# Earth Observation Data, Climate Change, and Human Rights

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Where climate change represents one of the biggest threats to human security, the international community must rise to meet this challenge before time runs out. As climate change magnifies the relationship between the environment and protection of human rights, untold harm has been wrought upon human health and dignity within recent years by the most significant increase in greenhouse gas emissions since the industrial revolution. This has endangered the future sustainability of the planet through the unsavory degradation of both the environment and human life. Consequently, over the second half of the twentieth century, the advent of space and satellite technology has revolutionized humanity's ability to monitor the health of the planet, from upper atmospheric layers to surface measurements.

In the immediate aftermath of the Second World War, the international community agreed upon a set of fundamental human rights, under which every human was to be treated equally and with dignity in principle and practice under international law. Several decades later, International Space Law (ISL) affirmed that outer space was the province of all humankind. Toward the end of the millennium, the reality of anthropogenic climate change spurred nations into action, to coordinate upon the international monitoring of environmental conditions across the Earth. Use of outer space and space technology emerged as a prominent resource for monitoring climate change. This resulted in a convergence of environmental science with space applications and international policy, guided by the sentiment of outer space as the province of all humankind. Therefore, the process of Earth observation is of great importance for monitoring climate change, and in gauging its effects upon basic human rights.

What follows is an review of the relationship between human rights and international environmental protections; the legal instruments used by nation-states and international organizations; and an analysis of the core problems which arise in the context of human rights and climate change, and the use of data acquired from remote sensing of the Earth from outer space.

## Human Rights and the Environment

An increasingly intimate connection between climate change and human rights has been observed through the rising threat posed by climate events to agriculture, food security, and biodiversity worldwide - manifested across displaced communities and sinking homes. A recent UN Environmental Program (UNEP) study, in collaboration with Columbia Law School identified several significant impacts of climate change upon human rights[1]:

- Impacts on the ecosystem and natural resources;
- Impacts on physical infrastructures and human settlements; and
- Impacts on livelihoods, health, and security.

Regarding impacts on the ecosystem and natural resources, access to water is possibly the most critical. The growing competition for its use in agriculture, food security, industry, and human settlements underscores the immediate connection between climate change and the enjoyment of fundamental human rights[2]. In this context, satellite data is essential for the monitoring of environmental variations and, with particular reference to food security, for tracking food production in the face of unexpected climate developments upon agriculture[3].

Concerning physical infrastructure and human settlements, climate change has a visible impact on both urban and rural areas. This is evident through several human rights principles - including the right to life, right to adequate living, right to housing, and the right to property. Satellite technology is useful for observing and predicting the impacts of climate change on physical infrastructure. Similarly, the impact of climate change upon livelihoods, health, and security stresses how the environmental conditions caused by climate change may contributed to increases poverty, political instability, and constitute a threat to human security[4]. Migratory movements represent the direct consequence of these impacts of environmental changes on human life.

Article III of the Universal Declaration of Human Rights (UDHR) extols and upholds the right to life, liberty, and the security of person. This is highlighted under Article XXV which deals with the right to an adequate standard of living, the right to health and well-being of individuals and their family - including in the provision of food and housing. In order for States to prevent foreseeable adverse effects of climate change on the enjoyment of human rights and human dignity, the utilization and sharing of Earth observation data is of paramount importance.

The rights of future generations represent a crucial consideration within international law. The concept of intergenerational equity, the ontology of sustainability, is prevalent within conversations on international human rights and constitutional rights, especially concerning environmentalism. The climate emergency has raised several concerns regarding the possibility for future generations to enjoy basic human rights principles[5]. Satellite data and images are examined and considered by various international courts in the course of human rights cases.[6] The international and domestic relevance of space law and policy are demonstrated across the capacity of policymakers to recognize and adapt in monitoring climate change as an issue of global collective concern.

[1] https://wedocs.unep.org/bitstream/handle/20.500.11822/9530/-Climate_Change_and_Human_Rightshuman-rights-climate-change.pdf.pdf?sequence=2&amp%3BisAllowed=

[2] Ibid.

[3] From a team conversation with Tanja Harrinson (Planet Lab).

[4] See n.1

[5] Catherine Redgwell (2016). Principles and Emerging Norms in International Law: Intra- and Inter-generational Equity, in Kevin R. Gray, Richard Tarasofsky, and Cinnamon Carlarne (eds), The Oxford Handbook of International Climate Change Law.

[6] ESPI - European Space Policy Institute, *Space in Support of Human Rights*, 2020, https://doi.org/10.1007/978-3-030-35426-8

## Earth Observation to Monitor Climate Change

There exist many laws and regulations supporting the use of Earth observation data for climate change monitoring purposes. The Global Climate Observation System (GCOS) is an operational system sponsored by the UNEP, the World Meteorological Organization (WMO), and other organizations. GCOS serves as the climate observation component of the Global Earth Observation System of Systems (GEOSS),[7] a critical element in the process of climate change detection, monitoring, and management through the comprehensive observations that it provides. It is built on existing observing systems, in the belief that d international and national needs for climate observations can only be met through the unified aggregation and enhancement of different systems.

The design and implementation of GCOS observing systems follow general standards and practices to achieve interoperability and coherence of data. In embodying the spirit of international cooperation in space, essential GCOS observations are made available for free and unrestricted international exchange.[8] This is provided for under WMO Resolutions 25 and 40, and the data policies of the Intergovernmental Oceanographic Commission (IOC) and International Council for Science (ICSU).

Furthermore, within ISL jurisprudence, Principle X of the 1986 UN General Assembly's "Principles Relating to Remote Sensing of the Earth from Outer Space" promotes the protection of Earth's natural environment as a general objective of remote sensing of the Earth's surface from space. This includes improving natural resources management, land use, and environmental protections.[9] Although not legally-binding, the UN Principles have found extensive confirmation in state practice.

Principle IV likewise establishes the freedom of sensing from space. This is based on the 1967 Outer Space Treaty (OST), representing the most important international space law treaty - defining the elementary aspects of outer space activities, such as the peaceful uses of outer space in consideration of the global public good and human environment.[10] Article I of the OST states that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all humankind.

Another important aspect of remote sensing is that of data sharing and open access policies. This is crucial when considering the role of Earth observation in improving the quality of life on Earth. The Land Remote Sensing Policy Act (Policy Act) adopted by the US in 1992 [11] held that data collected through the Landsat Satellite Program[12] could be commercialized - limiting the public's free and open access to such data. However, in 2008, the U.S. Geological Survey adopted a free and open Landsat

[7] The Intergovernmental Oceanographic Commission of UNESCO and the International Council for Science.
[8] World Meteorological Organization,*Global Climate Observing System. Ensuring the Availability of Global Observations for Climate*, November 2007, https://library.wmo.int/doc_num.php?explnum_id=6348. See also Lewis J. A., Ladislaw S. O., Zheng D. E., *Earth Observation for Climate Change. A Report of the CSIS Technology and Public Policy Progra*m, June 2010, https://ciaotest.cc.columbia.edu/wps/csis/0019051/f_0019051_16310.pdf
[9] Marchisio S., *The 1986 United Nations Principles on Remote Sensing: A Critical Assessment*, Scritti in onore di Gaetano Arangio-Ruiz, 2004, ISBN: 9788888321905
[10] Meishan Goh G., *Legal Implications of Space Applications for Global Climate Change*, Report of the Symposium jointly organized by the International Institute of Space Law and the European Centre for Space Law on the occasion of the 47th Session of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, 31 March-01 April 2008, https://iislweb.org/docs/2008_IISL-ECSL-report.pdf
[11] Gouyon Matignon L., *The Land Remote Sensing Policy Act of 1992*, 12 September 2019, https://www.spacelegalissues.com/the-land-remote-sensing-policy-act-of-1992/ (accessed 25.06.2021)
[12] The United States Geological Survey (USGS), https://www.usgs.gov/faqs/what-landsat-satellite-program-and-why-it-important?qt-news_science_products=0#qt-news_science_products (accessed 09.09.21)

data policy.[13] The increased use of Landsat data has been beneficial to many segments of society and plays a critical role in understanding climate change.[14]

Support for data sharing and open access has also been highlighted within Copernicus, the European Union's Earth observation programme. The programme is a key tool for the implementation of the European Green Deal and to tackle climate change effects.[15] Among the services provided by Copernicus, the Climate Change Service (C3S) offers free and open access to climate data to support adaptation and mitigation policies of the European Union and to the rest of the World.[16] The C3S also elaborates monthly maps which present the current condition of the climate using key climate change indicators in order to increase awareness on the impact of climate change on the Earth.[17]

[13] Landsat Data Distribution Policy, 2 January 2008, available at https://prd-wret.s3.us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/atoms/files/Landsat_Data_Policy_0.pdf

[14] Zuh *et Al.*, *Benefits of the free and open Landsat data policy*, Remote Sensing of Environment, Volume 224, pp. 382-385, 2019, https://www.sciencedirect.com/science/article/pii/S0034425719300719. See also NASA-National Aeronautics and Space Administration, *Landsat's Critical Role in Understanding Climate Change*, https://landsat.gsfc.nasa.gov/sites/landsat/files/2013/02/LandsatClimateChangeFactSheet.pdf (accessed 30.06.2021)

[15] Lukaszczyk A., From Orbit to Soil: How Earth Observation Can Help Achieve the European Green Deal, May 2021, https://spacewatch.global/2021/05/spacewatchgl-share-from-orbit-to-soil-how-earth-observation-can-help-achieve-the-european-green-deal/

[16] Copernicus Programme Climate Change Service website https://climate.copernicus.eu/about-us

[17] The maps are available at https://climate.copernicus.eu/climate-bulletins

## Legal and Social Challenges Using Earth Observation

### Empowering Users to Interpret Satellite Data

The increasing availability and coverage of satellite data for climate monitoring represents a tremendous force for public good. It can facilitate scientific research and catalyze pre-emptive action to save lives. However, interpreting satellite data to retrieve vital climate insights requires technical resources, expertise, and an ability to translate technical results into knowledge informing policy. In many cases, states or groups experiencing the most severe impacts of climate change lack sufficient resources to fully utilize satellite data. While states with such resources may assist in some capacity, a continuing distance between themselves and the consequences of climate crises contributes to a lack of urgency and general displacency.

The availability of satellite data is a step in the right direction, but there is a need to empower underdeveloped states and vulnerable groups in its use. One possible approach is to encourage private-public partnerships. Private companies could perform technical tasks and data interpretation for governments or other users. Even if satellite data is inexpensive, having educational and technological capacities to interpret data is an issue potentially undermining the notion of transparency and data sharing. This represents an added complex dimension, with its own discrete issues surrounding the attempted proliferation of satellite data uses worldwide.

Though there is no binding set of norms to standardize satellite data analysis, the Committee on Earth Observation Satellites' (CEOS) Data Democracy Initiative is making satellite data more readily and freely available, especially to developing countries. The initiative also includes enhanced data dissemination, sharing of software tools, training, and technology transfer to end users. CEOS also recognises that GEOSS Data Sharing Principles serves as the basis for data access for a greater good, and hence contributes to GEOSS Data Core by making data available on a full and open basis.[18]

### Data Sharing and Privacy Concerns

When considering satellite data, both data sharing and privacy present significant concerns. There is always the risk of data being exploited or used for nefarious purposes by third parties. One way of mitigating this, as employed by Planet Labs Inc.,[19] is to constitute an internal ethics committee. The committee at Planet Labs Inc., after a review, reserves the right to refuse access to data to any user of Planet images[20].

The issue of data sharing and privacy for satellite data depends heavily on the kind of data being collected and by whom.[21] Though there exist no binding international laws to tackle privacy issues arising out of Earth observation, Article 12 of UDHR protects an individual's right against arbitrary interference with their privacy. This is also reinforced under Article 17 of the International Covenant on Civil and Political Rights (ICCPR). Similarly, Article 8 of the European Convention on Human Rights (ECHR) and other national legislations protect against violations of privacy by public authority. However, these regulations merely manage to cover privacy issues arising out of the use of satellite data by public authorities, and are almost completely unregulated for commercial or private use.

In the absence of a uniform set of law at international level to regulate data sharing and privacy issues, the domestic law of each country addresses this issue to an extent. This may be approached through purchasing exclusive rights to such images, by barring imaging of certain regions, or by banning release of images of certain locations. States can also impose restrictions on the capacity of the satellites,

[18] Taken from the CEOS Rio Statement, available at: http://www.ceos.org/images/General/14Oct2010- CEOS-RIO-Statement.pdf - GEOSS stands for Global Earth Observation System of Systems.
[19] Planet Labs Inc. https://www.planet.com/
[20] From a team conversation with Tanja Harrinson (Planet Lab).
[21] Schoenmaker, A., Community Remote Sensing Legal Issues, April 2011, pp. 4, https://swfound.org/media/62081/schoenmaker_paper_community_remote_sensing_legal_issues_final. pdf, (accessed 25.06.2021).

resolution limits and export control along with compulsory licensing and authorization to operate from their territory.[22] It is important to note that in most cases, the resolution necessary to identify individuals in satellite images is restricted to government spy satellites.

**Inconsistent Methodologies for Analyzing Satellite Data**

While satellite data may be used to study climate change in a wide range of ways, a uniform framework may be necessary in some instances. International environmental law does not prescribe a single methodology for States to calculate their historic emissions. As States adopt inconsistent ways to analyze and report emissions data, it can cause hindrance in monitoring a State's compliance under international environmental agreements. A consistent set of satellite data is therefore necessary to identify non-compliant acts and helps deter them.

A key and current example entails Intended Nationally Determined Contributions (INDCs) under the 2015 Paris Agreement,[23] where states in good faith commit to limiting their contributions to climate change through emissions. The details of their INDCs are at the responsible State's discretion to determine. As such, some nations present details on how they measure emissions, while others do not. This gives states the ability to adjust their metrics as convenient, reducing the reliability and consistency of reported emissions.[24] In this instance the international doctrine of common but differentiated responsibilities, whereby States have a common purpose but different levels of responsibility to address said purpose,[25] must operationalize commonality to understand the responsibilities of individual States. Hence, the use of independent satellite imagery could be a valuable tool for consistently tracking emissions, but a framework for doing so must be established.

[22] NOAA—National Oceanic and Atmospheric Administration, About Commercial Remote Sensing Regulatory Affairs, 20 March 2019, https://www.nesdis.noaa.gov/CRSRA/, (accessed 25.06.2021).
[23] Paris Agreement to the United Nations Framework Convention on Climate Change, Art 2(1)(a), T.I.A.S. No. 16-1104, Dec. 12, 2015, entered into force 4 November 2016.
[24] UNFCCC Interim NDC Registry, https://www4.unfccc.int/sites/ndcstaging/Pages/Home.aspx (accessed 18.08.2021)
[25] Ellen Hey, Common but Differentiated Responsibilities, February 2011, Max Planck Encyclopaedia of Public international Law https://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e1568

## Conclusion

Space and space technology present a useful set of tools for the observance and monitoring of climate change on Earth. Through the use of satellite data, changes in Earth's ecosystem and the patterns of human settlements, livelihoods, and security can be traced and quantified. Numerous challenges remain however, as the interpretation of information into formats useful for policy development requires specialized skills, and the technical barrier to the gathering and retrieval of space-based information can exist as a barrier to its use.

In leveraging the power of Earth observation technologies in support of human rights, states must consider measures to respect, protect, and fulfill human rights through the utilization and management of satellite data. Prioritizing broad respect for the right to life, right to shelter, and right to food underscores the intimate and interdependent relationship between space, human rights, and the environment.

Regardless, the use of satellite technology as an important human rights and environmental resource has been acknowledged by the international community, and the needed legal frameworks for its successful implementation are undergoing continuing development. In the struggle to combat the pressing crisis of climate change, space applications in the form of satellite data represents a powerful and transformative tool for reinforcing human rights and international environmental protections.