



Mineral and Energy
Economy Research
Institute
Polish Academy of Sciences

2 nd International Conference


Strategies toward
Green Deal Implementation
Water, Raw Materials & Energy



ABSTRACT BOOK

8 - 10 December 2021
ONLINE

HONORARY PATRONAGE

 Ministry of Climate
and Environment



Minister
Edukacji i Nauki



Izba Gospodarcza
WODOCIĄGI POLSKIE

Conference proceedings

2nd International Conference Strategies toward Green Deal Implementation Water, Raw Materials & Energy

8 – 10 December 2021





SCIENTIFIC EDITOR

*Prof. Marzena Smol
Mineral and Energy Economy Research Institute
Polish Academy of Sciences
Division of Biogenic Raw Materials*

REVIEWERS

*Prof. Marzena Smol
Mineral and Energy Economy Research Institute
Polish Academy of Sciences
Division of Biogenic Raw Materials*

COVER

*Dominika Szoldrowska
Mineral and Energy Economy Research Institute
Polish Academy of Sciences
Division of Biogenic Raw Materials*

COMPOSITION

*Dominika Szoldrowska & Paulina Marcinek
Mineral and Energy Economy Research Institute
Polish Academy of Sciences
Division of Biogenic Raw Materials*

CORRESPONDENCE ADDRESS

*Division of Biogenic Raw Materials
Mineral and Energy Economy Research Institute
Polish Academy of Sciences
J. Wybickiego 7A str., 31-261 Cracow, Poland
E-mail: smol@meeri.pl
www.min-pan.krakow.pl/psb*

© COPYRIGHT

*Publishing House
Mineral and Energy Economy Research Institute
Polish Academy of Sciences
Cracow 2021*

ISBN 978-83-963280-3-8



Scientific committee

- **Prof. Marzena Smol**, *Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland, Chairwoman*
- **Dr-Ing. Christian Adam**, *Federal Institute for Materials Research and Testing (BAM), Germany*
- **Dr. Anna Avdiushchenko**, *Jagiellonian University, Poland*
- **Prof. Tomasz Bajda**, *AGH University of Science and Technology, Poland*
- **Prof. Miriam Balaban**, *University Campus Bio-Medico of Rome, Italy*
- **Dr. Anna Berbesz**, *Wroclaw University of Science and Technology, Poland*
- **Prof. Augusto Bianchini**, *Universita di Bologna, Italy*
- **Prof. Michał Bodzek**, *Institute of Environmental Engineering of the Polish Academy of Sciences in Zabrze, Poland*
- **Prof. Idiano D’Adamo**, *Spienza University of Rome, Italy*
- **Prof. Joanna Duda**, *AGH University of Science and Technology, Poland*
- **Prof. Krzysztof Galos**, *Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland*
- **Prof. Krzysztof Gaska**, *Silesia University of Technology, Poland*
- **Prof. Lidia Gawlik**, *Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland*
- **Prof. Agnieszka Generowicz**, *Cracow University of Technology, Poland*
- **Prof. Ludwig Halicz**, *Geological Survey of Israel, Israel*
- **Mr. Ludwig Hermann**, *President of the European Sustainable Phosphorus Platform (ESPP), Proman Management GmbH, Austria*
- **Prof. Mika Horttanainen**, *Lappeenranta-Lahti University of Technology, Finland*
- **Prof. Māris Kļaviņš**, *University of Latvia, Latvia*
- **Prof. Jiří Jaromír Klemeš**, *Brno University of Technology, Czech Republic*
- **Prof. Eugeniusz Koda**, *Warsaw University of Life Sciences – SGGW, Poland*
- **Prof. Viktor Koval**, *Southern Scientific Center of National Academy of Sciences of Ukraine and Ministry of Education and Science of Ukraine, Ukraine*
- **Prof. Jolita Kruopienė**, *Kaunas University of Technology, Lithuania*
- **Dr. Marcin Kuczera**, *CreativeTime, Poland*
- **Dr. Edyta Kudlek**, *Silesia University of Technology, Poland*
- **Katalin Kurucz**, *Bay Zoltán Nonprofit Ltd. Applied Research, Hungary*
- **Dr. Bartłomiej Macherzyński**, *Cardinal Stefan Wyszyński University in Warsaw, Poland*
- **Prof. Izabela Majchrzak-Kućęba**, *Czestochowa University of Technology, Poland*
- **Prof. Jacek Małania**, *Gdańsk University of Technology, Poland*
- **Prof. Alfonso Mejia**, *Pennsylvania State University, United States*
- **Prof. Eugeniusz Mokrzycki**, *Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland*
- **Prof. Majeti Narasimha Vara Prasad**, *University of Hyderabad, India*
- **Dr. Konstantinos Moustakas**, *National Technical University of Athens, Greece*
- **Prof. Zenon Pilecki**, *Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland*
- **Prof. Eric Pirard**, *University of Liège, Belgium*
- **Prof. Arkadiusz Piwowar**, *Wroclaw University of Economics and Business, Poland*
- **Prof. Alexandra Ribeiro**, *NOVA University Lisbon, Portugal*
- **Prof. Czesława Rosik-Dulewska**, *Corresponding Member of the Polish Academy of Sciences, Institute of Environmental Engineering of the Polish Academy of Sciences in Zabrze, Poland*
- **Dr. Monika Sady**, *Cracow University of Economics, Poland*
- **Prof. Agnieszka Sobczak-Kupiec**, *Cracow University of Technology, Poland*
- **Prof. Alexandros Stefanakis**, *School of Environmental Engineering, Technical University of Crete, Greece*



- **Prof. Krzysztof Szamalek**, *University of Warsaw, Poland*
- **Dr. Beata Szatkowska**, *Aquateam COWI, Norway – Poland*
- **Dr. Renata Tomczak-Wandzel**, *Aquateam COWI, Norway – Poland*
- **Prof. Konstantinos Tsagarakis**, *Democritus University of Thrace, Greece*
- **Prof. Magdalena Wdowin**, *Mineral and Energy Economy Research Institute, Polish Academy of Sciences, Poland*
- **Prof. Sebastian Werle**, *Silesian University of Technology, Poland*
- **Prof. Maria Włodarczyk – Makula**, *Częstochowa University of Technology, Poland*
- **Dr. Dariusz Włóka**, *GreenBack, Poland*
- **Dr. Kari Ylivainio**, *Natural Resources Institute (Luke), Finland*



Division of Biogenic Raw Materials

Mineral and Energy Economy Research Institute Polish Academy of Sciences

Division of Biogenic Raw Materials conducts research in the field of environmental management and engineering as well as biotechnology. The special interest is dedicated to the Circular Economy (CE) model and the Green Deal Strategies in food, water and raw materials sectors.

Division of Biogenic Raw Materials specializes in the analysis and assessment of specific problems and phenomena related to the management of fertilizer raw materials, with particular emphasis on phosphorus, nitrogen and potassium. A special area of interest are issues related to sustainable and circular management of the raw materials in order to optimize the use of resources at the local, regional, national and international levels.

The division's work includes development of management strategies and recommendations (roadmaps) regarding the sustainable and circular management of fertilizer raw materials (from primary and secondary sources) with the identification of market, technological, legal, environmental and social conditions, developing strategies for preventing food waste at the stages of production and consumption. Team has experience in developing strategies for water protection against nitrogen and phosphorus pollution from anthropogenic sources, determining directions for counteracting eutrophication and recommendations for the management of waste from the water and sewage sector in the context of water, raw materials and energy recovery. The division conducts activities in the field of identification and assessment of saturation of soils and surface waters (lakes, rivers) with fertilizer components and development of the concept of environmentally safe fertilizers, based on model studies on the transfer of phosphates and nitrates to surface waters and soils. In addition, the division conducts research in the field of searching for new materials (including nanomaterials) that may be used in the processes of municipal and industrial wastewater and soils treatment.

Division of Biogenic Raw Materials participates in international projects (Horizon 2020, EIT Raw Materials, NAWA) related to the management of phosphorus raw materials and the development of recommendations (roadmaps) for the management of raw materials in the context of implementing the assumptions of sustainable development (SD), circular economy and the European Green Deal in the water and sewage, fertilizer and agri-food sectors.



Table of Contents

Introduction	18
---------------------------	----

Green Deal Strategies

Marzena Smol

Importance of Green Deal strategies in the 21 st century.....	20
--	----

Sustainable and Circular Waste Management

Juris Burlakovs, Maris Klavins

Humic substances and their role in waste management	22
---	----

Md. Zia ul haq, Hemant Sood

Sustainable approach towards waste usage in brick development	23
---	----

Ausrine Vitkute, Jolanta Dvarioniene

Assessing the contribution of high-density polyethylene recovery from residual household waste for the transformation towards the circular economy and sustainable development	24
--	----

Edyta Strzelec

Fermentation as a way of glycerin waste management towards the production of lactic acid – PLA mer.....	25
---	----

Apurva Goel

India on Circular Economy and e-waste management	26
--	----

Ayoub Haouas, Anas Tallou, Fatima Ezzahraa El Minaoui

Evaluation of the fertilizing capacity of composts produced from bio-waste and phosphate additive in deficient soils.....	27
---	----

Anas Tallou, Ayoub Haouas, Francisco Pedrero Salcedo, Faissal Aziz

Application of biofertilizers on tomatoes: targeting Circular Economy	28
---	----

Beata Pošpiech

Application of polymer inclusion membranes for the selective removal of copper from model leach liquors of waste printed circuit boards (PCBs).....	29
---	----

Adam Nawrocki

Lawns vs meadows. What is better to accumulation particulate matter in an urbanized area?.....	30
--	----

PhosV4 Workshops - Our Phosphorus Raw Materials. Our Food. Our Future - V4's resilience in the face of pandemic

Marzena Smol

Phosphorus raw materials in the Visegrad Group (V4) countries	32
---	----

Ludwig Hermann

Importance of phosphorus raw materials – trends and perspectives	33
--	----

Dominika Szoldrowska, Marzena Smol, Anna Podlasek

Phosphorus raw materials in Poland.....	35
---	----

Péter Chrabák, László Erdei

Phosphorus raw materials in Hungary.....	36
--	----

Zuzana Šimková , Henrieta Pavolová, Tomáš Bakalár

Present situation with phosphorus in Slovakia.....	37
--	----



Energy in Green Deal

Maciej Mróz	
The impact of coal prices on wind-power-related metal prices.....	39
Katarzyna Daniluk	
Financing Green Deal and effectiveness of investment in renewable energy stocks in Poland.....	40
Bartosz Sobik	
Investment in the shift towards green energy in Poland – selected aspects of energy security and energy prices.....	41
Dagmara Dragan, Pablo Benalcazar	
Green hydrogen production in Poland - strategic and legal perspectives.....	42
Meryem Taoufik, Ahmed Fekri	
Solar-hydrogen system site selection using a GIS-MCDM-based approach with an application in Sus-Massa region - Morocco.....	43
Hadi Pirasteh-Anosheh, Gholamhassan Ranjbar, Piotr Hulisz	
Seawater greenhouse, a sustainable system for using renewable energy	44
Przemysław Ogarek, Mariusz Ruszel, Adam Masłoń	
Comparative analysis of support tools for biogas plants development based on the example of selected European countries	45
Irina Kliopova, Artūras Torkelis	
Energy efficiency solutions in end-of-life tyres recycling process: case study in Lithuania	46

Toxic-free environment

Dariusz Włóka	
The innovative method for the lakes and ponds remediation.....	48
Hemen Deka	
Leucas aspera in crude oil polluted soil: enzymatic defence of the herb and changes in soil properties.....	49
Edyta Kudlek, Mariusz Dudziak	
Determination of compounds of emerging concern in surface water from agricultural land.....	50
Prasenjit Ghosh, Suparna Mukherji	
Development of methods for identification and quantification of fluorene, carbazole, dibenzothiophene and various indigenous PAHs and heterocyclics in petroleum refinery wastewater for monitoring their degradation by pseudomonas aeruginosa RS1.....	51
Katarzyna Zatorska	
Research and evaluation of the effectiveness of the developed design solution of a hybrid filter limiting the emission of dust from fireplaces and low-power solid fuel heating boilers	52
Nurul Umairah Mohd Nizam, Marlia M. Hanafiash, Ebrahim Mahmoudi, Abdul Wahammad	
Removal of dyes and cadmium using graphene oxide by NaOH and H ₂ SO ₄ activation: isotherm and kinetic studies.....	53



Cross-H2020-seminar LEX4BIO & FERTIMANURE “Bio-based fertilizers of the Future”

Kari Ylivainio

LEX4BIO – Optimising bio-based fertilisers in agriculture – Providing a knowledge basis for new policies 55

Supta Das, Rick Helmus, Yan Dong, Steven Beijer, Antonia Praetorius, Chris Slootweg, John Parsons, Boris Jansen

Concentrations of organic contaminants in bio-based fertilizer treated soil 56

Katarzyna Kraj, Marzena Smol

Barriers and drivers for usage of bio-based fertilisers – perspective of stakeholders 57

Laia Llenas Argelaquet

FERTIMANURE project – goals and assumptions..... 58

Nagore Guerra Gorostegi, Mabel Mora Garrido

FERTIMANURE Spanish on-farm pilot. Recovery of bio-based fertilisers from pig slurry 59

Water Resources Management

Rimene Dhahri, Younes Moussaoui

Adsorption kinetics, isotherm and reusability studies for the removal of cationic dye from aqueous medium using activated carbon 61

Anna Podlasek, Eugeniusz Koda, Magdalena Daria Vaverková, Aleksandra Jakimiuk

Study on temporal and areal variability of pollution indicators in groundwater nearby the landfill. 62

Dominika Piwowska, Edyta Kiedrzyńska

The use of ecohydrological biotechnologies and NBS for the elimination of xenobiotics from the aquatic environment 63

Yuliia Trach, Victor Melnychuk, Roman Trach

The removal of cationic and anionic pollutions from water solutions using Ukrainian limestones: comparative analysis 64

Agnieszka Starzyk, Kinga Rybak-Niedziółka, Magdalena Grochulska-Salak, Janusz Marchwiński

Sponge City – the rainwater management concept in Polish cities/sponge city..... 65

Michał Preisner

Eutrophication mitigation strategies – environmental effects of taken measures in terms of water resources protection..... 66

Magdalena Grochulska-Salak, Kinga Rybak-Niedziółka

Water retention in the process of re-urbanization – planning for urban resilience and sustainable urban landscape 67

Ayla Novruzova

Climate change impacts on water resources..... 68

Wastewater and Sludge Management

Jolita Kruopienė, Miglė Žiukaitė

Circularity of wastewater sector in Lithuania 70

Małgorzata Cimołowicz-Rybicka, Stanisław Rybicki, Tadeusz Żaba

Characteristics of sewage sludge thermal processing – Kraków WWTP case study 71

Dominika Poproch, Justyna Górka, Małgorzata Cimołowicz-Rybicka, Bartosz Łuszczek

Sludge management in the wastewater treatment plant – Kraków-Płaszów case study..... 72



Khalisah Khairina Razman, Marlia Mohd Hanafiah, Abdul Wahab Mohammad, Ang Wei Lun	
Evaluating environmental performance of membrane-based wastewater treatment system.....	73
Rupak Kumar, Eyal Kurzbaum	
Olive mill wastewater isolate for its bioprospect to the production of laccase and the removal of phenolic compound	74
El Moll Ahmad	
Sustainable and circular management of wastewater in eastern Mediterranean region under the current climate changes	75
Alexandros Stefanakis, Mohammad-Hosein Mozaffari	
A novel aerobic constructed wetland for oil refinery wastewater treatment and reuse.....	76
Agnieszka Solińska, Tomasz Bajda	
Application of low-cost materials as the sorbent for removal of pharmaceuticals from contaminated water	77

Environmental Sustainability

Krzysztof Rogatka, Aleksandra Lewandowska, Ewelina Łopata, Tomasz Starczewski, Mateusz Kowalski	
Perception of sustainable development by generation Z. Experience from Poland	79
Ewelina Antonowicz, Małgorzata Roge-Wiśniewska	
Sustainability indicators – water, raw materials and energy in the fashion industry based on practices of global fashion brands	80
Pınar Kocabey Çiftçi, Emrah Çiftçi	
A framework for sustainability of personal and home care products manufacturers with Circular Economy and Green Deal perspectives.....	81
Karol Langie, Kinga Rybak-Niedziółka	
Principles of designing water elements locations in public space composition	82
Anna Gierek-Ożóg, Małgorzata Cimołowicz-Rybicka, Tadeusz Żaba, Marek Przytułski	
The role of risk assessment and water safety plans in environmental management	83
Rambabu Lavuri	
Extending the theory of planned behaviour: Factors fostering on the millennial intention to purchase of eco-sustainable products in an emerging market	84
Kinga Kimic, Martyna Otręba	
Assessment of blue and green infrastructure solutions in shaping residential areas – spatial and functional aspects	85
Dimitrios Dimitriou, Aristi Karagkounia	
Airport’s sustainability strategy: a Circular Economy comprehensiveness evaluation framework ..	86
Weronika Muszyńska	
Green human resource management – the importance of the concept in the light of own research .	87

MonGOS Seminar – “Water in Circular Economy”

Marzena Smol	
Management of water and wastewater in the Circular Economy	89
Michał Bodzek	
The use of nanoparticles in water and wastewater technology	90
Karolina Kmak	



Water reuse within a circular economy context - case studies of practical implementation in Poland	91
--	----

Klara Ramm

Importance of education and key competences for the implementation of CE in the water and wastewater sector	92
---	----

Research and Implementation of Innovation

Iolanda-Veronica Ganea, Alexandrina Nan, Călin Baci

New cross-linked eco-friendly polymer for environmental applications	94
--	----

Ahmed El Moukhtari, Arnould Savoure, Mohamed Farissi

How does exogenous silicon attenuate salinity-induced oxidative stress in Medicago sativa-rhizobia symbiosis?	95
---	----

Izabela Kielb-Sotkiewicz

Application of flow cytometry in environmental tests	96
--	----

Mariana Soraia Tomás Amândio, Ana Maria Rebelo Barreto Xavier, Jorge Manuel dos Santos Rocha

Valorization of eucalyptus bark for cellulosic ethanol production.....	97
--	----

Oskars Purmalis, Linards Klavins, Maris Klavins

Utilization approaches of invasive plants species	98
---	----

Konstantin Born

Innovating with nature in mining: why is adoption of nature-based technologies in the mining sector so limited?	99
---	----

Lakshmi Badrinarayanan, Dhanashree Ratra, Sailaja V. Elchuri

COVID 19 pandemic and eye diseases	100
--	-----

Environmental Protection – in Polish

Agnieszka Piotrowska-Kirschling, Joanna Brzeska

Brief introduction to the use of environmental life cycle assessment in the eco-design of new polyurethane materials	102
--	-----

Natalia Rudnicka

Saving water and using natural detergents as a form of climate cooperation	103
--	-----

Monika Czop

Evaluation of leaching of harmful substances and heavy metals from slag generated in the process of combustion of municipal wastes as an additive to concrete	104
---	-----

Sylwia Gubernat, Adam Masłoń, Joanna Czarnota, Piotr Koszelnik

Phosphorus removal and recovery from wastewater with the use of marl and travertine as part of a circular economy	105
---	-----

Paulina Marcinek, Marzena Smol

Prospects for the development of bioeconomy in Poland	106
---	-----

Edyta Gawrysiak, Klaudia Pawlus, Tomasz Jarosz

Green alternatives for industrial explosives as a mean to reduce environment poisoning with heavy metals	107
--	-----

Anna Wiktor-Sulkowska, Sylwia Lorenc, Arkadiusz Kustra, Natalia Kowalska

The RaVeN project - an example of university education for the Green Deal.....	108
--	-----



Water - Raw Materials - Energy – in Polish

Krzysztof Szuter, Ewa Puszczało, Ewa Łobos-Moysa	
Comparison of tap water softening technologies	110
Jagoda Worek, Katarzyna Styszko, Anna Białas	
Photocatalysis of pharmaceutical pollutants	111
Janusz Marchwiński, Karolina Kurtz-Orecka, Agnieszka Starzyk	
Influence of atrium glazing on energy performance of the building – case study	112
Marcin M. Rychlak, Mateusz L. Rychlak	
Critical study of the legal concept of the functioning of energy cooperatives in Poland	113
Bartłomiej Igliński	
The Polish wind energy sector compared to the world wind energy	114
Anna Beczak	
Photovoltaic power plants may positively impact the changes of biological diversity	115
Justyna Durak, Katarzyna Styszko	
Hydroxy derivatives of polycyclic aromatic hydrocarbons as emerging contaminants	116
Robert Kasparek, Michał Dziedzic, Marian Mokwa	
The importance of small hydropower in Poland's climate and energy transformation	117

Green Deal for the Future

Majeti Narasimha Vara Prasad	
Treasure from toxins – role of plants in environmental decontamination	119

Poster Session

Iwona Zawieja, Kinga Brzeska	
Influence of Fenton's reagent on the intensification of the hydrolysis phase of the methane fermentation of excess sludge and microbiological indicators	121
Ewa Wiśniowska	
Potassium recovery as K-struvite – challenges and potential applications	122
Sergei Levchenko, Andrei Orlov	
Intelligent energy efficiency as the main trend in the construction and operation of “green” buildings	123
Ario Fahimi, Bruno Valentim, Elza Bontempi	
Environmental assessment based on embodied energy and carbon footprint on phosphorus recovery from incinerated waste streams	124
Anas Driouich, Anas Tallou	
Optimization of eco materials synthesis by the alkaine activation of natural Moroccan metakaolin and blast furnace slag waste using mixture design	125
Taiana She Mir Mui, Nazem Nascimento	
The importance of reusing water in offshore platforms	126
Laura Fiameni, Ario Fahimi, Claudio Marchesi, Giampiero Pasquale Sorrentino, Elza Bontempi	
The sustainability analysis of a zero-waste process combined with a statistical optimization: the case of rice husk poultry litter ash for phosphorous and silica recovery	127



Elena Neverova-Dziopak, Olena Dan Assessment of metallurgical plant impact on the sea of Azov	128
Nadia Lamsaadi, Saad Elaassali, Ahmed Ek Moukhtari, Mohamed Farissi, Cherki Ghoulam Exogenous silicon application improves fenugreek (<i>Trigonella foenum-graecum L.</i>) tolerance to low phosphorus availability.....	129
Inna Pitak, Arūnas Baltušnikas, Jūratė Čėsniėnė, Gintaras Denafas Opportunity production solid recovery fuel from refuse derived fuel and use it as an alternative fuel for the cement industry of Lithuania	130
Antonella Cornelio, Alessandra Zanoletti, Roberto Braga, Elza Bontempi Synthesis of sustainable porous materials to improve air quality entrapping particulate matter	131
Justyna Cader, Renata Koneczna, Magdalena Wdowin, Piotr Olczak Transition towards a circular economy: a case study of Wielkopolska region, Poland	132
Małgorzata Worwąg, Iwona Zawieja Influence of ultrasonic field parameters on the biochemical activity of leachates from the composting process	133
Dorota Babilas, Piotr Dydo The application of electrodialysis in [Emim] Cl and [Omim] Cl ionic liquid recovery from wastewaters	134
Viesturs Ozols, Linda Ansone-Bertina, Lauris Arbidans, Maris Klavins Metal-organic framework composite sorbents on clays for carbon capture.....	135
Jakub Copik, Edyta Kudlek, Mariusz Dudziak, Martyna Kaczmarek The use of ultrasound to removal of 4-tert octylphenol by hydrogen peroxide assistance	136
Jamal Khmiyas, Douae El Khachine Characterization, physico-chemical study of municipal sewage sludge and its potential use as fertilizers: case of Tetouan city in Morocco.....	137
Wioleta Bolesta, Katarzyna Styszko, Marcin Głodniok From sewage sludge to soil – sorption of pharmaceuticals	138
Agnieszka Bus, Agnieszka Karczmarczyk, Anna Baryła Enhanced nature-based solutions by reactive materials for protection of urban water bodies.....	139
Agnieszka Karczmarczyk, Agnieszka Bus, Anna Baryła Environmental and economic effect of upgrading of on-site wastewater treatment plant	140
Katarzyna Gabryś Experimental research on compressibility characteristics of recycled concrete aggregate – recycled tire waste mixtures.....	141
Anna Lempart-Rapacewicz, Edyta Kudlek, Mariusz Dudziak Studies on the caffeine occurrence in swimming pool water	142
Krzysztof Słota, Zbigniew Słota Reduction of energy costs associated with ventilation at the Queen Luisa Adit – case study	143
Zbigniew Słota, Krzysztof Słota Impact of the revision of the legislation on limit values for nitrogen oxides on the design of ventilation in excavated tunnels – case study.....	144
Izabela Puchyrska, Robert Pacan, Piotr Sacha, Dawid Cegłowski Development of an innovative, environment-friendly production technology of large-format, deeply structured ceramic tiles using a pioneering method of recycling green scraps generated at the product forming stage.....	145
Paulina Bąk-Patyna, Małgorzata Widłak, Robert Kowalik LumiMARA as an indicator of water quality in the Świętokrzyskie voivodeship.....	146



Wioleta Mikucka, Magdalena Zielinska, Katarzyna Bulkowska Recovery of bioactive compounds from distillery stillage using acetone with conventional solid-liquid extraction.....	147
Marta Styś-Maniara, Edyta Nartowska Management of salt hydrates from photovoltaic installations in the light of existing environmental legislation in the light of existing environmental legislation	148
Anna Kowalik-Klimczak, Maciej Życki, Monika Łożyńska, Bogusław Woźniak, Christian Schadewell, Thomas Fiehn, Monika Flisek Towards the circular economy – an integrated system of thermal hydrolysis/membrane processes for recovery of chromium from wastes to reuse in tannery practise	149
Wiktoria Piątek, Monika Osińska Jaroszek, Justyna Sulej Biotechnological perspectives of food packaging production based on biodegradable polymers ..	150
Aleksandra Kozłowska-Woszczycka, Katarzyna Pactwa Social license for closure – consequences of closing mining enterprises	151
Justyna Dzięcioł, Wojciech Sas, Andrzej Gluchowski Machine learning algorithms as a modern tool for geotechnical parameters determination of combustion slag in the context of sustainable development policy for the civil engineering sector	152
Joanna Wyczarska-Kokot, Mariusz Dudziak Reuse – reduce – recycle: responsible water and wastewater management in swimming pool facilities	153
Anita Zapalowska, Justyna Koc-Jurczyk, Łukasz Jurczyk, Andrzej Skwiercz Nematodes inhabiting recultivated municipal sludge and its biological microbiome activity	154
Gabriela Kamińska, Anna Marszałek, Ewa Puszczało, Noura Fathy Removal of heavy metals in ultrafiltration with clay based mixed matrix nanocomposite membranes – mechanism and performance.....	155
Maria del Mar Cerrillo-Gonzalez, Maria Villen-Guzman, Brahim Arhoun, J.M. Paz-Garcia, José M. Rodriguez-Maroto EU’s policies for lithium ion batteries – an overview	156
Rafał Jasiński PM10 and PM2.5 concentrations in winter periods of smog episodes in Poland.....	157
Paulina Szulc	158
Contribution of GHG emissions from bioreactors to the total carbon footprint (CF) of municipal wastewater treatment plants (WWTP).....	158
Wojciech Derej Green jobs as a factor supporting of the European Green Deal implementation	159
Anirban Sil, Neethu Narayanan, Suman Gupta Pesticide remediation behaviour of magnetite-clay composites from water	160
Krzysztof Chyła, Krzysztof Gaska Application of the FSW method in joining metal components of car seats	161
Edyta Łaskawiec The environmental risk of using filter waste from the seasonal bathing area	162
Paweł Kut, Katarzyna Pietrucha-Urbanik Numerical simulation based design of photovoltaic installations	163
Brahim Arhoun, Maria del Mar Cerrillo-Gonzalez, Maria Villen-Guzman, José Miguel Artacho, José M. Rodriguez-Maroto Phosphorous removal from antequera WWTP using ferric chloride: a pilot - scale study	164
Kristine Blumfelde-Rutka, Santa Klieidere Climate change narrative in Latvia: marketing communication evaluation in retail sector	165



Łukasz Jurczyk, Justyna Koc-Jurczyk Toxicity of products of two-stage biological and chemical municipal landfill leachate treatment towards selected model organisms	166
Justyna Sułowska, Magdalena Szumera Sulfur bearing glasses as potential sulfur glassy carriers for soil environment.....	167
Ahmad Mohammad Nafea Masoud, Sabrina Sorlini Integrating NBS – constructed wetland in sustainable sanitation	168
Robert Kowalik, Jolanta Latosińska, Jarosław Gawdzik Municipal sewage sludge in a circular economy.....	169
Martyna Janek Repair of cement mortars by applying a microbial healing agent.....	170
Barbara Breza-Boruta Emission of bioaerosol from a composting facilities and the microbiological composition of the air in its surroundings	171
Sylwia Sady, Bogdan Pacholek, Leszek Matuszak Impact of sonication on the extraction process of bioactive compounds contained in by-products of chokeberry processing.....	172
Joanna Fronczyk, Adam Pyzik, Nadella Marchelina, Katarzyna Otłowska, Małgorzata Wdowska Assessment of the influence of MICP process conditions on the sandy soil hydraulic conductivity	173
Raimonda Soloha, Liva Kristina Lukasa, Elina Dace Enabling circular bioeconomy via estimating biowaste and food loss valorisation potential in Latvia	174
Łukasz Mazur, Aleksandra Nowysz The impact of negative effects of urbanization on Park Dolina Służewiecka in Warsaw: a regeneration project.....	175
Tomasz Furmańczyk, Karolina Kurtz-Orecka, Leszek Jastrzębski, Justyna Strzyżewska Spatial and strategic planning in the cross-border area to support green transformation.....	176
Wojciech Tuchowski, Jacek Mazur, Andrzej Skwierawski, Piotr Nikończuk Preliminary analysis of the potential of using surface water for cooling purposes – case study.....	177
Waheed A. Rasaq Opportunities and challenges of methodology of pyrolysis of biomass.....	178
Lidia Wolny Acrylamide as by-product of wastewater and sewage sludge treatment	179
Bartłomiej Macherzyński, Maria Włodarczyk-Makula, Dorota Andrzejewska-Górecka, Małgorzata Wszelaka-Rylik Determination of the toxic concentration of PAHs for mesophilic biocenosis	180
Wojciech Tuchowski, Karolina Kurtz – Orecka, Aleksandra Pych, Laura Wojnicz The use of renewable energy sources in refrigeration and air conditioning.....	181
Norbert Dąbkowski, Katarzyna Jeleniewicz, Gabriela Rutkowska, Krzysztof Wiśniewski, Jarosław Wójt The impact of fly ashes from thermal conversion of sewage sludge on properties of natural building materials on the example of clay.....	182
Maciej Miturski Reduction of cement in road sub-bases as a result of dispersed reinforcement	183
Robert Popek, Arkadiusz Przybysz The importance of precipitation in the process of air purification by plants.....	184



Álvaro Rivas Bascón, Brahim Arhoun, Maria del Mar Cerrillo-Gonzalez, Oscar López Artacho, José M. Rodríguez-Maroto	
Modeling chemical precipitation removal in Antequera’s WWTP by STOAT software.....	185
Brahim Arhoun, Álvaro Rivas Bascón, Maria del Mar Cerrillo-Gonzalez, José M. Rodríguez-Maroto, Rosario León Muñoz	
Implementation in STOAT’s simulator and biological removal of phosphorus of Antequera’s WWTP.....	186
Aleksander Czapla, Jakub Drewnowski, Bartosz Szelaĝ	
Sustainable way of managing rainwater with composite systems in Green Deal implementation .	187
Aleksandra Nowysz	
Urban farms in residential areas – water and food in cities.....	188
Noura Fathy Abdel Salam, Gabriela Kamińska, Anna Marszałek	
Adsorbent based on bentonite and carbon nanotubes for removing bisphenol A from water.....	189
Magdalena Zabochnicka-Świątek	
Industrial wastewater treatment using simultaneous sorption by microalgae and zeolite.....	190
Dagmara Słota, Wioletta Florkiewicz, Karina Piętek, Agnieszka Tomala, Agnieszka Sobczak-Kupiec	
Polymeric hydrogel materials as a sustainable platform for advanced biomedical and environmental applications.....	191
Jakub Drewnowski, Przemysław Kowal, Bartosz Szelaĝ	
Strategies of AOB-NOB activity control with free ammonia and free nitrous acid under short-cut nitrogen removal for energy-neutrality in WWTPs towards Green Deal implementation.....	192

Poster session – in Polish

Paweł Wolski	
Evaluation of thickening and dewatering of the digested sludge preconditioned by sonication.....	194
Damian Zarzecki	
Phytoremediation – plants as a “green” way to a toxin-free environment.....	195
Weronika Urbańska	
Methods of recovering metals from waste Li-ion batteries - current state and prospects.....	196
Szymon Stocki, Rafał Hübner	
Green hydrogen is the future of renewable energy and energetics.....	197
Zuzanna Kościukiewicz, Ewa Zaraś-Januszkiewicz	
The awareness and importance of technical sciences among the society in the context of the climate crisis.....	198
Ewa Hołota	
Proposal of water intake location in a rural area – case study.....	199
Monika Metryka-Telka, Jarosław Gawdzik, Agnieszka Dolhańczuk-Śródka	
Activity of ²²² Rn in tap water in Kielce district.....	200
Witold Nocoń, Karolina Skorb	
Dragonflies of the upper Silesian agglomeration as an indicator of biodiversity and climate change.....	201
Michał Fiłonowicz	
Green building as an element of implementing the idea of sustainable development on the example of beddington zero energy development in London.....	202



Izabela Płonka, Monika Adamkowska The influence of ultrasonic disintegration on the change of properties of sludge from water treatment.....	203
Monika Partyka Directive EU on the quality of water intended for human consumption – new testing and analysis requirements.....	204
Yurii Delikhovskyi, Łukasz Wójcik Sealing clay-cement binders for flood protection dikes	205
Uszczelniające spoiwa iłowo-cementowe dla wałów przeciwpowodziowych.....	205
Barbara Pieczykolan Helactin Blue F2R adsorption on waste sorbent made from post-coagulation sludge	206
Katarzyna Moraczewska-Majkut, Witold K. Nocoń Microplastic in tap water – preliminary tests	207
Anna Marszałek Removal of copper and lead from rainwater with inexpensive hybrid composite beads based on diatomite and sodium alginate.....	208
Gabriela Kamińska, Ewa Puszczalo, Anna Marszałek Assessment of the impact of nanomaterials on the germination of monocotyledonous and dicotyledonous plants in unpolluted and oil contaminated soil.....	209
Martyna Grzegorzek Water reclaim as an alternative source of water.....	210
Magdalena Głąb, Sonia Kudłacik-Kramarczyk, Anna Drabczyk, Dagmara Słota, Wioletta Florkiewicz, Agnieszka Tomala, Bożena Tyliszczak, Agnieszka Sobczak-Kupiec Photopolymerization as an economical and waste-free method of the synthesis of composite materials designed for bone tissue regeneration.....	211
Radosław Piech, Anna Drabczyk Magnetic nanoparticles in the diagnosis and treatment of neoplastic diseases	212
Maksymilian Skrzypiec, Magdalena Głąb Characteristics of magnetic nanoparticles as innovative materials of the 21 st century	213
Michał Salwa, Sonia Kudłacik-Kramarczyk Polymer superabsorbents – properties and application	214
Joanna Witkowska-Dobrev, Marek Dohojda, Olga Szlachetka, Maciej Malarski Influence of sewage on concrete elements of sewage treatment plants.....	215

Division of Biogenic Raw Materials projects



Introduction

We currently live in a world in which we have to face one of the greatest civilization threats of the 21st century, resulting from the coronavirus pandemic that has started in the beginning of 2020. Globally, regions, countries and cities needed to change their priorities and direct all their efforts and resources to protect the health and well-being of their inhabitants. In this context, the coronavirus pandemic has endangered the implementation of the Green Deal Strategies (GDSs) in various regions and countries. However, various international organisations, as the European Commission (EC) recognised this crisis as the opportunity to rebuild the economies and make them more resilient. Therefore, the further development of green solutions - technological, legal, organizational, economic, social and environmental - under the GDSs may turn out to be crucial for building the resilience of individual economies to various threats that may arise in the future, both climatic and epidemiological.

The purpose of the 2nd International Conference on Strategies toward Green Deal Implementation – Water, Raw Materials & Energy (ICGreenDeal2021) was to present possible solutions that fit into the green economy and can be implemented under the Green Deal Strategies. This event was a continuation of the 1st International Conference Strategies toward Green Deal Implementation – Water and Raw Materials, which turned out to be a great success with almost 500 Participants from all over the world.

ICGreenDeal2021 aimed to exchange of good practices and knowledge transfer between Participants representing all sides of the Quadruple Helix - society, entrepreneurs, scientists and educators, and administration. Sharing of multidisciplinary knowledge with high scientific and practical importance could accelerate the implementation of the Green Deal Strategies, and through this contribute to improving the quality of the environment and achieving a balance between People and Environment in our Planet.

This publication includes papers presented at the ICGreenDeal2021 that took place 8-10 December 2021, online and was organised by the Division of Biogenic Raw Materials of the Mineral and Energy Economy Research Institute of the Polish Academy of Sciences. I would like to thank all Participants – both Presenters and Listeners for sharing and listening 198 papers in 14 thematic sessions during this 3-days online Conference.

In this edition we go one step further - Together we can save the Planet!

Prof. Marzena Smol
ICGreenDeal2021 Chairwoman

GREEN DEAL STRATEGIES





Raimonda Soloha, Liva Kristina Lukasa, Elina Dace

University of Latvia, Latvia

Contact: raimonda.soloha@lu.lv, liva_kristiana.lukasa@lu.lv, elina.dace@lu.lv

Enabling circular bioeconomy via estimating biowaste and food loss valorisation potential in Latvia

Biowaste and food loss management in Latvia has not been efficient enough. Currently, a significant proportion of biowaste ends up in landfills, limiting their further valorisation. Also, the more homogenous food loss is left underutilised. Valorisation of biowaste and food loss (FL) into higher added-value products is not considered in the National Waste Management Plan of Latvia at all. FL estimation has been difficult due to lack of uniform guidelines for monitoring and measuring FL, and no obligation or system for reporting. However, FL generation is associated with various environmental, economic, and social burdens. Thus, its prevention, reduction and valorisation play a crucial role within the circular bioeconomy. Our study aims to (1) estimate the extent of FL for the top 10 most-produced food products in Latvia, (2) identify the current valorisation pathways, (3) estimate the potential amount of valorisable FL, and (4) identify the obtainable value-added products based on the emerging biological valorisation approaches reported in scientific literature to sustainably close the bio-based material and resource loop. Understanding the amount, composition, seasonal variability, and geographical distribution of generated FL and other biowaste in Latvia is important to make better forecasts of possible recycling and valorisation capacities. Knowledge and data availability on the FL flows is an essential precondition not only for implementing FL valorisation pathways at an industrial scale, but also for developing sustainable circular bioeconomy strategies at local and national scales. This study is the first attempt to estimate the valorisable FL and obtainable value-added products in Latvia.

Keywords: biowaste, data availability, food loss, valorisation, value-added products

Acknowledgments: This research has been supported by the European Regional Development Fund within the project No. 1.1.1.2/VIAA/3/19/528 “Decision Support Tool for an Integrated Food Waste Valorisation System (DeSTInation)”.