Between Control and Cooperation: Dual-Use, Technology Transfers and the Non-Proliferation of Weapons of Mass Destruction[1]

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Zusammenfassung

Die Nichtverbreitung von Massenvernichtungswaffen (MVW) ist heute weitgehend gleichbedeutend mit der Kontrolle von doppelt verwendbaren nuklearen, biologischen oder chemischen Technologien. Während die Kontrolle solcher „*dual-use*"-Technologien zentraler Bestandteil moderner Nonproliferationsbemühungen ist, nimmt die Bedeutung dieser Technologien für die wirtschaftliche und technologische Entwicklung zu. Ein ausgewogenes Verhältnis zwischen der Kontrolle sowie der Kooperation bei der friedlichen Nutzung von „*dual-use*"-Technologien ist daher eine notwendige Voraussetzung, um die Legitimität von Nichtverbreitungsregimen zu erhalten und zu stärken.

Erschwert wird eine effektive Kontrolle von „*dual-use*"-Technologien durch die zunehmende Verbreitung solcher Technologien in der Folge der Globalisierung. Zudem wird die Entwicklung und Anwendung vieler missbrauchsrelevanter Technologien immer einfacher, während gleichzeitig ihr Zerstörungspotenzial zunimmt.

Wichtig ist, dass Regeln über den Transfer von „*dual-use*"-Technologien als kompatibel mit bestehenden Regeln und Normen wahrgenommen werden (Legalität), dass solche Arrangements wesentliche Akteure einbeziehen (Inklusivität) und die Erwartungen der beteiligten Akteure erfüllt werden (Effektivität).

Gegenwärtig sind Nichtverbreitungsregime nicht flexibel genug, um angemessen auf technologische Fortschritte oder sich ändernde politische Umstände zu reagieren. Allerdings wird die Zusammenarbeit bei der friedlichen Nutzung von „*dual-use*"-Technologien zunehmend als Teil des in Nichtverbreitungsregimen angelegten Gegengeschäfts akzeptiert und zwar unabhängig davon, ob solche Zusammenarbeit inner- oder außerhalb bestehender multilateraler Regime stattfindet.

Kooperation und Kontrolle werden zunehmend als komplementäre und nicht als gegensätzliche Elemente einer wirksamen Nichtverbreitungspolitik wahrgenommen. Diese Studie betont die Bedeutung eines breiten Konzepts der Technologiekontrolle (*dual-use technology governance*). Projekte zur Zusammenarbeit bei der friedlichen Nutzung sollten entpolitisiert werden, und Kontrollbemühungen sollten auch auf jene proliferationsrelevanten „*dual-use*"-Technologien ausgeweitet werden, die bisher nicht verregelt sind.

Wichtig ist dabei, sowohl zwischen den industrialisierten Ländern, Schwellenstaaten und Entwicklungsländern eine möglichst breite politische Basis für Kooperations- und Kontrollbemühungen zu schaffen als auch innerhalb dieser Länder möglichst viele Akteure einzubeziehen, um die Gefahr des Missbrauchs von „*dual-use*"-Technologien nachhaltig zu minimieren.

Abstract

Stopping the spread of weapons of mass destruction (WMD) increasingly means preventing the misuse of nuclear, biological or chemical dual-use technologies. While the control of dual-use technologies is vital to prevent the proliferation of WMD, the importance of these technologies for economic and technological development has also grown. The right balance between control of dual-use technologies and efforts to facilitate cooperation for peaceful purposes is a necessary precondition for upholding and increasing the legitimacy of non-proliferation regimes.

Globalisation is facilitating the spread of dual-use technologies to new regions and countries. In addition, technological advances make it easier to develop and use such risk technologies, while their destructive potential is consistently growing.

It is thus important that dual-use transfer regulations are perceived to be compatible with existing norms and rules, involve major stakeholders, and do not contravene major interests in controlling or sharing access to such technologies. Legality, inclusiveness and effectiveness are three key dimensions against which to evaluate instruments to prevent the misuse of dual-use technologies.

Non-proliferation regimes are currently too inflexible to reflect technological advances and changing political circumstances. However, there is growing acceptance of international cooperation on peaceful uses of dual-use technology as part of the non-proliferation bargain, regardless whether such cooperation takes place within or outside of multilateral regimes.

Cooperation and control on dual-use technology transfers are increasingly viewed as complementary (and not conflicting) elements of an effective non-proliferation strategy. This paper argues for a broad concept of dual-use technology governance. Specifically, cooperative projects should be de-politicized and governance approaches should be applied to technologies that are currently not regulated by international non-proliferation accords.

It is particularly important to create broad political support for efforts to strengthen control and cooperation efforts – between industrialised states, threshold and developing countries as well as within states. Any sustainable effort to reduce the risk of the misuse of dual-use technologies will have to involve as many actors as possible.

1. Introduction

Efforts to stop the spread of weapons of mass destruction (WMD) increasingly focus on preventing the proliferation and misuse of dual-use technologies. Recent discoveries of efforts to develop nuclear or chemical weapons in Libya, Iran and Syria show that existing non-proliferation regimes are not sufficiently equipped to deter state-sponsored programs that exploit dual-use technologies for military purposes. More importantly, the perceived threat of terrorist attacks with nuclear, biological or chemical weapons makes it necessary to develop a sustainable non-proliferation policy that effectively hinders the misuse of dual-use technologies, i.e. information, materials and equipment that can be easily applied not just for peaceful but also for hostile purposes such as the production of weapons of mass destruction.

Preventing the misuse of dual-use technologies is not a new problem but it is one which needs to be addressed more urgently than ever.[2] The Al Qaeda attacks of 11 September 2001 marked a watershed in non-proliferation policy. These attacks together with the anthrax letter attacks shortly thereafter that killed five people in the United States, underscored the importance of intensifying efforts to secure materials, equipment and information that can be misused for the development or production of WMD. (Levy/Hanlon 2005: 9-18) This remains important, as some of the groups and individuals involved in terrorist networks would be prepared to use WMD if they had access to such capabilities. (Russell/Wirtz 2008)

An effective policy to stem the spread of nuclear, biological and chemical weapons must be global in reach and involve governments as well as non-state actors, such as industry and the scientific community. Because of the global diffusion of dual-use technologies, emerging economies and developing countries have to be part of the solution to the non-proliferation problem. Yet for them, unhindered access to technologies is of prime importance, because technology holds the promise of economic development. The countries of the global South have always criticized industrialized countries for not fulfilling their obligations on cooperation for peaceful purposes under the treaties on the non-proliferation of nuclear, biological and chemical weapons. The growing economic and political importance of these countries makes it difficult to sideline their interest in strengthening the cooperative side of the non-proliferation bargain contained in all three WMD control regimes. Thus, it "must be recognized that there are alternative views of nonproliferation regimes … which have their own weight and logic" and "cannot simply be ignored or wished away." (Leslie 2008: 482) To give developing countries the incentive to remain or become stakeholders in global non-proliferation efforts, it will therefore be necessary to expand efforts on economic cooperation and technological assistance. Such cooperation has the potential to improve the legitimacy of non-proliferation regimes, but can also contribute to the spread of dual-use technologies.[3] Vice versa, "[t]he dual-use nature of materials and equipment ... makes it difficult to curtail weapons proliferation without inhibiting legitimate commercial endeavours." (Smithson 1997: 5)

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2 While export controls during the Cold War were mainly discussed in a strategic context, studies from the 1990s addressed the issue mostly from a non-proliferation perspective focusing on the effectiveness of dual-use export control regimes and in many cases addressing conventional export controls in conjunction with WMD issues. Examples of such studies include Bailey/Rudney 1993, Bertsch 1994, Carlton 1995 and Gasparini/Hoffman 1997.

3 See Fuhrmann 2010 for an analysis of the impact of nuclear assistance on the proliferation of nuclear weapons.

This paper aims to shed light on the complicated relationship between restricting and promoting technology transfers and the effect these contradictory requirements have on the legitimacy of WMD control regimes. The next section introduces the three major WMD non-proliferation regimes and sets out a few conceptual ideas. Sections 3, 4 and 5 take a look at the debate on technology transfer arrangements in the nuclear, biological and chemical field, respectively. The last section provides comparative conclusions and recommendations.

2. Dual-Use Technology Transfer Regulations and the Legitimacy of Non-Proliferation Regimes[4]

2.1. Non-proliferation regime structure and technology transfer regulations

The core of the WMD non-proliferation regime are the 1968 nuclear Non-Proliferation Treaty (NPT), the 1972 Biological Weapons Convention (BWC) and the 1993 Chemical Weapons Convention (CWC). The NPT is an unequal treaty because it recognizes China, France, Russia, the United Kingdom, and the United States as the five nuclear weapons states. The NPT is a three-sided bargain balancing obligations on nuclear disarmament, non-proliferation and the peaceful application of nuclear energy. By contrast, the BWC and the CWC place equal disarmament, non-proliferation and cooperation obligations on all parties. Nuclear non-proliferation commitments are monitored by the International Atomic Energy Agency (IAEA), which applies safeguards to ensure that civil nuclear facilities and materials are not misused for the development of nuclear weapons. Compliance with the CWC, including obligations on chemical disarmament, is monitored by the Organisation for the Prohibition of Chemical Weapons (OPCW). The BWC only has a rudimentary confidence-building mechanism, no verification regime and a non-permanent three-person secretariat.

Despite these differences, similar frictions exist in all three regimes between the control of dual-use technology transfers and obligations on international cooperation for the peaceful application of these technologies. The three treaties not only contain commitments by member states to prevent the application of dual-use technologies for hostile purposes but also oblige them to facilitate the peaceful application of such technologies.[5]

Alongside these multilateral treaties, traditional technology holders coordinate their dual-use technology trade policies in informal export control regimes.[6] In the view of many developing states, groupings such as the Nuclear Suppliers Group (NSG), in which 46 participating states harmonize rules for the trade in nuclear technologies, or the Australia Group, in which 40 countries agree on joint rules for the trade in chemical and biological dual-use technologies, undermine the legitimacy of universal treaties such as the NPT, BWC and CWC. These groups are often criticized as being an “attempt by a self-selected group of ‘have’ nations, meeting in private, to develop and impose their own views of appropriate security policy by virtue of their technological and economic superiority.” (Chayes/Chayes 1994: 72)

4 This section is based on Meier 2013a.
5 The obligations to facilitate cooperation are contained in Article IV of the NPT, Article X of the BWC and Article XI of the CWC. See for example Anthony 2010 for an analysis of nuclear technology transfers and Zanders/French 1999 for a corresponding analysis of the CWC. For a similar analysis of the BWC see Zmorzynska/Jeremias 2012.
6 For a summary of recent trends see for example Anthony/Bauer 2009.

Table 1: Dual-use technology transfer control and cooperation activities under the three WMD non-proliferation regimes

	Nuclear weapons	Chemical weapons	Biological weapons
Control	– IAEA safeguards – Export control stipulations in Article III NPT – Export control guidelines of the Nuclear Suppliers Group – Export control guidelines of the Zangger Committee	– CWC verification regime – Multilateral export control guidelines in Article VI CWC – Export control guidelines of the Australia Group	– Export control norms in Article III BWC – Export control guidelines of the Australia Group
Cooperation	– Stipulations on peaceful use in Article IV NPT – IAEA technical cooperation – "Capacity-building" by IAEA	– Stipulations on assistance and protection against a chemical weapons attack in Article X CWC – Stipulations on peaceful use in Article XI CWC – "Capacity-building" by OPCW – Disaster assistance	– Stipulations on peaceful use in Article X BWC – "Capacity-building" by Implementation Support Unit

2.2. The necessity of improving controls of dual-use technology

New proliferation threats, such as possible terrorist attacks with WMD, the discovery of clandestine nuclear activities in Libya and Iran and the exposure of the nuclear black market network of A.Q. Khan, which sold nuclear dual-use technologies to Iran, Libya and North Korea, have triggered efforts to tighten controls on dual-use technologies over the last decade. Such controls encompass all measures to prevent the illicit transfer of technologies and rely on a variety of instruments. Legally-binding non-proliferation and arms control accords may include regulations for declarations of dual-use technologies and safeguards of sensitive technologies. Most verification regimes rely on inspections to increase confidence that dual-use facilities or materials are not being misused for prohibited purposes.

Plurilateral export control regimes are based on a politically-binding common set of guidelines for the trade in sensitive technologies. The traditionally controversial discussions on export controls have lost some of their vehemence because the necessity of such controls is increasingly accepted also in non-Western states. This is due not least to UNSC Resolution 1540 which was adopted in 2004 and obliges all countries to implement export controls and national measures to secure dangerous materials. (Bosch/van Ham 2005) In addition, states may cooperate in an *ad hoc* manner to prevent the illicit trade in dual-use technologies, through, for example, the Proliferation Security Initiative, a loose grouping of states that has pledged to cooperate in intercepting illicit transfers of WMD and enabling technologies.

Two long-term trends complicate efforts to better control dual-use technologies. First, globalization is inexorably linked to the sharing of technologies, including dual-use technologies. Multinational companies contribute to the diffusion of dual-use technologies

because they are acting globally, conducting research, development and production in facilities distributed across the globe.

This dispersion of dual-use technologies undermines the effectiveness of national laws and regulations that are supposed to ensure that businesses do not – intentionally or accidentally – contribute to the spread of sensitive technologies. Globalization also weakens the effectiveness of supply-side oriented instruments such as traditional export control regimes, which are based on the concept that a small group of technology holders among themselves set the rules for trade in sensitive commodities. (Turpen 2009: 1)

Secondary proliferation – defined as the spread of sensitive technologies from countries that recently acquired biological, chemical or nuclear weapons capabilities – is a specific outcome of this trend. The emergence of the A.Q. Khan network in Pakistan and other countries is the most well-known example of proliferation originating from countries outside the group of traditional technology holders. (Braun/Chyba 2004)

A second trend complicating dual-use technology controls is the rapid pace of technological progress. Many dual-use technologies have become cheaper, more efficient and their application less dependent on human skills. Biotechnology is leading this development. The development and production of more lethal biological agents is possible now with fewer means and on a smaller scale than ever before. The progress in synthetic biology, which can be used to "create" DNA, has a huge potential for the development of new drugs and medication but can also be misused to develop designer bioweapons. (Maurer/Fischer 2010) A similar situation exists in the chemical industry. (Tucker 2007: 9) Rapid technological progress has the effect that in constantly outdated lists of agents and equipment on which traditional export control regimes depend are constantly being outdated.

2.3. The growing importance of dual-use technologies for economic and technological development

While the control of dual-use technologies is vital to prevent the proliferation of WMD, the importance of these technologies for economic and technological development has also grown. Emerging economies such as Brazil, China, India and South Africa insist that international cooperation to facilitate the peaceful application of dual-use technologies has to be improved as part of the non-proliferation bargain.

Many countries are interested in expanding the use of nuclear energy. The long-term impact of the nuclear accident in Fukushima in March 2011 on the development of nuclear energy is not yet clear. Global energy production from nuclear plants has dropped, in 2011 by four percent and in 2012 by seven percent. (Schneider/Froggatt 2013: 10) The IAEA finds that globally the Fukushima accident "is expected to slow the growth of nuclear power but not reverse it." (IAEA 2012: 1) A few countries are considering joining the club of international nuclear fuel producers. (McGoldrick 2011: 10-11) These countries want to increase independence from current nuclear fuel suppliers and "are betting that the nuclear energy renaissance will indeed take place, and see themselves as suppliers of raw materials or enriched uranium." (Goldemberg 2009: 79)

An expansion of nuclear technologies requires substantial, long-term investments as well as an adequate infrastructure. This is less so the case in biotechnology and chemistry. The respective markets are comparatively easy to enter. "Biotechnology is not capital intensive in the way nuclear technology is; the tools and knowledge of biotechnology are widely dispersed; and the research relating to it is mostly unclassified." (Singer/Daar 2009: 24)

Biotech companies are often small or medium-sized enterprises. Unlike nuclear technology, which has matured over the last 60 years, biotechnology is a new field and "[t]he capabilities of biotechnology have increased at exponential rates in recent years, in some ways akin to the evolution of computer power" (Chyba 2006: 12) and immense hopes for progress in nutrition, environmental protection and health are attached to this technology.

Cooperative measures to promote or facilitate the peaceful application of dual-use technologies include:

- collaborative research on and development of new technologies for peaceful purposes,
- measures to promote technology transfers, such as provision of laboratory equipment,
- agreements on assistance and protection in case of a WMD attack or an incident involving hazardous nuclear, chemical or biological materials or agents,
- capacity-building, for example through training or exchange of scientific personnel, and
- assistance in the national implementation of international non-proliferation obligations.

As set out in table 2, from a proliferation point of view these areas of cooperation have different potentials for misuse.

Table 2: Risk of misuse of dual-use technology transfers

	No risk of misuse	Low risk of misuse	High
Nuclear	Technical cooperation in medicine, environment, nuclear safety and security	Research and development in civil nuclear energy	Cooperation on fuel-cycle technologies
Biological	Civil assistance/disaster preparedness, "capacity-building", disease outbreak surveillance, biosafety	Cooperation on dual-use research and development	Cooperation in biodefense/ biosecurity, dual-use research and development of concern
Chemical	Civil assistance/ disaster preparedness, "capacity-building"	Research and development in critical technologies	Cooperation in military defense against chemical attacks

2.4. Dual-use technology transfers and the legitimacy of non-proliferation regimes

The coexistence of multilateral treaties and plurilateral arrangements that regulate transfers of dual-use technology as well as controversial debates about the implementation of cooperation obligations are a constant source of tension between industrialized and developing countries and affect the legitimacy of all three WMD regimes. These discussions address an important issue – namely how to better control the spread of dual-

use technologies while also facilitating their application for peaceful purposes – yet they are highly ritualized. Western and industrialized countries emphasize the importance of controls while developing countries highlight the importance of strengthening cooperation.

The right balance between control of dual-use technologies and efforts to facilitate cooperation for peaceful purposes is a necessary precondition for upholding and increasing the legitimacy of non-proliferation regimes. Legitimacy – understood here to mean "the normative belief by an actor that a rule or institution ought to be obeyed" (Hurd 1999: 381) – matters because it is, in addition to self-interest and coercion, the third basis for compliance with international norms, rules and procedures.

For a regime to be perceived as legitimate, three preconditions must be fulfilled. It has to be

- legal, i.e. be in accordance with international law,
- accountable to its members (which at the very least means that it has to be inclusive and transparent), and
- effective in the sense that it fulfils key expectations of its members.[7]

Thus, international law is a critical source of legitimacy, but "[a]uthority can also be legitimized if the decisions in question are taken in the course of procedures considered to be adequate or fair." (Wolfrum 2008: 6) The legitimacy of norms, rules and regulations of non-proliferation regimes must be continually reaffirmed. Ideally, this happens through procedures that give regime members the opportunity to have a say in the regime's future.[8] At the very least, decision-making has to be transparent to those who are not directly involved in it. If these conditions are not met, regimes can be perceived as "clubs" or "cartels" that lack the legal and moral authority to set global standards. In addition, for a regime to have the ongoing support of its members, it needs to be seen as achieving its core objectives. Yet, members may have different understandings about the key functions of a regime, particularly in the case of agreements that pursue multiple goals simultaneously.

From the perspective of enhancing their legitimacy, non-proliferation regimes are then faced with four basic dilemmas:

- The legality of non-proliferation measures grounded in treaty-based, multilateral regimes is high, yet decision-making in these agreements is cumbersome, slow and subject to vetoes if the consensus principle is being applied.
- The more universal the membership of a non-proliferation regime is, the more legitimate it is - but the more complex decision-making becomes.
- Transparency is a necessary precondition for political acceptance, yet more openness can undermine the effectiveness of non-proliferation efforts.

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7 Other factors that can bolster the legitimacy of regimes are flexibility and democratic decision-making procedures based on fair representation of interests and capacity to set norms. See for example Buchanan/Keohane 2008.

8 Nina Rathbun argues that sovereign equality is a key standard for regime legitimacy because "regimes that create rules for uniform treatment of all states or members are generally more substantively legitimate than those that do not." (Rathbun 2006: 230)

- Sharing dual-use technologies for peaceful purposes increases regime legitimacy, but also the potential for their misuse.

It is important to resolve disputes about dual-use technology transfer regulations because they undermine all three foundations of the legitimacy of international non-proliferation efforts. Iran, for example, justifies its nuclear program with the stated goal of expanding the use of nuclear energy for power production and other peaceful purposes. Many Western states find this implausible but Tehran's argumentation does resonate among some developing countries. Thus, in 2006, when the IAEA turned down Iranian requests for technical assistance for its heavy-water reactor and in 2007 suspended several other technical assistance projects, this decision "drew quick protests from developing countries, who said the action threatened their rights to peaceful nuclear technology." (Boureston/Lacey 2007: 18) Some in the United States criticize the IAEA's technical support program for directly or indirectly helping countries that may be interested in developing nuclear weapons. (U.S. Government Accountability Office 2009; Goodenough 2011)

There is also an ongoing debate about how to increase the accountability of instruments to prevent the spread of WMD. Industrialized states tend to emphasize the importance of cooperating among themselves to prevent or roll back the proliferation of WMD through, for example, export control regimes, the EU, the Proliferation Security Initiative or the G8. Membership in these groups is by invitation only, decision-making generally not transparent. One of the problems associated with these bodies is the fact that states or companies affected by their decisions generally have no means of recourse. Even UNSC Resolution 1540, which obliges all states to strengthen their efforts to prevent terrorist acquisition of WMD, was initially criticized for having been agreed upon by the select group of UNSC members. (Datan 2005; Joyner 2006)

Finally, the spread of sensitive technologies to additional states and non-state entities outside of traditional control regimes is raising doubts about the effectiveness of these regimes in terms of non-proliferation. At the same time, developing countries are disappointed that the economic benefits derived from membership in such regimes remain limited, raising doubts about the effectiveness of these regimes in terms of development.

It is thus important that dual-use transfer regulations are perceived to be compatible with existing norms and rules (legality), involve major stakeholders (accountability) and do not contravene major interests in controlling or sharing access to such technologies (effectiveness).[9]

9 For a good overview see Joyner 2009.

3. Nuclear Dual-Use Technology Transfers: The Impact of the lifting of Nuclear Trade Restrictions on India as an example[10]

Norms on the sharing of nuclear technology remain contested. (Lantis 2011; Meier 2010b) A key issue is the relationship between the nuclear Non-Proliferation Treaty (NPT) and the Nuclear Suppliers Group (NSG). Both have the goal of preventing nuclear proliferation by regulating the transfers of nuclear technology. Yet, relations between these two arrangements, which have different legal characters, rules, coverage and membership, have been difficult. This tension has hampered the effectiveness of efforts to prevent the spread of nuclear weapons.

Under the NPT, only China, France, Russia, the United Kingdom and the United States are recognized as nuclear weapon states because they manufactured and detonated a nuclear explosion device before 1 January 1967. (Treaty on the Non-proliferation of Nuclear Weapons: Article IX) For India, which first conducted a nuclear test in 1974, the road to NPT accession therefore remains closed, unless the treaty were to be amended or India were to give up her nuclear weapons.

Many NPT members which do not participate in the NSG have criticised the arrangement as being at odds with the basic quid-pro-quo of the treaty. The NPT promises unrestricted access to nuclear technology and cooperation on the peaceful use of nuclear technology in return for the acceptance of controls which ensure that such technology is not misused for military purposes. Critics maintain that the NSG – which constrains nuclear trade – is an attempt by nuclear technology holders to preserve their economic advantages.

NSG members, on the other hand, have stressed that nuclear export controls, while going beyond the NPT, strengthen non-proliferation by preventing the spread of sensitive nuclear technology to problematic states. They see the NSG as a necessary and useful complement to the NPT. (Kassenova 2012)

The legitimacy of a regime depends on the legality of its rules and procedures, the inclusiveness of the arrangement and its effectiveness in fulfilling core functions. The announcement by then-US President George W. Bush and Indian Prime Minister Manmohan Singh in August 2005 to work towards the lifting of nuclear trade sanctions against India touched on all three factors influencing the legitimacy of the nuclear non-proliferation regime. (White House 2005) At the time, the rules of the NSG and the NPT prohibited nuclear trade with India because the country did not have in place a comprehensive safeguards agreement with the IAEA. India, which possesses nuclear weapons, was not (and still is not) a member of the NPT or the NSG. While some feared that exempting India from NSG rules would generally undermine the coherence and effectiveness of non-proliferation efforts, others argued that “[w]ithout the arrangement, India's nuclear power program would have remained a black box. With it, India will be brought into the international nuclear nonproliferation mainstream.” (Burns 2007: 131)

10 This section is based on Meier 2013b.

The August 2005 US-Indian initiative to end restrictions on nuclear trade with India was launched at a critical time for the NPT when the issue of nuclear dual-use technology controls was receiving unprecedented political attention.

Several developments had moved the issue up the political agenda:

- In May 2005, the NPT Review Conference had failed to agree on a final document and ended in disagreement over a range of issues, including disarmament and rules for technology transfers.
- The Iranian nuclear crisis had exposed shortcomings of controls on sensitive nuclear technology and diplomatic efforts to solve the problem were on the verge of failure.
- Four years after the 9/11 attacks, the risk that transnational terror groups could misuse nuclear materials or nuclear technology still dominated Western threat assessments. (Allison 2005)
- The declared interest by dozens of countries in joining the group of nuclear possessor states ("nuclear renaissance") raised the prospect of the further spread of nuclear technology. (Alger 2009)

The proposal to give India direct access to the international nuclear market rubbed salt into an open wound of the NPT, namely the question of whether and how to apply the regime's rules and norms to those states which remain outside the treaty. This problem has significant implications for regime support. Many states have joined the NPT under the assumption that they will get privileged access to nuclear technology in return for foregoing nuclear weapons and accepting nuclear safeguards. Yet, the United States proposed to grant India similar access to nuclear technology as NPT members even though Delhi continued to be critical of the treaty. Washington argued that India was a responsible state whose isolated position outside the nuclear non-proliferation mainstream was unjustified and hurt efforts to devise a regime that would have broader reach.

3.1. The legal dimension of the lifting of nuclear sanctions against India

For about 30 years, India's position as a state outside the non-proliferation regime, based on the NPT, went unchallenged. From the outset, Delhi rejected the NPT and argued that the treaty's lack of clear disarmament obligations was immoral and that the absence of security guarantees by the nuclear weapon states undermined the security of non-nuclear weapon states. The rules on the transfer of nuclear technology represented another important reason why India rejected the NPT. (Perkovich 1999: 138)

India's explosion of a nuclear device in 1974 cemented her status as a country outside the nuclear non-proliferation mainstream. Some of the plutonium used in the Indian nuclear devices had been produced using nuclear technology which Canada and the United States had supplied for peaceful purposes. (Perkovich 1999: 178–79) The Indian nuclear tests demonstrated to the supplier states that NPT-based controls on nuclear technology were not sufficient to prevent the diversion of such materials or technologies to non-peaceful purposes. This led to the founding of the Nuclear Suppliers Group.

The seven initial NSG members agreed among themselves in 1975 to implement stricter controls on the exports of nuclear technology. In 1977, they adopted guidelines containing a list of nuclear direct-use goods and technologies, which triggered export control licensing

procedures. NSG rules are not legally binding and member states decided to go beyond the NPT: “The NSG was expressly formed on the premise that the NPT and Article III.2 alone did not suffice to prevent nuclear items from being transferred to parties that aimed to develop nuclear weapons.” (Hibbs 2011: 5)

In 1992, NSG members agreed on a second control list of dual-use goods and made full-scope safeguards a condition of supply. (Anthony/Alhström/Fedchenko 2007: 18) Because the NPT under Article III also requires non-nuclear weapon states party to the treaty to implement full-scope safeguards, a link between NSG and NPT technology transfer rules was now firmly established. This connection was reinforced when NPT members in 1995 decided that

> New supply arrangements for the transfer of source or special fissionable material or equipment or material especially designed or prepared for the processing, use or production of special fissionable material to non-nuclear-weapon States should require, as a necessary precondition, acceptance of IAEA full-scope safeguards and internationally legally binding commitments not to acquire nuclear weapons or other nuclear explosive devices. (NPT 1995: paragraph 12)

The full-scope safeguards requirement put India outside the rules of both agreements. As long as India did not have a comprehensive safeguards agreement in place, nuclear trade with India remained prohibited by NSG and NPT rules. The legal distance between the NPT and the nuclear weapon possessor state, India, became insurmountable because only non-nuclear weapons states can conclude a comprehensive safeguards agreement, which requires a state to put all nuclear facilities on its territory under IAEA control.

India’s May 1998 nuclear tests widened the gap between India and the nuclear non-proliferation regime even further. The UN Security Council condemned the nuclear tests by India (as well as the subsequent nuclear tests by Pakistan) and encouraged “all States to prevent the export of equipment, materials or technology that could in any way assist programmes in India or Pakistan for nuclear weapons or for ballistic missiles capable of delivering such weapons... .“ (United Nations Security Council 1998: paragraph 8)

Against this legal background, Singh and Bush announced their intention to resume nuclear trade in 2005. The George W. Bush administration sought a “clean exemption” for India from NSG rules. Under the NSG consensus rule, such an exemption still had to be approved by all NSG participants, but it was intended to provide an unambiguous legal basis for the termination of nuclear trade restrictions, without raising the difficult problem of how to deal with the other NPT non-members Israel and Pakistan.

For many NSG participants, the US approach created political and legal problems. By granting India an exception from NSG guidelines, they would be acting counter to the 1992 NSG principle to make full-scope safeguards a condition for the supply of nuclear technology. Exempting India would also violate the political commitment given at the 1995 NPT review conference not provide nuclear technology to states without full-scope safeguards. At NPT preparatory meetings for the 2010 NPT review conference, several states indirectly raised their concerns about the effects on the NPT of a possible lifting of nuclear sanctions on India. This included a fear that the nuclear deal could undermine the norm that states outside the NPT should not have the same access to nuclear technology as treaty members. (Meier 2007: 26, Meier 2008a: 36)

3.2. Inclusiveness of the US-India deal

The debate among NSG members was focused on India's nuclear arms control and non-proliferation commitments and on her pledge "to assume the same responsibilities and practices and acquire the same benefits and advantages as other leading countries with advanced nuclear technology, such as the United States." (White House 2005) What steps would India undertake in return for the lifting of nuclear trade restrictions? How stringent would safeguards requirements be? And what consequences would India face if it were to break the pledges made in the context of the nuclear deal? The answers to these questions were perceived as key for the legitimacy of a deeply contested decision to lift nuclear trade restrictions.

Much of the discussion in the NSG between August 2005 and September 2008 took place behind closed doors, making it difficult for NPT members that were not NSG participants and for the general public to come up with good assessments of the status of discussions. Several key players hedged their bets. Middle powers, including arms control advocates such as Brazil, Germany, Japan and South Africa did not directly oppose the deal upfront. Some of the nuclear suppliers were apparently afraid that economic interests in India and relations with the United States would suffer, should they stand in the way of lifting nuclear sanctions.

Over the three years that NSG participants discussed the lifting of sanctions, the deal came several times close to failure. During the end game, however, only a handful of smaller states including Austria, Ireland and New Zealand demanded changes to the draft decision that had been tabled by the United States in August 2008. Among other things, the critics suggested that trade in proliferation-sensitive technologies should remain embargoed and that sanctions should be automatically re-imposed in case India resumed nuclear testing. (Boese 2008) In the end, these countries alone could not withstand the strong political pressure from the United States and India. (Sengupta/Mazzetti 2008; AFP 2008) As George Perkovich has pointed out, the heavy-handed approach of the United States particularly affected the non-proliferation regime:

> By proceeding more or less unilaterally and downgrading nonproliferation objectives, the United States disempowered other states, particularly those that did not share many or all of its strategic objectives and assumptions. (…) The sense that the world's strongest power was prepared to make exceptions based on its own prerogative undermines the perceived legitimacy of both the leader and the regime.
> (Perkovich 2010: 26)

On 19 September 2008, the NSG unanimously agreed to open the way for trade of nuclear technology with India "for use in [International Atomic Energy Agency, IAEA] safeguarded civil nuclear facilities." (IAEA 2008a)

3.3. Implications of the US-India deal for regime effectiveness

Supporters of ending nuclear trade restrictions on India had predicted that such a step would have a range of positive developments on international relations. They argued that India's role as a reliable partner of the West would be strengthened and that closer nuclear cooperation would be economically advantageous for both suppliers and for India. Then-IAEA Director General Mohamed ElBaradei captured these arguments in favor of closer cooperation by stating that the international community should "engage with [India, Israel and Pakistan] as nuclear partners rather than pariahs." (ElBaradei 2011: 224)

Others argued that the nuclear deal should be used to extract from India specific concessions with regard to arms control, such as ratification of the Comprehensive Nuclear Test Ban Treaty and to use the deal to initiate a new disarmament initiative. They quickly realised that this was not the way the Bush administration was going to go. (Müller/Rauch 2007: ii)

Proponents of the lifting of nuclear sanctions argued specifically that it would strengthen the nuclear non-proliferation regime in three ways:

- The separation of civil and nuclear activities in India would provide additional transparency on India's nuclear activities.
- India's commitment to adhere by NSG guidelines would strengthen nuclear export controls.
- India would generally be brought closer to the non-proliferation mainstream.

On all three issues, the net balance three years after the NSG decided to lift sanctions is sobering.

Ahead of the NSG waiver to exempt India from supply guidelines, India promised to put 14 nuclear facilities under safeguards. By December 2010, Delhi had declared that a total of 18 facilities would be monitored by the IAEA. (IAEA 2010) Yet, India's safeguards agreement gives India a special status. The agreement is based on a model protocol that provides for facility-specific safeguards but contains important exceptions and ambiguities. Thus, India has successfully insisted that it "may take corrective measures to ensure uninterrupted operation of its civilian nuclear reactors in the event of disruption of foreign fuel supplies." (IAEA 2009: 2) This clause is interpreted differently. While the IAEA and IAEA Board of Governors member states made it clear at the time that IAEA safeguards in India would be applied permanently, (see for example Hibbs/Horner 2008: 1) Indian officials have argued that India has the right to suspend or terminate safeguards should international nuclear fuel supplies be interrupted. (Subramian 2008) Such an interpretation would set a dangerous precedent by opening the possibility for other states to also make implementation of safeguards obligations contingent on political developments.

By accepting the "separation" of military and non-military facilities, the IAEA has come very close to recognizing India's nuclear weapon status, a point not lost on India's nuclear lobby. One of the NPT's central separation lines between nuclear haves and have-nots is that the nuclear weapon states have been granted the right to secrecy while non-nuclear weapon states are expected to open up their nuclear programs to international scrutiny. From this perspective, India — for all intents and purposes — has been accepted in the nuclear weapon states category because all facilities and activities associated with its nuclear weapons program will remain off-limits to the IAEA. (Walker 2008: 40-41)

The effect of exempting India from NSG guidelines on the group itself is mixed. China has pushed the limits of NSG guidelines in dealing with its client state, Pakistan, in the wake of the India waiver. In October 2008, China and Pakistan reportedly signed a deal on the construction of two additional nuclear power plants at Chasma, where one Chinese-built reactor is already operating and a second one is under construction. (Associated Press 2008) This deal has come under criticism for violating NSG guidelines. Beijing maintains that it is consistent with NSG guidelines because it was concluded before China joined the

NSG in 2004.[11] The United States and other NSG members take a different view, arguing that China did not mention the deal when it joined the group and that the "grandfathering" exception cannot be applied. (Hibbs 2011: 15-16)

On the other hand, in June 2011, the NSG was able to agree on a new set of stricter guidelines for the trade in enrichment and reprocessing (ENR) technologies. These proposals were originally viewed sceptically by various participants including Argentina, Brazil, Canada and South Africa, which feared negative repercussions for their own nuclear programs. The revised guidelines list NPT membership as one precondition for the licensing of exports of such technologies which are particularly proliferation sensitive. The agreement was therefore also strongly criticized by India which, for status reasons, opposed inclusion of NPT membership as an eligibility criterion.

Since India was exempted from NSG rules, Delhi's perspective on the NPT has not visibly changed. Delhi perceives the NSG's decision to lift sanctions as an implicit recognition of its status as a state possessing nuclear weapons. Delhi continues to be a critic of the NPT as a discriminatory treaty.

While all recognized NPT nuclear weapon states have signed the Comprehensive Nuclear Test Ban Treaty (CTBT), India continues to oppose the test ban. And while all NPT nuclear weapons states have stopped producing fissile materials for nuclear weapons, India has not declared such a moratorium. It must therefore be assumed that India is continuing to produce nuclear bomb fuel. India – unlike its regional competitor Pakistan – supports the formal decision of the Geneva-based Conference on Disarmament to commence negotiations on a treaty banning the production of fissile materials for nuclear weapons (FMCT), yet doubts remain whether the country would really be interested in acceding to an agreement prohibiting the production of such materials. (See for example Perkovich, no date: 6-7)

3.4. Policy implications

The lifting of nuclear trade restrictions against India has not increased the legitimacy of the NPT regime. Specifically, it appears not to have brought India closer to the non-proliferation mainstream. The waiver also continues to divide NPT members and the issue of nuclear supplies to non-members remains controversial among NPT members. (Crail 2010; Johnson 2010) The selective lifting of nuclear trade restrictions on India has, therefore, not helped to find a solution to the important problem of bringing NPT non-members closer to the regime. (Meier 2010a)

Much will depend on whether the NSG will be able to apply rules consistently in the future. China's attempts to sell nuclear technology to Pakistan in the wake of the deal will be one test for the NSG members' willingness to oppose a further erosion of export control standards.

NSG participants could signal their resolve to strengthen the linkage between the NSG and the NPT by conditioning a future Indian NSG membership on meaningful and sustainable

11 Under the NSG's rules, certain nuclear cooperation agreements that were concluded before a supplier state joins the group can be implemented even if they run counter to the guidelines. This except is called as "grandfathering" provision. See IAEA 2011 Paragraph 4(c).

steps by Delhi towards the global non-proliferation mainstream. Thus, they should insist that India stop the production of fissile materials for nuclear weapons and ratify the CTBT before the country joins the group.

4. Biological Dual-Use Technology Transfers[12]

The universal prohibition of biological weapons is written down in three international agreements. The 1925 Geneva Protocol prohibits the use by states of bacteriological methods of warfare. The 1972 Biological Weapons Convention (BWC) prohibits the development, production and stockpiling of biological weapons by states. The 2004 UNSC Resolution 1540 requires states to have effective mechanisms in place to prevent non-state actors getting access to WMD-related materials.

Both, the BWC and Resolution 1540 use the general purpose criterion to describe the items under prohibition. The BWC prohibits items that are used "for hostile purposes or in armed conflict" and "that have no justification for prophylactic, protective or other peaceful purposes." Resolution 1540 refers to materials "related" to biological weapons and their means of delivery.

The general purpose criterion is used because of the widespread dual-use nature of bioweapons-enabling technologies, and the fact that bioweapons agents exist in nature. Restricting life science research and the transfer of biotechnologies may help prevent their misuse for bioweapons development. At the same time, these restrictions may lead to restrictions on the peaceful application of science and technology, thereby hindering development.

4.1. The legal dimension of biotechnology transfer regulations

The regulation of technology transfers is explicitly addressed in the BWC and in Resolution 1540. The dual-use character of the life science is the reason for the inherently contradictory requirements in the BWC text on such transfers of technology. Article X requires states to facilitate "the fullest possible exchange" of technology and to "avoid hampering the economic or technological development" of states, while Article III obliges states to prevent transfers of material and technology for bioweapons development.

Resolution 1540 addresses technology transfers by prescribing export controls. Export controls as measures to prevent the proliferation of weapons and dual-use goods have a long history. Adding dual-use items to the traditionally pure military control lists characterized the change in export controls after the end of the Cold War. Countries from the global South used to view trade restrictions as discriminatory, designed by the West to prevent their economic development. Nowadays, national export controls are almost universally accepted and their general usefulness is no longer seriously questioned. In this context of almost universal application of export controls, the plurilateral Australia Group – an exclusive club of technology-holders mostly from the West for harmonizing export controls on CBW items – has lost most of its dispute potential.

While there is no questioning the legality of technology transfer controls, there are a number of states who question whether all aspects relating to technology transfers in the BWC are properly implemented. Since the 1990s, many countries commented on the balance between the implementation of Articles III and X of the BWC. During the 1996

12 This section is based on Hunger 2013.

BWC Review Conference, delegates of the NAM emphasized without exception the importance of implementing Article X. This is a characteristic statement from those days, made by Bangladesh:

> No Article may be employed to the detriment of another. There is concern that Article III may be used to deny transfer of technology, equipment and materials, clearly in contravention of Article X. For developing countries, Article X on international cooperation and development is of central importance. Should our preoccupation with compliance and verification lead to restrictive measures beyond those clearly spelt out in Article III, many in the developing world would see little merit in the ongoing exercise. (Hashim 1996)

The growing dispute is illustrated by the treatment of the technology transfer issue in the BWC Ad Hoc Group (AHG), tasked to develop a verification protocol for the BWC. In June 1997, the Chairman of the AHG presented the first draft of a verification protocol for the BWC. The 121-pages "Rolling Text" contained only eight pages of immature text on the promotion and restriction of technology transfers titled "Scientific and technological exchange for peaceful purposes and technical cooperation." (BWC/AD HOC GROUP/35: 43-51, 84, 93) Almost from the beginning to the end of the AHG's negotiations on a BWC verification protocol there was bitter disagreement over the restrictive side of technology transfer regulations. This debate focused on the future of export controls. Western states treated language on "measures to avoid hampering the economic and technological development" as a "non-issue". Several NAM states demanded substantive discussions on the practical and political problems of export controls. But Western states ignored these calls. The first working paper by Western states containing general statements on the issue was tabled only at the end of February 2001, eight years after work started on a verification system for the BWC, and six months before the AHG collapsed. (BWC/AD HOC GROUP/WP.443) During the final months of the AHG, discussions on the restriction of technology transfers became increasingly difficult. By 2001, "[t]he development orientation of the [BWC had] come to be the principal criterion, or one of the key criteria, by which many of its parties judge[d] its success." (Sims 2001: 119)

4.2. Inclusiveness of technology transfer arrangements

The legal instruments setting the norm against bioweapons prescribe identical rights and obligations to their parties. All parties have to give up bioweapons, control the transfer of technology, and promote technical cooperation for peaceful purposes. Due to Resolution 1540 and the growing acceptance of export controls in general, the plurilateral export control arrangements of the Australia Group have lost most of their dispute potential. The comprehensiveness and effectiveness of export controls around the globe differ widely but more and more states implement them. In 2006, only 65 states had reported to the 1540 Committee that they had passed export control legislation concerning "biological weapons and related materials". Five years later, 116 states reported that they had complied with the obligation to have such legislation. (S/2008/493: 57, S/2011/579: 49)

There are two main reasons for this change of perception: first, a number of emerging economies – e.g. Brazil, China and India – are no longer only technology-recipients but have also become suppliers of advanced technology. Second, despite differences in threat perception, the possibility of non-state actors invoking a bioterrorism attack is very much on the minds of politicians and experts. Thus, even Iran, traditionally the most vocal opponent of export controls in the BWC context, no longer merely argues against export

controls per se, but more specifically criticizes their unequal application and requests a mechanism “to deal with the issue of settlement of disputes arising from transfer denials”. (BWC/CONF.VII/WP.29: 3)

4.3. Importance of dual-use technology transfer regulations for regime effectiveness

Because of the dual-use character, technology transfer controls are important for the effectiveness of the bioweapons control regime. There is very little disagreement left over the required export controls. Currently, it is the question of technical cooperation that severely undermines the effectiveness of the bioweapons control regime.

Article X, the cooperation article in the BWC, became increasingly relevant after 1994. During the AHG years 1995 to 2001, the issue played an important and disruptive role, and debates on technological cooperation remain politically difficult to this day. Differences in view on the implementation of Article X remain a serious obstacle to making progress towards an effective bioweapons control regime.

Often, Western states attempt to end the debate about technological cooperation by pointing out their support for activities outside of the BWC. Thus, representatives of Western governments privately argue that the billions of Euros or Dollars they spend on official development assistance (ODA) in the health sector are sufficient contributions towards implementation of Article X. Increasingly this argument is also made in public. Germany, in its 2011 report on Article X implementation, provides a detailed list of its ODA funding in the health sector for the years 2005 to 2009. (BWC/CONF.VII/INF.8: 28) In December 2010, in its opening statement to the BWC Meeting of States Parties, the USA expressed its views on Article X as follows:

> Having raised the issue of Article X, let me affirm that the United States is deeply committed to implementing the Biological Weapons Convention in its entirety, and that includes Article X. We do a great deal to facilitate the international exchange of equipment, materials and scientific and technological information for peaceful purposes, and to support the further development and application of scientific discoveries in the life sciences for peaceful purposes. Article X is being vigorously implemented through many different channels and activities around the world. There is value in exploring ways to build awareness of the cooperation that is taking place, and to objectively identify needs that should be addressed. (Kennedy 2010: 7-8)

NAM states, on the other hand, always find fault with the implementation of the development aspect of the BWC. Some NAM states try to put the provisions in Article X on an equal footing with the core prohibition of the BWC on the development and possession of biological weapons contained in Article I, as most clearly put in 2011 by Iran:

> Each and every article of the Biological Weapons Convention bears the same value and importance. As such, a breach of Article X by a State Party is regarded as a violation of the Convention. (BWC/CONF.VII/INF.8: 31)

In addition, many non-Western states interpret Article X in such a way that they have a right to receive technology from developed states. During the 2012 BWC Meeting of Experts, Algeria expressed this view as follows:

> The state of implementation of [Article X] does not yet meet the legitimate expectations of developing countries. Inequalities between developed and developing countries in the life sciences and related technology persist and get worse. An additional effort is needed to give practical meaning to the commitments made and close the gap and strengthen the capacities of States, in particular in developing countries. (BWC/MSP/2012/MX/3: 13)

Among NAM states, there seems to be "a general notion of an entitlement to development and equal distribution" (Becker-Jakob 2011: 9) with respect to biotechnology and its advantages. To a certain degree, Article X implementation has been turned from being an issue of national interest into an issue of justice. It has been "justicized". As Harald Müller writes, "labeling an issue justice-related hardens the attitude of the claimant. Justice moves a claim towards the absolute and compromises are harder to achieve." (Müller 2011: 5) This transformation of technology transfer issues into a matter of justice certainly plays a role in why it has been so difficult to enter a meaningful debate and move into a modus of give and take in the quest for compromise.

4.4. Policy implications

As in other areas of WMD arms control, discussions in the context of the BWC about restricting technology transfers *versus* promoting technological development intensified over the last decade. The bitterness of disputes about export control regimes that existed in the early 2000s has substantially decreased while technological cooperation has become the more important topic.

Given the already existing cooperation in the life sciences and public health area, and the existing proliferation fears, broad and unconditional technology transfer will not be acceptable to the West. On the other hand, non-Western states will not be satisfied with the status quo and references to existing development assistance activities outside the BWC context. Thus, there is a political need to devise cooperation measures within the framework of the BWC. Those measures will have to have a clear relationship to the BWC's main goal of increasing security and could include biosafety and biosecurity, disease surveillance, bioincidence response planning and development of diagnostics, preventive measures and therapeutics with a focus on biothreat agents.

As to the restriction side of the technology transfer debate, there have been no proposals that enjoy wide support. But NGOs have provided ideas on how to regulate technology transfers in a post-export control era. One idea is to not have any legally binding regulations at all, just self-restrictions. Proponents argue that bioweapon-enabling technologies are globally distributed and that governmental control of those technologies is impossible. (Maurer/Fischer 2010: 46) Another idea rests on the principle of accreditation, which would require "economic units" (e.g. companies or research institutes) to "abide by internationally set standards and participate in a regime to generate transparency regarding biotechnology transfers." Accredited units would benefit from simplified technology transfer procedures. (Zanders 2004: 28) And a third idea is a passive technology transfer monitoring system. An international or non-governmental organization is envisaged to look at customs data – available from the World Customs Organization (WCO) – on the volume, value, time and destination of transfers of biological dual-use

equipment, in order to identify suspicious types or amounts of transfers or anomalies that would justify further inquiry. (Jeremias/Hunger 2010)

There is benefit in recognizing that restricting and promoting technology transfers are not opposing activities. They are interlinked. In fact, there is an increasing understanding that enhanced transfer controls would allow increased cooperation, as illustrated by the following statement by India:

> While legitimate peaceful uses should not be hampered, India is not in favour of unregulated transfers. We believe that strengthened implementation of Article III would ensure that the cooperation envisaged under Article X is not abused. (Mehta 2011)

Vice versa, it is much easier to push for better technology transfer control systems, if a cooperative relationship already exists. This reciprocal reinforcement of cooperation and control only works, however, if developed states do indeed provide more cooperation opportunities for countries with sufficient control systems; and if developing countries accept the need for control systems if they want to use certain technologies.

5. Chemical Dual-Use Technology Transfers

A complete ban on chemical weapons became possible only after the end of the Cold War. Negotiations on the Chemical Weapons Convention (CWC) were successfully completed in late 1992 in the Geneva Conference on Disarmament, and the treaty, which bans the development, production, possession, transfer and use of chemical weapons, entered into force in 1997. Like in the BWC, the prohibition of chemical weapons is comprehensive and based on a general purpose criterion. Thus, all toxic chemicals are banned, unless they are used for purposes not prohibited under the convention. The CWC is at heart a disarmament treaty and requires the destruction of all CW stocks within a specified time. (Zanders 2013)

5.1. The legal dimension of chemical dual-use technology controls

During the negotiation of the treaty, the issue of dual-use technology transfer controls was contentious. This was particularly true for controls of dual-use facilities that could be used for commercial purposes as well as to develop or produce chemical weapons: “Despite the constructive involvement of industry, the negotiations on the verification system were among the most agonizing and the most protracted of the whole CWC negotiation process.” (Findlay 1993: 29)

In the early days of the convention, developing countries were critical of the CWC because the treaty “unlike the NPT, does not mandate technical cooperation and assistance to commercial industry facilities in participating states.” (Smithson 1997: 27) Meanwhile, a variety of international cooperation activities has been launched under Article XI of the convention. Article XI on “economic and technological development” requires states to implement the CWC in a manner that does not hamper development and international cooperation for peaceful purposes.

OPCW efforts under the label international cooperation have grown considerably since the CWC entered into force. From 1997 to the end of 2012, the programmes on international cooperation have had 3,794 beneficiaries, including 297 Associate Programme participants, 442 analytical-skills-training participants, 292 Industry-Outreach Programme participants, 96 laboratory-assistance participants, 2,067 Conference-Support Programme participants, 263 conferences, 73 transfers of used and functional equipment, 469 research projects, and 127 interns. By region, these beneficiaries include Africa (1,259), Asia (1,046), Latin America and the Caribbean (547), Eastern Europe (546), and Western Europe and Other States (396).” (OPCW 2013b: 75)

The OPCW has also expanded programs for assistance and protection against chemical weapons use. After 11 September 2001 these programs have taken a new turn and the convention has also provided an umbrella under which several activities are taking place to alleviate the consequences of a possible chemical weapons attack, including by terrorists.

While the focus of many of these activities has been on improving the national implementation of the convention, rather than on international cooperation for the peaceful use of chemistry *per se*, they have defused arguments about the lack of implementation of obligations under Article XI.

5.2. Inclusiveness of technology control arrangements

The CWC contains an elaborate regime for overseeing trade in dual-use technologies between states parties and countries outside the convention. Through these provisions, the negotiators hoped to limit the spread of dual-use technology that could be used for chemical weapons to non-state parties and also wanted to create an incentive for joining the convention. (Findlay 1993: 37) Since the treaty entered into force in April 1997, trade in chemicals listed in Schedule 1 (which are directly suitable as chemical weapons) is permitted only between CWC states parties. A prohibition of the export of chemicals in Schedule 2 (which can be used as precursors of chemical weapons) to CWC non-states parties became effective as of April 2000. However, a corresponding prohibition of the trade in chemicals on Schedule 3 (which are toxic and may be used in large quantities for commercial purposes) has never been implemented.[13]

In the eyes of developing countries, the agreement on trade for those chemicals listed on schedules was to provide the basis for a multilateral export control regime that would eventually replace the Australia Group. This was based partly on the negotiating history. During the end-game of the negotiations, the Australia Group members attempted to calm the non-aligned criticism by promising that they would

> undertake to review, in the light of the implementation of the Convention, the measures that they take to prevent the spread of chemical substances and equipment for purposes contrary to the objectives of the Convention, with the aim of removing such measures for the benefit of States parties to the Convention acting in full compliance with their obligations under the Convention. They intend thus to contribute actively to an increase in commercial and technological exchanges between States and to the universal and full implementation of the Convention on the prohibition of chemical weapons. (Chemical Weapons Convention Bulletin 1992: 7-8)

Yet, hopes that the CWC would supersede the Australia Group, which at the time had 22 participants, were misplaced. The Australia Group continued to expand in membership and after 11 September 2001 also began to expand its remit by regulating trade in more dual-use technologies. From the perspective of Australia Group members, plurilateral export controls remain a necessary element of non-proliferation efforts because CWC schedules do not capture all relevant dual-use chemicals and technologies for chemical weapons production. (Zanders 2001: 16-17)

Initially, the unfulfilled promise of multilateralized export controls remained an issue of dispute between industrialised countries on the one side, and developing countries on the other side. More recently, however, criticism of the Australia Group as being discriminatory has receded. One factor was the unanimous adoption of Resolution 1540 by the UNSC in 2004, which makes export controls mandatory and has improved the legitimacy of such controls. (Bosch/van Ham 2005)

Not only the Australia Group poses problems because of its lack of inclusiveness. Even within the convention, small groups of states sometimes take decisions that affect the membership as a whole. During the routine procedure of the convention, decisions about implementation, including on dual-use technology controls are taken by the 41-member

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13 If this export control regulation were implemented, CWC states parties could no longer legally export chemicals listed in Schedule 3 to Israel, which has signed but not ratified the CWC. The United States objects to such a restriction of trade with Israel.

Executive Council, which has a rotating membership, based on regional representation. Formally, this ensures a relative large degree of inclusiveness. Yet, informal politics weighs heavily on the convention and tends to put the larger and more powerful states at an advantage. Thus, during the second review conference in 2008, a small group of about 20 states during the end game of the meeting among themselves negotiated key elements of the final document. This incident was viewed by many member states as an example of how the CWC should not work. (Meier 2008; Meier 2008a) At the third review conference in 2013, such selective decision-making could largely be avoided.

5.3. Importance of dual-use technology controls for regime effectiveness

The monitoring of the destruction of declared chemical weapon stockpiles has been up to now the main function of the OPCW. Currently, the organization spends almost three-quarters of inspectors' manpower on monitoring the destruction of chemical weapons, primarily in Russia and the United States. Yet, at the end of 2012, almost 80 percent of the roughly 70,000 metric tons of declared chemical weapons had already been destroyed. The budget of the OPCW has declined from roughly $75 million in 2011 to about $70 million in 2013, and the number of staff working in the inspections division in 2012 was reduced by about one-quarter from the previous year. (OPCW 2013b: Paragraphs. 3.104, 3.431, 3.449) For the OPCW this is "a shift in emphasis and perspective from creating to preserving a world free of chemical weapons." (Trapp 2012: 42) As destruction in Russia and the United States nears completion, resources for verification of destruction of stocks can be reduced. For years, diplomats at the OPCW, the organization's staffers, and independent analysts have said they fear that as the destruction of declared chemical weapons stockpiles progresses, the OPCW will lose expertise and manpower.

How to react to this shift is contested among CWC members. (Zanders 2013a) It is an indication of the sensitivity of this question that the OPCW itself does not speak of non-proliferation but rather of "preventing the re-emergence of chemical weapons." Some member states believe that such non-proliferation activities should be intensified as destruction activities are being downscaled. Others, particularly some key developing states such as India or China, believe that the organization should be downsized as verification of destruction is reduced. (Zanders 2013a)

The Director-General of the OPCW when opening the third review conference in April 2013 warned that

> [a] sudden reduction of resources for any institution can rapidly erode its capacities, its expertise, its institutional memory, and indeed its ability to carry on the remaining tasks. (...) As a treaty with verification and related transparency and confidence-building measures at its heart, programmatic elements for preventing the re-emergence of chemical weapons will acquire much greater salience in the future. States Parties need to consider continuing improvements in industry verification, transfer controls, and data monitoring, both nationally and by the Organisation. (OPCW 2013a: Paragraphs 18-20)

While the overall scope and balance of future verification activities is being debated, chemical dual-use technologies are spreading to new countries and regions. As the OPCW has pointed out, "the chemical industry is now a global enterprise and is very different from the time of the negotiations of the Convention." Chemical industry is growing at the relatively fastest pace in Asia and Latin America. As a result, "emerging economies now

outpace developed countries in chemicals production and […] production of chemicals in Asia equals that in Europe and North America combined." (OPCW 2013b: paragraph 3.67)

One leading international expert warns that

> structural change in the chemical industry could … pose risks to CWC implementation. Driven by market forces, the industry is moving from its traditional production locations (Japan, the United States, and Western Europe) to new places in Asia, Eastern Europe, Latin America, and the Middle East. Some of the countries involved in setting up new chemical operations have limited experience in regulating chemicals or weak implementation systems for the CWC. At the same time, international trade in chemicals is on the increase. These are challenges to the CWC's verification system as well as to traditional non-proliferation measures in the chemical field. (Trapp 2008: 19)

One key aspect of future viability of the non-proliferation regime is whether the OPCW will be able to more effectively monitor so-called Other Chemical Production Facilities (OCPFs). Many of these are modern facilities that can be adopted to the production of different chemicals, depending on market needs. This also means that these facilities would be well suited for the clandestine production of prohibited agents. So far, the CWC members have not been able to adequately address this issue. More than 5,000 OCPFs are in operation worldwide, many of them in emerging economies where the operational costs are often lower than in industrialized countries. At the end of 2012, the OPCW had conducted 1,153 OCPF inspections. This means that less than 20% of the 4,200 inspectable OCPFs had been visited by inspectors.[14]

This is mainly a debate between industrialized states on the one side and threshold as well as developing countries on the other side.[15] The main reason is the uneven global distribution of OCPFs. OCPFs are being established in more and more Asian and African countries, while the number of OECD countries that possess such facilities has remained relatively stable.

5.4. Policy implications

States parties to the CWC have only been partially successful in addressing problems of dual-use technology transfers. The debate on improving cooperation on the peaceful use of chemistry has moved beyond initial concerns about the Australia Group and the legitimacy of export controls. The OPCW has been successful in addressing a number of real needs by expanding the scope of international cooperation programs, which were endorsed through action plans on international cooperation at CWC review conferences.

There remain serious problems about adapting dual-use controls to current and future proliferation challenges. The convention's verification system, based on schedules of specific chemicals has proved too rigid. Efforts to adapt controls to new realities of global use of dual-use technologies and chemical production capacities have failed because of the resistance of a few developing countries. This inflexibility could be problematic in the

14 OPCW 2013b: paragraph 2.11

15 Some Western industry representatives, however, are also weary of the possibility that a revision of selection mechanism for on-site industry verification activities will "increase the burden on industry." See Maenning 2008.

future, as industry inspections are likely to be more an exercise in confidence-building, rather than inspections to verify compliance with the non-proliferation commitments enshrined in the CWC.

Measures that could help to improve dual-use technology controls include decisions by states parties to

- use resources that become available as a result of progress on the destruction of existing stockpiles to improve industry verification
- enable the OPCW to apply modern verification technologies,
- shift verification activities towards facilities with the greatest misuse potential, such as OCPFs.

These measures have been debated for some time, yet despite their potential to improve the monitoring of compliance with the CWC, have not been adopted for political reasons. The use of chemical weapons in Syria demonstrates that the use of chemical weapons remains an issue that deserves international attention. These weapons may remain attractive, either because they may have a perceived military utility or simply because the use of poisonous gas provokes horror. It is to be hoped that the conflict revitalizes the sense of urgency that once led to the adoption of the CWC. (Horner/Meier 2013)

6. Conclusions and Recommendations[16]

Non-proliferation is becoming more important but also more difficult. Stopping the spread of WMD increasingly means preventing the misuse of nuclear, biological or chemical dual-use technologies. Such a preventive approach has to entail more effective controls but also better cooperation to facilitate the peaceful use of dual-use technologies. Finding the right balance between these two intertwined and conflicting approaches is a necessary precondition for any effective non-proliferation policy.

Technology controls under multilateral regimes will have to become more flexible to take into account novel technological developments that make it easier to develop nuclear, biological or chemical weapons. Adapting rules and regulations to changing political and socio-economic interests remains another key challenge. In particular, the growing influence of emerging economies has to be taken into account.

A related trend is the new attention given to the safety and security of proliferation-sensitive materials, technology and activities. Over the last ten years, we have witnessed the 2010, 2012 and 2014 Nuclear Security Summits, the growing importance of international cooperation on biosafety and biosecurity as well as additional efforts to improve chemical safety and security. These activities reflect increased concern, at least in industrialized states, about the perceived threat of WMD terrorism. Often, these are cooperative programs to reduce vulnerabilities, rather than efforts to tighten technology controls, for example in the context of the G8 Global Partnership to Prevent the Spread of Weapons and Materials of Mass Destruction.

The role of cooperation on peaceful uses of dual-use technologies for the legitimacy of non-proliferation efforts is also evolving. During the Cold War, it had become increasingly difficult to differentiate between goods that had only military applications and those intended for civil uses. This development has continued. In more and more instances attempts to differentiate between civil and military goods or technologies are futile.

In many ways, sharing of technologies and capacity-building have become integral parts of modern non-proliferation strategies. Cooperation on and control of dual-use technology transfers are increasingly regarded as two aspects of the same issue, namely how to prevent the misuse of dual-use technologies for hostile purposes.

This development is based in part on the growing recognition that attempts to tighten controls on dual-use technologies without improving cooperation on peaceful uses are unlikely to be successful. They can even be counterproductive because a one-sided interpretation of obligations under non-proliferation regimes can undermine trust in the willingness of states to work towards an even-handed implementation of multilateral agreements. The good news is that the traditional divide between technology holders and technology recipients is slowly eroding and, in some cases, has already become largely irrelevant. By the same token, there is a growing recognition that international cooperation on the peaceful use of dual-use technology needs to take proliferation risks into account.

Yet, the political debate about the right balance between control and cooperation continues. Antagonistic and ritualized exchanges during which parties to multilateral non-proliferation accords regularly accuse each other of pursuing one-sided agendas often

16 This section is based on Meier 2013c.

dominate the political and diplomatic debates. To some degree, they are the result of conflicting economic interests and diverging threat perceptions of industrialized countries, emerging economies and developing nations. At the same time, these discussions do not reflect the evolving realities of cooperation and control on dual-use technologies.

6.1. A multifaceted problem

Finding the right balance between controls and cooperation is not a new problem, yet the attacks of 11 September 2001 have changed the terms of the non-proliferation debate. The threat of WMD terrorism has increased the importance of technology controls. Efforts to find a new balance between strengthened controls on dual-use technologies and wider cooperation on their peaceful uses can build on the momentum created by the 9/11 attacks and other proliferation crises that have taken place since, such as Libya and Iran. They will have to take the political, legal and technological dimensions of the problem into account:

- Politically, it is important to increase the legitimacy of global regimes governing technology transfers. The NPT, BWC and CWC are still at the heart of international non-proliferation efforts because these multilateral regimes and the rules and regulations that flow from them are almost universally accepted. Even though the stark dichotomy between control and cooperation measures no longer exists in many cases, arguments about the legitimacy of non-proliferation regimes persist.
- It is important that efforts to reform and update the legal frameworks that govern dual-use technology transfers do not damage the understandings that are at the core of these regimes. The NPT, the BWC and the CWC are based on reciprocal commitments, on non-proliferation as well as cooperation for the peaceful use of dual-use technologies. Changes to the rules and procedures that give life to these commitments are necessary, but they should be adopted and implemented with the support of all relevant parties and in a transparent manner.
- Technological advances will continue to complicate efforts to devise better dual-use technology transfer regulations in all three non-proliferation regimes, particularly in the biosciences where the rapid pace of scientific progress poses monitoring and control challenges. Synthetic biology in the future may be one example of the kind of challenges that “de-skilling” – i.e. a reduction of the (tacit) knowledge required for the use of a technology – entails. (Tucker 2012: 24-25) Even for mature technologies, such as nuclear technology, novel developments can complicate non-proliferation efforts. Advances in laser enrichment, for example, could make it easier for states to close the nuclear fuel cycle and thus pose new proliferation risks. (Boureston/Ferguson 2005)

6.2. Findings and recommendations

A comparison of the regimes to control nuclear, biological and chemical weapons leads to the following conclusions on control and cooperation of dual-use technology transfers.

Non-proliferation regimes are currently too inflexible to reflect technological advances and changing political circumstances.

Multilateral treaties on the non-proliferation of WMD are still the main points of reference for discussions on dual-use technology controls. But they are increasingly under threat of becoming technologically outdated, particularly in the area of chemical- and biological-weapons-related materials and technologies. Novel dual-use technologies, particularly in biotechnology, are being developed at an ever faster speed.

Persistent differences of opinion about the relationship between controls and cooperation (as well as about nuclear disarmament commitments under the NPT) prevent agreement on urgently needed reforms of control regimes so that they can adequately reflect such changes by, for example, adapting and strengthening verification procedures. The consensus principle underlying multilateral regimes complicates matters further. It ensures a high degree of inclusiveness, yet often hampers agreement on even modest improvements of control procedures. The view that intergovernmental regimes are not able to tackle the most urgent security problems is reinforced by the perception that non-state actors should be the focus of non-proliferation efforts. (Tucker 2008)

Export control regimes play an indispensable role in non-proliferation efforts by making it more difficult and more expensive for proliferators to acquire WMD capabilities. Because of their informal decision-making and limited membership, arrangements such as the Nuclear Suppliers Group and the Australia Group are generally better equipped to adapt to changing circumstances. Yet, globalization and technological advances are also challenging the effectiveness of these instruments. Broadening the membership of such groups would increase their reach but complicates decision-making. The net effect of increasing the inclusiveness on the effectiveness of export control regimes is unclear.

Emerging economies such as Brazil, China and India, are now suppliers rather than recipients of dual-use technologies. Economic changes thus affect the political geometry of non-proliferation agreements which were designed and negotiated under conditions of the East-West-conflict. There can be no doubt that the interests of emerging economies will need to be taken into account in a better way if multilateral regimes want to stay relevant. However, states need to be cautious when trying to reform dual-use technology transfer regulations. Economic and security interests among and within parties to non-proliferation agreements are often difficult to reconcile. When reform efforts are driven mainly by profit interests rather than by non-proliferation needs, they can damage international security.

There is growing acceptance of international cooperation on peaceful uses of dual-use technology within and outside of multilateral non-proliferation regimes.

Efforts aimed at improving cooperation on the peaceful uses of dual-use technologies have expanded and diversified over the last decade. Yet, significant differences remain over how international cooperation is administered under the three regimes.

Cooperation for peaceful activities is taking place not only between the traditional technology holders in the Organization for Economic Co-operation and Development (OECD) world and developing countries, but also increasingly between countries of the South directly. (Finlay 2011)

Cooperation and control on dual-use technology transfers are increasingly viewed as complementary (and not conflicting) elements of an effective non-proliferation strategy.

The overlap between non-proliferation and cooperation is real and growing. Traditional technology holders realize that peaceful cooperation can expand the global reach of their non-proliferation efforts. Assistance in improving safety and security of nuclear, biological and chemical materials and activities can also help to reduce the likelihood of accidents and incidents.

Likewise, through "dual-purpose programs, developing nations are able to achieve their local goals of building a more stable environment for development, while simultaneously fulfilling their non-proliferation obligations to the global community." (Finlay 2011)

UNSC Resolution 1540, which was originally intended as an instrument to tighten controls, has taken on additional functions as a tool to assist states in implementing non-proliferation norms. (Meier 2012: 47)

Much of such cooperation, however, is taking place under the heading of security, not development and outside of the NPT, the CWC and the BWC. This points to a general problem: It is unclear whether and how efforts to strengthen international cooperation on the peaceful use of dual-use technologies can be designed in such a way that they strengthen the legitimacy of multilateral regimes. The nexus between multilateral non-proliferation regimes and the many cooperative measures on dual-use technology needs, therefore, to be clarified.

Based on these general observations, three recommendations for improving the balance between control and cooperation in multilateral technology regimes can be made.

De-politicize cooperative projects

As a general rule, cooperation on the peaceful uses of dual-use technology appears to work better the less it is framed in a non-proliferation context. Such cooperation should, therefore, be de-politicized and viewed as a practical collaboration between states to achieve a particular non-proliferation, economic or social goal rather than merely as a measure taken to fulfil obligations related to technology sharing under multilateral treaties.

The degree to which cooperative measures are undertaken as part of multilateral treaty regimes differs among the NPT, the CWC and the BWC. Much of the international cooperation on the peaceful use of nuclear technology is facilitated by the IAEA. The CWC is playing a modest role in fostering the peaceful use of chemistry but in the future, the OPCW might also play a larger role in assisting member states to improve domestic controls over sensitive technologies. The lack of a strong institutional backing for the BWC means that there are only modest efforts to improve cooperation on the peaceful uses of biotechnology within the regime; outside of it, there is a multitude of cooperative projects.

It is difficult to implement such cooperative projects under the authority of other international bodies if these fear to become "securitized". This, for example is the case for the World Health Organization, which is concerned about sponsoring programmes that might be associated with the problem of preventing military misuse of the biosciences.

Thus, it might be better to create stand-alone frameworks where industrialised and developing countries can cooperate on the peaceful use of dual-use technologies. It is encouraging that implementation of UNSC Resolution 1540 appears to be moving in this direction and that also the G8 Global Partnership to Prevent the Spread of Weapons of Mass Destruction Weapons and Materials is increasingly viewed as a framework for such

international cooperation to jointly prevent the misuse of dual-use technologies. Yet, both have been created at the behest of industrialised countries (and particularly at the initiative of the United States), so it may useful to set up other, additional frameworks where developed and developing countries can cooperate equally.

Develop a broad concept of dual-use technology governance.

Traditional non-proliferation regimes are based on an intergovernmental approach to international security. Yet, there is an emerging consensus that, against the background of the diffusion and spread of dual-use technologies, a broader, governance-based approach is more effective in tackling proliferation challenges. International organizations, governments and non-state actors will all have to play a role in ensuring that dual-use technologies are not misused for hostile purposes.

Because the dual-use problem is ubiquitous, any effective approach to the problem will have to be comprehensive and global in reach.

Based on an analysis of the misuse potential of several chemical and biochemical dual-use technologies, Kirk Bansak and the late Jonathan Tucker have concluded that "technological artifacts do not pose an inherent or inevitable risk of misuse. Instead the mediating influence of social processes is required for a technology to be misapplied for hostile purposes." (Bansak/Tucker 2012: 327) Effective governance, they write, "should start at the national level and, if the technology has spread to other countries, should include efforts at international harmonization." (Bansak/Tucker 2012: 328) They argue that creating a level-playing field on dual-use technology transfers is important because gaps in regulations might create "safe havens" for proliferators and "inconsistent governance measures from country to country would tend to increase the burden of regulatory compliance and hamper innovation." (Bansak/Tucker 2012: 333) The "decision-framework for technology governance" they propose envisages a periodic review of the risk of misuse and governability of dual-use technologies and could serve as a starting point and possible blueprint for establishing more effective control mechanisms. (Bansak/Tucker 2012: 322)

Governance approaches work well within pluralistic states and between cooperative states that pursue similar goals. Yet, such approaches quickly run into difficulties when they are supposed to tackle proliferation problems in non-cooperative states or when there are serious non-compliance problems. A key challenge will be to bring traditional, state-based non-proliferation instruments in line with novel governance approaches on WMD non-proliferation so that they can involve novel stakeholders without losing their ability to detect, deter and penalize non-compliant behavior.

"Mind the gaps": Apply governance approaches to unregulated technologies.

Some dual-use technologies could turn out to be global "game changers" with significant potential for increased conflict and damaging societies, yet they are not regulated at all or, if so, only in a rudimentary fashion. (Global Trends 2030: 64) Missiles, for example, are a mature dual-use technology that has so far largely defied regulation. The civil use of space is of increasing economic importance. Eleven countries possess space launch capabilities, more than 60 operate satellites. (Zenko 2013) Many of these countries, in principle, are also capable of using these technologies for offensive military operations. International cooperation on the civil use will also be essential to tackle the growing threat to satellites by debris in outer space. (Mutschler 2013)

Existing regimes, such as the Missile Technology Control Regime and the Hague Code of Conduct provide guidelines for trade of certain types of missiles but "[n]ormative progress requires greater attention to the interconnectedness of all missiles." (Karp 2012) At the

same time, the spread of missiles is increasingly viewed as an important threat to international security, leading to the establishment of missiles defences, which not only require substantial investments, but may also have counterproductive effects on international security by triggering new arms races.

Information technology is an example of a novel technology where efforts to prevent its misuse are only at an embryonic stage. Here, the problem of controlling “intangibles”, i.e. technology that is not bound to hardware or materials, is at its most extreme. Cyber attacks differ in many ways from traditional security threats. Cyber weapons are immaterial; they can be developed without access to a specific military infrastructure. Their effects can be felt instantaneously, yet it is often extremely difficult, if not impossible to attribute such attacks to a perpetrator. (Clarke 2012)

Because the potential for disruption of our way of life through cyber attacks is so great, several states have begun to explore ways to define norms and possibly rules that would help to reduce the risk of hostile uses of information technology. Given the dual-use nature of cyber technology it is not surprising that international efforts to prevent the misuse of information technology focus on governance approaches. International codes of conduct and other instruments that aim to provide rules of the road for governments and non-state actors currently appear to be among the most promising answers to address the risks associated with cyber warfare. (Melzer 2011)

The question is: What lessons might be learnt from existing mechanisms to regulate the transfer of dual-use technologies and how could they be applied to other areas where no or few such regulations exist?

Finding the right balance between cooperation and control on dual-use technology transfers will remain a key issue for global non-proliferation efforts. This is a long-term exercise, particularly against the background of the shortcomings of past efforts to tackle the proliferation through coercive measures. (Meier/Daase 2012) The terrorist attacks of 11 September 2001 have increased the importance of the topic. Two key challenges will be keeping political attention on improving dual-use technology governance and bringing relevant actors to the table.

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