The West Bengal National University of Juridical Sciences

17th-18th January, 2020

Abstract Book

International Conference on Climate Change: Impact, Management, Law and Policy Formulation

Organised by:

Centre for Regulatory Studies, Governance and Public Policy

The West Bengal National University of Juridical Sciences

In Collaboration with

TECHNO INDIA UNIVERSITY
WESTBENGAL

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Welcome Message

Carbon Emissions have become one of the major reasons for climate change around the world, prompting an incessant need to monitor, map and regulate carbon emissions. The team from Centre for Regulatory Studies, Governance and Public Policy led by Dr. Shambhu Prasad Chakrabarty under the guidance of Dr. Abhijeet Mitra, Director, Research, Techno India University, West Bengal undertook an elaborate Carbon Mapping with a view to analyse Carbon Sequestration of some species of trees on our campus, in the High Court area, at Shyambazar area and specific locations in the district of South 24 Parganas. CRSGPP has taken this initiative towards achieving the United Nations Sustainable Development Goals and this project marks the beginning of their journey towards its fulfilment.

As an extension of this project, CRSGPP is organizing the International Conference that aims to enlighten other institutions of taking up similar initiative towards monitoring of carbon mapping impact on environment. With valuable insights from Legislators, Executives and members of the Judiciary, the Conference aims to bring to light the major ecological, legal and global concerns of 'Carbon Mapping'. This International Conference urges the Research Community to bring forward ideas regarding climate change and its impact in the social well being of people.

It is with great pride I present this Abstract book of the international conference that culminates close to 54 number of abstracts that have been minutely chosen from more than 80 abstracts that were submitted for the conference.

I hope the conference develops a fruitful outcome and the discussions lead to formulation of a comprehensive report that shall be submitted to the Government of West Bengal to take steps towards minimizing and tackling the carbon emissions in the city. I wish all the very best to the esteemed resource persons, paper presenters and participants who I am sure will whole-heartedly deliberate over the issue and make the conference a great success.

Prof. Dr. N.K. Chakrabarti
Vice Chancellor
The West Bengal National University of Juridical Sciences

Committees

Organising Committee

- **Patron: Prof. (Dr.) Nirmal Kanti Chakrabarti (Hon'ble Vice Chancellor, WBNUJS)**
- **Convenor: Dr. Shambhu Prasad Chakrabarty (Head & Research Fellow, CRSGPP)**
- **Co convenors: 1. Dr. Jayanta Ghosh (Research Fellow, CRSGPP)**
  2. Mr. Souvik Mukherjee (Research Associate, CRSGPP)

Organising Team

- **Dr. Sufia Zaman (Head, Department of Oceanography, Techno India University, West Bengal)**
- **Prof. (Dr.) Arup Poddar (Professor of Law, School of Technology, Law & Development, WBNUJS)**
- **Ms. Somabha Bandhopadhay (Research Assistant, CRSGPP)**
- **Ms. Sanghamitra Baladhikari (Research Assistant, CRSGPP)**
- **Mr. Prantik Roy (Research Assistant, CRSGPP)**

Editors

- **Prof. (Dr.) Ricardo Gobato (Editor-in-chief of PJSE)**
- **Dr. Shambhu Prasad Chakrabarty(Head & Research Fellow, CRSGPP)**
- **Dr. Sufia Zaman (Head, Department of Oceanography, Techno India University, West Bengal)**
- **Dr. Roopali Roychowdhury (Post Doctoral Fellow, Department of Oceanography, Techno India University, West Bengal)**
- **Dr. Jayanta Ghosh(Research Fellow, CRSGPP)**
- **Dr. Santanu Panda (Research Associate. CRSGPP, WBNUJS)**
- **Dr. Prosenjit Pramanick (Post Doctoral Fellow, Department of Oceanography, Techno India University, West Bengal)**

Assistant Editors

- **Vijoy Kumar Sinha (Research Assistant, CRSGPP)**
- **Abhijeet Nandy (Research Assistant, CRSGPP)**
- **Rima Ghosh (Research Assistant, CRSGPP)**
- **Arin Mukherjee (Research Intern, CRSGPP)**

Gardeners

- **Mahadeb Bayen**
- **Pratap Haldar**

Message from the Convenors

In recent *era*, the ecosystem services played by the urban trees have been widely recognized. The trees by virtue of their physiological system absorb carbon dioxide and release oxygen during the process of preparing their food. This is a boon for the human civilization as the entire civilization is standing on the pillar of oxygen.

It gives us a deep sense of pride to inform people of all ranks of the society that the WBNUJS in collaboration with Techno India University, West Bengal have performed the task of documentation of carbon sequestration and oxygen generation of urban trees using modern techniques.

Forest Survey of India (FSI), has been carrying out the gigantic task of nationwide biennial forest cover monitoring and assessment since 1987. For over three decades now, FSI has kept pace with the advancement of technologies for such assessments and created a niche for itself in this specialized field. This 16th India State of Forest Report, besides providing regular information on forest resources of the country, has also brought out findings of a few special studies which are important for the policy makers, planners, forest managers, researchers and students having interest in conservation of natural resources.

It gives immense satisfaction to note that our field workers, researchers and policy makers of both the universities have actively participated to carry out the exercise of carbon mapping in and around the city of Kolkata, which can be a roadmap for several industries, academic institutes and Govt. Departments to consider the effort as a part of CSR, research and projects.

We are really optimistic to replicate and carry forward this green venture for the betterment of the society through upgradation of environment.

Dr. Abhijit Mitra
Faculty Member
Department of Marine Science
University of Calcutta
&
Director, Research (Honorary)
Techno India University, West Bengal

Dr. Shambhu Prasad Chakrabarty
Head & Research Fellow
CRSGPP, WBNUJS

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Schedule

Program Schedule for Inauguration of International Conference on International Conference on Climate Change: Impact, Management, Law and Policy Formulation

17.01.2020

6:00 – 6:40: Registration, Welcome Drink/High Tea

6:45 – 6:55: Introduction to the Conference and Welcoming of Dignitaries on the dias

6:55 – 7:00: Felicitation of the dignitaries

7:00 – 7:05: Watering of the plant for inauguration

7:05 – 7:10: Welcome address by Prof. Dr. N.K. Chakrabarti, Vice Chancellor, WBNUJS

7:10 – 7:15: Address by Mrs. Manoshi Roy Chowdhury, Co – Chancellor, Techno India University, West Bengal

7:15 – 7:20: Address by Prof. (Dr.) Goutam Sengupta, Vice Chancellor, Techno India University, West Bengal

7:20 – 7:30: Presentation of the Report by Prof. Dr. Abhijit Mitra, Director, Research, Techno India University, West Bengal & Dr. Shambhu Prasad Chakrabarty, Head & Research Fellow

7:30 – 7:35: Inaugural address by Guest of Honor Hon'ble Shri Moloy Ghatak, Minister of Law and Justice, Government of West Bengal

7:35 – 7:40: Keynote address by Prof. Dr. Soumen Mahapatra, Minister of Water Resources Investigation and Development, Government of West Bengal

7:40 – 7:45: Address by Shri Sandip Kumar Ray Chaudhuri, Law Secretary, West Bengal

7:45 – 7:50: Address by Guest of Honor Justice Sri Debanshu Basak, Hon'ble Judge, High Court, Calcutta

7:50 – 7:55: Address by Guest of Honor Dr. Tanmay Ray Chaudhuri, Indian Police Service

7:55 – 8:05: Address by Mr. Meghdut Roy Chowdhury, Director of Global operations, Techno India Group

8:05 – 8:10: Address by Pauline Laravoire, Sustainability Director, Techno India Group

8:10 – 8:15: Release of the Report by the dignitaries

8:15 – 8:20: Vote of Thanks by Dr. Shambhu Prasad Chakrabarty, Head & Research Fellow, CRSGPP, WBNUJS

8:20 onwards: Dinner and Networking

18.01.2020

Technical Session I
Climate Change: Causes & Effects
Venue: 227
Time: 10:00AM -11:30AM
Chairperson: Mr. Shyama Prasad Bepari
Co-Chairperson: Dr. Santanu Panda
Rapporteur: Dr. Pritam Mukherjee

Sl. No.	Title	Author & Co-Author(s)
1.	Indian Diaspora in Southeast Asia and its Soft Power Dynamics	Nandini Tripathy
2.	Displacement Caused by Climate Change - A Case Study of Assam	ShumaTalukdar
3.	Influence of aquatic pH on dissolved Pb in East Kolkata Wetlands: A case study with reference to climate change induced acidification	Joystu Dutta, Joysurya Dutta, Tirthankar Sen, Sufia Zaman, Abhijit Mitra
4.	*Lexlata* application of peremptory norm of general International law in climate change regime	Atul Alexander
5.	Climate change management and its impact on policy	Aranya Nath, Shreeja Shyama Praharaj
6.	A Critical and Analytical Study on Climate Change and it's Impact on Human Migration	Chayan Chakraborty
7.	Nature and relevance of class in environmental adjudication in India	Syama Gopan, Haaris Moosa
8.	Climate-Induced Displacement and Rights-Based Protection: Need for a Sui Generis	Saurabh Bhattacharjee
9.	Carbon footprint in animal husbandry practices and its management	Prasanna Pal, Satarupa Ghosh

Technical Session I
Climate Change: Causes & Effects
Venue: Room No. 107
Time: 10:00AM -11:30AM
Chairperson: Prof. RathinBandhopadhay
Co-Chairperson: Mr. Surja Kanta Baladhikari
Rapporteur: Dr. Roopali Roychowdhury

Sl. No.	Title	Author & Co- Author(s)
10.	Making businesses sustainable, futuristic and eco-friendly: Is it an option or a responsibility	Aditya Jain
11.	Misgivings of systemic carbon footprint of the defense sector	Ranjana Dey
12.	Role of national green tribunal as a domestic legal mechanization for controlling carbon emission in India	Indralina Sen
13.	Constitution: A safeguard to carbon mapping	Bhaskar Mukherjee, Chandrika Saha
14.	Climate Change and Mangrove Conservation in India: Demarcating the Legal Void	Sharda Mandal, Arindam Basu
15.	Greener Traffic for Development? - Decoding E-Vehicle policies in light Smart City Guidelines	P. Bayola Kiran
16.	Greta Thunberg's idea of climate change and smart cities mission in India	Santu Seal
17.	Combating climate change with environmental ethics	Somabha Bandopadhay
18.	Climate Change, Human Displacement and Legal Protection Gap: A Case Based Analysis of Nexus Dynamics	Apala Goswami, Kaushik Saha
19.	A Review on Carbon Emission in Indian Metropolitans and SDG of UN from the Perspective of Anthropogenic Control	Partha Sarathi Sarkar

Technical Session I
Climate Change: Causes & Effects
Venue: Room No. 119
Time: 10:00AM -11:30AM
Chairperson: Prof. M.K. Ramesh
Co-Chairperson: Mr. Souvik Mukherjee
Rapporteur: Mr. Arin Mukherjee

Sl. No.	Title	Author & Co- Author(s)
20.	Geo-Engineering: Panacea for the Climatic Crisis	Rishi Raj Mukherjee, Samiksha Singh
21.	Routing Emotional Intelligence towards Ecological Intelligence	Rohan Girish Raj, Ananya Jain
22.	The Social Cost of Carbon Footprint and its Impact on Economy of a Country	Tejasvi Shukla
23.	Green Technology and Socio-economic Viability	Samar Islam Laskar
24.	Carbon sequestration in a common true mangrove flora, *Excoecariaagallocha*of Indian Sundarbans	Sufia Zaman, Abhijit Mitra
25.	Climate change and its impact on variability – an analytical study	Arpita Mitra
26.	Green Technologies and Their Impacts in Climate Change Mitigation	Susmita Dhar
27.	Impact of Petroleum Laws/Policies on Climate Change – A critical Analysis	A.Venkatesan
28.	Climate Change and Hilsa Fishery	Manmatha Nath Sarker

Technical Session II
Climate Change: Mitigation & Adaptation
Venue: 227
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Chairperson: Mr. S. Veeranna
Co-Chairperson: Mr. Saptarshi Sankar Chakrabarti
Rapporteur: Mr. Abhijeet Nandy

Sl. No.	Title	Author & Co- Author(s)
29.	Marine flora as potential source of Natural Carotenoids: Roadmap towards Green Technology and Socio-Economic Viability	Kunal Mondal
30.	Mangrove fruit based jelly as roadmap to alternative livelihood for Island dwellers of Indian Sundarbans	Prosenjit Pramanick, Sufia Zaman, Abhijit Mitra
31.	Mitigating atmospheric carbon dioxide load through mangrove seedling management: A case study from Indian Sundarbans	Nabonita Pal, Sufia Zaman, Abhijit Mitra
32.	Decadal variation of nitrate and phosphate in East Kolkata Wetlands	Sangita Agarwal, Abhijit Mitra
33.	Nitrate level in the Hooghly Estuary: A time series analysis	Pallavi Dutta, Tanmay Ray Chaudhuri, Sufia Zaman, Abhijit Mitra
34.	Inter-relationship between stored carbon in oyster and pH of the estuarine waters of Indian Sundarbans	Shampa Mitra, Prosenjit Pramanick, Sufia Zaman, Abhijit Mitra
35.	Microbial load in common edible fish *Liza parsia*: A time series analysis	Roopali Roychowdhury,Madhumita Roy, Sufia Zaman, Abhijit Mitra
36.	Use of phytogenic feed additive as nutritional intervention towards achieving climate friendly livestock production by mitigation of rumen methanogenesis in Murrah buffaloes	Kundan Kumar, Seema Yadav, Pramod Kumar Soni, Vipin Singh
37.	Sustainable Smart Cities through Green Buildings-Encouraging Brick Steps	Niranjan E. V, Abdullah Ghazali

Technical Session II
Climate Change: Mitigation & Adaptation
Venue: Room No. 107
Time: 12.00 – 1.30 PM
Chairperson: Prof. M.N. Sarkar
Co-Chairperson: Mr. Durjoy Kumar Deb
Rapporteur: Mr. Vijoy Kumar Sinha

Sl. No.	Title	Author & Co- Author(s)
38.	Climate Change Management and its impact on policy	Pramod Rai, Anusha Rai
39.	Observed changes in microbial load in the sediment samples of Indian Sundarbans during 2010-2019	Jayashree Saha, Nabonita Pal, Sufia Zaman, Abhijit Mitra
40.	Global Dimming: A global perspective on darkening problem	PoulamiAdhikary Mukherjee, Dr Ranajit Kumar Khalua
41.	Climate Change Migration: A rights perspective	Shimul Dutta
42.	Policy for mitigating carbon emission for a sustainable development in India: A critical appraisal	Ranit Mukherjee
43.	Study on the spatial variation of stored carbon in *Delonix regia* inhabiting the city of Kolkata through computer programming	Sitangshu Roy, Sufia Zaman, Mourani Sinha, Abhijit Mitra
44.	Environmental Jurisprudence for Sustainable Development: An Indian overview	Rahul Shaw
45.	Carbon Mapping and its importance in conserving the rights of nature	Senthil Kumar
46.	Sustainable living is a fight for all: A fight to prevent climate change suffering	Saheli Biswas, Rajasi Guharoy

Technical Session II
Climate Change: Mitigation & Adaptation
Venue: Room No. 119
Time: 12.00 – 1.30 PM
Chairperson: Dr. Abhijit Mitra
Co-Chairperson: Mr. Abheek Ghatak
Rapporteur: Ms. Rima Ghosh

Sl. No.	Title	Author & Co- Author(s)
47.	Challenging Colonial and Neocolonial Interventions through Interaction with Environment: A Study of Ecological Behavior of the Naga Tribes	Paloma Chaterji
48.	Fish quality upgradation through cutting edge feed technology research on monosex	Pavel Biswas, Mayukhmala Mondal, Prosenjit Pramanick, Sufia Zaman, Abhijit Mitra
49.	Bioconcentration of heavy metals in fish and associated health hazard in people of Kolkata	Satarupa Ghosh, Sangram Keshori Rout, Prasanna Pal, Bipul Kumar Das
50.	Green Growth and Sustainable Development in India: A Constitutional Approach	Abhisikta Basu
51.	Socio-Economic Impact of Climate Change Mitigation: International and National Way Forward	Amit Ghosh
52.	Common but differentiated responsibility: The need for hour of climate change	Devarshi Malviya, Khushbu Sood
53.	Intertidal mudflats of Indian Sundarbans: A potential sink of carbon	Arpita Saha, Saptarshi Sankar Chakrabarti, Sufia Zaman, Abhijit Mitra
54.	Climate Change and Its Challenges on Marine Environment Special Reference to Ecological Aspects in Bangladesh	Alim Abdul
55.	Bacterial abundance in mud crab, *Scylla serrata* collected from North 24 Parganas district of West Bengal, India	Pritam Mukherjee, Sufia Zaman, Abhijit Mitra

Technical Session III
Climate Change: Theory, Law & Policy
Venue: 227
Time: 2.30 PM -4.00 PM
Chairperson: Prof. Gopal Lamicchane
Co-Chairperson: Dr. Jayanta Ghosh
Rapporteur: Mr. Prantik Roy

Sl. No.	Title	Author & Co- Author(s)
56.	Green Federalism in India	Ananya Chatterjee
57.	Smart cities: Quest for sustainability with quality	Nabanita Sen
58.	Biomass and carbon stock estimation inventory of mangrove associate flora, *Suaeda maritima* and its potential role for alternative livelihood	Sudeshna Biswas, Sufia Zaman, Abhijit Mitra
59.	Climate change induced spatial variation of fish composition in Indian Sunderbans	Sana Ahmed, Sufia Zaman, Abhijit Mitra
60.	Traditionally agroforestry systems of North East India: A sustainable carbon offset strategy	Biplab Brahma, Arun Jyoti Nath, Ashesh Kumar Das, Prantik Roy
61.	Managing Waste through Circular Economy: Imposing legal burden on Small Businesses and End Use Consumers is not the Solution	Monalisa Saha
62.	Mapping the solar energy in India: An analysis of evolving policy trends towards rural electrification	Sachinkumar P.P.
63.	Study on the decadal variation of nutrients and chlorophyll a at Digha coast in West Bengal, India	Gahul Amin, Sufia Zaman, Abhijit Mitra
64.	Sustainable Development vs Market Economy	Wasim Aktar

Technical Session III
Climate Change: Theory, Law & Policy
Venue: Room No. 107
Time: 2:30PM -4:00PM
Chairperson: Prof. Tara Sapkota
Co-Chairperson: Mr. Durjoy Kumar Deb
Rapporteur: Ms. Sanghamitra Baladhikari

Sl. No.	Title	Author & Co- Author(s)
65.	Saving our earth with green technology looking into its socio-economic authenticity	M. Nikhila
66.	Mapping of Resource Rents to Carbon Emissions Intensity: Can India's Carbon Emissions Policy Achieve the Target Use of New Renewables?	Sovik Mukherjee, Sneha Singh
67.	The Commons Nature of Wildlife Corridors	Shreya Padukone
68.	Examining India Policy on Climate Change and its effects on Marine Ecosystem through the development of International Environmental Law	Tarique Faiyaz, Balraj Kaur Sidhu
69.	Climate change and sustainable public procurement policies: an analysis of the environmental considerations in WTO'S agreement on public procurement	Mukesh Rawat, K D Raju
70.	Management strategies towards climate resilient orange mud crab (*Scylla olivacea* Herbst 1896) farming in the context of climate induced salinity alterations in Indian Sundarbans	SupurnaLahiri, Subhra Bikash Bhattacharyya
71.	Socio-economic impact of carbon footprint from vehicular emission in Bankura town: An analysis	Sangeeta Chatterjee
72.	Conserving Nature from Toxic Carbon *Vis-A-Vis* Rule of Law	Rima Ghosh
73.	Recognizing Climatic Refugees: Interplay between International Environmental Law and International Refugee Law	Saheli Chakraborty
74.	Legal aspects of climate change - rethinking the dilapidated sublunary world	Kanimozhi. T, Sri Kabishna.S

Technical Session III
Climate Change: Theory, Law & Policy
Venue: Room No. 119
Time: 2:30PM -4:00PM
Chairperson: Dr. Sufia Zaman
Co-Chairperson: Dr. Shambhu Prasad Chakrabarty
Rapporteur: Ms. Somabha Bandhopadhay

Sl. No.	Title	Author & Co-Author(s)
75.	Assessing the pattern of infection caused by Non Tuberculous Mycobacteria in the coastal regions of West Bengal, India	Tapti Sengupta, Parijat Das, Tirthankar Saha, Abhijit Mitra
76.	Significance of the United Nations climate change conference (COP25): Weighing the pros and cons	Sudhanshu Singh, Anuttama Ghose
77.	Balancing Urbanization and Urban Governance-Towards Transformative Responses to Climate Change	Shelley Ghosh
78.	India's road map for carbon dioxide emission reduction and sustainable development	Subhasri Chatterjee
79.	Climate Change and its Impact through the 'Gendered' Lens: Recognizing Women's Reproductive Autonomy and Women as Agents of Change.	Sanghamitra Baladhikari
80.	Climate Change and Biological Resources in India: "Protecting the Source for Ensuring the Resource" with Legal Perception	Shova Devi
81.	Impact of climate on survival strategies among the PVTG's in West Bengal: A micro level study	Santanu Panda
82.	Smart Environment for Smart Cities with Smart Technology: Is it Negotiable?	Jayanta Ghosh, Durjoy Kumar Deb
83.	Construction and deconstruction of smart city: Environ-legal rumination	Shyamali Mukherjee
84.	Industrial Impact on Climate Change: A special reference to Asansol Town	Vijoy Kumar Sinha, Abhijeet Nandy
85.	Policies towards Smart Cities	Arin Mukherjee
86.	Climate Change: Impact, Management and Law formulation	Diamond Lamichhane

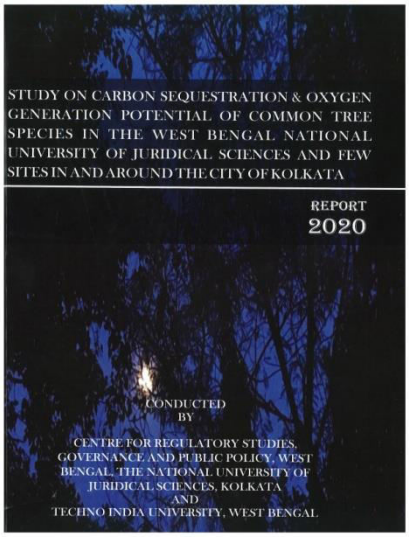
Valedictory Session: 4.00 – 5.00

Prizes and Awards

Best Presenter Award : To be Announced

Best Paper Award: To be Announced

Book Exhibit



Inaugural Guest Speakers

Hon'ble Shri Moloy Ghatak
Minister of Law and Justice
Government of West Bengal

Prof. Dr. Soumen Mahapatra
Minister of Water
Resources Investigation and Development
Government of West Bengal

Justice Debanshu Basak
Hon'ble Judge
High Court, Calcutta

Mrs. Manoshi Roy Chowdhury
Co Chancellor
Techno India University
West Bengal

Prof. (Dr.) Goutam Sengupta
Vice Chancellor
Techno India University
West Bengal

Dr. Tanmay Ray Chaudhuri
Indian Police Service

Mr. Meghdut Roy Chowdhury
Director of Global Operations
Techno India Group

Pauline Laravoire
Sustainability Director
Techno India Group

Technical Session I

10: 00 A.M. – 11: 30 a.m.

Climate Change: Causes & Effects

Saturday January 18, Technical Session 1
10: 00 a.m. – 11: 30 a.m.

Climate Change: Causes & Effects

Chairperson: Mr. Shyama Prasad Bepari
Co Chairperson: Dr. Santanu Panda
Rapporteur: Dr. Pritam Mukherjee
Room: 207

Indian Diaspora in Southeast Asia and its Soft Power Dynamics

Nandini Tripathy
Symbiosis Law School

The diaspora of any country provides a human dimension to the links between two countries. They have a unique role in International relations because they find themselves in between two countries, sharing in two cultures, having an emotional investment in two nations, and preserving social connections in two societies. As the diaspora has the capacity to influence a country foreign policy without coercion or the use of hard power, it inherently becomes a soft power tool in the hands of policy makers. In the case of Southeast Asia, ethnic Indians, as well as the Chinese, have long been an integral part of their societies. These communities have acted as a bridge between the two regions. However, the use of the diaspora as a tool of Indian foreign policy is relatively a new phenomenon. This article analyses the status of the Indian diaspora in Southeast Asia and evaluates if it can become a force to reckon with in the Indian foreign policy calculations. Historically, Southeast Asia has been hugely influenced by both India and China in the realms of art, culture, architecture, court etiquettes, religion and many other things. Thus, Indian civilisation was naturally extended to the territories of present-day Southeast Asia. Indian culture was welcome in Southeast Asia because it came without political strings. Moreover, these kingdoms remained politically independent of Indian kingdoms with the exception of a temporary conquest of Malaya by the Chola kingdom of southern India in the 11th century. The climatic conditions between India and Southeast Asia are similar. Monsoon was a common factor which played an important role in enhancing ties between the people of this region. Indian traders would embark on voyages to Southeast Asia when the weather would be suitable. The spice and silk routes helped in the exchange of ideas, culture and people apart from the trade. This brought large number of seafarers and merchants to Southeast Asia. Apart from that, the region elites would call Brahmins to serve at their courts as priests, astrologers and advisors, all of which encouraged the robust people to people interactions. Therefore, during pre-colonial times Indians were not seen as outsiders. The Colonial takeover of the region changed the equations between Indians and Southeast Asians towards the end of the 15th century. In addition to this, the Treaty of Westphalia signed in 1648 made territory and sovereignty the basic tenets of the evolution of nation-states. Now, people migrating from India were perceived as outsiders; agents for their colonial masters, since they became associated with colonial exploitation. Indians from various strata of society migrated during this period including indentured plantation labour, traders, clerks, bureaucrats, professionals along with the Indian slave diaspora and Indian convict diaspora.

Keywords: *Disapora, International, Power, Indian*

About the author: Nandini Tripathy is a BBA LL.B student of Symbiosis Law School

Displacement Caused by Climate Change - A Case Study of Assam

Shuma Talukdar
Amity University, Kolkata

As per the report of the Centre for Global Development the most developed nations are historically the ones most responsible for climate change. European Union is responsible for 40% of the climate change and USA 22%. Climate change results in climate refugee and also internally displaced people. The paper is a study of the impact of climate change on the very existence of an individual, with special reference to the state of Assam. As per Economic Survey of India, 40% of the state is flood prone. Millions of people were rendered homeless due to soil erosion in the river Brahmaputra in the last three decades. In 2012 alone 1.5 million people were displaced. Climate change resulted in sudden floods causing massive displacement. Flood not only washed away their land but also all the documentary evidence of their citizenship. Thousands of people in Assam fear that they will be stripped of their citizenship for no fault of their own. Ensuring the legitimacy of their existence in the state is of greater concern to the authorities than the continuity of their life.

***Keywords**: Climate Change, Migration, Internally Displaced People, Citizenship, Displacement, NRC*

About the Author: Shuma Talukdar is a corporate lawyer with expertise in arbitration and contract and equipped with experience in various sectors, such as aviation, FMCG, IT, media and entertainment, NGO, oil and gas, real estate, and shipping. She earned the degree of BA Honours (Pol.Science) from Gauhati University and LLB from Pune University, and holds certificates in Managing Intellectual Property in Universities from IIT, Madras, Women Entrepreneurship from IIM, Bangalore, and Patent Cooperation Treaty from WIPA, Geneva. She is currently pursuing LLM (Business Law) from Amity University, Kolkata. She has served Bodhi Global Services Pvt Ltd, Pune and India Law Offices, New Delhi as an Associate. She holds professional membership of the Supreme Court of India, the Bar Council of India, and the Department of Justice, Government of India. She co-founded a law firm, Droit India Legal Services in Noida, and ran it as a Managing Partner from 2013 to 2016. She is also a social entrepreneur. She established an NGO, Society for Social Regeneration & Equity (SSRE) in 2013 under the auspices of which she worked as its General Secretary in the fields of skill development, micro finance, livelihood, tobacco control, health and hygiene, women empowerment, gender equality, and legal rights.

Influence of aquatic pH on dissolved Pb in East Kolkata Wetlands: A case study with reference to climate change induced acidification

Joystu Dutta[1], Joysurya Dutta[1],Tirthankar Sen[2], Sufia Zaman[1], Abhijit Mitra[3]

[1]Department of Oceanography, Techno India University, West Bengal
[2]Department of Biotechnology, Techno India University, West Bengal
[3]Department of Marine Science, University of Calcutta

The present study was undertaken with the databank of dissolved Pb and pH of the aquatic system in the East Kolkata Wetlands, a designated Ramsar Site during a period of twenty years (2000-2019). The present study site is receiving huge amounts of domestic and industrial wastewater from surrounding areas. The data on pH exhibits a decreasing trend with the passage of time, which may be attributed to the phenomenon of acidification in which CO_2 dissolves with the water and shifts the pH to a lower value. This may result in the dissolution of accumulated Pb in the sediment and transfer the same to the overlying aquatic phase. The increasing trend of dissolved Pb confirms the hypothesis. The significant negative correlation between pH and dissolved Pb ($r= -0.7763$; $p<0.01$) supports the view of the

regulatory effect of pH on the dissolved Pb level in the aquatic systems of East Kolkata Wetland.

Keywords: *East Kolkata Wetlands; dissolved lead; aquatic pH; correlation; acidification*

About the author: Mr. Joystu Dutta is Research Scholar, Department of Oceanography, Techno India University, West Bengal, Salt Lake campus, Kolkata 700091, India. He is IUCN CEM Member and also a faculty of Department of Environmental Science, SGGU, Chhattisgarh. He has written many books and presented papers in national and international conferences.

Mr. Joysurya Dutta is currently associated with Siemens Ltd. Kolkata and is interested in research activities in environmental sector. He passed Electrical Engineering from Techno India University, West Bengal securing First Class marks.

Mr. Tirthankar Sen is attached with Department of Biotechnology, Techno India University, Kolkata, West Bengal. He has passed B.Tech Biotechnology from Techno India University, West Bengal and currently attached with the department carrying cutting edge research activities.

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Lex lata application of peremptory norm of general international law in climate change regime

Atul Alexander
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The central responsibility of International Community in modern times is to tackle the perpetual crisis called climate change, however, fixing legal responsibility in International law is complex as it can entail diluting the national interest of States, which frequently leave States red-faced. Also, since International Law operates on a consensual domain attributing responsibility and subsequent compliance becomes a futile exercise. In this backdrop, peremptory norms (hereinafter referred to as Jus Cogens) can offer a possible solution to tackle the existing crisis. The concept of Jus Cogens transcends State Consent as evinced in Article 53 of the Vienna Convention of Law of Treaties hereinafter referred to as VCLT). The paper is divided into three parts, the first segment of the paper covers the recent work of the International Law Commission (hereinafter referred to as ILC) on the identification of Jus Cogens, this part will be analysing the entire corpus of ILC on Jus Cogens. The second part of the paper discerns the existing jurisprudence on climate change regime in terms of damage and loss; this section provides a full-fledged coverage on the emergence of jus cogens norms in climate jurisprudence. In the third segment the author shifts to the responsibility mechanism in International Law *vis-A -vis* climate change, this section forms the core as it dwells in detail on the interpretation of State Responsibility for the internationally wrongful act committed by Sates (hereinafter referred to as ARSIWA, 2001). The author would conclude by

stating the *lexlata* proposition of the theme under discussion. The scope of research is doctrinal and descriptive; the author has relied on verifiable data such as the reports of the International Organisations (hereinafter referred as the IO), ILC report and draft conventions and articles to substantiate his stance.

***Keywords**: Climate Change, Jus Cogens, State Responsibility, ILC.*

About the Author: Atul Alexander completed his LLB from School of Excellence in Law Chennai, with distinction and was university topper, he completed his Masters in Law (International Law and Organisations) from The Tamilnadu Dr Ambedkar Law University Chennai and was a gold medalist and university topper. Mr Atul Alexander is presently Assistant Professor of Law at West Bengal National University of Juridical Sciences (WBNUJS). He is also a member of the Asian Society of International Law (ASIL), in the capacity of member he has taken part in the regional and biennial conferences of the ASIL in Beijing and Manila. Mr Atul Alexander is also a visiting research scholar at the prestigious Stockholm Center for International Law, U.S Naval War College, United States. Mr Atul Alexander is presently pursuing his Ph.D on the topic "The Concept of Peremptory Norm in International Law". Mr Atul Alexander has judged several national and international moot court competitions, also has several paper publications to his credit.

Climate change management and its impact on policy

Aranya Nath, Shreeja Shyama Praharaj
KIIT School of Law

The most debatable topic in today's discussion is the rights and obligations of developed and developing countries with respect to carbon footprint. Though climate change causes a serious threat to those countries which are still going to the path of developing countries like India. The source of carbon emissions are the industrial development which as a result our country's growth with respect to industrial sectors are increased but due to such type of emission of deadly gases like raw carbon, greenhouse gas led to cause our atmosphere to be polluted. Even in New Delhi to curb the pollution (which led to cause the atmosphere to be polluted as a result climatic changes takes place) additionally install an odd even scheme too.

Since our country India geared up from developing countries to developed countries like USA, UK at a very fast rate as a result of industrial pre-determination, the need for higher emissions of carbon and other deadly gases which led to increasing the emission level and as a result climate changes rapidly.

Climatic management is there to reduce emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere (mitigation); and also to reduce our vulnerability to the harmful effects of climate change (like sea-level encroachment, more intense extreme weather events or food insecurity). It also encompasses making the most of any potential beneficial opportunities associated with climate change (for example, longer growing seasons or increased yields in some regions). This paper dwells into the issue of climate change management and the impact it has on the economy of a country like India. It covers what India, being a developing Nation, is doing and how that is affecting the growth of key sectors like power and ultimately the Nation's economic growth.

This paper analyzes the management of climatic changes and its impact on several policies and also the rationale behind taking up carbon reduction measures when there are other more fundamental issues to be dealt with in the Indian economy

***Keywords**: Climate change, greenhouse gas emissions, environment, global warming, global climatic negotiations.*

About the Author: Aranya Nath is a student of fourth year B.Sc.LL.B KIIT SCHOOL OF LAW, Bhubaneswar having a good experience in research paper publication. Till now she has published nine papers on environmental laws, biodiversity laws, commercial laws, IPR Laws, cyber laws. She also has attended five conferences on drafting, environmental laws, biodiversity laws, IPR laws, commercial laws.

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A Critical and Analytical Study on Climate Change and it's Impact on Human Migration

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According to the Intergovernmental Panel on Climate Change (IPCC) the single impact of climate change could be on human migration, with millions of people displaced by several kinds of environmental hazards. If we discussed about the population movement and displacement then climate change will be one of the key drivers.

It is very common phenomenon that for last many decades, people are migrating from rural to urban areas for livelihood and higher incomes. However, in India there are two types of displacement and migration due to climate change. First, increased migration within India is likely due to the effects of climate change on disasters such as drought, desertification and specially sea level rise. Second, climate change might lead to increased flow of migrants from neighboring countries due to the adverse effects of climate change.

Apart from the cause of climate change and its effect on migration the author in this paper has tried to analyses the influence of environment on out-migration in Sundarban is an archipelago along the Bay of Bengal Coast. The principal means of living in Sundarban are farming and fishing which are moderately affected by the environmental change.

Henceforth, this paper analyses interlink between climate change and migration with special emphasis on Sundarban, the largest mangrove forest in the World.

***Keywords**: Climate, Population, Migration, Displacement, Environmental Degradation*

About the Author: Chayan Chakraborty is a Guest Faculty of Sarsuna Law College. He was also a part of a summer course at ISIL (Indian Society of International Law) at New Delhi. He is also member of Indian Red Cross Society.

Nature and relevance of class in environmental adjudication in India

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South Asian University, New Delhi

Many scholars have gone on to say that the environmental adjudication in India is disproportionately prejudicial to the poor. According to the authors the decision of the Supreme Court of India in The Kerala State Coastal Zone Management Authority v. The State of Kerala Maradu Municipality (2019), wherein the court ordered the demolition of three expensive apartment complexes housing upper-middle-class residents, can be seen as a challenge to this criticism of a prejudicial effect. This Supreme Court judgment has triggered a debate on the relevance of class in environmental adjudication in India. The Supreme Court of India through landmark environmental cases like M.C. Mehta *vs*

Union of India (1985) and T.N. Godavarman Thirumilpad *vs* Union of India (1995) has arrogated to itself vast powers using the alibi of Public Interest Litigation. Since the questions of environmental protection are intertwined with the questions of human existence, the dictates of the court in these matters have always had wide repercussions. However, the onslaught of neoliberal economic policies on environmental adjudication in India has made it susceptible to structural class bias(es) and has consequently resulted in many deleterious effects, including the invisibilization of certain stakeholders. This paper attempts to understand the role that class plays in structural class bias and the resultant invisibilization of certain stakeholders in environmental adjudication in India.

***Keywords**: environmental, adjudication, class, invisibilization*

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Climate-Induced Displacement and Rights-Based Protection: Need for a Sui Generis Convention

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West Bengal National University Juridical Sciences

Unprecedented forced human displacement is expected to be one of the manifold catastrophic consequences of climate change caused by carbon emission. Indeed, the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), 1990 had noted that the greatest single impact of climate change might be on human displacement. However, while the question of appropriate regulatory mechanisms for mitigation has deservedly been at the centre of international discourse on climate change, the legal implications of climate-induced displacement have not yet received commensurate attention. Worryingly, the status of legal protection available to such Climate-Change Induced-Displaced Persons (hereinafter CCDPs) is uncertain. There exist considerable gaps in the available normative frameworks under the international law of forced migration. CCDPs would arguably fail to meet the standards under the UN Refugee Convention 1951 which stipulate that a person must have been displaced by the fear of persecution on grounds of reasons race, religion, nationality, membership of a particular social group or political opinion. Not surprisingly, the UNHCR has expressed its serious reservations with respect to the terminology and notion of environmental refugees or climate refugees.

Theorists have sought to fill these lacunae in the existing framework by identifying elements and state-obligations under current international human rights law and environmental law which may be relied upon to provide protection to CCDPs. On the other hand, some states, scholars and campaign groups have suggested that the 1951 Refugee Convention should simply be amended and expressly extended to include CCDPs who have been forced to move across borders.

The proposed paper seeks to identify the existing gaps in the international legal framework and argue that ad hoc responses to protection needs of CCDPs based on existing international legal regimes are likely to be ineffective and would lead to inconsistency, confusion, and conflict. Climate change induced displacement presents a multi-faceted problem that spans across different international protection regimes Thus, it will be argued that an independent self-standing Convention would have certain advantages over other suggested alternatives in ensuring a tangible rights-based protection regime for CCDPs. However critically, the paper also proposes to

argue that a separate Convention regime may not inherently be a more suitable alternative.

The paper would identify certain key requirements that must be satisfied for any such Convention to be an effective instrument of international protection for CCDPs.

Keywords: *Climate, Climate-Change Induced-Displaced Persons, Sui Generis Convention*

About the Author: Saurabh Bhattacharjee teaches courses on Legal Methods, Labour Law, Law and Impoverishment and Socio-Economic Rights at NUJS. An alumnus of NALSAR Hyderabad and University of Michigan Law School. Saurabh worked on campaigns on issues of conflict and human rights, corporate accountability, refugee rights before joining academia. Apart from teaching, Saurabh has written and published for national and international journals and done research work for organisations like UNCTAD and IGNOU. He has authored several legislative reports submitted before Parliamentary Committees and Ministries of Union Government. Saurabh is also a Member of the Committee to Review Vagrancy Laws, constituted by the Government of West Bengal.

Carbon footprint in animal husbandry practices and its management

Prasanna Pal, Satarupa Ghosh
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Human livelihood has been closely interwoven with the animals from the prehistoric periods. At the present time also, we largely depend upon the animals for food, draft power and many other things. With the increase in the human population, the demands for animal products are increasing. The change in climatic conditions especially global warming has a negative impact on animal productivity also. But, interestingly, the livestock sector is contributing a major part of greenhouse gas (GHG) emission. Nearly 7.1 Gigatons of CO_2 equivalent are emitted every year by global livestock; representing 14.5% of total anthropogenic GHG emissions. Among the domestic animals, cattle only (raised for beef, milk, manure, draft power) account for about 65% of the total livestock sectors emissions. In terms of activities, the two main sources of emission which represent 45% and 39% of all emissions are feed production and treatment and enteric fermentation of the ruminants. The storage and processing of manure are responsible for 10%. The rest can be attributed to the processing and transportation of animal products. In terms of commodities, beef and cattle milk are contributing 41% and 20% of GHG output from the livestock sector. The principal gas produced from this sector is methane (44%) followed by nitrous oxide (29%) and CO_2 (27%). In order to fight climate change and global warming, we have to reduce the production of GHGs from animal husbandry practices. Interventions have to be formulated according to the local conditions. Nutritional management, breeding management and improving animal health are effective ways in reducing GHGs. We have to focus on more productivity from the animals along with less GHG production and less carbon footprint.

Keywords: *Animal husbandry, carbon footprint, greenhouse gases*

About the Author:Dr. Prasanna Pal is a Veterinary doctor and Ph.D. research scholar in Animal Physiology at ICAR-National Dairy Research Institute, Karnal, Haryana. He has published several research articles, review articles, short notes, popular articles etc in national and international journals. He has also authored five book chapters in three books. He has attended several national and international conferences, seminars, symposiums, workshops etc and presented his research work there. He has been

awarded Best Poster Presentation and Best Paper Presentation awards several times. He has also received the Best Article Award from Agriculture and Food magazine. He is a life member or annual member of societies like Society of Animal Physiologists of India, All India Agricultural Students Association etc. He is associated with Agriculture & food: e-Newsletter as Editor (Animal Science) and Biological Rhythm Research Journal as a reviewer.

Miss Satarupa Ghosh is a Ph.D. research scholar in the Department of Aquatic Environment Management at West Bengal University of Animal and Fishery Sciences, Kolkata. She has published several research articles, review articles, short notes etc in national and international journals. She is a regular author in many agricultural magazines in both Bengali and English like Indian Farmer, Agriallis, Krishijagran, Agriculture & food: e-Newsletter etc. She has also authored two book chapters in two books. She has attended several national and international conferences, seminars, symposiums etc and presented her research work there. She has also received the Best Article Award from Agriculture and Food magazine. She is associated with Agriculture & food: e-Newsletter as a reviewer. Her notable research works include- determination of heavy metal accumulation in common fishes, human health hazards due to heavy metals etc.

Saturday January 18, Technical Session 1
10: 00 a.m. – 11: 30 a.m.

Climate Change: Causes & Effects

Chairperson: Prof. Rathin Bandhopadhay
Co Chairperson: Mr. SurjaKanta Baladhikari
Rapporteur: Dr. Roopali Roy Chowdhury
Room: 107

Making businesses sustainable, futuristic and eco-friendly: Is it an option or a responsibility

Aditya Jain, Advocate
Supreme Court of India

Today's linear economy in which, quite simply, natural resources are extracted from the ground, made into products, used, and thrown away was highly successful in delivering economic development during the 20th century. However, global trends indicate that the traditional, linear models ability to produce economic growth is being increasingly challenged, prompting a search for alternative approaches that can work in the long term.

Companies are actively pursuing alternative approaches to the linear take-make-waste model that de couple economic growth from resource constraints such as the circular economy. This concept has captured the attention of many companies that see the economic opportunities of a viable model to successfully tackle sustainability challenges; drive performance, competitiveness, and innovation; and stimulate economic growth and development.

By way of this research paper, the author will try to focus on whether making sustainable business is an option or a responsibility which we all need to take. Furthermore, what models of business would be sustainable in the next two decades and how they could be remunerative and a DUI rewarding at the same time. It is high time that we move from

traditional way of thinking and think of restructuring our businesses on sustainable lines. Environment, not an option, but a responsibility is a new age concept, which would explore in detail in various facets of this research paper. Furthermore, this paper will throw some light on different ways, which some businesses across the globe have adopted to make businesses more sustainable, eco friendly and self sufficient. Traditional ways of running businesses would be rendered futile in the face of changing dynamics, environmental challenges and new socio-political challenges.

Keywords: *Sustainable, Environmental Challenges, Traditional, New-Age, Remunerative, Business*.

About the Author: Aditya Jain is an Advocate in Supreme Court and Rajasthan High Court since 2013. He is practicing on commercial, civil and criminal side at trial court, High Court and Apex Court. He is also working in various tribunals namely NCLT, Real Estate Regulatory Authority, Debt Recovery Tribunal, Central Administrative Tribunal, Consumer Redressal Forum *etc*. He has also presented papers at various conferences on diverse topics such as Arbitration, Criminal Law, Data Protection Act *etc*.

Misgivings of systemic carbon footprint of the defense sector

Ranjana Dey
IIT-Kharagpur

Goal 13 of the SDGs broaches on the need to take urgent action to combat climate change. While actions taken in this direction are many, the emission of greenhouse gases however is on the rise. Amidst various sources named and shamed to have been the highest contributors of greenhouse gases, one persistent source that has dodged itself from popular critique is the defense sector. Military weapons, equipment and vehicles are exceedingly fuel thirsty. War tanks and fighting vehicles have been found to consume 100-200 million liters of fuel every month during action. Aircraft bombers can burn 4-5 gallons of jet fuel per mile, thereby emitting tons of greenhouse gases in a flight of a few thousand nautical miles. A modern aerial refueling tanker itself consumes about 5 gallons per mile. One can now estimate the quantum of greenhouse gas emitted by aerial bombers (along with refueling tankers) that travel cross-continent through thousands of nautical miles to attack an enemy target.

Research has concluded the total emissions of the U.S. alone between 2001 and 2017, including overseas operations have generated not less than 500 million metric tons of carbon dioxide. With this and much more available data, the author seeks to stimulate dialogue on this not-so-visible and not-so-discussed contributor of substantial carbon footprint leading to global climate change. Attention will be paid to importance of arms control and diplomacy at reducing overall threats of war (Goal 16) that will go a long way at reducing carbon emissions.

Keywords*: SDGs, defense sector, greenhouse gas, carbon footprint, global climate change*

About the Author: Ranjana Dey is a doctoral student at the Rajiv Gandhi School of Intellectual Property Law in IIT-Kharagpur. For her doctoral thesis, she is working in the area of environmental jurisprudence. In addition to her area of doctoral research, she takes interest in International Humanitarian Law and Human Rights Law.

She has earned her degrees in LL.B. and LL.M. from University of Delhi, India and North Eastern Hill University, India respectively.

She served as an Assistant Professor (Law). She has presented papers at National and

International Conferences organized by institutions of repute.

Role of national green tribunal as a domestic legal mechanization for controlling carbon emission in India

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The University of Burdwan

Environmental safeguard is not a new notion to Indians. It is a 5000-year-old history and tradition in India to preserve and worship nature. But, climate change in the recent years have caused a Worldwide alarm by various means like, the burning of carbons, fossil fuels, burning of agricultural lands, etc. Carbon emission requires deterritorialization of global territory, since, it is a frontier less environmental nemesis and we are still hanging in the skyhook of going beyond our frontiers. This issue has been taken as the center concern of global negotiation and has culminated to various agreements and conferences. Thus, the harmful effects of climate change have led to the formation of a separate Tribunal to deal only with environmental matters known as the National Green Tribunal. In this respect the National Green Tribunal though appears as a patent Indian but significantly it has definite global ramification as a sophisticated legal means recognised by the global community. The paper will focus on the importance of the National Green Tribunal in controlling the carbon emission through some of the important judicial decisions laid by the National Green Tribunal. But it is found that the NGT is passing through its infant stage. Practically speaking it is a teethless instrument. It can be said to be a kind of instrument to fulfill our green dreams. The paper lays stress on the National legal policies and norms and important principles applied by the National Green Tribunal in combating carbon emission. This paper will therefore forecast on the functionality of the National Green Tribunal and whether the present scenario of the National Green Tribunal helps in reducing carbon emission or is lying in a stale condition.

Keywords*: Carbon Emission, National Green Tribunal, judicial decisions, climate change*

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Constitution: A safeguard to carbon mapping

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Development and Environmental protection must go hand in hand. With developmental steps somehow or the other the mother nature is going to get hampered, which is very much visible to us since industrial revolution. Emission of hazardous gases is a part of industrial process. There are specific legislation which set standards for factories regarding their emission of gases. But development still leads to degradation of the environment. Emission of carbon dioxide is one of such gases and continuous increase in its limit of existence in the atmosphere is leading to devastation of human life.

Carbon Mapping is one such efforts which makes it possible to measure and control presence of carbon dioxide in the atmosphere. Measurement and Control of Carbon dioxide with the help of Carbon Mapping is a fundamental method of promotion of Right to Environment. The Constitution of India plays a *vital* role in promoting such measure. The Preamble assures 'the dignity of the individual' whereby each and every citizen is entitled to live in a healthy environment. There are various interpretations of Article 21 one of which promotes Right to Environment accompanied by plethora of Case Precedents. Article 48(A) of The Directive Principles of State Policy lays down a guideline which the State should follow in order promote

measures which protect the nature and wildlife. Similarly, Article 51-A (g) lays down a duty for the citizens which they should perform in order to preserve the mother nature.

The State can take measures like funding and helping the Scientists in research and development to invent ways to carry out Carbon Mapping and the Citizens can perform their fundamental duty by planting trees and spreading awareness about carbon mapping.

***Keywords**: Development; Environment, Carbon Mapping, Constitution; State, Citizens*

About the Author: Bhaskar Mukherjee is a final year of B. A., LL. B (H), pursuing from, Amity Law School, Amity University Kolkata. He is specialised in Intellectual Property Laws.

Chandrika Saha is an undergraduate law student from Amity Law School, Amity University Kolkata pursuing B. A., LL. B.(H). She is specialized in Intellectual Property Laws.

Climate Change and Mangrove Conservation in India: Demarcating the Legal Void

Sharda Mandal, Arindam Basu
IIT Kharagpur

As climate change continues to intimidate the life expectancy of ecosystems all over the World, the health of mangrove forests is gradually becoming more vulnerable across the coastline in India. Being salt tolerant vegetation, mangroves are popularly known as tidal forests and come under the category of tropical wetland rainforest ecosystem. With the intricate structure, mangroves nurture distinct environment where large variety of fishes, crustaceans and other organisms thrive, providing rich sources for the livelihood of coastal communities. In India, mangroves are under severe threat because of rapid urbanization and increasing polluting activities. Unsustainable aquaculture also poses significant risk. But today the most impending threat to mangroves comes from climate change as increase in temperature, carbon dioxide build-up in the atmosphere, gradual rise in sea level, ocean acidification and extreme weather events like cyclones and extended spell of hot weather are likely to have deleterious effect on the health of mangroves. It is, thus, important to understand the probable responses of mangroves to climate change. In chorus, laws and policies are to be attuned. The Government of India seeks to protect and sustain mangroves in the country by various regulatory and promotional measures. However, there are lack of coherency and interconnectedness within such framework. Besides, India's recent climate policy fails to address the concern adequately. Indian judiciary has been repeatedly emphasizing on the need for scientific management of mangroves and the strict implementation of laws which may further ensure the traditional rights of coastal communities within their surrounding natural habitats. This paper aims to appraise the inherent lacuna present within the Indian legal framework for mangrove conservation and provide timely suggestions.

***Keywords**: Climate change, Mangrove ecosystem, Carbon sink, Ocean acidification.*

About the Author: Sharda Mandal is currently pursuing her Ph.D. from Rajiv Gandhi School of Intellectual Property Law (RGSOIPL), IIT Kharagpur. She has obtained her LL.M from Hidayatullah National Law University and M.Phil. from Pandit Ravi Shankar Shukla University, Raipur. She has also worked as junior advocate in District court of Raipur. Her research interest areas are environmental law, medical law, cyber law and civil law.

Dr. Arindam Basu is currently working as assistant professor in Rajiv Gandhi School of Intellectual Property Law (RGSOIPL) in IIT Kharagpur. He has completed his LL.M. from NALSAR,

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Greener Traffic for Development? - Decoding E-Vehicle policies in light Smart City Guidelines

P. Bayola Kiran
Damodaram Sanjivayya National Law University, Visakhapatnam

Just like you have fire regulations, they (Government) should have regulations that no building would be made without charging points for electric vehicles.

- Anand Mahindra

Mobility may be considered as a hallmark of development. The focus of the World is slowly shifting from faster mobility to greener mobility. Electric Vehicles may appear as an answer to the growing concerns of pollution. But to boast that we don't pollute with our vehicles directly has an inherent reference to the indirect pollution i.e., the question as to how green is the energy used for electric mobility always casts a spell of dirt on the aspirations of green ends by indicating not-so-green means. Almost all major Indian cities feature in the infamous list of most polluted cities in the World. To suit the need of the hour, we cannot stop our growing vehicular population (and thereby vehicular pollution) as it stalls development. India has to embrace the latest technological developments in making cities sustainable. It is an internationally recognized aspiration that SDG 11 (Sustainable Cities and Communities) should go together with SDG 7 (Affordable and Clean Energy). Contextualizing this to India, this paper tries to trace the possibility of having a clean transportation in the cities by decoding Electric Vehicle Policies, Smart City Guidelines and the energy policies, thereby examines the issues (of law and policy) in translating the aspiration into reality.

Keywords*: EV Policy, Smart City, Clean Energy*

About the Author: Mr. Poosarla Bayola Kiran teaches Infrastructure Law, Law relating to Banking and Negotiable Instruments at DSNLU, Visakhapatnam. He has also taught Natural Resources and Energy Laws, Professional Ethics, Law of Taxation -II (GST), Information Techonology and Law. He pursued B.A., LL.B (Hons.) from DSNLU and graduated in 2014 with Seven Gold Medals (including the best outgoing student). He then pursued LL.M (Business Laws) from Andhra University, Visakhapatnam. He cleared the UGC-NET in 2015. Before joined DSNLU in 2017, he taught for an year in GITAM School of Law, Visakhapatnam. Presently, he is pursuing Ph.D in Law from Andhra University.

Greta Thunberg's idea of climate change and smart cities mission in India

Santu Seal
St. Xavier's University, Kolkata

Greta Thunberg, a vociferous teenager, exposed the World to a demographic which she accused of World stealing her dreams. It uncovers the World that we inhabit and dearly love being under a massive threat. It was all about the threat that would endanger the existence of all the species that are known to the mankind and is the Climate Change crisis. The climate change and global warming is happening at such a rapid pace that the scientists (NASA) and the UN summit has declared that the inhabitants have less than a decade to fix the current crisis and all it takes it initiating macro and micro changes and activism. Climate change and its impact is not an unknown or uncovered territory. It has had World leaders, scientists and environmental activists engaged in dialogues,

initiate actions and take numerous steps trying to find ways to counter the impact and the adversities of such climate change crisis.

Narendra Modi's Government introduced India to Smart Cities Mission. The objective of the smart cities mission is to promote urban development and provide cities with such core infrastructure which would ensure decent quality of living while focusing on sustainability. The strategic components of area-based development in the mission are three pronged- city improvement (retrofitting), city renewal (redevelopment) and city extension (Greenfield development). The concept of city extension and new areas or green-fields to be developed around cities in order to accommodate the expanding population in urban areas will be key focus of this paper. The mission requires active participation in governance and reforms. Sustainability is a key aspect of the smart cities mission and the overall progress and establishment. Through this paper, the research will explore in depth about the climate change and its repercussions and influence on the smart cities mission introduced in India and the aspects introduced in the smart cities to counter the current climate change threats. The paper will elaborate on the smart cities mission of the country from a developing nations perspective and elucidate on its constituents and its implementation policies and how its implementation affects the current climate crisis that the World in general is harboring. The mission will be compared with one of the smart cities and its features in one of the developed countries to establish a collateral link on the terms of sustainability. The mission has its own drawbacks and could derive its inspirations and way forward from Greta's idea of climate change and its imperatives. If the current crisis is not dealt with, its affect can be devastating and irreversible and we will lose our planet.

Keywords: Sustainable development, climate change, smart cities mission,greens fields

About the Author: Santu Seal is an undergraduate student at St. Xavier's University, Kolkata.

Combating climate change with environmental ethics

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The conceptualization of environmental ethics lies amidst a state of dilemma. On one hand ethics-aesthetics mingle as a part of an integrated self-realization balancing the other element of excavating possibilities of formulating laws akin to this personal consciousness towards conservation, protection and preservation of the environment. The debate lies on two contrasting poles-one group of scholars (radical environmentalists) opine environmental ethics to be embedded in us and the consciousness is yet to be realized and that their movement is essentially to forge and bring to light this enhanced self-introspection. The other group of environmentalists argue that the ambiguity, non-palpability and absence of concrete element relying merely on intra-personal levels serve no purpose whatsoever in augmenting recognition and protection of environment. This paper shall address whether incorporation of the ideas of earth justice will be worthwhile in combating the environmental degradation underway across the globe, whether public consciousness is enough to maintain the green-planet or devising policies for effectuating the same is needed, if at all polices could be formulated in this line of argument. This paper hopes to offer a different research looking into forging concrete relationships between the society and environment sans much governmental interferences. The challenge is to lay down an outline for this novel idea and this paper will shall address.

Keywords: *Environmental Ethics, Deep Ecology, Self-Realization, Social Animism*

About the Author: SomabhaBandopadhay is an advocate at the Calcutta High Court and presently working as a Research Assistant at the Centre for Regulatory Studies, Governance and Public Policy, West Bengal National University for Juridical Sciences (WBNUJS), Kolkata. She is also pursuing her Ph.D from NUJS and has pursued BA.LLB with international law honors from School of Law, KIIT University, Bhubaneswar and LLM from National Law School of India University (NLSIU), Bangalore with specialization in human rights. She has been a scholarship holder at KIIT University. She was awarded the Nani Palkhivala Memorial Gold Medal at NLSIU Bangalore for securing the highest in LLM (Human Rights) and the Chancellor's Gold Medal and Nanibala Devi Memorial Gold Medal for securing in the highest in School of Law in 2018.

Somabha won the prestigious Bar Council of India Inter-University Moot Court competition in 2017 and was adjudged as the Best speaker as well as the Best Female Advocate that ensured her a scholarship from the Council for a year. She has seven research publications to her credit including the Journal of Bangladesh Institute for Legal Development and Indian Bar Review by the Bar Council of India among others. She has also presented papers at various conferences on issues concerning human rights including at seminar on Child Rights organized by South Asian Women in Media (SWAM) and Child Rights and You (CRY), Bhubaneswar, National Law University, Delhi and NUSRL Ranchi. One of her papers were selected for presentation at the Gender and Women Studies conference in Istanbul, Turkey in 2016.

Climate Change, Human Displacement and Legal Protection Gap "A Case Based Analysis of Nexus Dynamics

Apala Goswami, Kaushik Saha
L.J.D. Law College and WBNUJS

Recently the notion World Environmental Refugee has become more prominent due to media and news stories. These reports generally refers to those people who have either crossed the international borders due to extreme climatic situations or are extremely vulnerable to a change in climate. Although the United Nation High Commissioner for Refugees do not recognize the term World Environmental Refugee or World Climate Refugee, but off let it does recognize the concept of World climate change and disaster displacement. People move for various reasons and this movement can be broadly categorized into two heads, namely, internal displacement within the state borders, and another one is displacement across the border. The scenario is easy to describe when it comes to internal displacement induced by climate change as because the government of the respective country in obliged to cater the needs of those displaced persons. But the complexity arises when people due to extreme situations crosses the international border. They cannot be termed World refugees as the Convention relating the Status of Refugees of 1951 do not enlist climate change as a ground of human displacement. Moreover it was mainly created to solve the problem of statelessness that arose after the Second World War. They can be granted a relief under Cartagena Declaration of 1984 only if the event that leads to displacement is serious enough to disturb the public order. This is where the concept of nexus dynamics comes. It denotes that there is a situation of climatic disaster along with an event of conflict or violence, irrespective of the fact whether such conflict has or has not been arose due to such climatic disaster. As such in this paper case based study will be made of situations where nexus dynamics existed and how the destination states

responded as per their domestic law and international conventions. Another part of this paper will deal with situations where the nexus dynamics was not present and climatic disaster was the only reason of human displacement and how it was tackled by the destination country by framing legislation. Lastly the paper will suggest how the legal void that exists in protection of the climate change induced human displacement can be dealt with.

Keywords: *Climate change, human displacement, Nexus Dynamics*

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She has completed her LL.M (Gold Medalist) from National Law University Odisha in Constitutional Laws.

She has done her B.A.LL.B (Honours) from Department of Law, University of Calcutta, Hazra Campus, Honours specialization in graduation level was on Intellectual Property Laws, Gender Laws, Corporate Governance and International Trade Economics.

She has been part of two field studies conducted by NLU Odisha, namely; evaluating the working of Gram Nyalayas in the State of Odisha and Post-Disaster Socio-Legal Intervention in the State of Odisha.

Kaushik Saha is currently pursuing LL.M. from West Bengal National University of Juridical Sciences in Commercial and Corporate Laws specialization. He has also participated in many National Conferences and Seminar.

A Review on Carbon Emission in Indian Metropolitans and SDG of UN from the Perspective of Anthropogenic Control

Partha Sarathi Sarkar
IGNOU

A city is as beautiful as the residents think to make it. In metropolitans the sources of Carbon are increasing due to the over urbanization. There is no easy solution for it as Mahatma Gandhi has told nature cannot be adjusted with human greed. The Sustainable Development Goal has cantered the sustainability of cities as goal number 11 which can never ever be ignored by a country like India. The government has taken several steps in this connection as in the Constitutional principle under Directive Principle of State Policies has mandated the need to have protection by conserving forests. But the cities which are growing rampantly and without much planning due to the reason of economic hazards and culturally negative due to presence of slums or huge migration. In this connection the metropolitans in India have great risks as those are densely populated. 142 cities will be in great danger of extreme heat under global warming by 2050. Henceforth many sensible approaches should be taken by the governing authorities of those places. This heat condition can further be degraded if the Carbon emission is not controlled. Global Sustainable Development Report 2019 has suggested government as the key stakeholder for assuring change towards a better living. The Green House Gas footprint is still very high when Delhi has 38633.2 Gg and Ahmedabad has 9124.45 Gg and the main forces of it is the transportation or domestic therefore this connection be exemplary that tells anthropogenic conditions are the culprit. In this manner the governance can have a very limited authority to control on the total issue. In this study a review has been placed to see how the Carbon emission and due effect have to get a transformation from the governance to common living.

Keywords: City, Metropolitans, Populated, Carbon

About the Author: Partha Sarathi Sarkar is a researcher on Development Policy and Social Welfare. His research career is continuing since 2014. He has published several article at international and national level. He has also participated in many international and national seminars. He is a Master degree holder on Agriculture & Rural Development from Ramakrishna Mission Vivekananda Educational and Research Institute. This time he is continued with his second Masters on Anthropology from IGNOU. The researcher has Certificate on Sustainable Development from Azim Premji University and another Certification has been obtained on Integrated Planning for Climate Change and Biodiversity from UNITAR and IUCN. He has several publications in the connections of environment and those have got valuable appraisal. It is his wish here to tell how government cannot be the single share holder to mitigate problematic issues related to environment.

Saturday January 18, Technical Session 1
10: 00 a.m. – 11: 30 a.m.

Climate Change: Causes & Effects

Chairperson: Prof. M.K. Ramesh
Co Chairperson: Mr. Souvik Mukherjee
Rapporteur: Mr. Arin Mukherjee
Room: 119

Geo-Engineering: Panacea for the Climatic Crisis

Rishi Raj Mukherjee, Samiksha Singh
National University of Study and Research in Law

The greatest threat to our planet is the belief that someone else will save it.

"ROBERT SWAN"

One might reckon that rise in average global temperature since 19th century is merely a chance phenomenon, but the likelihood that man had a hand in the rise cannot be spurned. Climate Change is a burning issue with deleterious and devastating impacts on the ecosystem. From the 13th UN Sustainable Development Goal to Paris Agreement, catalysing European Union to decide on making a carbon-neutral economy by 2050, efforts are being made in every direction to explore possibilities that could deliberately cast a countervailing effect on the climatic changes. However, each year the situation continually deteriorates making it clearer that eliminating the risks associated to climatic changes is a mere hallucination because, CO_2, unlike other conventional air pollutants, stays in the atmosphere and its rate of transmission is higher than the methods that are in practice to control it. In this context, the paper deals with an alternative, suggested way back in 1830s by James Pollard, later used in the US Project Storm Fury and fulcrum of the famed US Presidents Science Advisory Councils Report, 1965, the concept of

Geo-Engineering. It is high time that a concept which has remained under the sheets in black and white be brought out and discussed by policymakers for its potential to curb the imminent disaster at a steady pace ensuring economic viability. The paper analyses Geo-Engineering and Solar Radiation Management and emphasizes on Stratospheric Aerosol Injection as the panacea to this grave crisis. The paper not only acknowledges the apprehension of moral-hazard and other dilemmas articulated by policymakers whilst reasoning this alternative but also holistically projects its development. Lastly, it highlights the political radioactivity and challenges that have to be surmounted before implementing this unique concept.

Keywords: *Geo-Engineering, Panacea, Climatic Crisis*

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Routing Emotional Intelligence towards Ecological Intelligence

Rohan Girish Raj, Ananya Jain
Tamil Nadu National Law University

The concept of emotional intelligence basically means to combine different categories of emotions and intelligence, with an objective to interpret these emotions as useful sources of information to get a clear view and to understand the social environment. Thinkers like Salovey and Mayer had proposed a theory regarding emotional intelligence as the skill or capacity to control ones feelings as well as that of others, and to use this information to guide ones thinking and actions. Later, this concept was divided into four branches. The first branch of emotional intelligence talks about perceiving emotions. That is, the ability to identify and interpret emotions of one's own. The second branch is using emotions. This is the ability to use emotions to carry out certain activities like thinking, problem solving, etc. the third branch understands emotions. This is the ability to understand emotional language and to realise the complicated relationships or connections between emotions. The fourth branch talks about understanding emotions. This is the ability to regulate and control emotions among us. A point is to be kept in mind, which is that, such branches of emotional intelligence would not exist if the concept of a society didn't exist. Therefore it is important to understand what is considered as appropriate behaviour when one interacts socially. It is to be understood through introspection that ecological happenings like climate change, loss of biodiversity, depletion of natural resources, etc. have not occurred on a natural basis. These happenings are the result of human behaviour and absence of values in us. If humans continue to live in an unsustainable manner, the nature would cease to support us anymore. Therefore education for a sustainable way of living should be inculcated in the minds of people by linking social, emotional and ecological intelligence theories.

Keywords: *Ecological, Emotional, Environment, Intelligence, Unsustainable.*

About the Author: Rohan Girish Raj is an Advocate and enrolled under Kerala Bar Council. He is an alumnus of Tamil Nadu National Law University.

Ananya Jain is pursuing BA LL.B.(H.) from Tamil Nadu National Law University.

The Social Cost of Carbon footprint and its impact on economy of a country

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Himachal Pradesh National Law University, Shimla

The social cost of carbon, the marginal external costs resulting from enhanced climate change due to carbon dioxide emissions is an important concept in environmental policy. It is closely related to the Pigou tax, the price that should apply to emissions if the aim is to maximise global welfare. The social cost of carbon could therefore theoretically inform assessment of the desirable intensity of climate policy, and it plays a crucial role in any cost-benefit analysis of emission abatement initiatives.

There are two major challenges to estimating the social cost of carbon. First, everything about climate change and its impacts is uncertain. This is partly because climate change is primarily a problem in the future; and partly because both the human and natural components of the Earth system" and thus both the drivers and the impacts of global climate change" are complex and only partially understood. Second, any assessment of the seriousness of climate change requires value judgments about the relative importance of temporal impacts: those that occur now and in the future; spatial impacts: those that impact people near and far across the globe; and the risk aversion of society for uncertain impacts: the more severe damages that may occur less likely, but still plausible, futures.

The aim of this special issue is to revisit the social cost of carbon dioxide and other greenhouse gases. The special issue is open to new estimates of its size, its composition, and its sensitivity to assumptions; to novel discussions of the conceptual and theoretical issues in estimating the social cost of carbon; and to assessments of its potential use in regulation and policy.

Keywords - pigou tax, climate change, greenhouse gases, carbon emission.

About the Author: Tejasvi Shukla is a second year student of Himachal Pradesh National Law University with special interest in socio economic aspect of various activities going into the society.

Green Technology and socio-economic viability

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In this paper the urgent need to switch to Green technology and its socio-economic viability is discussed. Green Technology has to be judged on various parameters like social equitability, economic feasibility and sustainability. Although green technology is our way out of destruction but its two edged; it has several disadvantages too. In this paper we have tried to accommodate all the possible views in favor of the Green technology as well as against it. It's good to hear the cons of anything first, so the paper is started with the negative impacts and various hindrances to its implementation. Ranging from economical, technical to even ethical downslide there are several problems attached to the green technology. Moving on to several analyses by United Nations Environmental Program (UNEP) on the topic is discussed and is critically analysed. The next thing discussed in the paper is the pros. From corporal benefits to urban and rural benefits, the pros seem to outweigh the cons but if understood in the right manner done do so. At the end, a study based on the government policies and as well as my own views on Green technology wraps up the paper. Several data's and analyses is done keeping in mind the differing point of view of today generation.

Keywords: *Green Technology, Analysis, UNEP, Pros and Cons, Government policies, feasibility.*

About the Author: Samar Islam Laskar is a student of Class 12 of Delhi Public School Mathura Road, New Delhi.

Carbon sequestration in a common true mangrove flora, *Excoecariaagallocha* of Indian Sundarbans

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Mangrove ecosystems play a key role in the global and oceans carbon cycle, acting as a potential sink for atmospheric CO_2. On this background we initiated our study on carbon sequestration of a true mangrove flora, *Excoecariaagallocha* that has wide range of tolerance to salinity.

We estimated the Above Ground Biomass (AGB) and Above Ground Carbon (AGC) of *E. agallocha* in 24 sampling stations of Indian Sundarbans in two different periods 2000 and 2019. These 24 stations are distributed in 3 sectors (western, central and eastern) of Indian Sundarbans with contrasting salinity profile. We observed significant temporal variation with the data sets, but no pronounced spatial variation of carbon sequestration is noticed, which confirms the wide range of tolerance at this species to salinity. The results indicate that *E. agallocha* has high resilience to climate change induced sea level rise and subsequent increase of salinity.

Keywords*: Carbon sequestration, Mangrove flora, Excoecaria agallocha, Indian Sundarbans*

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Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Climate change and its impact on variability – an analytical study

Arpita Mitra
Indian Institute of Legal Studies, Siliguri

Every countries are more or less affected with changes in climate due to growing global warming and in return is affecting lifestyle of the people as well as the economy of the county is deteriorating more and more with every passing day. People in the society are the ones to experience the ultimate consequences as well as results of the shifting arrangement of the climate. The main and serious victims of these changes are people belonging to the poorest sector of the society as they are the ones who are the most defenseless and susceptible to all the changing natural calamities. Therefore in this backdrop the research will initially deal with regard to the climatic situation by highlighting the factors that led to the changes in the climatic condition several times. Further it will deal with the laws regarding protection of the environment and stress on the constitutional perspective with regard to the same. The paper will further analyse the situation in the twenty first century and elaborate on the National Adaption Funds that have been undertaken by the Government of India in this furtherance. It will also mention further about the schemes those are framed for extensive tenures for

reducing the levels of emissions of carbon dioxide and other gases such as greenhouse in the air by the year 2020. Last but not the least the paper will neutrally examine the causes and consequences of such climatic changes due to rapid industrialisation across the country and suggest few reformatory measures to deal with the same thereby specifying the occurrences in the society. Thus this research will be oriented on the international conventions and treaties by India and will study the effect of implementation by our country and the necessity of framing new laws to reduce the changes further.

Keywords: *Climate change, National Adaption funds*

About the Author: Ms. Arpita Mitra is currently working as an Assistant Professor of Law at Indian Institute of Legal Studies, Siliguri. She has pursued her LLM with specialisation in Corporate and Commercial Laws from Christ University, School of Law and completed her graduation from University of North Bengal, Department of Law.

Green Technologies and Their Impacts in Climate Change Mitigation

Susmita Dhar
The University of Burdwan

Climate change a global emergency and we all are stakeholders. Climate changes have drastic effect on every sphere of life. This not only affects human right life but also the existence of the flora and fauna. Mitigation mechanism of climate change includes the use of efficient green technologies. Green Technologies which are having great potential to combat climate change now a days are using by the developed countries as well as the developing ones which are environment friendly and more sustainable in nature. These environmentally sound technologies having the power of climate controlling and secure sustainable development goals. The main guide line of using such technologies can be found in sustainability, social equitability and economic workability. This technologies have the power to answer climate change and is a new way out which include renewable. They can reduce carbon emissions, waste recycling and sustainable manufacturing, creation of green building etc. The natural sources of like solar, water, air and winds can be used as alternative to produce energy without emitting greenhouse gases. They have beneficial impact on urban and rural lifestyle though they are not so popular yet. They are sometime economically costlier due to the existence of patent regime. We need these green technologies to protect the human right to life in a free and fair environment which can be panacea to combat climate change. Technologies are always having done greater good to the society and enhancing the quality of lifestyle causing smart growth and long time costs saving which are same in case of green tech. Climate change and the global warming are the outcome of the damage already done to our environment and green technologies which are biodegradable, energy efficient can repair the damage slightly to maintain sustainability.

Keywords*: Green technology, climate change, mitigation*

About the Author: Susmita Dhar is guest faculty at The University of Burdwan and Calcutta University. She has participated in many National and International seminar and having some paper publication including the prestigious journal IJLPR of NUJS. She has also practiced in the Hon'ble Calcutta High Court for many years especially in Criminal side and Writ Jurisdiction.

Impact of Petroleum Laws/Policies on Climate Change – A critical Analysis

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The topic climate change has got different facets. I am confining this research study from the perspective of combating air pollution and ensuring clean air by bringing certain significant changes in Petroleum laws/Policies.

The major laws that can give new impetus for combating pollution is :

1. Petroleum and Natural Gas Regulatory Board Act 2006 (in short PNGRB Act)
2. Petroleum and Mineral Pipelines (Acquisition of Right of User in Land) Act 1962.

The Article 21 of the Indian Constitution ensures the Right to life and liberty includes right to decent way of livelihood. In other words, while going for right to Development, the right to breath clean air free from any pollution is also a paramount right envisaged by the constitution. We need to draw a line and reconcile between the two. Of late, the India's capital city Delhi is considered as Gas Chamber for some days owning to the fact that the pollution level was very alarming and the people were subject to lot of respiratory problems like asthma etc. The duty is casted upon the State to guarantee the wholesome air as envisaged by the framers of the constitution of India in the larger public interest. Article 48A of the constitution also mandates protection of environment. The Bhopal Disaster case, MC. Mehta (Taj Trapezium Matter) *v.* Union of India are land mark judgments of Apex court towards safeguarding the people from environmental degradation .

<u>How to combat the pollution thereby paving the way for climate change:</u>

1. The major cause for the air pollution is the vehicular emission and particulate matter. The carbon monoxide emissions from the diesel engines create respiratory problems like asthma, lung cancer etc. more particularly to the children reducing life expectancy. The need of the hour is to convert polluting Diesel vehicles into Green fuel. As on today, the number of CNG vehicles are far less than the polluting diesel vehicles. The reason behind the same is that we do not have adequate CNG stations covering nook and corner of India unlike Petrol Pumps to cater to the needs of the CNG vehicles. With the limited CNG Stations, the CNG vehicles have to stand in queue. Moreover as the CNG stations are existing only in main cities without any coverage of the CNG stations in outskirts and villages, the user of CNG vehicle is not in a position to go on long travel due to non-availability of filling stations.

However, the PNGRB vide its Notification dated 14.5.2010 stated that the activity of setting up CNG Station can be undertaken only in areas AUTHORISED by the Board. i.e. CNG dispensation cannot be done outside any authorized area without the specific permission of the Board.
Hence the need of the hour is to augment the CNG stations in all parts of India by filling up the gaps in the existing Petroleum and Natural Gas Regulatory Board (PNGRB) Policies/Guidelines by relaxing the rules for opening up of free market for setting up of CNG stations in line with Petrol Pumps instead of restricting the business through PNGRB controlled AUTHORISATION to only certain entities which are into City Gas Distribution.

2. Containing Flaring of Natural Gas:

In India, the natural gas is continued to be wasted through flaring in various places because the gas as it is difficult to store and transport and hence emergent steps needs to be taken for containing wastage of this precious fuel significantly by bringing in appropriate Policy .

3. Bringing User friendly Shale Gas Policy:

India needs to pluck the loopholes in Shale Gas Policy to augment maximum utilization of natural

resources for achieving Gas Based Economy in India.

The above are the tools to the policy makers and policy implementers as the same is crucial for India in climate change.

Keywords: *Petroleum Laws/Policies, Climate Change, CNG*

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Climate Change and Hilsa Fishery

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Hilsa fishery contributes about 12% of total fish production and about 75% of World's total catch of hilsa comes from Bangladesh alone. An estimated 0.51 million metric tons produced annually and 2.5 million people depends on Hilsa fishery. It is an important trans-boundary migratory fish species in Bangladesh, India and Myanmar as 90 % of the World's catch comes from these three countries. As hilsa is an anadromous fish, it migrates from the Bay of Bengal to rivers for spawning, nursing and growing and for all of these purposes hilsa needs fresh waters. Ripe broods prefer turbid, fast flowing freshwater for spawning but young prefer clear and slow flowing freshwater. Climate change (salinity intrusion, sea level rise, temperature rise, impact of fresh water flow) damaging the hilsa stock and its habitats. So, climate change and human interferences are predicted to have a range of direct and indirect impacts on marine and freshwater hilsa fishery, with implications for fisheries-dependent economies, coastal communities and fisher folk. As a migratory species, Hilsa starts spawning migration from sea to the upstream and the juvenile Hilsa (locally known as jatka) graze on rivers and floodplains for 5–6 months of age before starts its back migration to the sea. Several physico-chemical factors may influence the migratory movements of Hilsa. Eggs are deposited in freshwater and hatching takes place within 23–26 h at an average temperature of 23° C. Therefore, change in water temperature has enormous effect on Hilsa production. Moreover, change in water temperature also alters pH and DO (dissolved oxygen) level which are critical parameters for breeding. It revealed that for both breeding and nursing activities, salinity should be maintained ≤0.1 ppm and the water depth should be over 10 m for favorable migration and pre-breeding congregation.

Keyword: *Hilsa, trans-boundary species, climate change.*

About the Author: Mr. Manmatha Nath Sarker is a Ph.D. research scholar in the Department of Oceanography, Techno India University, Kolkata, West Bengal, India. He completed his M.Sc in Zoology with specialization in Fisheries in1977, from the Department of Zoology, University of Dhaka, Bangladesh. He is a fishery professional with 36 years of demonstrated success in research, development and extension. Mr. Sarker has been working in Bangladesh Marine Fisheries Capacity Building Project (IDB/GoM/GoB funded project) as National Consultant, Deputy National Project Director and Assistant Director. He started his career as Scientific Officer, Marine Fisheries Research Management and Development Project(FAO/BGD-80/025), Assistant Director, Strengthening of Coastal and Marine Fisheries Management Project. He also worked with Bay of Bengal Program (BOBP-IGO) as Counterpart Officer, UpazilaFisheries Officer, Farm Manager, Baor Manager and Curator He has travelled and worked in Singapore, Thailand and India for professional and duty requirements. He published over 45 articles in peer reviewed and referred international and national journals and popular

magazines. He is an active member of Zoological Society of Bangladesh (Vice President), Bangladesh Association for the Advancement of Science, Asiatic Society of Bangladesh, Bangladesh Fisheries Research Forum, Asian Fisheries Society, Cetacean Specialist Group-IUCN, National Oceanographic and Maritime Institute (NOAMI).

Climate change induced spatial variation of fish composition in Indian Sundarbans

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Climate change is not a myth, its a reality. Because of climate change, the sea level is rising and in some pockets of North East coasts of India, like Sundarbans it is rising at the rate of 3.1 5 mm/ year. Due to rise of sea level saline water is intruding into the aquatic systems of the islands. This has created an adverse impact on the osmoregulatory capacity of the fishes. This paper highlights the presence and dominancy of trash fishes like *Harpadonnehereus* in the central part of Sundarbans where the salinity is increasing not only due to sea level rise but also due to obstruction of fresh water due to siltation of the Bidyadhari channel. However, in the western parts of Sundarbans commercially important fishes like *Liza parsia, Liza tade*, *Tenualosailisha*, etc. are still showing their dominancy in the catch basket of the fisherman. This may be attributed to relatively low salinity in western Indian Sundarbans as it receives the fresh water through Farakka barrage.

***Keywords*:** Climate change, *Harpadonnehereus*, *Liza parsia*, *Liza tade*, *Tenualosailisha*

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Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

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Technical Session II

12:00 – 1: 30 p.m.

Climate Change: Mitigation & Adaptation

Saturday January 18, Technical Session II
12:00 – 1: 30 p.m.

Climate Change: Mitigation & Adaptation

Chairperson: Mr S. Veeranna
Co Chairperson: Mr. Saptarshi Sankar Chakrabarti
Rapporteur: Mr. Abhijeet Nandy
Room: 207

Marine flora as potential source of Natural Carotenoids: Roadmap towards Green Technology and Socio-Economic Viability

Kunal Mondal
Kakdwip Research Centre, CIBA-ICAR

Carotenoids are among the most abundant natural pigments available in nature. These pigments have received considerable attention because of their biotechnological applications and most importantly, due to their potential beneficial uses in human healthcare, aquaculture, food processing, pharmaceuticals and cosmetics. These bioactive compounds are in high demand throughout the World; Europe and the USA are the markets where the demand for carotenoids is the highest. The in *vitro* synthesis of carotenoids has sustained their large-scale production so far. However, the emerging modern standards for a healthy lifestyle and eco-friendly practices have given rise to a search for natural bioactive compounds as alternatives to synthetic ones. Therefore, nowadays, biomass (vegetables, fruits, yeast and microorganisms) is being used to obtain naturally available carotenoids with high antioxidant capacity and strong color, on a large scale. This is an alternative to the in *vitro* synthesis of carotenoids, which is expensive and generates a large number of residues, and the compounds synthesized are sometimes not active biologically. In this context, carotenoids of marine floral origin have recently emerged as a natural source for both common and uncommon valuable carotenoids. The present paper summarizes the potential of the floral community distributed along the estuarine and coastal stretches of Sundarbans, West Bengal for their carotenoid contents that exhibit interesting features useful for potential applications in biotechnology, pharmaceuticals, cosmetics and medicine.

Keywords*: Marine plants, mangroves, algae, microbes, carotenoids, astaxanthin*

About the Author*:* Dr. Kunal Mondal is currently a researcher at Kakdwip Research Centre of CIBA (ICAR), West Bengal. He obtained his PhD in Marine Science at University of Calcutta, where he contributed to studies related to application of mangrove floral based feed in aquaculture. Dr. Mondal had postdoctoral stints on ecophysiology/ experimental aquaculture in Germany. He was a visiting fellow at Biology of Marine Organisms and Biomimetics Unit, University of Mons, Belgium and served as a subject expert of sustainable aquaculture at Southeast Asian Fisheries Development Center (SEAFDEC), Philippines. His main research interest is on applied aquaculture with main focus on the algae, associate flora and their potential industrial applications. Dr. Mondal has explored several places in West Bengal and abroad in studying and collecting marine biological samples. He has published research papers in journals of national and international repute and also book chapters. He is a reviewer for some selected journals under Elsevier and PloS One. He continues to grow as a marine scientist and further hopes that his skills may contribute towards societal benefit in near future.

Mangrove fruit based jelly as roadmap to alternative livelihood for island dwellers of Indian Sundarbans

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Sonneratia apetala is a true mangrove floral species in the deltaic complex of Indian Sundarbans. The species is locally known as Keora and fruits are formed only during the monsoon season. The taste of this fruit is sour and basically island dwellers consume this fruit in various forms. We have prepared jelly from this fruit and analysed the protein, carbohydrate, vitamin C content of the product as well as the fruit. The study revealed that the fruit is nutritionally rich. Microbial population in terms of Total Coliform was also studied. We observed that both the fruit and prepared jelly are safe for consumption. A small scale cottage industry may be developed on this aspect to provide alternative livelihood to the island dwellers of Indian Sundarbans as adaptation to climate change.

Keywords*: Sonneratia apetala, Indian Sundabans, jelly, proximate composition, total coliform, alternative livelihood*

About the Author: Dr. Prosenjit Pramanick, is presently holding the position of Post Doctoral Research fellow, Dept. of Oceanography, Techno India University, West Bengal. He obtained his Ph.D in 2017 from Techno India University, West Bengal. He has to his credit about 88 scientific publications, 12 book chapters and 6 publications in conference proceedings in the sphere of Food technology, Aquaculture, Agri-biotechnology, Alternative livelihood, Environmental Science.

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Mitigating atmospheric carbon dioxide load through mangrove seedling management: A case study from Indian Sundarbans

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Stored carbon was estimated during 2017 in the seedlings of dominant mangrove species by CHN analyser after their population and biomass estimation in the western, central and eastern sectors of Indian Sundarbans. The spatial order of biomass and stored carbon in *S. apetala* was eastern sector > western sector > central sector, but for species like *Avicennia* spp. and *E. agallocha* the orders were different. Analysis of variance (ANOVA) was performed to assess whether seedling biomass and seedling carbon varied significantly between sectors. The total biomass of *S. apetala* and *Avicennia* spp. seedlings significantly varied between sectors. However, for *E. agallocha* there is no significant variation between sectors. The study suggests plantation of selective species (as per the salinity preference of the species) to increase the magnitude of stored carbon in the plants. Successful plantation and survival of mangrove seedlings can improve the

efficacy to absorb and store carbon dioxide from the atmosphere.

***Keywords**: Indian Sundarbans, mangrove seedlings, stored carbon, salinity*

About the Author: Nabonita Pal is a Research Scholar at Techno India University. She is a recipient of young scientist award in 2014.

Dr. Sufia Zaman is a Head of Dept. of Oceanography, Techno India University, West Bengal. She has to her credit about 285 scientific publications and 4 books of postgraduate standards. Dr. Zaman also successfully supervised 8 Ph.D students and 5 projects. She is awarded for the Bharat Shree Award, 2019 in the sector of environmental science. Dr. Zaman is in the editorial board of 2 journals of repute.

Dr. Abhijit Mitra is a former Head, Dept. of Marine Science, University of Calcutta and presently Advisor of Oceanography of TIU, has been active in the sphere of Oceanography since 1985. He has to his credit about 530 publications in various National and International journals, and 38 books. Dr. Mitra also successfully supervised 38 Ph.D students and 17 projects. Dr. Mitra is in the editorial board of 9 journals of repute.

Decadal variation of nitrate and phosphate in East Kolkata Wetlands

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Kolkata city, located on the east bank of the Hooghly River, is the capital of the maritime state of West Bengal. The wetlands to the east of Kolkata (22º27' N 88º27' E) comprises a large number of water bodies distributed across the districts of North and South 24 Parganas. The East Kolkata Wetlands (EKW) not only fulfills substantially the requirements of fish, vegetables and food grains but also act a potential carbon dioxide sink and thus help in improving the quality of air of the city and its surroundings. The region receives municipal waste from the city of Kolkata, which is presently sustaining a population ~ 14.5 million. The sewage generated from different municipalities of this megacity conveys nitrogen and phosphorus in considerable amount to the aquatic subsystem of EKW. EKW is presently facing anthropogenic pressure due to unplanned urbanization and release of municipal waste without proper treatment. The population of the city of Kolkata has increased significantly and during the study period of 34 years (1984 - 2017), the increase is around 48.6%.With this background the present paper aims to highlight the levels of nitrate and phosphate in the aquatic subsystem of EKW considering the average of three stations namely Munshir Bheri (22º33'06.2" N; 88º 24'38.4"E), Captain Bheri (22º34' 20.2"N; 88º 26'20.6"E) and Natur Bheri (22º32'59.8"N; 88º25'30.2" E) during three seasons.It was observed that the nutrients, nitrate and phosphate exhibit significant seasonal variations with highest values during monsoon followed by postmonsoon and premonsoon. It was also observed that both the nutrients have increased over a period of 34 years. Nitrate and phosphate increased as 0.569 $\mu gatml^{-1}yr^{-1}$and 0.022 $\mu gatml^{-1}yr^{-1}$ respectively during the premonsoon; 0.84 $\mu gatml^{-1}yr^{-1}$ and 0.12 $\mu gatml^{-1}yr^{-1}$ respectively during monsoon and 0.63 $\mu gatml^{-1}yr^{-1}$and 0.54 $\mu gatml^{-1}yr^{-1}$ respectively during postmonsoon. The increase of nutrients may result in eutrophication, which may drop the dissolved oxygen value to a minimum resulting in the death of aquatic life. Sewage treatment preferably through bioremediation is an effective road map to protect this designated RAMSAR site from further deterioration.

***Keywords**: East Kolkata Wetlands, nitrate, phosphate, eutrophication*

About the Author: Dr. Sangita Agarwal, Associate Professor RCC Institute of Information Technology, Kolkata has been active in the sphere of Environmental sciences since 2015. She is also an active member of NSS wing in the college and has been involved in programs like Blood Donation, Tree plantation, creating awareness about dengue and malaria etc. She obtained her Ph.D as GATE qualified scholar in 2001 from Jadavpur University. She received J. N. Talukdar Memorial Medal for standing 1st in B.Sc. (Chemistry) Hons. Class in 1992. She has to her credit about 35 scientific publications in various National and International journals, and 1 book of postgraduate standard. She has been actively involved in organizing a number of workshops, symposiums and faculty development program and conferences. Dr. Agarwal also visited as project participant under Indo Hungarian International Project (DST, Govt. of India) in the years 1998 and 1999. In 2008, Dr. Agarwal worked as a Visiting Academic in Monash University under the Endeavour fellowship, sponsored by the Govt. of Australia for a period of six months. She was also awarded DST women Scientist under the Department of Science & Technology, DST, New Delhi, Govt. of India during 2009-2012. She has been associated with Quality Improvement Programme (QIP) under Dept. of Pharmaceutical Technology, Jadavpur University, Kolkata since 2011 as invited speaker. She has been Course Coordinator of Clinical Research & Regulatory Affairs at Jadavpur University for 2 years. Presently her domain of expertise includes seasonal variability, heavy metals bioaccumulation, climate change and carbon sequestration.

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Nitrate level in the Hooghly Estuary: A time series analysis

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The level of nitrate in the Hooghly estuary of Indian Sundarbans was assessed for three decades (1984-2014). Nitrate is used as indicator of nutrient related water quality in the estuarine water. Our first order analysis reflects significant temporal variations of nitrate with relatively higher values in the monsoon season. Such pronounced variations may be attributed to the location of highly industrialized and urbanized city of Kolkata, Howrah and Haldia port-cum-industrial complex adjacent to the Hooghly estuary from which effluent discharges increase during monsoon. The sudden rise of nitrate during premonsoon, 2009 is directly related to AILA, a super-cyclone that occurred in the lower Gangetic delta during 22nd - 25th May, 2009.

Keywords*: Indian Sundarbans, nutrients, AILA, spatio-temporal variation*

About the Author: Pallavi Dutta is a research scholar attached with the department of oceanography of Techno India University, West Bengal.She is also attached as a lecturer in Charuchandra College, University of Calcutta. She has been in the field of research for 10 year.She had 2 papers in international peer reviewed journal and has presented research paper in 2 international seminars in the sphere of Aquaculture, Environmental Science.

Dr. Tanmay Ray Chaudhuri, an IPS Officer, worked extensively on pollution and ecological balance in

Sunderbans. During his association with the United Nations he had travelled extensively to Africa, Europe and South East Asia. Presently he is the research mentor of Techno India University, West Bengal.

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Microbial load in common edible fish *Liza parsia*: A time series analysis

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The present study was conducted for evaluating the bacterial load in *Liza parsia* muscle collected from the Digha fish landing station during the postmonsoon season of ten consecutive years (2010-2019). The Total Bacterial Count (TBC), Total Coliform (TC) and Faecal Coliform (FC) were determined by using the standard MPN (Most Probable Number method). The TBC, TC and FC ranged from 1100000 to 9800000 MPN/100g, 9100 to 23000 MPN/100g and 5400 to 15000 MPN/100g respectively. The gradual increase of microbial load is a matter of concern as the fish species is consumed almost regularly by the people and is one of the best sources of proteins, vitamins and minerals required for supplementing both infant and adult diets. Fishes become contaminated in various ways. However, the microbial load in the fish muscle depends on the quality of the ambient water body. The present area of catch is highly stressful as it receives waste materials from the tourism units and fish landing stations that are highly concentrated in the Digha coast. These waste materials are released without any proper treatment and hence may contain several strains of bacteria with high density. This paper evaluates the reason for the rising trend of TBC, TC and FC with the passage of time.

Keywords: *Digha, Liza parsia, Total Coliform (TC), Total Bacterial Count (TBC), Faecal Coliform (FC)*

About the Author: Dr. Roopali Roychowdhury is serving as a Post Doctoral Fellow in the Department of Oceanography, at Techno India University, West Bengal. She has published 22 scientific papers in National and International journals of repute. She has achieved the award of best paper presenter in the International Conference held at Bangladesh during 7-8 Dec 2019.

Dr. Madhumita Roy is serving as DST Women scientist at the Department of Microbiology of Bose Institute Kolkata. She has to her credit 20 research article.

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Inter-relationship between stored carbon in oyster and pH of the estuarine waters of Indian Sundarbans

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Human activities add about 5.5 billion tonnes of carbon dioxide per year to the atmosphere for which the molluscan community acts as a major sink. We analysed the stored carbon in the flesh and shell of mangrove oyster, *Saccostrea cucullata* collected from the western and central Indian Sundarbans during 2010 to 2019 along with aquatic pH.Kakdwip was selected as the sampling site in the western Indian Sundarbans, while in the Central Indian Sundarbans the sampling site was Bali island. The stored carbon in the flesh was more than that of the shell. In both the stations, the pH and the stored carbon in shell decreased with the passage of time confirming the foot prints of acidification in the estuarine waters of Indian Sundarbans.

***Keywords**: Saccostrea cucullata, Indian Sundarbans, acidification*

About the author: Dr. Shampa Mitra, did her post graduation in Environmental Science and completed her Ph.D from Techno India University, West Bengal in the branch of Oceanography. She is now a Post Doctoral Research Fellow in Techno India University, West Bengal. She is credited to publish 8 scientific articles and contributed 2 chapters in books published by Springer.

Dr. Prosenjit Pramanick, is presently holding the position of Post Doctoral Research fellow, Dept. of Oceanography, Techno India University, West Bengal. He obtained his Ph.D in 2017 from Techno India University, West Bengal. He has to his credit about 88 scientific publications, 12 book chapters and 6 publications in conference proceedings in the sphere of Food technology, Aquaculture, Agri-biotechnology, Alternative livelihood, Environmental Science.

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Use of phytogenic feed additive as nutritional intervention towards achieving climate friendly livestock production by mitigation of rumen methanogenesis in Murrah buffaloes

Kundan Kumar, Seema Yadav, Pramod Kumar Soni, Vipin Singh
Indian Veterinary Research Institute

The present experiment was conducted in 2 phases to study the effect of feeding ajwain seeds (*Trachyspermumammi*) as source of phytogenic additive Thymol on rumen microbial ecosystem, fermentation pattern and methane emission in male buffaloes. In Phase 1 three rumen fistulated animals were used in switch over design with three treatments *viz*., T1 (control) animals fed basal diet(straw and concentrate mixture in 50:50 ratio) T2 and T3 were fed basal diet with ajwain (thymol)

@ 1 and 2% DMI. The rumen fluid pH, concentration of ammonia N, activities of carboxymethylcellulase, xylanase and avicelase, protozoal count population density of total bacteria, Fibrobacter succinogenes, methanogens, fungi and protozoa as assessed by real time PCR, did not show any significant difference among the groups. In the second phase 15 animals were divided in three equal groups and assigned to the same three treatments. The methane emission in terms of l/d and l/kg DMI were comparable in all the groups, whereas, in terms of l/kg DDMI it was reduced by 18% (P=0.029) in T3 as compared to T1. Statistically the body weight being similar there was 10.75% more weight gain in the T3 where ajwain was fed @ of 2 of DMI resulting 13.51% improvement in FCR. It can be concluded that dietary supplementation of ajwain @ 2% of DMI is capable of reducing methane emission in buffaloes without affecting the performance of animals.

***Keywords**: Ajwain, buffaloes, methane*

About the Author: Dr. Kundan Kumar is a Research Scholar at Indian Veterinary Research Institute.

Sustainable Smart Cities through Green Buildings- Encouraging Brick Steps

Niranjan E V, Abdullah Ghazali
CHRIST (Deemed to be University)

For conservative development of a Nation, India introduced varied initiatives including the smart cities initiative. However, the idea of smart cities focus more on the institutional and physical infrastructure and somewhere down the lane forgets the greening aspect of infrastructure for a sustainable development. Thus, the key factor that is to be ensured is that the city has to be mandatorily sustainable irrespective of it being smart. Therefore, smart sustainable cities would be a best solution for a better urban future. In any given urban agency, infrastructure development is primary since it focuses on large-scale development, investment and subsistence. The number of buildings to look around oneself becomes the backbone of the entire concept of city and hence greening them becomes important. Therefore a green building movement is the need of the hour and is to be called for to ensure a move towards eco-friendly and sustainable methods of construction. Against the given backdrop, the researchers of this article in here are to discuss in detail about the definition of the very concept sustainable smart cities and green buildings, with a detailed analysis of various policies introduced to ensure that green buildings are to be made part of entire urban infrastructure, a follow up of how businesses would yield large scale benefit through green buildings, with the possible recommendations and suggestions that could be adapted in existing framework to ensure further greening and subsistence.

***Keywords:** Conservative Development, green buildings, sustainable smart cities, urban infrastructure, large scale investment.*

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Saturday January 18, Technical Session II
12:00 – 1: 30 p.m.

Climate Change: Mitigation & Adaptation

Chairperson: Prof. M.N. Sarkar
Co Chairperson: Mr. Durjoy Kumar Deb
Rapporteur: Mr. Vijoy Kumar Sinha
Room: 107

Climate Change Management and its impact on policy

Pramod Rai, Anusha Rai
Raja Rammohan Roy Mahavidyalaya

Scourge of climate change have become one of the most dreadful existential threat to the survival of the livings in this planet. Numbers of governmental, non-governmental, civil societies and other concerned bodies have come forward to tackle this global challenge with various plans and policies of climate change management. To frame and initiate urgent action to combat climate change is one amongst the seventeen points agenda of SDGs, targeted by the United Nations in 2015, meant to achieved by 2030. Sadly, the various international summits on Climate Change since 2015 have failed to draw a mutually agreed conclusion, under which the mechanism will be deployed to enhance cooperation in tackling climate change. Climate change management has been a major, most integral part of the policymaking, both at the micro-macro level. Governments around the World, whether developed or developing are obligated, prompt to bring the management which contributes in the mitigation(efforts to reduce greenhouse gases, adaptation(cope with the changes in climate, and knowledge base expansion(which supports risk management). Interestingly, we are witnessing the initiatives of the UN member countries, who are formulating policies which immensely intend to reduce emissions of Greenhouse gasses, the major factor of climate change. Policies have been formulated by promoting regulation, research, development and deployment of new advance technologies. And of course most notably, all the above mentioned steps would be futile, if the public awareness is minimal to minimize the anthropological activities, responsible for the multiples of pollution. While framing and executing the policies of climate change management, the government should draw the provisions that accommodate the public participation, by bringing awareness amongst them. Geo-engineering, carbon market, Carbon mapping etc. are emerging as the new mechanisms of climate management policy, which opens up the massive scope of research and development.

Keywords*: Climate change, management policy, mechanisms, carbon mapping.*

About the Author: Pramod Rai is a Research Scholar at Centre for Central Eurasian Studies, Mumbai University and also working as Asst. Prof. (Pol.Sc.) at Raja Rammohan Roy Mahavidyalaya Radhanagar, Hoogly (W.B.).

Anusha Rai, is currently working as Asst. Prof. (Law) at Indian Institute of Legal Studies (IILS) Siliguri, Darjeeling(W.B.).

Observed changes in microbial load in the sediment samples of Indian Sundarbans during 2010-2019

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We present evidence that the Indian Sundarbans is experiencing a change in microbial load (in terms of Total Coliform and Faecal Coliform) over the last

ten years. It is observed that the microbial load is much higher in Kakdwip (situated in the western Indian Sundarbans) compared to Bali island (a station in the central India of Sundarbans). We also observed a gradual increase of Total Coliform and Faecal Coliform load in both the stations with the passage of time, which may be attributed to increase of anthropogenic stress in the study area. The rapid growth of tourism units, shrimp farms and fish landing activities may be the reason for such temporal rise of microbial load in the present geographical locale.

Keywords*: Total Coliform, Faecal Coliform, Indian Sundarbans*

About the Author: Ms. Jayashree Saha is a post graduate student in microbiology in Techno India University, West Bengal.

Ms. Nabonita Pal, Research Scholar in the Department of Oceanography, Techno India University, West Bengal is a post graduate in Biotechnology. Ms. Pal is credited to have 53 publications in National and International journals of repute and also published 5 book chapters. Ms. Pal has experience in working in the mangrove ecosystem of Indian Sundarbans. On behalf of Techno India University, West Bengal, she attended several National and International seminars.

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Global Dimming: A global perspective on darkening problem

Poulami Adhikary Mukherjee, Ranajit Kumar Khalua
Narajole Raj College, Department of Zoology

In changing scenario of climate, Global Dimming is currently an important area of research and one of the most vexing global environmental issue that the planet is facing. The amount of solar radiation incident at the Earth's surface is not stable over the years but shows significant changes on decadal time scales. There is a steady decline in global solar radiation across the globe, a phenomenon that is generally termed as Global Dimming, which means that diminished amounts of sunlight are reaching the surface of the Earth, thus resulting in a drastic fall in the Earth's temperature. Increasing anthropogenic air pollution is believed to be the main causative factor of Global Dimming. The dimming effect is further enhanced due to atmospheric sulphate aerosols, which nucleate more cloud droplets thus making the clouds reflect more solar radiation. Global Dimming varies in time and location and the phenomenon is dominated by large urban sites contributing to atmospheric pollution. The Global Dimming phenomenon leads to several human health hazards and environmental disasters. It causes disruption of the World's rainfall pattern resulting in drying of the planet. However, it is believed that Global Dimming is actually effective in masking the phenomenon of Global Warming by preventing the sunlight from reaching the Earth's surface and creating a cooling effect on Earth. Here, the evidence for Global Dimming, it's possible causes, its effects, its overall impact on the global climatic system and its climate change policies are studied.

Keywords: *Global dimming; global warming; aerosols; atmospheric pollution*

About the Author: Dr. Poulami Adhikary Mukherjee holds a Doctoral degree with M.Phil in Zoology from the University of Burdwan She has completed her PhD as a full-time research scholar under Women Scientist Scheme-A (WOS-A), Department of Science and Technology (DST), Ministry of Science and Technology. Her schooling is from Carmel Convent High School (ICSE Board), Durgapur. She has also completed MCA (Master of Computer Application) from Indira Gandhi National Open University (IGNOU). Her research work includes Chemical Ecology, Plant-insect interactions etc. Presently, she has twelve papers published in both National and International Journals. She has keen interest in Insect Ecology and wants to focus on her postdoctoral work in Integrated Pest Management programme in future. She has thorough knowledge in Software programming. She was a former Guest Lecturer in the Department of Zoology in Jogamaya Devi College, University of Calcutta for a period of three years. Currently, she is an Assistant Professor in the Department of Zoology in Narajole Raj College, Vidyasagar University. In her spare time, she enjoys painting, listening to soft music and loves to spend time with her family and two daughters.

Dr. Ranajit Kumar Khalua, presently acting as Vice Principal and HOD of Department of Zoology, Narajole Raj College, Vidyasagar University, has many publications in UGC approved journals and main research area in the field of Ecology, Biodiversity and presently in Food Science and Technology. He has published two books (Fruits and its health benefits and Basic Principle of Instrumentation in Food Science from Delhi Publications). He is a life time member of Marine Biological Association and Zoological Society of India.

Climate Change Migration: A rights perspective

Shimul Dutta
IIT Kharagpur

People around the World are being forcibly displaced floods, windstorms, earthquakes or droughts. There is no doubt about the fact that with change in climate, the number of 'climate migrants' will rise in the future. So far, the national and international response to this challenge has been limited, and protection for the people affected remains inadequate. What adds further to the gap in the protection of such people who are often described as 'climate refugees' is that there is neither a clear definition for this category of people, nor are they covered by the 1951 Refugee Convention. The latter extends only to people who have a well-founded fear of being persecuted because of their race, religion, nationality, membership of a particular social group or political opinion, and is unable or unwilling to seek protection from their home countries. It has been expressed growing concern and has taken action to support and develop resilience in the countries potentially affected by climate-related stress. The primary emphasis of the paper will be identifying whether there exist any mechanism to recognize the rights of environmental migrants in India.

Keywords: *Climate change, migration, perspective*

About the Author: Shimul Dutta is presently a Research Scholar at IIT Kharagpur, working under Prof. Arindam Basu. She has previously worked at Assistant Professor at JIS University, Kolkata. She has also worked as Research Assistant at NUJS Kolkata in a project funded by WBJS.

Policy for mitigating carbon emission for a sustainable development in India: A critical appraisal

Ranit Mukherjee
George School of Law

India is a large, emerging economy which faces big challenges relating to energy and climate change. On the one hand, the country's huge chunk of population is without access to electricity and a demanding economy of more energy for the purpose of power growth. These pressures give a clear picture that energy use and emissions are likely to have a substantial growth over the coming decades. But on the other hand, it is also seen that India is vulnerable to the impacts of change in climate, to be specific water stress, agricultural impacts and susceptibility to disasters related to weather. With the ever increasing global temperature and the result of climate change is a matter of serious global concern. India is one of the 175 nations to have ratified the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). Further India has agreed to propagate a healthy and sustainable way of living by adopting a climate friendly policy and a cleaner path. India has committed in its Nationally Determined Contribution (NDC), for the purpose of reduction of the emissions intensity of its GDP by 33 to35 percent by 2030 from2005 level, to achieve 40% cumulative electric power to be installed from non fossil fuel energy resources by the year 2030.

Several measures both regulatory and fiscal have been undertaken by India, to achieve its NDC goals. These measures have varied degrees of effectiveness. This paper discusses and proposes a carbon tax structure in India. It was first introduced by Finland in the year 1990. In the recent years, carbon tax has a growing interest around the World. Many countries consider it to be an effective, transparent and cost effective means of inducing carbon abatement and also produce *vital* co-benefits.

***Keywords**: Sustainability, Carbon Emission, Carbon Tax*

About the Author: Ranit Mukherjee is presently studying as a 5th semester student of B.A.LL.B from George School of Law, Konnagar.

Study on the spatial variation of stored carbon in *Delonix regia* inhabiting the city of Kolkata through computer programming

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Anthropogenic carbon dioxide (CO_2) emissions from cities have significantly increased over the past several decades along with rapid urbanization. To what extent anthropogenic CO_2 emissions generated from cities can be offset through conserving or increasing carbon (C) stored by urban trees is a significant scientific question. The role of urban trees in offsetting anthropogenic CO_2 emissions still remains uncertain. Here, using data from field surveys, tree biomass estimation, we estimated the C storage in *Delonix regia* in 12 stations of the city of Kolkata. Results generated through computer programming show that the stored carbon in the trees from the south Kolkata is higher than that of the north and central part of Kolkata.

***Keywords**: Kolkata, Carbon dioxide, Delonix regia, computer programming*

About the Author: Sitangshu Roy is presently holding position of Research Scholar in Techno India University, West Bengal. He has published 4 papers in journals of repute.

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Environmental Jurisprudence for Sustainable Development: An Indian overview

Rahul Shaw, Advocate
Calcutta High Court

The World leaders attending the United Nations Sustainable Development Summit in 2015 adopted 17 Sustainable Development Goals (SDGs). These goals intend to combat the globally persistent inequalities and challenges to our planet. In accordance with these gallant goals, India has taken many strides in the right direction to battle in the struggle between environment and development. It is no news that India being a developing country lacks a lot in all three dimensions of sustainable development- environment, society and economy. But the mantle of uplifting all these areas of sustainable development has been taken up by the Indian judiciary. In several admirable occurrences of judicial activism, the Supreme Court of India has ensured that every individual, corporations or even the governments are held accountable for their actions and their subsequent consequences affecting the environment.

This paper aims to analyse all the existing laws currently in force in India and their impact on the collective global efforts towards realising the sustainable development goals. The current global political discourse regarding sustainable development goals and climate change legislations in the developed countries, developing countries and least developed countries have been discussed to make clear India's current stand and contributions towards achieving the sustainable development goals adopted in the United Nations Sustainable Development Summit in 2015.

The fundamental rights enshrined in the Indian Constitution have been interpreted in a broad manner by the Indian judiciary to include the right to clean, healthy and pollution free environment under the umbrella of right to life as per Article 21 of the Indian Constitution.

This paper seeks to address both the developments and shortcomings of active environmental jurisprudence in India.

Keywords: *Environmental Jurisprudence; Sustainable Development; Judicial Activism; Climate Change; Indian Environmental Laws*

About the Author: Rahul Shaw is a practicing advocate at Calcutta High Court.

Carbon Mapping and its importance in conserving the rights of nature

Senthil Kumar
School of Excellence in law, Tamil Nadu Dr Ambedkar Law University

The legal maxim World *Nemo judex in causa sua* meaning World's number one is a judge in his own cause is the Principle of Natural Justice. But the humans have to play the role of the judge and saviours of the environment despite their impact on the environment. Homo sapiens is not the only

organism in the Earth. With mountains, rivers, variety of flora and fauna, multi-directionally interacting Ecosystems etc as components, the Earth deserves the right to withhold its nature, right to sustainable energy flow in the ecosystems " the Rights of Nature " to be treated as legal entity as termed by one of its organisms, The Humans. The existence of human civilization and his activities has been impacting the stability of the nature of the Earth and its components. Assisted by the technological advancements, the human species shall assess the impact, bring the necessary measures and monitor the restoration of ecological balances. One such technology which maps the carbon emissions in a specified geography is called carbon mapping. This technological weapon shall be used in two prongedapproach "to identify and preserve the oxygen retaining vegetation zones and to identify the caution zones. This paper systematically highlights the options to utilize carbon mapping to conserve the rights of nature and developing international standard Procedures of using carbon mapping techniques, standardized Grading based on the indices, real time monitoring and decision making using the advancements in artificial intelligence thereby the achieving the goals of the international organizations within the targeted time.

Keywords: *Carbon mapping, real time monitoring, artificial intelligence*

About the Author: Senthil kumar Elumalai is a student of law pursuing first year LL.B(Hons.) at School of Excellence in Law , Tamil Nadu Dr Ambedkar Law University, Chennai.

Sustainable living is a fight for all: A fight to prevent climate change suffering

Saheli Biswas, Rajasi Guharoy
Adamas University

The 21st CE is the era of fast life, development, rapid growth of urbanization and modernisation but what remains neglected in course of this daily rapid environment is the continuous growing disparity, degradation of environment and the rapid imbalance in the ecosystem. The tendency to get and cherish the best has laid down the sheer question of crisis and emergency of lacking or decreasing storage and supply of natural energy for the upcoming generations. One of the major reasons for this environmental degradation and increasing effect of such is the rapid and frequent overuse of several greenhouse gas, immense carbon emission and lack of technique in combating this harm.

Excessive use and misuse of several chemicals and substance leads to an immense carbon emission which eventually has an adverse effect like environmental degradation and unnatural climatic effect leading to unpredictable and unbalanced climate change. This sudden and abrupt change in climate creates extreme effect over whole ecosystem, often the melting of glacier effects the lifestyle of several polar animals and also makes them refugee in their own living habitat. Another severe effect climate change and climatic degradation creates is the emerging scale of increase of climate refugees who becomes the prey of adverse climate change and thus becomes homeless and at times even lacks a proper living.

This paper would like to discuss regarding the derogatory effect immense carbon emission cause in terms of climatic and environmental degradation and how a well-planned act and action of sustainable development, keeping Bhutan as a role model of a carbon negative state can actually help upon to decrease and control the extreme emission of carbon and will eventually solve all the tragedy of adverse climatic change and create a sustainable balanced living situation for whole ecosystem.

Keywords: *Carbon, Sustainable, Climate, Refugee, Green House*

About the Author: Saheli Biswas is a Student of School of Law & Justice, Adamas University.

Rajasi Guharoy is a Teaching faculty at Department of Law Adamas University.

Saturday January 18, Technical Session II
12:00 – 1: 30 p.m.

Climate Change: Mitigation & Adaptation

Chairperson: Dr. Abhijit Mitra
Co Chairperson: Mr. Abheek Ghatak
Rapporteur: Ms. Sanghamitra Baladhikari
Room: 119

Challenging Colonial and Neocolonial Interventions through Interaction with Environment: A Study of Ecological Behavior of the Naga Tribes.

Paloma Chaterji
St Xavier's University

This paper strives to explore the ecological behavior of the tribes of Nagaland, especially that of the Angamis and Aos in order to reveal how they maintain ecological balance through their everyday interaction with environment. My paper will study how this society sticks to the indigenous agricultural methodologies without falling prey to the capitalistic mode of production. I will focus on the subsistence lifestyle of these tribes and how they combat the colonial and neocolonial agencies of power by treating nature as a living entity. This project will study how irrespective of their gender every member of these tribes share an ethics of care towards the environment. The gender fluidity within the tribes could be understood as women's Motherhood Mentality and men's Marketplace Mentality do not fit in the context of the Nagas. In this context it is important to highlight how women's contribution in agriculture; which in most parts of India is primarily a male domain, has led to farming being known as female farming in Nagaland. The non-utilitarian approach towards the environment is significant as it has helped the tribes in retaining their authenticity. How the animistic religion helps in creating an oneness with nature will also be explained. I will also reflect on the impact of various policies of land and forestry imposed by the Government Finally, how Christianity as a colonial imposition has deteriorated the nature-human relationship and how the concept of Kenotic Ecology could offer a better understanding of nature, will be a matter of discussion in my paper. This paper will thereby try to locate the paradigms through which the Naga culture closely follows the three dimensions of ecology- soil, soul and society in the face of continuous challenges put forward by modern ideologies.

Keywords: *Ecology, Naga Tribes, Indigenous Agriculture, Capitalism, Human-nature relationship.*

About the Author*:* Paloma Chaterji is a Research Scholar in the Department of English at St. Xavier's University along with that she is also Research Coordinator in Organic Studies at Kolkata.

Fish quality upgradation through cutting edge feed technology research on monosex tilapia

Pavel Biswas[1], Mayukhmala Mondal[2],Prosenjit Pramanick[1],Sufia Zaman[1]and Abhijit Mitra[3]

[1]Department of Oceanography, Techno India University, West Bengal
[2]Department of Zoology, Charuchandra College
[3]Department of Marine Science, University of Calcutta

Feed is the major operational cost for most fish farms, accounting for 50-70% of the variable cost depending on farming intensity. The rising cost of

commercial tilapia feed is therefore inducing some farmers to opt for alternative feeds. Some rotate commercial feed with kitchen and restaurant waste or chicken byproducts others replace tilapia feed with cheaper chicken or duck feed. Still others have begun formulating farm-made tilapia feed pellets. Here we were using mangrove floral base protein by reducing animal protein which is cost effective. Mangrove floral species like saltmarsh grass is very much effective to maintain good water quality by reducing heavy metal load. In the present study, we were prepared a culture area for monosex tilapia (*Oreochromis niloticus*) in the rooftop of Techno India University (E), West Bengal in the urban city of Kolkata. Another a farming of monosex tilapia was selected in Bali Island (C) in Indian Sundarbans. Better growth rate, survival rate and quality of fish were observed in experimental tank where we used formulated fish feed and salt marsh treatment.

Keywords*: Aquaculture, monosex tilapia, saltmarsh grass, Indian Sundarbans*

About the Author: Pavel Biswas, is presently holding the position of Junior Research fellow, Dept. of Oceanography, Techno India University, West Bengal. He has to his credit about 15 scientific publications, 2 book chapters and 3 publications in conference proceedings in the sphere of Food technology, Aquaculture, Alternative livelihood, Environmental Science.

Mayukhmala Mondal is the Associate Professor of the Dept. of Zoology, Charuchandra College, West Bengal. She has to her credit about 5 scientific publications and 3 book chapters and 3 publications in conference proceedings in the sphere of Food technology, Aquaculture, Alternative livelihood, Environmental Science.

Dr. Prosenjit Pramanick, is presently holding the position of Post Doctoral Research fellow, Dept. of Oceanography, Techno India University, West Bengal. He obtained his Ph.D in 2017 from Techno India University, West Bengal. He has to his credit about 88 scientific publications, 12 book chapters and 6 publications in conference proceedings in the sphere of Food technology, Aquaculture, Agri-biotechnology, Alternative livelihood, Environmental Science.

Dr. Sufia Zaman is the Associate Professor and Head of the Dept. of Oceanography, Techno India University, West Bengal. She obtained her Ph.D in 2010. She has to her credit about 285 scientific publications and 4 books of postgraduate standards.

Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Bioconcentration of heavy metals in fish and associated health hazard in people of Kolkata

Satarupa Ghosh, Sangram Keshori Rout, Prasanna Pal, Bipul Kumar Das
West Bengal University of Animal and Fishery Sciences, Kolkata

Heavy metals are one of the major pollutants for the environment and ecosystem. An important source of heavy metal toxicity in the human is through diet especially fish. Fish can accumulate a high level of metals from the contaminated environment through bio-magnification. These fish possess serious health risks for the human being following consumption. So, a study was conducted to assess the bio-concentration of Cadmium (Cd) and Lead (Pb) in the meat and offal of Rohu (*Labeorohita*) and Bagda (*Penaeus monodon*) collected from Sealdah,

Garia and Sonarpur fish markets of Kolkata and their probable human health hazards both in males and females of West Bengal separately. The metals were estimated using Atomic Absorption Spectrophotometer. It was observed that the maximum Cd contents in the meat of *L. rohita* and *P. monodon* were 0.88 µ/g and 1.20 µ/g respectively and Pb contents were 7.373µ/g and 10.00µ/g respectively. The maximum Cd and Pb contents in the offal of Rohu were 5.488µ/g and 9.174µ/g respectively and in shrimps were 1.27µ/g and 10.62 µ/g respectively. The average Estimated Weekly Intake (EWI) of Cd for female and male were 0.151±0.037 µg/kg/wk and 0.133±0.032 µg/kg/wk respectively from rohu and 0.050±0.008 µg/kg/wk and 0.044±0.007 µg/kg/wk respectively from shrimp. The average means EWI of Pb were 2.373±0.232 µg/kg/wk in female and 2.081±0.204 µg/kg/wk in male through rohu and 0.682±0.051 µg/kg/wk in female and 0.598±0.045 µg/kg/wk in male through shrimp. Though these levels were below the threshold limit, it warns us about the possible health hazard from the heavy metal toxicity in humans.

***Keywords**: Heavy metals, fish, human health hazard*

About the Author: Satarupa Ghosh is a Ph.D. research scholar in the Department of Aquatic Environment Management at West Bengal University of Animal and Fishery Sciences, Kolkata. Her notable research works include- determination of heavy metal accumulation in common fishes, human health hazards due to heavy metals etc. She has authored two book chapters in two books. She has attended several national and international conferences, seminars, symposiums etc and presented her research work there.

Dr. Sangram Keshori Rout is a Professor and Head of the Department of Aquatic Environment Management at West Bengal University of Animal and Fishery Sciences, Kolkata.

Dr. Prasanna Pal is a Veterinary doctor and Ph.D. research scholar in Animal Physiology at ICAR-National Dairy Research Institute, Karnal, Haryana.

Dr. Bipul Kumar Das is a Professor of the Department of Aquatic Environment Management and Dean of F/O Fishery Sciences at West Bengal University of Animal and Fishery Sciences, Kolkata.

Green Growth and Sustainable Development in India: A Constitutional Approach

Abhisikta Basu
George School of Law

India is a country with a dynamic and developing economy accompanied by a diverse society. With the view to achieve a sustainable and holistic development, there is a great need for a balance and harmony between the economic, social and environmental needs of the country. Specific provisions have been provided under the Constitution of India for the protection and improvement of the quality of environment. It has been stated under Art 48-A of the Constitution of India that the state shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country. It has also been stated under Art 51A(g) that It shall be duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures. The above mentioned provisions highlight the national conscience on the importance of environmental protection.

India is walking a path of sustainable development and it has emphasized on climate justice and eradication of poverty. So, there is a great need to strike a balance between environment protection and development. This paper details about various growth aspects and development of the environment and energy aspects at the national level. It also

depicts a holistic view of the path ahead for environmental sectors as well as energy sectors.

Keywords: *Sustainability, Environment, Constitution*

About the Author*:* Abhisikta Basu is working as Assistant Professor of Law at George School of Law.

Socio-Economic Impact of Climate Change Mitigation: International and National Way Forward

Amit Ghosh
The West Bengal National University of Juridical Sciences Kolkata

Climate Change Mitigation refers to efforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behaviour. It can be as complex as a plan for a new city or as a simple as improvements to a cook stove design. Efforts underway around the World range from high-tech subway systems to bicycling paths and walkways. Mitigating climate change is about reducing the release of greenhouse gas emissions that are warming our planet. Mitigation strategies include retrofitting buildings to make them more energy efficient; adopting renewable energy sources like solar, wind and small hydro; helping cities develop more sustainable transport such as bus rapid transit, electric vehicles, and biofuels; and promoting more sustainable uses of land and forests. About 1.4 billion people around the World rely on traditional fuels like coal and wood to meet their basic energy needs. This is not only harmful to the environment; it can also lead to premature deaths for millions of people, especially women and children. The paper would address the Impact of Socio-economic effort to India's agricultural practice and how International best practices can be adjusted in policy matter to reduce the climate change and how government is moulding National laws to mitigate climate change.

Keywords: *Socio-Economic, Climate Change Mitigation, International and National Way Forward*

About the Author: Amit Ghosh is a Assistant Professor of Law at The Neotia University, School of Legal Studies and also as Research Scholar at The West Bengal National University of Juridical Sciences.

Common but differentiated responsibility: The need for hour of climate change

Devarshi Malviya, KhushbuSood
Himachal Pradesh National Law University, Shimla

The organisational inception of the United Nations was for the development for the peace of the nations. The United Nation Framework Convention on Climate change is the evolving product of the bureau. The writers have visited the United Nations, United States of America for the real view of the schemes. The Common but Differentiated Responsibilities and Respective Capabilities is a principle within the United Nations Framework which acknowledges the different capabilities and differing responsibilities of nation states. The idea of a Worldcommon responsibility spoke directly to the notion of common heritage of mankind, that had first emerged as an expression of concern for the loss of natural resources and the levels at which different states product for the collective effort. The global nature of climate change needs for the widest possible cooperation by all countries and their participation in effective international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions therefore the writers had studied the agreements of the nations with the reciprocation which is based on the political and

economic factors, like the Kyoto Protocol (which is modified by) and the Paris Conference. The writers in the research paper have researched for the impact of the political relations of the nation states for assenting- dissenting. In India, the climate change is not the environmental issue but has possessed as a challenge for the nation. The emerging substance awakens the youth by the rear view product of the climate analysts, for example Greta Thunburg and the protests in Chile.

***Keywords**: United Nation Framework Convention on Climate Change, differentiated responsibility, Kyoto Protocol, Politico- economic factors*

About the Author: Devarshi Malviya is a Law student of Himachal Pradesh National Law University, Shimla.

Khusboo Sood is a student of Himachal Pradesh national Law University, Shimla.

Intertidal mudflats of Indian Sundarbans: A potential sink of carbon

Arpita Saha[1], Saptarshi Sankar Chakrabarti[2], Sufia Zaman[1] and Abhijit Mitra[3]

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[2]Department of Architecture, Techno India University, West Bengal
[3]Department of Marine Science, University of Calcutta

Soil Organic Carbon (SOC) was monitored in 24 stations distributed in the World Heritage Site of Indian Sundarbans during 2010 and 2019. High organic carbon load was observed in the stations of western Indian Sundarbans, which are near to the urbanized city of Kolkata. The central and eastern sectors of the study area, mostly within the reserve forest exhibit relatively less soil organic carbon. We observe significant spatial and temporal variations in SOC during our study period. The paper highlights the increase of SOC in all the stations with time. The data bank also confirms the soil of the intertidal mudflats of Indian Sundarbans as a potential sink of carbon.

***Keywords:** Indian Sundarbans, Soil Organic Carbon (SOC), Spatial variation, Temporal variation*

About the Author: Arpita Saha is Research Scholar at Techno India University, West Bengal. She has published 12 papers in journal of repute.

Prof. Ar. Saptarshi Sankar Chakrabarti, chartered Consulting Architect by profession, Smart City Specialist (Intelligent Urban Solutions & Sustainable Architecture), Indian Green Building Council Accredited Professional (IGBC^{TM}AP), Chief Architect, Project Management & Consultancy (PMC), Techno India Group, Associate Professor, School of Architecture & Planning, Techno India University, West Bengal, Ph.D Researcher Smart City Planning, is seasoned over two decades of hands-on experience in spearheading multidisciplinary projects in the domains of Architecture, interior design, urban design, master planning, landscaping & smart city missions across India and abroad. He is registered with the Council of Architecture (India) since 2004, associated actively with significant professional bodies of the industry like the Institute of Indian Interior Designers (IID), the Institute of Urban designers India (IUDI), the Indian Green Building Council (IGBC) and the Indian Institute of Architects (IIA).

Dr. Sufia Zaman is the Associate Professor and Head of the Dept. of Oceanography, Techno India University, West Bengal. She obtained her Ph.D in 2010. She has to her credit about 285 scientific publications and 4 books of postgraduate standards.

Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as

NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Climate Change and Its Challenges on Marine Environment Special Reference to Ecological Aspects in Bangladesh

M Abdul Alim
University of Rajshahi

Climate change is expected to have an intensely damaging affect on Bangladesh. Natural disasters may occur even more frequently and be greater in magnitude. A rise in sea levels could submerge a significant proportion of the country. The legal regulations pertaining to specific aspects of maritime law have been the concern of lawyers as natural risks such as rising sea levels, storm surges, or tsunami waves, the pollution of the marine environment represents a serious threat to coastal inhabitants. Climate change will thus not only cause environmental destruction, but will also drive massive social changes as millions of people migrate from devastated areas. This would further overstretch inadequate infrastructure and governance mechanisms, and could lead both to a collapse in living standards and an increase in social disorder. Thus, the proposed article would contribute to the improvement of the current regime of the bay water used for cooling purposes of a nuclear power plant preventing its use for fish farming purposes, an oil spill on the high seas polluting beaches that are essential for tourism in the coastal zone and how such activities destroys on our natural climate and it changes sea level, ocean acidification, ocean stratification, coral bleaching, changing species distributions and other biological change to sea.

***Keyword**: Climate Change, Marine environment, ecology, Bangladesh*

About the Author: Abdul Alim is a professor of law in a public University from Bangladesh. He has done his Masters Graduate (LL.M) from Michigan State University (MSU) College of Law. He has been awarded doctoral degree on the titled Gender Discrimination.

Bacterial abundance in mud crab, *Scylla serrata* collected from North 24 Parganas district of West Bengal, India

Pritam Mukherjee[1], Sufia Zaman[1], Abhijit Mitra[2]
[1]Department of Oceanography, Techno India University, West Bengal
[2]Department of Marine Science, University of Calcutta

The present study is a time series analysis of Total Bacterial Count (TBC), Total Coliform (TC) and Fecal Coliform (FC) in the flesh of *Scylla serrata*, an edible crab widely available in the water bodies of the maritime state of West Bengal, India. Mud crabs from the Malancha area of North 24 Parganas district of West Bengal were collected during 2010 – 2019 for analyzing the microbial load in the flesh of the selected species during monsoon. We observed gradual increase of microbial load with time. The TBC ranged from 2×10^6 MPN/100g to 10.5×10^6 MPN/100g. The TC and FC in flesh ranged from 11.1×10^3 MPN/100g to 26.0×10^3 MPN/100g and 9.5×10^3 MPN/100g to 24.1×10^3 MPN/100g respectively. The increasing trend in bacterial load may be attributed to increase of sewage input from the adjacent city of Kolkata as the collection site of the crab receives the domestic and industrial wastes through Dry Weather Flow (DWF) and Storm Water Flow (SWF) canals from the city.

***Keywords:** Scylla serrata*, Total Bacterial Count (TBC), Total Coliform (TC), Fecal Coliform (FC)

About the Author: Dr. Pritam Mukherjee is a Post-Doctoral Fellow in the Department of Oceanography, Techno India University, West Bengal. Dr. Mukherjee has completed his PhD degree in Biotechnology in 2018 from Techno India University, West Bengal. Dr. Mukherjee has expertise in microbiological, biochemical and molecular biological techniques, fluorescent microscopy, bacterial and yeast genetics.

Dr. Sufia Zaman is the Associate Professor and Head of the Dept. of Oceanography, Techno India University, West Bengal. She obtained her Ph.D in 2010. She has to her credit about 285 scientific publications and 4 books of postgraduate standards.

Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Technical Session III

2:30p.m. – 4:00 p.m.

Climate Change: Theory, Law & Policy

Saturday January 18, Technical Session III
2:30p.m. – 4:00 p.m.

Climate Change: Theory, Law & Policy

Chairperson: Prof. Gopal Lamicchane
Co Chairperson: Dr. Jayanta Ghosh
Rapporteur: Mr. Prantik Roy
Room: 227

Green Federalism in India

Ananya Chatterjee
Sister Nivedita University

The World is in the brink of environmental catastrophes. Ecological stress is at the core of World's current woes. Climate and politics are wearing a tipping point. Countries are gradually pushing the green issues up the political agenda. Indian federalism is constantly battling with its past. Centuries of centralized colonial rule were followed by decades of Governments to assume this legacy in the mistaken belief that it was the only way forward to keep the nation together. In this paper I propose to illustrate the cruel conundrum by dealing with one of the most significant areas of functional federalism. It is admittedly a remarkable intractable area for achieving sustainable development. Environmental protection goals are particularly set and green federalism is an inescapable imperative. The proper division of responsibilities for promoting green federalism between federal and sub-national units has long been the subject of fierce debate. Governments- both national and sub national need to draft and implement laws to maximize their contribution to sustainable development. Cooperative federalism is often the way to smoothen relations between the federal and sub- national units. But in India, given the over centralization of powers in the central government, critics have described Modi Government as 'Coercive Federalism'. But why green federalism? Because sustainable solutions can only come from the ground up. The ecological crisis and challenges of sustainable development demand that they fight the current battle. Green federalism is the current battle.

Keywords: *Green, Federalism, India*

About the Author: Ananya Chatterjee a full time faculty of law at Sister Nivedita University. She started her career as an academician since 2013.

Smart cities: Quest for sustainability with quality

Nabanita Sen
Sarsuna Law College

Once Peter Kropotkin quoted-What kind of World do you want to live in? Demand that your teachers teach you what you need to know to build it.
Economic Globalization in social arena is moulding the World into more uniform, and cities are being witnessed as the main source of economic empowerment. The United Nations Conference on Climate Change, 2016 held in Paris, gave many local communities the opportunity to rethink their environmental objectives to reduce CO_2 emissions through the use of Internet of Things (IoT). Cities today face challenges of increasing population, infrastructure and declining budgets which serve the need for new approaches to be adopted in order to make our cities to be Smart City.
A Smart City is a co-ordinated system of systems. Smart technologies and efficient building are the bullet points for energy efficiency and CO_2 Education. Smart City uses smart system characterized by interaction between capital, infrastructure, culture and behaviour achieved through integration. The Information of communication technology (ICT) enabled services and applications available to the citizens and authorities that are part of a citys system. It proposes to enhance citizens quality of life and improve the efficiency of the services provided by the Government entities and business authorities. IoT plays a pivotal role in shaping cities smarter.
Technology alone would not make cities smart. Smart terminology engulfs smart manpower,

economy, living, transit with smart management to magnify quality of life. Creating Smart Cities may sound difficult but not impossible. Successful implementation can lead to an improved, quality and sustainable life.

The paper would portray the current state of understanding of the Smart City concept and seek to chalk out a proposed platform for the development of city services.

Keywords: *Smart City; Internet of Things (IoT); Information of communication technology (ICT); Infrastructure; Quality and Sustainable life; Development*

About the Author: Nabanita Sen is pursuing LL.M. from Sarsuna Law College.

Biomass and carbon stock estimation inventory of mangrove associate flora, *Suaedamaritima* and its potential role for alternative livelihood

Sudeshna Biswas[1], Sufia Zaman[1], Abhijit Mitra[2]
[1]Department of Oceanography, Techno India University, West Bengal
[2]Department of Marine Science, University of Calcutta

Suaeda maritima is widely distributed in the supra littoral zone of Indian Sundarbans. There is limited knowledge on the role of this mangrove associate floral species in storing carbon from the atmosphere. The species grows luxuriantly above the high tide level, where the habitat is extremely harsh due to dryness. The species, however, is a rich source of mineral salts. We conducted a study during 2019 at 10 different stations in Indian Sundarbans to monitor the Above Ground Biomass (AGB) and Above Ground Carbon (AGC) of the species. It was observed that AGB and AGC of the species were highest in the hypersaline central sector (stations 6-10) compared to the hyposaline western sector (stations 1-5). Considering the potential of the species to grow in the hypersaline zone, it is strongly recommended to cultivate the species not only to sequester carbon, but also to link the same with alternative livelihoods (like preparation of snacks, health drinks etc.) as the species has high concentrations of Na, K and Ca.

Keywords: *Indian Sundarbans, Suaeda* sp.*, AGB, AGC, alternative, livelihood*

About the Author: Ms. Sudeshna Biswas is a research scholar at Techno India University, West Bengal in the Department of Oceanography. Presently she is pursuing her Ph.D on preparing of snacks from mangrove associate species from Indian Sundarbans. She is presently credited to have published 6 papers in journals of repute. Ms. Biswas has represented for paper presentation in 3 International Conferences and 3 National Seminars.

Dr. Sufia Zaman is the Associate Professor and Head of the Dept. of Oceanography, Techno India University, West Bengal. She obtained her Ph.D in 2010. She has to her credit about 285 scientific publications and 4 books of postgraduate standards.

Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Traditionally agroforestry systems of North East India: A sustainable carbon offset strategy

Biplab Brahma, Arun Jyoti Nath, Ashesh Kumar Das, Prantik Roy
Assam University

Across South and Southeast Asia, a large number of people depend fully or partly on agroforestry systems for their livelihood and food security. North East India (NEI) falling within one of the biodiversity hotspots of the World, the Indo-

Burma biodiversity hotspot, covers 17.2 million ha of land under forests, constituting ~25% of India's total forest area. Traditional agroforestry systems in NEI are being managed by over 100 different indigenous communities practising for millennia. The Paan jhum or Piper betle (PB) agroforestry system is one of the common and mostly distributed traditionally managed system in NEI. Betel leaf cultivation is a traditional agroforestry system that involves the deliberate growing of betel vine along with the other tree species within the same field. The present study has been conducted in 2015-16 to estimate the ecosystem carbon (C) stocks under PB systems. Similarly, ecosystem C stock under mature rubber plantation (RP) was also estimated to compare the results. The ecosystem C stock under PB, and RP was estimated at 172, and 175 Mg ha^{-1}. Although ecosystem C stock of RP is consistent with that of PB, the former has often been associated with diverse environmental issues including the loss of biodiversity and disruption of the hydrological cycle. Therefore, considering the perspective of environment management and conservation, PB agroforestry would be a better alternative to accelerate ecosystem C sequestration while maintaining the livelihood security of the farmers.

***Keywords**: Agroforestry, Ecosystem carbon, Rubber plantation, Paan jhum*

About the Author: Dr. Biplab Brahma, did his PhD from the Department of Ecology and Environmental Science, Assam University. His research was focused on ecosystem carbon management under rubber plantations. He has received Junior Scientist of the Year 2017 award by Confederation of Indian Universities, New Delhi and International Foundation for Environment and Ecology, Kolkata. He has also received Shastri Indo Canadian Post-doctoral Fellowship 2018-19 to carry out his post-doctoral study in Canada. Effect of different nutrient managements in soil carbon and health was the main focus of his postdoctoral research in Dalhousie University, Canada. During his 6 years research carrier he has presented number of research papers in international and national conferences around the world and could publish 10 research articles in international peer reviewed journals. He is also co-authored the book published by the Apple Academic Press USA and Canada in 2019, titled Rubber Plantations and Carbon Management. Dr. Brahma research interests include Plant biomass modelling, Soil carbon Sequestration, Soil health analysis, Sustainable Soil Management, Fine root dynamics, litter dynamics, Ecosystem carbon management, Ecosystem Health Assessment, Agroforestry management, Climate change mitigation and adaptation, Sustainable and Climate Smart Agriculture and Food security.

Dr. Arun Jyoti Nath is Assistant Professor in the Department of Ecology and Environmental Science, Assam University, Assam. He is an ecologist with diverse experience in research and teaching. His research focuses on biocarbon sequestration.

Dr Ashesh Kumar Das is Ex-Professor in the Department of Ecology and Environmental Science, Assam University, Assam. His research interests include tree diversity and ecology, carbon management on forest and agriculture ecosystem and soil ecology.

Prantik Roy is an Associate Member of the Institute of Cost Accountants of India. He is also a Member of the Bar Council and several other bodies. He did his post graduation from several Indian universities in Management, Public Administration and Law. Throughout his academic career he has been consistent in securing ranks and has been the recipient of university gold medals and several prizes and awards. He has been awarded with the prestigious National Doctoral Fellowship award by the ICSSR. He has presented papers in several international and national seminars. His research interests include, Cost Control and Quality Management, Corporate Finance, Climate Finance, Operations management, Quantitative Techniques for Decision Making, Corporate Law, Environmental Law, ESG, Public Policy and Management.

Managing Waste through Circular Economy: Imposing legal burden on Small Businesses and End Use Consumers is Not the Solution

Monalisa Saha
The University of Burdwan

The paper attempts to contexualise the present problem of waste management in the country. She limits her study to the management of municipal solid waste, generated in the households and small and medium business enterprises. The final destination of waste generated in these entities are the landfill sites which have reached their maximum carrying capacity. The presence of a mix of all types of waste, together, at a site, has proved to be extremely dangerous as the recent fires at landfill sites of Deonar in Mumbai, and Ghazipur in New Delhi, show.

The recent policies, laws and the stand of judiciary is focused on encouraging segregation of waste at source by households, business entities and municipalities and in penalizing the violators. But the author argues that in a country that is, seeing unplanned explosion of slums, vast presence of uneducated/unwilling persons, educated/employed persons complaining of time constraints, such expectation of behavioural change in viewing waste as a resource is farfetched.

The most plausible method of preventing environmental degradation and its consequential effects is through changing our linear economy model (where most products are meant to be used once) to a circular economy (where we interlink various infrastructural facilities, like waste collection/segregation/management with manure & planting entities, vehicular & cooking fuel generation entities).

She has in her paper elaborately explained the working modality of a circular economy, which has worked wonders in waste management and in providing ancillary benefit of a circular economy (power generation, job creation, production processes being less reliance on new resource inputs etc) across the globe. Expecting the general populace and especially small business entities to voluntarily manage waste, will be met with more resistance than achieve any desirable result.

Keywords: *Circular Economy, Linear Economy, Waste To Energy, Non-Penalising Initiatives, Municipal Household Waste, Slum*

About the Author: Monalisa Saha, a Ph.D scholar at WBNUJS, is also teaching at The University of Burdwan. She teaches Environmental Law amongst other subjects there. She graduated and secured both her B.A LL.B and LL.M degree from WBNUJS, Kolkata and has worked in various research projects before shifting to teaching full time 3 years ago.

Mapping the solar energy in India: An analysis of evolving policy trends towards rural electrification

Sachin kumar P.P.
Rajiv Gandhi School of Intellectual Property Law, IIT Kharagpur

India is positioned 109th in the World Energy Councils Trilemma Index of 2019, according to which the urban cities has 100 % access to electricity, however, the scenario in rural areas which constitute larger part of the country still lacks in access which leads to issues in grid connectivity. The energy security index of India is showing a steady decrease since 2000, owing to improvement in access to energy, resulting in a higher equity score. However, this is counterbalanced by challenges caused by the increase in demand.

India on global stage is committed towards clean energy and reducing carbon emission by increasing thrust on renewable energy. The increase set a five-fold target of 175 GW by 2022 of which 100 GW are to be produced from solar energy. This study aims to examine whether the existing solar policies are potent enough to satiate the increase in demand? The statistics shows that there is a lack of access in rural areas, hence, there

is a need to revisit the concept of access for all. Which brings us to next paradigm of this study; whether enough has been done to reduce the policy divide between urban areas and rural areas? And, what are the institutional and regulatory measures taken to reduce the gap between the urban and rural access to electricity?

This study focuses upon solar energy, owing to its universality. The equity sphere of energy trilemma is best addressed through this source of renewable energy. Today's equity dimension focuses not only upon access, rather upon quality access, abundance, and affordability for all. Hence, there is a need to relook universal access through the lens of rural electrification and grid connectivity.

***Keywords**: Energy Trilemma, Rural Electrification, Access*

About the Author: Sachin kumar P.P. is a Research Scholar at Rajiv Gandhi School of Intellectual Property Law, India Institute of Technology Kharagpur.

Study on the decadal variation of nutrients and chlorophyll a at Digha coast in West Bengal, India

Gahul Amin[1], Sufia Zaman[2] and Abhijit Mitra[3]

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[2]Department of Oceanography, Techno India University, West Bengal
[3]Department of Marine Science, University of Calcutta

We present data bank of three decades (1984-2014) to exhibit the rising trend of nutrients (NO_3 and PO_4) and *Chl a* in Digha, a well known tourist spot in the maritime state of West Bengal. Global warming, mushrooming of shrimp farms and several anthropogenic factors may have accelerated such changes over the last three decades. Observations of selected variables like the nutrients and chlorophyll a show significant long-term variation over a period of three decades. Significant positive correlation values were observed between NO_3, PO_4 and *chl a*, (nitrate X *chla* = 0.7535, $p < 0.01$ and phosphate X *chla* = 0.8331, $p < 0.01$) confirming nutrients to be extremely favourable for the growth and survival of the phytoplankton species in the present geographical locale. However, enrichment of nutrients and chlorophyll may lead to eutrophication, which may lower the dissolved oxygen of the aquatic phase leading to adverse impact on the aquatic lives.

***Keywords:** Coastal West Bengal, Nutrients, Chlorophyll a, Phytoplankton*

About the Author: Dr. Gahul Amin is a Faculty Member of Physics, School of Sciences, Netaji Subhas Open University. He started his career in Environmental Science since 2004. He has published 26 scientific papers in national and International journals.

Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Dr. Sufia Zaman is the Associate Professor and Head of the Dept. of Oceanography, Techno India University, West Bengal. She obtained her Ph.D in 2010. She has to his credit about 285 scientific publications and 4 books of postgraduate standards.

Sustainable Development *vs* Market Economy

Wasim Aktar
Department of Law, The University of Burdwan

Sustainable development has long been regarded as the best developmental strategy that can be adopted to save the World from the perils of man-made climate change disasters. Essentially

sustainable development is making some amends in our developmental strategy so that the limited environmental resources are not depleted so rapidly that the future generations are deprived of a healthy environment and environmental resources. But, it is a bitter fact that caring about the environment on a large scale generally makes corporations and countries alike lose economically to their competitors as the market economy is such a formidable force that the cheapest solution to a problem always wins and globalisation has made this force even more formidable. So, one of the biggest challenges in promoting sustainable development is agreeing on who will bear the cost of using environmental friendly alternatives. Various international environmental treaties have also faced the most serious and fierce debate about who will bear the loss of caring for the environment and this has over time made environmental protection a secondary concern and financial factor the first consideration in any debate and bargain in environmental protection treaties. In this paper, the researcher shall study the factors that makes the most successful environmental protection treaty ever- the 33 year old Montreal Protocol, such a huge success while most other environment protection treaties like Kyoto Protocol, Paris Climate Agreement etc. are falling apart even though all of them have had to face the same formidable force of the market economy. The researcher shall then factually assess the short and long term effects of this tug of war between sustainable development and market economy on the people of the World based on their economic status and suggest a solution based on that to make environment protection treaties more successful and effective.

Keywords*: Sustainable development, market economy, Environmental resources*

About the Author: Wasim Aktar is a second year Masters of Law student at the Department of Law, University of Burdwan. He is also an entrepreneur and trying to develop decentralised sustainable business models that can put money on the hands of poor working class rather than accumulating wealth on the hands of the rich people and adopts environment friendly measures along the way as gradually wealth gets decentralised. The researcher has plenty of hands on experience with settlement of disputes in village areas as a Para-legal Volunteer under the District Legal Services Authority, Nadia.

Saturday January 18, Technical Session III
2:30 pm – 4:00 pm

Climate Change: Theory Law & Policy

***Chairperson*: Prof. Tara Sapkota**
***Co Chairperson*: Mr. Durjoy Kumar Deb**
Rapporteur: **Ms. Rima Ghosh**
Room: **107**

Saving our Earth with green technology looking into its socio-economic authenticity

M. Nikhila
Damodaram Sanjivayya National Law University

Since 1906, there is an increase in the average surface temperature of the earth. It's high time to respond to the alarming Climate Change, switching from the Carbon emitting technology to Green Technology. Green Technology is the replacement of the subsisting harmful technology aiming to decrease the impacts of Climate Change. In the early years before the introduction of the industrial revolution, people used the natural and sustainable methods for aiding their daily needs, now it should go with the present technology making it clean technology which is environmentally friendly. The objective of the paper focuses on how Green Technology is going to protect the earth and its Social and Economic validity thereafter. Green Technology aims at protecting the environment repairing the damages

made to the environment. Strategies of Green Technology should create competitiveness among the industrialists making it necessary to follow. Green Technology creates job opportunities and a report by IRENA depicts that there would be positive change in the GDP through Green Technology. Energy be used efficiently and there would be a focused result of human welfare focusing the rural areas along with the cities. Probably there would be a good business sense leading to an ethical investment approach. So the researcher clearly explains how Green Technology helps for protection of the Earth. This paper also suggests some new approaches to make Green Technology not just a rational political method but making it realistic.

Keywords: *Climate change, green technology, GDP*

About the Author: Muppana Nikhila who is a student of Damodaram Sanjivayya National Law University pursuing B.A., LL.B. (Hons.), 4th Semester.

Mapping of Resource Rents to Carbon Emissions Intensity: Can India's Carbon Emissions Policy Achieve the Target Use of New Renewables?

Sovik Mukherjee, Sneha Singh
St. Xavier's University, Kolkata

In this fast growing World where 82 per cent of energy supply in the Worlds twenty biggest economies still comes from fossil fuels it is difficult to be in line with the emission targets of the Paris Accord. India's emission targets, by far, are the most ambitious and close to the 1.5°C limit agreed. Having said that, the question that arises is" is it enough? Continuously for three years, investments in renewable energy have pinnacled past fossil fuel related power investments. But at the same time, India's ongoing expansion of coal is a worrisome factor. The Paris agreement of 1.5°C limit means that there needs to be a phase-out of coal in the power sector by 2040 at least, if not earlier. Surprisingly, 90 GW of planned coal-fired capacity under the National Electricity Plan (NEP) in 2018 will lead to an increase in emissions unnecessarily. But, India at this point of time cannot even stop the use of coal immediately. Here lies the jinx. There has to be a tradeoff between India committing on its long run goals of greenhouse gas emissions in such a way that it does not raise the short run cost to the development process in India in terms of not being able to fund the huge costs of using new renewables. In this background, the paper discusses how the optimum fuel mix design should look like involving the use of using new renewables. We want to make it however, clear here that these projections are not predictions of India's future energy scenario, but represent certain alternative energy scenarios which may be considered attainable for India not only from the feasibility part but also from the financing part. This paper outlines the recent history and future prospects for carbon emissions in India under the alternative economic scenarios discussed. We project the share of non-fossil power generation capacity to reach 50"60% in 2030, corresponding to a 45% share of electricity generation. Though these results broadly support the targets of the present Government regarding the creation of generation capacity of new renewables based power, the paper argues that the rent domestically extracted from either coal or gas should be able to finance these capacity requirements from use of solar or wind or other renewables in line with the carbon emissions intensity of GDP target of 33-35% in 2030.

Keywords: *Anthropocentrism, Coal, CO_2 Emissions, Emissions Intensity, Energy, New Renewables*

About the Author: Sovik Mukherjee is an Assistant Professor of Department of Economics Faculty of Commerce and Management Studies, St. Xavier's University, Kolkata and also visiting Research Fellow of NISPA, Bratislava, Slovak Republic.

Sneha Singh is an Assistant Professor (Law).

The Commons nature of Wildlife Corridors

Shreya Padukone
Gujarat National Law University

Carbon maps launched at the COP10 show how carbon stocks in Asia, Africa and Latin America overlap with biodiversity hotspots. The health of these hotspots is maintained by the fragile links of migration corridors. Such ecosystems in India are gradually thriving under conservation efforts, but cannot be sustained without the connectivity facilitated by depleting corridors. Most susceptible to human-wildlife conflict, the cornerstone bearing India's flourishing biodiversity is crumbling. The basic determinant of society is carbon, and identifying the source is crucial. This makes the discussion on preservation of wildlife corridors imperative to the theme of carbon mapping in the light of climate change.

This study aims to explore interdisciplinary manifestations of carbon sequestration by examining the conservation science of corridors from a legal perspective. The systems in place can sometimes be counterproductive to what is sought to be achieved; the Indian Supreme Court has opined that the fundamental environmental principles are anthropocentric, and it is desirable for our jurisprudence to shift to an eco-centric approach. Respecting cultural knowledge and equitable land-use patterns that have persisted for centuries was the basis on which the Apex Court afforded protection to Village Commons, giving directions to all State Governments to prepare schemes for eviction of illegal/unauthorised occupants, making them immune projects already underway with huge investments or political connections. The focus of the research is the scope of taking a broader eco-centric view of the Commons to honor the Rights of Nature by extending the same sanctity to natures lands held for collective use. This is suggested as an organic corollary to an Uttarakhand High Court ruling the animal kingdom to be legal entities with the rights, duties and liabilities of a living person. Climate change is as much a social problem as environmental; the subtext must be recognized and addressed.

***Keywords**: COP10, wildlife corridors, climate change*

About the Author: Shreya Padukone graduated with a B.Sc. LL.B (Hons.) from Gujarat National Law University in 2018.

Examining India's Policy on Climate Change and its effects on Marine Ecosystem through the development of International Environmental Law

Tarique Faiyaz, Balraj Kaur Sidhu
IIT Kharagpur

Global Warming is the most glaring effect of climate change. The increasing Carbon dioxide (CO_2) and other greenhouse gas (GHG) are a result of the anthropogenic activities which makes the oceans more acidic and marine ecosystems prone to further extinction. It causes rising sea levels which disproportionately impacts the ocean, the coastlines and coastal communities and their livelihood, changes in the diversity and abundance of marine species which are at the centre of climate change. This Article in the first part addresses the issue of climate change and its impacts on the marine ecosystems. In the next part it addresses the question of whether the currently available instruments of international environmental law are applicable to climate change and its effect on developing states like India. The current regime under the Paris Agreement is significantly insufficient to address the issue of climate change. The article further examines the role of individual states as set out by the international environmental instruments under the International doctrine of state responsibility.
United Nations Convention on the Law of the Sea (UNCLOS) is a fairly stringent in ushering responsibility and liability for marine pollution. Climate change affects the marine ecosystem in different ways in which UNCLOS may be pertinent. The next part of the Article provides an overview of India's policy, outlining the possible

effects of intertwined nature of the marine ecosystem and climate change under the auspices of the International instruments.

In the last part the article explores the Marine policy gaps and responsibilities of developing nations like India in accordance with the principle of common but differentiated responsibilities and respective capabilities, taking into account social and economic conditions and other relevant factors and also examines as to how these policy gaps can be mitigated.

Keywords: *Climate Change, Global Warming, International Environmental law, Marine Policy, UNCLOS*

About the Author**:** Tarique Faiyaz holds B.A.LL.B from Aligarh Muslim University, Aligarh and has obtained his LL.M in Business Law from Amity University, Noida. He has worked as a lawyer for five years in and around Delhi appearing in various Courts and Tribunals. He is currently a Ph.D. candidate at the Rajiv Gandhi School of Intellectual Property Law, Indian Institute of Technology, Kharagpur.

Dr. Balraj Kaur Sidhu is currently working as an Assistant Professor at Rajiv Gandhi School of Intellectual Property Law, Indian Institute of Technology, Kharagpur. She obtained her Post-Doctoral Fellow from Centre for Global Cooperation Research, Duisburg, Germany. She was a Guest Faculty at Faculty of Law, University of Kashmir, Srinagar. She was also a Senior Visiting Research Fellow at School of Law & Social Justice, University of Liverpool, UK. She was a DAAD Visiting Fellow (June-August 2014), at Max Planck Institute for Foreign and International Criminal Law, Freiburg, Germany and a Senior Research Fellow at Jawaharlal Nehru Chair in International Environmental Law, SIS, Jawaharlal Nehru University, New Delhi, contributing to teaching of courses in MA and M.Phil. as well as Nehru Chair's research program. She was also a Visiting Research Scholar (August 2012) Centre of Excellence for International Courts (iCourts), Faculty of Law, University of Copenhagen, Denmark. She was also a Guest Research Scientist (January-July 2011), Max Planck Institute for Comparative Public Law and International Law, Heidelberg, Germany.

Climate change and sustainable public procurement policies: An analysis of the environmental considerations in WTO'S agreement on public procurement

Mukesh Rawat, K D Raju
Indian Institute of Technology

In the contemporary era, the entire human civilization is facing the severe effects of climate change. As a result, the approach of Sustainable Development (SD) has become a necessity to tackle the problem of climate change. With the increasing share of government spending, Sustainable Public Procurement Policies (SPPPs) has become a vital tool to address social, economic, and environmental concerns related to climate change. The SPPPs are a combination of a two-dimensional approach, which aims to promote environmentally sustainable and socially equitable procurement practices.

In 2014, the World Trade Organization members recognized the importance of SPPP's by incorporating environmental considerations in the revised Agreement on Government Procurement Agreement (GPA). The SPPP can play a pivotal role in mitigating the impacts of climate change as government procurement consists of a 15-20 % portion of GDP. In will create a market for green technologies and innovations, i.e., promoting the use of energy-efficient machines, environment-friendly material in construction, low energy buildings, low emission vehicles, and renewable energy. It can become a catalyst in mitigating the impacts and future risks of climate change.

This paper aims to highlight the significance of SPPP as a response to climate change. The paper will consist of four parts. The first part, will provide an introduction to the interface of SPPP, sustainable development, and climate change. The

second part aims to examine International regulations related to public procurement and the emergence of sustainable procurement policies. The third part will be an analysis of SPPP used by the governments to adapt and mitigate the impacts of climate change. In the final part, it will end with analysis and suggestions, which will contribute to the current discourse on what role GPA and SPPP may play in the efforts to tackle climate change.

Keywords*: Climate Change, Sustainable Development, Sustainable Public Procurement, Public Policy, and WTO*

About the Author: Mukesh is a doctoral candidate at IIT-KGP. He holds a bachelor's degree from the University of Delhi and an LLM degree in International Law from South Asian University, Delhi. In the past, he has worked with organisations like NADA, AIFF and FIFA.

Dr. Raju K.D is presently Professor of Law at Rajiv Gandhi School of Intellectual Property Law, Indian Institute of Technology, Kharagpur. His research career began with M.Phil studies at Jawaharlal Nehru University, New Delhi, on International Law and furthered his doctoral studies at JNU. He has been awarded the â€œFulbright Scholarship by the United States Education Foundation in India (USEFI) for completing his doctoral studies at the University of Illinois, Urbana Champagne, United States. He has been awarded the Microsoft Outstanding Young Faculty Award in 2011.

He has published papers in leading journals such as the Journal of Bio-Law and Business, Journal of Intellectual Property Rights, Foreign Trade Review, Journal of Commercial Biotechnology, International Company and Commercial Law Review, International Journal of Nuclear Law and Indian Journal of International Law. He is also the author of the books: Intellectual Property Laws in India, WTO Agreement on Anti-dumping: A GATT/WTO and Indian Jurisprudence, published by Kluwer Law International, etc. His latest book is on Interface between Intellectual Property and Competition Law, published by Eastern Law House, Kolkata in 2015 and the New Jurisprudence of IP in 2016.

Management strategies towards climate resilient orange mud crab (*Scylla olivacea* Herbst 1896) farming in the context of climate induced salinity alterations in Indian Sundarbans

Supurna Lahiir[1], Subhra Bikash Bhattacharyya
Department of Oceanography, Techno India University, West Bengal

Being a profitable venture, mud crab farming is gaining popularity in Indian Sundarbans. As Sundarbans is experiencing effects of climate change and associated alterations in salinity, it might affect crab farming operation negatively. As important parameters determining productivity and pricing of harvested crabs, condition factor (CF) and gonodal maturity in terms of gonado somatic index (GSI) of orange mud crab (*Scylla olivacea* Herbst 1896) thriving in Indian Sundarbans at different salinity regimes has been studied to formulate management strategies for farming. Low, medium and high salinity regions along the lower stretch of Hooghly River was selected. Regression equation depicting relationship of salinity and GSI for female ($y = 0.1182x + 3.0155$, $R2 = 0.9841$) and male ($y = 0.0059x + 0.0856$, $R^2 = 0.9341$) indicated significant ($p<0.05$) positive correlation. Condition of crab was improved with increasing salinity. Decreasing salinity in the western part of Indian Sundarban might deteriorate condition parameters and might result poor GSI of S olivacea in the long run. Establishing crab farms in the higher salinity regions in the western sector might be a better option.

Keywords: *Climate resilient, Scylla olivacea, salinity alteration, Indian Sundarbans*

About the Author: Mrs. Supurna Lahiri, is presently holding the position of Doctoral Research fellow, Dept. of Oceanography, Techno India University, West Bengal. She has to her credit about 2 scientific publications.

Dr. Subhra Bikash Bhattacharyya is presently working as Advisor-Technical Matters of Aquaculture, IFB Agro Industries Ltd., Kolkata and Assistant Professor (Honorary capacity), Techno India University, West Bengal. He has published about 38 research papers in various national and International journals, 2 books and 8 book chapters.

Socio-economic impact of carbon footprint from vehicular emission in Bankura town: An analysis

Sangeeta Chatterjee
Department of Law, Bankura University

Climate change is the biggest problem at present human beings are facing and if it is not checked as early as possible, life of humans in the earth will be at stake. Everyone, including United Nations and the countries throughout the World are trying to combat with this problem. As such, new techniques are developed day by day to find out the major issues in this respect as well as to prevent those. Carbon emissions or footprints are major sources of environmental pollution including climate change, especially in the developing countries like India, where general awareness of the common masses is very poor. Vehicular emission is one of the root causes of carbon emission, more specifically in the less developed districts, where old vehicles are still used escaping the long arms of the Pollution Control system of Motor Vehicles.

Bankura is a small town in the district of Bankura, situated in the southern part of West Bengal. The town is much underdeveloped from the point of socio-economic perspectives. It is thickly populated area with congested households. Narrow roads are found for running the buses and other vehicles. The main problem is the lack of urban planning in the town. The infrastructural problem includes lack of awareness of the illiterate or less educated common masses, owing to which vehicular and other emissions are causing incessantly in the town resulting into huge amount of carbon emissions therein. It leads to further socio-economic backwardness in the town. In this backdrop, the present study would like to find out the practical situation in the town as well as to provide suggestions for reducing carbon footprints therein for the betterment of socio-economic perspectives.

Keywords: *Climate, Change, Carbon, Footprint, Vehicular, Emission, Bankura*

About the Author: Dr. Sangeeta Chatterjee is an assistant professor of law at Department of Law at Bankura University.

Conserving Nature from Toxic 'Carbon'*Vis-A-Vis* Rule of Law

Rima Ghosh
CRSGPP, The West Bengal National University of Juridical Sciences, Kolkata

Conservation is the main aspects of human life cycle. It's sets out the goal of building the environmental rule of law as the legal foundation for environmental justice. Humanity exists within nature and that all life depends on the integrity of the biosphere and the interdependence of ecological systems. It emphasizes the anthropogenic stresses on the Earth, the close relationship between human rights and environmental conservation and protection and the fundamental importance of ecological integrity. The contribution of environmental law principles to the development of legal and policy regimes for conservation and sustainable and supports the evolution of such principles. The 'environmental rule of law' is a refinement of the traditional notions of 'rule of law'. An additional framework of procedural and substantive rights and obligations that incorporate the principles of ecologically sustainable development. It then sets out the key governance elements of environmental rule of law which conserving nature from toxic 'Carbon'. This paper focuses on environmentalism, approach of Supreme Court *vis* a vis sustainable development with conservation of nature. The models and methods adopted in the

Indian context appears and like those in other common law systems need to analyze.

***Keywords**: Carbon, Environment, Human Rights, Constitution*

About the Author: Rima Ghosh is currently working as a Research Assistant, Centre for Regulatory Studies, Governance and Public Policy, The W. B National University of Juridical Sciences. She has completed her LL.M degree with first class in Business Law as specialization subject with interest of Intellectual Property Law from Amity Law School Kolkata, Amity University Kolkata. She was recipient of Best Student Award in Intellectual Property Law. She holds core membership of Intellectual Property Facilitation Team (IPFT) to work on blogging and spreading awareness about Intellectual Property and also holds membership position of Youth for Human Rights International. Researcher has vast experience on researching on contemporary issues of present world. She has attended workshop on "The East India- US Symposium on Intellectual Property Rights" Organized by AUTM Foundation an AAPIOIX, USA, The American Consulate. She had presented research work in national and international forums.

Recognising Climatic Refugees: Interplay between International Environmental Law and International Refugee Law

Saheli Chakraborty
The West Bengal National University of Juridical Sciences, Kolkata

Climatic change is such phenomenon which is largely caused by the commercial economic policies of a few states, but has impacted the World, but a few states, largely. There are states, which are in the risk of being submerged completely by the catastrophic effect of the environment. Just as, the International environment law is finds it's scope in such a crisis, International Refugee Law also finds it's significant role in this case. There are record of people, who needs to be shifted from the endangered states, relocated to another state, given the nationality, rights and obligations thereafter. With no mention of environment as a criteria for getting refugee status, such climatic refugees doesn't have a right to be relocated or settled in another state, but is dependent on the discretionary power of the law makers of the states, in which they are seeking asylum.

Environmental refugees were recognised for the first time, in case of Carteret Island. Government of Papua New Guinea authorised and funded relocation of the inhabitants of the island, for it was at the risk of being submerged. Such danger has been forecasted in Tuvalu, which is the lowest lying country of the World. Considering the plight of people of such areas, it was imperative to go into an agreement with New Zealand, under Pacific Access Category, for which people of Tuvalu are shifted to Fiji, New Zealand and other countries.

Yet, such relocation or migrations are taking place on bi lateral or on regional level basis. On universal level, there is immediate need of the recognition of environmental or climatic refugees. One school of thinkers believe that, the people who are seeking for refuge, are in fear of being persecuted by environment. There is presence of fear of persecution, which is due to the detrimental decisions taken by some states over a large span of time, exploiting environment to their advantageous opportunities and hence, people of such area does fall under the ambit of refugee. Whereas, another school of thinkers believe as per the convention relating to the status of Refugees, 1951 migration due to environmental concerns doesn't fall under 'Refugee'. This paper shall examine the 'Climatic Refugee' in the light of Article 1 of the 1951 Convention of the Refugee Status, using doctrinal approach and provide necessary suggestions to curb the ambiguous situation.

Keywords: Climate Change, Environment, Refugee

About the Author: Saheli Chakraborty is a student of The West Bengal National University of Juridical Sciences.

Legal aspects of climate change - rethinking the dilapidated sublunary world

Kanimozhi. T, Sri Kabishna. S
School Of Excellence in Law, Chennai

With the glaciers truncating in the globe and the ice lakes cracking up, the effects of climate change on the environment have already been evidently witnessed. The two stirring subjects that are often seen to be scrupulously related are economic development and climate change. Global Warming is real and it is eventuating indeed most assuredly having the activities by human beings as its root cause, this is indeed debated as the dominant cause of climate change as maintained by a mind-boggling scientific consensus. With the technology coming up mapping the carbon (Carbon Mapping) is emerging as well as the most welcoming phenomenon that needs to be elucidated and understood. It is most compelling for the scientists as well to know where the carbon is absolutely stored. It is a constitutional imperative to safeguard our environment and in that line, the Indian Constitution through its sundry articles provides for preserving our nature and the environment including forests and wildlife. The first part of the paper seeks to offer a general perspective on the dimension of climate change in a nicety and its effects on the earth as a whole. The paper does not endeavor to elucidate the whole technical aspects in relation to climate change but focuses on a few scientific concepts here and there. The paper also ventures to shed light on the constitutional perspectives in preserving nature and the legal perspectives in relation to climate change.

Keywords: Climate Change, Constitutional Perspectives, Carbon Mapping.

About the Author: Kanimozhi. T is student of School Of Excellence in Law, Chennai.

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Saturday January 18, Technical Session III
2:30 pm – 4:00 pm

Climate Change: Theory Law & Policy

***Chairperson*: Dr. Sufia Zaman**
***Co Chairperson:* Dr. Shambhu Prasad Chakrabarty**
***Rapporteur:* Ms. Somabha Bandhopadhay**
***Room:* 107**

Assessing the pattern of infection caused by Non Tuberculous Mycobacteria in the coastal regions of West Bengal, India

Tapti Sengupta[1], Parijat Das[1], Tirthankar Saha[1], Abhijit Mitra[2]

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[2]Department of Marine Science, University of Calcutta

Marine capture fishery is one of the most important sectors for economic and social development of West Bengal. Anthropogenic pollutants and toxic contaminants affect the production, making the fishes prone to infectious diseases. The present work was conducted for ten years to isolate and categorize the pathogens causing infection. During the study period, the degree of infection was estimated in relation to the physico-chemical parameters. Samples were collected from three estuarine zones of West Bengal. Majority of fishes having haemorrhagic lesions, redness of skin and generalized morbidity belonged to the genus Arius spp. (46.16%) and the lowest from *Thunnus* spp. (15.17%) from the coastal zone during 2008-2018. Ulceration was noted on gills and body surfaces. A trend of

increase in the abundance of NTMs was noted, with maximum severity of infection during post monsoons (66.66%) in all stations. Infection by *Mycobacterium* spp. increased significantly with decrease in temperature and increase in salinity. Highest numbers were found during September "November (55%) and lowest during May-June (16.66%). The prevalence of *Aeromonas* spp. was highest in October (41.66%) and lowest during May (8.33%). Other pathogenic species were found throughout the year. The degree of infection increased during 2012-2016, showing that anthropogenic pollution and changes in water quality parameters like temperature, salinity and heavy metals significantly affected ($p<0.01$) the severity of pathogens in adult fishes. Increase in the number of fishing vessels, leaching of heavy metals and salinity change significantly affects the degree of NTM infection.

Keywords: *Mycobacterium* spp*., NTM, ulcerative lesions, salinity, seasonal variation.*

About the Author: Tapti Sengupta joined the Department of Microbiology at West Bengal State University, Barasat, 24 pgs North, as an Assistant Professor in 2009. She started her research career by focussing on aquatic animal diseases, Anti Microbial Resistance (AMR) in environmental and nosocomial microbes along with understanding their mode of transmission. She is also looking into the mechanism of infection in MDR and XDR pathogens. She also works on environmental modelling and bioremediation aspects. Currently she is pursuing detailed study on Mycobacteriosis and related zoonotics involving fish handlers and environment. Non Tuberculous Mycobacterial infections are at a rise now and Dr. Sengupta has documented it for the first time from the state of West Bengal. Research on the same is ongoing. A number of projects with Central and State Government funding, especially from Department of Biotechnology and ICAR are being handled by her. She is guiding a bunch of potential research scholars and supervising numerous students for their internships. She has many publications and book chapters to her credit.

Ms. Parijat Das is working as a research scholar in the Department of Microbiology since 2013. She received the Inspire Fellowship, Government of India, and pursued her research on phytoremediation and NTMs. She has submitted her thesis on the same. She is working under the guidance of Dr. Sengupta and is very dedicated to her work.

Mr. Tirthankar Saha is working a research fellow under DST, Higher Education sponsored project on Zoonosis under the supervision of Dr. Tapti Sengupta. He has submitted 5000 words pre thesis submission abstract. He is a hard worker and is very good in leading a team. He has a number of publications to his name.

Dr. Abhijit Mitra, Associate Professor and former Head, Dept. of Marine Science, University of Calcutta (INDIA) has been active in the sphere of Oceanography since 1985. He obtained his Ph.D as NET qualified scholar in 1994 after securing Gold Medal in M.Sc (Marine Science) from University of Calcutta. He has to his credit about 530 scientific publications and 38 books of postgraduate standards. Dr. Mitra also successfully guided 36 Ph.D students. Presently he is the Director, Research of Techno India University, West Bengal.

Significance of the United Nations climate change conference (COP25): Weighing the pros and cons

Sudhanshu Singh, Anuttama Ghose
Adamas University, Kolkata

With the upsurge in carbon emission, global warming and climate crisis is impacting the environment and people around the World today. From our well-being to our wallets, were seeing the effect of a World transformed by rising temperatures and changing climate patterns. Hence considering the gravity of this issue, from 2-13 December 2019, United Nations Climate Change Conference (COP25) was organized in Madrid, Spain to provide a platform for practitioners and expects from all areas to share

their notion on formulating effective policy, program and multi-stakeholder partnership to implement climate actions and maximize global benefits. However, so far no clear and effective outcome of such global initiative has been observed. In this research paper, an endeavor will be made to examine and assess the practicality of executing the measures and policies discussed at COP25.

The main objectives of this conference was to prelude the Paris Agreement by adopting strategies to control emanation of carbon in the atmosphere. One of the core issue that was aimed at resolving in this conference was collaboration with non-state entities for generation of finance for adaptation of the strategies. But despite of enormous publicity, the participants closed the discussion with very little concrete achievement. Key issues like regulation of carbon market and liability for damage caused by rising temperatures were not discussed at length in this conference. This paper likewise interlinks and analyzes the global significance of the Climate Ambition Alliance, a mitigation strategy proposed by the President of Chile, Carolina Schmidt to restore the environment and ensure co-operation amongst nations. Hence it is believed that in order to change the level of global pollution, it is necessary for the developed as well as developing nations to enhance their financial support and technology to build adequate resilience to climate change across the World.

***Keywords**: COP25, Climate Ambition Alliance, Carbon market*

About the Author: Mr. Sudhanshu Singh is currently pursuing his PhD from School of Law and Justice, Adamas University, West Bengal. He has also worked as an Assistant Professor of Law at St. Xavier's University, Kolkata; ILEAD (The Institute of Leadership, Entrepreneurship and Development), Kolkata, KLE society's law college, Bengaluru and as a Visiting Faculty at Ramaiah College of Law, Bengaluru; MT Educare, Mumbai. He is also a member of Bengal Taekwondo Association, Founding Member of Navodbhava IPR cell of KLE Society's Law College, Bengaluru and Faculty & coordinator, Green Lawyers Club, KLE Society's Law College, Bengaluru.

Ms. Anuttama Ghose is currently pursuing her PhD from School of Law and Justice, Adamas University, West Bengal. She is also working as an Assistant Professor of Law at Indian Institute of Legal Studies, Siliguri.

Balancing Urbanization and Urban Governance-Towards Transformative Responses to Climate Change

Shelley Ghosh
Jogesh Chandra Chaudhuri Law College

It is an ironical fact that urbanization and climate change are artefacts of human endaevour. Cities are the creation of the humans which provide for them better economic opportunities and better quality of life. According to United Nations latest datasets, 55 percent of the World's population lives in urban areas. However, it is unfortunate that growing interests in urbanization have undermined the efforts of good urban governance as a result of which many urban centers are having high level of greenhouse gas emissions. Human transformation of land and land use have triggered the level of global climate change which, in turn, has contributed to the emergence of a new geological period where adverse state of the Earth system is likely to provide greatest threats to planet as a whole. Thus time has come to counter this global threat with coordinated actions after understanding the implications for urban adaptation and mitigation agendas surrounding the concept of risk, vulnerability, resilience, transformation and development.

Thus, this paper intends to identify the urban indicators that are relevant for assessing the resilience to climate change impacts and offer some planning and guidance for action towards climate change adaptations in urban sector. There are needs for transformative adaptation policies for mitigation and sustainable ecological

footprints. Those policies should concentrate upon land use planning and management so as to improve conditions, infrastructure and services to informal settlements and low-income areas. Transformations should also be brought with actual emergence of new regimes in constitutional and legal framework where there would be new distributions of rights and responsibilities between states and urban city dwellers that would support risk reduction of climate change along with human development.

Keywords: *Urbanization, Urban Governance, Transformative Responses, Climate Change*

About the Author: Dr. Shelley Ghosh is currently working as an Assistant Professor of Law in the substantive post at Jogesh Chandra Chaudhuri Law College, Kolkata. She has almost 8 years of teaching experience and few publications to her credit.

India's road map for carbon dioxide emission reduction and sustainable development

Subhasri Chatterjee
Jogesh Chandra Chaudhuri Law College

India's carbon emissions accounted for 7% of the global carbon dioxide levels in 2018 which is more than any other major energy-consuming country. The International Energy Agency (IEA) report says that this data projects a 4.8% rise in emissions, compared to last year records. The rate of carbon dioxide emissions have increased due to increased consumption of biomass and fossil fuels. Rapid warming of the temperature of earth due to the meltdown of huge Himalayan glaciers and the consequent change in the monsoon pattern has made India vulnerable to climatic changes. The government of India has introduced various national level policies like Go Green, ban on plastics, odd-even rule, Swachh Bharat Mission and many more such regulations in order to regulate the degrading life on earth and protect our planet. India also ratified the Paris Agreement with the aim to make 40% of its total electricity power generation to be renewable or nuclear by the year 2030. The Constitution of India makes provision in Article 51-A (g) wherein it states the duty of every citizen to protect and improve the natural environment which includes our forests, lakes, rivers and wildlife. The Constitution framers realized that this goal cannot be achieved without love, compassion and empathy for living creatures on planet Earth, the only planet where life exists. This paper discusses the growing need to check environmental degradation before the greenhouse emissions reach a point where life on earth ceases to exist. Particular attention is given to appropriate energy pricing, cost-effective mitigation actions and the national reforms in the Nations energy sector that can contribute to the goal of sustainable development. In the concluding part, the researcher highlights the measures that need to be implemented by the policymakers to develop a road map and ensure a more effective utilization of energy.

Keywords*: India, Carbon Reduction, Temperature Rise, Global Warming, Climate Agreement, Mitigation Action, Sustainable Development*

About the Author: *Subhasri Chatterjee* has graduated from Jogesh Chandra Chaudhuri Law College affiliated under the University of Calcutta.

Climate Change and its Impact through the 'Gendered' Lens: Recognising Women's Reproductive Autonomy and Women as Agents of Change.

Sanghamitra Baladhikari
St. Xavier's University, Kolkata; Centre for Regulatory Studies, Governance and Public Policy, WBNUJS

The United Nations have been striving to assert the role of women in Sustainable Development. Research shows that the consequences of climate change exposes women, especially of countries with lower economic growth, to the hazards of climate change. Consequently, women are increasingly becoming vulnerable and they are

doubly marginalised. The impact of climate change on women coincides with a range of social, political, biological as well as economic factors. It is an unprecedented truth that the autonomy of women's reproductive rights should become a global initiative for the progress and development of the World, notwithstanding a particular country's population or carbon footprint. The social injustice of poor reproductive health policies and provisions gives birth to one of the disastrous factors of Climate Change – Population Explosion. The agendas of population control and family planning becomes vital forces of controlling greenhouse gas emissions and thereby reduces the burden on the natural habitat and its resources from being over-used and exploited by human beings. Women's inability to control their reproductive behaviour becomes a vindication for the scarcity of resources and lack of food security in and around the World. Apart from this women's role in the domestic sphere and their dependence on resources such as water subjects them to become victims of Climate Change. For example many women in the State of Rajasthan travel wearisome distances to collect water. Against the backdrop of this environmental scenario, women are increasingly identified as weapons of change. Their capacities are recognised and National and International agencies have started vindicating their reproductive autonomy and inclusion in policies of climate adaptation thereby encouraging not only 'Gender Mainstreaming' but also 'Climate Control'.

Keywords: *Reproduction, Gender, Climate Change, Natural Resources, Women*

About the Author: Sanghamitra Baladhikari is a Research Assistant, Centre for Regulatory Studies Governance and Public Policy, WBNUJS, India. Currently she is pursuing PhD in English from St. Xaviers University, Kolkata. She has done her B.A .English (Hons) and M.A. English with specialization in 'Gender and Literature' from the University of Calcutta. She has also done her B.Ed from Loreto College, University of Calcutta with specialization in 'Gender and Society' and 'Inclusive Education'.. She has an extensive research experience in Inclusive Education with special emphasis on institutions working for the education of disabled children. She has published works on collection of poetry and articles on the issues of feminism and women. She has also been an active volunteer in the Rainbow Schools of Kolkata which works for the underprivileged girl children. Her research interests are Gender studies, Women studies, Gender and literature, Inclusive education, Disability studies. She is also a member of Intercultural Poetry and Performance Library, ICCR-Kolkata. She has been awarded Certificate of Excellence in the field of Academic Pursuits, Leadership Qualities and Distinguished Contribution to the B.Ed Department. She is also awarded the class medal for Department of B.Ed (2019), Loreto College.

Climate Change and Biological Resources in India: "Protecting the Source for Ensuring the Resource" with Legal Perception

Dr. Shova Devi
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Climate change refers to the change in the weather patterns, which is attributed directly or indirectly to activity that alerts the global atmosphere. The change in temperature causes huge threat towards the life and existence of plants, animals and human beings. India is a unique country with a diverse climate regime and biodiversity. This climatic variation in the country is a reason for the existence of a wide range of biological resources in their natural habitat. The life and existence of these biological resources are dependent on the fact that how India is progressing towards protecting the 'Source of the Resource'. India's legal position in addressing climate change related threats is still a challenge and the Government is working towards it, (e.g. the Indian Government has initiated the National Action Plan on Climate

Change). However, the approach for the addressing issues related to climate change is mainly with the application of the principle of Sustainable Development. Whereas, issues of Biodiversity loss, Conservation of Resources, Access of Resources for commercial Utilisation etc., also need to be addressed and must be governed under the legal regime. In this regard, it is a pre-requisite for the country to revisit the Biological Resource Protection Law. This research work focuses on India's position in addressing the challenges of climate change in protecting its biological resources under legal perception.

***Keywords**: Biodiversity, Biological Resources, Climate Change, India.*

About the Author: Dr. Shova Devi is an Assistant Professor at Amity Law School Lucknow(ALSL), Amity University Uttar Pradesh. Before Joining ALSL, she was a faculty at Hidayatullah National Law University, Raipur. She has pursued her Doctorate from Rajiv Gandhi School of Intellectual Property Law, Indian Institute of Technology Kharagpur (West Bengal), India. She has strong orientation towards research and has presented her work at National and International platforms like World Biodiversity Congress (2016) and Tropical Ecology Congress (2015). She has been invited speaker and resource person for various national platforms. She has published research papers and also been author to Reports in the area of Biodiversity Law. Her area of research includes Intellectual Property Law, Biodiversity Law and Environment Law.

Impact of climate on survival strategies among the PVTG's in West Bengal: A micro level study

Dr. Santanu Panda
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The West Bengal National University of Juridical Sciences

In this paper, I have made an attempt to find out the survival strategies of Lodha and Birhor community (a Particularly Vulnerable Tribal Groups in West Bengal) in West Bengal. Both of them socio-economically marginalised community in West Bengal. Lodhas who were designated by the British colonialists as a "Criminal Tribe" and later this nomenclature underwent interesting evolution in the postcolonial period. This poor, marginalized community was later put under the category of "Denotified Community" and at present has been reclassified as a "Primitive Tribal Group" (PTG). The Lodhas and Birhor are inhabited hilly rugged terrain covered with jungle. Traditionally, they were forest dwellers. Birhor means jungle people. 'Bir' means Jungle and 'Hor' means Sikari. Traditionally they are nomadic. The study has been conducted Paschim Medinipur, Jhargram and Purulia districts of West Bengal. The study deals with economic activities of the PVTG have to survive themselves on the basis of changing climate. Both of them are forest dweller. Forest Produce Collection (FPC), hunting, rope making, domestic animal, day labour and poultry bird rearing are the pattern of occupation of the PVTG's. The forest Produce collection is the main traditional occupation as livelihood opportunity. They are collect various forest produce during six seasons. But due to change of climate they are depend on other source of economic activities. They are very much conscious about the geographical region and environmental situation. During summer they are depend on only non-agricultural day labourer. During spring they are depend on forest produce like new sal leaf, various creeper and agricultural day labour. During rainy season they are depend

on agricultural day labour. During autumn they were faced lean period, most of them have not got work and they did entire the forest. During winter they are only depend on forest produce collection.

The economic condition of the PVTG's have changed but not in the hopeful direction. And after seventy years of Independence of the country their socio-economic condition has improved little. The present study is an empirical evaluation of the survival strategies as marginalized community. The study revealed that how they survive themselves in deferent seasons. (369)

Keywords: PVTG, Birhor, Lodha, Denotified, Traditional

About the Author**:** Dr. Santanu Panda is currently working as Research Associate of the CRSGPP, WBNUJS. He did M.Sc and PhD in Anthropology from Vidyasagar University in Midnapore, West Bengal. He also did MSW from NSOU. He did PDF in Sociology and Social Anthropology under ICSSR, Govt. of India. He has taught Anthropology and Nutrition for five years. He has ten years research experiences in reputed academic institutions. He has published more than 40 research articles from Scopus, Springer, Rawat, Sage, International Journal of Sociology and social, anthropology, Tribal Tribune, Tribal Health Bulletin, and Journal of Indian Anthropological Society etc. He has acted as reviewer and editorial board members in various national and international Journals and presented. He was presented research paper in many conferences. He was acted a research consultant in professional organisations. Dr. Panda has received minor research project as PI from WBSCST finance corporation Department, Govt. of West Bengal. Most interested research area is PTG's development (SES, Health, Nutrition and rights)

Smart Environment for Smart Cities with Smart Technology: Is it Negotiable?

Dr. Jayanta Ghosh[1], Durjoy Kumar Deb[2]
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[2]Panchananbarma University, Cooch Behar

This research discusses the influences of the technology towards the environment of smart cities. Smart approach is undertaken for the modification of the cities to a smarter city, but the way it is growing up no one knows where it goes. The demand and supply of the city life is always influenced by technology. The tools e-governance, e-democracy and IOT system is the prime for the smart environment resource are commonly owned properties that require active inputs from the government and the people for the smart management of cities. The effective environmental management needs to achieve coordinated effective and efficient development by the smart approach of environment. Environmental welfare with socio-economic status of the should be the key aspect of the smart cities which needs to backed by the advanced technology. It analyses how both the technologies and the ideas smart cities are built on, oust trust and the rule of law as two important conditions for the city as a thriving political community. Through negotiation, we underline some necessary steps to re-subjectify citizens and to put the acceptance of vulnerability and transparency at the centre of our thinking and evaluation of the smart city. This article concludes that the current focus on participation and citizen-centric smart city projects is not sufficient to build and contribute to a genuine political community and that a re-evaluation of active citizenship in the smart city context is therefore needed.

Keywords: Climate, Environment, Technology, Government.

About the author: Dr. Ghosh is currently working as Research Fellow at Centre for Regulatory Studies, Governance and Public Policy, The West Bengal National University of Juridical Sciences.

He is an alumnus of Rajiv Gandhi School of Intellectual Property Law, Indian Institute of Technology Kharagpur, India, where he was conferred with a doctorate in law on "Right to Privacy and Data Protection in Digital India: Legislative Paradigm" as an Institute Scholar funded by Ministry of Human Resource Development. He has an extensive research experience of a decade. Dr. Ghosh specialized in law and technology, information privacy, data protection and security law issues. He has testified before numerous congressional committees and continues to works frequently on law and technology. He was awarded two most prestigious fellowships like DAAD Fellowship and Indo-Canadian Shastri Institute Fellowship. Dr. Ghosh is an academic committee member of International Trademark Association (INTA) committee. He is the founder of IP Think-Tank, to facilitate and spreading awareness of Intellectual Property Law for the society. He is a member of 'Data Security Council of India, Kolkata Chapter' and also the editor of two journals. Dr. Ghosh has also authored books, book chapters and research papers on several contemporary issues relating to Information Technology, Intellectual Property, Data Security and Public Law which has been published by journals of international and national repute. He has presented 20 plus research papers in several international and national conferences, Seminar & has conducted several seminars and workshops on contemporary issues.

Durjoy Kumar Deb is a Research Scholar at Panchananbarna University, Cooch Behar

Construction and deconstruction of smart city: Environ-legal rumination

Shyamali Mukherjee
University of Engineering and Management

Providing the basic needs of food, shelter, clothing, health, transport facilities to 1.33 billion people out of 7.8 billion World population, is a big challenge for India. The Government of India launched the Smart Cities Mission in 2015 with the objective of developing sustainable and inclusive citizen friendly cities that enhance the quality of life of its citizens. Environment in general and sustainable development in particular is conceived as a global issue, but the required policy decision and its proper implementation has to be done at local level. Even though World smart city is a buzz word but is not an alien concept to us Indians. The Harappan civilization (2750-1800 BCE) was way ahead of its time in urban development. Actually there is no strict definition of "Smart Cities" and each nation has its own necessity and requirement, but the objective is same Worldwide that is to drive economic growth and improve the quality of life of people. This paper elaborates the constitutional mechanism, legislative provisions and the policies adopted by the government regarding achieving the goal of smart city. The Indian judiciary has played a proactive role through Article 21 of Constitution, holding the hand of Public Interest Litigation. It has created innovative new procedural and substantive vehicles and strategic principles in this regard. In particular, the paper looks into some of the land mark judgments which impact Indian legal framework towards sustainable development and achieving the target of smart city. The main focus of this paper is in spite of reach heritage of sustainable development, plethora of legislations and judicial will smart city project faces drastic challenges in present era of clicktivism.

***Keywords**: Construction, deconstruction, smart city*

About the Author: Dr. *Shyamali Mukherjee is an* Associate Professor of Department of Law at University of Engineering & Management, Kolkata.

Industrial Impact on Climate Change: A special reference to Asansol Town

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Climate change is one of the biggest threats in today's world. Everyone around the world is trying to combat this problem. From shifting weather patterns that threaten food production to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without drastic action today, adapting to these impacts in the future will be more difficult and costly. Carbon emissions are major sources of environmental pollution including India, where the awareness among the people is very low. Industrial pollution is one of the root causes behind carbon emission from places, like Asansol, Durgapur *etc*.

Asansol in West Bengal is the hub of industrial region of India and more specifically eastern India. Some of the famous Public Sector Undertakings located in this region are SAIL, Coal India, Durgapur Steel Plant, etc. Besides, there are many other private industrial organisations working in this area. Despite being industries one of the key factors behind the development of the nation it certainly has some adverse effects on the climate of the region and also to the inhabitants living in those areas like respiratory problem, skin infection, health problems.

This research would like to explore the solutions to control the carbon emissions from these industries for better quality life.

Keywords: Climate Change, Sea Levels, Catastrophic Flooding, Carbon Emissions, Asansol, Industries

About the Author: Vijoy Kumar Sinha is presently working as Research Assistant of Law at Centre for Regulatory Studies, Governance and Public Policy, The West Bengal National University of Juridical Sciences.

Abhijeet Nandy is currently working as Research Assistant (Non-Law/ Social Science) in Centre for Regulatory Studies, Governance and Public Policy, The W.B. National University of Juridical Science, Kolkata.

Policies towards Smart Cities

Arin Mukherjee
Centre for Regulatory Studies, Governance and Public Policy, The West Bengal National University of Juridical Sciences

The rapid growth of population of India makes the government take up projects for the development of 'Smart Cities'. Basically the focus of such projects are to redevelop the urban areas. During the last few decades India has witnessed the switch of crowd from rural areas to the urban areas to get jobs and other facilities, as a result of which the cities have became over-crowded and consequently faced the problems like deficiency of water and hygienic condition to live. So, to deal with these problems the Government of India has taken up the project for the transformation of the urban areas into smart cities or redevelopment of the smart cities. So the main focus should be providing sufficient water and Infrastructure like electricity and internet, enhancement of transportation, administration and beautification of the cities.

Pollution is regarded as one of the major barrier towards achieving the goal for the redevelopment of the smart cities, as it is one of the most important criterion which is to be fulfilled at the very first inception, and in order to do so the united nations sustainable shall development goals will play a major role in the years to come.

Keywords: *Redevelopment, Over-population, Pollution, focus, Sustainable Development.*

About the Author: Arin Mukherjee is a 4th year student of Shyambazar Law College, Kolkata. He is a Research Intern (Law) at CRSGPP, WBNUJS as a Research Intern. He is also the member of International Advisory Board of RMR Foundation, Nepal.

Climate change: Impact Management and Law formulation

Diamond Lamichhane
University of Asia Pacific, Dhaka, Bangladesh

Climate change refers to the significant, long term changes in the global climate. The phenomenon of destruction of the global warming and climate is referred as the climate change. In the modern days due to no of increased industrialization and carbon production with emission of harmful gases made a serious impact on the climate. The global climate is the connected system of sun, earth and oceans, wind, rain and snow, forests, deserts and everything people do, too around it. The climate is more than the "average" of the climates of specific places. Climate change is significant long-term change. It includes the melting of Himalayan ranges, icebergs, and desertification that make the changes on the impact of human behavior for daily living. It is the long term process which held to deformation of human civilization.

In the expected patterns of average weather of a region over a significant period of time. Climate change is about abnormal variations to the climate, and the effects of these variations on other parts of the Earth.

The development of climate change policies should be based on characterization of interactions between invasive species and climate change, identification of areas where climate-change policies could negatively affect invasive-species management, and the policies that could be benefit from synergies between climate change and habitat species management for future generation.

Keywords: Climate Change, global warming, carbon, Himalayan Ranges

About the Author: Diamond Lamichhane is pursuing LL.M. from University of Asia Pacific. He is also Secretary General and Founder of RMR Foundation and along with that he is also a member of African Youth Parliament.

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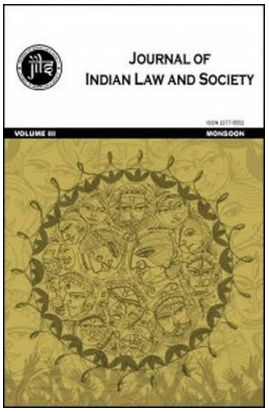

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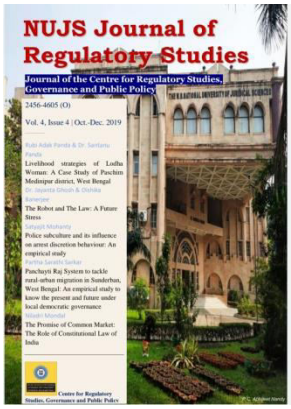

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