How Much Is Too Much? Bounding Nuclear Deterrents

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The United States’ nuclear weapons modernization budget is sloping up like a ski jump. It includes down payments to develop two new missiles, a new nuclear warhead, and new generations of bombers and ballistic missile submarines. Russia, with its stockpile of roughly 4,500 nuclear weapons, is developing and/or deploying a new type of intercontinental ballistic missile (ICBM) capable of carrying more than 10 nuclear warheads, a hypersonic glide vehicle, an autonomous underwater torpedo that President Putin claimed could deliver a nuclear weapon to the US coast, and a nuclear-powered cruise missile with unlimited range. The Defense Intelligence Agency predicts China will double the size of its (comparatively small) operational nuclear arsenal of “low 200” weapons in the next decade.1 Prospects of a new nuclear arms race are real: “We know how to win these races, and we know how to spend the adversary into oblivion,” President Trump’s special envoy Marshall Billingslea huffed and puffed at Russia and China in May 2020.2 For decades, policy debates in nuclear-armed states have centered on the question, “how much is enough?”3 What size and type of arsenal, and what doctrine, are credibly threatening enough to deter given adversaries? If deterrence theory alone is the guide, the answer is boundless—a country (and its adversaries) could always do with more. Today, however, on the cusp of a new arms race, the urgent question has shifted: how much is too much?

Most countries say that any number greater than zero is too much—in 2017, 122 states agreed on a treaty to prohibit nuclear weapons.4 But the Treaty on the Prohibition of Nuclear Weapons (TPNW), or so-called Ban Treaty, does not
bind the countries that did not sign it. These countries include all nine nuclear-armed states, the 27 members of NATO, Japan, South Korea, and Australia, among others. Their governments remain unpersuaded that they will be more secure without nuclear deterrents against aggression from militarily powerful adversaries. Still, the difference between a state possessing one nuclear weapon and the roughly 4,000 that the United States and Russia each stockpile is more than just a number.

To the extent that nuclear deterrents are necessary, national interests and common sense suggest that an arsenal is too much if detonating it would likely produce so much humanitarian and environmental harm that one’s own people would be overwhelmed, even if their side “won” the war or if doing so would be a war crime. To put it more positively, this article argues that nuclear-armed states and alliances should add two criteria beyond marginal deterrence effectiveness to determine their nuclear postures: first, if used in war, the arsenal—the number, explosive yield, and targets of weapons—probably would not cause environmental and humanitarian catastrophe to one’s own people or to those in non-belligerent nations. And second, the arsenal could plausibly be used in ways consistent with the Law of Armed Conflict (LOAC), as the United States and the United Kingdom say theirs would be. Arsenals that do not meet these criteria are “too much.”

The Escalation Problem

So long as deterrence works and nuclear weapons are not detonated, nuclear dangers are manageable. But if deterrence fails and the first salvo of nuclear weapons flies, escalation becomes the greatest danger in human history. No one knows whether escalation of nuclear war would be kept limited. There are no data. No two (or more) nuclear-armed states have used these weapons in war.

The US-Russia and India-Pakistan dyads are the two that have the most escalatory potential today. (China, with a doctrine of No First Use and less than 300 nuclear weapons compared to the United States’ 3,800, among other factors, does not plan on escalatory nuclear war-fighting.) If deterrence failed between the United States and Russia or Pakistan and India, conflict would likely begin with non-nuclear weapons and operations. If those did not produce the desired gains,
including de-escalation, then nuclear weapons could be used, initially in ways limited enough to avoid triggering massive escalation. However, if the adversary did not desist from further conflict or escalation in response to the other’s limited nuclear attacks, each side would seek to convince itself and its adversary that it would keep fighting as long as it takes to win or until both are destroyed (perhaps along with the rest of the world).

The larger the arsenals, the more tempting it is for strategists and operators to pursue escalatory doctrines (even if the stated purpose is to de-escalate or restore deterrence). And the larger the arsenals—in numbers and explosive yields—the more catastrophic escalation can be. Circularity often operates here: escalatory strategies may call for producing larger arsenals, which in turn invites escalatory planning to use the weapons in the quiver. As the then-commander of the US Strategic Command General John Hyten reflected on a recent nuclear war game in a 2018 speech, “It ends the same way every time. It does. It ends bad. ... Meaning it ends with global nuclear war.”

Nearly every US administration since Eisenhower has tried to find a way to use nuclear weapons to stop an aggressor without triggering mutually suicidal all-out nuclear war, as Fred Kaplan chronicles in his excellent new book, The Bomb. Civilian and military leaders of the US nuclear establishment preceding General Hyten—from Robert McNamara in 1962, to James Schlesinger in 1974, Franklin Miller and Lee Butler in the 1980s, and Jim Miller and Robert Kehler in 2013—also claimed success in reducing escalation risks. Yet with almost no exceptions, every incoming president has discovered that operational plans still call for more weapons to be detonated over more targets with more destruction than they could abide.

Presidents’ difficulties in changing nuclear postures and doctrines provide cautionary tales, also told well by Kaplan. Most recently, civilian and military leaders concluded in 2013 that the United States could meet its deterrence requirements with 1,000 deployed strategic nuclear weapons, 550 less than allowed under the 2010 New START Treaty. Barack Obama, faced with proposals to fund a new silo-based ICBM as part of a US$1.3 trillion nuclear modernization plan championed by hawks in Congress, asked for analysis on whether the United States could reasonably reduce its silo-based ICBM force from 450 to 300, or 150, or less. These weapons in fixed locations are most vulnerable to Russian attack, which increases pressure to launch them in minutes, before the reality and scope of an incoming attack can be assessed with certainty. The Secretary of Defense ignored the request and, when pushed by the National Security Advisor, said it would be a waste of time, according to Kaplan. The defense establishment and senators from the states where they are based would put up a big fight. In the end, Obama concluded there was not enough time and political capital to overcome all the sources of resistance to such change.
Global Climatic Effects

The theories, force postures, and plans that the United States, Russia, and, to a lesser extent, India and Pakistan deploy for conducting escalatory nuclear warfare miss an existential point: if nuclear strikes to destroy or at least significantly limit the adversary’s capacity to retaliate would themselves produce climatic effects and fallout that severely damaged one’s own agricultural sector and global food production for years, much less irradiate its own population, it would be self-defeating. Everyone would be better off with less destructive deterrents, since potential effects of a nuclear winter could severely harm not only the populations of belligerent states but also nations far from the conflicts. As the Defense Department Law of War manual declares, “the overall goal of the State in resorting to war should not be outweighed by the harm that the war is expected to produce.”

Data and models to assess the potential climatic effects of various nuclear war scenarios have improved enormously since the prospect of nuclear winter first emerged in the 1980s. For example, studies by Alan Robock et al. and by Owen B. Toon et al., both published in 2007, calculated that a nuclear conflict between India and Pakistan involving 50 detonations of Hiroshima-yield weapons in each country’s urban areas could produce fires of enough scale and intensity to cause global wintering effects. Decreases in global average temperatures would significantly shorten growing seasons, while diminished precipitation would impair growth of food crops. Subsequent simulations by additional researchers predicted 20 percent reductions of soybean and corn production in the midwestern United States and of rice in China for several years and 10 percent reductions for up to a decade. Such declines in agricultural production could profoundly harm both producers and consumers of food worldwide, especially those who could least afford the scarcity prices that would result. The potential consequences of war involving the much more destructive arsenals of the United States and Russia would likely be worse.

Nuclear policymakers generally have ignored these issues. Many worry that attention to consequences like nuclear winter could undermine deterrence. As Franklin Miller, a longtime US nuclear policymaker puts it, “no one has defined what the threshold of numbers, yields, targets would be that would cause nuclear winter. And there’s a risk also of Putin playing bully boy and saying, ‘go ahead, you go ahead and cause nuclear winter,’ and then we are self-deterred.”
Nuclear prohibitionists are less likely to oppose international scientific study and discussion of climatic effects of nuclear war. But they will be tempted to argue that seeking less environmentally threatening nuclear postures would wrongly preserve reliance on nuclear deterrence. Prohibition of all nuclear weapons is their priority. Yet, even if nuclear abolition were seriously pursued, it would take many years (possibly decades) to negotiate, implement, and verify. Meanwhile, the United States, Russia, China, India, Pakistan, and other states will continue to possess nuclear arsenals. Why not seek to reduce their potential destructiveness?

To be sure, the science of modeling climatic effects of nuclear war is uncertain and debated. In 2018, a group of researchers at the Los Alamos National Laboratory technically challenged the Robock and Toon studies on climatic effects of Indo-Pak nuclear conflict.\(^\text{16}\) It is more accurate to say that nuclear war could cause nuclear winter rather than it would. But scientific uncertainty does not negate the need to understand how variations in nuclear forces and targeting could raise or lower probabilities of climatic catastrophe. The “greatest uncertainty” in computing the climate after nuclear war “is how many weapons would be used, what yields would be employed, and which targets would be chosen,” according to the authors of a 2019 study of the subject.\(^\text{17}\) Thus, new studies should specifically consider scenarios that vary the number, locations, and sizes of nuclear explosions relative to fuel loading of targets.

Such studies could be initiated by one or more nuclear-armed states, singly or collectively. They could be requested by the Nuclear Non-Proliferation Treaty (NPT) Review Conference in 2021 or the UN General Assembly. If nuclear-armed states are reluctant to proffer scenarios they think are plausible for their arsenals and probable opponents, the United Nations Office for Disarmament Research or the United Nations Institute for Disarmament Research (UNIDIR) could enlist international experts to pose scenarios that could be feasible given publicly available descriptions of the arsenals and doctrines of the United States/NATO and Russia, the United States and China, India and Pakistan, and North Korea and the United States. Other governments or perhaps philanthropic foundations could commission qualified independent scientists to conduct parallel studies and/or to peer review those produced by nuclear-armed states.

In each postulated nuclear conflict, scenarios should range from low to medium to high in terms of the numbers and yields of weapons used and the extent of fires likely to be produced as a function of the environments in which detonations would occur. Whatever scenarios are studied, at least some version of the results should be made available for public review and analysis. Such assessments could then inform judgments about what levels of nuclear weapons—in terms of numbers and explosive yields—and targeting plans are too much for even “winners” of nuclear war to tolerate.
If models of climatic effects of plausible nuclear-war scenarios indicate little risk of agricultural or other catastrophe, then nuclear-armed states will have a stronger basis for retaining weapons and policies that could produce these scenarios, though other arguments for reductions in numbers and yields could still be validly made. Conversely, if multiple scientific studies, openly debated by governments and independent scientists, identify scenarios of detonations that would likely produce severe environmental and agricultural harm beyond the populations of belligerent states, then prevention (or minimization) of nuclear climatic catastrophe should become a physical standard for determining how much is too much.

**Law of Armed Conflict**

For decades, civilian and military nuclear war planners in the United States have declared that these weapons are not aimed “at population per se,” or that operations would spare cities “to the degree practicable.”18 The fuzzy language about targeting represents an important and admirable fealty to the LOAC, which is also known as international humanitarian law. The core principles are that the amount of force applied must not exceed that which is minimally necessary to defeat the enemy, that actors spare civilians and target only combatants and military objects (distinction), that attacks must not cause harm to civilians disproportionate to the military gain sought from the attack (proportionality), and that weapons used not cause unnecessary suffering. The Trump administration’s 2018 Nuclear Posture Review, like the Obama administration before it, affirms the United States’ commitment “to adhere to the law of armed conflict [in any] initiation and conduct of nuclear operations,” but it does not explain how this would be done.19 The United Kingdom’s position is similar, while the other seven nuclear-armed states are even less forthcoming.20

Advocates of prohibition take a different course and declare, as the TPNW does, that “any use of nuclear weapons would be contrary to the rules of international law applicable in armed conflict, in particular the principles and rules of international humanitarian law.”21 Yet, the legal and political issues surrounding the potential use of nuclear weapons remain unsettled. The 1996 advisory opinion by the International Court of Justice could not “reach a definitive conclusion as to the legality or illegality of the use of nuclear weapons by a State in an extreme circumstance of self-defense, in which its very survival would be at stake.”22 (The Court’s justices acknowledged they lacked expertise to evaluate scenarios involving the use of only “tactical” nuclear weapons.23)

Because nuclear-armed states insist that they are responsible stewards of these weapons and retain them only for legitimate defensive purposes, it is fair to ask
these governments whether and how they plan to adhere to the LOAC in the potential conduct of nuclear operations. The asking and answering of this two-part question should go beyond vagaries—these states and their allies should explain whether and how variations in explosive yields and numbers of weapons and their targets increase or decrease the probability that use of nuclear weapons would comport with the LOAC (and therefore international humanitarian law). For example, notwithstanding the United States’ claims that it did not (does not) target “populations per se,” in 1990 its nuclear operational plan aimed 689 nuclear weapons at targets within a 25-mile radius of Moscow, many with yields greater than a megaton.24

This dialogue and subsequent international debate could begin in many ways. Parties to the NPT could ask nuclear-weapon states to answer questions in this regard as part of transparency surveys, with follow-up discussion during NPT Preparatory Committee Meetings and review conferences. If nuclear-weapon states used the consensus rule—under which dissent from any state can block action—to prevent such discussions in the NPT process or in the UN Conference on Disarmament, a coalition of interested states could issue a public request for answers to these questions. Parliaments from each continent, singly or in groups, could write public letters to counterparts in all nuclear armed states asking for their views on these legal questions. Civil society organizations and journalists could do the same. Non-responses could be nearly as revealing as responses. Either way, this exceptionally important set of issues would be elevated in international politics.

Clarifying what types of nuclear forces and actions would be more or less likely to comport with the LOAC would be beneficial for several reasons. First, in today’s international environment, it would benefit the cause of peace and security if influential states reminded themselves and the world why international humanitarian law is important. This body of law was created because war is often hell. More narrowly, military personnel who could be ordered to conduct nuclear attacks—and their families—do not want to live with the horror of being involved in actions they will regret if they survive. The prospect of total war produces widespread anxieties and allocations of resources that undermine everyone psychologically, morally, economically, and politically. Thus, states—especially since World War II—have determined it would be better to have some norms, rules, or laws that could limit destructiveness, even at the expense of reassuring their potential adversaries, too. The time to educate leaders and influential citizens about why the LOAC matters is before their country is in an escalatory war when it would be more difficult to think clearly.
Of course, obtaining compliance with and enforcement of international norms and laws is always challenging. Winners of conflicts are particularly difficult to hold to account. Yet, even if effective prosecution and enforcement of judgments are unlikely, sustained airing of legal considerations can influence nuclear policy debates before and during initial stages of conflicts that have clear potential to escalate to the use of nuclear weapons. This restraining function, however modest it may be, is a second reason for pursuing this initiative.

Imagine, for example, two countries with nuclear deterrents engaged in an intensifying sovereignty dispute over uninhabited islands. Ships from the two collide one night, causing one to sink, with loss of life. Both sides rush more sea and air forces to the area and shooting amongst them breaks out. The world and perhaps the media and populations of these countries begin stoking threats or fears that this conflict could escalate, and nuclear weapons could become involved. Wouldn’t everyone be better off if the belligerent governments (and allies, where relevant) had previously clarified whether they would adhere to the LOAC? If one or both had declined to do so, the rest of the world would become alarmed and, presumably, would mount more pressure on them to commit not to escalate illegally. Conversely, if one or both had previously committed to apply the LOAC, they could be reminded of this and questioned about how using nuclear weapons in such a conflict could be justified. In both cases, the restraining function of legal considerations would be modest, but nonetheless worth pursuing.

Of course, some relevant governments do not allow domestic mobilization and debate on such issues. Yet, this does not mean that these governments are immune from domestic spillovers of international pressure. Greater international attention to these issues would attune media and others to respond more intensively and knowledgeably when officials threaten to use nuclear weapons. Such debates could educate current or future leaders who are unaware of the requirements of international law and the rationale behind them.

It is always possible that states could simply deem the LOAC irrelevant to nuclear war because, if situations become dire enough to warrant use of these weapons, the restraints of civilization (including law) would have already vanished. Yet, making this possibility clear could drive home the imperative to prevent aggression that could trigger nuclear escalation and to strengthen non-nuclear defenses against such aggression. Too often this imperative is lost in debates over nuclear policy and disarmament.

Finally, arsenals and policies that would be more likely to comport with the LOAC could provide more credible and therefore more effective deterrence. A state that has worked through and publicly articulated the legality of the various uses of its carefully considered numbers and types of weapons would presumably be less self-deterred than a state that had not taken such care, since the
latter's wanton approach could motivate unrestrained responses by others. Adversaries would need to take this into account before undertaking escalatory actions up to and during nuclear exchanges. And if deterrence failed, understanding whether and how variations in numbers, yields, and targets of nuclear weapons could change the probable humanitarian and environmental effects of nuclear operations could save lives.

Some might argue that smaller arsenals of lower-yield weapons would weaken deterrence in two opposite ways. Lowering the yields of one's own nuclear weapons could weaken adversaries’ inhibitions to go to war or use nuclear weapons themselves. But this argument neglects the reality that detonations in urban areas of even “low-yield” nuclear weapons would still be so enormously destructive as to inhibit any sane and informed leader. (The “low-yield” W76-2 warhead now deployed on 20 US submarine-launched ballistic missiles is 10 times more destructive than the estimated blast of the chemicals that destroyed the port of Beirut and would produce radioactive fallout.25) The other way that lower-yield weapons could weaken deterrence would be, as noted above, if they lessened a country’s own inhibitions to use nuclear weapons because its leaders thought this more legally defensible weapon with less destructive power would be less likely to prompt the adversary to escalate in return. But this is the inescapable paradox of deterrence: the more credible it is, the better it is thought to work; but the more credible the use of nuclear weapons becomes, the more adversaries search for ways to counter-escalate and avoid being deterred.

This escalation problem is one reason for joining legal considerations with environmental calculations in setting limits on the destructive power of nuclear arsenals. Without additional considerations, deterrence logic alone produces endless demand for more. Strategically and legally, the “upper limit of sanity in the actual use of nuclear weapons”26 would be that which causes more destruction than was caused by the aggression that began the war.

The real hazard of foregrounding international humanitarian law or the LOAC is that governments may claim fidelity to it and get away with refusing to detail how. This lack of true accountability is why it is important for nuclear-armed states to subject themselves to cross-examination by international experts regarding how their nuclear forces and doctrines would comport with international law under plausible scenarios. Those that refuse such dialogue would reasonably be assumed not to commit to apply international law to their potential use of nuclear weapons. The implications of this, including for potential

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adversaries that have committed to do so, would also be worth spotlighting in international fora.

**Ending Overkill**

Taking the problems of potential nuclear winter and gross violations of the LOAC seriously could offer a way out of the dangers and contradictions that lead to excessively destructive forces and operational plans for escalation dominance. If analysts more seriously consider the difficulty of limiting escalation, they may find more reason to bound escalation’s effects. This bounding or risk reduction can be done by significantly reducing the numbers and explosive yields of weapons and by informing the selection of targets in Russian, American, Indian, Pakistani, and other states’ operational plans. Both of these imperatives could alter the level of certainty that nuclear war planners require for destroying targets. Requirements of “near certainty” often drive the number and explosive yields of weapons sought by military planners higher, though strong arguments could be made that general deterrence would be effective with less demanding requirements of redundancy or overkill.

Many weapons in today’s arsenals are more destructive than they need to be because they were produced and deployed before improvements in accuracies of delivery systems were achieved. To be sure, replacing them would entail cost and political controversy. Many will argue in the abstract that lower-yield weapons would lower the threshold for their use and make nuclear war more likely. This argument neglects the fact that even “low-yield” nuclear weapons, say five kilotons, would cause immediate and massive destruction of urban environments beyond which anyone has experienced since 1945. The possibility that lower-yield weapons could make nuclear deterrents and their potential use more credible is not a reason to oppose substituting them for warheads that have excessive yields.

Conventional weapons should be the first choice, as non-proliferation experts Jeffrey Lewis and Scott Sagan have reminded. But if conventional weapons are insufficient, then in moral, legal, environmental, and strategic terms, the number and yields of nuclear weapons should be the minimal necessary to make adversary leaders conclude that targeted objects are likely to be destroyed if they (the adversaries) commit aggression or persist in one that is already under way.
The policies and forces of other nuclear-armed states indicate alternative possibilities to maintain nuclear deterrence with significantly less risk. Whereas Russia and the United States now stockpile 4,315 and 3,800 nuclear weapons, respectively, the next largest arsenal—France’s—contains less than 300, followed closely by China’s. The seven states with much smaller arsenals than the United States and Russia have not faced aggression of the scale and danger that has brought them close to needing to launch nuclear weapons. With the exception of Pakistan and, perhaps in the near future, India, these states have not envisioned starting and “winning” escalatory nuclear war.

Negotiating agreement among the United States, Russia, China, India, Pakistan, the UK, and France to actually reduce and balance their military forces to account for environmental and legal implications is quixotic today. (Israel does not acknowledge possessing nuclear weapons; moreover, it is not clear who its counterpart in negotiations would be. North Korea is a distinct case for many reasons.) For the United States, Russia, and China, emerging non-nuclear weapons such as precision cruise and hypersonic missiles, cyber, anti-satellite, and anti-missile systems bedevil efforts to define stabilizing balances and design arms control regimes to enhance and preserve stability. Before these governments would accept deep nuclear reductions (or in China’s case forego expansion) they would require confidence that adversaries would not be able to use new weapons to negate their smaller nuclear deterrents.

Building such confidence is a tall order in current politics. However, there is no reason why analysis and debate necessary to conceptualize such a collective shift to much less destructive deterrents could not begin now. If much smaller arsenals with less destructive yields and no additional targets (beyond those in current nuclear war plans) better reconcile nuclear deterrence with everyone’s interest in preventing war crimes and physically limiting the destructiveness of nuclear war, shouldn’t this outcome become an international objective? Pursuing it could help mobilize international political support to strengthen non-proliferation and the now-fraying global nuclear order.

To begin movement toward more accountable nuclear deterrents, a plurality of influential states—including in Europe and East Asia—and civil society actors would need to grasp how legal and environmental interests require bounding the destructive power of nuclear arsenals and reducing, if not ending, overkill. Leaders of such a grouping could then seek to persuade counterparts in one or more nuclear-armed states to join them. At that point, the plurality of supportive states and civil society actors would be larger than the number of populous states that prefer either nuclear escalation dominance or prohibition. With such a plurality (including at least one nuclear-armed state), the studies and debates proposed here could be launched.
China may be pivotal. Its leaders have shied away from dialogues, let alone negotiations, on nuclear stability and arms control. Its government does not have the cadres of military, technical, and diplomatic experts in nuclear arcana that the United States and Russia do. But China does have a unique record of restraint in the nuclear domain. At a time when Asian and European middle powers express growing concern over China’s increasing military power, many governments and civil society actors could welcome China’s contribution to a wider international effort to physically limit the destructiveness of nuclear war. This pressure should give further impetus for others to create such an opening for Chinese leadership—and for Beijing to take it.

In an interview for the television film World Order 2018, Russian President Vladimir Putin explained that if Russia’s warning systems detected an enemy attack with nuclear-armed missiles, he would order “reciprocal” nuclear strikes. “If there is this decision to destroy Russia then we have a legal right to respond,” Putin said. “Yes,” he acknowledged, “this would be a global catastrophe for humanity, but I, as a citizen of Russia and the head of the Russian state, would like to ask you this—what do we need a world for if there is no Russia in it?”

The power to destroy the world is too much for any individual or country to have. Nuclear deterrence may remain necessary for the foreseeable future (at least to some states), but this does not justify or require arsenals and targeting plans that threaten civilization itself. Governments and civil society organizations that may disagree on many issues should be able to cooperate to end overkill.

Notes


15. Franklin Miller, interview, December 3, 2018, Washington, DC.


23. Legality of the Threat or Use of Nuclear Weapons, para. 94.


