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The Duty to “Expect the Unexpected”: Mitigating Extreme Natural Threats to the Global Commons Such as Asteroid and Comet Impacts with the Earth

EVAN R. SEAMONE^{*}

This Article develops a framework to govern the interactions of nations cooperating to mitigate the threat of unexpected natural disasters that potentially could affect them all. It uses asteroid impact with the Earth as the representative example because this is an “unusual and extreme” disaster that has created difficulty for lawmakers due to its many unanswerable questions. By explaining a number of the legal requirements necessary to mitigate such threats, this Article identifies legal principles that apply equally to natural threats throughout the global commons. The law involved in this analysis arises, in great part, from the judicial recognition of a state’s duty of self-preservation. To this end, the American civil defense experience provides guidance on the extent of a government’s duty to plan for the unknown, as does the Vorsorgeprinzip in Germany. At the international level, the doctrine of “cooperative preservation” requires nations to cooperate in joint preventive actions to mitigate dangers so great that no single country alone could effectively protect its citizens from the harm. In order to obtain greater insight into developing an international framework for mitigating

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extreme natural disasters, this Article considers examples of the law applied to existing efforts to mitigate transboundary nuclear and biochemical disasters, multinational forest fires, and the spread of new and re-emerging infectious diseases across international borders.

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I. INTRODUCTION

On February 7, 2003, concurrent with a change in the national threat level from yellow (“elevated risk”) to orange (“high risk”), U.S. Attorney General John Ashcroft warned the American public: “This decision for an increased threat condition designation is based on specific intelligence . . . corroborated by multiple intelligence sources.”¹ The statement echoed similar warnings, which sounded in Australia only a few short months before, as then Acting Attorney General for Australia Chris Ellison stated, “[b]e alert but not alarmed,” based on “credible” information that an attack on Australia was being planned.² Increasingly, commentators have criticized these imprecise warnings on the grounds that governments are accomplishing little more than the creation of mass panic.³ Others admit that these warnings are the best that governments can do, marking “a strange new climate in which general warnings are issued to protect us from an undefined threat.”⁴ Yet, without focusing on the content of such warnings, the very existence of these public alerts, combined with the great lengths to which governments have gone in communicating them, are indicative of a crucial responsibility: the duty to prepare citizens for those threats that are unknowable by their very nature.⁵

Because this situation is similar to the one faced by public

1. Michael Kilian, *U.S. Raises Terrorism Alert Level: “Specific Intelligence” of Threats Cited*, CHI. TRIB., Feb. 8, 2003, at 1 (citing U.S. Attorney General John Ashcroft).

2. *The Terror of an Unspecified Risk*, AGE (MELBOURNE), Nov. 21, 2002, at 16 [hereinafter *Unspecified Risk*] (citing Australian Acting Attorney General Chris Ellison).

3. Suggesting the counterproductive nature of such warnings, one critic questioned, “[w]hat is the point of putting out a general alert which gives you no idea of timing or place and then tell[ing] everyone not to panic?” *Tighter Security for Aussie Icons*, NEWCASTLE HERALD (AUSTL.), Nov. 21, 2002, at 45 [hereinafter *Tighter Security*].

4. *Unspecified Risk*, *supra* note 2, at 1.

5. “A Federal Government in receipt of credible information but failing to pass that on to the public, would be irresponsible to the extreme.” *Tighter Security*, *supra* note 3, at 45 (citing Australian Premier Bob Carr).

planners in the 1960s, who were under great pressure to prepare citizens for the aftermath of an all-out nuclear war, it is not necessarily true that a duty to “expect the unexpected” is anything new.⁶ Recognizing the common elements of governmental responses to no-notice threats can provide significant guidance for addressing such threats. Another example of no-notice threats, which serves as the focus of this Article, consists of transboundary harms in which no human is responsible for their creation.

This Article addresses “extreme” natural threats that endanger multiple countries simultaneously, in particular the threat of “natural impact”—i.e., the threat of asteroids or comets striking the Earth. These threats are particularly dangerous because they are not preceded by the many indicators that enable law enforcement agencies to prevent acts of terrorism, such as “chatter,” the transfer of large sums of money, and odd travel patterns.⁸ Often, natural threats cannot be prevented, which means that equal, if not greater, emphasis must be placed on *post*-disaster response.⁹ Consequently, the prototype for identifying the duties of governments to plan for and act in the face of massive harm cannot be the traditional, isolated natural disaster, such as the tornado, earthquake, or typhoon, which does not necessarily involve an international response.

While the date of the next asteroid or comet disaster remains unknown, the potential for serious harm from these objects cannot be denied.¹⁰ Although the much glamorized “global killer” (perhaps as large as ten kilometers in diameter¹¹), which would potentially

6. See *infra* Parts III.A.2 & V.C (discussing aspects of the American civil defense experience).

7. Risk analysts often describe these events as “rare, severe, and outside the normal range of experience in question.” Vicki M. Bier et al., *A Survey of Approaches for Assessing and Managing the Risk of Extremes*, 19 RISK ANALYSIS 83, 83 (1999).

8. E.g., Chris McLaughlin, *War Chat Boom*, SUNDAY MIRROR (U.K.), Dec 1, 2002, at 8 (discussing methods of predicting terrorist attacks based on surveillance techniques).

9. HARLAN CLEVELAND, THE GLOBAL COMMONS: POLICY FOR THE PLANET 57–58 (1989) (recognizing as “an important advance in consensus” the desire to address both prevention and adaptation to global harm rather than treating the two as mutually exclusive).

10. See, e.g., REPORT OF THE TASK FORCE ON POTENTIALLY HAZARDOUS NEAR EARTH OBJECTS 16 (U.K., Sept. 2000) [hereinafter U.K. TASK FORCE REPORT]; Martin E.B. France, *Planetary Defense: Eliminating the Gigggle Factor*, AIR & SPACE POWER CHRON., at 1 (Aug. 7, 2000), available at <http://www.airpower.maxwell.af.mil/airchronicles/cc/france2.html> (citing numerous sources and related statistics for the proposition that “the threat is real”); Evan R. Seamone, Note, *When Wishing on a Star Just Won't Do: The Legal Basis for International Cooperation in the Mitigation of Asteroid Impacts and Similar Transboundary Disasters*, 87 IOWA L. REV. 1091, 1101–04 (2002).

11. In reality, asteroids or comets with the potential to cause “global” harm range in size, depending on the nature of harm. For a synopsis of the types of harm that would be created by different size asteroids or comets, see U.K. TASKFORCE REPORT, *supra* note 10, at

eliminate most life on Earth, might only occur after many millions of years,¹² our planet is bombarded daily with countless smaller objects.¹³ At least three events, in Tunguska, the Amazon, and Central Asia, within the last 100 years alone would have killed “thousands and perhaps hundreds of thousands,” had they occurred in more populated areas.¹⁴ While most objects end up in the Earth’s oceans, the closeness in time of these recorded smaller-scale events on land suggests that nations will probably have to deal with some level of harm from the sky within the next century.¹⁵

Regarding threats of the highest magnitude, the results of the bombardment of Jupiter by the Shoemaker Levy-9 comet¹⁶ basically confirm the statement of U.S. Representative George E. Brown, Jr.:

If some day in the future we discover well in advance that an asteroid that is big enough to cause a mass extinction is going to hit the Earth, and then we alter the course of that asteroid so that it does not hit us, it will be one of the most important accomplishments in

16. Yet, based on these figures, it is probably safe to say that an impact on the magnitude of 10 km. would produce harm roughly the equivalent of the dinosaur extinction. See France, *supra* note 10, at 1.

12. Clark R. Chapman et al., *The Comet/Asteroid Impact Hazard: A Systems Approach* at 6 and tbl. 1 (Feb. 24, 2001) (unpublished White Paper, on file with the Southwest Research Institute Office of Space Studies), available at <http://www.boulder.swri.edu/clark/neowp.html>.

13. See Herbert Adams, *Close Encounters of the Bolide Kind: Of Meteorites and Mainers*, available at <http://www.scarboroughmaine.com/slct/referen/a03/rp1003.html> (reprinted excerpt from 2(3) HABITAT: J. MAINE AUDUBON SOC’Y (1985)):

Meteoroids orbit our Sun in great swarms, each particle on its own path parallel to its neighbors, most being little more than dust-sized bits that burn quickly and brightly when they stray into the upper atmosphere of our planet. About 25 million bits of this cosmic dust—from 10 to 100 tons of matter—burn up in our atmosphere and filter down, quietly adding to the weight of our Earth every day.

Simon P. Worden explains that every year, there are roughly “30-odd impacts on the upper atmosphere” of the Earth large enough to result in “a bright flash accompanied by a damaging shock wave,” raising the concern that warring nations might misinterpret these events as attacks. Brigadier General Simon P. Worden, Deputy Director for Operations of U.S. Space Command, *Military Perspectives on the Near-Earth Object (NEO) Threat* 1 (Jul. 10, 2002) available at <http://www.spaceref.com/news/viewpr.html?pid=8834>.

14. *Id.* at 3; Worden, *supra* note 13, at 2.

15. Chapman et al., *supra* note 12, at 4 (“[T]here is a much higher chance . . . that we or our grandchildren will actually have to deal with [a threat that is approximately 200 meters or greater but less than one kilometer] during this century.”).

16. For a concise discussion of the 1994 bombardment of Jupiter by the comet with accompanying photographs of the damage caused to Jupiter, see U.K. TASK FORCE REPORT, *supra* note 10, at 15.

all of human history.¹⁷

Many characteristics of natural impact threats are common to all natural threats that endanger the global commons, as well as to harms originating from humans. Understanding applicable governmental duties requires an analysis of domestic and international law, historical precedents, and various aspects of risk analysis.

Part II of this Article discusses the sources of legal duties regarding unforeseen natural threats. It identifies a spectrum of choices ranging from traditional concepts of blame and liability, at one pole, to “good will” and charity, at the other. The nature of “exotic,” unfamiliar natural threats cannot be addressed sufficiently at either of these poles; instead, nations need to proceed from more traditional, intermediate notions rooted in the concept of self-preservation.

Part III identifies common principles of law that have existed in governmental efforts at self-preservation from historic times to the present. By identifying four common functions of domestic and international law that have appeared repeatedly in court decisions and legislation, Part III helps identify parameters for any efforts mounted by governments to combat the unknown. In order to examine the legal obligations of governments, Part III also focuses on judicial decisions related to the American civil defense era, during which courts examined specific attributes of preparedness programs.

Part IV explores the execution of governmental duties by examining current efforts by governments to address three similarly unpredictable transboundary harms: (1) nuclear reactor emergencies and nuclear and biological counterterrorism; (2) transboundary forest fire mitigation; and (3) efforts to detect and contain the international spread of exotic infectious diseases. Each area features not only many of the legal measures addressed in Part III, but also a common organizational structure and method for improving responsiveness to crises, particularly through the use of simulated exercises.

Part V applies existing law to the asteroid and comet threat. First, it recognizes that over-reliance on the law and policy related to space, i.e., the source of the threat, coupled with a lack of reliance on the law and policy related to the effects of the threat, have largely prevented the development of a more extensive legal regime to govern international responses to natural impact. After explaining the need for a combined source- and effects-based policy approach, Part

17. France, *supra* note 10, at 8.

V then addresses how the law overcomes common human reactions to exotic threats, such as the “giggle factor,” in relation to the science-fiction element of asteroid and comet impact.¹⁸

Part VI concludes with three key recommendations on how to structure the optimal international approach to natural impact, providing insight into responses for other types of natural and unpreventable harm. The first recommendation suggests the adoption of a “unified command” model, similar to existing approaches in varied settings, but one that is supplemented by regional agreements addressing unique circumstances. The role of the joint operations center would be to develop binding regulations, provide oversight, and offer guidance on various issues. Necessarily, this means removing *sole* responsibility from the United Nations (“U.N.”) committees in charge of space issues because their approaches are often ill-suited to taking immediate action in the face of grave danger.¹⁹ The second recommendation urges nations to consult with the international agencies that have learned how to prepare for unpredictable events after years of trial and error—i.e., the facilitators of the TOPOFF and INEX exercises,²⁰ the Northeastern Fire Protection Commission,²¹ and the commission that recently revised the International Health Regulations.²² The third recommendation calls for nations to conduct two simulated exercises addressing combined aspects of natural impact mitigation.

In addressing any natural threat, simulations can provide responses to many questions that, at first, may appear “impossible” to answer. This approach fosters cooperation with existing agencies and mutual exercises, which will assist in reducing costs and enable

18. *Id.* at 1; *infra* note 195, and accompanying discussion.

19. Dr. Jürgen Reifarh, for example, explains why he “would prefer a bilateral or unilateral approach [to space disaster], which—at least in the beginning—should be placed outside the U.N.”: “Unlike other subjects discussed in the Outer Space Committee of the United Nations, the topic of space debris does not involve a balancing of interests; what is important is that the common safety interests of the space nations be satisfied.” Jürgen Reifarh, *An Appropriate Legal Format for the Discussion of the Problem of Space Debris*, in ENVIRONMENTAL ASPECTS OF ACTIVITIES IN OUTER SPACE 301, 309 (Karl-Heinz Böckstiegel ed., 1988) [hereinafter ENVIRONMENTAL ASPECTS]. Dr. Eilene Galloway reaches a similar conclusion based on the inadequacy of the Outer Space Treaty’s warning mechanisms for dangerous situations. “Although the method of notifying the United Nations Secretary General of space debris damages to beneficial functions is desirable, it is not adequate for solving various environmental problems.” Eilene Galloway, *The Present Status of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, in ENVIRONMENTAL ASPECTS, *supra*, at 81, 98.

20. *Infra* Part IV.A.

21. *Infra* Part IV.B.

22. *Infra* Part IV.C.

evaluation of the natural impact mitigation program's effectiveness. The development of a functioning international regime addressing natural impacts will also greatly further the establishment of parameters for mitigating any widespread no-notice harm originating in the global commons, a policy area that currently lacks a coherent international approach.

II. THE IMPORTANCE OF BINDING OBLIGATIONS TO MITIGATE NATURAL HARM

When courts discuss the duties of nations to protect their citizens or abide by standards in their conduct with other states, the analysis is necessarily a legal one, often relying on treaties, caselaw, and customary international law. The law applicable to natural disaster, however, is a particularly narrow field that relies on a more restrictive "legal" approach, which rejects many of the traditional theories present in other venues. Consequently, distinguishing the areas of law that are inapplicable to natural disaster is perhaps just as important as the subsequent discussion of the applicable law.

Merely focusing on how a court might determine penalties for failure to comply with duties, where to place blame, and how to determine monetary damages or reparations for harm in the aftermath of a serious natural disaster would *defeat* the purpose of the necessary legal analysis. In many cases, the harm threatened by extreme disasters could very well leave defendants unable to satisfy their obligations and insurance companies unable to pay their policies.²³ Instead, the most useful legal principles applicable to natural disaster must provide a basis for intervention in advance of harm. Only then can governments intervene with the most meaningful action to aid potential victims and preserve social and political stability.

Legal approaches applicable to extreme natural disasters, such as a natural impact, a plague similar to the Black Plague, or the projected collapse of the Cumbre Vieja Volcano into the ocean, exist on a continuum.²⁴ On one end of the spectrum, nations might proceed from principles of blame and culpability. This has been the position

23. See, e.g., *Insured Against Disaster: Terrorism-Insurance Bill is Necessary to Protect Americans*, COLUMBUS DISPATCH (Home Final Ed.), Nov. 25, 2002, at 6A ("After the terrorist attacks of Sept. 11, reinsurance companies largely stopped offering coverage for losses stemming from acts of terrorism, because these businesses no longer could afford to do so.").

24. See Seamone, *supra* note 10, at 1096-97 (addressing similarities between these and other particular types of exotic transboundary harms).

of nations on the issue of space debris.²⁵ Yet, legal standards on even that issue have been difficult to achieve because it is almost impossible to prove that a nation caused harm.²⁶ When the threat is not man-made, as is the case for unforeseen natural harms, principles of blame remain largely inoperative until the harm has already occurred, in which case, it may be too late to apply such principles. Therefore, nations must reject the principle of blame as a legal framework for mitigating crises like natural impact.²⁷

At the other end of the spectrum are notions of charity and “good will.” Currently, in dealing with natural disasters of a smaller magnitude, nations operate from these principles. Even in routine cases, this framework creates problems, indicating that governments must also disregard charity as a viable principle, especially when addressing a larger threat.²⁸ Numerous agencies and organizations respond on the basis of charity, each with different and incompatible views that may exacerbate the harm suffered by victims of disaster.²⁹ For these reasons, it will be harmful for policymakers to assume that nongovernmental organizations and various arms of the U.N. will successfully respond to the harms posed by an unexpected and extreme natural disaster.³⁰

The optimal approach to the mitigation of sudden and widespread natural harm rests somewhere near the center of the continuum where well-settled principles of self-preservation lie. These principles recognize that governments cease to exist without citizens whose welfare is preserved. Because such notions are so fundamental, formal sources of international law and domestic obligations require intergovernmental cooperation for the purpose of

25. See generally Mark J. Sundahl, Note, *Unidentified Orbital Debris: The Case of a Market Share Liability Regime*, 24 HASTINGS INT’L & COMP. L. REV. 125, 126 (2000) (reviewing the development of law on the subject).

26. See *id.* at 137–38 (explaining why existing approaches, such as insurance and the liability pool, are ineffective); see also Stephanie Tai & Todd Bissett, 2000 *Manfred Lachs Space Law Moot Court Competition: Winning Briefs, Respondent Brief*, 13 GEO. INT’L ENVTL. L. REV. 303 (2000) (speculating why, even under the current regime, imposing liability is nearly impossible).

27. See, e.g., Seamone, *supra* note 10, at 1114–17.

28. See *id.* at 1111–14.

29. JOVICA PATRNOGIC & BOSKO JAKOVLJEVIC, PROTECTION OF HUMAN BEINGS IN DISASTER SITUATIONS: A PROPOSAL FOR GUIDING PRINCIPLES 8–9 (1989); David W. Sar, *Helping Hands: Aid for Natural Disaster Homeless vs. Aid for “Ordinary Homeless,”* 7 STAN. L. & POL’Y REV. 129, 139 (1995).

30. For an example of such estimations, see Michael B. Gerrard & John L. Remo, *Response to Sub-Critical Cosmic Impacts*, 52 J. BRIT. INTERPLANETARY SOC’Y 115, 118–20 (1999) (speculating that multiple United Nations’ programs will handle the aspects of natural impact).

self-preservation.

One very significant obstacle to the attainment of effective mitigation of natural harm at the international level is the notion that treaty law is the only source of governmental obligations.³¹ Many of the principles that are applicable to extreme natural disasters are binding, even though they do not exist in any treaty. According to the Statute of the International Court of Justice, international tribunals, and national courts interpreting international law, there are multiple “sources of international law” based on the practices of nations over time and other norms that impose requirements on the joint action of nations.³²

One source of law that applies to a threat like natural impact is “customary international law.”³³ The duty to warn another nation of a known danger arguably falls within this category.³⁴ This duty exists where nations have met two specific requirements for a customary obligation—they have: (1) repeatedly engaged in this practice when dealing with each other over time; and (2) demonstrated their interest in being bound by the duty.³⁵ Therefore, under customary international law, as applied to natural impact, once a nation is aware of an existing threat, its government has a duty to notify any nation likely to be harmed.³⁶

Another applicable source of law is the obligation to act in “good faith” when reaching international agreements. This broader duty is considered a “general principle of international law.”³⁷ Different requirements pertain to general principles. These notions help to fill gaps that would otherwise leave international courts

31. See *infra* note 200 and accompanying text (describing positions of the United Nations Committee addressing Near Earth Objects and the United Kingdom’s Taskforce).

32. E.g., STATUTE OF THE INTERNATIONAL COURT OF JUSTICE, June 26, 1945, 59 Stat. 1031 (entered into force Oct. 24, 1945), art. 38 (describing sources of international law); SOURCES OF INTERNATIONAL LAW (Martti Koskenniemi ed., 2000) (providing a general overview of how courts and scholars have interpreted principles relating to the sources of international law).

33. I L. OPPENHEIM, INTERNATIONAL LAW: A TREATISE 26 (Hersch Lauterpacht ed., 8th ed. 1955).

34. Deveraux McClatchey, *Chernobyl and Sandoz One Decade Later: The Evolution of State Responsibility for International Disasters, 1986–1996*, 25 GA. J. INT’L & COMP. L. 659, 669 (1996).

35. RESTATEMENT (THIRD) OF FOREIGN RELATIONS LAW OF THE UNITED STATES § 102 cmt. c (1987).

36. See Seamone, *supra* note 10, at 1131–33.

37. BIN CHENG, GENERAL PRINCIPLES OF LAW AS APPLIED BY INTERNATIONAL COURTS AND TRIBUNALS 388–90 (1953) (explaining that these principles “belong to no particular system of law but are common to them all”).

without a basis to settle a dispute.³⁸ Applied to natural impact, certain duties to cooperate in detecting the particular threat, or in rendering aid to those harmed by a comet or asteroid, would arise under general principles, rather than customary obligations because nations have not acted in the same manner previously.

Aside from obligations arising from the established practice of nations, there are also preemptory norms (*jus cogens*)—legal concepts which prohibit nations from engaging in specified behaviors. Genocide and the killing of prisoners of war are two noted examples.³⁹ These norms often overlap with the obligations of nations to the international community as a whole (obligations *erga omnes*).⁴⁰ Applied to natural impact, just as it may be a violation to willingly destroy an entire society, it may likewise be a violation to fail to act to prevent similar amounts of devastation resulting from an asteroid or comet collision.

III. BINDING LEGAL PRINCIPLES ADDRESSING RESPONSES TO UNEXPECTED NATURAL HARM

There are certain laws, binding upon systems of nations and the smallest municipalities alike, that arise from the necessity of governments to function and that have immediate force, even if they do not exist in writing after ratification by an approving authority.⁴¹ The proposition arises from the legal maxim, *salus populi est suprema lex*: “Regard for the public welfare is the highest law.”⁴² Pre-planning for an extreme natural disaster invokes the law of self-preservation, which is so essential that it is virtually “absolute.”⁴³

38. MALCOM N. SHAW, INTERNATIONAL LAW 80–81 (4th ed. 1997) (citing cases).

39. Roman Boed, *State of Necessity as a Justification for Intentionally Wrongful Conduct*, 3 YALE HUM. RTS. & DEV. L.J. 1, 32 (2000).

40. *In re Barcelona Traction, Light and Power Company, Limited*. (Belg. v. Spain), 1970 I.C.J. 4, 32 (Feb. 5). Examples noted by the International Court of Justice include the “outlawing of acts of aggression, and of genocide . . . and rules concerning the basic rights of the human person, including protection from slavery and racial discrimination.” *Id.*

41. For example, after extensive analysis of numerous international practices, the noted jurist, Prentice, pointed out: “The law of necessity has been stated to be an exception to all human ordinances and constitutions. . . .” W.P. PRENTICE, POLICE POWERS ARISING UNDER THE LAW OF OVERRULING NECESSITY 4 (1894).

42. HERBERT BROOM, A SELECTION OF MAXIMS, CLASSIFIED AND ILLUSTRATED I (10th ed. 1939); JOHN LOCKE, TWO TREATISES OF GOVERNMENT 391–92 (Peter Laslett ed., Cambridge Univ. Press 1960) (1690).

43. Noted international law scholar Henry Wheaton recognized as “absolute” a nation’s right of self-preservation respecting other states and duty to self-preserve. HENRY WHEATON,

Internationally, the rule of self-preservation takes on the dimension of “cooperative preservation,” which requires nations to cooperate in order to preserve their own citizens in the face of an international threat.⁴⁴ The four principles that arise from duties of self- and cooperative preservation at the national and international levels are: (1) the accomplishment of a common objective; (2) precautionary action; (3) expediency; and (4) discrimination in the prioritization of measures adopted.

The government’s actions pertaining to an individual may be justified on the basis of a common goal to preserve society.⁴⁵ In the international realm, to preserve international order, this function of law would require joint mitigation efforts, even where only one region may be harmed by an unexpected disaster.⁴⁶ This idea is also inherent in the concept of obligations of law, *erga omnes*, which are “obligations . . . towards the international community as a whole [as] the common concern of all States,” permitting or even commanding international intervention within the borders of a single nation.⁴⁷

Precautionary measures are those that would require mitigation in advance of actual threats, at both the domestic and international levels. The precautionary principle, which directs planning within the European Community, is one example of how this function of extreme natural disaster mitigation operates.⁴⁸ Under the principle of expediency, small groups, responsible for responding to international threats at the domestic and international levels, operate independently without the burdensome requirements of deliberative forums, such as state legislatures or the U.N. General Assembly.⁴⁹ Finally, the discriminatory function of the body of law applicable to natural impact requires nations and groups of nations to apply the former three frameworks only to threats that are deserving of exceptional treatment.⁵⁰

To better understand these principles, the following Section explores in depth the application of the discriminatory function.⁵¹

ELEMENTS OF INTERNATIONAL LAW WITH A SKETCH OF THE HISTORY OF THE SCIENCE 80 (De Capo ed., 1972) (1836).

44. See Seamone, *supra* note 10, at 1120–21 (defining term).

45. See *infra* Part III.A.

46. See *infra* Part III.B.

47. *Id.*

48. See *infra* Part III.B.

49. See *infra* Part III.A.2.

50. See *infra* Part III.A.1.

51. *Id.*

After explaining why natural impact meets the standard, an analysis of caselaw regarding civil defense exercises from the 1940s through the 1960s follows, offering applications of the other three legal principles.⁵² Court decisions from New Jersey, Massachusetts, and New York discern the legal bases for establishing the duty of governments to mitigate unforeseen threats. The same factors addressed in these American cases may be applied to international law.⁵³ Understanding the interactions of these principles of law at the domestic and international levels will enable policymakers to address the rights and responsibilities related to natural impact in a deliberate and formulaic manner.

A. *Self-Preservation at the National Level*

At a national level, self-preservation involves the state's inherent police power to regulate in the interest of the health, safety, and welfare of its citizens.⁵⁴ As noted in *Wymhammer v. The People*:

It is upon this principle [of the police power] that health and quarantine laws are established; that a building is blown up to arrest a conflagration in a populous town; that the public market is purged of infectious articles; that merchandise on ship board, infested with pestilence, is cast into the deep, and public nuisances are abated. It is the public exigency, which demands the summary destruction, upon the maxim, that the safety of society is the paramount law. It is the application of the personal right or principle of

52. See *infra* Part III.A.2.

53. See *infra* Part III.B.

54. Chief Justice Marshall identified this power in the *Gibbons v. Ogden* decision as an "immense mass of legislation, which embraces every thing within the territory of a State, not surrendered to the general government [including] . . . Inspection laws, quarantine laws, health laws of every description . . ." 22 U.S. 1, 203 (1824).

This body of law is so essential, it overrides traditional principles of liability and property rights:

[I]n cases of actual necessity, —as that of preventing fire, —the ravages of a pestilence, or any other great calamity, the private property of any individual may be lawfully taken, used or destroyed for the relief, protection, or safety of the many, without subjecting the actors to personal liability.

PRENTICE, *supra* note 41, at 444. As Joseph Chitty recognized, even "[t]he [Crown's] prerogative is not the iron tie of unbridled power: it holds the subject in the silken chain of mild subjection, for the general and permanent welfare of society." J. CHITTY, A TREATISE ON THE LAW OF THE PREROGATIVES OF THE CROWN iii (London, 1820).

self-preservation to the body politic.⁵⁵

Because the police power calls for prompt action, it is often called the law of “*overruling necessity*.”⁵⁶ Waiting ages to develop a long line of precedent to remedy an immediate threat would defeat the existence of governments and local order.⁵⁷ The U.S. Supreme Court has stated: “We reject any principle of governmental helplessness . . . which principle, carried to its logical conclusion, must lead to anarchy.”⁵⁸ Other domestic examples include the German government’s articulation of the *Vorsorgeprinzip*: “Environmental policy is not fully accomplished by warding off imminent hazards and the elimination of damage which has occurred. Precautionary environmental policy requires furthermore that natural resources are protected and demands on them are made with care.”⁵⁹

Planning for threats that have not yet occurred is one aspect of the duty of self-preservation.⁶⁰ The requirement materializes indirectly in various forms of self-protective legislation, including vaccinations and quarantine measures,⁶¹ force-feeding those who refuse to eat,⁶² requiring motorcycle helmets,⁶³ “Good Samaritan” laws

55. *Wynehamer v. People*, 13 N.Y. 378, 451–52 (N.Y. 1856).

56. PRENTICE, *supra* note 41, at 4.

57. In his acclaimed treatise on the doctrine of necessity, Prentice recognized well-settled common law:

Whatever is detrimental to the interests of the public, as understood at the time, falls within its ban. It is sufficient that this tendency be shown, and we have not to wait for the appearance of detrimental results The welfare and security of civil society, for which government is constituted and laws are made, are the common foundation of public policy and statute law, and necessity guides them both.

Id. at 299.

58. *Dennis v. United States*, 341 U.S. 494, 501 (1951) (addressing the need for governmental response to revolutionary activities).

59. Konrad von Moltke, *The Vorsorgeprinzip in West German Environmental Policy*, reprinted in ROYAL COMMISSION ON ENVTL. POLLUTION, TWELFTH REPORT: BEST PRACTICAL ENVIRONMENTAL OPTION 57, 58 (1988).

60. *See infra* Part III.A.2.

61. Respecting quarantine, the U.S. Supreme Court upheld the authority of a State to enact quarantine laws and “health laws of every description” on the basis of the police power. *Jacobson v. Massachusetts*, 197 U.S. 11, 25 (1905). Vaccination is similarly justifiable for serious diseases, as smallpox was at the time of the decision. *Id.* at 28.

62. Joel K. Greenberg, *Hunger Striking Prisoners: The Constitutionality of Force-Feeding*, 51 *FORDHAM L. REV.* 747, 759 (1983) (discussing as a justification for force-feeding “the preservation of society”).

63. Note particularly that the courts upholding such legislation do so on the basis of the threat to society, not simply the individual who would be harmed: “[A]ll of these decisions have attempted to characterize this type of legislation as an attempt to protect the public’s—not the affected individual’s—health or welfare.” KENNETH R. WING, *THE LAW AND THE*

compelling individuals to aid those in peril,⁶⁴ etc. Aside from the common argument that governments will cut medical expenses by implementing such protective measures,⁶⁵ the necessity of preserving society also has been cited.⁶⁶ Such legislation is usually directed toward predictable threats that can be prevented with proven measures. After all, a motorcycle rider can minimize the risk of harm to his head by making a conscious choice to wear a helmet before traveling.

Before determining the requirements to mitigate extreme and unexpected natural disasters, one must answer two questions: (1) what aspects of such unpredictable threats do governments have the responsibility to prevent; and (2) what action must governments take to satisfy their related obligations. *Ducey v. United States*,⁶⁷ a case from the Court of Appeals for the Ninth Circuit, draws an important distinction regarding the first question. As to the second inquiry, the law of civil defense reveals the need for preventive measures in response to the category of threats posed by natural impacts.

1. The *Ducey* Case and Identification of the Nature of the Threat

In *Ducey*, survivors of the victims of a 100-year flood, occurring on federal recreational land, sought compensation from the government for failure to warn the victims and to aid in their rescue.⁶⁸ The record revealed that the flood had not occurred when predicted and that the government had issued no warnings of this fact. Much like other extreme natural disasters, documents revealed that these types of major flash floods were “not fully understood” and, although

PUBLIC'S HEALTH 36 n.3 (3d ed. 1990). Aside from other rationales, some courts explain that “society has an interest in maintaining a strong and productive citizenry.” *Id.* at 28.

64. See David C. Biggs, “*The Good Samaritan is Packing*”: *An Overview of the Broadened Duty to Aid Your Fellowman, with the Modern Desire to Possess Concealed Weapons*, 22 DAYTON L. REV. 225, 226–36 (1997) (reviewing various laws in jurisdictions and recognizing “the movement by states to impose an affirmative duty to aid those who are victims of natural disasters”).

65. See Norman L. Cantor, *A Patient's Decision to Decline Life-Saving Medical Treatment: Bodily Integrity Versus the Preservation of Life*, 26 RUTGERS L. REV. 228, 247 n.100 (1973) (arguing how these rules are “rationalized by reliance on the state's interest in avoiding the economic burden of an injured person”).

66. *Id.* (recognizing *Congdon's* precedential value).

67. 830 F.2d 1071 (9th Cir. 1987).

68. This Article is not concerned with the nuances of the Federal Tort Claims Act, addressed by the court, which permits citizens to sue the government under certain limited circumstances for harm they suffer. See 28 U.S.C. §§ 1346, 2671, 2680 (2002) (describing standards as well as exceptions for such claims).

some occurred, they were “frequently ignored” by policymakers due to their lack of understanding.⁶⁹ When the flood finally did occur, it was seven times greater than projected and resulted in fatalities. The lower court held that the governmental entity could not have anticipated a flood so great and found no duty to warn the public of the unforeseen event.⁷⁰ The Court of Appeals, however, reversed, finding clear error in the district court’s reasoning:

The record shows that the government was aware that a life-threatening, 100-year flood was long overdue. From this awareness, it follows that the government foresaw the danger of a 100-year flood. Therefore, the government was under a duty to warn decedents (who were recreational users of the flood plain) of the hazards of a major 100-year flood, and to take the same precautionary measures that a reasonable private landowner would have taken under those circumstances.⁷¹

In rendering its ruling, which was based primarily on traditional principles of tort law, the *Ducey* Court drew an important distinction in determining governmental responsibilities.

A government is not liable to warn its citizens of all dangers or prevent all types of unforeseen events that may cause injury. On the one hand, the law recognizes that many threats are beyond human control and responsibility. This notion is clear in force majeure clauses⁷² as well as the “Act of God” defense.⁷³ Furthermore, the legal doctrine of *de minimis* risk dictates that some threats are simply too trivial to require the imposition of legal duties.⁷⁴ Courts will

69. *Ducey v. United States*, 523 F. Supp. 225, 227–28 (D. Nev. 1981).

70. *Ducey*, 830 F.2d at 1072 (“On remand, the district court found that the flood was not foreseeable and that defendant had no duty to warn decedents.”).

71. *Id.* at 1072.

72. Michael D. Hodges, *The Rights and Responsibilities of Using an International Waterway*, 4 D.C. J. INT’L L. & PRAC. 374, 386 (1995):

An earthquake is an example of a natural disaster that relieves a state’s liability. It is international law that force majeure relieves a party of liability, this international law even applies to environmental accidents. Also, a national emergency can give rise to exceptions to the rights and duties otherwise applied upon a state in international law.

73. See generally Denis Binder, *Act of God? or Act of Man?: A Reappraisal of the Act of God Defense in Tort Law*, 15 REV. LITIG. 1 (1996).

74. In courts, the notion arises in the “legal principle *de minimis non curat lex*; i.e., the law does not concern itself with trifles.” Joseph Fiskel, *De Minimis Risk: From Concept to Practice*, in DE MINIMIS RISK 3, 4 (Chris Whipple ed., 1987). See also Robert W. Hahn & Cass R. Sunstein, *A New Executive Order for Improving Federal Regulation?: Deeper and*

commonly find no governmental liability for claims by hikers who fall from the edges of cliffs,⁷⁵ campers attacked by grizzly bears,⁷⁶ tourists injured by lava-heated ocean water,⁷⁷ and people injured due to the natural accumulation of snow in public areas.⁷⁸ In these scenarios, victims are capable of avoiding the risk and governments are helpless to monitor the minute details of each citizen's activity.

On the other hand, 100-year floods are threats of an entirely different nature. Such threats naturally activate the machinery of governments, requiring investigation and record-keeping that the average citizen would be unprepared to perform alone. Even though the flood could not be predicted definitively, certain actions by the government created further obligations. Of importance to the court was a letter by an administrator recognizing that the area was overdue for a flood⁷⁹ and transcripts from public meetings in which officials stressed the need to plan for a major flood based on a "continuing concern for human life and public safety."⁸⁰ By rejecting the "Act of God" defense, notwithstanding the unexpected size of the disaster,⁸¹ *Ducey* suggests that unpredictable threats in the category of natural

Wider Cost Benefit Analysis, 150 U. PA. L. REV. 1489, 1524 (2002) ("In the regulatory context, the principle has special importance. When risks are trivial, it is not likely to be worthwhile to eliminate them, partly because the effort distracts attention from more serious problems, partly because of the sheer expense of the effort.").

75. *Whalen v. United States*, 29 F. Supp. 2d 1093, 1099 (D. S.D. 1998) ("To post signs and build railings everywhere in the park which had the potential for causing harm would not only defeat the aesthetic purpose of the park but would be cost prohibitive.").

76. *Rubenstein v. United States*, 338 F. Supp. 654, 656 (N.D. Cal. 1972) ("[T]he danger of which plaintiff here contends he should have been warned was not specific and was certainly not known to, or even reasonably foreseeable by, the rangers"); ("The court holds that a reasonable man under circumstances similar to those described herein would have realized this type of danger exists in a wild life park and that Mr. Rubenstein either knew or should have known of the risk of an unprovoked attack."). *Id.* at 656.

77. *Kahan v. United States*, 73 F. Supp. 2d 1172, 1179 (D. Haw. 1999) ("The NPS had no duty to warn of every possible harm that could befall one who ventured into that area.").

78. See generally Michael J. Polelle, *Is the Natural Accumulation Rule All Wet?*, 26 LOY. U. CHI. L.J. 631, 631 (1995).

79. *Ducey*, 830 F.2d at 1072 n.1.

80. *Id.* at 1072 (citing assistant superintendent).

81. The court stated:

The government anticipated that a 100-year flood would result in death. While it is possible that the extraordinary size of the 1974 flood was a superseding cause (*i.e.*, an Act of God) making warnings ineffective in preventing the deaths, the government's failure to warn might have been the proximate cause of decedents' deaths if the deaths would nonetheless have occurred in a 100-year flood.

Id. at 1073.

impacts are similarly distinguishable.⁸²

2. Civil Defense Law and the Extent of Mitigation

Roughly a generation before *Ducey*, the National Plan for Civil Defense and Defense Mobilization required all American states to develop and enact plans for the mitigation of a nuclear attack.⁸³ To assist states, the Office of Civil Defense and Mobilization consequently compared all existing state laws to develop a Model State Civil Defense Act (“Model Act”), which highlighted key requirements common to the diverse jurisdictions.⁸⁴ Certain of these characteristics shed light on the type of mitigation arguably required for extreme and unpredicted natural harm.

The “policy and purpose” section of the Model Act explained that mobilization measures were required for responding to the “existing and increasing possibilit[ies]” of unknown “disasters of unprecedented size and destructiveness.”⁸⁵ Threats requiring mitigation included not only intentional acts of war or sabotage, but also those related to “fire, flood, earthquake, or other natural causes.”⁸⁶ The primary objective of instituting such measures was to “insure that preparations of [governments] will be adequate” to overcome related difficulties.⁸⁷

A key section of the Model Act addressed the necessity for mutual assistance between all governmental agencies and many private entities. It called for the development of “mutual aid arrangements for reciprocal civil defense aid and assistance in case of

82. Although studies suggested that a major storm was overdue in the area, *id.*, there would have been no way to predict with any precision the exact time of the flood. In the same vein, researchers have reason to suggest the Earth is currently “overdue” for a smaller-scale impact in a populated area based on ocean strikes that have occurred. Consider that two additional events similar to Tunguska in 1908 occurred in the 1930s and 1940s in the Amazon and Central Asia, respectively. With the potential of these two to take the lives of “thousands and perhaps hundreds of thousands,” it is at least arguable that the duty to act on the threat of natural impact is even greater than the 100-year threat implicated in *Ducey*. Worden, *supra* note 13, at 3.

83. See generally B. WAYNE BLANCHARD, AMERICAN CIVIL DEFENSE 1945–1984: THE EVOLUTION OF PROGRAMS AND POLICIES (1986), available at http://www.survivalring.org/nbcprep/FEMA_107.polf (describing the history and development of this doctrine).

84. See generally EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF CIVIL AND DEFENSE MOBILIZATION, COMPARISON OF STATE CIVIL DEFENSE LEGISLATION 1–22 (1960) [hereinafter CIVIL DEFENSE REPORT].

85. *Id.* at 1.

86. *Id.*

87. *Id.*

disaster too great to be dealt with unassisted.”⁸⁸ Other noteworthy mandates included the following: the ability to “provide for and compel the evacuation of all or part of the population from any stricken or threatened areas . . . and to take such steps that are necessary for the receipt and care of such evacuees”;⁸⁹ expediency provisions enabling the conduct of mitigation “without regard to time-consuming procedures and formalities prescribed by law”;⁹⁰ the prohibition of political activity by members of the organization;⁹¹ utilization of existing facilities and personnel;⁹² and the provision of mobile support units.⁹³

In recognition of the need for preventive measures to combat unknown threats, the most crucial section of the Model Act provided that states are required to:

procure supplies and equipment, to institute training programs and public information programs, and to take other preparatory steps including the partial or full mobilization of civil defense organizations *in advance of actual disaster*, to insure the furnishing of adequately trained and equipped forces of civil defense personnel in time of need.⁹⁴

Civil defense agencies responded to these mandates by implementing nationwide readiness tests, such as “Operation Alert 1961.”⁹⁵

As states enacted the great majority of civil defense legislation from the mid-1940s to the early 1950s,⁹⁶ the line of judicial precedent on civil defense began in 1943 when the New Jersey Court of Common Pleas decided *State v. Natelson Brothers*.⁹⁷ In *Natelson*

88. *Id.* § 10, at 15.

89. *Id.* § 7, at 11.

90. *Id.* § 9, at 15.

91. *Id.* § 14, at 20.

92. *Id.* § 15.

93. *Id.* § 8, at 12.

94. *Id.* at 6–7, § 6(c)(3) (emphasis added).

95. See *State v. Congdon*, 185 A.2d 21, 23 (N.J. Super. Ct. App. Div. 1962) (“This drill was part of a national program cooperated in by federal, state and local governments, as well as the public at large.”).

96. While in 1960, “all states . . . ha[d] civil defense legislation of one type or another,” it was the case that “laws of a few states were enacted during World War II, those of others were adopted in the late forties and early fifties, and still others [were] of a more recent origin.” CIVIL DEFENSE REPORT, *supra* note 84, at i, ii.

97. 32 A.2d 581 (N.J.C.P. Essex County 1943).

Brothers, the court determined that a business could be held accountable as a disorderly person for violating rules regarding compulsory blackouts during air raid drills.⁹⁸ Upholding New Jersey's civil defense act, the court explained the necessity of self-preservation:

To contend that the state was without power to use its resources and its police powers to protect its people in time of war from a threatened invasion, or to assist them in preparing to defend themselves and train themselves to resist in case of invasion, would be to say that the state as an instrumentality of protection for its citizens had ceased to exist. And to further say that in order to provide this protection for the people the legislature must by legislative enactment define every detail and prescribe every administrative function would be to produce another absurdity.⁹⁹

The court then proceeded to take judicial notice of a key fact:

[A]cts of war are as unpredictable and uncertain as the future unknown acts of God; and therefore if the people are to be protected against them or be trained to meet them, the power of prescribing the conditions under which they are to be met must be so flexible as to permit them to be changed or regulated upon practically a moment's notice. The person entrusted with the regulating of these administrative functions . . . must, if he is to be effective, be clothed with authority to act as situations occur from time to time. Otherwise the policy of the legislature, namely, to provide the people of the state with every possible protection, becomes a nullity.¹⁰⁰

Natelson Brothers recognized that hard and fast rules are anomalies in the context of disaster response.

Commonwealth v. Reitz, which also pertained to blackouts, supported *Natelson Brothers* one year later.¹⁰¹ Under Pennsylvania's legislation, Mr. Reitz was obliged to take shelter during the sounding of an air raid siren and reemerge only after the all-clear signal had

98. *Id.* at 582.

99. *Id.* at 583.

100. *Id.* at 583–84.

101. 39 A.2d 522 (Pa. Super Ct. 1944).

been given.¹⁰² He was arrested after failing to act on a warning from an air raid warden to stop his business and turn out the lights. The court relied on *Natelson Brothers* and found Reitz liable, even though it was true that his “remote section of Western Pennsylvania” would have been an unlikely target for enemy attack.¹⁰³

Eleven years later, the New York decision of *People ex rel. Hearn v. Parilli*¹⁰⁴ expanded upon the two prior opinions. On June 15, 1955, the City of New York conducted an air raid drill enlisting the services of neighborhood captains and other safety officials.¹⁰⁵ Certain individuals intentionally congregated in the City Hall Park, prior to the drill, with the intention of defying orders to take shelter.¹⁰⁶ After a short-lived protest, they were arrested pursuant to New York’s State Defense Emergency Act of 1951; they defended on the grounds of religion and expression.¹⁰⁷ Aside from denying these more generic claims,¹⁰⁸ the *Parilli* Court rejected an additional alternative defense that the drill “did not apply to an actual and present danger” and therefore infringed on the freedoms of individuals compelled to participate.¹⁰⁹ The dismissal of this claim accorded to preparatory actions the same deference as to acts initiated to preserve public safety in times of real exigency.

After the introduction of the National Plan for Civil Defense and Defense Mobilization, New Jersey decided *State v. Congdon*, which related to “Operation Alert 1961.”¹¹⁰ As in *Parilli*, a group of citizens refused to take cover on the grounds of their college campus once the alarm sounded.¹¹¹ The defendants raised similar claims in support of their actions: (1) only in times of true exigency would the statute have effect;¹¹² (2) *Natelson Brothers* only applied to a time of war;¹¹³ and (3) the requirement to participate was an unconstitutional

102. *Id.* at 523.

103. *Id.* at 524.

104. 147 N.Y.S.2d 618 (Magis. Ct. 1955).

105. *Id.* at 625–26.

106. *Id.* at 626.

107. *Id.* at 627.

108. *Id.* at 628 (“[M]otives, however sincere or worthy, cannot ‘justify practices inconsistent with the peace or safety of this state.’”).

109. *Id.* at 626.

110. *Congdon*, 185 A.2d at 23.

111. *Id.* at 23–24.

112. *Id.* at 25 (describing this allegation among others).

113. *Id.* at 29.

exercise of the state's police power.¹¹⁴ Supporting the caselaw to date, the *Congdon* court methodically dismissed each claim.

First, in finding the civil defense law applicable for training purposes, the court took judicial notice of "the necessity of government to plan for the protection of its citizens" and reasoned that "the intent of the Legislature was not to wait until the community had been struck by the holocaust . . . before civil defense measures could become effective."¹¹⁵

Next, restricting the application of *Natelson Brothers* only to times of war, opined the court, "ignores not only the basic policy of civil defense but also the concern of the *Natelson Brothers* court with training, protection and preparedness . . . it is realistic to uphold this defensive assertion of the police power in peacetime."¹¹⁶ Finally, after recognizing the "welfare of the people" as "the supreme law" and analogizing it to the "law of necessity," the court cited Dean Roscoe Pound to explain that the drills were in the "exercise [of] the common good" because "[l]ife in a civilized society presupposes security from aggression."¹¹⁷ This rationale supported New Jersey's exercise of the police power.

In another portion of *Congdon*, the court clarified its reasoning:

A civil defense drill is much more than an enforced ritual. It is potentially a matter of life and death. As we have already pointed out, the basis of the State's police power is the protection of its citizens. This protection must be granted irrespective of the fact that certain individuals may not wish to be saved or protected. Just as the State may require persons to be vaccinated or to be quarantined, so may it, as here, take steps to reduce the exposure of the citizens to the dangers of a possible war, including atomic bomb radiation.¹¹⁸

While *Ducey* helped to distinguish the types of risks that governments are expected to mitigate, *Natelson Brothers* and *Congdon* support the principle that in order for states to fulfill their

114. *Id.* at 28.

115. *Id.* at 26.

116. *Id.* at 21.

117. *Id.* at 29 (citing Roscoe Pound, *Juristic Theory in the Atomic Age*, 9 RUTGERS L. REV. 464, 465 (1954)).

118. *Id.* at 31.

duties, even in executing practice drills, their responses to disaster cannot be impeded by traditional procedural rules. Additionally, *Reitz* and *Parilli* eliminate differences in judicial treatment of real and hypothetical responses because effectiveness in either response achieves the same societal objective. The Model Act highlights the uniform applicability of these precedents throughout the United States.

The essential nature of principles of self-preservation for the proper functioning of governments largely provides the basis for the emergency response regime of any nation, not just that of the United States.¹¹⁹ The precedents discussed above highlight the basis for and necessity of mobilizing resources to plan for threats no one has yet experienced.

B. *International Cooperative Preservation*

The rule of self-preservation applies not only at the national level, but also at the international level. Aspects of the rule appeared in the early writings of noted jurists such as Hugo Grotius, the “father of necessity,” who explained, “in cases of extreme necessity, the original right of using things, as if they had remained in common, must be revived; because in all human laws, and consequently in the laws relating to property, the case of extreme necessity seems to form an exception.”¹²⁰

Similar sentiments appeared in the writings of Samuel Pufendorf¹²¹ and John Locke.¹²² The principle of self-preservation has impacted actual court decisions. In the field of maritime law, the following portion of Sir William Scott’s legal opinion in *The “Eleanor”* illustrates the legal principle:

It has been said, that even upon the supposition that

119. See Seamone, *supra* note 10, at 1128 n.184 (discussing various international constitutions and other related requirements).

120. HUGO GROTIUS, *THE RIGHTS OF WAR AND PEACE: INCLUDING THE LAW OF NATURE AND NATIONS* § VI, at 92 (A.C. Campbell trans., 1901) (1625).

121. SAMUEL PUFENDORF, *DE JURE NATURAE ET GENTIUM LIBRI OCTO* bk. II, ch. VI, at 118–19 (C.H. Oldfather & W.A. Oldfather, trans., Clarendon Press 1934) (1688) (discussing the right and privilege of necessity).

122. JOHN LOCKE, *TWO TREATISES OF GOVERNMENT* bk. 2, ch. XVI § 183 at 391 (Peter Laslett ed., Cambridge Univ., 1988) (3d ed. 1698) (recognizing the “Fundamental Law of Nature . . . that all, as much as may be, should be preserved [and] if there be not to fully satisfy both he that hath, and to spare, must remit something of his full Satisfaction, and give way to the pressing and preferable Title of those, who are in danger to perish without it.”).

this is to be taken as an alien ship, yet whatever may have been the imprudencies of conduct on the part of the owner, she would be entitled to the rights of hospitality if driven into a British port in distress; and certainly if the distress were real, whether Hall [the owner of the ship] is a British subject or not, and whatever may be the character attaching to the ship, she would be entitled to that benefit. Real and irresistible distress must be at all times a sufficient passport for human beings under any such application of human laws.¹²³

Burleigh Rodick's in-depth exploration of the law of necessity summarized the applicable rule of law as follows:

The right to possess those things essential to life permits a people to pass through the territory of another state on the ground that necessity revives the common ownership of property which once existed, and even gives them the right to reside there, provided they submit to its territorial laws.¹²⁴

These authorities address the necessity of protecting one's own nation (or crew, in the case of a seafaring vessel) against imminent harm. While the doctrines may be helpful, they fail to govern responses to a common threat. Consider, for example, the recent actions of nations invoking their "right" to self-preservation or the necessity of closing borders to refugees.¹²⁵ The rule that addresses common threats to all is not merely clothed in self-defense. Rather, it is the duty of cooperative preservation—the recognition that when facing threats of a great magnitude which endanger more than one nation, nations must cooperate in order to fulfill duties to preserve their own citizens.¹²⁶

In *Henfield's Case*, a decision rendered in 1793, Judge Wilson explained, in his charge to the grand jury, how the theory might easily be overlooked:

It seems to have been thought that the law of nations respects and regulates their conduct only in their

123. The "Eleanor," 165 Eng. Rep. 1058, 1067 (1809).

124. BURLEIGH CUSHING RODICK, *THE DOCTRINE OF NECESSITY IN INTERNATIONAL LAW* 3 (1928) (footnotes omitted).

125. This issue has been discussed in great length by Roman Boed, who works as a legal officer for the United Nations. See generally Boed, *supra* note 39.

126. For a more detailed explanation, see generally Seamone, *supra* note 10.

intercourse with each other. A very important branch of this law containing the duties which a nation owes to itself, has in great measure escaped attention. Of a state, as well as of an individual, self-preservation is a primary duty Under all the obligations due to the universal society of the human race, the citizens of a state still continue. To this universal society it is a duty that each nation should contribute to the welfare, the perfection and the happiness of the others. If so, the first degree of this duty is to do no injury But nations are not only prohibited from doing evil, they are also commanded to do good to one another. On states as well as individuals the duties of humanity are strictly incumbent; what each is obliged to perform for others, from others it is entitled to receive. Hence the advantages as well as the duty of humanity.¹²⁷

In this sense, “even self-preservation typically require[s] individuals to cooperate.”¹²⁸

Perhaps the most noteworthy example of cooperative preservation is the recognition that “the preservation of society from disease is a fundamental duty of government.”¹²⁹ Not only have countries instituted policies within their own borders, but quarantine and other measures have “formed part of the interaction between states from the beginning of the international system.”¹³⁰ By the mid-1800s, “the national interest in disease control came to reflect a need for international cooperation—for attacking the problem systematically in international relations rather than just nationally within the state.”¹³¹ Similar to the civil defense precedent, governments here needed to prepare before the problem would escape their control. However, in order to achieve the goal of self-preservation and reap the benefits of mitigation, in the case of disease control, unlike civil defense, states had to work in concert.

The driving principle behind states’ cooperation—the health of their own citizens—is, to a great degree, the basis of the

127. *Henfield’s Case*, 11 F. Cas. 1099, 1107 (C.C.D. Pa. 1793).

128. Phillip A. Hamburger, *Natural Rights, Natural Law, and American Constitutions*, 102 *YALE L.J.* 907, 924 (1993).

129. Paul Slack, *Introduction to EPIDEMICS AND IDEAS: ESSAYS ON THE HISTORICAL PERCEPTION OF PESTILENCE* 12 (Terence Ranger & Paul Slack eds., 1992).

130. David P. Fidler, *Microbialpolitik: Infectious Diseases and International Relations*, 14 *AM. U. INT’L L. REV.* 1, 18 (1998).

131. *Id.* at 19.

precautionary principle underlying many European laws. While common to all nations, the precautionary principle manifests itself in different ways in their individual practices because nations each have “different degrees of accepting risk.”¹³²

Widespread adoption of preventive measures, however, is too common to be mere coincidence. Currently, the European Union’s reliance on the Maastricht Treaty of 1992¹³³ and documents aiding in the interpretation of its precautionary principle, such as the *Communication from the Commission on the Precautionary Principle*, published in February 2000,¹³⁴ reveal an international consensus indicative of cooperative preservation.¹³⁵ The key element relating to cooperative preservation requires that nations cooperate in reducing potential threats in advance of their deleterious effects.¹³⁶ To date, the precautionary principle has been applied in the uses of Sulfur Oxide (SO_x), responsive measures to mad-cow disease, and bans on the import of genetically modified beef.¹³⁷ In each of these three scenarios, governments did not wait for conclusive evidence of harm, but proceeded on the basis of “how much risk . . . society can tolerate.”¹³⁸ Actions were uniform because of a cooperative principle requiring the recognition of reciprocal threats and related objectives.¹³⁹

132. Yasushi Hibi, *Precautionary Approach Key to Managing Risks*, DAILY YOMIURI (Tokyo), Nov. 21, 2002, at 17. Even in Japan, where there must first be conclusive scientific findings, the preventive approach is still generally the accepted method. *Id.*

133. MAASTRICHT TREATY ON EUROPEAN UNION 1992 O.J. (C191) I TREATY ON EUROPEAN UNION, art. 130r (2) (as amended Jan. 1, 1995) [hereinafter MAASTRICHT TREATY].

134. Communication from the Commission on the Precautionary Principle, Commission of the European Communities, COM (2000), Feb. 2, 2000.

135. See, however, *infra* note 142, for a more comprehensive, global description.

136. See MAASTRICHT TREATY, *supra* note 131, at art. 130r (2) (“Community policy on the environment . . . Shall be based on the precautionary principle and on principles that preventive action should be taken, that environmental damage should as a priority be rectified at source . . .”).

The power of the principle should not be underestimated given its widespread adoption notwithstanding its limitations. For example, one observed limitation is ambiguity in the guidance offered. Lothar Gundling, *The Status in International Law of the Principle of Precautionary Action*, 5 INT’L J. ESTUARINE & COASTAL L. 23, 30 (1990). Specifically, “[i]t is not easy to say what meaning this ‘principle’ has, given that attempts to take precautions against one threat may exacerbate dangers from another and without clear understanding of a threat, it is impossible to know whether precautions are ‘cost-effective.’” Jeremy Rabkin, *Is EU Policy Eroding the Sovereignty of Non-Member States?*, 1 CHI. J. INT’L L. 273, 281 n.11 (2000). In many cases, there is widespread disappointment that national decisions are made based upon “logic rather than fact.” Michael Fry, *Creature of Burble and Froth Stitched Up in Beef Battle*, HERALD (GLASGOW), Dec. 21, 1999, at 15.

137. Hibi, *supra* note 132, at 17.

138. *Id.*

139. As recently observed, “[w]hile new as an environmental policy imperative, [the

Consensus on all types of risk is hardly achieved by the Maastricht Treaty alone. The recent *EC—Hormones* arbitration revealed a clash between European and American approaches to the genetic modification of food.¹⁴⁰ However, common actions taken by governments based on the high magnitude of harm threatened in a number of cases reveal similarities in precautionary approaches to environmental harm, even between jurisdictions with conflicting policies.¹⁴¹ African nations, such as Zimbabwe and Zambia, recently invoked the precautionary principle in rejecting donations of genetically modified food for feeding their hungry citizens, thereby further demonstrating the global reach of this notion.¹⁴² Thus, while scholars and courts engage in lengthy debates over the status of the precautionary principle as customary international law or its binding nature,¹⁴³ the virtual cornucopia of international agreements adopting the precautionary principle further supports the international salience of obligations to take preventive and anticipatory action.¹⁴⁴

precautionary principle] is not new as a human concept.” Jutta Brunnee, *The Precautionary Principle and International Law: The Challenge of Implementation*, 91 AM. J. INT’L L. 210, 210 (1997) (book review).

140. WTO, Appellate Body Report on E.C.—Measures Concerning Meat and Meat Products (Hormones), WT/DS26/AB/R, WT/DS48/AB/R (Jan. 16, 1998) [hereinafter *EC—Hormones*]. This dispute arose from challenges of the United States and Canada to the bases for the European Community’s ban on the importation of beef treated with growth hormones. For a brief summary, see Sue Ann Mota, *The World Trade Organization: An Analysis of Disputes*, 25 N.C. J. INT’L L. & COM. REG. 75, 86–87 (1999).

141. Two such examples would be the American Clean Air Act, 42 U.S.C. § 7411 (2002), and Clean Water Act, 33 U.S.C. § 1316 (2002), and various state forest management provisions. Thomas Lundmark, *Systematizing Environmental Law on a German Model*, 7 DICK. J. ENVTL. L. POL’Y 1, 15 & n.73 (1998) (citing the foregoing provisions as “comparable American legislation”).

142. Tony Hall, *An Argument that Keeps Africa Hungry*, FIN. TIMES (LONDON), Nov. 13, 2002, at 21.

143. Compare, e.g., Alexandre Kiss, *The Rights and Interests of Future Generations and the Precautionary Principle*, in THE PRECAUTIONARY PRINCIPLE AND INTERNATIONAL LAW: THE CHALLENGE OF IMPLEMENTATION 19, 27 (David Freestone & Ellen Hey eds., 1996) (opining that the precautionary principle is “the most developed form of the general Rule imposing an obligation to prevent harm to the environment”), with *EC—Hormones*, *supra* note 140 (rejecting the European Union’s position that the precautionary principle is customary international law and therefore binding on the United States).

144. See, e.g., Cartagena Protocol on Biosafety to the Convention on Biological Diversity pmbl., para. 4 and art. 11(8) (Jan. 29, 2002), available at <http://www.biodiv.org/doc/legal/cartagena-protocol-en.pdf> (“Lack of scientific certainty due to insufficient relevant scientific information and knowledge regarding the extent of the potential adverse effects of a living modified organism . . . shall not prevent that Party from taking a decision . . . in order to avoid or minimize such potential adverse effects.”); Convention for the Protection of the Marine Environment of the Baltic Sea Area, Apr. 9, 1992, art. 3(2), available at <http://fletcher.tufts.edu/multi/texts/22los.txt> (“The Contracting Parties shall apply the precautionary principle, i.e., to take preventative measures when there is a reason to assume that substances or energy . . . may create hazards . . . even when there is no conclusive

Applying the precautionary principle to unfamiliar types of disasters, such as those occurring in space, may seem to be a leap given the absence of similar historical precedents.¹⁴⁵ Yet, this appears so only because of the source of the threat. In relation to its effects, the same legal principles compelling cooperation in the field of public health still largely apply. When the Institute of Air and Space Law in Cologne, Germany, convened a panel to address the environmental aspects of activities in Outer Space, prominent figures in international law shared their views on the sources of law that would govern an international response to threats from Outer Space.¹⁴⁶ They also identified several approaches to more exotic harms in space.¹⁴⁷ However, regardless of the specific mitigation measures adopted, explained Judge Lachs, former President of the International Court of Justice (“ICJ”), the necessity of legal “principles formulated and accepted well in advance of potentially dangerous action” was eminently clear, even though law regarding a specific threat may be absent.¹⁴⁸ On the issue of natural impact, international law requires

evidence of a causal relationship between inputs and their alleged effects.”); U.N. Framework Convention on Climate Change, May 9, 1992, S. Treaty Doc. No. 102-38 (1992), 1771 U.N.T.S. 108, *reprinted in* 31 I.L.M. 849, art. 3(3) (“The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures”); Rio Declaration on Environment and Development (June 14, 1992), U.N. Doc. A/CONF.151/5/Rev.1, *reprinted in* 31 I.L.M. 874 (1992) at Prin. 15 (“Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”); Bergen Ministerial Declaration on Sustainable Development in the ECE Region. U.N. Doc. A/CONF.151/PC/10 (1990) at para. 7, 1 Y.B. INT’L ENVTL LAW 429, 431-32 (1990) (“In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent, and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.”); Final Declaration of the Third International Conference on Protection of the North Sea, Mar. 7-8, 1990, *pmbli.*, 1 Y.B. INT’L ENVTL LAW 658, 662-73 (1990). (“[Parties] will continue to apply the precautionary principle, that is to take action to avoid potentially damaging impacts of substances that are persistent toxic and liable to bioaccumulate even when there is no scientific evidence to prove a causal link between emissions and effects.”).

145. Planetary Protection (protection of the space environment by limiting activities of launching states) may be the single area in which such commitment has materialized. *See, e.g.,* COSPAR, *Resolution 26 COSPAR Position with regard to the Florence Report of its Consultative Group on Potentially Harmful Effects of Space Experiments*, art. 5, COSPAR Information Bull. No. 20, at 26 (1964), *available at* <http://www.cosparhg.org/scistr/PPPPolicy.htm> (addressing prevention of harm to the planetary environment). Alone, however, the principle relates not to unpredictable naturally occurring threats, but containable actions on the part of governments conducting space related activities.

146. *See generally* ENVIRONMENTAL ASPECTS, *supra* note 19.

147. *Id.*

148. Manfred Lachs, *Customary International Law and General Principles of*

cooperation and intense analysis so that specific rules of conduct may be developed.

Any effort to address a space threat posed to Earth, including a large-scale ecological threat, must be global. “[I]t affects the interests of all states and at the same time cannot be resolved by any country independently.”¹⁴⁹ When such a threat arises, the duty of prevention is customary international law.¹⁵⁰ Cooperation is “not only to sit around a table and talk but to pursue agreement on some kind of *legal framework* where the interests of all parties involved are adequately balanced.”¹⁵¹

The legal framework for cooperation that is necessary to mitigate extreme and unpredicted natural harm, such as natural impact, is one that will permit planning on several levels corresponding with the proximity of the threat at the time it is recognized. In essence, agencies with a responsibility for responding to harm must be prepared to execute their duties even if there is no advance warning. On this sliding scale, it becomes clear that different duties may be present at different times. With no specific and impending threat identified, an obligation still exists to investigate the full spectrum of measures and prepare for any level of harm. At a minimum, channels of communication should be established, responsive measures developed, and plans standardized across the international spectrum.

C. *Summary of Guidance Offered by Applicable Law*

In summary, the functions of domestic and international law provide the following guidance respecting the requirements of governments to respond to significant unforeseen harm:

(1) In order to guide mitigation, develop a framework that spells out particulars with definitions of the meanings of concepts. Undefined and ambiguous terms alone, such as those common to laws addressing the global commons—e.g., “common heritage of mankind,” “cooperation,” and “warning”—are unacceptable when addressing responses to the potential for serious harm;

International law, in ENVIRONMENTAL ASPECTS, *supra* note 19, at 187, 190.

149. Emil Konstantinov, *International Treaties and Ecological Protection from Activities in Outer Space*, in ENVIRONMENTAL ASPECTS, *supra* note 19, at 135, 136.

150. Maureen Williams, *Customary International Law and General Principles of Law*, in ENVIRONMENTAL ASPECTS, *supra* note 19, at 153, 159.

151. *Id.* (emphasis added).

(2) Practical approaches must pave the way for adequate warning in the face of an actual threat;

(3) Simulations of the full spectrum of a threat are necessary to fulfill obligations to respond to its unknown aspects;

(4) Rules established to guide a mitigation effort must have force and effect despite traditional administrative or procedural conventions that would stymie prompt and effective mitigation.

IV. LESSONS FROM THE PRACTICAL APPLICATION OF COOPERATIVE PRESERVATION

Identifying the applicable theories of law necessary for effective mitigation of the unknown is only one step toward accomplishing the goal of adequate preparation. It is just as important to gain an understanding of how binding principles of law may be applied in practical settings. This Part identifies examples of cooperative efforts to mitigate the effects of similarly unpredictable and widespread harm. They relate to: (1) international biological, chemical, and nuclear threats; (2) transboundary forest fires; and (3) the spread of “exotic” infectious diseases across borders. This Part identifies commonalities in the frameworks adopted to address these different types of harm, and highlights aspects of the law applied in the varied settings.

A. *TOPOFF, INEX, and CANATEX: The Operationalized Approaches to Unexpected Nuclear, Biological, and Chemical Disasters*

“TOPOFF,” which stands for “Top Officials,” refers to a series of simulations of different, simultaneous disasters.¹⁵² The combined response to such disasters has been hypothesized to

152. As recognized by all implementers of TOPOFF:

[T]he exercise scenario[s], extent and level of damage, and level of threat are based on a hypothetical situation and are not intended as a forecast of future terrorist-related events The exercise consists of simulated weapons of mass destruction incidents; there will be no release of any actual agents.

Department of Justice, Press Release, Justice Department, State Department to Conduct Exercises Combating Weapons of Mass Destruction: State and Local Law Enforcement/Emergency Responders From Illinois, Washington, and Canada to Participate, Oct. 8, 2002, *available at*, http://www.usdoj.gov/opa/pr/2002/October/02_ag_585.htm, at 1 [hereinafter *TOPOFF Release*].

improve national and international capacities to handle nuclear, biological, and chemical crises.¹⁵³ As is evident from the acronym, the strategy is not geared toward preparing every citizen for such events. Rather, the focus of the strategy rests primarily with “[t]op federal officials, state governors, mayors, city managers,” and secondarily, with first responders.¹⁵⁴ Notably, the institution of these measures grew from an international incident—the intentional release of sarin gas in a Tokyo subway on March 20, 1995.¹⁵⁵ After witnessing the death of twelve and the injury of 5000, the U.S. legislature recognized the transboundary implications of such threats and mandated the TOPOFF exercises.¹⁵⁶ The express goal was that the “scenarios will enable top officials and relevant personnel to practice different courses of action, gain and maintain situational awareness, as well as to assemble appropriate resources.”¹⁵⁷

Within a matter of years, “TOPOFF 2000” marked the first attempt to implement the strategy. The exercise, which occurred in May 2000, involved a single “no-notice” simulation of three simultaneous terrorist attacks: “[A] bioterrorism attack in Colorado, a chemical weapons attack in New Hampshire and detonation of a

153. *Id.*

154. *Id.*

155. See SUPER TERRORISM: BIOLOGICAL, CHEMICAL, AND NUCLEAR (Yonah Alexander & Milton Hoenig eds., 2001) (describing the circumstances surrounding the event).

156. The 2000 exercise, for example, emerged directly from a Senate Report:

The Committee is aware that numerous exercises are conducted each year to practice operations in the event of a terrorist incident. The Committee understands that few of the top officials have ever fully participated in these exercises. The Committee directs that an exercise be conducted in Fiscal Year 1999 with the participation of all key personnel who would participate in the consequence management of such an actual terrorist event. The decision on what type of simulated attack should be based upon the ability to best address one of these threats.

S. Rep. No. 105-235, at 14 (1999). This mandate arose from the Defense Against Weapons of Mass Destruction Act of 1996 (Nunn-Lugar-Domenici Act), which has been revised numerous times. 50 U.S.C.A. § 2301 (2002). Two key congressional findings led to the promulgation of requirements for the establishment of readiness measurement mechanisms as well as consistent reporting on their effectiveness. Finding (23) explains:

The development of, and allocation of responsibilities for, effective countermeasures to nuclear, radiological, biological, or chemical terrorism in the United States requires well-coordinated participation of many Federal agencies, and careful planning by the Federal Government and State and local governments.

Id.

Finding (24) additionally recognizes that “[t]raining and exercises can significantly improve the preparedness of State and local emergency response personnel for emergencies involving nuclear, radiological, biological, or chemical weapons or related materials.” *Id.*

157. *TOPOFF Release*, *supra* note 152, at 1.

'dirty' nuclear device in Washington, D.C."¹⁵⁸ In Colorado, for example, "Denver was hit by an imaginary release of a plague that quickly became a statewide epidemic."¹⁵⁹

In May 2003, TOPOFF 2 will expand to include a more comprehensive training approach. The newer simulations will "use a cycle of exercise activity of increasing complexity." They are geared toward "a limited number of critical crisis and consequence management objectives" and are based on the lessons learned from the first exercise.¹⁶⁰ The regions represented in TOPOFF 2 will include Chicago, Seattle, and Canada.¹⁶¹ Inclusion of the international component is no coincidence. Rather, it results from the recognition that "events involving weapons of mass destruction near the northern U.S. Border would have an impact on Canada and require cross-border coordination."¹⁶² The recognition that this intergovernmental approach is necessary to "significantly improve [the United States's] ability to respond to a terrorist event" clearly embraces the mandate of cooperative preservation.¹⁶³ "It is this cooperation," observed U.S. Secretary of State Colin L. Powell, "that will help defeat terrorism worldwide."¹⁶⁴

Similar international efforts have mirrored TOPOFF, although addressing a more limited spectrum of threats mostly related to nuclear crises. For example, in a simulated exercise in Finland in 1997:

A light aircraft had crashed into its electricity supply lines and caused the water pumps for the primary cooling system to fail, threatening to send one of the twin 445MW reactors into meltdown and cover the Baltic states, Poland, Belarus, and large parts of

158. Mike Barber, *Drill Will Test Terrorism Response*, SEATTLE POST-INTELLIGENCER, Oct. 9, 2002, at B2.

159. Jason Peckenpaugh, *Emergency Assistance: It's Up to State Officials to Make Uncle Sam's Complicated Anti-Terrorism Programs Work*, GOV'T EXECUTIVE, Nov. 2002, at 18.

160. *TOPOFF Release*, *supra* note 152, at 2. These objectives are:

To improve the nation's capacity to manage extreme events; create broader operating frameworks of expert crisis and consequence management systems; validate authorities, strategies, plans, policies, procedures, and protocols; and build a sustainable, systematic national exercise program to support the national strategy for homeland security.

Id.

161. *Id.* at 1.

162. *Id.*

163. *Id.* (quoting U.S. Attorney General John Ashcroft).

164. *Id.*

eastern Russia with radioactive dust. As if that were not enough, a gas pipeline had burst and the power station was in the middle of its annual maintenance programme.¹⁶⁵

As part of a three-year preparedness effort involving twenty-seven countries,¹⁶⁶ participants in the simulation sought to better understand “how they exchange information, release it to the media, and handle potential evacuations” at a multinational level.¹⁶⁷ Among comparable efforts are the INEX,¹⁶⁸ CANATEX,¹⁶⁹ and RADEX¹⁷⁰ simulations. The Nuclear Energy Agency (“NEA”) of the Organization for Economic Cooperation and Development (“OECD”) has coordinated many of these exercises for several nations, on a recurring basis, to assist in the development of policy for its member nations.¹⁷¹ Without fail, the simulations have grown in complexity

165. Jon Henley, *Finland's Mock Nuclear Meltdown Frays Nerves*, GUARDIAN (LONDON), Apr. 18, 1997, at 21.

166. In fact, while one would expect the participation of nations bordering Finland (“the Baltic states, Britain, France, Germany, Hungary, Italy, the Netherlands, Poland, Spain, and Switzerland”), countries as far from the disaster as “Japan and South Korea [also] monitored the situation.” *Id.*

167. *Id.*

168. In 1993, based on several workshops addressing the prevention of harm similar to Chernobyl, the Nuclear Energy Agency’s (NEA) Committee on Radiological Protection and Public Health instituted the International Nuclear Emergency Exercise (INEX) 1 as a tabletop simulation for 16 nations to test their responsiveness to a crisis involving fictitious countries. *Introduction to Organization for Economic Co-operation and Development, available at* <http://www.oecdwash.org/PUBS/ELECTRONIC/inexintro.pdf> [hereinafter *INEX Introduction*]. “The scenario . . . allowed countries to play either the country having the accident, the country adjacent to the accident country, or both.” *Id.* INEX 2 built on these initial exercises with the objective “to investigate various international aspects of accident planning, preparedness and management,” using exercises in Switzerland, Finland, Hungary, and Canada from 1996–1998. *Id.*

169. The acronym CATANEX stands for “Canadian National Exercise,” which consists of a series of exercises “every three to four years” instituted by Emergency Preparedness Canada. Environmental Protection Agency, *U.S. EPA Radiological Emergency Response, available at* <http://www.epa.gov/radiation/rert/exercises.htm> [hereinafter *EPA Response*]. Similar to TOPOFF, by CANATEX 3, their plans were jointly executed with the United States. *Id.* Specific goals included “[t]est[ing] the bilateral arrangements of the Canada-United States Joint Radiological Emergency Response Plan.” *Id.*

170. The RADEX, or International Radiological Exercise-94, represented the U.S. Environmental Protection Agency’s effort to deal with emergencies in Arctic environments, and involved the participation of the Emergency Response Working Group of the Arctic Environmental Protection Strategy and others. *Id.* “The exercise addressed international concern about the capability of member nations to respond to a radiological emergency affecting the Arctic.” *Id.* In the simulation, “a fictitious country, Articland, experienced a release of radioactive materials from a nuclear power plant.” *Id.*

171. See *INEX Introduction, supra* note 168 (explaining how the INEX exercises led to the development of further workshops to improve future simulations and develop new policies for the emergency management regimes in member nations).

based on various lessons learned at each stage, practically in parallel strides with the development of the TOPOFF simulations.

B. The Northeastern Compact: International Collaboration to Prevent the Spread of Transboundary Forest Fires

The Northeastern Compact (“Compact”) was promulgated by certain jurisdictions in both Canada and the United States¹⁷² that share a common geographic characteristic—abundant forestry.¹⁷³ Since the 1800s, the region has faced the unique problem of transboundary forest fires.¹⁷⁴ Similar to efforts in Southeast Asia,¹⁷⁵ each of these interests recognized the necessity of preventive action, for which simulations of extreme events have been recognized as an essential aspect of a sound mitigation effort.

Recognizing the need to preserve local interests in responding to the threat, the Compact found it more effective to develop its own responsive infrastructure, joint funding mechanisms,¹⁷⁶ and a set of legally-binding rules to govern warning provisions, priorities of actions taken, as well as disputes that might arise between members.¹⁷⁷ On a regular basis, the participants join to simulate fires for the purpose of developing more effective measures.¹⁷⁸ The document

172. Richard E. Mullavey, *Training Program Keeps Northeastern Compact Ready*, FIRE MGMT. NOTES, Apr. 1974, at 23 (“Members include Maine, New Hampshire, Vermont, Connecticut, Massachusetts, Rhode Island, and New York, plus the Canadian Provinces of Quebec and New Brunswick.”).

173. The massive acreage common to the members amounts to 66,047,101. Nicholas A. Robinson, *Forest Fires as Common International Concern: Precedents for the Progressive Development of International Environmental Law*, 18 PACE ENVTL L. REV. 459, 494 (2001).

174. See *id.* at 489 (describing circumstances surrounding New York’s first system of local fire wardens in 1885).

175. See ASS’N OF SOUTHEASTERN ASIAN NATIONS, REGIONAL HAZE PLAN (1997), available at http://www.adb.org/Documents/Reports/Fire_Smoke_Haze/appendices.pdf (describing various preventive measures). Of this combined effort, researchers have commented on the fact that “the [Association of Southeastern Asian Nations’ Specialized Meteorological Center’s] role in providing regional services that none of the states can secure on their own is truly operational.” Robinson, *supra* note 173, at 481.

176. “Member States and Provinces . . . pay membership fees based on their share of the protected area.” Robinson, *supra* note 173, at 494.

177. As such, the Commission serves as a “fact finding, coordinating and deliberative body with the power to make recommendations to the member states.” Rules and Regulations of the Northeastern Forest Fire Protection Commission, art.1, § 1 (1994), reprinted in NORTHEASTERN FOREST FIRE PROTECTION (NFFPC), BRIEFING MANUAL 23 (2000) [hereinafter BRIEFING MANUAL].

178. See Richard E. Mullavey, *Northeastern Compact Fire Exercise*, FIRE MGMT. NOTES, Jan. 1983, at 24 (explaining the necessity of multiple situational exercises at two different locations to “meet the needs of all concerned”); Mullavey notes:

governing the Compact recognizes, as the primary reason for its existence, the fact that the “fires . . . might be beyond the capabilities of a single member.”¹⁷⁹ This basis for action exemplifies the instrumental role of the duty of cooperative preservation.

C. *Combined Approaches to ERIDS: An International Network to Facilitate Prompt Responses to Unexpected Outbreaks of “Exotic” Infectious Diseases*

While the mid-1800s marked the worldwide recognition of infectious disease as a matter of international concern, the late 1960s marked the formalization of a legally-binding international framework to address the full range of modern threats.¹⁸⁰ As recognized by Dr. Ottorino Cosivi of the WHO, while the need for international cooperation has not changed, the need for improved response measures has.¹⁸¹ Of key concern are “exotic” diseases of which little is known, signifying the need for preventive measures. Unlike the methodology adopted by the Northeastern Compact or TOPOFF, which focuses more on mobilization, the combined approach to emerging and reemerging infectious diseases (“ERIDS”) focuses on the necessity of adequate communication in the transmission of warnings and the verification of threats.¹⁸²

Different mitigation methods have been adopted for various aspects of the ERIDS threat, including the following frameworks: the

The mutual aid provisions of the agreement have fortunately been activated only five times in 25 years [as of 1974]. But the success of these five calls and the success of potential future calls is based on the training programs instituted at the very beginning and carried on regularly and successfully ever since.

Mullavey, *supra* note 172, at 23.

179. BRIEFING MANUAL, *supra* note 177, at 3.

180. The body of law governing state responses to infectious disease is contained in the International Health Regulations. See generally International Health Regulations, *entered into force* Jan. 1, 1971, T.I.A.S. No. 7026 (outlining specific procedures to address multiple aspects of infectious disease mitigation). These regulations have remained virtually unchanged “since their most recent adoption in 1969.” Ottorino Cosivi, *WHO Contribution to Global Surveillance, Alert and Response to Microbial Threats*, Paper Delivered at the Conference on Biosecurity and Bioterrorism, Istituto Diplomatico Mario Toscano, Villa Madama, Rome, Italy, Sept. 18–19, 2000 at 4.

181. Cosivi, *supra* note 180, at 2 (“International cooperation is not new; however, current global circumstances confronting the control of infectious disease are.”).

182. See Richard Cash & Vasant Narasimhan, *Impediments to Global Surveillance of Infectious Disease: Economic and Societal Consequences of Open Reporting*, 78 BULL. WORLD HEALTH ORG. 1358, 1358–60 (2000) (explaining the primary focus on communications issues).

International Health Regulations,¹⁸³ the establishment of regional offices in regions with unique ERIDS concerns,¹⁸⁴ and a comprehensive Global Outbreak and Response Network.¹⁸⁵ In order to determine the effectiveness of the related measures to combat unknown health concerns, the WHO has practiced transboundary simulations.¹⁸⁶ The driving force behind these activities is the recognition that “any upsurge in cases of infectious diseases in a given country is potentially of concern for the international community,” which signifies the importance of the duty of cooperative preservation.¹⁸⁷

D. *Common Attributes of Existing Programs to Combat Similarly Unpredictable International Threats*

The above examples offer two lessons that also apply to the mitigation of all natural disasters of an extreme nature. First, all of the varied efforts use a unified command structure to some degree, which houses responsibility for disaster response in a joint

183. These regulations are binding on member states of the World Health Organization even without their consent when they address certain specified threats to the global community:

- (a) sanitary and quarantine requirements and other procedures designed to prevent the international spread of disease;
- (b) nomenclatures with respect to diseases, causes of death and public health practices;
- (c) standards with respect to diagnostic procedures for international use;
- (d) standards with respect to safety, purity and potency of biological and pharmaceutical and similar products moving in international commerce;
- (e) advertising and labeling of biological, pharmaceutical and similar products moving in international commerce.

World Health Organization Const. art. 21, *in* WORLD HEALTH ORGANIZATION, BASIC DOCUMENTS 2 (28th ed. 1978). Commentators have recognized the influence of these regulations in their expansive reach. Based on the need for uniform regulation of these calamities, the International Health Regulations remain the “only globally-based, international legal regime addressing the international transmission of infectious disease.” Bruce Jay Plotkin, *Mission Possible: The Future of the International Health Regulations*, 10 TEMP. INT’L & COMP. L.J. 503, 503 (1996).

184. Cosivi, *supra* note 180, at 3.

185. *Id.*

186. In the Finnish transboundary simulations addressed *supra* note 165 and accompanying text, the World Health Organization’s (“WHO’s”) role was prominent, as it participated alongside the World Meteorological Organization and the International Atomic Energy Agency in order to “assess the speed and quality of [its] reactions.” Henley, *supra* note 165, at 21.

187. Fifty-Fourth World Health Assembly, *Global Health Security: Epidemic Alert and Response*, May 21, 2001, Agenda Item 13.3.

headquarters/nerve center that involves the representation of all participating nations. When the nerve center cannot develop uniform policies due to unique issues pertaining to specific regions, it attempts to provide guidance to aid specific nations in their individual responses. A characteristic common to each approach is a code of conduct addressing the responsibilities of each participant and contingencies for action in the event that anticipated participants are unable to accomplish their assigned duties.

Second, when simulating the unknown aspects of a threat, the goal is limited. Since governments cannot anticipate the harm that will be caused by nature or terrorists in any specific case, responsible agencies aim to create levels of stress that would likely exist in responding to simultaneous, unplanned crises. In this recognition, they observe inadequacies in governmental coordination and improve responses accordingly. Applied to any extreme natural disaster, the concern of governments is two-fold: (1) confirming the existence of a threat; and (2) reacting to it. Governments must seek to simulate both aspects of all serious natural disasters to develop an effective response. These simulations are often the only method to provide guidance because untested guidelines do not sufficiently address unknown aspects of the harm threatened.

V. ASTEROIDS AS THE TEST CASE FOR UNDERSTANDING THE RESPONSIBILITIES OF GOVERNMENTS TO MITIGATE EXTREME NATURAL DISASTERS

The applied approaches offer certain general guidelines for potential responses to natural disasters. However, without the existence of an international organization responsible for responding to all variations of natural disasters, agencies must be given the task of responding to specific threats. Oftentimes, particular characteristics of “exotic” threats make it much harder for governments to mobilize the resources necessary to mount effective mitigation efforts. Natural impact provides crucial insight into the obstacles preventing governments from fulfilling their duties because it reflects common reactions to other extreme, hypothetical crises that people have never personally experienced.

Varied international reactions to the potential threat of asteroids and comets striking the Earth demonstrate the dilemma faced by policymakers. For example, on March 18, 2002, Australian Minister of Science Peter McGuaran explained why his government remained steadfast in its 1996 decision not to participate in

international efforts to search the sky for potential threats: “I’m not going to be spooked or panicked into spending scarce research dollars on a fruitless attempt to predict the next asteroid . . . I’m just not convinced that the hype and alarm and even fear-mongering is enough to justify an ‘instant’ investment.”¹⁸⁸ Even after reviewing an unprecedented letter from ninety-one scientists from seventeen countries urging collaboration on natural impact mitigation,¹⁸⁹ McGuaran’s decision remained firm.¹⁹⁰ Although scientists and governments of many nations are documenting large objects with orbits close to the Earth and developing better methods of communication in the event of a confirmed threat, plans to destroy or deflect an oncoming asteroid or comet, or to respond to an impact with the Earth, are still in their infancy, as most methods are yet untested and sometimes even conflicting in their approaches.¹⁹¹

Two key reasons explain the reluctance of governments to recognize legal obligations to develop an international framework on natural impact. First, policymakers can easily dismiss calls to action on the grounds that natural impact is a hypothetical fear, plagued with unanswerable questions. Second, current policy suffers from a “source-effects” imbalance in which policymakers overly rely on the frameworks applicable to the *source* of the threat—outer space—rather than the frameworks applicable to the *effects* of the threat on

188. See *Astronomers Left to Watch This Space*, CANBERRA TIMES, Mar. 20, 2002, at 15 (citing a portion of the *60 Minutes* broadcast) [hereinafter *Astronomers*]; *60 Minutes* (CBS television broadcast, Mar. 17, 2002).

189. See An Open Letter to the Australian Federal Government from International Scientists (Jan. 28, 2002), available at http://www1.tpgi.com.au/users/tps-seti/pr_oz_sg.htm (urging participation because, “[w]ithout Spaceguard there would be too little warning to prevent a disaster”); Simon Grose, *Australia Fails World on Asteroids*, CANBERRA TIMES, Feb. 5, 2002, at A5 (explaining the context of the letter).

190. See *Astronomers*, *supra* note 188, at 15 (“I wouldn’t like to divert up to five or more per cent [*sic*] of that budget towards a fruitless, unnecessary, self-indulgent exercise.”).

191. See Seamone, *supra* note 10, at 1105–08 (describing existing efforts and their drawbacks); U.K. TASK FORCE REPORT, *supra* note 10, at 33, Recommendation 9 (“There is an obvious need for some international forum for discussion of the scientific aspects of the problem. There is an equally obvious need for a forum of intergovernmental action.”). A report published in 2001 summarized the situation in general:

- No discovery programs in Europe and the Southern Hemisphere
- Follow-up centers understaffed and still poorly coordinated and funded
- Physical characterization very deficient
- Lack of studies in social and civil defense domains
- International coordination far from satisfactory.

Andrea Carusi, *Present and Future of the Spaceguard Survey*, in JAPAN SPACEGUARD ASSOCIATION, INTERNATIONAL WORKSHOP ON COLLABORATION AND COORDINATION AMONG NEO OBSERVERS AND ORBITAL COMPUTERS 59, 64 (Syuzo Isobe & Yoshifusa Asakura eds., Oct. 23–26, 2001).

Earth's population.

A. *The Impossible Questions Raised by Natural Impact Mitigation*

Natural impact is a “hypothetical fear,” similar to “biological and chemical warfare, mad-cow disease, suitcase bombs, terrorists, radiation, and foreign viruses.”¹⁹² Although each of these fears raises an infinite number of concerns, they generally fall within two categories of impossible questions that could easily lead one to accept ignorance of the harm as a viable policy option. First, it is unclear whether a significant threat will occur in the near future, thereby prompting concerns such as: “How can we mitigate a threat we can't simulate”; and “[w]ith hunger, poverty, terrorism, and health concerns facing the global community today, why prioritize this threat.” Second, assuming there is a threat, doubts arise regarding the government's ability to respond adequately: “Won't a mitigation plan create public panic that will undercut the plan's effectiveness?” and “[a]fter natural impact, won't morale problems, e.g., distrust of the government for failing to keep people safe, make reconstruction impossible.”¹⁹³ Similar concerns have led some to promote the policy position that governments intentionally withhold information of a known asteroid or comet threat if there is no way to intercept the object.¹⁹⁴

These questions, however, are not unique to natural impact. Without recognizing duties to act, international policymakers might have ignored forest fires, bioterrorism, and the threat of unknown infectious diseases because it is impossible to answer the same exact concerns definitively.¹⁹⁵ Despite identical dilemmas, however,

192. Chauncey Starr, *Hypothetical Fears and Quantitative Risk Analysis*, 21 RISK ANALYSIS 803, 804 (2001).

193. See HERMAN KAHN, ON THERMONUCLEAR WAR 641–51 (1960) (recognizing practically identical concerns in the nuclear context). Leo A. Hoegh, the former Director of the U.S. Office of Civil Defense and Mobilization initially recognized the two categories of impossible questions when faced with planning for nuclear war. “It's true that we're fighting two obstacles,” he commented. “One, the feeling that ‘it can't happen here.’ That's a mistake And secondly, there's the attitude that if it did happen you couldn't do anything about it. This is wrong.” *H-Bomb Survival: What Can We Do?*, TODAY'S HEALTH, Jan. 1959, at 36.

194. *Don't Tell Public of Doomsday Asteroid*, TIMES (LONDON), Feb. 15, 2003, at 9 (“It makes sense to warn if there's something you can do but if you can't intercept it, if you can't move people out of its way, it makes sense not to occasion further social costs”) (comments of Rand Corporation Policy Analyst Geoffrey Sommer).

195. Oftentimes, attempts to provide answers will be treated suspiciously because these

governments have articulated legally binding standards, which emphasize the feasibility of developing a similar regime to address natural impact. In a clear and unified voice, these collaborative efforts emphasize an important point: while familiarity may breed contempt, planners dealing with the potential for widespread harm cannot “let unfamiliarity breed neglect.”¹⁹⁶ Existing international measures overcome classic criticisms that nations are merely reacting to over-exaggerated fears championed by political interest groups.

B. *Over-reliance on Sources Rather Than Effects*

It is no shock that the primary focus of the United Nations, in shaping a natural impact mitigation strategy, is space—the source of the natural impact threat. Consequently, it is the law of outer space that dominates the U.N.’s policy and legal parameters. In July 1999, the U.N. Conference on the Exploration and Peaceful Uses of Outer Space adopted three key declarations addressing natural impacts within its “nucleus of a strategy to address global challenges in the future”:

- (1) To improve the scientific knowledge of near and outer space by promoting cooperative activities in such areas as astronomy, space biology and medicine, space physics, the study of near-Earth objects and planetary

threats are so exotic, suggesting that it is far better to admit that certain questions simply cannot be answered definitively. Because these are extreme events with which the public is unfamiliar, there is a real potential that exaggeration of a threat can lead to bad policy decisions. See Starr, *supra* note 192, at 804 (“If any alternative is too heavily weighted by hypothetical public fears, the decision response may be unwittingly flawed with serious consequences.”).

The “giggle factor” marks the common reaction of policymakers considering the notion of planetary defense. France, *supra* note 10, at 1. “One is tempted to laugh, or at least smile, at such prophecies. Perhaps by disbelieving them we can prevent them from coming true.” Ben Bova, *Introduction* to GERRIT L. VERSCHUUR, *COSMIC CATASTROPHES* vii, ix–x (1978). Along with the instinctual chuckle at the notion in general, there is a negative connotations of being involved “in a program that may never be used during a human lifetime.” France, *supra* note 10, at 1. This reaction may stem from the difficulty of visualizing a space phenomenon. When approaching the issue of asteroids or comets on a collision course with Earth, naturally, these analogies invoke comparisons to “invisibility, interstellar travel, immortality, visits from alien beings, travel through time, weather control, mental telepathy, and many other wonders that seem unlikely if not downright impossible.” Bova, *supra*, at viii. Accordingly, by comparing natural impact to the death of the Sun or some other cosmic crisis far beyond our control, it becomes very easy to ignore the threat on the basis that we cannot effectively prepare to overcome it.

196. Richard Danzig & Pamela B. Berkowsky, *Why Should We Be Concerned About Biological Warfare?*, in *BIOLOGICAL WEAPONS: LIMITING THE THREAT* 9, 12 (Joshua Lederberg ed., 1999).

exploration;¹⁹⁷

(2) [t]o improve the international coordination of activities related to near-Earth objects, harmonizing the worldwide efforts directed at identification, follow-up observation and orbit prediction, while at the same time giving consideration to developing a common strategy that would include future activities related to near-Earth objects; and¹⁹⁸

(3) [t]o protect the near and outer space environments through further research on designs, safety measures and procedures associated with the use of nuclear power sources in outer space.¹⁹⁹

The logic underlying these resolutions has been identified in great part by Dr. John Remo, Chair of the U.N. Conference on Near Earth Objects. He has noted the general consensus that there is no law specifically governing natural impact mitigation²⁰⁰ and that it would naturally be within the domain of organizations dealing with space issues to develop an international policy on the issue.²⁰¹

At first glance, it may seem logical that the drafters of policy are adopting an approach that compares natural impact with other types of harm in outer space addressed by existing treaties, such as the Outer Space Treaty's provisions on cooperation or notification in the face of danger.²⁰² Space law, after all, offers the benefit of the

197. Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space. Vienna, July 19–30 1999, U.N. Doc. A/CONF.184/6, Resolution I.I.c.i [hereinafter *Third Conference*].

198. *Id.* at Res. I.I.c.iii.

199. *Id.* at Res. I.I.c.iv.

200. John L. Remo, *Policy Perspectives from the UN International Conference on Near-Earth Objects*, 12 SPACE POL'Y 13, app. at 17 (1996) ("International law and practice does not address this issue directly."); see also U.K. TASK FORCE REPORT, *supra* note 10, at 33 ("There are no obvious precedents . . .").

201. John L. Remo, *Preliminary Report on Policy Issues and Research Recommendations of the United Nations International Conference on Near-Earth Objects (NEOs)* (undated) available at <http://www.llnl.gov/planetary/pdfs/Integration/06-Remo.pdf> (citing as the "singular reason" for the Committee to address this issue its continuing involvement in the development of Outer Space law).

202. See Remo, *supra* note 200, app. at 17, ("[W]ithin the U.N. Charter major international agreements that form the basis for international space law already contain some principles and norms that could be interpreted to provide limited guidance."). Projected as being compatible with natural impact are: "[A]rrangements . . . already in place for certain emergencies such as those associated with communication and reconnaissance satellites," *id.* at 16, and various provisions of the Outer Space Treaty relating to the "protection of human life from an extraterrestrial agent." *Id.* app. at 17. See also Seamone, *supra* note 10, at

“overview effect”—the notion that “[f]rom the perspective of space, we are unable to see the arbitrary borders that separate nations and we become keenly aware of a single delicate ecosystem.”²⁰³

The drawback of using the source-based approach is that space law principles are largely undefined, undeveloped, and untested.²⁰⁴ Even the fundamental bases underlying the Outer Space Treaty have been questioned in modern times.²⁰⁵ In adopting these undeveloped principles, natural impact mitigation inherits precisely the same dilemmas.²⁰⁶ These principles are also ill-suited to address harm to the Earth because of their inherent tendency to shift concern away from the effects of a space phenomenon on human life.²⁰⁷ Consequently, the effects of natural impacts on the Earth’s populations often have been viewed as merely tangential issues. Mitigation becomes one-dimensional, leaving the human dimension of how the threat relates to Earth-based populations for some other day, time, and place. While it is possible to view this disconnect between space policy and human rights as a traditional characteristic of space law,²⁰⁸ it is equally feasible to interpret the same as a

1132–34 (addressing various outer space provisions).

203. Michael Allen Potter, *Human Rights in the Space Age: An International and Legal Political Analysis*, 4 J.L. & TECH. 59, 63 (1989); cf. *id.* at 74 (“One of the luxuries afforded to space law is that it allows for law to guide events, as contrasted to the situation on Earth where law often lags behind.”). Space law, cannot, however, be the *exclusive* approach.

204. Regarding mitigation of threats from space, “neither the Outer Space Treaty nor any other space agreements provide a more detailed definition of [necessary] preventive measures. Quite often this has been described as the main shortcoming of codified space law.” Reifarth, *supra* note 19, at 302. For example, “[d]efinitions are lacking for such terms as ‘international regime,’ ‘common heritage of mankind’ and ‘international scientific preserves.’” Galloway, *supra* note 19, at 98. As a result, little can be done to expand on these phrases in new instruments except “repeat[ing] provisions of international law which are self-evident.” Reifarth, *supra* note 19, at 302.

205. See, e.g., Lawrence Risley, *An Examination of the Need to Amend Outer Space Law to Protect the Private Explorer in Outer Space*, 26 W. ST. U. L. REV. 47, 48 (1998) (expressing the sentiments of investors and private explorers that many of the crucial provisions of the Outer Space Treaty should be disregarded: “It is not clear that the United Nations is or should be the governing body for activities in outer space.”).

206. Despite the existence of provisions that only need to be extended to address the natural impact threat, comparable regimes involving some effect on human life are riddled with their own sets of conflicts, which may complicate further the ability to mobilize efforts in natural impact mitigation. See discussion *supra* note 204; see also Potter, *supra* note 203, at 68 (discussing dilemmas related to remote sensing and the rights of nations).

207. Potter, *supra* note 203, at 63–64.

208. Many observe that space in an inherently risky place where considerations of human rights will evolve in time when the risk is contained. George S. Robinson, *Astrolaw: Carrying Human Rights into Outer Space*, FUTURIST, May 1990, at 60:

Nowhere, in all of these domestic laws and international treaties, is there a definitive embracing of human rights and freedoms in space. Nowhere is the ‘spacelaw’ or ‘astrolaw’ guardianship role of these rights and freedoms

violation of the rights of people who are potentially at risk of significant harm due to governmental inaction. After all, people have rights in times of disaster,²⁰⁹ and decisions affecting future generations have legal priority.²¹⁰

The clearest example of the source-effects imbalance is evident in the development of policies that completely ignore *post-impact* mitigation measures, a view evident in a preliminary report identifying four “[s]teps towards mitigation . . . in the order of priority.”²¹¹ The report takes absolutely no consideration of *post-impact* response measures. In seeking to mitigate the full spectrum of the natural impact threat, policymakers must use well-established, Earth-based precedents that are more developed than outer space law.

specifically stated. And nowhere in this new body of law is there a clear recognition of the need for principles of social order in a truly unique physical and psychological environment.

Cf. Potter, *supra* note 203, at 62 n.3, citing CARL Q. CHRISTOL, HUMAN RIGHTS IN OUTER SPACE 1 (Am. Inst. Of Aeronautics and Astronautics (“AIAA”) Paper No. 68-910, 1968) (predicting that the simultaneous development of the law of space with recognition of international human rights is “not purely coincidental” and that they are “interrelated aspects of a common plane”). As a result of this limited development, it is expected that policymakers addressing human rights aspects of outer space phenomena will inevitably face “enormous challenges.” *Id.* at 74. However, policymakers addressing natural impact cannot wait for this day to arrive. Since the threat can cause harm to populations on Earth, a feasible approach must be recognized today.

209. Aside from the right to governmental protection under the theory of self-preservation, individuals are entitled to certain essential human rights. See JAIME ORAA, HUMAN RIGHTS IN STATES OF EMERGENCY IN INTERNATIONAL LAW 272 (1992) (recognizing “precise limits on States’ derogations from human rights standards in situations of emergency,” which exist “not only in treaty law but also according to general international law”).

210. *E.g.*, Michael B. Gerrard, *Risks of Hazardous Waste Sites versus Asteroid and Comet Impacts: Accounting for the Discrepancies in U.S. Resource Allocation*, 19 RISK ANALYSIS 895, 895 (2000) (explaining how natural impact is similar to existing requirements that command a preventive response by governments because, in these instances, “they are . . . ultimately concerned about managing intergenerational risk”). See also generally EDITH BROWN WEISS, IN FAIRNESS TO FUTURE GENERATIONS: INTERNATIONAL LAW, COMMON PATRIMONY, AND INTERGENERATIONAL EQUITY (1988) (justifying the importance of this requirement from a legal perspective).

211. Remo, *supra* note 201, at 4:

Steps towards mitigation should focus on, in the order of priority:

A vigorous NEO sky search with adequate follow-up for objects of special significance.

Laboratory experiments on surrogate NEO materials emphasizing special observables (especially for comet-like materials) and their response to mechanical and radiative interactions.

Development of long range rockets to carry out flyby, orbital, and penetrator reconnaissance missions.

Maintenance of the scientific and technological capabilities of the academic and industrial bases and the research and development laboratories.

Without this integration of source- and effects-based frameworks, nations in their collaborative approaches will fail to recognize a crucial point: there is binding law that applies to disaster mitigation, regardless of its source.

To better evaluate the implications of existing international natural impact provisions, suppose for a moment that the three resolutions of the U.N. Conference on the Exploration and Peaceful Uses of Outer Space were adopted by all nations as binding in determining the scope of their obligations to cooperate. Next, suppose that a single additional resolution accompanied the previous three:

Recognizing the potential of near-Earth objects (“NEO”) to destroy biodiversity, it is hereby resolved that research efforts to mitigate NEO threats include current options to mitigate general threats to biodiversity, each of which create similarly devastating effects on the natural environment, such as deforestation.

Simply considering policies that apply to harms on Earth would dramatically change policy priorities. Experts in environmental law have explained that the mere recognition of the common threats posed by assaults on biodiversity compel certain duties to cooperate in the mitigation of transboundary harm.²¹² Setting aside such specific duties, consider instead the many different additional experts, whose participation in global policy formation regarding natural impact mitigation would be required. Absent the reference to a potential loss of biodiversity, disaster response strategists and experts who deal with human, Earth-based approaches to hazard mitigation would be, and unfortunately are, absent from global mitigation efforts.

An example of this discrepancy in U.S. law has been noted by Professor Michael Gerrard. He points out that although polluted landfills pose a less significant threat than do natural impacts, entirely different bodies of personnel with entirely different objectives shape

212. Many stress the importance of Principle 7 of the Rio Declaration on Environment and Development of 1992: “States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth’s ecosystem.” U.N. ENV’T PROGRAMME, RIO DECLARATION ON ENV’T & DEV., U.N. Doc. A/CONF.151/26, Annex I, U.N. Sales No. E.73.II.A.14 (1972), available at <http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>. The Principle represents the following notion: “Given the interdependence of the natural systems of the biosphere it is normal that the states seek to cooperate on common matters of environmental protection.” Robinson, *supra* note 173, at 469.

the laws addressing mitigation of related harms because one type of ecological crisis originates on Earth and the other in space:

There is almost no overlap in the people studying [the risks of environmental pollution addressed by the Comprehensive Environmental Response, Compensation and Liability Act and the risks of natural impact] or the officials regulating them. They do not compete for funding or attention. Completely different disciplines and institutions care about them.²¹³

The remedy to the source-effects imbalance facing natural impact and other exotic natural harms is hardly as simple as the compelled inclusion of Earth-based disaster planners. Striking the appropriate balance requires adherence to the established principles of self-preservation and consideration of the full range of options available to mitigate natural threats. In terms of how a balance may be struck, the next Part relates an important lesson the U.S. government learned during the civil defense era.

C. *Determining How to Distinguish Between Prudent and Preposterous Plans: Lessons from the American Civil Defense Experience*

Even if binding law applies to disaster mitigation regardless of the source of the disaster, the bare mandate to include effects-based planning only skims the surface of an optimal solution. It offers no regulatory mechanism to strike a proper balance between source- and effects-based strategies. This dilemma poses numerous questions similar to those encountered in the regulation of toxic substances, greenhouse gasses, and the nuclear industry. “How safe is safe enough?” “When [will our] efforts go[] far enough?” “How far should we reduce the uncertainties before beginning to reduce the risk?”²¹⁴ If the international community cannot move beyond these inquiries, little will be accomplished, given the imprecision inherent in the task. An important historic lesson from the American civil defense experience provides significant insight into the regulatory mechanism that will yield an optimal allocation of source and effects emphasis, especially in post-disaster planning.

On September 15, 1961, President Kennedy addressed the

213. Gerrard, *supra* note 210, at 895.

214. JOSEPH G. MORONE & EDWARD I. WOODHOUSE, *AVERTING CATASTROPHE: STRATEGIES FOR REGULATING RISKY TECHNOLOGIES* 55, 152 (1986).

public in an open letter published in *Life Magazine*.²¹⁵ The letter introduced an article entitled, *Fallout Shelters: You Could Be Among the 97% to Survive*, and urged citizens to participate in the national effort to build and use fallout shelters, store food, and participate in civil defense programs.²¹⁶ While this showing of support for civil defense was sparked mainly by various policies promoting national solidarity, relevant aspects of the nuclear threat relate to a government's ability to "evacuate a high percentage of its urban population to protection."²¹⁷ In the context of extreme natural disaster mitigation, while it is not a rival state that nations must deal with, but rather nature itself, the necessity of evacuation for the sake of survival again arises. Thus, certain aspects of the civil defense experience can inform current natural impact mitigation efforts.

In his monumental work, *On Thermonuclear War*, Dr. Herman Kahn incorporated into mainstream notions the idea that Americans should be "thinking about the unthinkable" and be prepared for a significant nuclear attack.²¹⁸ Initially, these perspectives fostered so much optimism that, at least for a short time, it was envisioned that Americans would execute emergency evacuation drills "two or three times every decade."²¹⁹

These plans, however, terminated rather quickly. In December 1961, the Kennedy administration initially allocated \$695 million in expenditures to civil defense, but the final commitment approved by Congress in the summer of 1962 was only \$80 million, "with scarcely a gesture of protest or dismay."²²⁰ What caused this rapid decline in civil defense planning also applies to natural impact. Simply put, there was no mechanism to determine how feasible or extensive any mitigation approach should be. No formulae existed to determine whether a plan was prudent or preposterous. While the minimalist approach favored educational efforts and limited mock exercises, extreme sentiments such as those expressed by Dr. Edward Teller, the creator of the hydrogen bomb, dealt a severe and numbing blow:

First we will start with fallout shelters, he explained, but that won't cover everybody. So we will have to go

215. LIFE, Sept. 15, 1961, at 95 (reprinting Executive letter dated Sept. 7, 1961).

216. *Id.*

217. FRED KAPLAN, THE WIZARDS OF ARMAGEDDON 225 (1983) [hereinafter WIZARDS].

218. J. RONALD OAKLEY, GOD'S COUNTY: AMERICA IN THE FIFTIES 367 (1986).

219. WIZARDS, *supra* note 217, at 225.

220. *Id.* at 314.

to blast shelters. But that won't cover everybody, either, so finally we will have to build fire shelters. And if the Russians build bigger bombs, then we will have to dig deeper.²²¹

Without a means to determine optimal approaches, civil defense became the “number one political headache” of the Kennedy administration.²²² “Everywhere the shelter program seem[ed] to be emerging as the chief issue of domestic concern—and as one surrounded by an alarming amount of bewilderment, confusion, and, in some cases (both pro and con) of near hysteria.”²²³ In one noteworthy case, Father L.C. McHugh, a Georgetown professor of religious ethics, attempted to use “relevant principles [that] were the common property of the Catholic moralists long before Hiroshima” to support the “mount[ing] of a machine gun at [one’s] shelter in order to keep unwelcome strangers out” or those “ready to evict unbidden guests with tear gas if any such occupied [their] shelter before [their] family did.”²²⁴

While science supported various mitigation scenarios, most policymakers focused on the source of the harm with little focus on effect. The draft of the pamphlet instructing citizens on response measures, *Fallout Protection: What to Know About Nuclear Attack—What to Do About It*, which was to be distributed nationally, accepted broad notions of mitigation without further clarification:

One section title in the pamphlet read, *Shelter Living Will Be As Healthy As You Make It*. The vision of everyone coming out of their shelters and returning to previous circumstances—“The communities that are well organized and have planned their decontamination actions will be able to return to normal conditions”—struck most officials as “too facile.” There was nothing about the uncertainties and difficulties involved in decontamination, nothing that suggested that hospitals, doctors and nurses might no longer exist in abundance, no justification for the assumption that everyone can come out of his shelter after two weeks, no references to biological hazards of consuming fresh

221. *Id.* at 313.

222. *Id.* at 312 (citing letter from Ted Sorensen to President John F. Kennedy, Nov. 23, 1961).

223. *Id.* (citing letter from Arthur Schlesinger to President John F. Kennedy).

224. L.C. McHugh, *Ethics at the Shelter Doorway*, AMERICA, Sept. 30, 1961, at 824.

milk or foodstuffs that might be contaminated, no details about safe levels of radiation dosage or the area of damage that would be most endangered by blast of fire or fallout, given different sizes of nuclear explosives that might be involved in Soviet attack.²²⁵

This lack of focus on effect flowed naturally from a key policy flaw: seven factors, considered by Herman Kahn to be essential for all recovery measures to work, were presented but never fully explored or applied in a practical sense.²²⁶

In approaching a nuclear holocaust, natural impact, or any major societal disaster, the need to satisfy assumptions, similar to Kahn's seven, presented below, must drive policy decisions:²²⁷

Favorable political environment—no one seriously interferes with the reconstruction effort.²²⁸

Immediate survival and patch-up—where necessary, the debris is cleared, and basic necessities, such as communications, urgent repairs, credits and markets, a transportation system, and utilities are set up or restored.²²⁹

Maintenance of economic momentum—“the economy does not stop, that the resources for survival and recuperation are produced. This requires the establishment of markets and the furnishing of labor forces, credits, and management. In addition to the use of direct allocations and priorities, financial measures may be crucial here Almost as important to the encouragement of useful activities is the discouragement of wasteful and unimportant ones.”²³⁰

Specific bottlenecks resolved—“not any specific resource constraints which determine the gross

225. WIZARDS, *supra* note 217, at 311.

226. *Id.* at 229 (explaining how “none of the assumptions were subject to [thorough] analysis [and how they were, instead,] all held on faith”).

227. *Id.* The crucial nature of these assumptions has been emphasized. “If any of these assumptions didn’t hold in the real world all of Kahn’s bets were off.” *Id.* On Earth, after any global catastrophe, these same assumptions arguably hold true.

228. KAHN, *supra* note 193, at 84.

229. *Id.*

230. *Id.* at 87.

output . . . ten, and fifteen years [out].²³¹

“Bourgeois” virtues survive—“people will be willing to work at reconstructing the country and would have productivity at this task about equal to that of their pre[-crisis] work.”²³²

Workable post-crisis standards adopted—adopt workable post-crisis health and safety standards that are acceptable from both the individual and political point of view.²³³

Neglected effects unimportant—the economic and societal costs of dealing with other post-crisis problems, such as related environmental crises will not be overwhelming.²³⁴

In the context of natural impact, only after exploring common issues that apply equally at all levels of the mitigation process (for example, detection and evacuation alike) can we properly determine which measures are prudent and which measures are draining on other public health resources—a major objective recognized in the planning literature.²³⁵

In summary, these lessons suggest that nations participating in natural impact mitigation and mitigation of similar types of exotic natural disasters must seek to identify tradeoffs between legal and policy doctrine that relate to both the source of the problem they are trying to mitigate and the effects of the harm. Striking this balance does not mean ignoring crucial space policies. In fact, drawing on existing rules can help direct activities in the threat detection phase of mitigation. Policy related to space may support both providing advance notice of harm to others or the U.N. Secretary General²³⁶ and

231. *Id.* at 87–88.

232. *Id.* at 89.

233. *Id.* at 84, 90.

234. *Id.* at 90–91.

235. See generally Starr, *supra* note 192 (discussing the potential for wasteful allocations of resources based on exaggerated hypothetical fears).

236. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, art. V, 18 U.S.T. 2410, 610 U.N.T.S. 205 (entered into force Oct. 10, 1967) (“States Parties to the Treaty shall immediately inform other States Parties to the Treaty or the Secretary-General of the United Nations of any Phenomena they discover in Outer Space . . . which could constitute a danger to the life or health of astronauts.”).

assisting potential victims of harm revealed by remote sensing.²³⁷ However, the simultaneous consideration of frameworks applicable to threats occurring on Earth, such as lessons from the International Decade on Disaster²³⁸ and applications of the doctrine of necessity in international settings,²³⁹ permits policymakers to address other difficult issues. Ethical dilemmas that may be addressed with the balanced approach include: warning nations that are simultaneously at risk; different cultures' varying perceptions of serious risks;²⁴⁰ and the evacuation of potential victims of natural impact.

While it will clearly take more time and effort to produce an acceptable set of objectives to guide the prioritization of source-effects-balanced alternatives, risk analysts have identified other areas that require a similar "value"-driven approach.²⁴¹ Their research stresses the importance of "careful thinking about what we want . . . policies to achieve" in conjunction with such objectives.²⁴² Many of the resultant policies developed to aid in natural impact mitigation will apply to similar types of natural harm.

VI. RECOMMENDATIONS AND CONCLUSION

The following three recommendations should assist governments in directing international efforts to mitigate natural impacts and other unpredictable, extreme transboundary harm.

237. *Principles Relating to Remote Sensing of the Earth from Outer Space*, G.A. Res. 41/65, U.N. GAOR, 41st Sess., Prin. 11 (1986).

238. See, e.g., *International Decade for Natural Disaster Reduction*, G.A. Res. 51/185, 51 U.N. GAOR Supp. (No. 49) at 170, U.N. Doc. A/51/49 (Vol. I) (1996) (confirming the importance of the Decade in the development of international policy); *Yokohama Strategy and Plan of Action for a Safer World*, available at <http://www.unisdr.org/unisdr/resyokohama.htm> (further establishing various principles in greater detail).

239. See *supra* Part III.B (discussing the doctrine of necessity in international law).

240. See, e.g., Gerrard & Remo, *supra* note 30, at 117 ("Still greater difficulties will arise [in mounting an international response to asteroid or comet impact] if some religion, especially one that controls a national government, comes to believe that the NEO expresses the Will of God, and that efforts to stop it are heretical."). See generally VERSCHUUR, *supra* note 195 (speculating how nations might react to various types of cosmic catastrophe, and predicting the rise of religious sects in response to notification of potential space threats).

241. See generally Ralph L. Keeney & Timothy L. McDaniels, *A Framework to Thinking and Analysis Regarding Climate Change Policies*, 21 RISK ANALYSIS 989 (2001).

242. *Id.* at 989.

A. *Recommendation One: The Multilateral Framework*

Nations should adopt an organizational approach that extends beyond the confines of the United Nations framework for outer space or outer space law. Furthermore, nations should issue binding regulations and policy guidance through a single nerve center composed of international representatives; however, they should also encourage regions with unique and individual geographic and socio-political characteristics to work out specific details in bilateral or limited multilateral agreements.

Natural impact mitigation, as well as the mitigation of similar types of natural harm, requires an individualized and concerted effort to enable quick decision making. Traditional, deliberative, and time-consuming approaches increase opportunities for further damage. In responding to the question of who can fashion the rules governing such an organization, former U.S. Ambassador Harlan Cleveland's answer is apropos:

It has to be a club that credibly speaks for 'all mankind' The club that takes on such a responsibility has to be of manageable size, yet it must also represent the people who can do something about the problems If they don't agree on what's to be done, it won't get done. The important thing is not to debate blame but to organize remedies.²⁴³

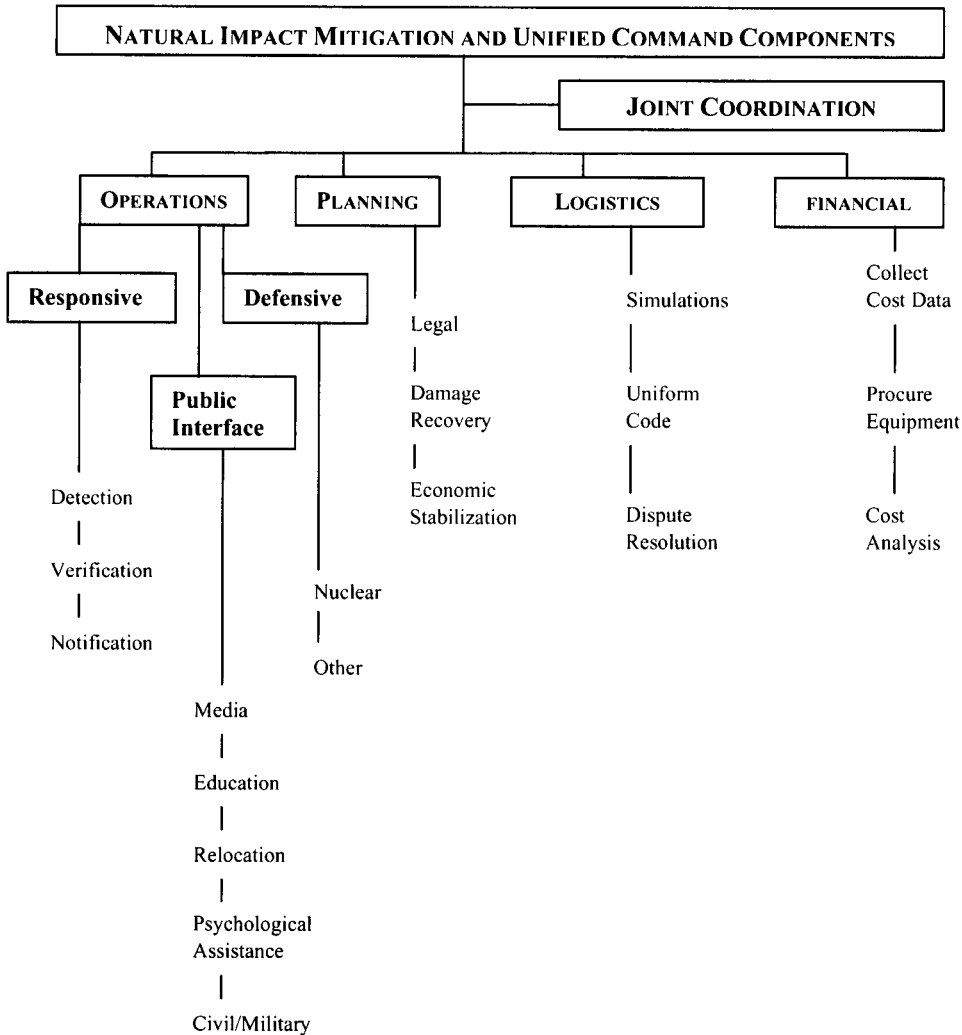
A key aspect necessary to meet this requirement is the "unified command" model of governance, in which "each [a]gency . . . at each level of government that has a role in responding to major . . . events will have a representative on [the decision-making panel]."²⁴⁴ The model permits the creation of "a common and consistent action plan to make the best possible uses of all resources."²⁴⁵

In contemplating the numerous responsibilities involved in an optimal mitigation approach, consider Figure 1.

243. Harlan Cleveland, *The Global Commons: Management of the Use of Oceans, Weather, Antarctica and Outer Space*, FUTURIST, May-June 1993, at 12.

244. STATE OF CALIFORNIA, GOVERNOR'S OFFICE OF EMERGENCY SERVICES, NUCLEAR EMERGENCY/TERRORISM RESPONSE PLAN 15 (Sept. 1991) [hereinafter CALIFORNIA TERRORISM PLAN].

245. *Id.*

Figure 1²⁴⁶

While the approach must be interdisciplinary, involving scientists, disaster response personnel, and lawyers, the framework developed must permit all members to determine which agencies have primary and alternate responsibility for specific actions.²⁴⁷ Policymakers

246. For a similar organizational diagram, see CALIFORNIA TERRORISM PLAN, *supra* note 244, at 16.

247. *E.g.*, *Third Conference*, *supra* note 197, at Res. I.1.c.i (calling for experts of various backgrounds to address this issue); Chapman et al., *supra* note 12, at 15 (calling for a “broader segment” of experts to address this issue); France, *supra* note 10, at 10, Recommendation 7 (“FEMA should be directed to include asteroid and cometary impacts in

should respond to the following questions in developing common action plans:

- (1) Who will determine whether a threat exists;
- (2) who will decide on the course of action;
- (3) who will direct the mission and determine when mission changes are to be made; and
- (4) who will determine whether the mission was successful?²⁴⁸

In responding, policymakers must seek to avoid the situation where “leadership roles and the roles of authorities in the crisis [are] uncertain.”²⁴⁹ For example, while a military agency may be the ultimate decision-maker in the case of specific defensive measures against an oncoming asteroid or comet, it may not be expected to have the final authority on evacuation measures. Likewise, those directing evacuations should not be overburdened with verifying the initial threat.

In response to binding obligations, nations should not underestimate either trust-building measures or their ultimate link to effective communication between diverse parties. One measure that has been instituted in disease surveillance policy is the implementation of Web sites that depend on members of the public to alert the medical community about disease outbreaks, even before they have been confirmed through appropriate verifying authorities.²⁵⁰

their planning, as well as nominating a representative to serve as liaison to the Air Force Space Command organization responsible for NEO detection, tracking, and mitigation.”); *id.* at Recommendation 1 (explaining the need for the President to direct the Secretary of Defense to include asteroid and comet impact mitigation within the mission of the Air Force’s Space Command).

248. Worden, *supra* note 13, at 5.

249. Thomas V. Inglesby et al., *A Plague on Your City: Observations from TOPOFF*, 32 *CLINICAL INFECTIOUS DISEASES* 436, 439 (Donald A. Henderson et al. eds., 2001). Such was the case in TOPOFF 2000, when, even armed with dozens of policy manuals, “the FBI was operating from the assumption that the state Attorney General’s Office was the organization with highest authority because this is the ranking state office to which the FBI reports in a crisis.” *Id.* This experience provides a clear indication of the need for detailed descriptions of actions to guide planning and response efforts. They must know where their duties end and their role in the overall functioning of the command structure.

250. See Mark W. Zacher, *Global Epidemiological Surveillance: International Cooperation to Monitor Infectious Diseases*, in *GLOBAL PUBLIC GOODS: INTERNATIONAL COOPERATION IN THE 21ST CENTURY* 266, 276–77 (Inge Kaul et al. eds., 1999) (describing the launching of the ProMed-mail and Canada’s Global Public Health Information Network rumor pages).

This measure increases the willingness of nations to cooperate in reporting because it will be more difficult to conceal a true outbreak.²⁵¹ As applied to natural impacts, existing websites, which enable astronomers to alert authorities and the public to potentially harmful impactors, should quell fears that individual nations would withhold vital information about a potential threat. Promotion of these measures and increased public awareness would increase the adherence of all participants to a regulatory framework addressing notification.

The facilitation of communication between diverse actors also aids in clarifying the limits of their individual responsibilities. One example can be found in the broadly accepted notion that conference calls will provide multiple nations with quick access to key decision makers. At the TOPOFF exercises, the experience of the participants proved this notion to be false. “[T]he process of decision-making by conference call was highly inefficient and led to indecision and significant delays in the taking of action.”²⁵² As applied to natural impact, this flaw would cost many lives. Channels of communication cannot create an environment where the “identities of those participating in the calls, as well as the leadership of and agendas for the calls, [a]re unclear.”²⁵³ These lessons stress the importance of having a communications structure that permits key decision makers to meet face-to-face during a natural impact crisis.²⁵⁴ For instance, Emergency Management Australia (“EMA”), when dealing with the Mir Crisis, relied on this policy to clarify roles between the Mir Mission Control Center and its government:

A central objective identified during initial planning was to place an Australian liaison officer in the Mir Mission Control Centre (MCC) outside Moscow. At the time this idea was first mooted, it was perceived by many as an admirable but far-fetched proposition. Fortunately, this proved not to be the case, with an Australian representative present in the MCC and in telephone contact with EMA throughout the re-entry.

251. *Id.* (explaining how this “new level of transparency on outbreaks has encouraged states to be more honest about their medical crises”).

252. Inglesby et al., *supra* note 249, at 439.

253. *Id.*

254. *See* France, *supra* note 10, at Recommend. 4 (“Liaisons from interested foreign nations should be invited to participate in the program, and be located [at] Air Force Space Command Headquarters, to ensure integration of their nation’s contributions into the overall effort. Supporting nations should have representatives on the planning and operational staffs much as Canadian Officers now serve on the NORAD staff.”).

This representative showed extreme dedication in ensuring the passage of real-time information to the National Emergency Management Coordination Centre in Canberra. This enabled all Australian stakeholders to be apprised of developments as they occurred which was vital to EMA's ability to rapidly pass information to those who sought it, particularly the media.²⁵⁵

To make communication effective, further precautions are necessary. The exercises of the Northeastern Compact reveal that communication channels must account for language differences.²⁵⁶ Even terminology unique to particular fields must be addressed when taking joint action.²⁵⁷ Without these clarifications laced into the fabric of a code of conduct, individuals and agencies will be forced to make separate and incompatible decisions rendering joint action ineffective.

In mounting an international response, general guidance will be useful but hardly adequate to successfully resolve crises affecting very different regions. Landlocked countries will be less concerned with defining duties to mitigate the effects of a tsunami, while coastal countries will share this as a primary concern. Nonetheless, binding regulations will be necessary not only to guarantee that the nerve center is adequately informed throughout a region's ensuing ordeal, but also to standardize the methods of warning and evacuation and the priorities related to them. In cases where specific regions are concerned with geographic issues, the law addressing international piracy of aircraft can serve as a useful model:

Sometimes where a problem is peculiarly complex and difficult in terms of its technical components, so that the attempt to include large numbers of parties in an agreement would be likely to produce only a long-delayed and unwieldy document, the problem may best be solved by the route of the bilateral treaty, the first such treaty serving as a model for innumerable subsequent treaties, so that, in the end, we have a

255. R.J. McKinnon & M.T. Sullivan, *Mir Emergency Management: National Arrangements for Managing the Public Safety Aspects of the Re-Entry of the Russian Mir Space Station*, 16 AUSTL. J. EMERGENCY MGMT. 36, 36 (2001).

256. Mullavey, *supra* note 178, at 25 (noting as one of a number of specific difficulties pertaining to joint mitigation efforts "the language barrier because both English and French speaking firefighters participated").

257. Inglesby et al., *supra* note 249, at 440 (noting "widespread lack of familiarity with the terms used by the emergency management community" when members of other technical fields were attempting to respond to vital information that featured such terminology).

series of more or less interlocking treaties that, in their sum, may present all the advantages of universality of a multilateral treaty, but perhaps also the advantage, secured by the more intensive and concentrated method of negotiation involved in bilateral treaties, of greater relative precision and concreteness as to objectives.²⁵⁸

At the very least, however, uniform standards are necessary to address threat detection, confirmation, warning, and the provision of mutual aid, since a lack of coordination in any of these stages can lead to catastrophic results.

As for the format of a controlling document, the International Health Regulations provide important insight. Their purpose is “to provide a universal code of practice to standardize the procedures to be followed by all countries in controlling . . . diseases.”²⁵⁹ Specifically, the document “specifies what should be done by whom and for what purpose—whether it is notification or measures for prevention and control”²⁶⁰ As they have been revised to address new and unfamiliar diseases, reflecting an enhanced effort to mitigate the unknown, the new requirements and the practical guidance interpreting such regulations could inform natural impact policymakers.²⁶¹

B. Recommendation Two: Learn from Analogous Experiences

Before adopting a coordinated international approach, nations should survey existing international efforts based on cooperative preservation, such as those that mitigate extreme and unpredictable terrorist threats, infectious disease, and transboundary forest fires and should learn from these collective experiences.

This recommendation aims to conserve resources and make an international effort more manageable. The natural impact mitigation effort can avoid common pitfalls by reviewing the transcripts of arbitrations in which disputes were resolved between conflicting members of existing organizations, examining revisions to

258. EDWARD MCWHINNEY, AERIAL PIRACY AND INTERNATIONAL TERRORISM: THE ILLEGAL DIVERSION OF AIRCRAFT AND INTERNATIONAL LAW 31 (2d. rev. ed. 1987).

259. WHO, *The Revisions of the International Health Regulations*, 71 WKLY. EPIDEMIOLOGICAL REC. 233, 233 (1996).

260. *Id.*

261. *Id.* at 234.

organizational guidelines (such as the recent revisions to the International Health Regulations), and discussing with facilitators of disaster simulations how they have gained the most from using specific methods. These inquiries will make natural impact mitigation far more approachable from a financial perspective and far less intimidating. Many would agree that this brainstorming is an obligation rather than a choice, especially given the many years of experience acquired by existing programs:

[T]he architects of international regulation will want to look broadly at all regulatory regimes, comparing one with another to avoid pitfalls and maximize effectiveness in designing the particular regime with which they are concerned. . . . [Further,] international lawyers handling matters governed by one regulatory regime will want to draw upon the law and precedents developed under other such regimes.²⁶²

Comparative analysis of existing practices will reveal certain standards of conduct that supplement the requirements of law.

C. *Recommendation Three: Conduct Targeted Simulation Exercises*

Finally, nations should set a goal of conducting two simulations to aid in the development of international policy on natural impact mitigation. The first simulation should focus on coordination of threat detection, confirmation, and communication procedures. The second simulation should focus on actual responses to a detected threat. For the second simulation, nations should simulate methods of diverting or destroying the threatening object, preparatory measures such as evacuations from projected impact zones, and post-impact response such as reaction to a tsunami. Perhaps such simulations eventually may be incorporated into existing international programs, such as TOPOFF or INEX.

The members of each existing effort to mitigate unforeseen transboundary harm will likely agree that the learning curve is a very “steep” one in their respective organizations.²⁶³ At the TOPOFF 2000

262. Daniel G. Partan, Note, *International Administrative Law*, 75 AM. J. INT’L L. 639, 639–40 (1981).

263. Jay C. Butler et al., *Collaboration Between Public Health and Law Enforcement: New Paradigms and Partnerships for Bioterrorism Planning and Response*, 8 EMERGING INFECTIOUS DISEASES 1152, 1154 (2002) (observing that the response of health professionals to the threat of unexpected mass disaster “has necessitated a steep learning curve”).

exercise, participants learned crucial lessons about the incompatibility of a familiar consensus-building model with times of crisis, the inadequacy of conference calls to make crucial decisions, and the lack of time to conduct research for instantaneous decisions.²⁶⁴ Without simulating responses to crises, these participants would have risked learning these lessons through actual blunders that could have easily resulted in the loss of life.

Any natural impact mitigation strategy adopted will involve numerous technological aspects that require new and untried approaches to the detection and destruction of harmful objects. To overtax the international approach from the outset with obligations to develop a completely new simulation program would be counterproductive. Yet, those mitigating natural impact must be prepared to respond to a set of crucial questions:

How do you practice mutual aid, if you do not regularly have [such crises] to practice on[;] . . . what is the most desirable location to hold the exercise[;] How much equipment and personnel is necessary[;] [a]nd how does the host State benefit if they do not have an opportunity to send equipment and personnel to another State?²⁶⁵

Those working to mitigate natural impact can simulate threats in different ways, some of which require fewer resources than others. The U.S. Department of Energy surveyed existing approaches to disaster response simulations and classified them into three categories:

- (1) Table Top Exercises;²⁶⁶
- (2) Command Post Exercises;²⁶⁷ and
- (3) Field Exercises.²⁶⁸

264. Inglesby et al., *supra* note 249, at 439.

265. Mullavey, *supra* note 178, at 24.

266. "During a tabletop exercise or TTX, participants test an emergency response plan and its standard operating procedure by informally "walking through" a hypothetical emergency. The TTX allows policy-making officials and key staff with emergency management responsibilities to identify and resolve problems with the emergency plan." *EPA Response*, *supra* note 169.

267. "A CPX is more extensive than a tabletop exercise in that it usually involves activities in other than a conference room atmosphere. It usually focuses on a single response or activity, for example, command and control. It can also involve limited deployment of equipment for a specific purpose." *Id.*

268. "An FTX is more extensive and realistic than either a tabletop or command post exercise. Activities extend beyond a conference room or operations center, taking place in a field environment over several days. An FTX tests many functions in an emergency plan in

Testing the adequacy of the prospective organization's procedures may initially involve cost efficient table top simulations or exercises, rather than full scale mobilizations of equipment and personnel. As the organization's approach becomes operational, participants can endeavor further along the spectrum until they reach a level that will enable them to reap the benefits of a full-fledged field exercise, such as TOPOFF. Such a field exercise may be conducted most efficiently within the context of existing simulations, e.g., by including natural impact mitigation as a component of TOPOFF 3.

Those working to mitigate natural impact also will also do well to recognize that the people who are most in need of training and simulations are officials whose decisions will affect communities. This is not to detract from the importance of an educational effort to keep the public apprised of the nature of the threat or measures and to aid the public's awareness of warnings that may be issued. Yet, the types of activities for which the government has responsibility are beyond these very basic considerations. For example, in implementing "a plan to vaccinate [the] entire population [of Colorado] against smallpox within three to five days," Robin Koons, Director of a recent antiterrorism grant, explained how the question must be framed to achieve optimal results: "It's more like where would we go versus where would [residents] go."²⁶⁹

With the single exception of the need to provide immediate psychological services to the victims of mass disaster, the common mitigation approach across the varied situations focuses on the officials who must make the crucial determinations. Training and simulation that rest squarely on the preparation of trained experts, rather than the entire public, from the outset are much more manageable and cost effective.

D. Conclusion

One of the reasons why the global commons, including Antarctica, the high seas, and space in general, suffer from a lack of practical solutions is the lack of a single organization responsible as a trustee for protecting these environments. Without any oversight mechanism for responses to international disasters, nations have adopted incompatible approaches among themselves.²⁷⁰ While this

realistic situations." *Id.*

269. Peckenpaugh, *supra* note 159, at 18.

270. Harlan Cleveland, *The Global Commons: Management of the Use of Oceans*,

Article focused on natural impacts, the framework developed to mitigate such threats is largely applicable to all types of unexpected natural harm. The basis for the coupling of law with science is cooperative preservation, a safety function that must be the first priority in any of the commons.²⁷¹ All nations benefit from the foregoing approach to natural impact because it necessarily incorporates a framework that assigns responsibilities for natural harm.

While there is much to be gained from the spillover effects of a uniform international approach to natural impact, countries can also benefit from the lesson learned by Emergency Management Australia during the fall of the Mir Space Station: “When prevention is not an option and mitigation efforts are of minimal utility, preparedness efforts are the only options left open to a vulnerable community.”²⁷² This realization explains the necessity of treating this threat seriously—as long as there is a potential that the threat of an incoming asteroid or comet will go undetected, or that its deflection or destruction will be ineffective, preparedness remains a crucial factor in the mitigation process.²⁷³ Legal principles suggest that the consequences of natural impact and other extreme natural harms are simply too great to ignore.

Weather, Antarctica and Outer Space, FUTURIST, May 1993, at 9.

271. Those who conduct joint operations in the Commons will inevitably agree with Harlan Cleveland that “you don’t need a visa to visit Antarctica, [for example,] but you do need plenty of help to get there and survive.” *Id.*

272. McKinnon & Sullivan, *supra* note 255, at 37.

273. See Seamone, *supra* note 10, at 1097 & 1097 n.31 (explaining that “mitigation” includes plans to deal with the harm created by potential threats, not only measures to prevent harm from occurring); Diego Llumá, *Terrorism: Low Probability, High Consequence*, BULL. ATOMIC SCIENTISTS 14, 14 (1999) (recognizing that “just because a terrorist attack using chemical or biological weapons hasn’t caused mass casualties yet, doesn’t mean that it never will”).