

Water Management in the context of climate change

International experiences

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and Politehnica University Timisoara**

**WATER MANAGEMENT IN THE CONTEXT OF
CLIMATE CHANGE
INTERNATIONAL EXPERIENCES**

International Scientific Conference

BOOK OF ABSTRACTS

Timisoara, October 11-12, 2018

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CONFERENCE PROGRAM

Thursday, October 11, 2018

9,00 – 10,00	Participants Registration	
10,00 – 12,00	Plenary session – Auditorium Room Opening Ceremony and Honorary Board Members Presentations	
12,00 – 13,00	Break	
13,00 – 17,00	Water Technology Session K1 Room	Benchmarking Session Auditorium Room

Friday, October 12, 2018

10,00 – 13,00	Parallel session 1 K1 Room	Parallel session 2 K2 Room
10,00 – 13,00	Poster session with discussions (K1 + K2 Lobby)	
13,00 – 14,00	Break	
14,00 – 15,00	Closing ceremony (K1)	



FOREWORD

In the last decades the climate has been changing for the worse all over the world. In the cities, the extreme weather phenomena cause a lot of damage, and sewer overflows, when the combined sewer system capacity is exceeded by floods of storm water, are one of the those. So far, water operators in Romania have been successful in managing to find solutions and deal with the critical situations, but the international cooperation as well as exchange of knowledge and experience in this field is necessary to stay up to date with the methodologies related to cope with climate change.

Aquademica International Scientific Conference continues the tradition of the previous Eco-Impuls Conference. This year's topic **“Water management in the context of climate change – international experiences”** is mainly focused on water and wastewater issues and gathers specialists from public services companies, important equipment and services suppliers, universities and research institutions from several European countries. Main topics of the conference will be international experiences in water management in the context of the climate change, advantages of specific standardization in the water sector, state-of-the-art water technologies and benchmarking in the Romanian Water Sector.

This year conference will be held in Timisoara, the city awarded by an international panel of experts with the title of European Capital of Culture in 2021. Timișoara was preferred over other short-listed candidate cities from Romania because of its attributes, not only cultural, but also economic and social, strong enough to cope with the coming challenge.

Ilie Vlaicu, Aquatim General Director

CONTENTS

FOREWORD.....	4
PERSPECTIVES OF ORGANIZATION OPERATIONAL PROCEDURES - THE DWA MODEL <i>Ilie Vlaicu, Monica Isacu</i>	7
CLIMATE CHANGE AND THE 15 GLOBAL CHALLENGES <i>Cristina Borca, Oana Mărginean, Crina Chirilă.....</i>	8
AWARENESS OF THE CONTRIBUTION TO ENVIRONMENTAL ISSUES IN THE WATER INDUSTRY <i>Cristina Borca, Anca Draghici.....</i>	9
HOW CAN KNOWLEDGE MANAGEMENT PROMOTE OCCUPATIONAL HEALTH AND SAFETY? <i>Corina Dufour, Anca Draghici.....</i>	10
OBSERVATIONS ON THE PRIVATIZATION OF PUBLIC WATER SERVICES <i>Caius Tudor Luminosu, Mircea Negrut</i>	11
ADDED VALUE AND PRODUCTIVITY DETERMINANTS IN THE WATER INDUSTRY: PANEL DATA EVIDENCE FROM THE WEST REGION OF ROMANIA <i>Claudiu Albulescu, Matei Tamasila, Mihaela Vartolomei</i>	12
ENHANCED PERFORMANCE OF P-TYPE DYE-SENSITIZED SOLAR CELL USING CrOOH AS SURFACE PASSIVATION MATERIAL <i>Melinda Vajda, Daniel Ursu, Anamaria Dabici, Marinela Miclau, Narcis Duteanu</i>	13
METHODS USED FOR MATERIALS FUNCTIONALIZATION TO RECOVER GOLD FROM WASTE SOLUTIONS <i>Maria Mihailescu, Adina Negrea, Mihaela Ciopec, Petru Negrea, Narcis Duteanu.....</i>	14
CROWN ETHER USED AS EXTRACTANT IN SELECTIVE RECOVERY OF SOME METAL IONS <i>Oana Grad, Mihaela Ciopec, Adina Negrea, Narcis Duțeanu, Petru Negrea, Iosif Hulka</i>	15
SILVER RECOVERY FROM AgCl WASTE SOLUTION <i>Bogdan Pascu, Adina Negrea, Mihaela Ciopec, Petru Negrea, Narcis Duțeanu</i>	16
SUSTAINABLE DEVELOPMENT AND MARKET TRENDS IN ROMANIA <i>Matei Tamasila, Larisa Ivascu, Anca Draghici, Alin Artene</i>	17
DETERMINATION OF CYTOSTATICS FROM WATER USING BORON-DOPED DIAMOND ELECTRODE <i>Sorina Claudia Negrea, Anamaria Baci, Aniela Pop, Florica Manea</i>	18

REMOVAL OF NITRATE FROM SIMULATED GROUND WATER BY ELECTROCHEMICAL PROCESS	
<i>Claudia Licurici, Sergiu Vasilie, Anamaria Baci, Aniela Pop, Rodica Pode, Florica Manea</i>	19
ACCOUNTING AND FISCAL AGRICULTURE INCENTIVES SUSTAINABILITY IN CLIMATE CHANGE CONDITIONS	
<i>Mihaela Vartolomei</i>	20
FUNCTIONALIZED POLYMERS USED FOR PHENOL ADSORPTION FROM AQUA SOLUTION	
<i>Cristina Ardean, Corneliu Mircea Davidescu, Radu Ardelean, Adriana Popa</i>	21
THE EFFICIENCY OF INVESTMENT IN IRRIGATION SYSTEMS	
<i>Mihaela Vartolomei</i>	22
EU POLICY IN CLIMATE CHANGE FRAMEWORK	
<i>Mihaela Vartolomei, Claudiu-Tiberiu Albulescu, Mihaela Boran</i>	23
IRRIGATION TECHNOLOGIES AND AGRICULTURAL EFFICIENCY	
<i>Mihaela Vartolomei</i>	24
WATER MANAGEMENT AND BIODIVERSITY CONSERVATION – IS THERE CURRENTLY A CONFLICT?	
<i>Jelka Crnobrnja-Isailović</i>	25
WATER GOVERNANCE AND ITS EFFECTIVENESS	
<i>Mihaela Boran</i>	26
AWARENESS OF THE CONTRIBUTION TO ENVIRONMENTAL ISSUES IN THE WATER INDUSTRY	
<i>Cristina Borca, Anca Draghici</i>	27
A QUANTITATIVE STUDY ON SUSTAINABILITY REPORTING OVER THE PAST 20 YEARS IN THE WATER UTILITIES SECTOR	
<i>Corina Dufour, Anca Draghici</i>	28
POSSIBILITY OF USING SEWAGE SLUDGE IN AGRICULTURE	
<i>Eugenia Grecu, Smaranda Masu</i>	29
USE OF BENCHMARKING IN SUPPORTING ACCESS TO COMPARATIVE INFORMATION AND BEST PRACTICE AMONG WATER SUPPLY PROVIDERS FROM ROMANIA	
<i>Maria Nemes</i>	30
ENGAGING CITIZENS IN EFFECTIVE COLLECTIVE ACTION: HOW AND WHY IN ROMANIAN PUBLIC SERVICES?	
<i>Sabina Potra, Șerban Miclea</i>	31
PUMPING STATION OPTIMISATION SAVES ENERGY, REDUCES LEAKS AND REDUCES TCO Mitsubishi Electric	32

PERSPECTIVES OF ORGANIZATION OPERATIONAL PROCEDURES - THE DWA MODEL

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Nowadays, one of the key challenges for the water supply and sanitation sector, is not only pertaining to the need to improve access in both urban and rural areas, but also the need to strengthen the investment implementation capacity of regional utilities, improving the efficiency of services and addressing affordability issues that have come with higher service levels and large investments in urban areas. Premise for achieving this goal is a very good organization of all WSSP service providers. This requires an internal organization that allows them to specify all functions and duties within, the distribution and dimensioning of the structural organizational components of the enterprise, the allocation financial and human resources, the definition of internal and external relationships. General task of all water supply and sewerage network operators is to ensure the functional and operational safety of the networks throughout their planned lifetime, while taking into account the economic aspects involved. This is mainly attained by developing sustainable exploitation strategies - which implies rigorous planning, coordination, implementation and documentation of all activities. An essential contribution to achieve this goal may be brought by defining rules and standards that reflect the state of the art, ensuring both economic rationalization and the assurance and improvement of service quality in relation to consumer and environmental protection. A worthy model to follow in this respect is the German model, based on DWA set of rules, which not only refer to technical and scientific issues, but also to the economic and legal aspects of environmental and water protection.

Keywords: Water supply and wastewater treatment sector, Efficiency of services, Strategies for sustainable operation, The DWA know-how.



CLIMATE CHANGE AND THE 15 GLOBAL CHALLENGES

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The planet is dealing lately with extended heavy rains that lead to floodings. The mass-media present all sorts of news regarding floods and landslides, also caused by heavy rains, followed by long periods of droughts and high temperatures. Barriers, built *ad hoc* by people against water, often break down – as a consequence the roads and houses are flooded and a lot of people become homeless. This is the overall picture of climate change. After many years of research in the Millenium Project on how the future will look like globally, the conclusion is that the world has the necessary resources to answer global challenges. Besides climate change, the Project has helped identifying some other global challenges to help making decisions. Thus, 15 global challenges provide the framework for the assessment of the global and local perspectives, to include specific actions, regional visions and progress reports up to date.

Keywords: Climate, Water, Management.

AWARENESS OF THE CONTRIBUTION TO ENVIRONMENTAL ISSUES IN THE WATER INDUSTRY

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The research objective is to highlight dimensions related to a responsible behavior of organizations and the perception of the public about these aspects. The underlying idea of this paper is to identify the factors of communication that can influence and facilitate a positive perception of the public about the dimensions of the social responsibility activities of an organization. The dimension considered for the discussion in this article is the public perception of the awareness about the contribution to environmental issues, that has been characterized by the customer perception equation: Environmental awareness = f (necessity of waste water treatment, payment acceptance for wastewater treatment services). The findings of the “Environmental Awareness” research have highlighted the fact that there is a category of customers with a poor perception of environmental issues and the company's efforts for the environment protection. That is why it is necessary to intensify communication efforts to increase perception in this area. Thus, the communication process needs to be improved, redefined so these differences will be eliminated in the future.

Keywords: Environmental protection, Communication, Customer perception, Longitudinal analysis.

HOW CAN KNOWLEDGE MANAGEMENT PROMOTE OCCUPATIONAL HEALTH AND SAFETY?

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The article proposes a theoretical framework regarding the use of Knowledge Management (KM) in solving specific Occupational Health and Safety (OHS) issues in the context of gas distribution companies (GDCs). GDCs are subject to the constraints of high-risk industries, but also aging workforce (generational turnover) and rapid technological change (technological turnover). Building on the three-phase cycle for development and implementation of knowledge management, according to the Australian Standard AS 5037- 2005, the proposed framework has been designed. After a brief chapter on the history of gas and on the context of GDCs, a short literature review is presented. In this research context, the scientific discourse will outline the link between KM and OHS in GDCs. In the core of the paper, the theoretical framework for OHS knowledge management for GDCs will be described and finally some conclusions of the research will be made. The theoretical framework consists of three stages: (1) Mapping - understanding the context and the culture (formal audits; analysis of past individual experiences (multi-annual knowledge progression curve) acting as a safeguard for the effectiveness of corrective measures; Analysis of Behavioral-Based Safety visit records of both line managers and experts); (2) Building experiences and linkages, to understand the actions that are pertinent, the organization's culture and its way of innovation (knowledge transfer, dissemination or sharing through training sessions and disseminated through narratives in hands-on workshops); (3) Operationalizing initiatives and capabilities to strengthen and expand the learnings of the previous phase (organizational redundancy between the managerial line and the expertise line on two levels: structural and cultural). In the context of local gas distribution companies (LGDCs) there is an indissoluble link between technological skills, aging workforce and OHS, to the extent to which cohabitate inherent OHS risks of natural gas, highly technical gestures, aging expertise and fewer technical gestures due to technological change. The article has a dual research novelty by firstly bridging a gap in the under researched domain of understanding how KM can promote OHS and by trying to transpose this to the context of gas distribution, lagging in the field of high-risk industries.

Keywords: Occupational Health and Safety, Knowledge Management, Standard Compliance, Behavioral-Based Safety, Local Gas Distribution Companies.

OBSERVATIONS ON THE PRIVATIZATION OF PUBLIC WATER SERVICES

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The paper provides an overview on legal aspects of the system of management public water services in Romania. The legal status of water is presented, along with the main aspects of the regulations of public water services. As the Romanian water service management system leaves the option for public or private management to the local authorities, it ensures a certain degree of democratic participation and public control. Privatization is not excluded by law, a situation which could have a great impact on the end-user of these services. A brief comparison and reference to German experiences in this field should show that privatization of such an important resource and service should not be regarded as the best option.

Keywords: Public water service, Public resources, Privatization of public services, Law.

ADDED VALUE AND PRODUCTIVITY DETERMINANTS IN THE WATER INDUSTRY: PANEL DATA EVIDENCE FROM THE WEST REGION OF ROMANIA

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This study compares the level of added value and productivity generated by the companies activating in the water and wastewater treatment sector and investigates their determinants. To this end, we perform a panel data analysis over the period 2007 to 2014 using firm-level data. We include in our analysis nine public companies located in four counties inside the West Region from Romania, namely Arad, Caraş-Severin, Hunedoara and Timiş. We compare a classic OLS, a fixed effect and a random effect estimator. Our static analysis shows that the added value is mainly explained by the operating revenue, profit margin and fixed to total assets ratio. While the size of these companies positively influences the level of added value, the liquidity ratio has no significant effect. It seems that the consumers wealth in a specific county, measured in terms of GDP per capita, has no significant influence on the added value, while the firms located in the county seats perform better. A similar result is recorded when we estimate the drivers of the productivity level, measured in terms of added value per employee. We conclude that the economies of scale recorded by companies located in the main cities of the region, and an adequate financial management of these companies, both contribute to their economic performances.

Keywords: Added value, Firms' productivity, Water industry, Regional study, Panel data analysis.

ENHANCED PERFORMANCE OF P-TYPE DYE-SENSITIZED SOLAR CELL USING α -CrOOH AS SURFACE PASSIVATION MATERIAL

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The n-type α -CrOOH is explored for the first time as a passivation material for 3R-CuCrO₂ based dye-sensitized solar cells, having a beneficial effect on the photovoltaic performance of p-type DSSC. α -CrOOH nanomaterial has been successfully synthesized via a facile one-step hydrothermal method using strong acid solution. P-type dye-sensitized solar cell based on 3R-CuCrO₂ delafossite passivated with the n-type α -CrOOH exhibits a doubling of JSC and a threefold increase in the VOC compared with pure 3R-CuCrO₂ photocathode used in DSSC. This remarkable enhancement could be explained taking in account that in α -CrOOH layer the recombination rate between the holes in the valence band and the electrolyte or dye has a lower value. Therefore, based on the optical investigation, Mott-Schottky (M-S) plots and the electrochemical impedance measurements, CrOOH is proposed as a promising material and high-performance surface passivation material for the photocathode of p-type DSSC with excellent photovoltaic efficiency.

Keywords: Semiconductors, Hydrothermal method, p-type dye-sensitized solar cell.

METHODS USED FOR MATERIALS FUNCTIONALIZATION TO RECOVER GOLD FROM WASTE SOLUTIONS

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Gold is widely used in various fields such as medicine, electronics, catalysts, jewelry, etc. Since gold has unique physical and chemical properties, such as chemical stability, corrosion resistance and ductility, and a high price, it is necessary to recover it from secondary industrial sources. Conventional recovery methods include solvent extraction, electrolysis, precipitation, ion exchange and adsorption. Solvent extraction is unsafe because most organic solvents are toxic, flammable and volatile, ion exchange is less selective. Adsorption is a fast recovery method, due to low costs, high efficiency, but it is necessary to develop new materials with good adsorbing properties. Some materials as: Amberlite resins, carbon nanotubes, chelating resins, silica gel or activated carbon were used as adsorbents. To improve the adsorbent properties of these materials over the last decade, emphasis has been placed on the development of new methods of obtaining or functioning of inert supports with extractants whose active groups improve the adsorbing properties for various metal ions. In present paper the adsorbent material was produced by using two different methods, dry impregnation and ultrasonication method. The extractant and the ratio between the solid support and extractant were chosen to recover the gold from the diluted solutions which are by-products from the industrial processes. For the study, Amberlite XAD7 commercial resin was used as a solid support, and L-glutamic acid and DL-cysteine as extracts. The materials obtained were tested as adsorbent materials, determining the maximum adsorption capacities. Based on obtained experimental data, it has been established that for gold recovery from waste diluted solutions, ultrasonation is the most economically and physico-chemically efficient method for obtaining materials. The extractant chosen was L-glutamic acid, and the ratio of solid support to extractant was 10:1.

Keywords: Gold recovery, Amberlite XAD7, Adsorption.

CROWN ETHER USED AS EXTRACTANT IN SELECTIVE RECOVERY OF SOME METAL IONS

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In the last years for the selective recovering and separation of some metals and non-metals ions was impetuous required the obtaining of advanced materials with applies in this process. To improve the adsorption properties of materials, the new methods of chemical modification of the inorganic and organic solid supports were developed, through functionalization with different extractants. The studies present an original method for obtaining a new material with efficient properties for selective recovery of palladium and arsenic from aqueous solutions. Paper presents novelty through the study of new material (Amberlite XAD7-DB30C10) obtained chemically by polymer Amberlite XAD7 functionalization with crown ether (Dibenzo-30-crown-10-DB30C10) used for palladium recovery and loaded with iron ions for arsenic removal. Even if the crown ethers are expensive reagents, the proposed method for their usage imply small quantities, this way combining the advantage of crown ethers usage with the properties of solid supports. New obtained adsorbent material was characterized by using X-ray dispersion (EDX) analysis, Fourier Transform Infrared Spectroscopy and Brunauer-Emmett-Teller (BET) surface area analysis. To establish the metal ions behavior on the surface of the adsorbent material during the adsorption process, the influence on initial concentration of metal ions on adsorption capacity was studied. From experimental data it has been found that the new adsorbent material can be successfully used in the selective recovery processes of palladium and arsenic ions.

Keywords: Water remediation, Crown ethers, Arsenic removal.

Acknowledgements

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SILVER RECOVERY FROM AGCL WASTE SOLUTION

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Silver is in the group of precious metals and is generally recovered by the processing of sulphurous ores, as a byproduct. The largest amount of silver is extracted from the existing mines in Mexico and Poland, being the countries with the largest reserve of precious metals. Other four major mines are found in Turkey, Bolivia, Peru and Australia. Its good electrical and thermal conductivity makes this metal suitable for use in the production of electrical and electronic components. Moreover, properties such as malleability and ductility allow the production of copper and silver alloys and not only, it can also be used in making coins, jewelry and for soldering alloys. Due to the photosensitivity properties of silver halides, this precious metal is also used in photography. In addition, thanks to its light reflecting property, it is also used in the production of several new photovoltaic cells. As there is the growing demand of Ag on the market, studies should focus on finding secondary resources for silver production. Such resource is also the residual AgCl solutions obtained from various industries and from chemical analysis laboratories. In this study, the silver was recovered from AgCl waste solutions with the purpose of reusing it as active carbon filter doped with silver and as metallic silver. Soluble starch was used to recover silver, thus being both inexpensive and environmentally friendly compound. The dose was varied from 10 g starch/1000 mL of residual solution till to 100 g starch/1000 mL of residual solution. The obtained product was characterized using X-ray fluorescence spectroscopy, FRX and thermal analysis TG.

Keywords: Water remediation, Silver recovery, Active carbon filter.

SUSTAINABLE DEVELOPMENT AND MARKET TRENDS IN ROMANIA

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The paper addresses sustainable development and shows the capacity of the Romanian market to achieve the goals set in the 2030 Agenda for Sustainable Development. The new Agenda focuses on a holistic approach to sustainable development to achieve global development. Sustainable development is addressed nationally and internationally because businesses do not exist in isolation. Business is a complex network that interacts and completes itself. The use of material, human, financial and informational resources by companies contributes to the assessment of the organisational capacity for sustainable development. Based on the 17 Sustainable Development Goals (SDGs) and 169 associated targets, the paper presents a general assessment of Romania's situation on the three dimensions: economic, social and environmental. Following this evaluation, we can conclude that the Romanian market needs to be aligned with the requirements of the European Union, and the difficulties encountered in various directions must be improved by defining strategic directions in line with international objectives.

Keywords: Technological capabilities, Education for sustainable development, Sustainability actions, Water, Waste management, Environmental pollution.

DETERMINATION OF CYTOSTATICS FROM WATER USING BORON-DOPED DIAMOND ELECTRODE

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The presence of cytostatics in water quite at low level has been raised alarming due to their potential impact and risk on the human health. Cytostatics are considered the emergent pollutants in water and the development of their quantitative determination methods is getting growing attention. Doxorubicin (DOX) is a clinically important anti-cancer agent extensively used in the treatment of a large spectrum of cancers and it was chosen as model for cytostatic class in this study. Boron-doped diamond (BDD) electrode was assessed to be used for the development of the electrochemical detection protocol for DOX in water. Cyclic voltammetry and differential-pulsed voltammetry are the electrochemical techniques at various operating conditions which were used for DOX detection in aqueous solution. Figure 1 shows as example the differential-pulsed voltammograms recorded at BDD electrode for various DOX concentrations. Differential-pulsed voltammetry allowed reaching the best sensitivity and the lowest limit of detection for DOX determination in water.

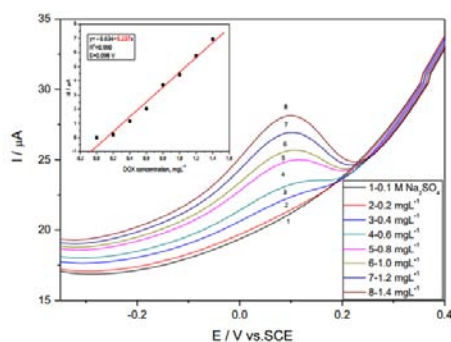


Fig. 1. Differential-pulsed voltammograms recorded on BDD electrode in 0.1 M Na₂SO₄ supporting electrolyte and various DOX concentrations; Inset: Calibration curve of current vs DOX concentrations

Keywords: Cytostatics, Doxorubicin, Boron-doped diamond electrode, Electrochemical detection.

Acknowledgements: This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI-UEFISCDI, project number 26PCCDI/01.03.2018, “Integrated and sustainable processes for environmental clean-up, wastewater reuse and waste valorization” (SUSTENVPRO), within PNCDI III.

REMOVAL OF NITRATE FROM SIMULATED GROUND WATER BY ELECTROCHEMICAL PROCESS

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In this study, removal of nitrate from simulated groundwater by electrochemical denitrification/nitrification was assessed. Boron doped diamond (BDD) electrode was tested as anode and cathode in comparison with copper cathode. BDD was not effectively towards the electrochemical reduction of nitrate, while copper cathode was very efficient. Various operating parameters were optimized to maximize nitrate conversion to nitrogen gas, cell configuration, supporting electrolyte type, pH, current density. Higher current density favored the electrochemical denitrification of nitrate, but the ammonium concentration increased and the energy consumption, which limited the current density, was also increasing. The presence of chloride generated the chlorine at the BDD anode that oxidized the ammonium. Figure 1 shows an example of nitrate and total nitrogen evolution during electrolysis for various nitrate concentration. The study results showed a great potential of copper cathode to be used for electrochemical denitrification of nitrate from real water.

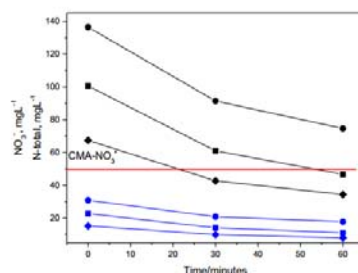


Fig. 1. Evolution of nitrate and total nitrogen during electrolysis using copper cathode for various nitrate concentrations; black-nitrate and blue-total nitrogen; pH=5; current density of 50 Am⁻²; 250 mgL⁻¹ NaCl

Keywords: Nitrate removal, Electrochemical denitrification, Electrolysis.

Acknowledgements: This work was supported by a grant of the Romanian Ministry of Research and Innovation, CCCDI-UEFISCDI, project number 26PCCDI/01.03.2018, “Integrated and sustainable processes for environmental clean-up, wastewater reuse and waste valorization” (SUSTENVPRO), within PNCDI III.

ACCOUNTING AND FISCAL AGRICULTURE INCENTIVES SUSTAINABILITY IN CLIMATE CHANGE CONDITIONS

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The main scope of the paper is to analyze the sustainability of fiscal incentives in agricultural sector, especially in irrigation field. Specific themes analyzed are related to the fiscal incentives that are established by Governments in agricultural sector. It makes a comparative study between Romania and other European countries regarding agricultural fiscal incentives. Also, it relies the manner these fiscal incentives are registered, especially the reduced VAT in Romanian firm accounting system for specific investments, more the investments in irrigation field. Finally, the paper studies the results of these decisions and actions in good-governance and, last but not the least, the sustainability on the frame of climate change conditions and water resources management. The main results obtained in this paper show first that the fiscal incentives for specific assets (irrigation installation) don't imply difficulty in accounting system. Second, investments in irrigation system determined increase in financial results. Third, the impact of good-governance in water management field on the activity of the plant is significant.

Keywords: Accounting, Water management, Fiscal incentives, Climate change, Irrigation, Investment, Sustainability.

FUNCTIONALIZED POLYMERS USED FOR PHENOL ADSORPTION FROM AQUEOUS SOLUTION

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In actual social development a stringent problem is represented by the presence of the proper water supply. Water quality represents a necessity for humans and for the entire ecological system. In actual development stage the reduction of water pollution represents a major concern for governments. Treatments used for pollutant removal are based in majority on bioremediation and are successfully used in developed countries. A main problem is represented by the presence on non-biodegradable products which are generated as a consequence of industrial or agricultural activities. The most of such pollutants are organic compounds and they present a higher toxicity for human health. In this class of pollutants we found phenols and phenols derivatives which present a higher toxicity for the environment and for human health. Taking this into account it is important to develop and implement new stages for such pollutant removal before or after the bioremediation stage, considering also the pollutant concentration and toxicity for microorganisms used in this stage. For the treatment of wastewaters containing phenols several conventional techniques are used such as reverse osmosis, different anaerobic processes, flotation-coagulation combined process, discoloration and oxidation, solvent extraction, etc. Among the methods used for the treatment of phenolic wastewaters the adsorption shown better results because of his simplicity, and ease of use. In this paper we studied the behaviour of four polymers functionalized with N and P groups used for the phenols removal from aqueous solutions. The influence of equilibrium time on the maximum adsorption capacity was determined, establishing in this way the most efficient material.

Keywords: Functionalized polymers, Phenol adsorption, Adsorption capacity.

THE EFFICIENCY OF INVESTMENT IN IRRIGATION SYSTEMS

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The main scope of the paper is to analyze the efficiency of investment in agricultural sector, especially in irrigation field. Specific themes analyzed are related to the study of irrigation investments and the efficiency of their settlement. The paper presents the study applied for Romanian case and a comparative analysis between European Union Countries using the share of agriculture sector in GDP and make an analysis of investments in irrigation tools and results. Another nowadays problem is linked by major climate change that affect agriculture sector efficiency in general. The results of the paper show that, despite Romania is an agricultural country, the yields level registered in this field is very low. Finally, the paper aims recommendation and solutions for a good-governance and for increase public administration efficiency facing worldwide major problems regarding scarcity and resources: to respect European Common Agricultural Policy, European Environmental Policy and national policies and programs established by the government.

Keywords: Efficiency, CAP, Climate change, Irrigation investment.

EU POLICY IN CLIMATE CHANGE FRAMEWORK

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The main scope of the paper is to study the European policies in the matter of climate change and water resources management, especially Common Agricultural Policy, Environmental Policy, EU Emission Trading System (ETS), climate and energy policies nexus with international agreements in climate action and world global warming from three points of view: economic efficiency, social equity and ecological sustainability, and the way these European policies are settled and applied in national countries. European Union approach is toward high energy efficiency and low carbon economy. Also, European Union policies are directed to encourage investment in green-technologies, to reduce greenhouse gases (GHG) and ozone-depleting, and to increase the use of renewable energy (water, wind, solar, biomass) with impact on economic competitiveness, social cohesion and friendly with the environment. The paper studies the manner these policies are implemented in European Union countries, funding resources for climate action, with impact on decision-making level.

Keywords: European policies, Climate change, Water management, Renewable energy, Green-technologies, Decision-maker, European integration.

IRRIGATION TECHNOLOGIES AND AGRICULTURAL EFFICIENCY

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The main scope of the paper is to make an empirical analysis regarding the relationship between irrigation and efficiency in agriculture sector, the use of water in irrigation and the share of agriculture sector in GDP related to European and world environmental policies, in the frame of water resource management and climate change conditions. Also, irrigation has a major role in food security, water save and agriculture sector independence in the context of quickly rise in population, climatic changes, agriculture sector activities. In this area research, literature is quite scarce. We find a shy relationship between water use and irrigation systems (drip and sprinkler irrigation), having no significant effects. Also, the relationship between natural events and performances is evident. Furthermore, between irrigation and GDP is a relevant relationship. The study is based on data collection using EU and Romanian databases. We conclude that even if the empirical results are week, it is necessary to continue with water management reform and European environmental policy

Keywords: European policies, Climate change, Water management, Efficiency, GDP.

WATER MANAGEMENT AND BIODIVERSITY CONSERVATION – IS THERE CURRENTLY A CONFLICT?

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Water is one of the pillars of life on Earth. However, development of human civilisation accelerated the exploitation of water and it became one of the main sources for providing electric power. From the moment the first big dam was built, the debates about costs and benefits of destroying entire gorges, canyons and valleys (local biodiversity included) started. Small hydropower facilities e.g. diversion mini-hydro power plants (DMHPP) were announced as “green” and “renewable” but, at least in the Balkans, turned into the nightmare and to something completely opposite to the concept of sustainability. In Serbia, currently 10 mountain rivers and therefore local populations of species dependent on them are hardly damaged by DMHPP. Some of those species are amphibians – the most threatened vertebrates on Earth. One endemic Balkan amphibian species (stream frog) directly require running water for breeding and larval development. Additionally, fire salamander, alpine newt, common and yellow-bellied toad, agile and common frog also depend on this type of aquatic habitat for reproduction due to disappearance of other water bodies caused by the climate change. Among reptiles, dice snakes will be directly hit by the destruction of mountain rivers, but also the common lizard, meadow lizard and adder - species that require highly humid habitats. Although all those species are strictly protected by national legislation, here the law makers are those that break the law. Internationalisation of this biodiversity deterioration issue is urgently needed as countries of south-eastern Europe obviously have no strength to solve the problem.

Keywords: Water management, Derivation mini hydro power plants, Amphibian and reptile conservation, Serbia.

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WATER GOVERNANCE AND ITS EFFECTIVENESS

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Water governance refers to the political, social, economic and administrative systems in place that influence water's use and management. Essentially, who gets what water, when and how, and who has the right to water and related services, and their benefits. It determines the equity and efficiency in water resource and services allocation and distribution, and balances water use between socio-economic activities and ecosystems. Governing water includes the formulation, establishment and implementation of water policies, legislation and institutions, and clarification of the roles and responsibilities of government, civil society and the private sector in relation to water resources and services. The outcomes depend on how the stakeholders act in relation to the rules and roles that have been taken or assigned to them. The water sector is a part of broader social, political and economic developments and is thus also affected by decisions of actors outside of the water sector. New forms of governance focusing on process-oriented societal co-steering through, for example, formal and informal networks, partnerships and dialogue, have emerged within the water sector. The governance transformation is intrinsically linked to the increasing focus on the complexity of water management and the multifunctional character of water and the search for alternative forms of organization.

Keywords: Dialogue; Governance; Integrated water management; Participation .

AWARENESS OF THE CONTRIBUTION TO ENVIRONMENTAL ISSUES IN THE WATER INDUSTRY

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The research objective is to highlight dimensions related to a responsible behavior of organizations and the perception of the public about these aspects. The underlying idea of this paper is to identify the factors of communication that can influence and facilitate a positive perception of the public about the dimensions of the social responsibility activities of an organization (Fig. 1).

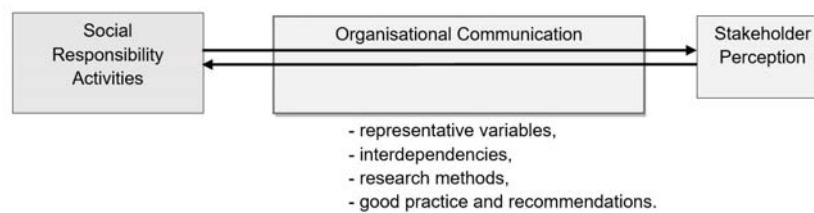


Fig. 1. The interrelation CSR – Communication - Perception

The proposed goals were achieved through the longitudinal analysis of statistical data, obtained from four opinion polls conducted during the period 2002 - 2015 within the organization chosen for the applied research (a company that operates in the water sector in Romania). The dimension considered for the discussion in this article is the public perception for the awareness of the contribution to environmental issues, that has been characterized by the customer perception equation: *Environmental awareness = f (necessity of waste water treatment, payment acceptance for wastewater treatment services)*. The findings of the "Environmental Awareness" research have highlighted the fact that there is a category of customers with a poor perception of environmental issues and the company's efforts for the environment protection (Table 1). That is why it is necessary to intensify communication efforts to increase perception in this area. Thus, the communication process needs to be improved, redefined so these differences will be eliminated in the future.

Table 1. Centralizing the responses to the "Environmental Awareness"

Customers/ respondents	Wastewater is treated in order not to affect the environment and then evacuated in nature.	"I accept payment for wastewater treatment"
Timisoara	Well-informed customers	Customers accept payment
2005-2015 trend	Strongly increased (from 50% to 80%)	Increased (from 63% to 75%)

Keywords: *Environmental protection, Communication, Customer perception, Longitudinal analysis.*

A QUANTITATIVE STUDY ON SUSTAINABILITY REPORTING OVER THE PAST 20 YEARS IN THE WATER UTILITIES SECTOR

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Water, the backbone of life, is a finite critical survival resource with a direct impact on the quality of life and general health of the population, as well as industry itself. Although the 1987 Brundtland report rang the bell regarding the challenges that post-war human development poses to society and environment, several decades have passed and initiatives aiming at a sustainable tomorrow are still varied, disjoint and difficultly measurable. The water industry manages water in its dual forms – drinking water and wastewater; consequently, the industry is subject to tight norms and controls which are usually defined at a national level. On the other hand, ownership of the water infrastructure spans from local / national government (most common types) to private ownership (rare). The operations of the infrastructure can be done directly through state owned companies or delegated to private operators. As part of the industrial basin, the water utilities companies have a dual role to play with regards to sustainable development as managers of a critical resource for human life and part of the more global economic actor tissue. The importance of reporting on sustainable development initiatives is no longer just a means of communication towards stakeholders but also a method to answer the increasing pressure for transparency on the social, environmental and economic dimensions. As such, the current study aims at analyzing, from a quantitative perspective, the communication around sustainability in the water utilities industry. The study outlines the trends in reporting initiatives over the past 20 years through a data analysis of the GRI database. The choice of the usage of the GRI database is based firstly on the worldwide recognition of this standard by industrial, academic or governmental bodies, as well as NGOs and secondly on the inclusion in the database of reports that are not necessarily in a GRI standard format. The purpose is to study the evolution of reporting initiatives and the usage of standardized reporting tools in the water utilities industry as an indication of increasing importance of sustainable development in the water utilities sector.

Keywords: Sustainable development reporting, Water utilities, GRI.

POSSIBILITY OF USING SEWAGE SLUDGE IN AGRICULTURE

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The use of sludge from sewage sludge in agriculture is one way of capitalizing on their content of organic matter and nutrients. Sewage sludge can be used in agriculture for: sustainable development of the environment benefiting both the sludge producer and the farmer; increasing crop yields; reducing the use of agricultural fertilizers; improving the physical and organic soil properties through the intake of nutrients, trace elements, organic compounds; water retention in soil; improving microbial activity in soil; rehabilitation of degraded lands by improving soil texture; low cost; simple technology. The use of sewage sludge through its use in agriculture is a good practical option for the environment, being promoted and encouraged by the European and national legislation in force. The use of sewage sludge in agriculture has created some concerns about their possible harmful effect. Studies have shown that these fears are unjustified. Although the results obtained so far are more than encouraging, the actual interest in using sludge in agriculture is still quite low; An involvement of public administration in this process could favor this activity.

Keywords: Sewage, Sludge, Agriculture, Administration.

USE OF BENCHMARKING IN SUPPORTING ACCESS TO COMPARATIVE INFORMATION AND BEST PRACTICE AMONG WATER SUPPLY PROVIDERS FROM ROMANIA

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A good way for identifying the main elements that can show us an image about the efficiency of a water supply system is to compare the performance level of your system with another system that has the same properties and after to choose the best practices. Romanian operators have started the benchmarking exercise for finding ways to improve their own efficiency. Collecting data is not about benchmarking, but, for conducting benchmarking is a very important step, especially when it is about realizing a case study in countries as Romania, where the data is unavailable or there is insufficient quality to provide any meaningful comparison of data. The wastewater and water have become, during the last years, very interesting, especially concerning the implementation of the management technique for improving the performance of the companies in this. In the European Union the benchmarking is a highly used technique, especially in evaluating managerial performance and quality of services. The results of the benchmark exercise are presented in the paper and the main objective of the analysis was to support access to comparative information that will help to promote best practice among water supply providers from Romania.

Keywords: Benchmarking, Managerial performance, Wastewater, Water supply system.

ENGAGING CITIZENS IN EFFECTIVE COLLECTIVE ACTION: HOW AND WHY IN ROMANIAN PUBLIC SERVICES?

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Scholars argue the fact that empowering civic groups may lead to better outcomes than a centralized decision-making in a society where the social power is concentrated in the hands of a few. We start from the assumption that citizens know best their local problems and will work towards the common interest. But effective collective action is almost always conditioned by the collaboration with functional state institutions which are forced to cede a certain amount of authority, power and finance in favour of communities they no longer totally control. Despite these challenges, there have been many community-driven development projects, some more successful than others. The question emerges: how can we understand and nurture citizen engagement projects for successful public services in a current political society? Are there crucial contextual domains to take them into account or a specific design criteria? The present paper explores the five-point public participation typology in terms of level of shared decision authority, participatory mechanisms, communication modes and other relevant criteria, with the final scope of developing a new citizen engagement model for the Romanian public service sector.

Keywords: Citizen engagement, Social accountability, Shared decision authority, Community-driven projects, Prosumption..

PUMPING STATION OPTIMISATION SAVES ENERGY, REDUCES LEAKS AND REDUCES TCO

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Water treatment and supply services, as well as wastewater treatment services fall under the provenance of the local municipal system. In 2015, a huge refurbishment programme of nearly 40 boosting pump stations in Eastern Europe was instigated. While replacing obsolete or worn-out control equipment with modern, energy-efficient products was an important aspect of the upgrade, the primary focus was on true optimisation of the water supply system. This upgrade of a water treatment and water supply system has seen the implementation of innovative software-driven process optimisation built on Mitsubishi Electric MAPS SCADA. Aquatoria, a software solution developed especially for the water industry, provides application configuration to reduce total cost of ownership of the control system, adaptive control to save energy, analytical reports to help reduce leaks, a pump selection tool to drive energy savings and increase pump lifetime, a GEO module and a process analysis tool with visual process monitor to save energy and reduce leaks. The optimisation and control solution implemented across nearly 40 boosting pumping stations has improved operational efficiencies, reduced leaks and reduced total cost of ownership.

Keywords: Pumping station optimisation, software-driven process optimisation, Aquatoria software, Eastern Europe, Mitsubishi Electric.

