BOOK OF ABSTRACTS

EU GREEN WEEK

An initiative of the European Commission

2nd International Workshop

TOWARDS ZERO POLLUTION

2022 Viseu 03 june

july, 2022

Title: 2nd International Workshop: Zero Pollution – Make it Real

Editor
Escola Superior de Tecnologia e Gestão de Viseu

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The large share of energy consumed at the industrial level is derived from fossil, nuclear and renewable sources. Fossil fuels are identified as one of the main sources of carbon emissions and cause of climate change. Global carbon dioxide (CO_2) emissions from fossil fuels and industry have increased considerably since 2000, and in 2019 reached a record high of 36.7 billion metric tons of CO_2. Environmental issues, especially climate change, have become hot topics around the world in recent years due to the magnitude and scope of their impacts. Carbon dioxide and greenhouse gases emitted by human activities, particularly related to energy consumption, have changed weather patterns around the world, causing extreme weather conditions such as hurricanes, drought, excessive rainfall and unusual temperatures. Many countries are trying to diversify the focus of primary energy sources, from fossil fuels to other sources, notably renewable energy. This situation has a particular interest in a global crisis arising from the war in Europe. The sources of energy must be diversified.
EU Green Week is an annual event where the objective is to debate European environmental policy towards a resource-efficient and climate-neutral Europe by 2050. This year's edition focuses on the European Green Deal and puts three important aspects into highlight the circular economy, zero pollution and biodiversity. In Viseu, the good practices role in the industry towards zero pollution, with particular focus in the efficient energy usage and resilient practices, was discussed.

By the Organizing Committee

A grande parte da energia consumida a nível industrial provém de fontes fósseis, nucleares e renováveis. Estes são identificados como uma das principais fontes de emissões de carbono e causa das alterações climáticas. As emissões globais de dióxido de carbono (CO_2) provenientes de combustíveis fósseis e indústria aumentaram consideravelmente desde 2000, tendo em 2019 atingido um recorde de 36,7 mil milhões de toneladas de CO_2. As questões ambientais, especialmente as alterações climáticas, tornaram-se temas quentes em todo o mundo nos últimos anos devido à magnitude e alcance dos seus impactos. O dióxido de carbono e os gases com efeito de estufa emitidos pelas atividades humanas, particularmente relacionadas com o consumo de energia, alteraram os padrões climáticos em todo o mundo, causando condições climáticas extremas, como furacões, secas, chuvas excessivas e temperaturas incomuns. Muitos países estão a tentar diversificar o foco das fontes de energia primárias, desde os combustíveis fósseis até outras fontes, nomeadamente as energias renováveis. Esta situação tem um interesse particular numa crise global decorrente da guerra na Europa. As fontes de energia devem ser diversificadas.
A Semana Verde da União Europeia (EU) é um evento anual onde o objetivo é debater a política ambiental europeia rumo a uma Europa eficiente em termos de recursos e neutra para o clima até 2050. A edição deste ano centra-se no *Green Deal* Europeu e coloca três aspetos importantes em destaque na economia circular, na poluição zero e na biodiversidade. Em Viseu, discutiu-se o papel das boas práticas na indústria para a poluição zero, com especial enfoque no uso eficiente da energia e nas práticas resilientes.

Pela Comissão Organizadora

EU GREEN WEEK

Brief description of the program

ZERO POLLUTION

MAKE IT REAL

2nd International Workshop

June 3rd 2022

AUDITORIUM
Superior School of Technology and Management
Polytechnic of Viseu

PROGRAM

09h00 WELCOME

José dos Santos Costa, President of the Polytechnic of Viseu
António Ventura, President of the Superior School of Technology and Management of Viseu
Isabel Brás, Head of the Environmental Department of ESTGV

2nd WORKSHOP - TOWARDS ZERO POLLUTION

Zero Pollution research: developments in research centers, schools, industries and public organizations

09h15 KEYNOTE: ENVIRONMENT & ENERGY IN INDUSTRY

- Present and Future of National and European Energy Policies, ***João Galamba***, Secretary of State for the Environment and Energy

Moderation: ***Luís Teixeira de Lemos***, Professor of the Environmental Department of ESTGV

10h00 ORAL PRESENTATIONS - Session 1

10h45 Coffee break / Poster Presentation

11h00 ORAL PRESENTATIONS - Session 2

13h00 Lunch

14h30 GOOD ENERGY PRACTICES IN INDUSTRY TOWARDS ZERO POLLUTION

Industries will share their experiences implementing good practices towards Zero Pollution

- ***Tiago Mendes***, MOB (Visabeira Group)
- ***Helena Serrano***, CERTENERGIA
- ***João Alexandre***, ENERGYCO
- ***Carlos Oliveira***, HEN - Serviços Energéticos
- ***Eduardo Costa***, SCIVEN

Moderation: ***Carlos Catorze Pereira***, Professor of the Mechanical Engineering and Industrial Managment Department [ESTGV]

17h00 CLOSING SESSION

Free Entry | Limited Capacity

REGISTRATION and PAPER SUBMISSION
at www.amb.estgv.ipv.pt

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Organizing Committee

Isabel Brás
Luísa Cruz-Lopes
Maria Elisabete Silva
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Sérgio Lopes

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CONSUMER PERSPECTIVE ABOUT PLASTIC FOOD PACKAGING

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Abstract

Plastic materials have been increasingly used for food in the latest decades, due to the many advantages associated with these materials: they offer considerable design flexibility; they are cheap and lightweight; and they have a wide range of physical and optical properties important to preserve the foods. Plastics made from petroleum are not degradable and are discarded in the environment, originating huge environmental problems, threatening all forms of life by entering the food chains. This work focused on the perspectives of Portuguese consumers concerning plastic food packaging and its consequences for the environment and the ecosystems. The research included a questionnaire survey applied to a sample of 385 adult citizens. The results showed that the participants are inclined to reflect about the negative impact of plastic packaging on the ecosystems and about 40% admit that they sometimes do not buy plastic while 30% try to use alternative materials. An important percentage, over 80%, are in favour of prohibition to use plastic utensils of single usage and the limitation in the use of plastic bags to carry goods and foods in particular. Most participants revealed a good knowledge about recycling and are favourable to the use of recycled materials. Nearly 90% of the participants separate the different types of waste aimed at recycling. Although shifting the usage of plastic towards more sustainable options has been facing some difficulties, it is also verified that consumers are becoming more worried about the impact of their choices on the sustainability of ecosystems and the whole planet Earth.

Keywords

Food packaging, Plastic, Recycling, Knowledge, Impact, Questionnaire survey.

WARENESS OF PLASTIC WASTE CORRECT DEPOSITION: FROM SELECTIVE COLLECTION TO THE VALORIZATION

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Abstract

The massive use of plastics increases an environmental and public health problem, due to the high production of waste and its mismanagement. It is necessary to sensitize citizens to the need for a plastics waste correct disposal, to allow an effective selective collection. To disseminate this information, a sensitize campaign was developed which included the development of a website that contains relevant information on the subject, in a summarized, appealing and clear way. This website aims to educate the general population about the importance of plastic packaging waste, through the explanation of how its correct disposal should be done, through selective collection, and the strengthening of the potential for creating various products that integrate recycled plastic in its composition.

To promote the dissemination of this platform (https://svplasticos.mystrikingly.com/), a QR code was generated that leads directly to the website and that will be disseminated through posters that will be shown in strategic locations such as schools and commercial areas. In addition, the web page will also be shared in social platforms. With this campaign it is proposed to contribute to the achievement of plastic recycling targets in Portugal, namely by 2030, at least 70% by weight of all packaging waste. It is intended to reach all population, regardless of age or gender, even if a greater attention is given to younger people once they are in a key period of learning. This will increase the selective collection that is crucial for this sector circularity.

Keywords

Plastics, Recycling, Valorization, Ecomaterial, Circular Economy.

RECOVERY OF ELECTRICAL AND ELECTRONIC EQUIPMENT WASTE - THE CITIZENS ROLE IN THE CIRCULAR ECONOMY

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Abstract

The technological and economic development of the last decades culminated in the commercialization increase of electrical and electronic equipment (EEE). These technological advances ended up making EEE cheaper, then more accessible to the population and reducing the useful life of these products. These factors contributed to the increase in the amount of Wastes Electrical and Electronic Equipment (WEEE) produced globally. According to the Portuguese Environment Agency (PEA), in 2019, in Portugal, 203 921 tons of EEE were sold and 52 772 tons of WEEE were collected, only 26% of the total, with 85% of this waste been recovered, 44 904 tons. In this scenario, it is possible to realize that one of the main barriers in the WEEE recovery is the difficulty of collecting it. This work aimed to sensitize the population of the Municipality of Viseu about the conscious consumption of EEE and the proper disposal of WEEE through a digital awareness campaign. The “Re-cicla Viseu” will take place on the social networks of the Environmental Department at ESTGV and will provide a free e-book containing all the information on the subject, seven enlightening digital flyers and an educational video. Eight publications will be made, including flyers and video, at times when better engagement with the public is achieved. Thus, achieving the objective of raising citizens awareness for correct disposal of WEEE to recover valuable materials to produce new EEE and developing an effective circular economy.

Keywords

WEEE disposal, Awareness campaign, Circular economy.

RESIDUAL BIOMASS COLLECTION CENTER OF BODIOSA – THE BIOMASS CHARACTERISATION

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Abstract

In the current climate change scenario, forest fires have caused an increasing economic, environmental and social impact in Portugal. One of the main causes of these fires deals with the inappropriate management of forest residues. In the municipality of Viseu, there is a network of Residual Biomass Collection Centers (RBCC) that allow owners and authorities to deposit agricultural and agroforestry residues, avoiding local burning that potentially cause fires, especially in the warmer months.

To enhance residual biomass valorization, collected biomass can be forwarded into several processes namely energy valorization and production of natural soil amendments, through composting or mulching processes. To understand the best application of such residues, qualitative characterization of the biomass was done. The preliminary analysis that has been carried out concerns the qualitative characterization of three samples collected from the RBCC, in different months of the year, to understand the different plant species that could be available for valorization, and the physical configuration of this biomass. With these data will be possible to preview the materials transformation needs for enhancing its valorization.

Plant species identification was carried out comparing trunks, branches, leaves, bark or roots collected with the literature and specific software. The physical characterization allowed to realize that the biomass has different forms: a lot of foliage, agricultural waste, but also trunks and branches can be found. Analyses showed that a large percentage of the biomass consisted of the most common plant species in northern Portugal, such as pine and eucalyptus, but many fruit tree residues, such as oranges, and olive and vine pruning waste were also recognized.

Keywords

Residual Biomass Collection Centers, Forest residues, Biomass valorization, Plant species.

LIFE CYCLE ASSESSMENT OF ENERGY VALORISATION, COMPOSTING AND MULCHING PROCESSES OF FOREST AND AGRICULTURAL RESIDUAL BIOMASS

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Abstract

The study focuses on the Residual Biomass Collection Centre of Bodiosa (RBCC), a parish council located in the north-western part of the Viseu municipality, where forest and agricultural residual biomass is collected.
Currently, biomass is then taken to the Biomass Power Plant of Mundão where it is first converted in thermal energy and latter in electricity. Two further processes could be implemented to valorise it: mulching, and composting. A Life Cycle Assessment (LCA) will be applied to define the best strategy to enhance this type of biomass. The analysed impact categories are: eutrophication, global warming, photochemical oxidation, ozone depletion, abiotic depletion (mineral elements), biotic depletion (fossil fuels), water scarcity, human toxicity, terrestrial ecotoxicity and aquatic ecotoxicity in fresh and marine water. The LCA procedure, according to the ISO 14040-14044 is structured in four steps (Goal and scope definition, Life Cycle Inventory, Life Cycle Impact Assessment, Interpretation and presentation of results). In the first step, the boundaries of the system are defined. The processes included in them are: the biomass delivery to the RBCC, the shredding of the biomass, the compost and mulch production, compared with the transportation to the Biomass Central and energy production.
In the second phase data concerning fuel consumption, emissions to soil, water, and atmosphere, energetic and water consumption are collected. Data refer to the functional unit of the study, 1 tonne of biomass stored at the RBCC.
The results of this study will permit to plan the best practices of the management of this type of wastes and to support local decision-makers.

Keywords

Residual Biomass Collection Centers, Forest residues, Biomass valorisation, Life Cycle Assessment, Impact categories.

RURAL TOURISM, CO-CREATION AND ENVIRONMENTAL SUSTAINABILITY – THE CASE OF CASA DAS PALMEIRAS, NATURE HOUSES & PEDAGOGIC FARM

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Abstract

In an era of increasing environmental problems, the focus on sustainability of tourism, particularly in rural tourism, is now acquiring a notable attention. An example of an environmental behavior in the rural tourism sector is located in one most peripheral municipalities of Viseu Dão Lafões Region (located in the Centro Region). The purpose of this study is to analyze and discuss the environmental actions of the rural tourism lodging - Casa das Palmeiras, Nature Houses & Pedagogic Farm.

Based on a direct observation and participation on the life of this rural tourism lodging, the results allow us to point out that the success of the unit is due to the environmental and sustainable behavior it has followed. Indeed, if from the very beginning sustainability was a concern, particularly the environmental one, today this is very visible in the following practices: promotion and protection of the biodiversity through the biological pool; offer organically grown vegetables and fruit that can be harvested directly from the garden by the hosts; promotion the separation of waste with the four recycling bins available on the farm and in each accommodation; offer a baby kit that includes a container just for diapers and containers for collecting coffee capsules and all kinds of caps; use of biodegradable plastic bags in undifferentiated garbage buckets in order to reduce the impact of this waste in landfill, among others. Moreover, since 2020, the energy used at Casa das Palmeiras comes from renewable sources, 100% GREEN. For all this is not surprising that the lodging is certified by the Green Key, but also by the Biosphere. If the first one is more related with the environmental principles of sustainability, the second one includes also economic and socio-cultural principles that benefit the region and tourists.

Keywords

Environmental Sustainability, Rural Tourism, Viseu Dão Lafões Region, Certifications.

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WATER QUALITY EFFECT ON THE FISH DISTRIBUTION IN PAIVA AND VOUGA RIVERS, VILA NOVA DE PAIVA, VISEU, PORTUGAL

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Abstract

Fish species diversity, its assemblage distribution regarding the effect of natural and anthropogenic effects on river ecosystems were investigated. Seven sites were sampled in the Vouga and Paiva rivers in Vila Nova de Paiva, Viseu, Portugal. Site choosing criteria were human or natural disturbance such as dams or wastewater treatment plants. Fish sampling was performed by electrofishing, and 13 water physicochemical parameters were recorded. Overall, 6 fish species were collected and the most representative were 2 endogenous species Squalius carolitertii and Achondrostoma oligolepis (30 and 50%, respectively). Biotic Integrity Index was calculated to estimate the degree of human pressure on these ecosystems. Canonical Correspondence Analysis was used to determine the relationship between fish assemblage and habitat variables. We could conclude that, concerning water quality and related fish fauna distribution, there are 2 totally different river ecosystems in Vila Nova de Paiva municipality. One in Paiva river with cold and less polluted water, where we could find Salmo trutta, and another one in the Vouga river, where we can find higher water temperature, lower dissolved oxygen, but we could not find any exotic species so far, like Lepomis gibbosus or Procambarus clarki. These relationships can provide useful information for better management, conservation and restoring of fish communities and habitats. Some guidelines were established both for requalifying critical places of anthropogenic degradation and to preserve the most sensitive places of Vila Nova de Paiva freshwater ecosystems.

Keywords

Fish assemblage, Water quality, Biotic Integrity Index, Canonical Correspondence Analysis, Vouga basin.

FOREST FUEL MOISTURE CONTENT AND FOREST FIRE WEATHER INDEX

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Abstract

One of the main factors determining the fire danger is the forest fuel moisture content, given its implications in almost all aspects of forest fire, including ignition probability, number and extension of fires, mode of fire spread, fire line intensity, ease of extinction and consequences. In Portugal, the dynamic fire danger is given by the Canadian Forest Fire Weather Index System. This index is calculated using information about meteorological conditions that is used to estimate the fuel moisture content. Therefore, the knowledge of the relationship between fuel moisture content and forest fire weather index, associated with extreme weather events, will contribute to the improvement of warning systems. In the present study, the forest fuel moisture content was monitored and was compared with forest fire weather index. The results showed that, in some weather events, the forest fuel moisture content reaches very low values, thus increasing the fire danger and the occurrence of forest fires with a potential extreme behavior. This study is part of the MCFire Project (PCIF/MPG/0108/2017) – Measuring the moisture content of forest fuels and assessing their behavior within the new climate realities, funded by the Portuguese Foundation for Science and Technology.

Keywords

Moisture content, Forest fuel, Forest fire weather index.

QEF – QUANTITATIVE EVALUATION FRAMEWORK

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Abstract

The diversity of technological solutions opens up new perspectives for improving the quality of educational systems, making it necessary to develop new methodologies of analysis and quality-assurance of these systems. The Quantitative Evaluation Framework (QEF) model, proposed by Paula Escudeiro (Escudeiro & Bidarra, 2006), allows the quantitative measurement of the quality of digital contents. It was developed based on ISO 9126, an international standard for the evaluation of software. This standard does not provide requirements for software, but it defines a quality model which is applicable to every kind of software.
The QEF framework is a three-dimensional conceptual space. For each dimension there is a group of factors and for each factor there is a group of requirements to evaluate the software. The performance of a dimension is obtained through its factors and the contribution of each factor must be calculated. In order to get a measure of quality on educational software systems a matrix that represents the requirements ideal system must be fulfilled. The QEF approach measurer quality relatively to a hypothetical ideal system whose quality is assumed to be 100%. This evaluation model can be applied during any phase of the system development cycle, allowing early flaws detection.
The QEF has been used in many projects, in special the Inclusive Cultural Heritage Tourism project that includes some North Portugal locations, such as São Pedro do Sul thermae. Therefore, the Quantitative Evaluation Framework is relevant as support, validation, evaluation, control and quality-assurance in the creation of a digital content.

Keywords

Quantitative Evaluation, Software, Digital content.

ICHT – INCLUSIVE CULTURAL HERITAGE TOURISM PROJECT

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Abstract

Communication for deaf people can be challenging due to the differences between sign and spoken/written languages. The lack of inclusion is evident when it comes to accessing information, visiting cultural heritage venues, or using services and infrastructures.
The ICHT- Inclusive Cultural Heritage Tourism project aims to raise awareness of sign language and promote inclusive tourism, by developing an assistive technology that helps deaf people to overcome the communication barriers in terms of accessing information. The project is focused on creating digital tools and content in sign language to be available online and on-site at cultural tourist attractions in the North of Portugal, such as Torre dos Clérigos, the Lello bookshop, Maia Zoo, Porto wine cellars, and Viseu thermae (São Pedro do Sul). The ICHT system includes an application using holography, a game to play on a mobile device, an online collaborative platform to assist deaf and non-deaf users, and a set of International Sign training courses. The project also brings a new approach to teaching sign languages to the workers in the tourism industry offering new opportunities for a more inclusive society.
Therefore, the sign language teaching and learning together with the assistive technology tools developed by the project generates an inclusive environment for the deaf community bringing results in the field of automatic sign language translation and helping to increase the Portuguese touristic sector recognition worldwide.

Keywords

Inclusive Tourism, Games, International Sign training, Deaf community.

WASTE RECYCLING EQUIPMENT FOR USE IN 3D PRINTING (REP3D)

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Abstract

3D printing is a constantly evolving technology and will be a crucial tool of industry 4.0. The massification of the use of plastic in general entails greater responsibility for the life cycle of these materials. Therefore, recycling plays a key role in the sustainability of these resources and waste management. This project has as main objective the construction of a compact and versatile equipment, aimed at the development of research work in the area of plastic packaging recycling as well as the residues resulting from the 3D printing process. It is intended to act in the valorization of materials such as Polyethylene terephthalate (PET), used in plastic packaging such as water bottles, and Polylactic Acid (PLA), material widely used in 3D printing. With this project it is also envisaged the promotion of several awareness actions with schools to encourage and make known the importance of the separation of plastic packaging for the consequent valorization.
The designed model consists of a knife mill to grind the plastic, an extruder based on a conventional plastic injection system with some adaptations. It also has the winding system, which consists of cooling, orientation and winding of the filament (in solid state) in reused coils. The filament will have as main use 3D printing. It is a versatile model that aims to stimulate research projects on a laboratory scale simulating different scenarios of material production from packaging waste. Thus, the performance of packaging is improved throughout its life cycle, more specifically in the transformation phase of packaging residue into raw material for use in 3D printing.

Keywords

Mechanical Design, Recycling, Plastic Shredder, Plastic Extruder, 3D Printing.

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VALIDATION OF AN EXPEDITIOUS METHOD TO QUANTIFY NITRATE IN SOILS

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Abstract

Nitrate has a great importance in the nitrogen cycle, essential to soil productivity. These compounds have a large spectrum of applications from use in fertilizers, food preservatives or medicine. However, its incorrect application leads to an increase in soil and water, causing pollution, especially water pollution, since these compounds have toxicity at high concentrations and can lead to serious health problems. Due to its ambiguous importance in terms of benefits for plants versus environmental damage, their correct quantification becomes essential. Previous authors developed an expeditious spectrophotometric method for nitrate quantification in soi, but the correct application and data evaluation assumes its validation. With his procedure, is possible to report data with the confidence that is expected from an accredited laboratory. The methodology uses the photometric reading spectrum at 430 nm, after reaction between nitrate extracted with chromotropic acid, resulting in compounds that absorb irradiation in this wavelength range.
The method validation was performed with the determination of precision, accuracy, limits of detection and quantification, and recovery rate. The detection limit and the quantification limit obtained with blank tests, soils without addition of standard, were 27 mg NO_3/kg soil and 59 mg NO_3/kg soil, respectively. The precision and accuracy were evaluated by the repeatability limit and the Zscore performance test, respectively, with the first being 28 mg NO_3/kg soil and the Zscore bellow 2. The methodology validation process resulted in accuracy and accuracy classified as acceptable, with known analytical limits, and a recovery rate of 100%. The follow-up of this method results in precise and accurate data, in which there is no loss of nitrate during the process.

Keywords

Soil contamination, Nitrate, Chromotropic acid, Validation.

CIRCULAR ECONOMY IN THE REGION OF CIM VISEU DÃO LAFÕES

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Abstract

Circular Economy is an economic model that aims to increase the efficiency in the use of resources, through the increase of its circularity, which makes possible to transform a waste into a new material or energy, replacing the concept of "end of life" by “reuse”, “recycling” and “recovery”. The implementation of a circular economy is suitable for sectors where the consumption of raw materials, water and energy is high, such as industrial and construction sectors. The studied area covered by CIM Viseu Dão Lafões presents a diversified group of companies, associated to AIRV - Business Association of the Viseu Region, as shown by the characterization carried out in the present work. In order to analyze the potential of circular economy in the studied area, several companies were asked to fill in a questionnaire, which addressed various issues related to its circularity actions. Despite the importance of the topic addressed, and the savings potential that the circular economy can represent for companies, the response rate to the questionnaires was reduced. In general, most companies indicated that they do not reuse materials, water and energy from another company's production process, however, some companies identify materials, water or energy that they could reuse in their production process or from another company. About half of the entities refer that they are not available to receive materials, water or energy from other companies, which may be due to the lack of infrastructure or equipment that allows them to do so.

Keywords

Circular Economy, Business Association of the Viseu Region.

MAPPING AND ANALYSIS OF THE EVOLUTION OF GREENHOUSE GAS EMISSIONS IN THE EUROPEAN UNION BETWEEN 2005 AND 2020

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Abstract

In recent years, public health accidents have seriously harmed human health leading countries worldwide to explore the causes from the perspective of environmental pollution or greenhouse gas (GHG) emissions, and it is important to assess compliance with the binding annual targets set by the European Union (EU) for its Member States to reduce GHG emissions.

To assist the implementation of policies of financial incentives and structural adjustments to strengthen the prevention and control of GHG pollution, this work aimed to map and analyze the evolution of GHG emissions in the EU, by member country, in the period 2005 to 2020. Data from PORDATA and geodata from GISCO were used. ArcGIS Pro (v2.9.2) was used for study area delimitation, georeferencing and spatial analysis with integration of the statistical analysis performed in SPSS (v28.0.1.0).

Under the Effort Sharing, in 2020, the GHG emissions of the EU with United Kingdom (UK), showed a reduction of 17% from 2005 levels, reaching the value set in the Intergovernmental Panel on Climate Change 2020/2030. Without UK, it shows a reduction of approximately 16%. However, from the results of the analysis there are significant differences between the values of GHG emissions of Member States in 2020 compared to 2005 levels and the limits of GHG emissions set in Decision No 406/2009/EC, with most of the Member States, except for Malta, Lithuania and Ireland, having met the targets set, their national emissions were below the national emission targets set for 2020.

Keywords

Air Quality, Greenhouse emissions, Climate change, Europe 2020 Targets.

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