

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

## COST Action TD1105

### INTERNATIONAL WORKSHOP MACPoll on *Traceability and Comparability of Measurements in Air Monitoring Techniques*

Joint Research Centre - Institute for Environment and Sustainability  
JRC-Ispra, Italy, 19 November 2013

### ***OVERVIEW AND PLANS of COST Action TD1105 EuNetAir***

Start date: 01/07/2012 - End date: 30/06/2016 - Year 2: 1 July 2013 - 30 June 2014

 **cost**  
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



**Michele Penza**

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



cost

# Air-pollution: An International problem



Chernobyl, Ukraine



Yamuna-River, New-Delhi, India



Wastes in the Pacific Ocean are Equivalent to Texas-Area



Linfen, China

Polluted Cities, Europe



ATIOI River-Riachuelo, Buenos-Aires, Argentina



## Some Environmental Emergencies:

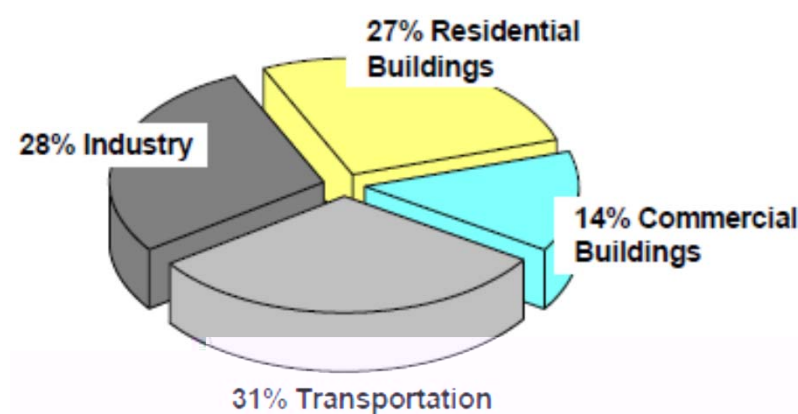
1930 - Meuse Valley (Belgium)  
 1952 - Great London Smog (UK)  
 1954 - Los Angeles (USA)  
 1984 - Bhopal (India)  
 2005 - Teheran (Iran)  
 2006 - Hong Kong (China)  
 2008 - Shanghai, Peking (China)  
 2012 - Taranto (Italy)  
 .....

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

Pollutant	Limit Level
NO <sub>x</sub>	100, 200 ppb
CO	8 ppm
SO <sub>2</sub>	130, 190 ppb
O <sub>3</sub>	120 µg/m <sup>3</sup>
PM <sub>10</sub>	50 µg/m <sup>3</sup>
BTEX	6 µg/m <sup>3</sup>
PAH (BaP)	1 ng/m <sup>3</sup>
PM <sub>2.5</sub>	-



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



Primary energy consumption in the EU<sup>1</sup>

<sup>1</sup> O. Seppanen,

11<sup>th</sup> Conference on Indoor Air Quality  
2008, Copenhagen, Denmark

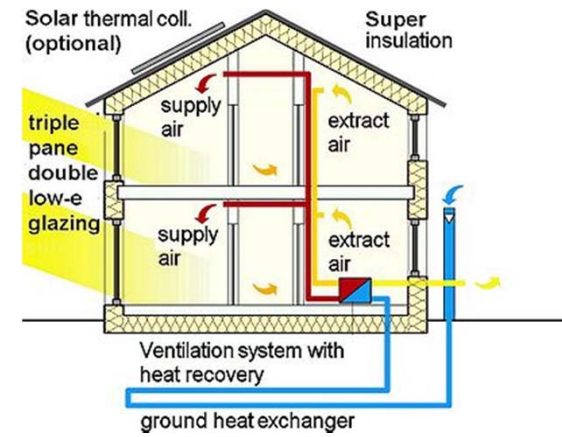
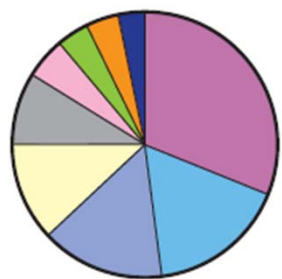
41% Primary Energy consumed in Buildings:

- 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

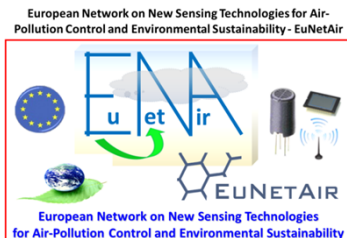
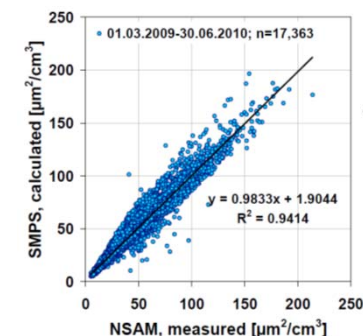
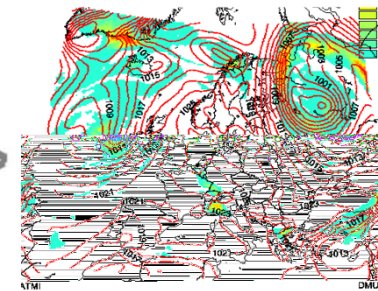
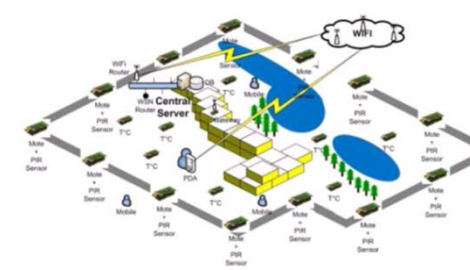
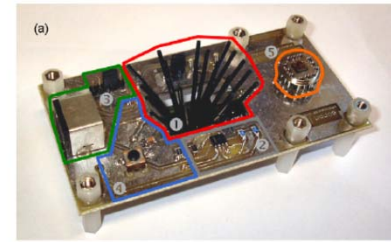
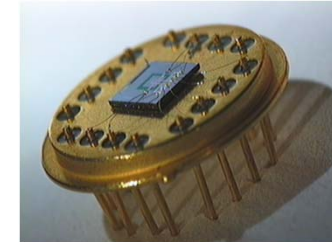
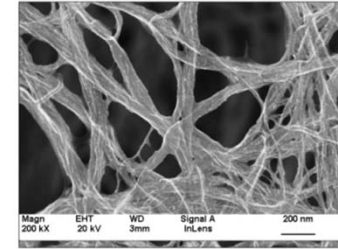
Indoor Air		Typical Substances		Cure
Contamination Source	Emission Source	VOCs	Others	
	• Breath	Acetone, Ethanol, Isoprene		
		CO <sub>2</sub>		
Respiration	Nonanal, Decanal, α-Pinene			• Skin & Tra
aspiration	Humidity			• Flu
Gas	Methanol, Hydrogen			• Co
metics	Limonene, Eucalyptol			• Ho
household Supplies	Alcohols, Esters, Limonene			• Co
mbustion	Unburnt Hydrocarbons			• (En
gines, Appliances, (coco=Smoke)	CO			• Tot
	CO <sub>2</sub>			
	Humidity			
ints, Adhesives, lvents, Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes	permanent 5-10% ventilation	• Building Material	• Pai
C	Toluene, Xylene, Decane		• Furniture	• So
nters, Copiers, mputers	Benzene, Styrene, Phenole		• Office Equipment	• PV
			• Consumer Products	• Pri
				• Co

typical Indoor Air Contaminants (VOCs and others)

Table 1 – Typ

# Challenges addressed by Action TD1105 (1/1)

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



# Action's Objectives (1/3)

## MoU Main Objectives of COST Action TD1105:

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

# Action's Objectives (2/3)

## MoU Secondary Objectives of COST Action TD1105:

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





# Action's Objectives (3/3)

## MoU Secondary Objectives of COST Action TD1105:

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



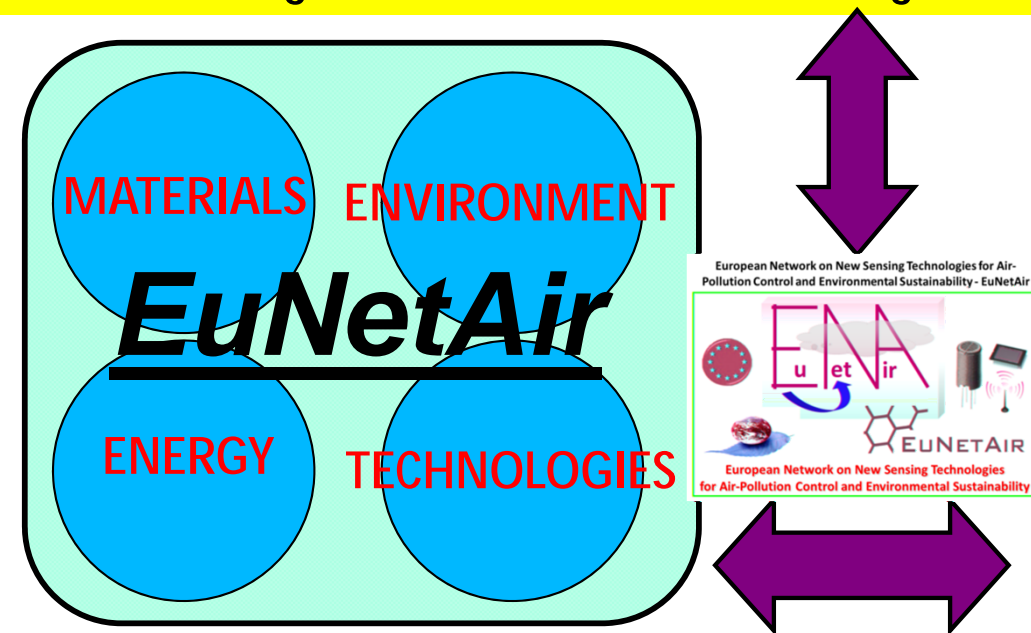
# ***COST Action EuNetAir: Some National Research Projects***



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

## Complementarity with other COST Actions:

- ES0602 Chemical Weather Forecasting and Information Systems
- ES1004 European Framework for Online Integrated Air Quality and Meteorology Modelling
- MP0701 Composites with Novel Functional and Structural Properties by Nanoscale Materials
- MP0901 Designing Novel Materials for Nanodevices: From Theory to Practice
- TU0902 Integrated Assessment Technologies to Support the Sustainable Development of Urban Areas



## RELATED FP6-FP7 PROJECTS:

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

## INNOVATION of ACTION:

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

# Action Research Directions: *Innovation* (2/2)

## 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

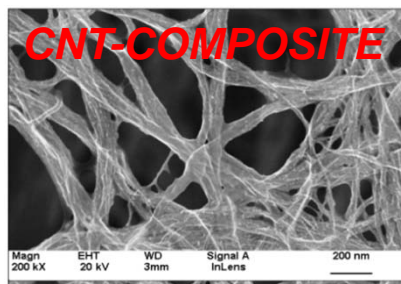
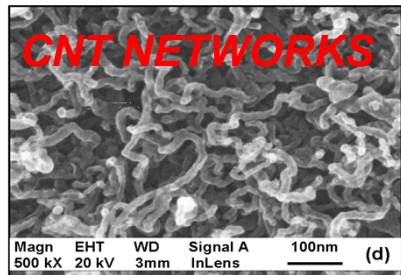
# EuNetAir SOLUTIONS: NANOMATERIALS AND NANOTECHNOLOGIES

## Metal Oxides Nanostructures by University of Brescia,

Italy.

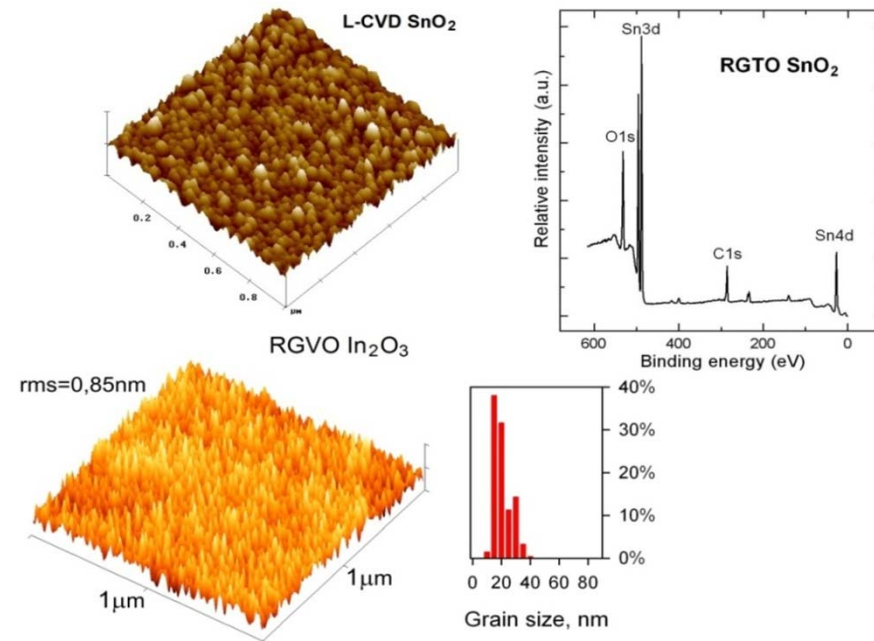


The increasing scientific interest in **1-D systems** (nanowires, nanobelts, nanorods, nanotubes) and single-crystalline 1-D nanostructures ( $\text{SnO}_2$ ,  $\text{ZnO}$ ,  $\text{WO}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{MoO}_3$ ,  $\text{TiO}_2$ , etc.) are nowadays emerging as building blocks for a new generation of electronic, and optoelectronic nanometer-scaled devices with superior performances for gas sensing and energy applications.



Carbon nanotubes (CNT) in the form of networks and composite as filler in an organic matrix by ENEA, Italy.

## RGTO (RGVO) $\text{SnO}_2$ and $\text{In}_2\text{O}_3$ nanolayers by Silesian University of Technology, Poland



PROPERTY OF CNTs	VALUE
High surface area	100 - 1800 $\text{m}^2/\text{g}$
Hollow structure	1 - 5 nm diameter
Nanosized morphology	10 - 1000 Aspect ratio
High electron mobility	up to 10000 $\text{cm}^2\text{Vs}^{-1}$ , at 300K
High structural/chemical reactivity	Bending at high angle ( $< 40^\circ$ )
High thermal stability	1800 - 6000 $\text{Wm}^{-1}\text{K}^{-1}$ therm. cond.
Electrical Resistivity	1 - 100 k (p-type Semiconductor)



# EuNetAir SOLUTIONS: WIRELESS TECHNOLOGY

Production version of the mote technology from EPSRC MESSAGE.

3 electrochemical gas sensors, temperature, humidity & noise.

IEEE 802.15.4 wireless mesh networking of up to 100 motes (up to 100 m between motes).

Custom network protocols for routing and power management.

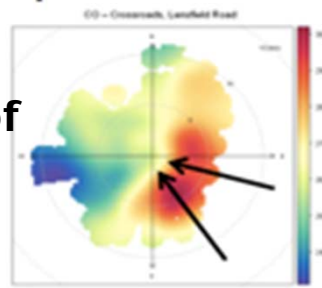
Solar rechargeable battery + Lithium D cell backup.

Designed for easy deployment on lighting columns etc.

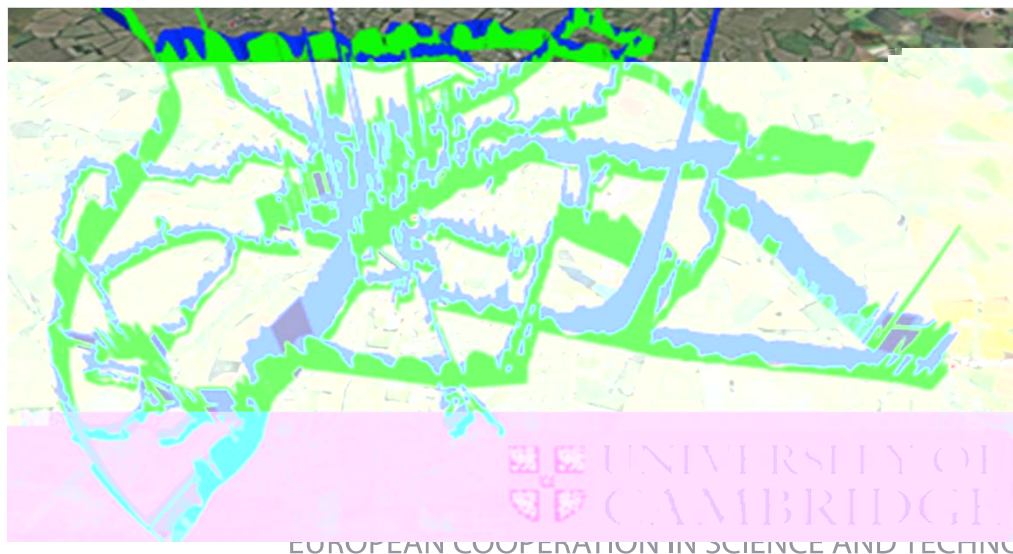
Low cost, rapid deployment and high spatial resolution.



High granularity evaluation of air quality (e.g.  $\text{NO}_x$ , below), source attribution (right).

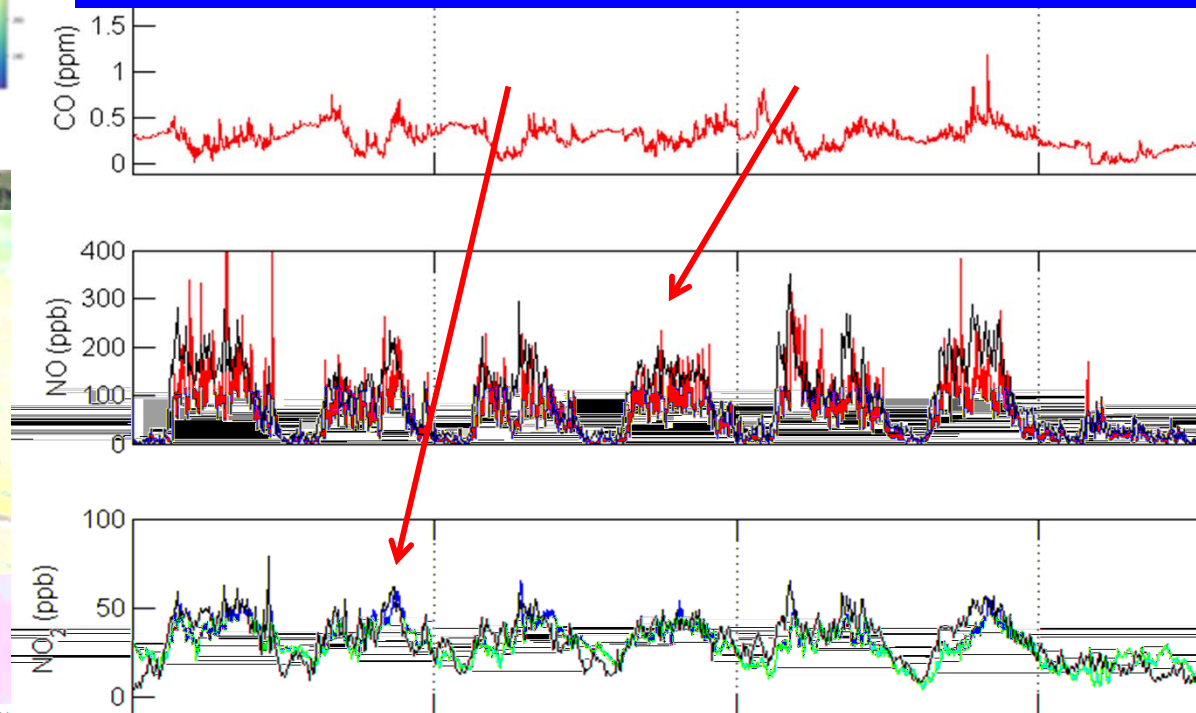


## WIRELESS SENSORS NETWORK for AQC



## The Envirowatch mote

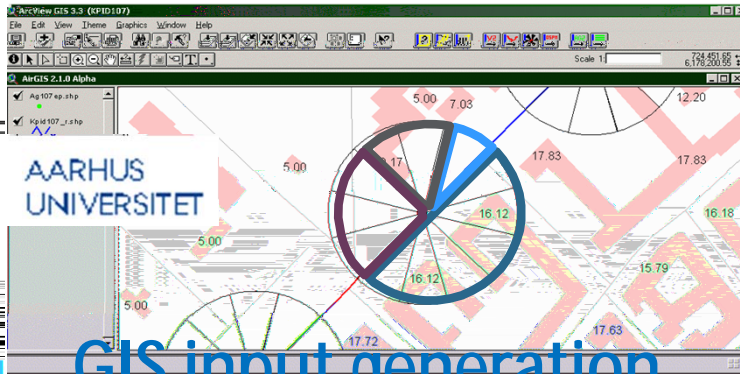
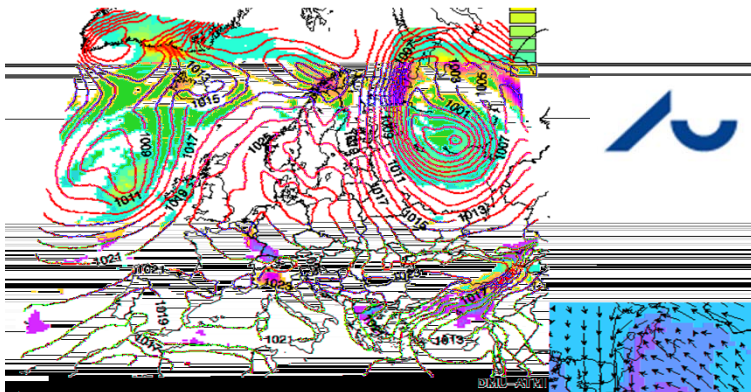
Automatically corrects mote electrochemical sensor data for temp and humidity (red) to achieve excellent agreement with precision instruments (black)





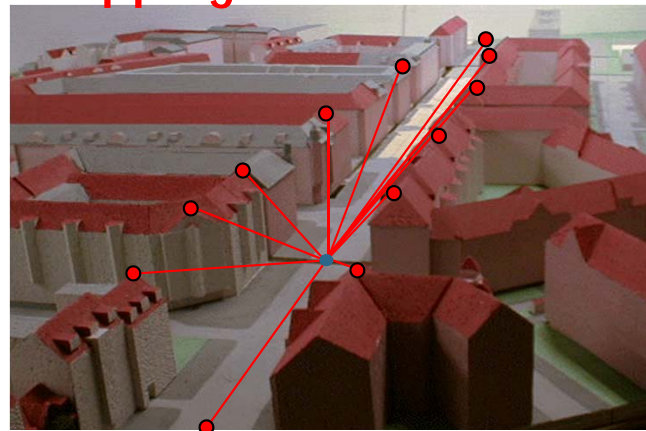
# EuNetAir SOLUTIONS: AIR QUALITY MODELLING

## Chemical weather

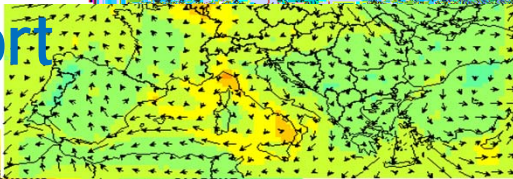


## GIS input generation

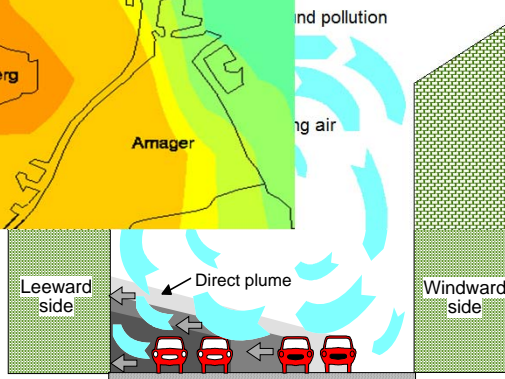
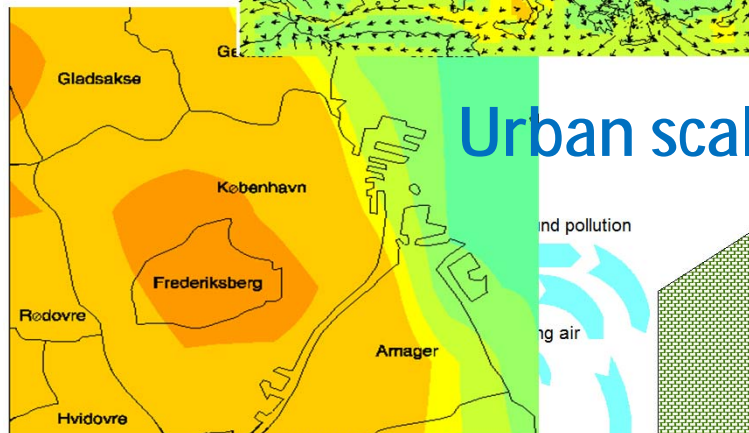
## Mapping addresses



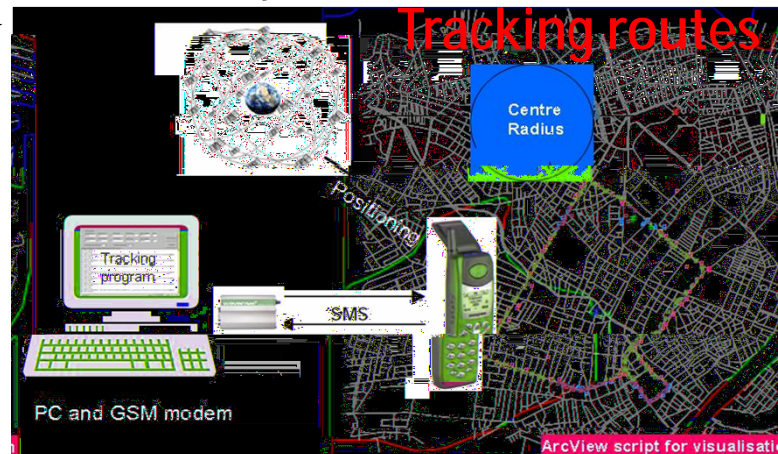
## Long-range transport



## Urban scale



## Street scale

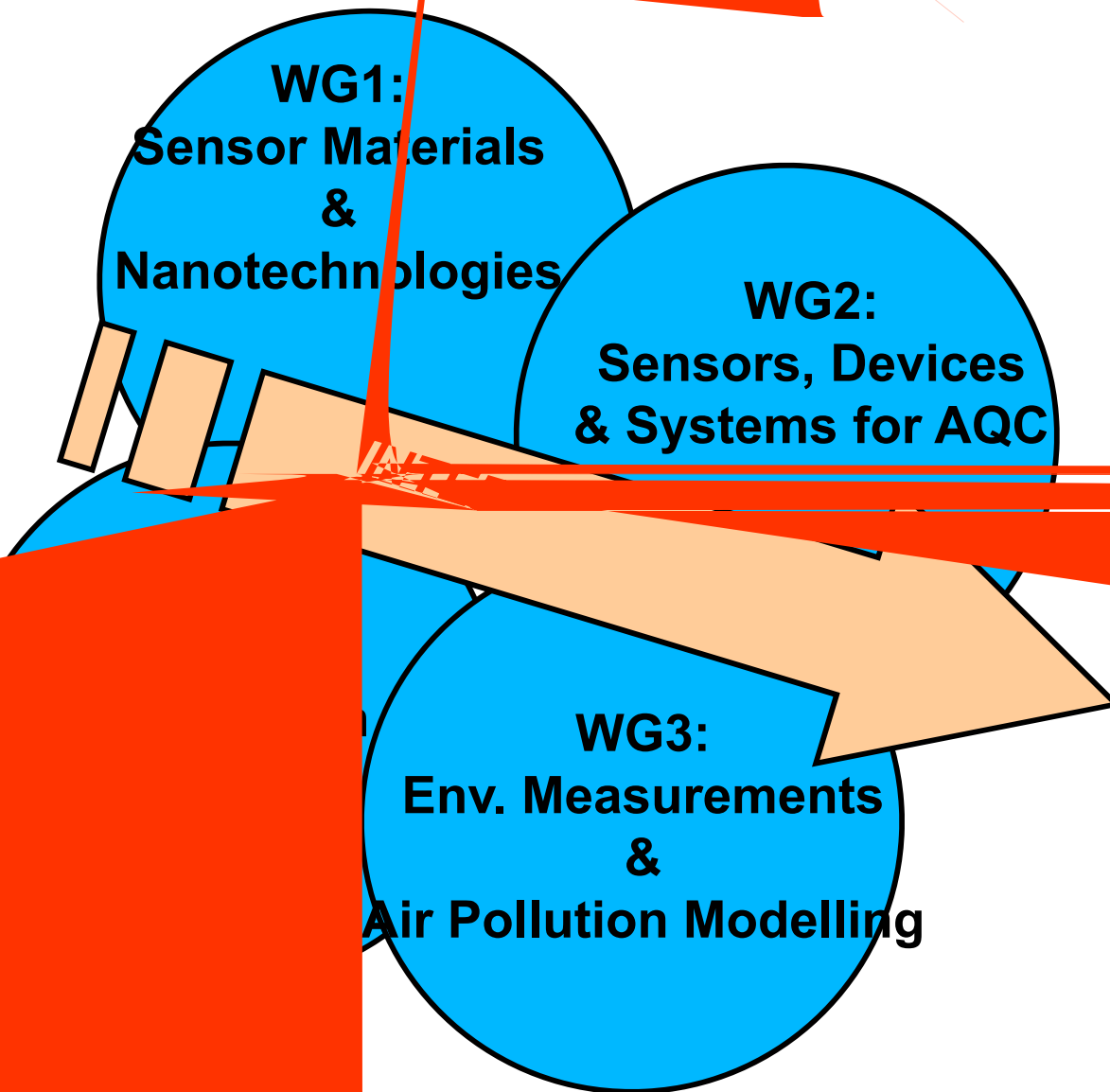


AirTHESS: operational AQ management and information system for Thessaloniki, Greece, employing Computational Intelligence for AQ forecasting and mobile phone technology for early warning messages.

*By Aristotle University, Greece.*

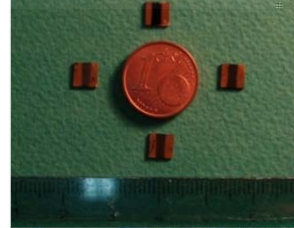


# Action TD1105 *NetAir*: Working Groups (1/5)

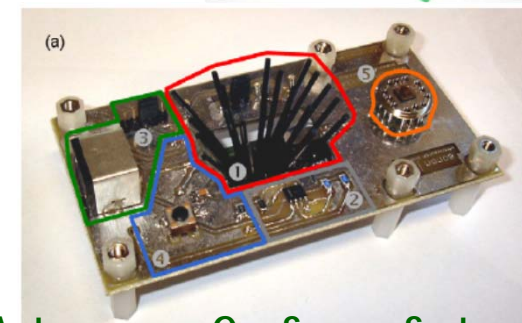
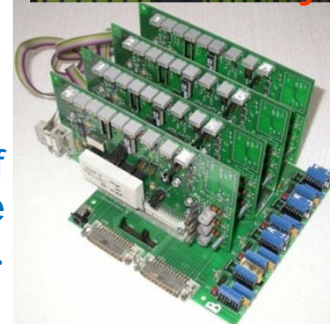








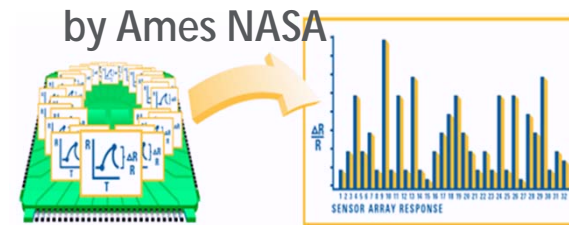
EnviroWatch mote by Newcastle University



Autonomous Gas Sensor System by IREC and Univ. of Barcelona



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



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

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

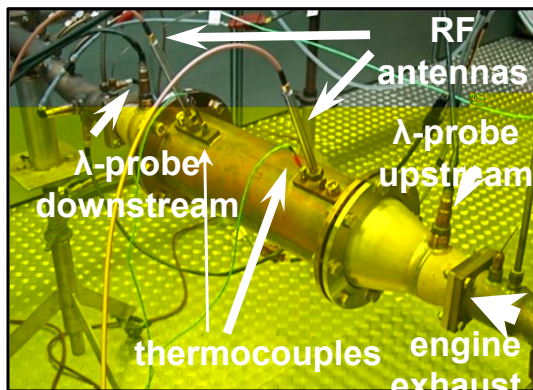


Environmental Sensor demo by IMEC, NL  
Low-ppb sensitivity for NO<sub>2</sub>  
GaN-based sensor concept

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

ERATION IN SCIENCE AND TECHNOLOGY

- 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.



## 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:

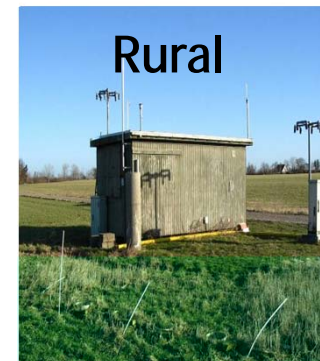
Harmonisation of environmental measurements.



Environmental measurements of PM and air pollution by CSIC, ES



AQ monitoring station by ARPA-PUGLIA, IT



AQ monitoring station by Aarhus University, DK



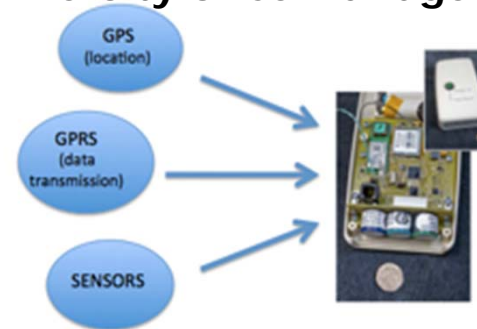
AQ monitoring station by Lithuanian EPA

by Aristotle University, EL

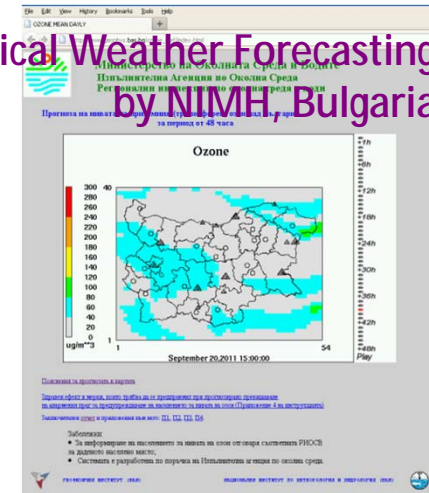


**AirMerge system for Chemical Weather Models**

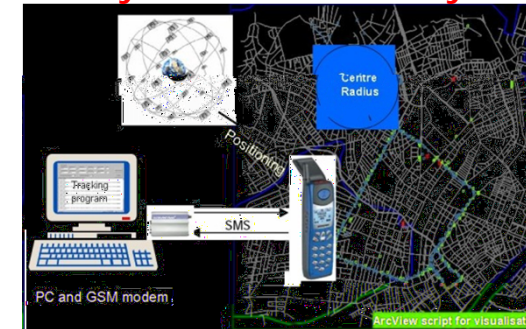
Mobile and static sensor network configurations by University of Cambridge.



Chemical Weather Forecasting by NIMH, Bulgaria



AQ Modeling: Tracking routes by Aarhus University, DK







# COST Action EuNetAir: COORDINATION AND ORGANIZATION



## MANAGEMENT COMMITTEE

**2 Representatives of participating Countries**

### Steering Committee:

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

### Core Group:

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

- Meet every 6 months
- S&T exchange
- Cooperation

- Researcher mobility (STSM)
- Budget management
- Report to COST Office
- Organize Workshops/Conferences
- Organize Training Schools
- Promote Gender Balance
- Action Results Dissemination
- Evaluation plans

## CORE GROUP

Action Chair  
Action Vice Chair  
Secretary

### WGs Coordinator

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

### STSM/ESR Coordinator

- STSM/ESR agenda
- Training agenda

### Gender Coordinator

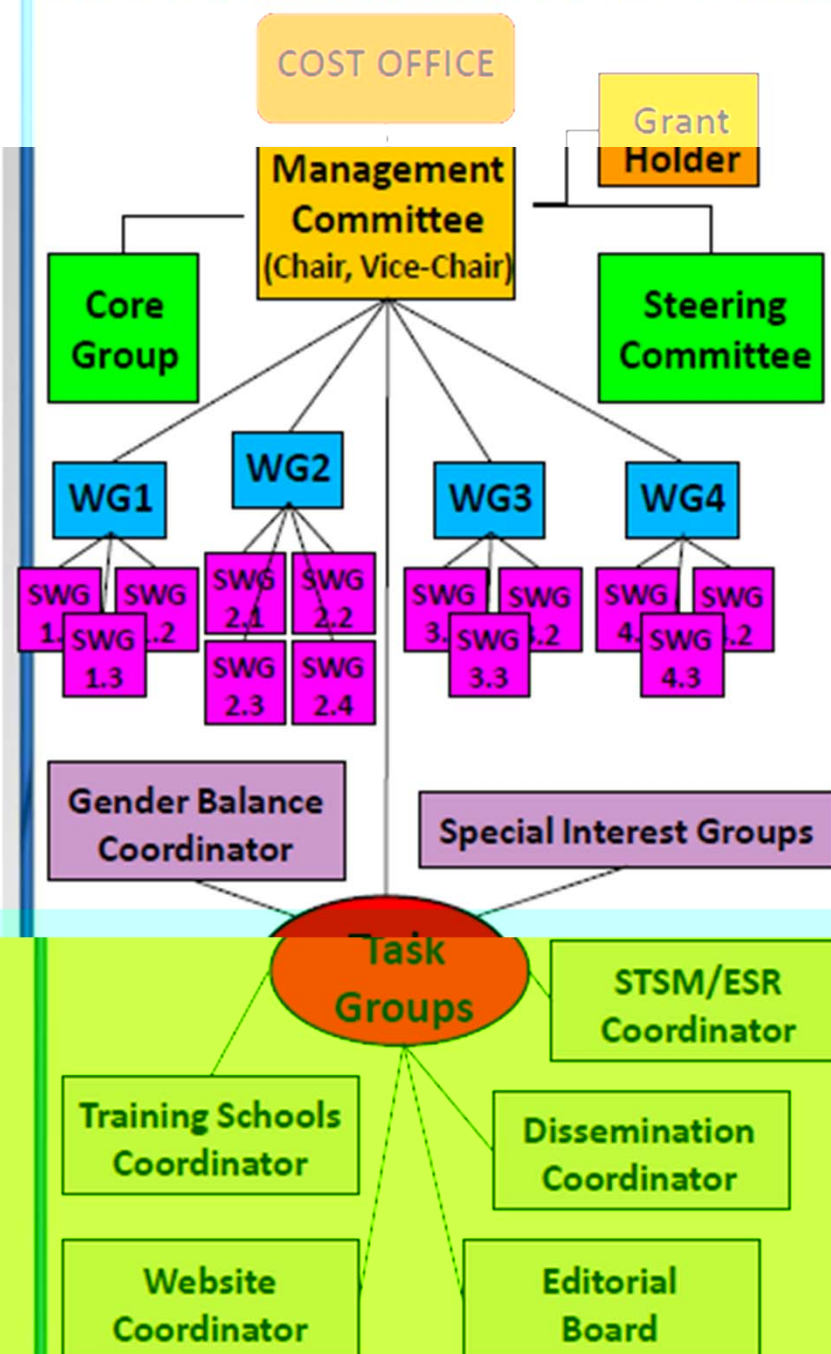
- Gender agenda
- Care for gender balance

### Dissemination Coordinator

- Dissemination activities
- Action Website
- Local Organizing Committee

### NETWORKING

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



# COST Action TD1105 ROADMAP (2012-2016)

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

M: Milestones    D: Deliverables



# COST Action TD1105 *EuNetAir*: Dimension

## PARTIES

**Already accepted MoU: 28 Countries**

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

**Non-COST Countries: 5**

**Australia, Canada, China, Russia, USA**

**New Candidates NNC: Morocco, Ukraine**

**Number of Participants: > 150**

**N.r of Research Teams including Academia, Research, Industry, Agencies: > 80**



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



	<b>AT - Austria</b>	Materials Center Leoben Forschung GmbH
	<b>BE - Belgium</b>	VITO, Université de Liège, Odometric S.A.
	<b>BG - Bulgaria</b>	National Institute of Meteorology and Hydrology - BAS; Institute of Electronics - BAS
	<b>CH - Switzerland</b>	Ecole Polytechnique Fédérale de Lausanne; e2v Microsensors S.A.; EnvEve S.A.; EMPA
	<b>CZ - Czech Republic</b>	Academy of Sciences of the Czech Republic
	<b>DE - Germany</b>	Institute of Energy and Environmental Technology; Saarland University; MPI for Biogeochemistry Univ. of Bayreuth; Univ. of Paderborn; Univ. Applied Sci. Ostwestfalen-Lippe; UST; Alfred Becker; 3S
	<b>DK - Denmark</b>	Aarhus University; Technical University of Denmark - DTU
	<b>EL - Greece</b>	Aristotle University; FORTH; Athena/ISI; University of Piraeus
	<b>ES - Spain</b>	Catalonia Institute for Energy Research - IREC; Spanish National Research Council - CSIC; University Rovira i Virgili; University of Barcelona, Worldsensing S.L.
	<b>FI - Finland</b>	University of Oulu; University of Helsinki; Tampere University of Technology
	<b>FR - France</b>	University of Bourgogne; University Blaise Pascal; Ecole des Mines de Douai; CEA-CNRS; ETHERA
	<b>HU - Hungary</b>	Hungarian Meteorological Service
	<b>IS - Iceland</b>	Agricultural University of Iceland
	<b>MK - Republic of Macedonia</b>	Ministry of Environment and Physical Planning
	<b>RO - Romania</b>	National R&D Institute for Nonferrous and Rare Metals; SC IPA SA - Research & Development
	<b>SE - Sweden</b>	Linköping University; Chalmers University of Technology; SenSiC AB; SenseAir AB
	<b>SI - Slovenia</b>	University of Ljubljana; Aerosol d.o.o.
	<b>UK - United Kingdom</b>	Imperial College London; Newcastle University; University of Manchester; Cambridge; University of Warwick; University of Edinburgh; Cambridge CMOS Sensors; Alphasense
	<b>TR - Turkey</b>	GEBZE Institute of Technology; Middle East Technical University of Ankara

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

## PARTIES

**already accepted MoU: 28 Countries**

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







# EuNetAir: List of Experts

IT - Italy

170 EXPERTS from 28 COST Countries and 7 Non-COST Countries

AT - Austria

Dr. Anton KOCK  
Dr. Stefan DEFREGGER

BE - Belgium

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

BG - Bulgaria

Dr. Dimiter SYRAKOV  
Dr. Ivan NEDKOV

CH - Switzerland

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

CZ - Czech Republic

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

DE - Germany

Dr. Thomas A. J. KUHNBUSCH  
Dr. Ulrich QUASS  
Prof. Anja...

EL - Greece

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

ES - Spain

Prof. Juan Ramon MORANTE  
Dr. Francisco HERNANDEZ  
Dr. Xavier QUEROL

LV - Latvia

Dr. Mar VIANA



MK - Rep. of Macedonia

Prof. Eduard LLOBET

Dr. Radu IONESCU

Prof. Albert ROMANO

Dr. Juan Daniel PRADES

Dr. Jordi LLOSA

NL - Netherlands

FI - Finland

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

FR - France

Prof. Marcel BOUVET

PL - Poland

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

PT - Portugal

Prof. Bernadete RIBEIRO  
Prof. Carlos BORRERO

UK - United Kingdom

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

NO - Norway

Dr. Nuria Castell-BALAGUER  
Dr. Philippe SCHNEIDER

RO - Romania

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

TR - Turkey

Prof. Zafer Ziya OZTURK

Dr. Olaf KIESEWETTER  
Dr. Thorsten CONRAD  
Dr. Thomas BECKER  
Prof. Wrenger Burkhard  
Dr. Jost-Valentin LAURIC

Dr. Philippe KARPE  
Prof. Jerome ROSSIGNOL  
Prof. Nadine LOCOGE  
Dr. Zita FERENCZI

HU - Hungary

Dr. Kees-Jan LABANZ

SE - Sweden

Prof. Anita LLOYD SPETZ  
Dr. Marina VOINOVA  
Dr. Mike ANDERSSON  
Dr. Donatella BUGLISI

Prof. John YEOW

CN - China

Dr. Yongxiang LI

Dr. Cornelia LADIN

IS - Iceland

Dr. Aronimar THORLACIUS

Dr. Hilmar HALL

Prof. David BRYNASE

Dr. Zhifu LIU

Prof. Ole HERTEL

IE - Ireland

Dr. Francisco PILA

Dr. Radoslaw ZABKAR

RS - Serbia

Dr. Alexey VASILYEV

Dr. Eero Lahti SORINEN

IL - Israel

Dr. Elia ORTAR

Greta MOCHNIK

Aleksa CVERKOVIC

Dr. Andrei KOZMAKOV

Prof. Anna ROSEN

Prof. Hossam HAICK

Dr. Anke STER

Dr. Mayya MEYERMAN

Dr. Sylvain SCHMITO



## Country

Austria	Dr. Anton KOCK
Belgium	Dr Jan THEUNIS; Dr Anne-Claude ROMAIN
Bulgaria	Dr Dimiter SYRAKOV; Dr Ivan NEDKOV
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
Israel	Dr. Liad ORTAR; Prof. Hossam HAICK
Italy	Dr Michele PENZA; Prof. G. SBERVEGLIERI; Dr. G. DE GENNARO
Latvia	Dr Iveta STEINBERGA
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
Slovenia	Dr Grisa MOCNIK; Dr Raneida 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 Members (51): *Male (73%) - Female (27%)*

**MC Chair:** Michele Penza, ENEA, IT

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

**Grant Holder:** Eurice GmbH, Saarbrucken, DE

## Country

## MC Substitutes (27)

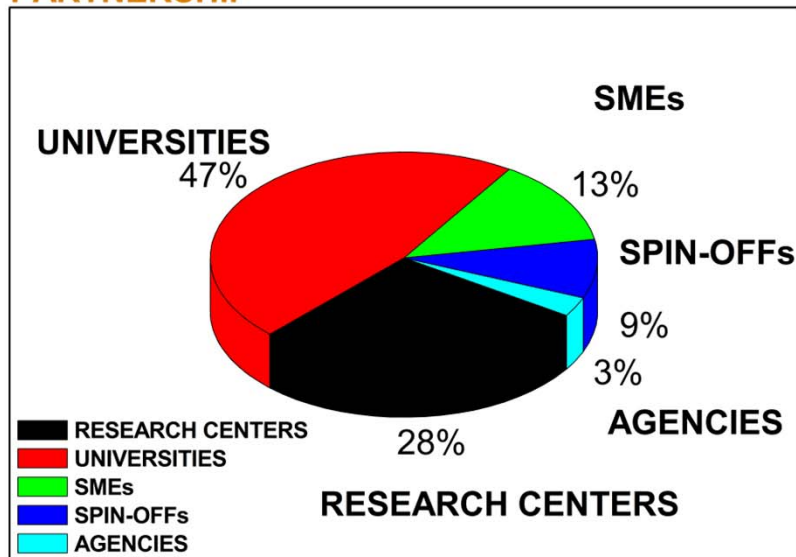
Austria	Dr Stefan DEFREGGER
Belgium	Dr Julien DELVA
Czech Republic	Dr. Roman NERUDA
Denmark	Dr. Lise Lotte SORENSEN
Finland	Prof. Jorma KESKINEN
France	Dr Jean SUISSE Prof. Alain PAULY
Germany	Dr. Daniela SCHONAUER-KAMIN Dr. Thomas KUHMBUSCH
Greece	Prof. George KIRIKIADIS Dr. Roberto SIMMARANO
Italy	Dr. Marco ALVISI Dr. Saverio DE VITO
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
UK	Prof. Julian GARDNER Dr Robin NORTH Prof. Florin UDREA

**MANAGEMENT COMMITTEE**

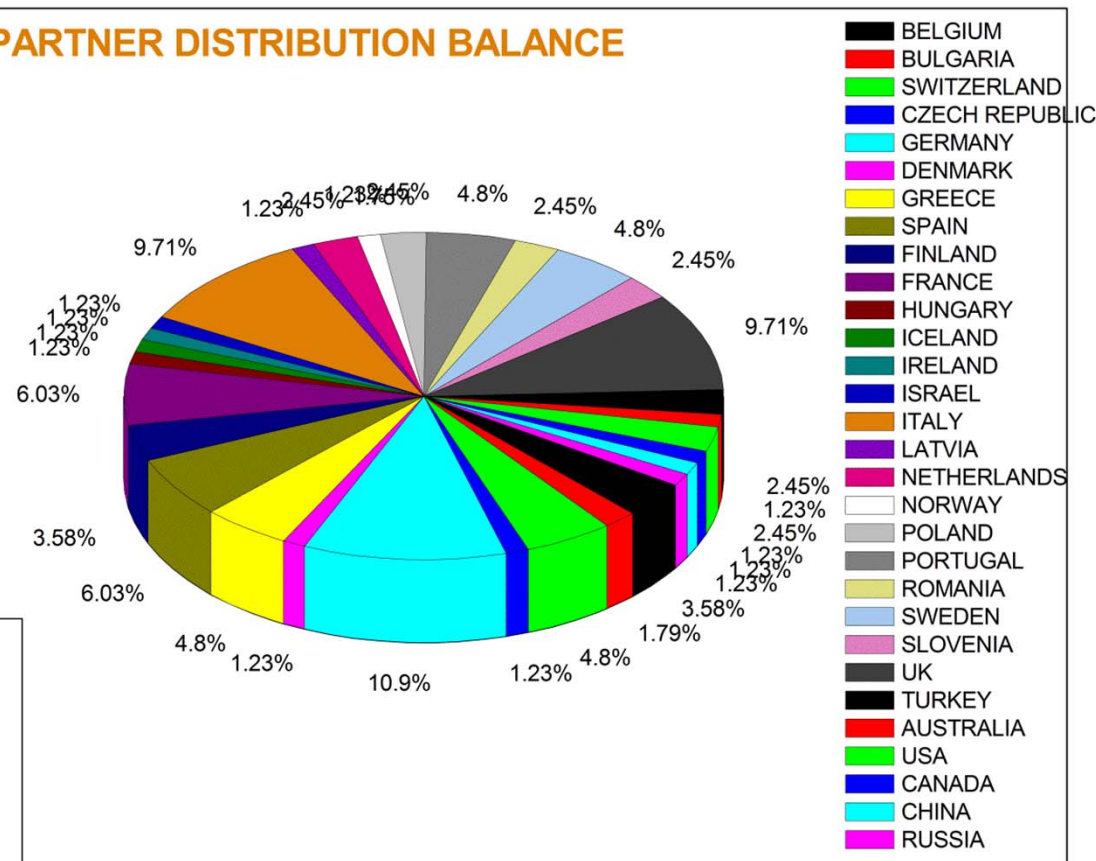
**Kick-off Meeting at Brussels on 16 May 2012**

# COST Action TD1105 *EuNetAir*: STATISTICS

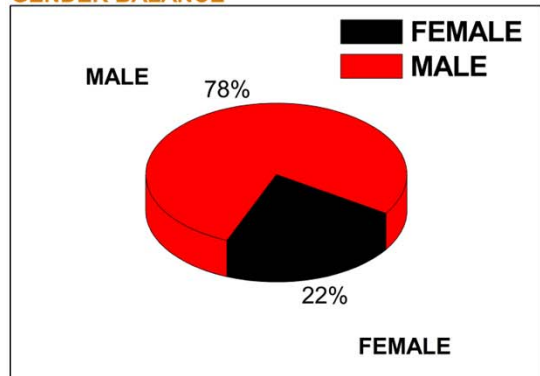
## PARTNERSHIP



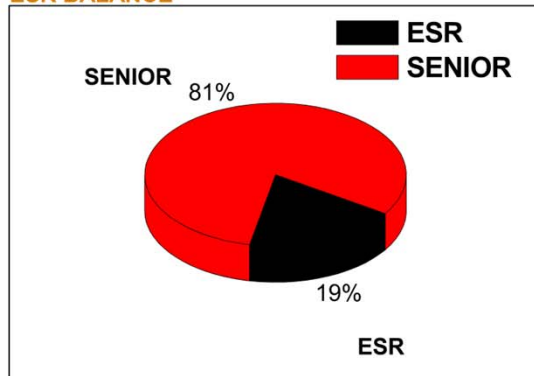
## COUNTRY PARTNER DISTRIBUTION BALANCE



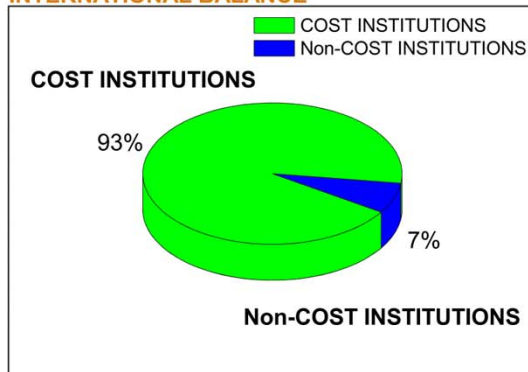
## GENDER BALANCE



## ESR BALANCE



## INTERNATIONAL BALANCE



**PARTIES: 28**  
**Action Coordinating Partner: IT (ENEA)**  
**Grant Holder: DE (Eurice GmbH)**





# COST ACTION TD1105 DISSEMINATION EVENTS: 2012 - 2013



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



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

COST Action TD1105 EuNetAir

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

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



VIII International Workshop on  
Semiconductor Gas Sensors  
11-15 September 2012, City Hotel Cracow, Poland

SGS 2012

VIII International Workshop on  
Semiconductor Gas Sensors  
September 11 - 15, 2012, Cracow, Poland



3<sup>th</sup> Intelligent Systems for Quality of Life information  
Services Workshop (ISQL 2012)  
8<sup>th</sup> AIAI Conference, September 27- 30, 2012,  
Halkidiki, Greece



TCM 2012

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



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

# COST ACTION TD1105 MEETINGS (1/2)

## 1 July 2012 - 30 June 2013 (Year 1)



### **COST ACTION TD1105 *EuNetAir***

**Kick-off Meeting of Action Management Committee**  
COST Office, 16 May 2012, Brussels (BE)



### **COST ACTION TD1105 *EuNetAir***

**First Meeting and 2<sup>nd</sup> Management Committee and Working Groups**  
ENEA Headquarters  
4-6 December 2012, Rome (IT)



### **COST ACTION TD1105 *EuNetAir***

**WG3-WG4 Meeting joined to AirMonTech project**  
Fraunhofer Inhaus Zentrum  
4-6 March 2013, Duisburg (DE)





# COST ACTION TD1105 MEETINGS (2/2)

## 1 July 2012 - 30 June 2013 (Year 1)



### **COST ACTION TD1105 *EuNetAir***

***Third Meeting*** of Action Management Committee  
IREC, 21 June 2013, Barcelona (ES)



### **COST ACTION TD1105 *EuNetAir***

***Action Workshop*** - Open Satellite Event to  
***Transducers 2013 - Eurosensors XXVII***  
Barcelona International Convention Centre  
20 June 2013, Barcelona (ES)



### **COST ACTION TD1105 *EuNetAir***

**1st Training School** of COST Action EuNetAir  
**University of Barcelona**  
***13-15 June 2013, Barcelona (ES)***



# 1<sup>ST</sup> TRAINING SCHOOL OF COST ACTION TD1105

Green Week 2013  
satellite event



## Training school on Environmental Technologies and Air-Quality Monitoring

13-15 June 2013

08:30 - 18:30

Barcelona

Spain



[ec.europa.eu/environment/greenweek](http://ec.europa.eu/environment/greenweek)

Training school on Environmental  
Technologies and Air-Quality Monitoring

Green Week 2013  
satellite event



### ORGANIZED BY

Universitat de Barcelona (UB)  
MIND-IN2UB Department of Electronics

### In collaboration with

Institute of Environmental Assessment and Water Research (IDAEA-CSIC)

### Within the framework of

COST Action TD1105 European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability (EuNetAir)

### VENUE

Universitat de Barcelona (UB)  
Faculty of Physics  
C/ Martí i Franquès, 1, 08028 Barcelona, Spain



### MORE INFORMATION

- Michele Penza, MC Chair/Proposer of COST Action TD1105 EuNetAir  
ENEA, Brindisi, Italy. [michele.penza@enea.it](mailto:michele.penza@enea.it)
- Albert Romano-Rodriguez, Coordinator of Action Training School Committee  
U. Barcelona, Barcelona, Spain. [aromano@el.ub.es](mailto:aromano@el.ub.es)

### Statistics

Received Trainees Applications: 39. Participating Trainees: 36. Assigned Trainees Grants: 20  
Involved Trainers: 14  
COST Countries involved from Action partnership: 15

### Training School Programme Committee

Albert Romano-Rodriguez, U. Barcelona, Spain  
Juan Daniel Prades, U. Barcelona, Spain  
Mar Viana, CSIC-IDAEA, Spain  
María Cruz Minguillón, CSIC-IDAEA, Spain  
Eduard Llobet, U. Rovira i Virgili, Spain  
Annamaria Demarinis Loiotile, U. Bari, Italy  
Michele Penza, ENEA, Italy

### Training School Action Committee

Albert Romano-Rodriguez, U. Barcelona, Spain  
Juan Daniel Prades, U. Barcelona, Spain  
Mar Viana, CSIC-IDAEA, Spain  
María Cruz Minguillón, CSIC-IDAEA, Spain  
George Kiriakidis, FORTH, Greece  
Philippe Schneider, NILU, Norway  
Monika Kwoka, Silesian U. Technology, Poland  
Rahela Zabkar, U. Ljubljana, Slovenia  
Francisco Hernandez-Ramirez, IREC, Spain  
Zafer Ziya Ozturk, Gebze Institute of Technology, Turkey  
Julian Gardner, U. Warwick, United Kingdom



In collaboration with the



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



## Short Term Scientific Missions (STSMs): A tool for networking

***“COST Strategy towards increased support for Early Stage Researchers”*** - COST 295/09 giving ESRs support and measures like STSMs, Training Schools, Action Think Thank, Conference Grants, inclusion of ESR in WGs, ESRs as national MC delegates.

***In order to increase visibility of ESRs in this COST Action:***

- ***11 STSMs have been funded in the First Year (1 July 2012 - 30 June 2013)***
- Workshop participation of ESRs
- Selection of ***best independent ideas*** from ESRs are awarded with ***grants for participation in S&T events***
- ***Invitation*** of high schools and University students to the ***training sessions and training schools***
- ***Social Scientific Network services*** (***LinkedIn***) based on free web software to promote cohesion in the ESRs community to outline needs
- Proposals to ***European Research Council - Starting Independent Research Grant*** and ***Marie-Curie Fellowships*** from Action ESRs are encouraged.



**INTERNATIONAL WG1-WG4 MEETING on**  
***New Sensing Technologies and Methods for Air-Pollution Monitoring***  
**European Environment Agency - EEA**  
**Copenhagen, Denmark, 3 - 4 October 2013**



**Meeting Proceedings  
at Action webpages:**

**[www.cost.eunetair.it](http://www.cost.eunetair.it)**



# COST Action TD1105 *EuNetAir* WG1-WG4 MEETING:

## *New Sensing Technologies and Methods for Air-Pollution Monitoring*

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

*Proceedings of the Action EEA Meeting open to external contributors.*

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

- **Guest Editors:**

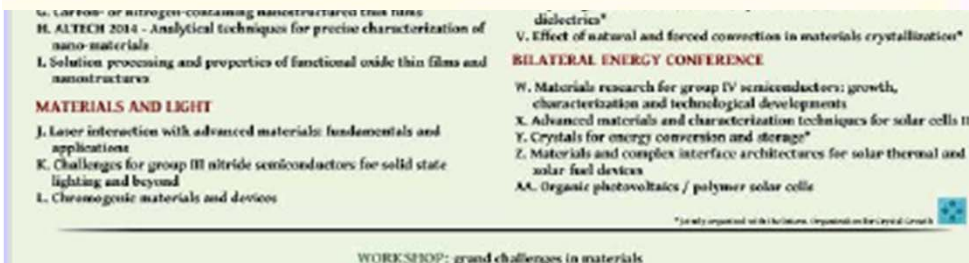
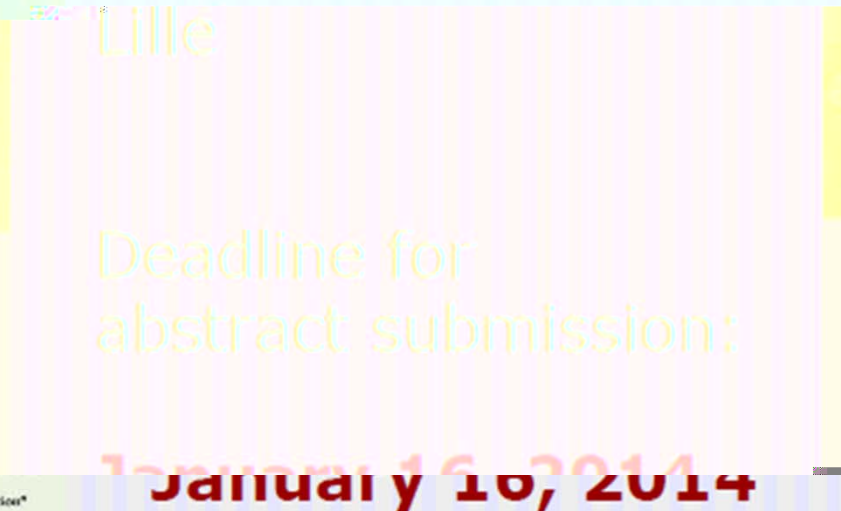
- ✓ Michele Penza, ENEA, Italy
- ✓ Anita Lloyd Spetz, Linköping University, Sweden
- ✓ Ole Hertel, Aarhus University, Denmark
- ✓ Ulrich Quass, IUTA eV, Germany

- **Deadline for submission: 30 November 2013**

- Expected Publication: *June 2014*



## ***Advanced Functional Materials for Environmental Monitoring and Applications***



**EMRS-2014 Symposium B Proceedings**  
**In Special Issue JSSS**  
***Journal of Sensors and Sensor Systems***

**Deadline for abstract submission: 16 Jan 2014**

# 14. Location and date of next MC Meeting

4<sup>rd</sup> MC Meeting, 20 December 2013, and  
WG1-WG4 Meeting, 18-19 December 2013  
Queens' College, Cambridge, UK

- **Letter of Commitment**  
to host 4<sup>th</sup> MC Meeting  
and **WG1-WG4 Meeting**  
from Prof. Rod Jones, Cambridge  
Action SIG2 Leader and UK MC Member

18-20 December, 2013, Cambridge, UK



Professor Roderic L. Jones  
Department of Chemistry  
Lensfield Road  
Cambridge  
CB2 1EW

University of Cambridge  
CENTRE FOR ATMOSPHERIC  
SCIENCE  
Department of Chemistry  
Department of Applied Mathematics  
and Theoretical Physics

FAX: (International) +44 1223 336362  
Telephone: +44 1223 336466  
(+44 1223 336339)  
e-mail: [rlj11001@cam.ac.uk](mailto:rlj11001@cam.ac.uk)

Monday, May 27, 2013

Dr. Michele Penza (Chair)  
COST Action TD1105 Eu Net Air,  
ENEA,  
Italian National Agency for New Technologies, Energy and Sustainable Economic Development,  
Brindisi Research Centre,  
PO BOX 51 Br-4 (Postal correspondence)  
SS7, Appia, km 706,13 (Location address)  
I-72100 Brindisi, Italy  
E-mail: [michele.penza@enea.it](mailto:michele.penza@enea.it)

Letter of invitation to host a COST Action TD1105 meeting at  
Cambridge on 18-20 December 2013

Dear Michele,  
I am delighted to be able to offer Queens' College, Cambridge as the venue for a COST Action TD1105 meeting to be held in Cambridge on 18-20 December 2013. The intention is that this meeting will be formally hosted by me, but local arrangements will be made through the Queens' College Catering Department, with whom I understand you have had discussions.  
This invitation is based on the assumption that all costs will be covered by the COST Action TD1105, with no costs falling to either the University of Cambridge or Queens' College Cambridge.

I look forward to a very successful meeting in highly conducive surroundings, perhaps even matching those of Rome last year!

Best wishes,

Roderic L. Jones  
Professor of Atmospheric Science  
Department of Chemistry  
Cambridge

COST Action  
Queens' College Catering Manager

# Upcoming EuNetAir Meeting

**CAMBRIDGE, 18-20 Dec. 2013**

**4<sup>th</sup> ACTION MC Meeting & WG1-WG4 Meeting  
at Queens' College, CAMBRIDGE, UK**

**CAMBRIDGE, 18-20 December 2013**





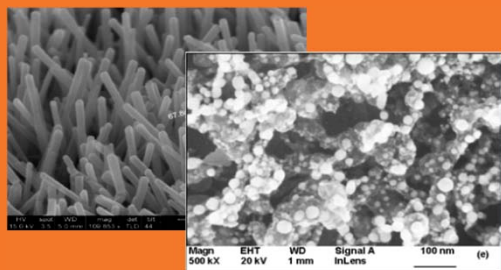
# *Expected Impact by Action TD1105*



- **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**

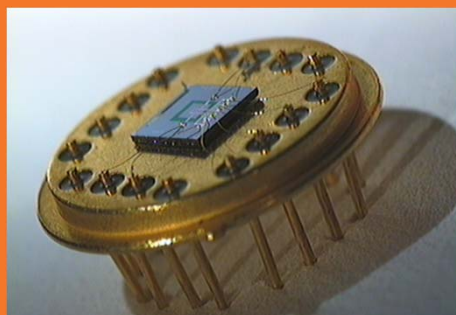
# ***COST Action EuNetAir: CHALLENGES***

## **MATERIALS & GAS SENSORS**



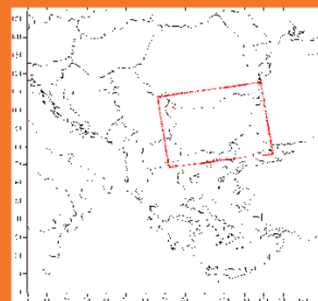
MOX by UNIBS IREC UB SICCAS  
CNT by ENEA NASA URV CSIRO

## **AQC SENSORS & SYSTEMS**



GasFET by EPFL, Switzerland

## **AQ MODELLING**

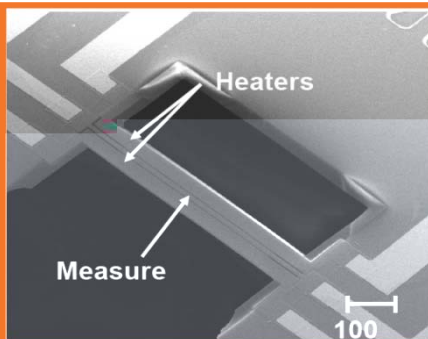


CMAQ Calculations  
by NIMH, BG

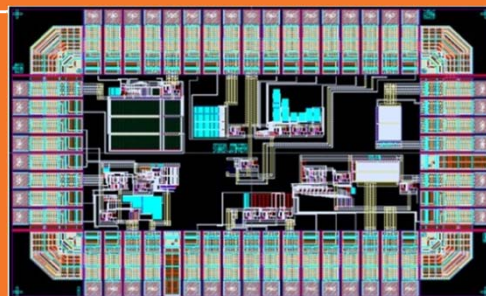
## **STANDARDS & PROTOCOLS**



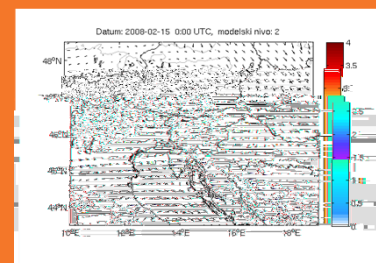
Dynamic Olfactometry (EN 13725/2003) by Univ. of Bari and Lenviros srl, IT



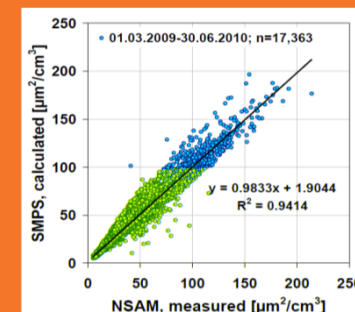
Cantilever Sensor by DTU, DK



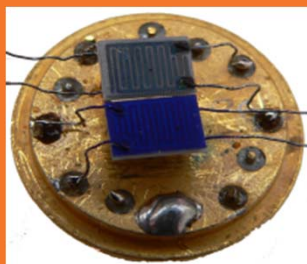
ASIC Circuit: CMOS SOI  
by WARWICK & CCMOS Ltd, UK



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



Particle Surface Area Measurements by IUTA eV, DE



Phthalocyanine Gas Sensors  
by CNRS UBP-LASMEA, FR



WIRELESS SENSORS NETWORK  
by ISI, Greece



Chemical Weather Forecasting and Information System  
by Hungarian Meteo Service

?

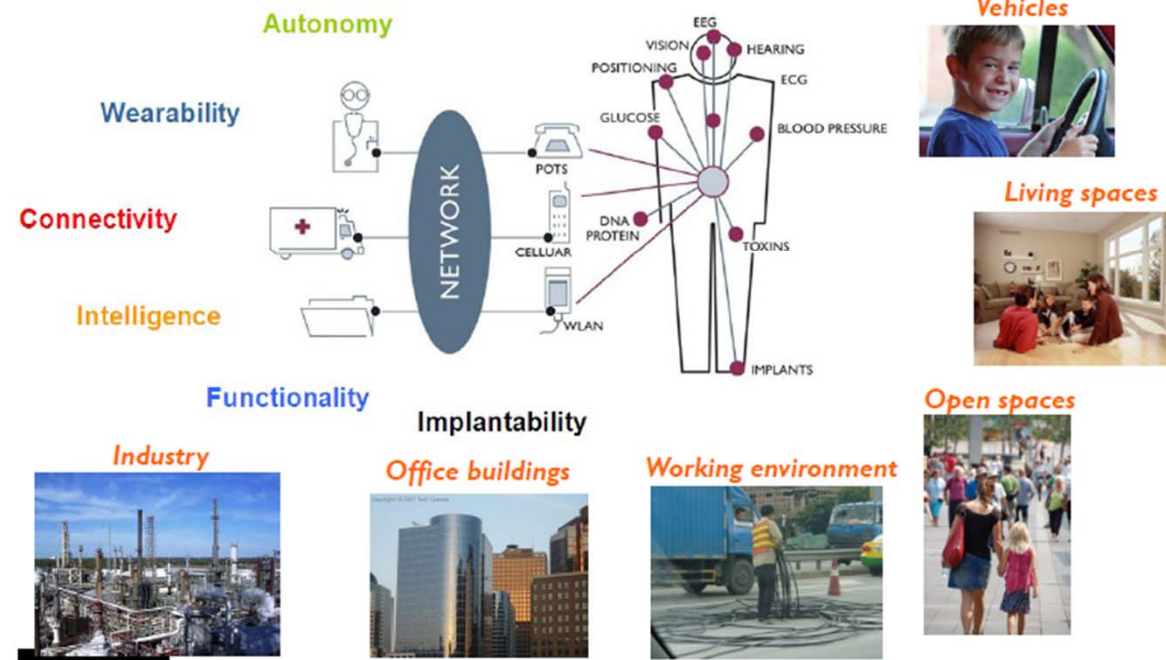
**HARMONISATION:**  
Definition of protocols and standards for gas sensing measurements and gas sensors

# CONCLUSIONS

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

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

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





# UPDATING AND BREAKING NEWS from Action TD1105

## COST Action TD1105 - EuNetAir

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

Action website:

[www.cost.eunetair.it](http://www.cost.eunetair.it)

hosted by ENEA

**Dr. Marco Alvisi, Webmaster Coordinator**

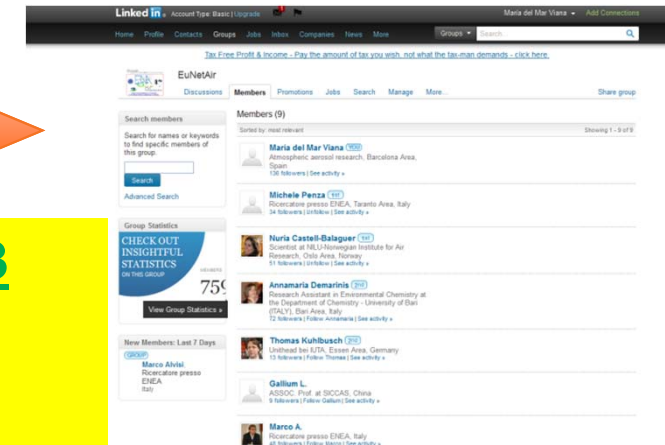
**Sebastiano Dipinto, Valerio Pfister, Gianfranco Zingarelli, Webmaster Team**

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



**2° CALL for Short Exchange Visits launched on Sept. 2013**  
**(STSM - Short Term Scientific Mission)**

**Dr. Jan Theunis, STSM Coordinator EuNetAir**



**EuNetAir Newsletter**

COST Action TD1105 Iss. 1/Dec 2012

**Opening Editorial**

**Issue 1:** published on Dec. 2012 ✓

**Issue 2:** published on June 2013 ✓

**Issue 3:** published on December 2013 ✓

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

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

NOLOGY

# ACKNOWLEDGEMENTS

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

## TD1105 MANAGEMENT COMMITTEE



**Link of COST Action TD1105 EuNetAir:**

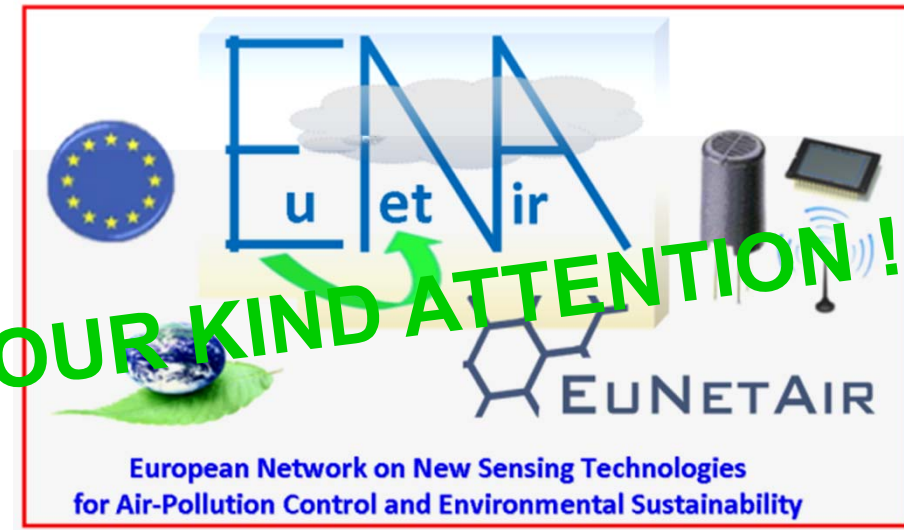
<b>MC Chair:</b>	Dr. Michele Penza, ENEA, IT <a href="mailto:michele.penza@enea.it">michele.penza@enea.it</a>
<b>MC Vice Chair:</b>	Prof. Anita Lloyd Spetz Linköping University, SE <a href="mailto:spetz@ifm.liu.se">spetz@ifm.liu.se</a>
<b>Grant Holder:</b>	Eurice GmbH, DE <a href="mailto:corinna.hahn@eurice.eu">corinna.hahn@eurice.eu</a>
<b>Scientific Secretary:</b>	Dr. Annamaria Demarinis Loiotile <a href="mailto:annamaria.demarinis@uniba.it">annamaria.demarinis@uniba.it</a>
<b>Science Officer:</b>	Dr. Deniz Karaca <a href="mailto:deniz.karaca@cost.eu">deniz.karaca@cost.eu</a>
<b>Administrative Officer:</b>	Dr. Kent Hung <a href="mailto:kent.hung@cost.eu">kent.hung@cost.eu</a>
<b>Rapporteur ESSEM:</b>	Prof. Kostantinos Kourtidis (GR) <a href="mailto:kourtidi@env.duth.gr">kourtidi@env.duth.gr</a>
<b>Rapporteur MPNS:</b>	Prof. Joaquim Manuel Vieira (PT) <a href="mailto:jvieira@cv.ua.pt">jvieira@cv.ua.pt</a>
<b>Rapporteur CMST:</b>	Prof. Antonio Lagana (IT) <a href="mailto:lagana05@gmail.com">lagana05@gmail.com</a>

# COST Action TD1105 EuNetAir at MACPoll project in JRC-Ispra

*19 November 2013*



**THANK YOU VERY MUCH FOR YOUR KIND ATTENTION!**



JOINT RESEARCH CENTRE

Institute for Environment and Sustainability (IES)

