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Editorial

Sustainable Development: 30 Years Since the Rio de Janeiro Earth Summit

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This year marks the 30th anniversary of *Sustainable Development* being institutionalized at the United Nations Conference on Environment and Development (also commonly called the Rio de Janeiro "Earth Summit") in 1992. The adoption of the 2030 Agenda for Sustainable Development in 2015 further laid out a concrete plan to achieve the 17 interlinked Sustainable Development Goals (SDGs) by 2030. These SDGs include poverty alleviation, clean water, human health, climate change, and sustainable energy, and are collectively regarded as "a shared blueprint for peace and prosperity for people and the planet, now and into the future."[1] Sustainability is gradually being integrated into every aspect of our society. A recent example is the emergence of environmental, social, and governance (ESG), which is now impacting the operation of major corporations worldwide. Yet, despite recent advances, we cannot ignore the fact that massive efforts are required to meet the SDGs by 2030. For instance, among many striking statistics is the fact that the proportion of the global population using safely managed drinking water services only increased from 70 to 74% between 2015 and 2020.[2] The rate of progress would need to grow 4-fold to reach universal coverage by 2030. Now more than ever, we require concerted efforts on financing, technology dissemination, capacity building, and international collaboration. Science and innovation play a pivotal role in facilitating advances, and open access to key research results accelerates our progress. In this issue of *ACS Environmental Au*, we are pleased to present a collection of six publications that contribute to advancing our progress toward some of the key SDGs. We have categorized them based on the SDG that each publication is most relevant to.

SDG 3: GOOD HEALTH AND WELL-BEING

Polycyclic aromatic hydrocarbons (PAHs) are a class of hydrophobic organic compounds that pose severe human health risks. The efforts by Meierdierks et al. to quantify their phase distribution and fluxes across environmental compartments have increased our understanding of their long-term fate in the environment. The study highlighted dry deposition as the main process affecting the long-term fate of PAHs in atmosphere-soil exchange, while wet and gaseous deposition and temporal revolatilization from soils do not appreciably affect the PAHs in soils. Their research findings showed that the PAH loads in topsoils will continue to increase despite clean air regulations and declining emission rates in recent decades.

SDG 6: CLEAN WATER AND SANITATION

Arp and Hale provided a comprehensive review of the assessment approaches for measuring persistent, mobile, and toxic (PMT) and very persistent and very mobile (vPvM) substances in water, which are to be regulated by the European Commission. These substances have the highest likelihood of contaminating water resources over long temporal and spatial scales. The researchers examined the simulated half-life, organic carbon−water distribution coefficient, and alternative parameters of the substances registered under REACH (Regulation 1907/2006 on the registration, evaluation, authorization, and restriction of chemicals), known transformation products, and the substances detected in various water resources. Their Review called for further efforts to close the substantial data gaps.

Escher et al. reported a new high-throughput SH-SY5Y cell-based assay for evaluating the developmental neurotoxicity of water samples. The assay quantifies neurite outgrowth and reduced cell viability caused by contaminants in water samples. This study showed higher neurotoxicity for surface water samples in agricultural areas than wastewater treatment plant effluent samples. The new assay could be a valuable complement to existing effect-based monitoring tools.

Following their earlier Perspective on colloidal properties of microplastics,[3] Bharti et al. investigated the weathering of microplastics under simulated sunlight irradiation and their subsequent aquatic behavior and contaminant uptake capacity. Due to photo-oxidation, the originally hydrophobic microplastics became markedly more hydrophilic, thus becoming dispersible in water. Due to enhanced electrostatic attraction, the aged microplastics also adsorbed more positively charged chemicals and heavy metal ions. This study provided useful information for assessing the long-term transport and fate of microplastics in the environment.

SDG 12: RESPONSIBLE CONSUMPTION AND PRODUCTION

In their Review, Mohanty et al. have discussed the copyrolysis of biomasses and plastic waste for improved graphitic char

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production, a precursor material for high-quality graphene synthesis. They discussed the effect of temperature, feedstock type, reactor, and the role of catalysts on the yield and properties of the graphitic char and examined current state-of-the-art graphene characterization methods. They also provided an overview of the potential applications and their perspective on scalability, challenges, and future development trends.

SDG 13: CLIMATE CHANGE IMPACT AND ACTION

Climate change potentially exacerbates groundwater contamination. Mukherjee et al. reported the impact of climate change on groundwater nitrate pollution in northwest India, one of the most intensely groundwater-irrigated areas in South Asia. Their prediction, based on a machine learning framework, indicates areas that are at a persistently high risk of groundwater nitrate pollution if fertilizer input and land use are not managed properly.

The six publications in this issue represent recent efforts from these researchers to accelerate our progress toward achieving key SDGs. We thank these authors, as well as the reviewers and Editors, for their valuable contributions. As we reflect on this work and the work of the broader academic community toward a more sustainable future, we have many reasons to be optimistic. The world population is projected to reach 8 billion on 15 November 2022,[4] a day before this issue is published. It is astounding to think how much humanity has learned and achieved since the first *Homo sapiens* left Africa to settle around the globe. The innovation and determination of humankind sustain, and we can be optimistic that we will be prepared to face many challenges in achieving a more sustainable future.

We hope you enjoy reading our latest issue!

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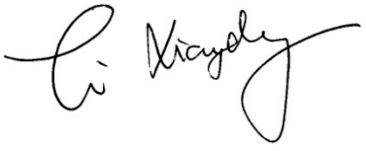

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Notes

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