Sustainability and an Equitable Energy Transition

Conference Abstracts

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Content

Oral Presentation

Transforming the buildings sector – How to achieve climate neutrality by 2045?

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ABSTRACT

The transformation of the buildings sector is of key importance for meeting the energy and climate targets at national and international level. The presentation addresses the challenges and opportunities for the transition of the buildings sector towards climate-neutrality The talk focusses on the social implications of the transition under different policy frameworks and gives an overview of the recent developments in the context of the revision of the German Buildings Energy Act, which has received extensive media attention in the past months.

Keywords: Buildings Sector, Energy Transition

Health, Environment & Education, 2024

Oral Presentation

Get out of the wake! – Challenges and opportunities for modern »wind farm flow control« strategies. Harnessing the Power of the North Sea: A Dive into Sustainable Energy Solutions, its promises, and pitfalls for the Ecosystem

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ABSTRACT

Wind energy is currently the largest source of renewable energy and plays a crucial role in our transition towards a sustainable energy future. Despite its historical use as one of the oldest forms of energy, researchers agree that there is still much we do not understand. The development of larger wind turbines and wind farms presents new challenges. Furthermore, finding suitable locations for the construction of wind turbines is becoming increasingly difficult. As a result, we have started to install more and more turbines offshore in recent years.
While harvesting energy from the North Sea may sound smart in the first place. Wind is blowing near constantly, and most of the visible infrastructure may be placed beyond horizon. No neighbors are complaining, and no tourist shocked from view of the large wind farms. Yet under the sea surface, a huge infrastructure is necessary to secure the wind farms and to collect and distribute the renewable energy. How does this affect the seabed and its ecosphere? We don’t know enough!
Wind turbines also influence the environment above the sea surface by extracting energy from the wind and converting it into electricity. This process changes the wind by slowing it down and introducing turbulence, i.e., wakes form behind the turbines. These wakes can be measured many kilometers downstream, and through these wakes the wind turbines in a large wind farm take the wind out of each other's sails. This leads to a reduction in power output and an increase in turbine loads. It is therefore essential to understand the interactions of the turbines with the flow and with each other to mitigate the adverse effects of wakes. Currently, research and industry are investigating different strategies to address this issue. In this presentation, you will find an overview of the current state-of-the-art.

Keywords: Wind Energy, Offshore, Environmental impacts

Oral Presentation

Harvesting Sunshine: Unlocking the Power of Green Hydrogen

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ABSTRACT

Advanced materials are driving innovation across all fields of technology, ranging from construction and mechanical engineering, automotive and electromobility, to medical technology, energy storage and conversion technologies, and microelectronics. Given their technological impact, functional materials represent an essential segment of industrial technologies with significant value creation potential for both established markets and emerging technologies. Especially in the context of sustainable production techniques, substitution of critical raw materials, and energy- and resource-efficient manufacturing, tailored surfaces and interfaces are gaining increasing importance in the future. In this context, chemical processing of nanostructured ceramics in tuning the functional and interfacial properties for better charge transport, higher corrosion protection and enhanced performance. The examples will include the role of functionalized inorganic surfaces in electrolysers for hydrogen production, and advances in photon-harvesting technologies for perovskite-based photovoltaics. In addition, bioconjugation of dispersed nanopowders relevant for in vivo transport of higher amounts of therapeutic payloads and to reduce anyundesired off-site effectswill be discussed. This talk will emphasize the power of chemical synthesis in designing new materials.

Health, Environment & Education, 2024

Oral Presentation

Climate Action for a More Just and Sustainable World

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ABSTRACT

In the face of escalating climate and biodiversity crises, the imperative for a sustainable economy has never been more urgent. Fossil fuels, while historically central to our energy supply, are not only the main reason why climate is changing; they're also the source of massive amounts of pollution, responsible for millions of deaths each year. The uneven impacts of climate change and pollution further exacerbate global inequities, disproportionately affecting those least responsible for the crisis. Our need for energy is indisputable, but our reliance on fossil fuels is not. The transition to clean energy and nature-positive solutions is not just a vision for the future; it's a call to action for today, underscoring both the need and our ability to accelerate our progress towards a fairer, resilient, and sustainable world.

Keywords:

Health, Environment & Education, 2024

Oral Presentation

Earth Observation for Climate Action and Sustainable Development

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ABSTRACT

Climate Action (SDG 13) is closely linked to the progress of several other SDGs. Without achieving SDG 13, it will be close to impossible to achieve Agenda 2030. As per the UN Global Sustainable Development Report (unedited 14 June 2023), the world is not on track to achieve the SDGs by 2030. Progress has been impacted in many areas partly due to cascading crises such as the post-pandemic effect, rising inflation and the cost-of-living crisis, environmental and economic distress, regional and national unrest, conflicts, and natural disasters. However, the world has moved forward on some fronts, such as deploying zero-carbon technologies as one of many climate mitigation strategies.

The presentation provides insight into rising challenges posed by climate change and how space-based and other disruptive technologies contribute to the national and global efforts towards achieving targets of climate Action and SDGs.

Keywords: Earth observation, Space technology, Geospatial, SDGs, Climate action

Health, Environment & Education, 2024

Oral Presentation

Our Sustainable Future:

Understanding Links Between Energy Choices, Emissions, and Climate Outcomes

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ABSTRACT

The Earth's climate has warmed by approximately 1.3ºC since the middle of the 19th century, with most of the observed increase confidently attributed to human activity. Specifically, the warming of the climate during this period has been attributed to changes in the carbon cycle associated primarily with energy production from fossil fuel combustion and changes in land use that collectively increase the atmospheric burden of greenhouse gases. Despite our robust understanding of the role that greenhouse gases play in warming the planet, global greenhouse gas emissions continue to increase annually, making it more difficult for future generations to meet international climate change mitigation goals, such as the 1.5ºC and 2.0ºC targets quantified in the Paris Agreement adopted at the 2015 United Nations Climate Conference (COP21). This presentation will explore our future, highlighting the role of energy choices and their associated climate outcomes, with a focus on global temperature.

Renewable energy sources currently provide around 30% of global electricity production but are expected to provide more than 40% within a decade, with continuing increases thereafter. While coal and natural gas still provide more electricity than renewables, change is underway. As the electrical grid becomes greener, the benefits of the growing number of electric vehicles are also realized. Finally, carbon dioxide removal technologies are being developed and tested and may contribute to reductions in the atmospheric carbon burden when coupled with deep cuts in emissions. How will these changes impact the climate of the 21st century?

This question can be explored with climate models that represent the best available tools for exploring climate outcomes associated with changes in atmospheric composition. With such tremendous dependence on our energy choices, the climate at the end of the 21st century is characterized by a wide range of possibilities. Global temperature increases, relative to preindustrial values, could be limited to 1.5ºC with an aggressive transition away from fossil fuels in both the electricity and fuel sectors. Alternatively, a more limited transition away from fossil fuels could result in global warming of more than 4.0ºC above preindustrial values. Between these two extremes lie many additional possibilities. Recent emissions (i.e., our current trajectory) do not put us on pace to meet the goals of the Paris Agreement. At the same time, the decline in coal-generated electricity in recent years makes coal-intensive scenarios with very high temperature changes unlikely to become a reality.

Keywords:

Health, Environment & Education, 2024

Oral Presentation

Southwestern Pennsylvania's Future: A Story of Air Quality and Sustainability

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ABSTRACT

What Can We Say About Southwestern Pennsylvania's Air Quality and its implications for the sustainability of the region? Matthew Mehalik, Executive Director of the Breathe Project will provide information about key facts, trends, and challenges facing Southwestern Pennsylvania's air quality stemming from both legacy polluters like coking and steelmaking facilities as well as new airshed threats from the invasion of petrochemicals in our state. The region continues to rank poorly on national lists of air quality assessments, a key lagging factor in the region's pursuit of a sustainable future. Mehalik will also discuss some of the latest initiatives, tools, and campaigns that the Breathe Project and its Collaborative of over 65 organizations has developed to help move the needle on improving the region's continuing poor air quality, improve regional public health, and position the community for a better chance at a more sustainable future.

The presentation will cover: creative technologies to assess regional air quality and how people experience air quality; sensemaking processes of regional air quality and environmental justice data; community engagement strategies and programs; development and elevation of environmental justice community voices; holding polluters accountable; navigating difficult socio-political environments in the pursuit of better air quality; integration of technical, legal, and public health expertise in campaigns aligned with community interests; and regional narrative work to align regional priorities and leadership.

Matt serves as Executive Director of the Breathe Project, a coalition of local residents, environmental advocates, public health professionals and academics advocating for healthier air for the Pittsburgh region. From 2007 – 2016, he served as Program Director, Sustainable Pittsburgh. Matt teaches environmental policy and community resiliency courses at both Heinz College, and the School of Social and Decision Sciences at Carnegie Mellon University since 2008. He has written multiple peer-reviewed publications in sustainability, design, and education and has co-authored *Ethical and Environmental Challenges to Engineering* with Michael E. Gorman and Patricia Werhane. Matt's Ph.D. is in Systems Engineering from the University of Virginia. He serves as the chair of the board of trustees of Phipps Conservatory in Pittsburgh.

Keywords:

Health, Environment & Education, 2024

Student Presentation

Reshaping waste: Transforming sugarcane bagasse into eco-friendly bioplastic films

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ABSTRACT

The study addresses the critical need for eco-friendly alternatives to conventional plastics. It investigates the largely untapped potential of sugarcane bagasse in bioplastic film production. Despite the growing interest in bioplastics, conventional methods of extracting cellulose are expensive. The proposed methodology employs a systematic approach, initiating with cellulose extraction from sugarcane bagasse through chemical treatment, followed by a bleaching process to enhance purity. Subsequently, the bagasse undergoes transformation into a water-soluble state, forming a versatile foundation for bioplastic film casting. Natural binders and cross-linkers are introduced to optimize the film's structural properties, ensuring a robust and environmentally friendly end product. Film casting and evaluation is under the process. But, the work offers a novel and comprehensive method for converting agricultural waste into biodegradable films, strategically addressing two problems at a time. One is the proper utilisation of agricultural waste and second, is the development of an eco-friendly product. It paves a way to sustainably manage resources and energy conservation. The proposed work represent a significant step towards a more eco-conscious future, effectively bridging the gap between current plastic usage and a sustainable, environmentally friendly alternative.

Keywords:

Health, Environment & Education, 2024

Student Presentation

Nature’s Palette: Turmeric's *(Curcuma longa)* Endophytic Bacteria as Sustainable Pigment Producers

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ABSTRACT

The widespread use of synthetic pigments in various industries poses environmental and health concerns due to their carcinogenicity and the impact of industrial waste disposal. Recent studies have focused on employing microbial pigments as a source of natural colorants instead of commonly used plant pigments to save plants from exploitation. This study explores the potential of endophytic bacteria from turmeric plants as sustainable source of natural pigments. Surface sterilized turmeric plant parts were used to isolate endophytes in Nutrient broth with 2% glycerol. After 48 hours of growth, the medium was streaked on Nutrient agar with 2% glycerol. Morphologically distinct colonies isolated were further screened for production of curcuminoid by boric acid assay and HPTLC. It was observed that out of 17 endophytes isolated, 2 cultures showed positive results to boric acid assay. HPTLC analysis showed that one culture could produce all three curcuminoids. The results suggest the possibility of obtaining natural pigments from bacteria associated from turmeric plants, potentially mitigating the need to exploit the entire plant for pigment extraction. This study contributes to the growing interest in microbial pigments as a safe, non-toxic, and biodegradable alternative to synthetic dyes, aligning with principles of green technology and environmental conservation.
Keywords: Clothing, Sustainability, Environment

Health, Environment & Education, 2024

Student Presentation

Climate and Clothes

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ABSTRACT

Clothing plays a central role for us humans, especially for young people. It is important for young people to keep up with the latest fashion trends. They often buy a variety of clothes, but it turns out that many of these purchased items are rarely worn or not worn at all. Given the changing fashion trends set by the fashion industry and the desire for novelty, this ephemerality is reinforced by the constant stream of new collections from fashion brands. These give the impression that it is necessary to regularly buy new clothes in order to stay on trend. By making conscious purchasing decisions, consumers can help to shape a sustainable and environmentally friendly future. After all, the responsibility for a sustainable future for fashion lies not only with the fashion industry, but also with consumers. Sustainability in the fashion industry helps to reduce emissions by using more environmentally friendly production methods and materials. The choice of materials plays an important role. The increased use of environmentally harmful materials such as polyester increases the negative environmental impact of the fashion industry. The "Climate and Clothes" project aims to draw attention to the ecological impact of the fashion industry. It aims to raise awareness among young people and encourage them to think about the ecological footprint of our clothing. In particular, it aims to show how the production and consumption of clothing leads to environmental impacts, including emissions, resource consumption and waste. It emphasizes the need for more conscious consumer behavior to help promote a more climate-friendly and sustainable fashion culture. The project gives young people the opportunity to make a decisive contribution to making fashion not only style-conscious, but also environmentally conscious. This shows that not only the fashion industry, but also consumers need to change their behavior.

Keywords: Clothing, Sustainability, Environment

Health, Environment & Education, 2024

Student Presentation

"Frac-outs" in the Development of Unconventional Gas Wells"

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ABSTRACT

The United States heavily relies on the natural gas industry, consuming an average of over 32.31 trillion cubic feet of natural gas annually. This dependence can be attributed to the Energy Policy Act of 2005, enacted during the presidency of former President George W. Bush and former Vice President Dick Cheney. This legislation exempted the oil and gas industry from key environmental regulations, specifically The Safe Drinking Water Act, leading to a significant industry wide expansion.

One major environmental consequence of this expansion is the occurrence of "frac-outs", where fluids from the hydraulic fracturing of an unconventional well communicate with another well (conventional or unconventional). The resulting loss of fluids can result in the contamination of subsurface and surface water and fugitive methane migration. The consequences can be the contamination of private water wells.

To gain a better understanding of the impacts of a frac-out, this presentation will provide a brief overview of the fracking process and an explanation of what a frac-out entails. The presentation will also highlight specific instances where communities have been adversely affected by frac-outs and provide insight from some of our current research on the effects of fracking. Lastly, the presentation will highlight some of the environmental policy and regulations that need to be changed to safeguard the overall health and well-being of both local communities and the environment.

Keywords: Frac-out, Environmental concerns, New Regulations

Health, Environment & Education, 2024

Student Presentation

Clear Skies Ahead: Leveraging TROPOMI for Sustainable Energy: A Pathway to Emission Control and Air Quality Enhancement in India

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ABSTRACT

In India, air pollution is a serious environmental health hazard, and coal-fed thermal power plants (TPPs) are the main source of the problem. Strict adherence to emission rules by TPP is necessary for effective control of air quality. However, challenges persist since India is not well equipped with in-situ measurements, and the emission inventory not updated on a regular basis.

In order to overcome this, data from the TROPOspheric Monitoring Instrument (TROPOMI) was utilised in a top-down manner to estimate the nitrogen dioxide (NO2) emissions from TPPs in Maharashtra, India. Determining the NO2 emission from each TPP by considering the emission value was the main aim of the study. Using TROPOMI's observations of NO2 columnar molecular density, the NO2 emissions from the TPPs were calculated. For the study, thirty-one thermal plants were taken into account. There are twenty-two commercial plants (ten of which are captive plants) and nine public sector thermal plants. These plants consist of total 89 units of boilers. It was discovered that the NO2 levels surrounding certain TPPs are higher than annual ceiling limit of 40 NO2 (mg/m3).

The results of this research have significant ramifications for emission inventories and air quality monitoring. TPP's compliance with emission rules throughout the nation may be monitored using TROPOMI data. This work provides a method for monitoring TPP's emissions, eventually assisting initiatives to enhance air quality and safeguard human health. Furthermore, the methodology can also aid in identifying potential hotspots of high emissions and prioritizing areas for targeted mitigation measures. By utilizing TROPOMI data, this approach offers a cost-effective and efficient way to monitor TPP emissions, compared to traditional ground-based monitoring methods.

Keywords:

Health, Environment & Education, 2024

Student Presentation

Ackerhelden machen Schule

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ABSTRACT

Ackerhelden machen Schule is a non-profit educational project organised by Ackerhelden machen Schule gGmbH for kindergartens and schools in Germany. Since 2013, organic vegetables have been grown for and with children and young people, using exciting practical experiences to impart knowledge about good food, healthy nutrition, organic farming and the fascinating processes of nature. Ackerhelden machen Schule thus contributes to a better understanding of organic farming and equips participants to make socially, ecologically and healthily sustainable, i.e. good consumer decisions in the future. The elimination of fresh, natural foods from our daily diet is an urgent call to take a closer look at what we eat every day – for ecological and health reasons and the consequences for society as a whole. Ackerhelden machen Schule wants to bring people closer to what they eat again – the earlier these points of contact are created, the more sustainable the effect on people and thus on society and the environment.
In large and small beds, different plants are provided with a basis for life, which in turn benefits other creatures. The participating children see with their own eyes why colourful diversity in flower beds and in the great outdoors is so important and good.
A variety of projects at schools themselves, as well as in an urban gardening lab, contribute to and promote biodiversity:
The Ackerhelden Urban Gardening Lab is a raised bed farm on the grounds of the former Zollverein Coal Mine Industrial Complex UNESCO World Heritage Site in Essen – a place of learning for children, young people and adults.
It's all about discovering, perceiving and researching and, of course, crunchy fresh vegetables in all their facets. The focus is on natural processes, ecological relationships and biological diversity. The aim is to encourage the joy of discovery, surmising and a fascination for nature.
Interactive units and creative ideas are tried out and evaluated together. Content is introduced according to seasonal conditions, participating groups and thematic focuses. Biological diversity is an essential prerequisite for organic gardening and organic farming, it is an important cornerstone of an intact nature and necessary for the many processes that happen around us every day. Contributing to its preservation is therefore a key objective of their work.

Ackerhelden machen Schule (2023): Wer wir sind, abrufbar unter: https://www.ackerheldenmachenschule.de/wer-wir-sind/, Stand: 19.12.2023.
Deutsche UNESCO-Kommission (2023): Ackerhelden machen Schule, abrufbar unter: https://www.unesco.de/bildung/bne-akteure/ackerhelden-machen-schule, Stand: 19.12.2023.

Keywords:

Student Presentation

Roots of Sustainability: Unveiling Traditional Home Gardens as Ecosystem Champions

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ABSTRACT

Traditional home gardens are man-made ecosystems that are essential to the local housing system, and play an important role in delivering a wide range of services. The study delves into the significance of traditional home gardens in Kizhamanakudi, Tamil Nadu, India, emphasizing their often-overlooked ecosystem functions. Through participatory surveys involving stakeholders, ecosystem services were identified and assessed using the Toolkit for Ecosystem Service Site-Based Assessment (TESSA) for precise local-scale evaluations. Participatory surveys revealed that cultural services, cultivated goods, and carbon storage are the top priorities in the community The findings unveiled a substantial carbon stock of 46 tons/ha in these gardens and these gardens contributing goods valued at ₹40,270 per annum per household. Cultural ecosystem services, including leisure, recreation, mental health, spiritual value, and well-being, were highlighted. This study uncovers that traditional home gardens in this region represent a more sustainable land use system compared to other prevalent alternatives. Challenges such as residential growth, fire, and pollution were identified, emphasizing the need for informed decision-making on land use adjustments. Balancing challenges with informed decisions and awareness promotes sustainability, ensuring harmony between humans, wildlife, and the environment.

Keywords:

Health, Environment & Education, 2024

Student Presentation

The “Rheinkrake”

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ABSTRACT

Pollution of the environment is a major problem in today's consumer society. Even rivers are affected by waste. According to UNEP around one third of all rivers in Latin America, Africa, and Asia suffer from severe pathogenic pollution, which can lead to disease, and is attributed to untreated wastewater disposal, agricultural pesticides run-off and industrial pollution. In this video we would like to present to you a project, which tries to collect and analyse the garbage in Cologne’s river, the Rhine. The project is called Rheinkrake. The Rhinekrake is a garbage trap, which is especially constructed for this purpose. It consists of a catch basket that is attached between two floats. It is open against the direction of flow. The catch basket is 10 meters long and 3 meters wide and covering 1% of the width of the river. Everything floats in through there and is blocked over there by the mesh, which has holes that are 5 x 5 cm in size. Every two weeks, the garbage trap is emptied by helpers and the garbage is brought ashore. The helpers climb into the trap basket and collect the garbage and separate it from the driftwood by hand. Once the garbage has been brought ashore, it is sorted and categorised in detail and then prepared for disposal. The waste is analysed using an app created for this purpose and is differentiated into 183 possible categories according to the J-code list. Therefore, the individual parts are measured, checked for possible fillings, weighed and then examined with a spectrometer to determine the type of plastic. Since the project is still relatively new, only few results are yet available. According to initial findings, 70% of the waste found is plastic. There are also many bottles. Microplastics can also be found in the bycatch, which causes considerable damage to river animals.

Keywords:

Health, Environment & Education, 2024

Student Presentation

Echoes Amidst Urban Clamor: Vocal Adaptations of the Malabar Whistling Thrush (*Myophonus horsfieldii*) in Urban Environments for Sustainable Coexistence

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ABSTRACT

Birds use acoustic communication to defend their territories and attract mates. Various urban green spaces serve as stepping stones and protect habitat for wildlife. Low-frequency anthropogenic noise in urban environments usually masks sound transmissions, and we often miss the impact of noise on wildlife. Therefore, this study aimed to understand the vocalizations of the Malabar Whistling Thrush (Myophonus horsfieldii) and the variations in the spectral characteristics of the calls in two different locations. 124 recordings were recorded from June to August 2023 in the Siddhagad and Mumbra Hills, which have different background noise levels. Birds in the urban environment raise their minimum frequency of songs to a higher level than those in the forest with lower anthropogenic noise. The minimum frequency of the songs at Mumbra Hills (1262.38 Hz ± 193.40) is significantly higher than Siddhagad (1104.48 ± 202.84). The background noise has a significant positive correlation with the minimum frequency of songs and a negative correlation with song lengths. These results show that anthropogenic noise significantly influences the vocal behaviour of Malabar Whistling Thrush. Therefore, anthropogenic noise also should be considered while developing sustainable cities to ensure that people and wildlife can dwell together.

Keywords:

Health, Environment & Education, 2024

Student Presentation

STARS: A Platform for Reporting Sustainability at Institutions of Higher Education

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ABSTRACT

The Sustainability Tracking, Assessment, and Rating System (STARS) is a comprehensive, self-reporting tool for higher education institutions to engage in sustainability reporting. As environmental concerns escalate worldwide, sustainability reporting has become increasingly relevant and valuable. Utilizing a reporting system demonstrates an organization's commitment to transparency and making measurable sustainability progress. The Association for Advancement of Sustainability in Higher Education (AASHE) launched the international pilot for STARS in 2011. Currently, 347 international academic institutions hold a valid STARS rating.

The STARS platform provides a framework for understanding sustainability, enables constructive comparisons across institutions, and creates incentives for continual improvement. Institutions participating in STARS earn ratings ranging from bronze to platinum based on their sustainability performance and leadership. Duquesne University has participated since 2019 and currently holds a silver rating. This presentation will highlight the STARS report's structure, including academic curriculum and research, campus and public engagement, operations, administration, and innovation. The required data surrounding building energy efficiency, renewable energy, transportation, waste management, water usage, and greenhouse gas emissions will be discussed. By disclosing this data in STARS, educational organizations contribute to the sustainability and energy transition dialogue, fostering a global community that is committed to these crucial issues. Additional benefits such as community engagement, identifying areas of improvement, campus research and involvement opportunities, and acknowledging sustainable efforts will also be explored. The STARS program recognizes academic intuitions at various stages of their sustainability journey and encourages growth through long-term sustainability goals. Ultimately, STARS offers a valuable platform for higher education institutions to document, measure, and progress towards sustainability goals.

Keywords: Sustainability Reporting, Higher Education, Renewable Energy

Health, Environment & Education, 2024

Student Presentation

Turning Pages for tomorrow: Textbooks in Education for Sustainable Development, India

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ABSTRACT

The localization of Sustainable Development Goals (SDGs) is pivotal for their global adoption. In India, textbooks are a powerful medium for imparting these concepts, yet they have not significantly influenced students towards sustainable lifestyles. Education for Sustainable Development (ESD) plays a key role in SDG implementation. India's 2020 National Education Policy (NEP) aligns with ESD principles, emphasizing holistic, multidisciplinary education to cultivate informed decision-making and sustainability awareness. Although not explicitly named, NEP 2020 emphasizes a holistic, cross-curricular approach and diverse pedagogies aimed at developing students' abilities for future sustainability.

The study examines experimental (Science), place (Geography & Environment Science), and language-based textbooks (classes I to X, NCERT board) to gauge their alignment with ESD competencies and learning outcomes. Analysis of parameters like local-global connection, curriculum integration, reflection on impacts, solutions, and ESD competencies reveals gaps. While sustainability concepts are present, they lack deep integration. The textbooks lack local connections and reflection aspects, gradually introducing ESD competencies across grades but missing key competencies like systems, anticipatory, and strategic thinking.

Innovative pedagogical approaches, including games, competency-based learning, field-based activities, and technology, empowering learners beyond traditional classrooms, are absent. Integrating ESD with NEP 2020 in textbooks can transform young minds, fostering sustainable behavior and resourceful thinking. This integration is crucial for a paradigm shift towards sustainability and holistic skills development in students.

Keywords:

Health, Environment & Education, 2024

Student Presentation

Energy generation through hydropower – a new possibility

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ABSTRACT

The video "Energy generation through hydropower – a new possibility" presents the Rheinsharing-project. This project is being developed at the Technical University in Cologne. Two engineers are interviewed about the project.
The project focuses on the sustainable use of hydropower for base load-capable, decentralized and sustainable energy generation. The main aim of the project is to generate energy within the city, primarily through hydropower, and to use this to support the infrastructure, particularly for micromobility. The basic idea is to place turbines directly on the river to generate electricity with minimal losses and without long transmission routes.
The first prototype, a simple flow machine, was developed to efficiently generate energy from rivers. Power is generated by placing the generator on the river, driven by the impeller. This innovative approach enables direct and local power generation, making efficient use of resources.
The prototype of the project is in the final phase and is about to undergo water testing. The market launch is expected at the end of next year, which represents an important milestone for the implementation of this promising project.
The longterm sustainability of the Rheinsharing project lies in the promotion of renewable energies, especially hydropower, through the development of decentralized, small power plants. The planned integration with the transport sector promises extended added value for a comprehensive energy transition by not only generating energy, but also using it efficiently for sustainable transport solutions.

Keywords: Energy generation, hydropower, sustainability

Health, Environment & Education, 2024

Student Presentation

The linguistic discourse of “genetic engineering of crops” in German newspapers: a frame semantic analysis in the environmental humanities

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ABSTRACT

Since the development of CrisprCas9 (a highly specific tool for genetic engineering) in 2013, the discourse surrounding genetically engineered crops in Germany has been a focal point of public debate. Genetic engineering is expressed via a variety of synonyms such as “recominant”, “transgenic” (used in scientific language) or “genetically manipulated” (used in everyday language). However, there is a strong contrast between the discourse in the scientific community and the public, raising questions about the impact of these linguistic representations. The interdisciplinary field of environmental humanities allows for an analysis to which extent the use of language determines the understanding of science and environmental issues. In the context of this discourse, the question arose, whether the use of a particular term in the public debate leads to a different understanding towards the topic has yet not been addressed.

This linguistic analysis delves into the nuances of the terms “genmanipuliert”, “genmodifiziert”, and “genverändert” within German newspaper articles from 2013 to 2023. Using Fillmore’s frame semantics, the analysis aims to examine the distribution of words to unravel the frames that the semantic differences of the word’s environment evoke in the reader’s mind. DWDS and Nexis are used for providing a corpus consisting of newspaper articles (2013–2023). For each of the named terms, three articles are examined in detail.

First results of the analysis show that context of “genmodifiziert” varies between the positive effects of progress concerning the distribution of food supply and the financial gain for companies and its rejection mainly because of the image in the European market. While for “genmanipuliert”, the area is more nationally centered, still focusing on financial benefits with the fear of being politically regulated. The texts using “genverändert” focus on adaptation to conditions, efficiency, financial gain, and scientific progress. They appear to be more nuanced as they consider several aspects.

With these results, the expected difference in the frames of the terms can be confirmed, while a clear association of the terms in the different contexts cannot be seen. For further research, it should be noted that the term “manipulated” itself tends to be an element of negatively connoted frames. Now the task is to investigate whether this linguistic representation implicates a certain wariness towards new scientific breakthroughs such as CrispCas9 in the public discourse.

Keywords: Linguistic Discourse Analysis, Genetic Engineering, Frame Semantics, Scientific and Everyday Language

Health, Environment & Education, 2024

Student Presentation

Linguistic discourse analysis of sustainability communication regarding child labour of four chocolate manufacturers

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ABSTRACT

It is very likely that there is child labour in every chocolate bar one eats. However, brands communicate this issue in different ways: from neglect to pronounced vocalization.
We analyzed sustainability reports and Instagram posts of four chocolate companies with individual brands in Germany: Lindt, Ritter Sport, Tony's Chocolonely and Jokolade – the former two being traditional players and the latter ones being newly established brands with an alleged mission of ending child labour in the industry. Using the DIMEAN model proposed by Spitzmüller and Warnke (2011), our linguistic discourse analysis sheds light on how their communication addresses the issue. Are there differences between organizational communication (sustainability reports) and social media communication (instagram posts)? And how do the four chocolate companies differ in their communication strategies concerning child labour?
First of all, the research uncovers differences in mentioning the topic. While Tony's and Jokolade explicitly use the keyword 'Child Labour' both in their sustainability reports and their instagram posts, the established players follow another approach: Lindt is using the term only in its sustainability report, not on Instagram. Ritter Sport avoids the term altogether. Instead, the traditional players switch to a positive framing, talking about 'responsible sourcing', 'transparent supply chains' or 'social standards', at least in their public posts on Instagram. Second, new players like Tony's and Jokolade use linguistic elements to identify actors to blame and to distinguish themselves. They use the pronoun 'we' in contrast to 'the others' to emphasize their special efforts to deal transparently with the issue of child labour. Jokolade and Tony's also combine the call to buy with support for its goals. In contrast, Lindt attempts to justify the problem of child labour in systematic terms and does not see itself as responsible for solving it. Rittersport rather deflects attention from the topic of child labour by emphasizing their support for the German Supply Chain Act.Third, it is noticeable that the term child labour is generally often used in combination with the terms 'illegal child labour', 'slavery' and 'exploitation'. Tony's in particular explicitly explains how child labour is defined. While the other companies make no attempt to explain or define it.

In conclusion, it should be noted that all of the companies surveyed state that they cannot rule out child labour 100 % in their supply chains and therefore it can be assumed that no chocolate is 100 % free from child labour. This research thus offers a new perspective to evaluating the measures taken by and the sincerity of chocolate brands in the 'fight' against child labour.

Spitzmüller, Jürgen; Warnke, Ingo H. (2011): Discourse as a 'Linguistic Object': Methodical and Methodological Delimitations. In: Critical Discourse Studies, 8:2, 75–94. DOI: 10.1080/17405904.2011.558680.

Keywords: Linguistic Discourse Analysis, Organizational Sustainability Communication, Social Media, Child Labour, Lexical Analysis

Student Presentation

A linguistic analysis of the agonality in the discourse about zoos

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ABSTRACT

In the contemporary landscape, the discourse surrounding human-animal-relations has become a focal point of discussion, predominantly fueled by the amplifying influence of public media. This study addresses our understanding of the linguistic discourse about zoos by investigating the existence of agonal centers and discerning the linguistic markers characterizing them.

The research aims to explore whether agonal centers exist within the debate and, if so, to identify the specific linguistic indicators that distinguish them. Additionally, the study seeks to quantify the frequency of various semantic dimensions within these identified centers. Employing Anna Mattfeldt's framework for semantic dimensions of agonality, the investigation delves into the nuanced layers of linguistic negotiation within the 2023 discourse about zoos.

The study reveals different uses of the semantic dimensions depending on the agonal center. The anti-zoo position is marked by an abundance of negatively charged language and emotional rhetoric. In contrast, the pro-zoo stance is characterized by a dimension of competition for relevance and a notable degree of self-reflection. Moreover, an overarching meta-level dimension emerges in the discourse, emphasizing explicit comparisons, particularly evident in news articles.

The implications of these findings underscore the role of media outlets in fostering agonality within discourses, particularly through the deliberate use of indicators for explicit comparison. Furthermore, the study highlights the differential utilization of semantic dimensions by agonal centers, shedding light on the intricate linguistic negotiations underpinning the conflict surrounding human-animal relations. This research contributes a novel perspective on selected linguistic levels of the debate, offering valuable insights into the ongoing linguistic dynamics of the 2023 discourse on human-animal relation.

Mattfeldt, A. (2018). Wettstreit in der Sprache: Ein empirischer Diskursvergleich zur Agonalität im Deutschen und Englischen am Beispiel des Mensch-Natur-Verhältnisses. Berlin/Boston: De Gruyter.

Keywords: Linguistic Discourse Analysis, Human-Animal Relations, Agonalities

Student Presentation

Green facades as an alternative insulation method for buildings

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ABSTRACT

The urban climate is characterized by sealed surfaces, little vegetation, and dense development. There is also a high level of pollution due to the heavy traffic. Especially in summer, heat is stored in the surfaces during the day due to the high temperatures and released again at night. This leads to the development of tropical nights. This phenomenon is known as the urban heat island effect and explains why the urban climate is generally significantly warmer than in the surrounding rural areas. The global rise in temperature in recent decades, which has been observed with concern, could further exacerbate the problems for urban life. In the search for ecologically sustainable solutions, Vertical greening can make a significant contribution to sustainable urban development. This is because greenery can not only improve the physical properties of buildings and act as a pollutant filter to improve air quality, but can also have a major impact on the biodiversity of the city. Whether a greening measure is carried out as part of a refurbishment, or a new build depends not least on the costs incurred and the potential benefits. The aim of this interview is to gain an insight into the ecological and sustainable implementation of facade greening in urban development. To this end, interviews were conducted with Prof. Dr. Hans Edelmann and Minka Aduse-Poku, both from the University of Cologne and experts in the field of green facades. In this interview, questions were asked about the design and implementation of green facades, their benefits for biodiversity and the improvement of the urban climate as well as the challenges and acceptance were discussed.

Keywords: Greenfacades, Biodiversity

Health, Environment & Education, 2024

Student Presentation

One Step At a Time: Reporting on Duquesne University's 10th Greenhouse Gas Emissions Inventory

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ABSTRACT

Duquesne University's tenth Greenhouse Gas (GHG) emissions inventory was conducted for fiscal year 2022 (FY22), which began on July 1, 2021, and ended on June 30, 2022. Assembled by graduate assistants Brianna Marks and Maria Mlinarcik at the Center for Environmental Research and Education (CERE), these findings were compared with those derived from the previous inventories to assess trends in Duquesne University's GHG emissions. Per Duquesne University's commitment to sustainability, CERE conducted its first GHG emissions inventory in 2006, which served as the first completed GHG inventory by any university in Western Pennsylvania. This inventory provides campus officials, students, and community members with knowledge regarding the size and sources of Duquesne's GHG emissions. While the purpose of the GHG emissions inventory is to provide the University with knowledge of their GHG emissions, the report also serves as a valuable tool for creating innovative solutions to reduce carbon emissions over time. Additionally, the report compares the most current inventory to previous inventories to track the University's progress toward its goal of achieving carbon neutrality and discusses options for reducing Duquesne's carbon footprint in future years. Duquesne University has adopted the Sustainability Indicator Management & Analysis Platform (SIMAP) as the primary emissions calculation tool and implementation of a detailed protocol for data collection has allowed for standardization of GHG emission calculations. Emissions are generally trending downward with a 17.51% reduction in emissions from FY18 to FY22. There are several recommendations Duquesne University can follow to reduce their carbon footprint in coming years, which include (1) increasing the purchasing and use of renewable energy, (2) improving the energy and water efficiencies of campus facilities, (3) providing alternative transportation options for commuters and/or incentivizing them to utilize sustainable transportation, and (4) increasing composting or considering additional offsets that will help neutralize Scope 1 and Scope 3 GHG emissions.

Keywords: Greenhouse Gas, Carbon Neutrality, Sustainability

Student Presentation

The Threat Within Our Closet

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ABSTRACT

The TextileMission initiative, funded by the Federal Ministry of Education and Research (BMBF), is dedicated to minimizing environmental pollution caused by microplastic particles with a diameter of less than 5 mm. This collaborative project involves nine organizations from the sports equipment industry, washing machine and detergent sectors, as well as research and environmental protection. The primary focus is on advancing textile technological innovations and optimizing production processes to create textiles with reduced microplastic emissions. Notably, synthetic fibers like polyester are recognized as a significant source of environmental microplastics, primarily generated through abrasion during household laundry especially in active wear.

Within the research alliance, Maik Schössow, an expert in the field of microplastics, was interviewed for his valuable insights. Currently affiliated with the University of Cologne in the field of biology didactics, Mr. Schössow contributes his expertise to the project. The research initiative also explores biodegradable fibers as an environmentally friendly alternative to synthetic materials. Concurrently, project partners are actively involved in optimizing wastewater treatment plant technology to curtail the entry of microplastics into the environment.

The overarching goal of the project is to develop a comprehensive catalog of measures that provides specific recommendations for mitigating the entry of microplastics from textile sources into the environment. TextileMission is signifying a concerted effort to address and rectify the challenges posed by microplastic pollution.

Keywords: Microplastics, Active Wear, Pollution, TextileMission

Health, Environment & Education, 2024

Student Presentation

Kleiderei – LIVE SLOW, DIE OLD

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ABSTRACT

The enormous environmental impact of the clothing industry shows that the fashion industry should be slowed down and sustainable consumption should be introduced. A clothing store in Cologne, for example, shows how this can be implemented. In this clothing store items of clothing from the collections of fair fashion brands can be selected and borrowed for a monthly membership fee. These items of clothing can then be worn as long and as often as you like or if necessary, purchased. If you don't like an item of clothing, you can exchange it for another item. Every day you will find a new range of clothing in the stores. The garments are used for as long as possible. As a result of this and the local offer without shipping, textiles are often reused and a lot of CO2 is saved. The video presents this concept as well as an interview with the store manager at the Cologne location. Among other things, the interview discusses the demand for such sustainable concepts and the store's future prospects.

Keywords: pollution, sustainability, slow fashion

Health, Environment & Education, 2024

Student Presentation

Water Contamination Issues Related to Unconventional Gas Development

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ABSTRACT

Water is one of the most important resources we use and manage. Unconventional gas development has begun to impact our groundwater as well as our rivers, lakes, and streams. These water sources are critical for the health of communities as well as the economy. Water scarcity is becoming a problem in many parts of the world, and we should strive to protect what resources we have at our disposal. The environmental issues that have been caused by unconventional gas development include contamination of river sediments with radioactive wastes (i.e., produced water or brine) containing Ra-226 and 228, and fugitive methane migration causing high methane levels in private well water, as well as high manganese and iron levels in the latter. Brine contamination in surface and groundwater has been documented throughout Western Pennsylvania. Water wells impacted by brine in some cases had methane concentrations above 28mg/L, the saturation level in water. This presentation will present data from our ongoing study of the impact of unconventional gas development on water quality in surface and groundwater.

Keywords: Brine, Methane, Action Level

Health, Environment & Education, 2024

Student Presentation

Climate change prevention strategies for the Region Cologne/Bonn

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ABSTRACT

Climate change is one of the most important Topics in the 21 Century which should be given more attention than ever. The phenomenon of climate change poses an unprecedented threat to the global environment, impacting ecosystems, weather patterns and human societies. Threats like rising temperatures with extreme weather events force us humans to act immediately. There is a growing urgency to develop comprehensive and resilient measures to mitigate the adverse effects of climate change. This abstract provides information on the impacts of climate change in urban areas, such as Cologne, which face challenges such as heatwaves, storms, and floods. It also discusses prevention strategies to overcome these extreme weather events and create a sustainable region.
One example is the greening of courtyards and facades, the creation of green spaces, and the adaptation of buildings and infrastructure to rising temperatures in the densely populated city of Cologne. Another crucial measure is transitioning away from unsustainable fossil fuels to electric cars and a developed public transportation system to reduce greenhouse gas emissions. In addition, the involvement of the local population is an important point, because an enlightened population will take care to do things like track carbon footprints, ride bikes, eat less meat, or just use less energy. That's why it is an important step to raise awareness within the population and essential to inform the people so that everyone can contribute to the adaptation measures of climate change. Overall, the cologne Region is on a positive way in addressing challenges of climate change. The measures that have been implemented are important steps in the right direction towards creating an environmentally sustainable city, as are those that are yet to be implemented.

Keywords:

Health, Environment & Education, 2024

Student Presentation

Heat(ed) Debate – The German ‘Building Energy Act’ and its heat pump saga, a Linguistic Frame Semantics discourse reconstruction

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ABSTRACT

German Federal Government put the new Buildings Energy Act (BMI) into force on the 1st of November 2020 and started a ‘Heat Pump Offensive’ to communicate one of its preferred solutions to reach its ‘Climate Action Plan 2050’ goals. Its aftermath sparked a heated debate in the public sphere, which showed that there seems to be a gap between expert and public discourse around the topic.

Linguistic Frame Semantics are the perfect toolbox to analyse specific differences and/or similarities within any given discourse. We created four different text corpora: a selection of government texts, German newspaper articles, social media postings and, to gain another perspective on this topic, some international media output. We are currently analysing their text material and semantic frames to compare characteristics, relevant contexts and important actors involved in the ‘Heat Pump Offensive’.

Initial results seem to prove that the gap is a substantial one, as the linguistic material comes from variant semantic fields, e.g., German newspaper articles do not usually deal with characteristics of the object heat pump, but rather with the policy of the heat pump offensive.

Furthermore, there are many important actors called upon in each corpus, i.e. real estate owners, craftsmen or companies, but contrary to the government corpus, the other 3 corpora also make use of specific actors involved in the field, e.g. referring to parties like the SPD, politicians like Robert Habeck and so forth. In contrast to the represented German discourse, international newspaper coverage seems to use more similar semantic frames to the official’s texts. To gain a more extensive insight and to be able to interpretate the results, we noted that it would be good to include the scientific background texts, which led to the ‘Heat Pump Offensive’ as well.

Keywords: Linguistic Discourse Analysis, Heat Pump Offensive, Frame Semantics, Discourse Actors

Health, Environment & Education, 2024

Student Presentation

The *Agenda 2030* in the German media discussion

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ABSTRACT

In the face of increasing global warming, the global community came together in 2015 and adopted the *Agenda 2030* with a total of 17 Sustainable Development Goals (SDGs) through the United Nations. These contain perspectives for a fairer world on a social, economic and ecological level. Eight years have passed since then and climate change is still one of, if not the greatest challenge facing humanity. It is therefore only logical that a large, broad and multi-layered discourse emerged even before the *Agenda 2030*. We observed this discussion and more specifically, wanted to examine the German discourse.

On a methodological basis we utilize a linguistic discourse analysis approach. Our group specified the discourse frame and chose the press as the object of our analysis. However, the *Agenda 2030* and its SDGs are situated in a time span of 15 years. We want to highlight this detail and decided to look at the discourse at two points in time: one at the beginning (2015), and the other after eight years – the midpoint of the *Agenda 2030*. These press articles can be categorized as "commentary" articles. Taking into account the linguistic argumentation strategies, the question arises as to which normative arguments appear in the media discussion about the *Agenda 2030* and how they are used. We want to focus on the development of the discourse centered around normative arguments.

Discourses on topics such as climate change, which are closely linked to the survival of humans and humanity itself, often revolve around normative arguments that elevate the discussion to a moral or ethical level – this is one of the most important conclusions from the results. The analysis reveals those normative arguments – in both press articles from 2015 and 2023 – are used relatively frequently. We argue that certain normative arguments take on the role of 'key arguments' and that they can be categorized by keywords such as 'justice', 'morality' and 'sustainability'. Compared to 2015, the urgency is clearer in the press articles from 2023. They often contain normative arguments that appeal to the common sense of people and politicians.

Keywords: Linguistic Discourse Analysis, Agenda 2030, Linguistic Strategies, Normative Arguments

Student Presentation

Resource extraction in the automobile industry: Communication analysis of the discourse participants

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ABSTRACT

In consideration of the very high arsenic levels found near the mine in Bou Azzer in mid-November, a linguistic discourse analysis was conducted for the resource extraction in the automobile industry in Germany. The Moroccan raw materials group Managem operating in Bou Azzer, also supplies the German BMW Group. The mining of resources in the automobile industry is becoming increasingly important, particularly in relation to electromobility. An increasing demand for (critical) raw materials – for example for the construction of batteries – is offset by the aspect of sustainability. Social and environmental concerns must be reconciled with the increasing demand of the economy.

An agonistic analysis was carried out as part of the linguistic discourse analysis looking at German sources written in German language from November 2022 to November 2023. The following discourse actors and their perspectives were considered: e.g. the public media, BMW (representing the German automobile industry), activist organizations and political statements made in the coalition agreement. The most frequently used keywords and topics per interest group were analyzed and the results were visualized in a word cloud and a mind map. These keywords were then correlated with the arguments used in this context.

The coalition agreement increasingly uses imprecise expressions such as “we are committed”, “we want”, “we will support/strengthen” and “should”. The extraction of raw materials in the automobile industry is not addressed; instead, the focus is on domestic problems and how to combat them. Nevertheless, the “transformation of the automobile industry” away from the combustion engine towards e-mobility plays a major role. BMW focusses on the terms “responsibility” and “risk assessment or management” especially when addressing the resource suppliers. Their group report 2022 states that they simply comply with the (EU) regulations whereas in the website representation words like “care”, “engagement” and “sustainability” are used more often, emphasizing a much more pro-active and involved approach. The main players in public media representation in relation to the Supply Chain Act and the resource extraction in electric mobility are the economy in connection to politics as well as automobile corporations. Media articles use typical journalistic language structures like the use of subjunctive and direct quotations to distance themselves from specific opinions. The main topics are the implementation of the Supply Chain Act, with a focus on possible challenges, the calculation of risks and benefits of electric mobility for environmental protection and the e-mobility in Germany as an industry for job creation. It is important to notice that the frequency of articles depends on events in relation to this topic. Activist groups and NGOs use quite stylistic, often expressive language, for example through rhetorical questions and environmental-metaphors. The wording of these actors is intended to appeal to the morals and empathy of the readership, for example by emphasizing A) the extreme situation, B) the urgency for change or C) the ethical reprehensibility of the ecological and social conditions in the extraction of raw materials. By repeatedly referring to

human rights and the Supply Chain Act, automobile companies are held accountable. Imperatives and "must"/"should" phrases are used to repeatedly make concrete demands.
The main goal of the analysis is questioning e-mobility as a sustainable technology of the future especially regarding the planned energy transition in Germany. By looking at the analyzed agonality, it is possible to conclude that the topics and used linguistic expressions differ between the various actors. Depending on the sources and the actors, different argumentation structures and thematic focuses can be recognized. The linguistic discourse analysis has emphasized how different sources of information lead to various perceptions of one specific topic.

Keywords: Linguistic Discourse Analysis, Mining, Automobile Industry, Agonalities, Discourse Actors

Student Presentation

“Net Zero” as Defined and Interpreted by Fossil Fuel and Renewable Energy Companies

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ABSTRACT

The term “net zero” as it relates to emissions and the broader global energy transition is a scientifically straightforward concept, but its application varies in its usage by different companies and industries.

In the study, a linguistic discourse analysis was conducted concerning traditional fossil fuel companies ExxonMobil, Shell, and BP alongside renewable energy companies Ørsted, Siemens Energy, and Iberdrola. Despite “net zero” having a clear-cut scientific definition, these companies approach and frame the concept of “going net zero” in different ways, especially in regards to Scope 1, 2, and 3 emissions. These six companies’ most recent corporate sustainability reports were analyzed along with their social media activity on X (Twitter) to find patterns in the framing and usage of “net zero”.

Findings of note include fossil fuel companies dismissing or neglecting implementation of Scope 3 emission targets while focusing on Scope 1 and 2 emissions, which are minimal in comparison. Renewable energy companies, in contrast, report accelerated timelines and net zero goals for 2040, ten years before the typical benchmark year of 2050. Additionally, companies from both industries framed “net zero” as a multi-faceted concept, incorporating ideas like energy security and sustainability related to the global energy transition. Finally, both groups of companies discussed the effects of national and global politics on transitioning to net zero, with fossil fuel companies seemingly shifting the responsibility to governments and renewable energy companies partnering with organizations to plot a path to net zero.

Overall, there are clear differences in the way fossil fuel and renewable energy companies address the term “net zero”, with the differences lending themselves to a difference in the accountability and responsibility taken by the two industries in regard to the global energy transition.

Keywords: Linguistic Discourse Analysis, Social Media, Renewable Energy Companies, Net Zero

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