- 18 COST Countries



Focus Group Meeting *EuNetAir*

Data Analysis of Aveiro Air Quality Sensors Intercomparison

hosted by WHO CC - Federal Environment Agency, **Berlin** (Germany), 17 April 2015



Local Organizer:

Dr. Hans-Guido Muecke
WHO CC - FEA
Berlin (Germany)

Participation:

- 9 Participants
- 8 COST Countries

Output:

Planned Joint-Publication
on AQ Sensors Aveiro Database



Focus Group Meeting *EuNetAir*

Innovation on Environmental Sensor Technologies

hosted by Siemens, **Munich** (Germany), 29 April 2015

SIEMENS

Local Organizer:

Dr. Olivier von Sicard
Siemens AG
Munich (Germany)



Participation:

- 15 Participants
- 10 COST Countries

Output:

Planned Report on
Innovation on Environmental Sensor Technologies



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)



Participation:

- 13 COST Trainees
- 3 Trainers



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

- **4 June 2015:** Roundtable on the ***European Sensor-Systems Cluster (ESSC)***
- **5 June 2015:** ***World Environment Day 2015, 5 June - Global Day by UNEP***
- **22 June 2015:** ***AMA Science Proceedings - Published Sept. 2015 with DOI***
- **28 February 2016:** ***Special Issue JSSS (Copernicus) - Peer Review Process***

**EuNetAir at 2nd Consultation Meeting on
the Global Platform on Air Quality and Health**

WHO Geneva, 18-20 August 2015, *Meeting Report - DRAFT 23.09.2015*



Session 3, cont. Low cost AQ monitoring

- Portable Sensor-Systems for Air Quality Monitoring: The case-study of EuNetAir (*M. Penza – remote presentation*)
- Experiences of USEPA (*T. Watkins – remote presentation*)

Discussion: Perspectives for application of low cost sensors for AQ monitoring

COST Session & Core-Group Meeting at **EUROSENSORS 2015**



The 29th European Conference on Solid-State Transducers

10:30 - 12:30 **Open Session COST: New Sensing Technologies for Air Quality Monitoring**
Chairperson: Michele Penza, ENEA, Brindisi, Italy

10:30 - 10:50 **COST Action TD1105: European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability. Overview and Plans**
Michele Penza, Action Chair, ENEA, Brindisi, Italy

10:50 - 11:10 **Performance Evaluation of Amperometric Sensors for the Monitoring of O₃ and NO₂ in Ambient Air at ppb Level**
Laurent Spinelle, Manuel Aleixandre, Michel Gerboles, JRC, EC DG ENV, Institute for Environment and Sustainability, Ispra, Italy

11:10 - 11:30 **LTCC, New Packaging Approach for Toxic Gas and Particle Detection**
Anita Lloyd Spetz, M. Sobocinski, N. Halonen, D. Puglisi, J. Juuti, H. Jantunen, M. Andersson, Action Vice-Chair, Linköping University, Linköping, Sweden

11:30 - 11:50 **Low-Cost Fabrication of Zero-Power Metal Oxide Nanowire Gas Sensors: Trends and Challenges**
Jordi Samà^a, Juan Daniel Prades^a, Olga Casals^a, Guillem Domènech-Gil^a, Sven Barth^b, Isabel Gracia^c, Carles Cané^c, Francisco Hernández-Ramírez^{a,d}, Albert Romano-Rodríguez^a, Action MC Substitute, ^aUniversitat de Barcelona, Barcelona, Spain; ^bTechnical University Vienna (TUW), Institut für Material Chemistry, Vienna, Austria; ^cConsejo Superior de Investigaciones Científicas (CSIC), Institut de Microelectrònica de Barcelona (IMB-CNM), Bellaterra, Spain; ^dCatalonia Institute for Energy Research (IREC), Barcelona, Spain

11:50 - 12:10 **Integrated Sensor Systems for Indoor Applications: Ubiquitous Monitoring for Improved Health, Comfort and Safety**
Andreas Schuetze, WG2 Leader and MC Member, Saarland University, Saarbrücken, Germany

12:10 - 12:30 **Towards Disposable Sensing Platforms and Analytical Instruments for Air Quality Monitoring**
Danick Briand, Action MC Member, EPFL, Neuchâtel, Switzerland



WGs MEETING:

Air Quality Monitoring: Horizons in Sensing Technologies, Methods and Modelling

VINCA Institute & Public Institute of Health, **Belgrade** (Serbia), 13 - 14 Oct. 2015



Joint-Exercise Sensors-vs-Analyzers
Belgrade, October 2015 - running 2016



Local Co-Organizers:

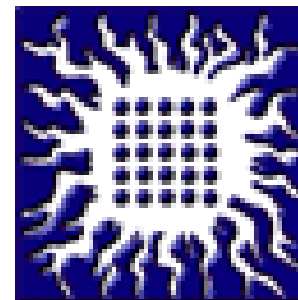
Dr. Milena Jovasevic-Stojanovic, RS MC Member,

Dr. Anka Cvetkovic, RS MC Member,

VINCA Institute and Public Institute of Health

Belgrade - (Serbia)

joined to WeBIOPATR 2015 Conference



EuNetAir at **WEBINAR on CLIMATE ADAPT**

Copenhagen, **16 Dec. 2015**, 11:30-13:00 (CET) **Webinar**

European Environment Agency



Hereby I would like to invite the European climate change adaptation research community and related funding organisations to a second webinar on the progress in and the development of the European Climate Adaptation Platform (Climate-ADAPT). I would also like to invite the national reference centres on climate change impacts, vulnerability and adaptation in EEA member countries and experts from the European Commission, international organisations, transnational initiatives and cities networks on adaptation.

André Jol

EEA Head of Group Climate change impacts, vulnerability and adaptation

EU funded research initiatives:

Climate-KIC (Innovation Pillar, Policy), Cost Action (Actions ES1404, **TD 1105**, ES1102, ES1106)

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

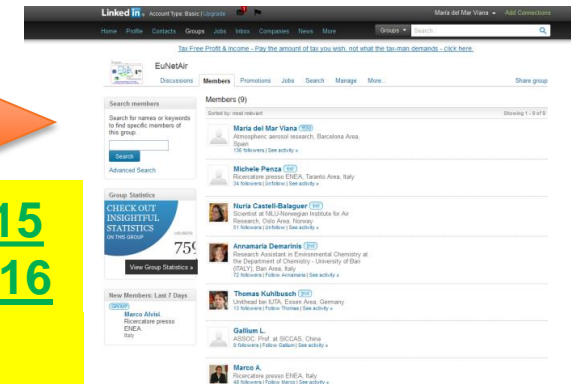
hosted by ENEA

Dr. Marco Alvisi, Webmaster Coordinator

Sebastiano Dipinto, Valerio Pfister, Gianfranco Zingarelli, Webmaster Team

Social Scientific ESRs Network (SSEN) by LinkedIn

Members: >80 - Moderators: M. Viana, M. Minguillon



4° CALL for Short Exchange Visits launched on September 2015
Short Term Scientific Mission: **9 TO BE FUNDED** by 30 April 2016

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 ✓
- Issue 6: published on June 2015 ✓
- Issue 7: published on Dec. 2015 ✓

Prof. Ralf Moos, Editor-in-Chief

Dr. Daniela Schonauer-Kamin, Editorial Board Manager

- **Alena Bartonova**, Coordinator FP7 Project CITI-SENSE, NILU, Kjeller, Norway
- **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)**

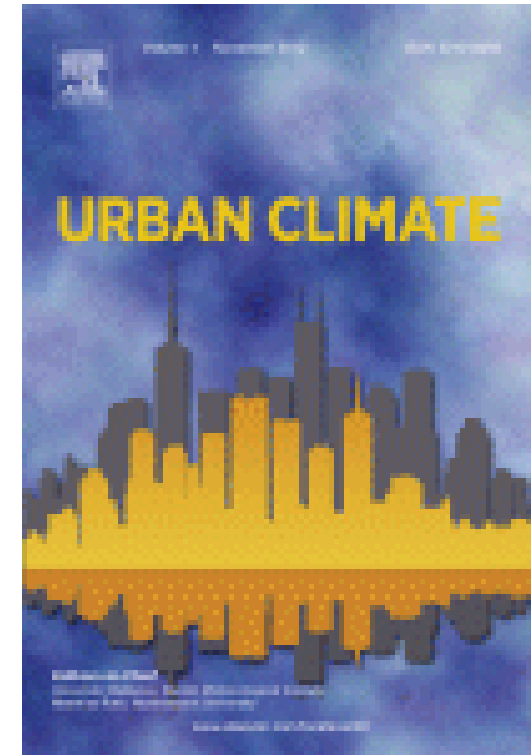
New Sensing Technologies and Methods for Air-Pollution Monitoring

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**
- Publication: **December 2015, Issued Vol. 14 (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)***

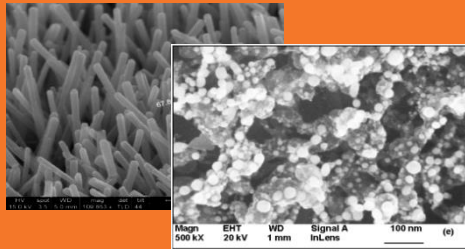


Expected Impact by Action TD1105

- **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**

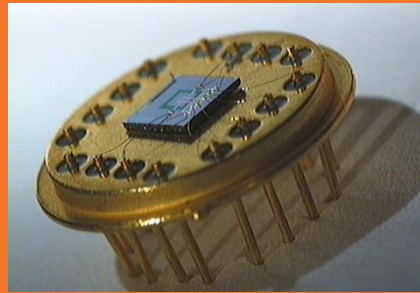
COST Action EuNetAir: CHALLENGES

MATERIALS & GAS SENSORS



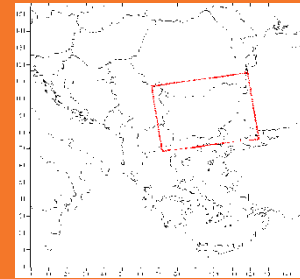
MOX by UNIBS IREC UB SICCAS
CNT by ENEA NASA URV CSIRO

AQC SENSORS & SYSTEMS



GasFET by EPFL, Switzerland

AQ MODELLING

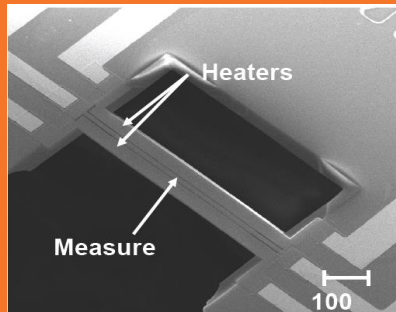


CMAQ Calculations
by NIMH, BG

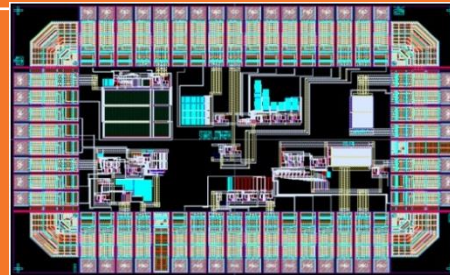
STANDARDS & PROTOCOLS



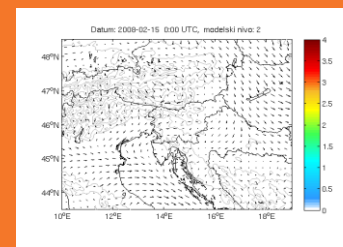
Dynamic Olfactometry (EN 13725/2003) by Univ. of Bari and Lenviros srl, IT



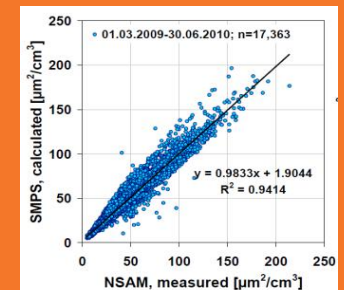
Cantilever Sensor by DTU, DK



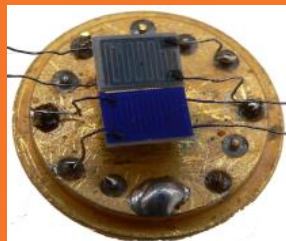
ASIC Circuit: CMOS SOI
by WARWICK & CCMOS Ltd, UK



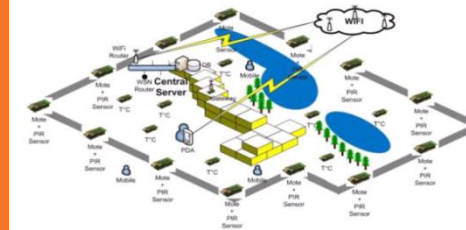
AQ Modelling dispersion in meteorological mesoscale by University of Ljubljana, SL



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

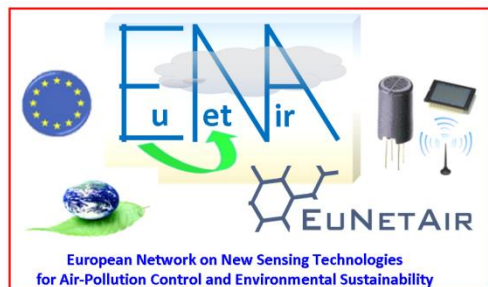
The COST Action TD1105 *EuNetAir* is proposed to solve problems in the area of:

- 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



CSO Approval: 01 Dec. 2011
Kick-off Meeting: 16 May 2012
Start of Grant: 01 July 2012
End of Grant: 15 Nov. 2016

www.cost.eunetair.it

MC Chair:

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

MC Vice Chair:

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

Grant Holder:

Dr. Corinna Hahn, Dr. Juliane Rossbach
Eurice GmbH, DE
c.hahn@eurice.eu; j.rossbach@eurice.eu

Scientific Secretary:

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

Science Officer:

Dr. Deniz Karaca
deniz.karaca@cost.eu

Administrative Officer:

Dr. Andrea Tortajada
andrea.tortajada@cost.eu

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

Top Story 
▶ all stories

***TD1105 selected as Top-Story
by COST Association***



Taking charge of air quality control in Europe's smart, green cities



A COST funded network of European spin-offs, SMEs, agencies, research centres and universities is working on developing cheaper and energy efficient sensors for air quality control in Europe's future smart cities.

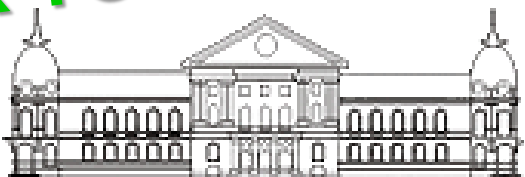
▶ full story

ACKNOWLEDGEMENTS

Sofia, Bulgaria, 16 - 18 December 2015



THANK YOU VERY MUCH FOR YOUR KIND ATTENTION !



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BAS - Institute of Electronics

**BAS - National Institute for
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