Exposogas NEWSLETTER

EDITORIAL

We are happy to deliver the 1st newsletter of the EXPOSOGAS project. This is a Twinning Horizon 2020 project that will promote the training and career development of its researchers in the field of occupational and environmental health sciences. Special focus is paid on workers directly involved with oil and gas activities, including the population health surveillance of surrounding communities, using the human exposome tools. We hope you will find this newsletter informative. If you have any questions or comments, please get in touch with us!

Konstantinos C. Makris, PhD EXPOSOGAS project coordinator

What is EXPOSOGAS about?

EXPOSOGAS is a 3-year project funded by the European Union, which aims to develop the research capacity of the Cyprus International Institute for Environmental and Public Health (CII) in using the human exposome platform and tools. EXPOSOGAS will use the exposome framework for assessing, managing and communicating information about the overall health risk of hydrocarbons operations to workers and the general population.

What is the human exposome?

The human exposome is a relatively new framework for conducting research. The exposome concept was first coined by the cancer epidemiologist Dr. Christopher Wild in 2005, who defined it as the cumulative set of all non-genetic (i.e. environmental) exposures which an individual experiences of from the moment conception throughout their life. Thus, exposome studies focus on the effects of multiple environmental exposure and sequent health-related outcomes.

For more info, please visit our website: www.exposogas.eu and our Facebook Page

What is EXPOSOGAS interested in?

EXPOSOGAS is interested in oil/gas operations that often involve exposures to multiple chemicals, shift work, noise, high temperatures, and ergonomic and psychological factors and the collective impact on health that these multiple exposures have. Important operation stages of hydrocarbons occur throughout the industry lifecycle and include the preparation and installation, production, transport, storage, distribution, use and end of life activities and each of these will affect health differently, thus increased training is necessary in order to be able to establish how health is affected across the stages.

Why focus on the oil and gas industry in Cyprus?

The oil and gas industry in Cyprus is growing at a tremendous rate, especially with the recent discovery of the natural gas reserves in the Cypriot exclusive economic zone. In order to increase the autonomy and energy independence of the Southern European region, the EEZ region is of primary importance. However, given the expansion of the oil and gas sector in Cyprus, there is also a need to similarly increase the capacity of the occupational and environmental health sciences in maintaining active surveillance of affected communities.

How will we do this?

Primarily by promoting the training and career development of CII researchers in the field of occupational and environmental health sciences through training that teaches them how to apply the exposome concept and related technologies on workers directly involved with oil/gas activities. EXPOSOGAS is actively trying to engage stakeholders and the general public to express their views as a means of furthering the exposomic framework.



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EXPOSOGAS PROJECT ACTIVITIES 1st and 2nd STAKEHOLDER WORKSHOPS

Our EXPOSOGAS stakeholder workshops are held bi-annually and are open all interested stakeholders. Their purpose is to discuss the project together with the Project Members (meet the team in the "Partners' Biographies " section) and give their valued insights on the topics of discussion as outlined by the workshops agenda.

English.

During the **1**st **Stakeholder Workshop**, which took place on 6th September 2018, the public was introduced to the project members and the EXPOSOGAS project concept and activities. This kick-off event commemorated the start of the 3-year long EXPOSOGAS project and attendees included the Ministry of Labour, the Firefighters' Association, and members from the Republic's General Laboratory. To read more about this event, please see the media coverage in Greek and

The **2nd Stakeholder Workshop** was hosted by the Cyprus University of Technology on the 18th March 2019. Stakeholders were invited to attend and discuss hydrocarbons health risks with the Project Members. The attendees



Top left: CUT, IOM, and TNO Project Partners at the 1st Stakeholder Workshop. **Bottom left:** 1st Stakeholder Workshop in action.

We want to hear your views!



represented members from the Firefighters Association, the Republic's General Chemistry Laboratory, and special interest groups such as those assessing the People's Quality of Living. To read more about this event, please refer to the media coverage of this event in Greek and English.
 EXPOSOGAS research project is keen to english stakeholders who have an interest in the activit the oil and gas industry. If you are a member of

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<u>Top right:</u> 2nd Stakeholder Workshop in action. <u>Bottom right</u>: presentation by Dr. Rob Stierum on the internal exposome during the 2nd Stakeholder Workshop.

The EXPOSOGAS research project is keen to engage with stakeholders who have an interest in the activities of the oil and gas industry. If you are a member of the government, the public, industry or an academic, please get in touch with us and introduce yourself via <u>our website contact form</u> or over a message through <u>our Facebook page!</u>

For more info, please visit our website: <u>www.exposogas.eu</u> and <u>our Facebook Page</u>



EXPOSOGAS PROJECT ACTIVITIES



Top: CUT students that attended the first training sessions together with the EXPOSOGAS Project Members. **Bottom:** Close-up image of students paying attention during the presentation on the 'Internal Exposome'



FIRST STUDENT TRAINING SESSIONS AT CUT

One of the major objectives of the EXPOSOGAS project is to train young and early researchers



and scientists on the human exposome concept as applied to the hydrocarbon risk scenario and various oil and gas settings.

Teaming up with the EXPOSOGAS Project Members, the Master's students at the Cyprus University of Technology were trained on exposome concepts and were divided into groups in order to complete real-world assignments related to oil and gas activities.

By applying their new skills to existing healthrelated problems in Cyprus due to the hydrocarbon industry, students were able to have breakthroughs and develop critical thinking skills, which relate to designing exposome research studies.

To read more about this event, please see the corresponding media coverage <u>(GR)</u> and <u>(EN)</u>.

MAPPING STAKEHOLDERS

In an effort to engage more stakeholders to participate in the EXPOSOGAS research project, the EXPOSOGAS team members identified stakeholders across multiple domains (governmental, academic, business, and non-governmental) which may be affected or play a role in the hydrocarbon industry. The EXPOSOGAS research project is keen to engage with all interested stakeholders. If you are a member of the government, the public, a part of the industry, or an academic, please get in touch with us and introduce yourself via <u>our website contact form</u> or over a message through <u>our Facebook page!</u>



EXPOSOGAS PROJECT ACTIVITIES



Dr. Pietro Comba lecturing on refineries and human health.



<u>**Top**</u>: Exposome Symposium guide <u>**Bottom**</u>: Symposium Poster exhibition

LECTURE ON 'REFINERIES AND HUMAN HEALTH'

Dr. Pietro Comba, an expert in environmental epidemiology of industrially contaminated sites, from the Italian National Institute of Health, visited the Master's students of Public Health at CII on April 16-17 to lecture about the 'Human health risks and emissions from refineries and petrochemical plants.' Students had the unique opportunity to engage with a world authoritative epidemiologist and learn about advanced research methods for assessing human health and risks associated with refineries.

PARTICIPATION IN THE 2019 EXPOSOME SYMPOSIUM

The CII was represented by Dr. K. Makris in the 2019 Exposome Symposium that took place at the Univ. of Brescia entitled: Emerging Science and Technology for Effective Prevention and Healthy Outcomes. This prestigious symposium, held at the University of Brescia on May 20-21, 2019, was hosted by leaders of the exposome field, i.e., the Mount Sinai Institute for Exposomic Research. The CII participated by presenting and communicating the framework of the urban exposome, both its theoretical and practical applications. During the symposium, the major components and applications of the human exposome were presented by leaders in the field from the USA, the Netherlands, the UK and the Italy. Some topics that were covered included: data mining, human biomonitoring and targeted assays, occupational exposome, untargeted analysis, and precision medicine.

What are your views on EXPOSOGAS?

EXPOSOGAS is all about building a collaborative network across disciplines in order to make it possible to integrate the exposome as a research framework for studying health in the hydrocarbon industry. If you are interested, please get in touch with us and introduce yourself via <u>our website contact form</u> or over a message through <u>our Facebook page!</u>



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EXPOSOGAS PROJECT ACTIVITIES



PUBLIC PRESENTATION: Hydrocarbons and Health Risks On 29/5, a public presentation on '*Hydrocarbons: Their use in everyday life and*

their potential effect' was held at the Cyprus University of Technology in an event supported by the Cyprus Research Promotion Foundation. For more information about this event go <u>here (GR)</u> and <u>here (EN)</u>.



INTERNAL TRAINING: A Webinar on Stakeholder Engagement On 4/6, a webinar on '*How to Engage with Stakeholders*' was hosted for internal training purposes. This training was offered by Dr. Joanne Crawford from IOM, an expert in stakeholder engagement. Topics included: understanding the different types of stakeholders, importance of planning for stakeholder engagement throughout the project and understanding the benefits ad risks of using stakeholders.

FUTURE EXPOSOGAS ACTIVITIES



18/8 – 22/8 International Society of Exposure Science (ISES) Conference Kaunas, *Lithuania* Members of the EXPOSOGAS project team will be presenting their findings from a series of literature reviews which are currently being undertaken on cohort studies in the oil and gas industry and the use of exposomic technologies. The abstracts "Review of environmental and occupational cohort studies related to the up- and mid-stream oil and gas industry" was accepted as a poster and the EELCOS abstract "Review on technologies and their applicability in an exposomebased assessment of hazards and risk in the petrochemical industry."



25/8 - 28/8 Poster Presentation at the ISEE Conference *Utrecht, Netherlands* The abstract "Human exposome studies: explored domains, methods, tools and future recommendations" was accepted for the International Society for Environmental Epidemiology (ISEE) Conference to be held in Utrecht, Netherlands. The main focus of this work was to generate a working definition of 'exposome research' based on existing academic literature since, currently, a rigorous definition outlining what constitutes as 'exposome research' is lacking.



5/11 and 6/11 Upcoming Student Training Sessions *Limassol, Cyprus* The next student training sessions are scheduled to occur November 5th and 7th where students will learn new exposome-related skills from the visiting Project Members. For more details, please refer to the EXPOSOGAS website <u>www.exposogas.eu</u> at a time closer to the date of the event.



7/11 Stakeholders Workshop Limassol, Cyprus On 6/11, the upcoming stakeholders workshop is scheduled to occur. For more details, please refer to the EXPOSOGAS website <u>www.exposogas.eu</u> at a time closer to the date of the event.



MEET THE EXPOSOGAS TEAM



Cyprus Cyprus International University of Technology Cyprus International Institute for Environment and Public Health

Dr. Konstantinos C. Makris supervises the Water and Health laboratory in the Cyprus International Institute for Environmental and Public Health and is the coordinator of the EXPOSOGAS project.

He is an associate professor of environmental health and he held an appointment as adjunct assistant professor of environmental health at the Dept. of Environmental Health, Harvard University, USA (2009-2015). Dr. Makris leads the exposome-based water and health lab which aims to minimize the human health risk associated with chronic exposures to environmental stressors. Towards this goal, his team applies improved exposure assessment protocols that refine the degree of association with metabolic health outcomes, participating in human studies in Cyprus, Greece, France, Kuwait, the Netherlands, and Norway. His laboratory is equipped with state-of-the art instrumentation valued at >0.5M euros to generate its own biomarker and metabolomics data.

Since 2009, Prof. Makris has received > 1.5 million euros in external funding from the EU, the Cyprus RPF, the BBMRI-LPC biobanking network in the EU, and the National Institutes of Environmental Health Sciences Center at Harvard University. He has produced over 85 peer-reviewed journal articles and >40 conference proceedings. He was one of the two investigators that conducted the cancer cluster investigation for the Astrasol brain cancer case in Cyprus. Prof. Makris was invited by the Cyprus Parliament Senate Committee on Environment and Health to provide expert testimony about the environmental health consequences for the surrounding populations after the Mari tragedy/explosion and has also served as a member of the scientific advisory committee to the Ministry of Health concerning arsenic exposures in Cyprus. Prof. Makris has been invited by >10 universities and organizations in the USA/EU to deliver research talks, such as in Harvard University, Emory University, University of Alberta, University of Delaware, etc. and he has presided 6 symposia in international conferences.

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- Andrianou XD, **Makris KC.** The framework of urban exposome: Application of the exposome concept in urban health studies. Sci Total Environ. 2018 Sep 15; 15;636:963-967. doi: 10.1016/j.scitotenv.2018.04.329. Epub 2018 May 3.
- Ioannou S, Ioannou S, Andrianou XD, Charisiadis P, Yiasoumi G, Christophi CA, Makris KC. Occupational exposures to disinfectants and pre-diabetes status among active nurses in Cyprus.Scand J Work Environ Health. 2019 Mar 14. pii: 3804. doi: 10.5271/sjweh.3804.
- Tsangari X, Andrianou XD, Agapiou A, Mochalski P, Makris KC. Spatial characteristics of urinary BTEX concentrations in the general population. Chemosphere. 2017 Apr;173:261-266. doi: 10.1016/j.chemosphere.2017.01.043.

Dr. Wouter Fransman is senior research scientist at the department of Risk Analysis for Products in Development at TNO in The Netherlands, one of the major non-profit contract research organisations in Europe. His



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innovation for life main fields of interest are exposure assessment in epidemiology and exposure assessment for risk assessment / risk management. He has extensive knowledge in measuring and assessing (occupational) exposure and statistical modeling, and is involved in a wide variety of projects on modeling of exposure variability.

He is leading the team on exposure assessment and risk management and coordinates studies on measuring exposure in different (work) situations and designing exposure / risk assessment models based on these measurement data. He has >75 publications in the areas of risk assessment, occupational exposure assessment and epidemiology.

- Wouter Fransman. (2017) How Accurate and Reliable Are Exposure Models? Ann Work Exp Health 2017.
- Remy Franken, Neeraj Shandilya, Hans Marquart, Kevin McNally, Wouter Fransman. (2019) Extrapolating the applicability of measurement data on worker inhalation exposure to chemical substances. Ann Work Exp Health;
- Hans Marquart, Remy Franken, Henk Goede, Wouter Fransman, and Jody Schinkel. (2017) Validation of the dermal exposure model in ECETOC TRA. Ann Work Exp Health; 61(7): 854-871.





Dr. Karen Galea is Section Head of Exposure Science at the IOM. Her relevant experience (oil & gas industry) has focused predominantly on dermal exposure to crude oil and drilling fluids as well as consumer dermal exposure to diesel and lubricant oils. She has investigated inhalation exposure to oil mists and vapours during shale shaker operations and completed a toxicological review of the possible effects associated with inhalation and dermal exposure to drilling fluid streams. She is also a member of an independent air quality review group which reviews air quality data pertaining to two large petrochemical complexes in the central belt of Scotland.

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TNO innovation for life

Dr. Anjoeka Pronk is a senior scientist at TNO, one of the major non-profit contract research organisations in Europe. She is an interdisciplinary researcher on environmental and occupational exposure and risk assessment, health impact assessment and epidemiology (registered epidemiologist). She heads the TNO exposome program which was established to facilitate translational exposome research and to apply exposome knowledge and technologies for health applications. Within this program, innovative techniques for measurement and modelling of personal external and internal exposures in relation to health are developed, e.g. (wearable) sensorbased sampling, passive sampling techniques or integrated modelling

These exposome technologies are applied in environmental and occupational health studies for evaluating the effect of the exposome on health, and also form the basis for preventive strategies at group level and personalized interventions. The program focusses on high risk populations, with specific focus on 'the working life exposome'. Anjoeka has over 50 publications on exposure assessment, epidemiology and exposome. She participates in relevant EU projects HEALS and HBM4EU. She also coordinates exposome projects for the Dutch government and the private sector. She has set up several collaborations with oil and gas industry e.g for the development of point of care biomarker assays for benzene exposure and for the application of (wearable) sensor systems for personalized exposure assessment.

- Tromp, P.C., Beeltje, B., Okeme, J.O., Vermeulen, R., Pronk, A., Diamons, M.L. Calibration of polydimethylsiloxane and polyurethane foam passive air samplers for measuring semi volatile organic compounds using a novel exposure chamber design (2019). Chemosphere. Accepted
- de Kluizenaar, Y., Kuijpers, E., Eekhout, I., Voogt, M., Vermeulen, R.C.H., Hoek, G., Sterkenburg, R.P., Pierik, F.H., Duyzer, J.H., Meijer, E.W., **Pronk, A**. Personal exposure to UFP in different microenvironments and time of day (2017). Building and Environment, 122, pp. 237-246.
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Dr. Miranda Loh is a Senior Scientist working in the Centre for Human Exposure Science of the Research Division at the Institute of Occupational Medicine (IOM). She is an exposure scientist who tries to understand how people interact with their environment, and how this affects their exposure to both negative and positive aspects of the environment. Her work involves multi-media exposure field methods and modelling methods for environmental health studies. She has experience with a variety of research areas including volatile organic compounds and metals. She has been involved in evaluating air pollution and physical activity sensors and has developed a multi-stressor indoor and personal exposure assessment system, based on sensor technology, that can be used in exposome studies as part of the Health and Environment-wide Associations based on Large Population Surveys (HEALS) study, funded by the European Union. Her work on environmental health extends also to Asia, as the Principal Investigator for the Air Pollution Impacts on Cardiopulmonary disease in Beijing: An integrated study of Exposure Science, Toxicogenomics & Environmental Epidemiology (APIC-ESTEE) funded by the British Natural Environment Research Council, the Medical Research Council, and China's National Natural Science Foundation

She is also involved in air pollution exposure and health projects in India and Thailand. Past projects include assessment of metals exposures of children living near a hazardous waste site in a former mining community and measurement and modelling of exposures and risk to volatile organic compounds. Dr. Loh has a B.A. from Stanford University and an MS and Sc.D. (2006) from the Harvard School of Public Health in Environmental Health. She then worked at the National Institute for Health and Welfare (THL) in Finland. Prior to joining the IOM, Dr. Loh was assistant professor at the University of Arizona in the United States, where she maintains a faculty affiliation.

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for life

Dr. Rob Stierum is an interdisciplinary researcher and European Registered Toxicologist at The Netherlands Organisation for Applied Scientific Research TNO. In the past, he coordinated various programs on omics/bioinformatics applied to in vitro toxicology (funded a.o. by EC, CEFIC, ZonMw). Currently, his interest shifts towards understanding the internal exposome and from this developing approaches to improve personalized (occupational) health. This, via the integration of toxicology with omics, computational modelling approaches and external personalized exposure data. Part of this involves the coordination of the genomics activities for the EU FP7 exposome innovation project HEALS, as well as participation in the European Biomonitoring Initiative HBM4EU, in which he is involved in modelling external to internal exposure in relation to adverse outcome pathways.

Further, Rob is co-leading the exposome Early Research Program within TNO (see: whitepaper 'Exposome: connecting the dots for effective prevention of disease'), with special focus on the internal exposome. His expertise with respect to hydrocarbons is primarily on the application of modelling approaches for benzene.

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