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Costs of Disarmament

Rethinking the Price Tag: A Methodological Inquiry into the Costs and Benefits of Arms Control

Susan Willett

UNIDIR
United Nations Institute for Disarmament Research
Geneva, Switzerland

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Susan Willett
UNIDIR
Geneva, April 2002

LIST OF ACRONYMS

ACDA	Arms Control and Disarmament Agency (USA, Washington)
ATTU	Atlantic-to-the-Urals (zone)
BESA	Begin-Sadat Center for Strategic Studies (Israel)
BICC	Bonn International Center for Conversion (Germany, Bonn)
BMD	Ballistic Missile Defence
CBA	cost-benefit analysis
CBO	Congressional Budget Office
CEA	cost-effectiveness analysis
CFE	Conventional Armed Forces in Europe (or Conventional Forces in Europe Talks)
CPI	Permanent Inter-Ministerial Commission (Brazil)
CTBT	Comprehensive Test Ban Treaty
CTR	Cooperative Threat Reduction
CSP	Centre for Security Policy
CWC	Chemical Weapons Convention
GAO	General Accounting Office
GDP	Gross Domestic Product
IAEA	International Atomic Energy Agency
ICBL	International Campaign to Ban Landmines
INF	Intermediate-Range Nuclear Forces (Treaty)
MIT	Massachusetts Institute of Technology
MTCR	Missile Technology Control Regime
NACD	Non-Proliferation, Arms Control and Disarmament
NATO	North Atlantic Treaty Organization
NMD	National Missile Defense (Star Wars)
NSG	Nuclear Suppliers Group
OSCE	Organization for Security and Cooperation in Europe
OPCW	Organization for the Prohibition of Chemical Weapons
OTA	Office of Technology Assessment
PNET	Peaceful Nuclear Explosions Treaty
SIPRI	Stockholm International Peace Research Institute (Sweden)

START	Strategic Arms Reduction Talks (Treaty)
TTBT	Threshold Test Ban Treaty
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USIA	United States Information Agency
USSR	Union of Soviet Socialist Republics

INTRODUCTION

This study investigates the methodological challenges of analysing the costs and benefits associated with arms control. The need for such a study has arisen because the cumulative increases in the cost of treaty compliance have, in no small way, impeded arms control implementation and contributed to its growing marginalization.[1] In addition, rising costs have provided fuel to those who wish to abandon arms control and disarmament in favour of security policies that promote rearmament and the remilitarization of the global security agenda.

Controversies over the costs of arms control have arisen, in part, because the expenditures have been viewed in isolation from the longer-term economic and security benefits of arms control, namely reduced military spending, improved security, enhanced mutual trust, improved confidence and reduced tensions. The costs, therefore, need to be assessed, not in isolation, but in relation to the benefits accrued and relative to the alternative scenarios to arms control and disarmament, including arms racing and the more catastrophic effects that can arise from the failure to disarm.[2]

From the outset, however, the task of analysing the costs and benefits of arms control is beset with methodological challenges. Arms control, despite being a "public good" does not readily lend itself to traditional cost benefit analysis, particularly as many of its most notable benefits, such as peace and stability, are hard, if not impossible, to quantify.[3]

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1 Alison Baylies, "Arms Control: An Endangered Species in the New Security Environment?", speech given at the 1999 Nobel Symposium, Stockholm, 1-2 October 1999.

2 Jayantha Dhanapala, "The Environmental Impacts of Manufacturing, Storing, Deploying and Retiring Weapons", paper presented to the Arms and the Environment Conference, NELPI, University of Tulsa, Oklahoma, 9-10 December 1999.

3 In standard cost benefit analysis it is recognized that certain public goods or services have highly beneficial though unpriced spillover effects often referred to as externalities. The magnitude of the benefits derived from the externalities demand that they be produced, even if they cannot be measured. In an attempt to overcome the problems with measuring

(continued...)

An equally important analytical consideration is the need for greater conceptual clarity about the variables under examination. Much of the existing literature on the economic costs of disarmament takes the costs as given, without questioning the assumptions behind how the costs are construed. This paper argues that many of the existing costs of disarmament, and particularly those that have been held responsible for the high and rising costs of disarmament, have been misallocated and should rightly be perceived as the life cycle cost of armaments. Misallocating costs is cynically used as one of the justifications for the current retreat from arms control, a process that needs to be challenged if arms control and disarmament are to have a future in this uncertain and troubled world.

In the ensuing sections these issues are examined in some detail. The following section provides some background material to the rising costs of disarmament. Section three examines some of the methodological challenges of analysing the costs and benefits of arms control. The fourth section questions the way in which certain costs are ascribed to arms control and disarmament. And the final section looks at the *averted costs* of arms control, namely arms racing, military expenditure increases, opportunity costs and the costs of war—as a technique for identifying the benefits of arms control.

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[3] (...continued)
externalities, economists apply the technique of shadow pricing. This is a bid to quantify the welfare gains of the unpriced benefits of public goods. It is hard, however, to envisage a shadow price for global peace and security as these are an ultimate form of social welfare that benefit the maximum number of people around the world. It would be of a magnitude that would dwarf all other variables.

BACKGROUND TO THE RISING COSTS OF ARMS CONTROL

It is an incontrovertible fact that the costs of arms control and disarmament are rising. In 1995 an Inspector General's investigation into the US Arms Control and Disarmament Agency warned that:

> The United States will not be able to meet the funding obligations implicit in all arms control agreements currently contemplated. It will be difficult to fully fund United States participation in even those agreements to which the United States is already a party. All such agreements should be subjected to a rigorous cost-benefit analysis of the contribution they make to vital United States interests. It is no longer sufficient to argue that international requirements require these budget outlays. Increasingly—as Congressional limitations on funding for United Nations assessments underscore—trade-offs will have to be made within budget categories. Budgetary constraints, including the political momentum to achieve a balanced budget early in the next century, require persuasive evidence that expenditures to implement current and proposed international understandings serve the priority US interests.[4]

During the Cold War it would have appeared peculiar to raise the issue of the costs of implementing or verifying arms control agreements between the super-Powers. At the time each side was allocating vast sums to weapons procurement, and while satellites, seismographs and antennas used to monitor the Soviet Union were expensive, their primary functions were threat assessment, order of battle surveillance and early warning, all at the time attributable to military costs. In this context such systems were considered "free goods" in terms of their arms control utility. Thus questions about the costs of arms control monitoring and verification were rarely raised.

Arguably, the reason that perceptions about arms control have changed in the US, has less to do with the growing economic burden of arms control, than it has to do with a major shift in security thinking, which rejects cooperative security in favour of a growing reliance upon

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[4] *Report of Inspection*, United States Arms Control and Disarmament Agency (ACDA), Office of Inspector General, August 1995, p. 38.

sovereign defence predicated upon unilateral rearmament.[5] Nevertheless, if in a resource-rich country like the United States of America, the perception prevails that the cost of treaty implementation is onerous, then it is understandable that in countries less well endowed the task is far more burdensome. This is most apparent in the Russian Federation where long-term economic decline has created serious funding constraints on the Russian Government's attempts to comply with the destruction of stockpiles under its Strategic Arms Reduction Treaties (START I, START II) and Chemical Weapons Convention (CWC) agreements.[6]

Following a prolonged delay, the Russian Duma finally ratified the START II Treaty on 14 April 2000, but not without some provisos concerning the economic implications of disarmament. Article 2 of the Federal Law on the Ratification of the START Treaty between the Russian Federation and the United States, claims the right to withdraw from the Treaty if "extraordinary events of economic and technical origin, which make it impossible for the Russian Federation to fulfil its obligations under START II Treaty or jeopardize the environmental security of the Russian Federation". In a similar vein Article 5 argues that the Russian Federation's obligations under the START II Treaty can only be fulfilled on the basis of "appropriate financing of the strategic nuclear forces of

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5 J. E. Nolan, *Perspectives on the Decade: Ten Years in Disarmament and security: A Mixed Legacy*, Monograph National Security Studies, George Town University, 2000, and J. Cirincione, "The Assault on Arms Control", *The Bulletin of Atomic Scientists*, Vol. 56, No 1, January-February 2000, pp. 32-37.

6 With the exception of 1997, the Russian Federation's gross domestic product (GDP) has decreased every year for the past decade, with an accumulated decline of 40 per cent since 1991. Inflation rose to 84 per cent in 1998 and remains high. In the second half of 1998 the general economic and financial situation worsened further, the rouble was devalued, the Government defaulted on domestic and some foreign debts, there was a major drop in industrial output and a worsening of the budget crisis. The Government was forced to take extraordinary measures to cut the federal budget. In the light of mounting economic difficulties, resources for weapons disposal were severely constrained.

the Russian Federation and of the works on safe elimination and disposal of strategic offensive arms".

Reflecting concerns over the broader socio-economic costs of adjustment associated with nuclear downsizing, Article 4 of the same Federal Law mentions the importance of securing "optimal economic use of the existing infrastructure of the strategic nuclear forces of the Russian Federation, essential cost reduction for the implementation of the programmes of elimination and disposal of strategic offensive arms, and broadening of the Russian capabilities to use the reduced components of the aforesaid arms and their infrastructure in the interests of national economic development".

One of the factors pushing up the costs and delaying the disposal of nuclear weapons in both the Russian Federation and the United States has been the huge and unforeseen environmental costs associated with the legacy of nuclear weapons production and of the clean-up costs associated with nuclear weapons disposal. In 1995 the US General Accounting Office estimated that the clean-up costs associated with nuclear weapons "will cost at least US$300 billion (and perhaps as much as US$1 trillion) and take more than 30 years to complete".[7] No known cost estimates exist for Russian nuclear weapons legacy, but given the widespread existence of radio-active contamination at different sites in the country, and due to the country's poor health and safety record, these costs are likely to be as much, if not more than those generated in the United States.

Delays are also being experienced with chemical weapons disposal due to economic constraints and environmental considerations. The 1997 Chemical Weapons Convention requires its member States to destroy all chemical munitions and chemical weapons plants by the year 2007. The Organisation for the Prohibition of Chemical Weapons (OPCW) has already had to concede to a request by the Russian Federation to extend the Chemical Weapons Convention's deadline for

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7 General Accounting Office, *Nuclear Weapons Complex Establishing A National Risk Based Strategy for Clean Up*, GAO/T-RCED-95-120, Washington, DC, 3 March 1995.

the destruction of one per cent of their chemical weapons stocks. Under the Convention this deadline fell on 29 April 2000. The Russian request cited the difficult economic situation as the reason for the delay. It is clear that because of the Russian Federation's economic difficulties the destruction of its chemical stockpiles (consisting of over 40,000 tonnes of chemical weapons/agents) will require substantial support from the global community if this is to be achieved within the terms of the treaty.[8] So far insufficient international aid has been allocated to this task.

Even in the United States the official cost estimates for destroying the US chemical agent and munitions inventory have been constantly rising over recent years amidst growing public anxieties over the safety of storing, transporting, and incinerating chemical agents.[9] As the costs have risen the projected completion dates have been drawn out, with the consequence that full implementation has been delayed. OPCW, tasked with overseeing compliance and verification of the CWC, is itself facing a severe financial crisis, which has forced it into cutting back on its verification roles and functions.[10]

Economic constraints, in addition to circumscribing the START process and the CWC, have precipitated the erosion of safety and security standards in the Russian Federation's nuclear and chemical weapons industries and military sites, including missile and submarine bases, raising fears about the potential for "leakage" of fissile materials and chemical agents, and even actual nuclear warheads, especially tactical nuclear warheads, which may provide a source of materials for future weapons proliferators.

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8 Statement by Jose Mauricio Bustani, Director-General of OPCW, to the First Committee of the United Nations General Assembly, New York, 19 October 1999.

9 General Accounting Office, *Chemical Weapons and Materiel: Key Factors Affecting Disposal Costs and Schedule*, GAO/NSIA-97-18, Report to Congressional Committees, Washington, DC: Government Printing Office, February 1997.

10 John Hart, "CWC Verification in Question", *Trust and Verify*, March- April 2001, p. 3.

In response to the potential problem of proliferation from the Russian Federation, the US Congress established the Cooperative Threat Reduction (CTR) programme in 1991. CTR has assisted in the destruction of 373 ballistic missiles, 354 ballistic-missile launchers, 52 bombers, 164 submarine missile launchers, 46 submarine-launched ballistic missiles and 12 strategic-missile submarines. So far CTR has cost the US taxpayer US$ 4.7 billion. Despite the programme's impressive results, questions are being raised about the future viability of co-operative assistance programmes, the rationale for long-term funding, the scale of the problem and the approximate numbers of the remaining strategic and tactical nuclear warheads.[11]

Growing resentment towards the use of US funds to clean up the Soviet Union's Cold War legacy and the perception that arms control comes at a high and rising price have strengthened opposition to arms control and fortified arguments for unilateral deterrence within the US Congress. The Center for Security Policy (CSP), an influential right-wing think-tank in the United States, has been claiming for a number of years that arms control "holds out the false promise of cheap alternatives to costly military problems", being a "utopian delusion which can only lead the United States towards unilateral disarmament, a formula for disaster rather than increased security".[12] Hostile sentiments towards arms control and disarmament, especially in their multilateral versions, were made apparent in the US Senate decision not to ratify the Comprehensive Test Ban Treaty in October 1999, and in subsequent decisions towards the Biological Weapons Convention Protocol and the United Nations Conference on Illicit Trade in Small Arms and Light Weapons in all its Aspects in 2001.

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11 R. Lugar, *Nun Lugar Past as a Guide to the Future*, paper presented at the NISNP Conference, Assessing US Disarmament and Non-Proliferation Assistance Programs in the Newly Independent States, Monterey, California, 11-13 December 1999.

12 "The New Arms Control Gambit: Unilateral US Disarmament That Masquerades as Noblesse Oblige", *Decision Brief*, No 97-D 84, Center for Security Policy, 23 June 1997, http://www.security-policy.org/papers/1997/97-D84.

At the other end of the weapons spectrum, the Mine Ban Treaty, which was opened for signature on 3 December 1997 and entered into force on 1 March 1999, requires State parties to destroy all existing anti-personnel mines whether they are stockpiled or emplaced.[13] Under the terms of the treaty minefields have to be cleared within ten years following entry into force and stockpiles have to be destroyed within three years of signing. State parties have also been called upon to provide assistance for the care, rehabilitation and social and economic reintegration of mine victims. Despite the relatively low level of funding required to accomplish these objectives when compared to the costs of nuclear and chemical weapons destruction, the international community has still failed to allocate adequate resources to these tasks.

Landmines are cheap to produce, costing from between US$ 3-30 depending on the design, but expensive and dangerous to remove once deployed. The average cost of mine removal and destruction has been estimated at between US$ 300-1,000 per mine. Estimates of the total cost of clearing all existing landmines are subject to great variability as there is uncertainty about the global scale of the problem. Initial estimates of 110 million landmines have been revised downward in the light of recent survey findings. It is now thought there are between 60-80 million emplaced landmines located around the world.[14] On the basis of current estimates it will cost the international community between US$ 18-60 billion to remove all the mines currently threatening life and limb. Article 6, paragraph 3, of the Mine Ban Treaty also requires State parties to provide assistance for the care, rehabilitation and social and economic reintegration of mine victims. Kenneth Rutherford has estimated that to rehabilitate the 300,000 survivors of landmine

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13 For an overview of the progress on the implementation of the Mine Ban Treaty, see the International Campaign to Ban Landmines (ICBL) *Landmine Monitor 1999*, *2000* and *2001*.

14 Figures in this paragraph are taken from Jerry White, "Landmine Survivors Speak Out", *Disarmament Forum*, 4/1999, UNIDIR, Geneva: United Nations, p. 7.

accidents it would cost more than US$ 3 billion over the next ten years.[15] So far allocations for humanitarian landmine action have fallen far short of these funding requirement. Drawing from the details within the country reports *Landmine Monitor 1999* identified approximately US$ 640 million spent by 17 major donors.[16] Nearly all this spending occurred between 1993 and 1998.

Indirect Costs of Arms Control and Disarmament

The problems associated with the rising costs of implementing arms control agreements have been compounded by the indirect costs associated with the process. Arms control and disarmament measures invariably lead to cuts in military expenditures, the closure of military bases, the demobilization of armed forces, the contraction of the defence industrial base and a downsizing of the defence industrial labour force. Such measures affect particular communities and geographical locations imposing socio-economic hardships and prolonged periods of adjustment.

In the Russian Federation where whole cities are dependent on armaments production, the adjustment problems have been particularly acute and compounded by the generalized economic crisis.[17] For such communities disarmament has become synonymous with economic marginalization, unemployment and poverty. In the absence of alternative employment opportunities there have been growing fears that the 7,000 highly skilled scientists and technical staff from the Russian nuclear weapons complexes will be tempted to sell their knowledge and skills to rogue States keen to develop weapons of mass destruction

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15 For a discussion of landmine victim assistance see Kenneth R. Rutherford, "The Landmine Victim Assistance Responsibilities of State Parties to the 1997 Mine Ban Treaty", in ICBL *Landmine Monitor Report 2000: Towards a Mine Free World*, Human Rights Watch, August 2000, pp. 1078-1080.

16 "Mine Action Funding", *Landmine Monitor Report 1999*.

17 For a detailed analysis of the state of Russia's defence industry see Bonn International Center for Conversion (BICC), "Russia's Defence Industry at the Turn of the Century", *BICC Brief 17*, November 2000.

capabilities.[18] In such circumstances, identifying solutions to socio-economic hardships imposed by disarmament measures has become a pressing security issue.

Defence-dependent communities, wherever they are located, are often highly resistant to arms control and disarmament measures.[19] When they join forces with defence corporations they contribute to a formidable lobby that can moderate or even undermine arms control and disarmament measures. On this issue a 1993 UNIDIR study on the economic aspects of disarmament noted that "economic agents in the military industrial complex are always seeking alternative ways of ensuring national security, of making money and protecting their incomes and budgets. Thus, a successful arms limitation agreement for one class of weapons might lead to the search for new weapons and the continuation of the arms race in new and different forms".[20]

The adjustment problems associated with the downsizing of defence plants or military bases have become the focus of specialized research on conversion and demilitarization.[21] Nevertheless, practical progress in conversion has been limited, hampered as it is by the considerable barriers to exit from the defence market and the general lack of political will by States to implement national conversion strategies.

The indirect outcomes of arms control and disarmament present the international arms control community with the complex task of simultaneously ensuring the implementation of treaties, preventing the possibility of proliferation, and minimizing the social costs. These multiple tasks have undoubtedly pushed up the burden of disarmament in the short to medium term. But such cost needs to be set against the possible alternatives. Without arms control and disarmament measures, military expenditures tend to rise, arms races gather momentum, mistrust

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18 J. Wolfstahl, "Surveying the Nuclear Cities", *Bulletin of Atomic Scientists*, Vol. 57, No 4, July/August 2001, pp.15-17.

19 Keith Hartley, *Economic Aspects of Disarmament: Disarmament as an Investment Process*, UNIDIR, Geneva: United Nations, 1993, p. 9.

20 Ibid., p. 43.

21 See, for instance, the research output of the BICC: http://www.bicc.de.

and tension cloud international relations and the spectre of potential conflict menaces the global security landscape. The costs of arms control and disarmament therefore need to be assessed not in isolation, but relative to alternative scenarios, including the catastrophic effects that might arise from the failure to disarm.[22]

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[22] Jayantha Dhanapala, "The Environmental Impacts of Manufacturing, Storing, Deploying and Retiring Weapons", paper presented to Arms and the Environment Conference, NELPI, University of Tulsa, Oklahoma, 9-10 December 1999.

THE METHODOLOGICAL CHALLENGE

The multiple tasks confronting the arms control community have undoubtedly pushed up the price of disarmament in the short to medium term, but such cost needs to be set against the costs of possible alternatives. This observation raises the issue of the way in which we approach the question of costs. It poses a methodological challenge to the current perceptions of the costs of disarmament, which are viewed without reference to the benefits, or without closer scrutiny of the variables under examination. The ensuing section provides a discussion of the methodological challenges of assessing the costs and benefits of disarmament.

Arms control is a public good inasmuch as it provides a collective benefit to society, which is guaranteed and funded by the State. There are two methodological approaches that are traditionally used to examine the costs and benefits of "public goods": cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA).

CBA involves the identification of gains and losses, converted into monetary units, and the comparison of these monetary units contributes to an assessment of the desirability for a particular programme of expenditure or investment. Calculations usually use net present value, the internal rate of return or cost-benefit ratios. CBA as a methodology evolved in order to evaluate the effective decision-making in public sector investment projects such as infrastructural investments, i.e. roads, bridges, dam building, etc. It sets out to maximize the net present value of all the benefits and all the costs subject to specific constraints. Given its preoccupation with monetary units, however, CBA as a methodology is limited in its ability to compare quantifiable costs with non-quantifiable benefits, as in the case of arms control. For instance peace and stability, generally perceived as the ultimate benefit of arms control, are non-quantifiable characteristics representing as they do political, social and cultural benefits rather than economic advantages.

In standard cost-benefit analysis it is recognized that certain public goods or services have highly beneficial, though unpriced, spillover effects, often referred to as externalities. The magnitude of the benefits derived from externalities demand that they be produced, even if they cannot be measured. In an attempt to overcome the problems with measuring externalities, economists apply the technique of shadow

pricing. This is an attempt to quantify the welfare gains of the unpriced benefits of public goods. It is hard, however, to envisage a shadow price for global peace and security as these are an ultimate form of social welfare that benefit the maximum number of people and would produce a figure of such magnitude that it would dwarf all other variables into insignificance.

The resistance to quantification does not mean that peace and security have no value. On the contrary they have huge *social value*, as they are the conditions which guarantee the sanctity of life and all human endeavour. As such, peace and security contribute to a conducive environment for all forms of human activity. In the economic realm they enable trade, economic growth and development to occur. In the social sphere they enable communities and societies to flourish and to evolve in a secure and harmonious environment, devoid of the abrupt dislocations, disruptions and destruction associated with war.

Given the limitations of CBA in being able to capture these important benefits, it is necessary to look for an alternative method of analysis. Cost-effectiveness analysis (CEA) has been developed to take into account "non-monetary" aspects of a public good. Applied to arms control, CEA is able to account for non-quantifiable aspects of the costs and benefits such as the lives improved or saved, or lost with opportunities forgone.[23] The basic methodology for CEA offers a process predicated on CBA, yet one that is able to move beyond the limitations of quantification by addressing the benefits of peace and stability etc. Since the late 1980s CEA has been extensively used by US government departments such as the General Accounting Office (GAO), the Office of Technology Assessment (OTA) and the Congressional Budget Office (CBO) to make value-for-money assessments about the utility of arms control and disarmament measures.

Despite the apparent scientism of analytical tools such as CBA and CEA, the results of both forms of analysis depend upon the perceptions of the practitioner. If, for example, a hypothesis is posed that the costs

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[23] F. Tevik, *Cost-Benefit Analysis: Theory and Application*, Thousand Oaks, CA: Sage Publishing, 1996, pp. 1-2.

of arms control are out of control, then the likely results will prove just this. This is because the perceptions of costs and benefits are inevitably normative and depend on the analyst's values and basic assumptions.

In the following paragraphs three studies on the costs and benefits of arms control and disarmament are examined. These include those by Philip Jones and UNIDIR.[24] Interestingly these studies utilized highly divergent economic techniques to assess the costs and benefits of arms control and disarmament. Jones, for instance, uses production functions to assess the savings effect of the 1987 Intermediate-range Nuclear Forces Treaty.[25] He demonstrates that a weapon treaty creates costs by interfering with the choice of technique of production. Whether or not this automatically implies that defence expenditure will be greater or lower after implementation is a matter of political choice. He cautions, however, that, "if the same level of defence capability is required after signing the treaty as was demanded before then, almost inevitably, the budgetary costs of defence must rise".[26] In other words the economic benefits of an arms control treaty depend upon the willingness of decision makers to exploit the economic opportunities that arms control treaties present. There can be no assumption of an automatic economic gain outside of a political process that engineers gain.

In contrast to the Jones' micro-economic study, the 1993 UNIDIR investigation focuses on the issue of costs and benefits at the meso and macroeconomic levels, by analysing the social and economic returns from arms control and disarmament.[27] According to the report's author:

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24 Philip Jones, "The Cost of Disarmament Treaties: A Research Note", *Arms Control*, Vol. 9, No 3, December 1988, pp. 280-291; Keith Hartley, *Economic Aspects of Disarmament: Disarmament as an Investment Process*, UNIDIR, Geneva: United Nations, 1993; and Allan S. Krass, *The Costs, Risks and Benefits of Arms Control*, Centre for International Security, Stanford University, February 1996.

25 Philip Jones, "The Cost of Disarmament Treaties: A Research Note", *Arms Control*, Vol. 9, No 3, December 1988, pp. 280-291.

26 Loc. cit., p. 290.

27 Keith Hartley, *Economic Aspects of Disarmament: Disarmament as an Investment Process*, UNIDIR, Geneva: United Nations, 1993.

> Disarmament has major economic consequences involving costs as well as benefits. On the cost side, it requires a fundamental reallocation of resources from military to civilian production. This is likely to result in major potential problems of unemployment or underemployment of labour, capital and other resources in the process of disarmament. As a result, the economic dividends of disarmament are likely to be small in the short-term. Ultimately however, in the long term, disarmament leads to significant and worthwhile benefits through the production of civil goods and services as resources are reallocated to the civilian sector. Thus, in its economic aspects, disarmament is like an investment process involving short-run costs and long-run benefits.[28]

The report cautions that in order to maximize the social rate of return from disarmament, reductions in military expenditures should be gradual and predictable, allowing for smooth economic and social adjustments to declining defence spending. With prescience the report argues that there should be explicit recognition of the unprecedented economic problems of disarmament in the current world situation, particularly where disarmament is occurring simultaneously with a shift from centrally planned to market economies.

Allan Krass in his study *The Costs, Risks and Benefits of Arms Control*, utilizes a basic accounting approach to analyse the costs and benefits to the United States of implementing and verifying arms control agreements.[29] While cost-effectiveness has become a key criterion in arms control, Krass cautions that it is exceedingly difficult to apply in practice, because not only are financial costs problematic to estimate in advance, but the issue of the benefits can never be quantifiable in any meaningful or useful way. Nevertheless, he argues that rough estimates of the costs and benefits should be made during negotiations in order that solid arguments can be provided to challenge those that use exaggerated cost projections to oppose arms control and disarmament measures.

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28 Op. cit., p. xiii.

29 Krass, op. cit., p. 3.

In his conclusion Krass argues that in order to prevent the erosion of treaties in force, and to allow further progress in arms control, especially nuclear arms control, the case will have to be made that expenditures on arms control can still increase security far more cost effectively than equivalent or even much greater expenditures on military hardware.[30] Finally he stresses that "while arms control is not cheap, neither is it all that expensive. Costs have risen rapidly because so many treaties have entered into force in such a short time, and the great majority of costs of each treaty must be paid during the early implementation years. Awareness of costs has risen faster than the costs themselves, largely because old perceptions of threat that made rigorous verification seem so important, have been replaced by a more diffuse perception of threat and a concern with weapons far less easy to identify than the ones that dominated arms control negotiations during the Cold War".[31]

Although very different methodologies are used in each of the studies mentioned above, an underlying theme emerges about the role of perceptions and political will in the process of realizing benefits and assessing the costs. These factors point to the complexity of assessing the cost-effectiveness of a public good designed to promote what are essentially political outcomes, namely peace and security.

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30 Op. cit., p. 39.

31 Op. cit., p. 40.

A QUESTION ABOUT COSTS

The easiest way for countries to manage the costs associated with disarmament is to desist from arming in the first place. Jayantha Dhanapala, United Nations Under-Secretary-General for Disarmament Affairs, has argued that "it is high time that due credit is given to the enormous savings that countries have reaped from what might be called the "non-armament dividend", that is the savings in human, environmental, and financial resources from not having pursued weapons of mass destruction".[32] This is sound advice to those States contemplating the acquisition of weapons of mass destruction. But it also provides an interesting insight into how we should be thinking about the costs of disarmament. Currently much of the existing literature on arms control identifies the costs of disarmament to include:

- administrative and organizational expenditures linked to treaty negotiation and implementation;
- the costs of storage and destruction of weapon systems;
- the budgetary allocations required for verifying and monitoring treaty compliance;
- the environmental costs associated with arms control and disarmament measures, including the management and clean-up of nuclear materials resulting from nuclear weapons production, the clean-up of chemical contaminants as a result of the use of chemicals in weapon systems and the cost of mine clearance to render land reusable for human habitation and agricultural production.

Yet, as Dhanapala's quote suggests, if arms had not been acquired then many of these costs would not exist, which poses the question whether these costs are in fact those of disarmament or in fact those of armaments.

Krass, in examining the rising costs of chemical weapons disposition in the United States, queries how much should be attributable to the Chemical Weapons Convention.[33] As he points out, the vast majority of US chemical weapons were obsolete and in some cases dangerously

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32 Dhanapala, op. cit, p. 7.

33 Op. cit., p. 24.

unstable long before Congress ratified the treaty. "It would therefore be misleading to consider the full cost of eliminating them as a cost of chemical disarmament."[34] Here Krass strongly questions which budget heading weapon systems disposal costs should come under. Should they be under disarmament costs, or alternatively should they be allocated to the life cycle costs of weapon systems? This is an important point which needs further exploration, because if indeed weapons disposal costs are recognized as the an inevitable component of the life cycle costs of a weapon system, then the real cost of disarmament becomes greatly reduced.

In exploring this dilemma we turn to the North Atlantic Treaty Organisation (NATO) definition for military expenditures, which categorically includes the expenditures for stockpiling and weapons destruction under military expenditure headings. Section 9 of NATO's Definition of Military Expenditure states that:

> Expenditures for stockpiling of war reserves of finished military equipment or supplies for use directly by the armed forces are to be included.[35]

In addition, Section 10 of the NATO definition of military expenditures states that:

> Expenditures for ... the destruction of weapons, equipment and ammunition, and the costs associated with inspection and control of equipment destruction, are included in defence expenditures.[36]

These definitions confirm that weapons disposal costs should come under the costs of armaments heading rather than arms control and disarmament budgetary heading. After all, at some point in its life a weapon has to be disposed of, whether or not it is subject to treaty limitations. The problem arises in relation to arms control treaties because of the strict timelines that are agreed upon for weapons disposal

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34 Ibid.

35 NATO Economics Directorate, *NATO Definition of Military Expenditures*, quoted in BICC MILEX Newsletter, Monday 6 April 1996, pp. 1-2.

36 Ibid.

at the time of treaty negotiation. Deadlines often appear to be made before a clear appreciation of the scale of the disposal challenge is fully known.

The current practice of placing stockpiling and disposal costs under the arms control heading means that the final costs of certain weapon systems are rarely if ever attributed to a weapon's total life cycle costs. The indirect effect of shifting the stockpiling and disposal costs of weapon systems onto arms control and disarmament is to protect the rearmament lobby against the defence budgetary constraints that might restrain new procurement proposals. If the total life cycle costs were to be available from the outset of decision-making over budgetary allocations for weapon systems, far greater caution might be exercised in decisions to rearm. By enabling military acquisitions to proceed undeterred by revelations about the true economic costs of weapons programmes, arms control and disarmament, rather than rearmament, have become the focus of debate about rising costs, and thus a target for political controversy.

Furthermore, if we accept that the costs of weapons disposal is attributable to the cost of armaments, then what we are witnessing today is the ongoing legacy of arms racing, most notably that of the Cold War, which continues to impose a burden upon taxpayers long after bipolar confrontation has terminated.

These observations about the legacies of past arms races apply equally to the perceived environmental costs of disarmament. As mentioned briefly in the rising cost of disarmament section, there has been growing environmental concern about the effects of weapons disposal techniques on the environment and public health. This has resulted in the imposition of increasingly exacting methods of weapon systems destruction in order to prevent further environmental damage and public health risks. These factors have increased the costs of weapons disposal, making the environmental costs of disposal of weapon systems a major sticking point in arms control negotiation and implementation.

National leaders are likely to face increasingly difficult choices in the years ahead over the extent to which environmental considerations

should guide funding decisions, particularly those decisions linked to international disarmament agreements.[37] The more critical the environmental challenges associated with disarmament become, the narrower will be the margin for choice. When arsenals are as large as those in the Russian Federation and the US, the environmental costs of disarmament can become prohibitive and considerable opportunity costs arise. The danger with this situation is that leaders will react by either delaying arms control implementation or by proceeding with disarmament measures that lack concern for the environment. This is to be observed where countries cut corners in destruction activities, exempt military programmes from environmental controls, underfund clean-up programmes or fail to apply stringent domestic environmental legislation.

Problems also arise when the environmental costs of disarmament become convenient excuses not to disarm. Despite the fact that recent arms control agreements are being influenced by environmental considerations, the relationship between disarmament and the environment is a tenuous one. Currently the environmental costs of disarmament are being viewed in isolation from the environmental costs of rearmament or the environmental costs of war involving the use of nuclear or highly toxic weapons. Once produced, the environmental costs of weapons do not go away. In fact ageing weapons may present the highest risk to the environment. There are always costs to be measured as a result of action, but there are also cost consequences associated with inaction.

Regardless of whether or not weapons are subjected to arms control treaties, environmental costs will arise because of the toxic characteristics of the weapon systems. Arms control treaties may be increasingly sensitive to methods of disposal for environmental reasons,[38] but the

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[37] Jayantha Dhanapala, "The Environmental Impacts of Manufacturing, Storing, Deploying and Retiring Weapons", paper presented to the Arms and the Environment Conference, NELPI, University of Tulsa, Oklahoma, 9-10 December 1999.

[38] Examples of treaties where environmental concerns have been a major influencing factor include the 1959 Antarctic Treaty, the 1963 Partial Test Ban Treaty, the 1967 Treaty of Tlatelolco, the 1967 Outer Space Treaty, the

(continued...)

problem and costs of the environmental impact of weapon systems should be viewed as part of the weapon system life cycle costs, not the cost of disarmament per se. This raises an important issue about the need for environmental impact assessments of weapon systems at the point of procurement, rather than the idea of environmental impact assessments being added on to arms control treaties, as has been argued by certain lawyers concerned with the environmental cost of disarmament.[39]

If these costs are removed from the disarmament price tag, then we are left with the costs of negotiation, administration, implementation, monitoring and verification of arms control treaties. While these are undoubtedly rising, they pale into insignificance when compared with disposition and environmental clean-up costs that the US and the Russian Federation are currently facing.

Moreover, monitoring and verification costs, when viewed in relation to the resources spent on weapon systems, also appear inconsequential.[40] For instance, compare the cost of maintaining the US nuclear complex for one year, which has been estimated at US$ 25 billion per annum, including US$ 4.5 billion per annum for the controversial Stockpile Stewardship programme,[41] against the total annual costs of International Atomic Energy Agency (IAEA) verification and monitoring of their nuclear power programmes to ensure that nuclear material does not get diverted into arms production, which was

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38 (...continued)
1972 Sea-bed Treaty, 1985 Treaty of Rarotonga, the 1997 Pelindaba Treaty, the 1997 Bangkok Treaty, the 1996 CTBT, the 1997 CWC and the 1972 BTWC.

39 Symposium on Arms and the Environment: Preventing the Perils of Disarmament, National Energy-Environment Law and Energy Policy Institute, The University of Tulsa College of Law, Tulsa, Oklahoma, 9 December 1999.

40 Krass, op. cit., p. 39.

41 Cirincione, loc. cit.

estimated at US$ 82 million in 1998.[42] As this comparison illustrates, the costs of maintaining a large nuclear arsenal outweigh the costs of monitoring and verifying non-proliferation by a factor of 30 to one. And these figures do not even account for the initial costs of research, development and production of the nuclear weapons.

This comparative approach may seem an obvious exercise, but there are many studies on the rising costs of monitoring and verification, which do not set these costs in this broader context.[43] However, while these sorts of comparative cost exercise may be illustrative of the cost-effectiveness of arms control vis-à-vis armament costs, the case still has to be made that expenditures on arms control can increase security far more cost-effectively than equivalent or much greater expenditures on military hardware. Critics of arms control argue that if treaties have little positive effect on security and stability, even if they are inexpensive, they represent bad economic investment. They go on to claim that, if nuclear deterrence helps prevent war, then, however expensive it is, it represents value for money, with high security returns. To address these issues in some detail, we examine the averted costs of arms control in the following section.

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42 G. MacLean and J. Fergusson, "Leassons Learned and Lessons Shared: A Comparative Analysis of Verification Costs and NACD Agreements", *Centre for Defence and Security Studies Occasional Paper 40*, University of Manitoba, September 2000.

43 Loc. cit. and J. Fergusson; and Wim Meijer, *Costs of Multinational Verification Organisations in Europe: NATO, WEU and CSCE*, Mosbach: Peace Research and European Security Studies (AFES-PRESSS), 1992.

AVERTED COSTS

The averted political and economic costs of arms control constitute the direct benefits of arms control and provide important indicators of the success or failure of arms control and disarmament in both qualitative and quantitative terms. While the most conspicuous averted costs include arms racing and rising military expenditures, associated with these trends are the broader opportunity costs to society and the potential costs of war, which can result from unrestrained arms racing.

Arms Races

An understanding of why countries arm themselves is essential if arms control measures are to be successful. Most studies of arms races are concerned with understanding the processes that induce States to increase their military capabilities. Two models dominate the literature. The first is the action/reaction model, which attempts to define the driving force of an arm dynamic in competitive relationships between States. The second model concerns itself with internal structural forces of the State that contribute to the arms dynamic.[44] These include internal economic, organizational and political forces. Both these models contain a technological imperative, derived from the drive towards incremental and/or radical technological change within the armaments systems. These models are complementary rather than mutually exclusive. They both offer some useful insights into the nature of the arms racing which allows arms controllers to better target their efforts in controlling arms, and working towards disarmament.

The basic premise of the actions reaction model is that States strengthen their military capabilities as a result of perceived threats from a rival State or States. Examples include the arms race between the former Soviet Union and the United States between 1945-1990[45] and

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[44] For a detailed discussion of arms race dynamics, see B. Buzan and E. Herring, *The Arms Dynamic in World Politics*, Boulder, Colorado and London: Lynee Reinner, 1998.

[45] For insights into the Cold War arms race see, for instance, Marek Thee, *Military Technology, Military Strategy and the Arms Race,* London: Croom Helm, 1986; and Matthew Evangelista, *Innovation and the Arms Race : How the United States and the Soviet Union Develop New Military Technologies*, (continued...)

the regional arms races in the Middle East,[46] North-East Asia[47] and South Asia.[48] Currently there are growing concerns that new military technologies embodied in the concept of the revolution in military affairs[49] and in ballistic missile defences (BMD)[50] will generate new asymmetric arms races. The fear is that nations unable to keep up with the military technological developments of the leading military Powers, in particular with the United States, will increasingly come to rely upon nuclear, chemical and biological weaponry to maintain some sort of parity in the global military balance of power. This foreboding has been intensified since the events of 11 September 2001 in New York when hijackers flew two aeroplanes into the Twin Towers killing over 3,500 people.

Action/reaction dynamics have been captured in Richardson's classic arms race model, which exposes the way in which a State increases its defence spending in response to rising levels of military

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45 (...continued)
Ithaca: Cornell University Press, 1988.

46 Geoffrey Kemp, *The Control of the Middle East Arms Race*, Carnegie Endowment for International Peace, 1991; Shai Feldman, *Nuclear Weapons and Arms Control in the Middle East*, Cambridge, Massachusetts: MIT Press; and Gerald Steinberg, *Report on Arms Control and Non Proliferation Developments in the Middle East*, 1998, Monograph, BESA, Bar Ilan University: Centre for Strategic Studies, 13 October 1999.

47 Michael Klare, "The Next Great Arms Race", *Foreign Affairs*, 1993; Bates Gill, "Arms Acquisitions in East Asia" in *SIPRI Yearbook 1994*, Oxford: Oxford University Press for the Stockholm International Peace Research Institute, 1994; Tim Huxely and Sue Willett, "Arming East Asia", *Adelphi Paper*, 1999.

48 Eric Arnett, *Military Capacity and the Risks of War, China, India, Pakistan and Iran*, Oxford: Oxford University Press for the Stockholm International Peace Research Institute, 1997.

49 Kerstin Vignard (ed.), "(R)evolution in Military Affairs", *Disarmament Forum*, 4/2001, UNIDIR, Geneva: United Nations, 2001.

50 Ibid., "NMD: Jumping the Gun", *Disarmament Forum*, 1/2001, UNIDIR, Geneva: United Nations, 2001.

expenditure of a competing State.[51] The reaction of a State to a rival's action, is however, conditioned by a number of factors such as grievance, and/or fatigue and objective economic circumstances. At the same time the Richardson model attempts to capture the economic burdens of defence expenditures, or its opportunity costs. Over a period of time, as more and more resources are allocated to the military, negative effects are felt within the civil economy. There may come a point where sacrifices in the civil economy become unacceptable, such as occurred in the Soviet Union in the late 1980s; in such circumstances structural disarmament may occur.[52]

Most arms race models focus on the actions of highly militarized developed States, but recently Collier and Hoeffler have attempted to model arms racing in the context of poor developing countries.[53] They conclude that the spillover effects of rising military expenditure represent a "public bad" in a regional context as they generate conflict in neighbouring States, rather than providing a "public good" by deterring the aggression of State or non-State actors committed to violent confrontation.

In theory the action-reaction dynamic of these arms race models can work in reverse. If a State reduces its arsenals then rival States will perceive a reduction in threat and correspondingly reduce their own military inventories. Thus the degree to which action-reaction dynamics work in reverse to encourage a military build-down will set the terms for a successful arms control and disarmament process by providing the means to move from a vicious to a virtuous circle.

The alternative model examines the extent to which arms races are driven by the domestic pressures of military bureaucracies and/or

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51 L. F. Richardson, *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War*, Pittsburg: Boxwood Press, 1960.

52 K. Hartley and N. Hooper, *The Economics of Defence, Disarmament and Peace: An Annotated Bibliography*, Aldershot: Elgar, 1990.

53 Paul Collier and Anke Hoeffler, "Regional Military Spill-overs", paper presented to the Defence Economics Conference, New Jersey: Rutgers University, 10 May 2001.

domestic arms lobbies. Such theories have given rise to the notion of the *military industrial complex*, which captures the synergistic interests of the military, the military bureaucracy and sections of industry, in driving the military procurement process.[54] The model highlights the vested interests of the military industrial complex in driving arms procurement agendas.[55] These powerful domestic constituencies are adept at devising "perceived threats" to justify spending on ever more sophisticated and expensive weapon systems. Where the military industrial complex exerts considerable influence over budgetary decisions, the likelihood of arms control leading to disarmament is very remote. If arms control agreements are embraced at all, they may be seized on as an opportunity to develop alternative military capabilities. This internally driven form of arms build-up, which can generate external responses, may be harder to reverse than arms races driven by external dynamics, because the powerful economic and political interests that drive an arms build-up are less susceptible to accepting the universal norms and values embodied in multilateral arms control processes.

Both models concede to the existence of a technological imperative, which provides a major impetus to arms racing. This imperative is revealed in the drive towards incremental and/or radical technological change within the armaments production system.[56] The danger of unrestrained military technological development is that it creates an environment of insecurity, reflected in the notion of the "security dilemma".[57] A security dilemma exists when the military preparation of one State creates an unresolvable uncertainty in the mind of another, as to whether those preparations are for "defensive" purposes only (to enhance the security in an uncertain world) or whether they are for

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54 B. Fine, "The Military–Industrial Complex: An Analytical Assessment", *Cyprus Journal of Economics*, Vol. 6, No 1, 1993, pp. 26-51.

55 S. Melman, *The Permanent War Economy: American Capitalism in Decline*, New York: Simon and Schuster, 1985.

56 Mary Kaldor, *The Baroque Arsenal*, 1986.

57 The concept of the security dilemma was first articulated by John Hertz in "Idealist Internationalism and the Security Dilemma", *World Politics*, Vol. 2, No 2, 1950.

offensive purposes (to change the status quo to its advantage).[58] Due to the unresolvable uncertainty about the military technological developments being made by other States, mistrust becomes a dominant theme in relations. If mistrust is mutual, a dynamic action-reaction cycle is likely to be the outcome. Insecurity breeds further insecurity with an ever-present possibility for war to break out.[59]

Not all arms race analysts are convinced that an arms race makes war more likely. So-called realists such as Gray and Hammond have argued that the Cold War nuclear arms race contributed to deterrence, which in turn had the positive effect of averting war.[60] To their mind the institutionalization of the nuclear arms race ensured that the appropriate military means to stabilize deterrence and thus avoid war were available. These stabilizing features of deterrence were translated into net economic gains. They go on to argue that, in the absence of war, dramatic improvements have been made in the standard of living, levels of industrial output, technological innovation, trade and services that have been achieved in contemporary western Europe and the United States. It follows from this argument that the high economic costs associated with nuclear deterrence should be set against the net economic gains accrued from the aversion of war.

This reasoning, however, tends to overlook the fact that the cost of nuclear deterrence is high, not just because of the costs of the weapons programmes per se, but also because there is always the risk of a nuclear accident.[61] Even if the probability of a nuclear war or accident is small, utilizing the concept of "Pascal's wager" where the expected negative

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58 Nick Wheeler and Ken Booth, "The Security Dilemma", in J. Baylis and N.J. Rengger (eds), *Dilemmas of World Politics: International Issues in a Changing World*, Oxford: Oxford University Press, 1992, p. 30.

59 Ibid., pp. 29-31.

60 C. Gray, *Weapons Don't Make War: Policy Strategy and Military Technology*, Lawrence: University of Kansas Press, 1993; and G. Hammond, *Ploughshares into Swords: Arms Races in International Politics*, Columbia: University of South Carolina Press, 1993.

61 Granted, this risk still exists under an arms control treaty because of potential hidden weapons it is still reduced dramatically.

value of a nuclear accident/war is very high, then by implication the strategy of deterrence has a very high premium associated with its risks.

Moreover, focusing on peace in Europe as a benefit from nuclear deterrence detracts attention from the many and costly wars of proxy that the super-Powers sustained in the developing world during the Cold War. From Indo-China, to the Horn of Africa, and from Southern Africa to Central America, the human, environmental and economic cost of the Cold War has been immense and the legacies of these conflicts continue to haunt regional stability and economic development of these regions today (see section on the costs of war).

Statistical evidence provides no proof that the possession of nuclear weapons makes war less likely. The five declared nuclear-weapon States have been involved in an average of five wars each since 1945, compared to an average of 0.65 wars each for non-nuclear States.[62] This is clearly not compatible with the idea that nuclear weapons prevent war, despite the possibility that it might have helped to deter war between nuclear-weapon States themselves. Certainly the existence of nuclear weapons in South Asia did not deter India and Pakistan from going to war over Kashmir.[63] In fact to certain writers the South Asian nuclear arms race has led to a deterioration in relations between the two States, leading to increased hostilities which have fuelled the conflict in Kashmir and taken both countries to the brink of nuclear war.[64]

With the advent of BMD, the whole notion of nuclear deterrence is under review. Nuclear deterrence strategies, based on a recognition

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62 C. Gert Harigel, "The Impact of the Military Industrial Complex on Society", in D. Schroeer and A. Pascolini (eds), *The Weapons Legacy of the Cold War: Problems and Opportunities*, Aldershot: Ashgate, 1997, p. 34.

63 For greater details of South Asia's arms race see Hilary Synott, "The Causes and Consequences of South Asia's Nuclear Tests", *Adelphi Paper 332*, Oxford: Oxford University Press for IISS, December 1999.

64 P. R. Lavoy, "The Costs of Nuclear Weapons in South Asia", USIA, *US Foreign Policy Agenda*, September 1999, http://www.fas.org/news/india/1999/pj29lavo.htm

of mutually assured destruction, led to a deliberate effort to maintain mutual vulnerability—hence the limitations placed on anti-ballistic missile (ABM) systems through the ABM Treaty. BMD, by claiming the ability to strike against incoming missiles, undermines the established stability of deterrence, not just against the Russian Federation, but also against China.

The issue of "rogue" States, which is being used to justify BMD, does not really hold, because the likelihood of a missile attack on the US mainland from a State like the Democratic People's Republic of Korea is highly unlikely. Moreover, any entity intent on undermining US territorial integrity is far more likely to use unconventional means like the terrorist attacks on the Twin Towers and the Pentagon, which used civil aircraft as highly destructive and accurate missiles.

To understand the logic of BMD deployment, one has to grasp the Bush Administration's obsession with creating fortress America, impervious to any form of attack. But BMD is more than just a defensive strategy. According to Michael Klare it is part of a strategy of unilateral military supremacy, which will allow the US to intervene anywhere with impunity.[65] BMD will enable the use of US military power in "a pre-emptive mode to destroy an enemy's WMD [weapons of mass destruction] capabilities before they are used in combat."[66] The danger is that BMD will provoke the horizontal and vertical proliferation of WMD by potential rivals.

If the US insists on the possession of a massive military arsenal as the bedrock of its national security, then it will not be surprising if other countries follow suit. China and the Russian Federation, in particular, are likely to seek to overcome the US advantage in missile defences by expanding the size and potency of their nuclear arsenals and by developing BMD counter-measures. Other countries unable to afford such sophisticated and expensive countermeasures are likely to rely on

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65 On the issue of US military supremacy see M. Klare, "US Supremacism and Weapons of Mass Destruction in the 21st Century", *Foreign Affairs In Focus*, http://www.fpif.org/presentations/wmd01/klare.html

66 Loc. cit.

chemical and biological agents along with unconventional methods of delivery. Asymmetric warfare will evolve to another more dangerous level, which will make the world a less secure and more dangerous place. And one in which citizens of the United States, despite its huge and destructive arsenals, will become an increasingly vulnerable target.

This section on arms racing has tried to show that the build-up of arms, whether for reasons of deterrence, military balance of power or the vested interests of national arms lobbies, tends to be highly destabilizing and makes the likelihood of war more probable. Arms control, as we know it today, evolved in order to prevent destabilizing arms build-ups from resulting in destructive and deadly wars, that in the twentieth and now in the twenty-first century, are able to wreak havoc on a global scale.

Military Expenditure Trends

Arms races are closely aligned with rising military expenditure trends. By the same token, successful arms control implementation tends to produce downward effects on military spending patterns. Given this relationship, military expenditure trends provided a classic indicator of international security relations and of the successes and failures of arms control and disarmament measures.[67] An examination of recent world military expenditure trends illustrates the relationship.

In Graph 1 below global military expenditures are plotted from 1980 to 2000 to illustrate the peaks and troughs of military expenditure over the last two decades. The lack of constant time-series data that are compatible over the two decades has meant that we have had to plot moving averages over time to provide a presentation of trends over time. The graph should read as illustrative of long-term trends and not taken as representative of actual expenditures at any given point in time. For more details on the construction of the graph and the statistics used, see Annex 1.

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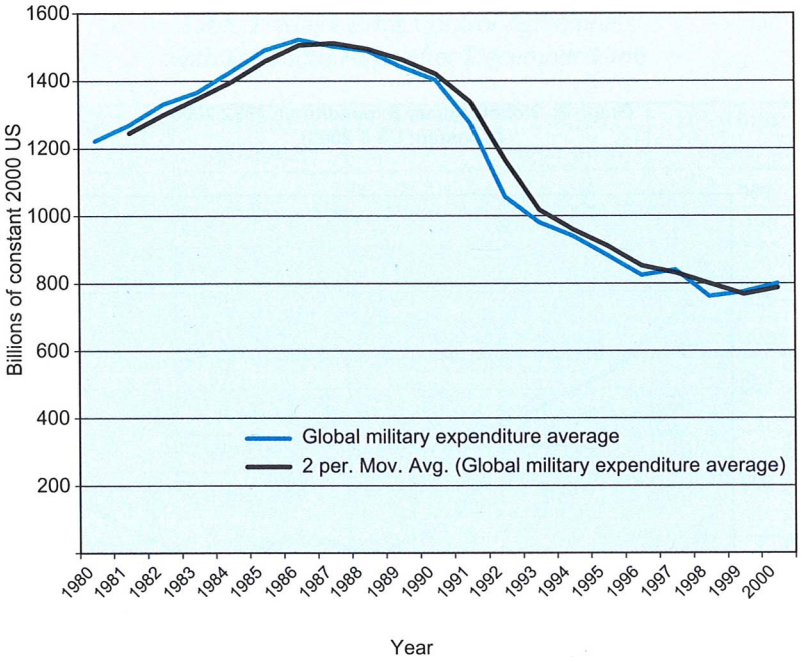
[67] For a discussion of military expenditure as an indicator of security trends, see Saadet Deger and Somneth Sen, *Military Expenditure: The Political Economy of International Security*, Stockholm: SIPRI, 1990.

Graph 1: Global Military Expenditure Trends



Graph 2 shows the trends in military expenditure since 1992, illustrating a sharp decline in the immediate aftermath of the Cold War and the rise that has been occurring since 1998.

During the height of super-Power confrontation, global military expenditures reached a staggering US$ 1.5 billion in 1987 (in 2000 prices). A significant part of these global resources was allocated to the amassing of huge nuclear arsenals, estimated at 75,000 strategic warheads in 1987. The highly dangerous situation of nuclear overkill was captured in Jonathan Schell's famous book *The Fate of the Earth*.[68] The growing risk of Armageddon led the two super-Powers to stabilize their nuclear arms race through the signing of bilateral arms control

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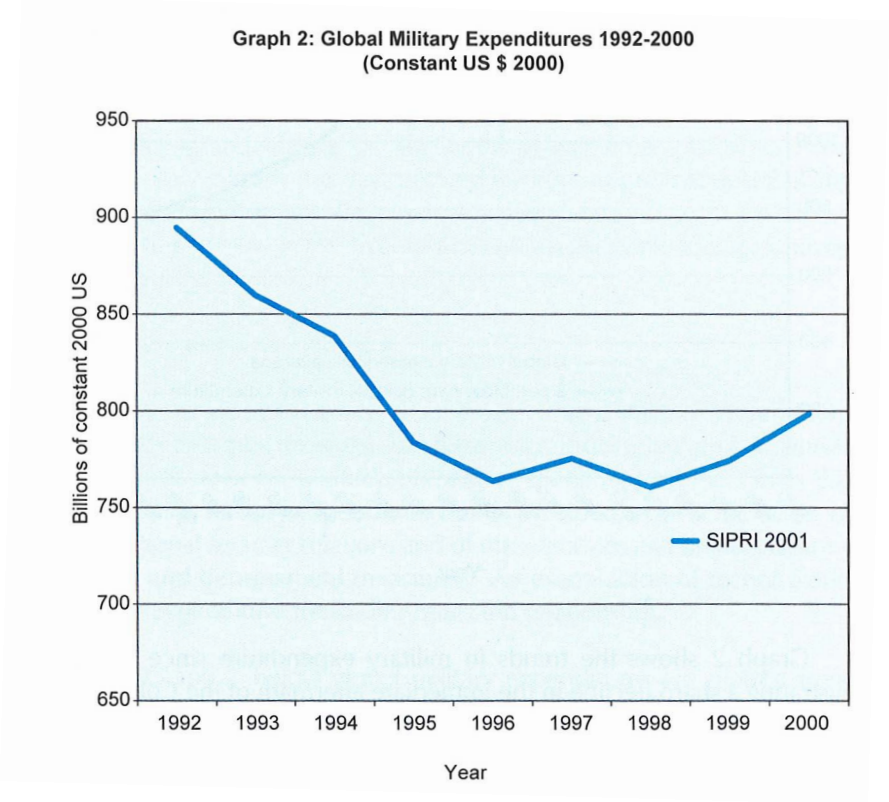
[68] J. Schell, *The Fate of the Earth*, London: Cape, 1982.

agreements such as the Intermediate Nuclear Forces (INF) treaty, the Strategic Arms Limitation Treaty (SALT) and eventually the START Treaties .



The INF Treaty was in fact the first agreed reduction in nuclear weapons or the first nuclear disarmament agreement worthy of its name, as it stipulated the elimination of an entire category of nuclear weapons delivery vehicles. The INF Treaty helped pave the way for an end to the strategic nuclear arms race and a reduction in military expenditures. As a consequence of this remarkable achievement, a wide range of bilateral and multilateral arms control agreements were secured such as START I,

START II, the Conventional Armed Forces in Europe (CFE) Treaty and the CWC (see Table 1).

Table 1: Major Arms Control Agreements with Entry into Force after December 1986

Weapon Type	Treaty/ Agreement	Date Signed	Parties/ Signatories[69]	Entry into Force
Nuclear	INF	8 Dec. 1987	US-USSR	32294
	TTBT	27212	US-USSR	1 Dec. 1990
	PNET	27907	US-USSR	11 Dec. 1990
	START 1	33449	US-USSR	5 Dec. 1994
	START 11	3 Jan. 1993	US-Russia	Not achieved
	CTBT	24 Sept. 1996	148 States	Not achieved
Conventional	CFE/CFE 1A	19 Nov. 1990	30 States	31777
	Stockholm Acc.	1986	ATTU (OSCE)	1986
	Vienna CSBM[70]	24 Mar. 1999	52 States (OSCE)	36525
	Open Skies	28 Nov. 1994	27 States	Not achieved
	Ottawa Treaty	1 Dec. 1997	122 States	36219
Chemical	Wyoming-MOU	23 Sept. 1989	US-USSR (Russia)	Not applicable
	Bilateral CW	33024	US-USSR (Russia)	33024
	CWC	13 Jan. 1993	143 States	35548
Biological	Trilateral BW	11 Sep. 1992	US-UK-Russia	Not achieved

In the early 1990s these arms control gains helped to establish a more benign and secure world. Negotiations on weapon ceilings and on transparency on weapons holdings, deployments and production, promoted trust and confidence between previous adversaries and affected how States perceived their security and relations between each

69 Depending on whether the treaty has entered into force or not.

70 Dates for the Vienna Document 1999 that supercedes the 1990, 1992 and 1994 Vienna documents.

other.[71] Such mechanisms were found to enhance both regional and global security. Non-proliferation efforts designed to prevent the spread of military technology, whether they be weapons of mass destruction or more conventional weapon systems, also benefited from the more benign security environment of the immediate post-Cold War era.[72]

Multilateral treaties and their organizations experienced renewed support and purpose in their attempts to prevent proliferation and defend non-proliferation norms. Other non-proliferation tools, without a vocation to universality, also evolved and were strengthened, including export control mechanisms and suppliers clubs such as the Wassenaar Agreement, the Missile Technology Control Regime (MTCR) and the Nuclear Suppliers Group (NSG).

During the ten-year period from 1989 to 1998 global military expenditures declined by 34 per cent, to US$ 760 billion (in 2000 prices). At a regional level the trends in military expenditure over the decade 1989-1998 varied considerably. The largest declines in military spending estimated at 95 per cent, were in central and eastern Europe, largely attributable to the collapse of the Soviet Union and the dissolution of the Warsaw Treaty Organization. Africa, with a 25 per cent decline, and Central America, with a 50 per cent drop, also sustained dramatic declines in defence spending. The Middle East, with its ongoing conflicts, experienced an increase of 17 per cent in military spending and Asia, another region with mounting tensions, produced an increase of 27 per cent. In contrast western Europe only experienced a 14 per cent reduction in military expenditures.

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71 Jenonne Walker, "Security and Arms Control in Post Confrontation Europe", *Strategic Issues Papers*, SIPRI, Oxford: Oxford University Press, 1994, p. 6.

72 Traditionally separate treaties, laws, policies, research agendas and government bureaucracies have supported arms control and non-proliferation initiatives, but the boundaries between the two have been breaking down. On this matter see, for instance, Zachary Davis, "The Convergence of Arms Control and Non-proliferation: vive la différence", *The Non-proliferation Review*, Spring/Summer 1999, p. 98.

The decline in military expenditures following the easing of East-West tensions and the implementation of arms control treaties led to high expectations of a "peace dividend". Studies on the potential uses of the peace dividend flourished during the early 1990s.[73] Tragically, this debate has become largely immaterial in the face of current rising military expenditure trends.

The positive arms control climate of the early 1990s was encouraged by the leadership role adopted by the United States in arms control and non-proliferation negotiations. By the mid-1990s, however, US support for arms control began to weaken as an increasing number of members of Congress became concerned about ballistic missile proliferation. The evolution of counter-proliferation strategies offered an alternative means of challenging weapons proliferation in the face of the perceived failure of the non-proliferation movement to contain the proliferation of WMD. Support for counter-proliferation in the US has been accompanied by the increasing marginalization of arms control and reduced support for collective security. US withdrawal from arms control has been explicit in Congress's refusal to ratify the CTBT in October 1999, the Bush Administration's intention to withdraw from the ABM Treaty if no agreement with the Russian Federation can be found, and the decision not to support the Protocol to Strengthen the Biological and Toxin Weapons Convention in Geneva in July 2001.

Budgetary allocations to counter-proliferation technologies, particularly the costly BMD programme began to push the US defence budget upwards. Between 1998 and 2000 US military expenditure rose

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73 See, for example, J. Brommelhorster, "Peace Dividends Resulting from Defence Budget Cuts", paper presented at BICC Conference on Converting Defence Resources to Human Development, Bonn, 1998; Chan, "Grasping the Peace Dividend: Some Propositions on the Conversion of Swords into Ploughshares", in *Mershon, International Studies Review*, Vol. 39, 1995, pp. 53-95; E. Dommen and D. Loukakos, *The Peace Dividend: A Check-up*, UNCTAD, Geneva: United Nations, 1995; Nils Peter, Gleditsch et al., *The Peace Dividend*, Elsevier Science Publishers, 1996; N. Ettlinger, "The Peace Dividend and Defence Conversion in the Context of Corporate Restructuring" in *Growth and Change*, Vol. 24, Winter 1993, pp. 107-126; L.R. Klein, "The Peace Dividend", unpublished paper, 1997.

by 2.3 per cent in real terms, an increase of roughly US$ 6 billion (at constant 1998 prices).[74] Largely as a result of US increases, world military expenditure began to increase in the late 1990s after a 10-year period of post-cold war reductions. The rise began in 1999 and continued in 2000. According to provisional figures supplied by SIPRI for 2000, world military expenditure amounted to US$ 798 billion (in current dollars). This was an increase of 3 per cent in real terms over 1999 and an increase of 5 per cent over 1998. The overall level of world military spending in 2000 was equivalent to 2.5 per cent of the world gross domestic product.

Military expenditure increased in all regions between 1998 and 2000—Africa, the Americas, Asia and Oceania, Europe and the Middle East. In South Asia military expenditure is on an upward trend as a result of the India–Pakistan conflict in Kashmir which has contributed to an intractable and highly dangerous conventional and nuclear arms race. The regions with the largest volume increases were, however, North America and Europe, the result primarily of increases in the military expenditure of the United States and the Russian Federation respectively. Provisional figures for Russian military expenditure in 2000 showed an increase of 44 per cent in real terms over 1998. The increase amounted to US$ 13 billion (at constant 1998 prices). However, this dramatic increase needs to be put in some perspective, the level of Russian military expenditure being only one sixth of that of the United States.

The rises in regional and global military expenditures can be taken as a measure of growing instability. At the same time they are an indication that regional and global arms build-ups are being pursued, ostensibly, in pursuit of unilateral security, but with the broader consequence of increased global insecurity.

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[74] All figures in this section have been taken from the SIPRI military expenditures database, http://www.sipri.org.

Opportunity Costs

Rising military expenditures generate opportunity costs.[75] Opportunity costs refer to the sacrifice involved in using resources for one form of public expenditure, rather than another form of public expenditure, i.e. the alternative use of those resources. The benefits that could have been derived from the alternative not chosen is the opportunity costs of the option selected. In a situation where resources are scarce, military expenditure may crowd out other forms of public expenditure such as health and education, and therefore have negative effects in terms of social welfare, human capital formation and economic growth. Military expenditure is treated as a pure public good. In its expenditure planning the State will attempt to balance the security benefits of increased military expenditures against reductions in other forms of public expenditures.[76] Opportunity costs are usually measured in monetary terms, but the concept can also be used to measure physical rather than monetary units. When using opportunity cost analysis in the context of military expenditures, one might, for example, identify the number of dialysis machines that can be purchased for the price of a fighter aircraft or a tank. Utilized in this manner opportunity costs are referred to as *real* opportunity costs to help distinguish them from monetary costs.

During the 1970s and 1980s the United Nations produced a number of reports which explored the opportunity costs of military expenditures for developing countries, in terms of resources that might otherwise have been used to meet social needs.[77] More recently the

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75 See, for instance, C. Lyttkens and C. Vedorato, "Opportunity Costs of Defence, A Comment on Dabelko and McCormick", *Journal of Peace Research*, Vol. 21, No 4, 1984, pp. 389-94; D. Dabelko and J.M. McCormick, "Opportunity Costs of Defence Some Cross National Evidence", *Journal of Peace Research*, Vol. 14, No 2, 1997, pp. 143-154.

76 See S. Deger and R. Smith, "Military Expenditure and Development: The Economic Linkages", *IDS Bulletin*, Vol. 16, No 4, 1985, pp. 49-54.

77 United Nations, *Reduction of Military Budgets. Measurement and International Reporting of Military Expenditures*, report prepared by the Group of Experts on the reduction of military budgets, Report to the

(continued...)

United Nations has examined the opportunity costs of military expenditures in terms of human security. The United Nations Development Programme (UNDP) *Human Development Report 1994* suggests that "arms expenditure (in developing countries) undermines human security by eating up precious resources that could have been used for human development".[78]

The opportunity costs associated with high or rising military expenditures tend to be higher in countries that experience resource constraints. In most developing countries, government revenues are insufficiently elastic to be able to accommodate rising military expenditures; in this situation a government has two options; it can reallocate expenditures from other government expenditure headings, such as health and education; and/or it can borrow foreign exchange in the international financial markets. Either form of revenue generation creates opportunity costs.

The main focus of opportunity cost studies has been on developing countries, but even in highly developed economies the opportunity costs of military expenditure can be significant. Stephen Swartz in his exhaustive audit of US nuclear weapons argues that in the US, spending

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77 (...continued)
Secretary-General, New York: United Nations, 1977; *Economic and Social Consequences of the Arms Race and Disarmament*, Report to the Secretary-General, New York: United Nations, 1978; *Social and Economic Consequences of the Arms Race and Disarmament: Review of Research Trends and Annotated Bibliography*, reports and papers in Social Sciences 39, UNESCO, 1978; United Nations General Assembly, *Economic and Social Consequences of the Arms Race and of Military Expenditures*, United Nations document A/37/386, 1983; United Nations General Assembly, *Study on the Economics and Social Consequences of the Arms Race and Military Expenditures*, United Nations document A/43/368, 1988; *Study on the Economic and Social Consequences of the Arms Race and Military Expenditures*, United Nations document A/43/368, 1989. The lack of resources to meet basic human needs is well documented by the United Nations and includes poverty, high infant mortality, and lack of adequate housing, health care, clean water, sanitation, education and so on.

78 UNDP, *Human Development Report 1994*, Oxford: Oxford University Press, 1994, p. 50.

on the nuclear arms programme over the 56-year period 1940-1996 exceeded the total federal spending on education, training, employment and social services, agriculture, natural resources, the environment, general sciences, space and technology, community and regional development (including disaster relief), law enforcement, energy production and regulation.[79]

The Soviet Union is thought to have paid even higher economic and social opportunity costs than the United States in its bid to maintain its role in the nuclear arms race. In fact, it was the unsustainable burden of the Cold War nuclear arms race that eventually led President Gorbachev to make his historic speech announcing unilateral cuts and disarmament measures before the UN General Assembly on 7 December 1988. This momentous event marked the beginning of the end of the Cold War and triggered a round of unilateral cuts in military spending and weapons inventories across the globe.

The Costs of War

The feared outcome of unrestrained arms racing and burgeoning military expenditures is war. Wars have occurred throughout human history without substantial interruption, establishing them among the major characteristics of human social behaviour. However, during the twentieth century, war was taken to unprecedented levels of destruction via the development of new and lethal military technologies. Most notable of these has been the development of weapons of mass destruction, in particular nuclear weapons which have an overwhelming capacity for death and destruction.

The precise character of the destructive and costly nature of war depends upon the duration of conflict, the nature of military targets, and the types of weapons used in conflict. Whatever the nature of war it always creates humanitarian disasters, and it can also generate environmental crises the scale and durability of which partly depend on the nature of the weapons used.

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[79] Stephen Swartz (ed.), *Automic Audit: The Costs and Consequences of US Nuclear Weapons since 1940*, Washington: The Brookings Institution, 1998.

Nuclear War

The most costly form of conflict in economic, human and environmental terms is nuclear war. During the Cold War there were a plethora of estimates about the social, economic and environmental costs of nuclear war, many of which lie forgotten, gathering dust on peace researchers' shelves. Such reports emphasized the capacity of nuclear weapons to destroy the human habitat through the outbreak of a nuclear winter, so that even those who survived the blast and nuclear fallout would be unlikely to survive the ensuing ecological catastrophe.[80] Attempts were made by proponents of nuclear deterrence to discredit the notion of nuclear winter, but continuing research with modern modelling techniques has confirmed that nuclear winter remains a very real likelihood in the event of a major nuclear exchange.[81]

Recent events in South Asia have returned attention to the horrors of nuclear war. Arundhati Roy, the Indian writer and environmental activist, reminds us in an article entitled "The End of Imagination" that:

> If there is a nuclear war … Our cities and forests, our fields and villages will burn for days. Rivers will turn to poison. The air will become fire. The wind will spread flames. When everything is burned and the fires die, smoke will rise and shut out the sun. The earth will be enveloped in darkness. There will be no day only interminable night. What shall we do then, those of us who are still alive? Burned and blind and bald and ill, carrying cancerous carcasses of our children in our arms, where shall we go? What shall we eat? What shall we drink? What shall we breathe?

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80 A. Robock, "Nuclear Winter: Climatic Consequences of Nuclear War", in R. Ehrlich (ed.), *Perspectives of Nuclear War and Peace Education,* New York: Greenwood, 1987, pp. 157-168; and A. H. Westing et al., "Warfare in a Fragile World: Conventional Nuclear and Environmental Weapons", in Marek Thee (ed.), *Arms and Disarmament SIPRI Findings,* SIPRI, Oxford: Oxford University Press, 1986, pp. 153-178.

81 See, for instance, Alan Robock, "Nuclear Winter", in J. Holton, J. A. Curry & J. Pyle (eds), *Encyclopaedia of Atmospheric Sciences*, London: Academic Press, 2001.

The destructive power per unit of nuclear weapons can have an explosive yield far greater than the total of all explosives ever used since the invention of gunpowder. The feature that makes nuclear weapons unique is that, in addition to causing loss of life through a mechanical blast, or by burns from the heat of the fireball, nuclear weapons have a third killer—radiation. And the lethal action of radiation extends well beyond the theatre of war and continues long after military exchanges have ended.

The actual effects of a future nuclear war are difficult to estimate because of the many quandaries involved. For instance, we can only guess at how many warheads will be exchanged and what types their yields will be. The impact of nuclear exchange also depends on the geographic location of the blast and on what percentage of warheads are ground as opposed to air burst.

A great variety of circumstances, created intentionally or arising accidentally, may trigger the use of nuclear weapons. And although the occurrence of any one triggering event is very small it is certainly not zero. And as more and more States acquire nuclear weapons then the probability of a nuclear exchange becomes more probable.

Nuclear war is the most extreme and devastating form of warfare. Nuclear weapons have, however, only been used on two occasions, in Hiroshima and Nagasaki in 1945. Proponents of nuclear deterrence, such as Waltz, argue that with such devastating consequences, nuclear weapons are unlikely ever to be used again.[82] The fear of the consequence of nuclear reprisals acts as a powerful deterrent against possible attack. In the 1960s the role of nuclear weapons in securing super-Power restraint came to be known as mutually assured destruction or MAD. Over time East-West conflict became institutionalized and relatively stable, giving the "logic" of deterrence greater legitimacy. Nevertheless, the moral dilemma of a strategic doctrine that was predicated upon immeasurable destruction created niggling doubts about the validity of its strategic utility even in the heart of the military.

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[82] K. Waltz, "The Spread of Nuclear Weapons: More May be Better", *Adelphi Paper 171*, London: International Institute of Strategic Studies.

Moreover there was a persistent nagging fear that something could go terribly wrong with or without belligerence.

The Effect of a 15 kt Nuclear Bomb on Mumbai[83]

The effects of a 15 kt nuclear air burst at a height of 600 metres above Mumbai would include:

The blast—would completely destroy a circle radius of 1.1 kilometres. If the attack were centred on the Fort area, the financial district and the secretariat would be destroyed. Many of the buildings in Mumbai are poorly constructed which suggests that the destruction to buildings outside of the immediate blast area would also be severely damaged.

Firestorm—in a high density city like Mumbai with 23,000 people per square metre and where many houses are built of highly flammable substances, the firestorm is likely to claim many lives .

Prompt radiation would extend for approximately 4,000 feet which roughly corresponds to the area of the firestorm and blast zone, adding to the unlikelyhood of anyone surviving in the immediate radius of the blast.

Fallout—if the bomb was an air burst then the amount of fallout would be quite small. But because Mumbai is close to the sea, there are high levels of water vapour in the atmosphere which could lead to water droplets condensing around radioactive particles and descending as rain, as occurred in Hiroshima and Nagasaki where black rain descended for several hours after the attack.

The total number of immediate deaths from these combined effects has been calculated at between 200,000- 800,000 depending on where the air burst occurs over the city and what the population density is in the area.

Long-term effects—there would certainly be many more deaths from the long-term effects, due to radiation-related causes. These would include leukaemia, thyroid cancer, breast cancer and lung cancer.

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83 M.V. Ramana, *Bombing Bombay? Effects of Nuclear Weapons and a Case Study of a Hypothetical Explosion*, Security Studies Programme, Centre for International Studies, Cambridge: Massachusetts Institute of Technology, http://www.fas.org/nuke/guide/india/target/primer/bombay.pdf

Given the nature of nuclear weapons, there is always unprecedented risk attached to their existence. When diplomatic crises occur between nuclear-armed States, the risks rise with the possible outbreak of war. The classic nuclear crisis was the Cuban Missile Crisis of October 1962, when the world held its breath for thirteen days as the two super-Powers engaged in what must be the most dangerous brinkmanship in the history of mankind. Since then, there have been numerous other incidents of false alarms. There have been at least three incidents in the last 20 years when the US and the Russian Federation almost launched nuclear missiles due to false warnings:

1. In 1979 a US training tape showing a massive attack was accidentally played;
2. In 1983 a Soviet satellite mistakenly signalled the launch of US missiles;
3. And in 1995 the Russian Federation almost launched its missiles because of a Norwegian rocket studying the northern lights.[84]

Queen Noor al Hussein of Jordan has noted of the logic of deterrence: "The sheer folly of trying to defend a nation by destroying all life on the planet must be apparent to anyone capable of rational thought".[85] With the end of the Cold War deterrence has largely become "marginal, tangential or speculative".[86] The Bush Administration claims it wants to put the Cold War behind it by cutting its nuclear arsenal to between 1,700-2,200, a level lower than that proposed by the START III proposals. The smaller the nuclear arsenals, the lower the risk of nuclear war and accidents. However, a reduction in nuclear arsenals does not remove the possibility of nuclear war and accidents altogether. Only total nuclear disarmament will rid humankind of this ultimate threat to its security.

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[84] Examples taken from D. Babst, "Preventing an Accidental Armageddon", *Nuclear Age Peace Foundation*, http://www.wagingpeace.org/articles/babst-armageddon.html

[85] Hussein Queen Nooral, "The Responsibilities of World Citizenship", *Waging Peace Series*, Booklet No 4, Santa Barbara, California: Nuclear Age Peace Foundation, July 2000.

[86] L. Freedman, "Does Deterrence Have a Future", *Arms Control Today*, October 2000.

Conventional Wars

Far less devastating than nuclear war, but nonetheless, more likely to occur, are conventional wars the effects of which have been subjected to increasingly sophisticated analysis in recent years.[87] In the 20 major conventional wars that took place over the twentieth century more than 100 million people were killed. Wars in all their various forms result in the loss of human life, in the destruction of property, in social disruption, environmental damage and ecological disturbance.

The economic and social consequences of conventional wars are multiple and complex.[88] They can be divided into immediate human costs and the longer-term development costs. This division is somewhat artificial because human costs such as the deterioration in nutrition and education, the loss of life and depletion of skills constitute development costs, while developmental costs such as destroyed infrastructure and negative growth are major factors contributing to human suffering and deprivation.

The direct economic costs of war include the loss of infrastructure, loss of economic output, destruction of both fixed and human capital, loss of livelihoods and medical costs. Human costs include the loss of life, followed by the loss of limbs and psychological trauma. There are also vital secondary effects—such as the forced displacement of civilians which has a destructive impact on social capital. At least two thirds of the world's 40 million refugees and internally displaced persons have fled

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87 See, for instance, F. Stewart and V. Fitzgerald, *War and Underdevelopment, Vol. 1: The Economic and Social Consequences of Conflict,* Oxford: Oxford University Press, 2001; G. Tansey, K. Tansey and P. Rogers, *A World Divided: Militarism and Development after the Cold War,* London: Earthscan, 1994; M. Cranna for Saferworld, *The True Cost of Conflict* London:, Earthscan, 1994.

88 F. Stewart, F. Humphreys and N. Lea, "Civil Conflict in Developing Countries Over the Last Quarter of a Century: An Empirical Overview of the Social and Economic Consequences", *Oxford Development Studies*, 25, 1, pp. 11-41.

their homes and countries because of conflict.[89] Many refugees and displaced persons end up "de skilled" as a result of extended leave from their communities. Those whose schooling is interrupted are excluded from formal labour markets and often resort to the gun as a source of livelihood. Even when armed conflict has terminated, the suffering and threat to civilians may continue.

The widespread availability of arms, especially small arms and light weapons and the "cultures of violence" which emerge during protracted conflicts often prove durable and continue to undermine the rule of law and human security for years to come in post-war communities. Generations of children growing up in conditions of violence and conflict end up as victims of injury, or highly traumatized and unable to adjust to normal life. Women find themselves as heads of households often in societies based on a traditional division of labour that provides no basis for economic independence. Women who have been violated, a common occurrence during war, are often rejected by their communities altogether.

Landmines pose a particularly ghastly threat to the physical security of many communities around the world long after the violence of war has ceased. Currently there are some 87 countries in the world, suffering from varying degrees of landmine infestation. The worst affected countries include Afghanistan, Angola, Bosnia and Herzegovina, Cambodia, Croatia, Eritrea, Iraq (Kurdistan), Mozambique, Namibia, Nicaragua, Somalia and Sudan. Landmines are indiscriminate in the destruction they cause. They cannot distinguish between a soldier and a child. They can lie dormant for years and even decades after a conflict has been resolved, only to be triggered by a passing and unsuspecting human or animal. It has been estimated that each year landmines kill or maim over 26,000 men, women and children. Most mine victims die. In Cambodia alone there have been over 35,000 amputees injured by landmines—these are the survivors. Those who survive the initial blast inevitably require amputations, long periods of hospitalization, the fitting

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[89] John Lloyd, "Antipersonnel Mines: The Time to Act is Now", *Worldwide Refugee Information*, US Committee for Refugees, http://www.refugees.org/world/articles/mines

of prosthetics and extensive rehabilitation. Many of the survivors, who lose legs, arms and eyes are condemned to a life with little dignity. Mine deaths and injuries, over the last few decades, have totalled in the hundreds of thousands. Even if no more mines were to be produced or laid, landmines will continue to claim victims for years and even decades to come.

Apart from the terrible threat to human security, mine infestation generates huge development costs as it excludes economically viable resources from production, and erodes the socio-economic underpinnings of whole communities in mine-affected areas. While land remains uncultivable there is a loss of livelihoods, output and tradable commodities. Refugees cannot be repatriated and may remain dependent on international humanitarian aid. Mined roads, bridges and railway tracks impede transportation, communications and trading activities, inhibit the distribution of aid and discourage foreign direct investment. These factors combine to erode the possibility of the normalization of economic activity and trade and constitute a major impediment to post-conflict socio-economic reconstruction.[90] Moreover, the presence of mines makes the delivery of humanitarian assistance and development more costly and dangerous.

In general the economic legacies of war continue long after termination of conflict. The debt incurred through war and the process of reconstruction imposes a burden on generations to come. For example, in Southern Africa the sustained costs incurred through the destabilization campaign waged by South Africa on its neighbouring States have been estimated to be US$ 115 billion.[91] With the end of the Cold War the Southern African region has witnessed the withdrawal of super-Power intervention, the end of apartheid, the termination of conflict in Namibia and Mozambique, a thirty per cent decline in

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[90] For details on the way in which mines inhibit peace-building and socio-economic reconstruction in post-war situations, see UNDP *Mine Action for Peace Building and Reconstruction*, http://www.undp.org/erd/archives/brochures/mine_action/peace_building.htm

[91] Mascha Madörin and Gottfried Wellmer, *Apartheid Caused Debt: The Role of Swiss and German Finance*, South Africa Jubilee 2000, available at http://www.aidc.org.za/j2000/acd/summary.html

regional military expenditure and the demobilization of tens of thousands of soldiers. However, the debts and cost of destruction that accumulated during the region, will remain a burden for generations to come. Children not yet born will have to pay the price of debt for wars they did not fight, for ideas they do not hold, for a regional and global system that no longer exists and for decisions made by regional and world leaders that are no longer in power.

With the concept of averted costs, we have tried to show how the current erosion of arms control and the undermining of collective security which arms control promotes have very high costs for humanity. At best there may be high socio-economic opportunity costs generated by rising military expenditures, at worst they may involve the costs of war or nuclear accident. Tragically those that bear the burden of these costs are rarely those that make the decisions to reject arms control and rearm. By averting these costs, arms control generates tangible and desirable benefits in the economic, political and social spheres of human existence. While the "public good" of such averted costs may be hard, if not impossible, to measure in quantitative terms, the qualitative benefits are wholly desirable and beneficial to the whole of humanity.

CONCLUSION

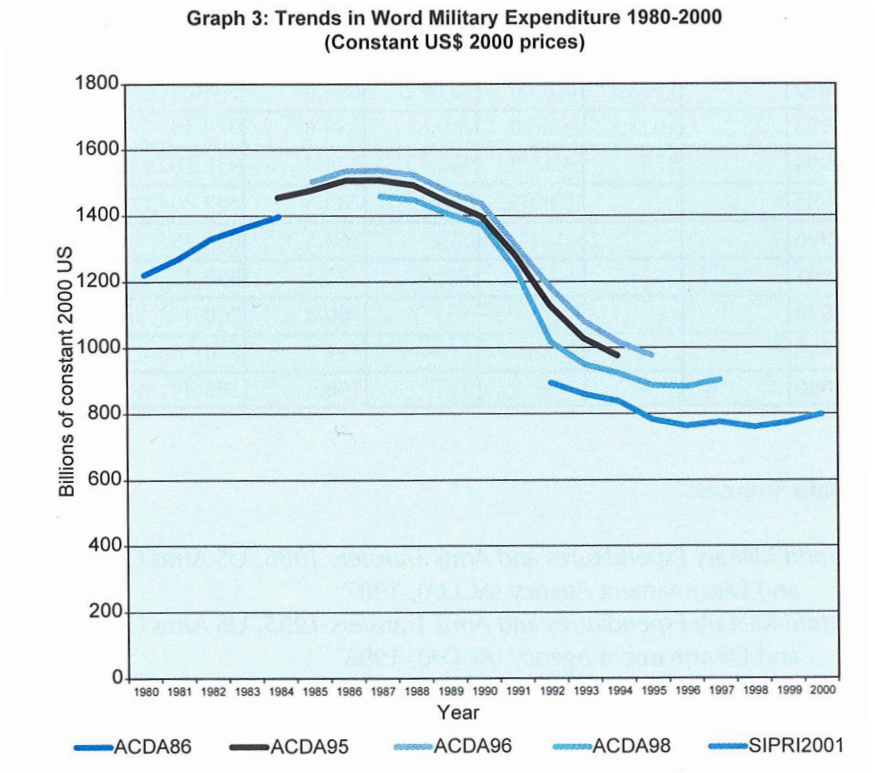
The costs of arms control and disarmament have been rising. This fact is incontrovertible and is partly due to the increasing number of treaties agreed on in the last twenty years. Contention remains, however, over what the costs of arms control treaties entail. As this paper has suggested, many of the costs currently ascribed to arms control and disarmament, such as disposal and environmental clean-up costs, are attributable to the life cycle costs of weapon systems and arise with or without arms control treaties. If this argument is accepted then the true costs of armaments and rearmament have been underestimated and cannot be presented as a cheaper alternative to arms control. At the same time the true costs of arms control have been overestimated.

Moreover, where there is an appreciation of the fact that the costs of preventive actions in the form of arms control and disarmament are less than the costs associated with dangerous and escalating arms races, or in extreme cases the costs of conflict, the case for arms control becomes compelling. Thus if the true costs and benefits of arms control are understood, policy makers might be more inclined to strengthen their arms control efforts and resist security strategies predicated upon weaponisation and remilitarization.

ANNEX 1

Due to the lack of consistent time-series data on global military expenditures over the period 1980-2000, we were confronted with considerable statistical problems in constructing Graph 1 on page 43. For the sake of ocular gratification we produced a "best fit" graph constructed from differently compiled statistics by using the technique of moving averages. In effect this produces a linear flow which represents the trends over time, but these should not be regarded as statistical "truths".

The actual statistics used, which involved a combination of ACDA and SIPRI data converted to 2000 prices, would have produced a broken graph as illustrated below:



The separate time-series data that were used are presented in the table below, along with the calculations for the moving averages.

	ACDA86	ACDS95	ACDA96	ACDA98	SIPRI2001	Simple Average
1980	1221.8					1221.8
1981	1268					1268
1982	1329.9					1329.9
1983	1365.2					1365.2
1984	1397.6	1453.9				1425.75
1985		1476.9	1503.7			1490.3
1986		1506.4	1535.6			1521
1987		1507.2	1536.7	1459.2		1501.033333
1988		1492.2	1524	1448.5		1488.233333
1989		1441.7	1474.4	1405.6		1440.566667
1990		1397.6	1435.7	1373.4		1402.233333
1991		1278.9	1309.5	1233.9		1274.1
1992		1128.2	1183.6	1018.2	894.4	1056.1
1993		1027.8	1080.8	949.6	859.6	979.45
1994		976	1017.9	922.75	838.4	938.7625
1995			976.84	886.27	783.5	882.2033333
1996				883	763.5	823.25
1997				903.4	775.1	839.25
1998					760.3	760.3
1999					774	774
2000					798.3	798.3

Data Sources:

World Military Expenditures and Arms Transfers 1986, US Arms Control and Disarmament Agency (ACDA), 1987

World Military Expenditures and Arms Transfers 1995, US Arms Control and Disarmament Agency (ACDA), 1996

World Military Expenditures and Arms Transfers 1996, US Arms Control and Disarmament Agency (ACDA), 1997

World Military Expenditures and Arms Transfers 1998, US Arms Control and Disarmament Agency (ACDA), 1999

SIPRI Yearbook 2001, Armaments, Disarmament and International Security, Oxford: Oxford University Press, United Kingdom, 2001

Dollar Conversion Data:

Conversion factors based on Consumer Price Index (CPI) © Robert F. Sahr, Political Science Department, Oregon State University, Corvallis, OR, United States