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Resilience in the Face of Change

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ADMIN OFFICE

Nayabad, Nabodit, Kolkata 700099

Web: www.progyanfoundation.org

Email: info@progyanfoundation.org

Himachal Pradesh, India



Resilience in the Face of Change

Welcome to this edition of Progyan Communique. In our ongoing commitment to raise awareness about environmental and social issues, we present a collection of articles that explore the intricate relationships between ecosystems and the communities that depend on them.

This issue addresses challenges faced by local communities in coastal areas, highlighting the urgent need for conservation efforts while recognizing the vital ecosystem services these regions provide. We also delve into pressing environmental threats, such as microplastics in marine life, and the socio-economic factors influencing community resilience.

Through these diverse perspectives, we aim to foster dialogue and inspire action toward sustainable solutions that benefit both people and the planet. Thank you for being a part of this journey with us.

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Roy, AK. (2023). Seagrass growing on plastic debris. Coastal West Bengal, India.

Tourism is a blessing or curse for the environment

Uma Paul

Tourism and the environment share a complex, interdependent relationship. Tourism can benefit the environment by raising awareness and generating revenue for conservation, but it can also lead to environmental degradation when poorly managed.



Roy, AK. (2023). Macro-plastic pollution. Coastal West Bengal, India.

Tourism can encourage the protection of natural areas. National parks, wildlife reserves,

Alternative Livelihood Options for Sustainable Development in the Indian Sundarbans

Soumik Sarkar

and conservation areas are often maintained and funded through tourism revenue, which helps to safeguard biodiversity and ecosystems. Green certifications for hotels and tour operators encourage businesses to minimize their environmental footprint. Tourism can foster a deeper connection between people and nature. Educational tours, wildlife safaris, and nature treks can raise awareness about the importance of conserving fragile ecosystems and the consequences of human activity on the environment.

In recent times overtourism has been harmful to our environment. Tourism often strains natural resources like water, energy, and land. Overuse of these resources, particularly in arid or vulnerable regions, can lead to long-term environmental damage. Increased tourism can result in higher levels of air and water pollution. Popular tourist activities, such as air travel, motorized boats, and vehicles, contribute to greenhouse gas emissions. Plastic waste, sewage, and littering in natural environments (beaches, rivers, forests) are common issues. Infrastructure development, such as hotels, resorts, and transportation systems, can lead to deforestation, loss of wetlands, and coastal erosion. Sensitive habitats may be destroyed to accommodate tourist facilities. Tourist activities can disrupt animal habitats and behaviour. Crowds, noise pollution, and physical proximity to animals in their natural environments can cause stress, reduce breeding success, and alter migration patterns.

To minimize environmental harm, sustainable tourism practices are being promoted, focusing on, reducing energy consumption, waste, and emissions, using sustainable materials, water-saving technologies, and renewable energy sources in tourism development. Encouraging the protection of local environments, traditions, and biodiversity. The relationship between tourism and the environment is shaped by the balance between development and conservation. Sustainable tourism practices aim to ensure that tourism provides long-term benefits for local communities and the environment, rather than short-term gains at the expense of ecological health.

The Sundarbans, a UNESCO World Heritage Site, is the largest mangrove forest globally, spanning the Ganga-Brahmaputra-Meghna delta. The Sundarbans Biosphere Reserve (SBR) covers an area of 9,360 km² (Source: South 24 Parganas Human Development Report, 2009, Govt. of West Bengal) and includes parts in Bangladesh. It is India's second biosphere reserve after Nilgiri, forming part of the global network of biosphere reserves. Declared a National Park in 1984 and recognized as a World Heritage Site and a Biosphere Reserve in 1989, the Sundarbans is home to an extraordinarily diverse ecosystem, with unique flora and fauna and a rich variety of plant species. While fishing and agriculture remain primary livelihoods, alternative non-farm-based options are increasingly essential for sustainable development. These alternatives can help local communities mitigate the challenges of environmental degradation, economic instability, and climate change.

Ecotourism in the Sundarbans capitalizes on its unique biodiversity and cultural heritage. This sector provides an authentic nature-based experience for tourists while supporting local livelihoods. Through guided tours, homestays, and cultural experiences, communities can generate direct income and build conservation awareness. Promoting responsible ecotourism, based on the definition by The International Ecotourism Society (TIES, 1990), helps protect the environment and improve local welfare, ensuring that tourism remains ecologically and economically sustainable. The region's traditional crafts, such as kantha stitch, pottery, and woodwork, provide further livelihood opportunities. By forming cooperatives, local artisans can access larger markets, improve product quality, and earn better wages. Training programs and workshops can enhance artisans' skills and introduce

designs suited to contemporary markets, with online marketing expanding their reach beyond local buyers.



Roy, AK. (2024). Eco-tourism. Indian Sundarban.

Aquaculture offers a sustainable alternative to traditional fishing. Through methods like Integrated Mangrove Aquaculture (IMA), communities can sustainably cultivate fish and shrimp, reducing pressure on natural water bodies. Integrated farming systems, which use nutrient-rich water from fish ponds for irrigation, boost crop yields and income. Training in sustainable aquaculture minimizes environmental impact while diversifying livelihood options.



The Plight of Tiger Widows in the Indian Sundarbans: A Struggle for Survival

Shreya Ghosh

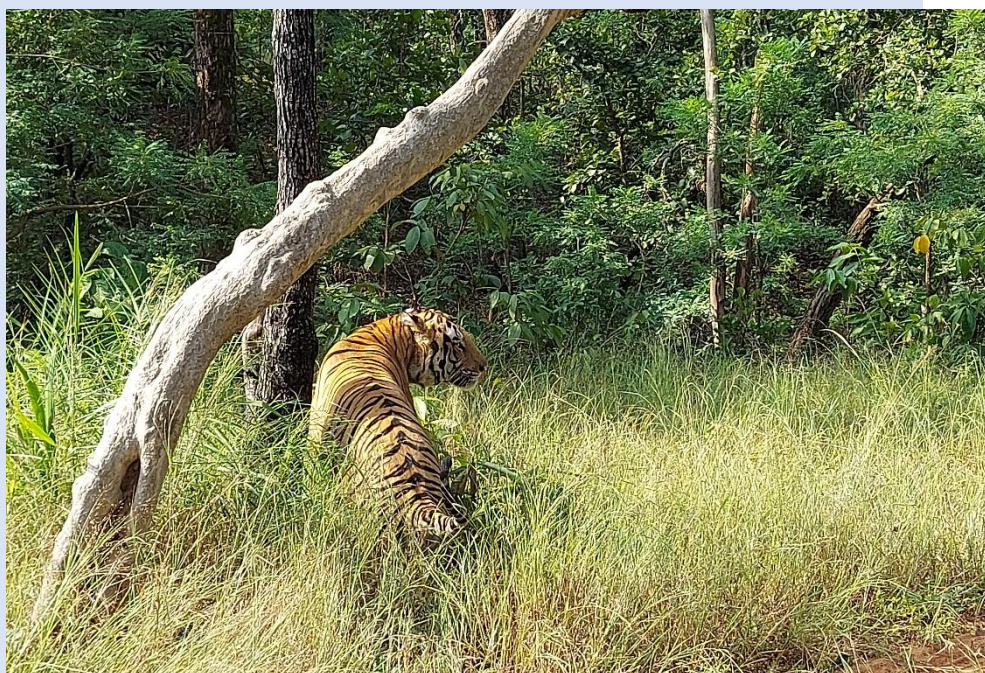
The Sundarbans, the world's largest tidal halophytic forest, is home to the resilient yet formidable Royal Bengal Tiger. While these iconic tigers symbolize strength, their silent presence often poses daily risks to the forest's

inhabitants. People engaged in essential activities like fishing, honey collection, or wood gathering frequently encounter these tigers, leading to severe human-wildlife conflicts and tragic loss of life. The Sundarbans is a vast tidal mangrove forest shared by India and Bangladesh, situated in southern West Bengal. This ecologically rich region supports a diverse array of species, including the critically endangered Royal Bengal Tiger (*Panthera tigris tigris*), uniquely adapted to its dense mangrove and tidal ecosystem. Over 4.5 million people live within or near the Sundarbans, heavily dependent on forest resources like fish, honey, wood, and crabs for their livelihoods. The convergence of human and tiger territories has created one of the world's highest rates of human-tiger conflicts, as shrinking natural prey populations and tidal patterns bring tigers closer to human settlements. Tiger attacks are a significant issue in the Sundarbans, with around 30 to 100 human fatalities reported annually. Areas near villages such as Sajnekhali, Pirkhali, and Bhangar, including the island of Satjelia in Gosaba Block, experience some of the highest incidences. Those at greatest risk are fishermen, honey gatherers, and crab collectors, with many of the victims being men, resulting in a rising number of 'tiger widows' who face profound socioeconomic challenges following the loss of their husbands.

For many, entering tiger territory is a necessity due to limited income opportunities outside the forest. The local economy heavily depends on forest resources; without viable alternatives, communities are compelled to engage in high-risk activities, despite awareness of the dangers involved. A door-to-door survey conducted in 2005-06 highlighted the plight of tiger widows, especially in villages like Bidhoba Para and Jalepara in Satjelia, where nearly 38 widows were identified. These women endure not only the pain of losing their spouses but also social isolation and economic hardship.

The challenges facing these tiger widows are multifaceted. Manju Mondal, for instance, lost her husband to a tiger attack while he was collecting wood. Bereft of income, she faced severe social stigma but eventually managed to learn tailoring through the support of local NGOs. Similarly, Sujata Bala, whose husband was a fisherman, took up heavy manual labour after his death until a microfinance group helped her establish a small shop to support her family. For Asha Mondal and many others, the struggle for survival is ongoing, with little government or local support and cultural beliefs that cast widows as symbols of misfortune. Such stigma further isolates these women, making employment and community support difficult to obtain. The psychological toll on tiger widows is profound. Many experience post-traumatic stress, often without access to psychological counselling. Cultural

stigmatization intensifies their hardship, with local beliefs associating widows with bad luck, leaving them socially marginalized. The economic impact is severe as well, as most of these women are uneducated and struggle to provide for their families without the primary breadwinner. Poverty and lack of support perpetuate a cycle of vulnerability and despair.



Dey, M. (2023). Encounter with a Royal Bengal Tiger in a forest-fringe village. Indian Sundarban.

In recent years, NGOs and grassroots organizations have stepped up to provide relief, offering vocational training, financial support, and education to help tiger widows find alternative livelihoods. Initiatives like the Sundarban Tiger Project and Prakriti Bandhu focus on sustainable employment opportunities within forest communities to reduce dependence on dangerous resource collection. However, significant government intervention is urgently needed to address these women's socioeconomic needs. Providing alternative income sources, improving education, and offering financial assistance can reduce their reliance on the forest and foster safer, more sustainable livelihoods.

Casualty statistics related to tiger attacks often remain unreported, as forest access typically requires permits, and many villagers enter the forest illegally for wood or honey collection. A recent attack on Mr. Haridas Das from Rampur Para, who is currently hospitalized, highlights the dangers and challenges faced by local communities due to the lack of legal permits and resources. The tiger widows of the Sundarbans endure immense hardships, balancing the high costs of living alongside nature's predators with poverty and social exclusion. Addressing their plight through socio-economic support and conflict mitigation strategies is vital to ensure their survival, dignity, and well-being.



Guardians of the Coast: The Urgent Call to Protect and Restore Our Mangroves

Muktaram Sardar

Mangroves, known as the 'guardians of the coast', play a critical role in stabilizing our environment and supporting biodiversity. However, this vital ecosystem has faced significant transformations in recent years, especially due to seasonal environmental fluctuations. These shifts have had profound impacts on the overall biodiversity within mangrove regions, with cascading effects on plant and animal life. A key observation is the noticeable decline in fruit-bearing tree productivity, which, in turn, affects food sources and habitat stability for various species. Among the

unique mangrove species, certain trees, such as *Avicennia marina*, stand out for their remarkable ability to absorb carbon dioxide up to 70% of their surrounding CO₂, while releasing equivalent oxygen levels, making them invaluable allies in combating climate change. This carbon sequestration capacity is comparable to any other tree globally, underscoring the importance of protecting and restoring mangroves for long-term climate resilience. However, not all developments in the mangrove ecosystem have been positive. The recent flowering of the *Avicennia marina* tree, which usually draws a diverse population of pollinators like bees, has seen a reduction in bee visitation. This shift has led to decreased honey production, directly affecting both local biodiversity and communities that rely on honey as a source of livelihood. Additional changes have been noted in tree health across mangrove areas, with root analyses indicating a 58% reduction in leaf density. This reduction in foliage and fruit production further hampers natural afforestation processes and diminishes ecosystem resilience. While initiatives aimed at planting more trees and seeds have gained attention, it is essential to conduct soil and ecological assessments before undertaking reforestation to ensure optimal growth conditions. The degradation of mangrove forests has brought severe consequences, including changes in river courses, increased prevalence of diseases, and the loss of flowers and fruits in many tree species. Furthermore, reports of burnt and diseased mangroves add to the challenges facing this ecosystem.

Moving forward, it is crucial to adopt a holistic approach that not only focuses on reforestation but also considers infrastructure needs, resource allocation, and community engagement. While tree planting is a valuable step, we must prioritize the preservation and restoration of existing mangrove areas to maintain their essential ecological functions. Investing in the protection of mangroves is an investment in biodiversity, coastal resilience, and climate stability.



Roy, AK. (2024). Mangrove shield of Indian Sundarban.

Sualkuchi: The Mekhela Village

Malancha Dey

Sualkuchi, known as 'Hualkusi' in Assamese, is one of the largest weaving villages globally, with its entire population dedicated to creating exquisite silk fabrics. This enchanting village is often referred to as the 'Silk-heaven' or the 'Manchester of Assam' and has gained recognition as a prominent hub for silk production, especially for the unique 'Muga' silk, which is exclusive to Assam. Located just 35 km from Guwahati on the northern bank of the Brahmaputra River, Sualkuchi serves as a sanctuary for various silk types, including the radiant golden 'Muga,' pristine ivory white 'Pat,' and delicate beige 'Eri' silks. Muga and Eri, also known as 'Ahimsa' silk, are integral to Assam's cultural fabric, enhancing the charm of Sualkuchi. Established as a silk-weaving village in the 17th century by Momai Tamuli Barbarua, an esteemed administrator of the Ahom Kingdom, Sualkuchi has a rich history in silk weaving that dates back to the 10th -11th centuries.

Historical texts, including the 'Arthashastra' of Kautilya, reference Sualkuchi as 'Suvarnakudya' of ancient Kamrupa, recognized for producing high-quality silk around the 4th century BC. The village evolved as a weaving centre when the Ahoms defeated the Mughals in the mid-17th century, establishing a tradition of luxury silk weaving supported by royal patronage.



Dey, M. (2023). A female weaver at work in Mekhela Village, Assam, India.

Initially a craft village that included various cottage industries, Sualkuchi has seen a decline in these other crafts, with handloom weaving becoming the primary focus. The weaving industry remained primarily within the Tanti community until the 1930s when others, including fishermen and Brahmins, began to participate due to the profitability of handloom work. The industry expanded significantly during World War II, leading to widespread participation from the village. Today, weaving is deeply embedded in the lifestyle of the locals, with expert weavers flocking to Sualkuchi for its commercial significance. The rhythmic sounds of looms fill the streets as both men and women skilfully transform silk threads into magnificent fabrics, employing intricate designs often inspired by the local flora and fauna, such as peacocks, deer, and traditional Assamese motifs like the 'Japi' (hat). Weaving a single saree can take about six days or more, depending on the complexity of the design. While the use of golden zari was common during royal times, the commercialization of weaving has led to the incorporation of silk and cotton threads. The rising costs of indigenous silks have resulted in some weavers opting for cheaper imported yarns, impacting quality. The streets of Sualkuchi are lined with silk shops offering a wide array of traditional and blended silk products, attracting both local and international visitors seeking these finely crafted fabrics. Sualkuchi, situated in the Kamrup district of Assam, provides an interesting demographic snapshot. According to the 2011 Census, the town's population was recorded at 13,898, with a gender distribution of 6,809 males and 7,089 females. The child demographic is notable, with 1,002 children aged 0 to 6 years, representing about 7.21% of the



Dey, M. (2023). Mekhela fabric. Assam, India.

The craft was initially supported by King Dharma Pal of the Pala dynasty, who relocated 26 weaving families from 'Tantikuchi' to Sualkuchi.

population. The town exhibits a higher female ratio of 1,041 compared to the state average of 958 and a child ratio slightly above the state average. Sualkuchi boasts an impressive literacy rate of 92.99%, significantly higher than the Assam state average of 72.19%. Male literacy is approximately 89.5%, while female literacy stands at 83.2%. The town's social landscape is diverse, with Scheduled Castes making up 30.59% and Scheduled Tribes at only 0.19%. As of 2023, the estimated population has increased to around 19,000, with 7,230 individuals engaged in work or business activities, including 4,220 males and 3,010 females. Among the working population, 73.25% are involved in main work, while 26.75% are engaged in marginal activities providing livelihoods for less than six months.

Sualkuchi specializes in three silk varieties: golden Muga, white Paat, and light beige Eri or Endi silk. The village boasts approximately 17,000 working silk looms, producing various silk

products, including Mekhela Chaddar, Gamosa, and Riha. Over 25,000 individuals are directly or indirectly employed in the silk industry of Sualkuchi. The annual consumption of mulberry silk is nearly 200,000 kg, while Muga and allied silk consumption is about 98,000 kg, contributing to Assam's total silk consumption of 438,870 kg, which includes Eri silk. Sualkuchi alone produces over 3.1 million linear meters of silk fabrics, valued at approximately Rs. 90 million. The region is characterized by specific host plants for different silkworms, crucial for silk production. The Muga silkworm primarily feeds on Som and Soalu plants, while the tasar silkworm consumes various plants, including Arjun and Sal. The Mulberry silkworm exclusively feeds on mulberry leaves, and the Eri silkworm feeds on Castor and other plants. This ecological interplay significantly influences the silk industry in Sualkuchi.

The traditional symbols and motifs woven into silk garments have evolved dramatically. Originally, designs featured angular geometric shapes, but contemporary styles now showcase more elaborate patterns. Motifs often imitate elements from nature, including flowers, ferns, and animals, as well as traditional Assamese ornaments. Some notable styles include Kaziranga style, inspired by local wildlife; King Khap style, reflecting the Ahom dynasty; and Joon Biri style, inspired by traditional Assamese neckpieces. Other motifs include elephant designs, Bodo patterns, and geometrically shaped trees. Nature serves as a significant influence, with floral motifs and symbols like the Japi, traditionally associated with Assamese heritage, frequently featured. Contemporary patterns, such as Kalki, have gained popularity in recent years, illustrating the dynamic nature of weaving traditions of Sualkuchi. The rich tapestry Sualkuchi silk weaving not only embodies the artistry and cultural heritage of Assam but also highlights the community's resilience and adaptability in preserving this ancient craft amidst modern challenges.



Cradle of the Tides: The Sundarbans as a Vital Nursery for India's Aquatic Riches

Jalad Kumar Gayen

The Indian Sundarbans, a UNESCO World Heritage Site and one of the world's largest mangrove ecosystems, plays a crucial role as a nursery ground for a variety of finfish and shellfish species. The unique tidal environment and dense mangrove forest create a rich, nutrient-filled habitat that supports early life stages for numerous commercially significant fish and crustacean species. Seasonal tidal flows deposit organic matter, sediment, and nutrients from the Ganges-Brahmaputra-Meghna River system, creating an ideal breeding and nursery environment for aquatic life. Juvenile fish and shellfish find refuge in the intricate mangrove roots, which act as natural barriers against predators and offer abundant sources of food from

decomposing leaves, plankton, and detritus. Species such as the mud crab (*Scylla serrata*), prawns (*Penaeus monodon*), and other economically important crustaceans thrive in these sheltered areas during their early life stages. As they mature, many of these species migrate to open waters, supporting the coastal and offshore fishing industries that are vital to the local and national economy. The biodiversity of the Sundarbans has a profound ecological impact as well, particularly in the life cycles of fish like Hilsa (*Tenualosa ilisha*) and Barramundi (*Lates calcarifer*), which spawn and nurse in the estuarine waters. These species contribute significantly to India's seafood exports, linking the Sundarbans' health to

broader economic and food security concerns. The nursery role of these mangrove ecosystems also promotes biodiversity, as a range of indigenous and exotic fish species depend on the Sundarbans for part of their lifecycle, supporting the balance of marine and coastal ecosystems.

Despite its ecological importance, the Sundarbans faces multiple threats, including climate change, pollution, and unsustainable fishing practices, all of which have intensified over recent decades. Rising sea levels and increased salinity from saltwater intrusion threaten the delicate balance of the mangrove ecosystem. These changes could have a long-lasting impact on the spawning and nursery habitats that sustain fish populations, ultimately affecting the regional economy and the livelihoods of those who depend on fisheries. Conservation of the Sundarbans mangrove forests and surrounding estuaries is vital to maintain the habitat's nursery functions. This includes sustainable management practices, pollution control, and community engagement to ensure that these nursery grounds continue to support diverse fish populations. Scientific monitoring of fish stocks, water quality, and the overall health of the ecosystem can inform policies to protect this invaluable natural resource. By safeguarding the Sundarbans, India can continue to rely on this natural nursery to support its fishing industry, maintain biodiversity, and protect food resources for future generations.



Policy-induced socio-economic instability in the global south- A Case study of the Koch-Rajbanshi community of India

Chandreyi Sengupta

Policy failure is possibly one of the prime causes of socio-economic unsustainability throughout the world. This is particularly true for the global south, most of which is still recovering from the long-lasting ravages of European imperialism. Instances of such non-optimal policy making is common in India and is often manifested in latently or

blatantly violent conflicts, both among groups and with the state. Interestingly, the origin of a number of such conflicts may be traced back to the decision to partition the country, thereby creating one of the most severe refugee crises in the world. The continuing tumultuous social situation in northeastern India is a glaring example in this regard. Most of the conflicts in these parts are usually products of colonial decisions in combination with social and economic policies incompatible with the prevalent socio-economic fabric of the region.

Out of the many conflicts plaguing India's northeast, the case of the indigenous Koch-Rajbanshi community of northern West Bengal and western Assam is unique owing to its latent nature. Although never as violent as other sovereignty struggles in the region, the Koch-Rajbanshi community has persisted in its demands for socio-economic upliftment and, subsequently, statehood since the Indian independence. The partition-induced immigration of the Hindu Bengali community, locally known as the Bhatiya, into northern West Bengal and western Assam culminated in a struggle over resource control between the Koch-Rajbanshi and them. Before the advent of the Bhatiya, the Koch-Rajbanshi dominated the socio-economic hierarchy of the region on account of being the primary land-owning class. However, being far better sedentary cultivators, the Bhatiya not only introduced vegetable cultivation in the region but also improved the prevailing paddy production. They were especially aided by the land reform policy of the leftist government in West Bengal that gave them ownership of the excess lands of the state. Although the major proportion of people losing their lands due to these reforms were Koch-Rajbanshi, the poorer sections of

the community had rarely benefitted from such redistribution. In fact, integration of the Bhatiya into the mainstream regional society was one of the most important factors behind the introduction of these land reforms and the abolition of the Zamindari system. The noticeable governmental bias towards the immigrant Bhatiya naturally angered the indigenous community who were relegated to a socio-

economically disadvantageous position in their homeland. In western Assam, the Koch-Rajbanshi community were plagued with similar socio-economic marginalization from both the Bhatia and other non-Bengali immigrants. These grievances led to the origin of their statehood demands as they believed their conditions would improve in a separate state under their control.

Even after several years, the situation of the Koch-Rajbanshi has remained the same, and consequently, their demands for statehood have endured. Unfortunately, both the state and central governments have either resorted to force or appeasement to deal with this issue instead of drafting robust policies for the comprehensive socio-economic development of the Koch-Rajbanshi community.

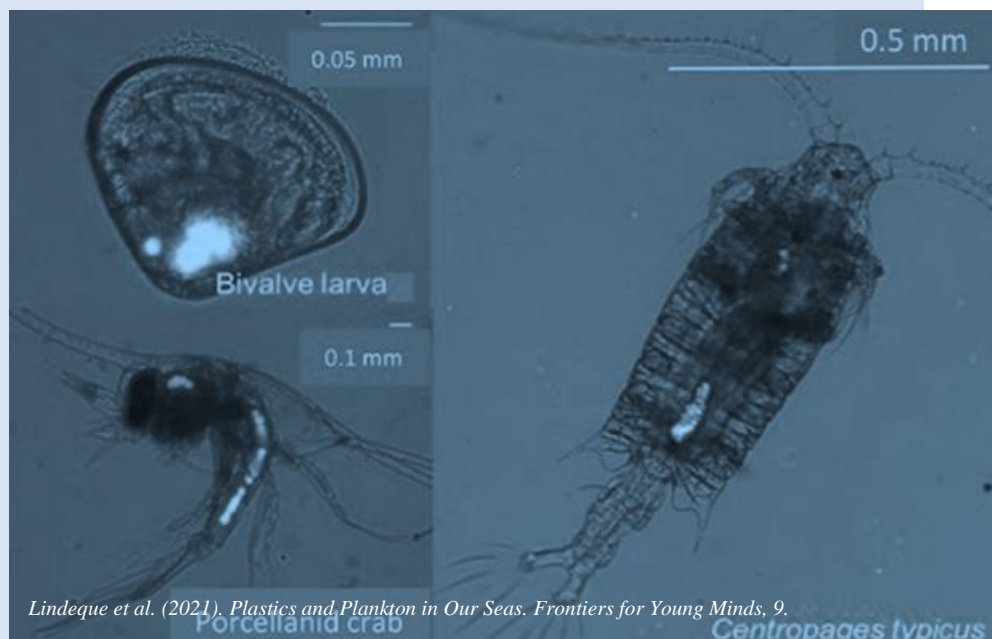


Microplastics in Marine Life: An Escalating Threat to Oceanic Ecosystems

Bhaskar Deb Bhattacharya

Microplastics, tiny plastic particles less than 5 mm in size, have emerged as a global environmental threat, infiltrating marine ecosystems at an alarming rate. These particles, derived from the degradation of larger plastic debris, cosmetic products, clothing, and industrial processes, have been found in virtually every ocean on Earth. The pervasive presence of microplastics has raised significant concerns about their impact on marine organisms and ecosystems, as well as the potential risks to human health through the food chain. Microplastics enter marine environments through multiple pathways. These include the breakdown of larger plastic debris, runoff from urban and agricultural areas, wastewater discharge, and direct release from personal

care products containing microbeads. Additionally, synthetic fibers shed from textiles during washing contribute to the microplastic load in marine waters. Once in the ocean, microplastics are carried by currents, making their way into the deepest parts of the sea and remote regions far from human activity.



Lindeque et al. (2021). Plastics and Plankton in Our Seas. Frontiers for Young Minds, 9.

Microplastics pose a serious threat to marine organisms, from the tiniest plankton to the largest marine mammals. Many marine species, including fish, shellfish, and zooplankton, mistake these small particles for food. Ingesting microplastics can cause physical harm, block digestive tracts, reduce nutrient absorption, and lead to malnutrition or death. For filter feeders like oysters and mussels, microplastics can clog feeding appendages and reduce feeding efficiency. The ingestion of microplastics by smaller organisms also has cascading effects throughout the food web. Predators consuming prey that has ingested microplastics are exposed to these particles, leading to bioaccumulation of plastic materials within higher trophic levels. As a result, microplastics are making their way into human diets,

particularly through seafood consumption, raising concerns about long-term health effects.

One of the major concerns surrounding microplastics is their ability to absorb and concentrate toxic chemicals from the surrounding water. Persistent organic pollutants (POPs), heavy metals, and other hazardous substances can adhere to the surface of microplastic particles. When marine organisms ingest these particles, they are exposed to these toxic chemicals, which can disrupt hormonal systems, impair reproductive functions, and increase susceptibility to diseases. The chemical composition of microplastics themselves can also pose risks. Many plastics contain harmful

additives, such as plasticizers, flame retardants, and stabilizers, which can leach into marine environments. These chemicals are known to interfere with endocrine systems in wildlife, leading to reproductive and developmental abnormalities. The bioaccumulation of microplastics in marine organisms raises significant concerns for human health. Studies have detected microplastics in seafood, including fish, shrimp, and bivalves, which are commonly consumed by humans. While the full health implications are still under investigation, potential risks include inflammation, immune system disruption, and the transfer of toxic chemicals to humans.

Addressing the issue of microplastics in marine environments requires concerted global action. Efforts to reduce plastic pollution have focused on limiting the use of single-use plastics, improving waste management practices, and developing biodegradable alternatives. On a larger scale, international policies, such as the 2018 UN Environment Assembly's commitment to drastically reduce marine plastic litter, are crucial for curbing the flow of plastics into oceans. Research into innovative solutions, such as microplastic filtration technologies for wastewater treatment plants, is also underway. Additionally, public awareness campaigns are critical for changing consumer behaviour and reducing plastic consumption at the source.



Challenges Faced by Local Communities in Bhitarkanika Mangrove Forest Conservation

Abhijit Sarkar

Bhitarkanika Mangrove Forest, located in Odisha's Kendrapara district, stands as one of India's most expansive and significant mangrove ecosystems, celebrated for its rich biodiversity, unique landscape, and vital role in coastal protection. This remarkable ecosystem is home to a variety of flora and fauna, including several rare and endangered species that contribute to its international importance. With over 55 mangrove species,

Bhitarkanika provides sanctuary to a diverse range of wildlife, including the saltwater crocodile (*Crocodylus porosus*), one of the largest crocodile species in the world along with spotted deer, wild boars, king cobras, Indian pythons, and a vibrant bird population. Ramsar status of Bhitarkanika further underscores its global ecological value, recognizing it as a wetland of international importance.



Roy, AK. (2020). Mangrove-dependent livelihoods of coastal communities. Coastal Odisha.

The forest's complex network of tidal rivers, creeks, and mudflats, fed by the Brahmani, Baitarani, and Dhamra rivers creates an intricate ecosystem that serves as a natural defence against storms, soil erosion, and tidal waves. Beyond its ecological functions, Bhitarkanika holds rich cultural and historical significance, hosting ancient temples and monuments that trace back to early Indian civilization and Odisha's maritime heritage. Bhitarkanika National Park, situated within the mangrove forest, draws numerous tourists each year, offering eco-tourism activities such as wildlife safaris, boat rides, birdwatching, and photography. While tourism supports the local economy, balancing conservation with sustainable tourism practices remains crucial to protect this fragile environment.

However, the local population in and around Bhitarkanika faces several challenges related to mangrove conservation efforts. These communities rely heavily on the mangroves for their livelihoods, utilizing resources such as timber, fish, and forest products essential for their survival. Restrictions imposed by conservation policies often limit access to these resources, impacting traditional livelihoods

and causing economic hardship. Similarly, farming and aquaculture practices like shrimp farming, which provide income for local families, are sometimes curtailed to preserve the mangrove ecosystem, leaving many without sufficient alternative livelihood options.

Human-wildlife conflict is another significant concern, with crocodile attacks posing risks to people, livestock, and boats, and other wildlife like wild boars and deer frequently damaging crops and property. Compensation for such losses is often delayed or inadequate, creating ongoing tension. Additionally, conservation initiatives sometimes necessitate relocating communities outside protected zones, a move met with resistance due to the deep-rooted cultural and historical ties that people have with their land. Ambiguities in land tenure and ownership further complicate these relocations, as many residents lack legal rights to the lands they've occupied for generations.

Environmental vulnerability also remains high. While mangroves offer protection against natural disasters like cyclones and tidal waves, the region remains prone to such events. Flooding from river overflows and changing water salinity levels have disrupted local agriculture and rendered some lands unproductive. Social and cultural impacts are also profound, as conservation restrictions may limit traditional practices, displacing communities not only physically but culturally. Additionally, the exclusion of local communities from conservation planning results in resentment and a lack of cooperation, as top-down conservation approaches often ignore the valuable traditional knowledge of sustainable mangrove management.

Addressing these challenges will require inclusive and community-based conservation efforts that prioritize the well-being of local populations. Engaging communities in conservation planning, supporting alternative livelihood programs like sustainable aquaculture, eco-tourism, or organic farming, and improving compensation mechanisms for wildlife-related losses are vital steps toward harmonizing conservation goals with the needs of local communities. Through inclusive policies, Bhitarkanika can continue to thrive as an ecological treasure while ensuring the socio-economic welfare of the communities that depend on it.



Ecosystem Services of Coastal Wetlands

Asit Kumar Roy

Coastal wetlands are remarkable ecosystems that offer a multitude of vital services to humanity. Defined as the benefits derived from wetland ecosystems, these services encompass flood control, groundwater replenishment, shoreline stabilization, sediment and nutrient retention, water purification,



Roy, AK. (2020). Biodiversity conservation as ecosystem services in coastal wetland ecosystems. Odisha.

biodiversity reservoirs, cultural values, recreation, tourism, and climate change mitigation and adaptation. Each wetland possesses unique characteristics that determine their capacity to provide the services, influenced by factors such as type, size, and geographical location. Globally, coastal wetlands have demonstrated their importance through various case studies. For instance, during Hurricane Katrina in 2005, the destruction of coastal wetlands in the Mississippi Delta resulted in significant flooding and economic losses, highlighting their role in flood protection. Similarly, the Geropotamou Basin in Crete of Greece has faced severe groundwater depletion due to the loss of spring-fed wetlands, underscoring the role of wetlands in aquifer recharge. Moreover, coral reefs in the Caribbean not only provide shoreline protection but also deliver substantial economic benefits, proving that natural

solutions are often more cost-effective than artificial structures. The ecosystem services provided by coastal wetlands extend to nutrient cycling and water purification. These habitats play a crucial role in maintaining the natural cycles of nutrients and sediments, supporting fisheries and migratory birds as well. For example, the Ebro Delta in Spain requires regular sediment input to sustain its ecosystem. In the United States, restoration projects in the Everglades and Chesapeake Bay have highlighted the effectiveness of wetlands in purifying water and maintaining ecological balance, showcasing their importance for both environmental health and human needs. In addition to their ecological functions, coastal wetlands also provide numerous products and cultural values. In regions like Southeast Asia, wetlands support agricultural practices such as paddy culture and fisheries. The economic benefits derived from these ecosystems are significant, as illustrated by the utilization of mangroves for various resources in Thailand. Moreover, cultural connections to wetlands, as seen in the Kakadu National Park of Australia, emphasize the inseparable bond between the local communities and their natural surroundings. In addition, coastal wetlands play a critical role in climate change mitigation and adaptation. They act as important carbon sinks, particularly peatlands and mangroves, which absorb and store carbon from the atmosphere. However, the degradation of these ecosystems can release significant amounts of greenhouse gases, underscoring the need for conservation efforts. In India, coastal wetlands like mangroves are particularly effective in carbon sequestration, contributing to global efforts in addressing climate change. Overall, the multifaceted benefits of coastal wetlands highlight their importance for environmental sustainability, economic resilience, and cultural heritage.



Navigating the Financial Markets in 2024: Key Trends and Strategies for Investors

Abhay Das

As we journey further into 2024, the financial landscape is evolving rapidly, shaped by economic changes, technological advancements, and geopolitical uncertainties. Whether you're an experienced investor or just starting out, understanding the key market trends can empower you to make informed decisions and skilfully navigate the complexities of the current financial world. This article examines some of the most prominent trends and offers strategic insights for strengthening your investment portfolio in this dynamic environment. One of the most significant shifts is the rise of Artificial Intelligence (AI) in finance. AI is revolutionizing investment practices, from AI-powered trading algorithms to robo-advisors that manage portfolios efficiently. This technology-driven approach is transforming how decisions are made in the financial world, with new opportunities emerging for those interested in AI-driven investments. Allocating a portion of your portfolio to companies or ETFs focused on AI and technology could enable you to capitalize on this trend, while robo-advisors offer tailored portfolio optimizations aligned with your financial goals and risk tolerance.

Sustainable investing, particularly Environmental, Social, and Governance (ESG) investing, has also gained momentum as investors increasingly seek opportunities that align with their



Google Image. (2020).

values. Companies prioritizing sustainability and ethical practices are being recognized not only by regulators but also by consumers and investors. Incorporating ESG-focused funds in your portfolio may provide the chance to support companies known for environmental stewardship, social responsibility, and governance transparency, which, in turn, could offer better long-term, risk-adjusted returns. Interest rates and inflation continue to play a crucial role in shaping 2024's financial landscape. As central banks adjust interest rates to manage inflation, investors need to recalibrate their strategies to address potential rate hikes and

their impact on various assets. Bonds and dividend-paying stocks may become attractive in this climate due to their steady income and growth potential. Moreover, assets like real estate and commodities, which tend to perform well in inflationary periods, can add resilience to your portfolio.

Global supply chain challenges persist, affecting industries worldwide, from consumer electronics to automobiles. These disruptions present both risks and opportunities, with sectors like logistics, automation, and local manufacturing receiving increased attention. Companies innovating in these areas, particularly those integrating automation and AI-driven solutions, may offer compelling growth potential as industries work to reduce dependency on global supply chains. In 2024, familiar and emerging dynamics are shaping financial markets. By understanding trends like the growth of AI, the shift towards ESG investing, and ongoing supply chain challenges, investors can protect their portfolios while seizing new opportunities. Whether you're seasoned or just beginning, adopting a diversified approach informed by these trends can help you stay ahead in today's ever-evolving financial environment.

Behind the Scenes at COP 16: Power Plays and the Future of Biodiversity Conservation

Dipayan Dey

As COP 16 draws to a close in Cali, Colombia, I find myself reflecting on the dynamics, both visible and concealed, that have defined the gathering this year. Like others, this conference achieved some notable

outcomes such as the formulation of guidelines for managing invasive alien species, frameworks to incorporate Indigenous communities more deeply into conservation, and mechanisms for benefit-sharing from digital genetic information. Yet, behind these actions, the summit was marred by power struggles, mistrust, and a deep-seated divide among negotiators, casting doubts on the overall purpose and impact of the conference. As the days progressed, a troubling trend became apparent wherein discussions were moving increasingly behind closed doors, and observers were excluded from critical dialogues. This shift was a warning sign, reflecting low levels of trust among negotiating parties. Once the doors closed, we saw countries taking tougher, more rigid stances, particularly around Digital Sequence Information (DSI), a highly charged issue due to its potential implications for sovereignty and economic value. Behind the public facade of unity, these private negotiations revealed another reality, where political manoeuvring and positioning seemed to take precedence over ecological commitment. Throughout these sessions, I observed no debate about the future of our planet but rather a contest of interests and influence. Rather than simplifying and clarifying commitments, negotiators added more unresolved issues into the text—represented by new brackets and vague terms that would later be contested. The atmosphere in these meetings underscored the level of mistrust and reluctance to compromise. As negotiators clung to every word, it became clear that for many, the stakes were more political than ecological. With COP 16 formally ending, we now enter what I call the 'spin zone', where narratives are crafted to present the conference in the best possible light. From here, countries, organizations, and communities will shape their own versions of events, focusing on successes while conveniently glossing over the many unresolved issues. This selective retelling will likely perpetuate a legacy of



Dey, D. (2024). Protest at COP16 by participants.

speculation and half-truths, as each party crafts its story to suit its own interests. In doing so, the very purpose of COP is diluted, transformed into a political exercise that satisfies egos and agendas rather than fulfilling the urgent needs of our planet. Among conference outcomes, India launched its National Biodiversity Strategy and Action Plan (NBSAP) in one of the proudest moments, placing it among the first 16% of nations to submit a robust biodiversity plan under the Kunming-Montreal Global Biodiversity Framework (KMGBF). However, this achievement was tarnished by the conspicuous silence on two critical issues: the large-scale development plans for Nicobar Island and the contentious Forest Rule Amendments of 2023. These omissions raised valid concerns about the administrative commitment to biodiversity conservation when faced with economic ambitions. Equally concerning was the shift in the institutions responsible for developing the NBSAP of India. Traditionally, organizations like the Botanical Survey of India (BSI), the Zoological Survey of India (ZSI), and the Indian Council of Agricultural Research (ICAR) have spearheaded efforts to conserve the rich agrobiodiversity of India. This year, however, international organizations such as the World Wildlife Fund (WWF) and the United Nations Development Programme (UNDP) took a

leading role, effectively sidelining these trusted national institutions. While global organizations bring valuable expertise, this shift diminishes the role of local knowledge and expertise. As an Indian taxpayer, I found this development disheartening, reflecting a 'Make in India' philosophy that favours external influence over homegrown capability in the realm of conservation. Perhaps the most contentious discussion at COP 16 revolved around the concept of 'Biodiversity Credits'. Backed by powerful entities such as the European Union, IUCN, WWF, and nations like France and the UK, this framework aims to create a market-driven mechanism for biodiversity funding. The Biodiversity Credit Alliance envisions a system where corporate efforts toward environmental sustainability can be certified and traded, creating financial incentives for biodiversity initiatives. Yet, the proposed system offers little for local communities and Indigenous peoples, whose traditional role as stewards of biodiversity is often unrecognized in such financial schemes. Civil society groups and organizations, including the CBD Alliance, rallied in strong opposition to this framework. For these groups, the model failed to consider the rights and needs of communities whose livelihoods and cultural ties to the land make them invaluable guardians of biodiversity. Under the current proposal, corporations could earn certification for their sustainability efforts, but communities would receive little or no compensation for the sacrifices they make to protect these natural areas. For Indigenous and local communities, those who truly bear the costs of conservation, this system is not just inequitable; it is exploitative.

Leaving COP 16, I feel a mixture of hope and concern. On one hand, the agreements represent small but meaningful steps toward addressing biodiversity loss and engaging a broader range of stakeholders. On the other, the underlying political struggles raise doubts about how these agreements will be implemented. If COP 16 is to be remembered as a critical moment for biodiversity, we must confront these challenges and move forward with transparency, trust, and an unwavering commitment to equity and justice. In the coming months, civil society, governments, and international organizations must hold each other accountable to ensure that the commitments made in Cali are carried out in both spirit and action. COP 16 cannot become just another chapter in a long history of unfulfilled promises. To make biodiversity conservation a shared responsibility rather than a political battleground, we must strive for a system that respects the contributions and rights of all stakeholders, especially those who have focused on the long-term protection of our planetary biodiversity.



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Conceptualised by Dipayan Dey & Malancha Dey
Edited by Bhaskar Deb Bhattacharya & Chandreyi Sengupta
Designed by Asit Kumar Roy

