



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

The ESD Newsletter is a monthly newsletter involving ALL members of ESD. Members are encouraged to forward materials, authored papers on Environmental and Environmental Systems topics, and comments on newsletter topics or current events to the Editor. Your participation is greatly appreciated.

The ESD newsletter features **Five** Sections:
(Please use the **blue** links below to navigate within the newsletter)

[Webinars \(Live or recorded\) / Conferences \(Web-access/in-person\)](#)

1. ESD DIVISION NEWS

[ASME IMECE 2023 ESD TRACK](#)

[ESD's Waste Information Exchange \(WIE\) 2022 - Call for Technical Chairs](#)

[ICEM 2023 Call for Abstracts and Session Chairs](#)

[Update from TEC](#)

2. ENVIRONMENTAL TECHNOLOGIES

[Carbon-Based Nanomaterials in Agriculture](#)

[Small modular reactors: what are the barriers to deployment?](#)

3. ENVIRONMENTAL REGULATIONS

[Greenchains: Can blockchains save the environment?](#)

[Pesticides and environmental injustice: root causes, current regulatory reinforcement and a path forward](#)

4. EDITORIAL BOARD SELECTIONS

[Pathogens can hitch a ride on plastic to reach the sea](#)

[Microplastics are in our bodies. How much do they harm us?](#)

[Behavioral intentions of rural farmers to recycle human excreta in agriculture](#)

[A hybrid machine learning approach for estimating the water-use efficiency and yield in agriculture](#)

[New Green NCAP \(New Car Assessment Program\) Emissions Ratings Cast Doubt on Electric Cars' green credentials](#)

5. READER COMMENTS TO THE EDITOR

1. ESD DIVISION NEWS

ASME IMECE 2023 ESD TRACK

If you want to volunteer to be Chair or Co-Chair or have ideas for specific sessions, please contact Arnie Feldman (jjdsenv@att.net). [Back to Newsletter's Page 1](#)



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

ESD's Waste Information Exchange (WIE) 2022 Call for Technical Chairs

ESD, the Research Committee on Energy, Environment and Waste (RCEEW) and the Materials Energy Recovery Division (MER), in conjunction with the Air and Waste Management Association (A&WMA) are planning a Waste information Exchange (WIE) in 2022 in the DC Metropolitan Area. The WIE is being modeled after the [Air] Information Exchange, which has been held annually since 1975 in Research Triangle Park (RTP), NC, in which USEPA (QAQPS and ORD) are key participants. The WIE will not require a written paper and any graphics used will be made available to attendees at the discretion of speaker. The purpose of the Information Exchange is to make participation as a speaker as easy and simple as possible. The idea is to invite experts to come talk about research or regulations on which they are working without having to spend a lot of time in preparation. The WIE will cover policy updates, regulatory changes, and research on the latest waste topics.

ESD, RCEEW and MER are looking for individuals who want to participate in the planning including Track Chairs, Session Chairs, and Panel Chairs. In addition, ESD is looking for a Technical Chair to represent them on the planning Committee.

If you are interested in volunteering or want further information, please contact Arnold Feldman at jjdsenv@att.net.

Look for more information on WIE in future ESD Newsletters. **[Back to Newsletter's Page 1](#)**

ICEM 2023 Call for Abstracts and Session Chairs

Nuclear Engineering and ESD, are pleased to announce Call for Abstracts. ICEM promotes a broad global exchange of information on technologies, operations, management, economics, and public policies in environmental remediation and radioactive waste management. This is a unique opportunity to foster cooperation among specialists from mature environmental management programs and those with emerging programs. The program Tracks and Topics are on the ICEM website (<https://event.asme.org/ICEM/Program>).

Abstracts for articles, papers and presentations are due Jan 29, 2023. Abstracts should be submitted on-line at <https://icem.secure-platform.com/a/organizations/main/home>. For additional information on submitting Abstracts please send an email to ASME at toolboxhelp@asme.org.

The ICEM Program Chairs, Martin Edelson and Jovica Riznic, request your help as Session Chairs or Co-Chairs. You can either volunteer for a specific Session/Topic or just in general. "Roles of the Session Chairs" is available to review duties.



CONFERENCE #ICEM2023
Oct 3 – 6, 2023

ICEM[®] 2023
International Conference on Environmental
Remediation and Radioactive Waste Management[®]

International Conference Centre Stuttgart
Stuttgart, Germany

CALL FOR ABSTRACTS

SUBMIT BY JANUARY 29, 2023

ASME
SETTING THE STANDARD

For additional information please contact either Martin Edelson (mcedelson@gmail.com) or Jovica Riznic (Jovica.Riznic@cnsccsn.gc.ca). **[Back to Newsletter's Page 1](#)**

Update from TEC

TEC held its monthly meeting on April 28. TEC is looking for volunteers to serve on the "Conference Review Share Agreement" Committee.

In addition TEC looking for volunteers to serve on the "Increasing Industry Engagement" Committee and "Clean Energy Technology Group" – the contact details will be provided soon.

Annual Plans are due 31.05.2022 – the ESD Executive committee is looking for ideas about what is needed. Plans for FY 2023 will be approved 20.06.2022. **[Back to Newsletter's Page 1](#)**

2. ENVIRONMENTAL TECHNOLOGIES

Carbon-Based Nanomaterials in Agriculture

During plant growth, both abiotic and biotic stresses are present. As a result, finding solutions to help plants cope with stress is critical for resourceful and sustainable agriculture, as well as for decreasing the heavy reliance on chemical treatments. Nano-enabled agriculture is



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

progressing, and nanomaterials have shown promise in agriculture, notably in enhancing crop nutrition, decreasing pests and diseases, increasing stress durability, and measuring plant physiological state. The main role of nanotechnology in agriculture includes nano-fertilizer and nano-pesticides to monitor products and nutrient levels to boost production without disinfecting lands and waterways, as well as provide a shield against a variety of insect pests and microbiological illnesses.

Carbon-based nanomaterials (CNMs) are used as fertilizer which is important for the growth of the agricultural industry. Traditional fertilizers are water-soluble and quickly seep into the soil, leading to environmental contamination and higher expenses. Previous research suggests that nano fertilizers outperform conventional fertilizers in terms of effectiveness by 18 - 29 percent. Carbon nanomaterials (CNMs) can be used as excellent fertilizer carriers due to their stable molecular arrangement, uniform dispersion, and low toxicity in application media. For example, graphene oxide nanoparticles are effective trace element transporters. Pesticides, in contrast to fertilizers, are an important part of agricultural chemicals. Nonetheless, traditional pesticides create biosafety and pollution concerns among the general public due to their ease of leaching, volatilization, and loss. Among all carbon-based nanomaterials, the most effective nanomaterials for agricultural applications are carbon nanotubes (CNTs).

Recent studies show that carbon nanotubes (CNTs) chemically modified with the aliphatic alcohol 1-octadecanol (C18H38O) demonstrated exceptional antibacterial capabilities because the long carbon chains contributed to greater microwave absorption by carbon nanotubes (CNTs). Furthermore, due to their high fluorescence stability and long life, CNTs are widely used in plants under abiotic and biotic stress to detect signaling molecules such as H₂O₂, Ca²⁺, and NO. Durability, adaptability, health, and decent exposure are all challenges that farming, agriculture, and environmental assets experience. In agriculture, carbon-based nanomaterials attempt to decrease the number of pesticides distributed, minimize nutrient leaching in fertilization, and increase pest and disease control output. Nanotechnology has the potential to help the agricultural and environmental industries by producing novel products for pest reduction and increased nutrient absorption capability, among other applications. (Ref. 1)

[Back to Newsletter's Page 1](#)

Small modular reactors: what are the barriers to deployment?

Today 10% of the world's electricity (and 26% of its low-carbon electricity) is generated by nuclear power plants. The present and potential future contributions of nuclear power to combatting climate change have been documented and acknowledged by national governments in many countries. Although the final communique from COP26 in Glasgow contains no mention of nuclear power — as with all earlier COP conferences — most scenarios looking to a low or net-zero carbon future include an important nuclear contribution. However, in existing nuclear power nations and in many potential newcomers, there is



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

significant public skepticism or even opposition to more nuclear plants. What new developments might enhance public acceptability of the technology?

Today, over 60 new reactor designs are under development whose common feature is their small size. These small modular reactors (SMRs), which typically have capacity of less than 300MWe per module, are based on a wide range of technologies, some of which have never been deployed commercially. Some SMR designs are in advanced stages of development, and the first few are being deployed. However, whether SMRs will become an important part of worldwide energy supply is not yet known. The principal technical challenge for any nuclear power reactor is to achieve a very strong safety performance, so that the likelihood of accidents is small, and the consequences of an accident can be managed. The new SMR reactor concepts aim to achieve this through a design that is shown to be acceptable based on a combination of experimental evidence, analyses, test performance and operating experience with systems similar enough to provide assurance.

There is evidence, based on extensive experience with operating large reactors, that most of the SMRs will be significantly safer than existing reactors. SMRs are expected to have lower financial risk exposure and potentially cheaper generating costs than the large reactors currently dominating the marketplace. Unit sizes of about one tenth to one quarter of the size of today's reactors — in some cases even smaller — imply lower upfront capital commitments per reactor. But they need SMR-specific advantages to compensate for the economies of scale that led to reactors increasing to as large as 1600MWe. One of the key challenges facing SMRs is the need to secure design and operating licenses within a reasonable time and at acceptable cost, both in vendor and user countries. The licensing process for new reactor designs is typically slow and will likely be slower for new SMR designs because regulators lack experience with these designs and because some of the new features may require time-consuming experimental evidence.

For any nuclear energy system to be accepted by politicians, regulators and the public, the developers must be able to show that there is a credible strategy leading to safe radioactive waste disposal. For SMR designs based on current LWR technologies, the spent fuel may differ in detail (enrichment, dimensions, etc.) but it can be managed as for existing large LWRs. For other SMR concepts, based on liquid metal or gas cooled reactors, pebble bed reactors or molten salt reactors, there are no standardized methods at industrial scales for conditioning or packaging the spent fuel into a form suitable for disposal in a geological repository. Some of the SMR spent fuels have favorable characteristics, such as lower actinide concentrations or low thermal densities. In some cases, as for pebble bed fuel, the low thermal density is offset by the high specific volume of waste per unit of energy output. There are few different nuclear reactor designs in commercial operation today and all of them have received some form of governmental support to help them establish a market.

The threshold for introducing a new design has been high, so that today most reactors in operation around the world have evolved from the early light water reactor designs used on



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

submarine propulsion units. Will the situation be different for SMRs? There are positive indications that the governments in countries aiming to be a supplier of SMRs are willing to help. In Russia and China this is done by the government providing all the resources for the SMR designs. Western countries have also provided direct financial support, for example in the USA and the UK, but primarily for the research work needed for the first of a kind designs (Ref. 2) [Back to Newsletter's Page 1](#)

3. ENVIRONMENTAL REGULATIONS

Greenchains: Can blockchains save the environment?

Carbon emissions, as a key driver of environmental change, are coming increasingly under scrutiny by government regulators and in the court of investor opinion. Recent moves by the Biden administration to limit greenhouse gasses and by the SEC to force all public companies to disclose even low levels of carbon footprint impact have garnered significant media attention — reporting and compliance trends that are only likely to accelerate over time as the effects of climate change become more visible and pronounced.

The two most popular public blockchains, Bitcoin and Ethereum, employ a proof-of-work algorithm that consumes vast amounts of processing power, with Bitcoin alone using around 136 Terawatt-hours of electricity per year, more than the Netherlands or Argentina. Not only are these public chains massively inefficient on a per-transaction basis, but their power-hungry algorithms have inevitably led to block construction – known as mining – migrating to countries where environment laws are weaker and electrical power is produced from dirty sources, such as coal. This environmentally destructive footprint is inconsistent with the environmental stance of most U.S. public companies, the U.S. government's focus on carbon footprint reduction, and in the court of public opinion.

Signs of climate change routinely make headlines. Media attention that is increasingly shared with government and private industry attempts to control greenhouse gas emissions. Steps by the current U.S. administration to reduce carbon footprints and their resulting environmental damage include a variety of programs targeting supply chains, power production, and – most recently – SEC reporting requirements for public companies. While lowering greenhouse emissions and improving IT efficiency has been on the minds of CIOs for some time, this increased transparency and accountability is just the beginning of a push for compliance that will eventually rival SOC and PCI in its impact on R&D, business operations and investor reporting. Companies, especially larger enterprises, need to begin planning now for the inevitable impact of exposing their IT portfolio choices to the broader public.



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

In cryptocurrencies and other “public” blockchains, proof of stake has largely replaced proof of work in more modern implementations. Although proof of stake has occasionally been criticized as another form of centralization, it does avoid the high carbon footprint required by the Sybil attack-resistance proof-of-work approach. Public chains also serve a large, worldwide ecosystem, so at least the more popular ones enjoy a reasonable level of utilization. While databases may be the stars of enterprise data storage and sharing applications, the bulk of data owned and managed by companies is actually in the form of files. Thus, how files are shared, stored, exchanged, duplicated, and governed ends up having a larger effect on greenhouse gas emissions than database storage. Files are also key to partner data sharing solutions, as they often form the basis for both de jure and de facto industry data exchange standards.

Because blockchain technology ranges from the environmentally destructive (Bitcoin, Ethereum) to “merely” low utilization (Hyperledger Fabric, Quorum) to guarantees of perfect application utilization (serverless solutions such as Vendia’s), IT professionals facing technology choices need to be careful to ensure they are adoption technologies that will be both cost-effective and present their companies in the best possible light when carbon footprint reporting goes fully into effect.

In a few short years, “saving the environment” has gone from a fringe movement to one of the top concerns of nations, influencing domestic and international policy. With new reporting requirements already present and the high likelihood of increased corporate compliance and reporting requirements likely, now is the time for CIOs, CEOs, and others to evaluate their IT choices and put strategies in place to lower carbon emissions over the long haul. Focusing on data and compute – the two key drivers of cost and power consumption – will enable companies to identify areas of improvement. With the increasing role of blockchains as mechanisms to share both code and data across companies and clouds, understanding and identifying which blockchain technologies and providers can help improve carbon footprint versus worsen it is an important question facing IT decision-makers and architects at all levels of an organization. The checklist provided in this article can serve as a vendor selection tool to help make informed decisions and guide a company towards a “carbon and cost” efficient solution. (Ref. 3)

[Back to Newsletter’s Page 1](#)

Pesticides and environmental injustice: root causes, current regulatory reinforcement and a path forward

Many environmental pollutants are known to have disproportionate effects on Black, Indigenous and People of Color (BIPOC) as well as communities of low-income and wealth. The reasons for these disproportionate effects are complex and involve hundreds of years of systematic oppression kept in place through structural racism and classism in the USA. In a study, a group of researchers analyze the available literature and existing datasets to determine the extent to which disparities in exposure and harm exist for one of the most widespread pollutants in the world – pesticides. Their objective was to identify and discuss



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

not only the historical injustices that have led to these disparities, but also the current laws, policies and regulatory practices that perpetuate them to this day with the ultimate goal of proposing achievable solutions. Disparities in exposures and harms from pesticides are widespread, impacting BIPOC and low-income communities in both rural and urban settings and occurring throughout the entire lifecycle of the pesticide from production to end-use.

These disparities are being perpetuated by current laws and regulations through 1) a pesticide safety double standard, 2) inadequate worker protections, and 3) export of dangerous pesticides to developing countries. Racial, ethnic and income disparities are also maintained through policies and regulatory practices that 4) fail to implement environmental justice Executive Orders, 5) fail to account for unintended pesticide use or provide adequate training and support, 6) fail to effectively monitor and follow-up with vulnerable communities post-approval, and 7) fail to implement essential protections for children. Here they have identified federal laws, regulations, policies, and practices that allow for disparities in pesticide exposure and harm to remain entrenched in everyday life for environmental justice communities. This is not simply a pesticides issue, but a broader public health and civil rights issue. The true fix is to shift the USA to a more just system based on the Precautionary Principle to prevent harmful pollution exposure to everyone, regardless of skin tone or income. However, there are actions that can be taken within our existing framework in the short term to make our unjust regulatory system work better for everyone.

Exposure to many, if not most, pollutants fall along racial, ethnic, or sociodemographic lines in the USA – and pesticides are no exception. Disparities in exposure and harm from pesticides are widespread, impacting BIPOC and low-income communities in both the rural and urban settings and occurring throughout the entire lifecycle of the pesticide from production to end-use. The root causes of these disparities involve hundreds of years of systematic oppression kept in place through structural racism and classism in the USA. Despite many of the atrocities that gave rise to these disparities being seemingly in the past, there are ways in which the federal government perpetuates these disparities and hinders progress even today. Here we've identified laws and regulatory practices and policies that allow for such disparities to remain entrenched in everyday life for environmental justice communities. While the true fix is to shift the USA to a more just system of preventing pollution exposure to everyone regardless of skin tone or income, there are actions that can be taken right now to make our unjust regulatory system work better for everyone and begin to rectify the grave injustices it has perpetuated. (Ref. 4)

[Back to Newsletter's Page 1](#)

4. EDITORIAL BOARD SELECTIONS

Pathogens can hitch a ride on plastic to reach the sea

Microplastics are a pathway for pathogens on land to reach the ocean, with likely consequences for human and wildlife health, according to a study from the University of California, Davis. The study, published April 26 in the journal *Scientific Reports*, is the first to connect microplastics in the ocean with land-based pathogens. It found that microplastics can make it easier for disease-causing pathogens to concentrate in plastic-contaminated areas of the ocean. The pathogens studied -- *Toxoplasma gondii*, *Cryptosporidium* (Crypto) and *Giardia* -- can infect both humans and animals. They are recognized by the World Health Organization as underestimated causes of illness from shellfish consumption and are found throughout the ocean.

"It's easy for people to dismiss plastic problems as something that doesn't matter for them, like, 'I'm not a turtle in the ocean; I won't choke on this thing,'" . "But once you start talking about disease and health, there's more power to implement change. Microplastics can actually move germs around, and these germs end up in our water and our food." For the study, the authors conducted laboratory experiments to test whether the selected pathogens can associate with plastics in sea water. They used two different types of microplastics: polyethylene microbeads and polyester microfibers. Microbeads are often found in cosmetics, such as exfoliants and cleansers, while microfibers are in clothing and fishing nets. Microplastics that float along the surface can travel long distances, spreading pathogens far from their sources on land. Plastics that sink may concentrate pathogens in the benthos environment, near the bottom of the sea. That's where filter-feeding animals like zooplankton, clams, mussels, oysters, abalone and other shellfish live, increasing the likelihood of their ingesting both plastic and pathogens.

The scientists found that more parasites adhered to microfibers than to microbeads, though both types of plastic can carry land pathogens. The wispy particles of microfibers are common in California's waters and have been found in shellfish. There are several ways humans can help reduce the impacts of microplastics in the ocean. Microfibers are commonly shed in washing machines and can reach waterways via wastewater systems. Mitigation strategies include filters on washing machines, filters on dryers, bioretention cells or other technologies to treat stormwater, and best management practices to prevent microplastic release from plastic industries and construction sites. (Ref. 5) [**Back to Newsletter's Page 1**](#)

Microplastics are in our bodies. How much do they harm us?

As plastic waste proliferates around the world, an essential question remains unanswered: What harm, if any, does it cause to human health? A few years ago, as microplastics began turning up in the guts of fish and shellfish, the concern was focused on the safety of seafood.



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

**ENVIRONMENTAL
SYSTEMS DIVISION**

MAY 2022

Shellfish were a particular worry, because in their case, unlike fish, we eat the entire animal—stomach, microplastics and all. In 2017, Belgian scientists announced that seafood lovers could consume up to 11,000 plastic particles a year by eating mussels, a favorite dish in that country. By then, however, scientists already understood that plastics continuously fragment in the environment, shredding over time into fibers even smaller than a strand of human hair — particles so small they easily become airborne. A team at the U.K.’s University of Plymouth decided to compare the threat from eating contaminated wild mussels in Scotland to that of breathing air in a typical home. Their conclusion: People will take in more plastic during a mussels dinner by inhaling or ingesting tiny, invisible plastic fibers floating in the air around them, fibers shed by their own clothes, carpets, and upholstery, than they will by eating the mussels.

Microplastics are in salt, beer, fresh fruit and vegetables, and drinking water. Airborne particles can circle the globe in a matter of days and fall from the sky like rain. Seagoing expeditions to count microplastics in the ocean produce incomprehensible numbers, which have multiplied over time as more tonnage of plastic waste enters the oceans every year and disintegrates. A peer-reviewed count published in 2014 put the total at five trillion. In the latest tally, made last year, Japanese scientists from Kyushu University estimated 24.4 trillion microplastics in the world’s upper oceans—the equivalent of roughly 30 billion half-liter water bottles—a number in itself hard to fathom. Measuring possible adverse effects of plastics on humans is far more difficult than on animals—unlike quail and fish, human subjects can’t intentionally be fed a diet of plastics. In laboratory tests, microplastics have been shown to cause damage to human cells, including both allergic reactions and cell death. But so far there have been no epidemiologic studies documenting, in a large group of people, a connection between exposure to microplastics and impacts on health. A 2018 study found microplastics in the feces of eight people. Another study documented the presence of microplastics in the placentas of unborn babies. Scientists aren’t entirely fumbling around in the dark. There is extensive research on toxins found in plastics, as well as on lung diseases, from asthma and chronic obstructive pulmonary disease (COPD) to cancer, which kill millions of people every year and have been linked to exposure to other pollutants. The American Lung Association, in its latest report, declared COPD, which results from chronic inflammation, to be the fourth leading cause of death in the US. (Ref. 6) [**Back to Newsletter’s Page 1**](#)

Behavioral intentions of rural farmers to recycle human excreta in agriculture

Considerable progress has been made in developing human excreta recovery pathways and processes for maximum nutrient recovery and contaminant elimination. The demand segment has often been ignored as an area for future research, especially during the technology

development. The findings from the few published articles on social acceptance show missing and inconclusive influence of demographic, sociological, and economic farmer-characteristics. This study endeavours to close this gap by using the social psychological theories, technology adoption theories and the new ecological paradigm to investigate the factors that influence the behavioral intentions of rural farmers to recycle human excreta in agriculture. Study findings show that social acceptance was driven by awareness, religiosity, income, source of income, and environmental dispositions. Perceived behavioral control represents a potential barrier to human excreta reuse. The study recommends the demographic, cultural, sociological, and economic mainstreaming of dissemination strategies of circular bioeconomy approaches within the context of agricultural innovation systems.

Behavioral intentions to use human excreta were evaluated using the theory of planned behavior in this study. The segregated attitudes were evaluated for production attitudes, consumption attitudes, subjective norms, perceived behavioral control, and the overall or combined attitudes. Attitudes towards the reuse of human excreta are mainly sensitive to subjective norms and perceived behavioral control suggesting the importance of understanding local context when mainstreaming recycling initiatives and when designing and implementing dissemination plans and strategies. The findings of this study suggest that there is demand for human excreta derived fertilizers in rural agricultural communities of South Africa. The farmers exhibited positive attitude towards the recycling of human excreta in agricultural food systems.

The effect of farmer characteristics, such as religiosity, income, education level, gender, and environmental consciousness need to be understood and tailor interventions and target customer segments, rather than implementing blanket recommendations. The perceived behavioral control was reported to be a potential barrier to human excreta reuse in agriculture, indicating strong influence of health risk perception and demand for skills. Behavioral intentions to use human excreta were driven by age, awareness, religiosity, income, income source, and environmental disposition. Understanding the nature, and direction of the influence of attitudinal dimensions and farmer characteristics is important for mainstreaming circular bioeconomy interventions. (Ref. 7) [Back to Newsletter's Page 1](#)

A hybrid machine learning approach for estimating the water-use efficiency and yield in agriculture

The research paper by a group of researchers introduces the narrow strip irrigation (NSI) method and aims to estimate water-use efficiency (WUE) and yield in apple orchards under NSI in the Miandoab region located southeast of Lake Urmia using a machine learning approach. To perform the estimation, a hybrid method based on an adaptive neuro-fuzzy inference system (ANFIS) and seasons optimization (SO) algorithm was proposed. According

to the irrigation and climate factors, six different models have been proposed to combine the parameters in the SO-ANFIS. The proposed method is evaluated on a test data set that contains information about apple orchards in Miandoab city from 2019 to 2021. The NSI model was compared with two popular irrigation methods including two-sided furrow irrigation (TSFI) and basin irrigation (BI) on benchmark scenarios. The results justified that the NSI model increased WUE by 1.90 kg/m³ and 3.13 kg/m³, and yield by 8.57% and 14.30% compared to TSFI and BI methods, respectively. The experimental results show that the proposed SO-ANFIS has achieved the performance of 0.989 and 0.988 in terms of R² criterion in estimating WUE and yield of NSI irrigation method, respectively. The results confirmed that the SO-ANFIS outperformed the counterpart methods in terms of performance measures.

In their study, the effect of NSI method on yield and WUE in apple orchards was investigated. The SO-ANFIS method was proposed to estimate WUE and yield in the NSI model. In the SO-ANFIS, six models were created to determine the most effective parameters in estimating WUE and yield of NSI method. The SO-ANFIS with model ω₆ generated the superior results with R² = 0.988, RMSE = 0.006, SI = 0.007, δ = 0.860, and NSE = 0.982, respectively. One of the future works is to apply the SO-ANFIS method to other engineering problems to identify its strengths and weaknesses. (Ref. 8)

[Back to Newsletter's Page 1](#)

New Green NCAP (New Car Assessment Program) Emissions Ratings Cast Doubt on Electric Cars' green credentials

New ratings comparing whole life car emissions show little difference between many electric and internal combustion engine cars. The Green NCAP (New Car Assessment Program), the sustainability offshoot of Independent crash test body Euro NCAP has launched a new life cycle assessment (LCA) programme designed to help consumers choose the most eco-friendly cars. A total of 61 cars have been assessed for the first phase of the LCA under Euro NCAP's Green NCAP banner, with an electric Fiat 500 coming out as the car with the smallest whole-life CO₂ footprint. However, in contrast to its crash test results, Green NCAP is not offering consumers an easy to compare star rating system. Instead it is providing a 'best and worst case' range for each model giving an indication of its eco performance. There are two key rating elements that make up the Green NCAP LCA results. One rating is for lifetime greenhouse gas emissions, which is an indication of how much CO₂ a new car will produce from its manufacture, through a lifetime of use based on 240,000km (around 150,000 miles) of driving over 16 years, to recycling at the end of its life. The second rating is Primary Energy Demand (PED) which calculates the total amount of energy required over a similar cycle of manufacture, usage and recycling - irrespective of how that energy is derived, be it from renewable energy, fossil fuels or nuclear. Interestingly, in terms of its total demand for energy, a diesel Skoda Octavia Estate has the lowest PED rate of all the cars so far assessed. (Ref. 9)

[Back to Newsletter's Page 1](#)



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

5. ESD NEWSLETTER READER COMMENTS

None received this month.

NB: Readers may request for “name withheld from printing” while submitting their comments/suggestions.

[Back to Newsletter's Page 1](#)

ESD NEWSLETTER BOARD

Editor: DR. K. J. SREEKANTH – (sreekanthkj@kisar.edu.kw)

Assoc: DR. JAMES ZUCCHETTO – (jimzuc@comcast.net)

NEWSLETTER ARTICLE REFERENCES

1. <https://www.azonano.com/article.aspx?ArticleID=6098>
2. <https://www.neimagazine.com/features/features-small-modular-reactors-what-are-the-barriers-to-deployment-9651893/>
3. <https://venturebeat.com/2022/04/22/greenchains-can-blockchains-save-the-environment/>
4. <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-022-13057-4>
5. <https://www.sciencedaily.com/releases/2022/04/220426101709.htm>
6. <https://www.nationalgeographic.com/environment/article/microplastics-are-in-our-bodies-how-much-do-they-harm-us>
7. <https://www.nature.com/articles/s41598-022-09917-z>
8. <https://www.nature.com/articles/s41598-022-10844-2>
9. <https://www.autoexpress.co.uk/news/357817/new-green-ncap-emissions-ratings-cast-doubt-electric-cars-green-credentials>

ABOUT NEWSLETTER

ENVIRONMENTAL ENGINEERING features the application of environmental technologies to engineering systems to attain optimal performance according to established standards. The Newsletter of the Environmental Systems Division (ESD) will attempt to highlight a variety of environmental technology applications aimed at enhancing engineering systems performances in accordance with the latest standards by presenting excerpts of and links to selected articles from a variety of websites.

DISCLAIMER

Disclaimer: This newsletter may contain articles that offer differing points of view. Any opinions expressed in this publication do not represent the positions of the ESD Executive Board members of the American Society of Mechanical Engineers (ASME).



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

ENVIRONMENTAL
SYSTEMS DIVISION

MAY 2022

Upcoming Webinars (Live or Recorded Access) / [Conferences](#)

[41st International Conference on Ocean, Offshore & Arctic Engineering](#)

Congress Center Hamburg, Hamburg, Germany from June 5 – June 10, 2022

[Summer Heat Transfer Conference Co-Located with 16th International Conference on Energy Sustainability](#)

Philadelphia, Pennsylvania USA from July 11 – 13, 2022

[29th International Conference on Nuclear Engineering](#)

Shenzen, China and Virtual from August 8 – August 12, 2022

[International Design Engineering Technical Conferences & Computers and Information in Engineering Conference](#)

St. Louis Union Station Hotel, St. Louis, Missouri USA from August 14 – 17, 2022

[International Pipeline Conference](#)

Hyatt Regency - Telus Convention Centre, Calgary, Alberta, Canada from September 26–30, 2022

[International Additive Manufacturing Conference](#)

Lisbon, Portugal from October 19 – 20, 2022

[International Mechanical Engineering Congress & Exposition®](#)

Greater Columbus Convention Center, Columbus, Ohio USA from October 30 – November 3, 2022