



GREENTECH SYMPOSIUM 2019

Book of Abstracts of the GreenTech Symposium

The GreenTech Symposium is an international scientific conference aimed at connecting the academic community to corporates by presenting all the new innovative products of researchers and startups in the fields of Smart Cities, Innovative Green, Advanced Materials, Environment, Energy, Entrepreneurship and Innovation. The call for papers focuses on showcasing the best research papers in the field of Smart Cities, Innovative Green and Advanced Materials and Environment & Energy.

Technopolis, City of Athens

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of the
GreenTech Symposium 2019

Discover Innovation in Green Technologies

The **GreenTech Symposium** is an international scientific conference aimed at connecting the academic community to corporates by presenting all the new innovative products of researchers and startups in the fields of Smart Cities, Innovative Green, Advanced Materials, Environment, Energy, Entrepreneurship and Innovation. The conference is supported scientifically by the **Environmental Economics and Sustainability Unit** of the National Technical University of Athens and it was held at Technopolis, City of Athens on October 23rd & 24th.

The call for papers focuses on showcasing the best research papers in the field of Smart Cities, Innovative Green and Advanced Materials and Environment & Energy. All the topics are aligned with the core topic of the GreenTech Symposium which is targeting on achieving the Sustainable Development Goals by UN. The purpose is to connect the research findings and ideas with the daily applications that serve the needs of people and make their life simpler while also decrease the environmental footprint.

Technopolis City of Athens that was chosen to host the **GreenTech Symposium** has become a hub of cultural events, thus upgrading a historic area of the capital and creating another focal point in the cultural identity of Athens.

Editor

*Konstantinos Aravossis
Assoc. Professor, NTUA,
General Secretary for Natural Environment and water, Greek Ministry of Environment and Energy,
Scientific Responsible, GreenTech Symposium*

October 23-24, 2019 • Technopolis, City of Athens

• **Conference Program**

October 23rd, 2019

- **13.30-14.00 GreenTech Symposium Opening**
Konstantinos Aravossis, Assoc. Professor, NTUA, General Secretary for Natural Environment and water, Greek Ministry of Environment and Energy, Scientific Responsible, GreenTech Symposium
- **14.00-15.00 Environmental economy and sustainable growth. The role of private sector (PASEPPE)**
Powered by: Greek Association of Environmental Protection Companies, Charalabos Charalabidis, Public Relations Consultant, PASEPPE, Efi Tritopoulou, President, NoWaste21, Panagiotis Skiadas, Sustainability Director, Viohalco Group, Stavros Theodoropoulos, CEO, ANAMET, Board of Directors Representative, SEPAN
- **15.00-16.00 Launch of GreenTech Challenge by ESU NTUA 2019 – The institutional competition for startups in the sectors of Energy, Environment and Smart Cities**
Prof. Konstantinos Aravosis, Assoc. Professor, NTUA, General Secretary for Natural Environment and Water, Greek Ministry of Environment and Energy, Scientific Responsible, GreenTech Symposium, Christos Nikoloudis, CEO & Founder, Mantis Business Innovation, Curator, StartupNow Forum, Christos Kalantzis, Coordinator, Student Committee GreenTech Challenge, Vasilis Stenos, Winner GreenTech Challenge 2018, Solmeyea, Mark D. Kyriazis, Winner GreenTech Challenge 2018, PTA REHAB Ecorthotics
- **16.00 - 17.00 Innovation. Education. Entrepreneurship. Strengthening the raw materials and environment sector by educating the lifecycle of innovators**
Coordinator: Antonis Politis, Business Developer, EIT RawMaterials - CLC East, Ioannis Paspaliaris, Scientific Responsible, EIT RawMaterials HUB_Regional Center Greece, Konstantinos Miltiadis Sakkas, Managing Director, Enalos Research and Development
- **17.00 - 17.40 Circular Economy side by side with New Green Technologies**
Coordinator: Konstantinos Maragkogiannis, Circular Economy Representative, Ministry of Environment & Energy, Dionissis Boudouvas, Managing Director, COMBATT S.A., Christos Raftogiannis, Founder & CEO, CityCrop
- **17.40 - 18.15 The 4th Industrial Revolution in Energy and Environmental Policy in Municipalities**
Coordinator: Dr. Nikolaos Kakogiannis, General Manager, ABEC Group, Stavros Alexakis, Managing Director & Co-owner, 360 Trust Services, Prof. Haris Doukas, Associate Professor of Management & Decision Support Systems Laboratory, National Technical University of Athens
- **18.15 - 19.00 Sustainability era - energy, environment, food - “climate mitigation” challenges & “livestock revolution” opportunities in Greece & abroad**
Coordinator: Vasilis Stenos, CEO & Founder of Solmeyea, Georgios Papadakis, Ex Dean, Agricultural University of Athens, Nikolaos Labrou, Biotechnology Lab Coordinator, Agricultural University of Athens, Georgios Stratakis, General Secretary, Ministry of Rural Development and Food, Prof. George N. Skaracis, Professor Emeritus & Director, Biometry Science Center of Agricultural University of Athens
- **19.00 - 21.00 Innovation on Fire (IoF) - Excellent examples of innovation in practice by Greek agri-food companies.**
Coordinators: Kostas Tsaousis, Journalist & Founder, Idea Lab, Diomidis Theocharopoulos, Co-Founder, Beyond Exports, Dimitris Mitrakos, Founder of Yamas Drinks

October 24th, 2019

- **12.00 - 12.40 Technological Progress in Sea and Water Resources Management**
Coordinator: Giorgos Manolis, Founding Member, Envinow.gr Prof. Anastasios Stamou, Professor, School of Civil Engineering, National Technical University of Athens, Prof. Simeon Malamis, Assistant Professor, School of Civil Engineering, National Technical University of Athens
- **12.40 - 13.20 Linking research, innovation and entrepreneurship at the National Technical University of Athens**
Coordinator: Dr. Vaggelis Siokas, Project Manager, EPINOO – Invent ICT Prof. Aggelos Tsakanikas, Assistant Professor, National Technical University of Athens, Prof. Yannis Caloghiourou, Professor, National Technical University of Athens, Ioanna Kastelli, Teaching and Research Associate at the Laboratory of Industrial and Energy Economics, National Technical University of Athens
- **13.20 - 14.00 Needs for Green Skills in new digital era**
Coordinator: Ilias Vartholomaios, CEO & Co-Founder, Owiwi, George M. Tentes, Managing Director, Green2Sustain, Dr. Vasilis Liogkas, Circular Economy Representative, Ministry of Environment & Energy
- **14.00 - 14.20 Energy efficiency optimization in cement industry using modern powerful regression tools**
Thanassis Gentimis, General Manager, SymbioLabs
- **14.20 - 15.00 Smart weather for weather-sensitive industries and smart cities**
Coordinator: Vassilis Chryssos, Co-Founder, Ex Machina | Grigorios Chasanis, Electromechanical Systems Manager, Olympia Odos S.A. | Christos A. Gizelis, Digital Transformation Analyst, IT Digitalization & Innovation OTE Group of Companies | Konstantinos Gogos, Digital & innovation, Athens International Airport
- **15:00 – 15:40 Agri-tech tools to decrease the environmental footprint**
Coordinator: Socratis Ploussas, Project manager, ID-GC
- **15:40 – 17:05 Research Papers Presentation**
Coordinator: Dr. Lena Strantali, Environmental Economics and Sustainability Unit, National Technical University of Athens, Environment & Energy, Innovative Green, Advanced Materials, Smart Cities, Entrepreneurship & Innovation
- **17:05 – 17:20 The use of high technology and financial tool as important factors in promoting recycling in the country**
Pavlos Ravanis, President, REWARDING PACKAGING RECYCLING
- **17:20 – 19:00 How Industry 4.0 Transforms the Waste Sector**
Powered by: Hellenic Solid Waste Management Association, Introduction: The main proposals of HSWMA for Circular Economy Alexandros Katsiamboulas, President, HSWMA, Main Presentation: How Industry 4.0 Transforms the Waste Sector; ISWA report, George Firfilionis , Scientific Research Assistant of A. Mavropoulos, President ISWA, Panel Discussion HSWMA, Coordinator: Argiris Demertzis, Chief Editor, ecopress.gr, Alexandros Katsiamboulas, President, HSWMA, Prof. Andreas Andreopoulos, Ex Dean NTUA, member of HSWMA, George Iliopoulos, Vice President, HSWMA, Andreas Loukatos, Executive Vice President for Industry, HSWMA, Antonis Papadakis, General Secretary, HSWMA

Committees

Scientific Committee

- Aravossis Konstantinos, School of Mechanical Engineering, NTUA
- Kapsalis Vasilis, School of Mechanical Engineering, NTUA
- Andreopoulos Andreas, School of Chemical Engineering, NTUA
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- Tounta Terry, NTUA
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- Kalantzis Christos, GreenTech Challenge
- Goliopoulos Nikos, JA Alumni

A total of 9 abstracts are included in the book of abstracts by the participants of **GreenTech Symposium** who have contributed their work to the conference. The organizing committee chose this time to publish the book of abstracts in a hard copy volume which is properly edited and has a separate ISBN number.

The main themes of the conference can be summarized in the following categories:

1) Smart Cities

- Smart administration and energy management of cities
- Smart and innovative operation of viable cities
- Eco-Mobility, Sustainable waste management
- Optimal energy management
- Applications for the development of civic participation and the development of eco-consciousness

2) Advanced Materials

- Nanotechnology
- Advanced Green Materials & New Chemicals
- Intelligent control systems
- Robotics
- Structural products

3) Environment & Energy

- Adequacy and sustainability of mineral resources
- Climate change
- Reduction of CO2 emissions
- Cyclical Economy
- Marine Development
- Renewable energy sources
- Developing sustainable and efficient models of energy models in RES
- Development and transfer of RES technology
- Citizen participation in environmental and ecological policy

4) Innovation & Entrepreneurship

- Disrupting Innovation and New Business Models
- Agile Organization, Culture & Leadership for Innovation
- Digital Innovation and Business Transformation
- AI, Blockchain & Deep Tech Technologies
- Startup Collaboration, Ecosystems and Open Innovation
- Multicriteria Decision Making Models in Entrepreneurship
- Business process modeling for SMEs & Startups
- Human resources-oriented innovativeness
- SMEs, Startups and real global entrepreneurship
- Technological innovativeness and entrepreneurship
- Future engineers and entrepreneurship
- Financing Innovations and Entrepreneurial Ventures
- Simplicity and system process in engineering and development
- Green smart technology and innovation

The artificial intelligence in the fashion retail industry

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Marketing literature abounds with discussions of the importance of store atmospherics cues affecting the purchase intention. Next to the classical in-store atmospherics, e-atmospherics offer new experiences to the consumers. Elements of the store atmospherics, such as mirrors of augmented reality and RFID shelves, are based on new technologies and especially on artificial intelligence (AI). In this study examined is the evolution of fashion retailing, as a result of the change of the contemporary consumeru2019s behavior. The customer experience is a matter of greatest importance. New technologies aim at the customeru2019s satisfaction and increase the profit of the stores. Primary target of the study is to investigate the way the artificial intelligence affects the purchase intention of clothing at brick-and-mortar stores. The research is based on the quantitative method analysis of 236 questionnaires. Results: Young Greeks are familiar to artificial intelligence and more than 50% consider that physical stores will continue to exist in the future. Moreover, consumers who have little time to spend in a store, at the cashier or the fitting room, are very fond of the idea of buying clothing in less time in a physical store using new technologies. The absence of stuff and the need of tactile input reinforce the purchase intention in AI store. Many consumers are skeptical giving away personal data and this a problem that AI stores have to overcome too.

Keywords: artificial intelligence, clothing, store atmospherics

Innovative smart city recycling platform

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FOLLOWGREEN is a digital application (platform – www.followgreen.gr) that rewards citizens who reuse or recycle at municipal level. It is a useful tool for Municipalities, as it motivates citizens through local market discounts and educates them -in a simple and entertaining way- at the same time. The main functions of the platform include: • The citizens register as household users and earn reward points by being educated on environmental issues (reading articles, solving quiz and watching videos) and by certifying or registering their day-to-day recycling activities. • The citizens can then redeem their reward points for special discounts in local shops and municipality services, or donate points as support to local schools in the framework of recycling school contests. It is thus a rewarding scheme for green citizens who recycle! >>Phase of development The platform was initially launched in December 2016 in one Greek Municipality (Municipality of Pallini) and now it has been expanded to other 12 covering a population of 700.000 inhabitants. >>Main benefits and significance • Providing Municipalities with a contemporary digital tool to reward citizens who promote reuse and recycling through local market discounts. • Educating citizens -in a simple and entertaining way- on reuse and recycling practices. • Motivating schools (students and parents) through recycling contests in order to play a key role in Municipality's recycling. • Strengthening the social services of a Municipality, as it connects reuse of materials (e.g. clothes, household items, books offered for social vulnerable people) with rewards. • Strengthening the local market (as points can be redeemed in local shops) and providing free of charge advertisement to local businesses. • Boosting reuse and recycling in a Municipality, introducing the basic elements of circular economy.

Keywords: Smart city application, Recycling, Reward, Followgreen, Platform

3.

Use of poultry manure as a sustainable resource for bioenergy/ biomethane production

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Poultry manure is a solid residue of major concern characterized by a high inorganic and organic matter content. It is suitable for biogas production through anaerobic digestion technologies. However conventional anaerobic digesters encounter major process instabilities mainly due to the accumulation of soluble salts and ammonia. Thermal hydrolysis pre-treatment can achieve pasteurisation and enhance solubilization of poultry manure organics. The optimal conditions for thermal hydrolysis were determined as 70 ° C temperature and 60 min and processing. Under optimum conditions it was possible to recover 700-900 kg COD / tn VS. The pre-treated poultry manure was characterized by a high total COD concentration, while batch anaerobic digestion revealed high anaerobic biodegradability with a biogas yield equal to 0.50 m³ / kgCOD.

Keywords: anaerobic digestion, poultry manure, biogas, organic wastes, pre-treatment

Charybdis satellite system for active debris removal from lower earth orbit

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This paper discusses the process of integration of the subsystem components and development of the satellite configuration to achieve a final layout for the satellite system “Charybdis”. The process will be applied on a test case and it is called “Charybdis Test Sat”. The Satellite structural configuration is designed to accommodate all the mission components. All mechanical requirements are derived from the satellite’s configuration and for its mission which is “Active Debris Removal”. The process used to create the satellite configuration of Charybdis satellite system is described. It begins with mission definition, launch vehicle selection, and subsystem identification. This is followed by a description of the satellite composition, and the major design constraints that guide the configuration design. Then a configuration development process is presented to create the preliminary configuration. Finally, the issued layout drawings and the calculated mass properties for the developed Charybdis satellite system are presented.

Keywords: satellite, space, debris, charybdis, environment, prometheus

Energy consumption and greenhouse gas emissions on wastewater treatment plants

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The objective of this research was to assess the energy consumption and the greenhouse gas emissions of wastewater treatment plants (WWTPs) and to propose several possible strategies that can be implemented to reduce both energy consumption and greenhouse gas (GHG) emissions. The survey was focused on WWTPs all over the world in different regions in order to spot differences in energy consumption and GHG emissions in different countries and different size of wastewater treatment plants. Based on the research, the annual specific energy consumption ranged from 20 to 120 kWh/PE in most wastewater treatment plants and the average consumption varies between countries, even the ones that are in the same region. Also, the energy consumption is higher in small wastewater treatment plants due to several generic problems. The highest energy consumer in all the WWTPs is aeration, which is usually ranged 40–75% of total energy requirements. The annual GHG emissions varied significantly according to the treatment schemes employed and ranged between approximately 60 and 200 kgCO₂e/PE. It is important to track the percentage of on and off-site GHG emissions. Small wastewater treatment plants with extended aeration have much higher energy consumption and GHG emissions in comparison to larger activated sludge systems. Energy consumption is reduced in more modern WWTPs. There are many strategies that can be implemented to improve the WWTPs energy efficiency and the GHG emissions, related to their design, operational capacity, technological progress and monitoring.

Keywords: optimisation strategies, energy efficiency, greenhouse gas emissions, energy consumption, wastewater treatment

Precision Hydroponia: a sustainable way to produce gastronomics early vegetables and fruits in respect of the Environment

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Introduction: Because of the increasing needs of food vegetal Agriculture have passed through many revolution processes first starting greenhouses productions and then using different substrates instead of soils. But intensive culture was done without thinking of the environmental damages and the plants stress. Quality falls more and more as also the economic incomes of producers. The last few years we started to study the real parameters of our own greenhouses microclimate and the real demands of plants. By this way we were then able to establish a new production protocole: Precision Hydroponia Methods: Many daily measurments of plants water demands combined with daily data of pH and Ec evolution studied in parallele with weekly analyzes of 13 nutrients alouded us to determine important mechanisms influencing the growth of plants. We were then able to adapt our production protocole to these new parameters respecting the rythm of plants and specially the phases of nutrients absorption and maturation. Results: Very soon positive results appeared concerning the quantity, the quality and the lasting of vegetables. We were then able to predict the behavior of plants 2-3 days earlier. Conclusion: There are still more to do. The first new objectives are to determine the necessary physicochemical parameters to create a mathematical model wich coud aloud the producers to improve their production protocole respecting Sustainability and Environment.

Keywords: Precision Hydroponia, Agriculture, Sustainability, Environment

ePatentItNow: a technological variation of eBookItNow for innovative stratupers and entrepreneurs

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By 2015, eBookItNow technology has pointed out an alternative nature in knowledge brokerage taking advantage of ICT services. This technology formed a time and space disjoined learning surface, allowing for the reader to match his own reading rythm and draw dynamically the learning path of his choice. It is extremely important to take in mind that adult training should be focused on scope and outcomes that are profitable for the participants. As such the academic procedure of training is not always proper for awaring professionals and extending their perception horizons. In this paper, the target group of interest is formed by entrepreneurs that seek innovation in their deeds. As hard as it is to prescribe what innovation really is, the sources of informations that validate innovativeness are limited. One sound source is the ESPACENET, a web application available to public run from European Patent Offices containing over 90 millions of patent applications worldwide. This source of information can guide anyone wishing to develop innovation through a dedicated user interface. As entrepreneurs are more business people and less academicians, the seeking of information may puzzle them. At the other hand, they are well aware of their ideas as formed in their business plans. The idea proposed here is to merge the eBookItNow technology in business plan validation process in order to check innovativeness. This means that the information contained in ESPACENET shall be accessed dynamically by the technological agent and shall enrich the base text of business plan with information on lemmas found elsewhere. In this way entrepreneurs shall validate the innovativeness of their ideas in near real time, without the need to get familiarized with a dedicated interface. The innovation process shall be served as ideas shall be validated towards existing ones and the people shall enjoy an affordable learning leeway towards potential enhancements of their plans. The overall footprint of innovation life cycle shall be reduced dramatically as the consumers become linked to the source of information directly, eliminating intermediate steps. Finally, the interface towards innovation becomes smarter for the entrepreneur.

Keywords: knowledge brokerage, innovation verification, smart and energy efficient utilisation of digital resources, time and space disjoint learning

An evaluation model for small "smart" cities' footprint, with less than 50.000 inhabitants

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Cities have a key role in fighting against climate change and the deployment of new intelligent technologies is seen as key factor in decreasing greenhouse gas emissions and improving energy efficiency of cities. A "smart city" is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business. According to literature, a "smart city" is a city well performing in 6 characteristics-domains: Economy, Environment, Governance, Living, Mobility and People. The present paper aims to present an evaluation model able to measure the "smartness" of a city, that could be applied in cities with less than 50.000 inhabitants. The above mentioned six characteristics have been broken down into 25 factors, which represent the most important aspects of each domain. Each factor has been matched with relevant indicators, obtained using questionnaires. A questionnaire has been developed which is addressed to the municipalities, based on the European guidelines for smart cities, in order to find the "answers" for each indicator. In total, 62 indicators were elicited. The model has been implemented for the municipality of "Elefsina". The current status of the city has been recorded with regard to the six main characteristics. The obtained evaluation showed that Elefsina is at low level of ranking in almost all the examined domains. An advance is observed in the sector of "Smart Governance" followed by "Smart People" and "Smart Living". The sectors "Smart Mobility" and "Smart Environment" have a very poor performance. The proposed model will help cities with similar characteristics (less than 50.000 inhabitants) evaluate their status in the field of "smart cities" in order to develop programs and strategies in the direction of promoting the 6 "smart" characteristics-domains. The presented methodology could further enhanced with the incorporation of actions that will be proposed as an improvement measure for the performance of a city in each examined indicator. The cities will, then, have the opportunity to select the actions that will fit best in their profile.

Keywords: Smart Cities, Smart Economy, Smart Environment, Smart Governance, Smart Mobility, Smart Living

Co-incineration technologies of RDF and biomass streams of solid waste- an implementation in Greek industry

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Waste to energy (WtE) technologies are considered to be a significant concept in the waste management process. In this paper we investigate the co-incineration technologies of RDF and biomass streams of solid waste, which typically are worldwide used by municipalities to exploit waste streams or by industries to lower the energy costs in their production process by satisfying self-consumption or/and acquiring revenues stream from the energy sales. Therefore, the analysis proceeds in direction to embrace the perspectives of the implementation in Greek industry. The the literature review, the results from a technical and economic analysis of case studies data and the current situation in Greece are taken into the account. Initially, the state of the art is investigated, worldwide, conducting a literature review in existing incineration and co-incineration plants, the characteristics and the key parameters of the process. The classification according to a multi parameter analysis and the comparison with other WtE technologies reveal the social, economic, technical and environmental issues of the implementation. Then, the current situation in Greece is delineated taking into account the above framework of analysis and the potential of the implementation in small to medium scale industries is researched. Thoroughly, the existing data analysis in case studies derived from the cement industry, food industry etc, brings into light a deeper insight of the concept of the co incineration in the industry and the advantages and disadvantages generated from these are discussed.

Keywords: waste to energy, co-incineration, rdf