



SUPREME AUDIT INSTITUTION OF INDIA
लोकहितार्थं सत्यनिष्ठा
Dedicated to Truth in Public Interest

Green Files



October to December 2022 / Volume 44



Editorial



Green Files is iCED's quarterly newsletter, featuring glimpses of recent environmental news, events, emerging trends, innovations, initiatives and efforts, of different organisations including SAI India. As in every issue we attempt to highlight both the local, and the global, with a special emphasis on SAI India under the aegis of the Comptroller and Auditor General of India.

The Government of the Arab Republic of Egypt has recently hosted the 27th conference of the Parties of the UNFCCC(COP 27), with the goal of building on previous successes and paving the way for future ambition to effectively tackle the global challenge of climate change. In this context, an article on "Highlights of COP 27 with special reference to "India's Espousal of the cause of Historical Emissions and Green Finance" is included. This reflects on how India is well positioned in its leadership to the G20 and the Shanghai Cooperation Organization as chairs to the organizations in 2023.

This edition continues to look at a diverse set of environmental issues in India. These are articles on environmental awareness titled "Green initiatives – Conservation of Gandhamardan Forests in Odisha" and "Forest Fires in India". We continue some of our earlier features such as a State-Centric article. In this issue we focus on the State of Goa and a preliminary analysis of critical issues in the State, related to the environment, which can help audit planning to map plausible areas for environmental audit.

This edition also includes an article on "Pay-As-You-Throw (PAYT) as a tool in Solid Waste Management" model which highlights methods of collecting fees from the city-residents to fund the growing expenditure on solid waste management systems.

Glimpses of recent environmental news, key events, and some print media environmental news items and emerging trends are present in this volume. It is hoped these will act as a corpus of information for environment audits.

The newsletter further covers a gist of the trainings/workshops/other activities at iCED and recent happenings in SAI India and INTOSAI WGEA community during the period October-December 2022. To increase environmental awareness among readers, we have continued to feature a Cross Word and some interesting environmental terminologies.

As has been the trend in previous editions, we have also showcased selected Environment Audit Reports of both a national and international nature. "The audit report on "Implementing the United Nations' Sustainable Development Goals" (Office of Auditor General of Canada, 2021)" highlights important findings and conclusions, compiled by the SAI of Canada.

Performance Audit on preparedness and response to floods in Kerala (Report no 6 of year 2021) (CAG India, 2021) highlights key findings and recommendations pertaining to the planning and implementation of flood management measures with focus on floods in 2018.

A list of References is included in this newsletter to provide further reading material on featured themes. Recently we have uploaded some useful reference material and case studies on Environmental issues on the iCED web-site. The links to these are available in the "Research Articles from iCED Research" section.

On behalf of the entire team of "Green Files" at iCED, we strive to showcase various environmental issues and look forward to your suggestions to make Green Files as informative and user friendly as possible. Your contributions within the broad scope of the newsletter will be highly appreciated, including any feedback you may like to share on the featured articles.

Sayantani Jafa

**ADAI and Director General,
iCED, Jaipur**

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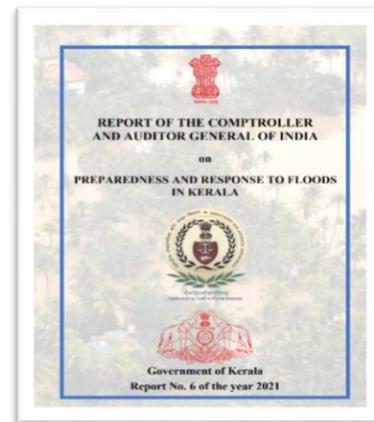
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SAI INDIA/iCED/INTOSAI WGEA NEWS*by Kailash Bajya, AAO, Rohan Sharma AAO & Pawan Meena, AAO***MoU signed between SAI India and SAI Chile**

Shri Girish Chandra Murmu, Comptroller and Auditor General of India (C&AG), and Mr Jorge Bermudez Soto, the Comptroller General of the Republic of Chile signed a Memorandum of Understanding (MoU) on 29 November 2022, to strengthen institutional and professional capacities and learn from each other's best practices at the Chilean capital of Santiago.



Bilateral meeting held between Mr. Girish Chandra Murmu, Comptroller and Auditor General of India(C&AG) and Mr. Jorge Bermúdez Soto, Comptroller General of the Republic of Chile, for signing of the MoU between both the SAIs, on 28 November 2022, at Santiago, Chile on the sidelines of the U.N. Technical Group and Panel Meeting (CAG, 2022)

Speaking on the occasion, Shri Murmu stated that it was the right time to enter into a new phase of collaborative engagement and strengthen bilateral cooperation with the Supreme Audit Institution (SAI) of Chile. He also praised Chile for declaring 4th November as the National Day of Yoga, and appreciated the popularity of yoga among the general populace in that country. Shri Murmu mentioned about SAI India's global training facility -The International Centre for Environmental Audit & Sustainable Development (iCED) and stated that iCED has been closely working with SAIs and other international organisations for capacity development initiatives in the field of environmental audit and sustainable

development. Shri Murmu also talked about SAI India's efforts to develop the National Compendium of Asset Accounts on Mineral and Energy Resources which contains the stock and flow of resources across states, alongside their sustainability prospects. The compendium examines areas of focus and possible remedies, for further improving the overall management of natural resources and realization of revenues (CAG, India, 2022).

SAI India gains the Chairmanship of SAI20- Focus on “Blue Economy” and “Responsible Artificial Intelligence”.

India took over the G 20 presidency on 01 December 2022, and with that SAI India, shall take the chairmanship of SAI20 formally from 31 January 2023. Shri Girish Chandra Murmu, Comptroller and Auditor General of India (C&AG), has proposed the collaboration of G20 SAIs on two priority areas— Blue Economy and Responsible Artificial Intelligence(AI) and highlighted that SAI India shall remain dedicated to the recognition of independence, transparency, accountability, collaboration, and continuity as the vital pillars of this engagement group. (The Financial Express, 2022)

Blue Economy is an economic system that encompasses a spectrum of policy and operational dimensions aimed at conserving marine and freshwater environments while promoting their sustainable use, producing food and energy, supporting livelihoods and act as a driver for economic advancement and welfare. The SAI India, shall strive to formulate consensual and widely applicable standards or guidelines that shall enable SAIs to evaluate and guide, within their respective mandates, the development and effective implementation of policies and programs which balance sustainability on the one hand with economic progress and welfare on the other. The SAI India seeks to develop a body of research, best-practice compilations, toolkits etc and foster possible modalities for closer collaboration between SAIs as also with other stakeholder communities.

Shri Murmu has stated that the focus on Artificial Intelligence, is in sync with the fast snowballing role that Artificial Intelligence systems are playing in the lives of citizens while also appreciating its deeply disruptive potential. As with the blue economy, the problems related to responsible AI are topical, multidimensional, and interdependent. The concerns span issues of legality, ethicality, and the philosophical choices of human versus non-human agency. Apart from concerns of privacy, Artificial Intelligence poses issues of biases and discrimination on account of the lack of comprehensibility of the algorithms to the common man, as the systems progressively auto-evolve.

INTERNATIONAL TRAININGS/WEBINARS/NATIONAL WORKSHOPS AND NATIONAL TRAINING PROGRAMMES HELD AT iCED JAIPUR

International Centre for Environment Audit & Sustainable Development (iCED), organized the 10th International Training Programme (ITP) on “Introduction to Environmental Auditing from 28 November to 10 December 2022. A total of 09 participants from European Court of Auditors, SAI Vietnam, SAI Maldives, SAI Sudan and SAI India participated in the training programme.

During the ITP, Ms Vivi Niemenmaa, SAI Finland briefed the participants about the Basics of Environment Auditing, Evolution of Environment Auditing, INTOSAI WGEA and Environment Governance and group work on environment governance. An overview of issues related to air, climate change and use of data in Audits on the example of climate change, Forming audit questions and audit cooperation in climate change issues- was presented by Mr Paul Stafford, European Court of Auditors. Mr Iwan Novarian and Mr Normas Andi Ahmad, SAI Indonesia deliberated on the global water challenges, overview of various methods used in water audits worldwide and practical application of audit methods involving complex topics. Informative and knowledge enriching sessions were presented on topic such as “The Concept of Sustainable Development and Sustainable Development Goals and Auditing Implementation of SDGs”, “Audit of



Participants along with Director General (iCED) during the ITP on “Environmental Auditing”.

renewable Energy Experience sharing”, “Selecting an audit topic in the area of biodiversity” and “Designing audits of biodiversity and Audits of biodiversity based on MEAs” by SAI India representatives, Shri J R Inamdar, PD (iCISA), Sri B. Basantia, AG (G&SSA), Shri Datta Prasad Shirsat, Director, DGCR and Shri Mehul Grover, Sr. DAG, AG Audit II, respectively. Domain experts from India Programme Climate Bonds Initiative, Reserve Bank of India, The Energy and Resources Institute, The National Biodiversity Authority of India, Paradigm Environmental Strategies (P) Ltd and Indian Institute of Water Management took sessions on varied environmental topics viz. Finance, Carbon Neutrality, Renewable Energy, Biodiversity and Waste.



Participants during the classroom training sessions and Valediction Ceremony

The participants were actively involved with local cultural visits too, and biodiversity study tours to Keoladeo National Park, Bharatpur and Jhalana Leopard Sanctuary, Jaipur. The Valediction ceremony held on marked the conclusion of the 10th International Training Programme. Ms. Sayantani Jafa, Additional Deputy Comptroller and Auditor General and Director General (iCED) congratulated the participants for successful completion of the International Training Programme and presented completion certificates to the participants.

Feedback from ITP participants.

I would like to thank iCED for the good organization of the training programme and their hospitality. It is very challenging to organize a 2 weeks International Training and iCED has set a high standard. Course was very good and trainers were very knowledgeable. I want to express my gratitude to the authorities of iCED, organisers, researchers, staff.



Mr Xavier Ignasi Farrero Gonzalez,
European Court of Auditors



Ms Ngo Thi Ngoc Tu, SAI Vietnam

I received a lot of helpful information about Environment Audit during this course. I am glad that I joined some interesting study tours of iCED and got to know about environment conservation in the local state. The campus is green and full of facilities for dining, sports and research. The hostel is clean and the room is comfortable. The whole training programme is meaningful, updated and networking among SAIs of countries. It was a Good Opportunity to share experiences between SAIs.

Topics were relevant and diverse. Lot of areas were covered in a short period of time. Most of the faculties were very knowledgeable and interactive. Both of the study tours were relevant and enjoyable. The trips and activities were a good exposure. Everything at iCED is great, from the food, staff, rooms and recreation activities available. The atmosphere of the campus is also very nice and rooms are spacious and clean. In general, the sessions were interactive and informative and the extra activities and campus facilities were very good. It was a pleasure to be here and I hope to come again.



Ms Aminath Shuaa Mohamed,
SAI Maldives



It was going well despite of the intensification of the course and the training programme was comprehensive. Thank you very much.

Ms. Misoon Elssideg Hamed Eneel,
SAI Sudan

- The National Training Programme on “Environment Audit for IA&AS Officer Trainees (2021 Batch)” was conducted by iCED, Jaipur from 10 to 15 October, 2022. The programme involved 19 IA&AS Officer Trainees of 2021 Batch. During the training programme, experts from the Indian Audit and Accounts Department and other reputed organizations covered various aspects related to “Environment Audit”. There were interactive sessions on topics such as, Climate Change - Green Finance, Conservation of Biodiversity and its Audit, Environmental Impact Assessments, Regulations and Issues related to Waste Management in India and Audit of Waste Management, Overview on Environmental, Social and Governance (ESG), Use of Geospatial Technology in Study of Environmental Issues and Energy Economy Modelling for Climate Change Mitigation by subject experts from Malaviya National Institute of Technology, Jaipur, National Bio-Diversity Authority, International Solid Waste Association, Jaipur, The Energy and Resources Institute, Jawaharlal Nehru University, New Delhi and World Resources Institute, Bengaluru.

- Two National Training Programmes on “Environment Audit” were conducted by iCED during the period 31 October to 04 November 2022(9 no of participants) and 19 December to 23 December 2022(11 no of participants). The training programmes involved 20 Participants from state audit offices. During the training programmes, subject experts from IA&AD and other reputed organizations covered various aspects related to “Environment Audit”.

There were sessions related to Geographical Information System and Remote Sensing, Environment Impact Assessment, Control of Air Emissions, Environment Risks of Mining, Biodiversity - Essence of biodiversity and Identifying topics for audit, Water and Liquid Wastes, Solid Wastes, Performance Audit on Conservation on Costal Ecosystem and Land Management. The sessions were taken by eminent subject experts including



Participants during the National Training Programme on “Environment Audit for IA&AS Officer Trainees (2021 Batch)”



Participants during the National Training Programme on “Environment Audit”

from National Remote Sensing Centre, Indian Space Research Organisation, Hyderabad, Indian Institute of Technology, Kanpur, Regional Remote Sensing Centre, Bengaluru, University of Delhi, National Biodiversity Authority of India, Dehradun and Malaviya National Institute of Technology, Jaipur.

- A one day Workshop on “Wild Life Conservation in India” was organised by the International Centre for Environment Audit and Sustainable Development (iCED), Jaipur on 09 November, 2022. A total of 17 Group Officers from the Indian Audit and Accounts Department (IA&AD) participated in the workshop.

During the workshop, Dr Ankur Awadhya, IFS discussed the Principles of Wild Life Conservation in India and highlighted the need for Wild Life Conservation. Prof K Siva Kumar covered the theme “Framework and Implementation of SDG 14: Conservation of Marine Biodiversity”, “2030: Sustainable Development Goals and Convention on Biodiversity”, National Mission of “Himalayan Ecosystem” and “Clean Ganga”.

Shri C S Jha in his presentation on “Fulfilling the Sustainable Development Goals for Natural Resources and Wild Life habitat Conservation using Earth observation” explained Indian Space Program, Sustainable Development Goals and Earth Observation (EO) Indian Initiatives, and Protected Area (PA) biodiversity Conservation. Dr Vishaish Uppal explained about Wild Life Conservation and current status of Wild Life Conservation in India during his session on “Role of State and Non State Actors in Wild Life Conservation”.



Ms Sayantani Jafa, Additional Deputy Comptroller and Auditor General and Director General, iCED, Shri Pushkar Kumar, Director, iCED and participants during the workshop on “Wild Life Conservation in India”

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INTOSAI WGEA News

INTOSAI WGEA TRAININGS ON WASTE MANAGEMENT

INTOSAI WGEA Members in coordination with the WGEA Secretariat will continue supporting peer SAIs by providing training on environmental auditing. As per Work Plan 2023-2025, SAI Estonia will deliver several massive open online courses (MOOCs) and iCED in India will provide annually both an international course on environmental auditing as well as webinars on specific topics.

The training course on Waste Management was conducted by SAI Indonesia taking into consideration the UN SDGs as a starting point from 21 November- 25 November 2022. The training course through Massive Open Online Course (MOOC) on Auditing Waste Management will be organised by SAI Estonia. A Webinar will also be organised by International Centre for Environment Audit and Sustainable Development (iCED), Jaipur (India) on “Waste Management with Special Reference (INTOSAI WGEA Sectt, 2022) to Plastic Menace”.

• **Raising Resilience: A Seminar Summary from the 21st INTOSAI WGEA Assembly**

The summary of the first day of the 21st INTOSAI WGEA has been released as a booklet by the INTOSAI WGEA. The Booklet aims to shine a light on the concept of resilience and the importance of climate resilience. The Booklet contains audit cases on climate resilience-related topics from SAIs around the world (INTOSAI WGEA Sectt., 2022). The summary can be accessed from [here](#).

• **WGEA COP27 Webinar available to Watch**

INTOSAI WGEA organized a webinar (INTOSAI WGEA Sectt., 2022) in context with the UN Conference of Parties of the Climate Change Convention. Speakers from the SAIs of Brazil, Canada, the Maldives, the EU, USA and INTOSAI Development Initiative

participated in the webinar. As per the Webinar, Climate finance has been one of the main topics under discussion during COP 27 and data barriers are the main issue also in auditing climate finance. In addition to this, the following was also discussed;

- a) A new global coordinated project, Climate Scanner by SAI Brazil and WGEA aims of providing consolidated data on governments climate governance, financing, and public policies.
- b) Adaptation has received less funding, but also less attention from auditors. This may change in 2023, when an IDI and WGEA project on climate change adaptation actions will start.
- c) A strategic partnership with INTOSAI Donor Cooperation on scaling up support for SAI's to address climate change, including peer-to-peer support for SAIs has been set up.
- d) Some other interesting areas of concern that should be addressed by auditors in tandem include energy subsidies, forests and carbon offset markets, mechanisms to redirect private finance to sustainable direction, and climate change and biodiversity as twin crises, as well as impacts of sea-level rise.
- e) Starting point of audits may include, a risk analysis approach and then choosing the most pressing topics, National goals and the institutions that are in place and asking how they manage climate risks and implement actions or concentrating on government operations or lack of it.

The webinar can be accessed from [here](#).

• **Environmental auditing e-courses open for registration**

The INTOSAI WGEA has released the registration for two Massive Open Online Courses (MOOCs) running from January to April 2023.

The courses are given below-

- Auditing Waste Management (23 January - 19 February 2023)
- Auditing the Sustainability of Infrastructure (06 March – 02 April 2023)

These courses are fully online, free of charge and self-paced. The courses have been developed under the auspices of INTOSAI WGEA by the project lead - National Audit Office of Estonia - in close collaboration with various supreme audit institutions as well as the University of Tartu. (INTOSAI WGEA Sectt, 2022)

• **COP15: 2022 Montreal Biodiversity Conference**

The COP15 of the United Nation Convention on Biological Diversity was held from 7 December to 19 December 2022 in Montreal. The main focus of this conference was for governments to commit to adopting a post-2020 global biodiversity framework (INTOSAI WGEA Sectt., 2022). The framework will provide a strategic vision and a global roadmap for the conservation, protection, restoration and sustainable management of biodiversity, and ecosystems for the next decade. The INTOSAI WGEA has also published a Bulletin, which summarises the action of WGEA and SAIs in the areas of SDG 14 on Life Below Water and SDG 15 on Life on Land. WGEA. Overall, when it comes to biodiversity SAIs have recommended the following to their governments:

- A) follow- up on compliance with legislation/policies
- B) improve planning and long-term considerations
- C) conduct better environmental impact assessments
- D) follow the principles of good governance, such as transparency
- E) improve on coordination and cooperation
- F) pay attention to funding gaps as well as prudent and effective use of public funds
- G) collect more high-quality data

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FROM THE ARCHIVES- ENVIRONMENTAL DEGRADATION DUE TO OIL SPILLAGE

by Manoj Kumar, AAO

Recent incidence of oil spill pollution involving, nearly 20,000 tonnes of Diesel in Russia's Arctic north contaminating the Lake Pyasina has gained the world news headlines. The leak is a huge threat to the fragile Arctic ecosystem as it is headed to the Arctic sea and a state of emergency has been declared in the affected region in northern Siberia. Another incident of oil spill and fire in Tinsukia region of Assam, India in recent past also raised concern over the surrounding ecological zones including the Moguari Motapung Beel wetland, Dibru Saikhowa National Park, Dibru river which is one of the 1200 "Important Bird and Biodiversity Area" in the world.

Oil spill incidents of 7 tonne and above in last few decades		
Decade	No. of oil spills	Oil in tonnes
1990s	358 oil spill incidents	1134000 tonnes of oil lost, 73% of this amount was spilt in just 10 incidents.
2000s	181 oil spill incidents	196000 tonnes of oil lost, 75% of this amount was spilt in just 10 incidents.
Since 2010	62 oil spill incidents	164000 tonnes of oil lost, 91% of this amount was spilt in just 10 incidents. One incident is responsible for about 70% of the quantity of oil spilt this decade.

The production of petroleum products has risen from 500 million tons in 1950 to 2,500 million tons in mid-1990 (Mohit, 2022). This has led to massive increase in transportation and subsequently, associated oil spill incidents. Some facts are given below (ITOPF, 2022) :This is only the trend of major oil spills by oil tankers. The whole dimension of oil spills in the human history can be imagined with the mere fact that the total of top ten spills by oil tankers equals to a mere 1.209 per cent of the largest oil spill in the Kuwaiti Oil fires in 1991.

When an oil spill incident occurs major part of its light components evaporate within a few days. If the oil is thick it may reach the shorelines and result in small oil reservoirs which may harm the environment.

Of course, any oil spill imparts a huge economic loss to the oil companies. But its implications for ecology and environment are critically severe.

Effects of Oil Spills on Environment:-

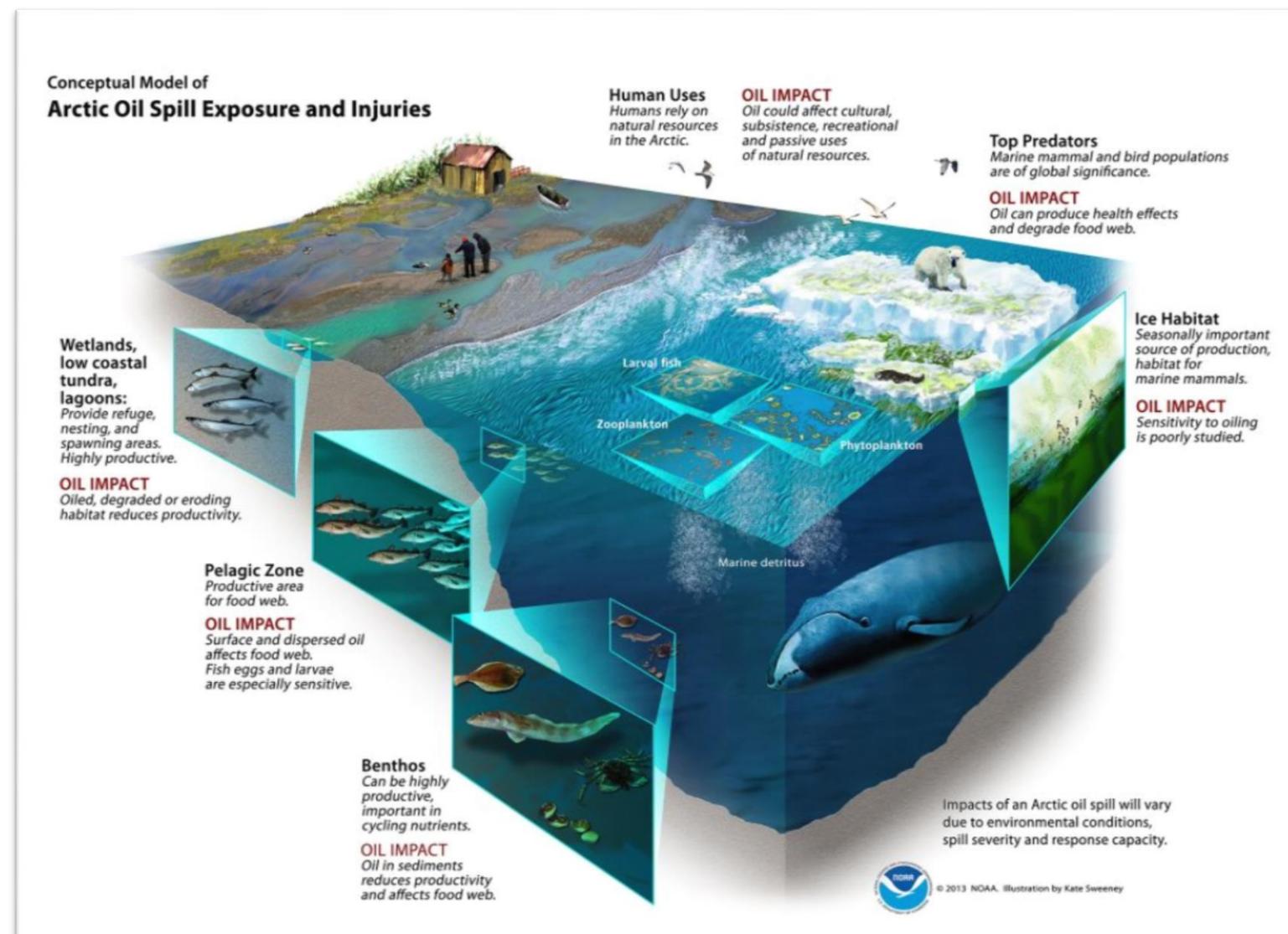
Fragile Aquatic Ecosystems (ITOPF, 2022)

Species that rely on fur for regulating their body temperatures are more susceptible to oil spills. Spilled oil reduces insulating ability of fur bearing mammals and makes them vulnerable to the harmful constituents. At many places where there are subzero temperatures, most time of the year, aquatic animals die of hypothermia. Turtles, usually mistake the spilled oil as food and inhale it which further increases the chances of infection in its mucus membrane inflammation. In cases where the oil spill reaches the nesting shores of sea turtles, the results could be total destruction of hatchlings and eggs.

Nearshore benthos is the production area for crabs, shrimps and fish. Tarmac and oil in these sediments may reduce their productivity and further effect the food chain.

Corals are highly sensitive organisms that may take long time to recover if polluted by oil spills. The aquatic communities which the corals support are also highly susceptible to oil spills. Other consequences of oil spill may result in decrease in colony viability, damage to the reproductive system of corals, decline of life expectancy of coral larvae and total lack of colonization of corals. Birds are one of the worst effected creatures of oil spills. The plumage of a bird provides both buoyancy and insulation. It also acts as a medium to trap warmth against the skin. When the birds come in contact with the oil, the oil damages the insulating and repelling capacity of bird feathers. At places where there is heavy oil spillage the plumage damage makes it difficult for the birds to take off. This restricts the birds to move freely for search of food and also save themselves from predators.

Ingestion of oil may cause dehydration, starvation, arthritis, gastrointestinal problems, infections, pneumonias, and eye irritation. Oil spilling can reduce or completely alter the invertebrate species which are a main source of many birds. This may force the birds to prey switching such switching of prey and habitat can have further conflicts with other predators indigenous to the new habitat. The prey and habitat switching can cause extra burden on the new habitat and its dependents.



When exposed to oil, adult fish may experience reduced growth, enlarged livers, and changes in heart and respiration rates, fin erosion, and reproduction impairment. Oil can make fish and shellfish unsafe for humans to eat. Oil may be taken up by the tissues or surface contamination of other sea creatures like crustaceans, clams, oysters, and mussels which are consumed by the local communities residing in that area. This may result in tainting in sea food organisms and considerable health risks

Arctic oil spill exposure and injuries. Infographics (<https://response.restoration.noaa.gov/taxonomy/term/335>)

Wetlands

The oil spill when comes in contact with the wetland plants, it delays the transport of oxygen to the root system of the plants (American petroleum institute, 2013) . This leads to increased stress under which the wetland plants perish. Loss of wetland plants loosens the sediment grip and contributes to accelerated loss of wetland areas through erosion.

Effect on Mangroves

Mangroves are highly susceptible to oil exposure. Acute effects of oil (mortality) occur within six months of exposure and usually within a much shorter time frame (a few weeks). Heavy oil spill in the root system of mangroves may alter the oxygen supply and cause the mangroves to perish. The oil spill also interferes with the plant system to maintain the salt balance and diminishes their capability to tolerate salt water making the mangroves weak.

Commonly observed mangrove responses to oil include yellowing of leaves, defoliation, and tree death. More subtle responses include germination failure, decreased canopy cover, increased rate of mutation, and increased sensitivity to other stresses.

International Conventions

There are various international conventions, set up to facilitate oil spill response and preparedness. None, however, are specifically dedicated to the oiled wildlife community. Some important international conventions related to the subject are given below (International conventions and key players, n.d.)-

OPRC (1990)	International Convention on Oil Pollution Preparedness, Response and Co-operation. It provided for establishing measures by governments of coastal states for dealing with pollution incidents, either nationally or in co-operation with other countries
OPRC-HNS Protocol (2000)	International Oil Pollution Compensation Funds (OPRC) adopted a protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS Protocol).
SOLAS (1974)	International Convention for the Safety of Life at Sea
MARPOL (1973)	International Convention for the Prevention of Pollution from Ships For preventing and minimizing pollution from ships - both accidental and routine operations.
GESAMP (1969)	Group of Experts on the Scientific Aspects of Marine Environmental Pollution Advises the United Nations system on scientific aspects of marine environmental protection

Good prevention initiatives can go a long way in reducing the risk of pollution from oil spills. However, in spite of best efforts, spills will inevitably occur. When this happens, it is necessary to ensure that effective preparedness measures are in place that will ensure a timely and coordinated response to limit the adverse consequences of pollution incidents involving oil and hazardous and noxious substances (HNS), or else, the effected ecosystems would take years to regain their original state of order.

Each country has a government agency that takes care of stringent practices, which need to be followed to avoid oil spills and to support immediate action in case of any

spill. International key players in the oil and maritime industries, intergovernmental bodies and specific centers of excellence often work together to share experiences and develop guidelines for best practice in responding to oil affected wildlife. With the technological advances from using Geographical Information System (GIS) and satellite imagery to detect the oil spills to advanced communication systems giving timely information about possible oil spill dangers we can further enhance our understanding about the adverse impacts of oil spills on the environment and how to best protect it from oil spill incidents.

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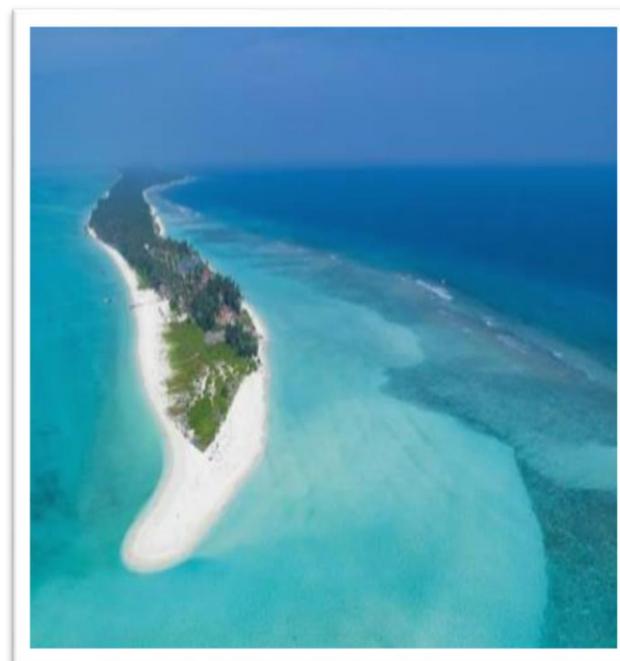
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ENVIRONMENTAL NEWS*by Rohan Sharma, AAO***Two more Indian Beaches enter the coveted list of Blue Beaches**

The Minicoy Thundi Beach and Kadmat Beach in Lakshadweep have been accorded the internationally renowned and coveted International eco-label of "Blue Flag" beaches. This is yet another acknowledgment of India's commitment to protecting and conserving the pristine coastal and marine ecosystems through holistic management of the resources.



Kadmat Beach (Ministry of Environment, 2022)



Thundi Beach (Ministry of Environment, 2022)

With this, there are now 12 beaches that have received Blue Flag accreditation. Both beaches comply with all 33 criteria as mandated by the Foundation for Environment Education (FEE). The other Indian beaches in the blue list are Shivrajpur-Gujarat, Ghoghla-Diu, Kasarkod and Padubidri-Karnataka, Kappad-Kerala, Rushikonda-Andhra Pradesh, Golden-Odisha, Radhanagar- Andaman and Nicobar, Kovalam in Tamil Nadu and Eden in Puducherry (Ministry of Environment, 2022).

Sumangalam Panch Mahabhoot Conference Series VAYU- The vital life force held in Bhubaneswar

A conference titled 'Vayu - The Vital Life Force' was organized at Siksha O Anusandhan University, Bhubaneswar, Odisha, from 02 December - 04 December 2022, to celebrate the spirit of Azadi Ka Amrit Mahotsav in the 75th year of Independence and channel dialogue on the need for clean air in the country. The aim of the Vayu conference is to build upon the multidimensional efforts taken by Governments to achieve the air quality targets as set in National Clean Air Program by uniting all the important stakeholders.



The Siksha O Anusandhan University, Bhubaneswar, Odisha, 2 December – 4 December 2022. Venue for the Sumangalam Panch Mahabhoot Conference Series VAYU- The vital life force (Dwivedi, 2022).

The 'National Clean Air City' awards were given to 9 best performing cities in meeting air quality targets and implementation of corrective, preventive, and mitigation actions, based on Swachh Vayu Sarvekshan 2022. The city of Lucknow bagged the first prize for reducing average ambient PM10 (Particulate Matter 10) concentration by 31 per cent from 2019-20 to 2021-22 and scoring higher on actions taken for abating the burning of biomass and solid waste (Ministry of Environment, Forest and Climate Change, 2022).

India needs a dedicated wing to release Green GDP estimates, says Reserve Bank of India

The Green GDP (Gross Domestic Product) or GGDP is an index of economic growth with the environmental consequences of that growth factored into a country's conventional GDP. Green GDP monetizes the loss of biodiversity and accounts for costs caused by climate change (DBpedia, 2023).



Green GDP (mathur, 2015)

The Reserve Bank of India stated that in India, the lack of data related to environmental indicators is posing a major challenge for engaging in research work in the area and that while India has a dedicated Open Government Data (OGD) platform for data dissemination, it needs to be revamped to smoothen its use. A dedicated house group in the Ministry of Environment, Forest and Climate Change may be formed for providing a time-series database required for the estimation of green gross domestic

product (Green GDP or GGDP) and release estimates of Green GDP for India periodically on a regular basis. There is a need for a user-friendly data dissemination platform along the lines of The Organization for Economic Cooperation and Development (OECD) and Eurostat, as well as better coordination of power flow between state-owned power distribution companies and the rollout of nationwide charging infrastructure for Electric Vehicles (EVs). There is an increasing need for the financial system to move towards green financing, keeping in mind the social and development objectives of India (Business Standard, 2022).

India's renewable energy sector powering Aatmanirbhar Bharat: Report

As per the report "Pathways for global partnership in green energy – Powering Aatmanirbhar Bharat & the world" in the first half of 2022, renewable energy sources accounted for roughly 90.4 per cent of new power capacity additions, with solar energy accounting for a staggering 77.9 per cent of the total. According to the report, ten states account for 90 per cent of the Renewable Energy installations in the nation.

In three of the top 10 states—Rajasthan, Karnataka, and Telangana—solar energy has been the main source. Gujarat, Tamil Nadu, Maharashtra, and Andhra Pradesh are the four states where wind power predominates.

The Ministry of New & Renewable Energy (MNRE) has introduced the Renewable Energy Research and Technology Development Programme (RE-RTD) to promote indigenous technology development for the widespread deployment of new and renewable energy efficiently and cost-effectively.

The report highlighted that the states such as Rajasthan and Jharkhand have developed dedicated solar PV (Photovoltaic) and wind energy policies that incentivize the installation and manufacturing of those technologies in the respective states. (Luthra, 2022)



Renewable energy sources accounted for about 90.4 per cent of new power capacity additions in the first half of 2022. (Getty Images/iStockphoto) (Luthra, 2022)

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ENVIRONMENTAL AWARENESS DAY (OCT – DECEMBER 2022)



International Sloth Day
October 20



Climate Action Day
October 24



International Jaguar Day
November 29



World Wildlife Conservation Day
December 04



World Soil Day
December 05

HIGHLIGHTS OF COP27 WITH A SPECIAL REFERENCE TO INDIA'S ESPOUSAL OF THE CAUSE OF HISTORICAL EMISSIONS AND GREEN FINANCE.*By Neha Jhakar, AAO***27th Conference of the Parties of the UNFCCC (COP27) held at Sharm el-Sheikh, Egypt (6 November to 18 November 2022)**

The 2022 United Nations Climate Change Framework Convention (UNFCCC) Conference of Parties (COP), commonly referred to as COP27, concluded recently in Sharm el-Sheikh (Egypt) under the theme “Together for Implementation” and with a view to renewing and extending the agreements reached in the historic Paris Agreement. An estimated 35,000 delegates from more than 190 countries participated in the Conference. (United Nations, 2022)

Key Outcomes of COP 27 (United Nations , 2022):

- a) The United Nations Climate Change Conference COP27 concluded with a breakthrough agreement to provide “loss and damage” funding for vulnerable countries hit hard by climate disasters. This was an historic decision because for the first time, countries recognized the need for finance to respond to loss and damage associated with the catastrophic effects of climate change, and agreed to the establishing of a fund and the necessary funding arrangements.
- b) It was also agreed upon by the governments to establish a “transitional committee” to make recommendations on how to operationalize both the new funding arrangements and the fund at COP28 next year.
- c) COP27 resulted in countries delivering a package of decisions which reaffirmed their commitment to limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels.

- d) COP27 saw significant progress on adaptation. New pledges, totalling more than USD 230 million, were made to the Adaptation Fund at COP27. These pledges will help many more vulnerable communities adapt to climate change through concrete adaptation solutions.
- e) Sharm el-Sheikh Adaptation Agenda was also announced at COP27 to enhance resilience for people living in the most climate vulnerable communities by 2030.
- f) At COP27, there was great concern expressed that developed nation parties target of mobilizing \$100 billion annually by 2020 had not yet been attained.
- g) At COP27, there was discussion of establishing "a new collective quantifiable target on climate finance" for 2024 while taking the interests and priorities of developing nations into consideration.

India's participation and stand:

At the conference of parties the UNFCCC, the outcomes are in the form of decisions agreed to by consensus of all the parties following extensive negotiations. Based on the decisions, India undertakes below listed actions as appropriate in fulfilment of its responsibilities:-

- I. In keeping with this, India has submitted its updated NDC's (nationally determined contribution) on 26 August 2022 and its long-term low carbon development strategy on 14 November 2022. These documents lay out India's vision and approaches towards reaching net-zero by 2070, which are expected to evolve as necessary over time. (MOEFCC, 2022)
- II. India also seeks to foster strong international cooperation through action and solutions-oriented coalitions like International Solar Alliance and Coalition of Disaster Resilience Infrastructure, both of which were launched and nurtured by India. (MOEFCC, 2022)

III. The one-word Mantra - Lifestyle for Environment - that Prime Minister Modi outlined in our National Statement at COP26 is at the heart of India's vision of a safe planet. (MOEFCC, 2022)

IV. Taking a step further, at COP27, India submitted its Long-Term Low Emission Development Strategy (LT LEDS) to UNFCCC (MOEFCC, 2022). The focus will be on increased usage of natural resources. The National Hydrogen Mission launched in 2021 aims to make India a green hydrogen hub. Along with the overall development of the power sector, other milestones envisaged include the quick expansion of green hydrogen generation, a rise in the nation's electrolyser manufacturing capacity, and a threefold increase of nuclear capacity by 2032. (MOEFCC, 2022)

Greenhouse gas Emissions

According to "Global Carbon Budget Report 2022", at the fourth spot, India accounted for 7 per cent of the global CO₂ emissions. (Outlook, 2022). However, at 2.4 tCO₂e (**tonne carbon dioxide equivalent**), India's per capita greenhouse gas emissions are far below the world average of 6.3 tCO₂e, according to a report released by the United Nations Environment Programme (UNEP) last month.

Per capita emissions in the US (14 tCO₂e) are far above the global average, followed by Russia (13 tCO₂e), China (9.7 tCO₂e), Brazil and Indonesia (around 7.5 tCO₂e each), and the European Union (7.2 tCO₂e). (Outlook, 2022)

Green Bonds

The 2022-23 Union Budget also announced sovereign green bonds under the government's overall market borrowings in 2022-23, which will be used to raise funds for climate-friendly infrastructure. (MOEFCC, 2022).

Climate Finance

India needs \$100 billion in additional climate finance every year for the next ten years to create a positive impact and combat climate change by 2030. Recently, India and the US have agreed to come up with a new climate finance assistance deal for developing countries. However, COP27 needs to provide India and other developing nations with the financial arsenal to fight global warming. (The Times of India, 2022). At COP27, India pushed for climate finance (including implementing the annual funding from the floor of US\$100 billion). (ORF, 2022)

Union Environment Minister Bhupender Yadav said at the UN Climate Conference (COP27) in Egypt, "While climate finance is still a mirage, climate adaptation in the form of early warning dissemination is key to safeguarding lives and livelihoods from cascading natural hazards causing substantial losses around the world" (Economic times, 2022)

COP27 is an important milestone for achieving concrete progress and moving the needle on the climate agenda. India did well in preserving its equities at COP27 and in supporting the developing countries constituencies. It is well positioned to use its upcoming G20 and the Shanghai Cooperation Organization chairmanships to set a good example in addressing climate change. (The Indian Express, 2022)

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STATE IN FOCUS- GOA

by Maneesh Mangal, AAO

Introduction: - Goa is the smallest state of India ensconced on the slopes of the Western Ghats which is bounded on the North by Sindhudurg District of Maharashtra, on the East by Belgaum and on the South by Karwar Districts of Karnataka. Goa's 103 km coastline is blessed with the most enchanting beaches lapped by the Arabian Sea (Commissionerate of NRI affairs, 2022). It covers an area of 3702 square kilometres and has a maximum elevation of 1022 metres above sea level. Climate of Goa is tropical and maximum rainfall



Figure 1 State of Goa (Maps of India, 2022)

Million (data, population census, 2022). The Official language is Konkani in Devnagiri script. However, use of English, Hindi and Marathi is also allowed. Goa became the 25th State of the Indian Union when it was conferred Statehood on 30 May 1987. (Goa, Government of, 2022)

Water Resources

Goa has nine separate rivers, four of which are inter-state. Terekhol, Chapora, baga, Mandovi, Zuari, Sal, Saleri, Talpona, and galgibag are listed in order of geographical location from north to south

of the state. The majority of Goa's cities are built on river banks. Goa was the first state in the Union of India to regulate ground water, enacting the "Goa ground water regulation Act 2002" to govern ground water usage. The combined command area irrigated by reservoirs and lift irrigation schemes is approximately 31,000 Ha. Only three towns in Goa, Panjim, Margaon, and Vasco, have a sewerage network that serves 16 per cent of the population. (Goa, Govt of, 2021)

Mineral Resources

Goa has a small geographical area, therefore only few minerals are found in the state. Goa is well-known for its iron and manganese ores. Other than Iron and manganese ores, Bauxite and laterite are the other minerals produced in the State. Iron and manganese ore belts extend from south-east to north-west of the State. Manganese ores are associated with iron ores and occur as pockets of various sizes in the form of concretionary pebbles in shales. Important iron ore and manganese ore deposits are located at Bicholim, Sanguem and Satari talukas. Bauxite is found in both the North and South Goa districts; kaolin is said to be found in the South Goa district; and quartz/silica sand deposits are found in both the North and South Goa districts. (Mines, Indian Bureau of, 2019)

Air Pollution

GSPCB (Goa State Pollution Control Board) monitors air under Central Pollution Control Board (CPCB) sponsored projects such as National Air Monitoring Programme . NAMP project 18 ambient air quality monitoring locations in Goa. According to GSPCB report for 2020-21, the state is dealing with pollution on all fronts. While dust pollution from transportation has increased in mining areas, faecal coliform was found in rivers, lakes, and beaches. According to the Board, pollution levels exceeded the 'red line' not only in the State's mining belt, but also in Panaji, the State capital and rural areas in Kundai.

The Report also says that PM10 is within permissible limits at all locations except

Panaji, Bicholim, Honda, Usgao, Kodli, Tilamul, Cuncolim and Kundaim. PM 2.5 is within permissible limits at all locations. (Times of India, 2021).

Water Pollution

GSPCB monitors water quality under National Water Monitoring Programme (NWMP). NWMP covers 63 locations in Goa. Low PH was also observed at Kundaim, Corlim, Verna, Bethora and Madkai industrial estates borewell water samples. Faecal Coliform exceeding permissible limits was also reported at many locations including Mandovi, Zuari, Tiracol, Sal, Mapusa, Chapora and Tiracol rivers. It may be attributed to the release of untreated or partially treated effluents along the water course. (Times of India, 2021).

Biodiversity

As per the State of Forest Report (Goa, Forest Department of, 2023) published by the Forest Survey of India, the forest cover of the State is 2219 Square Km, which is 59.94 per cent of the State’s geographical area. The estimated tree cover in the state is 334 Square Km, which is 9.02 per cent of the Geographical area. Figure at the right shows the Green Cover of Goa

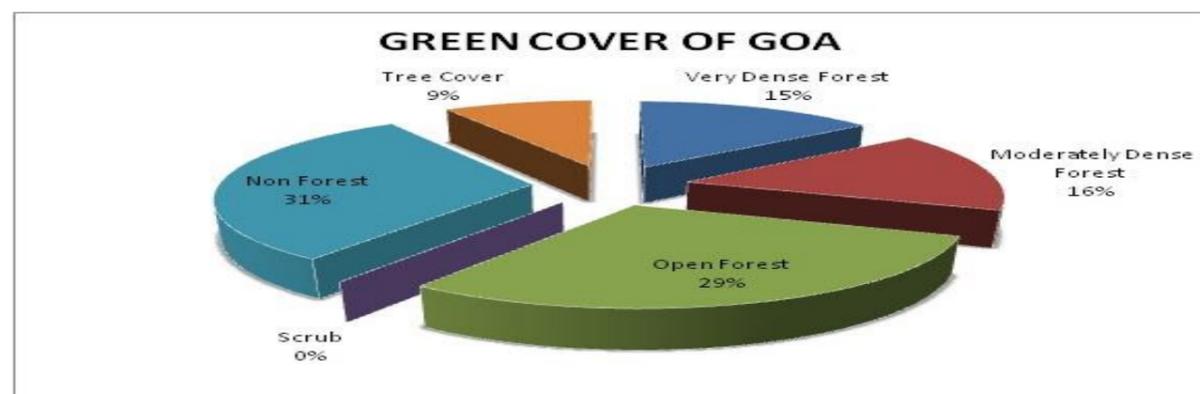


Figure 2 Green Cover of Goa (Goa, Forest Department of, 2023)

The Forest Survey of India has mapped the forest types in using satellite data with reference to Champion and Seth Classification. As per this assessment in the State of Forest Report(SFR) 2011, the state has five forest types which belong to five forest type groups. The forest types are listed in the table 1 at the right.

Sl.No	Forest Type	Percentage Area
1	Tropical Wet Evergreen	24.97
2	Tropical Semi Evergreen	19.33
3	Tropical Moist Deciduous	25.39
4	Littoral and Swamp	0.45
5	Tropical Dry Deciduous	0.01

Table 1

Mangroves are found along the tropical and sub-tropical tidal regions of the world between 24 degrees north and 38 degrees south latitudes. Mangrove are salt tolerant plant which exhibit a number of morphological and physiological adaptations in order to survive in such harsh conditions characterized by lack of oxygen, high salinity and frequent tidal inundation. As per the **SFR 2013**, the area of the mangrove vegetation was 22 Sq.Km in Goa. (Goa, Forest Department of, 2023)

Climate Change

According to Goa's State Action Plan on Climate Change (Board, Goa State Biodiversity, 2019-20) the State's mean annual temperature has risen by more than 1°C since the beginning of the twentieth century (1901-2018), with the majority of the increase occurring between 1990 and 2018. The mean annual rainfall has also increased by 68 per cent between 1901 and 2015. With increased rainfall, the State's inter-annual rainfall variability has increased, particularly since the 1970s. The State's very heavy and exceptionally heavy rainfall events (IMD category III) have increased by more than 100 per cent. According to the State's flood vulnerability analysis, 14.73 per cent of the land is under 15 metres of elevation, much of it in coastal zones, and is severely vulnerable to flooding from both extreme rainfall events and sea-level rise.

Effect of Tourism activity on beaches

Goa beaches are congested and have reached their carrying capacity. The massive influx of tourists places enormous pressure on the beaches resulting in both major and minor physical changes in the immediate ecosystem. Some of the physical changes include coastal landscape changes, the building of Starred Hotels, Shacks and Huts on beaches, erection and upkeep of jetties, dredging, sand mining, sand dune dressing, destruction of mangroves and saltpans etc. It has been noticed that many of the beach shacks use water from bore wells, which are prohibited under the Coastal Regulation Zone Act. Such efforts may result in the intrusion of saline water into freshwater. (Research Gate, 2020)

Illegal and Non-compliance in Mining Sector

Goa has 38 Mining Leases operating till 2017 (Goa State Biodiversity Board, 2020) which have reported production of Iron ore to the tune of 6.08 million tons. Illegal mining has left an impact on several sectors in the State like water, biodiversity, and environment.

Coastal Vulnerability-

As per UNDP, Goa stands to lose a large percentage of its land area, including many of its famous beaches and tourist infrastructure, which are very significant to states' socio-economic status. It is estimated that one-metre rise in sea level, it is estimated, will affect 7 per cent of Goa's population and cause damage to the tune of Rs 8,100 crore. (Board, Goa State Biodiversity, 2019-20).

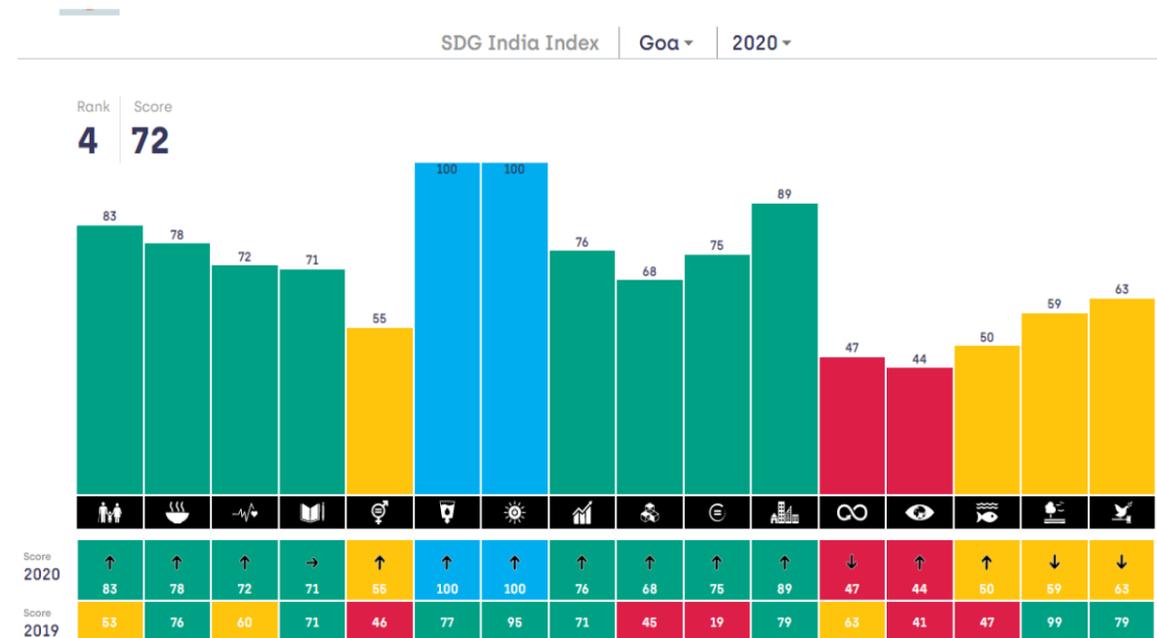


Figure 3 SDG India Index Goa (Niti Aayog, 2020)

Performance under the SDGs (Niti Aayog, 2020) -

As per SDG India Index 2020 Goa has fourth rank with a composite score of 72, shown in the figure at the right (an improvement from a score of 6 in the year 2019) among the Indian states with highest score in SDG 6 (Clean water and sanitation) and SDG 7 (Affordable and Clean Energy) and rank 21 in SDG 13 on Climate Action, (Niti Aayog, 2020).

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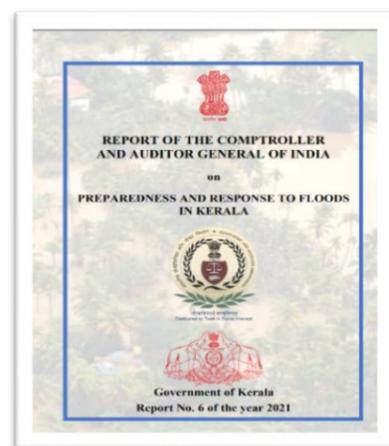
PERFORMANCE AUDIT ON PREPAREDNESS AND RESPONSE TO FLOODS IN KERALA (CAG audit report no 6 of year 2021) (CAG India, 2021)*By Gaurav Jain Sr.AO*

Background: - The National Centre for Earth Science Studies (NCESS) estimates that 14.52 percent of the total area of Kerala is prone to floods. Floods are the most common of natural hazards that affect people, infrastructure and natural environment in Kerala. Incidence of floods in the State is becoming more frequent and severe. While high intensity rainfall causes flooding during monsoons in the State, increase in flood plain occupancy and reclamation of water bodies and wetlands over the years have contributed to increasing flood damages. Hence, flood management needs to be accorded high priority in the disaster management profile of the State. The mitigation of damages caused by floods is dependent upon a combination of pre-flood preparedness, operational flood management and post flood review.

Audit Objective: -

The Performance Audit was conducted with a view to assess whether

- Planning for flood management was comprehensive and effective;
- Implementation of measures for management and control of floods was effective.
- Preparedness and response to the floods in 2018 was adequate and timely.

**Audit Scope:**

A Performance Audit on 'Preparedness and response to floods in Kerala' covering the period 2014-19 was conducted to assess whether planning and implementation of flood management measures were effective with focus on the floods in 2018.

Audit methodology included scrutiny of records in selected offices, joint field visits with department officers to dam sites, river basins, flood prone areas, flood management structures etc. Audit also conducted a survey of 800 persons affected by flood in the test-checked districts.

Audit Criteria: -

Audit observations were benchmarked against the criteria derived from the following documents:

- The Disaster Management Act 2005
- NDMA Guidelines on Management of Floods 2008
- Kerala State Disaster Management Rules 2007
- State Disaster Management Policy 2010
- National Disaster Management Plan 2016

Major audit findings:

- The Kerala State Water Policy 2008 was not updated in accordance with the National Water Policy and lacked provision for flood control and flood management in the State.
- Provisions in the Kerala State Water Policy 2008 requiring the preparation of a State Level Master Plan for water resources development, formulation of Master Plans for the major rivers of the State and constitution of a State Level Authority for coordinating all water related activities at the river basin level were not complied with.
- Flood plains of the State are yet to be demarcated and flood plain zoning legislation remains to be enacted.
- No large-scale flood hazard map is available in the State; State's Disaster Management Plan includes flood susceptibility map not conforming to Central Water Commission (CWC) criteria for flood prone area. According to GoK, responsibility to provide the large-scale map is that of the Ministry of Water Resources, CWC, etc.
- The Civil Defence Training Institute building at Thrissur, which was to cater to the dedicated purpose of a full-time residential training institute for civil defence, has not served the intended purpose even after the passage of five years.

Flood forecasting and reservoir operation

- Only six rain gauges against the requirement of 32 gauges (as per existing BIS norms) are available for rainfall estimation in Periyar basin by IMD.
- A project for obtaining real time data on rainfall, streamflow etc. failed to deliver reliable data on real time basis even after a lapse of five years.
- The system cannot be relied upon to predict and give early warning of major hydro-meteorological hazards since its effective functioning is dependent on the receipt of externally sourced real time data which is yet to be made available.
- Communication infrastructure was non-functional in some areas including dam sites and Government offices during or subsequent to the 2018 floods.

Impact of change in Land Use and Land Cover

- The Land Use Land Cover analysis for the entire Periyar basin including the test-checked districts of Idukki and Ernakulam revealed an increase in the built-up area by nearly 450 per cent during 1985-2015 and decrease in water bodies by nearly 17 per cent. During 2005-2015, the built-up area increased by nearly 139 per cent. Had the same rainfall and spills of 2018 occurred with 1985 land use conditions, the flood depth at Neeleswaram gauge station would have reduced from 12.32 m to 10.03 m and the flood inundated area would have reduced from 520.04 sq. km to 414.76 sq. km.
- Continuing presence of encroachments on Cheruthoni river bed obstructed the free flow of the river resulting in damages during the 2018 floods.
- Lower than targeted dredging to deepen and widen the leading channel of Thottapally spillway coupled with the presence of over 500 trees planted inside the spillway mouth resulted in reduction of spillway capacity, contributing to the flood situation in Alappuzha in August 2018.
- **Financial management and survey**
- Though 7124 works of immediate repair and restoration of damages in 2018 flood were approved for execution under State Disaster Response Fund,

18 per cent of the works were yet to be completed.

Conclusion:-

- Floods are the most common of natural hazards that affect the people, infrastructure and natural environment in Kerala, and incidence of floods in the State is becoming more frequent and severe. Audit observed that in the context of management of floods, better planning, implementation and integration of efforts of different authorities/ bodies are among the measures urgently required to enable the State to be better prepared to face any eventuality of extreme rainfall and severe flooding in the future.
- The State needs to explore options for having in place a reliable large-scale flood hazard map. Infrastructure needs to be strengthened and shortages of equipment met for effective functioning of Fire and Rescue personnel. Flood forecasting stations need to be set up on priority and real time data be made available at the earliest for optimal results.
- Continuous monitoring and timely action is essential for eviction of encroachers obstructing free flow of the river waters and to ensure removal of operational bottlenecks hindering smooth spillway operations.

Recommendations:-

- Government of Kerala may consider revision of the State Water Policy to include aspects relating to flood management, in line with the National Water Policy and after considering the specific requirements of the State.
- Government may ensure adequacy of the number of rain gauges capable of generating real time data in order to ensure accuracy of rainfall estimation.
- The Government needs to prioritise speedy resolution of the issues relating to removal of unauthorised constructions from the construction free zone in Cheruthoni.

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ENVIRONMENTAL SNIPPETS*By Jayant Sharma, Consultant***Study finds leopards making home close to human habitats in Delhi urban forest***(The Hindustan Times, 2022) (01 October 2022)*

There are eight leopards at Delhi's Asola Bhatti Wildlife Sanctuary (ABWS), five of which are probably using the sanctuary as their permanent home according to a yearlong study of sanctuary's mammals. During the study, more than 14,000 different mammals were captured using camera traps of which eight were identified as unique leopards. Five of them (four males and one female) appeared in the same week multiple times. This indicates that they have made this urban forest their permanent home.

The World must unite to address climate change crisis: PM*(The Times Of India, 2022) (21 October 2022)*

Prime Minister Shri Narendra Modi and UN Secretary-General Antonio Guterres on Thursday, 15 October 2022 launched "Mission LiFE" (Lifestyle for Environment), a global initiative by India to combat climate change and make it a people's movement across the world.

Mission LiFE aims to change people's collective approach towards sustainability. The PM also said that the initiative envisions to make every individual and community a trustee of the environment who does not allow blind exploitation of resources. Mission life will strengthen the concept of 3P –pro planet people.

India to see the highest growth globally in energy demand through 2030: IEA*(The Times Of India, 2022) (28 October 2022)*

According to the World Energy Outlook 2022 report released by the International Energy Agency (IEA), in the stated policy scenario (STEPS) the growth in India's energy demand will rise by more than 3 per cent annually from 2021 to 2030 driven by urbanisation and industrialisation as it becomes the world's most populous country by 2025.

At COP-27 India and three others oppose the carbon border tax.*(The Hindu, 2022) (17 November 2022)*

A consortium of countries including India jointly opposed carbon border tax as it could result in market distortion and aggravated trust deficit among parties. A policy called Carbon Border Adjustment Mechanism has been proposed by the European Union for tax products such as cement and steel which are extremely carbon intensive.

'BASIC', a group consisting of Brazil, India, South Africa and China, large economies that are dependent on coal, has for several years voiced common concerns and reiterated their rights to use fossil fuels during their transition to clean energy. Their statement expressed "concern" that developed countries were not showing leadership or responding with a matching progression of efforts.

India bats for 'realistic and practical' deal, a new fund for biodiversity conservation.*(The Times of India, 2022) (19 December 2022)*

India has emphasized on the need to have ambitious global deal to protect nature. At the same time India has also stressed on the need to have an "equally ambitious" new and dedicated resource mobilisation for the successful implementation of the global deal. The mechanism, if successfully created will provide financial resources to developing countries for implementing various targets under the deal.

Pollution watchdog devising plan to curb Balotra effluents

(Times of India , 2022) (**20 December 2022**)

Bithuja village of Balotra in Barmer district has attracted the attention of Rajasthan State Control Pollution Board (RSPCB). 214 textile units in Bithuja are releasing huge amounts of caustic which are polluting the Luni river, the largest river in the desert area. According to the RSPCB, 30 million litres per day (MLD) are being discharged from the textile units, out of which 3 MLD is caustic-rich discharged.

Rajasthan State Pollution Control Board (RSPCB) has pointed out that it is devising a formula by which such units will be saved from being closed and pollution will be checked at the same time. RSPCB is finding a solution in the form of setting up a caustic recovery plant in Bithuja. The officials of RSPCB are targeting to encourage textile unit owners for recycling 30 MLD discharged water for reducing the demand for water by such units.

India had localised climate disasters nearly every day in '22: CSE

(The Hindustan Times, 2022) (**04 November 2022**)

Based on an analysis of data from the India Meteorological Department (IMD) Centre for Science and Environment (CSE) said on Tuesday (November 01, 2022) that India recorded a localised climate disaster nearly every day in the first nine months of 2022. As per the analysis, the country experienced extreme weather events on 241 of 273 days till 01 October 2022 which claimed 2755 lives, affected 1.8 million hectares of crop area, destroyed 4, 16,667 houses and killed 69, 007 livestock.

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GREEN INITIATIVES-CONSERVATION OF GANDHAMARDAN FORESTS IN ODISHA

by Vikas Dhir, AAO

Introduction

Gandhamardan hills are located between Balangir and Bargarh districts in the state of Odisha. Gandhamardan hills are part of the Eastern Ghats along the east coast and Western Central Table Land. The hills are covered with tropical moist deciduous forests which are considered sacred by the local people. The Botanical Survey of India has reported an occurrence of 220 plant species of medicinal value along with 2,700 angiosperms (MOEFCC, GWP, UNDP, 2019). The hills are inhabited by a variety of fauna such as wild bear, spotted tiger, jungle fowls, capped langur, barking and spotted deer etc, along with species listed under the IUCN Red List of Threatened Species such as pangolin, fan-throated lizard, Günther's writhing snake, Jerdon's bullfrog, Eluru dot frog, ant frog, Asian common toad, Orissa frog etc. Additionally, the hills harbor 42 perennial water streams that sustain thousands of acres of land down the hill.

Need for Conservation (MOEFCC, GWP,UNDP, 2019)

In addition to this, the bauxite reserves in the Gandhamardan hills are substantial. In the past, a number of aluminium firms have shown interest in building infrastructure in the region for mining. The ecosystem was threatened due to hunting and poaching activities, unsustainable extraction of Non-Timber Forest Products (NTFPs), illegal trade of forest produce, cultivation of genetically modified seeds in parts of forest areas and poorly managed forest fires. Moreover, the introduction of genetically modified seeds such as cotton, and the use of chemical fertilizers and pesticides, in the upland of forest areas, contributed to the degradation and contamination of the land and water resources

Conservation Initiatives by the Gandhamardhan Surakshya Action Committee (GSAC) (Bytes, Odisha, 2022)

The Gandhamardan hills were the platform for one of India's most vocal people's

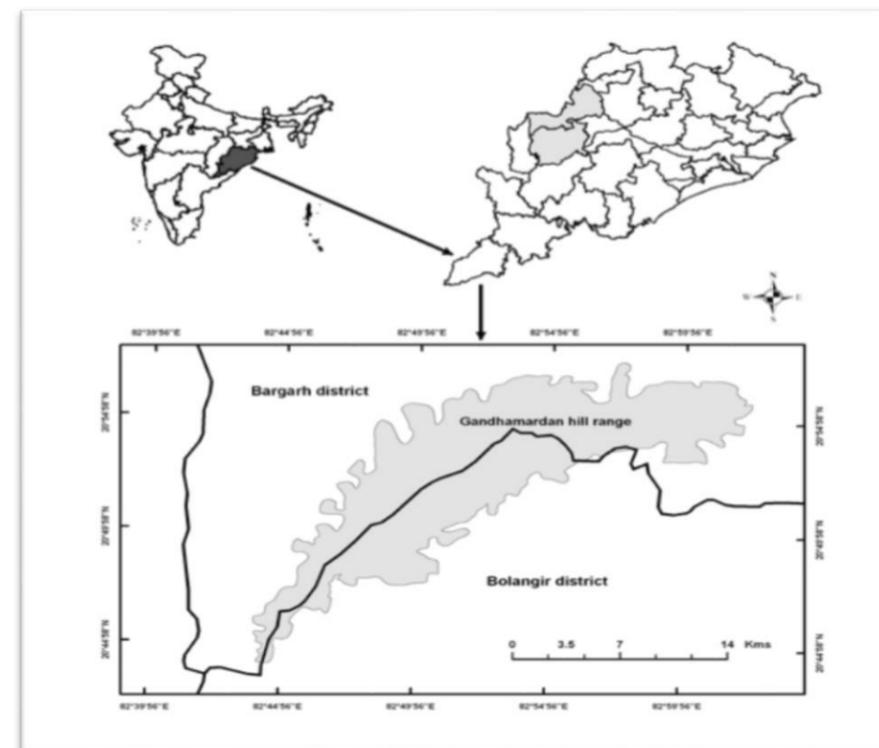


Figure 4 Map of Gandhamardan Hill Range (Research Gate, 2009)



Figure 5 Gandhamardan Forests in Odisha (NetZone, 2016)

struggles to preserve forests and livelihoods fifteen years ago. Bharat Aluminium Company Limited (BALCO) operation to mine 213 million tonnes of bauxite was closed down after a five-year sustained campaign led by the local people.

Riding on the tradition the Gandhamardhan Surakshya Action Committee (GSAC) has been working effortlessly to conserve the flora and fauna of the hills. The major conservation initiatives of the committee are given below:

Conservation Initiatives (MOEFCC, GWP, UNDP, 2019)

a) The GSAC, which is also directly and indirectly, responsible for the protection of 4500 hectares of environmentally vulnerable land, has increased community awareness in over 200 adjacent settlements. It has led to a reduction in wood theft, unsustainable harvesting, trading of NTFPs, and wildlife hunting.

The committee has also initiated celebrating traditional festivals and customs for the conservation of forests and thus has established a harmonious relationship between people and forests. It has resulted in the conservation of a 45 sq. km area.

b) The GSAC has demarcated 239 eco-sensitive zones for conservation.

c) Ecosystem registers have been initiated by selecting villages with 148 Rare, Endangered and Threatened (RET) species. Out of these, 37 are at a critical stage of vulnerability.

d) GSAC has initiated the plantation of over 3,500 saplings of RET species in 32 zones.

The areas are covered with bamboo fencing.

e) In order to prevent illicit tree felling and unauthorised extraction of NTFPs, a biodiversity protection committee has been formed in each village.

f) In order to patrol the forests and to keep a check on poaching activities, especially in eco-sensible zones, a wildlife protection committee has been formed in each village.

g) GSAC has revived the traditional farming system in the region.

h) In order to enhance livelihood opportunities, the committee in consultation with other institutions (Forest Department, TRIFED, NABARD, and IDE India), facilitated sustainable harvesting of forest produce, value addition, and sale of such products through establishing suitable market linkages.

Impact:

Sensitization has resulted in decreased poaching and tree felling incidents and has assisted in preventing forest fires. Mining activities in the region have come to an end. With the revival of traditional farming practices, the productivity of land has improved. There has been considerable increase in the occurrence of flora and fauna and RET (Rare, Endangered and Threatened) species within the eco-sensitive zones.

Awareness and knowledge about the importance of forests go a long way in preventing the forest areas and the coordination between local communities and organisations such as GSAC goes a long way in preserving the forest areas

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PAY-AS –YOU-THROW (PAYT) MODEL AS A TOOL IN SOLID WASTE MANAGEMENT

Introduction

Pay-As-You-Throw (PAYT) model is a method of collecting fees from the city-residents to fund the growing expenditure on solid waste management systems. United States' Environmental Protection Agency (EPA) defines PAYT as 'unit-pricing or variable-rate pricing where residents are charged for the collection of municipal solid waste- ordinary household trash- based on the amount they throw away' (US EPA).

Background

These 'fees' are separate from 'taxes' as they are meant to serve a specific purpose and is not as generalized as 'taxes', which apply to a larger section of population. Effective management of solid waste requires encouragement of sorting, recycling, and composting behavior among the city-residents. Deciding on an appropriate user-fee structure to incentivize these behaviors and disincentivizing generation of garbage is one of the important mechanisms towards sustainable management of solid waste. Policy directions, as observed in different cities, are reflected in their PAYT models. While cities in the USA have a long history of collection of user fees, the time when initiation of such fees was done as early as in the first half of the 20th century, citizens made efforts to avoid payment of such fees and resorted to open dumping and burning of waste, causing public nuisance (San Diego City Government, 2013).

In India, SWM Rules, 2016 empowered the local authorities to levy 'user fee' for management of solid waste from all kinds of waste generators, which invigorated efforts undertaken by different cities in piecemeal manner throughout India (Ministry of Environment, Forest, and Climate Change, 2016). This fee was long been subsumed under different kinds of house/property taxes. While full-cost recovery for

by *Dr. Nanda Dulal Das, Director (T&R)*

civic services was prescribed by Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and 13th Finance Commission, the SWM Rules, 2016 made ground for its strong enforcement (Housing and Urban Development Department. Govt. of Odisha, 2012)

Municipal Solid Waste Management Manual (Part-II), 2016 has laid down the principles of Full-Cost Assessment/Accounting (FCA), which identifies cost-drivers like front-end costs, capital costs, operating costs, contingent costs, back-end costs, environmental, and social costs (Central Public Health and Environmental Engineering Organisation (CPHEEO), 2016). Efforts are now increasingly being made by the Cities to service cities' waste collection, treatment, and disposal by collection of user fees from the households and businesses.

Common models of unit-based PAYT-pricing, as followed in the USA, (Canterbury, 1999):

- A) Proportional Systems, wherein residents are charged at a uniform rate for each unit of waste generated. Thus, households generating more waste pays more, but the rate of increase in cost to the households remain same. Many cities (e.g. Dallas, Los Angeles, etc.) in the USA also follow a flat-rate system, wherein the monthly fee does not increase with quantity of waste generated (Los Angeles Sanitation and Environment, 2022; City of Dallas: Sanitation, 2022).
- B) Variable Rate Pricing Systems (e.g., Seattle, Austin etc.), wherein residents are charged at a differential rate, with higher rate being charged as the size of the garbage container increases (Austin Resource Recovery, 2022; Seattle Public Utilities, 2022) and
- C) Two-Tiered or Multi-Tiered Systems, wherein (E.g., San Francisco), wherein residents pay a 'base-fee' or 'flat-fee' for initial level of service and then pay an 'additional fee' or 'second-tier' fee based on the amount of waste generated by them (San Francisco Public Works, 2021).

A 1998 National Solid Waste Survey in the USA had found that 16 per cent of the large communities (with population more than 1,00,000) and 5 per cent of the smaller communities (with population less than 1,00,000) surveyed had unit-based pricing structure in effect (R.W. Beck Inc. and Solid Waste Association of North America, 1998). Studies in around 7,100 communities in the USA had shown that Pay-As-You-Throw (PAYT), which charges users based on the quantity of waste they produce, had been successful in reducing the residential trash by around 17 per cent in the USA (Skumatz L. A., 2006; Morris, 1999). PAYT also has a potential to change behavior through persistent economic structure (Skumatz, L. A., 2008).

Indian Context

While India has targeted to achieve a recycling/waste diversion (from landfills) rate of 80 per cent, the cleanest city in India, Indore, is having a recycling rate of about 40 per cent (MoHUA, 2021; Singh, 2021). On the other hand, smart cities like Bhubaneswar and Shimla are having negligible recycling activities, except for the collection of recyclables by the informal sector rag-pickers (Rout, Tripathy, & Dash, 2020; Mohit Ganeriwala, 2021).

The Municipal Solid Waste Management Manual in India (2016) prescribed levying of user fees either with utility (electricity/water) bills/property taxes or through separate charges for solid waste management (Central Public Health and Environmental Engineering Organisation (CPHEEO), 2016). Indore and Bhubaneswar, at present, follow a model of flat-fee model of PAYT which is not linked to the amount of garbage generated, but location of house in revenue zones and area of house respectively. User charges, varying between Rs. 60 and 150, are collected alongside property tax or households can make direct payment through the online portal (Indore Municipal Corporation, 2022). In the year 2015, levying of user charges was notified by the Bhubaneswar Municipal Corporation based on area of the house, the system is still being stabilised after facing legal challenges (BMC, 2015).

While Shimla had attempted to introduce a PAYT structure depending on the quantity of waste generated, the effort had not been successful and present model is a flat-rate PAYT structure (Omesh Kumar Bharti, 2014). Shimla introduced user fee for solid waste collection services even earlier in the year 1999, although the collection system did not succeed. Municipal Corporation Shimla Door-to-Door Garbage Collection Byelaws, 2006 reintroduced mandatory collection of user fee in the year 2006 (Himachal Pradesh Department of Urban Development, 2006).

Monthly user-charge for a single-family household in Shimla was set at Rs 88 in April 2020, with provision for annual rate increase of 10 per cent (Omesh Kumar Bharti, 2014; Tribune News Service, 2021; Mohit Ganeriwala, 2021). Reflection of these fees on generation of solid waste and recycling activities are yet to be pronounced in the context of Indian cities.

Conclusion

While a beginning in the right direction has been made in the Indian cities in terms of imposition of user fees, these cities are yet to recover their full cost of solid-waste management through this mode of collection. Besides, awareness among urban residents is apparently low about different aspects of solid waste management. An effective increase in source segregation, increasing in reuse, recycling, and composting activities among the urban households would require mass awareness generation programs in different cities along-with awareness of introduction of variable unit-pricing structure in future. This would also help reduce overall generation of solid waste at the household level and increase waste diversion away from landfills.

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FOREST FIRES IN INDIA-THREATS AND MAJOR CHALLENGES

By Saurabh Sharma, AAO

Introduction

India is a country blessed with numerous bio-diversity zones and also abundant with unique and diversified floral and faunal wealth. As per the India State of Forest Report (IFSR) – 2021 (PIB, 2022), the total Recorded Forest Area in India is 7,75,288 Km² which is accounted for a major share of total forest cover in the world.

Forest fires have always been an integral part of the forest environment and have played an important role in shaping the forest ecosystems in terms of clearing the forest and paving way for the regeneration of new grass, herbs, and saplings, yet these are marginal when compared to huge loss linked to it. Every year, many parts of the forests in India come under fire and result in immense loss to the environment as well as the livelihoods of the people living in or near the forests.

Trend in fire incidents

A number (Forest Survey of India, 2021) of 52,785 forest fires were detected using MODIS (Moderate Resolution Imaging Spectro-radiometer) sensor and 3,45,989 forest fires were detected using SNPP-VIIRS (Suomi-National Polar-orbiting Partnership - Visible Infrared Imaging Radiometer Suite) Sensor in forest fire season from Nov 2020 to June 2021. The data released by Forest Survey of India on forest fire shows a clear spike in forest fire incidents during fire season 2019-20 and 2020-21 coinciding with rising heat wave conditions as depicted in chart. (Figure 5 to the right)

In India, severe fire incidents are reported throughout the year particularly in the dry deciduous forests while evergreen, semi-evergreen forests situated in mountain areas are comparatively less prone to fire (Forest Survey of India, 2015). According to data released in India State of Forest Report (IFSR) -2021, around 20,074 sq km forest cover (approx. 2.8 per cent) in India is extremely fire-prone whereas around 56,049 sq km (7.85 per cent) and nearly 82,900 sq km (11.61 per cent) is very highly fire-prone and highly

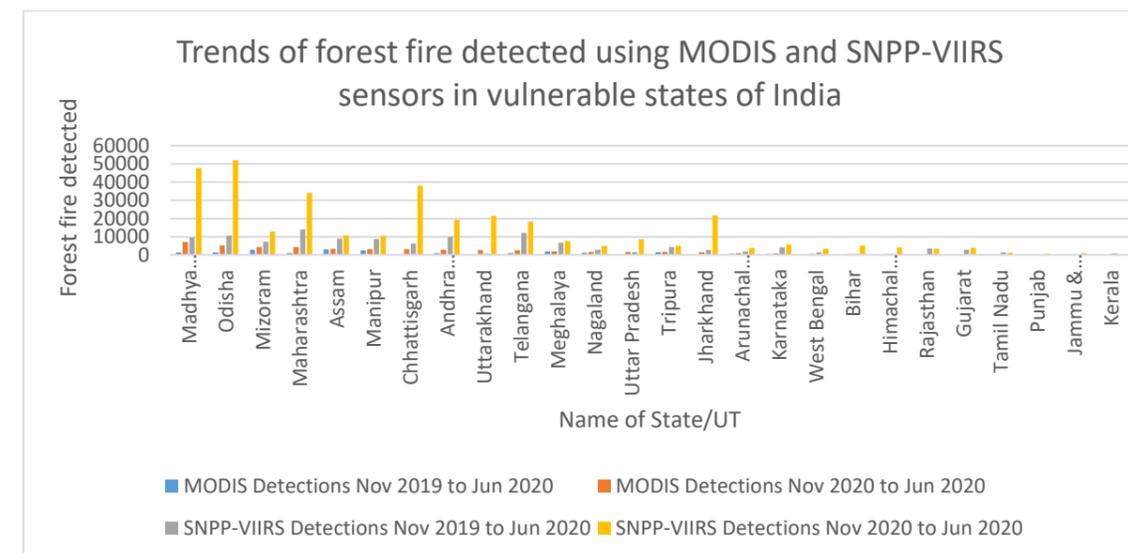


Figure 6(Data source: IFSR- 2021 issued by FSI)(Self Compiled)

fire-prone respectively. So, approximately 22 per cent area of forest cover in India falls under the highly and extremely fire-prone category.

Causes and Threats

Usually, the forest fire season in India lasts between November and June. The higher fire incidents in this period are mainly due to ample availability of dry biomass (fuel load) following the end of winter and the on-going summer season. The natural causes attributable to these fires include dry climate, lightning, climate variability, however most of the fire tragedies are directly and indirectly linked with extreme interference of human activities in forest lifecycle such as creation of infrastructure, change in agriculture pattern, mining of natural resources, unchecked land-use patterns etc.

These forest fires has resulted in scorch of thousands of hectares green cover throughout India. Precious forest resources including carbon locked in the biomass is lost due to forest fires every year and also adversely impact the flow of goods and services from forests. States like (Forest Survey of India, 2021) Mizoram, Tripura, Meghalaya and Mainpur in North

-Eastern part of India exhibit the highest fire probability in terms of event occurrence and probability. Likewise some part of Western Maharashtra, Southern Part of Chhattisgarh, Central Part of Odisha and few parts of Andhra Pradesh, Telangana and Karnataka are highly/extremely high fire prone zones.



Figure 7) Photo Credit: The Week Magazine (The Week Magazine, 2022)

Mitigation efforts

In India, the responsibility of forest-fire prevention and management lies primarily with the respective state and Forest Survey of India (FSI) under aegis of Ministry of Environment, Forest and Climate Change primarily entrusted with the task to provide support and technical assistance to State Forest Departments and other agencies. FSI has undergone significant improvements during the recent years to deal with forest fires.

The measures include use of modern tools for extinguishing fire, use of communication and information technology, creation and maintenance of fire lines in forest areas, engagement of fire watchers, creation of water storage structures in forest areas, strengthening of the forest infrastructure, procurement of fire fighting equipment, soil and moisture conservation work in high-risk areas, awareness creation and incentivising

villages etc. Satellite based remote sensing technology and GIS tools have been effective in better prevention and management of fires through creation of early warning for fire prone areas and some of the notable fire related services provided by FSI are FSI Van Agni Geo-Portal, Real-Time Forest Fire Monitoring, Early Warning Alert based on ForestFire Danger Rating System etc (Forest Survey of India, 2021).

Challenges

Despite of all these efforts, there has been a sharp rise in forest fires across the country. We need to strengthen our predictive and forest fire alert systems further to limit the damage caused by forest fires. State and district-level government officials must also prioritise enhancing the capacity of frontline forest officials and forest-dependent communities to prevent forest fires. Apart from this, the forest fires should be recognised as a disaster under the National Disaster Management Act (NDMA). This would certainly strengthen the National Plan on Forest Fires. There has been an urgent need for improvement in financial allocation under the National Disaster Management Act (NDMA) and creation of a specialised cadre trained to contain and combat forest fires in India.

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THE AUDIT REPORT ON “IMPLEMENTING THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS” (Office of Auditor General of Canada, 2021)

by Anupam Srivastava (Sr.AO)

An independent assurance report on “Implementing the United Nations’ Sustainable Development Goals” was prepared by the Office of the Auditor General of Canada on the national implementation of the United Nations’ 2030 Agenda for Sustainable Development and the Sustainable Development Goals. In this audit, actions in support of the goals of No Poverty (Goal 1), Gender Equality (Goal 5), Decent Work and Economic Growth (Goal 8), and selected associated targets were examined.



Framework, whereas 6 goals had only broad ambitions that were not specific, measurable or time-bound.

It is essential for federal departments and agencies to work together with external advisors, other jurisdictions, and stakeholders in order to achieve the goals and reach Canada’s most vulnerable populations first.

Need for audit

Canada agreed to implement the 2030 Agenda by adopting policies and implementing actions domestically in the pursuit of the United Nations’ Sustainable Development Goals, which commit to leaving no one behind. All federal departments and agencies are accountable for implementing the 2030 Agenda and the Sustainable Development Goals that relate to their individual mandates. Of the 17 global goals, 11 goals had targets in the Canadian Indicator

Audit objective, Scope and approach of audit

The objective of the audit was to determine whether Employment and Social Development Canada and selected organizations:

- were implementing a national approach to achieve the United Nations’ 2030 Agenda for Sustainable Development
- had made progress toward selected national targets that would result in more inclusive and sustainable outcomes for Canadians

The audit covered the period from 24 November 2017 to 01 July 2020.

United Nations’ Sustainable Development Goal	United Nations’ global target	Proposed in the Canadian Indicator Framework
No poverty (Goal 1)	1.2: By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	Target: 50% reduction in the poverty rate for 2015, by 2030
Gender equality (Goal 5)	5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life	Ambition: Canadians are well represented at all levels of decision making
Decent work and economic growth (Goal 8)	8.6: By 2020, substantially reduce the proportion of youth not in employment, education or training	Ambition: Canadians have access to quality jobs

Source: United Nations (Sustainable Development Goals and global targets) and Towards Canada’s 2030 Agenda National Strategy, Employment and Social Development Canada, 2019 (Canadian Indicator Framework)

The audit focused on Employment and Social Development Canada, Statistics Canada, the Department of Finance Canada, the Privy Council Office, the Treasury Board of Canada Secretariat, and Women

Methodology

The audit was conducted through examination and analysis of documentary evidence provided by the selected federal organizations and verbal information collected during interviews with federal officials and some relevant stakeholders. The audit also included examples of other countries’ implementation of the 2030 Agenda.

Important findings

- The departments and agencies had taken some steps toward a national approach to implementing the United Nations’ 2030 Agenda for Sustainable Development and achieving the Sustainable Development Goals.
- The government had not established an implementation plan.
- Federal departments and agencies did not have the tools they needed to coordinate their work on Sustainable Development Goals.
- There were gaps in assessing and reporting on national progress toward Sustainable Development Goals.

Recommendations

- Employment and Social Development Canada, in collaboration with other responsible federal departments and agencies, should establish and communicate an implementation plan that would:
 - a) Clearly articulate measurable targets as part of the Canadian Indicator Framework,
 - b) Clarify the roles and responsibilities of federal departments and agencies to support coordinated implementation across the federal government,
 - c) Support effective cooperation with other levels of government and other stakeholders, and
 - d) Clearly define the reporting process to ensure transparency to Canadians.
 - e) Implement tools and processes to improve policy coherence for sustainable development
 - f) support other responsible federal departments and agencies to identify gaps, trade-offs, and synergies among federal policies and programs for sustainable development
- Statistics Canada should coordinate with responsible federal departments and agencies and other stakeholders to determine priorities for additional disaggregation of data about vulnerable groups and should make that disaggregated data publicly available while meeting data quality and confidentiality requirements.

Conclusion

- Employment and Social Development Canada, together with the departments and agencies included in this audit, had initiated a national approach to implementing the United Nations' 2030 Agenda for Sustainable Development. However, achieving the United Nations' Sustainable Development Goals by 2030 will require a strong national implementation plan, complete with clear roles and responsibilities, tools for policy coherence, and more detailed data.
- In the examination of targets associated with poverty; gender representation in leadership; and youth not in employment, education, or training, it was concluded that progress was made where measurable targets existed, together with designated leadership, coordination, and disaggregated data. These elements allow for a better understanding of sustainable outcomes for Canadians.

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MICROPLASTICS IN HUMAN BODY

By Dr. Divya Singh (Research Associate)

Introduction

Microplastics have polluted the entire planet, from Arctic snow and Alpine soils to the deepest oceans. People are also known to consume them via food and water, and to breathe them in, but the potential impact on human health is not yet known (The Guardian, 2020). Microplastics are particles smaller than five millimeters and are derived from the degradation of plastic objects present in the environment (Science Direct, 2021). Microplastics can be found in salt, beer, fresh fruit and vegetables, drinking water, and other food items (National Geographic, 2022).

Impact of Plastic on Health

A study reported that plastics are present in the air we breathe, the water we drink, the items we touch, and the food we eat (Elsevier, 2022). As per the research findings, microplastics were identified in lung tissue obtained from participants after surgery in all lung regions, including the deeper sections. Researchers found 39 microplastics in 11 of the 13 lung tissue samples and 12 different types of microplastics (Medical News Today, 2022). The plastics managed to pass through smaller airways of the lower lung and polypropylene (used for packaging and pipes) and PET, commonly used for beverage bottles, were the two most common types of plastics found (The Print, 2022).

The plastics may enter the bloodstream — via air, food, water, personal care products such as toothpaste and lip gloss, dental polymers, and tattoo ink residues (Medical News Today, 2022). As per a report the analysed blood samples from 22 anonymous healthy adult donors, plastic particles were present in 17 donors (Elsevier, 2022). The finding also suggested that the “half the samples contained PET plastic, which is commonly used in drinks bottles, while a third contained polystyrene, used for packaging food and other products. A quarter of the blood samples contained polyethylene, from which plastic carrier bags are made” (The Guardian, 2022). Another study reported “microplastics in

human blood in almost 80 per cent of the people sampled”

But what happens to the microplastics once they enter the bloodstream is still unclear and need more research. However, some scientists believe that “it is scientifically plausible that plastic particles may be transported to organs via the bloodstream residues (Medical News Today, 2022). The microplastics in blood can also be transported throughout the body via the river of blood and target other organs as well (The Print, 2022).

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ENVIRONMENTAL CHALLENGES WITH ROOFTOP SOLAR SCHEME

By Dr. Divya Singh (Research Associate)

Introduction

Solar photovoltaic rooftop systems have gained attention as a possible green technology to address climate change issues by reducing dependence on conventional fossil fuel-based electricity. India has pledged to strongly increase the capacity of renewable source-based electricity to 175 GW (Giga Watt) by 2022. As part of that commitment, India has set a goal of adding 100 GW of solar energy capacity (Science Direct, 2016).

Grid Connected Rooftop Solar Scheme

Grid-connected Rooftop Solar Scheme is being implemented by the Ministry of New and Renewable Energy to produce solar power by mounting solar panels on the rooftops. It is a photovoltaic (PV) system that uses solar panels on the roof of a house or other structure to generate electricity. Rooftop mounted systems are small compared to solar power plants that are ground-mounted and have capacity in the megawatt range. More rooftop solar installations can boost the production of renewable electricity while preserving the state's open spaces and enhancing community resilience to power system interruptions caused by global warming. In States like Rajasthan where water is a precious commodity, a lot of water is required for the maintenance of large solar farms (Mongabay, 2021).

Use of large amount of ground water or surface water may negatively impact sustainability of solar farms. Also, strong beam of the concentrated solar light may kill birds and insects coming on the way adds challenges to the biodiversity. (US Energy Information Administration, 2022).

Recycling Photo Voltaic Modules

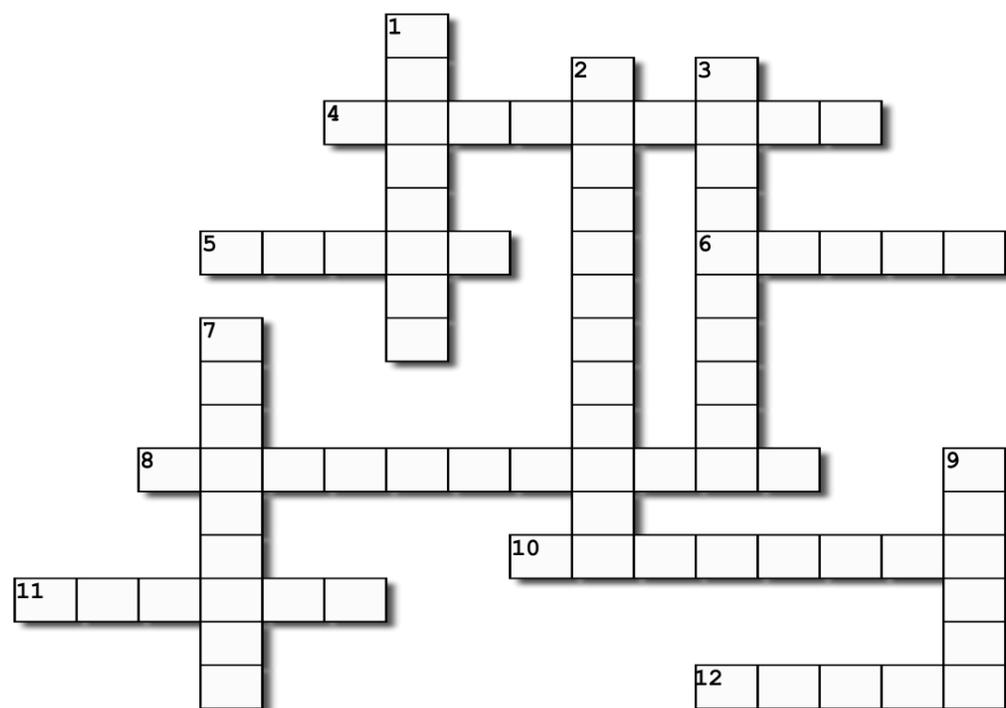
The current situation and management after the end-of-life solar photovoltaic (PV) module in India is a growing challenge. The recycling potential of solar PVs is high, and this also comes with risk of producing hazardous waste. The solar PV based e-waste might be an environmental concern in the long run (Heliyon, 2022). Solar PV cells may contain hazardous toxic metals like lead, selenium, tellurium, and cadmium. Many countries have regulation on cadmium containing products as it is toxic to fish and wildlife posing threats to food safety in food chain (Science Direct, 2010).

Solar PV panels also generate greenhouse gas like carbon dioxide at certain stage of their life cycle (Science Direct, 2015). The constituents of solar PV cells have cancerous, non-cancerous and toxicity potential for water, soil and ecological systems (Taylor & Francis Online, 2018). In future, more research on PV recycling is required to maximize resource recovery and reduce environmental burden of e-waste.

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CROSS THE GREEN WORD



DOWN

1. Which mascot is recently launched by MoEF&CC to create awareness on plastic pollution ?
2. Which is one of the priority areas that the Comptroller and Auditor General of India has proposed for collaboration among the G20 Supreme audit institutes?
3. “Carbon Calculator feature”, recently in the news, is associated with which company?
7. Which major tech-company recently announced that it has planned to cut more than half of carbon emissions across its supply chain by 2030?
9. UN Biodiversity Conference from 7 December to 19 December 2022 held in which country?

ACROSS

4. Which Indian state has set up first ever special purpose vehicle (SPV) to manage three critical natural conservation missions?
5. Which country launched the “In our Lifetime” campaign in the COP 27 Summit?
6. COP27 summit on UN Climate change held in 6 November-20 November 2022 organised in which country?
8. What is the name of the financial instruments that generate proceeds for investment in environmentally sustainable projects?
10. Recently union cabinet of India approved a National green mission for which gas costing Rs 19,744 crores?
11. As per Swachh Survekshan 2022, which is India’s Cleanest City for the Sixth consecutive year, and India’s first 7-Star Garbage free city?
12. The ‘Innovation Roadmap of the Mission Integrated Bio-refineries’ launched by which country?

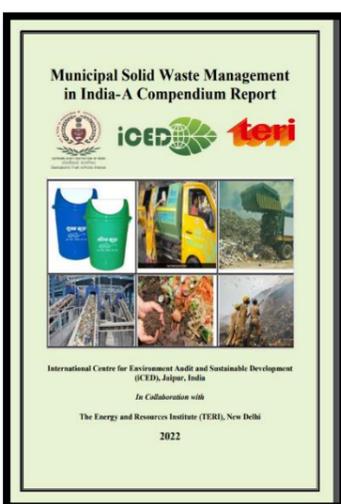
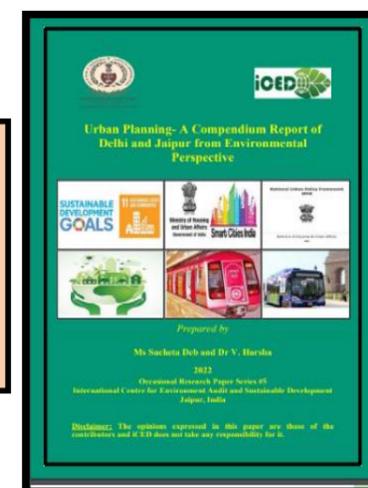
Answers: 1. Pratikriti 2. Blue Economy 3. Mastercard 4. TamilNadu 5. India 6. Egypt 7. Microsoft 8. Green Bonds 9. Canada 10. Hydrogen 11. Indore 12. India

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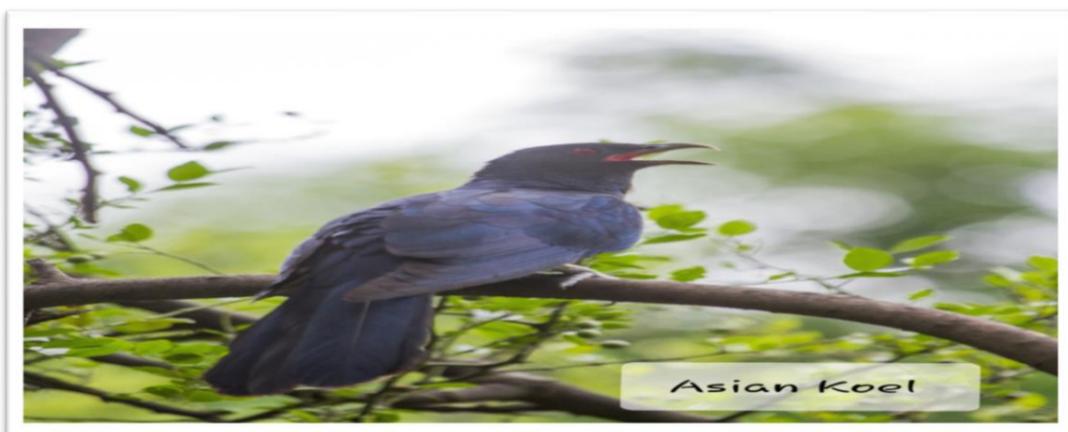


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BIODIVERSITY IN ICED, JAIPUR



Bird found in iCED Campus Photo Credit: Capt. Shashank. (Dy.Chief Mechanical Engineer-North Western Railway)

ASAIN KOEL

Eudynamys Scolopaceus

The Asian koel (*Eudynamys scolopaceus*) is a member of the cuckoo order of birds, the Cuculiformes. It is found in the Indian Subcontinent, China, and Southeast Asia. The Asian koel like many of its related cuckoo kin is a brood parasite that lays its eggs in the nests of crows and other hosts, who raise its young. The bird is a widely used symbol in Indian and Nepali poetry. (Animalia, n.d.)

BULBUL

Pycnonotus barbatus

The common bulbul (*Pycnonotus barbatus*) is a member of the bulbul family of passerine birds. It is found in north-eastern, northern, western and central Africa. The common bulbul is usually seen in pairs or small groups. It is a conspicuous bird, which tends to sit at the top of a bush. This species nests throughout the year in the moist tropics, elsewhere it is a more seasonal breeder with a peak in breeding coinciding with the onset of the rainy season. (Animalia, n.d.)



Bird found in iCED Campus Photo Credit: Capt. Shashank. (Dy.Chief Mechanical Engineer-North Western Railway)

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Audit Week Celebrations at iCED-2022



Award by ADAI and DG/iCED to Shri Rohan Sharma (AAO) [1st Prize in DPC Act Quiz]



Award by ADAI and DG/iCED to Shri Manoj Kumar (AAO) [1st Prize in Badminton Tournament]



Audit week celebration at iCED Auditorium. ADAI and DG/iCED (centre), Director Administration, Shri Deen Dayal Verma(Left), and Director (T&R) Shri Pushkar Kumar (Right)



Award to Neetu Gurjar (class VIIth) [2nd Prize in Essay Competition]



iCED officials present in auditorium at Audit Week celebration