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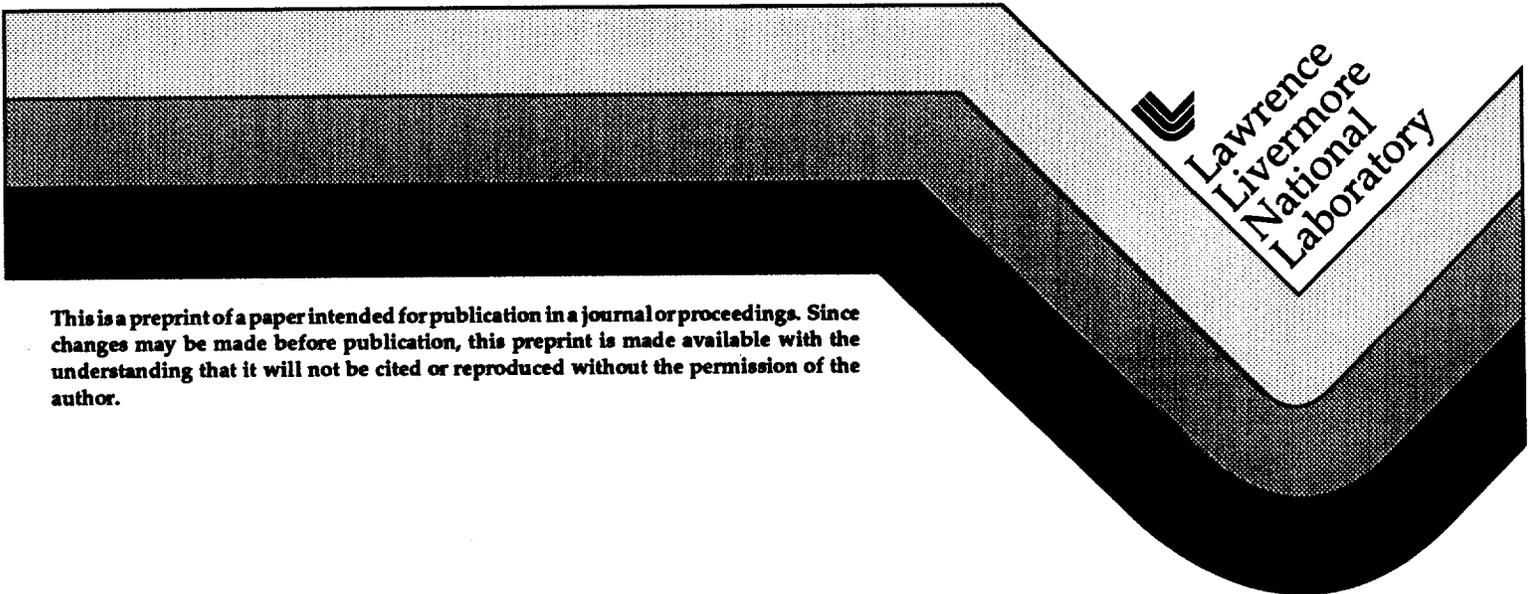
UCRL-JC-127518
PREPRINT

Learning from the Arms Control Experience

R. F. Lehman II

This paper was prepared for submittal to
MIT Press and planned as a chapter in the book entitled
Environmental Threats and National Security

June 5, 1997



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Learning from the arms control experience

Ronald F. Lehman II

Arms control and disarmament policy became an integral part of America's national defense strategy during the Cold War. The implementation of that policy brought with it into the security arena a number of environmental issues. In some instances, addressing environmental concerns was a major goal of our arms control agenda, as in the treaty banning environmental modification as a method of warfare (U.S. Arms Control and Disarmament Agency 1996). In other cases, environmental problems presented challenges to the achievement of other goals, as in the obstacles created by clean air standards to the rapid elimination of ballistic missiles required by new treaties.

The environmental consequences of conflict were also a matter of debate within the arms control community: for example, the fear that a "nuclear winter" could follow a global war, the controversy over use of defoliants in counter-insurgency operations, and the uncertainty about regional consequences of Saddam Hussein's burning of the Kuwaiti oil fields during the Gulf War. Environmental degradation was increasingly seen also as a cause of conflict or a hindrance to peace. Concerns that environmental threats might undermine negotiations led to considerable parallelism in the Multilateral Middle East Peace Process as the Arms Control and Regional Security (ACRS) working group found itself following closely developments in the working groups dealing with water, refugees, and economics.

As we consider suggestions that our notions of international security be broadened or enhanced to include a greater centrality for environmental issues, insights can be gained from recent arms control experience. In part, that experience places before us case studies of the national security establishment coming to grips with environmental questions. Perhaps of even greater value is the recognition that the arms control policy process, with themes, institutions, and individuals mirroring and even overlapping those involved in the environmental policy process, has debated many of the same issues now central to the question of what is "environmental security." Thus, one can gain some insight into the role environmental issues play in national security by looking at the arms control experience. In the process, thinking about what is meant by "environmental security" may be clarified.

Admittedly, the methodology of looking at arms control to determine how it became a new national security discipline involving, but somehow different from, diplomacy, military strategy, or international law is to generalize from a part to the whole. Certainly, the arms control and disarmament agenda is but one of many national and international security

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considerations. Yet, the same is also true of the environmental security perspective. Thus the analogy may be even stronger. In a sense, in both cases the germ of the whole is contained in the parts. Just as the history of arms control is filled with the history of broader political, social, economic, and military affairs, so the history of environmental security will reflect these as well.

The analogy of arms control to environmental security is not a perfect one. Arms control, ultimately recognized as a specialty, of necessity involves the very essence of national security no matter how defined. Arms control deals with military weapons, forces, and operations, the traditional "stuff" of national security. Arms control tries to help address relatively directly the causes of war and the consequences of war. Arms control theory incorporates and is incorporated into the theories and strategies of national security. The same cannot now be said of most environmental threats except in the very broadest sense of "security." Furthermore, much of the contemporary discussion of environmental security involves expanding our current concept of national security to incorporate many or all environmental threats rather than filtering out those threats that do not meet today's definition of national security.

The multiple personalities of "environmental security"

The idea of "environmental security" is not new, but in recent years it seems to have taken on a greater sense of urgency.

Within the next decade, what has been called "the environment" holds promise of emerging as the most troublesome problem in the field of international relations. Complex enough in a physical sense, the issue grows even more intricate on the political plane through its close association with health and survival. Until the recent past, strategic considerations of a nation have been based on its national interests, and although this kind of thinking may be not completely out of date, it is now definitely not adequate. This is because the national security of a country is not only threatened by other nations with hostile intentions but also by the increasingly serious problem of environment (Sien-chong 1977).

The above statement is particularly interesting because it was made in 1977 and was published in a NATO journal. It was neither the first such declaration nor the last. Neither was it definitive. The author, Niu Sien-chong, did not advocate a field or discipline called "environmental security," but the author did highlight a number of ways in which environmental

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concerns impinged upon international security, ranging from threats common to all the inhabitants of the Earth to the impact of anti-pollution regulations on the operations of naval vessels on the high seas and in coastal waters. The author also highlighted the importance of environmental and health considerations in bringing about the ban on nuclear explosive tests in the atmosphere. More significantly, however, Niu Sien-chong highlighted to the defense community environmental threats to national security that were largely independent of nation-state conflict.

Interest in an "environmental security" perspective has continued to grow, but no consensus has yet emerged on how central environmental issues are to traditional national security policy. Nor has a consensus been achieved that the concept of national security should be broadened to include at its core the security issues we normally associate with prosperity and well-being beyond basic freedom from military violence and coercion. Some analysts have gravitated toward the view that environmental security involves environmental threats to the stability or survival of regimes and peoples. Indeed, for a number of these analysts the real test of the relevance of environmental issues to national security is the degree to which conflict is involved or the deployment of military forces becomes essential.

The current debate over a definition of environmental security reflects more than different ideas about how best to organize our thinking and clarify our language. It also involves differing ideologies, budget priorities, and institutional special interests. The debate even reflects alternative views of national sovereignty and the future of the nation-state in an increasingly transnational and sub-national world. Indeed, the battle over the scope of environmental security parallels in many ways past and present disputes that arose within the field of international security during the Cold War over the proper role of arms control.

As we look at recent arms control activities to inform what we might say "environmental security" is, a number of questions can usefully be kept in mind:

- How relevant, how significant, and how immediate are environmental challenges to traditional national security as we have known it, and vice versa?
- Has an "environmental security" perspective, practice, or even discipline emerged in policy or technology that involves a broader concept of national security?
- What is the role of the defense community from both a broad and a narrow perspective?
- What does this mean for defense science and technology?

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Environmental issues in the arms control arena

One does not need to detail the history of environmental issues in arms control to measure their impact. It is considerable. In some examples, environmental concerns about specific military activities are raised. In other examples, environmental goals themselves are promoted or come into conflict with other objectives. It is not uncommon for a number of environmental objectives to come into conflict with each other as well. In the broadest sense, all arms control can be said to be about the environment. Still, it is seldom that environmental substance is as central and explicit as was the case with the Environmental Modification Convention (ENMOD).

Environmental Modification Convention (ENMOD)

A common strategy in arms control is to identify potential threats early in their formation so that they can be managed more easily. Once competitive pressures accelerate actions and reactions, policy factions become polarized and special interests become dependent upon programs. At that point, often only a defining event or crisis can inspire change. Banning something no one has is easier than banning something everyone wants. The Environmental Modification Convention (ENMOD) is an example of acting before a capability is in hand (USACDA 1966, 153-159).

In the late 1960s and early 1970s, a number of experiments in the modification of weather for benign purposes were conducted. In particular, science was put to work examining whether the uncertain art of "rainmaking" by seeding clouds could be made more effective. The hope was that water could be directed to more productive uses or even that storms could be mitigated. As scientists debated the merits of peaceful weather modification, they also began to express concerns about the possibility that weather modification might be used for military purposes in ways harmful to the environment.

During the Vietnam War, congressional hearings were held on experiments conducted in Southeast Asia. Although a number of experts had described possibilities for altering climate or manipulating natural forces such as earthquakes and tidal waves, such technologies did not seem near at hand. Nevertheless, momentum for international action grew, in part influenced by the much more immediate and intense debate over the ecological consequences of the use of herbicides in Vietnam and the possibility that the Red River dikes near Hanoi might be bombed.

The resulting "Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques" was opened for signature in Geneva on May 18, 1977. Two and a half years later, the United States ratified the ENMOD treaty. The essence of the convention is

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contained in article I, section 1: "Each State Party to this Convention undertakes not to engage in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party."

The convention fell short of a ban on weather modification for military purposes or peaceful purposes and did not itself ban the use of technologies or techniques that have a temporary or limited effect on the environment. "Environmental modification techniques" were defined in Article II as "any techniques for changing—through the deliberate manipulation of natural processes—the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space."

It was left to the "Understanding Relating to Article II," which is not incorporated into the treaty, but is part of the negotiating record, to provide more detail:

It is the understanding of the Committee that the following examples are illustrative of phenomena that could be caused by the use of environmental modification techniques as defined in Article II of the Convention: earthquakes, tsunamis; an upset in the ecological balance of a region; changes in weather patterns (clouds, precipitation, cyclones of various types and tornadic storms); changes in climate patterns; changes in ocean currents; changes in the state of the ozone layer; and changes in the state of the ionosphere.

The understanding goes on to explain that these examples are not exhaustive. The ban is based upon a principle not a list of prohibited activities. Nevertheless, the ban is subject to certain thresholds most notably "destruction, damage, or injury" that is "widespread, long-lasting, or severe." These later terms are explained in the "Understanding Relating to Article I":

It is the understanding of the Committee that, for the purposes of this Convention, the terms "widespread", "long-lasting" and "severe" shall be interpreted as follows:

- (a) "widespread": encompassing an area on the scale of several hundred square kilometers;
- (b) "long-lasting": lasting for a period of months, or approximately a season;
- (c) "severe": involving serious or significant disruption or harm to human life, natural and economic resources or other assets.

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The prohibitions in the ENMOD Treaty are among the most general in any arms control agreement. The lack of specificity reflected in part the very preliminary scientific understanding of techniques or technologies that might be involved. To deal with this problem, the ENMOD convention provides for a "Consultative Committee of Experts" and for the possibility of review conferences every five years.

Another reason why the provisions of the ENMOD are so generic becomes clear when one considers the policy and political circumstances of the times. Concern about protecting or providing a clean, safe, productive environment, independent of its national security aspects, had been growing. The ENMOD Treaty itself, in its preamble, offers highlights:

Recognizing that scientific and technical advances may open new possibilities with respect to modification of the environment,

Recalling the Declaration of the United Nations Conference on the Human Environment adopted at Stockholm on 16 June 1972.

Realizing that the use of environmental modification techniques for peaceful purposes could improve the interrelationship of man and nature and contribute to the preservation and improvement of the environment for the benefit of present and future generations . . .

On its face, the ENMOD Treaty anticipates technologies for peaceful, desirable modifications of the environment and Article III makes clear that "this Convention shall not hinder the use of environmental modification for peaceful purposes. . ." and that parties "have the right to participate, in the fullest possible exchange of scientific and technological information on the use of environmental modification techniques for peaceful purposes." As in the case of the nuclear Non-Proliferation Treaty (NPT), the Chemical Weapons Convention (CWC), and some other arms control agreements, ENMOD promotes the distribution of technology for peaceful purposes even at the risk that the spread of that technology may proliferate destructive capabilities which are prohibited by the same treaties.

In the case of the ENMOD Treaty, however, the real motivation for concluding the convention that was finally agreed upon was more to further the goal of protecting the environment from major harm than in preventing new capabilities of immediate military consequence. Further language contained in Article III reinforces this point: "States parties in a position to do so shall contribute, alone or together with other States or international organizations, to international economic and scientific co-operation in the

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preservation, improvement, and peaceful utilization of the environment, with due consideration for the needs of the developing areas of the world."

In form, ENMOD contains a structure similar to that of some other arms control treaties. In substance, however, it lacks much of the specificity of contemporary arms control treaties. Its subsequent implementation reinforces this view also.

Faced with the prospect that the Gulf War coalition would attempt to expel his forces from Kuwait, Iraqi leader Saddam Hussein threatened to burn the Kuwaiti oil fields. A number of scientists produced calculations suggesting that the environmental consequences would be devastating over wide areas of southwest Asia. Many groups and individuals, environmentalists and others, opposed to going beyond sanctions, added this fear of environmental devastation to their argumentation. For an American government contemplating air and ground attacks against Iraq and Iraqi forces, Saddam Hussein was presenting an environmental threat (and an economic one as well) as a deterrent. Public opinion was increasingly concerned. In this case, and in future cases, the national security policy of the United States requires the science and technology to determine how credible such environmental threats are. The alternative could be self-deterrence on the one hand or possibly a horrible environmental mistake on the other hand.

The United States was not deterred by Saddam Hussein's environmental hostage-taking, just as it was not deterred by Iraq's chemical and biological weapons or its nuclear weapons program. Still, the threat was real. Iraqi forces did ignite massive fires in the Kuwaiti oil fields, and they also pumped huge volumes of oil into the Persian Gulf. These may have been acts of retaliation or retribution as threatened, but they also seemed aimed at complicating coalition military operations. Interestingly, the international legal community was divided over whether these actions constituted violations of the Environmental Modification Convention. The United States government, after reviewing the case, decided at that time not to charge Iraq with such a violation.

Extensive environmental harm as a result of warfare is not in all cases banned by ENMOD, and some environmental harm can result from a range of military and combat operations. A number of national and international efforts, within arms control and outside it, have sought to deal with some of these other environmental risks. Public opinion has been particularly sensitive to environmental dangers with public health connotations. The same public opinion which largely ignored the use of chemical weapons by Iran and Iraq, an arms control compliance question, has become increasingly focused on science's inability to present explanations for the so-called "Gulf War Syndrome." In attempting to understand an uncertain pattern of symptoms, a number of physicians have suggested the possibility that a

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number of medical maladies suffered by veterans of that war are the result of environmental factors. These factors include the possible effects of chemical or biological agents manufactured by Iraq, side-effects of American vaccines and antidotes, air pollution from the burning oil fields, and fuels and industrial chemicals used in military operations. The American public is more aware now because its own citizens are suffering, but the insidious nature of lingering environmental poisoning that strikes close to home galvanizes public opinion to examine national security in ways that other arms control challenges and even war in foreign lands do not.

Nuclear explosive testing

If the ENMOD Treaty is the clearest and largest example of arms control attempting to address environmental concerns, the history of negotiations of nuclear test bans provides earlier examples of an environmental imperative in arms control. From the beginning of the nuclear age, concern about the health consequences of atmospheric detonation of nuclear weapons proved more powerful in motivating public political action than did arcane arguments about crisis stability or complex theories of an arms race. In many ways, the peace movements of the 1950s were the prototypes of many environmental groups today. Certainly, the "Ban the Bomb" and "Better Red than Dead" slogans of that era were concerned with the potential devastation that a nuclear war could bring, and in that sense were environmental security themes as well as national security issues.

More immediately compelling, however, was the measurable harm done to people exposed to radioactivity and to habitats near test sites. Indeed, the fact that fallout from a distant, single source could be measured around the globe contributed to international action and transnational political mobilization in opposition to testing. Despite a national security rationale for continued nuclear weapons testing, President Eisenhower felt it proper to announce a nuclear testing moratorium in 1958, which, after an extensive Soviet nuclear test series, lasted for three years. The massive atmospheric tests by the Soviet Union that ended that moratorium in 1961 served to re-energize interest in arms control and disarmament and led to the completion of the Limited or Partial Test Ban Treaty (LTBT) in 1963.

The environmental protection function of the LTBT is highlighted in the preamble in which the parties "desiring to put an end to the contamination of man's environment by radioactive substances," agreed to the treaty which bans testing: (a) in the atmosphere; beyond its limits including outer space; or under water, including territorial waters or high seas; or (b) in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted. . . (USACDA 1996, 29).

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The ban on testing in the atmosphere reduced interest in further limits on nuclear testing, in part because underground testing offered less environmental impact and permitted national security concerns to be addressed. Venting from underground testing did, however, prompt support for further limitations and in 1974, the Threshold Test Ban Treaty (TTBT) was signed limiting underground nuclear weapons tests to 150 kilotons (USACDA 1996, 133-137). Two years later, the Peaceful Nuclear Explosions Treaty (PNET) was signed limiting the use of nuclear explosions for nonmilitary purposes also to 150 kilotons (USACDA 1996, 133-141).

The public debate over proposals to use nuclear explosives for canal building, diverting rivers, mining, and the like prompted great opposition from environmentalists. Nevertheless, neither the TTBT nor the PNET was particularly popular with these groups. Both were seen by most such activists as small steps that served to legitimize continued nuclear testing. Lack of enthusiasm for the TTBT and the PNET by some parts of the environmental community and concern about verification among many in the national security community resulted in no definitive action on these treaties until after a new Verification Protocol had been negotiated between the United States and the Soviet Union. The treaties only entered into force in December 1990.

In the absence of atmospheric testing, environmental arguments for a Comprehensive Test Ban (CTB) carried less weight in most of the policy community than countervailing national security considerations. In 1996, long after the Cold War was declared over, a CTB Treaty was finally concluded. During public discussion of the CTB, environmental concerns about underground testing of even very small explosions were featured, but the main arguments presented by negotiators for the CTB involved arms control and nonproliferation. Many significant groups acting in support of the CTB, however, are leaders in environmental activism.

Antarctic Treaty, Seabed Treaty, Outer Space Treaty, etc.

The LTBT, with its obvious focus on the environment, was not the first of the modern arms control agreements nor was it the first to deal with the environment. Those accolades go to the Antarctic Treaty, signed in December 1959 (USACDA 1996, 11-17). The Antarctic Treaty demilitarizes that continent and provides the institutional basis for peaceful cooperation. Although some individual states continue to protect claims to mineral resources and national control there, the spirit of the treaty has been to keep the southern polar region as pristine as possible. This has been aided by the emphasis given to international scientific cooperation in Antarctica, which is encouraged by the treaty. Science in Antarctica frequently has focused on global as well as local environment studies. The effort to protect the environment in areas not yet

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spoiled by the burdens of civilization and the destructiveness of war has continued. In 1967, the Outer Space Treaty was concluded, and in 1971, the Seabed Treaty was opened for signature (USACDA 1996, 35-41, 80-85).

A parallel focus on keeping regions unspoiled has developed within nation states. Frequently, military activities are permitted in and around built up areas but are prohibited in areas less impacted by people such as deserts, mountains, and forests. This has added another example of the impact of environmental issues on national security as the location of strategic radars, missile fields, and the like have been subjected to more careful environmental review. Indeed, the environmental impact statement (EIS) and its related process now covers a wide range of national security activities including defense conversion. Follow-on use of closed military facilities is now also subject to environmental review because many such installations have large unpopulated areas where protected flora and fauna reside. The arms control community copied this review concept in the legislative requirement under which, for many years, the U.S. Arms Control and Disarmament Agency (ACDA) was required to issue an arms control impact statement (ACIS) on proposed weapons systems and even some early technology.

The nuclear nonproliferation regime

Environmental concerns about nuclear technology have played heavily in national security debates. Environmental consequences of nuclear war or from the plants and laboratories that support nuclear weapons, however, are not the only issues. Perhaps more environmental activism has been focused on the civilian use of nuclear technology, especially nuclear power. Again, to the degree that economic prosperity means "economic security," the international arms control community has sought to accommodate the peaceful uses of nuclear technology while trying to control the spread of nuclear weapons and other military use of nuclear technology. In some cases, however, the distinction between peaceful and non-peaceful is blurred.

The accident at Chernobyl generated greater caution about nuclear power plants, but it also re-energized fear about the dangers posed by military nuclear forces. That the great arms control agreements between the United States and the Soviet Union—the Intermediate-Range Nuclear Forces Treaty (INF) and the Strategic Arms Reduction Treaty (START)—followed relatively soon after the Chernobyl disaster is not surprising.

The centerpiece of the nuclear control regime is the Nuclear Non-Proliferation Treaty (NPT) concluded July 1, 1968 (USACDA 1996, 65-79). Of the 193 nation states typically considered candidates to join treaties, 183 are already parties and Taiwan also is considered bound by its provisions. Among countries with advanced nuclear technology, only Brazil, India, Pakistan, and

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Israel are not parties. Brazil is, however, a party to a similar, earlier regime, the Latin American Nuclear-Free Zone Treaty of 1967, also known as the Treaty of Tlatelolco (USACDA 1996, 45-64). Under Article IV of the NPT, nuclear cooperation for peaceful purposes is encouraged among parties, but under Article VI, all nations are committed to "General and Complete Disarmament (GCD)" with the five recognized nuclear weapons states required to work toward "an early end to the nuclear arms race" and nuclear disarmament. All other parties are prohibited from having nuclear weapons or programs to acquire them.

In support of the NPT, the International Atomic Energy Agency (IAEA) was created. The IAEA inspects fissile material to ensure that it has not been diverted for military purposes, but it also promotes scientific cooperation including in the environmental sciences. Many of the verification technologies used have parallels in environmental sampling. Much of the model for cooperation and confrontation on environmental issues among international bodies, governments, industry, non-governmental organizations, and publics developed in the context of the NPT regime. The regime has been strengthened by additional agreements such as the Nuclear Material Physical Protection Convention (USACDA 1996, 218-227); a Fissile Material Cut Off treaty is being negotiated under which no fissile material would be produced by any country unless under international safeguards.

In short, the NPT is the keystone of a nuclear technology management regime. It also has important disarmament implications in Article VI especially for the five nuclear weapons parties and further important environmental implications in that another 178 countries covering much of the globe have agreed to forgo nuclear weapons and weapons complexes immediately, thus mitigating some environmental concerns. This continues the process of the Treaty of Tlatelolco of limiting nuclear weapons activity on a broader geographical basis. A number of additional nuclear weapons free zones have been established, including in the South Pacific, Africa, and Southeast Asia. Although these treaties seek to keep nuclear weapons out of their zones, signatories have had to compromise continuously with the nuclear weapons states on the issues of transits of ships or aircraft with nuclear weapons on board and the transit or port calls of nuclear powered ships and submarines.

Given that the United States lost two nuclear submarines at sea early in its program and that more recent Russian nuclear submarine sinkings and accidents have caused alarm in Scandinavia and Japan, environmental concerns over the deployment of nuclear technology at sea has been long-standing. Major steps have been taken by both Russia and the United States to remove tactical nuclear weapons from the high seas. These steps have been followed by increased bilateral and multilateral efforts to deal with problems such as the Russian dumping of radioactive power assemblies and

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components at sea. Because the major nuclear forces of Britain, France, and the United States are at sea, however, environmental opposition to all deployments of nuclear weapons at sea or to naval nuclear propulsion could have vital national security consequences. Russia and China may also wish to maintain nuclear submarines at sea. Also, one of the reasons that Brazil has given for not joining the NPT is that it does not wish to compromise its options to acquire naval nuclear propulsion technology for military submarines.

Chemical and biological weapons

The Geneva Protocol of 1925 prohibited "the use in war of asphyxiating, poisonous other gases, and of bacteriological methods of warfare" (USACDA 1996, 5-10). It was not proclaimed by the United States until 1975, in part over a dispute as to whether it limited herbicides. The Executive Branch determined that it did not, but agreed to consult with the Senate before changing existing restrictive use. The Geneva Protocol banned use, but not research, development, testing, production, and stockpiling. In 1972, the Biological Weapons Convention (BWC) instituted such a ban (USACDA 1996, 95-104). No provisions were made for verification of the BWC. This was justified on two grounds. First, deterrence could be maintained by chemical or nuclear weapons. Second, verification would be necessary for a ban on chemical weapons and from that process measures might be identified that would build confidence that the compliance with the BWC was taking place.

Biological warfare was not new, and the historical abhorrence to it reminds us again that public health fears are among the most powerful in dealing with either national security or environmental matters. The revolution in biotechnology and health sciences, to include manipulating genetic material, has set off alarms in both the defense and environmental communities and adds an additional dimension to the notion of environmental security. At the same time, both concerns run into fears that intrusive inspection might compromise intellectual property rights and proprietary information as well as personal privacy. The emerging battle over strengthening the BWC will undoubtedly illustrate the difficulty in balancing the broader definitions of security.

The Chemical Weapons Convention (CWC), which contains the most detailed and intrusive inspection regime ever negotiated, was finally concluded in January 1993 (USACDA 1993, 247-267). Many modern chemical weapons grew out of medical studies conducted at the turn of the century on industrial diseases, or what some today call environmental health. Not surprisingly, a major issue in negotiating the CWC was the question of how to verify the convention without unduly disrupting the chemical industry. As with the BWC, proprietary information, intellectual property, and

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personal privacy were all issues. Concern exists that foreign governments, potential proliferators or terrorists, or commercial competitors may gain dangerous access to sensitive information. During the negotiation of the CWC, concerns arose that domestic environmental watchdog groups or regulatory agencies would focus on data exchanges and inspections for evidence of pollution or unsafe practices.

Developing countries were particularly sensitive to the possibility that the CWC would expose them to embarrassment over abuse of the environment, but developed countries also expressed concerns that bodies like our Environmental Protection Agency (EPA) would use the CW arms control process to tip them off to problems. Such concerns were magnified by the use of some of the same verification sensor and sampling technologies that are used for monitoring compliance with environmental regulations. The similarity of the challenges had, in the United States, resulted in a memorandum of understanding between the EPA and ACDA. The administrative and procedural regulatory aspects of arms control can look very much like the environmental regulatory process. Indeed, during recent discussion of CWC ratification in the U.S. Senate, critics pointed to reporting requirements for small business not central to the chemical industry as a potentially unwarranted regulatory burden, which, in their view, would be worse than the American regulatory bureaucracy alone because it would be directed by an international organization based in the Netherlands.

Other similarities between the environmental regulatory process and arms control emerge in the CW arms control regime. The United States and the Soviet Union negotiated a separate Bilateral CW Destruction Agreement designed to strengthen confidence in compliance and to develop monitoring experience. That agreement, not yet in force, provided that CW destruction must take place in a "safe and environmentally sound" manner. Consideration of what was "environmentally sound" led to the enhancement of a grass roots environmental movement in Russia not unlike that which has been a major player in the development of the U.S. CW destruction program. This process has reinforced the development of democracy in Russia, but, as in the United States, "NIMBY—Not in My Back Yard" is often the watchword. The current major U.S. CW destruction site is on Johnston Island, isolated in the South Pacific Ocean far from populated areas. When the United States proposed to move its CW stocks in Germany to Johnston Island to be destroyed, many environmental groups on the Pacific Rim were opposed. Similar groups in Europe, however, were more supportive.

Interestingly, much of the controversy over the environmental implications of CW destruction has to do with the basic environmental debate over the safety of incineration of toxics. The similarities to broader contamination issues is also strong. In Wyoming in 1989, the United States and the Soviet Union negotiated a Bilateral CW Data Exchange Agreement.

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When Russia reported on its stocks, the amount was far smaller than was known to have been produced. When queried, the Soviet Union, which had no significant CW destruction facilities, indicated that it had disposed of huge amounts. The bad news is that they might have been lying. The worse news could well be that they were telling the truth. Huge amounts of chemical weapons may have been dumped in ways that would be totally unacceptable today by environmental standards. The Soviet proposal that chemical weapons be destroyed with underground nuclear weapons detonations illustrates a very different view of environmental security.

Regulating nuclear arms

Another regulatory aspect of the arms control process that parallels the environmental policy experience is known as the "gray area" problem. When the growth of strategic nuclear weapons began to be limited by the Strategic Arms Limitations Treaties (SALT I in 1972 and SALT II in 1979), the importance of missiles of less than intercontinental range increased. The completion of the Strategic Arms Reduction Treaty (START I) was made by the Soviet Union contingent upon the Intermediate-range Nuclear Forces Treaty (INF) in 1987. Both INF and the START Treaties illustrate the problems of substitution and circumvention that have plagued the environmental regulatory process. The nuclear force negotiations also offer examples of environmental issues impinging upon national security such as air quality standards limiting the rate at which missiles could be destroyed.

The more important lessons in the search for the meaning of "environmental security," however, may come from some broader considerations. INF and START were greatly influenced by theories of behavior and balance first derived from economic models and later transplanted to the interactions of technologies. Environmentalism today is struggling with concepts of risk-benefit analysis and is still trying to model global, regional, and local environmental equilibrium and "sustainable development."

At the same time, the nuclear arms negotiations took place in the depths of the Cold War. Political, economic, strategic, and ideological factors weighed heavily, just as they often do in disputes over environmental policy. Under these circumstances, the arms control process found that the many scientists who were involved in the nuclear arms control process brought with them different ways of examining and characterizing problems. Often, they helped resolve the questions of incommensurates. More often, they offered alternative language, which was less politically charged. This, of course, did not erase the fundamental differences, but scientific language helped make possible politically acceptable compromises that were deemed militarily acceptable.

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Similarly, nuclear arms control did not cause either side to forget that the other was a potential adversary, but the destructive potential of nuclear weapons made it possible to focus on them as a common threat requiring cooperation. When the debate over "nuclear winter" emerged, the overlap between environmental threats and military threats was made clear, even if the scientific community found itself divided over the quality of its atmospheric, oceans, and related environmental modeling. The national security community, already convinced of the destructiveness of all out nuclear war, was not greatly influenced by the findings, but the political climate was influenced by the debate. In a sense, the debate over global warming raises many similar political, social, and economic considerations.

One also sees the North-South split, found so often in arms control negotiations, playing an even greater role in environmental negotiations. Developing countries anxious for economic growth frequently resent being denied the right to make the same mistakes that the developed countries have already made, whether it is air pollution or an arms race. All countries speak of threats to the environment as a common enemy, but environmental diplomacy like arms control negotiations is filled with maneuvering for advantage. Everyone understands that all is not a "zero-sum" game, and most understand that zero-sum thinking can be harmful to all. Unfortunately, relative gain can be as important in the minds of policy makers as absolute gains, particularly when there is a national security dimension, and environmental issues such as the tension between protecting the environment and promoting economic growth can raise national security concerns. In summary, an examination of arms control illuminates linkages between national security and the environment. It also illustrates similar concepts and behavior in analogous matters which are only distantly related. North-South disputes over the migration of older, pollution causing technologies to poor countries parallels disputes over the migration of older weapons to developing nations.

Defense economics and non-weapons of mass destruction

Principal objectives of arms control are to reduce the economic burdens of defense and to encourage the economic and political conditions which discourage conflict. The end of the Cold War has accelerated interest in achieving these objectives. The Treaty on Conventional Forces in Europe (CFE) has resulted in the destruction of vast arsenals of tanks, artillery, and aircraft. Disposing of this equipment in ways that are affordable, verifiable, and protective of the environment also has not been easy. At one point, the Soviet Union, which had once suggested the use of nuclear weapons to destroy chemical weapons, proposed that military equipment be dumped in the ocean to form reefs able to sustain fish and other marine life. This

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strained effort to bring defense and economics together with the environment reads like the debate today over whether some examples of "recycling" and "industrial ecology" have been stretched beyond a solid business foundation.

The end of the Cold War has exposed important environmental challenges such as the massive cleanup required at military installations that have been shut down. These cleanup problems, in turn, complicate the conversion of defense installations and industries to peaceful uses, which in turn creates domestic and international tensions. Defense conversion programs and cooperative threat reduction programs such as provided for by the Nunn-Lugar legislation of necessity must take on these environmental challenges.

Another aspect of arms control that might be considered part of an environmental security perspective is dealt with in the Convention on Conventional Weapons (CCW). Current efforts seek to block the spread of land mines, particularly those that are scattered and abandoned only to take the lives and limbs of innocent people long after conflict has ended. This can be considered an environmental issue in that the threat is analogous to the spread of toxic waste. The harm to populations is steady and cumulative and denies access to important land resources.

**Arms control and environmental security:
similarities and differences**

The arms control analog to environmental security goes beyond the examples discussed above. The arms control process also illustrates how the national security bureaucracy organized to meet environmental challenges. It is not uncommon to hear environmental activists complain that the foreign policy community buries within its much broader agenda disputes such as compliance with international law on drift nets and other undesirable fishing techniques. The complaint is one familiar to the arms control community which itself complains, for example, that our economic ties with China water down our nonproliferation agenda. Diplomats respond, of course, that just the opposite may be true; namely, that political engagement strengthens the entire U.S. agenda.

Environmental policy, like arms control, constitutes an encroachment on core "national security" turf. Bringing more players to the table complicates decisions and implementation. Bringing more perspectives to the table makes the calculation of risks and benefits more difficult. Bringing more institutions and programs to the table can increase costs overall, reduce the funding of existing activities, and introduce other inefficiencies. Indeed, as arms control became a larger part of national security, defense programs sought to be labeled "arms control." When "nonproliferation," and then

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"counter-proliferation" received emphasis, many of the same activities sought the new labels. The same will be true as "environmental security" moves into the spotlight. Arms control often sought to be labeled a "defense" program in order to gain access to defense dollars. Defense programs sought to be labeled "arms control" in order to gain public support. The same behavior is likely if "environmental security" catches on. Environmentalists will be seeking defense dollars, and national security programs will be seeking support from environmentalists to protect their current funding.

These similarities in bureaucratic behavior should not be dismissed as nothing but greed. Underneath the self interest are important implications for thinking about broader definitions of "security." The environment, the economy, energy, resources, biology/ecology, and national security are all related, but some relationships are close and others are not. Grand histories of civilizations, and archeological evidence of prehistoric societies, suggest that changes in weather, water, forests, and soil have contributed to the rise and fall of civilizations and peoples. If resource depletion or climate change created the migrations and invasions out of Central Europe that altered significantly the histories of Europe, the Mediterranean, India, and the Middle East, at one very high level, that is "environmental security." (need citation, reference) If lead poisoning of an elite privileged enough to have lead utensils and pipes brought about the collapse of the Roman Empire, (Gilfillan 1970, 55-60) that might also be called "environmental security." If nations deploy diplomacy and military forces abroad to protect sources of raw materials and their transit routes, is that a form of "environmental security" (Mahan 1890)? If national security is a precondition for economic development that, in turn, has generated some of the most "green" attitudes within the wealthiest countries, then should this also be called "environmental security"? (See, for example, Raw Materials & Foreign Policy, International Economic Studies Institute 1976). This approach, however, illustrates the danger of defining either national security or environmental security too broadly. They lose their essence. Environmental security, like arms control, overlaps, interacts, complements, and supplements national security, but the wider we spread the concept, the more shallow our concept may become.

The arms control experience also reflects many of the same political dynamics that influence environmental decisions. Some citizens find compromising among competing goods easy. Others demand to know why any good should be sacrificed. Navigating this realm is not easy. Both arms control and protecting the environment are good, but each carries a price. In this regard, a marketplace of ideas that also brought broader science and technology to the table proved useful in promoting worthy compromises in the highly polarized arms control arena, and it has also been useful in dealing with environmental disputes.

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An examination of the emergence of arms control as a multidisciplinary security discipline including, but different from diplomacy, law, and strategy may prove useful to those who see environmental security more as an academic field or professional discipline rather than as a category, a grouping of issues, or a perspective. Arms control issues clearly required a collection of knowledge and skills that went beyond any single traditional approach to national security. At the same time, drawing upon economic theory, behavioral theory, and scientific analysis, arms control was able to put forth a "general theory" or at least a number of models that unified the arms control perspective tightly. One saw debates over whether arms control should be defined narrowly as negotiated agreements, or broadly as including nonproliferation, defense conversion, and even elements of peacekeeping and human rights. That the value of arms control skills seemed to be less on the periphery of the definition does not distract from the existence of a solid core to the definition.

Environmental security may not yet have found the solid core to anchor its broader application. If one attempts to include the wide range of environmental issues one seeks within national security tightly enumerated, relevance suffers. The alternative of broadening the definition of national security to make environmental security fit more naturally runs the opposite risk; namely, of undermining the value of the contributions those activities related to protecting the environment can make to national security.

The discussion above, both the examples and the analogies, hopefully have illuminated useful similarities and differences in thinking about arms control and environmental security as national security fields. The parallelism can be misleading, however. Important differences exist between the two concepts. Arms control has much more proximity to the causes and consequences of conflict. It deals more emphatically with military weapons, forces, and operations. Arms control has been incorporated into the national security process because it can be seen to have rather immediate consequences for the survival of a nation state or regime. Because so many environmental security concerns are chronic, they lack the sense of immediacy that motivates national security action. Arms control offers somewhat greater clarity in its national security theory, and more of its policy strategies are seen as linked to present rather than future generations overall. In short, arms control has been more successful at quantifying its "security" impact on states and societies. Arms control, whatever our dissatisfaction with its analytical rigor, has been able to identify a systemic "security" equilibrium or path attractive to national security policy makers.

Science and technology in support of environmental security

Science and technology helped create our arms control and environmental challenges. It may also help in addressing them. This analysis of arms control and environmental security has stressed that not all problems are technical, but it has also suggested that science and technology can help even with non-technical issues. Scientists and engineers may be no better at policy than some policy makers are at understanding technology, but the scientific style of thinking can help illuminate, and sometimes quantify non-technical issues. It can help us understand systemic relationships and trade-offs, and thus clarify policy questions.

At the tactical level, the scientific style can provide new language with less bias or bile to market compromise, and it can introduce different ways to measure success, which may facilitate the process without undermining the achievement of goals. By broadening the circle of players and, perhaps also the issues, science can expand the possible, viable compromises. Of course, the major contribution of science and engineering is to provide technological solutions to those problems that are amenable to technical solutions. Not surprisingly, many of the very technologies that are associated with the conduct of the Cold War are now used to help put the Cold War behind us.

Conclusions

The arms control experience provides considerable insight into the ongoing debates over what environmental security is and what we should do about it. Many of the issues, institutions, decision-making processes, and even individual actors overlap. The differences are as important as the similarities, but important lessons can be learned, particularly about the contributions of science and technology.

Environmentalism, like interest in arms control and disarmament, predates the industrial revolution, but both owe their contemporary centrality to the downsides of technological progress. Environmentalism and arms control both map onto the incredible numerical, economic, and scientific growth of mankind over the past century. Each illustrates the power of an overarching, positive theme, yet each works through human institutions, which evolve slowly. Each must deal with the impact of rapid change on societies, but human nature itself seems relatively constant. And each bears heavily on the future of our security.

Arms control has become an established discipline in the field of national and international security. The "environmental security" perspective, however, has not found such a niche. As with economic security, energy security, and resource security, the idea of environmental security seems to bubble up each time an environmental issue intrudes upon the

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boundaries of national security, whether it be the cleanup of former military bases, the prospects of conflict over water, or the rise and fall of civilizations due to climate change or ecological degradation. That there are important security implications of environmental issues is widely accepted; that a discipline of environmental science and policy rests near the center of the study of military conflict is much less clear.

Everything is related to everything, but some things are more related than others. Arms control has been defined in the broadest of terms to include disarmament, nonproliferation, confidence- and security-building, verification, enforcement, transparency, defense conversion, unilateral restraint, and elements of peacekeeping, as well as negotiated constraints. It has also been defined narrowly to mean arms limitations that are negotiated but that are less than disarmament. Whether defined broadly or narrowly, however, arms control became a discipline because diverse issues were pulled together by common logic, common actors, and a sense of urgency, and it became a national security discipline because its subject matter *inter alia* are the implements of war. Environmental security seems to be moving in the direction of a discipline, but does not yet seem to have arrived. In part, reluctance to define the word security in a way that is distant from conflict and the use of force continues to inhibit the development of a discipline called environmental security.

Whether one defines security broadly or narrowly, environmental issues are at play in foreign and defense policy and in military operations. If these issues should prove too disparate to form a broader discipline or too lacking in immediacy to constitute a more focused discipline associated with the balance of military forces and their deployments, the concept of environmental security will still continue as a perspective that informs the national security community. Thus, a fresh look at how arms control evolved as a discipline (under the influence of economic theorists, technologists, and statesmen, etc.) and at how as a discipline it has dealt with what one might call environmental security issues (nuclear testing in the atmosphere, the Environmental Modification Convention, defense conversion, the destruction of chemical and other weapons, Open Skies, the land mine cleanup crisis, etc.) may be helpful in clarifying our thinking about the environment and security.

Environmental security, like the arms control perspective, builds upon a broader view of security that encompasses well-being and prosperity. Yet, both also have important implications for more specific, essentially military elements of national and international security. Each requires a multidisciplinary approach weaving together fields as diverse as economics, biology, electronics, law, diplomacy, and strategy. Both require global awareness, but they are also particularly sensitive to national differences. Both are steeped in theories of cooperative behavior; still, both present arenas

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for continued competition. Both present attractive visions of global public goods, but both involve tough policy and economic decisions that can translate nonpartisan goals into highly polarized political debate wherein the trade-off of one public good for another inevitably subjects any compromise to the critique of having given up too much for too little.

Because both environmental security and arms control deal with the unintended consequences of the advance of technology, both have of necessity invited the scientific community to join the debate over policy problems and solutions. At the heart of both fields are questions about technology; questions that must be dealt with in the midst of the significant political, social, and economic differences such as the East-West, North-South, and "have-have not" splits. In such a divisive climate, the distinction between "political science" and "political" science can blur. Progress has required that scientists be brought more deeply into the political process, and laymen must understand science and technology more than ever before to secure their futures. This certainly proved true in the emergence of arms control as a national security discipline.

Science, however, brought more to arms control than just its scientists. It brought new tools, new processes, new language, and new standards. Similar opportunities exist in support of environmental security concerns. National technical means of verification (NTM) bring to mind enhanced environmental sampling and modeling. The cooperative development of such systems constitutes a transparency and confidence-building process. Scientific jargon cannot make real differences disappear, but environmental security can benefit, as arms control did, from precise terminology keyed to an analytical process. This, in turn, leads to functional measures of merit. A more science-based approach to environmental security may reformulate questions in ways that can permit answers that most people find compelling.

Acknowledgement

The views and opinions expressed in this document are those of the author and not those of the Lawrence Livermore National Laboratory.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

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