

FACULTY: Science	DEPARTMENT Botany	IQAC ACTIVITY No:
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NAME OF THE ACTIVITY: National Seminar on Challenges in Climate Change and Sustainable Development			
DATE	FACULTY	DEPARTMENT/ COMMITTEE	COORDINATOR NAME
6-7 April 2019	Science	Botany Environmental Science	Dr. Kalyani Krishna Dr. Abhishek Chandra Dr. Pooja Gokhale Sinha Dr. Sunita Yadav
TIME	VENUE	NUMBER OF PARTICIPANTS	NATURE: Outdoor/Indoor
	College	120	Indoor
SUPPO RT/ ASSIST ANCE:	SED India		

BRIEF INFORMATION ABOUT THE ACTIVITY

TOPIC/SUBJECT OF THE ACTIVITY	National Seminar on Challenges in Climate Change and Sustainable Development
OBJECTIVES	
METHODOLOGY	
OUTCOMES	

PROOFS & DOCUMENTS ATTACHED (Tick mark the proofs attached):

Notice & Letters	Student list of participation ‘	Activity report	Photos	Feedback form
Feedback analysis	News clip with details	Certificate	Any other	

IQAC Document No:	Criterion No:	Metric No:
Departmental file no	IQAC file No;	

NAME OF TEACHER & SIGNATURE	NAME OF HEAD/ COMMITTEEINCHARGE &SIGNATURE	IQAC COORDINATOR (SEAL & SIGNATURE)
Dr. Kalyani Krishna Dr. Abhishek Chandra Dr. Pooja Gokhale Sinha Dr. Sunita Yadav		

For Reference

Criterion I	Curricular Aspects (planning & Implementation)	Criterion V	Student Support & Progression
CriterionII	Teaching Learning & Evaluation	Criterion VI	Governance
CriterionIII	Research, Innovations & Extension	Criterion VII	Institutional Values & Best Practices
CriterionIV	Learning Resources and Infrastructure		

National Seminar on Challenges in Climate Change and Sustainable Development (CCCSD-2019)

jointly organized by
Sri Venkateswara College, University of Delhi
& Society for Environment and Development (SED), India
on
6-7th April, 2019

PROGRAMME SCHEDULE

Day 1	6th April 2019		
	Venue: Seminar hall, Sri Venkateswara College, University of Delhi		
09:00-9.30	Registration		
9:30 -10.00	Inaugural function Chief Guest: Prof C. K. Varshney Guest of Honor: Prof. Anubha Kaushik		
10:00-10:30	HIGH TEA		
	Events	Speakers	Topic
10:30-11:30	Keynote Address	Prof. C.K. Varshney	Climate change, biodiversity and human wellbeing
11:30 -12:30	Keynote Address	Prof. Anubha Kaushik	Reducing carbon and ecological footprints for sustainable development
12:.30-13:30	LUNCH		
13:30-16:00	Invited lecture	Dr. Shiv Pratap Raghuvanshi	Impacts of climate change on water resources with special reference to river Ganga
	Invited lecture	Dr. Vikrant Tyagi	Institutional dynamics and climate change adaptation in India cities
	Invited lecture	Dr. Mustafa Ali Khan	Climate policy adaptation in Indian Himalaya
	Invited lecture	Dr Hardeep Rai Sharma	Techniques of generating energy from municipal solid wastes: an Indian perspective
	Invited lecture	Dr. Pravin K. Mutiyar	National mission on clean Ganga
16:00-16:15	TEA		

16:15-17:30	Theme: Biodiversity Conservation and Ecosystem Services Venue: Seminar Hall	Oral presentations OL 6; OL 11; OL 12; OL 15; OL 16; OL 18; OL 22; OL 26	
16:15-17:30	Theme: Environment Management, Pollution and Livelihoods Venue: Room No. 13 (T1)	Oral presentations OL 1; OL 2; OL 8; OL 10; OL 13; OL 17; OL 42	
16:15-17:30	Theme: Climate change and Sustainable Development Venue: Room no 14 (T2)	Oral presentations OL 7; OL 24; OL 27; OL 28; OL 34; OL 36; OL 37; OL 38	
16:15-17:30	Theme: Waste Management Venue: Room No 215	Oral presentations OL 20; OL 30; OL 31; OL 32; OL 33; OL 35; OL 39; OL 41	
Day 2	7th April 2019 Venue: Seminar hall, Sri Venkateswara College, University of Delhi		
	Events	Speakers	Topic
9:00-10:00	Keynote Address	Prof. C. Rajasekaran	Impact of climate change on floristic diversity in coastal Tamil Nadu
10:00-11:30	Invited lecture	Dr Y. S. C. Khuman	Achieving sustainable development and sustainability science education in India
	Invited lecture	Dr Amit Kumar Gupta	Role of flue gas desulphurization (FGD) toward controlling of green house gases (GHGs) emission
	Invited lecture	Dr. Puneeta Pandey	Variability of climate trends in Punjab-an overview
	Invited lecture	Dr. P.C. Phondani	Bioresource Utilization Pattern and Energy Value of Agroforestry Systems in Himalayan Rural Landscape
11.30-11:45	TEA		

11:45-13:45	SED India Sponsored Young Scientist Conclave	OL 3; OL 4; OL 5; OL 9; OL 14; OL 19; OL 21; OL 23; OL 25	
13:45-14:15	LUNCH		
14:15-15:45	Keynote Address	Prof. K.S. Rao	Climate change and human wellbeing
	Invited lecture	Dr. Nisha Mendiratta	Eight national missions on climate change
15:45-16:00	TEA		
16:00-16:45	Valedictory Session Chief Guest: Prof. K. S. Rao Guest of Honour: Dr. Nisha Mendiratta Concluding remarks and vote of thanks Dr. Kalyani Krishna and Dr. Abhishek Chandra (Conveners) Dr. Pooja Gokhale Sinha and Dr. Sunita Yadav (Co-conveners)		

National Seminar

Challenges in Climate Change and Sustainable Development

6-7th April, 2019

Abstract Book



**Organized by
Sri Venkateswara College, University of Delhi,
Delhi
&
Society for Environment and Development
(SED India) New Delhi**



**NATIONAL SEMINAR
ON**

Challenges in Climate Change And Sustainable Development

6 – 7th April 2019

Abstracts Book

Organized by
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New Delhi**
&
**Society for Environment and Development
(SED India) New Delhi**



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Keynote lectures

Climate Change, Biodiversity and Human Wellbeing

C.K. Varshney

Professor Emeritus

School of Environmental Sciences, Jawaharlal Nehru University (JNU), New Delhi

&

Distinguished Adjunct Professor

Asian Institute of Technology (AIT), Bangkok

Abstract

Climate change is one of the most important global environmental challenges of unprecedented scale and impact on biodiversity. The enormity of climate change is daunting and dispiriting. Climate change scenarios include increased temperature of land and ocean surfaces caused by accelerated emission of CO₂ from burning of fossil fuels. Secondly, CO₂-induced changes of climate may alter levels of temperature, rainfall pattern and sunshine resulting in significant loss of biodiversity, plant growth and global primary productivity. Further, melting of glaciers and rise in sea level may lead to, inundation and increasing salinity and loss of coastal agroecosystems. Climate change over the last few decades has already affected biodiversity. Warmer temperatures have, affected the timing, reproduction of plants and animals and/or migration of animals, the length of growing season, species distribution and population size, and the frequency of pest and disease outbreaks. The projected climate change during the 21st century will occur faster than in at least the 10,000 years and combined with land use changes and exotic and alien species spread. The projected impact due to change in mean climate, extreme climate events and climate variability will shift the climate range of many species towards poleward or upward in elevation from their current locations. Species will be affected differently by climate change; some will be able to migrate through fragmented landscapes whilst others may not be able to do so. Many species that are already vulnerable are likely to become extinct. Climate change induced biodiversity loss will affect all but the impacts will be more prominent on the already stressed ecosystems. The changing climate has serious consequences for agrobiodiversity, crop production, food security, poverty reduction, inclusive growth and human wellbeing.

Keywords: Climate change; biodiversity; agroecosystems; food security



Climate Change and Human Wellbeing

K.S. Rao

Department of Botany, University of Delhi
New Delhi

Abstract

The anthropogenic influences on climate change are considered to be the unavoidable future where human wellbeing is being looked at by policy planners and development agencies. This outlook of facing the climate change uncertainty requires proper understanding of sustainable development principles. The IPCC projections indicate under the business as usual model the global mean temperatures could be increasing by more than 3°C while the projected mean temperature increase could be reduced to as low as about 0.5°C with reduction in global CO₂ footprints by various stakeholders. While the potential climate change could impact the sea levels, varied precipitation levels and atmospheric temperatures; this will lead to disruptions in human health, food production and natural resource availability. The trends in the mean temperatures during the 20th century indicate significant increase in maximum temperatures while no such changes were seen in the minimum temperatures. Thus the diurnal temperature variations are increasing. The monsoon period precipitation anomalies also indicate that the number of deficit years is becoming more frequent during the late 20th century. The foundation of the human wellbeing lies in the simple principle that the environment is supreme in which the sociopolitical system has to use economic instruments to achieve sustainable society. The progress made towards achieving the Millennium Development Goals was so disheartening that, people started doubting whether the proposed Sustainable Development Goals could be achievable or not. The biodiversity front is more alarming as more species are expected to be extinct in the near future is proper conservation efforts are not put in place. Competition for land is the major cause of disruption in the conservation efforts. Barring Asia Pacific and Europe no region has recorded positive net change in the vegetation cover during the last few decades. Population growth, affluence and technology impact are the major causes of current state of anthropogenic influences on the climate. While technology could be put to better use to make people aware and take mitigative steps, the economic costs are becoming prohibitive. The investment requirements for GHG mitigation and ameliorative measures will be increasing exponentially in the next few decades and thus going to put additional costs on the development projections of the country. To achieve the human wellbeing in a sustainable way, population control and reduction in wastage of resources need to be addressed urgently.

Keywords: Climate change; biodiversity; human wellbeing



Reducing Carbon and Ecological Footprints for Sustainable Development

Anubha Kaushik

University School of Environment Management, Guru Gobind Singh Indraprastha University
New Delhi -110078. Email: akaushik@ipu.ac.in

Abstract

Sustainability is the capacity of the earth's natural systems and human cultural systems to survive, flourish and adapt in to a long-term future. But, in the pursuit for growth and development, we are jeopardizing the sustainability of our life support systems. Development is, however, vital to raise the standards and quality of life of people on this earth. It is therefore, very important that we know our natural capital, its carrying capacity and assimilation capacity. The ecological footprints of humanity has to be maintained in tune with the earth's carrying capacity, which has already been exceeded by 21%. In this context, it is absolutely essential that we also reduce our carbon footprints. Today's economy is largely carbon based and worldwide demand for energy is growing at an alarming rate of 1.8% per annum for 2000-2030, which is being met largely by limited reserves of fossil fuels. Carbon dioxide emissions from developing nations are projected to account for more than half the world CO₂ emissions by 2030. Hence we have to move towards a low carbon economy. The paper evaluates the pressures created by increasing populations in developing and developed countries on our natural capital and on earth's carrying capacity, and discusses ways and approaches to develop in a sustainable manner by reducing our carbon and ecological footprints.

Keywords: Climate change; Sustainability; Carbon dioxide emissions



Impact of Climate change on floristic diversity in coastal Tamilnadu

C. Rajasekaran and T. Kalaivani

Department of Biotechnology, School of Bio Sciences and Technology
Vellore Institute of Technology, Vellore – 632 014, Tamilnadu
Mobile : +91-9442994888, Email: drcrs70@gmail.com

Abstract

The word climate refers to the long-term weather patterns within a defined region including temperature, humidity, wind, and amount and type of precipitation. Weather refers to hourly, daily, or weekly changes in the atmosphere, while climate is generally realized for years, decades, centuries, and millennia. Global warming reflected in changing the seasonal and climatic pattern which affects the biological diversity. Recent past, climate change and its impact on life forms being considered as an important area of investigation. Sand dunes in coastal region indulge as an ecological niche between terrestrial and marine ecosystems, this region biological diversity huge and has ecological significance. It has been severely disturbed due to global warming, increasing anthropogenic activities, rapid urbanization and industrialization resulting in loss of habitat as well as flora and fauna. Therefore, constitution of effective strategies to recover the biotic and abiotic components of the sand dunes and marine environment is the need of the hour. Further, floristic diversity in sand dunes and marine coastal region is poorly understood in many parts of Tamilnadu. Therefore, it is our maiden attempt on document the effect of seasonal changes on sand dune vegetation and seaweed diversity of coastal regions of Tamilnadu starting from Pulicate Lake to Thengapattanam. This study may also enable us to understand the phytosociology pattern between sand dune vegetation and seaweeds dwelling in coastal regions and also for the development of effective conservation strategies to protect our precious bio resources.

Keywords: Bio resources; Biodiversity; Conservation; Coastal ecosystem; Sand dune; Seaweeds



Invited lectures

Bioresource Utilization Pattern and Energy Value of Agroforestry Systems in Himalayan Rural Landscape

P.C. Phondani^{1*}, Abhishek Chandra^{2#} and R.K. Maikhuri³

^{1*}Department of Botany, Government Degree College Chandrabadni (Naikhari), Tehri Garhwal
Uttarakhand

²Department of Environmental Science, Sri Venkateswara College, University of Delhi South Campus
New Delhi- 110021

³G. B. Pant National Institute of Himalayan Environment and Sustainable Development, Garhwal Unit
Srinagar-246174, Uttarakhand

*Email: prakashphondani@gmail.com

#Email: ac.india@gmail.com

Abstract

Agroforestry is widely practiced and internationally recognized as a farming practice with the potential to promote biomass and supply of domestic energy demand. However, this region face sharp decline in availability of fuelwood and fodder as a result of changing climatic conditions and depletion of bioresources. In the present study, comparison of seasonal consumption pattern of fuelwood, fodder and energy was analyzed in different village clusters across elevational gradients. Diverse stakeholders were consulted in ranking of plants having ecological and social values, and 10 species were prioritised for plantation and sustainability of the indigenous system. The average fuelwood consumption ranged between 258.27 ± 37.14 to 342.72 ± 38.02 kg capita⁻¹ year⁻¹ and fodder consumption ranged between 158.37 ± 13.81 to 468.05 ± 18.97 kg unit⁻¹ year⁻¹. However, the energy value of fuelwood and fodder consumption ranged between 2217.23 ± 193.36 to 7395.24 ± 299.70 MJ kg⁻¹. The study highlighted that the fuelwood and fodder consumption was significantly higher ($p < 0.05$) during the winter season as compared to summer and monsoon. The outcome of the study advocates the growing of knowledge for efficient and effective conservation and planning to increase in provision of different ecosystem services, that agroforestry provides not only to farming communities to this region but also to the global population.

Keywords: Agroforestry; Bioresources; Biomass; Energy value; Local people; Western Himalaya



Techniques of generating energy from municipal solid wastes: an Indian perspective

Hardeep Rai Sharma

Institute of Environmental Studies, Kurukshetra University, Kurukshetra, Haryana-136119

Email: sharmahardeeprai@gmail.com

Abstract

Annually about 62 million tonnes of waste is generated in India and generation will increase to about 165 million tonnes in 2030 as per Press Information Bureau, 2016. More than 50% of the total solid waste generated remains untreated and disposed in landfill sites. The improper and unscientific methods of municipal solid wastes (MSW) disposal particularly open dumping, uncontrolled burning and landfilling leads to public health hazards and environmental hazards like groundwater contamination, soil and air pollution. However if managed properly these waste can be converted to compost, biogas, ethanol, generate electricity and save resources. Different waste processing technologies like composting, vermin-composting and bio-methanation, mass burn incineration, gasification, and pyrolysis are in use to generate “Wealth from the Wastes”. Refuse derived fuel (RDF) can also be prepared from combustible portion of MSW and used as a feedstock for Waste-to-Energy (WTE) plants. The processing of MSW like proper segregation and appropriate choice and use of technology is must for the success of any WTE plant and failure to do so result in malfunction and economic loss to country. The present work will discuss different disposal techniques of MSW and waste to energy options currently in operation in India which ultimately cause less environmental pollution and reduce the greenhouse gas emissions.

Keywords: municipal solid waste; disposal; landfilling; incineration; waste-to-energy



Achieving Sustainable Development and Sustainability Science

Education in India

Y. S. C. Khuman

School of Interdisciplinary and Transdisciplinary Studies
Indira Gandhi National Open University, Maidan Garhi
New Delhi - 110068

*Email: yanglem@gmail.com

Abstract

Climate change is one of the major challenges in achieving sustainable development across the globe. The challenges need to be aware to all stakeholders of the society. It is here where education plays an important role. In India, Indira Gandhi National Open University (IGNOU) is taking key roles in inclusive education across the country with a major approach to reaching the unreached in different disciplines. In this line, IGNOU has developed different programmes at different levels viz. appreciation, certificate and diploma under new emerging discipline Sustainability Science with an objective to inclusive sustainability education in India. This paper briefly gives an account on the concept and genesis of sustainability science in India. The major focus is on the objectives and contents of different courses on sustainability science.

Keywords: Climate change; Education; Sustainable development



Variability of Climate Trends in Punjab-An Overview

Puneeta Pandey

Department of Environmental Science and Technology
Central University of Punjab, City Campus, Mansa Road, Bathinda, Punjab-151001
Email: puneetapandey@gmail.com

Abstract

The climate of the earth has been changing since historical times. However, the term ‘Climate Change’ has been gaining a lot of attention in recent years due to increased anthropogenic inputs as a result of rising industrialization and urbanization; that have resulted in change in climate patterns over the last few decades or a few hundred years. Changes in climate can occur through both natural and human-induced causes. The natural causes include internal fluctuations that exchange energy, water and carbon between the environmental matrices as well as variations in the solar energy received from the sun and volcanic eruptions. The anthropogenic causes include changing concentrations of greenhouse gases in the atmosphere (CO_2 , CH_4 , N_2O) as well as aerosols and changing land cover. The impact of climate change in Punjab may be assessed through variability in rainfall, temperature and relative humidity. The paper discusses India’s response to climate change and the adaptation methods for climate change adopted by the state of Punjab. The key sectors requiring emphasis for mitigating the climate change have also been discussed.

Keywords: Climate Change; Greenhouse gases; Aerosols; Variability; Adaptation



Impacts of climate change on Water Resources with special reference to River Ganga

Shiv Pratap Raghuvanshi, Pankaj Kumar, Ajit Kr. Vidyarthi

WQM-II Division, Central Pollution Control Board, Delhi

Email: spriitd@gmail.com ; +919811240580

Abstract

Climate change due to global warming is assumed to increase intensity and frequency of climate hazards, extreme weather events, enhanced monsoon variability, rise in sea level including socio-economic impacts on living species. Water being elixir of life and is utmost important natural resource for living beings have direct impact on variable changes in climate. Water resources are sources of water that are useful or potentially useful to human. India, the largest peninsula of the world, with a total area of 3.3 million km², receives an average precipitation of 1170 mm (46") per year or about 1720m³ of freshwater per person per year. There are three main sources of water in India: groundwater, rainfall and glacial snow melt in Himalayas. Rivers acts as arteries for circulation of water received from precipitation or glacial melt. India have 14 major river basins and Ganga basin is fed by 23 river systems and catchment is in states of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal. Ganga River or any river flows from high gradients to low gradient, owing to the force and velocities created as a result of gradient difference and amount of water flowing, riverbed surface material easily erode away in form of silt, building banks, side-edge lands. Due to the process of silt deposition en-route, the stream power is lost proportionately, as well. The river streams forming Ganga are mostly glacier fed streams. More the climate changes due to growing temperatures as a result of global warming, heavy and sudden precipitation causing cloud bursts, flash floods, more and more ice melts from glaciers leading to higher volume of water with higher velocity streams feeding Ganga. Due to increase in greenhouse gases in atmosphere because of uncontrolled industrial growth and other unscientific developmental anthropogenic activities that cause global warming and leads to climate change. Recently floods situations are on rise in most of river basins including Ganga River Basin. It can be understood that Rising trends in floods quantity can be due to absence of continuous embankments along river stretches, course-shifting tendencies of rivers, reduction in carrying capacity of river due to enhanced silt deposition in river beds and encroachment of flood plains by people. Present paper presents a brief overview on greenhouse gases, impacts of global warming generated climate change on water resources with focus on Ganga River in India.

Keywords: Climate change, water resources, Ganga River, Greenhouse gas, floods



Role of flue gas desulphurization (FGD) toward controlling of Green House Gases (GHSs) emission

Amit Kumar Gupta

Regional Office, Ministry Of Environment, Forest & Climate Change, Lucknow

Email: amitenv@yahoo.com, amitkr.gupta@nic.in

Abstract

Combustion of fossil fuels (e.g., coal and oil) resulting in emissions of sulfur dioxide (SO₂) which can harm human health and deteriorate environments (Acid deposition & Soil acidification). Ministry of Environment, Forest and Climate Change (MoEF& CC) vide Notification dated 7.12.2015 has brought out new emission norms for thermal power stations. To meet the new emission norms, installation of flue gas desulphurization (FGD), is a process of removing Sulphur from flue gas of Thermal power plants (TPPs) before it is released into the atmosphere, system has become essential in new as well as existing thermal power plants. The flue gas scrubbing process using three technology including limestone or lime as an absorbent and producing gypsum as a by-product, which is being used in different sector like cement, wall board, plaster of paris, soil conditioning etc. Overall installation of FGD up to 2022 will certainly helpful for controlling of SO_x and NO_x emission in the country and play pivotal role towards controlling of GHSs emission or minimizing the pace of climate change.

Key words: flue gas desulphurization (FGD), Thermal power plant (TPPs)



Institutional dynamics and climate change adaptation in India cities

Vikrant Tyagi

Project Coordinator, Implementation Support to the India EU Water Partnership

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

GIZ Office (India)

Abstract

Cities across the globe are experiencing changes in weather and climatic patterns attributed to global climate change. Consequently, urban areas are experiencing events like heat waves, water shortage, storm surges and natural disasters like floods. The impact of these events is hampering the various services provided by the urban areas and in the process, create housing, health and livelihood hardships for urban dwellers. Cities, to continue with their role as engine to socio-economic development require that urban local bodies make efforts to protect the urban ecology, the built environment and human populace. In line with what is experienced globally, Indian cities, too, are vulnerable to hazards posed by climate change. However, most of the cities are not ready with the resilience and adaptation strategies to reduce the vulnerabilities posed by changing climate. There are multiple reasons for this. First, majority of urban local bodies are still struggling with development challenges such as education, road and drainage infrastructure, health facilities etc as a result managing the impacts of climate change is still not on their priority list. Second concept of developing and implementing climate resilient plans is completely missing in Indian cities like as in many other developing economies. Third, urban local bodies have limited personnel and technical capacities to work on issues related to management of climate change in urban areas. Fourth, though there are many research institutions generating the data on climate change and possible impacts, but data is not converted into aggregated information which can help in planning especially related with infrastructure investment. Further, there is not just multiplicity of problems but also of authorities which tend to work in silos whereas climate change cuts across several departments: public health, water, environment & forest, energy, social justice to name a few. Considering that India has been ranked as the sixth most climate change-vulnerable country by the Climate Risk Index 2018 as well looking on the capacities and resources available it is prudent that urban local bodies should have governance framework for climate risk management in cities.

Key words: Climate change; adaptation; urban local bodies; governance



Oral lectures

Role of Tribal Peoples in Conservation of Water Resources: A Lesson to Learn for a Sustainable Future

Shambhu Prasad Chakrabarty¹ and Durjay Kumar Deb²

¹Amity Law School Kolkata

²CBPBU, West Bengal

Abstract

Tribal peoples and indigenous communities across the world have lived a life which is sustainable and conservative. The various methods that the tribal communities have adhered to and inherited for thousands of years is worth a consideration in the era which is considering every possible means to conserve drinking water. The article explores some of those techniques used by these peoples and how they managed to conserve it. The other broad area of the paper includes the modern technological development as the prime reason for water scarcity in this planet. Technology has developed to such an extent that sea water are now transferred to drinking water. But the process is very expensive and increases the cost beyond the reach of most countries. Would reconsidering the old techniques used by indigenous communities in India or those in Amazon and reintroducing them solve the problem, or are we too far from that due to practical reasons. The time has come to adapt the older techniques in a new avatar to address the gravest challenge the world have ever faced. The time has come to make a change and it is worth a consideration to look back into the pages of the past.

Keywords: Climate change; tribal people; water resources; conservation



Use of Commercial Media to Cultivate *Scendesmus* Sp. for Biodiesel Production in Race Way

Randhir K. Bharti¹, Richa Katiyar², Prerana Sharma¹, Dolly Wattal Dhar^{3*}, Anubha Kaushik^{1#}

¹University School of environmental management, GGS Indraprastha University, Dwarka
New Delhi

²Centre for Technology Alternatives in Rural Areas (CTARA), Indian Institute of Technology
Bombay, Mumbai-400076, Maharashtra

³ Centre for conservation and utilisation of blue green algae (CCUBGA), Division of Microbiology
Indian Agricultural Research Institute (IARI) , Pusa, New Delhi

*Email: dollywattaldhar@yahoo.com

#Email: anubhakaushikes@gmail.com

Abstract

Already existing literatures have been reported microalgae as the efficient source of renewable energy. By considering this fact, this study is mainly focused towards the assessment of indigenous microalga i.e. *Scendesmus* sp. for biodiesel production. The low-cost commercial medium (N,P,Kfertilizer) was utilized to cultivate microalgae in 1000 L capacity raceway pond. The assessment of growth was performed after 14 days, followed by cell harvesting by using economical gravimetric method. Results have shown 437g /1000 L of dry weight (dw) of algae, with lipid content of 22.6% (dw).The analysis of lipid samples was performed by using FTIR and NMR spectrum. Further, the optimized lipid extraction and transesterification protocols were used for biodiesel production and estimation. The data has shown nearly 76% yield of fatty acid methyl ester (FAMES), which mainly comprises of palmitic, oleic,linoleic and linolenic acid methyl esters. Moreover, the physical parameters estimation showed the better quality biodiesel production, which was compliance well with ASTM standard. Hence, *Scendesmus* sp. can be explored as a promising strain for biodiesel production in future.

Key words: *Scendesmus* sp; Race way; Biodiesel; Lipids; Commercial media; FAMES



Mapping surface soil characteristics of barren land by using geospatial technology in NCT of Delhi

Sangita Singh¹ and Kiranmay Sarma¹

¹University School of Environment Management, Guru Gobind Singh Indraprastha University,
Sector 16C, Dwarka, New Delhi-110078

#Email: sangita.usem.007163@ipu.ac.in,

*Email: kiranmay@ipu.ac.in

Abstract

Mapping of barren land is considered to be of great concern as it is the most increasing land use type around the world. Mostly soil was assessed in terms of agricultural purposes but there is a need to assess the soil characteristics of barren lands as well. The present study aimed to determine and map the spatial variability in chemical properties of barren lands of NCT of Delhi. A total number of 22 sampling sites were selected and soil surface samples were collected during January 2018. The parametric analysis was done for soil pH, Electrical Conductivity (EC), Bulk Density (BD), Organic Matter (OM), Gypsum Requirement, Calcium Carbonate (%), Soil Calcium and Soil Magnesium. The results showed that the mean value ranges for pH (6-8.2), EC (70-6100 μs^{-1}), BD (1.46-2.79), OM (1.84-17.67), Gypsum Requirement (154.08-175.65 tons/ha), Calcium Carbonate % (41.85-132.52) were obtained. The study utilizes the data for the thematic map generation for interpolation by using kriging tool. Interpolation maps were prepared for each of the parameter. From the analyzed description, a linear correlation existed between some of the parameters (soil pH and EC) followed by Gypsum requirement and calcium carbonate percentage. The study provides an idea for locals, administrators, policy makers as well as stakeholders to use the barren lands for developing green spaces in city or recreational sites. This study is an approach towards integration of field data with GIS integration using ArcGIS. Till date no study has been carried out in Delhi region regarding the mapping of barren fields.

Keywords: Barren land; Delhi; Soil; Kriging; Interpolation



Recovery pattern of soil physico-chemical properties in landslides triggered in Alaknanda watershed, Uttarakhand

Deepesh Goyal and Varun Joshi*

University School of Environment Management
Guru Gobind Singh Indraprastha University, New Delhi – 110078

*Email: varunj63@gmail.com

Abstract

Uttarakhand being a part of Indian Himalayan Region (IHR) is highly vulnerable to number of natural hazards. This region has been severely affected as the frequency of environmental hazards, such as earthquakes, landslides, cloudbursts and flash floods has increased. Among these disasters, landslides are one of the major natural disasters that occur very frequently in the Indian Himalayas causing excessive damage of infrastructure and loss of lives every year. Himalayan region, because of its fragile geology and active tectonic activity, is highly prone to landslides. The major causes of the landslides are both natural and anthropogenic. In landslides, upper fertile layer of soil is carried downslope, taking all the vegetation with it. Because no fertile soil is left for new plants to germinate, the bare areas of landslides can remain visible for many years. In the Alaknanda valley there are many landslide prone areas along the roads and in nearby villages where landslides causes significant damage to ecosystem, vegetation and cropland. Since, local dwellers are completely dependent on forest products and on land for crop production; it becomes crucial to assess the loss of soil (fertility, concentration of nutrients and other physico-chemical characteristics) and how much time would be required by soil to recover its characteristics to reach the level of undisturbed soils. Therefore, the present study aims to quantify the changes in the soil characteristics along the chronosequence of landslides occurred in Alaknanda watershed. The effect of landslides on soil characteristics is determined by comparing the properties of soil of landslide affected and unaffected areas. Soil physico-chemical properties are considerably changed after the occurrence of landslide; especially in terms of high soil pH value, low nutrient content and soil organic carbon (OC), K^+ and total N in recent landslides as compared to the older sites. Temporal variation in soil characteristics suggests that the soil fertility and nutrient content in landslide affected soil increases over time and reaches the levels of the corresponding undisturbed soils.

Keywords: Fertile soil; Alaknanda; Physico-chemical characteristics; Chronosequence



Mapping gender based risk to climate change: using the gender analysis approach

Smita Chakravarty, Savita Aggarwal, Vandana Sharma, Jagriti Kher

Department of Development Communication and Extension, Institute of Home Economics,
University of Delhi

Department of Development Communication and Extension, Institute of Home Economics,
University of Delhi

Email: smitachak.21@gmail.com

Abstract

The impacts of climate change are being experienced across the globe and climate change is now recognized as a top global threat. Changes in climatic parameters are expected to have widespread effects on the environment as well as different socio-economic sectors. The differential impacts of climate change on women have been well documented. Climatic changes, stresses and extremes have a negative impact on the availability of natural resources on which poor women are highly dependent. Due to increased time required to fulfill their gender based roles, women continue to remain disadvantaged leading to high gender inequalities in different domains. The present study uses the IPCC risk assessment framework proposed in AR5 to map the risk faced by women at the sub-national level in India. In view of the multiple roles played by women in the household including production, reproduction and childcare, Caroline Moser's Gender Analysis Framework (a subset of socio-economic tools to examine the gender based differences/impacts of a phenomenon or technology) has been used to incorporate gender specific vulnerability of women to climatic variability and extremes. A Gender based Climate Risk Index (GCRI) in current climate scenario has been developed to capture the vulnerability and resultant risk faced by both men and women at the sub-national (state) level in India using secondary data from a variety of sources. The index has been validated and checked for reliability. Normalization method was used to compute the index values with equal weightage to all the components. The study has shown considerable differences in the risk faced by men and women across all states. The values of the Gender based Climate Risk Index for females varied from 0.32 in Chandigarh to 0.60 in Bihar. For males, the values of risk index varied from 0.22 in Goa to 0.44 in Bihar. Despite experiencing the same level of hazards and exposure, females experienced much greater level of sensitivity to climate change and extremes and had much lower capacity to adapt to climate change leading to their greater vulnerability and consequently risk to climate change and hazards. The study emphasizes that gender based quantification of risk can help in formulating climate policies which are gender transformative leading to equitable development and empowerment of women.

Keywords: Climate change; gender; vulnerability; risk; lack of adaptive capacity



Lichen as bioindicators: their mechanisms and role in biomonitoring

Nikita Goel, Kadambini Das, Pooja Baweja* and Adesh Rani

Department of Botany, Maitreyi College, University of Delhi, New Delhi – 110 021

E mail: poojabaweja@gmail.com

Abstract

The overexploitation of natural resources, exponential growth of the human population and advancement in the technological growth over a short period of time has changed the major biogeochemical cycles. This has also lead to irreversible loss and even the extinction of genetically distinct species from the surface of the Earth. Use of technology and modernization has led to socioeconomic development. However, these have also led to a variety of harmful side effects. Various harmful pollutants are liberated into the atmosphere from different sources in the form of pesticide, herbicide, nitrogen oxides, sulphur oxides, heavy metals and particulate matter. These pollutants not only threaten the human and animal health, reproduction of insect and birds, but also cause plant diseases and disturb the structure of the ecosystem. Significant primary information about the diversity, quantity and quality of pollutants present in the atmosphere can be easily studied by the use of biomonitors. This information could be very useful as an early warning signs for the identification of alterations in the environment. Different organisms have been used as bioindicators for monitoring of the atmospheric air pollution. Among these organisms, lichens were very early designated as “bioindicator” to obtain information about local and regional variations in air and heavy metal pollution. This presentation will explore the suitability of lichens as biomonitors/bioindicators and methods which can be used for biomonitoring using lichens.

Keywords: Lichen; Ecology; Pollution; Bioindicator; Biomonitor



Are the impacts of climate change gender neutral? A case study of slums in capital city of India

Theme: Climate change: Impacts, Mitigation and Adaptations

***Jagriti Kher^a, & Savita Aggarwal^b**

^a Department of Development Communication and Extension, Institute of Home Economics,
University of Delhi

^b Department of Development Communication and Extension Institute of Home Economics,
University of Delhi

*Email: jagriti28@gmail.com&savitaaggarwal@gmail.com

Abstract

Women share a very special relationship with water and their role as water managers for the family is undisputed in most of the developing world. Studies conducted in different parts of the world have shown a clear linkage between gender and water. In developing countries including India, a considerable portion of rural and peri-urban population lack access to safe water and sanitation. This adversely affects the lives of women and children since they bear the burden of head loading water for their families. All developing countries including India are facing rapid urbanisation, adding to slum population. As per estimates, almost 600 million people will be living in slums in India by 2030, giving a character of giant slum to the country. Climatic changes coupled with non-climatic drivers affecting the quantity and quality of water availability and will further confound the scenario. The present study has been conducted to assess the vulnerability of the slum women to climate linked water stresses using both qualitative and quantitative approaches in Delhi, the capital city of India. A tool called 'Climate Vulnerability Index for water at the household level' (CVI-WH), which links physical availability of water to socio-economic drivers of human development, was used to quantify the vulnerability of slum families to climate linked water stresses. The quantification of CVI-WH was done using a combination of primary and secondary data. The primary data was collected through a survey conducted on a statistically defined sample of 300 families across the five major regions of Delhi. The secondary data was collected from a variety of sources. As part of the qualitative assessment, Participatory Learning and Action (PLA) techniques such as focused group discussions, resource maps and seasonal calendars were used. The qualitative and quantitative assessments have shown that the slum women were highly vulnerable to climate mediated water stresses with CVI-WH values ranging between 0.62 and 0.67 across regions of Delhi as compared to whole of Delhi placed at 0.36 (higher values indicated increased vulnerability). This was due to limited human development, poor access to water resources, very limited use of water and a dismal state of environment. The study has shown that there is an urgent need for enhancing the adaptive capacity of poor women to enable them to lead climate resilient lives.

Key words: Climate change; slums; water; women; vulnerability



Effect of Cadmium stress on Growth and Development of *Cicer arietinum* (Fabaceae)

Akshita¹, Vanshika Maheshwari¹, Muskan Singla¹, Ritu¹, Parul¹, Nisha Jariyal¹, Dharmendra Kumar² and Pooja Baweja^{*1}

¹Department of Botany, Maitreyi College, University of Delhi, Delhi – 110021

²Marine Biotechnology Laboratory, Department of Botany, University of Delhi, Delhi – 110007

*E mail: poojabaweja@gmail.com

Abstract

Heavy metals are major environmental pollutants, which are being accumulated in soil due to various anthropogenic activities posing a greater risk to plants, animals and humans. Contamination of soil with heavy metals causes degradation of cultivable lands. When plants are grown on such lands, usually accumulate metals in appreciable quantities, thereby resulting in reduced growth and yield. Increasing evidences, that excessive occurrence of heavy metals is associated with human and animal diseases have emphasized the need for a better knowledge of the way plants respond to heavy metal stress. When the soil is contaminated with heavy metals, plants take up them through root system. Later, these heavy metals get accumulated in plants affecting physiological and metabolic processes, leading to agricultural loss. In the present study, one of the heavy metal i.e. Cadmium (Cd) is selected to study its effect on *Cicer arietinum* (Chick Pea). Different concentrations of Cd are used i.e. 25µg/ml, 75µg/ml, and 150µg/ml to study its effect on various morphological & biochemical parameters such as % seed germination, number of leaves, number of branches, root length, shoot length, cotyledons, chlorophyll pigments, total proteins, phenols, lipids, and total carbohydrates. The salient findings obtained during present investigations will be discussed in the following presentation.

Keywords: Cadmium; Carbohydrates; Growth; Heavy Metals; Stress



Mapping of vulnerable landslide zones using remote sensing and field techniques between Saknidhar and Devprayag area along National Highway 58, Uttarakhand, India

Kush Kumar, Varun Joshi* and Prakash Biswakarma
University School of Environment Management,
Guru Gobind Singh Indraprastha University, Delhi-110078.
*Email: varunj63@gmail.com

Abstract

The Himalayas being a part of instable tectonic system faces various natural and man made disasters. Hilly terrain of Uttarakhand state similarly encounters numerous natural disasters. Landslide, one of the most common disaster during monsoon season results in loss of life, property and transportation communication. Present study aims to investigate vulnerable landslides zones and their causative factors from Saknidhar to Devprayag, Uttarakhand along National Highway (NH) 58. NH 58 is the life line for residents of the district Tehri, Uttarkashi, Chamoli, Rudraprayag and Pauri Garhwal. Satellite imagery, toposheet (53J/12) and GPS on GIS platform used to analyse the data. Large scale geological mapping and lineament density mapping carried out in the study area along National Highway 58 to identify the slope instability. Sandstone, quartzite of Chakrata Formation and phyllites of Chandpur Formation of this area displays different types of discontinuities and shattering of rocks. Debris slide, rock fall and creeping are most prominent mass movement observed in the study area. Present road widening under Char Dham Yojana project along NH 58 necessitates simultaneous suitable mitigation and treatment of potential landslide zones. Even the dumping zone of debris accumulated by hill slope cut need to be properly tackled as it could pollute and increase the sediment load in Ganga river water. There are 10 vulnerable landslides observed in and around study area. Based on information, landslide location, landslide inventory and map prepared. The paper discusses about the causative factors of triggering of landslide such as precipitation, higher density of fracture, joints, steep slopes, brittle-ductile shearing zone toe erosion, and unplanned construction work. Bioengineering, retaining wall, wire mesh, anchoring, rock bolting, shotcrete and culvert pipe are the suggested mitigation measures which will be very helpful for slope stability and smooth operation of vehicular traffic in future.

Keywords: Landslide; Saknidhar-Devprayag; Large scale mapping; Mitigation measures; National Highway 58



Production of sustainable bricks using waste fly ash in Kota District of Rajasthan, India

Hemant Kumar Nagar^{1#}, Shibaji Baghar^{1,2}, J. Dinakaran^{1,3} and Abhishek Chandra^{1,4}

¹ Society for Environment and Development (SED India), New Delhi

Department of Botany, Swami Shardhanad College, University of Delhi, Delhi 110035

Department of Botany, University of Delhi, Delhi 110007

Department of Environmental Science, Sri Venkateswara College University of Delhi, Delhi 110021

[#]Email: er.hemant15@gmail.com

^{*}Email: ac.india@gamil.com

Abstract

The fly ash from thermal power stations is a most hazardous material and affecting the ecosystem function. The fly ash material has been used extensively as a soil promoter in the agricultural system to improve the soil quality. Thus the use of fly ash material in making bricks can also lessen the consumption of clay material and reduce the over exploitation of the natural resources. The fly ash bricks are chemically bonded bricks manufactured by utilizing 80- 82% of fly ash, which is a major waste byproduct of pulverized coal fired Thermal Power Stations. In the current study, we manufactured the bricks by using fly ash from the Thermal Power Stations at Kota district of Rajasthan. The manufactured bricks are having the salient features 1) stronger than class-I burnt clay building bricks 2) uniform in size and shape which consumes 20-25% less cement mortar 3) these bricks have cement gray in color, smooth surface and low water absorption capacity and 4) being lighter in weight in comparison to the conventional red bricks and the transportation cost will be less. Therefore, adoption of this process helps to conserve invaluable topsoil of agricultural land. By consuming 80-82% fly ash, the cause of environmental pollution and hazards due to disposal is minimized. Reduction in weight was also observed in the fly ash bricks, which would lead to overall weight reduction of the structures. The present study suggests that fly ash material can be used to make sustainable bricks and reduce the environmental pollution. It also helps to reduce the problem of fly ash in the environment and reduce the high carbon footprint.

Keywords: Brick; Fly Ash; carbon footprint; top soil fertility; Environmental Pollution



Status, Conservation and Threats to Red Junglefowl (*Gallus gallus*) in Katarniaghat Wildlife Sanctuary, Uttar Pradesh, India

Ahmad Masood Khan¹ and Satish Kumar²

¹Center of Environmental Sciences and Engineering (CESE), School of Natural Sciences (SNS), Shiv Nadar University, Greater Noida-201 314, Uttar Pradesh

²Department of Wildlife Sciences, Aligarh Muslim University, Aligarh-202 002, Uttar Pradesh
E-mail¹: masoodwls@gmail.com; E-mail²: satishkumar.amu@gmail.com

Abstract

Galliformes are one of India's best known bird groups. The larger species, particularly the pheasants, are well known in India. The Red Junglefowl (*Gallus gallus*) is a tropical member of the pheasant family. The species is declining owing to habitat loss, its degradation and over-hunting for food almost all over its distributional range in India. The Red Junglefowl is widely distributed and its five subspecies are spread from the Indian subcontinent eastwards across Myanmar, South China, Indonesia to Java. In India, two sub-species occur, the type specimen, *Gallus gallus murghii* and *Gallus gallus spadiceus*. While the former is found in the north and central part of India, extending eastwards to Orissa and West Bengal, the latter is confined to the north eastern parts of India. The species' range across India is now highly fragmented due to agricultural encroachment and other developmental activities. Very little information is available regarding the status and threats of Red Junglefowl whereas fewer details are available regarding patterns of habitat use by this species in India. The goal of this present study was to examine habitat-wise and temporal patterns of distribution and abundance of Red Junglefowl in Katarniaghat Wildlife Sanctuary, India to help develop a long-term conservation and management of the species. It is believed that the genome of Red Junglefowl in India has become impure due to its hybridization with Domestic fowl (*Gallus domesticus*). However, the level to which contamination of its genome has occurred is not known to date. This is a very serious threat to the species pertaining to its long-time survival. The major threat for this species at present is excessive hunting all over its distribution range irrespective of the protection status of forest habitat where it occurs.

Keywords: *Gallus gallus*; Population; Conservation; Katarniaghat; Wildlife Sanctuary



Securing livelihood and community-based conservation for sustainable resource management in Darma valley

Abhimanyu^{1,2*}, Mahendra Singh Kunwar¹, and Amarjeet Kaur²

¹Himalayan Action Research Centre, Indira Nagar, Dehradun

²University School of Environment Management, Guru Gobind Singh Indraprastha University
Sector 16C, Dwarka, New Delhi

*Email: singhabhimanyu0209@gmail.com

Abstract

The present study investigates the livelihood pattern of Darma valley which comes under Dharchula tehsil of Pithoragarh district in Uttarakhand and its linkage with conservation of snow Leopard (*Panthera Uncia*) in that particular landscape. This study was done under SECURE HIMALAYA project by UNDP as 6 villages was selected named as Baun, Dugtu, Dantu, Marchha, Sipu, Tidang for the field-based survey. As the valley receives a very high snowfall during winter season i.e. from November to April the people of villages have to migrate for 6 months near Dharchula. Apart from desk research different tools like PRA (Participatory Rural Appraisal), Household survey, FGD (focused group discussions), Key informant interviews, Direct observations was done during the field-based survey. Out of 185 total households from all the 6 villages, 35 household were selected as a sample for the survey as we have to select 20% sample. The selected area is considered to be habitat of Snow Leopard and due to dependency of local people on natural resources for their livelihood which results into human wildlife conflict. Main livestock includes Sheep and Goat and by carnivore in nature Snow Leopard attacks them which cause conflict. Their livelihood related activities are agriculture, medicinal plant cultivation and other related household works. Main agricultural crops are Potato, Palthi, Fafar, Rajma and many people in the villages with traditional knowledge of medicinal plants which includes Gandrani, koont, Jambu, Atish, Kutki. Meanwhile during the time of migration, they also depend on various woolen related work like weaving dan, chutka etc. and if provided a proper channel of market they can earn a good amount from them. Traditionally trading of insect-pathogenic fungus *Ophiocoryceps sinensis* (Keera Jari) through borders is done which results as intensive pressure on natural resources and their exploitation during the process. Therefore, the local people need to use the available natural resources in sustainable way and community-based conservation of Ounch is suggested in the region.

Keywords: Livelihood; sustainability; resource management



Variations in benzene concentration in ambient air at selected sites in Delhi

***Anshika and Shwetna Sharma**

Department of Environmental Sciences, YMCA University of Science & Technology, Faridabad

Department of Environmental Sciences, Panjab University, Chandigarh

Email: *anshikaac6@gmail.com, shwets158@gmail.com

Both the authors contributed equally

Abstract

Air pollution has been increasing drastically, especially over the last few decades mainly because of the increased industrial and other anthropogenic activities. It has many direct and indirect harmful effects on health of humans and other living organisms. Therefore, it is crucial to study the presence of various pollutants in the air. With growing pollution in Delhi-The national capital of India and it ranking consistently as one of the most polluted cities in the world (including the recent WHO rankings) makes it an ideal study area for Air pollution research in India. Benzene is a Group-1 carcinogen, which means it can cause cancer in humans, that makes it an important parameter to be studied in spite of not being one of the criteria pollutants under NAAQS. It is a VOC and is released into the air continuously through various natural as well as anthropogenic sources. Its cancerous property becomes more prominent when it is present as an indoor air pollutant. VOCs are released from various sources at home and can have long lasting impacts on the health of people. Benzene is known to cause acute myeloid leukaemia, aplastic anaemia and several other diseases. This paper deals with the study of variation of benzene on diurnal, monthly, seasonally, yearly basis in ambient air in Delhi at two selected monitoring stations of CPCB (Central Pollution Control Board Of India). Meteorological parameters such as temperature and mixing height and their variation with benzene were also studied. VOC analyzer with GC-PID was used to obtain the concentrations of benzene. Conclusions were drawn and some measures to avoid the increase in benzene concentration in ambient and indoor air were given after analyzing the data.

Keywords: Air pollution; Benzene; VOC; Carcinogen; Health effects



Preliminary assessment of natural resources and socio economic parameters of the watershed for sustainable development in Takoli Gad watershed, Tehri Garhwal district, Uttarakhand, India

Nidhi Chhillar and Varun Joshi*

University School of Environment Management
Guru Gobind Singh Indraprastha University, Delhi-110078
*Email: varunj63@gmail.com

Abstract

A watershed is a drainage basin where all water drains into common outlet which makes it an interesting hydrological unit, for the scientific attempts to manage water and soil resources. Watershed management involves mechanism of organizing and navigating land, water and other natural resources utilized in a watershed to cater the useful goods and services while reducing the impact on the soil and watershed resources. Watershed management has met with many challenges such as land degradation, soil erosion, deforestation, shortage of drinking water, and inequitable benefit sharing. Thus, prioritization of watersheds based on socio economic factors are important parameter of the vulnerable and marginal resources for sustainable development. Sustainability indicator is an important tool used to assess the status of the resource inventory of a watershed and essential to support the decision making process. The natural resources and socio economic factors both effect the watershed and its development. The entire watershed consist of 67 villages with total population of 17765 (Census of India, 2011) and total number of households are 3488 with an area of about 131.43 sq km. The watershed is divided into different land use categories like agricultural land, non-agricultural land, forest and barren land. The spring water is mainly used by local people for drinking purpose. Generally springs are community managed that is common resource which is a natural source of groundwater. Demography, occupational structure, landholding, developmental activities, education, health, general amenities, drinking water, social and cultural activities, land use are the factors considered for socio economic assessment and geomorphology, meteorology, water, soil, forest, wildlife are the factors considered for the natural resources assessment. The current status of natural resources are not adequate to cater their day to day demand. Hence, it is identified that local people must needed to be involved in decision making so that rural people can utilize their lands and natural resources in a fruitful way without deteriorating the natural resources of the watershed. The study presents a preliminary assessment of natural resources and socio economic condition in the Takoli Gad area in Tehri Garhwal district of Uttarakhand for sustainable development.

Keywords: Watershed Management; Takoli Gad; Sustainability; Resource Inventory; Socioeconomic



Effect of alternative farming practices on soil health and crop productivity

Upma Singh¹, Anil K. Choudhary², Shilpi Sharma¹

¹Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi,
Hauz Khas, New Delhi 110016

²Division of Agronomy, IARI, Pusa, New Delhi

Abstract

With the current thrust on sustainable development, eco-friendly alternatives are being applied in agriculture. While such alternative approaches are known to enhance crop productivity their impact on soil microbiome, which are sensitive markers for soil health, is less studied. Hence, the study aimed to understand the effects of different farming practices on structural and functional dynamics of rhizospheric microbial community in two legume crop systems, pigeonpea and soybean. Different modules were designed under three farming approaches, i.e. convention, conservation and organic agriculture, that also included varying parameters including types of beds, tillage, crop rotation, NPK and fertilizers dosages. The rhizospheric microbial community dynamics was examined quantitatively and qualitatively. Qualitative assessment was performed by 16S rRNA PCR-DGGE, and quantitative evaluation was done by qPCR of different genes of nitrogen and phosphorus cycles. Qualitative and quantitative assessment showed enhanced soil microbial community in conservation agriculture, trailed by organic and conventional agriculture. The results give an exhaustive picture of mechanisms involved in enhanced performance of conservation agriculture. Further it stresses upon the significance of microbiome as marker for any perturbation.

Keywords: Soil health; crop productivity; microbiome



Assessment of dominant macrophytes and paradigm for emerging invasion dynamics of Okhla Bird Sanctuary

Satish Kumar[#] and Dr. Tuisem Shimrah^{*}

University School of Environment Management

Guru Gobind Singh Indraprastha University, Sector 16C, Dwarka, New Delhi - 110078

[#] Email: ksatishindia@gmail.com ^{*} Email: tsshimrah@gmail.com

Abstract

Most of the vegetated wetlands of the globe are infested with invasive macrophytes. Invasive species are recognised as one of the leading threats to biodiversity. It causes significant impact on ecosystem service and associated livelihoods. Invasive macrophytes also influence the ecological character of wetland ecosystem through its expression associate with high production rate and number of adaptive features in various hydrological condition. Vulnerability of wetlands to invasive macrophytes has described a narrow and fragmented approach under the concept of environmental risk assessment. Within this context, eco-biological information of invasive macrophytes of the vegetated urban wetland namely Okhla Bird Sanctuary (OBS) was analysed for invasion dynamics on structural components of wetland ecosystem. Vegetation analysis of the sanctuary described that more than half of the open water area of the sanctuary is infested with invasive species. *Eichhornia crassipes*, *Alternanthera philoxeroides*, *Typha angustata*, *Saccharum spontaneum* and *Pistia stratiotes* are major invasive species reported in dominant macrophyte communities of the sanctuary. These species observed in almost all parts of the sanctuary, including both lotic and lentic habitats from densely vegetated summer season to disperse vegetation during winter season. These aggressive tropical invasive macrophytes are causing serious problem in wetland functioning. Some of the ecosystem attributes such as water quality, flow, depth and changes in landscape areas etc. have significant impact on invasion mechanisms.

Key words: macrophytes; invasion; vulnerability; environmental risk assessment; invasion dynamics



EIA : Sustainable Development Tool For Climate Change Mitigation

Kamlesh Joshi*

*School of Law, Gujarat University, Ahmedabad
Email: joshikb1971@gmail.com

Abstract

Properly performed, Environmental Impact assessment (EIA) is a useful tool for promoting Sustainable Development because it includes many components that can help facilitate intra-generational and inter-generational equity. Since the publication of the Brundtland Report in 1987, the concept of sustainable development has emerged in the centre stage of developmental planning of countries worldwide. EIA also has been identified as an important instrument for facilitating sustainability. However, to do so requires the integration of sustainability into EIA Theory and practice. Climate change is one of the key challenges facing the world today; however, there is a gap between awareness and implementation of urban development practices to address climate change and it is still perceived as a distant phenomenon by planners. Climate change incorporation in environmental assessment is a growing research area, particularly following the Paris agreement. Environmental Impact Assessment (EIA) is considered in many quarters to be an important tool in factoring climate-related components in the planning and design of a project. Sustainable development considers earth's regenerative capacity as the central theme along with the ability of its systems to recuperate and maintain productivity; with resilience as the focus. Conservation of resources is an important component of sustainable development. Environmental planning is aimed at achieving the goals of sustainable development by adopting precautionary approach; reflects the integrated nature of environmental processes and policies and takes a strategic view of decision making. The Precautionary principle urges that action be taken promptly at comparatively low cost to avoid more costly impacts and irreversible damages in the longer run. Pollution control and nature conservation are two facets of environmental protection, embodied in the principles and practice of Environmental Impact Assessment. This incorporates environmental economics, risk assessment, and relevant cultural and social considerations. The main objective of environmental management is to maintain the environment's carrying capacity on behalf of sustainable development. Thus EIA process is also used as a planning tool to promote sustainable development to mitigate climate change by integrating environmental considerations into a wide range of proposed actions. It aims to see that the environmental benefits are maximized.

Keywords: EIA; Climate Change; Sustainable Development; Precautionary Principle; Intra-generational & Inter-generational equity



The diversity of *Trichoderma* species from soil in Uttarakhand, Haryana & Punjab showing antagonistic behaviour against virulent pathogens of Poplar

Sheeba Madaan^{*1}, Nidhi Gupta¹, Ritika Gangotia³, Amit Pandey¹, Ranjana Juwantha¹,
Maneesh S. Bhandari² and Shailesh Pandey¹

^{1*} Forest Pathology Discipline, Forest Protection Division, Forest Research Institute, Dehradun
Uttarakhand

² Genetics and Tree Improvement Division, Forest Research Institute, Dehradun, Uttarakhand

³ Forest Entomology Discipline, Forest Protection Division, Himalayan Forest Research Institute
Shimla, Himachal Pradesh

*E-mail: sheeba.madaan@yahoo.in (for correspondence)

Abstract

Humankind harnesses a multitude of natural resources for the provision of food, materials, energy and recreation. Conservation of natural resources (biodiversity and habitat) is vitally important for the future. Biodiversity and its conservation need to be considered at a range of levels; habitat, species and genetic. *Trichoderma* (Hypocreales) species were identified during a survey of the genus in different forest ecosystems of Uttarakhand, Haryana & Punjab. These include *Trichoderma harzianum*, *T. asperelloides*, *T. asperellum*, *T. hamatum*, *T. viride* and *T. reesei*. These novel *Trichoderma* species display morphological traits that are typical of the genus. Based on molecular identification using nuclear ribosomal DNA internal transcribed spacers (ITS5-ITS4), and translation elongation factor 1- α gene sequence data, different members belonging to the different clades of genus *Trichoderma* are being investigated. They are occupying a distinct lineage distantly related to other *Trichoderma* species. In this work, the diversity of *Trichoderma* species from Poplar plantations and their antagonistic activity against virulent strains of pathogens attacking *Populus deltoides* were studied. The maximum likelihood phylogenetic analysis based on multi-locus studies revealed divergent evolution in the population structure of *Trichoderma* species exhibiting antagonistic activities against *Alternaria alternata*, *Trametes scabrosa*, *Fusarium roseus* and *Sclerotium rolfsii*. *In vitro* confrontation analysis revealed that *T. harzianum*, *T. viride* and *T. reesei* displayed over 73% to 85% inhibition of growth of *A. alternata*, *T. scabrosa*, *F. roseus* and *Sclerotium rolfsii*. We provide evidence of genetic diversity amongst beneficial *Trichoderma* species in poplar plantations having both bio-control potential against virulent pathogens coupled with growth promoting properties for poplar roots.

Keywords: *Trichoderma*; Phylogeny; Biodiversity; Internal transcribed spacer (ITS); Poplar



Study of slope failures in and around Yuksom, the first capital of Sikkim, India- A case study

Prakash Biswakarma, Varun Joshi* and Kush Kumar

University School of Environment Management
Guru Gobind Singh Indraprastha University, New Delhi-110078

*Email: varunj63@gmail.com

Abstract

Indian Himalayan region has always been the victim of the adverse effects of the slope failures. Sikkim Himalayas has no exception in this context as every year the state is affected by the series of slope failures at different locations. The fact that Himalayan terrain is unstable due to its inherent intense tectonic activity and the complex geology. These disasters are triggered naturally as well as due to intervention anthropogenic activities. The rapid urbanization in the hilly terrains and consequently exploited for the benefits of the dwellers of the state. At present the increasing in number of landslides are due to the extension of anthropogenic activities in the different areas. Loss of lives and property along with economic losses in the state is a big challenge. Hampering of road traffics in Sikkim are very much affected due to landslides and the tourism which is the major source of revenue in the state is heavily affected. Yuksom is a well known tourist destination in the state. The present study carried out on Yuksom- Tashiding road section of West Sikkim district in the state of Sikkim. The roads are being affected by slope failures especially during the monsoon season where massive landslides triggers in this road section. This road is the shortest route between Yuksom and Tashiding (another tourist destination). Yuksom was also the first capital of Sikkim and lies in the Kangchenjunga National Park area. So from tourism point of view this road section is very significant. The geology plays an important role in triggering of landslide along with other factors. The area comprises of rocks belongs to Daling Group, which consists of phyllites and quartzites rocks. As per the nature of phyllite, when wet it loses 25% shear strength as compared to dry rocks, hence this becomes highly vulnerable for landslides during monsoon period. The geological mapping of the landslides using Survey of India topographic maps, satellite imagery, Google earth, landslide inventory from published literature, field survey and preparation of various thematic layers. By integrating all the data in the ArcGis 10.6 and Erdas Imagine 2016 proper delineation of the slope failures done. A total of 15 landslides studied to understand their types and causative factors.

Keywords: Indian Himalayan region; Slope failures; Yuksom-Tashiding; Daling Group; ArcGis 10.6



Cyanobacterial growth inhibition by different crop residues

Monu Arora* and Anubha Kaushik

Department of Environmental Sciences, IIS University, Jaipur- 302020 (Raj.)*

Email: monu.arora@iisuniv.ac.in

Abstract

Allelopathic effects of crop residues of wheat, maize, rice and mustard on chlorophyll and biomass of *Nostoc spongiaeforme* was studied at various time intervals as compared to control. Crop residues are either burned or mulched. During mulching, the soil is covered by crop residues. Crop residues act as algal inhibitor by secreting various phenolic compounds to soil. It was found that in control (without any crop residues) the algal showed maximum growth in terms of chlorophyll and biomass. Crop residues exerted a direct allelopathic effect on the algal growth. Algal growth was significantly inhibited 40 to 80% in the presence of crop residues at 10 days interval and 85 to 99% reduction in chlorophyll at 20 days interval. It was found that in control (without any crop residues) algal biomass increased by 54-95% whereas in the presence of all four crops residues, algal biomass decreased by 63 to 35%.

Keywords: Crop residues; Algal inhibition; Chlorophyll, Biomass; Allelopathic effect



Evaluation of groundwater quality and assessment of various drinking water treatment practices in rural households

Anjali Malan* and Hardeep Rai Sharma

Institute of Environmental Studies, Kurukshetra University, Kurukshetra-136119, Haryana

*Email: malan.anjali@gmail.com

Abstract

Groundwater is an essential fresh water resource and its contamination can be a cause of many water borne diseases as a big size of population is dependent on it for drinking purposes. The bacterial as well as physico-chemical analysis of groundwater is very important for the assessment of groundwater quality. In the present study, nine samples were collected from different open-defecation-free (ODF) villages or *Nirmal Grams* of kurukshetra district during September 2016 (MON season). The groundwater samples were analyzed for bacteriological [total coliform (TC), faecal coliform (FC)] and some physico-chemical (pH, EC, TDS, Cl, TH, Ca and Mg) parameters by using standard methods as provided by APHA, 2005. The bacterial isolates were obtained and identified on the basis of cultural and morphological characteristics and gram negative (rod shaped) bacteria were observed as dominant. Out of the total isolates the dominating genera were *Salmonella* sp and *Klebsiella* sp. The source identification of various isolates was carried out through Multiple Antibiotic Resistance (MAR) technique. Maximum resistance of isolates was observed for clindamycin and zero resistance was observed against tetracycline. MAR Index values revealed that the majority of samples were found contaminated from non-human or some animal sources. The water samples were then treated by different household practices like boiling, solar disinfection or Sodis (traditional methods) and chlorination, reverse osmosis or RO (modern methods). The trend obtained from the analysis after treatment for the removal of bacteriological contaminants as well as for some physico-chemical parameters follows as RO > boiling > chlorination \approx sodis. The results indicated that majority of the samples were found contaminated with total coliform and EC, TDS and TH were also observed above the permissible limits in some samples, which does not comply with the International Standards by WHO (2011). The contaminants may be as a result of faulty construction of the borewells or due to breakage or leakage from the septic tanks or pipes in the villages. Therefore, the groundwater should be treated by different easily available household practices before consumption for drinking.

Keywords: Groundwater; Total coliform; Faecal coliform; MAR; Water treatment; Kurukshetra



Quantitative Assessment and Spatial Distribution of Avian Fauna of Okhla Bird Sanctuary of Delhi NCR

Hriday Sagar Sarma and Sarma Kiranmay*

University School of Environment Management
GGS Indraprastha University, New Delhi 110078

*Email: kiranmay@ipu.ac.in & hridayasarma16@gmail.com

Abstract

The present study was conducted to quantitatively assess the avian fauna of Okhla Bird Sanctuary (OBS) of Delhi NCR and their spatial distribution. Point count method was applied for the study from selected 25 locations covering the entire OBS. Total number of 23 species of 10 families in 8 orders were recorded during the study, out of which 11 are migratory in nature. Two species each have been listed as vulnerable (*Aythya ferina* and *Clanga clanga*) and near threatened (*Fulica atra* and *Mycteria leucocephala*) from the total recorded species. The fully water dependant species counted was 16, partly water dependant 6 and one species was terrestrial origin. The maximum relative diversity of families was found for Anatidae (22.74) followed by Phalacrocoridae (13.63). The spatial distribution of total species was depicted using geospatial technology where diverse distribution was found mostly in the areas bordering Uttar Pradesh state. The area touching the NCT of Delhi side had low diverse distribution of the species.

Keywords: Okhla Bird Sanctuary; Vulnerable and threatened species; Point Count method; Relative diversity index; Geospatial technology



Optimizing conditions for enhanced cellulase and xylanase production with agro-industrial waste substrate under solid state fermentation

*Anita Singh^{1,2}, Somvir Bajar^{1,3}, Narsi R. Bishnoi¹

¹ Department of Environmental Science and Engineering, Guru Jambheshwar University of Science and Technology, Hisar-125001, Haryana

² Department of Environmental Sciences, Central University of Jammu, Jammu & Kashmir-180011

³ Department of Environmental Sciences, Central University of Haryana, Jant-Pali, Mahendergarh-123029, Haryana

*Email: anitasaharan@gmail.com

Abstract

Filamentous fungi has been well recognized for the production of commercially important product over the last half Century and enzyme production is one of them. The purpose of enzyme production might be achieved on exploiting solid state fermentation (SSF), which provide sufficiency on moist solid substrate even in absence of free water. Agro- industrial waste has an enormous potential as a substrate for production of high-value cellulase and xylanase enzymes production. Various lignocellulosic substrates and microbial cultures were successfully studied for cellulase production on solid state fermentation. The variety of factors including particle size, carbon substrates, nitrogen sources, metal ions, surfactants, initial pH, initial inoculum level, incubation temperature, substrate to moisture content and incubation time were studied in the past for enzyme production. Considering the fact, the present study is focused towards investigation of culture conditions for enhanced production of cellulase and xylanase by *Aspergillus flavus* under solid state fermentation (SSF). Among the different tested carbon sources microwave alkali pretreated rice straw appeared significant towards production of cellulase and xylanase. An initial pH 5.5, temperature 30 °C, substrate to moisture 1:3.5, particle size 500-1000 µm were found optimal for enhanced enzyme production. Particle size, moisture content, pH, inoculum size, temperature and carbon sources were also found to effective towards enhanced enzyme yield. Significant production of both of the enzymes highlighted enormous potential of agro- industrial waste with SSF. The agro- industrial waste residues not only provides an alternative substrate but also helps to tackle problems related with their accumulation and burning.

Keywords: Agro- industrial waste; Cellulase; Xylanase; Solid State Fermentation; *A. flavus*



Evaluation of PBL and Microphysics schemes for weather event occurred over Indian region

Dinesh Kumar*, U C Mohanty¹, Krishan Kumar²

*Assistant Professor, Department of Environmental Sciences, Central University of Jammu, Jammu

¹Emeritus Professor, School of Earth, Ocean and Climate Sciences, IIT Bhubneswar, Orisha

²Professor, School of Env Sciences, Jawaharlal Nehru University, New Delhi

Abstract

Physical processes taking place within the atmospheric clouds is a difficult task to represent in mesoscale numerical simulation. And these processes play significant role in all forms of precipitation. Correct initial condition in NWP would lead the atmospheric processes evolution to more realistic way which might reflect in improvement of convective system rainfall forecast. And this has been proved by scientific work done. Among many aspects such as understanding the precipitation process, model initial condition accuracy and resolved/sub grid-scale precipitation processes representation, are the important areas which needed to improve in order to represent the mesoscale features properly. Among all, physical parameterizations plays role to provide a convective atmosphere for the development and intensification of convective events. Physical parameterizations schemes are ste of physics like cumulus convection, surface fluxes of heat, moisture, momentum, and vertical mixing in the planetary boundary layer (PBL) which are needed to be evaluated to model aweather event. The preset study evaluated PBL and cumulus for the evolution of atmosphere taking thunderstorm events. The chosen PBL and cumulus schemes were used with the combination of WSM-6 microphysics. Analysis indicate that that KF (PBL scheme) and WSM-6 (Cumulus Scheme) captured the evolution of surface variable such as CAPE, temperature and rainfall close to observation. Further, KF and WSM-6 scheme also provided the increased moisture availability in the lower atmosphere resulting into favorable condition for initiating a thunderstorm much better way. These Schemes have reproduced the spatial pattern and peak rainfall coverage closer to TRMM observation. It is the the combination of WSM-6, and KF schemes which have performed reasonably well to reproduce the right atmospheric condition for a thunderstorm leading to improved spatial and temporal rainfall over the study domain. Thus the parameterization schemes of WMS-6 and KF have shown significant improvement by capturing the location, intensity and surface meteorological parameters closer to observed details.

Key Words: Parametrization; Microphysics; Mesoscale; PBL; CAPE



Land use mapping and time series analysis of coal mining area in Makum coalfield, Assam, India

***Lakhyajit Baruah , Varun Joshi and Kiranmay Sarma**

University School of Environment Management, Guru Gobind Singh Indraprastha University
Sector 16C, Dwarka, New Delhi 110078

*Email: lbaruah@ipu.ac.in

Abstract

Makum coalfield is one the most important coalfield in northeast India and has a very good deposit of sub-bituminous tertiary coal. Rapid underground and opencast mining going on in this area leads to various land use changes in the mine operating areas. Therefore, land use studies are of utmost significant in the present case. This paper demonstrate the various uses of Landsat data for highlighting the various land use classes and identifying the time sequential changes in Makum coalfield, Assam. It was found that the various digitally enhanced product like standard FCC, hybrid FCC 763(RGB), hybrid FCC 764(RGB), edge enhancement and image rationing, are very useful in classifying a variety of land-use classes in Makum coalfield. The outcome of the remote sensing and GIS technique were verified by ground truthing. The various land use classes identified from satellite imagery and field survey are vegetation, opencast mining, transport network, river, and water bodies. The various enhancement techniques used for land-use studies include edge enhancement of NIR and SWIR band images, false color compositing (FCC bands 7, 6 and 3; FCC bands 7, 6 and 4; and FCC bands 5,4 and 3), color manipulation and image rationing (NDVI image). Temporal surface changes that have occurred in the Makum coalfield since 1998, 2007 and 2017 was also been investigated. Spatial analysis of different years' imagery shows an increasing trend of coal mine areas of Makum coalfields. During 1998 the area under mining was estimated to be about 243.49 ha. In the year 2007 it increased to 398 ha and in 2017 it was assessed 438 ha. A total of 194.51 ha of coal mine area increased from 1998 to 2017. Therefore, the present study give an overview of time sequential changes in the coal mining area with the help of satellite imageries and also discuss few RS-GIS techniques that were used for identification of various land use classes on the satellite imagery. It can also be inferred from the study that extensive coal mining had drastically change the facade of Makum coalfield and its surroundings.

Key words: Makum coalfield; Coal mining; Remote sensing and GIS; False colour composite; Edge enhancement; temporal analysis

Sustainable harvest of medicinal plants: a case study of Biligiri Rangaswamy Temple Wildlife Sanctuary, Karnataka, India

Sneh Smita*

Sikkim Manipal University, Magadh University, Patna, Bihar

*Email: sneh.smita@gmail.com

Abstract



Seeds of *Phyllanthus emblica* (Top Left)

Terminalia bellirica (Top right)

T. chebula (Bottom)

TERI undertook a study in the Biligiri Rangaswamy Temple Wildlife Sanctuary to determine what levels of major non-timber harvest of such tree species as *Emblica officinalis*, *Terminalia chebula*, and *Terminalia bellerica* would be sustainable. The species are used mainly for medicinal purposes. The project attempted to identify medicinal plants that occur naturally in the sanctuary and, more important, to assess their density and the impact of harvest of those medicinal plants, that are harvested commercially. For the purpose of the project, sustainable use of medicinal plant was defined as 'the level of harvest at which a species can maintain its population at natural or near-natural levels and the harvest, will not change the species composition of the community'. As a general model, the effect of different extractions levels on the growth and reproduction of these species was studied. In different plots of standard sizes laid randomly, a gradient of harvesting intensity was created that ranging from no harvest at all through 25% and 50% to 100% harvest. Each level of harvest was replicated in 10 plots. The plots were permanently marked and each was assessed prior to harvest. In the subsequent season these plots were monitored to re-enumerate the plot of such harvest. The density of the plants and the number of regenerating individuals in the subsequent season were recorded. For the tree species where bark is harvested, observed parameters include fruit yield per tree, seed dispersal, seed weight, rate of bark growth, and general vegetative cover. The experiments revealed that most of the plants were affected by the harvest. However, two species, namely *Hemidesmum indicus* and *Dioscorea bulbifera*, did not show any sign of decreasing regeneration due to harvest. Four other species, namely *Sida rhombifolia*, *S. cordifolia*, *Decalepis hamiltonii*, and *Asparagus racemosus* showed greatly decreased regeneration only at 25% harvest, indicating that a tolerable of harvest, whereas Asparagus and Decalepis showed much lower regeneration at that harvest intensity, indicating their vulnerability to harvest. It therefore, became apparent that for the survival of the wild populations, either alternative species be explored to supplement Asparagus and Decalepis or their wild population would have to be supplemented by cultivation to minimize collection from the wild. For the other species, it is essential to reduce collection intensities to ensure a sustainable supply.

Keywords: Biligiri Rangaswamy Temple; sustainable harvest; medicinal plants; Emblica, bellerica



Effect of Climate and Anthropogenic Activities on Butterfly (Insecta: Lepidoptera) Population of Delhi Ridge

Manpreet Kaur, Anand Bedgujar, Pranjal Vats, Abhishek Chandra

Sri Venkateswara College, University of Delhi, Delhi – 110021

*Email: kaurmanpreet160@gmail.com, ac.india@gmail.com, ac@svc.ac.in

Abstract

Each and every species present on this earth is contributing its share for the continuity and well-being of the Earth's ecosystem in its own unique way. The more unique a species is, more unique is its contribution and effect on the environment. Butterfly is of cultural, economic and aesthetic value. In addition to this butterflies act as active pollinators for some plants too. Pollination is the most important ecosystem service butterflies provide. The presence and distribution pattern of various species of butterfly in a particular area shows a great potential to act as a biological indicator for the type of climate and pollution levels of that area. The sensitive nature and multi-staged lifecycle of butterfly is the main reason why ecological distribution of only butterfly populations is being analyzed. To find the effect of climatic, pollution and anthropogenic factors on the environment, the ecological distribution of butterfly species in Delhi ridge in years 2017 and 2018 were studied and compared. A survey was done and a checklist was prepared of the number of butterfly species spotted. Species diversity, evenness and species richness was calculated from the recorded data by Shannon-Weiner diversity index and evenness index. It has been seen that there was an increase in the number of species spotted in 2018 from that in 2017 which may have been because of the climatic factors such as no smog incident and less pollution in Delhi and anthropogenic factors such as construction activities which were being done near the areas of study. Thus ecological distribution and species richness of butterfly species can be actively used as biological indicators of climate change.

Keywords: Ecology; Butterfly; Species diversity; Indicators of Climate change; anthropogenic activities



21st Century Modernization of Rural Gurugram

Simran Singh^{1*} and Dr. Abhishek Chandra^{2#}

¹School of Interdisciplinary and Transdisciplinary Studies
Indira Gandhi National Open University, Maidan Garhi, New Delhi-110068

²Department of Environmental Science, Sri Venkateswara College
University of Delhi, New Delhi 110021

*Email: simran.1296@gmail.com&ac.india@gmail.com

Abstract

Today's traditional rural lifestyle is risking replacement by modern livelihood preferences and unsustainable development practices, instead of serving as inspiration for the urban society. This study intends to study changes in rural lifestyle and impact on eco-friendly indigenous practices since the commencement of the 21st century. Local communities' long history of interaction with their natural environment have produced a treasure trove of knowledge passed on from generation to generation. The term indigenous knowledge, is used to describe any rural knowledge, innovation, custom, or tradition that contributes to protection, conservation and sustainable use of biodiversity and of traditions. It can further prove as a key resource for empowering communities against marginalization, impoverishment, as well as inspiring change. These practices seems to be getting negatively influenced by an infatuation with modernization. The scope of this study will emphasise on the occupational aspect of such traditional knowledge, discussing a variety of traditional occupations. An example being the Kumhar community of Haryana that practices pottery, a village craft, using all raw materials from earth itself. Another such illustration is the use of the Sarkanda plant in *Mudha* making. This perennial grass grows on riversides of parts of north India. Dried up stalk of the grass is harvested and crafted into furniture known as *Mudha*. This study aims to speculate the tilt of Gurugram's villages towards conventional urban practices on two levels - daily habits as well as occupational changes. The span of two decades prior to and two decades after the commencement of the 21st century is the period of concern, due to drastic modernisation of the district. The methodology of the study will, making use the of RRA (rapid rural appraisal) survey method, accumulate data from village dwellers of a handful of villages of Gurugram district of Haryana. A strategic survey and series of interviews will procure information from a diverse set of persons. Analysis and interpretation of data, based on the opinions of various demographics, will help understand rural development in a magnified manner. The study aims to conclude with the determination of positive or negative effects of modernisation on overall lifestyle and on traditional occupations of villagers, contrasting time periods 20 years before and after the year 2000.

Keywords: Traditional knowledge; modernization; village ecosystem; Haryana



Water Pollution: Sources, Effects and Mitigation Methods

Yamini Singh and Ankita Bidalia*

Department of Botany, Bhaskaracharya College of Applied Sciences, University of Delhi

Dwarka Sector-2, New Delhi- 110 075

Email: dr.ysingh74@gmail.com, *bidaliaankita@gmail.com

Abstract

Water plays a pivotal role in the survival of life on the planet earth. Polluting water resources can lead to serious environmental and health hazards in our ecosystems. It has been observed that both point and non-point sources deteriorate the water quality; consequently, leading to the bioaccumulation and biomagnification of some of the toxic chemicals in the food chain. Unfortunately, the condition is foulest in the developing countries like India, Ghana, Pakistan, and Vietnam etc. Depending on the type of water body and its source of pollution, different control measures can be employed in order to mitigate/minimize the effect of water pollution. The present work attempts to summarize the water pollution in a compact and comprehensive manner to make a better understanding of this global issue.

Keywords: food chain; human health; lakes; pollutants; rivers



Solid Waste Management in Urban Areas

Nikhil Khatri, Nupur Bansal and Ankita Bidalia*

Department of Botany, Bhaskaracharya College of Applied Sciences,
University of Delhi, Dwarka Sector-2, New Delhi- 110 075

*Email:bidaliaankita@gmail.com

Abstract

Solid waste management (SWM) has emerged as a new environmental challenge worldwide, especially in the developing countries. The main challenges in the SWM are improper understanding of the different stages of management processes, high cost involved in the management practices, and lack of awareness in the society. Solid waste can be categorized in three ways, such as depending on its origin, content and its hazard potential. In the urban areas due to increasing population, migration of people from rural areas has led to an increase in tons of solid waste. Waste includes household waste, residential and commercial street waste and construction and demolition wastes. SWM is abided by certain rules and regulations by the government, but needs skilled labor and public awareness. The present work summarizes the type, cause, management practices, and steps required to combat SWM practices in particular the urban areas.

Keywords: cities; sewage; incinerators; rag-pickers



Arsenic in the Environment-Source, Human Health Effect and its Current Removal Technologies

Radheshyam Yadav and Puneeta Pandey*

Centre for Environmental Science and Technology, School of Environment and Earth Sciences
Central University of Punjab, Bathinda – 151001, Punjab

*Email: puneetapandey@gmail.com, Contact No. +91-9501982035

Abstract

Arsenic is a natural metalloid element. It is present in the water naturally and also due to certain human activities such as mining, smelting, thermal power plant and industrial processes. Arsenic is found in many structural forms and oxidation states in the environment, which are inorganic and organic, and exist in trivalent arsenite and pentavalent arsenate state. Its oxidation states change in sequential process from pentavalent trivalent. Adverse health effects of arsenic are related to its chemical form, time and dose. Arsenite is more toxic species of arsenic than arsenate. Recent studies have been reported the world wide poisoning of arsenic in drinking water is a primary concern of human health problem and remediation of arsenic from water. The present study deals with arsenic toxicity, its effect on the human being and various conventional and physicochemical process of its remediation with particular emphasis on using nanoparticles for arsenic removal over another conventional process.

Keywords: Arsenic; nanoparticles; adsorption; remediation; arsenite



Agricultural variation in cropping and irrigation intensity in western part of Rajasthan

Leela Kaur*, Divyaman Singh Rathore, Prem Godara

Dept. of Environmental Science, Maharaja Ganga Singh University, Bikaner-334004 Rajasthan

*Email: leela.kaur@gmail.com

Abstract

Climate change has become a real global challenge for humanity. India is also facing climate change. Climate change adversely affect human health due to fluctuations in temperature, rainfall pattern and natural hazards etc. The impact of climate change is also on agriculture where food security is greatly affected by climate change. The present paper deals with change in cropping and irrigation intensity in western part of Rajasthan due to climate change. The study includes comparison of cropping intensity and irrigation intensity of 12 districts of Rajasthan in 2015-2016 with the year of 2006-2007. The data were collected from the website of department of agriculture, Government of Rajasthan. The cropping and irrigation intensity were calculated. It was found that Jhunjhunun have the highest cropping intensity from 2006 to 2016 which means a higher portion of the net area is being cropped more than once during one agricultural year. While, Barmer recorded the lowest cropping intensity for both years 2006 and 2016. Sikar did not show change in cropping intensity in this duration while churu had a decline in cropping intensity from 2006 to 2016. Further, Ganganagar district have an increase in cropping intensity in 2015-2016 as compared to 2006-2007. Jaisalmer and Hanumangarh recorded the highest irrigation intensity which increased from 2006 to 2016 and the lowest irrigation intensity was recorded in Pali and Jhunjhunun. Pali and Jalore district had not shown change in irrigation intensity form 2006 to 2016. While Barmer, Jhunjhunun and Sikar districts showed a decrease in irrigation intensity from 2006 to 2016. Henceforth, the study shows the scenario of cropping and irrigation intensity as well as variation due to climate change in western part of Rajasthan.

Keywords: Climate change; Agricultural variation; Cropping intensity; Irrigation intensity; Rajasthan.



Designing a lab scale biofilm reactor with coconut shell and gravels as surface medium for municipal wastewater treatment

Satyajeet Arya* Md Masroor Azam**

**Sri Sri University, Cuttack*

***International Institute of Health Management Research, New Delhi*

Email: satyajeetarya111@gmail.com, masroorazam786@gmail.com

Abstract

Wastewater is of serious concern all over the world. Categorically, Municipal wastewater occupies a big percentage of total wastewater. Several methods were introduced for treatment and many methods are still in the research phase. In this study, Biofilm reactor was used as an advanced technique to treat municipal wastewater. A lab scale biofilm reactor was designed in which coconut shell (BRC) and gravels (BRS) were introduced as the surface medium for the microbial growth. This study comprised of the wastewater treatment by microbes and continuous analysis of water quality e.g. TDS, BOD, SS, and HRT. Samples were collected from municipal wastewater storage at Cuttack, Odisha India. Water quality analysis was performed on 2nd, 4th, 6th and 8th day continuously. For acclimatization of microbial growth, MSM media was introduced to the reactor and aeration was provided to both containers for the better commencing of the microbial growth. Results showed a good reduction in TDS from the 2nd day – 8th day onwards in BRC (coconut shells) from 4.87% to 28.78 % whereas BRS (gravels) showed a reduction from 11.28 % - 40.48%. Suspended Solid (SS) was reduced from 11.11% - 31.11 % in BRC and 14.44 % - 44.44% in BRS from 2nd day - 8th day. BOD reduced drastically in BRC from 4.54 % - 22.72 % and 9.09 % - 36.36 % in BRS was also observed. A visible improvement was observed in the water quality on both medium BRC (coconut shells) and BRS (gravels). HRT was also performed for 12 hours to check the efficiency of the reactor to remove the pollutants. TDS reduced from 26.98% - 39.51% whereas BOD reduced from 9.09% - 45.45% in 12 hours and SS reduced 12.19%-48.48 % in 12 hours HRT. Results showed a measurable improvement in water quality. Design of the biofilm reactor can further be improved and analysis can be extended to a larger scale.

Keywords: Wastewater treatment; Water Quality; TDS; BOD; SS; HRT



Role of Biotechnology in Plant Biodiversity Conservation

Nupur Mondal* and Seema Talwar

Shivaji College

*Email: nupur.mondal2010@gmail.com

Abstract

Plants are very important for humankind since time immemorial as it has given food, medicines, clothes and even shelter. The plant genetic resources has always played a crucial role throughout. Genetic diversity of plants has improved the livelihood of farmers by making the agricultural ecosystem more productive. The variation in the gene pool, has helped the plants to survive various biotic or abiotic stresses be it because of climate change or pests and diseases. But due to domestication and selection of high yielding traits, followed by creation of new uniform varieties, there has been rapid decrease in genetic diversity of plants. Also, with increasing population, deforestation and extreme soil erosion, there has been considerable loss in plant genetic resources. This has decreased the gene pool for breeders and researchers thereby, making it difficult for them to create better varieties with demanding climate changes and increasing population size. The alarming rate by which humankind is losing biodiversity of plants has led to use of biotechnological tools which can conserve plant genetic resources effectively and efficiently. Creation of DNA banks, genotypic databases, tissue culture, molecular marker techniques are some of the methods by which plant biodiversity can be conserved using biotechnological tools. In today's times, when biotechnology is still seen with a hint of doubt, this field of science has helped a lot to increase our knowledge for plant science which when mixed with traditional knowledge, will help us in conserving plant genetic resources and biodiversity.

Keywords: Biotechnology; biodiversity; traditional knowledge; gene pool nidhi



Integrated Enhanced Production of Biohydrogen and Reutilization of Spent biomass of Cyanobacteria for Wastewater Treatment

Sharma Mona^{1*} and Anubha Kaushik^{1,2}

¹Department of Environmental Science & Engineering, Guru Jambheshwar University of Science & Technology, Hisar 125001, Haryana

²University School of Environment Management, GGS Indraprastha University, Dwarka, New Delhi

*Email: drmonasharma1@gmail.com

Abstract

Environmental and economic aspects of sustainability are important consideration for enhancing the demand of energy self-dependent wastewater treatment techniques. The fossil fuel based economy of India has been a major cause of environmental pollution leading to the problem of global climate change. Amongst the new renewable and clean energy resources, hydrogen (H₂) is a promising alternative source of energy. Biohydrogen production using microbes is a clean and less energy intensive technology. Hence, synergy between basic and applied aspects needs to be developed to make cyanobacterial biohydrogen production as a sustainable alternative fuel for the future. Cyanobacteria have already proved their potential in bioremediation of various pollutants like heavy metals, dyes, etc. from wastewaters due to excellent biosorptive properties. Thus, cyanobacteria can be helpful in facing the one of the major challenges of environmental pollution due to discharge of various pollutants from different sources of anthropogenic activities. One of the leading contributors to the national economy is textile industry, which is largely decentralized as small scale cottage industries in most parts of the developing countries. Textile and dying industries are using several synthetic/natural dyes, heavy metals and other chemicals, but due to financial constraints, many of these toxic chemicals are released into the environment without proper treatment. Therefore, the present study was aimed at continuous biohydrogen production by free cells of *Nostoc linckia* in a photobioreactor at various already optimized conditions. After 15 days, the rate of hydrogen production declined, the biomass waste or spent biomass (remains after the hydrogen production) from the photobioreactor was collected, immobilized as alginate beads and reutilized for biosorption of toxic dyes and carcinogenic heavy metals from simulated textile wastewater using separate packed bed column (under optimized conditions of bed height and flow rate). *Nostoc linckia* is showing luxuriant growth in the sub-tropical conditions and its utilization by small textile units in the integrated system with dual applications holds promise for continuous larger scale operations considering the suitable ambient and operating conditions.

Keywords: Biohydrogen; photobioreactor; cyanobacteria; textile dyes; heavy metals



National Parks and conservation: from exclusion to joint forest management and beyond

Aruna Rao

Department of Economics, Sri Venkateswara College, New Delhi

Email: arunarao24@gmail.com

Abstract

Man's relationship with his environment is a two armed one- with one arm he harvests natural resources to meet both his direct consumption needs as well as inputs for producing commodities. With the other hand he returns to the environment an important by-product of both these activities - Pollution (liquid, gaseous and solid waste). Nature's capacity to provide resources is not infinite and there are serious limitations to its rejuvenation and waste assimilation capacities. Environmental protection has therefore come to be recognized by societies and governments of both developed and developing countries as a top public policy issue in debates relating to sustainable development, climate change, global warming and other matters relating to the quality of life of both the present and future generations. Forests play a crucial role in environmental issues, both by providing resources for so called "Development" needs as well as acting as carbon sinks to absorb the toxic by-products of the said development process. Today, the percentage of the world's green cover is at an all- time low- with biodiversity loss and extinction of endangered species emerging as very real phenomenon. Most countries have reacted to this threat of biodiversity loss by earmarking certain Protected areas as National Parks. Traditionally most policies relating to National Parks have been exclusionary. Entire villages of forest dependent communities have been either forcefully evicted or motivated to leave by offering them suitable compensation packages. The justification for this relocation has primarily been "conservation" and to a lesser extent increased revenue generation through wildlife tourism to National Parks. A number of case studies in India and abroad detail the various effects of relocation and the exclusionary policies on the conservation objective, with varying results. But, since the locals are important stakeholders in this entire conservation process, it is useful to examine how they are integrated into the wildlife tourism sector. This study was conducted in 2 villages around the Ranthambhore National Park to obtain an empirical estimate of the extent to which tourism to the park augments local livelihoods as well as the direct and indirect benefits from tourism. It also attempts to look at the local villager's perceptions regarding tourism's socio- cultural- economic impacts (whether it has been positive or negative)

Keywords: Conservation; national Parks; Biodiversity conservation; wildlife tourism; local livelihoods



Biodiversity Parks

Yamal Gupta

Department of Botany, Kirori Mal College, University of Delhi, Delhi 110007

Email: yamalgupta@gmail.com

Abstract

The variety of life forms that occur on earth is 'biological diversity' or 'biodiversity'. It includes diversity within species, between species and of the ecosystem and is the foundation of ecosystem services that we enjoy and take for granted. With fast growing economies and expanding urban areas greener patches and biodiversity is shrinking. Monitoring biodiversity helps to realize the signs of change. Biodiversity parks provide a database of flora and fauna of the areas concerned to monitor the changes in the biodiversity of the area. These biodiversity parks recreate self-sustaining ecosystems with native flora and fauna and enhance the quality of urban environment. Such parks restore the intricate balance between humans and atmosphere. The parks also serve as a hub for educational, cultural and conservation activities. Efforts are also made to preserve and protect endemic and threatened plant and animal species of the area. In urban matrix establishment of biodiversity parks is an innovative and positive approach. The Delhi Development Authority has notified six biodiversity parks and out of this the two viz. Yamuna Biodiversity Park and Arravali Biodiversity Park are fully operational. These parks have terrestrial and biological communities conservation zone wherein the wetlands are interspersed with grasslands. A visitor zone, butterfly conservatory, climbers groove recreational gardens with walkways and conservatories of endemic and, rare and threatened plants of the area are managed amicably and with diligence. These parks provide fresh breath to the city. One must visit these parks to feel the fresh air and the aesthetics that cannot be described in words. It's an experience for lifetime.

Keywords: urban; biodiversity; parks



Climate change scenario and implications in Punjab

Yogalakshmi K.N*, Gini Rani*

*Central University of Punjab, Bathinda 151001, India

*Email: yogalakshmi25@gmail.com

Abstract

Punjab, a state located in north- west region of India is an agrarian state and major population lives in rural area. The long term meteorological survey of the year 1971 to 2000 suggests 0.5 to 1 °C increase in mean temperature. The projected increase in annual mean temperature is 1 to 2 °C throughout the Punjab region. Similarly in case of annual rainfall, the predicted precipitation scenario for the year 2021 to 2050 is around 13 to 21% compared to the trend that followed through the year 1961 to 1990. In present study, the mean maximum and minimum temperature and average rainfall for the year 2013 to 2017 is studied and compared with the projected reports. The mean temperature and average rainfall data of five years taken from the India Meteorological Department showed increasing rainfall trend with the year 2015 to receive maximum average rainfall while 2016 to receive the least average rainfall. The present climatic condition has put pressure on ecosystem and biodiversity. Extreme events in form of heavy precipitation will lead to run off causing soil degradation. The crop productivity will decline and so the groundwater will be overexploited. It will have direct implication on the livelihood of the people relying on agriculture. The increasing average temperature will lead to thermal stress condition leading to fall in rate of fish spawning. Along with fisheries, livestock will also be affected because of thermal stress. The behavior of migratory birds may change because of changing climatic pattern. The overall flora and fauna of Punjab may suffer phonological changes driven by climate change scenario.

Keywords: Climate; Mean temperature; Annual rainfall; climate implications



Bio-plastic production potential of waste tissue paper

Sneh Lata¹ and *Dhanya MS²

¹Research Scholar, ²Assistant Professor,
Department of Environmental Science and Technology,
Central University of Punjab, Bathinda, Punjab, India.
Email: snehlata.lata8@gmail.com and ms.dhanya@cup.edu.in

Abstract

The paper waste contributes a major portion to the municipal solid waste and its improper disposal results in environmental pollution. Being a source of carbon, it can be a good feedstock for sustainable production of various products. The aim of the present study was to find out the production potential of polyhydroxyalkanoate (PHA) from waste tissue paper by the bacterium isolated from cow dung. The 1% H₂SO₄ acid pretreatment of waste tissue paper produced reducing sugar of 288.24 g/L. The maximum PHA yield from acid treated waste tissue paper by the isolate was 63.50 percent in 48h which was 1.68 times than that of its yield from glucose. The PHA production from glucose by the isolate was highest in 48h but PHA production from waste tissue paper was found maximum in 72h with biomass production of 0.277 g/L. The utilization of waste tissue paper as a carbon source for polyhydroxyalkanoate production is an alternative, environmental friendly route of waste management as well as value addition. Hence the tissue paper after use can be a suitable feed stock for bioplastics production and thereby leads to a sustainable environment.

Keywords: Waste tissue paper; pretreatment; reducing sugar; polyhydroxyalkanoate



Impact of Climate Change on Plants and Pollinators

Seema Talwar*, Nupur Mondal

Department of Botany, Shivaji College, Raja Garden, University of Delhi, Delhi
Email: seematalwar2014@gmail.com; nupur.mondal2010@gmail.com

Abstract

Climate change is one of the leading problems of 21st century. There is a significant increase in temperature and carbon-di-oxide concentration, which is going to have an adverse impact on many physiological and ecological processes. One of such processes which are undergoing the severe pressure is mutualistic interaction between plants and pollinators. Interactions among flowering plants and pollinators are ecologically significant and economically precious. Plant-pollinator interactions play a crucial role in the maintenance of stability of a community. Any disruption in this service can create the ecological disturbance. Reduction in the pollinator services can be one of the major reasons leading to the scarcity of many plant species. Deforestation, habitat destruction, pollution, forest fire, invasion of exotic species, increased use of insecticides, radiations arising from the mobile towers and climate change are the major factors, responsible for declining the pollinator populations. One of the significant challenges arising from climate change in agriculture sector is the food insecurity because of the scarcity of pollinators. Pollinators are important contributors to world food production and nutritional security. If pollination ceases to happen, the world will be witnessing the increasing risk of malnutrition. Absence of pollinators can adversely affect the yield in many plant species. Limitation of pollinators is identified as one of the major constraints in various crop productions. Global Climate change may directly have an economic impact on the agriculture. Among all the pollinators, honey bees are considered to be the most efficient and important pollinators for many wild and cultivated plant species. A plant response to the climate change alters the floral development, nectar and pollen production, which are directly linked with floral resource availability, foraging activity, as well as the reproductive output of pollinating agents. Therefore, there is an urgent need to execute management and conservation strategies to protect our biodiversity.

Keywords: Deforestation; habitat destruction; pollution; forest fire; invasion of exotic species



Quorum Quenching Activity of *Bacillus cereus* Immobilized Magnetic Iron Nanocomposites Against n-hexanoyl homoserine lactone

Jaskiran Kaur¹ and Yogalakshmi K.N.^{2*}

^{1,2} Department of Environmental Sciences and Technology, School of Environment and Earth Sciences, Central University of Punjab, Bathinda 151001, India

*Email: yogalakshmi25@gmail.com

Abstract

A group of bioactive acylated amides such as acyl homoserine lactone (AHL) has been used by many gram negative bacteria for regulating biofilm formation on membranes treating wastewater. Formation of biofilm is the cause behind the biofouling of membrane surfaces which thereby limit the hydraulic throughput of wastewater treatment technologies. As membrane biofouling problems are on the rise in wastewater treatment processes now a days, degradation of acyl homoserine lactone molecules has been regarded as a promising anti biofouling strategy. Certain group of bacteria termed as quorum quenching (QQ) bacteria have an inherent potential to degrade these signaling molecules. QQ bacteria entrapped in different matrices that show low toxicity and high survival rates are of great interest in the recent times in disruption of signaling molecules. In the present study, the quorum quenching (QQ) efficacy for magnetic iron nanocomposite beads containing QQ bacteria *Bacillus cereus* 1306 with respect to disruption of signaling molecule (i.e.) n- hexanoyl homoserine lactone (C6-HSL) was investigated. The successful entrapment of *Bacillus cereus* 1306 within the alginate nanoparticle beads was confirmed using scanning electron microscopy (SEM) analysis. *Chromobacterium violaceum* 2656 bioassay was used for evaluating the QQ activity of *Bacillus cereus* 1306 immobilized magnetic nanocomposite (IMN) beads. The degradation of C6-HSL was further quantified using Gas chromatography-Mass spectrometry (GC–MS) analysis. Results revealed that the *Bacillus cereus* 1306 IMN beads is able to hinder the purple coloration of the biosensor strain *Chromobacterium violaceum* 2656. Further, GC–MS analysis revealed the better efficiency of *Bacillus cereus* 1306 IMN beads in degrading C6-HSL as evident from its higher degradation percentage of 96% within 6h of incubation.

Keywords: acyl homoserine lactone; biofilm formation; membrane biofouling; quorum quenching; *Bacillus cereus*.



Geogenic Contamination of Group Water: An Overview

Leela Kaur*, PremGodara, Divyaman Singh Rathore

Department of Environmental Science, Maharaja Ganga Singh University, Bikaner-334004
(Rajasthan), India

*Email: leela.kaur@gmail.com

Abstract

The aim of the study was assessment of geogenic contamination of ground water in Bikaner city, (Rajasthan). Geogenic contamination of ground water is a major concern in current scenario. As water resources are limited and most of these resources are polluted too. Hence, it is very important to assess the water quality for the welfare of humanity. Ground water is always considered safe but nowadays, due to overexploitation and use of chemicals, ground water has also become contaminated. The present paper gives an overview of ground water and its geogenic contamination. The natural sources of ground water contamination are leaching of contaminants from rocks and minerals (such as arsenic) and brine (such as high concentration of salt and bromine) etc. geogenic contamination of ground water were found in Rajasthan, Madhya pradesh, Punjab, Gujarat, West Bengal, Odisha, Andhra Pradesh, Tripura, Chhattisgarh, Delhi and Bihar states of India. Arsenic, flouride, nitrate and uranium are common geogenic contaminants in groundwater.

Keywords: Ground water; Geogenic contamination; Arsenic; Nitrate; Fluoride



Black carbon aerosol reduction in the atmosphere due to scavenging effect of rainfall over Delhi

Charu Tyagi^{*}, NC Gupta, Kiranmay Sarma

University School of Environment Management (USEM), GGS Indraprastha University, Dwarka,
Sec-16C, New Delhi, India.

^{*}Email ; charudec10@gmail.com

Abstract

Among the absorbing aerosols, Black carbon (BC) is gaining significant importance because it is a strong absorber of the solar radiation in the visible and near infrared wavelengths and subsequently because of its ability to alter the radiation budget. Atmospheric pollutants suspended in the atmosphere are removed by dry deposition and precipitation. Precipitation intensity plays an important role in the cleaning of suspended pollutants and ventilation coefficient (VC) is paramount to disperse and dilute pollution load of the atmosphere. This study investigates the estimation of the trapping coefficient of black carbon aerosols due to rainfall and helps in understanding the relationship between VC and BC in an urban environment in India, like Delhi. Seasonal fluctuations in the mass concentration of BC aerosols showed high concentrations during the dry season and low concentrations during the monsoon season. Compared to a normal day, a drastic reduction in the BC load was observed on a rainy day. The statistical adjustment between the mass concentration of the BC aerosol and the precipitation indicates approximately 4.1 times reduction of the atmospheric flux of the black carbon aerosol in the atmosphere for each 1 mm increase in rainfall. Daily fluctuations in BC indicate that concentrations were higher during the morning and evening hours on normal days. The average BC when plotted against average VC, clearly indicates that both are anticorrelated, during the higher VC and BC concentration was lower.

Keywords: Black carbon; ventilation coefficient; Atmospheric pollutants; aerosols



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N. Latha

IQAC Coordinator
Sri Venkateswara College

Coordinator, IQAC
Sri Venkateswara College
(University of Delhi)
Dhaura Kuan, New Delhi-110021

C. Sheela Reddy
PRINCIPAL

Sri Venkateswara College

PRINCIPAL
Sri Venkateswara College
(University of Delhi)
Dhaura Kuan, New Delhi-110021