



DEPARTMENT OF ENVIRONMENTAL SCIENCE & ENGINEERING

Enviro Buzz

OCTOBER 2024

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MONTHLY NEWSLETTER

An Insight into the Department of Environmental Science and Engineering, Exploring Key Events, Research Highlights, and Sustainable Initiatives – October 2024 Issue.

Let us unite in our mission to protect and restore our planet—fostering a culture of sustainable choices, innovative solutions, and collective action to ensure a thriving, resilient ecosystem for generations to come.

DEPTT. OF ENVIRONMENTAL SC. & ENGG.

HIGHLIGHTS

Swachhata Diwas Celebration: A Collective Step Towards a Cleaner Community, reflecting our commitment to environmental hygiene.

Celebrating World Habitat Day 2024: Inspiring Youth for Shaping Sustainable Urban Future through Keynote Lectures and Awareness Initiatives.

Expanding Horizons: Industry-Institute Interaction and Global Academic, Research, and Career Opportunities.

Research Highlight: A compilation of information highlighting severe impacts of oil spills



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MESSAGE

from The

HOD's Desk

Dear Readers,

As we embark on the October issue of our departmental newsletter - **Enviro Buzz**, I am pleased to share with you the strides we are making in environmental science & engineering, research, and outreach. The past month has been marked by impactful events and initiatives that reflect our collective commitment to sustainability, innovation, and education. Likewise, this month also has been marked by significant strides in fostering environmental awareness, industry collaboration, and academic growth, all aimed at advancing sustainable solutions and enhancing our educational reach.

This month of October, in celebration of Swachhata Diwas, we extended our cleanliness drive from our IIT(ISM) campus to surrounding market places, promoting awareness and proactive participation in creating cleaner, greener spaces that benefit the wider community. The ESE Department also observed World Habitat Day, and organized events to inspire youth engagement in sustainable urban development, with keynote lectures and awareness programs emphasizing the importance of building resilient, eco-friendly communities.

Our students' curiosity and commitment to environmental protection were further demonstrated in a Research Highlight Byte on the impacts of oil spills.

Additionally, this month we hosted talk providing our students with valuable insights into how international academic exposure can broaden their career horizons and enhance their contributions to the field of environmental science. We also held an Industry - Institute Interaction event, which served as a platform to encourage collaboration between academia and industry. These partnerships are vital for driving impactful research and real-world applications, ensuring our work contributes meaningfully to sustainable environmental solutions.

As we continue our journey, I encourage each of you to engage actively, share your insights, and celebrate our progress as we work together towards a future marked by innovation, collaboration, and sustainable growth.

Thank you & Warm regards.

PROF. ALOK SINHA

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EVENTS AT A GLANCE

1. Celebration of Swachhata Diwas under "Swachhata Hi Seva" campaign on 2nd October 2024.



On October 2nd, 2024, the EIACP Programme Centre (RP), Dept. of ESE, IIT (ISM) and Centre of Societal Mission (CSM), IIT (ISM) Dhanbad organized a Cleanliness Drive under the "Swachh Bharat Mission – Naya Sankalp" campaign. The event aimed to promote the elimination of single-use plastics and promote cleanliness as a tribute to Mahatma Gandhi. The event was flagged off by Prof. Sukumar Mishra, Director of IIT(ISM), and his wife, Smt. Sakuntala Mishra. The event was attended by Deans, Faculty Members, Research Scholars, Students, Staffs, and Sanitation Workers. The event was overseen by Prof. Alok Sinha, HOD, Dept. of ESE & Coordinator, EIACP(PC-RP), Prof. Suresh Pandian, Assoc. Professor, Dept. of ESE & Co-Coordinator, EIACP(PC-RP), and Prof. Sanjeev Sahu, Head, CSM, IIT(ISM) Dhanbad. The Swachhata Rally followed, with participants expressing slogans. The event involved intensive cleaning of the campus, vegetable market, fish market, fruit market, and nearby roads. A Nukkad Natak was performed by IIT(ISM) Dhanbad students to raise awareness about littering and cleanliness.

(Source: <https://ismenvis.nic.in/ViewMajorActivity.aspx?Id=30148&Year=2024>).

Glimpses of Swachhata Diwas, 2024 Celebration.



EVENTS AT A GLANCE

2. Celebration of World Habitat Day on 07th October 2024.



The EIACP Programme Centre, Dept. of ESE, IIT(ISM) Dhanbad, in collaboration with The Institution of Engineers (India), Dhanbad Local Centre, celebrated World Habitat Day on October 7th, 2024. The event aimed to raise awareness about sustainable urban development and the importance of engaging youth in creating a better urban future. Prof. Biswajit Paul, Department of Environmental Science & Engineering, IIT(ISM) Dhanbad, delivered the inaugural address, emphasizing the interconnectedness of sustainable infrastructure, urban planning, and climate resilience. Prof. Suresh Pandian, Associate Professor, delivered the keynote lecture on "The Concept of Green Building," exploring sustainable urban design, energy efficiency, reduced carbon footprints, and healthier living spaces. The event also included an interactive Q&A session, fostering a rich exchange of ideas and practical solutions for a sustainable urban future.

(Source: <https://ismenvis.nic.in/ViewMajorActivity.aspx?Id=30158&Year=2024>)

Glimpses of World Habitat Day 2024 Celebration.



EVENTS AT A GLANCE

3. Keynote Lecture on "Best from the Waste: Biochar added Wood Polymer Composites".



The EIACP Programme Centre (PC-RP) at Department of ESE, IIT (ISM) Dhanbad, organized an insightful session under the Mission LiFE Keynote Lecture Series [2024-25] on 22nd October 2024, featuring a keynote lecture and a talk by distinguished speakers Prof. Oisik Das - Associate Professor and Dr. Sarah Conrad - Senior Lecturer, from Luleå University of Technology, Sweden. The keynote lecture focused on the use of biochar, a renewable material from agricultural and organic waste, as an innovative additive in wood polymer composites (WPCs). The session also provided insights into the academic, research, and career opportunities available at Luleå University of Technology, particularly for students in fields such as mining, geosciences, environment, and sustainable resource management. The event included a Q&A session, with over 150 attendees, including faculty members, research scholars, and UG/PG students. The event was a memorable and impactful learning experience, contributing significantly to academic and professional growth.

(Source: <https://ismenvis.nic.in/ViewMajorActivity.aspx?Id=30167&Year=2024>)

Glimpses of Keynote Lecture on "The Best from the Waste: Biochar added Wood Polymer Composites" 22nd October, 2024.



EVENTS AT A GLANCE

4. Industry Institute Interaction: Insights from Mr. N Senthil Kumar's Visit to IIT (ISM).



The Department of ESE, IIT (ISM) Dhanbad on 25.10.2024 organized an insightful Interaction with Industry Person, Mr. N Senthil Kumar, COO & Designated Partner of Global Lab and Consultancy Services LLP. The programme was organized to encourage Industry-Academia Collaboration for Sustainable Solutions. Prof. Biswajit Paul, a professor at IIT Dhanbad, highlighted the importance of industry interaction for academic and professional growth. He encouraged students to actively engage in collaborative opportunities to gain hands-on experience and align their skills with industry needs. The event attracted 30 participants, highlighting IIT Dhanbad's role in bridging the gap between academic knowledge and industry practice.

(Source: <https://ismenvis.nic.in/ViewMajorActivity.aspx?Id=30171&Year=2024>)

5. Observance of Vigilance Awareness Week 2024 at Dept. of ESE, IIT (ISM) Dhanbad.



In alignment with the annual observance of Vigilance Awareness Week, observed every year nationwide during the week in which Sardar Vallabhbhai Patel's birthday falls, i.e. October 31st, honouring his legacy as a symbol of integrity and unity, the Department of ESE, IIT (ISM) Dhanbad on 28th October conducted a Vigilance Awareness Programme. Under this year's theme "Culture of Integrity for Nation's Prosperity," emphasizing honesty and transparency for a prosperous India. 22 participants, including faculty members, technical officers, and staff, took the Integrity Pledge for Citizens and Organizations, committing to upholding integrity, transparency, and accountability.

(Source: <https://ismenvis.nic.in/ViewMajorActivity.aspx?Id=30170&Year=2024>)

धनबाद (कांस) : स्वच्छता ही सेवा अभियान के अंतर्गत २ को स्वच्छता दिवस पर सेंटर ऑफ सोशियल मिशन द्वारा आईआईसीपी प्रोग्राम सेंटर (आरपी), पर्यावरण विज्ञान और इंजीनियरिंग विभाग, आईआईटीआईएसएम) धनबाद के सहयोग से स्वच्छता एवं मिशन लाइफ शायप, नुकड़

A group of men dressed in black robes and red scarves are kneeling in prayer on a paved street. They are part of a religious procession, with a banner in the background that reads "Sri Venkateswara Temple, Tirumala". Other people are visible in the background, some standing and some walking.

नाटिक और सफाई आभयान को आयोजन किया गया। इस कार्यक्रम को आईआईटी (आईएसएम) धनबाद के डीन, संकाय सदस्यों, शोध विद्वानों, छात्रों, कर्मचारियों और स्वच्छता कार्यकर्ताओं की उपस्थिति में प्रोफेसर सुकुमार मिश्रा - निदेशक, आईआईटी (आईएसएम) और उनकी पत्नी शकुन्तला मिश्रा के साथ प्रोफेसर धीरज कुमार उपाध्यक्ष निदेशक,

आईआईटी (आईएसएम) और प्रबंध प्रबंधन-रजिस्ट्रार ने हरी शर्मा दिशाक्ष कान्हा किया २५० से अधिक प्रतिभागियों के सहित रूप से शामिल होने के साथ सह कार्यक्रमों के व्यवस्थापक और विप्लवा के लिए साक्षात्कार कार्यक्रमों का प्रदर्शन किया। सावधानी पूर्वक व्यवस्थाओं की देखरेख प्रोफेसर आलोक सिन्हा-एंग्रेजी, ईएसएम विभाग और समन्वयक, आईआईसीपी (पीसी-आईसीपी), प्रोफेसर सुरेश पांडित्यएससीएसए प्रोफेसर, ईएसएम विभाग और सह-समन्वयक, आईआईसीपी (पीसी-आईसीपी), और प्रोफेसर नीलेश साहसमुख, सीएएसएम, आईआईटी (आईएसएम) धनबाद ने की कार्यक्रम का संचालन और प्रभावी निष्पादन सुनिश्चित किया।

Swachhata Diwas Celebration.
(Source: Bihar Observer; Dt: 03.10.2024)



बुधवार को आईआईटी में स्वच्छता को लेकर को शपथ दिलाते कर्मी।

आईआईटी: स्वच्छता शपथ लेकर सभी ने की सफाई

धनबाद। स्वच्छता ही सेवा अभियान के तहत बुधवार को आईआईटी में स्वच्छ भारत दिवस का आयोजन हुआ। नैतिक पुर सुकुमार मिश्रा व लैडिंग क्लब की अध्यक्ष शकुन्ता मिश्रा दीर्घ के जुतेव में स्वच्छता रेली निकाली गई। निदेशक ने रेली को हरी झंडी दिखाई। इससे पहले सभी को स्वच्छता की शपथ दिलाई गई। निदेशक ने कहा कि हमने आज स्वच्छता मिशन के लिए प्रतिदिन दो घंटे समर्पित करने को अभ्यास्य करना और स्वच्छता के संदेश को फैलाने का संकल्प लेने को।

Swachhata Diwas Celebration.
(Source: Hindustan; Dt: 03.10.2024)



आद-आदटी आदणसणम में आयोजित कार्यक्रम में शामिल अतिथि .

धनबाद. आइआईटी आइएसएम के इंटरव्यू से साहस एंड इंजीनियरिंग विभाग की कोचिंग के दौरान ईट के अवसर पर सोमवार को व्याखाना का आयोजन गया. प्रो. सुरेश पांडेय ने छात्र-आयोजित गया. सुरेश पांडेय ने छात्र के सिद्धांत पर आयोजित किया गया. इस वर्कशॉप ईट के छात्र विषय 'युवाओं को एक बेहतर शहरी प्रणाली बनाने के लिए शांतिशांति का' था. प्रो. पांडेय ने संयोजन के उपनिदेशक प्रोफेसर

World Habitat Day Celebration.
(Source: Prabhat Khabar: Dt: 08.10.2024)

धनबाद जागरण

रोज दो घंटे स्वच्छता का संदेश देगा आइआइटी

राष्ट्रपिता महात्मा गांधी व **लाल बहादूर शास्त्री** को कोयलांचल ने किया नमन. जिले भर में हुए कार्यक्रम

जागरण संवाददाता, धनबाद : आठ-आठवीं आणखण्डम को ओर से 17 तिसरको ते स्वच्छता हो सेवा अभियान स्वच्छता ज राह पुनःपार को गांधी जयंती के अनंतर पर स्वच्छ भारत दिवस कार्यक्रम मनाना कार्यक्रम संपन्न नही, स्वच्छता पर स्वच्छता रही, स्वच्छता को शायद, नुकसान नटक का मंगन और फैसल से नसे पुनिल हानन राज्वा बाजार से गानन स्वच्छता अभियान सतिह करे कार्यक्रम आयोजित किए गए। अभियान को शुक्रातार संपन्न के अंकेल ब्रह्मद के पास स्वच्छता को शायल से साय हनु। आणखण्डम के निदेशक प्रो सुकुमार मिश्र और सतिह सेनल कलव को अय्यस नकुतल मिश्र के साय प्रोफेसर, अधिकारिण और कर्मचारिण ने स्वच्छता के प्रति प्रियवद करने, स्वच्छता का प्रसिध्द करणे को शायल ले।



बापू को जमन करते पूर्व सांसद एलन सिंह

- आइआइटी ने पुलिस लाइन में चलाया स्वच्छ अभियान
- बीसीएसएल समेत कई संगठनों ने भी किया कार्यक्रम

भाजपा नेता ने गांधी-शास्त्री की प्रतिमा पर किया मातृपार्षण

नमो भद्रकाले : संसदीय गांधी एवं शास्त्री

विधायक राज सिन्हा • जगद्वला

आइआईटी के गेट के पास नुककड़ नाटक



डा. मदन कारंटे ध्याव • जळवत

डीआरएम ने की तलाव की सफाई, बांटे जूट के वेग

जासं, धनबाद : स्वच्छ भारत मिशन अभियान के तहत रेलवे में आयोजित स्वच्छता प्रतियोगिता के समान दिवस डॉ. धनबाद मंडल के 152 स्टेशन, कोयंबटूर, छोटो, छोटो डिपो एवं अन्य रेल परिसरों में स्वच्छ भारत दिवस मनाया गया।

युवा चित्राश ने मनाई
शास्त्रीय एवं गांधी जयंती
जार्ज, धनबाद : युव चित्राश के अंश के संयुक्त को सत्यमेव जयते के निजट में महान्ता गाना एवं पूर्व प्रगानमन्त्रो लाला बहदुर शास्त्री जयंती मनाई अलक्षता शिल्पी सिन्हा ने गांमिया कलेज के प्राचार्य डा. गोमिया श्रीवास्तव ने टोनी महापुरुष के जीवनी पर प्रकाश डाला। न्ति के उनेक आदर्श पर चलने के बात कही। भाजिया ने रमा कलेज ने कहा कि आज के युवाओं के ठोके सोंष, त्याग एवं सादगी के अनेक जीवन में उतारना चाहिए। अन्त्य नाशना लाल को लिला पैर। डा. भास्करिष बनने पर सम्मानित कृत गया।

बहदुर शाही की जयंती बहदुर को
 घुमाया मेरमाँई गई। इस अवसर पर
 मन्ना डेता राखेडा कुमार एंव नगर
 आयुक्त रविजल शर्मा ने गांधी जीक
 स्टील सेक्टर पर महामाजी ओर लाल
 बिन्दु। गांधी की प्रतिमा पर मर्यादा
 बिन्दु। गांधी एंव शाही के जीवन से
 प्रेरित होकर मानवता के पथ पर चलने
 को प्रेरित किया।

स्वच्छता ही सेवा में

जम्मुर साबादता, धनबाद : आवास
 एंव शही कार्य मंत्रालय भारत सरकार
 एंव नगर विकास एंव वन्यता अभिभाग
 स्वच्छता की ओर से वसुन्त जा रहे
 कार्यक्रम ही सेवा कार्यक्रम का समाप्न
 एंव। नगर आयुक्त रविजल शर्मा के
 नेतृत्व में अतिथि वरगा मे विरामादी के

31 अक्टूबर तक के दिने बीसवीं सदी
अन्त, घनवदः महाना गणकी जय
द्वये 4.0 की गुरुत्वात् की गई। सौर
तक वृत्तने को इद शिखे अभियान 4
रिक्तो प्रान्त, फास्ती की समीक्षा, रि
अनावश्यक फास्ती को इद करना, स
तृप्त दायित्व। राष्ट्रपति महाना
अन्त कार्यक्रम। राष्ट्रपति महाना
गनी एवं पूर्व प्रधानमन्त्री लाल बहदुर
शास्त्री की पुण्यर्चिता को नगर आयुज,
एनार नगर आयुज, मुख्य अभियान,
सहायक नगर आयुज, कार्यक्रम
अभियान, नगर प्रबन्ध, नगर मिशन
प्रबन्ध, सहायक अभियान, केन्द्र

नमो राकेश कुमार • जगद्वय

हमें नमो शुरु की संस्था केंपन 4.0 के अन्दर प्र बीसीसीसी में संस्था की सीसीसी नंद द अन्दर से 31 अक्टूबर का अंधारिक गुणनर किछा । असेमिंडी आर निशित प्रिथिया के तहत स-सकडि आदि कर्य होपे ।

वर्धन काले वारे सफे

अभियन्ता, ब्राड एलेक्टर नमो वीक सिटी नंदर प्र मात्यारण किछा । इस दोन नंदी सीकुंर रीड में ब्रमदन्त आइआइटी सीकुंर रीड एंगर निगिती ओर से पुनित लवद न संकुल ब्रमदन्त, बाइक हसी एंगर प्रसिन्त प्रब का थिचर कायड रीपे । अउकट

संस्कृत भाषा में 'संस्कृत' शब्द का अर्थ होता है 'संस्कृत'। यह शब्द प्राचीन काल में प्रचलित था।

Swachhata Diwas Celebration. (Source: Dainik Jagaran; Dt: 03.10.2024)

आईआईटी में स्वच्छता रैली, स्वच्छता की शपथ ली, नक्कड़ नाटक का मंचन हुआ

धनबाद। आईआईटी (आईएसएम) द्वारा 17 सितंबर से चलाया जा रहा स्वच्छता ही सेवा अभियान 2024 गंधी जयंती पर स्वच्छ भारत दिवस मनाने के साथ संपन्न हुआ। इस दौरान स्वच्छता रैली, स्वच्छता का शपथ, नुककड़ नाटक का मंचन और परिसर से सटे पुलिस लाइन के सच्ची बाजार में स्वच्छता अभियान सहित कई कार्यक्रम किए गए। अभियान सुबह 8.30 बजे संस्थान के ओवल ग्राउंड के पास स्वच्छता की शपथ के साथ शुरू हुआ। निदेशक प्रो. सुकुमार मिश्रा, वीटिप लेडीज क्लब की अध्यक्ष शकुंतला मिश्रा, संस्थान के संकाय सदस्यों, अधिकारियों और कर्मचारियों ने स्वच्छता के प्रति प्रतिबद्ध रहने, स्वच्छता का अनुसरण करने का शपथ लिया। अभय ड्रामाटिक्स क्लब के सदस्यों ने मुख्य द्वार पर हमारे दैनिक जीवन में स्वच्छता के महत्व पर नुककड़ नाटक का मंचन किया। रैली परिसर से लगभग 500 मीटर की दूर तक निकाली गई। उप निदेशक प्रो. धीरज कुमार, प्रो. एसके. सिंह, प्रो. रजनी सिंह, प्रो. एसके. गुप्ता, प्रो. आलोक सिन्हा, रजिस्टार प्रबोध पांडेय आदि थे।

Swachhata Diwas Celebration.
(Source: Dainik Bhaskar; Dt: 03.10.2024)

Prof. Oisik Das Presents Keynote on Biochar Innovations at IIT-ISM



Dhanab: Professor Oisik Das, Associate Professor in the Department of Civil, Environmental & Natural Resources Engineering at Luleå University of Technology, Sweden, delivered an insightful lecture titled "The Best from the Waste: Biochar Added Wood Polymer Composites" at the Golden Jubilee Lecture Theatre of IIT (ISM) as part of the Mission LIFE keynote Lecture Series 2024-25. Organized by IIT-ISM EIACP (PC-RR), the lecture focused on the innovative use of biochar—a renewable material produced from agricultural and organic waste—as an additive in wood polymer composites (WPCs). Professor Das, an expert in biocomposites, biochar production, and sustainable materials, highlighted how incorporating biochar not only enhances the performance of WPCs but also addresses waste management challenges, promoting ecological efficiency and economic sustainability. The discussion emphasized the importance of creating eco-friendly products from waste, aligning with the Mission LIFE in India. Dr. Sarath Konar, Senior Lecturer at Luleå University, engaged in a dialogue about opportunities in Sweden, including Master's programs and research prospects at their institution.

Mission LiFE Keynote Lecture.
(Source: The Researcher;
Dt: 21.10.2024)

मिशन लाइफ के तहत आइआइटी में व्याख्यान का आयोजन

धनबाद. आइआइटि आइएसएम में मंगलवार को मिशन लाइफ की नोट लेक्चर सीरीज के तहत का व्याख्यान का आयोजन किया गया. इसका विषय 'द बेस्ट प्रॉम वेस्ट, बायोचार एंडेड वुड पॉलीमर कंपोजिट्स' था. इसके मुख्य वक्ता स्वीडन के लुलिया प्रौद्योगिकी विश्वविद्यालय में सिल्विल, पर्यावरण और प्राकृतिक संसाधन इंजीनियरिंग विभाग के एसोसिएट प्रोफेसर प्रो. ओइसिक दास थे. प्रो. दास हल्के वजन की संरचनाओं (बायोकेंपोजिट्स) बायोचार उत्पादन, लक्षण, वर्णन और अनुप्रयोग, अग्नि व्यवहार और पॉलीमरिक कंपोजिट लकड़ी और कंक्रीट, समग्र डिजाइन व अग्निरोधी में विशेषज्ञ हैं.

Mission LiFE
Keynote Lecture.
(Source: Prabhat
Khabar;
Dt: 21.10.2024)

LATEST PUBLICATIONS IN JOURNALS & BOOK CHAPTERS

Sl. No.	Research Paper / Article
1.	Singh, A., Kumar, V., Anand, S., Phukan, D., & Pandey, N. (2024). Fungi-derived Chitosan-CTAB composite-based electrode for electrochemical simultaneous detection of Cd (II) and Pb (II). <i>International Journal of Biological Macromolecules</i> , 280, 136113. [IF: 7.7 Q1] DOI: https://doi.org/10.1016/j.ijbiomac.2024.136113
2.	Dhibar, N. C., Busigari, R. R., & Patel, M. (2024). Investigation of kinetics, reaction mechanisms, thermodynamics, and synergetic effects in co-pyrolysis of wood sawdust and linear low-density polyethylene using the thermogravimetric approach. <i>Environmental Science and Pollution Research</i> , 31(44), 56091-56113. [IF: 5.4 Q1] DOI: https://doi.org/10.1007/s11356-024-34886-3
3.	Mishra, R. K., Barman, B., & Pathania, T. (2024). Three-dimensional modeling of hydro-morphodynamic characteristics of mining affected alluvial channel using TELEMAC and GAIA. <i>Physics of Fluids</i> , 36(10). [IF: 4.1 Q1] DOI: https://doi.org/10.1063/5.0227477

R&D AND CONSULTANCY PROJECTS

Sl. No.	Project Title	Status	Project Value	Funding Agency
1.	Developing portable potentiometric biosensors for in-situ detection of trace metal pollutants (Cd, Pb, Hg and Cu).	Received Consultancy Project	Rs.41.925 lakhs	DBT, Govt. of India.

PATENTS SUBMITTED

Sl. No.	Title	Application No.	Project Value Funding Agency
1.	An integrated process for copper extraction from waste printed circuit boards.	202431072102	Prof. Sukha Ranjan Samadder and Ms. Rima Kumari
2.	A Process of Discharging Spent-Lithium Cobalt Oxide Batteries using Ultrasonic-Assisted Partial Immersion Method.	202431079756	Prof. Sukha Ranjan Samadder and Ms. Pratima Kumari

PhD THESIS SUBMITTED / PhD AWARDED

Sl. No.	Awardee	Supervisor	Thesis Title
1.	Mr. Nitin Pratap Varma	Prof. Alok Sinha	Synthesis of Alum Modified Biometric Nano – Hydroxyapatite and its Application in Defluoridation of Groundwater.

RESEARCH HIGHLIGHT

The 1st and 2nd year B.Tech. Environmental Engineering students, in collaboration with the Society of Environmental Science and Engineering, IIT (ISM) Dhanbad, presents an insightful byte on the hazardous impacts of oil spills. Their compilation of information highlights how oil spills not only harm marine ecosystems but also jeopardize the livelihoods of communities dependent on fishing, tourism, and coastal resources. By raising awareness of the widespread economic and environmental damage, they emphasize the urgent need for stronger protective measures to safeguard ecosystems and support affected communities.

Compiled by: Rahul Mondal, Yatin Sai Yedla, Vishal Tiwari and Roopkatha Biswas.

Hazardous Impacts of OIL SPILLS on the Aquatic Ecosystem and Economy

What are Oil Spills?

Natural Gas and Oil account for about 50% of the earth's primary energy sources, but their integration into the aquatic ecosystem introduces a plethora of problems for the environment. Oil spills refer to the **anthropogenic introduction of crude oil** into a freshwater body or a marine ecosystem, often lead to some of the worst known ecological disasters known to mankind.



This photograph shows a local drive organized to attempt to clean up (and mitigate the impacts of) a recent oil spill in the Equadorian Amazon (2022).

Source: greenisthenewblack.com

CHARACTERISTICS OF OIL SPILLS:

Oil spills have devastating impacts on freshwater and marine ecosystems, harming the quality of water and aquatic life. Once released onto the water surface, crude oil undergoes various **chemical breakdown** and **physical transformations**, introducing an amalgamation of several chemicals into the water body, including:

- Hydrocarbons;
- Aromatics;
- Polycyclic aromatic hydrocarbons (PAHs);
- Compounds of Sulphur, Nitrogen, and Oxygen;
- Metals.



FIGURE 1: Fate of Crude Oil after an Oil Spill

Source: Image provided courtesy of the American Petroleum Institute, produced by Iron Octopus Productions, Inc.

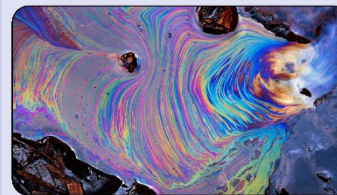


FIGURE 2: Once in the water, crude oil undergoes processes like spreading, evaporation, emulsification, dispersion, dissolution, oxidation, sedimentation and biodegradation, which prove to have detrimental consequences for the marine ecosystem.

Source: atechboom.com

Source: absorbentsonline.com

CAUSES OF OIL SPILLS:

NATURAL OCCURANCES~

- **Geological Events**, including natural disasters like earthquakes and hurricanes;
- **Climatic disturbances**, like sea storms;
- **Eroding Sedimentary Rocks**, causing cracks or fractures in the ocean floor.

ANTHROPOGENIC CAUSES~

- **Transportation**: Accidental spills (or at times, deliberate releases) can occur from oil tankers, barges, and other vessels.
- **Storage**: Oil spills can occur from storage facilities.
- **Improper Disposal**: Oil spills result from people improperly dumping motor oil into water bodies.
- **Maintenance**: Inadequate maintenance leads to corrosion in pipelines and storage tank. Faulty equipment and blowout preventers can also lead to oil spill.
- **Drilling**: Oil spills can result from drilling rigs, offshore exploration and production platforms.
- **River Runoff**: Some of the oil-sediment combination may settle at the bottom of the river, usually near the river mouth as the water slows down and reaches the ocean.

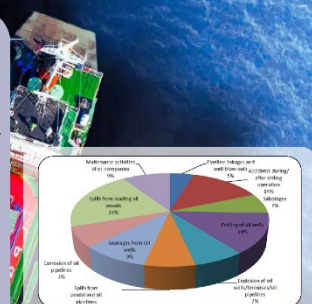


FIGURE 3: Pie Chart showing the various causes of Oil Spills across the globe

Source: Assessment of the Impact of Crude Oil Spillages on Surface Water and Aquatic Life in some Selected Oil Producing Communities in Delta State, Meghnaikar et al. 2024

Source: themaritimepost.com

ENVIRONMENTAL IMPACTS OF OIL SPILLS:

IMPACT ON MARINE ECOSYSTEM~

- Polycyclic aromatic hydrocarbons (PAHs) present in oil, when ingested possess **risk to zooplanktons**. These substances then traverse through the food webs and get transferred to higher trophic levels. PAHs have carcinogenic properties and thus pose a considerable risk.
- Surface slick formed due to an oil spill can remain in the saltwater for a long time before microbial breakdown. This emulsion of water and oil leads to **eutrophication, biodiversity loss, and depleted dissolved oxygen**.

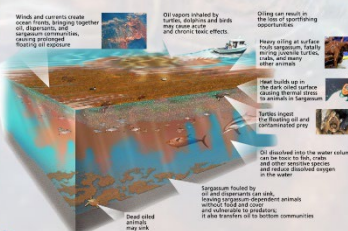


FIGURE 4: Impact of Oil Spills on Aquatic Life

Source: response.restoration.noaa.gov

IMPACT ON SOIL ECOSYSTEMS~

- Organic contaminants **obstruct the pores** in the soil, affecting capillary conduction.
- Oil pollution reduces the nutrient richness of the soil. Hydrophobic oil particles **hinder the supply of moisture and oxygen** to the roots of the plants.

EFFECTS ON SEA BIRDS~

- Birds like Pelicans and Seagulls frequently interact with oil-water surface and often consume or inhale the oil particles. This causes severe **poisoning and mortality**.
- Feathers become contaminated when birds come in contact with oil slicks, which affects their buoyancy and insulation. Ingestion of oil **reduces their reproductive rates** and increases their susceptibility towards illness, because of elevated stress. The **transfer of oil to eggs**, or young ones **compounds** these effects.



FIGURE 5: Pelicans affected by Oil Spill

Source: www.greenconnect.gov

Source: www.rbcnews.com

RESEARCH HIGHLIGHT

IMPACT OF OIL SPILLS ON ECONOMY:

Contents from Oil Spills get wasted and direct expenditures are required for cleanup. Loss of oil value, cost of restoration and the cost of the damages incurred by the ship (such as mechanical failure) are often severe. Delays in rehabilitation causes formation of aggregates on the seashore, which are even more difficult to remove. Oil Spills also have an **adverse effects on fishing and tourism** industries. Due to the harmful impact on fish health and growth, fishermen incur heavy losses. Oil contaminated beaches are unappealing to visitors, thus adversely affecting tourism. Furthermore, **contaminated** fish or even drinking water sourced from any such polluted water body, can have immediate **impacts on human health**.



FIGURE 6: The cleanup cost for a typical Oil Spill can be estimated to be somewhere between \$2.4 billion and \$9.4 billion dollars.

Source: oasacredtrust.ca

Typically, the average salary of an Indian citizen is estimated to be around INR 342,489 per annum (as of 2024), which roughly translates to around US \$11,245. This means that the cleanup cost of a single oil spill can range from somewhere around the **annual income of 213,429 to 835,927 people** in our country!

Source: Negative impacts of mining on Neotropical freshwater fishes, Azevedo-Santos et al. 2021

CONCLUSION:

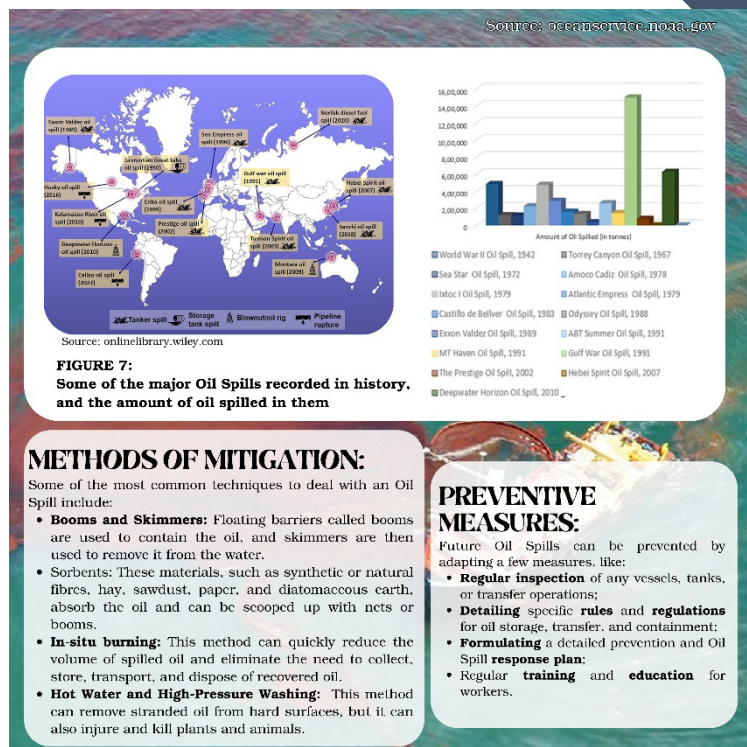
Spills in aquatic habitats can affect fish, plants, and other animals, resulting in a reduction in biodiversity and the stability of the ecosystem. Oil Spills can leave a coating on the water's surface that prevents sunlight from accessing the bottom layers, interfering with photosynthesis and hindering the growth of plants and algae. Further, they undergo chemical transformations and find their way into marine food chains, which can affect not only the aquatic life but also the human beings who are the tertiary consumers in these food chains. Further, they cause economic losses and severely affect the lives of the fishermen and other people who depend on the coasts for their livelihoods. While most of the Spills are accidental in nature, preventing them through better safety measures and investing in research to mitigate their impacts is imperative in protecting both ecosystems and economies from such disasters in the future.

References~

- *Aquatic ecosystem dynamics following petroleum hydrocarbon perturbations: A review of the current state of knowledge*. G. Perhar, G.B. Arhonditsis 2014
- *Environmental Impacts and Challenges Associated with Oil Spills on Shorelines*. Zunaira Asif, Zhi Chen, Chunjiang An and Jinxin Dong 2022
- *Potential Impact of Oil Spills on Aquatic Ecosystem and Public Health*. Pragati Inwanti, Durgesh Kumar Verma 2023
- *Comprehensive insights into the impact of oil pollution on the environment*. Komal Sharma et al. 2024

This photograph shows an oil-soaked pelican after the Deepwater Horizon Oil Spill of 2010. This picture was one of the firsts to go viral on a global scale, to pictorially depict exactly how adverse the impacts of an Oil Spills can be.

Source: www.bbc.com



Few More Research Publications on Oil Spillage:

- Ogbu, A. D., Ozowe, W., & Ikevuje, A. H. (2024). Oil spill response strategies: *A comparative conceptual study between the USA and Nigeria*. GSC Advanced Research and Reviews, 20(1), 208-227.
- Prajapat, R., Yadav, H., Shaik, A. H., Kiran, B., Kanchi, R. S., Shaik, S., ... & Chakraborty, S. (2024). *A review of the prospects, efficacy and sustainability of nanotechnology-based approaches for oil spill remediation*. Waste Management & Research, 0734242X241257095.
- Chen, J., Chen, H., Shi, J., Yan, T., Gu, M., & Huang, X. (2023). *Factor diagnosis and governance strategies of ship oil spill accidents based on formal concept analysis*. Marine Pollution Bulletin, 196, 115606.
- Singh, V., Negi, R., Jacob, M., Gayathri, A., Rokade, A., Sarma, H., ... & Qureshi, Q. (2023). *Polycyclic Aromatic Hydrocarbons (PAHs) in aquatic ecosystem exposed to the 2020 Baghjan oil spill in upper Assam, India: Short-term toxicity and ecological risk assessment*. Plos one, 18(11), e0293601.

ABOUT THE DEPARTMENT OF ESE

The Department of Environmental Science and Engineering (ESE) was created out of the existing Centre of Mining Environment (established in 1987) at Institute in June 2007 with the commencement of a regular B.Tech Degree in Environmental Engineering under IIT-JEE (first of its kind offered by any national institute). The Department also offers a regular M.Tech program (since 1991) and PhD program in Environmental Science & Engineering. The students of the Department have been well received by the industries like CIL, BCCL, ECL, CCL, NCL, MCL, SECL, CMPDIL, WCL, SCCL, Sterlite, HCL, HZL, NALCO, BALCO, NTPC, L&T, and many other esteem companies along with regulatory authorities like MoEF&CC, CPCB, SPCBs, Research Organizations (CSIR Labs, CIMFR, RRLs) & academic institutes (IITs, NITs etc.), Consultancy Organizations & NGOs. The department is equipped with sophisticated equipment to cater for the needs of research. The Department is conferred with ISO 9001 and OHSAS 18001 Certification and Labs are accredited by CPCB.

The **Environmental Information, Awareness, Capacity Building and Livelihood Programme (EIACP)** Centre (erstwhile, ENVIS-Environmental Information System) was established in 1991 by the MoEF&CC, GOI. The subject area of the Center is "Environmental Problems of Mining". The Centre focuses on Collection, Collation, Storage, Retrieval and Dissemination of environmental information related to its subject area and on providing that information to decision makers, policy planners, scientists, engineers, researchers, students etc all over the country. The Centre publishes Quarterly Newsletters, monthly e-Newsletters and Monographs. The Centre celebrates world important days organizes various events, competitions, etc and helps in spreading awareness among the masses. The Centre also conducts GSDP in Air Water Pollution and Waste Management courses and MoEF&CC Sponsored Internship Programs. The centre has been Graded A since 2013-14 and awarded the Best Performing EIACP Centre in the East Zone under the Regional category awards in the year 2024. (Website: www.ismenvis.nic.in/)

Coordinator: **Prof. Alok Sinha.**

Co-coordinator: **Prof. Suresh Pandian E.**

The **Key Resource Centre (KRC)** was awarded to Department of Environmental Science & Engineering in the year 2014 by Ministry of Jal Shakti, Department of Drinking Water and Sanitation, GOI, New Delhi under the scheme of National Rural Drinking Water Programme (NRDWP). The mission of the KRC is to organize various training programme / workshops and exchange of ideas from different stakeholders in the field of Water & Wastewater Engineering and Management. The centre has carried our training in the following topics/subject areas: Low-cost treatment method for fluoride and Arsenic contaminated groundwater, Greywater Management in the Rural Area.

Coordinator: **Prof. Brijesh Kumar Mishra.**

The **Centre for Water Resource Management (CWRM)** established in 2020, undertake research and development activities for the restoration and conservation of surface and subsurface aquatic systems. The vision of the CWRM is to address the "Water Security" which is one of the most important global economic development issues classified under "UN-Sustainable Development Goals 2015-30 (UN-SDGs, 2015-30)". The centre is run by a multi-disciplinary team of scientists, engineers, expertise from disciplines including geology, geophysics, management, civil, mining and mineralogy, petroleum, and environmental engineering, to conduct research and development studies in the specified areas. "The mission of the CWRM is to create basic and use-inspired knowledge, technologies, methodologies and capabilities for sustainable utilization and management of the Earth's water resources".

Coordinator: **Prof. Sukh Ranjan Samadder.**

(Website: <https://people.iitism.ac.in/~cwrml/>)

The **Mining, Employability & Livelihood Hub (MEL HUB)** was established at Department of Environmental Science & Engineering in the year 2024 by American India Foundation Trust (AIFT). The objective is to create a program designed to cultivate future resilience and establish an alternative livelihood ecosystem, actively involving youth and promoting economic empowerment for women with an aim for expanding green livelihoods in mining areas. The MEL CoE is poised to create a climate-resilient livelihood ecosystem with a focus on Ecosystem Building, Entitlements, Employment Access, and Entrepreneurship (the 4E model).

Coordinator: **Prof. Anshumali.**

(Website: <https://people.iitism.ac.in/~melhub/>)

FACULTY MEMBERS AT DEPT OF ESE



Prof. Alok Sinha
Professor & Head

Research Areas: Water And Wastewater Engineering, Groundwater Remediation, Solid Waste Management.



Prof. Anshumali
Professor

Research Areas: Geochemistry/ Biogeochemistry of Terrestrial and Aquatic Ecosystems, Environmental Microbiology, Ecology and Biodiversity, Natural Resource Mgmt. (Forests, Rivers, Reservoirs and Aquifers).



Prof. Biswajit Paul
Professor

Research Areas: Mine Environment, Land Reclamation, Intellectual Property Mgmt., EIA/Audit, Fly-Ash Utilization, Mine Fill, Mine Closure.



Prof. Brijesh Kumar Mishra
Associate Professor

Research Areas: Advanced Oxidation Processes Coupled Hybrid Systems for the Treatment of Water and Wastewater Treatment, Feasibility of Different Disinfection Processes and Devices for Controlling Disinfection By-product, Pollution Exposure and Human Health Risk Assessment.



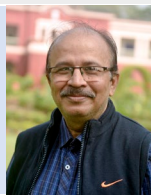
Prof. Madhumita Patel
Assistant Professor

Research Areas: Waste to Energy, Up-cycling of Plastic Waste, Life Cycle Assessment and Techno Economic Analysis Co-processing of Biofuels with Refinery Process Modelling, Development of Catalyst, Thermochemical Conversion Process.



Prof. Manish Kumar Jain
Professor

Research Areas: Environmental Aspects of Mining Industry, RS & GIS, Air Pollution, Fly Ash Utilization.



Prof. Prasoon Kumar Singh
Professor

Research Areas: Groundwater Quality Assessment & Quantity Management, Environmental Geochemistry, Environmental Hydrogeology, Remote Sensing & GIS Application in Environmental Management, Noise Pollution, Soil Quality Assessment.



Prof. Riya Dutta
Assistant Professor

Research Areas: Hydraulics and Water Resources Engineering, Impact of Climate Change on Hydrologic Processes.



Prof. Saifi Izhar
Assistant Professor

Research Areas: Air Quality and its chemical and optical characterization (BC and BrC); Source apportionment; Atmospheric Processing of aerosols; Fog-aerosol interactions; Application of Low-cost sensors; Personal exposure and Deposition modelling.



Prof. Saravanan Pichiah
Professor

Research Areas: Advanced Functional Nanomaterials, Materials Chemistry, Water Energy Nexus, Solar Water Treatment, Solar Fuel.



Prof. Sheeja Jagadevan
Assistant Professor

Research Areas: Treatment of industrial wastewater, Low-cost treatment of arsenic and fluoride in drinking water, Resource recovery from wastewater, Development of biochar for water purification, Valorization of agricultural residues via biochar application.



Prof. Subodh Kumar Maiti
Professor (HAG)

Research Areas: Restoration Ecology; Carbon Sequestration, Biodiversity Conservation; Soil Conservation; Fly Ash Mgmt.; Bioremediation of Metallic Waste, Environmental Microbiology; Biological Wastewater Treatment, EIA & Auditing.



Prof. Sukha Ranjan Samadder
Professor

Research Areas: Application of LCA and RS & GIS in Environmental Management, Municipal Solid Waste Management, Water Treatment.



Prof. Sunil Kumar Gupta
Professor (HAG)

Research Areas: Water and Wastewater Engineering, Industrial Wastewater Engineering, Solid and Hazardous Waste Management.



Prof. Suresh Pandian E.
Associate Professor

Research Areas: Air Pollution, Emission and Dispersion Modelling, Vehicular Pollution & Traffic Flow Modelling.



Prof. Tinesh Pathania
Assistant Professor

Research Areas: Groundwater Modelling, Simulation-Optimization Models for Groundwater Remediation, Hydrology, Water Resources Management.



Prof. Vipin Kumar
Professor

Research Areas: Microbial remediation of persistent pollutants, Bio-electrochemical Systems for economical resource recovery, Biosensors for monitoring effluent quality, Solid waste management, Ecological restoration.



Prof. Vittal H.
Assistant Professor

Research Areas: Hydroclimatology, dynamics of Indian summer monsoon rainfall, heatwaves, drought, tropical cyclones, vulnerability, climate risk.

2024 CALENDAR

January

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
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28	29	30	31			

February

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March

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31						

April

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28	29	30				

May

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June

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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

July

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

November

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
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17	18	19	20	21	22	23
24	25	26	27	28	29	30

December

S	M	T	W	T	F	S
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

2024 Calendar: Important Environmental Days

2nd February: World Wetland Day
 3rd March: World Wildlife Day
 14th March: International Day of Action for Rivers
 18th March: Global Recycling Day
 21st March: International Day of Forests
 22nd March: World Water Day
 23rd March: World Meteorological Day
 4th April: International Mine Awareness Day
 7th April: World Health Day
 22nd April: World Earth Day
 4th May: Coal Miners Day
 11th May: World Migratory Bird Day
 17th May: Endangered Species Day

22nd May: International Day for Biological Diversity
 3rd June: World Bicycle Day
 5th June: World Environment Day
 7th June: World Food Safety Day
 8th June: World Ocean Day
 15th June: Global Wind Day
 17th June: World Day to Combat Desertification & Drought
 21st June: International Day of Yoga
 26th July: World Mangrove Day
 28th July: World Nature Conservation Day
 16th September: World Ozone Day
 18th September: International Coastal Clean-up Day
 21st September: Zero Emission Day

22nd September: World River Day
 26th September: World Environmental Health Day
 28th September: Green Consumer Day
 2nd October: Swachhta Diwas
 7th October: World Habitat Day
 16th October: World Food Day
 24th October: International Day of Climate Action
 2nd December: National Pollution Prevention Day
 5th December: World Soil Day
 11th December: International Mountain Day
 14th December: National Energy Conservation Day

