



Input on Technologies related to Climate Change and their Impacts on Human Rights

Special Rapporteur on Climate Change

South Centre*

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Background

The world faces deeply interconnected environmental crises, including climate change, biodiversity loss, land degradation, and pollution.¹ To address these obstacles, structural transformation is needed and cannot be based on technological progress alone. Effective climate action requires a whole-of-government and whole-of-society approach that links technological advancement with socio-economic assessments to avoid impacts that exacerbate inequalities and climate vulnerabilities.

Current climate-related technology activities could deepen existing inequalities and limit the full enjoyment of human rights. For example, extraction of transition minerals,² geo-engineering and land-intensive energy transition projects typically depend on large-scale water extraction that threaten fragile high-altitude wetlands and drain vital freshwater aquifers.³ The social impacts of these processes extend beyond environmental

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¹ United Nations Environment Programme. (2025). *Global Environment Outlook 7: A future we choose – Why investing in Earth now can lead to a trillion-dollar benefit for all*. <https://wedocs.unep.org/items/bba44efd-7715-4054-8432-92b270ee9d67>

² Alywin, J., Didier, M., & Mora, O. (2023). The lithium industry and its human rights impacts: The case of the Lickanantay people in Chile. *Wyoming Law Review*, 23, 107–114. <https://doi.org/10.59643/1942-9916.1489>

³ Human Rights Council Advisory Committee. (2023). *Impact of new technologies intended for climate protection on the enjoyment of human rights* (UN Doc. A/HRC/54/47). United Nations General Assembly. See also *Eco Oro Minerals Corp. v. Republic of Colombia*, ICSID Case No. ARB/16/41, Award on Damages (July 15, 2024). <https://icsid.worldbank.org/cases/case-database/case-detail?CaseNo=ARB/16/41>

degradation, as they could exacerbate social injustices and increase the risk of conflict in areas vulnerable to climate-related disasters and resource competition.⁴

The expansion of digital technologies, such as artificial intelligence, can similarly worsen human rights impacts, not only through natural-resource use but also because its life cycle distributes benefits and environmental effects unequally. Global South countries often manage resource extraction and hardware disposal for artificial intelligence, while having lower computing capacity to develop domestic systems and limited participation in decision-making processes for climate-related artificial intelligence development. Therefore, a holistic, human rights approach to technological interventions is needed to reduce the risks these processes pose to those countries and planetary boundaries.

The Special Rapporteur signalled that a human rights lens on these impacts asks questions that carbon accounting does not.⁵ Who controls the system? Who bears the system's local costs? Who can claim harm from the system's outputs? A full set of rights is relevant here, including the right to life, right to health, right to clean water and sanitation, right to food, right to a healthy environment, right to information, right to participation, right to remedy, right to non-discrimination, rights of Indigenous Peoples, right to development, and right to benefits from scientific progress and its applications.⁶

This input to the Special Rapporteur on Climate Change examines the multidimensional human rights implications of climate-related technologies, spanning geo-engineering, fossil-dependent transition technologies, waste-to-energy systems, and artificial intelligence, recognising that a narrow "carbon tunnel vision" shifts ecological, resource, and economic burdens onto vulnerable communities and developing countries. It considers how the binding due diligence standards affirmed by the International Court of Justice (ICJ),⁷ the International Tribunal for the Law of the Sea (ITLOS),⁸ the right to science under Article 15 of the ICESCR and the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC) protect the rights of vulnerable

⁴ United Nations Environment Programme, & European Union. (2022). *Climate change and security partnership project - Final report: March 2017 - February 2022*. <https://wedocs.unep.org/bitstreams/74a43ac3-e394-4a75-ae76-198bf05b5a9c/download>

⁵ OHCHR, 'Call for Input – Technologies related to climate change and their impacts on human rights' (Special Rapporteur on climate change, 2026) <<https://www.ohchr.org/en/calls-for-input/2026/call-input-technologies-related-climate-change-and-their-impacts-human-rights>> accessed 24 September 2026.

⁶ Committee on Economic, Social and Cultural Rights, 'General Comment No 25 (2020) on Science and Economic, Social and Cultural Rights' (30 April 2020) UN Doc E/C.12/GC/25; Elisa Morgera, 'Access to Information on Climate Change and Human Rights' (18 July 2024) UN Doc A/79/176, paras 51–56.

⁷ *Obligations of States in Respect of Climate Change*, Advisory Opinion, 2025 I.C.J. Rep. 187 (July 23). <https://www.icj-cij.org/case/187>

⁸ *Request for an Advisory Opinion Submitted by the Commission of Small Island States on Climate Change and International Law*, Case No. 31, Advisory Opinion (Int'l Trib. for the Law of the Sea May 21, 2024). https://www.itlos.org/fileadmin/itlos/documents/cases/31/Advisory_Opinion/C31_Adv_Op_21.05.2024_corr.pdf

communities, promote sustainable and equitable resource management and protect the rights of future generations.

What are the human rights concerns arising from climate-related technologies, and specifically from: geo-engineering (CDR, CCS, SRM); fossil fuel-dependent "transition technologies"; waste-to-energy technologies; and relevant AI and outer space technologies?

To analyse the human rights concerns arising from climate-related technologies, it is first necessary to avoid a ‘carbon tunnel vision’ in life-cycle assessments (LCAs), as focusing only on operational greenhouse gas emissions can obscure other social and environmental impacts. Article 15(1)(b) of the International Covenant on Economic, Social and Cultural Rights (ICESCR), recognising the right to science, should serve as a benchmark for the use of the best available science to incorporate comprehensive criteria for LCA assessments. For developing countries, this assessment matters more because climate-related technologies may externalise ecological and socio-economic burdens onto marginalised populations, reproducing historical extractivism under the mantle of green transitions.

At the same time, climate-related technologies related to geo-engineering risk affecting the food security and livelihoods of communities dependent on forests, marine and coastal ecosystems, arable land, and freshwater aquifers, and increasing the dispossession of land of smallholder farmers, pastoralists, small-scale fishers and Indigenous Peoples.⁹

Fossil-dependent transition technologies, such as industrial carbon capture and storage (CCS), blue hydrogen, and expanded liquefied natural gas (LNG), may prolong fossil fuel dependency while failing to deliver human rights benefits. In addition, investment made in necessary infrastructure and supply chains can create an ‘infrastructure lock-in,’ as such costs and contracts could disincentivise a transformative approach to zero-emissions alternatives.¹⁰ Similarly, reliance on these systems can increase debt exposure in sectors that “contribute little to the sort of structural transformation and productivity growth that is crucial for developing countries to achieve a just transition.”¹¹

While artificial intelligence (AI) offers promising capabilities for climate mitigation, weather forecasting, and early warning systems, it is necessary to recognise that it is not

⁹ Human Rights Council. (2023). Impact of new technologies intended for climate protection on the enjoyment of human rights: Report of the Human Rights Council Advisory Committee (A/HRC/54/47). <https://digitallibrary.un.org/record/4020175>

¹⁰ Erickson, P., Kartha, S., Lazarus, M., & Tempest, K. (2015). Assessing carbon lock-in. *Environmental Research Letters*, 10(8), Article 084023. <https://doi.org/10.1088/1748-9326/10/8/084023>

¹¹ United Nations Conference on Trade and Development. (2022). A global just transition: Climate and development goals in a world of extreme inequalities (Background Note, COP27 High-Level Event Series). https://unctad.org/system/files/non-official-document/UNCTAD_Just_Transition_BACKGROUND_NOTE_COP27.pdf

environmentally neutral.¹² AI social and environmental risks include mineral extraction, toxic e-waste dumping, and intense localised pressure on energy and freshwater supplies.¹³ In addition, AI is characterised by data biases and limited representation of developing countries in global AI governance, which excludes linguistic minorities and vulnerable communities from the benefits of AI in climate action and represents a risk for data sovereignty.¹⁴

At the same time, the current global financial and intellectual property architectures enables the ‘monopolisation’ of green technologies and limits technology-transfer mechanisms.¹⁵ This creates a “green technology divide” that limits access to the climate mitigation and adaptation technologies developing countries need. Thus, climate-related technology deployment should be grounded in a human rights approach that considers a full life-cycle assessment, applies the precautionary principle in implementation, prioritises necessity tests against less intrusive alternatives, respects states' sovereign right to regulate, encourages locally developed infrastructure, and avoids creating technological dependencies.

Are there individuals or groups who see their human rights particularly impacted by climate-related technologies, including in light of intersecting forms of discrimination? Which human rights are the most impacted?

Different groups and individuals can be impacted by the development and deployment of climate-related technologies. Identifying such challenges requires avoiding a ‘carbon tunnel vision,’ focusing rather on the intersecting forms of discrimination that different groups and communities face, such as geography, race, gender, socioeconomic status, among others. For example, extracting transition minerals necessary for green technologies could deplete water basins, forests, and ancestral territories. If extractive and processing projects are executed without free, prior, and informed consent, they also risk violating the right to self-determination and heightening the risk of social conflict.¹⁶

Using these technologies in rural and coastal regions risks increasing displacement, disruption, and acute food insecurity. Projects related to bioenergy with carbon capture

¹² United Nations University Institute for Water, Environment and Health. (2026). Rising emissions, depleting water and vanishing land—UN scientists: AI is threatening natural resources for billions. <https://unu.edu/inweh/news/environmental-cost-of-AIs-Enrgy-use-carbon-water-and-land-footprints>

¹³ United Nations Environment Programme. (2025). AI has an environmental problem. Here's what the world can do about that. <https://www.unep.org/news-and-stories/story/ai-has-environmental-problem-heres-what-world-can-do-about>

¹⁴ United Nations, High-Level Advisory Body on Artificial Intelligence. (2024). Governing AI for humanity: Final report. United Nations. https://www.un.org/sites/un2.un.org/files/governing_ai_for_humanity_final_report_en.pdf

¹⁵ Li, N. (2026). *Transparency without results: UN climate reports fail to show effective transfer of technology to developing countries*. South Centre. https://www.southcentre.int/wp-content/uploads/2026/06/Tech-Transfer-Report_Li-June-2026.pdf and Esteves, P. (2026). *Intellectual property and the green technology divide: Barriers, policy spaces and collective options for developing countries*, Policy Brief No. 162, South Centre. <https://www.southcentre.int/policy-brief-162-2-september-2026/>

¹⁶ Aylwin, J., Carmona, R., & Chávez, P. (2023). *Transition minerals and Indigenous Peoples' rights: The case of lithium mining in Chile and the Atacama basin*. International Work Group for Indigenous Affairs (IWGIA).

and storage (BCCS) usually require large land enclosures, which limit open-access land available for farming and livestock herding, and undermine food security and traditional economic and cultural systems of small farmers and pastoralists. Likewise, marine geo-engineering also impacts fish stocks and damages ocean seabeds, turning climate challenges into broader human rights and food security impacts, including migration, loss of livelihoods, and cultural heritage.¹⁷

Similarly, waste-to-energy (WtE) technologies could impact informal waste workers and marginalised populations. Local governments privatise waste streams to intensive incineration and gasification plants. Informal workers are displaced into recycling highly toxic sectors, such as metals, plastics, and paper, increasing health risks and depriving them of their primary means of economic survival.¹⁸ The lack of alternative work options pushes these vulnerable populations into systemic poverty, violating their rights to work, an adequate standard of living, and a clean, healthy, and sustainable environment.

The human rights analysis of climate-related technologies should also consider the rights of children and future generations. Focusing only on carbon dioxide removal (CDR) and geoengineering processes tends to justify delayed emissions reduction and allow irreversible ecological disruptions across temporal boundaries.¹⁹ Therefore, deploying these technologies requires human rights-compliant mechanisms that reduce emissions and avoid institutionalising intergenerational injustice under the banner of climate action.

This discussion should also consider the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC). Deploying climate-related technology should not shift the burden of mitigation to communities that have contributed the least to historical emissions. Advanced economies, with greater historical responsibility and financial capabilities, should not only reduce their domestic decarbonisation and guarantee climate finance, but also avoid increasing land-intensive carbon offsets, extractivist transition projects, or untested geoengineering experiments in developing countries. Recognising the CBDR-RC principle in the use and deployment of these technologies could help avoid entrenching existing global inequalities, safeguard the right to development, and protect vulnerable populations from the technological and ecological risks associated with a green transition.

What is the best available science to assess, through a full life-cycle assessment (LCA), the human rights impacts of climate technologies? To what extent do these assessments include all available options and align with the ecosystem approach?

As discussed above, assessment of climate technology should not be confined to the operational phase. There is a need for robust LCAs that cover impacts throughout the

¹⁷ Human Rights Council. (2023), n. 7.

¹⁸ Dias, S. M. (2020). The open dump dilemma: How to help the environment and respect human rights. WIEGO Blog. <https://www.wiego.org/blog/open-dump-dilemma-how-help-environment-and-respect-human-rights/>

¹⁹ Human Rights Council. (2023), n. 7.

entire process from raw mineral extraction, to hardware manufacturing, operational resource needs and end-of-life disposal. Current assessment mechanisms focus on administrative compliance and narrow corporate greenhouse gas accounting, which usually overlook broader human rights impacts.

Beyond greenhouse accounting, a scientifically sound assessment should evaluate the structural socio-economic impacts of these technologies, including whether supply chains reproduce unequal global trade patterns and commodity dependence in developing countries. Upstream technology deployment often triggers intense competition over local resources while concentrating benefits and profits in foreign jurisdictions.²⁰

Therefore, assessing the human rights impact of climate-related technologies requires considering their socio-economic impacts across the life cycle. The United Nations Environment Program (UNEP) Social Life Cycle Assessment (SLCA) guidelines assess the positive and negative human impacts along the product value chain, taking into account workers' rights, child protection, community health and value-chain governance in relation to international labour and human rights standards.²¹ Using the SLCA alongside systemic frameworks from the Intergovernmental Panel on Climate Change (IPCC) Assessment Reports²² and UNEP's GEO-7²³ report bridges social impacts and Earth-system impacts. This bridge will allow the assessment of non-linear tipping points and planetary boundaries with human rights impacts that could exacerbate socio-economic inequalities and existing vulnerabilities, before locking communities into capital-intensive, hardware-centric pathways.

What are the obligations arising from stringent due diligence to prevent significant harm to the climate system and environment? How should the principle of CBDR-RC be interpreted in this context?

As recently confirmed by the ICJ²⁴ and the ITLOS,²⁵ international environmental and human rights law imposes upon states an objective and binding due diligence obligation

²⁰ United Nations Environment Programme. (2009). *Title of the report in sentence case: Subtitle if applicable* (Report No. if available). <https://wedocs.unep.org/rest/api/core/bitstreams/a8c00a35-628a-4dce-b8ac-ceec36e481a1/content>

²¹ Ibid.

²² Intergovernmental Panel on Climate Change. (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Core Writing Team, H. Lee, & J. Romero, Eds.). IPCC. <https://doi.org/10.59327/IPCC/AR6-9789291691647>

²³ United Nations Environment Programme. (2025), "UN Report: Investing in Planetary Health Would Deliver Higher GDP, Fewer Deaths, Less Poverty," press release, December 9, 2025, <https://www.unep.org/news-and-stories/press-release/un-report-investing-planetary-health-would-deliver-higher-gdp-fewer>.

²⁴ *Obligations of States in Respect of Climate Change*, Advisory Opinion, 2025 I.C.J. Rep. 187 (July 23). <https://www.icj-cij.org/case/187>

²⁵ *Request for an Advisory Opinion Submitted by the Commission of Small Island States on Climate Change and International Law*, Case No. 31, Advisory Opinion (Int'l Trib. for the Law of the Sea May 21, 2024). https://www.itlos.org/fileadmin/itlos/documents/cases/31/Advisory_Opinion/C31_Adv_Op_21.05.2024_corr.pdf

to exercise the greatest care to prevent significant transboundary harm to the climate system.²⁶ This overarching principle requires ongoing surveillance, precautionary regulation and thorough prior impact assessments before public bodies can approve or license new climate technologies.

In implementing these obligations, the CBDR-RC principle should be taken into account. Developed countries have a higher standard of care because of their historical responsibility for the accumulation of emissions and their control over financial and technological assets. This obligation includes phasing out domestic fossil fuel infrastructure and providing public, grant-based climate finance and green technology transfers to developing countries.²⁷

Implementing the CBDR-RC in the deployment of climate-related technologies implies that states should not attempt to fulfil domestic mitigation targets through speculative technologies that externalise ecological, resource, and land burdens into developing countries.²⁸ In contrast, developing host states remain obligated to exercise reasonable care within their available state resources. As a result, historically responsible states bear primary responsibility for underwriting capacity-building, funding independent verification regimes, and providing structural remedies.

What are the obligations arising from the right to science for public authorities, and the responsibilities of private companies, finance actors, and researchers?

The ICJ and ITLOS advisory opinions on climate change acknowledge the importance of science as authoritative judicial evidence for assessing States' obligations under the UNFCCC and the Paris Agreement. They also provide a strong basis for revitalising Article 15 of the ICESCR.

In its 2024 advisory opinion, ITLOS hold that the due diligence standard owed under Article 194(1) of the United Nations Convention on the Law of the Sea (UNCLOS) to prevent marine pollution from greenhouse gas emissions is an objective, strict obligation, which must be assessed by reference to the 'best available science', specifically identifying the reports of the IPCC as the authoritative benchmark. Similarly, in its 2025 advisory opinion, the ICJ confirmed and expanded this reasoning by rejecting the idea that climate treaties constitute a closed *lex specialis*, finding that international human rights treaties such as the ICESCR and ICCPR, as well as customary international law, all

²⁶ Uribe Terán, D. (2025). *Leveraging the ICJ opinion to secure a just climate future for the South during COP30* (Climate Policy Brief No. 29). South Centre. https://www.southcentre.int/wp-content/uploads/2025/11/CPB29_Leveraging-the-ICJ-Opinion-to-Secure-a-Just-Climate-Future-for-the-South-during-COP30_EN.pdf

²⁷ Li, N. (2026), n. 15 and Uribe Terán, D. (2026). *The First Conference on Transitioning Away from Fossil Fuels: Reclaiming multilateralism for a just transition* (South Centre Informal Note). South Centre. https://www.southcentre.int/wp-content/uploads/2026/04/SC-IN_The-First-Conference-on-Transitioning-Away-from-Fossil-Fuels-Reclaiming-Multilateralism-for-a-Just-Transition-Apr-26.pdf

²⁸ Human Rights Council. (2023), n. 7.

operate in parallel to regulate state conduct.²⁹

In particular, the ICJ stressed that States have a strict, non-discretionary due diligence duty to prevent transboundary environmental harm and to protect human rights.³⁰ This due diligence obligation should be assessed against objective scientific consensus. Together, these landmark opinions effectively operationalise Article 15(1)(b) of the ICESCR, as it requires focusing on scientific assessments, and by underscoring mandatory international cooperation and capacity-sharing. The ICJ and ITLOS confirm that access to, participation in, and governance guided by the best available science are legally indispensable imperatives for state legitimacy, survival and international accountability.

What are the challenges and opportunities to defossilize our economies in the context of climate-related technologies?

Climate-related technologies offer strong opportunities to scale up transition economies, but they still face severe legal, economic, and institutional hurdles, including, for example, those emerging from the international investment regime. This regime comprises more than 2,200 investment agreements in force. Most contain Investor-State Dispute Settlement (ISDS) mechanisms that allow private investors to submit claims against States including for enacting regulations or policies aligned with climate action and obligations.³¹

A major problem for countries is the use of speculative discounted cash flow (DCF) accounting methods to award damages based on projected future profits and not only sunk costs. This methods create billions of dollars of potential liability for transitioning states, leading in many instances to a “regulatory chill” that inhibits the uptake of climate-related technologies and environmental policy.³²

Defossilisation offers an opportunity to move to sovereign, decentralised, community-based energy systems. To take advantage of this opportunity, developing countries need to actively remove legacy legal and administrative bottlenecks, particularly by modernising or terminating outdated international investment treaties with ISDS provisions and introducing provisions that safeguard States' regulatory power over climate action from the jurisdiction of arbitral tribunals.

Regulatory policy space enables states to protect domestic green industrial policies and deploy local renewable technologies without risking litigation from foreign investors. In

²⁹ *Obligations of States in Respect of Climate Change*, Advisory Opinion, 2025 I.C.J. Rep. 187 (July 23). <https://www.icj-cij.org/case/187>, para. 145.

³⁰ Ibid. Para. 289.

³¹ Uribe Terán, D. (2026). *Addressing the systemic risks of ISDS to climate action* (South Centre Informal Note). South Centre. https://www.southcentre.int/wp-content/uploads/2026/06/SC-IN-Addressing-the-Systemic-Risks-of-ISDS-to-Climate-Action_5-June-2026.pdf

³² Marzal, T. (2021). Against DCF valuation in ISDS: On the inflation of awards and the need to rethink the calculation of compensation for the loss of future profits. *EJIL: Talk!* <https://www.ejiltalk.org/against-dcf-valuation-in-isds-on-the-inflation-of-awards-and-the-need-to-rethink-the-calculation-of-compensation-for-the-loss-of-future-profits/>

this context, multilateral initiatives like the Santa Marta Working Group on Investment Arbitration (ISDS Working Group) can play a key role in helping States align international investment frameworks with climate obligations and coordinating collective legal defences and actions in the face of challenges arising from ISDS mechanisms.

Recommendations

Climate technology governance needs to go beyond narrow carbon accounting to a rights-centred, systemic framework that supports a just and equitable transition. In this context, four inter-related priorities can be identified to protect vulnerable populations, in particular maintaining sovereign regulatory space and aligning technological deployment with developing countries' needs and planetary boundaries:

1. **Require comprehensive life-cycle assessments:** Multi-criteria Social Life Cycle Assessments (SLCAs) should be performed on the best available science to evaluate impacts across the entire value chain, from mineral extraction to hardware disposal, not just operational impacts of climate-related technologies.
2. **Implement strict due diligence:** Rigorous prior impact assessments, strict necessity tests for less intrusive alternatives, and the precautionary principle should be considered before licensing climate technologies. Consider participation and consultation with affected communities, including free, prior, and informed consent (FPIC) from affected Indigenous Peoples and local communities.
3. **Respect CBDR-RC principle:** Developed countries should meet their mitigation responsibilities through domestic decarbonization, climate finance with public grants, and effective technology transfer that avoid shifting the impacts of climate-related technologies to vulnerable communities.
4. **Protect regulatory space from ISDS:** Modernise or terminate international investment treaties that limit States' capacity to react against climate change. This requires aligning collective action towards ISDS mechanisms that cause regulatory chill on decarbonization and defossilisation policies, including mandatory transfer of technology.