

# Sustainability Dimensions

Annual Report of the Laboratory of Heat Transfer and Environmental Engineering - Mechanical Engineering Department, Aristotle University Thessaloniki, Greece

# 2015

Initially, 2015 was expected to be the first year of recovery for Greek economy and the country as a whole. Yet, the last months turned out to be very critical, especially for the education sector. Capital controls that were imposed in the middle of the year were only the dramatic peak of a gradual deterioration of the overall unstable situation, and so the financial status of Greek universities became alarming. With a yearly budget 70% lower compared to 2010 figures and with the obligation to transfer surpluses to the central government, university authorities were confronted with hard to accomplish tasks.

Apart from the abysmal financial situation, research institutions are facing also the problem of severe human capital losses. Numerous talented young scientists decide to emigrate, hoping to find better working conditions abroad. The combination of budget cuts and brain drain are seriously challenging the Greek higher education institutions.

Against all odds, our Laboratory is continuing its efforts towards excellence in education and research in its fields of specialisation. Milestones in this year were the completion of the Urban Empathy project and the refinements introduced for an improved simulation of multiscale interactions in

the context of our involvement in the Air Quality Management System for Cyprus. In the framework of Urban Empathy, our Laboratory evaluated the results of several past projects and uploaded those complying with specific criteria to the Sustainable Urban Model toolkit defined as a database organising and giving value to capitalised project deliverables. It should be noted that key barriers were identified that hinder the implementation of the selected results into sustainable urban policies.

A significant new feature of the system applied for simulating and forecasting air quality in Cyprus is the development of a novel approach for estimating air pollution levels at the street scale. This is achieved by the aid of the so-called street concentration increment calculated on top of the urban background concentration. Thus, we hope that the performance of the improved Air Quality Management System would have satisfied the inspired pioneer in this field, the late Dr. Savvas Kleantous. We will keep him in good memory as an efficient colleague combining a deep scientific understanding and clear views regarding the policy maker's needs.

Laboratory Director  
Prof. Dr. Nicolas Moussiopoulos

**Collaboration Highlight:** Our Laboratory hosted the Urban Empathy transnational meeting.



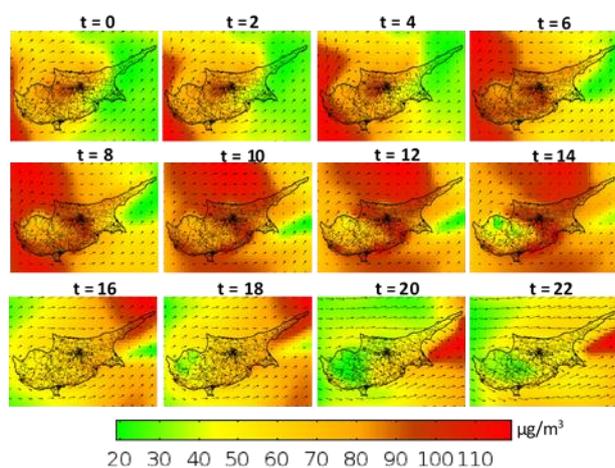
## Provision of services for the emissions database maintenance and air quality simulation and forecasting in Cyprus

*Dedicated to the memory of Dr. Savvas Kleanthous, who passed away in November 2015. As the director of the Cypriot Air Quality authority, he has actively supported the development and the continued funding of an advanced Air Quality Management System for Cyprus.*

This project aimed to support and update the operation of the Air Quality Management System (AQMS) that has been developed for the Laboratory for the Department of Labour Inspection (DLI) of the Republic of Cyprus. As a part of a series of service contracts, the model core and user interface parts of the system are undergoing continuous development and enhancement in accordance with evolving user needs and regulatory requirements.

Following an operational evaluation of the system's performance, a range of improvements of the model core have been implemented. In an effort to optimize the model core performance, a revised methodology has been incorporated in the boundary condition module. This new approach enables the downloading, the modification into the proper format and, finally, the utilization of regional-scale boundary condition data originating from the ensemble forecasts of the regional-scale models of the MACC project. Validation results for the new module reveal a distinct improvement in the performance of the AQMS, especially during episodes attributed to long range pollutant transport.

Addressing a limitation of the existing computational procedure of the AQMS in predicting air pollution levels at the street scale, a simple approach for the accurate estimation of a street concentration increment on top of the urban background has been developed.



Spatial evolution of PM<sub>10</sub> concentrations in Cyprus during a typical Saharan dust episode, simulated using the newly developed methodology for the calculation of initial and boundary conditions.

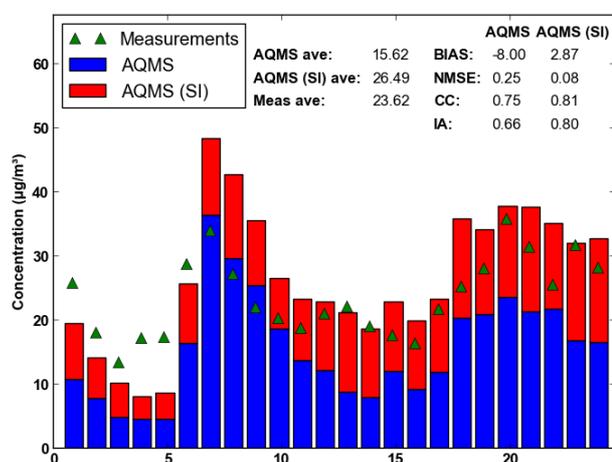
The methodology is based on the establishment of a functional relationship between local meteorological parameters, street characteristics and traffic emissions on the basis of calculated increments on sample locations.

The overall procedure for the determination of the street increment therefore involves three main processing steps: the selection of representative pairs of urban background and street-scale concentration measurements; the multiple regression analysis for determining a functional relationship for the street increment, which constitutes the core of the method; and finally, the application of the methodology so as to validate its capability to simulate accurately the air quality status at the street scale.

The concentration sets used for the definition of the statistical relationships were derived both from on-site measurements as well as from application of the OSPM model in a series of hot spots in the city of Thessaloniki during the calendar year 2013. These relationships were then incorporated in the computational procedure of the AQMS in an effort to optimize its performance down to the street scale.

As part of the validation of the new street-scale computational scheme, a pilot two-month application of the methodology was carried out using the AQMS's core operational calculations for providing the urban background concentrations and the meteorological parameters as input data for the application of the functional relationships. The results of this pilot application were then compared against observational data at urban hotspots. This validation process indicated a notable improvement in the ability of the AQMS operational module to predict the air quality status at the street scale in Cypriot cities.

This work is funded by the Department of Labour Inspection, Ministry of Labour, Welfare and Social Insurance of the Republic of Cyprus.



Indicative results of the street increment methodology for NO<sub>2</sub> concentrations in a hotspot in the city of Nicosia

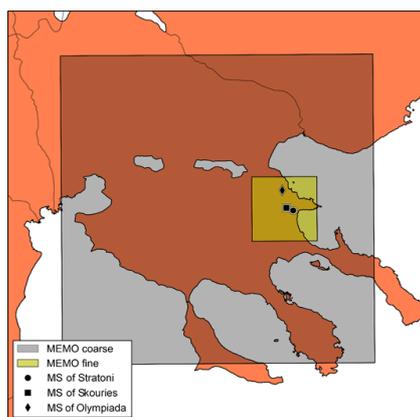
## Siting study of air quality monitoring stations in the Kassandra mines/area, Chalkidiki

The study was part of a larger environmental baseline assessment of the greater area of Kassandra mines\*, in the Prefecture of Chalkidiki in Northern Greece. The study undertaken by our Laboratory on behalf of Hellas Gold S.A., focused on the optimal siting of air quality monitoring stations in the greater mines area, taking into account the spatial distribution of air pollutant concentrations attributed to the development operation phase of the mines.

The study covered the mines of Stratoni, Olympiada and Skouries and the optimal siting of 21 air quality monitoring stations was examined. The planning and operation of an air quality monitoring station network was established according to the requirements of the relevant Technical Report of the European Environment Agency. In order to consider all the above needs, the siting study for the monitoring stations was undertaken in the frame of a pollution dispersion study of the greater mines area, with the aim to determine the potentially most affected sites.

The study performed by our Laboratory examined particulate and gaseous pollutants emitted from the mining activities of all three mining sites, during both the mine development and full operation phases, taking into account the meteorological and topographical features of the area. The impact on seven nearby residential receptor points was examined.

For the description of the meteorological conditions prevailing over the study area, the non-hydrostatic prognostic 3-dimensional mesoscale meteorological model MEMO was utilised. The meteorological simulations were performed for the entire calendar year of 2010 on a nested computational grid with a maximum resolution of 0.5×0.5 km<sup>2</sup>. In this way, the typical local circulation systems that develop over the mine areas were realistically simulated.



Extents of the nested computational grids used for the meteorological model MEMO and locations of the three Mining Sites (MS)

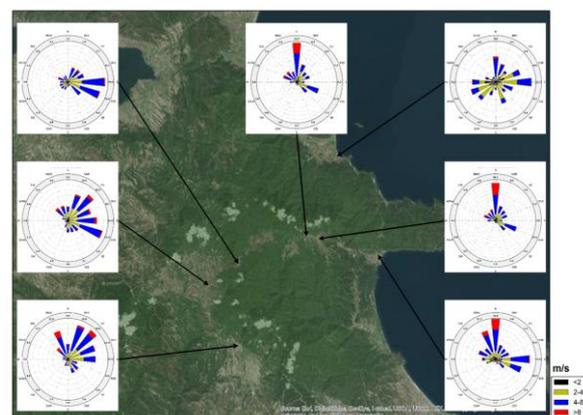
Measurement data from meteorological stations were also analysed to produce annual wind flow rose charts for the seven receptor points studied.

For the quantification and distribution of the emitted pollutants, the AUSTAL 2000 model was applied in a number of air quality simulations aiming to quantify the contribution of the development and operation of the mines in the surrounding residential areas, including worst case scenarios for which unfavourable meteorological conditions could lead to pollutant accumulation. The results were compared with mean annual concentrations reported in monitoring stations in the selected populated areas for the year 2010, so that the additional pollution occurring as a result of the mining activities could be determined.

With regard to the development phase, the model simulations revealed a distinct spatial distribution in the concentration fields attributable to the mining activities within the study areas. The contributions in PM<sub>10</sub> were slightly increased in the vicinity of the two coastal receptors, in the eastern part of the domain, while for NO<sub>2</sub> the spatial maxima were located in the northern and south-western parts of the study area.

With regard to the operation phase, model simulations were performed for a time period for which operational mining activities are expected to take place simultaneously in all three mines, representing a “worst case” scenario. Calculations under this scenario indicate locally increased contributions from the mining activity near two receptor points in the western/north-western part of the domain. Nevertheless, the calculated concentration increments indicate a minimal contribution to air pollution levels in all of the receptor points around the mining sites. Based on the analysis of these results, it is suggested that air quality monitoring stations are sited in the residential areas near those aforementioned receptor points which are most likely to be affected by the mining activities.

This work is funded by ENVECO S.A.



Annual wind roses (distribution of prevailing wind directions) calculated for the seven receptor points under study

\*The name “Kassandra mines” has been in use since the late 19<sup>th</sup> century for denoting a complex of mining sites and activities in north-eastern Chalkidiki, active since the early Hellenistic Age

## Empowering Policies on Urban Sustainability (Urban Empathy)

The Urban Empathy project aimed at consolidating a permanent structure bringing together projects, policy makers and stakeholders to share concrete results towards the improvement of sustainable urban policies in the Mediterranean, ensuring their consideration in future programming periods.

The project ensured the long-term impact of existing tools and methodologies, already developed in the framework of other urban sustainability European projects. The key element of the Urban Empathy project was the direct involvement of decision-makers, policy-makers and key actors, facilitating thus the integration of existing results into sustainable urban policies. The project aimed also to improve the coordination between the Mediterranean Transnational Cooperation programme and the regional operational programmes through the development of a set of propositions that focus on how to better promote the implementation and development of the Sustainable Urban Model.

In the framework of the Urban Empathy project, our Laboratory was involved in the evaluation of the results from previous European projects through a set of transferability criteria and cross check so as to ensure that they comply with the Sustainable Urban Model, shared among the partners.

The results were uploaded to the SUMO (Sustainable Urban Model) Toolkit that is defined as a database (catalogue of results) which organises and gives value to the capitalised project deliverables, highlighting those

with the greatest potential and those that match decision-makers' specific needs. The decision makers' needs were recorded through a structured dialogue so as to identify key barriers to the implementation of the selected results into sustainable urban policies. Moreover, a series of high level seminars have been organised in country level, in order to present to decision makers and high level administration employees those innovative approaches and tools.

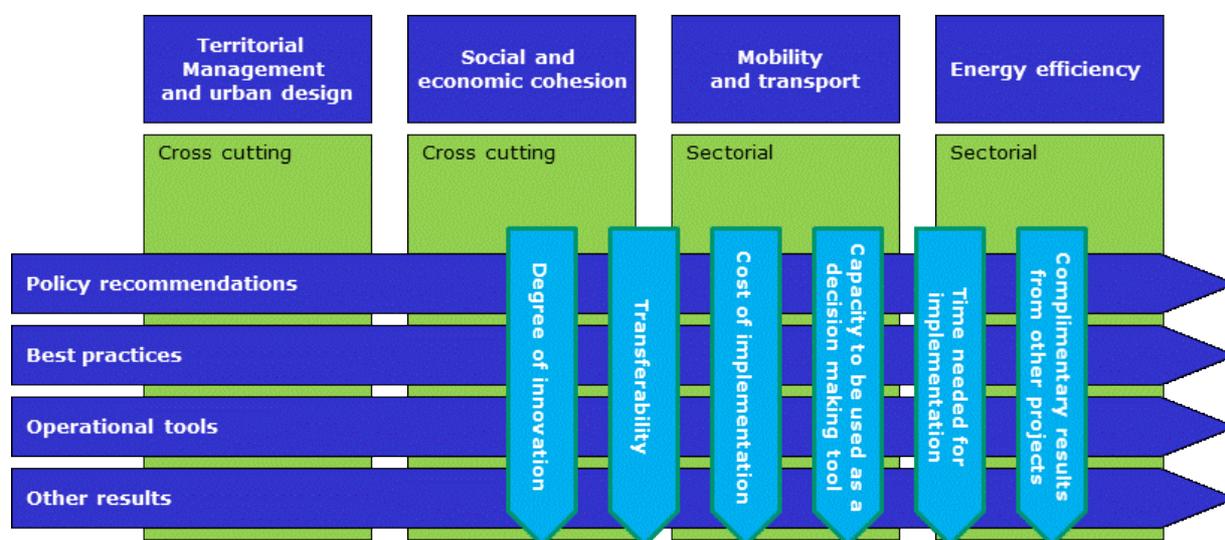
Moreover, the Urban Empathy project scaled up transnational cooperation in the Mediterranean related to the SUMO Toolkit. Common priorities were defined and articulation between territorial cooperation and regional operative programmes has been worked on using real pilot results, analysing how (a) to bring them into policies, (b) to include them in the new programming period, (c) to implement them, and (d) to mainstream them to a bigger scale. As a last step a set of recommendations aiming to influence calls for the next programming period has been produced.

Based on this role in the Urban Empathy project, our Laboratory became a scientific member of the CAT MED Platform for Sustainable Urban Models. A natural capitalisation process started under this Platform, promoting initiatives like the Cluster of Policies for Sustainable Urban Models & Climate Change in the Mediterranean.

More information about the Urban Empathy project and the Sustainable Urban Model Toolkit is available in the Internet:

- [http://www.catmed.eu/urban\\_index.php](http://www.catmed.eu/urban_index.php),
- [http://www.catmed.eu/urban\\_sumo.php](http://www.catmed.eu/urban_sumo.php).

This work is funded by European Regional Development Fund.



Cross-check and evaluation of results' transferability against certain criteria

## Research

### **Refinement of the emissions database and software simulation and forecasting of air quality in Cyprus.**

*Objective:* This project aims at supporting and updating the operational Air Quality Management System (AQMS) that has been developed by LHTEE and installed in the Department of Labour Inspection (DLI) of the Republic of Cyprus.

*LHTEE contribution:* Following an operational evaluation of the system's performance and by incorporating user feedback, a range of improvements on the model core and structural modifications on the AQMS user interface are to be implemented, in an effort to optimise its performance at the local scale, as well as during pollution episodes attributed to long range transport.

*Funded by:* Department of Labour Inspection, Ministry of Labour, Provision and Social Security of Cyprus

## Services

### **Provision of services for technical support in issues related to the protection and management of the environment (waste management, energy systems, air pollution).**

*Objective:* To provide specialised technical support to Thermi Municipality Services in issues of environmental impact studies, related to activities and projects regarding environmental pollution and management solid waste treatment and management and energy technologies.

*LHTEE contribution:* Examination of the content of environmental assessment studies of projects and activities for which the Thermi Municipality bodies have to give their opinion during public consultations. Assessment of comprehensiveness, consistency and completeness of environmental impact studies and their connection documents and particulars submitted. Reasoned opinion on the contents of the environmental impact studies.

*Funded by:* Municipality of Thermi

## Events

*Members of the Laboratory participated at several important events giving speeches, chairing sessions or contributing to seminars. Some of the most interesting ones include:*

Prof. N. Moussiopoulos participated at an event organised by the Technical Chamber of Greece on "Entrepreneurship and Employment" held in Thessaloniki, on December 1<sup>st</sup> 2014.

Prof. N. Moussiopoulos participated at a workshop on "Alternative thermal processing of solid wastes in Greece" organised by the Region of Central Macedonia in Thessaloniki, on December 17<sup>th</sup> 2014.

Prof. N. Moussiopoulos organised and chaired a workshop on Sustainable Cities on the occasion of the Conference on

Scientific Cooperation between Greece and Germany 2015 held in Hamburg, on February 5<sup>th</sup> -7<sup>th</sup>.

Dr. Ch. Achillas participated as a member of the EU Technical Working Group for the EMAS Sectoral Reference Document on Best Environmental Management Practices for the Electrical and Electronic Equipment Manufacturing Sector in Brussels, on February 23<sup>rd</sup> - 24<sup>th</sup>.

Dr. G. Tsegas participated with an oral presentation at the final event of the THEOPHRASTOS project in the West Macedonia Lignite Centre, Ptolemais, on March 18<sup>th</sup>.

Prof. N. Moussiopoulos coordinated a scientific soiree event on Green Harbors with the title "Thessaloniki 2015 - The environmental feedbacks between the harbor and the city", organised by the Ecocity NGO in the Municipality of Thessaloniki City Hall, Thessaloniki, on March 19<sup>th</sup>.

Prof. N. Moussiopoulos participated at the "Berlin Energy Transition Dialogue-Towards a Global Energiewende" conference, held in Berlin, on March 25<sup>th</sup> - 27<sup>th</sup>.

Prof. N. Moussiopoulos chaired a round table on "Innovations in pharmaceutical science" in the frame of the 1st Panhellenic Conference of Applied Pharmacy held at the Met Hotel and organised by the Pharmaceutical Association of Thessaloniki, Thessaloniki, on April 26<sup>th</sup>.

Prof. N. Moussiopoulos gave a keynote speech at the "Global Conference on Global Warming" organised by the Academy of Athens, on May 25<sup>th</sup>.

Dr. Ch. Vlachokostas was an invited plenary speaker at the International conference "EnE14 / ENV.net Conference, Environment to Europe, Chapter 27 - EU integration in the sector Environment and Climate Change" in the celebration on Environmental Day organised by the United Nations Environmental Programme, Belgrade, on June 4<sup>th</sup> - 6<sup>th</sup>.

Dr. G. Perkoulidis gave a speech at the World Environment Day Workshop organised by the Dairy Industry TYRAS S.A. in Trikala, Thessaly, on June 5<sup>th</sup>.

Dr. G. Tsegas gave a presentation at the meeting "Approaches and Methodologies for Climate Change Adaptation in Cities", in the Municipality of Thessaloniki City Hall, Thessaloniki, on June 5<sup>th</sup>.

Prof. N. Moussiopoulos was one of the keynote speakers of the 5<sup>th</sup> International Conference on Environmental Management, Engineering, Planning and Economics, Mykonos, on June 14<sup>th</sup> - 18<sup>th</sup>.

Dr. G. Perkoulidis co-chaired the session on "Recovery of resources from municipal solid waste" and gave a speech at the 2015 International Landfill Mining Athens Conference held at the Divani Palace Acropolis Hotel in the context of the LIFE-Reclaim Project, Athens, on September 24<sup>th</sup> - 25<sup>th</sup>.

Prof. N. Moussiopoulos chaired one session of the "Waste to Energy: Organic waste energy exploitation mainly through biogas", held at the Makedonia Palace Hotel, and organised by German-Hellenic Chamber of Industry and Commerce, Thessaloniki, on September 29<sup>th</sup>.

Prof. N. Moussiopoulos was an invited speaker of the "Aussenwirtschaftsconvent" organised by the Senate of Economy Germany, Berlin, on October 7<sup>th</sup>. On the occasion of this event the "Senate of Economy Europe" was launched.

## News

Prof. N. Moussiopoulos was appointed Management Board member of AUTH's Teloglion Foundation of Art.

Prof. N. Moussiopoulos was confirmed in his post as a member of AUTH's Environment Council.

The Ecocity NGO awarded our Laboratory for its participation and overall contribution to the realization of the 12th period of the ECOMOBILITY Campaign 2014-2015, in a special ceremony in Athens.

Prof. N. Moussiopoulos co-signed as a founder member the charter of the Senate of Economy Europe in Berlin.

Prof. N. Moussiopoulos was re-elected as the Director of the Energy Division of AUTH's Department of Mechanical Engineering.

Dr. John Douros is on a 2 year leave of absence while A. Athanasiadis left our Laboratory to seek future prospects.

Eleftherios Chourdakis completed successfully his doctorate and will soon obtain his degree.

Dr Maria Mavroudi was awarded a fellowship for post-doctoral research on "Application of Membrane-based Absorption Process for CO<sub>2</sub> Capture" through the "State Scholarships Foundation/IKY Fellowships of Excellence for Postgraduate Studies in Greece – Siemens Programme" for the academic period 2014-2015.

Dr. Antti Hellsten (Senior Researcher at the Atmospheric Composition Research unit, Finnish Meteorological Institute and Adjunct Professor, Lappeenranta University of Technology Finland) visited LHTEE during the period 2nd November – 17th December 2015. Dr. Hellsten and FMI are collaborating closely with LHTEE in the frame of the CityClim project, funded by the National Academy of Finland and focussing on urban morphology and atmospheric boundary layer modelling. Dr. Hellsten's visit to Thessaloniki aimed at jointly working on the basic verification and functional testing of a nested LES-system.

## Papers in Journals

**Michailidou A.V., Vlachokostas Ch. and Moussiopoulos N. (2014)**

A methodology to assess the overall environmental pressure attributed to tourism areas: a combined approach for typical all-sized hotels in Chalkidiki, Greece, *Ecological Indicators*, **50**, 109-115.

**Gallus M., Akylas V., Barmpas F., Beeldens A., Boonen E., Boréave A., Cazaunau M., Chen H., Daële V., Doussin J.F., Dupart Y., Gaimoz C., George C., Grosselin B., Herrmann H., Ifang S., Kurtenbach R., Maille M., Mellouki A., Miet K., Mothes F., Moussiopoulos N., Poulain L., Rabe R., Zapf P. and Kleffmann J. (2014)**

Photocatalytic de-pollution in the Leopold II tunnel in Brussels: NO<sub>x</sub> abatement results, *Building and Environment*, **84**, 125-133.

**Vlachokostas Ch., Michailidou A.V., Matziris E., Achilles Ch. and Moussiopoulos N. (2014)**

A multiple criteria decision-making approach to put forward tree species in urban environment, *Urban Climate*, **10** (1), 105-118.

**Karkanias C., Perkoulidis G., Grigoriadis N., Stafylas S., Dagdilelis E., Feleki E. and Moussiopoulos N. (2014)**

Assessing recycling potential in local level: the case of Neapoli-Sykies municipality, Greece, *Fresenius Environmental Bulletin*, **23**, 2884-2889.

**Boonen E., Akylas V., Barmpas F., Boréave A., Bottalico L., Cazaunau M., Chen H., Daële V., De Marco T., Doussin J.F., Gaimoz C., Gallus M., George C., Grand N., Grosselin B., Guerrini G.L., Herrmann H., Ifang S., Kleffmann J., Kurtenbach R., Maille M., Manganelli G., Mellouki A., Miet K., Mothes F., Moussiopoulos N., Poulain L., Rabe R., Zapf P. and Beeldens A. (2015)**

Construction of a photocatalytic de-polluting field site in the Leopold II tunnel in Brussels, *Journal of Environmental Management*, **155**, 136-144.

**Gallus M., Ciuraru R., Mothes F., Akylas V., Barmpas F., Beeldens A., Bernard F., Boonen E., Boréave A., Cazaunau M., Charbonnel N., Chen H., Daële V., Dupart Y., Gaimoz C., Grosselin B., Herrmann H., Ifang S., Kurtenbach R., Maille M., Marjanovic I., Michoud V., Mellouki A., Miet K., Moussiopoulos N., Poulain L., Zapf P., George C., Doussin J.-F. and Kleffmann J. (2015)**

Can photocatalysis help to improve urban air quality? Results from the LIFE+-project PhotoPAQ, *Umweltchemie und Ökotoxikologie Journal*, **2**, 41-45.

**Gallus M., Ciuraru R., Mothes F., Akylas V., Barmpas F., Beeldens A., Bernard F., Boonen E., Boréave A., Cazaunau M., Charbonnel N., Chen H., Daële V., Dupart Y., Gaimoz C., Grosselin B., Herrmann H., Ifang S., Kurtenbach R., Maille M., Marjanovic I., Michoud V., Mellouki A., Miet K., Moussiopoulos N., Poulain L., Zapf P., George C., Doussin J.-F. and Kleffmann J. (2015)**

Photocatalytic abatement results from a model street canyon, *Environmental Science and Pollution Research*, doi: 10.1007/s11356-015-4926-4.

**Spyridi D., Vlachokostas Ch., Michailidou A., Sioutas C. and Moussiopoulos N. (2015)**

Strategic planning for climate change mitigation and adaptation: the case of Greece, *International Journal of Climate Change Strategies and Management*, **7**, 272-289.

**Kukkonen J., Karl M., Keuken M.P., Denier van der Gon H.A.C., Denby B.R., Singh V., Douros J., Manders A., Samaras Z., Moussiopoulos N., Jonkers S., Aarnio M., Karppinen A., Kangas L., Lützenkirchen S., Petäjä T., Vouitsis I. and Sokhi R.S. (2015)**

Modelling the dispersion of particle numbers in five European cities, *Geoscientific Model Development*, doi: 10.5194/gmdd-8-5873-2015.

**Tsegas G., Moussiopoulos N., Barmpas F. and Akylas V. (2015)**

An integrated numerical methodology for describing multiscale interactions on atmospheric flow and pollutant dispersion in the urban atmospheric boundary

layer, *Journal of Wind Engineering and Industrial Aerodynamics*, **144**, 191-201.

**Theodoridou G., Stylos N. and Koroneos Ch. (2015)** Intergration of the environmental management aspect in the optimization of the design and planning of energy systems, *Journal of Cleaner Production*, **106**, 576-593.

**Perkoulidis G., Kasampalis Th., Karagiannidis L. and Moussiopoulos N. (2015)** Development of waste-to-energy plants database for evaluating the efficiency of energy recovery from waste in Europe, *Waste and Biomass Valorization*, doi: 10.1007/s12649-015-9397-9.

## Participation at Conferences

*The list contains only the titles of papers given as oral presentations. Poster presentations were also made in several conferences.*

**Sustainable Consumption & Production in the Mediterranean: territorial approaches to match global challenges, 2 December 2014, Marseille, France.** A sustainable Urban Model Toolkit (E.Feleki)

**1st International Academic Conference on Climate Change and Sustainable Heritage - CCSH15, Graz, Austria, 18-20 February.**

A methodological framework for sustainable tourism planning: a strategic governance for a greek destination

**Global Conference on Global Warming (2015), Athens, Greece, 24-27 May.**

Pollutant emissions from the transport sector and their impact on urban air quality and health (N. Moussiopoulos, keynote paper, p. 75-85 in the volume with the main findings, keynote and plenary session papers)

Air temperature data analysis of the period 1983-2012 in Athens and Thessaloniki-climate change effect in Greek cities (Th. Slini)

Air quality, climate and health, air quality in the urban environment: the gender approach (Th. Slini)

**1st International Conference of Agrifood Supply Chain Management and Green Logistics, Porto Carras, Chalkidiki, Greece, 27-30 May.**

Collaborative work on air quality performed under the GREEN-AgriChains project: funding opportunities and prospects for developing new joint projects (G. Tsegas)

Green tourism supply chain management based on life cycle impact assessment (A.V. Michailidou)

Determining optimum urban solid waste collection frequency and schedule through the development and implementation of a green logistics model (A. Malamakis)

The need for integrated assessment of air quality and climate effects on agricultural production and logistic chains (E. Fragkou)

**5th International Conference on Environmental Management, Engineering, Planning and Economics, Mykonos, Greece, 14-18 June.**

Air pollution from traffic and associated health impacts (N. Moussiopoulos, keynote paper)

An interactive knowledge centre on urban sustainability: transferring scientific results into policies (G. Banias)

Identification of best environmental waste management practices in the retail sector: the case study of Greek retailers (G. Banias)

Pay-As-You-Throw project: monitoring the aspects of implementation

**3rd International Conference on Sustainable Solid Waste Management, Tinos, Greece, 2-4 July.**

Developing an EU standardised approach to vocational qualifications in healthcare waste management

**14th International Conference on Environmental Science and Technology - CEST2015, Rhodes, Greece, 3-5 September.**

Life cycle impact approach to promote sustainable tourism: a case study from Greek hotels (A.V. Michailidou)

Assessment of health impacts from the incineration of municipal solid waste in Thessaloniki, Greece (Ch. Vlachokostas)

Involving decision-makers in the transformation of results into urban sustainability policies (A.V. Michailidou)

THEOPHRASTOS: PM<sub>x</sub> emission factors – dispersion from fugitive dust sources in lignite mines of Western Macedonia, Greece (Ch. Vlachokostas)

1 poster was presented

**ATHENS 2015 International Landfill Mining Conference, Athens, Greece, 24-25 September**

History of dump sites in Greece: integrated tools and methods for their registration (G. Perkoulidis)

## Contribution to COST actions

### COST Action ES1004

European framework for online integrated air quality and meteorology modelling

- Short-term scientific mission, Cachoeira Paulista, Brasil, 9-16 February (G. Tsegas)

- Final Conference with Management Committee Meeting, Geneva, Switzerland, 23-25 February (N. Moussiopoulos)

### COST Action ES1006

Evaluation, improvement and guidance for the use of local-scale emergency prediction and response tools for airborne hazards in built environments

- Management Committee Meeting, Ljubljana, Slovenia, 9-13 February (F. Barmpas)

### COST Action genderSTE

GenderSTE is a new COST initiative intended to advance the state of the art in knowledge and policy implementation on gender, science, technology and environment through creating a network of policy-makers and experts on gender, science and technology

- Meeting of Working Group 3, Istanbul, Turkey, 5-6 November (Th. Slini)

## Laboratory Personnel

### Permanent staff with teaching and research assignment

Nicolas Moussiopoulos Professor, Dr.-Ing. habil. (Director)

Fotios Barmpas, Dr.-Eng, Aerosp. Engineer, MSc

Ioannis Douros, Dr.-Eng., Physicist, MSc

Georgios Perkoulidis, Dr.-Eng.

Theodora Slini, Dr.-Eng., Mathematician

Christos Vlachokostas, Dr.-Eng.

### Researchers and PhD Candidates

Evangelia Fragkou  
Stamatia Kontogianni  
Apostolos Malamakis  
Maria Mavroudi  
Georgios Tsegas

Biologist, Environ., PhD  
Dr.-Eng.  
Dr.-Eng.  
Dr.-Chem. Engineer  
Physicist, PhD

Vasilios-Ioannis Akylas  
Lefteris Chourdakis  
Eleni Feleki  
Christos Karkanias  
Alexandra Michailidou

Mech. Engineer  
Mech. Engineer  
Chem. Engineer, MSc  
Environ. Scientist, MSc  
Mech. Engineer

### Administration/Support team

Afedo Koukounaris  
Eugenia Agorastoudi

Administration Officer  
Administrative Support

Dimitrios Altinoglou  
Georgios Kotriklas

Administrative Support  
System Administrator



### Lecture book

3<sup>rd</sup> extended and revised version of the lecture book on the course Environmental Engineering – Sustainability Principles released as an e-book November 2015 (in Greek)

Contents:

Introduction: Sustainability principles; Natural resources and sustainability; Sustainability and development; Sustainability evaluation techniques; Biogeochemical cycles; Air pollution; Air pollution abatement strategies; Sustainability in energy production and consumption; Waste management; Life cycle analysis overview; Environmental management tools; Integrated product policy; Assessment and risk management



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