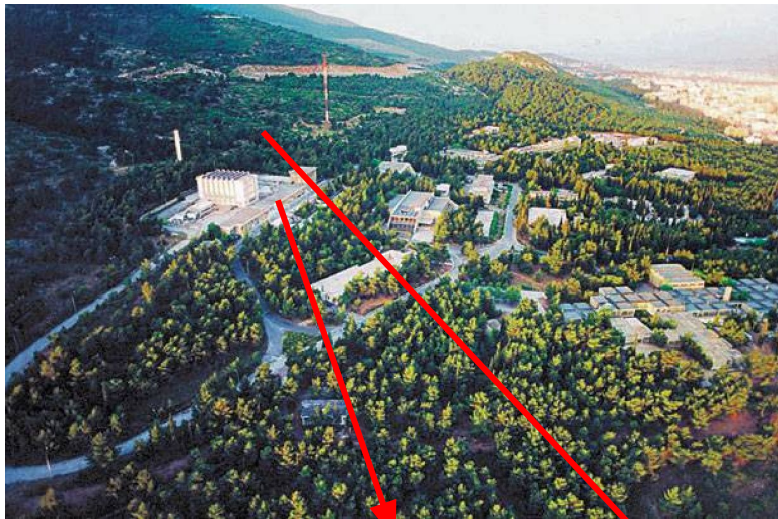# *Collaboration proposal between NCSR "DEMOKRITOS" & Almaty KAZAKHSTAN*

Dr. Thomas Maggos, Senior Researcher

Almaty January 2017

Who we are

- The National Centre for Scientific Research "Demokritos" (NCSRD) is **the largest and most acclaimed research center in Greece**, employing over 1,000 researchers, engineers, technicians and administrative personnel. It is a **multidisciplinary research center** focusing on several fields of natural sciences and engineering and hosting important laboratory national facilities. **The main mission of the center is conduct of basic and applied research**, develop specialized **"know-how"** and contribute to the social and economic development of the country, offer customized high technology services to the public and private sectors. **The NCSR is a self-administered governmental legal entity**, under the supervision of the General Secretariat of Research and Technology of the Ministry of Education, Research and Religious Affairs.

What we do

Environmental Research Laboratory provides research activities and service provision in the field of air pollution and environmental protection, through R&D projects and contracts with National Authorities, industries, public and private companies respectively.

The activities of the lab are focused on **four main actions:**

- **Indoor and Outdoor Air Quality**

- **Impact of air pollution in Human Health**

- **De-pollution Technologies (Photocatalysis)**

- **Advice and Policy support on Environmental issues**

QA/QC

- EREL is accredited by the Hellenic Accreditation System S.A (ESYD) under the terms of ***ELOT EN ISO/IEC 17025:2005 Standard***, to carry out the following tests:
- Sampling and determination of PM10
- Determination of PAHs-collection on sorbent backed filters with GC-MS analysis
- Pumped sampling and analysis of benzene by GC / TDS

What we do (I)

- **Indoor and outdoor Air Quality**

  *The current action focuses on the assessment and improvement of **indoor and outdoor air quality** through:*

- Airborne Particulate Matter (TSP, PM_{10}, $PM_{2.5}$ and PM_1)

- Volatile Organic Compounds (n-alkanes, aromatic H/C, aldehydes and ketones, sulfur compounds etc) sampling and analysis.

- **Chemical characterization of PM** for the detection of OC/EC, ions and PAHs and cross-correlation with atmospheric pollution indicators in order to estimate their origin.

- **Receptor modelling application** (Principal Component Analysis, Positive Matrix Factorization, Chemical Mass Balance, ME etc) for **the identification of sources and quantitative assessment of their contribution.**

- Continuous inorganic compounds measurements (NO_X, SO_2, O_3, CO, CO_2)

- Isokinetic stack sampling for the determination of air pollutants emissions from industries

- Meteorological measurements (WS, WD, T, RH) in order to investigate the role of meteorology to the recorded air pollutants' values.

- Based on the above field measurements and using mathematical models we **perform calculation of atmospheric pollutants dispersion in industrial and urban areas**

- **Assess the impact of Air Pollution on Human Health**

  Estimation of the local population exposure profile

- This action aims at deriving exposure profiles representative of population subgroups, which will be used to quantitatively estimate the associated adverse health impact of the major air pollutants. To this aim an Agent Based Model (ABM) platform is used.

- The concentration-response functions established by WHO in the HRAPIE project will be used for the health impact assessment of the major air pollutants.

What we do (II)

Photocatalysis (de-pollution technology)

- This action, aims to **provide support to policy makers and authorities** at a regional and national level in relation to the large scale **application of photo catalytic materials** as a means **for the improvement of the air quality** in the coupled indoor – outdoor environment.

- The photo catalytic remediation approach will be efficient in achieving levels of air quality that do not give rise to significant negative impacts and risk to human health and the environment.

- By providing such an assessment, we will provide a basis for **encouraging local authorities to adopt a more integrated approach** to urban management by informing stakeholders to use those techniques and methods which have been positively assessed and have successfully been tested in projects for their performance. Thus, it constitutes a **new, alternative means for the effective reduction of airborne agents** in indoor and/or outdoor environments improving this way our day-to-day life, while at the same time contributing to coordinated efforts for the promotion of *Innovative Clean Air Technologies*.

- The current action focuses on laboratory and real scale applications of innovative titanium dioxide containing materials for testing the **degradation of air pollutants** in the urban and indoor environment.

APPLICATION OF TiO$_2$ PHOTOCATALYTIC PROPERTIES ON ATMOSPHERIC DEPOLLUTION

The use of TiO$_2$ in building matrix or surface coating could give to the material **self cleaning** and **depolluting activities**

Such materials, when exposed to solar UV rays, will act as a catalyst for the photo induced decomposition of inorganic and organic molecules adsorbed on its surface.

The Method of NOx Removal

- **Photocatalysis** by semiconductor particles provides a very promising solution for **pollutants removal** compared with other technologies

–Pollutants are oxidized

–Energetically interesting process:

- It operates near ambient temperature
- Use solar energy to initiate photocatalytic reactions

- **TiO$_2$** is considered to be the most promising photo catalyst for the treatment of air pollutants due to:

- its highly strong oxidative ability even at low U.V irradiati
- chemical stable material
- non toxic
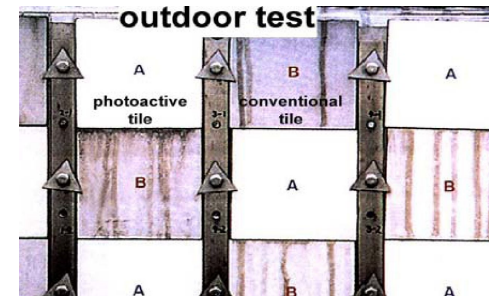- its very common and relative cheap
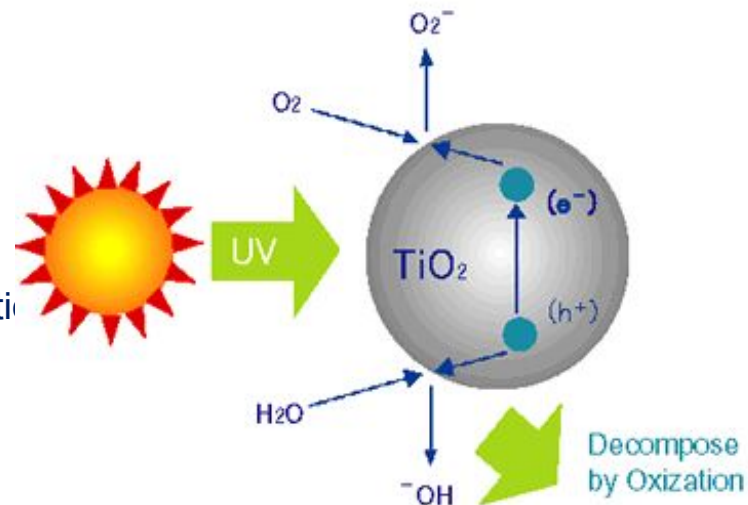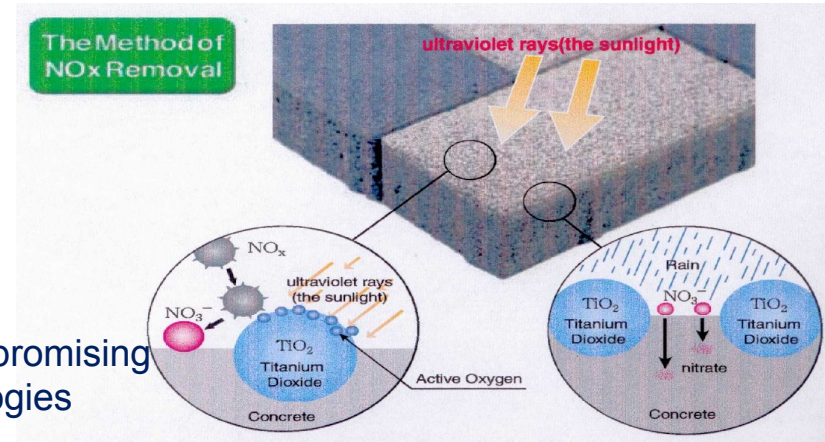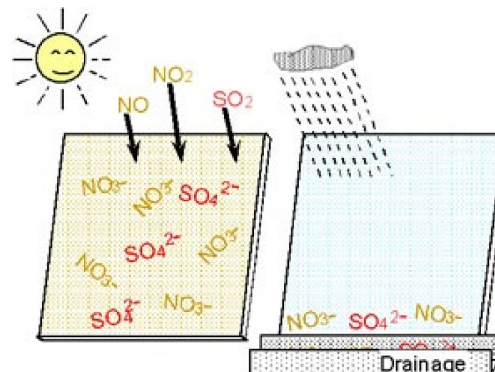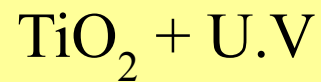
Application of TiO$_2$ Technology

Antidazzle

Antibacterial

Self cleaning

Water cleaning

TiO$_2$ + U.V

Air pollution removal

What we do (III)

Materials' ability to degrade air pollutants are examined through their competence to photocatalytically decomposes them under controlled external conditions.

Within a **Specially Designed Reactor**, the evaluation of the materials' photocatalytic performance is carried out through the **calculation of certain photocatalytic and chemical kinetics parameters**. Additionally, the mechanisms of the chemical reactions taking place between nanomaterials and gaseous pollutants are investigated.

For the needs of the photocatalytic experiments, EREL has constructed a $0.125m^3$ stainless-steel, cubic photocatalytic reactor according to the provisions of the ISO standard. The reactor:

- is light-sealed to avoid possible light interference
- is equipped with two cubic glassy environmental chambers of $0.001 m^3$ and $0.125 m^3$ volume capacity
- is equipped with up to 10 (UV or Vis) lamps for the provision of irradiation
- is equipped with two fans to prevent temperature fluctuations
- can operate under both dynamic and static conditions
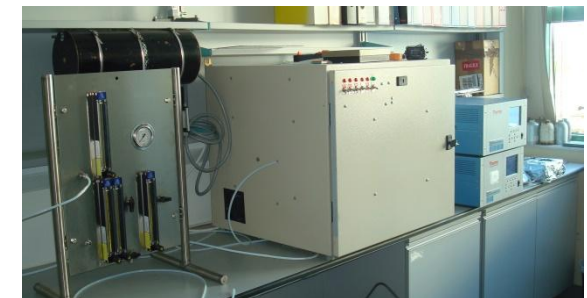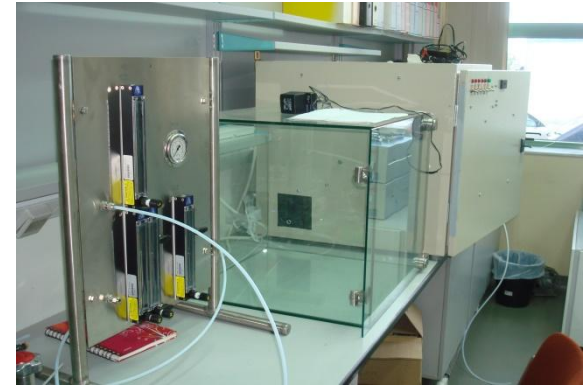
Participation in various European projects funded by EC

- ***Horizon2020-SC5-04-2015** (Grant Agreement No 690105, 2016-2020)*: "Integrated Climate forcing and Air pollution Reduction in Urban Systems" (**ICARUS**). Budget: 6.472.015,00 €.

- **FP7-ENV-2013** (Grant Agreement No 690105, 2013-2018) Health and Environment-wide Associations based on Large population Surveys **(HEALS)** Budget:11.514.483,78 €

- **FP7-REGPOT-2013** (Grant Agreement No 690105, 2013-2015) Enhancing the Capacity for Environmental Technology & Climate Research **(EnTEC)** Budget: 2.736.953,00 €.

- **FP7-REGPOT-2009** (Grant Agreement No 229773, 2009-2011) - Enhancing the Research Potential of the NCSR "Demokritos" Environmental Research Laboratory in the European, National and Regional Research Areas **(PERL)** Budget: 797.000,00 €.

• **Participation in various European projects funded by EC**

- *CEN/TC264/WG15 (*2013-2015) Standardization mandate to European Commission CEN, CENELEC and ETSI in support of the Implementation of the Ambient Air Quality Legislation Budget: 390.000,00 €

- **LIFE+11-ENV** (2012-2016) Testing and Development of air quality mitigation measures in Southern Europe **(AIRUSE)** Budget: 1,138,861 €

- **LIFE+09-ENV** (2009-2014) Development of A Cost Efficient Policy Tool for reduction of Particulate Matter in AIR **(ACEPT AIR)** Budget: 836,449 €.

…and beyond EU
- *Ministry of Health, QATAR* (2015) Provision of Consultancy Services and Analysis of Indoor and Outdoor Air monitoring stations' filters in Doha, Qatar

Environment & Health company

Envionian is located in the Technology & Science Park of Attica (TE.S.P.A) **"Lefkippos"**

✔ is **established in the campus of NCSR "Demokritos"** in Aghia Paraskevi of Attica since 2009

✔ TESPA "Lefkippos" owns a new building of an area of 1760 m^2 (with 50 incubators from 20m^2 to 45m^2 each)

✔ The objective of TE.S.P.A "Lefkippos" is to support the **development of new companies** and to reinforce their effort to exploit commercially innovative ideas and high-end technologies in close collaboration with NCSRD Labs.

Who we are

ENVIONIAN is a start-up company whose team is comprised by **experienced young and senior engineers and scientists** in the field of environmental research.

ENVIONIAN is leading the way in delivering a diverse range of services, knowledge and insight to clients across a number of sectors. It provides a **global management, engineering** and **development consultancy** adding value for public and private clients on agenda-setting.
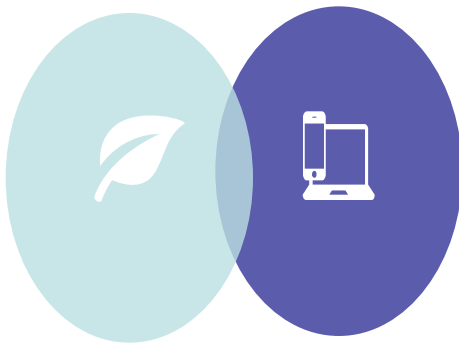
ENVIONIAN's aim is to provide certified and tailored services in the field of **air quality in working, living and ambient environments**, to **assess the health effects of human exposure to indoor air pollutants**, to **study the mechanisms of human exposure** (i.e. intake, translocation, clearance) through fluid mechanics models and to provide the most effective and efficient solutions.

![ENVIONIAN - Research | Innovation | Enviromental Technology]

What we do

ENVIONIAN main activities are focused on:

✔ Elaboration and implementation of research and innovation activities;
✔ Consultation on governmental research and innovation policy issues;

Machine Learning	Environmental Measurements	Human Health	Research Projects
Development of Computational Tools (Machine Learning System) for the on-line management of a range of environmental parameters	Identification of air quality problems, performing comprehensive chemical analysis and suggestion of effective and efficient solutions to industry, government agencies and local authorities	Environmental research focused on air quality and health related effects	Management of European and national research projects

ENVIONIAN also provides:

✔ Development of an Integrated Air Quality Monitoring Action Plan;

✔ Studies to assess the health effects of human exposure to indoor air pollutants;

✔ Integrated and advanced services in the field of air quality in working, living and ambient environments;

✔ Laboratory and real scale applications of innovative photocatalytic building materials for testing the removal of air pollutants in the urban and indoor environment;

✔ Advanced studies in the field of photocatalytic materials through in-vitro experimental studies and in relation to pollutants that effecting human diseases;

✔ Studies of the mechanisms of human exposure (i.e. intake, translocation, clearance) through fluid mechanics models;

✔ Health Risk Assessment of environmental stressors through environment and health examination surveys;

✔ Assessment and management of Air Quality in Industry (Oil/Gas, Chemical, Food, Pharmaceuticals, Car industry, Refineries);

✔ Aerial monitoring and recording of environmental and infrastructure parameters;

✔ Assessment of air pollution exposure in vessels.

Clients

ENVIONIAN develops a broad range of cooperation with **Public and Private Organizations** in Greece and abroad, such as:

- Industry: Oil/Gas, Chemical, Food, Pharmaceuticals, Car industry, Refineries;

- Public & Private Organizations, Environmental & other related Agencies;

- Public authorities: Ministry of Environment, Ministry of Employment, Ministry of Economy, Municipalities, Regions, General Chemical State Lab., Greek Universities and Research Centers

Contact:

Technology & Science Park of Attica (TE.S.P.A) "Lefkippos", NCSR Demokritos, 15310 Aghia Paraskevi Attiki Greece

00306977390796

info@envionian.gr

www.envionian.gr

What's our proposal for Almaty Kazakhstan
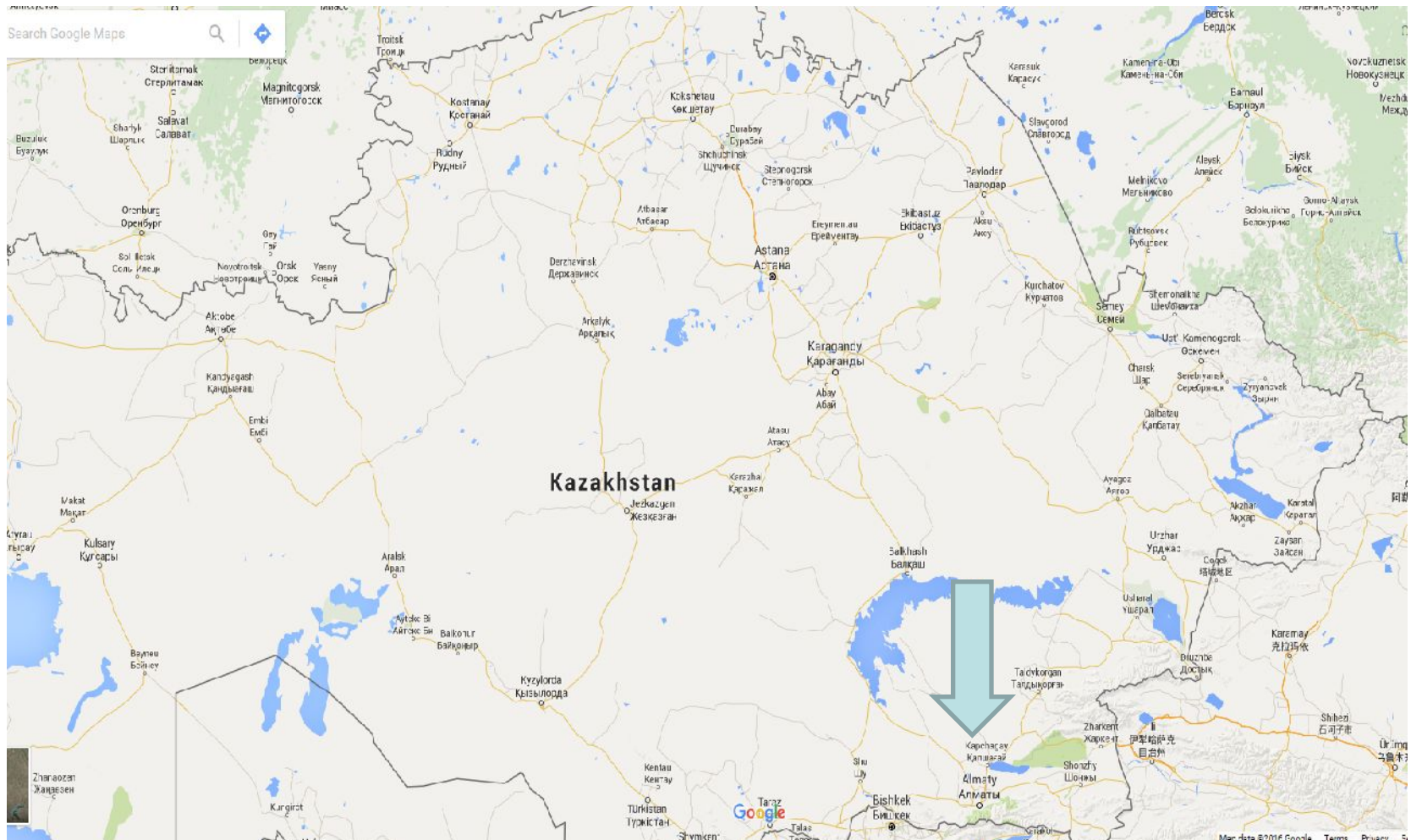
Almaty's Environmental and Public Health Network (AEPHeN)

Project I:

Almaty's Outdoor Air Quality and Public Health Monitoring Network

Background

• The Almaty city is characterized by *heavy local pollution* and *increased smog* due to its complex terrain, *frequent thermal inversions* together with the *atmospheric pollutant emissions* produced by around 1.5 million inhabitants of the city.

• Main pollution sources: emissions from *energy production*, *industrial processes* and *vehicular exhaust emissions (gas, coal and diesel combustion)*.

• Currently measured pollutants (particulate matter-PM10, NO_2, CO and heavy metals) <u>frequently exceed the EU limit values</u>, implying the necessity for <u>immediate mitigation actions</u>.

Current Status (II)

A joined work by the Ministry of Environment and Water Resources (MEWR) of Kazakhstan and the World Bank, under the auspices of the Joint Economic Research Program (JERP) has been carried out so far named:

"Towards Cleaner Industry and Improved Air Quality Monitoring in Kazakhstan"

Q: How many of the actions-recommendations proposed are implemented or are under implementation?

Aim of the project

The establishment of a modern Outdoor Air Pollution Monitoring and Health Impact Network which will support :

- *DSS (Decision Support System) for the local authorities which will* analyze and propose technological and non-technological measures and policy options for air pollution abatement
- *Cloud based tool to inform citizens* of environment-conscious alternatives that may have a positive impact on air quality and finally on their health and motivate them to adopt alternative behaviors

The above project is proposed to be applied by the National Centre for Scientific Research "DEMOKRITOS" (NCSR"D") and ENVIONIAN.

AEPHeN Overview

- Demokritos — National Centre for Scientific Research
- ENVIONIAN — Research | Innovation | Enviromental Technology

- SES
- Surveys
- Multi-sensors campaigns

- Stakeholders
- City Authorities
- Literature review

Data from:
- monitoring network
- Field campaign
- Satellite data

ABM modeling

CRF, HRT, PBTK/ BBDR modelling

Current status on
- levels of AQ
  - policies
  - measures

AQ and emission modeling SA/IoT

Current & Future AQ concentrations

Current & future personal and population Exposure

Current & future Health Impact

Cost benefit analysis

TOOLS

Questionnaires
Expert elicitation
Models

DSS for policy makers
- Geodata base
- Guidebook
- Computational system

Citizens – Tool
Web and mobile based

CITIZENS

Implementation chart of the proposal
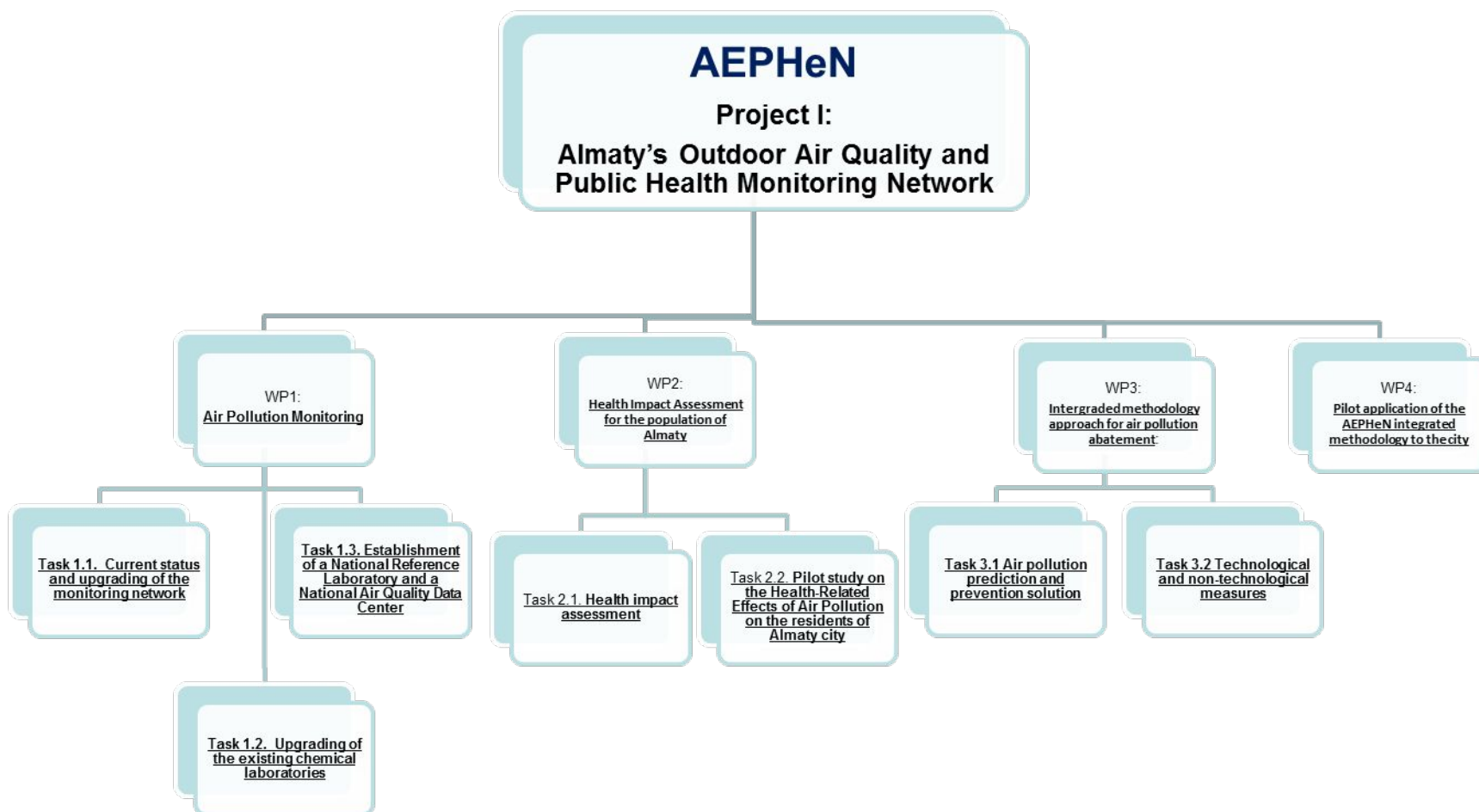
WP1: Air Pollution Monitoring

- The current situation will be assessed to derive **a "picture"** as reliable as possible with regard **to current AQ situation** in the Almaty city.

- AQ data from **ground-based monitoring stations** from a) local monitoring stations, b) AQ databases and c) from **field campaigns** will be collated and anayzed (filling gaps)

- Afterwards they will feed **atmospheric dispersion models** which will be used for future estimation of AQ at ground level. For that purpose expanding and upgrading of the current monitoring network is proposed:

Task 1.1. Current status and upgrading of the monitoring network

- **expanding** and **upgrading** of the air pollution monitoring network targeted to the protection of the public health

- setting up of a number of **fully-equipped fixed** and **mobile stations**

- **modernization** of the existing network with high priority pollutants monitoring equipment

- *an up to date report of the existing monitoring network status* in Almaty city will be conducted, regarding
  i) the number and the location of the sampling sites
  ii) the sufficiency and accuracy of the monitoring instrumentation
  iii) the range of the pollutants measured etc.

<u>pre-existing and new stations</u>:

- at focal and representative sites within the city

- high resolution automatic instrumentation for the monitoring of **particulate matter (PM1, PM2.5, PM10 and TSP fractions), volatile organic compounds** as well as **inorganic gases (O_3, NOx, SO_2, CO)**

- according European Directives (ISO, EN)

- an **open-access monitoring network** will be established so as to achieve public and stakeholders' immediate information about short-term air pollution episodes

- With the use of **cutting edge information technology methods**, safe data transport from the data acquisition systems in the field to the public and policymaking professionals will be achieved.

Task 1.2. Upgrading of the existing chemical laboratories

• upgrading of the existing **chemical laboratories**
• analysis of: **trace elements, ions, polycyclic aromatic compounds (PAHs), PCBs, dioxins, organic/elemental carbon, volatile organic compounds** etc
• regular calibrations, data validation and analytical methods' harmonization according to the international and European standards
• ionic chromatography and gas-chromatography systems, X-Ray Fluorescence system, OC/EC analyzer

Task 1.3. Establishment of a National Reference Laboratory and a National Air Quality Data Center

• establishment of a **National Reference Laboratory** and a **National Air Quality Data Center** in line to a Quality Assurance and Quality Control system to ensure representativeness and traceability of collected data
• the laboratory will be authorized by the European Commission or other international authority for the control of air pollution in Kazakhstan in general.

WP2: Health Impact Assessment for the population of Almaty

- **Field campaigns with individual sensors** will take place to derive detailed time activity patterns at individual level. Then will be coupled to air pollutants concentrations derived from WP1 in order to **assess individual exposure profile** through ABM.

- Furthermore **SES info** will be collected through questionaries (during the field campaigns) in order to derive **exposure profile for vulnerable population** subgroups.

- Refined approaches including human respiratory tract (HRT) deposition modeling (for PM, MH, PAHs) and (PBTK/BBDR) models will be applied to **finally estimate health impact**

Task 2.2. **Pilot study on the Health-Related Effects of Air Pollution on the residents of Almaty city**

• suitable candidate **sensor technologies** to be used by volunteers, will be selected based on the NCSR"D" reviews and preliminary trials of instrument reliability and utility (GPS-enabled personal sensors, remote sensing etc)

• A **data collection tool** will be developed in order to store and manage all data coming from different devices

• **agent-based modelling** (ABM) will be used, informed from the collected multi-sensor data **to capture individual spatio-temporal behaviours** and to **model individual exposure.**

WP3: Intergraded methodology approach for air pollution abatement

2 types of tools will be developed tailored to the specific needs of
2 stakeholder groups

1)a **DSS (Decision Support System)** which will include:
      a) guidebook for estimating the effects of a number of policies in Almaty   b) a GeoDatabase which will give access to city data and
      c) an integrated computational system
and

2) a **citizen web-mobile based tool** which will inform citizens about the CF and the AQ and associated **health impact of their actions**. They could monitor the results of their actions

Task 3.1 Air pollution prediction and prevention solution.

Based on the state of the art of the **Artificial Intelligence Technology**, this activity aims at building a system that by combining information collected by the National Air Quality Data Center and different models will be able to:

    a) **predict the severity of air pollution** and
    b) **suggest remediation actions** in order to reduce impact on the environment and on the population (for example by restricting number of permitted vehicles in circulation etc).
    c) **predict the impact of AEPHeN** proposed measures or policies

This system that will be based on the **innovative technologies of the Internet of Things (IoT)**, will position Kazakhstan as a World Wide Level Center of Excellence in Government digitization for control Air Quality and Health quality in general.

Task 3.2 Technological and non-technological measures

Technological measures:

• The application of **Depollution Technologies (photocatalysis)** through a pilot study in Almaty city could reduce the harmful substances present in the air and preserve the aesthetic quality of buildings over time

• **Real scale application of photocatalytic building materials** (cement-based, paints) in public buildings in Almaty will be a first step for the estimation of the benefits of photocatalytic technology in the city

• Other proposed technological measures include: enhancement of **electricity-based public transportation**, penetration of bio-fuel, energy-efficient design of buildings etc.

Task 3.2 Technological and non-technological measures

Non technological measures:

• Measures concerning **transportation domain** (access limitations zones to city centers, taxation based on emissions, intelligent traffic management systems)

• **urban planning** domain (establishment of low emission zones, design of additional green spaces within the city)

• **residential domain** (public awareness about energy conservation

• eco-labelling of energy **efficient/environment-friendly products**

WP4: Pilot application of the AEPHeN integrated methodology to the city

• For the assessment of the long-term impact of the project outcome on the air quality of the city, **a pilot application** of the methodology derived from WP3 will be performed at the city of Almaty with the **interaction of both stakeholders and citizens through the DSS and the citizen app tool.**

• A program of **user training** will be delivered to the authorities and updated during the project's life in order to encourage uptake of tools and measures.

Almaty's Environmental and Public Health Network (AEPHeN)

Project II:

Almaty's Indoor Air Quality and Public Health Monitoring Study

Background

- Indoor Air Quality (IAQ) is of great importance for the health of the population, especially for vulnerable groups i.e. children, elderly or people suffering from respiratory, cardiovascular diseases etc.

- the identification of the sources contributing to primary and secondary pollutants inside buildings originating from indoor sources as well as the estimation of the outdoor environment's contribution is crucial.

- Special attention should be paid in case of urban cities of aggravated outdoor air quality, as Almaty city.

A proposal for the establishment of a Modern Indoor Air Pollution Monitoring and Health Impact Study is applied by the National Centre for Scientific Research "DEMOKRITOS" (NCSR"D") and ENVIONIAN.

Overview of the proposal of NCSRD and ENVIONIAN

AEPHeN

Project II: Almaty's Indoor Air Quality and Public Health Monitoring Study

WP1:
Assessment of Indoor Environment Quality in Almaty public buildings

WP2:
Indoor environment quality and health Impact assessment

Task 1.1. Indoor air quality monitoring in selected public buildings of Almaty

Task 1.2. Questionnaire-based survey in selected public buildings of Almaty

Task 2.1 Linked to Task 2.2 of Project I and Task 1.1 of Project II, a **Health-Related Effects of Air Pollution** study on the residents of Almaty city will be performed.

Task 2.2. Linked to Task 2.1 of Project I, a **Health impact assessment** will be performed.

Task 2.3. Developing of IAQ guidelines which conform to conditions that satisfy the public health and welfare of the Almaty city.

WP1: Assessment of Indoor Environment Quality in Almaty public buildings

Task 1.1. Indoor air quality monitoring in selected public buildings of Almaty.

• extended campaign of indoor air quality assessment in selected Almaty's buildings used by the citizens

• priority will be given to **buildings occupied by vulnerable population groups** (children, elderly and sick people): schools, hospitals, public buildings etc.

• A number of fully-equipped monitoring **stations** for the indoor **measurement of high priority pollutants** (PM10, PM2.5, PM1, volatile organic compounds, carbonyls, phthalates, inorganic compounds, mold, etc.) and other parameters (**temperature, humidity, ventilation**)

WP1: Assessment of Indoor Environment Quality in Almaty public buildings

Task 1.1. Indoor air quality monitoring in selected public buildings of Almaty.

• coupled outdoor measurements will be performed for an outdoor to indoor contribution estimation

• Linked to WP1 (Task 1.2) of Project I, a **complete chemical composition analysis on PM (ions, metals, organic and elemental carbon, polycyclic aromatic compounds**)

• application of a receptor model for a **source apportionment study**

• emphasis will be given in the required frequency of calibrations, checks and maintenance as well as on the requirements for ongoing comparisons with the corresponding ISO EN standards.

Task 1.2. **Questionnaire-based survey in selected public buildings of Almaty.**

Indoor environmental conditions (thermal, noise, light, and indoor air quality) may affect occupants' health and well-being

• A **questionnaire-based survey** will be performed with the purpose of **assessing the relations between perceived indoor environment and occupants' comfort and health**, as well as of examining the modifying effects of both personal and building characteristics.

WP2: Indoor environment quality and health Impact assessment

Task 2.1 Linked to Task 2.2 of Project I and Task 1.1 of Project II, a **Health-Related Effects of Air Pollution** study on the residents of Almaty city will be performed.

Task 2.2. Linked to Task 2.1 of Project I, a **Health impact assessment** will be performed**.**

Task 2.3. *Developing of IAQ guidelines which conform to conditions that satisfy the public health and welfare of the Almaty city.*

Three main Pillars of Experts will be involved in the implementation of the project:
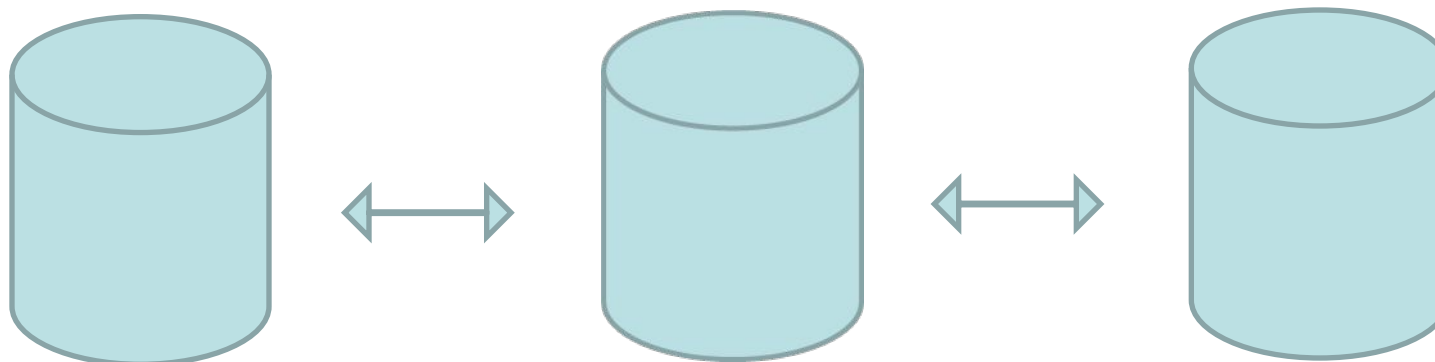
Air Quality Experts
(analytical, modelling)

NCSRD*

ENVIONIAN **

AUTH***

Health Impact Assessment

AUTH***

NCSRD*

ENVIONIAN**

IT (computational)

ENVIONIAN**

EVOLUTION**

* National Research Center "Demokritos"
** Private companies
*** University of Thessaloniki

Timetable Gant Chart

AEPHeN I

		MONTH:																						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1	Task 1.1	█	█	█	█	█	█	█	█	█	█	█	█												
	Task 1.2	█	█	█	█	█	█	█	█	█	█	█	█												
	Task 1.3	█	█	█	█	█	█	█	█	█	█	█	█												
WP2	Task 2.1						█	█	█	█	█	█	█	█	█	█	█	█	█						
	Task 2.2						█	█	█	█	█	█	█	█	█	█	█	█	█						
WP3	Task 3.1			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█			
	Task 3.2			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█			
WP4	Task 4.1																			█	█	█	█	█	█

AEPHeN II

		MONTH:																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1	Task 1.1	█	█	█	█	█	█	█	█	█	█	█	█												
	Task 1.2	█	█	█	█	█	█	█	█	█	█	█	█												
WP2	Task 2.1						█	█	█	█	█	█	█	█	█	█	█	█	█						
	Task 2.2						█	█	█	█	█	█	█	█	█	█	█	█	█						
	Task 2.3																			█	█	█	█	█	█

THE ABOVE PROPOSED ACTION ARE ALREADY UNDER IMPLEMENTATION PROCESS IN 6 EUROPEAN CITIES
IN THE FRAMEWORK OF HORIZON & FP7 EUROPEAN PROJECTS

THE CHALLENGE OF THE CURRENT PROPOSAL IS TO LINK & TRANSFER THE KNOWLEDGE GAINED FROM THE APPLICATION OF THE ABOVE ACTIONs IN EUROPE TO ALMATY