JRP ENV01 MACPoll

Jun 2011 – Jun 2014

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Programme of EURAMET

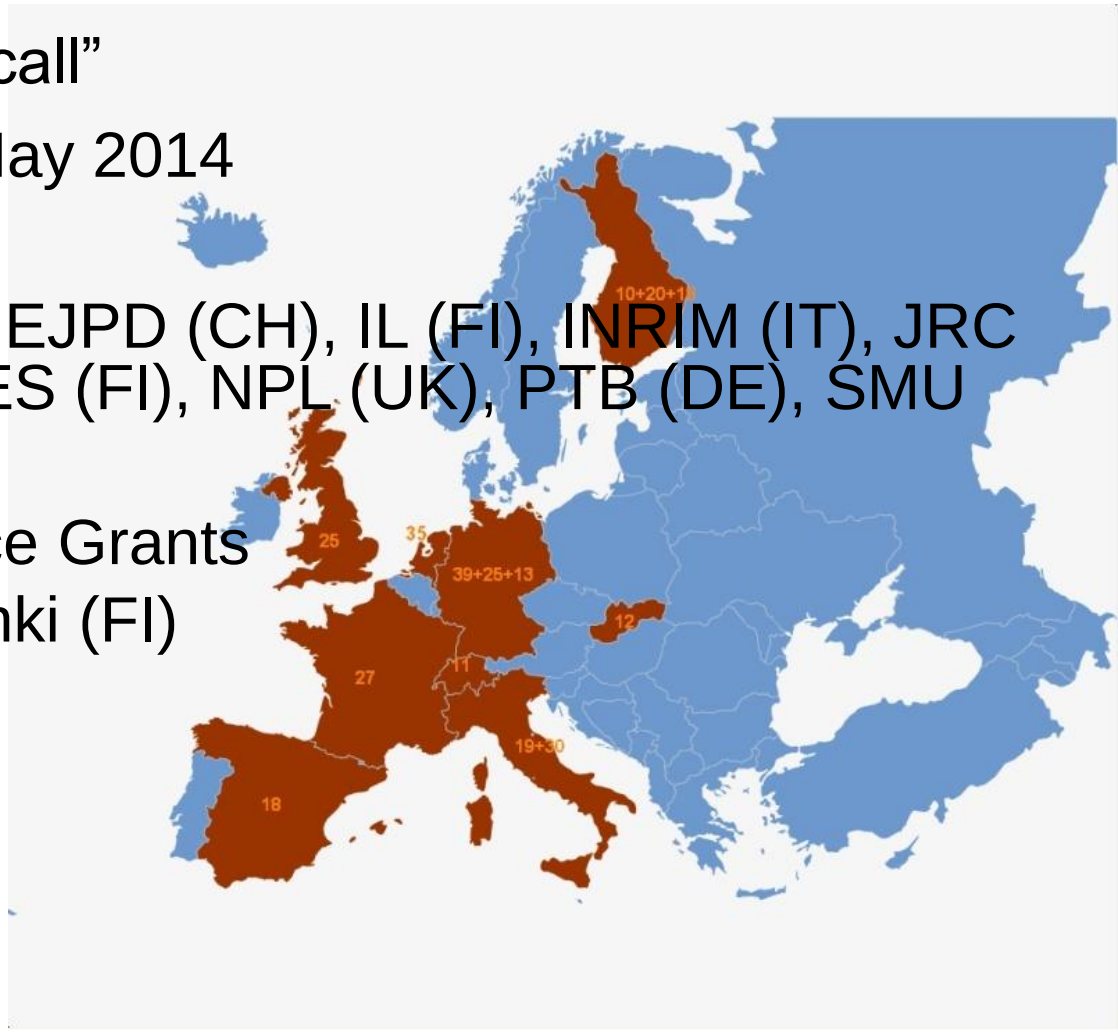
The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

Metrology for Chemical Pollutants in Air

- EMRP “Environment call”
- Period June 2011 – May 2014
- 12 Partners

  VSL (NL), BAM (DE), EJPD (CH), IL (FI), INRIM (IT), JRC (EC), LNE (FR), MIKES (FI), NPL (UK), PTB (DE), SMU (SK), UBA (DE)
- 2 Research Excellence Grants

  CSIC (ES), Un. Helsinki (FI)



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Objectives

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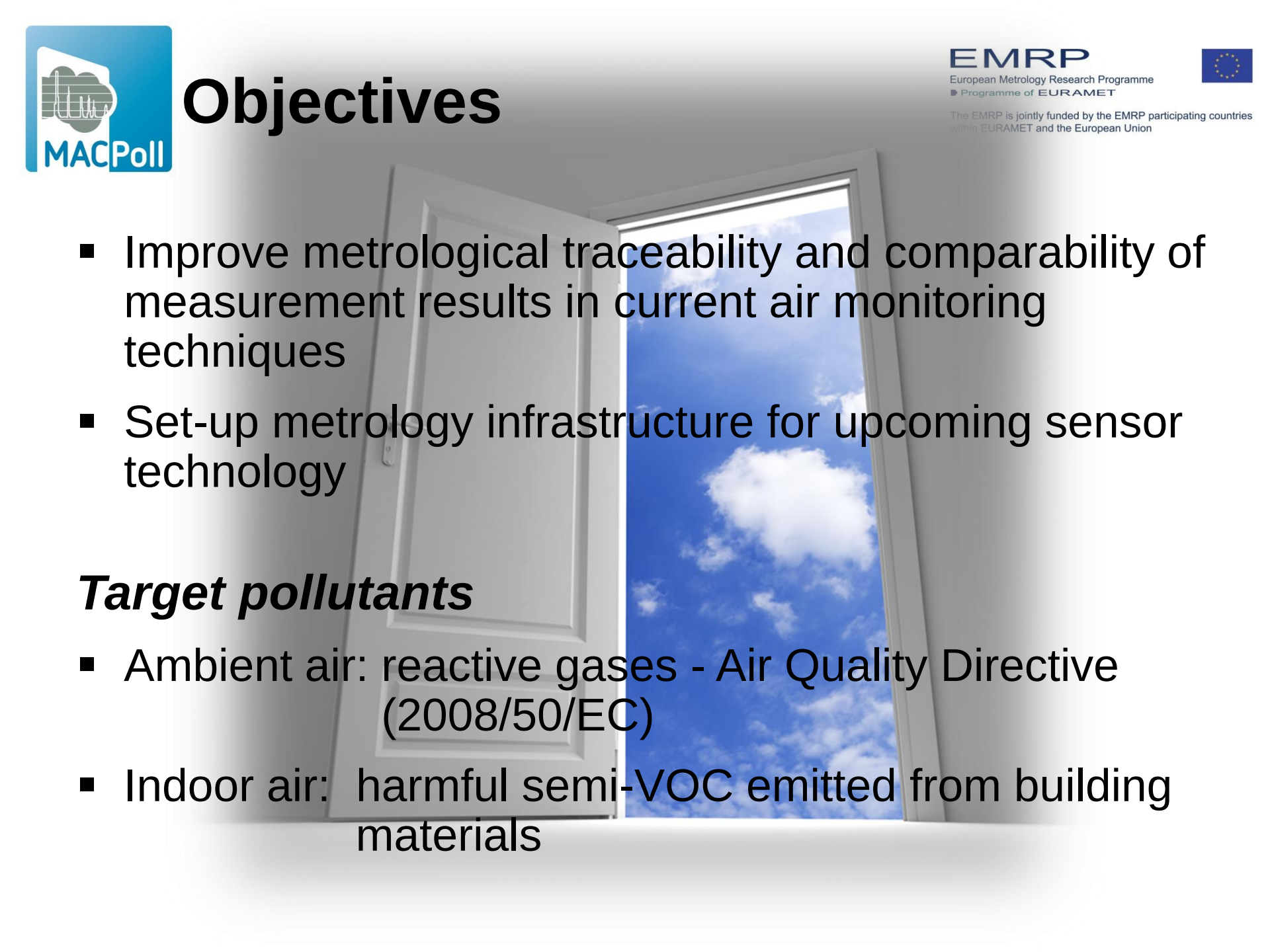

- Improve metrological traceability and comparability of measurement results in current air monitoring techniques
- Set-up metrology infrastructure for upcoming sensor technology

Target pollutants

- Ambient air: reactive gases - Air Quality Directive (2008/50/EC)
- Indoor air: harmful semi-VOC emitted from building materials

JRP structure

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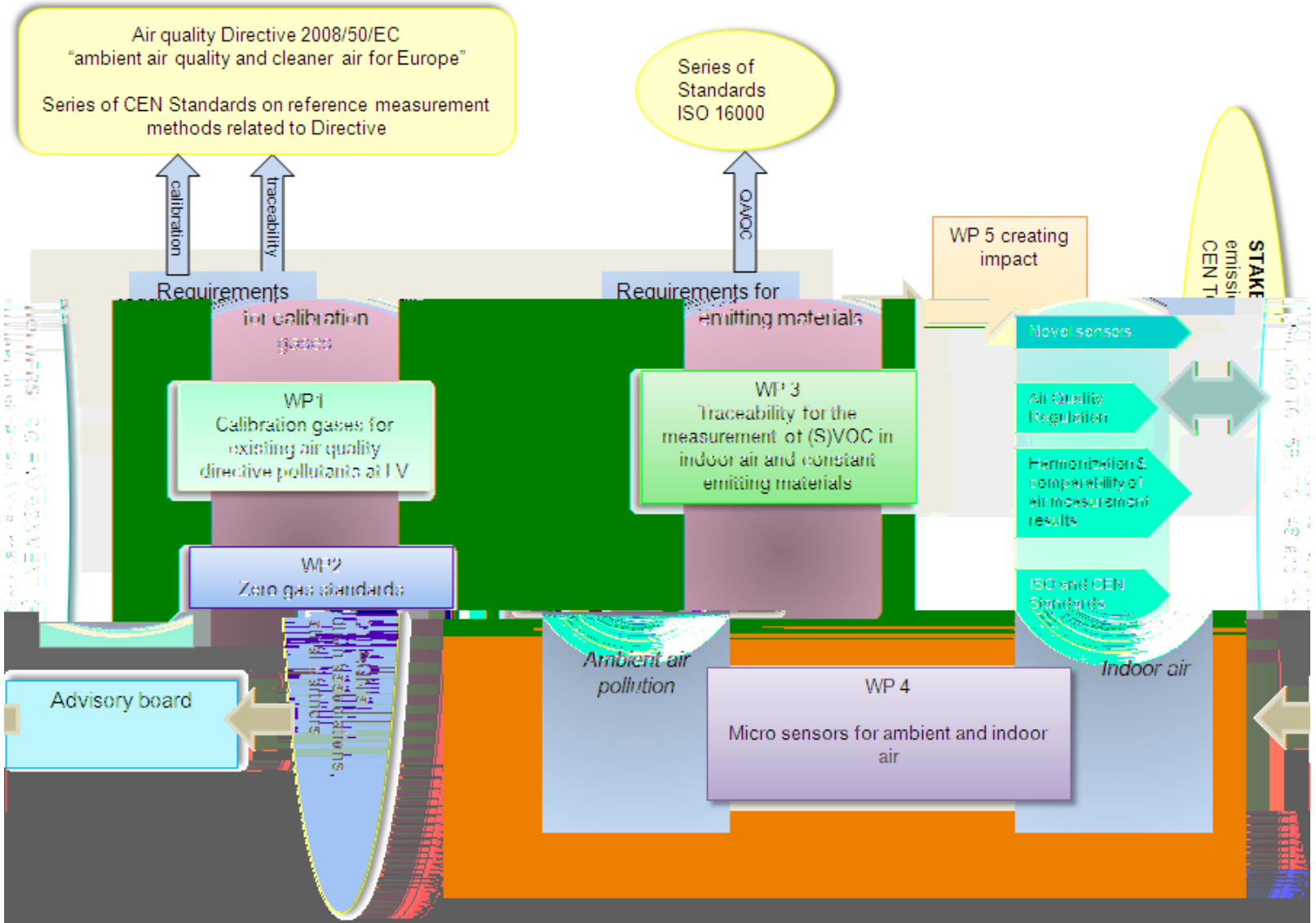

WP1: Reactive calibration gases

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- Focus on SO_2 and NO_x pollutants under EU Air Quality Directive (2008/50/EC)

	Limit Values, nmol/mol	Gas standard, nmol/mol
SO_2	One hour: 132 One day: 47 Calendar year: 8	***40 to 150*** by permeation, static/dynamic dilution and cylinders, **U<3%**
NO_2	One hour: 105 Calendar year: 21	***20 to 100*** by GPT, permeation, dynamic dilution and cylinders **U<3%**

- NO will be used as test gas to validate the work approach

Reactive calibration gases at EU Limit Values

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- Improve static and dynamic dilution methods to lower uncertainty at the Limit Values
  - Permeation (SO_2, NO_2)
  - Dynamic dilution of CRMs (SO_2, NO, NO_2)
  - Static dilution (SO_2, NO)
  - GPT (NO_2)
- Comparison of the generation methods

→ **Preliminary conclusions**

Impurities of pure and zero gases are major factors in the uncertainty of preparation

Zero gas standards

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- Focus on zero gases for the measurement of SO_2 and NO_x
- Typical impurity specifications are listed in CEN standards related to “reference measurement methods for SO2, NO and NO2” (prEN14211 and prEN14212)

Specs zero gas in prEN14211	
Pollutant	Concentration
CO_2	≦ 400 µmol/mol
O_3	≦ 2.0 nmol/mol
NH_3	≦ 10 nmol/mol
Water	≦ 150 µmol/mol
NO	≦ 1nmol/mol
NO_2	≦ 1 nmol/mol

Zero gas standards WP2

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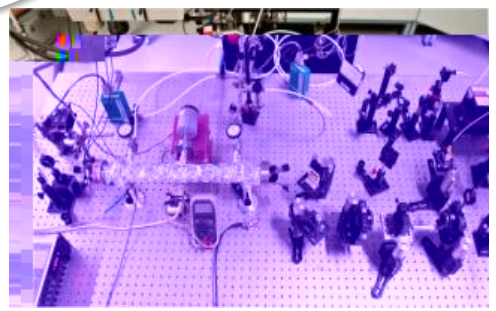
- New measurement approaches for (simultaneous) determination of impurities in zero gas below ppb level
- Classical analytical methods (e.g. chemiluminescence, fluorescence) versus new optical techniques based on laser absorption



Zero gas standards

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Assess absorption effect in measuring reactive gases at trace level (NH_3 case study) by advanced laser spectroscopy

- Use of cavity-enhanced absorption spectrometer able to measure NH_3 in almost real time
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Indoor Air WP3

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- Focus on semi-VOC gas standards (BP >250 ℃)

Compound	Category according to standard ISO 16000-9	Origin
Hexadecane	VOC-SVOC	Paints, flooring material, etc.
Dibutyl phthalate (DBP)	SVOC	Plasticizer; compound of very high concern (ECHA list)
Dimethyl phthalate (DMP)	SVOC	Plasticizer
2-ethyl-1-hexanol	VOC	Carpets, electronic devices
1-methyl-2-pyrrolidone	VOC	flooring material PVC-type;compound of very high concern (ECHA list)
Styrene	VOC	Reference compound

Indoor Air WP4

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- Feasibility of generating standards VOC and SVOC in vapour phase and at trace levels (ppb)
- Preparation of transfer standards in sorbent tubes
- Validation of the measurement method
- Preparation of “diffusion-controlled” reference materials for indoor air applications

Sensors WP4

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- Focus on gaseous pollutants regulated by the Air Quality Directive (2008/50/EC) –suitability of sensors as indicative methods (U<25% for NO_2, U<30 for O_3…)
- NO_2: development and validation of new graphene sensors + validation of available NO_2 commercial sensors with laboratory and field tests
- O_3: validation of available commercial sensors with laboratory and field tests

Sensors WP4

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- 3rd year of project: field tests of a clustered system including NO/NOx/ NO_2, SO_2, CO, O_3 and benzene sensors at 2 field sites
- Protocol to validate the performance of micro-sensors
- Procedure for calibration of sensors
- Measurement uncertainty for NO_2, O_3 and the cluster of sensors
- Limited tests in indoor air

Creating impact

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- Role of the Advisory Board: feed-back and dissemination
- Stake-holders involved in the JRP as collaborators (gas suppliers, sensor manufacturers, university and air monitoring networks)
- MACPoll takes part in the EU Air Policy Review
- Dissemination of project results (articles and lectures)
- Organisation of workshops and trainings