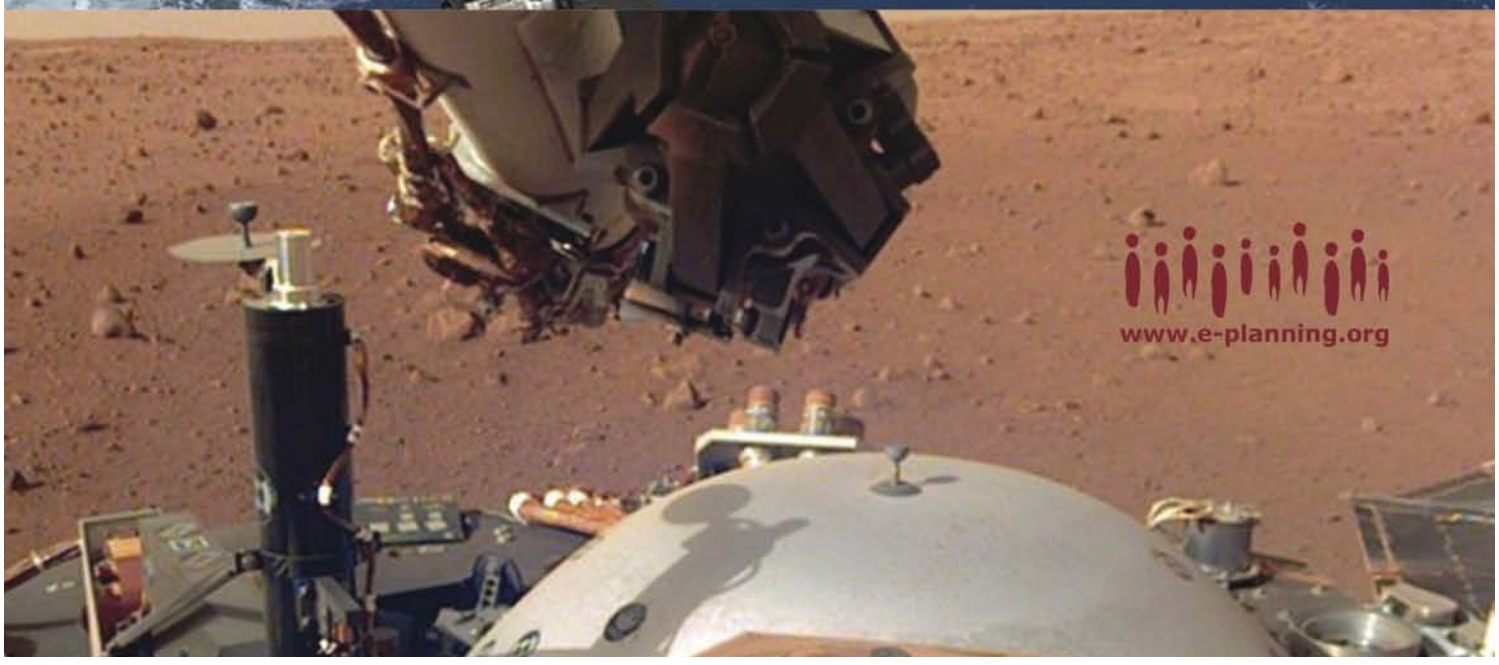
e-Planeamento & Ubiquidade

e-Planning & Ubiquity

Pedro Ferraz de Abreu
et al.



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Preface

The Ubiquity of the new Information and Communication Technologies (ICT), confront our society - and our planet - with potential never before available to the Human species, but also with challenges on an unimaginable scale in the last century.

This is well illustrated by the spatial reach achieved by technological leaps, as is the case of the interconnected Human presence, through its Technology. Not only at the scale of our planet, but connected to neighboring celestial bodies. The common thread exemplified by the probes on Venus and Mars, intermediated by a permanent space station in Earth orbit.

We live therefore an Age in which Humanity has at its disposal knowledge and technology, on a scale and nature as no previous generation witnessed, nor could it anticipate. In particular, information and communication technologies, in some cases in unexpected leaps, with their increasingly ubiquitous presence, show how their intrinsic nature favor accessibility, participation, and empowerment, in a comprehensive and equal way.

And yet, instead of decreasing, social inequalities increase and imbalances in society's relationship with nature are accentuated, even putting the sustainability of human life at risk.

Today, we have evidence of more and more serious abuses of this ubiquity, side by side with its benefits (and the covid-19 crisis is no exception). And yet, the path that technology development has followed, dominated by giant private companies, is presented to us as inevitable. As if the abuses were a "small" price to pay for progress, for the advantages offered, and which will be benevolently corrected.

Is that the case? We will not find the answer in opinionated debates. We need Science.

To identify and characterize the potential of the growing Technological Ubiquity, finding the way to its realization; as well as to understand and judge the new challenges and corresponding risks, the emergence of new scientific areas is essential. This is what gave rise to e-Planning, articulating the in-depth study of the technological leap, especially in ICT, with the study of its transversal impact on the whole of Society.

Which brings with it its own challenges - such as that of transdisciplinarity. Because the articulation of these studies, requires combining engineering curricula with that of social and human sciences.

This is the *leitmotiv* of a Book on e-Planning & Ubiquity.

Roadmap

The structure of this work follows the intent of presenting 5 key sections:

- The Keynote (and its framework) of Prof. Joseph Ferreira Jr., from MIT (Massachusetts Institute of Technology), Dept. Urban Studies & Planning, and co-founder of the e-Planning scientific area, focusing on a remarkable initiative in the international scientific community: the constitution of a new multi-disciplinary College at MIT, as a result of the recognition of the danger of developing technology without awareness of its impact;

- The Roots and Scientific construction of the e-Planning area, as it is important to support the study and interpretation of the phenomena that stand out today, in what was, and continues to be, a solid research work, by those who were able to foresee the dilemmas we face with the new technologies, when many still denied their relevance.

- The state of the art of research and practice in this field, in this edition focusing on cities and territory, and on inclusion and cohesion;

- The potential of the technological leap to promote cohesion and inclusion in regional spaces that benefit from a common language - in this edition, CPLP (Community of Countries with Portuguese Language);

and last, but not least,

- The Challenges of transdisciplinarity, required to deal fully with the challenges of Technological Ubiquity and its transversal impacts.

As the bilingual title indicates, it is our intention to provide a version of the texts in English, *ipso facto* the international language of science, in addition to the version in Portuguese.

In this 1st edition, the predominant language is Portuguese, and all articles or interventions in English have either a Portuguese version, or articles whose content is substantially equivalent. The reader can thus choose to read one or the other, without losing information. While english-only readers have fewer articles, those that are present cover the most substantive issues.

In the 2nd edition, in addition to broadening the spectrum to more of the important topics of Technological Ubiquity (such as privacy and new economic models), the predominant language will be English. This sequence is also intended to give current authors time to write good quality English versions of their work.

Here is the call and challenge.

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4. e-Planning Participatory Science Methodology: The EuroLifeNet Project

Pedro Ferraz de Abreu[1], Emile de Saeger[2] (2009)

[1] CITIDEP, TSG-CAPP, e-Planning Lab, [2] IES-JRC
IES-JRC: Institute for Environment & Sustainability, Joint Research Center (EU)
TSG-CAPP: Research Cluster "Tecnologia, Sociedade e Governança", Centro de Administração e Politicas Públicas, Universidade Técnica de Lisboa.
CITIDEP – Research Center on Information Technologies & Participatory Democracy

* Presented to IES-JRC, CAPP–UTL, and used in part for a FCT-MCES research call, 2009.

Summary

e-Planning transdisciplinary framework was the fertile ground that enabled an innovative approach to a complex problem: study personal exposure to air pollutants in all its multiple dimensions. Health, environment, education, urban planning, mobility, policy-making, regulation, citizen awareness, citizen participation and empowerment, are some of the more evident, but do not exhaust the list. It was the e-Planning approach that noticed first how the technological qualitative jumps (f.i. in sensor and measuring devices) enabled different methods, and thus created the participatory science methodology.

This work derives from 3 documents, produced by the authors in different stages: Document 1 (2009 - based also on earlier documents, between 2005 and 2009), is the core part of a research proposal / application, led by the authors, that was graded as "excellent" but still was not funded; Document 2 (2006) is an executive summary, by Prof. Ferraz de Abreu, of EuroLife goals and participtory science network architecture; Document 3 (2007), with Dr. Saeger as first author, presented preliminary results from an earlier EuroLifeNet project and its relation with policy making. In this work, the first 2 documents were merged, and document 3 is included as an Annex. Together, they provide an useful description of EuroLifeNet and its e-Planning Participatory Science Methodology.

Many researchers, teachers and activists must be credited for the success of this project and its innovative methodology. In particular, relevant input was provided by Luisa Nogueira (air quality), Tania Fonseca (school and student engagement), Melissa Shinn (policy issues, *monitoring fatigue* concept), Patrick Goodman (instruments), among others. EuroLifeNet original design had also valuable input from Isabel Medina (schools, teachers & ministry of education engagement); Anna Gerometta (civic action); António Fernandes (geo-referencing sensor data). Ana Cabral (consumer rights) was a key facilitator connecting IES-JRC with Portuguese partners, and Luisa Schmidt (environmental sociology), brought UNESCO's attention to EuroLifeNet. We are grateful for their contributions.

1. EuroLifeNet goals and strategy summary

More than 600 students between 12 and 18, from 5 regions of Portugal and Italy, were the pioneers in a first school-oriented pilot project of the exciting EuroLifeNet Program. But a research-oriented EuroLifeNet is required to build on this success.

Air pollution in Europe is causing alarming increases in respiratory diseases especially among children. To help policy makers justify difficult decisions on air pollution, scientists need to correlate indoor, outdoor and personal exposure data.

But to gather extensive personal exposure data, through current or new agencies and institutes, is a heavy and expensive burden. This is preventing its large-scale implementation.

Policy makers need also to raise awareness on air pollution, to gain citizen support for good policies. Also, citizen behavior is part of the problem and its educated improvement must be part of the solution.

Leaders agree on the strategic need to promote citizenship. But traditional approaches clearly do not produce sustained results, in schools or elsewhere.

Schools seek to raise the quality of learning through experimental science and promoting social responsibility, but motivating students remains a challenge.

The EuroLifeNet Program brings it all together.

EuroLifeNet's objective is to test and characterize an innovative methodology for the collection of data on personal exposure to particulate matter (PM), in conditions that satisfy the needs of scientists and decision makers: data trustworthiness, sampling coverage adequacy, institutional sustainability, cost effective, and raising awareness of the citizens, in particular young people.

We propose the collection of data on personal exposure to PM2.5 to be carried out by students, using protocols defined by scientists and experts interested in the data (public health and air quality), to better understand the determinants of personal exposure.

These are the base foundation for what we call a participatory science methodology.

EuroLifeNet's strategic goal is to articulate the collection of scientific data with citizen education via their direct participation, giving a priority to young people. Schools of all levels, especially high schools, are key partners.

Students will discuss the data, engage in educational activities on the interaction air quality-public health, sharing experiences and results in interschool meetings.

Their contribution to PM measures may be a model of pro-active citizenship role, contributing to society to improve health and environment for the benefit of all citizens.

The environment-health axis and the promotion of citizenship are strategic priorities of the EU as well the recent decision by the United Nations, proclaiming 2005-2014 the Decade of Education for Sustainable Development (Ferraz de Abreu, P. 2006). These strategic priorities require innovative projects, capable of inspiring enthusiasm and supra-national cooperation.

The EuroLifeNet proposal is built on CITIDEP and IES/JRC experience gained from PEOPLE (Ballesta, P.P. et al. 2006) (Field, R.A. et al 2005) (Cabral, A. et al. 2003) and PEOPLE–Citizenship (Ferraz de Abreu, P., et al. 2004) (Fonseca, T., et al. 2003). Its

architecture is inspired also by other valuable experiences of participatory science (GLOBE-NASA, BOINC – Berkeley Open Infrastructure for Network Computing). We incorporated them in the design of data collection with distributed sources and how to integrate these actions with the school curriculum.

2. Research questions.

The proposed research addresses the main question: Is it possible to collect personal exposure to PM2.5 data, bringing new insights on the factors that impact such exposure, with the required scientific conditions, in a sustainable way, using this participatory methodology?

This large question is closely interconnected with several specific questions in the domains of environment, education and citizenship:

What condition and factors made it possible (if yes) or obstructed it (of not)? What is the added value (if any) brought by the quality and richness of information associated with the data collected for this process? What level of analysis on personal exposure to PM was it possible to obtain with this process? What differences, if they exist, occurred in the different regions? How to carry out curricular integration in such a way as to permit future replication of school participation in these measures? What's the impact of this project on the development of the participative and scientific competences in students and teachers? How do the perceptions of the teachers, students (and their families) evolve, concerning the air quality problem? What operational and institutional relationships facilitated or impeded the process and how? What are the main costs of the operation and could they be sustained long-term? What benefits and consequences may this process have for better monitoring and enforcement of environmental policies and future policy making?

The EuroLifeNet multidisplinary team, which includes key contributors to the current state of the art in these issues, has the unique know-how obtained from conceiving and implementing a first pilot experiment. Therefore, it is not only well placed but also highly motivated to tackle the challenge this research represents.

3. The Problem and Literature review

An increase of respiratory diseases relates to air pollution (APHEIS 2004). Today there is a scientific consensus that it is necessary to obtain, in addition to indexes of outdoor air pollution, data on interior air and in particular personal exposure, in a way that can correlate to public health indicators (Le Tertre et al 2005).

The 2005 report of PEOPLE (Population Exposure to Air Pollutants in Europe) project, led by Emile De Saeger (IES-JRC) and co-authored by Pedro Ferraz de Abreu and other team members, shows that indoor levels of concentration of pollutants like benzene can exceed the outdoor levels by ratios of 2:1.

Pedro Ferraz de Abreu, EuroLifeNet team leader and currently heading the new e-Planning "LabTec for Society" (www.labtec-cs.net) at ISCSP, was a guest scientist at the 2005 APHEIS meeting hosted by IES/JRC, in sequence of his leading work in participatory

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science at PEOPLE and other work (Ferraz de Abreu 2007), and presented this vision of using the potential of the last generation portable devices for PM measuring ~ 300 grams, as enabling a new monitoring paradigm, opening the way for large scale personal exposure (Ferraz de Abreu, 2005). A scientific partnership emerged between CITIDEP and IES-JRC, the exciting concept of EuroLifeNet.

The personal exposure of children is dominated by air pollution concentrations in three microenvironments – home, school, and transport (Ashmore and Dimitroulopoulou, 2009). Although children spend much less time in transport than at home or school, the limited available data suggest this could be an important source of exposure.

The PEOPLE project (Ballesta et al., 2006) showed that school children generally have a higher benzene exposure than control subjects who primarily remain at home or walk locally. This was primarily associated with exposure during travel to and from school, as concentrations in schools were comparable to those in the home, and the personal exposure of children was comparable to that of adult commuters. Indoor exposure to ultra-fine particles has been highlighted as a potential concern for childhood asthma (Weichenthal et al., 2007). Kingham et al. (2008) show that there is a close relationship between the fine fraction (PM2.5) of indoor and outdoor particles.

Diapouli et al. (2007) reported that mean indoor number concentrations of ultra-fine particles in Athens were generally lower than those outdoors at homes, except during specific activities, such as cleaning; however, much higher concentrations were found in car journeys, implying that exposure during transport to school could be a significant contributor to daily mean exposure for many children.

The choice of school and travel mode may thus be an important factor in personal exposure. Policies that allow greater parental choice rather than assigning children to neighborhood schools have implications for CO2 emissions and air pollutants because of the increased travel, and may also influence the personal exposure of children (Wilson et al., 2007).

Current policy often encourages children to walk or cycle to school; besides the safety issues, the implications for personal exposure need to be considered.

This project has also potential impacts concerning the policy making process in environmental and public health issues. The new Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe entered into force on 11 June 2008. This new Directive includes new air quality objectives for PM2.5 (fine particles).

Evidence is emerging that outdoor air quality levels measured in the monitoring networks underestimate the real human exposure as they exclude the effects of indoor air quality. By doing so, past epidemiological studies using these data have overestimated the health effect of air pollutants. Nowadays, one of the major issues that challenge the air quality scientific community is the evaluation of how representative monitoring networks measurements are.

As from 1st January 2009 the new directive (2008/50/EC) will however require monitoring at urban background sites selected for exposure assessment and the same directive will impose limit values also in hotspot locations (in the vicinity of traffic).

If used, these data will lead to an overestimation of the health effect from air pollution. A clear understanding of all the processes contributing to human exposure is therefore necessary to make a correct assessment.

In addition, there are social and governance bottlenecks – such lack of monitoring and enforcement capacities. Increasingly the development or revision of environmental policies are faced with challenges as to the social acceptability of their costs of enforcement, often related directly to the costs of comprehensive monitoring.

As the body of environmental policy grows so do these costs. This can lead to potentially constructive policies being rejected by policy makers due to *enforcement-resource-fatigue*.

EuroLifeNet-like approaches to monitoring and enforcement that reduce the burden on authority resources and at the same time achieve multiple secondary benefits – such as scientific education, environmental awareness raising and participative citizenship education can reduce overall costs to society of performing these activities and reduce policy maker reluctance.

The project team integrates also elements with experience in the formulation, and implementation of the pertinent EU legislation – such as the new Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe - with participation in adoption and implementation structures.

This provides a strong understanding of the importance of the role of data collection in the functioning and implementation of the policy tools foreseen.

Our team has 6 years of experience working together in these issues. We want to contribute further, to open the way to a new paradigm of monitoring.

4. Plan and methodology

The description of a complex, multidisciplinary project cannot be properly described in text-only form. Therefore we attach a graphic diagram (Fig.1) of our measuring strategy. Here we include a summary of the overall plan, rationale and methodology.

This project has 5 components:

1) Environment-air quality (core component), design and supervision of the measure of personal exposure to PM2.5, with selected sets of students from high schools;

2) Education-citizenship (structural), performing the measures, integrating them in the regular curricula and school life, as both a scientific process and a citizenship act, providing a public service and discussing its implications; pointing to a possible certification framework,

3) Environment sociology (observatory), surveying behaviors and opinion shaping;

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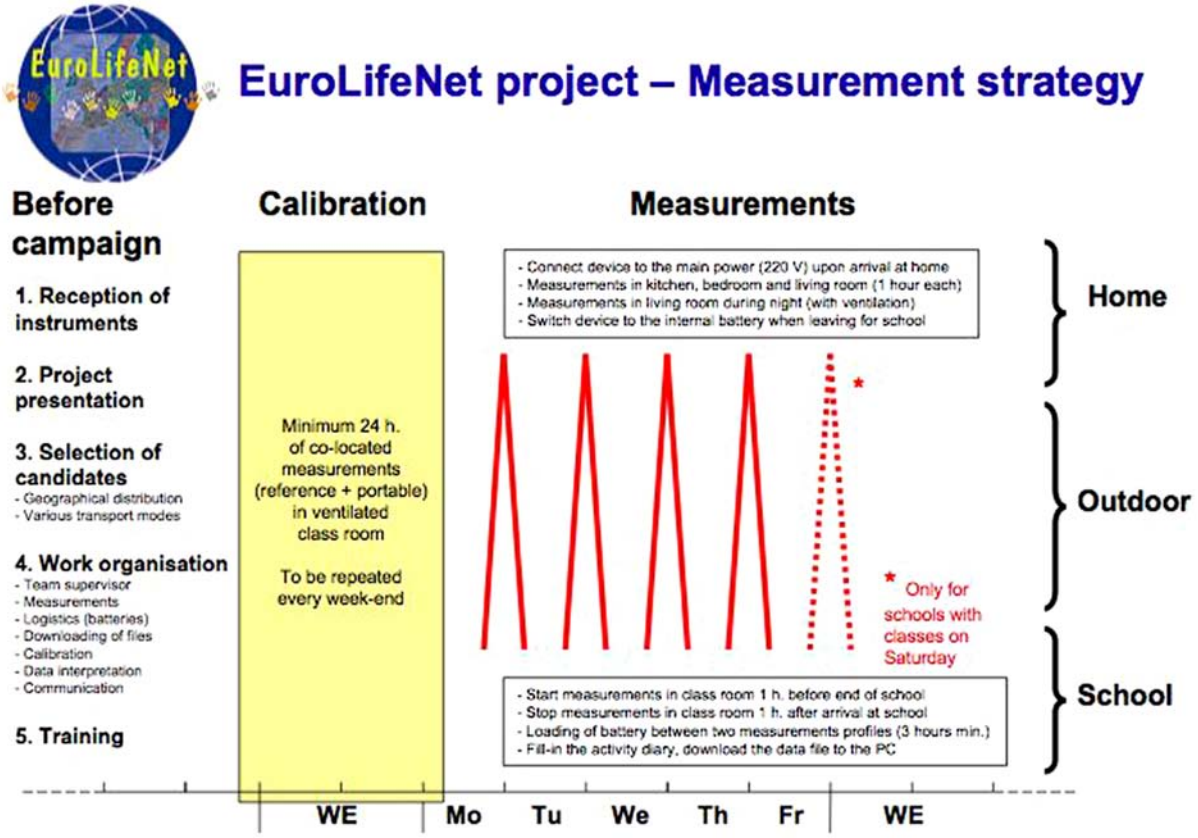
4) Environment-policy-making (institutional), identifying data requirements and policy consequences, and observing the institutional interactions and the potential of looking at high schools as regular sources of real monitoring data;

5) Technological-georeferencing (infrastructure), the glue enabling a participatory science methodology, allowing a combination of cost-effectiveness with wide breath of information and real-time integration and access.

Fig.1 Measurement Strategy



source: Dr. Emile De Saeger, 2009

Hence the different sets of tasks planned to perform. But since all relies on gathering PM2.5 personal exposure data, the master plan is based on its core task; and since the main question is to validate the new proposed paradigm of relying on schools and young students for credible data, the master plan is structured around the school reality, and a sustainable (therefore replicable) compromise between the science agenda and the school's agenda.

Our plan derives directly of our team (and our team leader) unique experience in participatory gathering of similar georeferenced data, and of integrating this with the school reality (PEOPLE, and first EuroLifeNet pilot).

Core plan rationale.

Our measure strategy derives from known factors that we need to characterize and understand better: Indoor PM2.5 sources include cooking, burning wood or fuel for heating, and smoking. Outdoor most important PM2.5 source is car traffic. While PM can travel a long

distance through the atmosphere, higher concentrations usually occur near traffic. We can therefore expect to find higher exposure of citizens to PM2.5 when they are commuting, whether by car / bus, bicycle, or walking along the roads.

According to several authors, continued exposure to high levels of PM2.5 even in short periods of time, originates chronicle health effects. Hence, the importance of methods that enables to study in detail these situations. From these factors, arise our main criteria for selecting sets of students and our measure strategy.

But we need also to better understand the factors that influence the relationship between levels of outdoor concentration of PM2.5 in indoor levels and personal exposure. This implies to evaluate similarities and differences between PM2.5 levels and characteristics in different microenvironments, and in which way individual activity patterns influence personal exposure.

It is easy to understand why until now such kind of data on personal exposure to PM were rare and of limited scope; equipment was heavy, and traditional measure paradigms called for expert teams and agencies or consultants, therefore extensive data was out of reach – either from budget and\or human resource limitations.

This is why we think EuroLifeNet proposed paradigm, if proven credible and effective, could mark an authentic revolution in providing science – and policy-makers, with a wealth and scope of critical information, that was out of reach until today.

The equipments we use, can measure levels of integrated concentration of PM2.5 on the order of 30 exposure secs. These very short periods enable to evaluate different personal exposure depending on different daily routines, the presence of tobacco smoke, and different transportation modes used by students.

Using a combined PM2.5 analyzer and GPS, we intend also to better understand the spatial and temporal distribution of the data.

The plan.

The project has a planned duration of three years and implemented in four schools in three different regions of Portugal: north rural (Ponte de Lima), in two zones of the Área Metropolitana de Lisboa (Lisbon/Almada) and on an island (Açores – Ilha Terceira).

In periods of 24 hours, selected students from each school will carry a portable optical PM2.5 monitor and a GPS. They also keep a 'location/activity diary' about the microenvironments and places they have been in and activities they performed to provide support for the analysis of the graph produced by the device and the observed exposure levels.

This graph analysis is a powerful tool, both in terms of science and education for understanding the roads that lead to increased exposure.

The students participating in the project will be selected to represent the different exposure vectors (home location, living habits/passive smoking f.i, transportation modes, behavior like smoking/non smoking, different in-door and door activities, etc.) typical for the citizens

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living in their area. The exposure of students is representative of exposure of population at large. A gravimetric PM2.5 sampler will be placed in the school, to allow for calibration of the optical PM2.5 monitors.

The work plan is divided In 4 phases:

1. the general preparation phase to all activities;
2. the periods of personal exposure evaluation campaigns;
3. periods of post campaign evaluation and
4. treatment, discussion and awareness of the final results.

In the first phase (September to March), emphasis will be given to the preparation of the detailed monitoring strategy and logistics of the campaigns and training of teachers and students in handling the equipment (GPS, PM 2,5); the production of education material; create interactive activities and dialogue between schools, between students, teachers and researchers.

In each school 4 campaigns on personal exposure to PM 2.5 will be carried out each with the duration of 2 weeks, in two distinct periods of the year (April, May and November, December).

The timing april/november is a compromise between the scientific interest in summer/winter data sets, and the school calendars that optimize student and teacher engagement, therefore, realistic conditions for a sustainable strategy of using schools to gather this data with higher coverage.

Intercalibraton exercises between the portable equipment (SidePak) and the reference equipment (sequential PM 2,5 sampler) will be carried out at the weekends. In order to improve the quality of the measurements we will apply daily calibration over a 24h-period with a permanently located optical sensor next to a sequential PM2.5 sampler.

In the Metropolitan Lisbon area, where we have available adequate data and resources, EuroLifeNet results will be compared to the existing air quality “fixed” monitoring network, to analyze how much this network may provide a representative picture of the personal exposure of the citizens in the area, and the influence of outdoor pollution in indoor exposure.

We intend to assess and fine-tune our plan between campaigns; hence the 4 milestones set.

From our past EuroLifenet experience, while without such research context, we gathered valuable insights on where to expect major hurdles and bottlenecks. The proposed EuroLifeNet project will allow assessing if these problems were circumstantial, or structural, and extract from the experience a clear set of guidelines for the future.

We have also the advantage of starting already with a previous set of data, collected during the pilot experiment. While it lacks the rigorous context that we will provide for the proposed project, since it did not have either the resources or conditions, these initial sets of previous data will allow scientists, teachers and students to use the first year to discuss, in concrete terms, both data and methodology.

The final outcome of the core component will allow the development of a statistical exposure model, allowing the researcher to associate exposure factors to specific activities and micro-environments, allowing simulation and prediction of the exposure of citizens and the calculation of associated health risks.

To help us to access, by the end of the project, whether we reached conditions that satisfy the needs of scientists and decision makers (with the required data rigor and trustworthiness, sampling coverage adequacy, financial and institutional sustainability and raising awareness of the citizens, in particular young people), we will collect several internal and external indicators, such as described in the tasks, and in particular a ratio of data collected by students, versus data validated by experts.

5. EuroLifeNet strategic design and network architecture

EuroLifeNet addresses two strategic priorities in the European Union: the Environment-Health critical relationship, and fostering Citizenship. EuroLifeNet also responds to UN's Decade of Education for Sustainable Development. These priorities require inspiring, innovative projects.

EuroLifeNet is conceived as a long-term Program (fitting UN's decade time-frame), with a series of specific, focused projects, which respond to concrete requests from the scientific community and policy-makers. Each project is therefore to be dedicated to a subset of data indicators and related public awareness-raising themes and priorities.

CITIDEP presented for the first time its EuroLifeNet proposal the 26th May 2005, in Ispra, Italy, at the APHEIS [8] meeting hosted by the Institute for Environment and Sustainability (IES) of the Joint Research Centre (JRC) of the European Commission (EU).

Thanks to the immediate interest and support of the Emission and Health Unit of the IES/JRC, EuroLifeNet first pilot project was designed to measure particulate matter (PM 10 or 2.5) and raise awareness on air pollution.

As mentioned above, EuroLifeNet builds directly on CITIDEP and IES/JRC rich experience with PEOPLE [9] and "PEOPLE-Citizenship [10]" projects.

Its design is also inspired by other recent experiences of participatory science that were equally successful (NASA's GLOBE [11], Berkeley's BOINC [12]).

Here we describe briefly the EuroLifeNet Program strategy and network architecture, applied to the first pilot project – EuroLifeNet-PM.

[8] APHEIS - Air Pollution and Health: A European Information System (www.apheis.net)
[9] PEOPLE - Population Exposure to Air Pollutants in Europe (www.people-pt.net) (www.citidep.net/people/)
[10] P.E.O.P.L.E-Citizenship (www.citidep.net/act/peoplecitidep.html)
[11] GLOBE, NASA (**http://www.globe.gov**)
[12] BOINC – Berkeley Open Infrastructure for Network Computing (boinc.berkeley.edu)

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EuroLifeNet as a simple, sustainable concept, for a long-term program:

In each School in the EuroLifeNet, groups of students lead by a teacher will "adopt" an **"EuroLifeNet Node",** and keep a regular record of indicators measured on this Node.

- Node ID: School, GPS Long/Lat/Z, type
- Nodes may be indoor or outdoor
- Bio-Physics measures at the Node
- Socio-economic measures in a circle (or grid) centered at the Node
- Composite data (tracing data around the node, eg. students carrying sensor 24h measuring personal exposure, with diary)

All **"EuroLifeNet Nodes"** share their data at multiple scales, "feeding" different uses and agregate levels. In many cases, procedures can be incorporated in curricula.

- Adoption of common data protocols
- Data validation procedures with institutions
- Sets of tool kits for schools and teachers
- Use of integrating tools and architectures*
- Events inter-schools and public awareness
- Scalable + modular, easy procedure to join

EuroLifeNet

ENVIRONMENT - HEALTH - CITIZENSHIP

EDUCATION FOR SUSTAINABLE DEVELOPMENT

www.eurolifenet.org

Pilot Project with focus on Particulate Matter (PM 10 / PM 2.5)
The goal is to contribute to EU (APHEIS, JRC/IES) Environment-Health Strategy and to the United Nations ***"Education for Sustainable Development" Decade***

Scientific Coordination by IES-JRC

10 Schools in EU, distributed East-West, North-South, urban and non-urban

Portable PM samplers + local station (right)

Local partnerships with Schools + Gov/PAd + Environment/Healh Institutions + NGOs

Funding application to EU Programs and National funding sources (public & private)

EuroLifeNet

ENVIRONMENT - HEALTH - CITIZENSHIP

EDUCATION FOR SUSTAINABLE DEVELOPMENT

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IES-JRC will equip*[13] EuroLifeNet schools and coordinate scientific procedures

Students carry portable PM sampler (right), a portable GPS and make a 24h diary

One student at a time, with different habits and trajectories, will provide a rich map

Other associated projects may benefit from this pilot EuroLifeNet project, and amplify it

The electronic nature of the portable samplers allows for easy data extraction, network sharing and analysis. Together with a diary and GPS data, this becames a powerful tool both for scientists and teachers.

[13] EuroLifeNet promotes local partnerships with Air Quality Agencies, to foster building local capacity

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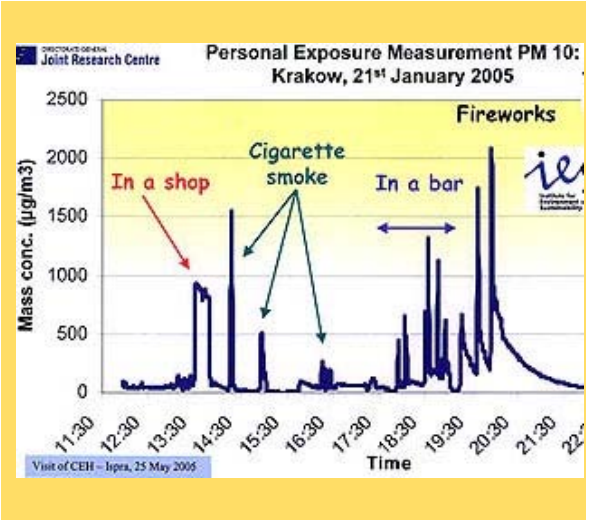


Summing up,

The Environment-Health-Education approach optimizes sinergies:

1. To help policy makers justify difficult decisions on pollution, scientists need to correlate public health indicators with indoor, outdoor and personal exposure data, and improve continuously data quality and comprehensiveness. Schools and students are a resource already in place, able to contribute to some of these requirements, thus minimizing costs.

2. Any investment in School equipment and Teacher training for this purpose is a double gain, adding to School resources that improve quality of education.

3. Involving students in the data gathering is a triple gain: scientists get valuable data, class curricula becomes more motivating for students in their role as serious partners in the pollution analysis and, **as "co-authors" of the scientific data, they become champions of its use for extracting real consequences, raising their personal awareness**, as well driving the raise of educated public awareness through their parents and local community.

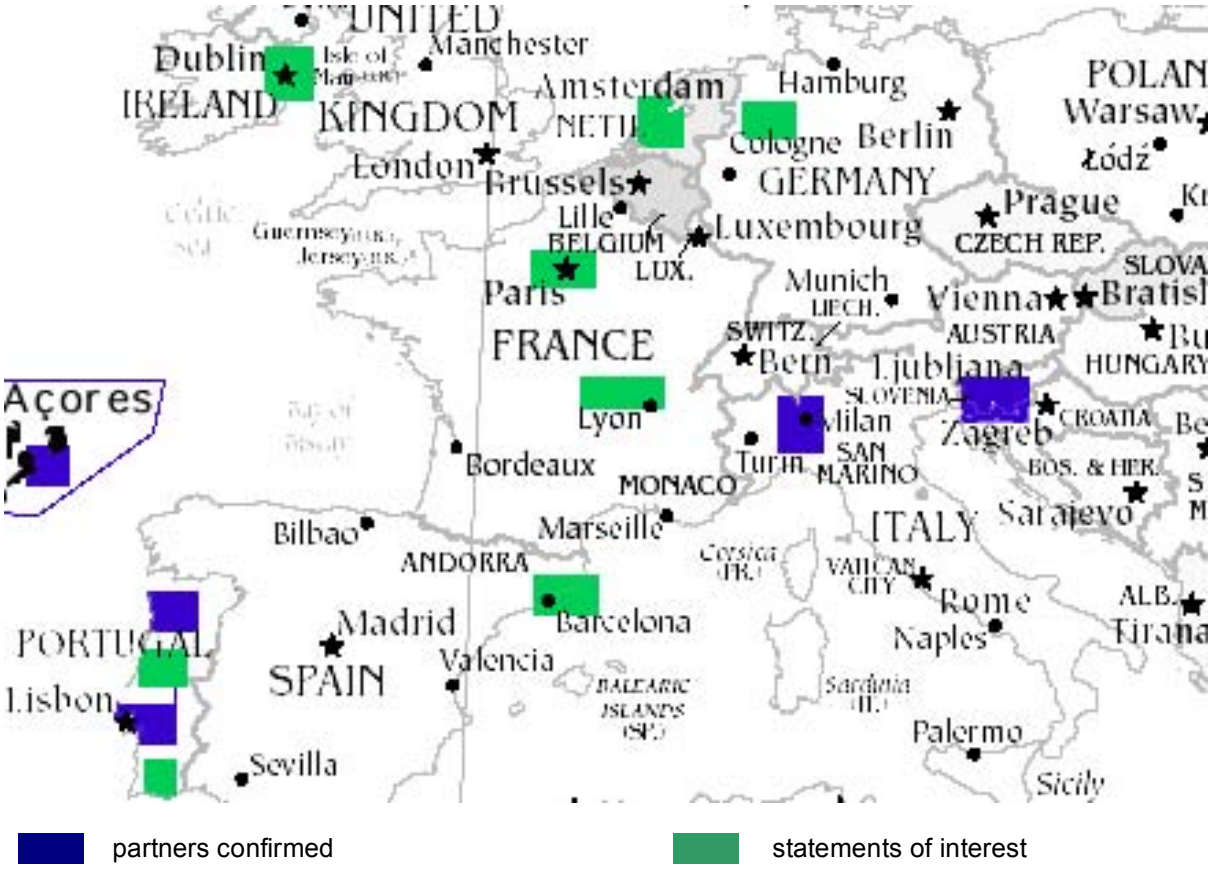
6. EuroLifeNet Pilot Project Partners.

Europe: CITIDEP leads the Operational Program, IES-JRC leads the Scientific Process.

Portugal: 3 regional clusters (Lisboa, Açores, Viana), with 6 highschools, 4 universities, 1 research center and 1 ministry agency (environment); pilot project was led by ESE-IPVC

Italy: 1 regional cluster (Milan), with 3 highschools, 1 medical and research center, 2 non-governmental organizations (environment, transportation); led by Genitori Antismog di Milano.

More than 600 students, 50 techers provided hundreds of PM2.5 daily profiles. Data is being processed, and preliminary results were already presented in 2007.



source: http://www.eurolifenet.org/ * email: pfa@mit.edu

In Portugal, the Secretaries of State for Education and for Environment have stated their support to EuroLifeNet. The UNESCO Committee in charge of implementing United Nations resolution 57/254 (Decade of Education for Sustainable Development), presented EuroLifeNet as an example of good practices.

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EuroLifeNet Project

Preliminary Results from 2006 and 2007 Campaigns
Political and Scientific Context

www.eurolifenet.org

1 June 2007

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Background: Proposal of new EC directive on air pollution by Particulate Matter (PM)

- There is a change in the philosophy of the European Commission's Air Quality policy. In the past, air quality directives were imposing limit values not to be exceeded. Today, with the new air quality directive proposal that is currently in discussion at the European Council and Parliament, it will become necessary, in addition to the respect of the limit values, to reduce as well the levels of exposure of the population.

- This new directive, expected to enter in force in 2010, will impose, in addition to a new limit value for PM10, the following requirements for PM2.5 (PM 2.5 are the smaller particles with a diameter lower than 2.5 micrometer, that can penetrate deeper in the lungs and are more toxic than PM10):
  - a yearly limit value of 25 micrograms per cubic meter not to be exceeded anywhere;
  - a 20% reduction of the levels of exposure of the population, to be achieved between 2010 and 2020.

- The Joint Research Centre, as Directorate General of the European Commission responsible for providing technical and scientific support to the development and implementation of European Community policies, has therefore started a number of activities in support to this new directive proposal, under the EuroLifeNet project.

JOINT RESEARCH CENTRE EUROPEAN COMMISSION	ies Institute for Environment and Sustainability	IES-JRC - Institute for Environment and sustainability of the Joint Research Centre of the European Commission. CITIDEP - Research Center on Information Technology and Participatory Democracy.	CITIDEP

Objectives of the EuroLifeNet project

The EuroLifeNet project was carried out as a pilot study supporting this new directive, with the following objectives:

- to make an assessment of the current PM2.5 exposure levels in a number of representative areas in Europe. A series of pilot measurement campaigns were conducted in areas ranging from low to highly polluted areas (from continental background like Açores Islands, rural areas in north of Portugal, moderately polluted city with Lisbon and highly polluted agglomeration with Milano).

- to understand the routes, i.e. the outdoor and indoor locations as well as the activities that lead to increased exposure of the citizens, with the perspective to establish the most efficient strategies to reduce exposure, to be implemented at local level.

- to raise the awareness of the citizen on the health risk of air pollution and on the impact of life style and personal choices on exposure. In the past air pollution was mainly caused by industrial emissions. Today industry has strongly reduced its emissions. In a city, about 90% of the air pollution is caused from emissions generated inside of the city, with 60 to 80% coming from automotive sources, and the rest from heating. Today, each citizen is contributing directly to the air pollution levels in his city, and his life style and personal choices have a direct impact on the air quality that he is breathing.

Project description

- This project was carried out by using optical sensors that register every 10 seconds the concentration levels in the air of fine particles (PM2.5) to which students are exposed during the normal activities during a day in their life: in the street, in the car, in public transport means, at home or at school. This approach allows to assess in a more precise way the real exposure of the population and to give information to the citizen on the specific locations, activities and behaviors that may lead to increased health risks.

- The measurement method is based on the use of small, portable and easy to use devices (weight 300 gram), that provide reliable result if properly and regularly calibrated.

- Students were invited to assess their personal exposure during one day of their life, making measurements at school, on the way from school to home and back, during specific outdoor and indoor activities, and at home. The students were selected to cover a range of different exposure routes, like different living environments across the city, different transport modes (foot, bike, motorbike, public transport, car), different life style and personal choices (active and passive smoking, specific indoor/outdoor activities, home ventilation).

- The Eurolifenet project is a joint initiative of CITIDEP – Research Center on Information Technologies and Participatory Democracy, and the Joint Research Centre, Institute for Environment and Sustainability, with the support of many partners (see partner list), and carried out in collaboration of 3 schools in Milan (Italy), 2 schools in Lisbon, 1 school in Almada, 1 Povoa do Varzim, 1 in Ponte de Lima, and 1 in Angra do Heroismo, Açores (Portugal).

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Main results of the EuroLifeNet campaign

- From the comparison between the data from the fixed air quality monitoring network and the personal exposure measurements, it appears that the student's exposure is to 50% a function of the external air quality, and to 50% conditioned by life style and personal choices.

- The outdoor air quality in a city changes with the location, but essentially depends on the proximity of the traffic emissions. The air quality in a larger agglomeration is therefore not homogeneous, and exposure levels that derive from the external air quality may vary strongly over the city.

- Aspects in life style and personal choices that mostly affect exposure liked to the means of transportation and the smoking habits. Traveling in busy roads during hours with intense traffic increase exposure dramatically, for all means of transport that are considered. Smoking and passive smoking in indoor environments is responsible for the highest exposure levels, that can last for hours.

- In general there is a good agreement between the measurements made in the stations of the air quality monitoring networks and the exposure measurements. The quality monitoring network provides a good estimation of the global exposure of the general population in 24 hours, whereas the data obtained in the EuroLifeNet project give a more detailed information on the locations and activities that are leading to increased exposure levels. Both approaches provide complementary information: the monitoring network allows to control the compliance of limit values; personal exposure data are giving more detailed information and allow to better understand the exposure process.

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