R&D NEWSLETTER

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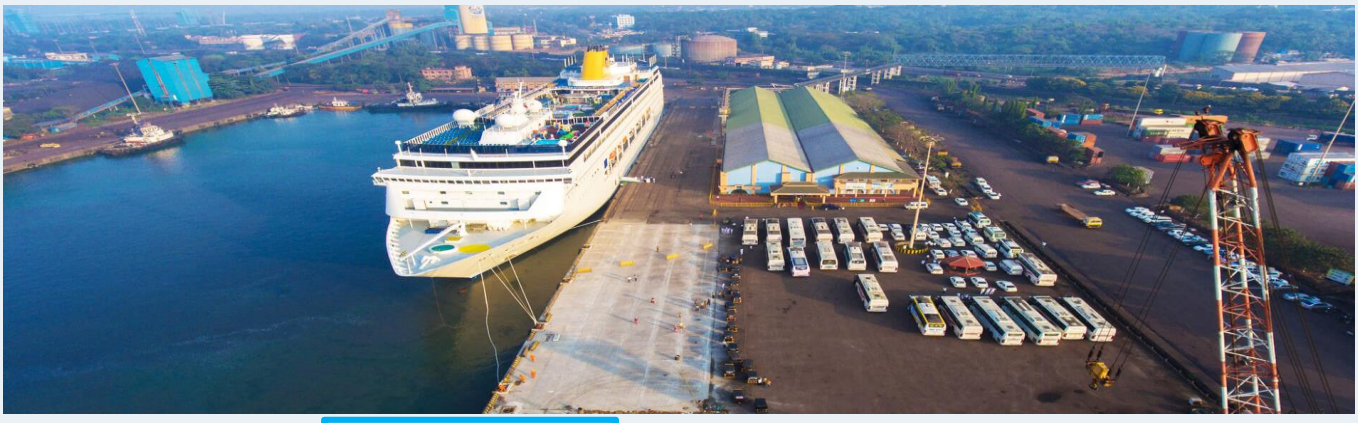

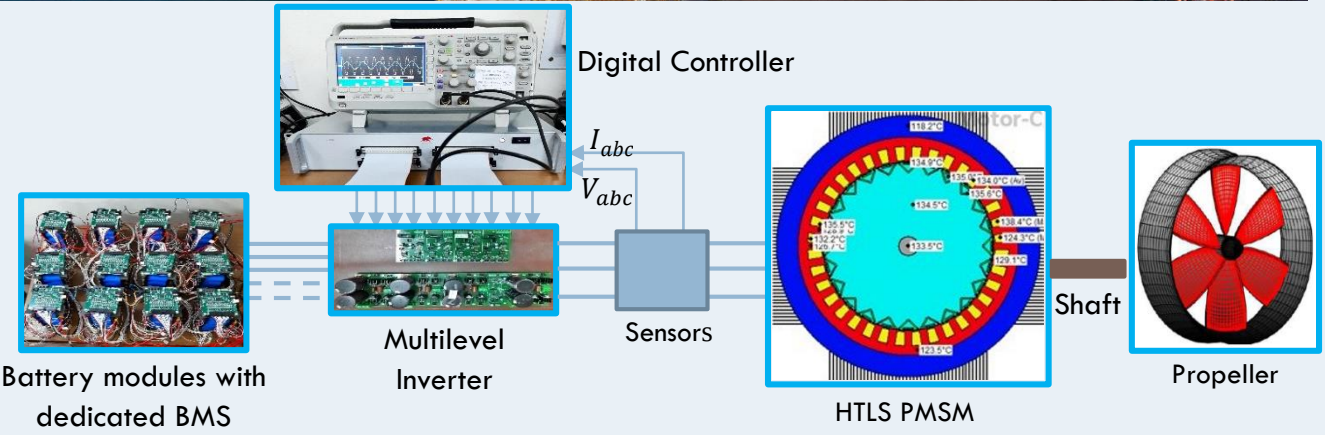

Fuel-efficient Maritime Transport Solution

Prof. Thanga Raj Chelliah and his group from the Hydropower Simulation Laboratory (HSL), Department of Water Resources Development and Management at IIT Roorkee in collaboration with the Indian Maritime University, Visakhapatnam (IMU-V) have developed an environment-friendly, fuel efficient and cost-effective maritime transport solution. The project funded by the Ministry of Ports, Shipping and Waterways was aimed to develop zero-emission electric vessels to attain sustainable solutions and reduce carbon footprint of Indian seaports. The research yielded significant results, providing fuel savings to the extent of 29.8% for Diesel-Electric Tugs. The overall system efficiency, fault tolerability, fast charging feasibility, and zero-emissions are the advantages of the absolute battery-operated short endurance vessels. A mathematical model of a marine vessel prepared with the operational characteristics of hull & propeller was employed for the optimal sizing of the propulsion motor. The high torque & low speed (HTLS) propulsion motor designed for high voltage & low current operation has the advantages of high efficiency and superior dynamic control since it is mainly controlled by the voltage. The system has been designed for adopting a configuration which can prevent complete system failure during critical faults.

Recently Registered Research Projects

Hindon Roots Sensing (HIROS): River Rejuvenation through Scalable Water and Solute Balance Modelling and Informed Farmers' Actions

Sponsor: Department of Science & Technology

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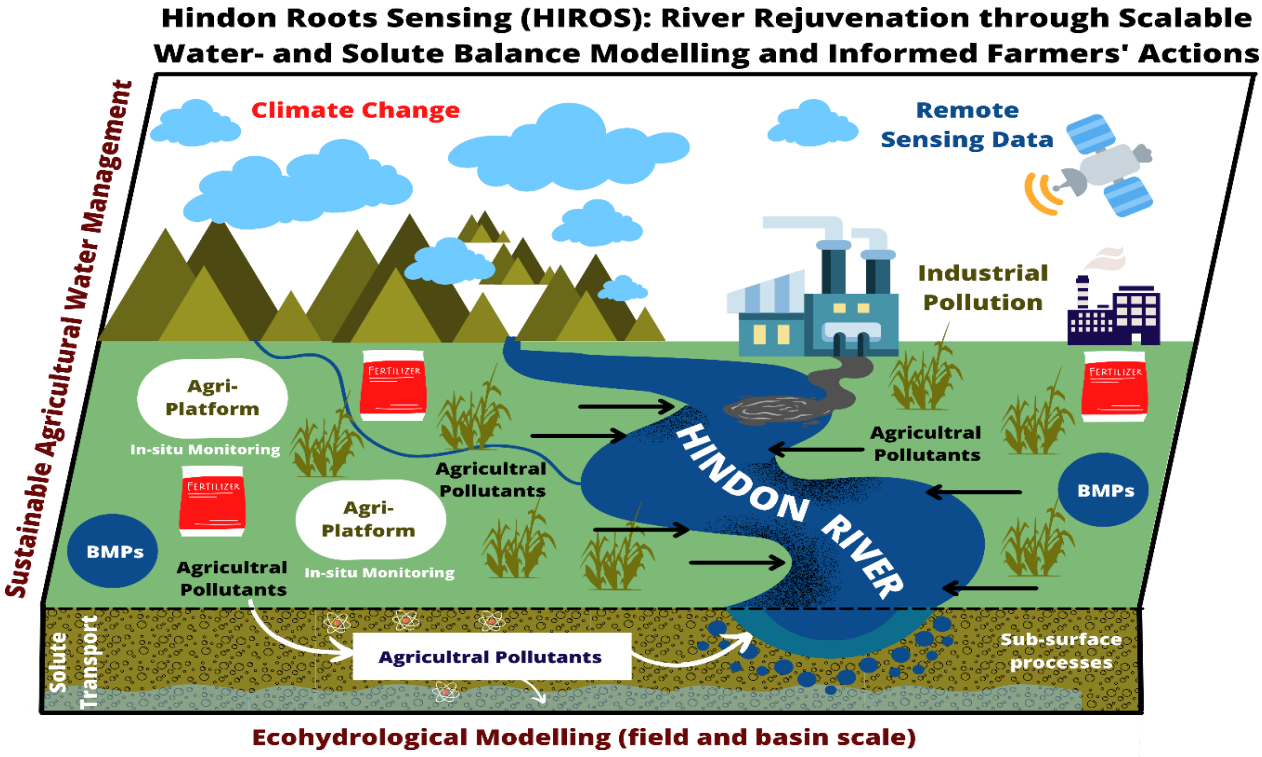
The Hindon river, a tributary of the Ganga, is significantly contaminated by a range of pollutants. Industrial wastes are disposed untreated or partially treated. These are coupled with run-off from agricultural fields contaminated with fertilizers and pesticides. These highly polluted waters deteriorate the quality of surface and sub-surface water resources in the basin. The HIROS project aims to develop a package of agri-water interventions that aims to control the significant groundwater over-exploitation and improves the surface water quality in the Hindon basin. The impact of farming interventions will be studied through application of remote sensing technologies and in-situ soil physical and chemical monitoring; eco-hydrological modelling at field/farm level; and integrated modelling from field to basin scale.



Smart Cyber-Physical Security of Electric Powertrains in Autonomous e-mobility Systems

Sponsor: Science & Engineering Research Board
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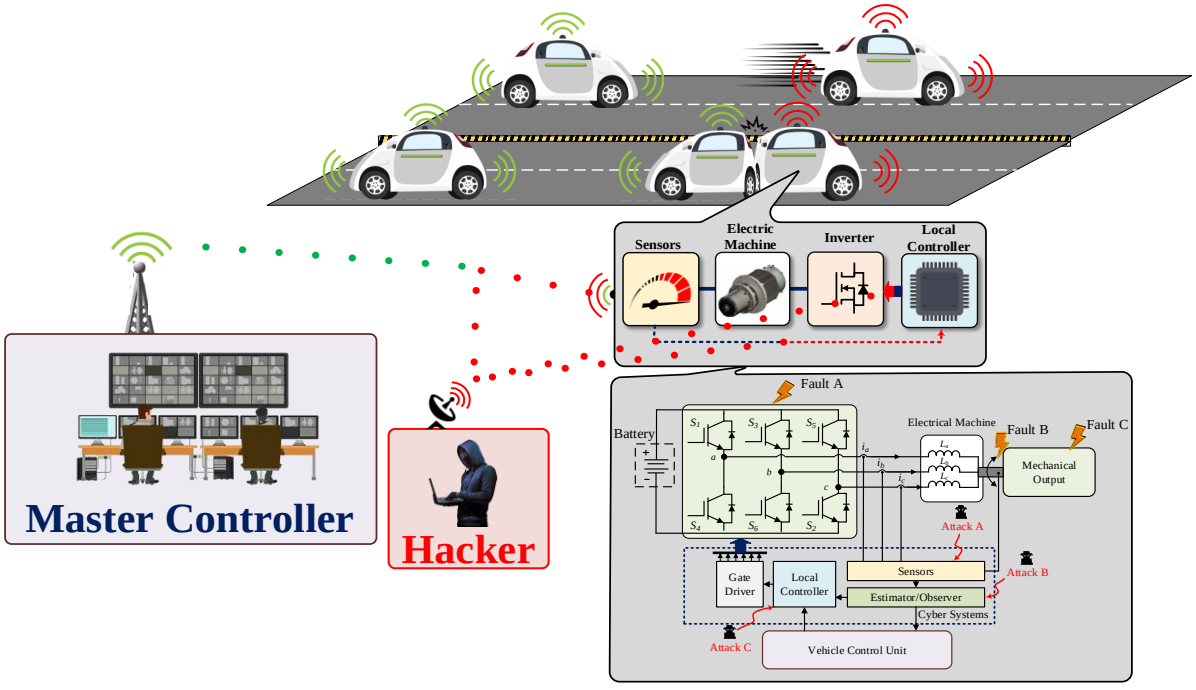
Since the last decade, the growth of electric vehicle (EV) technologies also throws up an interesting opportunity and is expected to increase by 40% in 2040. Recently, growing penetration in the Internet of Things (IoT)-enabled solutions to achieve autonomous e-mobility will be one of the possible solutions without human intervention. However, automated EVs are facing cyber-physical security challenges due to a large number of electronic control units. Consequently, they cause cyber-physical threats, which have become vulnerable to power electronic systems in connected EVs. Therefore, it is an urge to develop monitoring and diagnosis approaches to develop hack-free control systems under cyber-physical threats. In this research project, vulnerabilities of these vehicles are investigated under data integrity attacks, which are pertained to powertrain control security in EVs.



Components of an electric powertrain of the EV with physical and cyber connections including possible data attacks

Design and Synthesis of Advanced Energetic Materials using Metal Catalyzed Cross- Coupling Reactions

Sponsor: Science and Engineering Research Board
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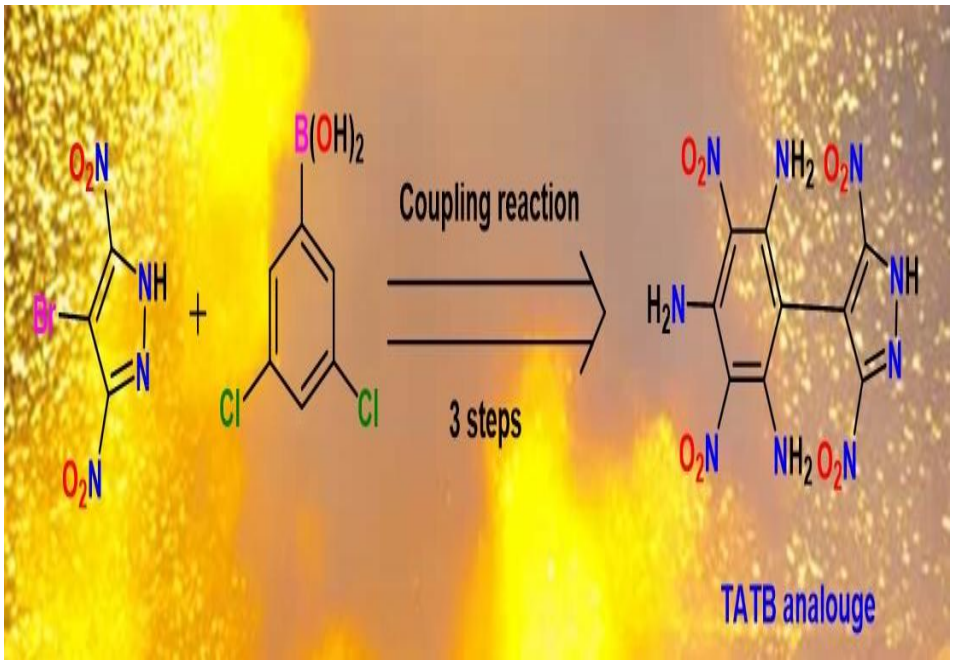
Search for green energetic materials with high-performance properties and decent stability (thermal and physical) is one of the most challenging studies in materials science. This project's main goal will be to use metal-catalyzed coupling reactions to synthesize advanced HEDMs based on azoles with energetic properties matching or surpassing that of RDX while tuning them for better stability (thermal and physical) and environmental safety. Coupling reactions will provide a new route for blending energetic rings through carbon-carbon bond and unlike nitrogen-nitrogen and nitrogen-carbon coupled products, carbon-carbon coupled products are expected to have better thermal stability and insensitivity.



Fine-tuning of the properties of energetic compounds by connecting different energetic rings using metal catalysed cross- coupling reactions

Mitigation of Cyber Attacks in Power System using Non-Linear Control System Design

Sponsor: IHUB NTIHAC Foundation, IIT Kanpur

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Automatic Generation Control (AGC) is a distributed control mechanism, which regulates the frequency and keeps tie-line power flows at scheduled values. In this closed loop feedback control system, AGC is an interface between cyber and physical infrastructure. Thus, it is highly susceptible to malicious attacks. In the project, main objective is to design a non-linear active disturbance rejection controller (comprising of non-linear extended state observer and non-linear state feedback based controller) such that the power system exhibits robustness in the presence of cyber-attacks such as time delay attack (TDA) and false data injection attack (FDIA) wherein the control signal or measurement signal are deliberately introduced by the hacker.

Model Experiments to Measure the Spread of Forest Fires in a Realistic Configuration

Sponsor: Science and Engineering Research Board

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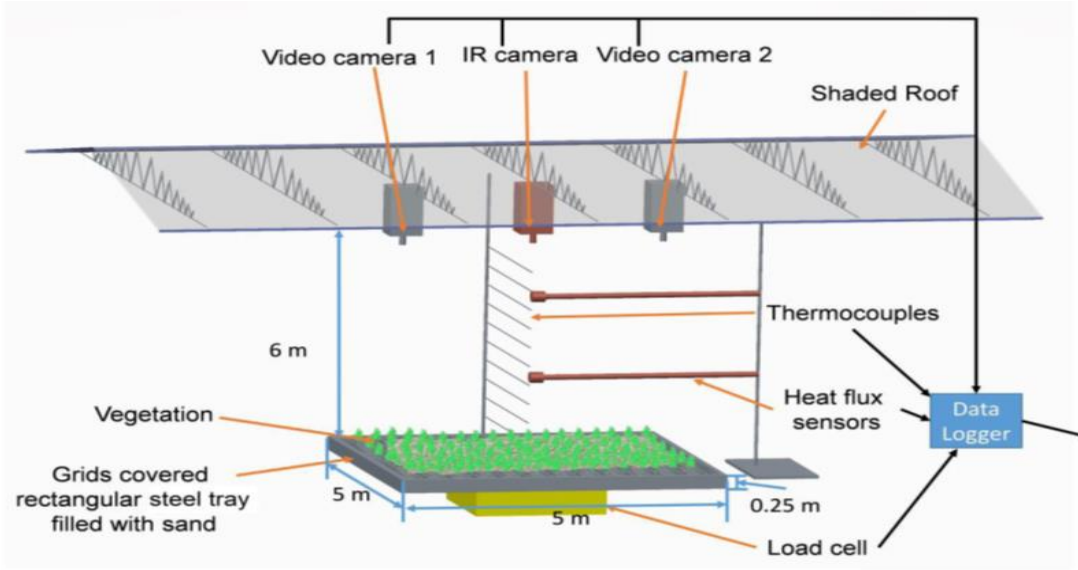
This project addresses the natural cum man-made disaster of forest fires and the scientific methods to prevent and mitigate the same with the study on a lab-scale forest fire test set-up. The measurements of detailed fire characteristics will help develop better models for the prediction of fire spread under realistic terrain, fuel, and atmospheric conditions. The computational model will be tested and validated for real-scale forest fires based on the experimental data. Due to the significant social and environmental impact, all possible means to avoid or control such disasters should be explored in a scientifically justified manner. Therefore, a detailed investigation by the institutions of higher learnings in-country is necessary to strengthen the current know-how on strategies for early control of forest fires.



Schematic of proposed experimental set-up for model forest fire investigations

Impact Analysis of Cyber Attacks on Microgrid SCADA (IACA-μG SCADA)

Sponsor: Central Power Research Institute
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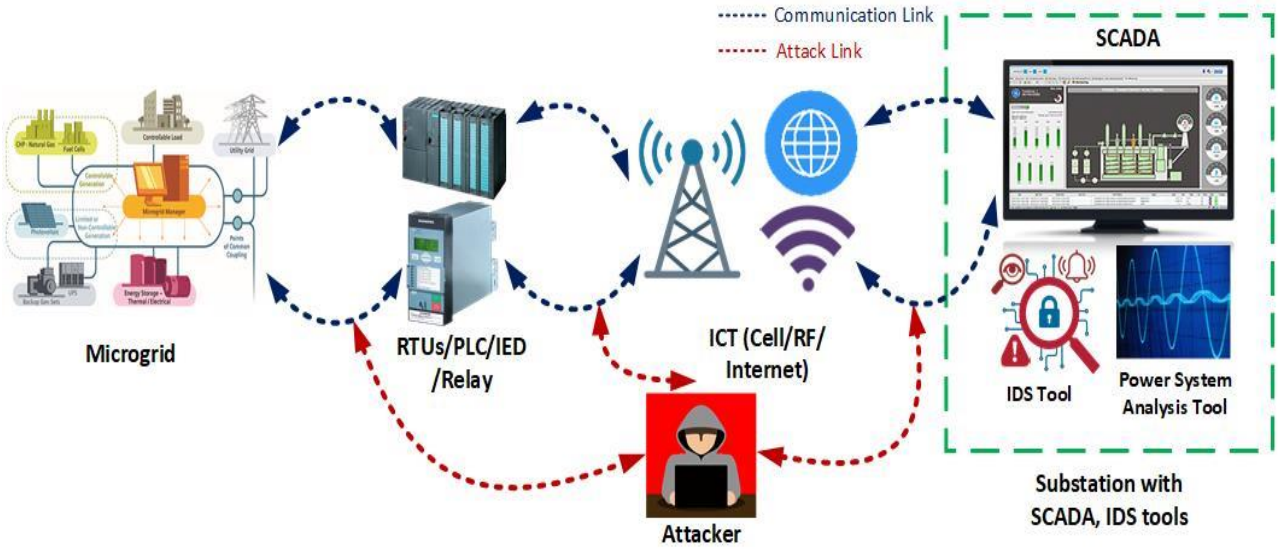
Electric power systems have heavily adopted Information Technology (IT) to perform real-time control, monitoring, and maintenance tasks. This has improved the operational aspects of power systems but has led the power sector exposed to numerous cyber threats. The power sector being a strategic and critical sector, any threat to the power supply system can have catastrophic effects, even potential to cripple the entire country. In this project, a power system security assessment methodology from a Cyber Physical Energy System (CPES) perspective is being developed. In order to provide safety, security, and sustainability of CPES, Intrusion Detection Algorithms and impact analysis of cyber-attack on microgrid SCADA (Supervisory Control and Data Acquisition) and Hardware-in-Loop cyber-physical testbed set up for microgrid SCADA at the laboratory scale are being done.



A schematic diagram of the proposed approach

Mission Innovation 2.0- Green Powered Future Mission Resource Unit for Scientific & Technical Analysis, Management, and Coordination

Sponsor: Department of Science & Technology

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Since the inception of MI IC1, DST, India has developed close connections with international government agencies, international organizations, national public, and private players in smart grids. DST has also announced and collaborated with international/national academia and industry in various R&D projects such as UI-ASSIST, JVCEC & Mission Innovation among many others. During the CEM12/MI6 event (Clean Energy Ministerial-12 and Mission Innovation-6 international workshop), India has announced active participation in the second phase of Mission Innovation (MI) and Green Powered Future Mission and is willing to continue the momentum created in the last five years. DST India is the core coalition member of the next phase of Mission Innovation Challenge on Smart Grids (IC1) i.e., Green Powered Future Mission. The mission aims to develop a joint roadmap that identifies the national and international efforts needed to achieve cost-efficient, secure, and resilient power systems with 100% VRE integration by 2030. In this context, a dedicated resource unit has been established

at IIT Roorkee for efficiently functioning of MI 2.0 activities, especially Green Powered Future Mission activities.

Development of Novel Protection Schemes for Zonal DC Microgrid

Sponsor: Science and Engineering Research Board

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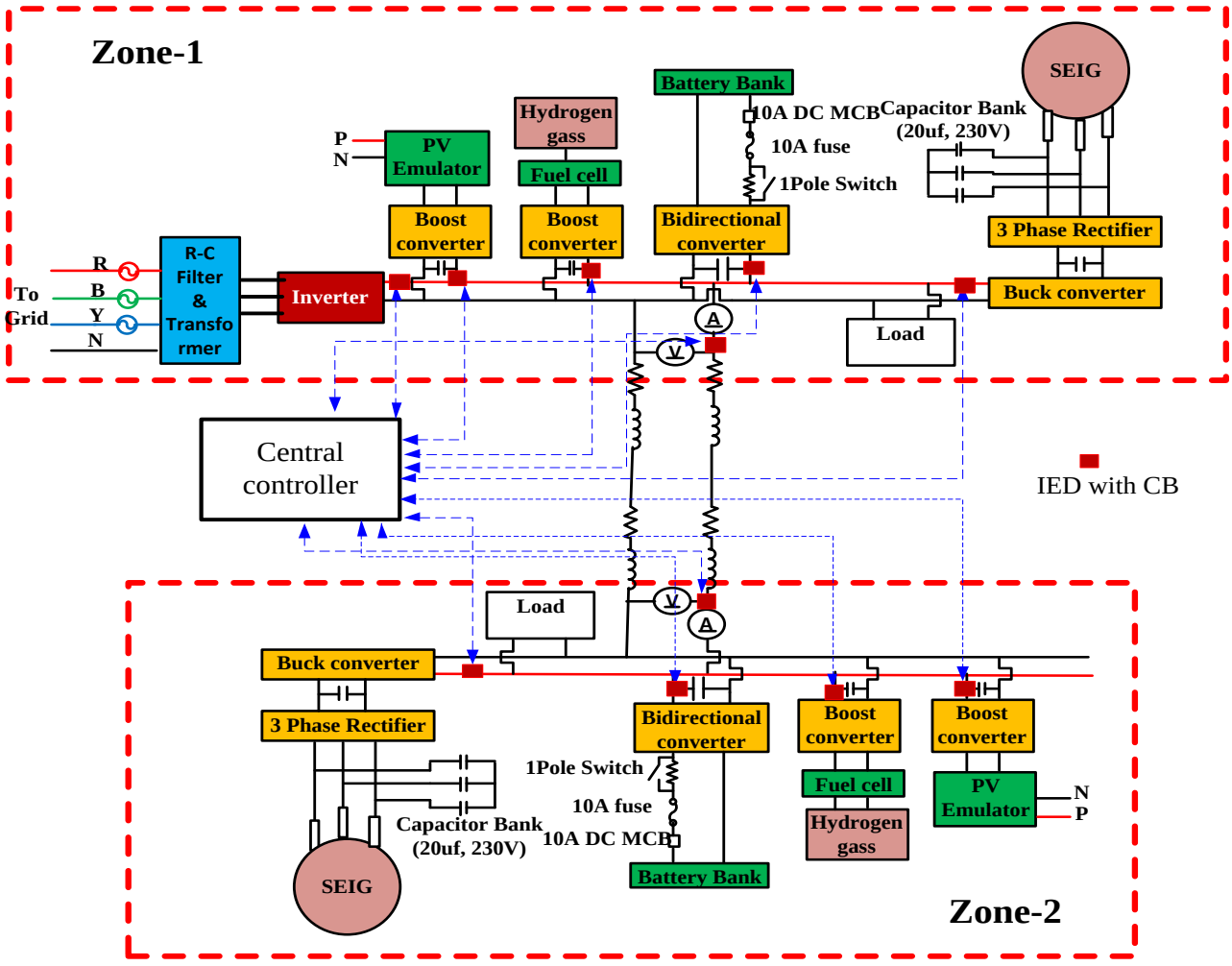
The zonal DC microgrid is gaining interest due to its advantages like reliability, maximum utilization of available energy, and providing an alternate path for power supply to the connected DC loads from the available sources.



The architecture of Zonal DC Microgrid

However, fault detection, section identification, islanding detection, and restoration are the most important protection issues which are being handled in this project. A DC distribution system is less prone to short circuit faults, however, out of all the faults, a pole-to-ground fault is the most prominent one because of the degradation of cable insulation. Whenever a short circuit fault occurs, the DC-link capacitor discharges very quickly and this leads to a fault current having a high di/dt value. Hence, the basic methods for fault detection in a DC microgrid are (i) calculating the rate of change of fault current owing through a cable, and (ii) observing the voltage across the DC-link capacitor. However, by using these basic methods, it is difficult to discriminate high resistive faults from external disturbances (switching events and AC side faults). Due to the absence of zero crossing in the DC fault current, conventional AC circuit breaker is not suitable for the DC system. While designing the DC circuit breaker speed of the operation, current handling capacity and cost are the main factors to be considered. Further, in case of LG fault incepted in DC microgrid, the magnitude of the fault current depends on the type of grounding. Therefore, the protection of a zonal DC microgrid is critical in terms of reliability and speed. Improved numerical data processing units introduce the implementation of numerical relays for microgrid protection systems. They provide much flexibility and possible on-chip application of perceptive solutions. The project aims in providing solutions to the protection issues like fault detection, section identification, localization, and islanding detection for the Zonal DC microgrid. The techniques are being implemented and verified using a laboratory prototype and HIL testbed.

N(eutron stars) I(slands) C(olliders) H(olography) E(ntanglement) (color) S(uperconductivity) and ACMS in(/from) String/M-Theoretic Holography at Intermediate Coupling

Sponsoring Agency: Science and Engineering Research Board

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In the intermediate coupling limit of M theory dual of large-N thermal QCD-like theories, recently worked out by the PI and one of his students, the project seeks (i) to obtain a bound on the bulk-to-shear-viscosity interpolating between the weak and strong coupling limits; (ii) to explore whether one can see a signature of chaos; (iii) to explain the low energy peaks in transport coefficients, and the results of ALICE/ATLAS

pertaining to the low-transverse-momentum distribution of hadrons produced in heavy ion collisions; (iv) to understand color-flavor locking, and its applications to obtaining mass-vs-radius plots of neutron stars and to compare the results obtained with recent astrophysical data; (v) to obtain the Page curve for black hole M-theoretic background relevant to high temperatures; (vi) to study the photons emitted in heavy ion collisions at RHIC/ALICE/JLab, as well as the production of heavy mesons such as charmonia through the use of photo-production; (vii) to study the effects of high magnetic fields created in heavy ion collisions and possible enhancement of photoemission; (viii) to obtain explicitly (a) an Almost Complex Metric/Contact Structure, (b) the induced transverse SU(3)-structure in terms of the torsion classes of G_2 structure, and (c) an SU(2) structure (induced by the G_2 structure).

Epigenetic Regulation of Cell Fate Transition during Crown Root Initiation in Rice

Sponsor: Science and Engineering Research Board
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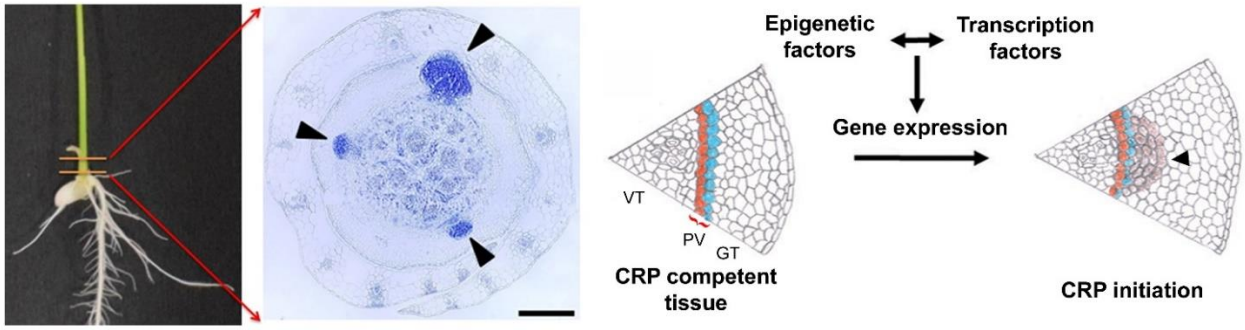
Homepage: https://bt.iitr.ac.in/~BT/Shri_Ram_Yadav

It is hypothesized that specialized transcription factors may directly interact with chromatin remodeling factors and recruit them to the specific target genes in a sequence-specific manner. Thus, investigating physical interaction among them and identifying target genes of epigenetic regulation would provide a mechanistic insight on genetic reprogramming and tissue trans-differentiation required for establishment of CRP in rice. This problem is being addressed by investigating protein-protein interactions among chromatin modifiers and transcription factors, identifying the global genes regulated epigenetically and correlating with their temporal and spatially restricted expression pattern during plant root establishment.



Crown root initiation in rice

Phenotypic Characterization and Gene Mapping of Novel Early Rice Flowering Mutants During the Floral Transition and Seed Formation

Sponsor: Science and Engineering Research Board
Prof. Shri Ram Yadav

Flowering is an important agronomic trait for seed production in economically important crop plants, thus can be genetically manipulated to increase crop yield. Our collaborator at MNNIT, Allahabad has developed mutant basmati rice lines which flowers earlier than their parental line, thus have reduced maturity time. This project is aimed to establish these mutants, analyze their genetic inheritance pattern, characterize them phenotypically to understand the effect during entire reproductive development, and finally map the mutations to clone the associated genes responsible for the phenotype. This has the potential to identify novel genes involved in regulating flowering time and therefore may provide new genetic lines for crop improvement though molecular breeding.

Control and Mutant variants of Basmati rice

Co-Creating Sustainable Agri-Water use in the Hindon Sub Basin: A Multi Scale Participatory Approach

Sponsor: Department of Science & Technology
Prof. Brijesh Kumar Yadav
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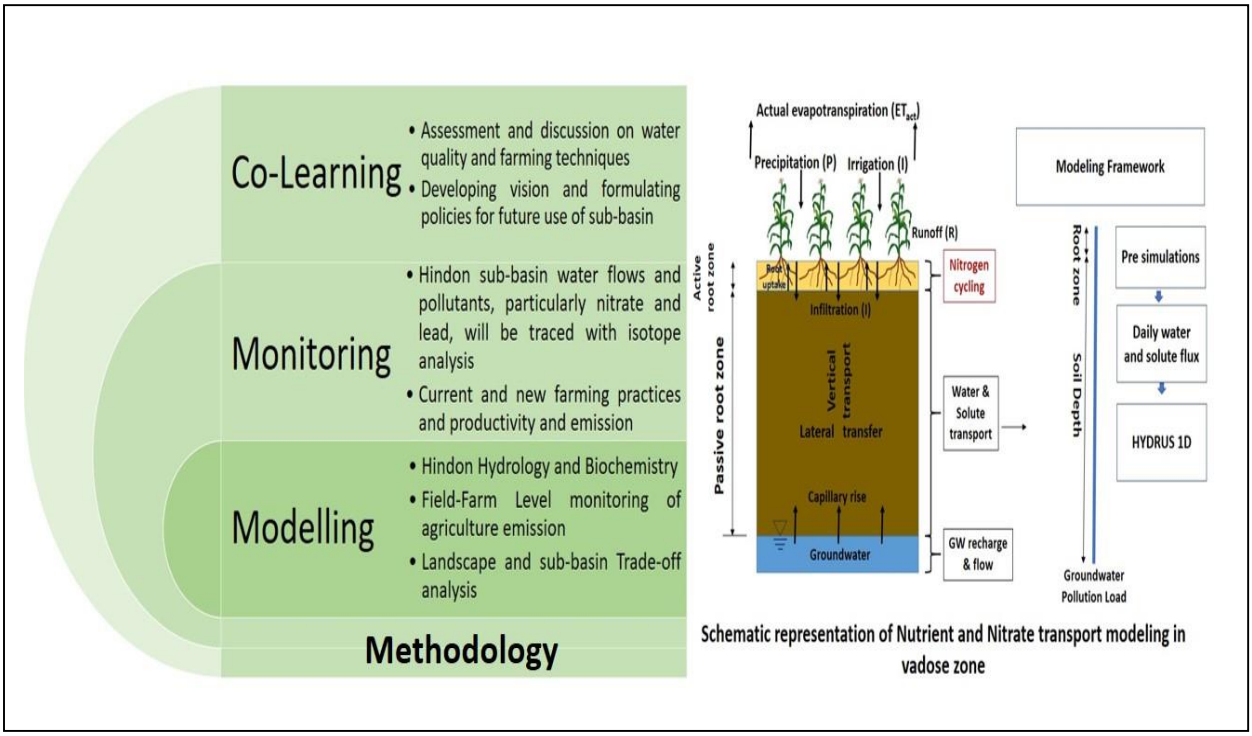
Homepage:https://hy.iitr.ac.in/~HY/Dr__Brijesh_Kumar_Yadav

This Indo-Dutch project involves identifying different areas within the Hindon sub basin having pollution load primarily from (1) agricultural activities, (2) domestic effluents, (3) industrial discharges, and (4) mix of the above three. This will enable to have an in depth understanding of the contribution of different sources to river water pollution. We will determine major pollution hotspots or primary pollution sources discharge

points into the Hindon and the water quality index (WQI) based on physico-chemical parameters during different seasons for indicating the health of water resource and using it as a yardstick to assess water quality. This will be helpful in determining the spatial and temporal changes in water quality which will be prelude to effective regulation programmes.

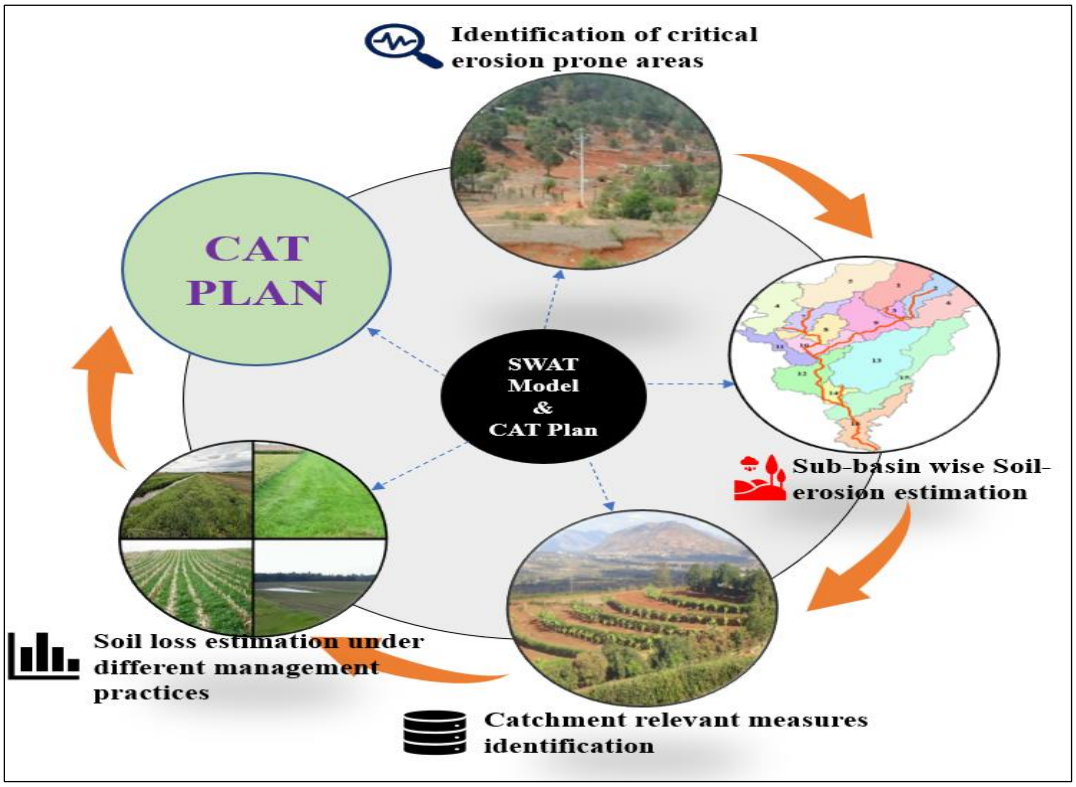


Identification of Critical Soil Erosion Prone Areas and Preparation of CAT Plan

Sponsor: National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti
Prof. Ashish Pandey
Water Resources Development and Management
Email: ashish.pandey@wr.iitr.ac.in
Homepage: https://wr.iitr.ac.in/~WR/ashisfwt

Soil erosion and land degradation issues need to be addressed through proper identification, understanding, and implementing suitable soil and water conservation practices. The current study will identify the vulnerable areas in the Kamla River basin, Bihar. Preparation of Catchment Area Treatment (CAT) plan for recommendation soil conservation measures in the vulnerable areas of the catchment shall be also carried out. The SWAT model will be used to evaluate the efficacy of management practices

such as agronomic and structural approaches, as well as their combinations, to control sediment yields at the sub-watershed and watershed levels.



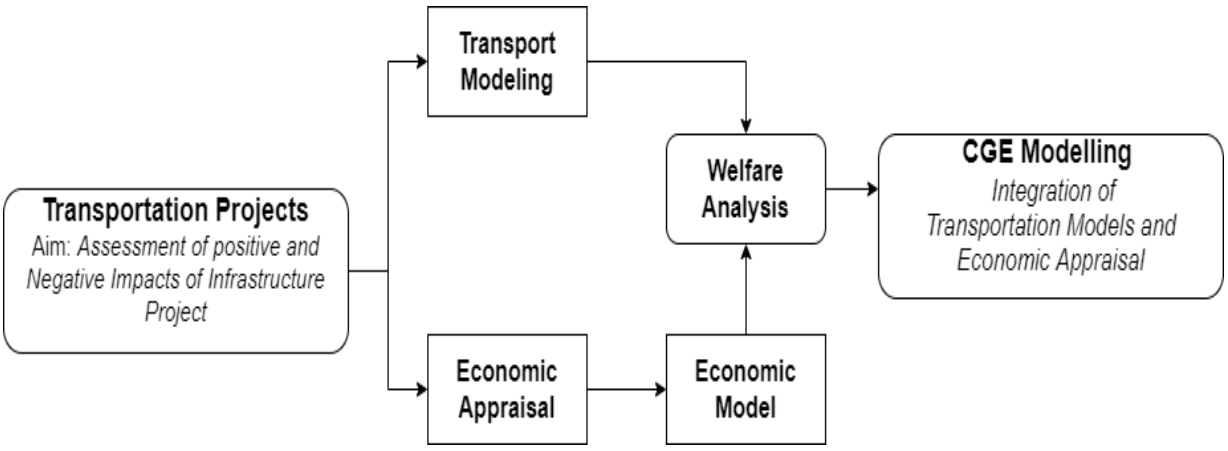
Advanced Transport Modelling and Simulation for National Highways in India

Sponsor: Indian Academy of Highway Engineers (IAHE), MoRTH

Prof. Amit Agarwal
Civil Engineering
Email: amit.agarwal@ce.iitr.ac.in
Homepage: http://faculty.iitr.ac.in/~amitfce/

Indian Institute of Technology Roorkee (IITR) in association with the Indian Academy of Highway Engineers (IAHE) has undertaken the project on setting up a "Centre for Advanced Transportation Technology and Systems (CATTS)" at IAHE, Noida. Apart from indigenous research and applications on transportation modelling and simulations in India, IIT Roorkee is also involved in the development, calibration, validation of a Computable General Equilibrium (CGE) model and an Urban Pervasive Data (UPD) model in collaboration with the University of New South Wales (UNSW) Sydney. In this project, the aim is to integrate the transport and economic models and to create a framework for the economic appraisal of transport projects. Also, a mesoscopic transport

modelling tool is being developed using the crowdsourced/ pervasive data sources. The model will assist in the evaluation of safety, assessment of hot-spots and other policy measures. The project will also facilitate capacity building by educating and training engineers/ officers.



Scheme of the project

Selection Guidelines for Constructed Wetland Systems for Treatment of Sewage in India

Sponsor: National Mission for Clean Ganga (NMCG), Ministry of Jal Shakti

Prof. Sanjeev Kumar Prajapati
Hydro and Renewable Energy
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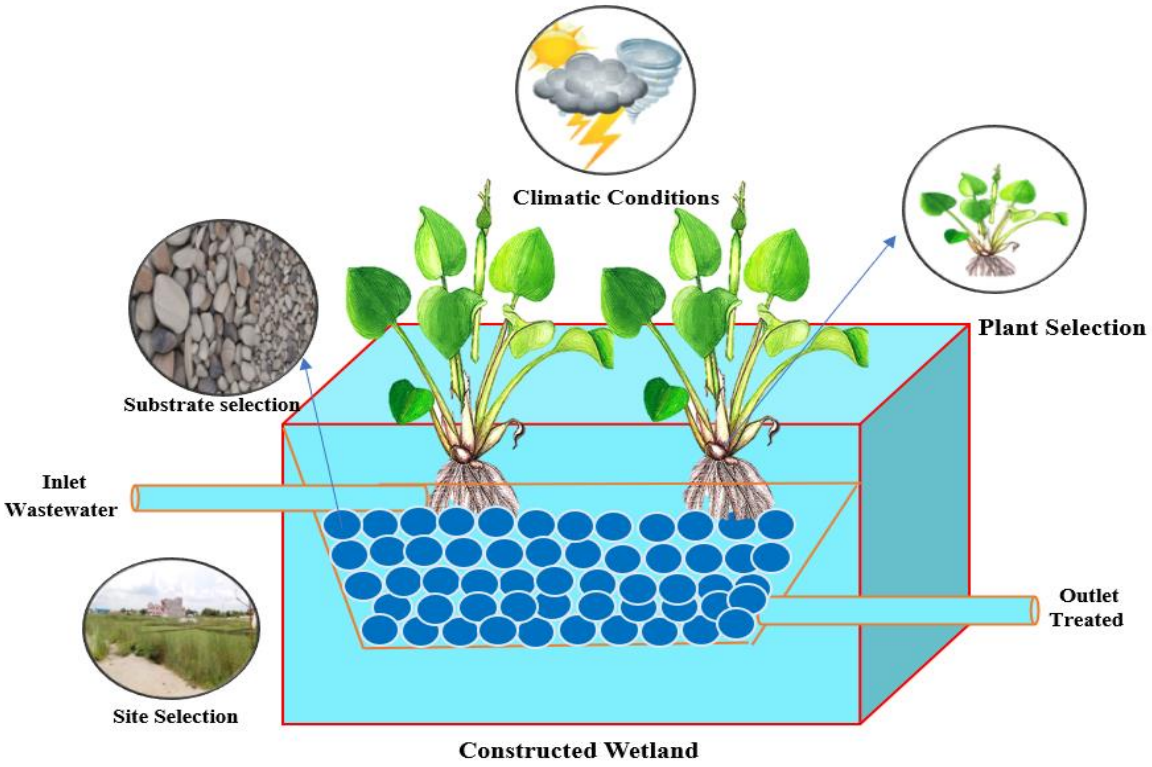
Under the flagship program of the NMCG on effective abatement of pollution, conservation, and rejuvenation of National River Ganga, several initiatives have been taken for proper treatment of sewage. Along with the conventional STP based on biological treatment (such as ASP and SBR), some of the recently developed STPs are based on constructed wetland (CW) technology. Compared to conventional treatment systems, CWs are low cost, are easily operated and maintained, and have a strong potential for application in developing countries like India. CWs are human-made systems that mimic the natural wetlands and utilize the potential of natural resources (soil, vegetation, and microbial communities) to treat wastewater. More than 20 different designs of CWs are available for the treatment of sewage. However, selecting a suitable CW system as per the requirements, such as characteristics of sewage, desired treatment ranges, and the climatic conditions, is the pre-requite stage for

efficient utilization of CW technology for sewage treatment. This project aims to develop a set of selection guidelines for CW systems for their efficient use in STPs.



Constructed wetland systems for wastewater treatment

Comprehensive Characterization of Variably Processed Sewage Sludge in Ganga Basin to Classify its Suitability for Safe Disposal

Sponsor: Central Pollution Control Board

Prof. Absar Ahmad Kazmi
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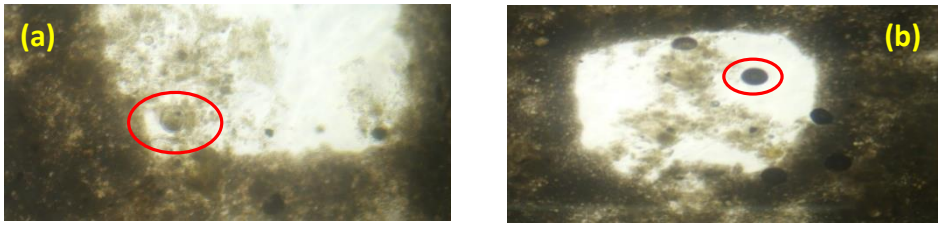
Homepage: https://civil.iitr.ac.in/CE?Uid=kazmifce

Ganga Basin produces a voluminous amount of waste sludge from the sewage treatment plants (STPs), which is usually a semi-solid waste or slurry that requires further treatment before being disposed of or used for land application. In India, sewage sludge handling and maintenance is a significant challenging issue due to the lack of infrastructure and policy framework for sludge management owing to the non-availability of waste sludge generation data. Hence, the proposed study aims to

comprehensively characterize the variably processed sewage sludge and recommend the best sludge management options in Ganga Basin for proper sludge disposal and reuse. The findings can be the stepping stone in developing sewage sludge utilization standards and achieving sustainable sludge management practices.

Sludge from Sewage Treatment Plant



Microscopic Images of Helminthes Eggs: a) Ascaris Species and b) Taenia in Sludge

Deciphering the Role of small RNAs in *Acinetobacter baumannii* Physiology and Pathophysiology

Sponsor: DBT-Wellcome Trust India Alliance Program

Prof. Ranjana Pathania
BioSciences & BioEngineering
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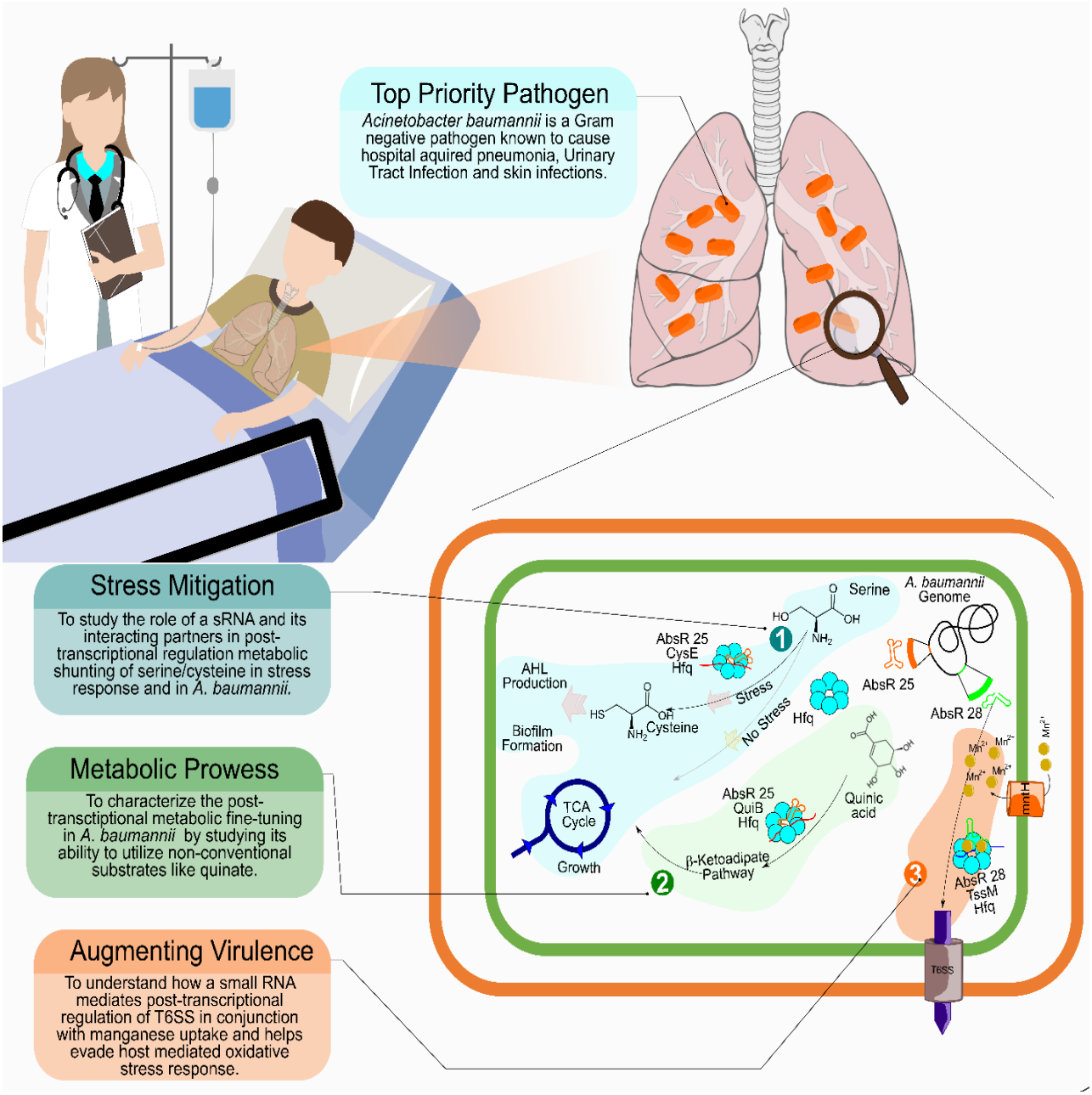
Homepage: https://bt.iitr.ac.in/~BT/rpathfbs

Acinetobacter baumannii is a nosocomial pathogen known to cause multi drug resistant pneumonia, wound and urinary tract infections. The ability of *A. baumannii* to persist in the environment and its host is mediated via a post-transcriptional route via small RNAs and Hfq protein. The project is aimed at deciphering such regulatory networks in this clinically relevant pathogen. First, we investigate how sRNAs regulate cysteine and quinate metabolism; two diverse metabolic pathways responsible for conferring physiological fitness to *A. baumannii*. In addition, we are also looking into how an alternative sRNA, manganese and a secretion system is involved in a cross-talk that help

this pathogen in evading host mediated oxidative stress response. The project is being carried out to expose the regulatory and central nutrient utilization and uptake processes that may be a “dent in the armour” of *A. baumannii* and will lead to new treatment strategies in the future.



The role of small RNAs in A. Baumanni pathophysiology

OTHER RECENTLY REGISTERED RESEARCH PROJECTS

Principal Investigator	Title of the project	Sponsoring Agency
Prof. Debasis Banerjee Chemistry debasis.banerjee@cy.iitr.ac.in	Unprecedented Bifunctional Strategies for Harnessing CO2 for Enantioselective organic transformations : Application towards the synthesis of Antidepressant Drugs Rolipram and Paroxetine	SERB
Prof. Dharmendra Singh Electronics & Communication Engineering dharmfec@ece.iitr.ac.in	Development of Auto-change Detection system for Gas pipeline ROU surveillance using satellite Images	GAIL (India) Limited , Noida
Prof. Felix Orlando Maria Joseph Electrical Engineering m.orlando@ee.iitr.ac.in	Development of active or passive leg exoskeleton based on series elastic actuation for assistance of elderly humans	IHF Foundation for Cobotics (IHFC), IIT Delhi
Prof. P.C. Ashwin Kumar Earthquake Engineering pcashwin.feq2018@iitr.ac.in	Sub Assemblage testing and study of seismic Brakes	KLA Const. Technologies Pvt. Ltd. New Delhi
Prof. Zulfequar Ahmad Civil Engineering z.ahmad@ce.iitr.ac.in	Replenishment study of Mahanadi and its tributaries in Chhattisgarh state	Mining Resources Dept, Chhattisgarh
Prof. Rama Krishna Peddinti Chemistry rkpeddinti@cy.iitr.ac.in	Harnessing dienaminal and dienaminone intermediates for the synthesis of nitrogenous and other frame works	SERB
Prof. Manoj Kumar Jain Hydrology manoj.jain@hy.iitr.ac.in	Dynamics of glaciers degradation due to climate change and its impacts on river flow in the mountain system of Uzbekistan	DST
Prof. Puneet Gupta Chemistry puneet.gupta@cy.iitr.ac.in	Metal-free boron-based catalysts for direct conversion of alkanes of aldehydes and alkanes of aldehydes and alkenes : role of catalyst at the electronic level in product selectivity	SERB
Prof. Priti Maheshwari Civil Engineering priti.maheshwari@ce.iitr.ac.in	Probabilistic analysis of failure criteria of rocks under triaxial state of stress	SERB
Prof. Sumeet Mishra Metallurgical & Materials Engineering sumeet.mishra@mt.iitr.ac.in	Developing pathways for simultaneous improvement in	SERB

	formability and paint bake response of automative grade Al-Mg-Si alloys	
Prof. Sandeep Bhatt Earth Sciences sandeep.bhatt@es.iitr.ac.in	Evolution of fabric in isotrophic medium : A case study of Berach Granitoid and its implication for terrane accretion	SERB
Prof. Avirup Dasgupta Electronics & Communication Engineering avirup@ece.iitr.ac.in	Variability aware compact modeling nanosheet FETs	SERB
Prof. Jishnu Kavil Kambrath Electrical Engineering jishnukkambrath@ee.iitr.ac.in	Development of grid forming controls for doubly fed induction machine based wind turbines (TYPE III Wind turbines)	SERB
Prof. Ashish Yadav Chemical Engineering ashish@ch.iitr.ac.in	Simultaneous recalcitrant pollutant degradation coupled with carbon dioxide conversion to value-added fuels in a photoelectrochemical cell	SERB
Prof. Prateek Kumar Jha Chemical Engineering prateek.jha@ch.iitr.ac.in	Studying drug diffusion in multiresponsive, multilayered polymeric materials for applications in oral and ocular delivery	SERB
Prof. Sanjeev Kumar Prajapati Hydro & Renewable Energy sanjukec@hre.iitr.ac.in	Resource recovery and biofuel production through algae cultivation in hydroponic wastewater : pilot-scale studies towards circular bioeconomy	SERB
	Waste algae to biogas for clean energy and environment : techno-environ-economic prospects	DST
Prof. Shubhankar Roy Chowdhury Civil Engineering shubhankar.rc@ce.iitr.ac.in	Computational multiscale modeling as a virtual experimental setup for prediction of elastic and inelastic response of unidirectional fibre reinforced polymer composites	DRDO
	Multiscale virtual testing and experiments of FRP composites for high-speed train and infrastructure applications	SERB
Prof. Avanish Tripathi Electrical Engineering avanish.tripathi@ee.iitr.ac.in	Design and development of high-power-density motor drives meant for high-speed applications	SERB
Prof. Deepak Ronanki Hydro & Renewable Energy dronanki@hre.iitr.ac.in	Modular and Reconfigurable High-power Fast Charging Topologies for Next-Generation e-Transportation Systems	SERB

Prof. Dharmendra Pratap Singh Earth Sciences dharmendra.singh@es.iitr.ac.in	Late Quaternary Peleoceanography of the northern Indian Ocean and its impact on global climate modulation	SERB
Prof. Alok Bhardwaj Civil Engineering alok.bhardwaj@ce.iitr.ac.in	Rapid Estimation of flood extents using synthetic aperture radar and deep learning	SERB
Prof. Deep Kiran Electrical Engineering deepkiran@ee.iitr.ac.in	Privacy Pricing in power systems under obfuscation	SERB
Prof. Avinash Parashar Mechanical & Industrial Engineering avinash.parashar@me.iitr.ac.in	Static and dynamics behaviour of organic and inorganic nanofiller reinforced hydrogels for biomedical applications	SERB
	Atomistic simulation to study high strain rate behavior of high entropy alloys	SERB
Prof. Arun Kumar Hydro & Renewable Energy arun.kumar@hre.iitr.ac.in	Work order for the Efficiency/ Performance testing of Mallapur Mini Hydel Scheme (2x4.5 MW) at Mallapur Village, Taluk- Gangavathi, Koppal- District, Karnataka	Engineered Power Resource India Pvt. Ltd. Bangalore
Prof. Arup Kumar Das Mechanical & Industrial Engineering arup.das@me.iitr.ac.in	Design, Fabrication and characterization of enhanced micro heat pipe for electronic cooling	SERB
Prof. Kirtiraj K. Gaikwad Paper Technology kirtiraj.gaikwad@pt.iitr.ac.in	Turning waste to wealth : Development of biodegradable packaging material from agriculture waste via green route for sustainable environment	SERB
Prof. Vipul Silwal Earth Science vipul.silwal@es.iitr.ac.in	Seismic imaging of the central Himalayas using spectral- element methodology	SERB
Prof. Tanmoy Pramanik Electronics & Communication Engineering pramanik.tanmoy@ece.iitr.ac.in	Development and optimization of magnetic field tolerant spintronic devices targeted toward mobile and IoT Applications	SERB
Prof. Basant Yadav Water Resources Development & Management basant.yadav@wr.iitr.ac.in	Design of climate resilient managed aquifer recharge strategy for safe water supplies and improved groundwater protection in Hindon river basin	SERB
	Potential for scaling up indigenous	Natural

	rainwater harvesting techniques in semi-arid regions of India	Environment Research Council, Polaris House, Swindon
Prof. Rajagopal Krishnamurthi Earth Sciences r.krishnamurthi@es.iitr.ac.in	Fluid inclusions and hydrothermal alteration studies of mineralized zones in paramanahalli gold prospect, chitradurga greenstone belt, Karnataka	SERB
Prof. Abhishek Kumar Behera Electrical Engineering abhisek.behera@ee.iitr.ac.in	Distributed sampled data control of autonomous multi vehicle systems	SERB
Prof. Sonal K. Thengane Hydro & Renewable Energy sonalt@hre.iitr.ac.in	Evaluation of torrefied biomass product application in Soil	Takachar (Himalayan Sustainable energy solutions private limited)
Prof. Z. Rahman Management Studies zillur.rahman@ms.iitr.ac.in	Stakeholder consultation as a corporate governance mechanism : challenges and opportunities in the lake ecosystem of Jammu & Kashmir	National Foundation for corporate governance (NFCGL), New Delhi
Prof. Abhay Kumar Sah Electronics & Communication Engineering abhaysah@ece.iitr.ac.in	Realizing cell- free massive MIMO for beyond 5G systems	SERB
Prof. Deepak Sharma BioSciences & BioEngineering deepak.sharma@bt.iitr.ac.in	Development and validation of phone-based App, SwasthGarbh, for improving antenatal care (ameliorating maternal and fetal health issues)	ICMR
Prof. Dheeraj Kumar Electronics & Communication Engineering dheeraj.kumar@ece.iitr.ac.in	Deep learning - based linguistic summarization of clustering results for enhanced understanding of novel datasets	SERB
Prof. Sonal Atreya Architecture & Planning sonal.atreya@ar.iitr.ac.in	Design and Development of a decision support system for early identification of Deaf and Hard of Hearing Neonates and Infants in Rural India	ICMR

Prof. Krishna Mohan Singh Mechanical & Industrial Engineering krishna.singh@me.iitr.ac.in	Large -eddy simulation of flow instabilities in hydraulic turbines at off-design operation	CPRI
Prof. Raja Chowdhury Civil Engineering raja.chowdhury@ce.iitr.ac.in	Effects of sludge modification on treatment efficiency of algae-based wastewater treatment : batch and continuous study and sustainability assessment of the same as an emerging technology	SERB
Prof. Amit Chandrakant Bhosale Hydro & Renewable Energy achbhosale@hre.iitr.ac.in	Innovative lightweight cylindrical PEM fuel cells based on conducting plastic	SERB
Prof. Harsh Chauhan BioSciences & BioEngineering harsh.chauhan@bt.iitr.ac.in	Elucidating the genetic architecture of tillering in wheat through CRISPR/CAS based editing of Ideal Plant Architecture gene (IPA1) and TEOSINTE BRANCHED 1 (TB1)	DBT
Prof. Krishna Mohan Poluri BioSciences & BioEngineering krishna.poluri@bt.iitr.ac.in	Elucidating the molecular mechanisms and biomarkers associated with progression and prognosis of retinoblastoma	SERB
Prof. Vishvendra Singh Poonia Electronics & Communication Engineering vishvendra@ece.iitr.ac.in	Development of a biomimetic quantum photovoltaic cell	SERB
Prof. Bishnu Prasad Das Electronics & Communication Engineering bishnu.das@ece.iitr.ac.in	On-Chip implementation and energy - efficient processing of ECG signals for Early detection of cardiovascular Diseases	SERB
Prof. V. Venkatesh Chemistry venkatesh.v@cy.iitr.ac.in	Functional gold Nanoclusters and AU(I) complexes for therapeutic applications	CSIR
Prof. M.Sankar Chemistry m.sankar@cy.iitr.ac.in	Synthesis of MESO/B-Functionalized Porphyrins for solar cell and catalytic applications	CSIR
Prof. Sandeep Kumar Computer Science & Engineering sandeep.garg@cs.iitr.ac.in	Design and development of a software tool for digitalization and investigation of microstructure of materials using computer vision and machine learning	SERB
Prof. Gnanamani Elumalai Chemistry gnanam@cy.iitr.ac.in	Enantio-and diastereo selective cascade synthesis of poly-heterocyclic chiral compounds	SERB

Prof. Mahendra Kumar Verma Mathematics mahendraverma@ma.iitr.ac.in	On certain multiplicity one results	SERB
Prof. Harshit Sosan Lakra Architecture & Planning harshit.lakra@ar.iitr.ac.in	Benchmark Survey and Developing Tribal Development Index	Dr. Ramdayal Munda Tribal Welfare Research Institute
Prof. Rajan Arora Applied Science & Engineering rajan.arora@as.iitr.ac.in	Solutions of some non-linear evolution equations using homotopy analysis method	Uttarakhand State Council for Science and Technology
Prof. Amit Maji Mathematics amit.maji@ma.iitr.ac.in	BCL Representation for isometries and invariant subspaces	SERB
Prof. BVVS Pavan Bosukonda Chemistry pavan.bosukonda@cy.iitr.ac.in	Spatiotemporal control over signalling between artificial micro-compartments with a reversible coatcervate glue	CEFIPRA
Prof. Prabhat Kumar Mandal BioSciences & BioEngineering prabhat.mandal@bt.iitr.ac.in	Investigating the mechanisms of L1 retrotransposon activation in oral squamous cell carcinoma (OSCC)	SERB
	Development of a membrane based kit to find out L1 retrotransposon activity in oral squamous cell carcinoma (OSCC)	Uttarakhand State Council for Science and Technology
Prof. Manil T. Mohan Mathematics maniltmohan@ma.iitr.ac.in	Stochastic analysis of the convective Brinkman Forchheimer equations perturbed by levy noise	SERB
Prof. Manish Madhav Joglekar Mechanical & Industrial Engineering manish.joglekar@me.iitr.ac.in	A coupled field finite element framework for the dynamic analysis of inhomogeneously deforming electroactive polymers	SERB

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