

Before Celestial Bodies Collide- Enhanced Dialogue and Coordination: Precursors to a Treaty for Effective Near Earth Object (NEO) Response

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Problems

Trans-border crises on Earth are increasingly serious and unpredictable.² Root causes are often socio-political, intercultural, natural and/or unexpected. Cooperation among actors is hindered by differing views about crises and viable solutions, from the State-level that drafts and grasps its own views of International Law (IL), to policy-level responses and operations practitioners who may know less about IL or interpret it as they will.

Another concern is that feedback loops seldom exist among policymakers, lawyers, tech. operations practitioners or other entities. Economic issues and power dynamics among actors in crisis prevention and response cause delays and determine who is given data or not.

Lack of information complicates IL applications. Legal practitioners base them on rules and principles that govern State relations. Yet, not all actors involved in trans-border crisis and response grasp the implications of State rights in Public International Law (PIL) or know how Private International Law (PrIL) addresses conflicts of private persons, natural or juridical, arising out of State situations. As lines between PIL and PrIL have been blurred, so has the clarity of relationships among international community members.³

Inevitably, at the fall 2003 opening of the UN General Assembly, Kofi Annan said, "we've come to a fork in the road no less decisive than 1945 itself, when the UN was founded."⁴ He urged taking radical action to combat the global threats that cause global crises and reduce the value of cooperation, including views of terrorism and weapons of mass destruction, as well as situations where States may act unilaterally.

Chosen Case

The epitome of unexpected crisis would be a huge NEO collision with Earth. A NEO is a minor body of the solar system (e.g., a comet or asteroid) that enters Earth's vicinity. NEOs split into NECs (Near Earth Comets) and NEAs, (Near Earth Asteroids), the latter defined by orbits that never go further than 195 million km from the sun."⁵

Although the search for extra-terrestrial intelligence (SETI) group has proposed a global response model for SETI contact to the UN Committee on the Peaceful Uses of Outer Space (COPUOS),⁶ the call for a parallel NEO defense model assumes a definite threat, and would benefit from clauses about the nature of NEO observations, more varied professional contributions, wider global promotion and intercultural debate. To help Earth better prepare for and respond to a large NEO collision, diverse actors need to better understand mutual data needs, share views of issues, coordination and responsibility.

The effectiveness of IL hinges on the evolution of interdisciplinary dialogue and striving for a clearer grasp of terms. This paper calls for a new mindset to help designate rotating coordinators and funding from varied nations for NEO sightings, to encourage the creation and upkeep of NEO observation programs in both hemispheres,⁷ and guide cooperation among governments, and actors in crisis planning and response.

Outline

Recognizing that no global NEO program⁸ yet exists,⁹ the paper analyzes views of leaders and other actors.¹⁰

Firstly, the paper examines the impact of globalization on State sovereignty and international mindsets.

Secondly, the paper addresses why law and policy actors, as well as other practitioners, should clarify their

understanding and use of terms, and how the nature of text may change in light of unique aspects of the NEO threat.¹¹

Finally, the paper supposes an event like the destructive Tunguska meteor¹² of 1908 is foreseen in a populated area to discuss key precursors to a more cooperative, treaty mindset.

Impact of Globalization¹³

Before focusing on crises linked to a large NEO impact with Earth, one should note that forces of co-operation and conflict among cultures and civilizations influence who drafts or merely interprets IL,¹⁴ as much as which nations and organizations influence wider State interpretation and execution of related laws and policies.¹⁵

Consider that State borders are now permeable in real space and cyber-space. Weaker borders intensify competition.¹⁶ Global exchanges, economic transactions, and entities also dilute State sovereignty and weaken the enforceability of IL. Organizations (e.g., NGOs) even refer to IL to network internationally, in efforts to change State policies and laws.¹⁷

Major quarrels still continue among industrial States. These powers initiated both world wars and founded IL, "on hegemonic patterns of force monopoly."¹⁸ Tensions continue among developing and industrial States about agriculture, trade, and other issues. IL has even been accused of reinforcing inequality.¹⁹ It's arguable that smaller countries should derive greater benefits from IL protection against larger, economically powerful States. Yet, in non-security matters,²⁰ it's less likely claims will be made by weaker States to engage in pre-emptive or anticipatory conduct.

Not surprisingly, views of IL differ among law and policy actors and other practitioners. Terms can seem imprecise to people who deal with the practical sides of terrorism, disease, refugees, nuclear disasters, smuggling, environmental crises, electronic threats,²¹ and drug trafficking.²² For these people, treaties, conventions, and

customary international law (CIL)²³ often appear too general or situation-specific.

Nonetheless, principles set forth in five Space Treaties²⁴ reflect the widespread State desire for international efforts to improve space cooperation and security. Diverging views on the role of national security helped justify space technology-related defense agreements and export control regimes emerging after the Cold War.²⁵ Military rationale also determines which States sign or opt out of the Nuclear Test-Ban Treaty.²⁶ Military defense is not the only interpretation of national security.

Civilian approaches to security are also used for trans-border disaster planning and response. Yet, when site imagery of an environmental disaster is needed, response teams must wait for images from commercial or scientific satellites, even if a military satellite is already nearby. Thus, military protocol obscures environmental defense strategy.

An effective NEO treaty would need a shared, interdisciplinary mindset among nations. The International Space Station (ISS) Program, its agreements and evolving interprofessional teams offer hope for new approaches to cooperation.²⁷ This mindset needs to expand so as to include more nations outside the ISS Program, and also to involve developing nations.

Definitions²⁸

Interpretations of terms by different actors influence State compliance with IL.²⁹ The prospect of a large NEO impact with Earth³⁰ urges leaders and diverse actors to learn from small-scale crises in practice and scale-up possible future scenarios, but also to promote or provide input to regional, national and international fora.³¹

In essence, the pressing issues of security, sustainability³² and planetary survival, urge actors from the State-level down³³ to review meanings of at least 7 key terms and recognize differences in interpretation and practice. Then, could the world be prepared to deal more effectively with unexpected asteroid events.

Term 1: 'Harm'

According to John Stuart Mill, power, "can only be rightfully exercised over any member of a civilized community [...] to prevent harm."³⁴

Nonetheless, regarding security, diverse notions of *harm* exist at the State-level that drafts and interprets IL.³⁵ Documents such as the Hague Code of Conduct Against Ballistic Missile Proliferation³⁶ create a sharp distinction between what State action should and shouldn't be permitted. Yet, terms like *peaceful purposes* still have varied meanings in law and also in practice by non-lawyers.³⁷

As it stands, lawyers mainly interpret harm after it's occurred, based on fault and evaluated damage,³⁸ and chiefly in liability and humanitarian law cases.³⁹

Of special interest to technical practitioners is the U.S. Model State Defense Act. It requires States to mobilize and respond to "existing and increasing possibilit[ies] of unknown disasters of unprecedented size and destructiveness."⁴⁰ Yet, the measures to be taken are vague, and diverse actors' needs at local, regional and national levels aren't specified. This void is serious where the success of such policy is based on a changing execution during crisis.

Consider also the UNISPACE III Recommendations and Vienna Declaration on Space and Human Development.⁴¹ These legal documents propose that space-based activity for telemedicine and controlling infectious diseases should be expanded and coordinated, that an integrated, global system should be implemented to manage natural disaster mitigation, and many other initiatives. Space technology applications are linked to human security, development and welfare, but issues of how, where, when, for whom and by whom are unspecified.

Term 2: 'Threat'

IL urges action should be taken to minimize a given *threat*. For example, the Biodiversity Convention states, "where there

is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat [...]."⁴² Action required for planet survival should then be grasped in thought, word and deed. Yet, its unclear by when, whom or how.

Consider the historic ICJ declaration July 8, 1996, that the threat or use of nuclear weapons would be "contrary to the rules of [IL] applicable in armed conflict." The only exception was that, "the Court cannot conclude definitively whether the threat or use of nuclear weapons would be lawful or unlawful in an extreme circumstance of self-defense, in which the very survival of a State would be at stake."⁴³ Thus, an extreme threat could compel a new view of this ICJ verdict: any planetary defense strategy for asteroid deflection may call for nuclear technology applications.⁴⁴

Term 3: 'Mitigate'

In the general NEO scientific community, *mitigate* implies actual deflection of the NEO away from Earth.

At the same time, disaster managers define mitigate as, "sustained actions to reduce or eliminate the long-term impacts and risks associated with natural and human-induced disasters."⁴⁵ In practice, this becomes response strategies more than prevention measures. Yet, action may still be taken before a disaster to reduce the event's risk of occurrence, to avert or diminish the eventual event impact.⁴⁶

Engineers in debris communities see 'mitigate' as action taken to prevent additional space debris, especially in the centimeter and millimeter range. This term is defined in papers and technical studies.⁴⁷

The legal community currently has no standard meaning for 'mitigate,' although legal groups have deliberated possibilities.

Academics have even proposed details to help define the term, including better construction, shielding, technical controls and safer ground management for satellites in Earth orbit.⁴⁸

Term 4: 'Risk'

Definitions of *risk* are based on views and experience of different actors facing a potential threat.⁴⁹ Scientists, the public, governments, agencies and entities weigh risks based on interests and a grasp on a given situation. Actors in practice see risks 'at hand' differently.

Note that the U.S. Environmental Protection Agency (EPA), under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), states a one in a million risk of getting cancer is the threshold for determining clean-up levels for sites contaminated with hazardous substances. Using statistics, CERCLA deals with risks much lower than those predicted from a major asteroid or comet disaster. The cost of cleaning up two sites (avg. cost 30\$M each) is said to be comparable to the cost of a large asteroid detection program.⁵⁰ The complexity of reconciling national laws and policy can complicate efforts to avoid disasters.

Term 5: 'Self-Preservation'⁵¹

All life forms are seen to protect themselves against harm, which is the principle of inherent *self-preservation*.⁵² This concept is found for instance, in the Rio Declaration⁵³ (art. II) and the 1992 Convention on Industrial Accidents. The latter stresses the need to identify risk of contamination (art. I), to convey information to States and the public (art. II), and to detail contamination protection (art. III). All people have "the right to life, liberty and security."⁵⁴ How such principles guide coordinated planetary defense is yet to be seen.

The need to prepare for unexpected crises requires that closer attention be paid to the precautionary principle.⁵⁵ This notion summarizes why governments must act to ward off potential harm, even when the likelihood of harm occurring is unclear.

Governments and other actors can also benefit from cooperative preservation. This implies that decision-makers at varied levels of authority can only meet a duty to

protect citizens when they cooperate. Effective emergency planning and large disaster mitigation without cooperation are unlikely.⁵⁶

Encouraging lessons can be learned from coherent IL applications in smaller disasters. See mechanisms used to deal with "international biological, chemical and nuclear threats, trans-boundary forest fires and the threat of infectious diseases across borders."⁵⁷

Recall also the Chernobyl nuclear fallout. Art. 55 and 56 of the UN Charter set out the related human rights obligations of the UN member States.⁵⁸

In respect of preservation, many governments give legal status to disaster preparedness reserve funds. The Canadian government used such a fund to help pay for unforeseen SARS, forest fire and flood-related expenses. The Ethiopia Disaster Prevention and Preparedness Commission (DPPC), formerly known as the Relief and Rehabilitation Commission (RRC), maintains a national famine relief fund.

Certain aspects of international human rights law remain in force in national emergencies. Some civil and political freedoms may be derogated, but only under highly-restricted conditions: derogation must be for a limited period, in a way that doesn't discriminate, and only to the extent required by a severe emergency that threatens the stability of a nation.⁵⁹ 'Rights' and 'protection' as terms are often left undefined.⁶⁰

Ultimately, unresolved tension among actors about uncertainty of events and general disorganization⁶¹ helps to explain why the self-preservation principle hasn't yet caused the emergence of more consensual views of IL applications in precautionary disaster planning and response. It could improve.

Term 6: 'Environmental Security'⁶²

The views of *environmental security* embrace the military and non-military defense. Large NEO threats would compare to a theoretical post-global-nuclear war

holocaust, or key bio-terrorism effects.⁶³ Security is also linked to environmental preservation.

Nonetheless, a Millennium Research Project reveals few States have official definitions of environmental security that unify thought and action.⁶⁴ Among the countries that have definitions are: The Russian Federation and the Commonwealth of Independent States. The U.S. has several working definitions and a Department of Defense (DoD) Directive that includes program-specific definitions. Embassy Representatives from Argentina and India noted their States have an official definition, but the text is not in writing. Respondents in China, Australia, and Hungary said their governments were creating a definition. Similar to the European Union (EU), China puts environmental security under the roof of “environmental protection.”

Consider the UN Environment Program (UNEP) and World Health Organization (WHO) don’t define it. The UN Development Program (UNDP) refers to it in a 1994 report on human development (p.28): “Environmental threats countries face are a combination of the degradation of local ecosystems and that of the global system. These comprise threats to environmental security.”

The label is addressed in four other instruments-The U.N. Secretary General’s Bulletin (6 August 1999)-“Observance of UN Forces of International Humanitarian Law”, the Geneva Convention’s First Protocol (1977), International Criminal Court’s Charter (Rome Statute), and Convention on the Prohibition of Military or Any other Hostile Use of Environmental Modification Techniques (ENMOD).⁶⁵

A recent Rockefeller report on world security notes that a definition in the post-Cold War has “proven elusive despite massive efforts.” Many irreconcilable views exist in statements, policies, and international agreements.⁶⁶

‘Duty’

IL imposes a certain *duty* upon States regarding States and individuals. Treaties are legally-binding by definition, unless parties withdraw or don’t observe obligations.⁶⁷ Other legal duties exist to protect public welfare. This recognizes duties to research or simulate potential disasters like NEO collisions that aren’t understood.⁶⁸ Moral obligations lead States to define and adhere to codes of conduct.⁶⁹

Text Proposals: ‘Harm’

Altruistic legal principles and declarations are drafted to prevent harm, but key terms seldom illustrate a grasp the phases of a disaster, or the diverse actors’ needs for different data at different times. An eventual NEO treaty should note the degree of harm varies before and after awareness of a potential threat, and after harm occurs.⁷⁰ As well, roles of different practitioners, and the nature of the harm should be addressed and scaled from minor to severe. The timeframe for these activities to be completed and the distribution of responsibilities (hierarchies) among entities and actors also must be defined.

Text Proposals: ‘Threat’

The term *threat* also needs to be understood on a time continuum and on a scale from minor to serious. Threats aren’t linked equally with problematic socio-economic activities, or trans-border issues. Each threat has unique causes and processes with regard to which legal, scientific and policy issues need to be grasped and applied. Only by breaking down interdisciplinary elements can perceived rights, duties, obligations, and divisions of control be defined at each phase of awareness.

Text Proposals: ‘Mitigate’

Technical, socio-political and other views need to be inter-related, on a timeline of awareness of the threat.

A big problem is that different professional groups have their own notions of 'mitigate' and the concepts aren't always understood by or useful to other groups.

Text Proposals: 'Risk'

This paper contends when States sign and accede to the proposed NEO treaty, they assume the risk as a political gesture, demonstrate a belief in a regime based on more than principle, and/or act as reciprocity strategy. The aim is to ensure observance of issues behind space law, humanitarian law, and other facets of IL. Risk need also be defined through time and other actors.

Text Proposals: 'Rights & Protection'

Terms need to be clarified with respect to existing IL and according to needs of actors before and after awareness of the threat, and also after harm has occurred.

Text Proposals: 'Self-Preservation'

New emphasis on the international scope, interdependence and practical urgency of terrestrial preservation could change the attitudes of authorities⁷¹ and their views on intergovernmental responsibility for environmental security and NEOs.⁷²

Text Proposals: 'Environmental Security'

This term requires both military and civilian contexts to be considered. Choosing one at the expense of the other for any NEO treaty would be inaccurate and unsatisfactory. Nature's involvement makes normal legal blame a problem. This term also needs to be defined at different points in a time continuum.⁷³

Text Proposals: 'Duty'

The proposed NEO treaty requires consensual agreement about the existence of the NEO threat. If widespread agreement is not reached and no repercussions exist for non-observance of the treaty, States may

undermine their shared moral duty to protect their citizens and global biodiversity.

The UN purposes are a helpful guide for the duties to be considered: to maintain peace and security, to develop friendly state relations, to achieve international cooperation in solving international problems, and to be a center for harmonizing national actions and attaining their common ends.⁷⁴

If duties to prepare for and respond to large-scale threats such as NEOs are to be respected, people and entities⁷⁵ need to commit resources in anticipation of problems based on principle, rather than solely after attributing fault.⁷⁶

Text Proposals: All Terms

Re-visiting notions of the above terms associated with natural and man-made disasters⁷⁷ could motivate domestic actors to learn more about or revisit the relevance of IL. All actors should reflect on three key reasons why their State joins treaties: (1) beliefs in treaty norms; (2) predictions about binding nature or binding other States for action; and (3) State interactions.

Key Problems with an NEO Treaty

At present, local policies and procedures are often defined after a local event, with plans to apply them in the future as a more effective means of prevention and crisis management.⁷⁸ Motives to enter into treaties vary and reveal how States may react to obligations during crises. Comparing political obstacles that complicate state commitment and compliance is helpful when considering different treaties.⁷⁹

Reality is that the codification of key instruments and the accession to space treaties by a large majority of states, doesn't guarantee consistent or predictable State behavior in times of international crisis.⁸⁰ Problems with co-commitment and compliance at the state-level reveal the need to examine coordination and communication at decision-making levels and below that.⁸¹

Consider that large-scale disaster mitigation and management on Earth can mobilize multiple actors to co-ordinate a concerted intergovernmental response.⁸² The will to cooperate thus already exists, even when emergency response systems tend to evolve within political jurisdictions. Although local, regional and national disasters may be partially controlled by existing procedures,⁸³ the impact of a major disaster has no limit, and repercussions aren't well understood at varied levels of awareness of a threat.⁸⁴

Thus, the value of trans-national disaster mitigation and response relates to State motives to work together and learn from each other as much as State pressures to ignore historical patterns of compliance and commitment.⁸⁵

Precursors to an NEO Treaty

In the event of a huge NEO collision in a populated area, acknowledgement of a single entity would best guide practical operations and applications of IL.⁸⁶ However, communication, co-ordination as well as interdisciplinary understanding of IL terms and implications must improve regionally and nationally before large-scale disaster management can be more effective and promote a the mindset for a NEO treaty.

For instance, OECD Workshop conclusions imply many industrial States have yet to acknowledge the outer space threat, enable a policy level response, promote State-level risk assessments, and support exploratory research and development (R&D) for mitigation.⁸⁷

Further, decision-making about the development of an NEO treaty will need to breakdown the essential aspects of the surmised threat, including "long-time horizon, possible irreversibilities (physical and socio-economic), large uncertainties and impacts of future scientific progress."⁸⁸

An effective NEO treaty could only evolve in interdisciplinary fora that exchange views on terms like *harm, threat, mitigate, rights & protection, and environmental security*, in ways applicable

to policy and operations along a timeframe of awareness. The key may be to grasp the interdisciplinary nature of *mitigate*.⁸⁹

Further, an NEO treaty could have no withdrawal clause or parties that would consider non-participation an option. This would differ from Geneva Conventions.⁹⁰ Views on self-preservation issues should evolve to motivate standard compliance.

Conclusion

Actual practice reveals that many factors determine whether legal terms offer an acceptable guide to lawyers, policymakers and other practitioners in emergency management. Problems arise where the intention of IL drafters is that the chosen terms will be read as only one community knows or understands them. Divergent, even conflicting, intentions may continue to underlie a given text unless proposed definitions integrate more practical elements in key concepts.

New approaches to dialogue and promoting IL applications could lead to more effective interactions among actors and the international, interdisciplinary, intercultural mindset needed to successfully execute an NEO treaty.⁹¹

If legal writings remain problematic to non-legal practitioners, and even lawyers fail to reach agreement about context of terms, perhaps interdisciplinary efforts to strengthen an evolving international mindset for global self-preservation can...

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² See *Report on the Status of Multilateral Environmental Agreements in the European Region*, UNEP Regional Center, June (1998).

³ See Brownlie, I.: *Principles of Public International Law*, 6th Ed., Oxford University; also see the Cornell University Law database.

⁴ See Annan, K.A., "Speech for Opening of the UN General Assembly," Sept. 23, 2003.

⁵ See *The Tumbling Stone*, Num. 1., Dictionary; "Origin & Evolution of NEOs," Morbidelli et al., (1998), p. 1-14; *Spaceguard Asteroid Dictionary*.

⁶ Jasentulyana, N., Kopal, V., Fasan, E., Sterns, P., Carrigan, D., SETI members

(Communications, 2003); COPUOS (2000) U.N. Doc. A/55/20; Official SETI Protocol www.seti-inst.edu (accessed Oct. 4, 2003).

⁷ Coradini, M. Chapman, C., (Communications, 2003); Steel, D. (V.P. Spaceguard, comments).

⁸ See Grabowski, M. and Roberts, K., "Risk Mitigation in Virtual Organizations," JCMC 3 (4) June 1998—interdisciplinary dialogue is key.

⁹ See www.b612foundation.org (accessed Sept. 18, 2003); Komisar, L., "Avoiding the Impact," *Scientific American*, July 8, 2002, esp. former astronaut R. Schweickart's view; Kunich, J.C., "Planetary Defense: Legality of Global Survival," *AFLR*, Summer 1997; France, Lt.Col M.E., "Planetary Defense: Eliminating the Giggle Factor," *Air & Space Power Chronicles*, August 2000, p. 1-20; Bell, L. et al., "Planetary Asteroid Defense Study: Assessing and Responding to the Natural Space Debris Threat," April 1995; Nici, Lt.Col. R. and Kaupa, Lt.D., "Planetary Defense: DoD Cost for Detection, Exploration, and Rendezvous Mission of NEOs," *Airpower Journal*. Vol. 11, No. 2, 1997; Burnell, S., "U.S. Military Takes Asteroid Threat Seriously," www.rense.com/general29/threat.htm (accessed Sept. 10, 2003).

¹⁰ Consider five decision-making levels analyzed in, "International Space Station Negotiations & Manned Space Strategy (MSS): Toward Consideration of a Multinational Astronaut Consortium (MAC)," Covert, L.M., (2002, Ph.D., Intro), Le Centre D'Études Diplomatiques & Stratégiques (C.E.D.S.), Paris, France.

¹¹ Michalowski, S., (Communications, March, 2002); OECD Global Science Forum, NEOs: Risks, Policies & Actions: Final Report, 13pgs, <http://www.oecd.org/dataoecd/39/40/2503992.pdf> (accessed Sept. 10, 2003).

¹² See Tunguska Catastrophe Event, www.orc.ru/~azorcord/page_sob.htm (accessed Sept. 10, 2003); Hartmann, W.K., "1908 Siberia Explosion: Re-constructing and Asteroid Impact from Eyewitness Accounts," <http://www.psi.edu/projects/siberia/siberia.html> (accessed Sept. 22, 2003).

¹³ See Huntington, S.P., *Clash of Civilizations and the Remaking of World Order*, (1996).

¹⁴ Recall the original ICJ Statute, June 26, 1945, art. 38(1)(a)-(d), 59 Stat. 1055,1060, 33 U.N.T.S. 993 (defines "international conventions", "international custom," and "general principles of law recognized by civilized nations").

¹⁵ See for instance, Fidler, D.P., "American Society of International Law (ASIL) Insights: SARS and International Law," April 2003,

<http://www.asil.org/insights/insigh101.htm>

(accessed Sept. 16, 2003); also Ho, A., "Does the War on Terror Violate International Law?," *The Straits Times*, January 12, 2003, <http://straitstimes.asia1.com.sg/columnist/0,1886,56-96106,00.html> (accessed Sept. 10, 2003).

¹⁶ See von der Dunk, F.G, *Private Enterprise and Public Interest in the European Seascape* (1998).

¹⁷ Consider how Greenpeace lobbied European markets not to buy seal products in their efforts to fight the Newfoundland (Canada) seal hunts.

¹⁸ See Baxi U., "Operation Enduring Freedom: Towards a New IL & Order?," (*LGD*), 2001 (2).

¹⁹ See Downey, J., "The Third World versus the West," *Open Democracy*, Global Policy Forum August 21, 2002 (1-4); also www.wto.int (last accessed Oct 4, 2003).

²⁰ National 'safety' can hinge on socio-economic, trade or defense issues, among others.

²¹ Cyber-crime grew 400% to 83,000 cases-- www.cert.org/stats/cert_stats.html#incidents (accessed Oct. 4, 2003)—(from 1999-2002).

²² See Love, M.C., *Beyond Sovereignty: Issues for a Global Agenda*, 2nd Ed., 2003, 384 pgs.

²³ Codified in the Vienna Convention of Treaties, esp. Preamble ("Believing that the codification and progressive development of the law of treaties achieved in the present Convention will promote the purposes of the UN set forth in the Charter, namely, the maintenance of international peace and security, the development of friendly relations and the achievement of co-operation among nations, Affirming that the rules of [CIL] will continue to govern questions not regulated by the provisions of the present Convention [...]") and Art. VI; Sinclair, I., *Vienna Convention on Law of Treaties*, 1984, p. 22; Brownlie, I., *Principles of Public International Law*, 6th Ed., Ch. 27, "Law of Treaties," p.580, "nonetheless, a good number of articles are essentially declaratory of existing law and certainly those provisions which are not constitute emergent rules of general [IL]."

²⁴ See *The UN Treaties and Principles on Outer Space*, UN Publications, NY, 1999; Diedriks-Verschuur, I.H.P., *Intro. to Space Law* (1999).

²⁵ See the Missile Technology Control Regime (MTCR), and Anti-Ballistic Missile Treaty; Krepon, M. and Clary, C., "Space Assurance or Space Dominance? The Case Against Weaponizing Space," 2003, Henry L. Stimson Center, Washington, D.C., 131pgs.; van Fenema, P., "Export Controls & Satellite Launches: What's New?," IISL Paper (2003).

²⁶ See Chyba, C.F., van der Wink, G.E., and Hennes, C.B., "Monitoring the Comprehensive Test Ban Treaty: possible ambiguities due to meteorite impacts," *Geophysical Research Letters*. Volume 25, 1998; also "Preparing for planetary defense: detection and interception of asteroids on collision course with Earth," White Paper on NEO Planetary Defense, on-line at <http://www.fas.org/ssp/military/dccops/usaf/2020/app-r.htm> (accessed Sept. 20, 2003); also Preparatory Commission for the Comprehensive Nuclear Test Ban Treaty Organization, e.g., treaty signatories and follow-up programs, <http://pws.ctbto.org/> (accessed Sept. 20, 2003).

²⁷ See Covert, L.M., "Multicultural Issues in Law & Ethics of International Space Station (ISS) Astronaut-related Medical Decision-making," IISL-00-IISL-1.08, p.1-15; also Covert Ph.D. Thesis (2002, 1-650), *supra*. note. 10.

²⁸ See Shue H. (1980). *Basic Rights: Subsistence, Affluence, and U.S. Foreign Policy*, 2nd Ed.; and Huntington, S.P., *supra*. note.13 (Intro).

²⁹ See Simmons, B.A., "Compliance with International Agreements", *Annual Review of Political Science*, June 1998, Vol. I. p. 75.

³⁰ See "Asteroid Threat in 2014": http://news.ninensn.com.au/World/story_51450.asp (accessed Sept. 2, 2003); in contrast to "Asteroid Strike Ruled out for 2014": <http://stacks.msnbc.com/news/960340.asp> (accessed Sept. 3, 2003); "Report of the U.K. Task Force on Potentially Hazardous Near Earth Objects," 2000, 53 pgs; NASA "Study to Determine the Feasibility of Extending the Search for Near Earth Objects and to Smaller Limiting Diameters," August 22, 2003, 166pgs. <http://neo.jpl.nasa.gov/neo/neoreport030825.pdf> (accessed Sept. 5, 2003); Chapman C.R., "How a Near-Earth Object Impact Might Affect Society," (2003), p.1-25; also *supra*. note. 10.

³¹ See selected national disaster management plans of the Red Cross Federation--<http://www.ifrc.org/what/dp/biblio/dpplans.asp> (accessed Sept. 19, 2003); also *What Disaster Response Management Can Learn From Chaos Theory Conference Proceedings*, May 18-19, 1995, Koehler, G.A. Ph.D. (Ed.), <http://www.library.ca.gov/CRB/96/05/>; Canadian Office of Critical Infrastructure Protection and Emergency preparedness (OCIPEP) <http://www.ocipep-bpiepc.gc.ca> and Emergency Management Australia www.ema.gov.au (accessed Sept. 18, 2003); also UNCOUOS Technical Committee Meeting Reports (various).

³² See UNISPACE III Vienna Convention (space tech uses to enhance terrestrial sustainability and International Agreements on sustainability), <http://www.sustreport.org/policy/international.html> (accessed Sept. 22, 2003).

³³ See *supra*. note 10 generally, (1-650).

³⁴ See *The Oxford Dictionary of Quotations*, Fifth Edition, Knowles E. (Ed), p. 508 (18)—from *On Liberty* (1859) Ch. I.

³⁵ See Reijnen, Bess, C.M., *United Nations Space Treaties Analyzed*, 1992, p.163-170; COSMOS 954 incident where a nuclear-powered Russian satellite crash landed in Canada in 1978.

³⁶ <http://projects.sipri.se/expcon/hcocfinal.htm> (accessed Oct. 4, 2003).

³⁷ Consider the Outer Space Treaty (1967) and Principles Related to the Uses of Remote Sensing [resolution 3234 (XXIX); 1974]; Gantt, J.B., "The Concepts of 'Peaceful Purposes'/'Peaceful Uses' in the Exploration and Use of Outer Space... Practical Examples," IISL paper, 2003 where 'peaceful purposes' is interpreted as "non-aggressive" and/or "non-military."

³⁸ See e.g., Wetterstein, P.(Ed.), *Harm to the Environment: The Right to Compensation and the Assessment of Damages*. Oxford: Clarendon Press, (1997), esp. Jones, B. paper, "Deterring, Compensating, and Remediating Environmental Damage: The Contribution of Tort Liability."

³⁹ See International Disaster Response Law (IDRL) applied by the International Federation of the Red Cross and Red Crescent Societies.

⁴⁰ See Blanchard, W.B., *American Civil Defense 1945-1984: The Evolution of Programs & Policies* (1986) (describes Model Act history & development), cited in Seamone, E., "The Duty to Expect the Unexpected: Mitigating Extreme Natural Threats to the Global Commons Such as Asteroid & Comet Impacts with the Earth," *Columbia Journal Transnational Law* Vol.41 No. 3 (2003, 735-794).

⁴¹ Note also Space Priorities for the 21st Century.

⁴² See The Biodiversity Convention [Preamble].

⁴³ See ICJ Declaration on the Legality of the Threat or Use of Nuclear Weapons, (July 8, 1996). Note the U.S., U.K., France and Russia had all urged the ICJ not to consider the case.

⁴⁴ See Schweickart, R.L., "The Need for United Nations Asteroid Deflection Treaty to Establish a System for Trustworthy Mission Design and Execution," January 8, 2003, B612 Foundation, 7 pgs.; also B612 (*supra*. note 9) proposal to develop an asteroid deflection strategy by 2015.

⁴⁵ See OCIPEP, *supra*. note. 31; also Bartley, A., and Saucier, R. (Communications, Oct. 2003).

⁴⁶ Becking, I., Wilson, S., (Communications, 2003); also "Towards a National Mitigation Strategy," Discussion paper, OCIPEP, (2002).

⁴⁷ Kopal, V., Wiedemann, C. and Lips, T., (Communications, Oct., 2003); for other sample definitions, see UN Technical Reports on Space Debris; ESA Space Debris Mitigation Handbook.

⁴⁸ See *Special Project Report on MEO/LEO Constellations: U.S. Laws, Policies and Regulations on Orbital Debris Mitigation*, AIAA, May 1999; also UNCOPUOS Technical Committee Reports (various).

⁴⁹ See *Risk Analysis and Uncertainty in Flood Damage Reduction Studies* (2000), Commission on Geosciences, Environment & Resources (CGER); by the Commission on Geosciences, Environment and Resources (CGER).

⁵⁰ See Gerrard M., "Legal Issues in Defending Against Asteroids," NYLJ Vol 219, No. 58 (1998), p.5/12; contrasts smaller amounts of money requested by scientists and organizations.

⁵¹ See Achilleas, P; Marchisio, S., IISL papers/03

⁵² See Haley, A.G. "Space Law and Metalaw—A Synoptic View," *Proceedings of the VIIth International Astronautical Congress*, Rome, Italy, (1956) and "Survey of Legal Opinion on Extraterrestrial Jurisdiction," (1960); Fasan, E., "Asteroids and other celestial bodies - some legal differences," 26 *J. of Space Law* #1, (1998), p33.

⁵³ Also known as the 1992 Declaration of the UN Conference on Environment and Development.

⁵⁴ See Universal Declaration on Human Rights (UDHR) [Article 3].

⁵⁵ See Morris J., (Ed.), *Rethinking Risk & the Precautionary Principle*, Butterworth-Heinemann, 16 October 2000, esp. p.3-9 (from "defining the precautionary principle" and "the development of the precautionary principle" to applications of "the precautionary principle as a premise for international agreements."); also Seamone E., *supra*. note. 40 (1).

⁵⁶ Seamone, E., (Communications, Oct., 2003).

⁵⁷ Seamone, *supra*. note 40, (33- 41).

⁵⁸ www.chernobyl.info/en/Facts/Lessons/Lessons_Security (accessed Sept. 19, 2003).

⁵⁹ See, "Legal Issues Arising from the War in Afghanistan and Anti-Terrorism Efforts," <http://www.hrw.org/campaigns/september11/ihlqna.htm> (accessed Sept. 21, 2003); UDHR, *supra*. note 54; also Human Rights resolution 1995/32.

⁶⁰ An exception can be found in, Battiste M., and Henderson, J.Y., "The International Intellectual and Cultural Property Regime," *Protecting Indigenous Knowledge and Heritage: A Global Challenge*, (2000), p. 171-200; Principles and

Guidelines for Protection of the Heritage of Indigenous Peoples (Annex, UN document E/CN.4/Sub.2/1995/26).

⁶¹ See Gollier, C. and Treich, N., "Decision-making under scientific uncertainty: economics of the precautionary principle," 2002 (7).

⁶² Sample problematic definitions proposed by panelists of the Millennium Project—<http://www.acunu.org/millennium/es-2def.html> (accessed Sept. 20, 2003); also Gross O. and Alain F.N., "Emergency, War and International Law—Another Perspective," 70 *Nordic Journal of International Law* 29 (2001).

⁶³ See Spana, M.S., "Beyond Pacification and a Panicked Public: New Principles for Bio-terrorism Preparedness and Response," Interdisciplinary Committee to Catastrophic Events, Nov. 11, 2002, p. 1-2, commentary available at <http://www.campbellinstitute.org> (accessed Sept. 13, 2003); also Morone J.G. and Woodhouse E.J., *Averting Catastrophe: Strategies for Regulating Risky Technologies*, University of California Press (1986).

⁶⁴ See *supra*. note 62; Thomas, L., "A comparative analysis of international regimes on ozone and climate change with implications for regime design," 41 *Columbia Journal Transnational Law* 795-859 (2003).

⁶⁵ See "Environmental Security: UN Doctrine for Managing Environmental Issues in Military Actions," Exec. Summary, 2000, *supra*. note 62.

⁶⁶ *Ibid*.

⁶⁷ State reaction to treaty breaches have included UN sanctions and other international boycotts.

⁶⁸ Seamone, E., (Communications, Sept., 2003)—about the 2003 simulation in U.S. States.

⁶⁹ See e.g., the ISS Crew Code of Conduct, 14 CFR Sec. 1214.403-404 (1-1-03 Edition).

⁷⁰ For example, the Supreme Court of Canada has defined "serious bodily harm" vis-à-vis Terrorism in the Criminal Code as *any hurt or injury, whether physical or psychological, that interferes in a substantial way with a person's physical or psychological well-being, health or integrity*. Other meanings of the term "serious bodily harm" are more restrictive—see Parliamentary Bill C-36, (after Sept. 11, 2001).

⁷¹ See "An Open Letter to the Australian Federal Government from International Scientists (Australia's contribution to Spaceguard)," at http://www4.tpg.com/au/users/tps-seti/pr_oz_sg.pdf (accessed Sept. 5, 2003); also Britt R.R. "Why We Fear Ourselves More than Asteroids," *Space News on-line*, 26 March, 2002, p.1-2; also "Letter to OECD Global Science

Forum Participants and Permanent Delegations about U.K. proposal for a follow-up Workshop on NEOs, Natural Hazard Assessment & Risk Methodologies,” July 28, 2003.

⁷² See Colonna, T.E. and Descencia, T.E., “Be Careful Saving the World from Near Earth Orbit Objects: You May be Breaking the Law,” *Mercury* 28 No. 5., Sept./Oct., 1999: 36-40; also Crawford J., *The ILC’s Articles on State Responsibility*, Cambridge, Jan. 2002, 422 pgs.

⁷³ Compare to U.S. Homeland Security (HSD) Personal Preparedness Guide available on-line at www.washingtonpost.ca (accessed Oct. 2003).

⁷⁴ See UN Charter, June 26, 1945, [Preamble].

⁷⁵ NATO military responses to large disasters may be partly translated into civilian responses.

⁷⁶ Theoretically, a self-binding pre-commitment to CIL applies before awareness of a threat on a timeline when responsibilities should be designated by a framework to apply in the event of potential harm- Seamone, E., (2003), *supra*. note 40; see also Davis E., press release entitled, “Legal Duty to Mitigate Asteroid or Comet Collisions with Earth involves Much More than Stargazing, says Policy Analyst,” *Iowa Law Review*, April 14, 2002 or available on-line at <http://www.prweb.com/releases/2002/4/prweb36870.php> (accessed Feb. 17, 2003).

⁷⁷ For instance, floods, fire, droughts, landslides, earthquakes, avalanches, tidal waves, localized industrial pollution, and severe storms.

⁷⁸ See for instance, *supra*. note 31; also Bartley, A., Saucier, R., (Communications, Oct., 2003).

⁷⁹ The Antarctica Treaty, UN Convention on the Law of the Sea (UNCLOS)- *High Seas, Space Treaties comprise the *Global Commons*; Covert, L.M., and Gantt, J.B., “Autonomous Multilateral Teams & Their Impact on Customary Practice: New Contributions to Public International Space Law,” (2001) *IISL*, 15pgs.

⁸⁰ See Covert, L.M., “Commitment and Compliance in the Evolution of the ISS Program,” *Proc. of the 45th Colloquium on the Law of Outer Space*, p. 98-112 (2002); Covert L.M., *supra*. note 10 (1-650); *supra*. note 35; also Watson, G.R., “The Death of Treaty,” 55 *Ohio St. L.J.* 781-2 (1994); McKinnon R.J., & Sullivan M.T., “Mir Emergency Management: National Arrangements for Managing Public Safety Aspects of the Re-Entry of the Russian Mir Space Station,” 16 *Australian Journal of Emergency Management* (2001) p.36-37.

⁸¹ “First and foremost, better coordination is needed between NASA and Air Force observation efforts. This is probably best

accomplished by someone taking charge—that someone should be the Air Force (through the US Space Command-USSPACECOM and AFSPC)...,” Kiziah, Lt. Col R.R., “Air Force and NASA Activities To Address the Threat of Asteroid/Comet-Earth Impacts,” in *Air & Space Power Chronicles*, 2 May, 2000 (6).

⁸² Consider the UN/ISDR World Disaster Reduction Campaign (2003) to raise awareness.

⁸³ See “Insurance: Unified Law for Disaster Management Favored,” June 25, 2003 on-line at <http://www.hinduonnet.com/thehindu/2003/06/26/stories/2003062602351800.htm> (accessed Sept. 20, 2003).

⁸⁴ See UN Declaration of Preservation of the Human Environment (Stockholm, 1972); also Viikari, L.E., “Environmental Impact Assessment and Space Activities,” *Proc. of the 45th Colloquium on the Law of Outer Space*, p.476-480 (2002); Seamone E., “When Wishing on a Star Just Won’t Do: The Legal Basis for International Cooperation in the Mitigation of Asteroid Impacts and Similar Trans-boundary Disasters,” *Iowa Law Review*, Vol. 87, No. 3, March 2002, 1093-1139, esp. Part V., “The Historically Entrenched Right to Global Survival,” 1119-1139.

⁸⁵ Consider Pryke, I., former ESA representative to Washington, D.C., “ESA’s future needs to be based on today’s progress, not yesterday’s achievements,” (Pryke, Communications, 2002).

⁸⁶ Consider current uncertain State commitment and lack of interdisciplinary promotion of the *International Charter on Space Cooperation...for Natural or Tech. Disasters-
www.disastercharter.org/charter_e.html*

(accessed Sept. 10, 2003), related to U.N. Resolution 41/65 of 1986 on Remote-sensing; Gerrard M.B., Barber A.W., “Asteroids and Comets: U.S. and [IL] and the lowest probability, highest consequence risk,” *NYU ELJ* (1997) p.1-45.

⁸⁷ See *supra*. note. 10.

⁸⁸ See *supra*. note 61, (6).

⁸⁹ See Schweickart, R.L., (Jan., 2003); *supra*. note. 35; Schweickart et al., “The Asteroid Tugboat,” *Scientific American*, (Nov., 2003).

⁹⁰ See Geneva Conventions, Aug 12, 1949, art. 158, 75 UNTS 287 ; (and 1977 protocols).

⁹¹ See Abbott K.W. and Snidal D., “Hard and Soft Law in International Governance,” 54 *International Organizations* 421 (2000); Haug, H., “Neutrality as a Fundamental Principle of the Red Cross,” 31-12-1996, *International Review of the Red Cross*, No. 315, (627-630).