Topic A: Tackling the Global E-Waste Crisis and the Circular Economy

Introduction

The global rise in electronic device production has generated increasing volumes of electronic waste (e-waste), posing serious environmental and health risks. In 2022, an estimated 62 million metric tonnes of e-waste were generated worldwide, but only 22.3% was formally collected and recycled, leaving hazardous substances such as lead, mercury, and cadmium to contaminate soil, water, and air, particularly in low- and middle-income countries.[1] Informal recycling and cross-border dumping exacerbate these risks, creating inequities in the global distribution of environmental harm.[2]

Addressing e-waste aligns with Sustainable Development Goal 12 on responsible consumption and production. The United Nations Environment Programme (UNEP) promotes circular economy approaches, including product design for longevity, take-back systems, and sustainable recycling, to minimize waste and recover valuable materials.[3]Circular economy strategies also reduce greenhouse gas emissions by limiting raw material extraction, linking to climate objectives. Extended producer responsibility schemes and technical guidance under the Basel Convention aim to support Member States in managing e-waste safely and efficiently.[4] Compliance monitoring is still a challenge for many developing countries, which affects policy effectiveness.

International cooperation is essential to tackle the global e-waste crisis. The Basel Convention regulates transboundary e-waste movement and promotes environmentally sound practices.[5] UNEP encourages partnerships between governments, industry, and civil society to build recycling infrastructure, share best practices, and provide capacity-building for developing countries.[6] [7] For UNEA delegates, addressing e-waste requires integrating environmental protection, sustainable consumption, and equitable access to technology while mitigating the risks associated with hazardous waste. Public awareness campaigns and community engagement

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[1] Global E-Waste Monitor 2024. (2024). *Electronic waste rising five times faster than documented e-waste recycling*. United Nations University (UNU), ITU, UNITAR. https://unitar.org/about/news-stories/press/global-e-waste-monitor-2024-electronic-waste-rising-five-times-faster-documented-e-waste-recycling

[2] UN Environment Programme. (2019). *Time to seize opportunity, tackle challenge of e-waste*. https://www.unep.org/news-and-stories/press-release/un-report-time-seize-opportunity-tackle-challenge-e-waste

[3] UN Sustainable Development Goals. (2025). *Hazardous waste generated by type, including e-waste (SDG indicator 12.4.2)*. https://sdgs.un.org/article/2a7-hazardous-waste-generated-type-including-e-waste

[4] UN Environment Management Group. (n.d.). *Inter-agency Group on Tackling E-Waste*. https://unemg.org/our-work/emerging-issues/innter-agency-issue-management-group-on-tackling-e-waste

[5] Basel Convention. (n.d.). *About the Basel Convention*. UNEP. https://www.basel.int/TheConvention/Overview

[6] UN SDGs. (2025). *Hazardous waste including e-waste*.

[7] UN Environment Management Group. (n.d.). *Tackling e-waste*.

are essential to ensure that e-waste management initiatives are inclusive, encouraging responsible disposal practices and fostering local participation in recycling programs.

Current Situation

Electronic waste has substantial environmental and human health impacts, especially where informal recycling predominates. E-waste contains hazardous substances that can contaminate soil, water, and air, leading to toxic exposures for nearby communities; less than a quarter of e-waste is formally recycled, leaving much to be handled in unregulated settings with high ecological and health costs.[8] In Ghana, assessments under the Basel Convention e-Waste Africa Programme identify large flows of used electrical and electronic equipment—much of it beyond repair—that contribute to contamination sites and expose workers and residents to pollution in the absence of adequate disposal infrastructure and regulatory enforcement.[9] In India, the informal sector processes a significant proportion of the country's e-waste, with open dumping and burning of components releasing hazardous chemicals into the environment, reflecting broader challenges in implementing environmentally sound recycling practices.[10] These practices also contribute to regional air pollution and public health crises, reinforcing the global impact of local actions.

Countries have introduced regulatory and policy measures to address these effects, often in coordination with international frameworks. The Basel Convention's *Technical Guidelines on Transboundary Movements of Electrical and Electronic Waste* guide Parties on distinguishing waste from non-waste and on managing e-waste streams in an environmentally sound manner, with amendments extending obligations on hazardous and non-hazardous e-waste to reduce unsafe exports and support national oversight.[11] Regional assessments under the Convention's e-Waste Africa Project have included multi-stakeholder analysis of informal recycling impacts and feasibility studies for sustainable management, aiming to build governance capacity and control illegal traffic of e-waste across borders.[12] Initiatives under the Convention and related partnerships also extend training and pilot projects to help governments formalize collection and treatment systems.

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[8] United Nations Environment Programme. (2025). *As electronic waste surges, countries look for answers*. https://www.unep.org/news-and-stories/story/electronic-waste-surges-countries-look-answers

[9] Basel Convention Secretariat & Partners. (2011). *Ghana e-Waste Country Assessment*. Secretariat of the Basel Convention. https://www.basel.int/portals/4/basel%20convention/docs/ewaste/e-wasteassessmentghana.pdf

[10] Mmereki, D., & Baldwin, A. (2018). *Emerging public health threat of e-waste management: global and Indian perspective*. Environmental Health Perspectives; PubMed. https://pubmed.ncbi.nlm.nih.gov/30098289/

[11] Basel Convention. (2025). *Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment*. https://www.basel.int/Implementation/PublicAwareness/NewsFeatures/Ewastetechnicalguidelines/tabid/5122/Default.aspx

[12] Basel Convention Secretariat. (2011). *Ghana e-waste assessment*.

UN bodies have also highlighted strategic approaches to strengthen national responses. UNEP's reporting emphasizes that rising e-waste generation and inadequate recycling infrastructure have contributed to high externalized costs to human health and ecosystems, and that upstream interventions—such as design for durability, improved collection systems, and formal recycling investment—are critical components of comprehensive policy responses.[13] Technical guidelines and capacity-building resources developed under the Basel Convention and the *Guideline for the Development of an E-Waste Management System* of the ITU aim to assist Member States in establishing lifecycle-based frameworks that align with sustainable consumption and production under SDG 12, including training, data collection, and integration of circular economy principles into national legislation.[14] The integration of digital tracking systems and IoT solutions can significantly enhance the traceability of electronic waste, enabling authorities to monitor collection and recycling processes in real time and prevent illegal dumping or cross-border trafficking of hazardous materials.

Conclusion

The global e-waste crisis presents urgent environmental, health, and social challenges that demand coordinated international, national, and local action. While frameworks such as the Basel Convention and UNEP guidelines provide essential regulatory and technical support, gaps remain in enforcement, infrastructure, and public participation.

Effective solutions require integrating circular economy principles, enhancing formal recycling systems, and leveraging digital tracking and IoT technologies to improve traceability and prevent illegal dumping. Equally critical are public awareness campaigns, community engagement, and capacity-building initiatives to ensure that all stakeholders—governments, industry, and civil society—participate in sustainable e-waste management. By combining regulatory oversight, technological innovation, and inclusive policies, Member States can reduce hazardous exposures, promote resource efficiency, and advance Sustainable Development Goal 12 on responsible consumption and production.

Questions to Address

1. How can countries balance economic growth and technology consumption with the need to reduce e-waste and protect human health and the environment?

[13]UN Environment Programme. (2025). *Electronic waste surges*.
[14] International Telecommunication Union. (2024). *Guideline for the development of an e-waste management system and achieving the e-waste targets of the Connect 2030 Agenda*. https://www.itu.int/epublications/fr/publication/itu-t-l-1031-2024-06-guideline-for-the-development-of-an-e-waste-management-system-and-achieving-the-e-waste-targets-of-the-connect-2030-agenda

2. What roles should producers, governments, and international organizations play in creating effective e-waste management systems and promoting circular economy principles?
3. How can the international community prevent the export of hazardous e-waste to countries with limited recycling infrastructure while still supporting global trade and technological access?
4. How can governments, civil society, and international organizations leverage public awareness campaigns and technological solutions, such as digital tracking systems and IoT, to enhance e-waste traceability, promote responsible disposal, and prevent illegal dumping?

Topic B: Governance of Solar Radiation Management and Climate Geoengineering

Introduction

As the climate crisis intensifies and global efforts continue to fall short of the Paris Agreement's temperature targets, policymakers and scientists have increasingly turned to unconventional and controversial responses to climate change. One such approach is solar radiation management (SRM), a category of climate geoengineering techniques designed to cool the Earth by reflecting a fraction of incoming solar radiation into space. Proposed methods include stratospheric aerosol injection and marine cloud brightening. While SRM could, in theory, reduce global temperatures relatively rapidly, it does not address the root cause of anthropogenic climate change—rising concentrations of greenhouse gases in the atmosphere—and raises profound concerns regarding environmental impacts, intergenerational risk, and governance at a planetary scale.[15] [16] SRM could also provoke geopolitical tensions, public opposition, and ethical dilemmas over who decides deployment.

In recent years, the United Nations and its specialized agencies have begun to engage more explicitly with SRM as both a scientific and policy issue, reflecting its potential implications for international climate cooperation. A 2025 brief by the UN Secretary-General's Scientific Advisory Board notes that although SRM might temporarily moderate temperature increases, it is associated with significant scientific uncertainties and risks. These include uneven regional cooling, disruptions to precipitation patterns, and potential harm to stratospheric chemistry.[17] Similarly, the United Nations Environment Programme (UNEP) emphasizes that SRM remains speculative and poorly understood, warning that it should not be viewed as a substitute for ambitious mitigation and adaptation efforts. UNEP further highlights the possibility of

[15] UN Secretary-General's Scientific Advisory Board. (2025, May 28). *Solar radiation modification* [Brief]. United Nations.
[16] Intergovernmental Panel on Climate Change. (2023). *AR6 Synthesis Report: Climate change 2023*. IPCC.
[17] UN Environment Programme. (2025). *Electronic waste surges*.

unintended and potentially irreversible consequences for climate systems and ecosystems that have yet to be fully characterized.[18] This highlights the importance of adaptive governance, precautionary research protocols, and transparent public engagement before any potential field experiments.

These concerns underscore the urgent need for comprehensive and coherent global governance frameworks to oversee SRM research, development, and any potential future deployment. At present, international legal and institutional arrangements are fragmented, with no single body possessing a clear mandate to regulate SRM activities. Existing instruments—such as the Convention on Biological Diversity's precautionary approach to geoengineering—provide partial guidance but lack enforceability and universal coverage.[19] This governance gap has prompted calls for multilateral oversight mechanisms, robust transparency and accountability protocols, and inclusive international scientific dialogue. Crucially, such discussions must incorporate perspectives from climate-vulnerable regions, which are likely to bear disproportionate risks from both climate change and potential SRM interventions.[20] Stakeholder engagement must ensure that voices from low- and middle-income countries, small island states, and Indigenous communities are included in decision-making. In this context, debates surrounding SRM governance intersect with broader normative questions about equity, intergenerational justice, and the appropriateness of technological "fixes" in comparison to systemic emissions reductions under Sustainable Development Goal 13 (Climate Action).

Current Situation

Solar radiation management has affected international climate discussions for climate-vulnerable countries, particularly small island developing states such as Tuvalu and the Maldives. These states face high exposure to sea-level rise and limited capacity to influence SRM research agendas, illustrating equity and governance challenges. In UN General Assembly and UNEP consultations, representatives from these countries have expressed concern that SRM research by major emitting states could reshape global climate priorities, even without deployment. UN reports document that these states view SRM debates through the lens of survival, as sea-level rise already threatens their territory, while SRM discussions occur largely outside their control.[21] [22]

[18] United Nations Environment Programme. (2025, November 28). *Solar radiation modification: No substitute for real climate action* [Report]. UNEP.
[19] Secretariat of the Convention on Biological Diversity. (2010). *Decision X/33: Biodiversity and climate change*. United Nations.
[20] The Wilson Center. (n.d.). *Solar radiation management: Governance and international cooperation.*
[21] UN Secretary-General's Scientific Advisory Board. (2025). *Solar radiation modification* [Brief]. United Nations.
[22] United Nations Environment Programme. (2025). *Solar radiation modification: No substitute for real climate action* [Report]. UNEP.

In South Asia, SRM has been discussed in relation to potential regional climate impacts, especially on monsoon-dependent countries such as India and Bangladesh. UN scientific assessments note that modelled SRM scenarios may alter precipitation patterns, which has raised concerns in UN forums about food security and water availability in these regions. These concerns have been reflected in UNEP and IPCC-related discussions, where countries reliant on predictable rainfall have highlighted the sensitivity of their climate systems to large-scale atmospheric interventions.[23] This underscores the need for regional risk assessments and inclusion of local expertise in evaluating potential SRM scenarios.

At the global governance level, SRM has highlighted ethical tensions between industrialized countries, including the United States and European states, and developing countries with limited decision-making influence. UN bodies have noted that SRM research capacity is concentrated in a small number of technologically advanced states, while potential risks would be globally distributed. This imbalance has been discussed within the Convention on Biological Diversity and UN human rights forums as an ethical issue related to unequal power, cross-border environmental effects, and long-term responsibility, even in the absence of SRM deployment.[24] [25]

Conclusion

Solar radiation management (SRM) presents profound ethical, environmental, and governance challenges. While it could temporarily reduce global temperatures, it does not address greenhouse gas emissions and carries uncertainties, including uneven regional impacts on precipitation, ecosystem risks, and potential long-term stratospheric harm. Decision-making power is concentrated in a few technologically advanced states, while climate-vulnerable countries, such as small island developing states and monsoon-dependent nations, face disproportionate exposure. This highlights the need for governance frameworks that are equitable, inclusive, and accountable, incorporating perspectives from all affected regions.

Current international frameworks provide partial guidance but lack enforceable mechanisms or universal coverage. The Convention on Biological Diversity's precautionary approach offers a foundation, yet no single body regulates SRM research or deployment. Ethical considerations, including intergenerational justice, consent of affected populations, and global risk-sharing, must guide experimentation and implementation. Multilateral oversight, transparency protocols, and inclusive scientific dialogue are essential to ensure that technological interventions do not exacerbate inequalities or undermine mitigation efforts.

[23] Intergovernmental Panel on Climate Change. (2023). *AR6 Synthesis Report: Climate change 2023*. IPCC.
[24] Secretariat of the Convention on Biological Diversity. (2010). *Decision X/33: Biodiversity and climate change*. United Nations.
[25] United Nations Human Rights Council. (2022). *Promotion and protection of human rights in the context of climate change.*

The SRM debate emphasizes balancing innovative climate interventions with systemic mitigation, precautionary research, and robust governance. Potential solutions include establishing an international SRM regulatory body, developing region-specific risk assessments, and integrating ethical reviews alongside scientific evaluation. Combining scientific rigor, multilateral cooperation, and ethical stewardship can help explore SRM responsibly while safeguarding present and future generations, in line with Sustainable Development Goal 13 on Climate Action.

Questions to Address

1. Whether acknowledging solar radiation management within UN climate discussions affects the priority given to emissions reduction and mitigation commitments.
2. How decision-making authority over SRM research or potential use should be considered when its impacts could extend to countries with very different levels of responsibility for climate change.
3. The ethical implications of SRM research being led primarily by scientifically advanced countries, while climate risks may be borne disproportionately by more vulnerable states.
4. To what extent are existing UN legal and human-rights frameworks adequate for addressing a technology with global and long-term consequences?
5. How can the international community develop inclusive, enforceable governance frameworks to ensure SRM research and potential deployment respect equity, human rights, and the long-term interests of climate-vulnerable nations?