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

COST Action TD1105

Action TD1105 ROUND-TABLE, Duisburg, 6 March 2013

Environmental Research for Innovation: Best Practises, Methods and Protocols to support Harmonization of Measurements and Environmental Sustainability in Europe

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

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE

Michele Penza

Action Chair

ENEA, Brindisi / Italy

EUNETAIR

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

COST is supported by the EU Framework Programme

EUROPEAN SCIENCE FOUNDATION ESF provides the COST Office through a European Commission contract

Outline

- **ERA** - European Research Area
- **HORIZON 2020** - The Framework Programme for Research and Innovation
- **COST Programme** - Cooperation in Science & Technology
- **COST Action TD1105 *EuNetAir*** - European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability
- **STATE of the ART on AQC Technologies** - Short Notes
- **Inputs and Open Questions** for Discussions

European Research Area *An open space for knowledge and growth*

ERA is «*An* ***unified research area open to the world*** *based on the* ***Internal Market****,*
in which researchers, scientific ***knowledge*** *and technology*
circulate freely *and through which the Union and its Member States*
strenghten their scientific and technological bases, their ***competitiveness***
and their capacity to collectively address ***grand challenges»***

Improving Europe's research performance to promote growth and job creation

1. Europe is facing many **grand challenges**
2. Europe's **global position is weakening** measured by indicators of scientific quality, excellence
3. ERA at the heart of **Europe 2020 Strategy** and **Innovation Union**
4. Open Calls by **European Research Council** with deadline 10 January 2013 and 21 February 2013 to complete ERA in 2014 !

Robert-Jan SMITS, Director-General DG Research & Innovation

European Research Area

An open space for knowledge and growth

A reinforced partnership - Action-oriented & Responsability-based

•Member States

•Research Stakeholder Organizations

•European Commission

The Five Key ERA Priorities

1. More effective national **research systems**
2. Optimal **transnational cooperation and competition**
3. An **open labour market** for researchers
4. Gender **equality and gender mainstreaming** in research
5. Optimal circulation, access to and transfer of scientific **knowledge** including via digital ERA

Robert-Jan SMITS, Director-General DG Research & Innovation

EU R&I Funding Programmes: Which direction ?

HORIZON 2020: why?

To have a major IMPACT (2014 - 2020)

• FROM different priorities in each programme and initiative

➡ TO common strategic priorities focused on great societal challenges, competitiveness and excellence in R&I.

• FROM fragmentation of different phases (research, development, demonstration, prototyping, piloting, scale-up, market replication, etc.)

➡ TO coherent support to project and organizations along the entire innovation cycle (from research to commercialization)

• FROM research results often are not used and/or focused on technologies

➡ TO strong support to innovation, including non-technological innovations and commercialization

Horizon 2020: budget & characteristics

87,74 billion €, Commission proposal for UE research and innovation funding programme (2014-2020)

Horizon 2020: FP, CIP e EIT under a unique coordination mechanism and a set of common rules, divided in three priorities

Clear complementarity/sinergy with **Structural Funds** (SF) and the **Cohesion Policy** of the EU (**376 billion €** / 2014-2020)

The Structure of Horizon 2020 (1/2)

EXCELLENT SCIENCE

- ERC
- Future and Emerging Technologies
- Marie Curie Actions
- European Research Infrastructures (including e-infrastructures

INDUSTRIAL LEADERSHIP

- Leadership in enabling and industrial technologies
- Access to risk finance
- Innovation in SMEs

SOCIETAL CHALLENGES

- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research and the bio-economy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, resources efficiency and raw material
- Inclusive, innovative and secure societies
- EIT & JRC

The Structure of Horizon 2020 (2/2)

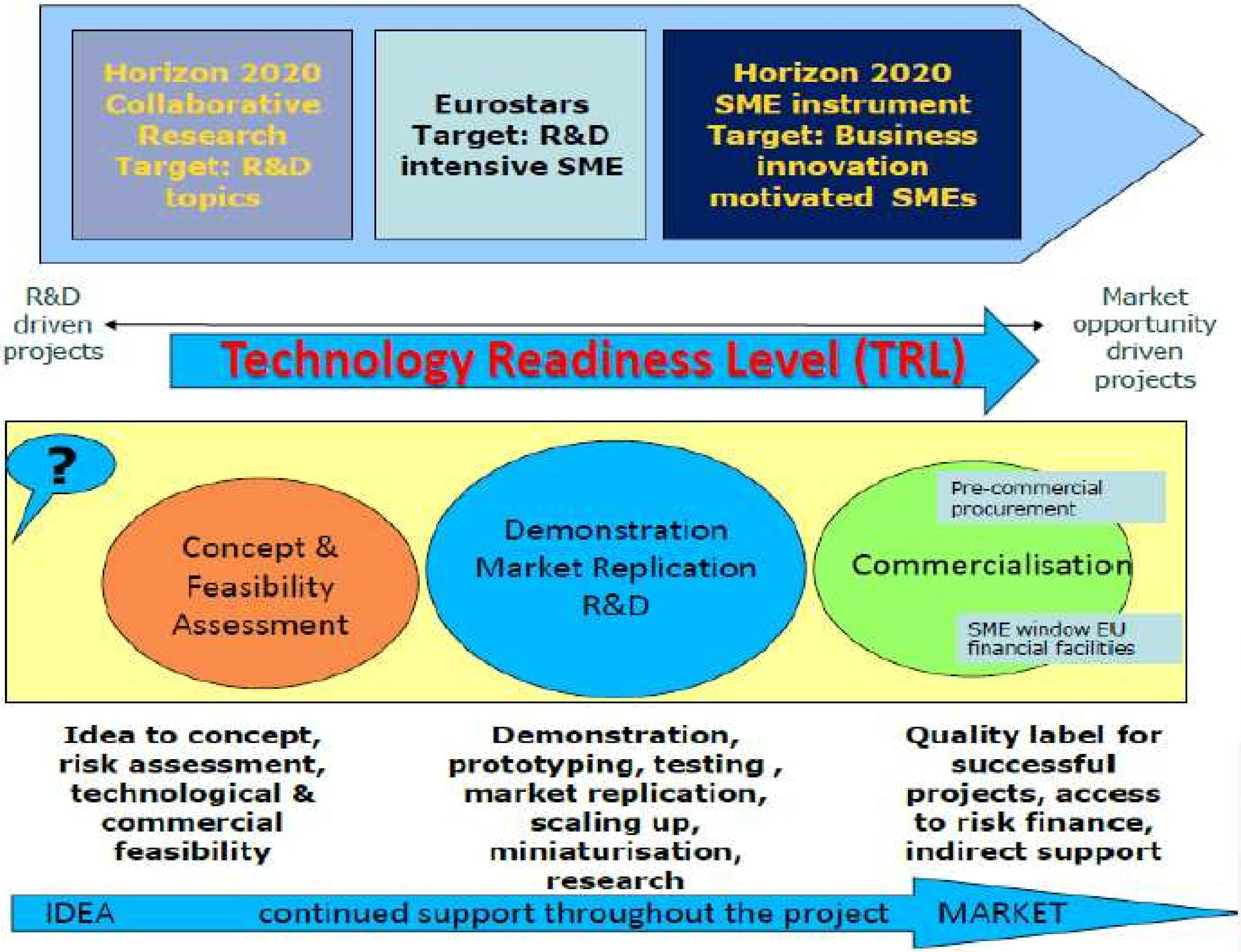
	EXCELLENT SCIENCE	INDUSTRIAL LEADERSHIP	SOCIETAL CHALLENGES
Rationale	Frontier research	Competitiveness	Global Challenges
Policy concept	ERC	ETP, EIB	EIP, EIT, JRC
Political responsibility	Autonomous Scientific Councils	EU	Partnerships UE & SM & Regions
Instruments	Starting & Advanced grants, Research Infrastructures	PPP, proof of concept, pre-commercial procurements, JTI, CIP, RSFF....	KIC, JPI, ERA-Net (+), Art. 185, EIP, Thematic priority…….
Cross cutting	Smart Specialization, Knowledge Transfer & IPR, International Cooperation		

H2020: Budget breakdown (M EUR) not definitive yet !

EXCELLENT SCIENCE	**27.818 (31.5%)**
1. The European resea	15.008
2. Future and Emergin	3.505
3. Marie Curie actions	6.503
4. European research i	2.802
INDUSTRIAL LEADEF	**20.280 (23.5%)**
1. Leadership in enabling and industrial technologies	15.580 whose 500 for EIT*
2. Access to risk finance	4.000 (4.5%)
3. Innovation in SMEs	700
SOCIETAL CHALLENGES	**35.888 (40.5%)** 15%
1. Health, demographic change and wellbeing	9.077 whose 292 for EIT*
2. Food security, sustainable agriculture, marine and maritime research and the bio-economy	4.694 whose 150 for EIT*
3. Secure, clean and efficient energy	6.537 whose 210 for EIT*
4. Smart, green and integrated transport	7.690 whose 247 for EIT*
5. Climate action, resources efficiency and raw material	3.573 whose 115 for EIT*
6. Inclusive, innovative and secure societies	4.317 whose 136 for EIT*
European Institute of Innovation and Technology (EIT)	1.542 + 1.652*
Non-nuclear direct actions of the Joint Research Centre	2.212
TOTAL	**87.740**

Includes
8.975 for ICT of which:
1.795 for photonics and micro-nanoelectronics
4.293 for nanotechnologies, advanced material and advanced manufacturing and processing
575 for biotechnology
1.737 for space

Strategic options for SMEs R&D projects in HORIZON 2020



Public Public Partnerships (PPP) and Societal Challenges

- **Joint Programming Initiatives (JPI)**

European Research Area
Joint Programming

EXISTING

- Neurodegenerative diseases/Alzheimer's
- Agriculture, Food Security and Climate Change (FACCE) – UK, FR
- Healthy diet for a healthy life - NL
- Cultural Heritage & Gobal Change - IT

- Ageing (More years, better life) - DE
- Water challenges for a changing world - ES
- Healthy and productive seas and oceans (Oceans) – NO, ES, BE
- Climate change (Clik'EU) – DE
- Antimicrobial resistance (AMR) – IT, SE
- Urban Europe - AT, NL

- **European Innovation Partnerships (EIP)**

NEW

- Active and Healthy Ageing
- Raw Materials
- Water Efficient Europe
- Agricultural Productivity and Sustainability
- Smart Cities
- Smart mobility

Others partnerships

- **Knowlegde and Innovation Communities (KICs)**

  ACTUAL
  - Energy
  - Climate
  - ICT

  2014 (?)
  - Human Life and Health
  - Food4Future
  - Raw material

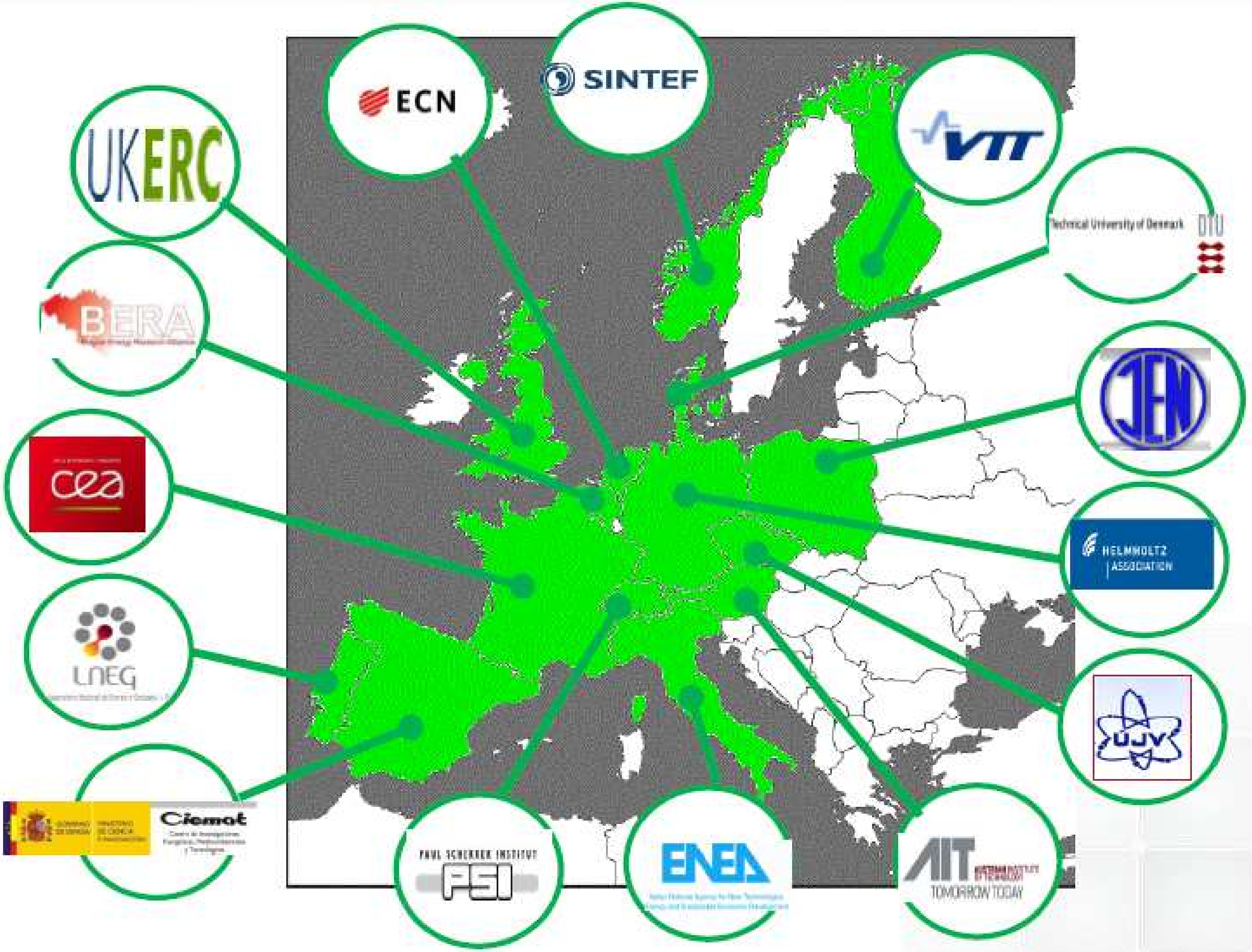
  2018 (?)
  - Manufacturing by and for Creative Human Beings
  - Security and Safety
  - Urban mobility and Smart Cities

- **PPPs**
  - PPPs (Factory of the Future, FoF; Energy Efficient Buildings, EeB; Green Cars, GC; Future Internet, FI)
  - 5 JTIs
  - Other news JTI (Bio-based industries, SESAR, SPIRE) o PPP (Robotics, Photonics, Security Technologies for Maritime Border Surveillance)
- **ALLIANCES**
  - EERA; ECRA
- **FET FLAGSHIPS**
  - Winner FET Flagships: **GRAPHENE**; **HUMAN BRAIN**. 1 Billion € per 10 years per project. 15 EU Countries, 200 institutes.

EERA: European Energy Research Alliance

Supported by :

EUA



ECRA: European Climate Research Alliance

ECRA
European Climate Research Alliance

DTU

Norwegian Meteorological Institute
met.no

SMHI

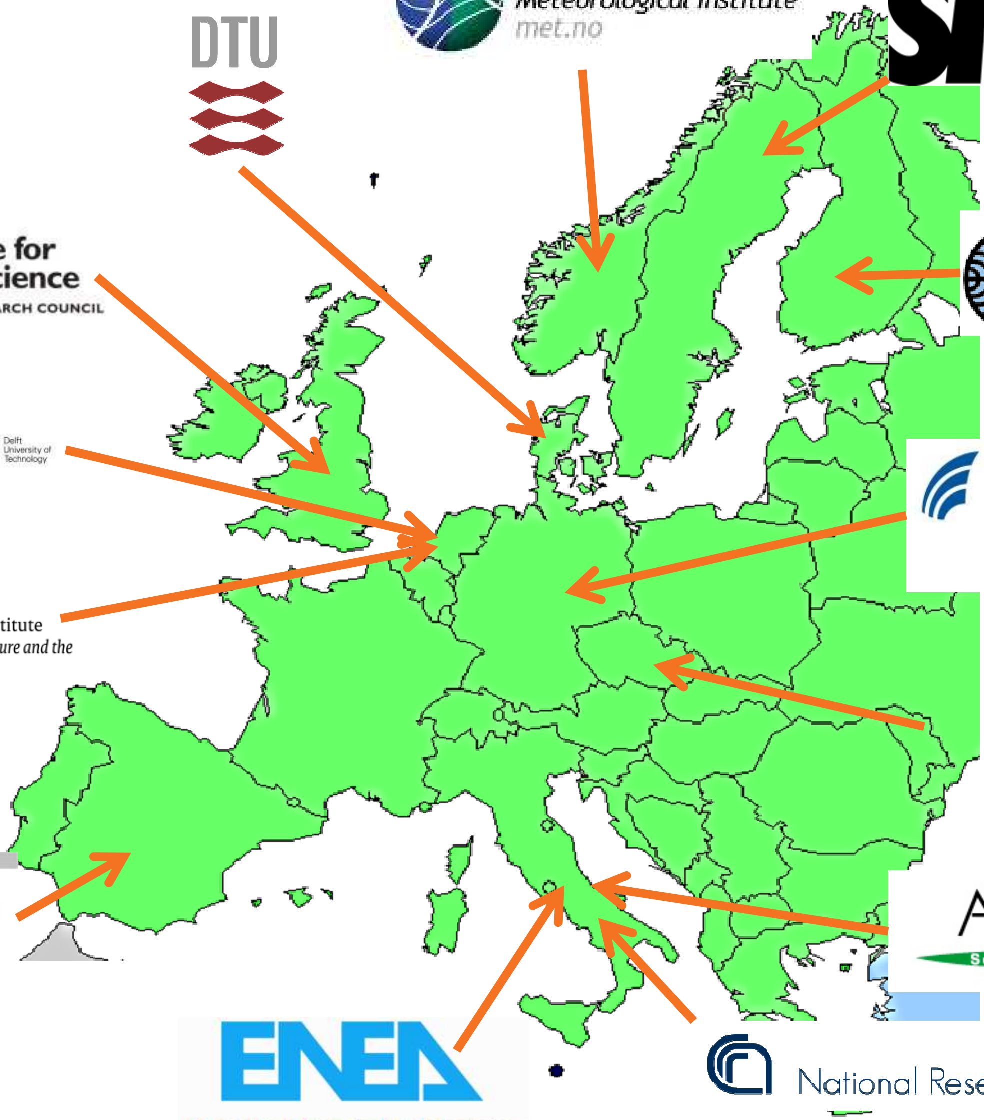
National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

FINNISH METEOROLOGICAL INSTITUTE

TUDelft Delft University of Technology

HELMHOLTZ | ASSOCIATION

Royal Netherlands Meteorological Institute
Ministry of Infrastructure and the Environment



GOBIERNO DE ESPAÑA | MINISTERIO DE CIENCIA E INNOVACIÓN

Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

AREA SciencePark

ENEA
Italian National Agency for New Technologies, Energy and Sustainable Economic Development

National Research Council of Italy

WHAT IS COST ?

COST is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level.

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST has a very specific *mission and goal*.
It contributes to reducing the fragmentation in European research investments and opening the European Research Area to cooperation worldwide.

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

MISSION OF A COST ACTION

As a precursor of advanced multidisciplinary research, COST plays a very important role in building a European Research Area (ERA). It anticipates and complements the activities of the EU Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries. It also increases the mobility of researchers across Europe and fosters the establishment of scientific excellence in the nine key domains:

- Biomedicine and Molecular Biosciences
- Food and Agriculture
- Forests, their Products and Services
- Materials, Physics and Nanosciences
- Chemistry and Molecular Sciences and Technologies
- Earth System Science and Environmental Management
- Information and Communication Technologies
- Transport and Urban Development
- Individuals, Societies, Cultures and Health

In addition, Trans-Domain Proposals allow for broad, multidisciplinary proposals to strike across the nine scientific domains.

cost
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Eligible Costs and Reimbursement Rules

Costs are incurred along these following categories:

- **Travel and subsistence allowances for meeting participants**
- **Organisation of meetings (Local Organiser Support)**
- **Short-Term Scientific Missions (STSMs)**
- **Training Schools**
- **Dissemination, e.g. Scientific Publication, Action website, Action promotion for Meetings and Training Schools, Communication, Outreach activities**
- **Other Expenses Related to Scientific Activities (such expenses need an approval from the COST Office)**
- **Financial and Scientific Administration and Coordination of the Action (*Fee up to 15% of the actual science expediture*)**

NO FUNDING FOR RESEARCH !

Estimated Action Total BUDGET for 4 Years: € 640.000

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST ACTION *EuNetAir*: *WHY* ?

PROPOSED SOLUTION

Networking of <u>Coordinated Action</u> on Integrated and Multidisciplinary Scale of Science and Technologies:
NANOMATERIALS, GAS SENSORS, WIRELESS TECHNOLOGY, AIR-QUALITY MODELLING, STANDARDS & PROTOCOLS

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

TARGETED OPEN PROBLEMS

AIR QUALITY CONTROL

INDOOR/OUTDOOR ENERGY EFFICIENCY

ENVIRONMENTAL SUSTAINABILITY

CLIMATIC CHANGES MONITORING

HEALTH EFFECTS OF AIR-POLLUTION

EuNetAir

BENEFIT & IMPACT

European Leadership on AQC Science & AQC Technologies
Development of Green-Economy
Support to Sustainable Development
Monitoring System for Clean Air for Europe

COST Action TD1105 EuNetAir: Leadership

cost
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

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

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

MC Chair:	Dr. Michele Penza, ENEA, IT michele.penza@enea.it
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Grant Holder:	University of Bari, IT gianluigi.degennaro@uniba.it
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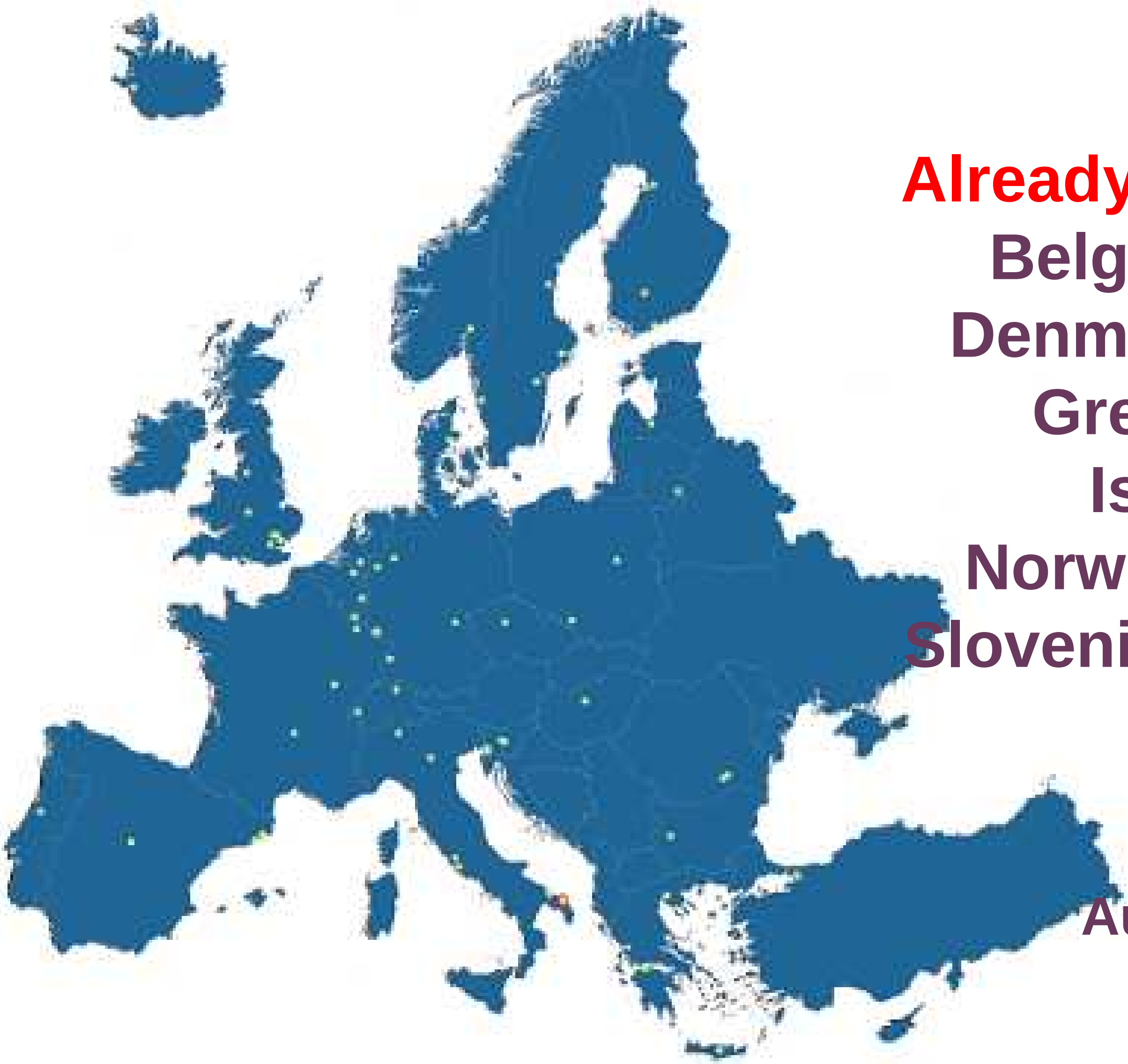
Rapporteur MPNS:	Prof. Joaquim Manuel Vieira (PT) jvieira@cv.ua.pt
Rapporteur CMST:	Prof. Antonio Lagana (IT) lagana05@gmail.com

COST Action TD1105 EuNetAir: Dimension



PARTIES

Already accepted MoU: 25 Countries

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

Non-COST Countries: 5

Australia, Canada, China, Russia, USA

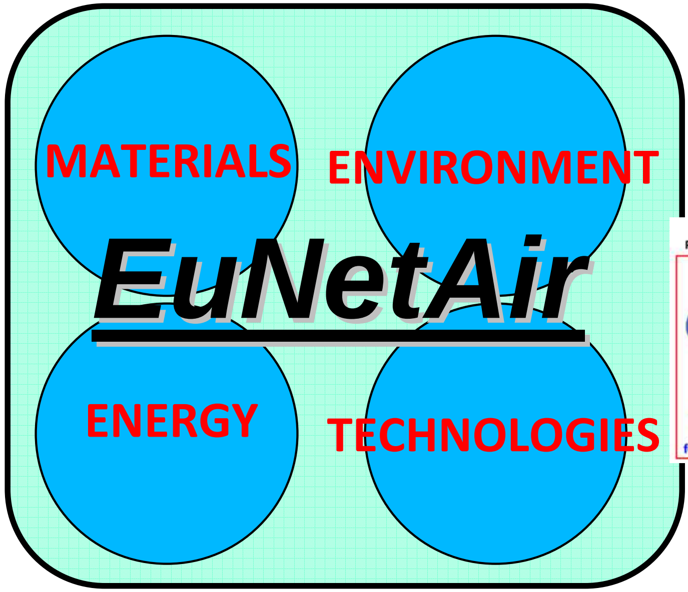
Number of Participants: > 100

N.r of Research Teams including Academia, Research, Industry, Agencies: > 70

COST Action EuNetAir: FEATURES AND INNOVATION

Complementarity with other COST Actions:

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



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

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.**

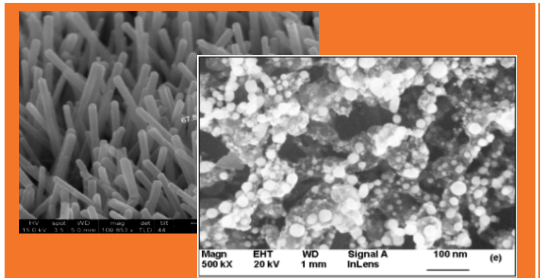
Challenges addressed by Action TD1105

- **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**

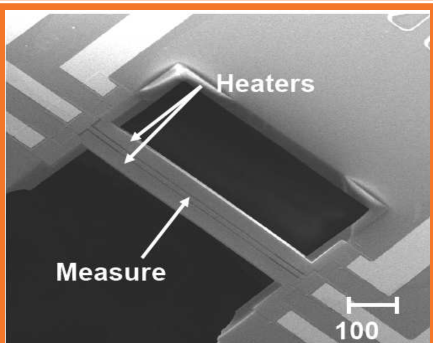
European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir

COST Action *EuNetAir*: CHALLENGES

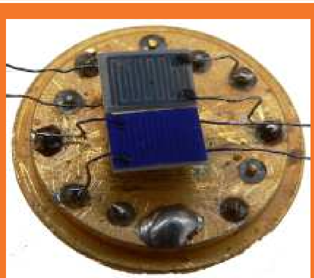
MATERIALS & GAS SENSORS



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

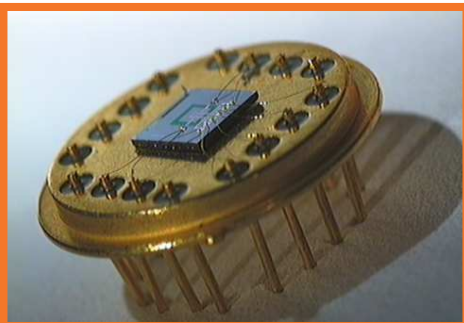


Cantilever Sensor by DTU, DK

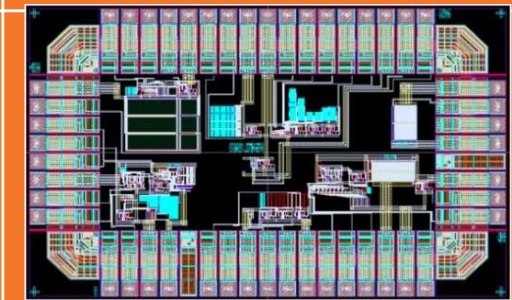


Phtalocyanine Gas Sensors
by CNRS UBP-LASMEA, FR

AQC SENSORS & SYSTEMS



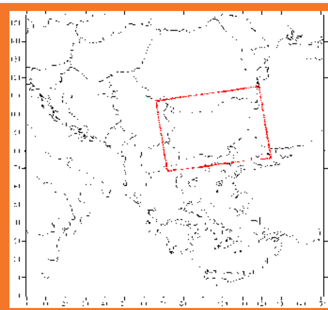
GasFET by EPFL, Switzerland



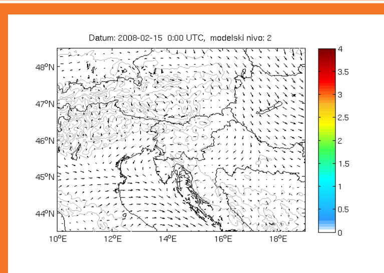
ASIC Circuit: CMOS SOI
by WARWICK & CCMOS Ltd, UK

WIRELESS SENSORS NETWORK
by ISI, Greece

AQ MODELLING



CMAQ Calculations
by NIMH, BG

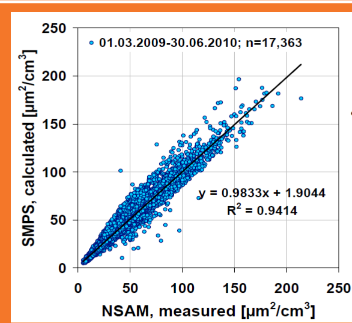


AQ Modelling dispersion in
meteorological mesoscale by
University of Ljubljana, SL

Chemical Weather Forecasting
and Information System
by Hungarian Meteo Service

STANDARDS & PROTOCOLS

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



Particle Surface Area
Measurements by IUTA eV, DE

?

HARMONISATION:

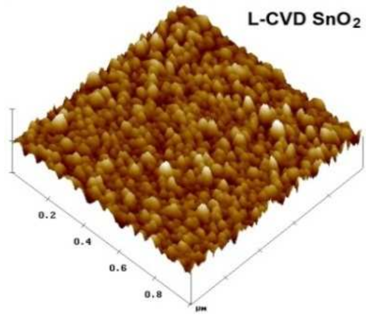
Definition of protocols and standards for gas sensing measurements and gas sensors

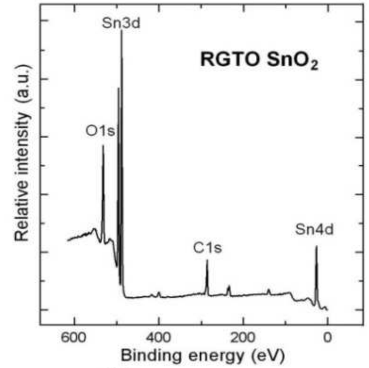
EuNetAir SOLUTIONS: NANOMATERIALS AND NANOTECHNOLOGIES

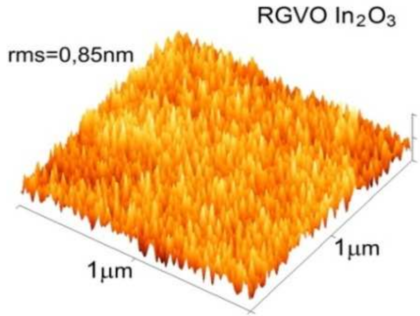
Metal Oxides Nanostructures by University of Brescia, Italy.

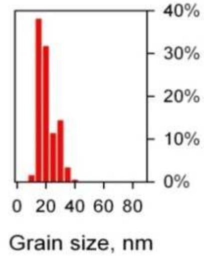
The increasing scientific interest in 1-D systems (nanowires, nanobelts, nanorods, nanotubes) and single-crystalline 1-D nanostructures (SnO_2, ZnO, WO_3, In_2O_3, MoO_3, TiO_2, etc.) are nowadays emerging as building blocks for a new generation of electronic, and optoelectronic nanometer-scaled devices with superior performances for gas sensing and energy applications.

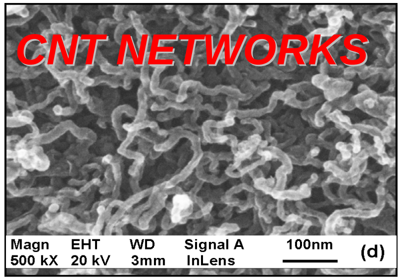
RGTO (RGVO) SnO_2 and In_2O_3 nanolayers by Silesian University of Technology, Poland

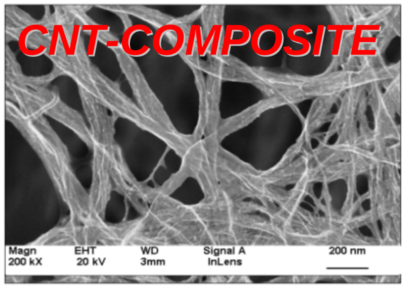












Carbon nanotubes (CNT) in the form of networks and composite as filler in an organic matrix by ENEA, Italy.

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

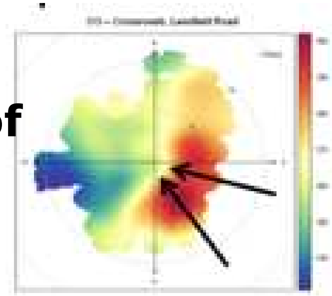
Designed for easy deployment on lighting columns etc.

Low cost, rapid deployment and high spatial resolution.

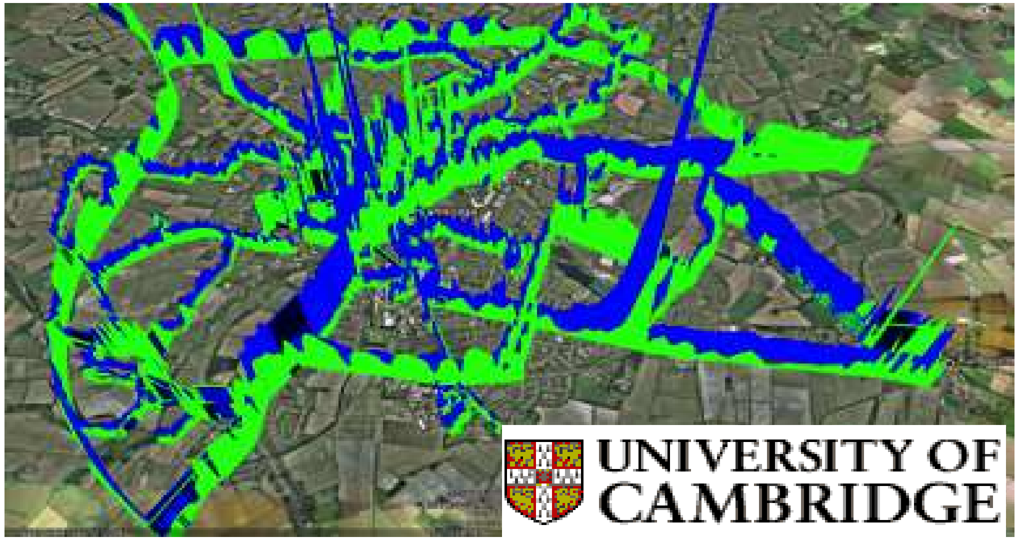
The Envirowatch mote

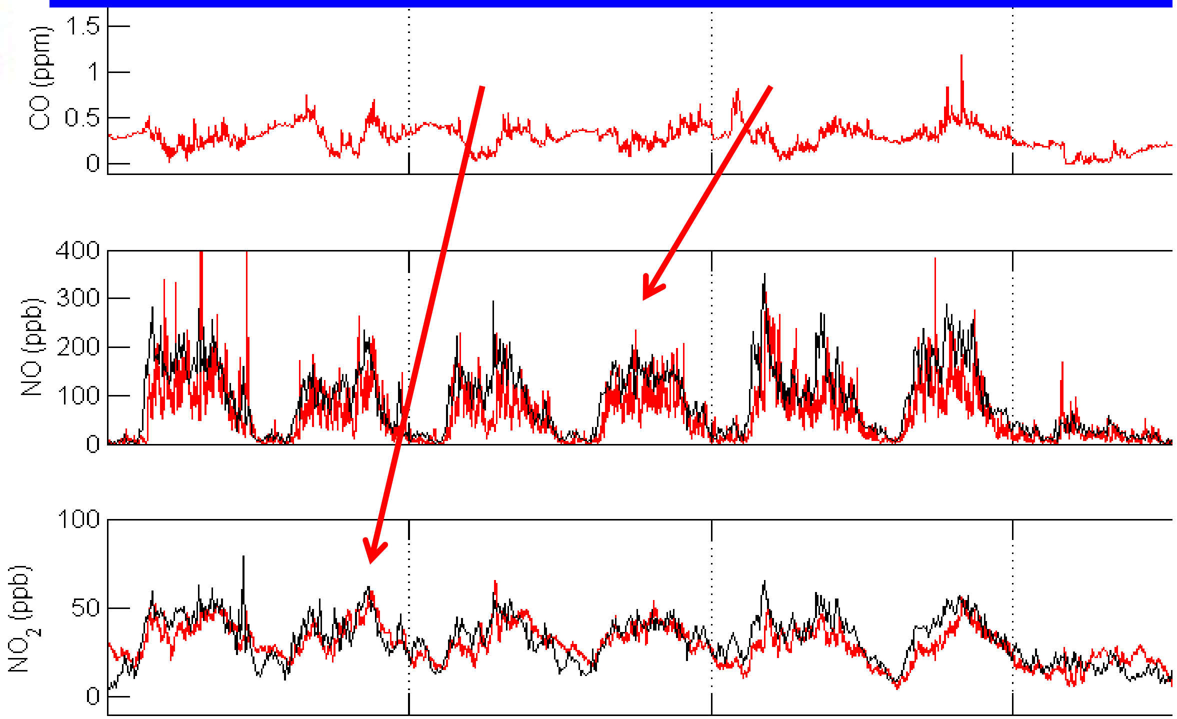
Automatically corrects mote electrochemical sensor data for temp and humidity (red) to achieve excellent agreement with precision instruments (black)

High granularity evaluation of air quality (e.g. NO_x, below), source attribution (right).



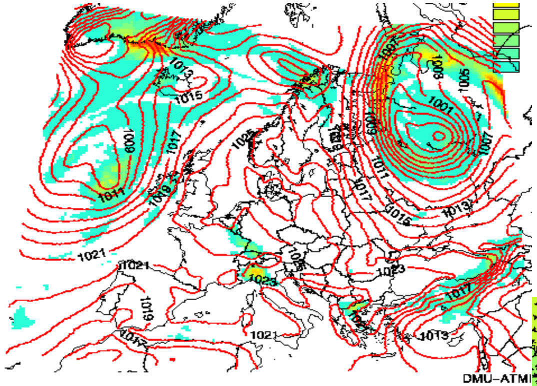
WIRELESS SENSORS NETWORK for AQC



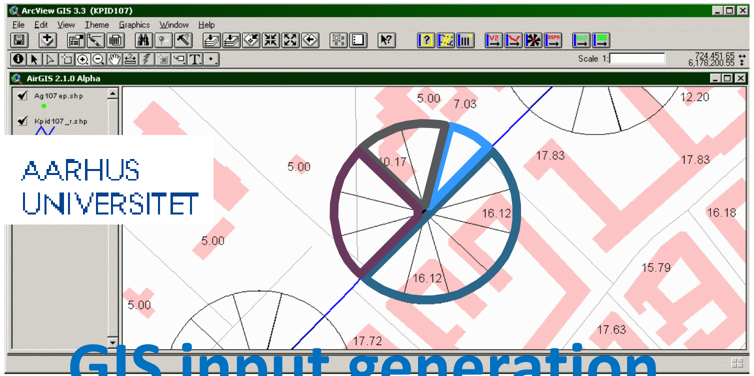


EuNetAir SOLUTIONS: AIR QUALITY MODELLING

Chemical weather

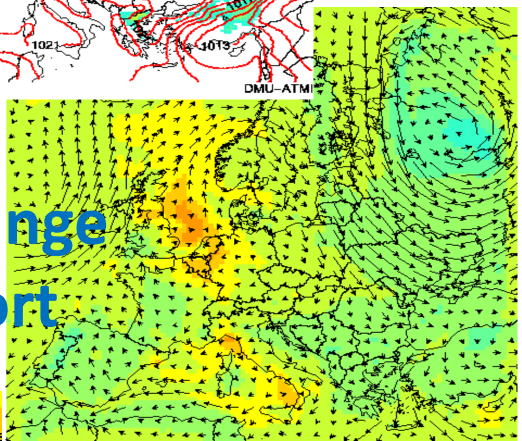


AARHUS UNIVERSITET

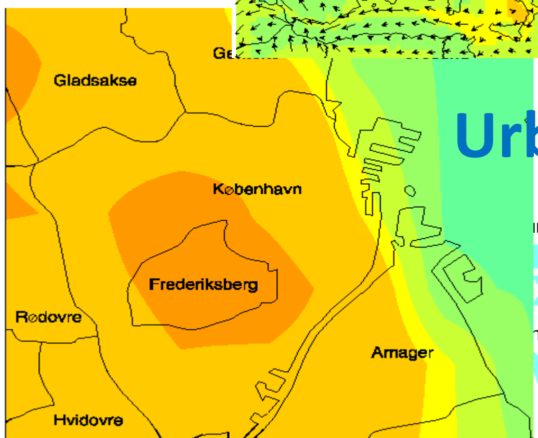


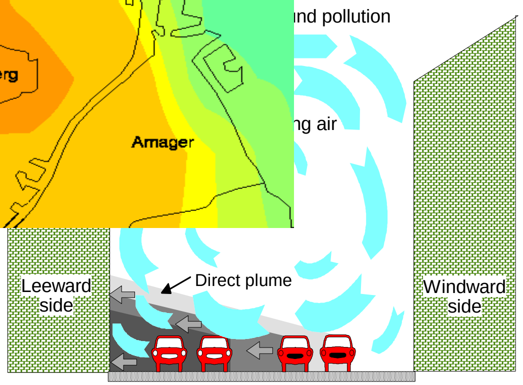
GIS input generation

Long-range transport



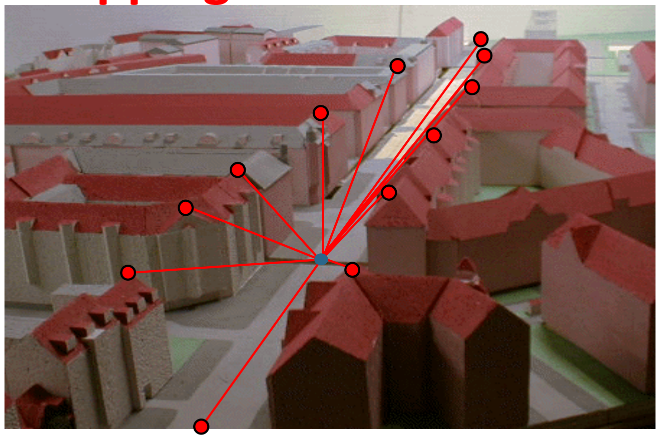
Urban scale





Street scale

Mapping addresses



Tracking routes

<u>AirTHESS</u>: 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*.**

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

COST ACTION TD1105
EuNetAir

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

State-of-the-Art on Air Quality Monitoring Technologies

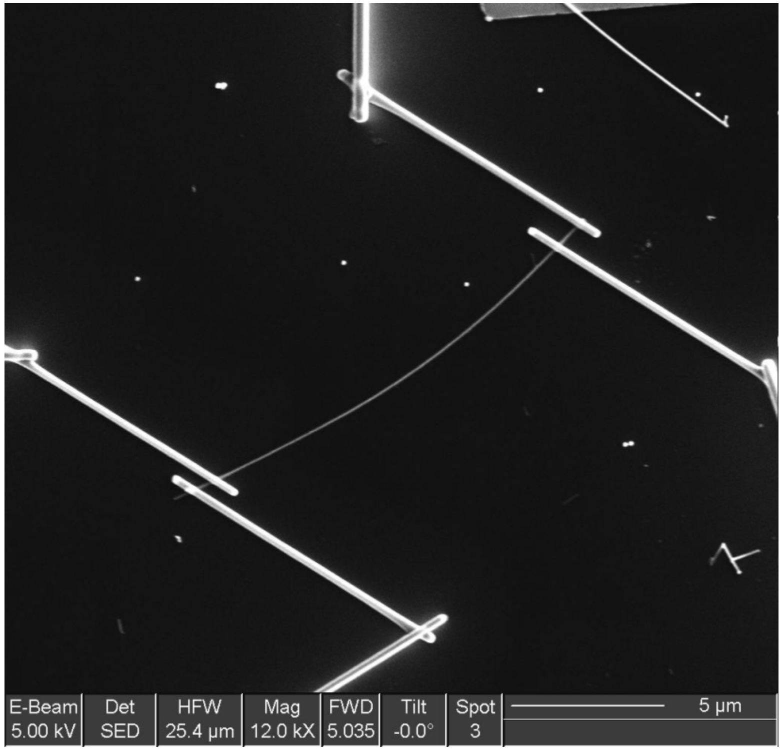
ACTION TD1105: *STATE OF ART ON AQC* - NANOMATERIALS

NANOSENSORS

J. D. Prades, et al., J. R. Morante, Sensors and Actuators B 144 (2010) 1-5

Courtesy from University of Barcelona and IREC.

SnO_2 Nanowires

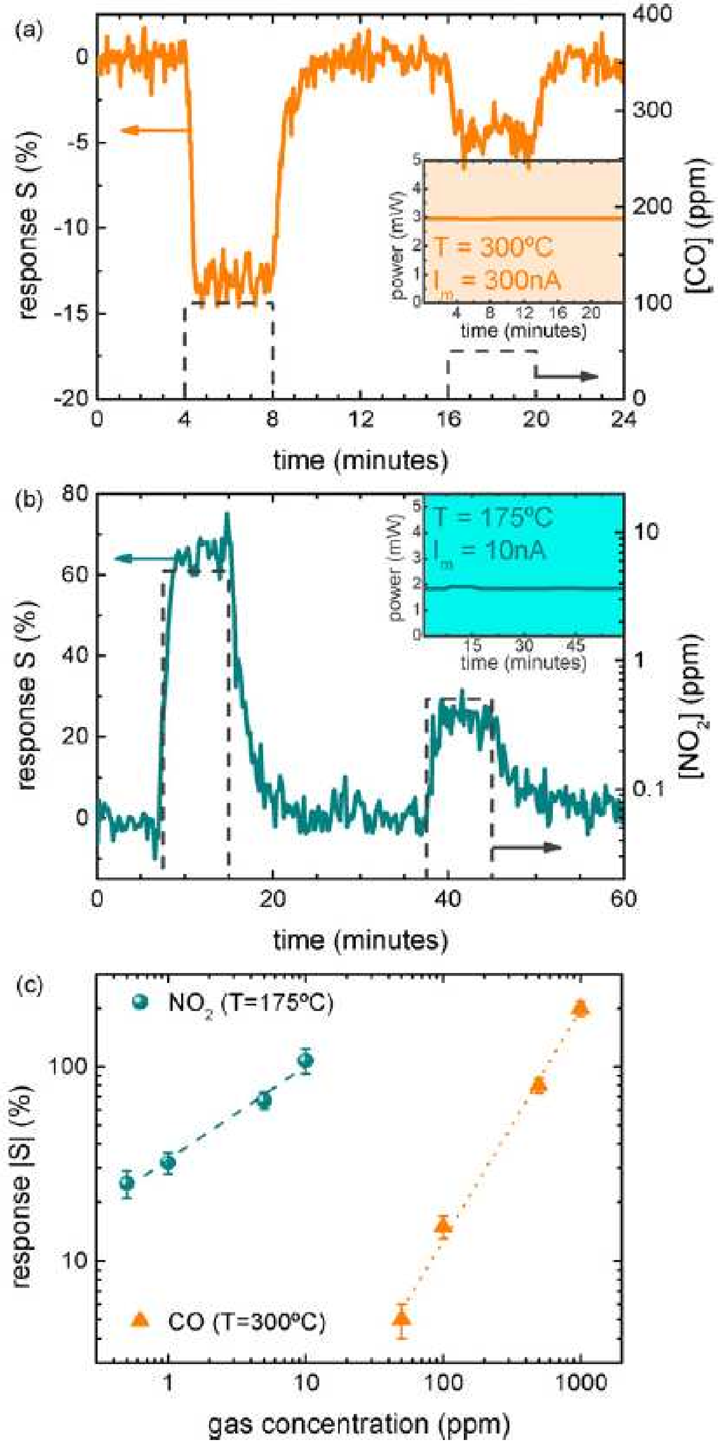


Self-heating of Nanowire

Temperature gradient of 20°C generates 5 mW to operate nanosensor, including electronics.

Micro-Nano sys … **nit**

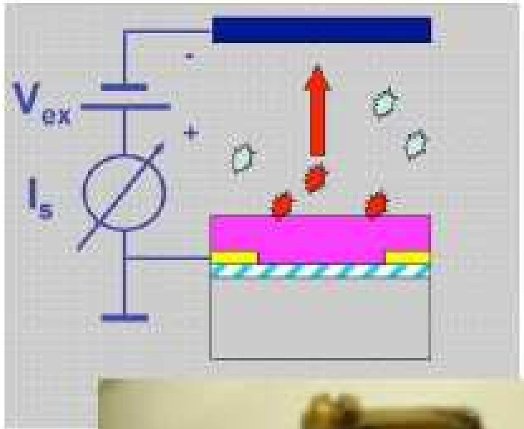
INOLO (b)

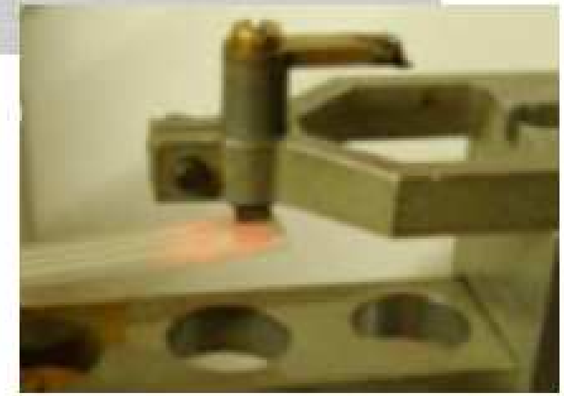


ACTION TD1105: *STATE OF ART ON AQC* - NANOMATERIALS

SURFACE IONIZATION (SI) device: Vertical Layout

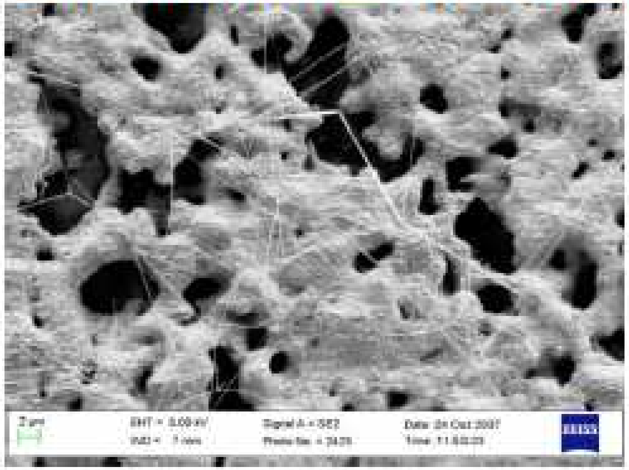
A. Ponzoni, et al., IMCS-2012, Nuremberg, 20-23 May 2012
Courtesy from University of Brescia

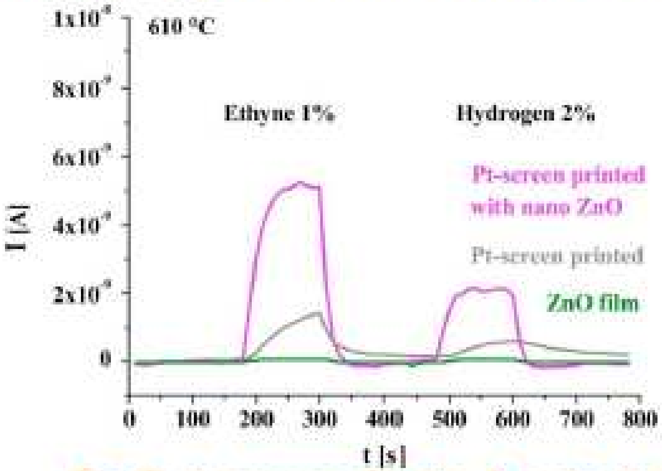




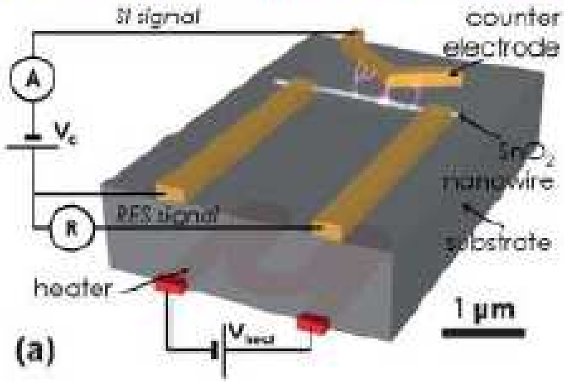
Typical experimental parameters
- Bias Voltage: 1000V
- Electrode-oxide spacing: d = 1mm → E = 10^6 V/m
- Sensor Temperature: 500-700° C

ZnO nanowires on Pt electrode to Ethyne and Hydrogen

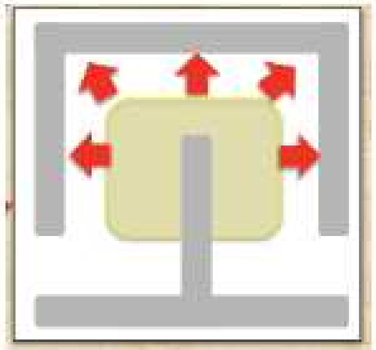




SI Single Nanowire device: Planar Layout

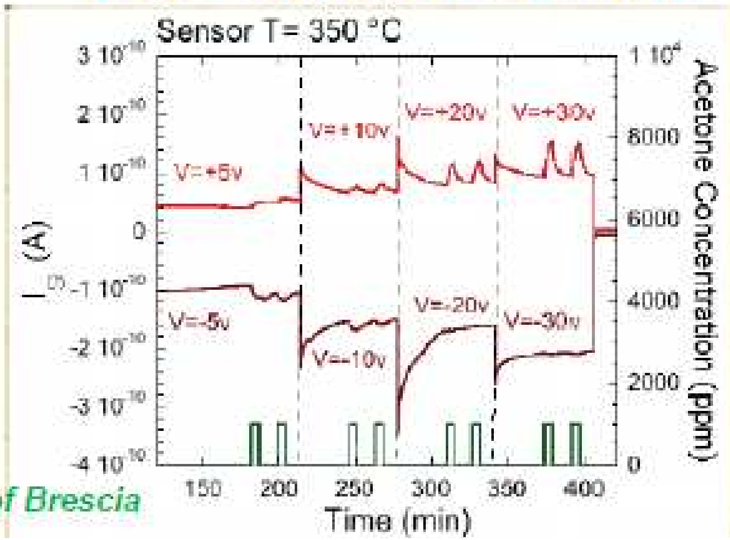


F. Hernandez-Ramirez, et al., Nanoscale 3 (2011), 630
Courtesy from IREC

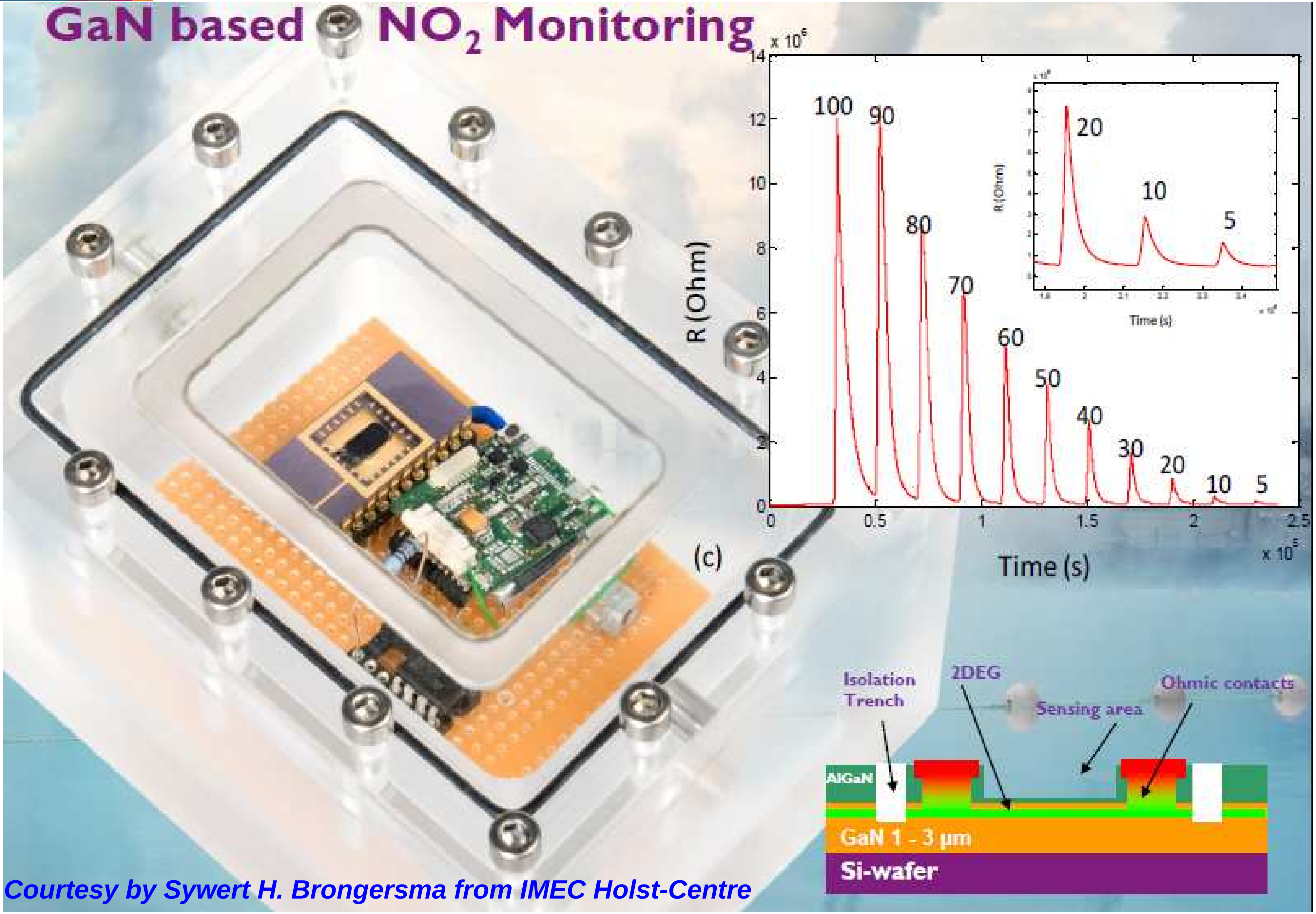


A. Ponzoni, et al.,
Courtesy from University of Brescia

CuO nanorods to Acetone



ACTION TD1105: *STATE OF ART ON AQC* - GAS SENSORS

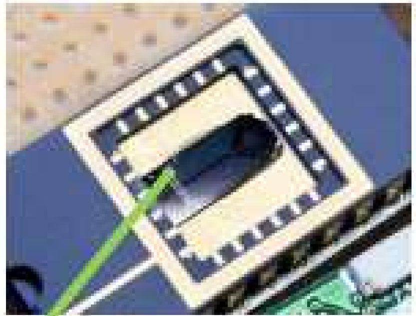


Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

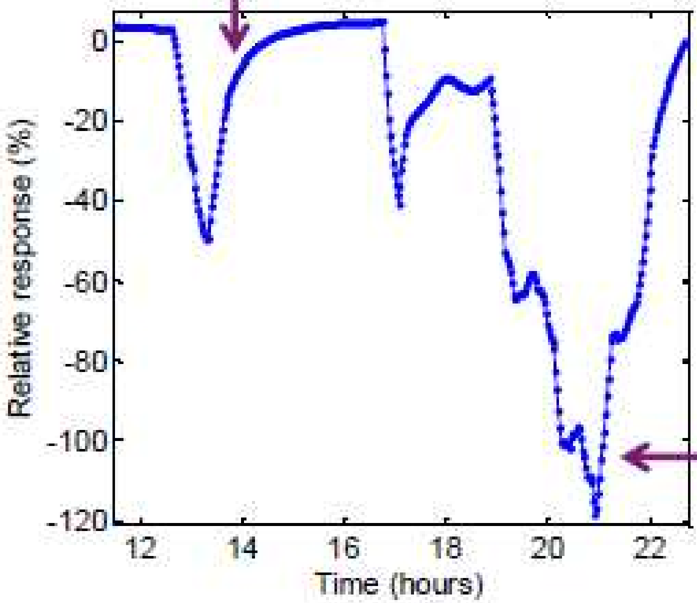
ACTION TD1105: ***STATE OF ART ON AQC*** - **GAS SENSORS**

Low-ppb environmental monitoring

Courtesy by Sywert H. Brongersma from IMEC Holst-Centre



Parking garage



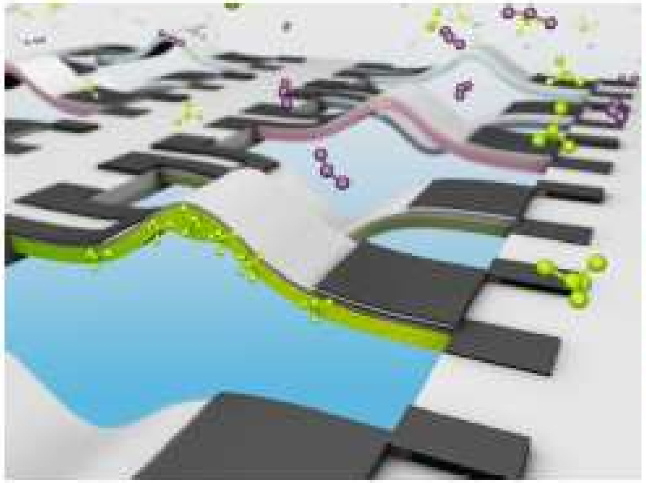
Clean air in nature

- ✓ Battery operated
- ✓ On-chip data storage
- ✓ Humidity and temperature
- ✓ Simple resistive readout
- ✓ Reversible
- ✓ Sub-ppb detection limit
- ✓ Very low cross-sensitive to e.g. SO_2, CO_2, NH_3

ACTION TD1105: *STATE OF ART ON AQC* - GAS SENSORS

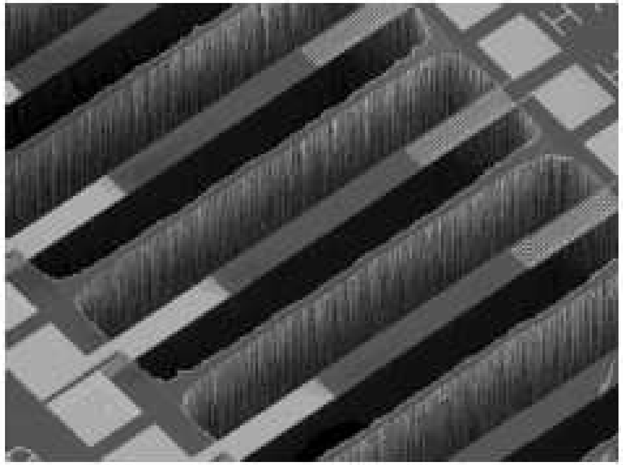
Courtesy by Sywert H. Brongersma from IMEC Holst-Centre

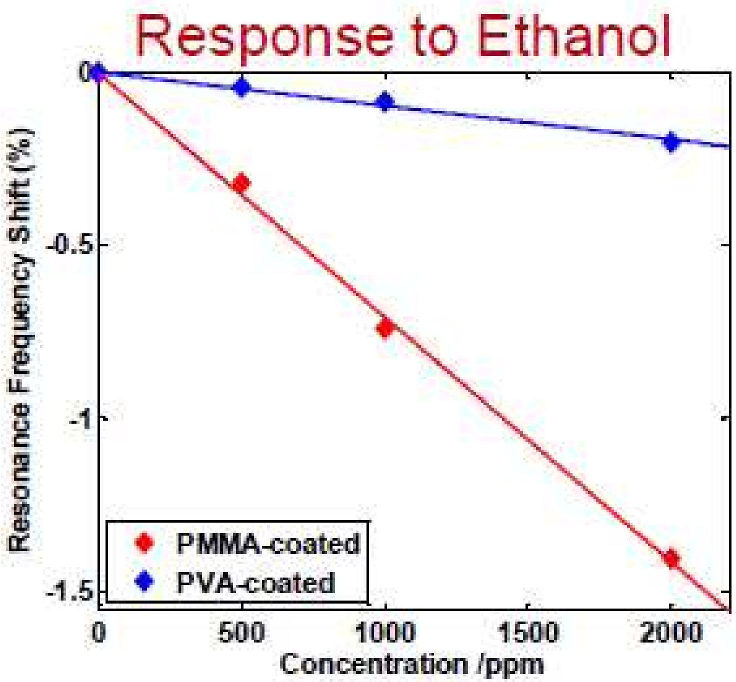
Towards a miniaturized MEMS e-nose

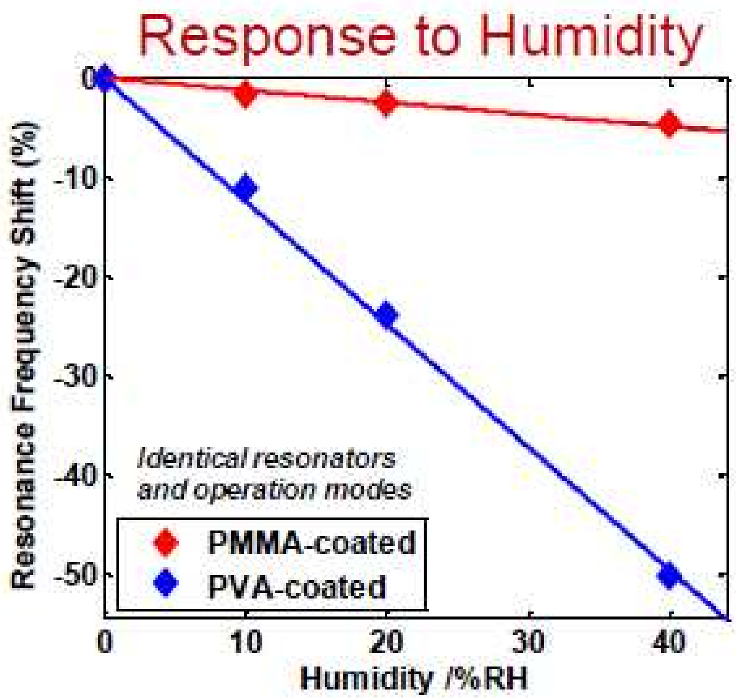


CONCEPT

REALITY



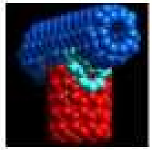




ACTION TD1105: *STATE OF ART ON AQC* - GAS SENSORS

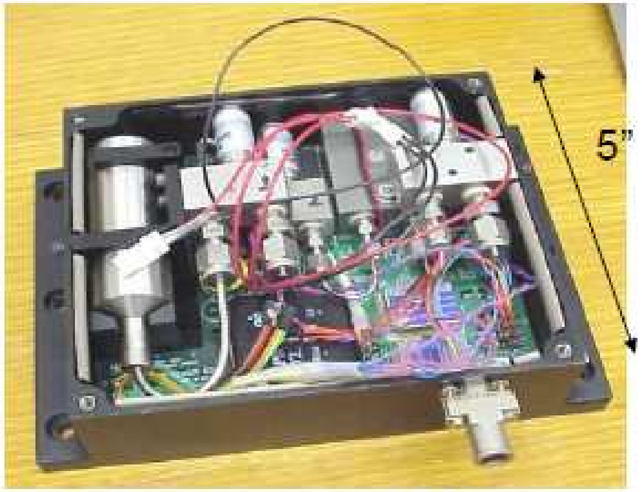
Ames Research Center

First Nano Product in Space



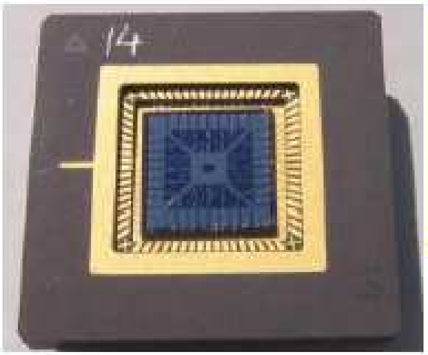
Courtesy by Dr. Meyya Meyyappan, NASA Ames Research Center

NASA Ames chemical sensor module was on a secondary payload of a Navy satellite (Midstar-1) launched via Atlas V on March 9, 2007. Sensor data downloaded for 60 days.



The nanosensor module (5”x 5”x 1.5”) contained a chip of 32 sensors, a data acquisition board, sampling system, and a tank with 20ppm NO_2 in N_2.

A 32-channel sensor chip (1cm x 1cm) with different nanostructured materials (CNT, MOX) for chemical sensing



This sensor chip was intergrated in the JPL E-nose aboard the International Space Station in January 2009 to monitor air quality in the crew cabin, especially formaldehyde.

The future is coming…!

NASA adapt *iPhone*
to *smell* chemicals
(Nov 17, 2009)

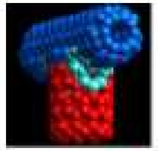
NTT DoCoMo
A Cell Phone that
spots *Bad Breath*

Nokia Scentsory Concept
e-nose samples the odor of
caller environment and transmit
to recipient electronically

Nokia EcoSensor Concept
Wearable sensor unit to sense
(environment, health..), and a
dedicated mobile phone (not an e-nose yet)

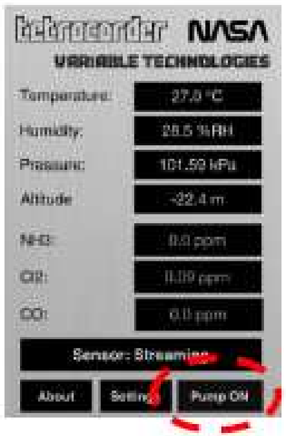
Other concepts:
Health conscious phone
that *smells* food properties

Chemsensor on the Cell Phone



Ames Research Center

Courtesy by Dr. Meyya Meyyappan, NASA Ames Research Center



Dept of Homeland Security (DHS) funded development of a cell-phone version of this sensor. DHS independently tested the sensor for undisclosed chemical threats in an undisclosed location in Alabama and informed us of the success. DHS also arranged for Los Angeles Fire Department test the cell phone sensors for CO detection in a public event in 2011.

ACTION TD1105: *STATE OF ART ON AQC* - GAS SENSORS

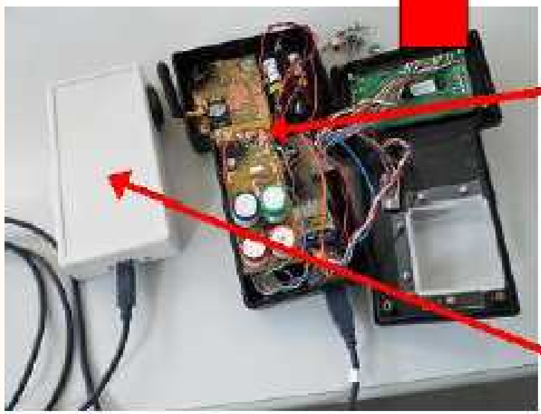
Handheld Gas Sensor System for Air Quality Monitoring with Wireless Functionalities (GSM) towards a CellPhone at ENEA (Brindisi)

Handheld Gas Sensor Node with EC sensors (CO, NO_2, SO_2, H_2S)

MAIN FEATURES

- Handheld device (high portability degree)
- Fully remote operated via GSM/GPRS network
- Powered by Li-Ion battery or electrical energy network or solar cells systems
- Data logging by means of SD-card memory inside the device
- PC interfacing for data downloading and local control
- Average battery autonomy: 46 hours
- Real time monitoring (ppb level)

Data Transfer via SMS or Email



NASUS 4

Data Demand via SMS

POWER-SUPPLY UNIT

ACTION TD1105: *STATE OF ART ON AQC* - APPLICATIONS

NanoTera OpenSense

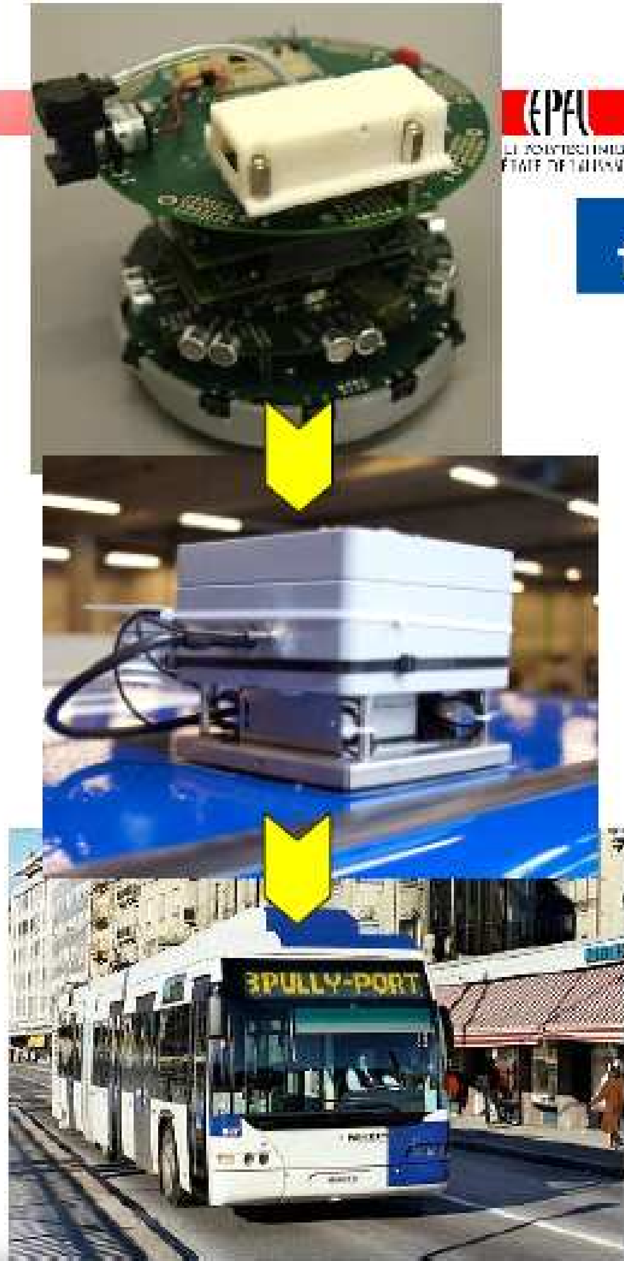
Coordinator Karl Aberer - EPFL

- Lausanne deployment

8 mobile stations

- NO_2, CO, CO_2, Humidity, Temperature
- Positioning module
- Communication: GSM

1 prototype station mounted on bus

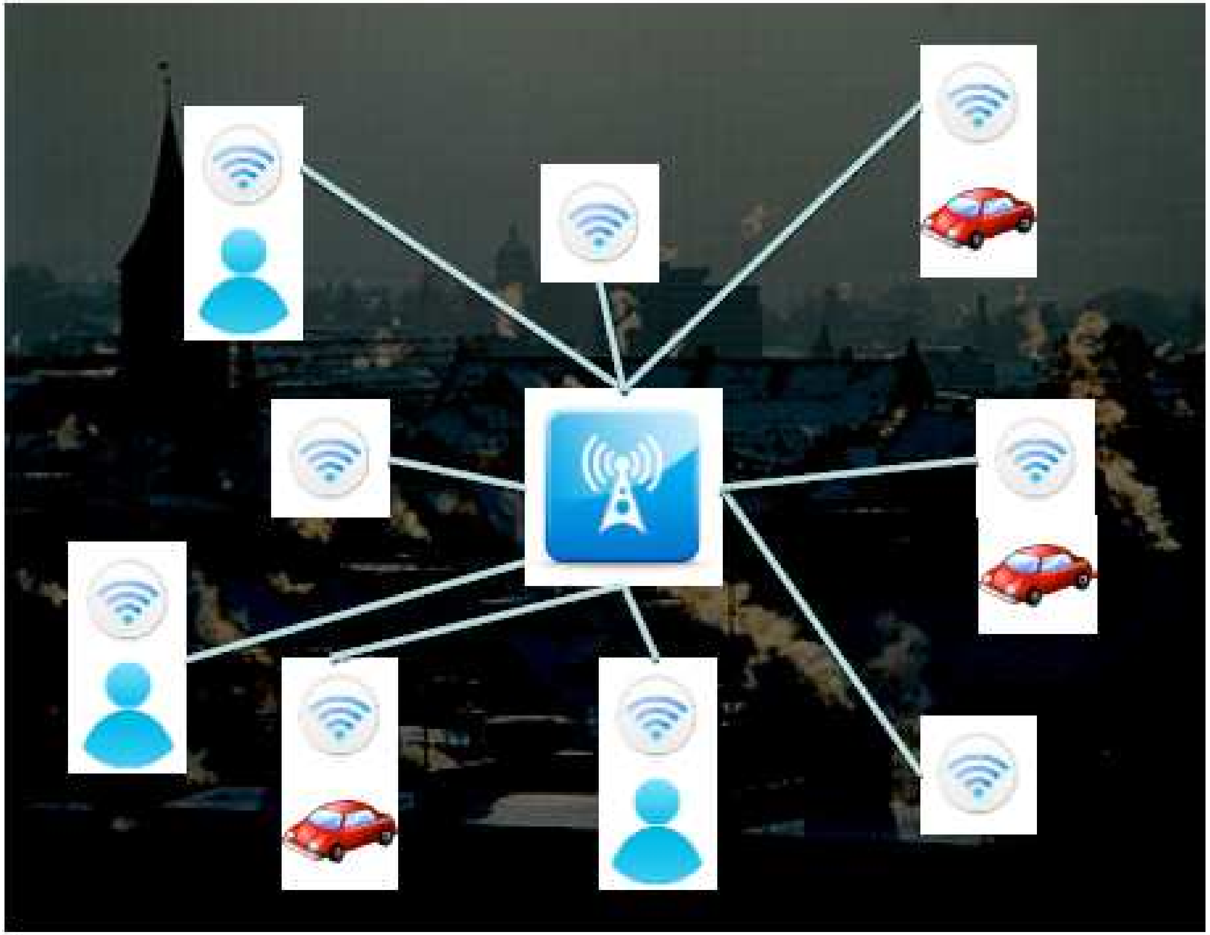


Courtesy by Danick Briand from IMT samlab, EnviroMEMS, EPFL, Switzerland

Mobile Urban Sensors Network deployed at Lausanne (CH) - OPENSENSE Project

Opportunities

- ***Wireless communication and low cost sensors***: deploy larger numbers of stations
- ***Mobility***: deploy mobile stations to increase spatial coverage
- ***Communities***: citizens as data producers and information consumers

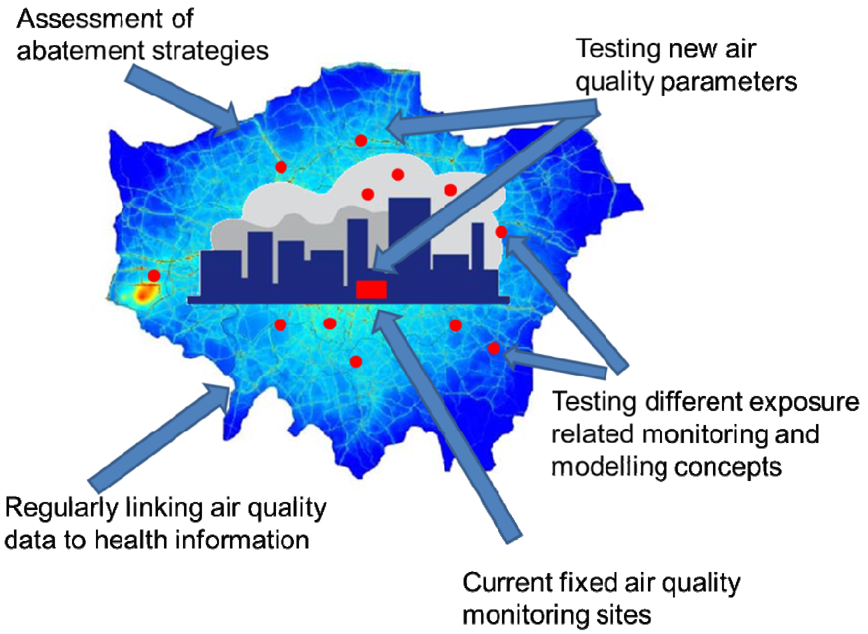


Courtesy by Danick Briand from IMT - samlab, EnviroMEMS, EPFL, Switzerland

ACTION TD1105: ***STATE OF ART ON AQC*** - APPLICATIONS

Air Pollution Monitoring Technologies for Urban Areas **- AirMonTech FP7 Project**

Coordinator: Dr. Thomas Kuhlbusch, IUTA eV, Duisburg (Germany)



NEW TECHNOLOGIES – NEW METRICS & PROXIES:

- **Science based reviews of metrics, detection principles and instrument performance (including sensors technologies)**
- **Collection of manufacturer's and developer's information**
- **Input into the database**
- **Evaluation of trends and options**

Aims of AirMonTech:

•Facilitating harmonisation and comparability of European air quality monitoring by making information on metrics, techniques and instrumentation available via a database

•Identification of trends and future options in measurement strategies, data quality and comparability

•Discussing and drafting recommendations of future urban air quality monitoring strategies in view of closer linkage to exposure, health effects and assessment of abatement strategies

ACTION TD1105: *STATE OF ART ON AQC* - APPLICATIONS

EU-Russia Cooperation – S3 FP7 Project

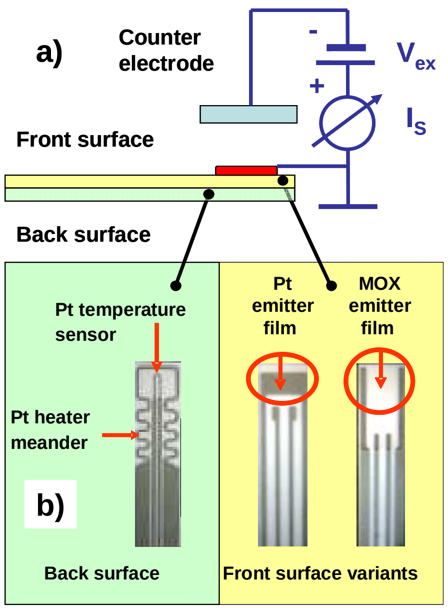
Coordinator: Prof. Giorgio Sberveglieri, Univ. of Brescia and CNR, Brescia (Italy)

Selectivity, Sensitivity, Stability

Surface ionization and novel concepts in nano-MOX gas sensors with increased Selectivity, Sensitivity and Stability for detection of low concentrations of toxic and explosive agents

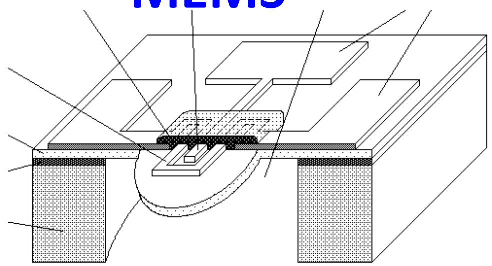
Project N. 247768 - Period: Sept. 1st 2009 - August 31st 2012

Public web-site: www.eurussias3.com

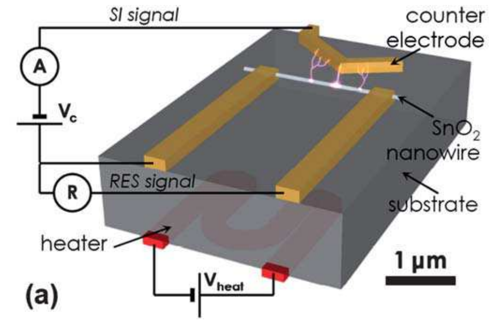


- **Functional characterisation of sensing materials**
- **Novel sensing mechanisms**

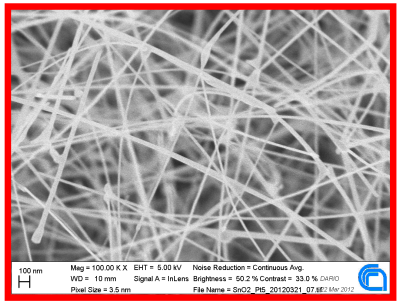
MEMS

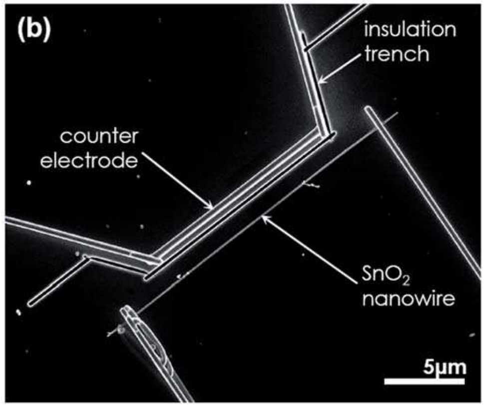


Surface ionization device with single nanowire



MOX Nanowires





EURO ... ION IN SCIENCE AND TECHNOLOGY

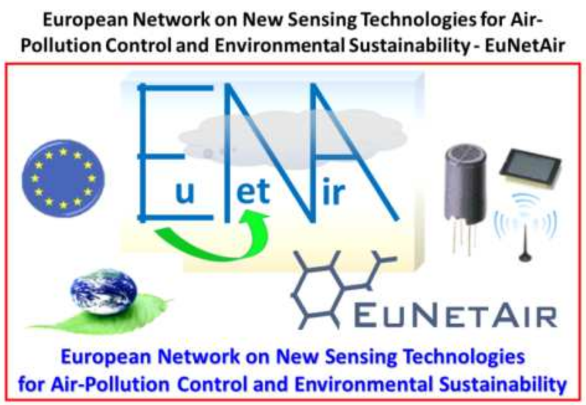
RELATED FP7 PROJECTS
linked to COST Action TD1105 *EuNetAir*

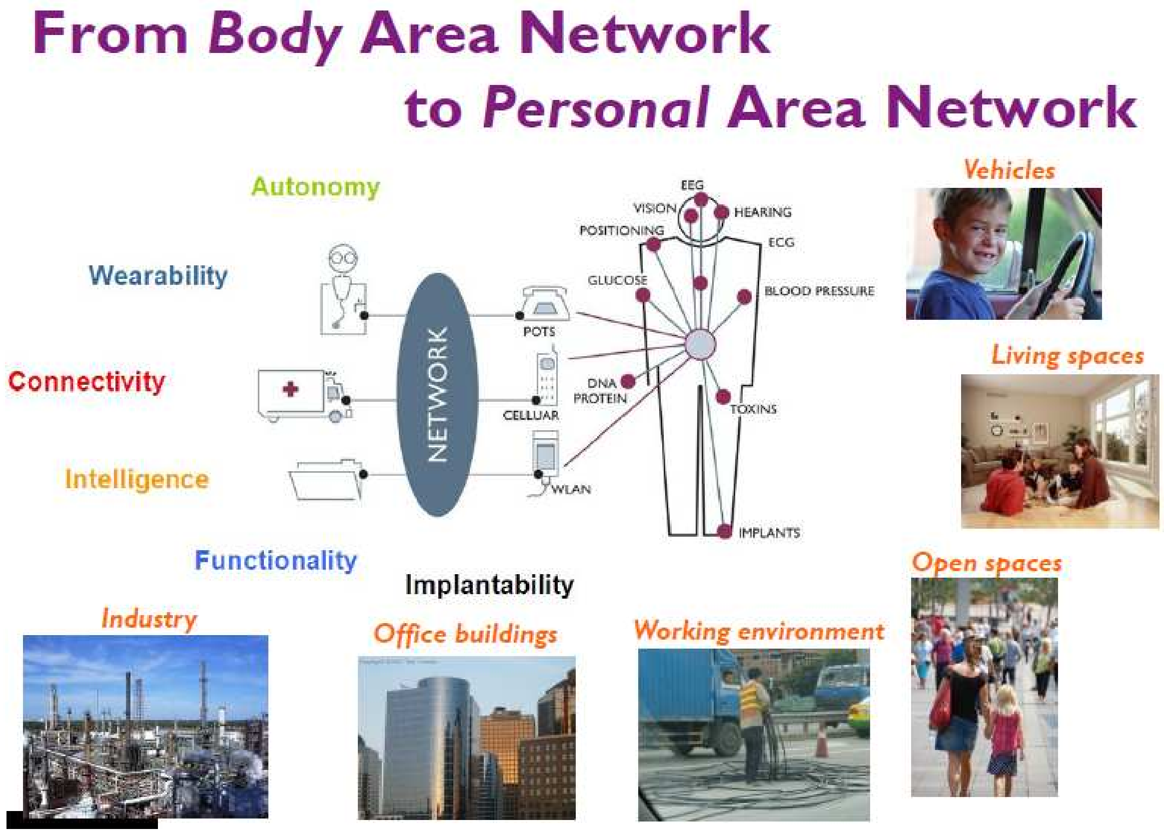
- **GRAFOL** is a FP7-Project Large scale integrating project (2011-16). High volume low-cost wafer level production of graphene for a number of different applications. Gas sensing applications lead by CCS.
- **EveryAware FP7-Project ICT-FET Open**. In the *EveryAware* project a portable SensorBox is developed based on an array of commercially available low-cost sensors, GPS, bluetooth and smartphone applications. This includes both lab testing and field calibration. These tasks are carried out by VITO.
- **CITI-SENSE FP7-Project** is a recently-funded European project involving UCAM and others with the main objective to involve citizens as active partners in environmental monitoring decision-making and empowering them to actively improve their own environment by using the information gathered by low-cost sensors.
- **AirMonTech FP7-Project** *(Air Pollution Monitoring Technologies for Urban Areas)*, leaded by IUTA, is implementing an open database on online air quality monitoring technologies and a research roadmap on urban air quality monitoring for Horizon 2020.
- **MESSAGE** (*Mobile Environmental Sensing System Across a Grid Environment*) UK national project. UCAM developed low-cost portable and static integrated sensor network systems for air quality measurements in the urban environment, combining miniaturised gas sensors with GPS and GPRS.
- **SNAQHeathrow** (*Sensor Network for Air Quality at Heathrow*) UK national project. UCAM is developing (2012) a high density sensor network to be deployed around London Heathrow Airport.
- **CHEMPACK** 40327/10 is a nationally funded FiDiPro project financed by TEKES in Finland together with University of Oulu (2011-2014). **CHEMPACK** intends to develop a particle detector for detection of size, concentration, shape and content of particles, since all these parameters have shown to be important for eventual toxic effect by the particles.
- **NANODEVICE (NMP-2009-211464)** is a large project - participated by IUTA - which intends to develop portable sensors for detection of the particles at workplaces. The project has published sensors based on quartz microbalance devices for detection of mass of particles.

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**





UPDATING AND BREAKING NEWS from Action TD1105

Action website:

www.cost.eunetair.it

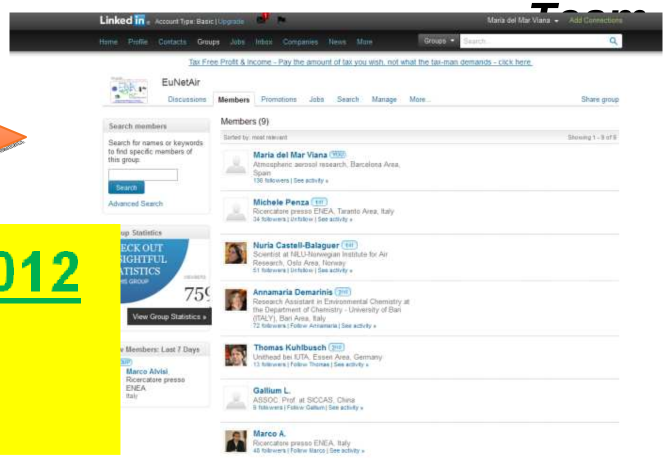
hosted by ENEA

Dr. Marco Alvisi, *Webmaster Coordinator*

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

Social Scientific ESRs Network (SSEN) by LinkedIn

Moderator(s): Mar Viana, Mariacruz Minguillon



CALL for Short Exchange Visits launched on 20 Nov. 2012

(STSM - Short Term Scientific Mission)

Dr. Jan Theunis, STSM Coordinator EuNetAir

Issue 1: finished and published - Dec. 2012 ✓

Issue 2: planned on April - June 2013

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

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

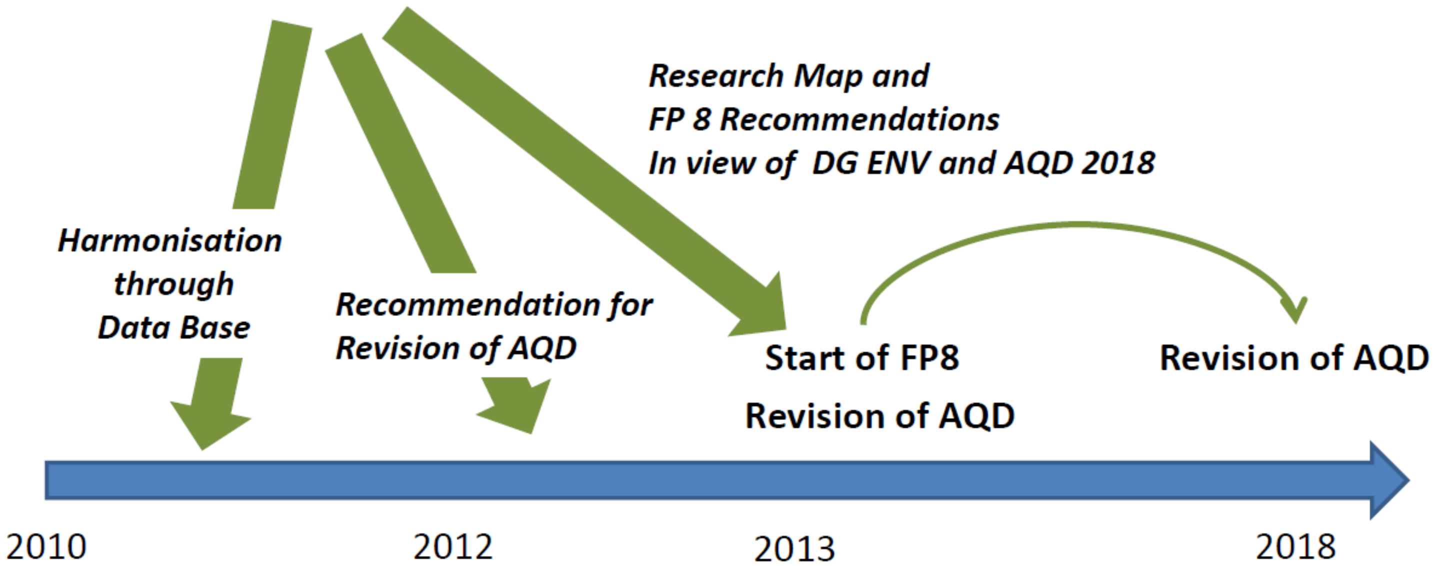
NOLOGY

Timeline of Air-Pollution EU Policy

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

EuNetAir

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



2013: Year of Air
declared by European Environment Agency and EC

EU Thematic Strategy on Air Pollution

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

Consultation by EC DG ENV from
<u>Citizens and Experts</u>
Deadline for Consultation: April 03, 2013

Winner of 'Imaginair' youth prize

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Open Questions:

Which Priorities for COST Action TD1105 EuNetAir

- **Which R&D Needs ????**
- **Which Strategies ????**
- **Which Inputs from Working Groups ????**
- **Which Roadmap for future joint-activities of Action TD1105 EuNetAir**
- **Please, Comments and Opinions from Action Partners and Stakeholders**

Thank you very much for your kind attention !