

Sustainability Dimensions

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

2013

The deep economic and financial recession undoubtedly characterized Greece also in 2013. Severe salary cuts practically for all state employees, an alarming rise of the unemployment rate, especially for young people, and drastic reductions of public funding were among the headline news on a daily basis. The crisis has exacerbated pre-existing problems of public higher education in Greece, with growing pressures upon funding sustainability. The governmental strategy towards restructuring Greek universities, including also administrative personnel layoffs, encountered massive opposition in the last months, and there are severe doubts that the decisions taken will prove favorable on the long run.

This awkward situation luckily did not have a negative impact neither on the Department of Mechanical Engineering as a whole, nor on our Laboratory: Thanks to the existence of various sources of income beyond public funding, we were not hit so hard by those developments and were therefore able to continue looking after our international collaborations as in the years before. The only real blow this year was the decease of our Department's Chairman Professor Nikos Kyriakis, a thoroughbred scientist and a gentle person and friend whom we all will miss. Since September 2013, his successor as the Head of the Process Equipment Design Laboratory is Professor Agis Papadopoulos, who thus left our Laboratory after 15 fruitful years, together with his team of co-workers. It goes without saying that we will continue working closely together in future. Another senior scientist leaving our Laboratory after almost 15 years of productive work with us is Dr. Christofer Koroneos, who was appointed Associate Professor at the University of Western Macedonia.

Even at times of crisis, our Laboratory succeeded to attract several new projects in 2013. One example is "Urban Empathy", a project aiming to improve the efficiency of sustainable urban policies in Mediterranean regions. This is intended by consolidating a permanent structure bringing together projects, policy makers and stakeholders to share and capitalize concrete results of previous activities. It is

my firm belief that our interdisciplinary expertise will be of value in the process of creating goal-oriented products of high transferability potential. Developing such innovative products that meet society needs will be in the core of the new EU programming period under "Horizon 2020".

Another research activity with our involvement this year is directly related to the economic recession: The gradual deterioration of household incomes in the last years, combined with the increased taxation imposed on heating oil, has triggered an unprecedented substitution of domestic central heating systems with low-quality wood-burning units, the latter constituting in the meantime the most significant source of fine particles in residential areas, particularly under unfavorable wintertime conditions. Within an international study of PM_{2.5} wintertime levels, involving model simulations and measurements at residential sites in Thessaloniki during the winter of 2012 and 2013, we found an overall increase of 30% in the PM_{2.5} concentration, while a distinct diurnal variation was observed for wood smoke tracers, with significantly higher concentrations in the colder evening period compared to the morning.

Among the study contracts awarded to our Laboratory this year, the most noteworthy one is to my opinion our participation at the "Re-think Athens" project through a contribution to the associated Environmental Impact Assessment study. "Re-think Athens" aims at contributing to the recreation of the centre of the Greek capital, converting large parts of it to pedestrian and bicycle friendly areas. One could consider this visionary project as exemplary for what the country as a whole needs, a comprehensive redesign taking into account traditional values and well-known Greek assets, above all its excellent human resource capital, but at the same time following good examples from other countries pointing at promising paths towards a sustainable future.

Prof. Dr. Nicolas Moussiopoulos
Laboratory Director

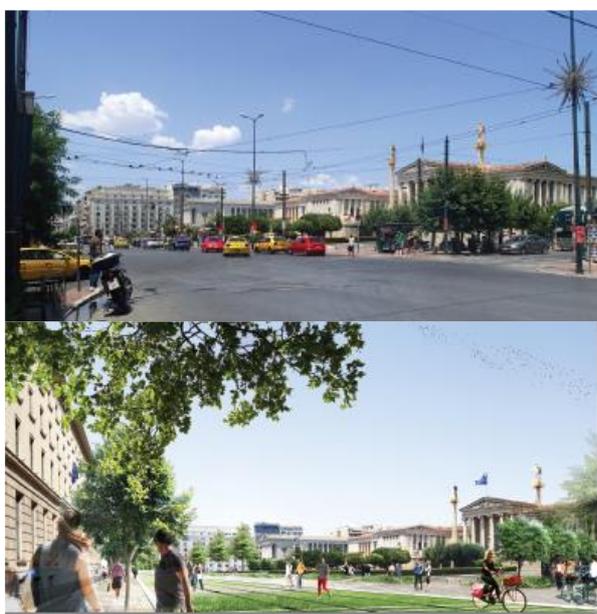
Air quality impacts associated with the redesigning of the Athens centre along the Panepistimiou street

This study has been undertaken within the frame of the “Re-think Athens” project which is a multifaceted intervention, aiming to contribute to the recreation of the centre of Athens.

The “Re-think Athens” intervention comprises of two phases. The first phase includes the installation of a tram line from Amalias Avenue to Egyptou Square centred on Panepistimiou street and ending at a brand new Omonia Square. Panepistimiou street will become pedestrian and bicycle friendly, without being converted into a pedestrian zone, as private cars and public transport vehicles will have access from four vertical streets, while taxis, tour buses and authorized vehicles will be allowed on the side road. The second phase of the project will include the extension of the tram line from Egyptou Square to Patissia. More information on the “Re-think Athens” project is available at: <http://www.rethinkathens.org>

Within the above context, the impact of the “Re-think Athens” project on the air quality of the intervention area and surrounding areas was assessed. The atmospheric pollutant emissions due to the construction and implementation of the project and the resulting pollutant levels were calculated with the use of appropriate computational tools for the current state situation (baseline scenario) and for two future implementation scenarios, in 2016 and 2023.

More specifically, two widely used and extensively validated computational models of different scale were applied for the air quality assessment.



The present and the revised urban site.

The mesoscale MEMO/MARS-aero modelling system was used to assess the urban background air quality, while the OSPM local scale model was applied to estimate pollutant levels within urban street canyons.

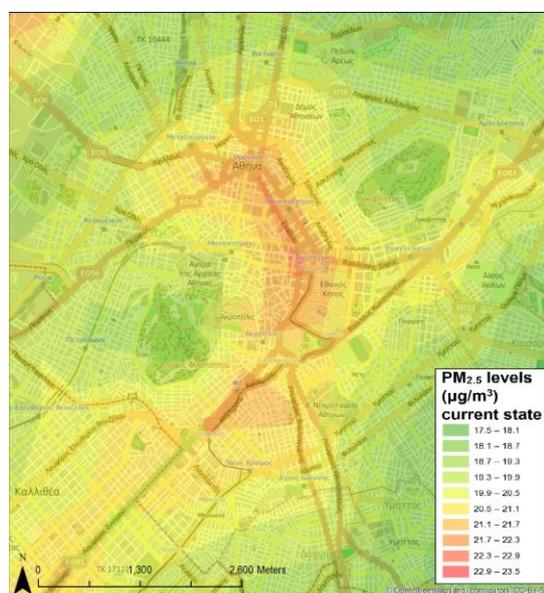
A rise in pollutant emissions during the construction phase was shown to lead to increased pollutant concentrations at site. This deterioration of the local air quality can be minimised substantially by conforming to regulations and best construction practices, as described in Greek national and EU legislation.

Based on the results of the MEMO/MARS-aero modelling system, the implementation of the project was found to lead to a decrease of urban background annual concentration levels of the examined pollutants (NO₂, CO, PM₁₀, PM_{2.5}, PM₁₀ and BaP). The “Re-think Athens” project is therefore expected to further improve future air quality of the Athens city centre, on top of the foreseen improvements resulting from the introduction of advanced technology vehicles in the fleet.

The air quality of Akadimias, Solonos and Skoufa streets was particularly examined, as diverted traffic from the Panepistimiou street due to the reconstruction works is expected to increase their traffic loads. This additional traffic load was found to lead to elevated local traffic emissions and pollutant concentrations for both the future scenarios of 2016 and 2023. However, this increase is not expected, in any case, to lead to exceedances of mean annual limit values or to additional number of exceedances for NO₂ and PM₁₀, as defined in the EU Air Quality Directive 2008/50/EC.

Project funded by the Onassis Foundation.

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PM_{2.5} annual levels for the current state situation.

Particulates Monitoring, Modelling and Management (PM3)

The main goal of the project has been the development of a state of the art air pollution modelling system in order to support the Department of Labour Inspection of the Ministry of Labour and Social Insurance in the Republic of Cyprus in preparing cost effective and efficient particulate matter (PM) management plans. In this frame, LHTEE was responsible for the quantification of local anthropogenic contributions to hotspot PM concentrations with a focus on urban areas. For this purpose, the OSPM street scale air quality model was applied in order to describe the processes that govern the distribution of pollutants inside typical Cypriot street canyons and thus compute the upper pollution levels at the street scale.

More specifically, the project provided estimates for the PM street scale increment, which is the contribution of local scale (mainly traffic) emissions and PM resuspension to the levels of PM concentrations at urban hotspots. Although only a few cases of Cypriot streets can strictly be classified as street canyons, it was important to investigate the upper levels of the street scale contribution for certain cases of streets where street geometry is clearly unfavourable for pollutant dispersion.

Besides, a factor which decisively affects dispersion characteristics inside street canyons and thus dictates the levels of the street scale increment is meteorology, most importantly wind speed and direction. For this reason, the impact of the variation of different meteorological conditions observed during recent years on the PM street scale increments was explored.

In order to make an accurate choice with respect to the representativity of the locations where the street scale model application would take place, a large number of

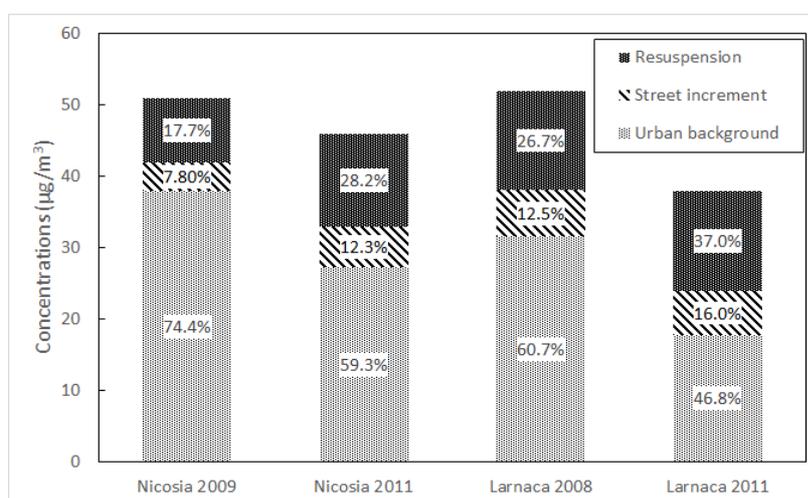
possible streets were initially preselected. Traffic data availability was a key factor in the selection of locations in the four major cities of Cyprus. The hotspots that were of particular interest were characterized by unfavourable geometry as well as high activity levels, as they are located close to or within the economic centres of each city. In the final stage of the selection process, two particular road segments, one in Makariou Ave. (Nicosia) and one in Afxediou Ave. (Larnaca) were chosen for a long term street scale model application, as they were found to constitute some of the most typical Cypriot urban street canyons and could therefore provide the basis for a worst case scenario in this project's framework. The calculations revealed that for Makariou Ave. in Nicosia the street scale increment for PM₁₀ can reach 18.5 µg/m³, while for PM_{2.5} it can reach 6.3 µg/m³. For Afxediou Ave. in Larnaca, the street scale increment for PM₁₀ can reach 26.9 µg/m³, while for PM_{2.5} it can reach 9.9 µg/m³.

Due to the fact that both Makariou and Afxediou avenues cannot be strictly characterized as street canyons along their whole length, these estimates were the upper limits for street level concentrations where multi storey buildings are present on both sides of the road. Nevertheless, it was clearly evident that pollutant levels inside street canyons can be significantly higher than the urban background, thus presenting more challenges as regards the attainment of the Air Quality Directive limit values.

Besides, it was also ascertained that during unfavourable wind conditions street canyon ventilation is reduced and therefore dispersion of air pollutants is inhibited, a fact which leads to significantly increased concentrations at the street level.

Project funded by the EU, under the LIFE+ (2007-2013) programme.

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PM₁₀ source apportionment as regards the hot spots under consideration (Makariou Ave. in Nicosia and Afxediou Ave. in Larnaca) for several years of application. The urban background here includes the regional background.

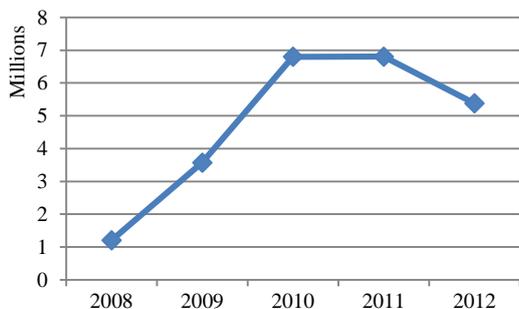
Definition of sustainable energy action plans within the “Energy for Mayors” frame

The Covenant of Mayors is the mainstream European movement involving local and regional authorities, voluntarily committed to increasing energy efficiency and use of renewable energy sources on their territories. By their commitment, Covenant signatories aim to meet and exceed the European Union objective of 20% CO₂ emissions reduction by 2020.

In order to translate their political commitment into concrete measures and projects, Covenant signatories undertake to develop and implement a Sustainable Energy Action Plan (SEAP) and to engage their citizens and local stakeholders in energy-related actions. SEAP is a formal commitment towards a sustainable energy future describing the direction in which authorities need to move. The specific objectives and targets are selected following the comparison with the current situation set as baseline, while the financial framework is determined taking under consideration conditions and limitations of local budgets. (Covenant of Mayors, 2010).

LHTEE closely collaborated with the Region of Central Macedonia, Greece, in order to support the development and assessment of SEAPs of seven local municipalities of the Greater Thessaloniki Area, Municipality of: Thessaloniki, Ampelokipi-Menemeni, Koredlio-Evosmos, Delta, Lagadas, Ther-maikos and Chalkidona.

LHTEE’s main task was to consider possible interventions and assess their final impact in order to gain a 20% reduction of GHG emissions compared to the reference year 2001 by 2020. Towards this direction LHTEE had to determine the energy consumption in the private sector, assess the energy consumption in the municipal buildings and provide viable solutions that can be adopted in the final SEAPs.



Energy consumption in 42 buildings in the Municipality of Thessaloniki for the period 2008-2012 (in kWh).

The classification of buildings was based on criteria such as the use and the age following the basic principles of the Hellenic Statistical Authority. The buildings were divided according to their use in the following categories:

- a) Residential buildings: single and multifamily houses.
- b) Public buildings: it includes municipal services offices, medical and cultural centres, warehouses etc.
- c) Schools: the category refers to all school infrastructures that operate under the surveillance of the municipality.
- d) Sport centres: the class consists of open air grounds and indoor facilities.

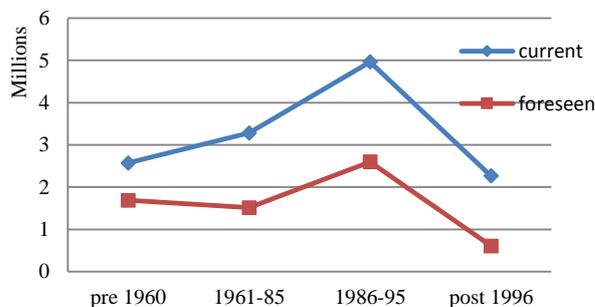
According to their year of construction the buildings were classified as follows:

- a) Before 1960: non insulated with old methods of construction
- b) 1961 - 1985: non insulated
- c) 1986 - 1995: poorly insulated
- d) 1996 - 2010: fully insulated (according to the Thermal Insulation Regulation)
- e) 2011 – today: constructed according to the recent regulation of building energy efficiency (KENAK).

The suggested solutions were analysed and evaluated taking under consideration the characteristics of the area, such as topographic and microclimatic parameters, along with the size of population, the housing density and the municipal infrastructure in terms of buildings. The calculation of the suggested savings was carried out according to KENAK and to the related EN standards.

Project funded by EU, Region of Central Macedonia.

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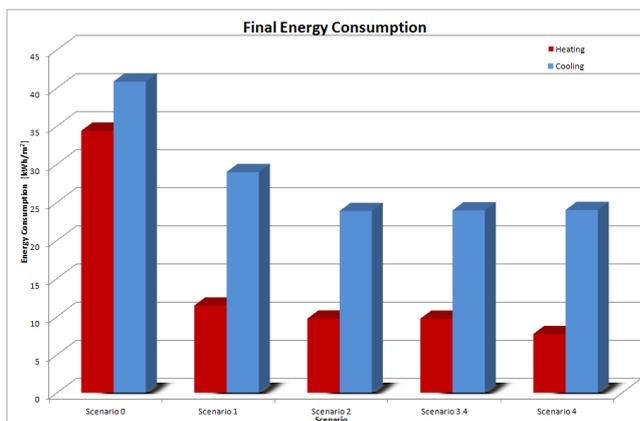
The annual energy consumption of public buildings in the Municipality of Lagadas (in kWh) by year of construction.

Integrated evaluation of retrospective thermal insulation solution in Cyprus

The European Union and 2010/31/EC on energy efficiency in buildings aim to save primary energy consumption by 20% until 2020 and to achieve buildings with zero or almost zero energy balance. This requires the development of innovative building materials, to ensure high indoor environmental quality and minimum environmental impact over the building's life cycle.

Towards this direction, LHTEE studied the potential for retrofitting thermal insulation in various types of buildings (including typical single houses, typical multi-store residential buildings and an office building), for the climatic conditions of Nicosia, Cyprus. The calculations of energy consumption in each case were carried out with the dynamic simulation tool Energy Plus. More specifically, different scenarios were studied and simulated. The results for the three buildings were evaluated on energy and economic terms. The scenarios included:

- The reference state scenario concerned the existing situation where simple bricks in masonry were placed and no insulation to any concrete element or on the roof was placed. The windows had aluminum frame and were single glazed.
- The next scenario referred to the buildings that were constructed before 2008 and the introduction of the Cyprus building regulation to construction.
- Another scenario examined the retrospective insulation of the building combined with the installation of high energy efficiency windows.
- A further scenario examined a very strong insulated construction where thermal insulating bricks and additional insulation on the concrete elements were placed.



Final Energy Consumption in single house (in kW/m²).

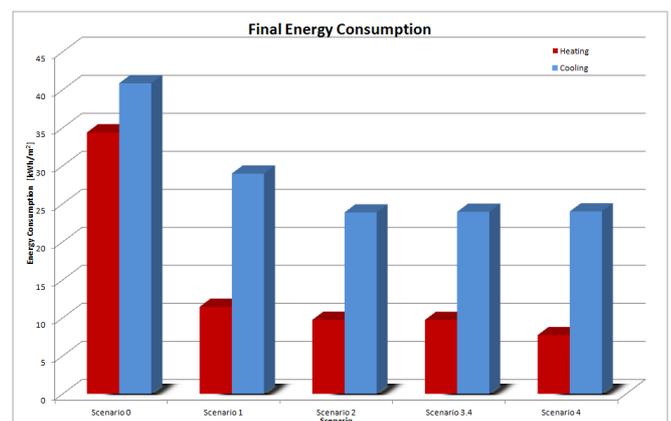
- The final scenario examined the case of internal insulation of all building components as well as the installation of double glazed windows.

Then, the scenarios were evaluated based on energy and economic criteria and the main conclusions were:

- The retrospective installation of thermal insulation significantly reduced the energy consumption for heating. The cooling loads are also reduced, but not to the same extent as the heating loads, which is reasonable as the solar gains through the glazed surfaces are not affected. As a result the energy consumption for cooling was not significantly decreased.
- The same observations were made in the case of the office buildings, where the reduction of the cooling loads was even smaller.
- The use of thermal insulating bricks combined with the application of external insulation established a surface temperature of 20°C, throughout the winter, which was a desirable result.
- The replacement of ordinary bricks with thermal insulating bricks and the installation of high energy efficiency windows significantly reduced energy consumption for heating.
- All interventions that included retrospective insulation of the building envelope were economically feasible (with one exception, the ultra-insulated construction scenario, in the single-house). The most attractive solutions were those that included 6cm external insulation on the vertical components and 6-10cm external insulation on the roof.

Project funded by FIBRAN SA.

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Final Energy Consumption in multi-store building (in kW/m²).

Assessment of the air quality impact of biomass and wood burning for domestic heating in Thessaloniki, Greece

The aim of this study was to quantify and assess the impacts of uncontrolled biomass burning emissions from domestic heating systems in the Greater Thessaloniki Area, using a combined approach involving pollutant dispersion modelling, measurements, and chemical analyses.

During the last few years, a gradual deterioration of household incomes combined with the increased taxation of heating oil has triggered a widespread substitution of oil-based central heating installations with low-quality wood-burning units in the Greater Thessaloniki Area. Emissions from domestic wood-burning devices have been recognised as one of the most significant sources of ambient PM_{2.5} in residential areas, particularly under unfavourable wintertime conditions. Wood smoke particles contain several toxic organic compounds such as benzene and polyaromatic hydrocarbons (PAHs) while exposure to ambient smoke has been linked to several adverse health endpoints in humans including pulmonary diseases, increased blood pressure and increased biomarkers of inflammation, coagulation and lipid peroxidation. Recent studies have shown that several chronic and acute health responses can be derived from PM-induced generation of reactive oxygen species (ROS) in cells.

A measurement and sampling campaign of fine particles (PM_{2.5} and PM_{1.0}) has been conducted, covering three urban locations in Thessaloniki. Results indicated a 30% increase in the PM_{2.5} mass concentration, as well as a 2- to 5-fold increase in the concentration of wood smoke tracers including potassium, levoglucosan, mannosan, galactosan and PAHs. At the same time, concentration of fuel oil tracers (e.g. Ni and V) declined by 20-30%. Moreover, a distinct diurnal variation was observed for wood smoke tracers, with significantly higher concentrations in the colder evening period compared to the morning.

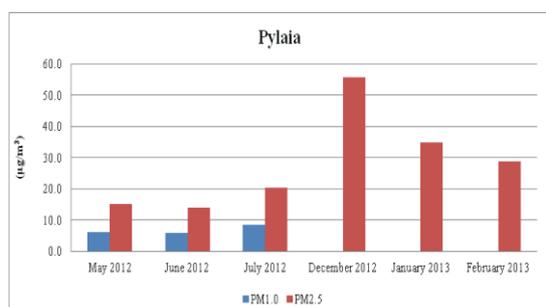
Correlation analysis also indicated a strong association between ROS activity and concentration of levoglucosan, galactosan and potassium, underscoring the potential impact of wood smoke on PM-induced toxicity during winter in Thessaloniki.

In parallel with the measurement campaign and with the aim to quantify the contribution of wood smoke on ambient PM levels in Thessaloniki, model calculations were performed using the mesoscale meteorological and chemical dispersion models MEMO/MARS-aero, for investigating two different heating emissions scenarios during the winter of 2012-2013: the baseline scenario, representing the previous widespread use of distilled fuel oil in central heating systems; and a substitution scenario, which assumes a replacement of fuel oil by biomass burning in 70% of existing installations. Results of the model calculations were validated on the basis of concentration data from the measurement campaign (see overleaf).

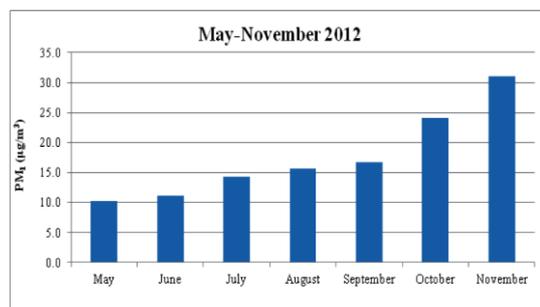
Overall, the results of this study reveal a sharp increase in wintertime PM_{2.5} concentrations of about 50 µg/m³ in the substitution scenario, compared to the baseline scenario. It is also notable that the spatial maxima of PM_{2.5} concentration are shifted outside the downtown traffic hotspot areas and, in contrast, are now appearing over city sectors characterised by dense residential land uses. Furthermore, the results indicate a remarkable increase in concentrations of organic carbon, PAHs and tracers of wood and biomass combustion. Moreover, wood smoke in Thessaloniki appears to be strongly correlated with wintertime PM-induced redox activity. In conclusion, backsliding from fuel oil burning for domestic heating to uncontrolled wood and biomass burning appears to have caused significant air quality deterioration. In view of these findings, a crucial need arises for a new consensus with the aim of promoting a realistic air quality control strategy in Thessaloniki.

Project supported by the Municipality of Thessaloniki and conducted in collaboration with Professors Costas Sioutas, University of South California, and Dina Samara, Department of Chemistry, AUTH.

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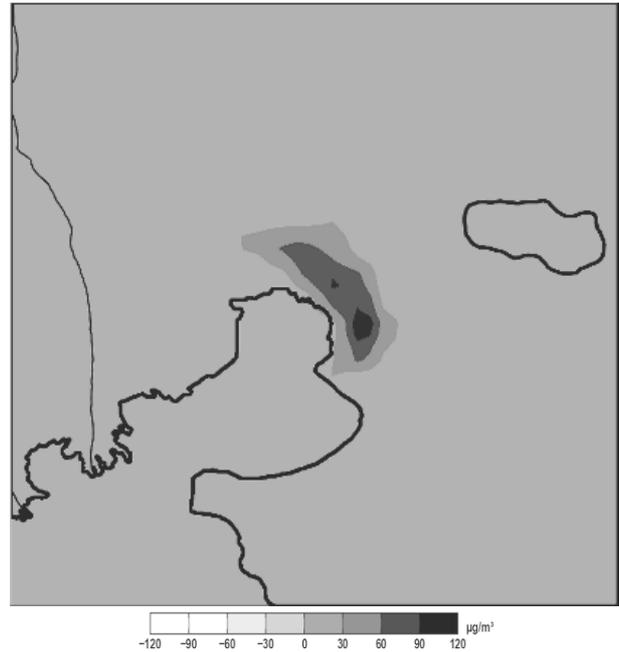
Average monthly variation of measured PM_{2.5} and PM_{1.0} in the Pylaia measurement station



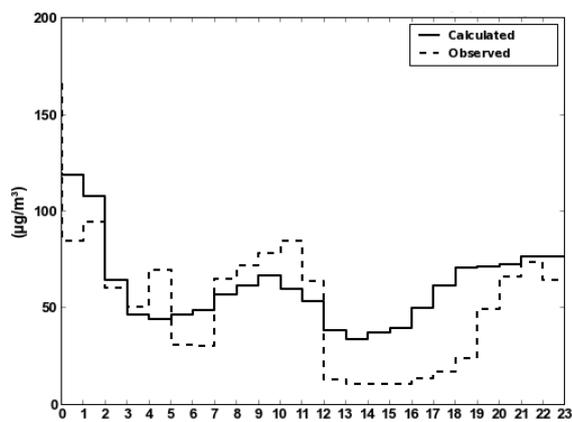
Average monthly variation of measured PM_{1.0} in Vassilissis Olgas street



Installation site of the PM measurement station in Triandria



Increase of wintertime PM_{2.5} concentrations (in µg/m³) in the biomass burning scenario



Diurnal variation of calculated and measured PM_{2.5} concentrations for 21 January 2013



Panoramic view of morning-time haze over a residential area near the Thessaloniki centre

Contribution to COST actions

COST Action ES1004

European framework for online integrated air quality and meteorology modeling

- Working Group meeting, Zurich, Switzerland, 18-19 March (N. Moussiopoulos, J. Douros and G. Tsegas)
- Management Committee meeting and Working Group meeting, Madrid, Spain, 9-10 May (N. Moussiopoulos and G. Tsegas)
- Working Group meetings, Ispra, Italy, 30 September-1 October (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

- 2nd Core Group meeting, Torino, Italy, 24-25 January (F. Barmpas)
- 6th Management Committee meeting and Working Group meeting, Budapest, Hungary, 20-21 March (F. Barmpas)
- 7th Management Committee meeting and Working Group meeting, Paris, France, 11-12 June
- 2nd International Open Workshop on Local-Scale Airborne Hazards Modelling and Emergency Response, Paris, France, 13 June

Research

Empowering Policies in Urban Sustainability (URBAN_EMPATHY)

Objective: URBAN EMPATHY aims at consolidating a permanent structure bringing together projects, policy makers and stakeholders to share and capitalize concrete results to improve the efficiency of sustainable urban policies in the Mediterranean ensuring their consideration in the new programming period. This will ensure the long-term impact of the capitalized projects' deliverables by the direct involvement of decision makers and key actors, facilitating the integration of these results in sustainable urban policies. The project will also aim 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 Urban Sustainable Models, to be included in the next programming period calls.

LHTEE contribution: LHTEE will participate in the project Scientific Committee and hold project activities that lead to the development of the Sustainable Urban MOdel (SUMO) tool kit. SUMO tool kit will organize and give value to the capitalized project deliverables that have a high transferability potential and that correspond to reported decision-makers needs. In this context, LHTEE will promote and disseminate an interactive policy tool for goal-oriented municipal waste management adaptable in all EU countries, for a long-term sustainable development in the Mediterranean macro-region.

Funded by: MED Programme, 2007-2013.

Pay As you Throw (PAYT)

Objective: The project PAYT aims at promoting the integration of Information Technologies (IT) into the waste management chain for supporting the general concept "Pay Less As You Efficiently/Effectively Recycle/Reuse/Reduce" in an effort to produce a new and complete commercial service to local authorities. In PAYT, emphasis is put on recycling and the particular principle that will be pursued behind this concept is to provide citizens with incentives and technological tools that will increase the efficiency and effectiveness of recycling in municipal scale. The proposed system will be introduced at a pilot scale in a pilot Municipality in Greece. The project will aim at the development and implementation of a customized user (recycler) identification system (smart card, thumb scan, PIN, etc) which will provide local authorities and citizens with a virtual identity and store relevant data.

LHTEE contribution: LHTEE will be the activity leader of the communication and dissemination work package with the task to supervise the dissemination procedure and communication plan and organize the conferences and workshop. Moreover, LHTEE will perform the investment and SWOT analysis of the

proposed pilot system and will also perform environmental monitoring and impact assessment for the duration of the demo project.

Funded by: General Secretariat for Research and Technology under SYNERGASIA 2011 programme.

Climate change adaption of the structural ceramic industry through the use of recycled glass as ceramic flux (CLAYGLASS)

Objective: The main objective of the project is to reduce the environmental impact in the structural ceramic industry by including glass, as a flux, in the ceramic mass. The use of this component enables a decrease of cooking temperature since it melts before the rest of the ceramic paste. In ceramic stoneware clay melts at 1250°C, whereas with the addition of glass, the temperature drops to 1100°C, which leads to: a) energy savings of 20-25% and b) decrease of CO₂ emissions of manufactured products. The production of stoneware bricks tiles with this innovative process will enable the achievement of the following specific objectives:

- Demonstrate the technical and economic feasibility of these stoneware ceramic products with any type of recycled glass.
- Reduce the manufacturing process cost up to 15% of stoneware bricks tiles thanks to: 1) a decrease of glass of original raw material cost, 2) decrease of energy needs.
- Reduce the glass recycling process cost by decreasing the requirements for reuse and by increasing the possibilities of its valorization.
- Reduce CO₂ emissions in the ceramic industries.
- Commercialize and distribute the resulting material (brick tiles) in the usual channels.
- Introduce a new Manual of Good Practices on the subject.

LHTEE contribution: LHTEE will be responsible for preparing the training modules for stakeholders in the ceramics industry to be introduced to the CLAYGLASS concept. Moreover, LHTEE will assess the technical and economic viability of the process through the analysis of data gathered during the pilot implementation.

Funded by: LIFE+Environm. Policy and Governance.

Services

During the year, the Laboratory provided consulting and other services in the following cases:

- Supply of services for the maintenance of the emissions inventory and the software for the simulation of Ambient Air Quality.
- Air quality impacts due to the project "Redesigning the Athens centre along the Panepistimiou street".
- Support of the waste management authority in further promoting recycling, composting and waste-to-energy
- Rational management of organic waste in the Municipality of Poligiros
- Rational management of organic waste in the Municipality of Sithonia

- Optimization of waste collection and recyclable packaging of Nea Zihni
- Application of the DSS Toolkit for RES investment evaluation
- Feasibility assessment of biomass energetic utilization in the SONOCO paper mill
- Zerowaste, lowcost masterplans for the municipality of Almopia: Towards a zero-dumping municipality
- Investigation of the production possibilities of 2nd-generation biodiesel from micro-algae
- Investigation of the production possibilities of 2nd generation biodiesel from biomass fractions of municipal and industrial wastes
- Low-Cost, Zero-Dumping Municipality
- Assessing the impact of long-term storage of biodiesel
- Services of energy - Technical consultant for the energy refurbishment of a school
- Integrated evaluation of retrospective thermal insulation solutions in Cyprus
- Energy consulting and sustainable development for the design study of the school of Engineering at the University of Cyprus
- Energy efficiency, renewable energy sources and environmental impacts- master study.

Publications

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Articles in Books

Moussiopoulos N., Baniyas G., Douros I., Michailidou A. B. and Tsegas G. (2013), Emission estimates and air quality impacts from using alternative fuels in a

Thessaloniki cement factory, in *Publication in honor of Professor D. Tolikas*, (K. L. Katsifarakis and M. Vafeiadis, eds), Published by the School of Engineering, Aristotle University Thessaloniki, pp. 267-276 (in Greek).

Participation at Conferences

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

Conference on District Heating with Biomass and Targeted Financing Tools for Renewable Energy Projects and Energy Efficiency in Municipalities, 22-23 February, Amintaio, Greece

Energy investments by and for local authorities

International Conference on Renewable Energy and its Future in the Arab World 2013, 21-24 April, Amman, Jordan

Integration of renewables in buildings (A.M. Papadopoulos)

15th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, 06-09 May, Madrid, Spain

A methodology to assess the impact of input data uncertainties to Air Quality modelling results

4th International Conference on Environmental Management, Engineering, Planning and Economics (CEMEPE), 24-28 June, Mykonos island, Greece

A methodology for encouraging recycling in local level: the case of Neapoli-Sykies municipality, Hellas (Ch. Karkanias)

4th International RES & Energy Efficiency Conference, 06-07 June, Nicosia, Cyprus

On the impact of economic recession on domestic energy consumption

Environmental assessment of insulating clay bricks

The energy efficiency concept for hotels: The Cyprus case study

Implementing the Greek Energy Performance of Buildings Regulation in practice

3rd International Exergy, Life Cycle Assessment and Sustainability Workshop & Symposium (ELCAS-2), 19-21 June, Nisyros island, Greece

Comparative exergetic analysis of desalination methods (C.J. Koroneos)

Review of environmental impacts in the life cycle of olive oil

Environmental Assessment of urban buses-diesel, CNG, and biofuel powered (C.J. Koroneos)

25th Conference of Commission Internationale de l'Organisation Scientifique du Travail en Agriculture, 03-05 July, Billund, Denmark

Assessment of Green Supply Chain Management practices in the Greek agrifood sector

33rd NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application, 26-30 August, Miami, Florida, USA

Assessment of the effect of multiscale interactions on the atmospheric flow and the dispersion of air pollution in the city of Paris (N. Moussiopoulos)

13th International Conference on Environmental Science and Technology (CEST 2013), 05-07 September, Athens, Greece

Evaluation of measures to address climate change using multicriteria analysis

A software for assessing personal exposure in urban areas based on combined dose and exposure indicators

7th International Conference on Environmental Engineering and Management- Integration Challenges for Sustainability, 18-21 September, Vienna, Austria

Integrated exposure assessment in Thessaloniki, Greece

6th International Scientific Conference on Energy and Climate Change, 09-11 October, Athens, Greece

Sustainable Energy Action Plans for cities: the potential of the building sector

10th Meeting of Multiple Criteria Decision Analysis, 21-23 November, Thessaloniki, Greece

The use of multi criteria decision aid in waste management problems (G. Banias)

Final conference of the LIFE+Project "Particulate Matter Modelling, Monitoring and Management (PM3)", 25 November, Nicosia, Cyprus

Air quality at the street level in Cypriot cities

1st Logistics International conference (LOGIC), 28-30 November, Belgrade, Serbia

DeconRCM: A web-based tool for the optimal management of waste from construction activities (Ch. Achillas)

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. A.M. Papadopoulos gave a lecture in a workshop on "After KENAK: Energetic and environmental demands from 2020 buildings" in the frame of INFACOMA in Thessaloniki, on February 21th-24th.

Prof. N. Moussiopoulos participated at an Editorial Board Meeting of "Philosophical Transactions A" at the Royal Society, in London, on April 8th-9th.

Assoc. Prof. A. Karagiannidis gave a lecture in a workshop on "Production, processing and supply of biomass", in Karditsa, on April 11th-12th.

Prof. N. Moussiopoulos was an invited speaker at an event of DAAD in the frame of the programme "Strengthening South Europe's academic future", in Athens, April 12th.

Assoc. Prof. A. Karagiannidis attended a workshop on "Recycling: The necessity of the daily life of citizens-from knowledge to action", in Xanthi, on April 13th.

Prof. N. Moussiopoulos and Assoc. Prof. A. Karagiannidis attended a workshop on "Waste management technologies", in Thessaloniki, on April 26th.

Assoc. Prof. A. Karagiannidis attended a workshop on "Regional Waste Management - Transport to new Regional SWMB", in Thessaloniki, on June 10th.

Prof. N. Moussiopoulos chaired a session on "Vocational Education and Training", in the frame of the "Northern Greece business forum", in Oreokastro, on September 6th.

Our Laboratory organized the 2nd Transnational Working Meeting in the frame of the URBAN EMPATHY programme at Aristotle University Research Dissemination Centre in Thessaloniki, on September 30th -October 1st.

Prof. N. Moussiopoulos gave a lecture on the economic, social and environmental facets of sustainability in the frame of the Thessaloniki Municipality Open University, on November 20th.

News

As of September 2013 Prof. A.M. Papadopoulos left our Laboratory to head the Process Equipment Design Laboratory. We wish him success in this new position.

Two Doctorates were completed successfully in 2013. Stamatia Kontogianni and Fotios Barmpas obtained their degree.

Two staff members (Sofoklis Antonopoulos and Sofia-Natalia Boemi) have left the Laboratory, while four members followed Professor Papadopoulos and thus joined the Process Equipment Design Laboratory: Efrosini Giama, Christina-Vassiliki Konstantinidou Elli Kyriaki, and Konstantina Leonidaki. We wish them all good luck for the new challenges that lie ahead.

Apostolos Athanasiadis joined our Laboratory.

Dr. Christofer Koroneos has been appointed as an Associate Professor at the University of Western Macedonia.

We congratulate Harisios Achilles and Dimitra Spyridi for the birth of their sons.

Laboratory Personnel

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

Agis Papadopoulos Professor, Dr.-Eng., MSc*

Avraam Karagiannidis Associate Professor, Dr.-Eng., MSc

Afedo Koukounaris, Administration Officer

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

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

Efrosini Giama, Dr.-Eng., MSc*

Ioannis Ossanlis, Mech. Engineer, MSc

Georgios Perkoulidis, Dr.-Eng

Theodora Slini, Dr.-Eng., Mathematician

Christos Vlachokostas, Dr.-Eng.

Researchers and PhD Candidates

Charisios Achillas

Dimitrios Anastaselos*

Apostolos Athanasiadis

George Banias

Sofia-Natalia Boemi*

Evangelia Fragkou

Evangelia-Anna Kalognomou

Christopher Koroneos

Apostolos Malamakis

Georgios Tsegas

Dr.-Eng.

Dr.-Eng.

Mech. Engineer

Dr.-Eng.

Environ. Scientist, PhD

Biologist, Environ., PhD

Dr.-Eng., MPhys

Chem. Engineer, PhD

Dr.-Eng.

Physicist, PhD

Vasilios-Ioannis Akylas

Lefteris Chourdakis

Eleni Feleki

Christos Karkanias

Christina Konstantinidou*

Stamatia Kontogianni

Konstantina Leonidaki*

Dionisios Logothetis

Alexandra Michailidou

Dimitra Spyridi

Mech. Engineer

Mech. Engineer

Chem. Engineer, MSc

Environ. Scientist, MSc

Civil Engineer

Mech. Engineer

Mech. Engineer

Mech. Engineer

Mech. Engineer

Mech. Engineer, MSc

*until 31st August, since then Process Equipment Design Laboratory

Technical Staff and Secretariat

Eugenia Agorastoudi

Dimitrios Altinoglou

Administrative Support

Administrative Support

Maria Zilou-Kapaktsi

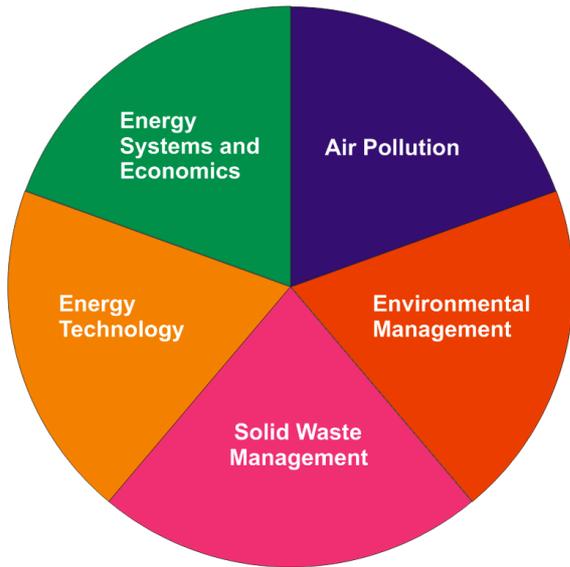
Georgios Kotriklas

Administrative Support

System Administrator



Main Research Topics



Energy Systems and Technology

- Energy conservation and renewable energy sources
- Energy design of buildings
- Energy and environmental evaluation of buildings
- LCA and environmental management
- Sustainable production

Air Pollution and Climate Change

- Multi-scale air pollution studies
- Air pollution-climate interactions
- Air quality assessment and management
- Environmental impact assessment
- Integrated environmental assessment

Waste Management

- Contaminated site management
- Recycling, logistics, waste scenaria
- Thermal treatment and energy recovery
- Pricing schemes, decision support tools
- Sustainable consumption, social issues

Undergraduate Courses offered by Laboratory Members

1st Level:

Heat Transfer

2nd Level:

Heating-Refrigeration-Air Conditioning
Introduction to Environmental Engineering

3rd Level:

Thermal Processes and Applications
Solid Waste Treatment and Management
Energy Design of Buildings
Environmental Impact Assessment
Economic Analysis of Energy Systems
Air Pollution
Investment Analysis and Assessment
Environmental Management

ISO Certificate



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