

Appendix 3: Analysis of existing international organisations and treaties potentially relevant to SRM research

Introduction

This Appendix surveys the existing landscape of institutions and treaties that may be most relevant to SRM governance, with an attempt to highlight aspects relevant to research governance. The format is as follows: the "overview" section introduces the purpose or mandate of the institution or treaty, as well as its membership. The "relevance" section describes provisions or functions that pertain to SRM governance. Where pertinent, the "capacity" section assesses the ability of a body to collect or process science, translate science to policy, set targets, monitor activities and enforce compliance, or transfer technology or funds. The "legitimacy" section provides an assessment of an organization or treaty's effectiveness, fairness, or authority.

1 Organisations

United Nations Environment Programme (UNEP) - 1972

Overview

UNEP works within the United Nations (UN) system to conceptualise and catalyse new initiatives and governance frameworks and to coordinate existing regimes along environmental lines. It has 192 Member States.

Relevance to SRM

UNEP has no mandate over SRM or any form of geoengineering but could be relevant to SRM governance as a synthesiser of environmental trends and as a first mover on the governance of nascent environmental issues. For example, UNEP co-founded the Intergovernmental Panel on Climate Change and catalyzed the international negotiations that led to the Montreal Protocol. In 1980, UNEP's Governing Council issued SRM-relevant international guidelines for weather modification techniques, calling for information sharing and for prohibition of transboundary harm.

Scientific and governance capacity

Nominally, UNEP coordinates all UN bodies and member states on environmental issues through the Environmental Management Group (EMG) and Global Ministerial Environment Forum (GMEF). Historically, it has also played a strong role in collecting, analysing, and integrating data from other organisations, such as convention secretariats, universities, science institutes, and nongovernmental organisations (NGOs), in order to synthesise broad environmental assessments for use at the global level.

In practice, however, UNEP's coordinating role is hampered by limited funding and operational resources and power struggles with other UN bodies. Moreover, UNEP does not directly govern the regimes it has helped establish, but passes this role on to other bodies. Thus, in terms of SRM, UNEP could prompt the emergence of a new body to which the governance of SRM research could be devolved.

Legitimacy

UNEP earns its legitimacy from its forward-looking approach and global ubiquity. This scope and cross-cutting approach, however, renders its mandate (in the eyes of some) broad to the point of ambiguity. Its effectiveness, and thus legitimacy, is also restricted by its limited resources, which place it low in the UN pecking order. It has remained only a programme, rather than becoming a specialised agency or international organisation within the UN system.

World Meteorological Organization (WMO) - 1950

Overview

The WMO is the UN's authoritative voice on the science of the Earth's climate and atmosphere. It has 189 members.

Relevance to SRM

The WMO's focus on climate and atmospheric science make it topically relevant to SRM research governance. For example, the WMO coordinates weather and climate observations, data exchange, and assists in technology transfer. It contributes to the mitigation of natural and human-induced disasters, such as those associated with chemical and nuclear accidents and volcanic eruptions. The WMO also contributes to policy formulation on weather-related safety and security issues. Further, the WMO co-sponsors programmes for scientific research and assessments to support environmental agreements on global environmental concerns such as ozone-layer depletion, climate change, desertification and biodiversity.

Although the WMO's weather and climate-related scientific authority make it potentially relevant for SRM research governance, other aspects of SRM governance (e.g., those relating to dispute resolution, deployment, or liability regimes) would not fit under the WMO's mandate.

Scientific and governance capacity

WMO policy is determined by the World Meteorological Congress, which meets every four years. This timing could be too infrequent to effectively govern a novel topic like SRM. The Executive Council, which implements Congress decisions, meets once a year. Each Member country is represented by a Permanent Representative, typically the director of the National Meteorological or Hydrometeorological Service. An SRM research governance system would likely benefit from the participation of similar technical experts.

Legitimacy

The WMO maintains a high degree of legitimacy in terms of its scientific authority and the democratic, technical nature of the Congress. Further, the WMO contributed to establishing the well-respected Intergovernmental Panel on Climate Change (IPCC) and hosts the IPCC's Secretariat in Geneva.

The Intergovernmental Panel on Climate Change (IPCC) - 1988

Overview

IPCC is a scientific intergovernmental body tasked with assessing scientific, technical, and socio-economic information relevant to climate change. It reports on peer-reviewed, published science and does not carry out its own original research. It was established by the WMO and UNEP. Currently, 194 countries are members of the IPCC.

Relevance to SRM

The IPCC already reviews and assesses scientific literature on climate change and its impacts in order to inform policy makers. The IPCC has long recognised the radiative forcing effects of sulphate aerosols, and an assessment of the scientific basis and potential impacts of geoengineering will be included in the IPCC's Fifth Assessment Report, scheduled to be finalized in 2014.

Scientific and governance capacity

The IPCC focuses on tasks allotted to it by WMO Executive Council and UNEP Governing Council resolutions and decisions as well as on actions in support of the UN Framework Convention on Climate Change (UNFCCC). The IPCC is best at establishing consensus and reporting existing research. Its work is explicitly policy neutral and is not policy prescriptive. Its role thus does not correspond well with the policy and governance needs of a novel and controversial topic like SRM.

Legitimacy

IPCC reports are widely cited in almost any debate related to climate change. National and international responses to climate change generally regard the IPCC as authoritative. This respect helped the IPCC share the 2007 Nobel Peace Prize.

International Maritime Organisation (IMO) - 1948

Overview

The IMO is a UN agency responsible for the safety of shipping and the prevention of marine pollution by ships. Its participation includes 169 Member States, three Associate Members, and 79 international NGOs having consultative status.

Relevance to SRM

The IMO mandate covers the environmental (including climatic) impacts of shipping emissions, which contain sulphate aerosols. Moreover, the IMO recognises the importance of mitigating six greenhouse gases mentioned in the Kyoto Protocol through IMO's Marine Environment Protection Committee (MEPC).

This nascent link to global climate policy could provide the potential for the IMO to explicitly incorporate the climate-forcing effects of SRM into its agenda; however, this would not be consistent with the MEPC's emphasis on mitigation.

Scientific and governance capacity

The IMO's environmental advisory body, the MEPC, would be best placed to govern SRM research (if done within the IMO) on account of its technical knowledge of the regulation of shipping pollutants. However, regulating SRM, especially experimentation, is likely very different from regulating shipping pollutants.

Legitimacy

The IMO is global in its scope; members include most OECD countries, all major emerging economies, and the majority of developing countries. With a clear mandate and widespread participation by key stakeholders, the IMO is generally viewed as effective in regulating international shipping. However, progress on mitigating ship emissions has been relatively slow to date, and extending the IMO role beyond its core mandate may also stretch its legitimacy.

Global Environmental Facility (GEF) - 1991

Overview

The GEF is a cooperative venture between UNEP, UNDP, and the World Bank. It was established to channel multilateral aid for environmental protection to developing countries and has 182 members.

Relevance to SRM

SRM governance may benefit from funding to support capacity building or to compensate for claimed damages from SRM research or deployment. Financial assistance and compensation could be directed to member states in accordance with a potential agreement on SRM governance.

If the GEF's mandate were expanded, such funding could plausibly flow through the GEF, which currently provides grants to developing and transitioning countries for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. The GEF's role as a funder, however, limits its usefulness for other aspects of SRM governance.

Scientific and governance capacity

The GEF is a major funder of projects aimed at improving the global environment. It has allocated \$9.2 billion, supplemented by more than \$40 billion in co-financing, for more than 2,700 projects in more than 165 developing and transitioning countries. A Scientific and Technical Advisory Panel provides technical and scientific advice on the GEF's policies and projects. The GEF also serves as the financial mechanism for the Convention on Biological Diversity and the UNFCCC.

Legitimacy

The GEF has been identified as an "inclusive and open international organization", due in part to a somewhat balanced representation of donor and recipient countries in its governing council, increased transparency, and direct participation by NGOs through formal consultations.

Group of Twenty (G-20) - 1999

Overview

The G-20 was established to promote open and constructive discussion between industrial and emerging-market countries on issues related to global economic stability, and to support international growth and development. The G-20 comprises the finance ministers and central bank governors of 19 countries and the European Union. Key officials from the International Monetary Fund (IMF) and World Bank also participate in G-20 meetings.

Relevance to SRM

Although the G-20 is not yet a full institution, some consider it a vital forum for global governance issues. While its primary focus is global economic and financial governance issues, some see it as likely to play an important role in a future climate change agreement. Nonetheless, there is disagreement within the G-20 on a wide range of issues, including climate change policy.

Scientific and governance capacity

The G-20 has no permanent staff of its own, and the Chair rotates between members. Not having a permanent staff hinders the capacity of the organization to govern novel issues, such as SRM.

The G-20 strives to achieve consensus on recommendations and measures to be adopted. There are no formal votes or resolutions on the basis of fixed voting shares or economic criteria. Every G-20 member has one "voice" with which it can take an active part in G-20 activity.

Legitimacy

Together, member countries represent around 90 percent of global gross national product, 80 percent of

world trade, and two-thirds of the world's population. While the G-20's economic weight and influence over the global economy grant it considerable standing, decisions made by a group of twenty may be perceived as having little legitimacy for the other 174 sovereign states. Decisions made by the G-20, however, could theoretically influence actions in more inclusive arenas, such as the UNFCCC.

2 Agreements

United Nations Framework Convention on Climate Change (UNFCCC) (1992) and Kyoto Protocol (1997)

Overview

The mandate of the UNFCCC, and its associated Kyoto Protocol, is to stabilise anthropogenic greenhouse gas concentrations at levels that preclude severe climatic changes and their attendant physical, social and economic impacts. The UNFCCC enjoys widespread participation with 194 Parties; there are 191 Parties to the Kyoto Protocol, but the US is not among them.

Relevance to SRM

Although SRM is not explicitly mentioned in the UNFCCC, the UNFCCC is thematically, structurally, and topically relevant to SRM.

First, the UNFCCC is thematically relevant because SRM is often framed as a complement to mitigation and adaptation responses. Thus, the UNFCCC could logically be extended to govern mitigation, adaptation, and SRM under the same regime. For example, the UNFCCC could be extended to include SRM as an emergency response, contingent on having met mitigation obligations and exhausted adaptation possibilities. The UNFCCC could also establish a fund for SRM (similar to that for adaptation) to pay for assistance or compensate for harm.

Second, the UNFCCC may be structurally relevant to SRM because the existing language and framework on adaptation (such as the guidelines for national adaptation programmes of action) could be adapted for SRM. Factors relevant to both include the need to minimize "adverse effects on the economy, on public health and on the quality of the environment" and "address convincing threats of climate and climate change", including those related to health, food security, water availability, biological diversity, and loss of land.

The UNFCCC also includes mechanisms that regulate private actors. For example, the Clean Development Mechanism (CDM), which certifies carbon offsets, applies to private actors. The CDM appeals procedure also allows projects rejected by the CDM to be challenged by private parties.

Third, the UNFCCC is topically relevant to SRM. While there are no provisions in the UNFCCC that explicitly contemplate SRM, there are provisions that could be construed as relevant to SRM. In particular, the UNFCCC requires that Parties "take precautionary measures to anticipate, prevent or minimize" the causes and effects of climate change "at the lowest possible cost", exchange "information related to the ... consequences of various response strategies", and "give full consideration to ... the specific needs and concerns of developing country Parties arising from the adverse effects of ... the implementation of response measures". Even though SRM was not negotiated in the drafting of this text, "precautionary measures", "response strategies", or "response measures" arguably could be read to include SRM.

The definition of adaptation could arguably be stretched to include SRM. This definition is not given in the Convention text, but is adopted from the IPCC and can be found in the UNFCCC and IPCC website glossaries. "Adaptation" is an "[a]djustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." This definition could literally include SRM; however, given it was not negotiated as part of the Convention or adopted as a COP decision, it has no direct, binding force.

Scientific and governance capacity

The UNFCCC, through the Intergovernmental Panel on Climate Change (IPCC), has the ability to generate scientific consensus and bring it into the policy-making arena. The Subsidiary Body for Scientific and Technological Advice (SBSTA) meets twice a year and advises the Conference of the Parties on matters of climate, the environment, technology, and method.

The Achilles' heel of UNFCCC governance is its slow decisionmaking process and overburdened agenda. The Conference of the Parties (COP) has adopted a consensus-based (or at least consensus minus one) decision-making approach, which means that there is considerable diplomatic leeway for a small number of states to block decisions approved by the majority, and – crucially for SRM – to cause gridlock on all novel issues. The UNFCCC and its associated Kyoto Protocol are also struggling to tackle a large and constantly expanding agenda.

Legitimacy

The UNFCCC is the only convention specifically focused on climate change and has near universal participation (with 194 Parties); as a result, some perceive it as the only legitimate forum in which to discuss climate change. This near universal membership and the UNFCCC's high profile in environmental governance is both a blessing and a curse: consensus-based decision-making allows a small minority to block agreement while the political prominence of the regime makes it difficult to tackle controversial issues. The existing tensions in the regime could be exacerbated by the controversies surrounding the impacts and ownership of SRM technologies, particularly between developed/emerging economies and least developed/physically vulnerable states.

Convention on Long-Range Transboundary Air Pollution (CLRTAP) - 1979

Overview

The mandate of CLRTAP is to research, control and reduce the environmental damage and health hazards caused by long-range transboundary air pollution. There are 51 Parties to this regional Convention, including most European countries, the US, and Canada.

Relevance to SRM

CLRTAP has adopted three protocols (Helsinki 1985, Oslo 1994, and Gothenburg 1999) that regulate sulphur emissions. For example, the Gothenburg Protocol attempts to “control and reduce emissions of sulphur . . . that are caused by anthropogenic activities and are likely to cause adverse effects on human health, natural ecosystems, materials and crops, due to acidification, . . . as a result of long-range transboundary atmospheric transport”. These Protocols could be relevant to sulphur aerosol SRM in imposing country-based ceilings on sulphur emissions; however, research indicates that sulphur deposits from stratospheric aerosols will likely contribute insignificantly to acidification.

Since these provisions only set limits on emissions or transboundary fluxes without distinguishing SRM activities from other emission sources, CLRTAP and its protocols would not effectively regulate SRM. Further, these protocols focus on counteracting the impacts of emissions on health, agriculture, and ecosystems, and do not account for sulphates' direct effect on the climate.

Scientific and governance capacity

The representatives of the Contracting Parties constitute the Executive Body, which meets at least annually to review the implementation of the Convention and establish working groups on implementation and development.

CLRTAP has proved to be very effective in regulating anthropogenic air pollution, and has substantially decreased air pollutant emissions in Europe during the last twenty years (~100 billion Euros per year have been saved in terms of avoided damage by sulphur and nitrous oxide emissions). However, because this success is the result of compliance, CLRTAP's enforcement mechanisms are currently untested.

Legitimacy

CLRTAP's decades-long familiarity with long-range transboundary air pollution monitoring and assessment, and its comprehensive data on aerosol particles, has earned the Convention high levels of public credibility and acceptance, particularly in Europe. Its ability to address climate-forcing transboundary air pollutants that are not covered by the UNFCCC, including black carbon, lends it additional flexibility. Its membership, however, is regional and limited. It does not include China, Brazil, Mexico and India, which now are considered to be major contributors to long-range air pollution. Its current geographical exclusiveness could be one factor preventing the Convention from developing an international and inclusive framework for SRM research governance.

Convention on Biological Diversity (CBD) - 1992

Overview

The CBD provides a legal framework for the conservation, sustainable use and equitable sharing of biodiversity by its 193 Parties (the US notably not among them). It is a United Nations Convention, initiated by UNEP.

Relevance to SRM

The CBD is the only United Nations treaty body to make a decision regarding SRM research to date. At the 10th Conference of the Parties (COP) in Nagoya, 2010, the CBD issued a decision inviting the Parties to: *"[e]nsure . . . in the absence of science based, global, transparent and effective control and regulatory mechanisms for geo-engineering . . . that no climate-related geo-engineering activities that may affect biodiversity take place, until there is an adequate scientific basis on which to justify such activities . . . , with the exception of small scale scientific research studies that would be conducted in a controlled setting . . . , and only if they are justified by the need to gather specific scientific data and are subject to a thorough prior assessment of the potential impacts on the environment"*.

The wording of this decision is hortatory and ambiguous, and it is not legally binding upon the Parties. Since the decision only *invites* the Parties to take action, state implementation of this decision will likely be weak and piecemeal. The decision leaves open the possibility that "small scale studies" contributing to the development of an adequate scientific basis for larger scale experimentation would be allowed, and there is an implication that an adequate scientific basis would make geoengineering permissible.

Aside from the recent decision, the CBD requires Parties to identify activities that have or are likely to have "significant adverse impacts" on the "conservation and sustainable use of biological diversity," to monitor their effects, and to regulate or manage such activities. If a Party finds the presence or likelihood of significant adverse impact in SRM activities, it would then be required to regulate or manage them. Since neither regulation nor management is elaborated by the Convention, Parties would retain much discretion and flexibility in implementation. The governance of SRM through the CBD would therefore be decentralized, likely with substantial variations across nations.

Two types of SRM activities may be considered to have significant adverse impact on biodiversity. SRM involving sulphate aerosols could impact biodiversity, but the effects may be difficult to detect in the absence of a significant deployment. SRM techniques that include selectively planting reflective vegetation or other land use change may also affect biological diversity if done on a sufficiently large scale.

Scientific and governance capacity

The CBD's scientific advisory body is known as the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). It was, in part, responsible for the Nagoya "moratorium", although there is evidence that this was largely attributable to the CBD's links to key NGOs opposed to geoengineering rather than to the CBD's subsidiary bodies. The CBD has weak compliance mechanisms; it can issue hortatory and advisory statements on violations, but leaves monitoring and enforcement to its constituent Parties. Further, since the CBD only has jurisdiction over activities that would affect biodiversity, some SRM techniques would be exempted from its limited coverage.

Legitimacy

The CBD's legitimacy with regard to SRM is hampered by the ambiguous nature of the decision taken at Nagoya. The "moratorium" is not legally binding, and how individual states will interpret it or see it as a deterrent is uncertain.

Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) - 1977

Overview

ENMOD grew out of a concern over the "dangers of the use of environmental modification techniques for military purposes." It is the only international treaty that directly covers environmental modification and has 74 Parties.

Relevance to SRM

ENMOD prohibits "military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury" to any other Party, while explicitly preserving the use of environmental modification techniques for peaceful purposes. It does not mention research or experimentation; however, as clarified in the Understanding Relating to Article I (which is not incorporated into the Convention but part of the negotiating record), the scale of the prohibition does not preclude small-scale, short-duration activities, which may effectively distinguish between experimentation and deployment.

Even if SRM activities are considered "environmental modification techniques," the environmental modifications must be "military" or "hostile" and used as "the means of destruction, damage or injury" to be prohibited. Further, SRM whose effects are domestically confined is excluded from ENMOD, which covers damage to any *other* Party. This is consistent with a concern for military use but does not inform the regulation of SRM within national boundaries.

Prohibited modifications also must be "widespread, long-lasting or severe". The negotiating committee defined "widespread" to encompass "an area on the scale of several hundred square kilometers", "long-lasting" to mean a duration "lasting months or approximately a season", and "severe" to involve "serious or significant disruption or harm to human life, natural and economic resources, or other assets". SRM experimentation could be designed to not exceed any of these triggers, though deployment would likely have to be widespread and long lasting to be effective.

These qualifications severely limit potential applications to SRM, and proving hostile intent in these activities likely would be difficult.

Scientific and governance capacity

Since ENMOD's mandate is to *ban* hostile weather modification techniques, it is not conducive to regulating

permissible SRM. As to exchange of scientific knowledge, it does recommend “the fullest possible exchange of scientific and technological information on the use of environmental modification techniques for peaceful purposes”. This seems to suggest that information involving SRM technologies should be shared, though the ENMOD Treaty has historically facilitated little scientific exchange.

ENMOD lacks implementation and compliance mechanisms and leaves it to each Party to monitor and enforce the Treaty. The Treaty only requires a majority to adopt amendments, but it would require a great deal of modification to adopt a framework that provides guidance as well as a governing body to continuously monitor and enforce. Further, Parties do not convene on a regular basis.

Any Party may file a complaint with the United Nations Security Council against another in breach of Convention obligations. Since the Security Council is theoretically the most powerful body in global governance, if any ENMOD Party were to lodge a complaint about SRM, the debate on geoengineering would be brought to the UN’s highest stage. The capacity of this system, however, remains untested, as no Party has ever been formally accused of breach of ENMOD’s provisions.

Legitimacy

ENMOD provides an obsolete and largely untested system of governance, with a low membership (48 signatories and 74 Parties, though these include most major economies), and infrequent convening of its Parties.

Vienna Convention for the Protection of the Ozone Layer (1985) and Montreal Protocol on Substances that Deplete the Ozone Layer (1987)

Overview

The Vienna Convention and Montreal Protocol’s mandate is to protect human health and the environment against the effects of modifying the ozone layer. Rather than regulating levels of ozone-depleting substances (ODS), it treats them as a hazard and seeks to eliminate them. The Vienna Convention has 194 parties.

Relevance to SRM

Sulphate aerosols are not included as ODS and are unregulated by the Montreal Protocol. There are procedures for identifying, assessing, and phasing out new substances with ozone-depleting potential not currently on the list of controlled substances, but sulphur compounds are commonly generated through the burning of fossil fuels and thus are neither “new” nor do they directly deplete ozone. Further, it may not be feasible to eliminate them. Therefore, although sulphate aerosols create chemical byproducts that destroy ozone, sulphate aerosols do not fall under the scope of the Montreal Protocol.

The wider scope of the Vienna Convention could be read to cover sulphate aerosols, but new agreements or protocols would have to be adopted to more adequately govern them.

Scientific and governance capacity

The Montreal Protocol has a good record of compliance, and is lauded as one of the most successful and coherent environmental regimes. It has universal membership (it has been ratified by 196 states), and a credible track record of assessment, regulation, and the translation of science to policy.

The Montreal Protocol requires a two thirds majority to adopt legally binding decisions, which allows it flexibility to expand its mandate and operations. This is in contrast to the consensus requirement of the UNFCCC.

Legitimacy

Even though a decisionmaking process that requires only a supermajority versus a consensus may diminish legitimacy because it lacks universal consent, the effectiveness and perceived fairness of the Protocol offsets that concern. In fact, the Protocol has enjoyed broad support in both developed and developing countries thanks to its successful implementation of the common but differentiated responsibilities principle (developing nations were given a decade's grace period before undertaking ODS cuts, and were allowed to increase ODS consumption for a time). Furthermore, the regime's funding mechanism, the Multilateral Fund, recognised the special needs of Southern states for financial and technology transfer, thus persuading Southern states to ratify the Protocol, and earning the Protocol near-universal membership.

However, considering that the UNFCCC has comparable processes and has not made significant progress on greenhouse gas governance, it seems plausible that the key to the Montreal Protocol's success is the fact that ozone depleting substances, unlike greenhouse gases, are not sufficiently tied to economic growth. If the Protocol were to adopt any SRM governance role - and its accompanying geopolitics - the coherence of its mandate would no doubt be muddled, and the legitimacy of the regime could be impaired.

Antarctic Treaty System (ATS) – 1959

Overview

The ATS comprises the 1959 Antarctic Treaty and several other agreements, including the 1991 Protocol on Environmental Protection to the Antarctic Treaty (PEPAT). The Antarctic Treaty was developed to preserve Antarctica for peaceful purposes (such as international scientific cooperation). PEPAT has 31 consultative parties and 12 non-consultative parties.

Relevance to SRM

The Antarctic Treaty has little applicability to SRM, but the PEPAT could be relevant in that it requires Parties conducting activities in the Antarctic Treaty area to "limit adverse impacts on the Antarctic environment" and to avoid "adverse effects on climate or weather patterns".

These provisions could apply to SRM activities conducted in the Antarctic Treaty area. For instance, some SRM deployment could be focused in the polar regions to slow icecap melting. Such techniques could implicate PEPAT, for example, if a resulting increase in cloud cover reduces the solar energy available to Antarctic ecosystems and leads to changes in the Antarctic climate. To avoid these PEPAT obligations, a party could simply conduct the activity outside of the Antarctic Treaty area.

Nevertheless, Annex II of the PEPAT – prohibiting the taking and harmful interference of native fauna and flora – arguably may not be restricted to activities in the Antarctic Treaty area. Because parts of Annex II do not explicitly include the "Antarctic Treaty area" limitation, these provisions may arguably govern SRM activities implemented elsewhere that result in the "significant adverse modification of habitats" of native flora and fauna in the Antarctic.

However, the ATS is not a good candidate for comprehensive SRM regulation, even with amendments, simply because of its limited applicability and geographic coverage.

Scientific and governance capacity

The Antarctic Treaty establishes the "Antarctic Treaty Consultative Meeting" (ATCM), for Parties who have established a threshold level of interest in Antarctica, to periodically meet to formulate and recommend measures to further the objectives of the Treaty. The ATCM meets annually. The Treaty System is thus governed by the few who are Antarctic Treaty Consultative Parties.

Under the Antarctic Treaty and PEPAT, Consultative Parties designate those who may conduct inspections; and non-compliance is enforced through, among other things, negotiations, mediations, or adjudication. PEPAT further instructs Parties to adopt their own regulations and procedures to ensure compliance and determine liability for damages.

The Scientific Committee on Antarctic Research (SCAR) provides independent scientific advice to the Antarctic Treaty system. The PEPAT establishes a Committee for Environmental Protection (CEP) to which each Party can appoint a representative, and to which the President of SCAR is invited as an observer. The function of the CEP is to provide advice and formulate recommendations to the Parties in connection with the implementation of the PEPAT.

Legitimacy

Even if PEPAT covers SRM, the governance structure of the ATS is likely inappropriate for regulating SRM. SRM techniques would benefit from continuous oversight, preferably by an international body where developing as well as developed countries have a voice. In contrast, the Treaty System is largely governed by a small number of Consultative Parties.

Although the ATS has a decades-long record of preserving Antarctica for peace and science, its legitimacy has been questioned on the grounds that Antarctica should be governed as part of the global commons, and decisions made by a limited membership cannot bind those who did not consent to the regime.

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) - 1967

Overview

The Outer Space Treaty provides a basic legal framework for international space law. It prohibits its 100 Parties from placing weapons of mass destruction (not conventional weapons) in space, and only allows the Moon and other celestial bodies to be used for peaceful activities.

Relevance to SRM

The Treaty does not define “outer space” but generally refers to “any location outside Earth's atmosphere”. As the treaty covers only outer space activities, its limited scope would exclude atmospheric SRM.

Scientific and governance capacity

The Treaty has weak international implementation provisions. The regulation of research, including control of its environmental impacts, falls to the national research sponsor alone.

The treaty also lacks compensation and dispute resolution mechanisms, the absence of which further undermines its prospect for SRM governance or regulation. Since “damage” is also undefined, the Outer Space treaty provides at most a legal basis from which nations can seek compensation for damages caused by outer space SRM.

Legitimacy

The Outer Space Treaty is a relatively untested instrument, of limited relevance for SRM governance because of its significant spatial and institutional limitations.

Convention on International Liability for Damage Caused by Space Objects (Space Liability Convention) - 1972

Overview

The Space Liability Convention expands on the liability rules created in the Outer Space Treaty. It has 90 parties.

Relevance to SRM

The Space Liability Convention is similarly relevant only to space-based SRM. It holds a launching State liable for damage caused by its space objects and devises an elaborate compensation mechanism. It has established, for example, provisions governing joint liability and indemnification, standing of claimants, channels to present claims, time limits, and principles for the determination of damage.

Despite its limited coverage, the Convention provides a liability framework that could be a model for addressing potential claims from SRM activities. A liability regime alone, however, would be inadequate to govern SRM research and deployment.

Scientific and governance capacity

The Space Liability Convention does not establish a governing body and thus does not have the capacity for SRM governance.

Legitimacy

The treaty has never been invoked and is therefore untested.

UN Convention on the Law of the Sea (UNCLOS) - 1982

Overview

UNCLOS is an attempt by the international community to regulate all aspects of the resources of the sea and peaceful uses of the ocean, including navigation, territorial sea limits, marine research, and conservation and management of marine resources. It has widespread participation with 116 Parties, although not the US.

Relevance to SRM

UNCLOS contains provisions to promote scientific research and protect the marine environment. The Convention may be applicable to specific geoenvironmental methods or activities within, or impacting on, the physical areas covered by the Convention. However, due to its limited spatial scope it could only ever apply to the indirect effects of SRM research.

Scientific and governance capacity

Like other spatially limited regimes (Outer Space Treaty, Antarctic Treaty System) UNCLOS contains weak international implementation provisions for research governance, which remains a national responsibility. A unique feature of UNCLOS is its binding procedure for settlement of disputes.

Legitimacy

UNCLOS has a significant impact on the regulation of ocean space, but its institutional mechanisms are principally concerned with governance of international ocean areas (the deep seabed in particular) and reliant on national governance for other ocean space. In its current form it lacks both the institutional structure and

geographic scope to regulate SRM activities.

Partial Test Ban Treaty (PTBT)- 1963 & Comprehensive Test Ban Treaty (CTBT) - 1996

Overview

The PTBT (ratified by 123 states) and the CTBT (ratified by 69 states) were designed to encourage nuclear non-proliferation by limiting technology development gained through nuclear testing.

The PTBT requires parties to “prohibit, to prevent, and not to carry out any nuclear weapon test explosion, or any other nuclear explosion” in the atmosphere, outer space, and under water. While the scope of the PTBT was limited by the technological feasibility of detection, the CTBT was able to include underground testing due to improvements in detection technology.

Relevance to SRM

The problem of nuclear testing is similar to that of SRM experimentation in the sense that individual parties may have the incentive to undertake the activity but desire that other parties do not. This is similar to any treaty limiting pollution, but the distinction here is the prohibition on experimentation.

The relevance to SRM is diminished, however, to the extent that some testing of SRM is desirable. These treaties' relevance is reduced further by the fact that both PTBT and CTBT apply only to state actors, while effective SRM governance would likely include both state and private parties.

Scientific and governance capacity

While precise and legally binding, the PTBT has not been successful in ensuring compliance from all states.

Legitimacy

Notable non-parties to the PTBT include France and China, which conducted tests from the 60's through the 80's. The CTBT has not been ratified by the US and has not entered into force.

3 Summary

No treaty or institution is currently equipped to govern SRM research or deployment. While several treaties or institutions could be modified to regulate or prohibit SRM in a piecemeal fashion, most regimes would thus be distorted beyond their core mandates. An exception may be the UNFCCC, which does have the appropriate mandate and context in which to regulate SRM. However, negotiating SRM governance within that regime would likely further strain - and perhaps collapse - an already overburdened and highly politicized negotiating agenda. It is unclear how adding SRM governance responsibilities would affect the capacity or legitimacy of other regimes.