

From the Desk of the Patron

Prologue

The Patron's column encapsulates the critical need to address the pressing environmental challenges we face today. It eloquently highlights the intricate interconnections within the scientific realms of earth, climate, planetary and environmental sciences. Moreover, it emphasizes the severe consequences and imminent dangers posed by the depletion of resources, climate anomalies, and global warming on earth system and suggests possible mitigation and adaptation measures.

Brief Elucidation

The patron's column which is the comprehensive version of the Earth System Science Panorama of this issue, addresses various earth and environmental aspects, including extreme weather events like heatwaves and floods, pervasive pollution across air, water, and land; acute water scarcity in urban and rural areas, unpredictable rainfall patterns, expanding arid regions, rapid deforestation, the perilous situation faced by animal and plant species, and resource discovery, evaluation and management strategy. Additionally, it sheds light on the plight of vulnerable populations in impoverished nations struggling to sustain their livelihoods due to the impacts of climate change. The correlation between soil microbiome and microbial response to global warming; the significance of Community Forest Governance (CFG) in maintaining carbon balance, biodiversity and livelihoods; and environmental crises due to extreme weather and climate events are some of the critical issues and require thorough understanding to resolve the challenges facing the earth system. Furthermore, it lauds significant advancements such as NASA's TEMPO mission, and ongoing extensive research in carbon sequestration, and sustainable technologies aimed at controlling water pollution and fostering conservation. Mention of various eco-friendly technologies like aquatic vegetation restoration, eco-remediation, bio-manipulation, wetlands rehabilitation, floating aquatic-plant bed systems, and adsorption technology showcases innovative solutions to environmental issues. Additionally, advocating for the transition to alternative energy sources from fossil fuels and stressing individual responsibility through actions like refraining from plastic use, prudent management of water and elec-

tricity, promoting cleanliness, biodiversity conservation, and implementing educational awareness programs in schools and colleges underline the holistic approach required for the survival of humanity. The UN Climate Change conferences, often referred to as Conference of the Parties (COP), are indeed crucial global events where different heads of nations deliberate and negotiate strategies to mitigate the effects of climate change. These conferences serve as pivotal forums for international cooperation and policymaking, fostering agreements and commitments to tackle climate-related challenges collectively. COP 28 in Dubai emphasizes the importance of this multilateral platform as the primary decision-making body focused on climate change. **Central objectives include setting ambitious targets to limit global temperature rise, aiding vulnerable communities in adapting to climate change impacts, and striving for net-zero emissions by 2050.** These goals are crucial for mitigating the adverse effects of climate change and safeguarding the planet's future. Pope Francis's remarks underscore the urgent need for decisive action, acknowledging the inadequacy of past responses to the unfolding environmental crisis. His call for binding agreements during the UN climate talks highlights the pivotal role of transitioning from fossil fuels to renewable energy sources like wind and solar power. This transition is crucial in reducing greenhouse gas emissions and combating climate change. The increasing intensity and frequency of disasters, including cyclones, floods, heavy rain, lightning, thunderstorms, heat waves, and the loss of biodiversity, is indicative of the profound challenges facing earth system. These events not only threaten human lives and infrastructure but also endanger ecosystems and biodiversity. While some countries have taken measures to address climate-related challenges, the need for global cooperation and more robust, comprehensive actions are of paramount significance. **Collaboration among nations, adherence to binding agreements, adoption of sustainable practices, and investment in renewable energy are essential for mitigating the impacts of climate change and ensuring the survival of human communities on Earth.** It's crucial to continue prioritizing climate action, implementing measures to mitigate emissions, adapt to changing environmental conditions, and foster resilience in the face of climate-related challenges for the well-being of current and

future generations. The ESS Panorama, Section-2 of this issue presents an insightful and comprehensive overview of various mitigation measures and commendable initiatives undertaken by India to address climate change and pollution. Massive Phosphate discovery in Norway has significant implications for global resource availability, **particularly in fertilizers, solar panels, and electric vehicle batteries**. The deposit, estimated at 70 billion metric tons, could potentially address global demand for essential resources and reduce dependency on external suppliers for Europe and other countries. The development of an optimization algorithm for quarrying dimension stones **aims to reduce waste production and resource loss represents Environmentally sustainable mining**. This algorithm considers discontinuities in rock masses, optimizing cutting patterns to enhance extraction while minimizing operational costs and environmental impact. The extraction of a rock core beneath 500 meters in Greenland's ice could provide insights into past ice stability and help in understanding the rate of ice melt due to global warming. This core contains valuable infor-

mation about past exposures and changes in Greenland's ice. India's Chandrayaan-3 lander successfully landed near the lunar south pole, conducting various experiments and measurements on the Moon's surface. This mission revealed the presence of elements like sulphur and offered insights into lunar soil composition, temperature variations, and subsurface characteristics. The occurrence of rare red auroras due to a hole in the Earth's magnetic field highlights unique astronomical phenomena.

Epilogue

These scientific discoveries and missions showcase significant advancements in space exploration, environmental research, resource discovery, and sustainable practices. They contribute to our understanding of various phenomena, paving the way for further advancements and addressing challenges related to climate change, resource sustainability, and environmental conservation. **The epilogue emphasizes the importance of balancing scientific progress with environmental stewardship for the sustainable existence of humanity.**

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