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UNSCR 1540 CIVIL SOCIETY FORUM

A DIALOGUE WITH ACADEMIA AND CIVIL SOCIETY

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UNSCR 1540 Civil Society Forum

A Dialogue with Academia and Civil Society

11-12 April 2016
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Research papers submitted by forum participants, as part of civil society input to the 2016 comprehensive review of the status of implementation of resolution 1540 (2004)

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Resolution 1540 (2004) Events Organized by Academic Institutions and NGOs, 2010-2015

1540 Group of Experts

April 4, 2016

Implementation of the obligations of 1540 is within the domain of States. Full and effective implementation can only be achieved by their individual efforts. It also requires more robust efforts, including, for example, cooperation and dialogue between themselves and with international and regional organizations and others; sharing information and best practices; and providing assistance where appropriate and necessary.

State actions alone may not suffice to achieve full and effective implementation everywhere. It also requires the participation and cooperation of all elements of civil society. This includes academia and other institutions that conduct research, educate, or promote dialogue on implementation of resolution 1540 (2004). The primary organizations that pursue these activities are universities and colleges and non-governmental organizations, including professional societies.

Such activities will benefit effective implementation of the resolution because, for example, they:

- broaden public awareness of its importance;
- improve understanding of measures need to implement resolution 1540 (2004), for example export controls or security arrangements;
- facilitate sharing of practices that are effective in implementation;
- identify obstacles to implementation as well as measures that can remove them; and
- provide inputs to the Committee about what measures have been successful and which have been less so.

At the same time, implementation of the obligations of resolution 1540 (2004) also has a direct impact on elements of civil society. One example is the application of export controls, which directly affects industry, but it also affects academia. This is especially so for research scientists and educators whose work advances and/or promulgates technologies of relevance to the design, manufacture, or use of WMD or their means of delivery.

Already a subject of attention, there is a need to better understand impacts of technology transfer and the emergence of new technologies and to enlist the cooperation of the academic community in addressing them. This will require dialogue and guidance.

An example of the former is the workshop held in London in 2014 that was organized by King's College, London. It addressed itself to "Preventing Proliferation through Intangible Technology Transfer and Balancing Academic Freedom and Non-proliferation: A Role for UNSCR 1540?"

A more recent example of the latter is the publication by the United Kingdom in 2015 of an effective-practices paper providing guidance to educators and a toolkit for implementing export controls and vetting students. While the guide is intended for university practitioners on the export control legislation on the transfer of technology applicable in the United Kingdom, it may also serve as a model for others to draw from in addressing the same issues.

These two examples are representative of activities that are relevant to the topics addressed by this workshop.

Annexes 1 and 2 contain a listing of all events organized or sponsored by universities and colleges and non-governmental organizations in which the Committee and its Group of Experts participated in 2010-2015. They are categorized as academic events and events organized by non-governmental organizations (NGO).

Each event is also categorized by its subject: nuclear (NW), chemical (CW), biological (BW). Many events, for example those on export controls, covered all three (NW/CW/BW). The following table tabulates how many events were in each category.

Subject of Event	Academic	NGO	Total
NW/CW/BW	12	13	25
NW	1	4	5
CW	-	1	1
BW	5	5	10
CW/BW	-	1	1
Total	18	24	42

Comment

In studying the listing of events, it should be borne in mind that the 1540 Committee and its Group of Experts did not directly organise any of the events concerned. Their participation was in response to invitations. Funding sources for the events range from governments to private foundations, and the topics selected reflect their priorities.

Thus, during the period concerned there was not a strategy for engagement with academia and non-governmental organisations. Without a substantial funding source dedicated to support events involving academia and NGOs, the development of such a strategy will be impeded. (One funding opportunity that emerged at the 2016 Nuclear Security Summit is the “Civil Society Gift Basket” provided by the Carnegie Corporation of New York and the John D. and Catherine T. MacArthur Foundation. In the “Basket,” they commit to invest up to \$25 million over the course of 2016 and 2017 to support non-government organizations for work to secure nuclear materials and reduce the threat they pose.)

The majority of the events covered all three types of weapons of mass destruction. This inevitably means that the three weapons areas were not always dealt with in depth. It is interesting to note that the highest number of events dedicated to one of the three weapons categories concerned biological weapons. It is difficult to offer an explanation for this except to observe that there is not an international organisation, equivalent to the IAEA or OPCW, dealing with the biological sector.

It is not practicable to measure the impact of these events since they were not planned against a set of criteria and a strategy, and they developed mostly independently of each other. It would be possible to quantify the number of participants and identify the sectoral and geographic scale of participation. However, to gain more insight, it would be necessary to identify metrics for impact and means to assess them. This might, for example, include the follow-up interviews with a representative sample of participants. In any case, additional human and financial resources would be needed to do this.

In light of the above, we invite participants to consider ways to enhance the value of such engagements, including the following questions for discussion:

- Is it desirable and practicable to develop a strategy, or at least guidelines, for the Committee's interaction with academia and NGOs?
- To what extent should the Committee seek to encourage professional associations or societies to engage in activities that support implementation of resolution 1540 (2004)?
- Should there be a preference for events related to any one of the three topical areas, NW, CW, or BW?
- What is the best way to measure the success or impact of academic and NGO events?
- What is the best way to encourage funding support for events to be organised by academia and the NGO community (from governments, research institutions and private foundations)?
- Reviewing the list of institutions involved since 2010, are there important institutions missing and how can we encourage a wider geographic involvement?

ANNEX 1: EVENTS ORGANIZED BY ACADEMIC (TEACHING AND RESEARCH) INSTITUTIONS

YEAR	LOCATION	EVENT TITLE/DESCRIPTION	TYPE OF EVENT	ORGANIZER	SPONSOR
2010	United States	Workshop on strategic trade control for Algerian Government Officials	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	U.S. Department of State's Export Control and Related Border Security Assistance Program (EXBS)
2010	Austria	Legal Framework for Strengthening Nuclear Security and Combating Nuclear Terrorism	NW	Center for International Trade and Security, University of Georgia (CITS/UGA)	Institute of World Economy and International Relations of the Russian Academy of Sciences (Russia)
2010	United States	The 10th Export Control Academy	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	
2011	Saudi Arabia	Arab Regional Workshop on "Monitoring and Securing Movement of Goods and Individuals from Terrorist Threats"	NW/CW/BW	League of Arab States	Naif Arab University for Security Sciences
2011	Indonesia	Nonproliferation and Strategic Trade Management: the Nexus of Security and Economic Development	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	Nuclear Energy Regulatory Agency of Indonesia (BAPETEN)

2011	United States	Workshop on "Legislative Gap Analysis vis-à-vis UNSCR 1540: Status of Regulatory Framework in the Caribbean Community",	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	
2013	United States	The 16th Security and Strategic Trade Management Academy	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	
2013	Switzerland	Side event entitled "Recent Advances in Biosecurity Education" at the Biological Weapons Convention (BWC) Meeting of Experts	BW	Wellcome Trust Dual-Use Bioethics Group at the University of Bradford, UK	
2013	United Kingdom	International meeting on Biochemical security 2030 - towards improved science-based multilevel governance	BW	University of Bath, UK	
2013	Croatia	International Workshop on Science Needs for Microbial Forensics: Developing an Initial International Roadmap	BW	Croatian Academy of Sciences and Arts	U.S. National Academy of Sciences
2013	United States	The 17th Security and Strategic Trade Management Academy	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	
2013	Switzerland	Developments in science and Technology	BW	University of Bath, Biochemical Security 2030 Project (UK)	

2013	Switzerland	Monitoring compliance relevant data - Launch of the Hamburg Research Group's trade monitoring website	BW	University of Hamburg	Research Group for Biological Arms Control (Germany)
2014	United States	The Fall 2014 Security and Strategic Trade Management Academy (SSTMA)	NW/CW/BW	Center for International Trade and Security, University of Georgia (CITS/UGA)	
2014	United Kingdom	Workshop "1540 Ten Years On: Challenges and Opportunities"	NW/CW/BW	King's College London	
2014	United Kingdom	Workshop "Preventing Proliferation Through Intangible Technology Transfer And Balancing Academic Freedom and Non-proliferation: A Role for UNSCR 1540?"	NW/CW/BW	King's College London	
2015	South Africa	Lecture on 1540 related subjects at the Nelson Mandela Metropolitan University	NW/CW/BW	Nelson Mandela Metropolitan University	
2015	South Africa	Lecture on 1540 related subjects at the University of Cape Town	NW/CW/BW	University of Cape Town	

ANNEX 2: EVENTS ORGANIZED BY OTHER NON-GOVERNMENTAL ORGANIZATIONS

YEAR	LOCATION	EVENT TITLE/DESCRIPTION	TYPE OF EVENT	ORGANIZER	SPONSOR
2010	Russia	2010 Moscow Non-proliferation Conference: Nuclear, Energy, Disarmament, and Non-proliferation	NW/CW/BW	Moscow-based Center for Energy and Security Studies (CENESS)	
2011	Finland	International Aspects of Arms Trade Treaty Implementation: Exploring Key Issues	NW/CW/BW	Saferworld	
2011	Germany	Seminar on Combating WMD and Terrorism	NW/CW/BW	George C Marshall European Center for Security Studies	
2011	Belgium	Workshop on the future of the Nuclear Suppliers Group and the international nuclear trade regime	NW	Carnegie Endowment for International Peace	MFA Netherlands
2011	Italy	The third annual international symposium on "Biosecurity and Biosafety: Future Trends and Solutions"	BW	Clinical Microbiology Laboratory of the Luigi Sacco University Hospital in Milan	
2011	Poland	Seminar on development of the international centre for chemical safety and security	CW	Municipality of Tarnow and Azoty Tarnow (a major chemical plant in Poland)	Polish Chamber of Chemical Industry
2011	Austria	Prospects for Nuclear Security Partnership in Southeast Asia	NW	James Martin Center for Nonproliferation Studies (CNS)	Vienna Center for Disarmament and Non-Proliferation (VCDNP)

2012	Belgium	European Security and Defence College (ESDC) Course on Non - proliferation of WMD and their delivery systems	NW/CW/BW	Federal College for Security Studies (BAKS) in Berlin	Institute for Higher National Defence Studies (IHEDN) in Paris
2012	United States	UNSC Resolution 1540 (2004) Implementation on the African Continent	NW/CW/BW	Hosted by the Stimson Center	
2013	Republic of Korea	Asan Nuclear Forum 2013	NW	Asan Institute for Policy Studies	
2013	United States	Conference on UNSCR 1540: Fostering Regional Momentum	NW/CW/BW	Stanley Foundation	
2013	China	Meeting on Applications for and Security Aspects of Synthetic Biology	BW	International Council of Life Sciences (ICLS)	BGI
2013	Croatia	Seminar on Effective Practices of the Implementation of UNSCR 1540	NW/CW/BW	Regional Arms Control Verification, Implementation and Assistance Centre for Security Cooperation (RACVIAC)	
2013	United Kingdom	Meeting the Emerging Challenge of Illicit Nuclear Procurement	NW	Wilton Park Centre (UK)	
2013	Brazil	The 8th Biosafety Congress	BW	National Biosafety Association of Brazil (ANBio)	
2013	United States	Biological risk management and the UN Security Council resolution 1540	BW	American Association for the Advancement of Science (AAAS) Center for Science, Technology and Security Policy (CSTSP) (US)	

2014	Switzerland	Roundtable “10 Years of UNSCR Resolution 1540: Global and Regional Efforts in Non-Proliferation of Weapons of Mass Destruction”	NW/CW/BW	Geneva Centre for Security Policy (GCSP)	Organization for Security and Co-operation in Europe (OSCE)
2014	Croatia	Seminar on Effective Practices of the Implementation of UNSCR 1540	NW/CW/BW	RACVIAC - Centre for Security Cooperation	
2014	South Africa	Meeting to discuss new activities to be undertaken by the Institute for Security Studies (ISS) on the implementation of resolution 1540 (2004) in Africa	NW/CW/BW	Institute for Security Studies (ISS)	Government of South Africa
2014	United States	American Biological Safety Association’s 57th Annual Conference	BW	American Biological Safety Association	
2014	Russia	2014 Moscow Non-proliferation Conference: Nuclear Energy, Disarmament, and Non-proliferation	NW/CW/BW	Centre for Energy and Security Studies (CENESS)	
2015	South Africa	Meeting of Former 1540 Committee Experts	NW/CW/BW	Institute for Security Studies (ISS)	
2015	South Africa	Round table meeting on the implementation of resolution 1540 in Africa	NW/CW/BW	Institute for Security Studies (ISS)	
2015	United States	CBW Proliferation Course for U.S. government officials	CW/BW	James Martin Center for Nonproliferation Studies	

Challenges in Emerging Threats in ASEAN and the Possible Roles of Civil Society

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ASEAN

The Association of South East Asian Nations (ASEAN) is a political and economic organisation of South East Asian countries. It was formed in 1967 by Indonesia, Malaysia, the Philippines, Thailand and Singapore. Later, Brunei joined the group. After 1995, ASEAN accepted four new members — Vietnam, Laos, Myanmar and Cambodia, which bolstered its claim to represent South East Asia. It now has two observers: Timor Leste and Papua and New Guinea.

ASEAN's aims include accelerating economic growth among its members, protection of regional stability and providing a mechanism of resolving political differences peacefully. ASEAN's co-operation style stresses respect for national sovereignty, avoiding confrontation, reaching agreement through consensus and proceeding at a pace that all members are comfortable with. Its now known as "the ASEAN Way of doing things".

Regional and Global Importance

ASEAN has a land area of approximately 1,712.00 million square miles with a population of 625 million (2013) and a GDP US 2.6 trillion. It's an economic community ranking the seventh largest in the world. It has important sea-lanes (Straits of Malacca, Sunda and Lombok Straits) and borders the South China Sea. ASEAN also borders China, India, Bangladesh, East Timor and New Guinea, and has maritime borders with India, Australia and China. Much of ASEAN trade extends to Japan and the Korean Peninsula.

Current Nuclear Activities in ASEAN Countries

Nuclear activities in ASEAN countries stem from the US Atoms for Peace Program. Currently there are six research reactors operating in the region i.e. in Indonesia, Malaysia, Thailand and Vietnam. The Philippine research reactor (the seventh) is being decommissioned. The only nuclear power plant build in the Philippines, the Bataan Nuclear power plant was never launched. Although seven ASEAN States have ambitious nuclear power programs (sixteen planned: Indonesia (4), Malaysia (2), Thailand (4) and Vietnam (6)) so far none have met the time-lines, and most have been further delayed after the Fukushima accident. Only Vietnam is realising the plants within a 10-15 year time frame.

There is an overall upward trend of both non-energy and energy-related usage of radioisotopes for medicine, agriculture and industry. Indonesian reactors generate a variety of radioisotopes for

industrial, medical and academic applications. Some local demands have increased and some are being exported to other ASEAN countries. Similar programs are being carried out in Vietnam. Cyclotrons, neutron generators and industrial gauges are being used at a faster rate in ASEAN countries.

ASEAN Security, Real and Perceived

There are a number of security related issues, some of which are old and inherent even before the formation of ASEAN. These can be divided into:

- a. Old and New insurgencies: The existence of freedom fighters within a region or community or a religious group within a state. Such cases occur in Southern Philippines, Southern Thailand and Myanmar.
- b. Political uncertainty and instability: Changes in government between civilian and military regimes, or the perception of such a possibility.
- c. Inter-State Disputes: Thailand-Cambodia border dispute, the latest development in the South China Sea conflicts due to claims on coral islands.
- d. Transnational/non-traditional security threats: There are problems related to terrorism, maritime piracy, drug trafficking, people smuggling, trans-boundary haze, etc. Many of the problems are due to porous borders and weak maritime control.
- e. Nuclear security: This may be due to weak national and international export controls of strategic items; export-import-transportation of radioactive materials and dual-use items.
- f. Power shifts and great power rivalry: These security problems may arise due to rivalry and political dominancy between China and United States; China and Japan, India and China as well security-related claims within the South China Sea.
- g. The non-state actors, the terrorists or extremist religious groups have so far not shown interest (perhaps due to lack of knowledge) in using radiological/dirty bombs within the region.

ASEAN Civilian Nuclear Considerations

The inevitable increase in demand of for fossil fuels and the upward trends in energy requirements in order to achieve economic development, industrialisation and an improved quality of life have prompted many ASEAN countries to look for alternative energy sources to sustain growth momentum. Many ASEAN countries have started opening doors and opportunities to go nuclear, citing energy security, climate change, and environmental friendly aspects as major reasons for going nuclear. Nuclear energy can be therefore be considered as long option for such states within ASEAN.

All ASEAN countries are signatories to the Bangkok Treaty, the NPT, the safeguards and other agreements, conventions and other international obligations on matters related to nuclear energy, safety and security.

ASEAN Working Group Committee

At Senior ASEAN Officials meetings in 2007, 2008 and 2009, it was agreed that ASEAN should explore nuclear as an alternative source of energy which is sustainable, safe and environmentally friendly. These special program areas and activities limited to capacity building and institutional agreement for cooperation through national and regional approaches within ASEAN.

The program areas include:

- a. Public information on nuclear energy for power generation
- b. Capacity building involving human resource development, training and education
- c. Regulatory framework and the establishment of a nuclear regulators network
- d. Emergency preparedness and response plan
- e. Cooperation among nuclear energy agencies engaging in the promotion, project development and R&D.
- f.

Nuclear Power Acceptance In ASEAN Countries

In many ASEAN countries one could always hear the public outcry against nuclear power by the Greens and other anti-nuclear groups. This is especially so after the Fukushima and Chernobyl accidents. The common outbursts include “We do not trust our politicians!” “We do not trust our local scientists and engineers!” “Our politicians are not concerned with nuclear wastes!”, “We have no competent operators to operate the plants!” , “Our government is corrupt!”, and “If this can happen in Japan, it can happen here.”

In some instances the public has been given wrong information by the media, the anti-nuclear groups or special political groups with specific agendas. When it comes to planning for nuclear power programs, there is restriction on the information given out to the general public. Governments do not encourage public debate, discussion, or publication of such programs, thus resulting in a lack of communication between the government and the general public.

Nuclear Power Programs in ASEAN

When a national nuclear power program is instituted, very often the project is delayed or shelved. This causes delays in the timeline in implementing the projects. The causes of the delays may be due to:

- a. Lack of political will by the ruling government for fear of protests and losing political power/elections
- b. Due to poor planning and the lack of infrastructure development.
- c. Scarcity of adequately trained and supported competent human resources
- d. Lack of local specialists with in depth experience
- e. Lack of public acceptance
- f. Pervasiveness of corruption

Roles of Civil Societies and NGOs in ASEAN

With the current economic development in ASEAN the roles and activities of civil society and NGOs are increasing, especially in promoting economic cooperation. In the past, they have been on the periphery, while the future may depend on their involvement in government policies and private enterprises. As ASEAN prospers economically and technologically, the civil society and NGOs will continue to grow by contributing to the well-being of ASEAN, forging links between the people of the region as well as internationally.

Challenges for ASEAN Civil Societies and NGOs

A well informed and effective civil society and NGOs can strengthen communication and co-ordination on matters related to nuclear energy across government ministries. They can strengthen media interaction programs at national and regional levels. Civil society and NGOs as groups can build a database of expert commentators across opinions. They can give a unified message to the general public by demystifying all things nuclear, and presenting nuclear energy as a viable option (and by NOT stating that “Nuclear is Best”).

Civil societies and NGOs can help government and policy makers by:

- a. Enhancing information, sharing/monitoring across clusters of government departments in all languages
- b. Conducting nuclear awareness and attitude surveys independently from government agencies
- c. Engage opinion makers, stakeholders in the planning process of introducing nuclear energy as a viable option.
- d. Engage professional bodies on skill development and economic benefits of nuclear energy
- e. Ensuring local universities introduce nuclear-related courses and capacity building and infrastructure development.

Civil Society Enhancing Communication within ASEAN Community

Civil society and NGOs can help governments and planners in communicating with the general public to accept nuclear power as an optional energy source by:

- a. Raising the level of awareness among concerned public on the benefits of nuclear power
- b. Addressing the issues being raised by the anti-nuclear lobby
- c. Creating an positive environment for the acceptance of nuclear power as a possible option in addressing the lack of generating capacity
- d. Targeting audiences such as the general public, media, decision makers, stake holders, local government units, religious communities, local media, non-governmental organisations and the private sector.

An Appeal

The issue of human capacity and infrastructure building in ASEAN has been highlighted as a major challenge by many international experts on nuclear power and nuclear security. Many ASEAN countries are striving to develop their own infrastructure and academic programs. Unfortunately, opportunities open for training in specialised areas of nuclear technology, reactor technology and plant operations, high level waste management, the fuel cycle, nuclear security, are limited within ASEAN, but there are difficulties in getting appropriate visas for those who want to do graduate studies elsewhere, or even have scientific visits or on-job training.

There are also restrictions for those who want to specialise in certain areas of nuclear technology, pursue research in advance techniques, computer coding, etc. Hence this shortfall in developing local expertise with in-depth experience.

Much institutional training is being provided on a bilateral basis. It would be better for ASEAN countries if the training was done on a regional basis so that many engineers and scientists can benefit. This would have the additional advantage of establishing the continued regional net-working.

Evolving State and Non-State Proliferation Threats and Strengthening UNSCR 1540's Role in Addressing Them

Matthew Bunn
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Both state and non-state nuclear threats remain very real – and there is much to be done to strengthen the international community's response to them, including through more effective implementation of UN Security Council Resolution (UNSCR) 1540. These threats are changing, as terrorist groups morph into different forms, state programs mature, technology traffickers develop new tactics, and technologies advance and spread.

The Threat of Nuclear Terrorism

In 2014, just before the last nuclear security summit, the testimony of the U.S. Director of National Intelligence to the U.S. Congress summarizing worldwide threats to U.S. interests did not even mention the group that now calls itself the Islamic State.¹ A few months later, the group had seized major portions of Iraq and Syria and declared a global caliphate. This makes clear that we simply do not know what the shape of the terrorist threat will be two, five, or ten years in the future – and what the risk is that the threat will include a nuclear component.

Harold Agnew, the former director of the Los Alamos National Laboratory, summarized the problem of nuclear terrorism well when he said: "Those who say that building a nuclear weapon is easy, they are very wrong, but those who say that building a crude device is very difficult are even more wrong."² Repeated government studies in the United States and several other countries have concluded that if a sophisticated terrorist group got enough highly enriched uranium (HEU) or separated plutonium, it is plausible that they could make a crude nuclear bomb.

Such material might potentially be available. There are about 20 cases that are well documented in the open literature of seizure of stolen HEU or separated plutonium. Many of these involved only a few grams of material, but often the smugglers asserted that what was seized was only a sample of a much larger stock – and some cases involved kilograms of material.

¹For a recent summary of the nuclear terrorism threat, see Matthew Bunn, Martin B. Malin, Nickolas Roth, and William H. Tobey, *Preventing Nuclear Terrorism: Continuous Improvement or Dangerous Decline?* (Cambridge, Mass.: Project on Managing the Atom, Belfer Center for Science and International Affairs, Harvard Kennedy School, March 2016), <http://belfercenter.ksg.harvard.edu/files/PreventingNuclearTerrorism-Web.pdf>.

² Quoted in Committee on Foreign Relations, *Dirty Bombs and Basement Nukes: The Terrorist Nuclear Threat*, U.S. Senate, 107th Congress, 2nd Session March 6, 2002, p. 22. Siegfried Hecker, a subsequent director of Los Alamos, frequently makes the same summary assertion, attributing it to Agnew. Personal communication, December 2010.

Both the Japanese terror cult Aum Shinrikyo and al Qaeda actively sought to acquire nuclear weapons. Al Qaeda had a focused program with a designated “nuclear CEO” – whose whereabouts today are unknown – that included multiple attempts to get nuclear bomb material and to recruit nuclear expertise, and progressed as far as conducting crude tests of conventional explosives for the bomb program in the Afghan desert.

To date, there is no publicly available evidence that the Islamic State is pursuing a similar focused nuclear weapons effort. But the group’s apocalyptic rhetoric, envisioning a final war between itself and the “crusader” forces, suggests a need for very powerful weapons, and recent incidents such as the in-depth monitoring of a senior official of a Belgian facility with substantial stocks of HEU are worrying indicators of possible nuclear intent. If the Islamic State does turn to seeking nuclear weapons, it has more money, more people, more territory under control, and more ability to recruit experts globally than al Qaeda at its strongest ever had.

These facts, and the large uncertainty surrounding the future threat, make a strong case for doing everything possible to implement the UNSCR 1540 provisions that obligate all states to provide appropriate effective security, physical protection, and accounting for all nuclear weapons and related materials. UNSCR 1540’s requirement for effective border control is also important – though very challenging for many states to implement.

The technologies of nuclear explosives have existed for decades, and for now, evolving technology is changing the threat only modestly. Evolving technology may also strengthen the world’s ability to respond to the threat – for example, through the use of big data and analysis of social media to help uncover terrorist plots, or the use of large numbers of low-cost networked detectors to increase the chance of detecting nuclear material on the move. New high-density fuels now in development should make it possible to phase out the civil use of HEU (and many research reactors can be replaced with particle accelerators); new technologies are also offering alternatives for many uses of dangerous radiological sources; and nuclear reactors with increased use of passive or inherent safety will make it far more difficult for terrorists to cause a major radioactive release through sabotage.

Evolving State Proliferation Threats

While the state proliferation threat also remains very real, the problem is not as widespread as it is sometimes made out to be. Today, there are nine states that have nuclear weapons – just as there were a quarter century ago. (North Korea joined the list, but South Africa became the first case of a state deciding to give up nuclear weapons that it built and controlled itself.) To have no net increase over 25 years that included all the chaos following the collapse of the Soviet Union; the export operations of the black-market nuclear network led by Pakistan’s A.Q. Khan; and secret nuclear weapons programs in Iraq, Iran, Libya, Syria, and North Korea is an amazing public policy success story. There are today more states that started nuclear weapons programs and verifiably gave them up than there are states with nuclear weapons – which means our efforts to talk states out of it succeed more often than they fail, even in the rare cases when states start down that path in the first place. All but a handful of states are party to the

nuclear Nonproliferation Treaty, committing them not to acquire nuclear weapons, and to accept international inspections; never in human history has the most powerful weapon available to our species been so widely foresworn.

Today there is only one state – Iran – that does not already have nuclear weapons but whose nuclear program raises serious proliferation concerns. And even Iran has entered into an agreement with P5+1 under which it agreed to roll back its enrichment capability by two-thirds, ship almost all of its enriched uranium stock out of the country, and accept much broader inspections.³ But looking back over the history of the nuclear age, the states that were of concern 40 years ago were very different – and one can expect that other states will pose concerns in the decades to come.

Even today, a number of states continue to shop for technologies related to nuclear weapons or missiles through illicit channels, making UNSCR 1540's requirements for appropriate effective export controls, transshipment controls, and border controls especially important. All of these are challenging to implement, particularly for states with few resources. Yet there were good reasons for UNSCR 1540 to obligate *all* states to take action in these areas. After all, in the case of the A.Q. Khan network, centrifuge components were being made at a factory in Malaysia, and integrated in Dubai; in the future, any other countries could see similar activity taking place.

Technology is changing the state proliferation picture more substantially. Decades ago, Saddam Hussein's procurement agents were told to only buy from companies in the United States and Europe; today, technology with quality sufficient to support a nuclear weapons program is available much more broadly. And with the rise of 3-D printing, some technologies will become still more difficult to control. Over the long term, there is no physical law that rules out the possibility that someone may invent ways to enrich uranium that are even easier to develop and easier to hide than gas centrifuges.

Here, too, evolving technology can help nonproliferation as well as proliferation. There are many areas where big data and new data sources – from commercial satellites to social media – can add to the ability to verify nonproliferation obligations and uncover illicit trafficking. Some new nuclear energy systems may offer the potential for reduced proliferation risk from the civil sector.

Stronger Implementation of UNSCR 1540

As the comprehensive review of UNSCR 1540 proceeds this year, several areas should be considered to strengthen its effectiveness.

- **Additional coverage.** In the nuclear space, UNSCR 1540 covers nuclear weapons and “related materials.” It does not obligate states to protect nuclear facilities (or facilities with deadly

³ For an analysis of the Joint Comprehensive Plan of Action, see Gary Samore, ed., *The Iran Nuclear Deal: A Definitive Guide* (Cambridge, Mass.: Belfer Center for Science and International Affairs, Harvard Kennedy School, August 2015), <http://belfercenter.ksg.harvard.edu/files/IranDealDefinitiveGuide.pdf>.

chemicals, for that matter) from sabotage. Nor does it require security for radiological materials that might be used in a so-called “dirty bomb.” Terrorist action in these areas could also pose threats to international peace and security. The review should consider whether additional Security Council action to strengthen international efforts in these areas is needed. Financing of proliferation and of terrorism is another area that might be more extensively covered.

- **Better definition of what is required.** UNSCR 1540 requires states to put in place “appropriate effective” measures in areas ranging from nuclear and biological security to export controls. But no one has ever defined what the essential elements of an “appropriate effective” nuclear security system or an “appropriate effective” export control system are. This job is likely beyond the expertise and political mandate of the Committee and the Group of Experts. But a group of interested member states could get together and develop a common understanding of what they saw as the essential elements, and work to build broad support for that approach. For example, in the case of what measures are needed for an “appropriate effective” security system for nuclear weapons, it might make sense to begin with an experts’ discussion among the P5, later broadening it out to other states.⁴
- **Better targeted assistance for implementation.** The donor states joined in the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction have focused much of their effort in recent years on helping states implement their UNSCR 1540 obligations. But the task of setting priorities among the many different specific obligations and the many countries that need to implement them is a daunting one, and better mechanisms for doing so are needed.
- **Aligning implementation with other incentives.** For many countries, focused on immediate problems, countering proliferation is a low priority. But there are many areas where steps to control proliferation could reinforce efforts states care more about, or could align with commercial incentives. Better border controls, for example, can help control smuggling of drugs, people, and guns, not just proliferation-sensitive items – and some new detector technologies may be able to detect radioactive material, drugs, people, and more inside a container. The international community should look for these win-win options to align incentives.⁵
- **Better, and more accessible, assessments of implementation.** The Committee and the Group

⁴ For one effort to define the essential nuclear security and accounting elements required by UNSCR 1540, see Matthew Bunn, “Appropriate Effective’ Nuclear Security and Accounting - What is It?” paper presented at the Global Initiative/UNSCR 1540 Workshop on “Appropriate Effective Material Accounting and Physical Protection,” Nashville, Tennessee, July 18 2008, <http://belfercenter.ksg.harvard.edu/files/bunn-1540-appropriate-effective50.pdf>

⁵ The Henry L. Stimson Center in Washington, D.C., has had a number of projects exploring efforts at such incentive alignment. See, for example, Brian Finlay and O’Neil Hamilton, “Sustaining Proliferation Prevention: Gaining Ground in the Global South” (Washington, D.C.: Stimson Center, February 23, 2011), <http://www.stimson.org/content/sustaining-proliferation-prevention-gaining-ground-global-south>; Debra Decker and Kathryn Rauhut, *Nuclear Energy: Securing the Future: A Case for Voluntary Consensus Standards* (Washington, D.C.: Stimson Center, January 28, 2016, <http://www.stimson.org/sites/default/files/file-attachments/Nuclear-Energy-web-122315.pdf>).

of Experts have done the international community a great service in developing, populating, and making available the UNSCR 1540 matrices. But there is a need for more real on-the-ground assessment of the quality of implementation. The Croatia-Poland peer review a few years ago is an important step in the right direction. Ways should be found to encourage broad use of peer reviews in each of the substantive areas of UNSCR 1540 implementation. And data on UNSCR 1540 implementation should be made more easily available in forms that civil society can use and analyze. For example, all the matrices could be made available in a single data file, permitting statistical analysis, correlation with other datasets (such as World Bank governance indicators), and more.

The world has done a great deal to put controls in place to block terrorists and states seeking nuclear weapons and related technologies. But the struggle to prevent proliferation is a never-ending one, as those seeking these technologies constantly find ways to get around existing controls. Both nuclear security and nuclear nonproliferation controls must focus on continuing improvement in the face of an evolving threat, changing technologies, and the ongoing discovery of new vulnerabilities.

Miniaturization Technologies: Effects on the Means of Delivery of Nuclear, Chemical and Biological Weapons

Angelo Minotti
Sapienza University of Rome

The 1540 UN Resolution affirms that *“proliferation of nuclear, chemical and biological weapons, as well as their means of delivery, constitutes a threat to international peace and security”*.

According to the UN Resolution, the means of delivery are *“missiles, rockets and other unmanned systems capable of delivering nuclear, chemical, or biological weapons, that are specially designed for such use.”*¹

Probably, today, the concept of *“specially designed”* should be revised, because the threats evolve with technologies, making possible the adoption of *“means of delivery”*, for non-peaceful purposes, which were unthinkable just a few years ago.

Such *“new”* means of delivery are not, at the present time, considered *“specially designed”* but they could be adopted for non peaceful purposes because they are technical capable to fulfil that goals.

Therefore, the delay between the unconventional use of uncontrolled items and their being recognized by the scientific/technical/legal international boards, as *“specially designed means of delivery”*, is crucial.

The Micro Electrical Mechanical Systems (MEMS) are surely part of this game, because they can provide systems of delivering almost impossible to be controlled due to their extremely small dimensions.²

Unfortunately, it is true that terrorist attacks are changing their approach, carrying out their threats simultaneously in several zones, even in the same city (last Paris attacks are a clear example).

This might be addressed to two main reasons, the accuracy of cross-checking controls of illicit trades of means of delivery such as missiles, rockets etc., and the purpose of keeping the available police busy in order to delay the rescue operations in all the zones under-attack.

Probably, the trend of the emerging threats will be smaller but more numerous, punctual and effective simultaneous attacks.

¹ United Nations, Security Council, S/Res/1540 (2004), [http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/1540\(2004\)](http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/1540(2004))

² Carlos Fernandez Pello, A. *“Micro-power generations using combustion: using and approaches”*, Colloquium: 14. New Concepts in Combustion Technology. Micro-combustors. Prepared for presentation as a Topical Review at the Twenty-Ninth International Symposium on Combustion, July 21-26, 2002, Sapporo, Japan.

In the light of this, miniaturized items are surely sensitive items. MEMS technologies and systems are characterized by having dimensions in the range $0.001 < [\text{mm}] < 1$. Besides this, there are also meso-systems that are characterized by overall dimensions in the range $1 < [\text{mm}] < 10$.

Micro and meso systems are made up of components of micro or, even, nano dimensions.

The field of micro-meso thermo-electric/electronic devices is rapidly developing under the pressure of evermore stringent requirements posed by the increasing technological need of portable power generation.³

Among them, an important role is played by the micro-meso-combustion systems, for which there are at least three main areas of interest: terrestrial and marine propulsion, UAV (“Unmanned Aerial Vehicles”), even for tactical uses, and portable electrical power generation.⁴

Nowadays, combustion chambers of few millimetres of diameter are available; they adopt catalytic walls to speed up the chemistry and/or radial and tangential injection ducts to impose swirling motions inside the chambers and then to increase the residence time.

All that permits to reduce the overall volume of the chamber, see Fig.1, and then of the final system.

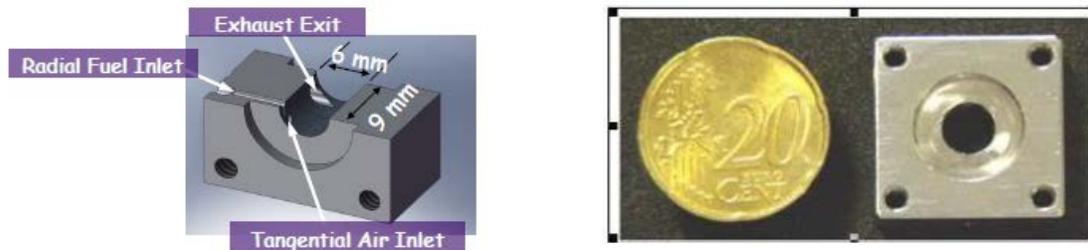


Fig.1 Swirling chambers structure (left) and dimensions (right)

These chambers might be connected to micronozzles, or to microturbines, see Fig.2-left, in order to define microthrusters, see Fig. 2-right, or micro power generators.

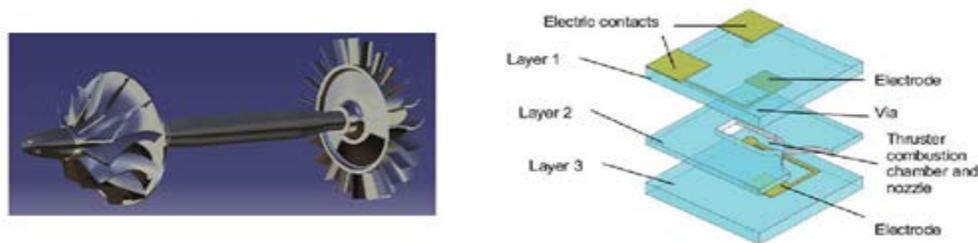


Fig.2 Microturbine (left) and microthruster (right)

³ Minotti, A. and Sciubba, E. “LES of a Meso Combustion Chamber with a Detailed Chemistry Model: Comparison between the Flamelet and EDC Models”, *Energies* 2010, 3, 1943-1959; doi:10.3390/en3121943.

⁴ Ibid.

Moreover, it is well known that liquid fuels have energy density levels much higher than the most advanced batteries see Fig. 3.⁵

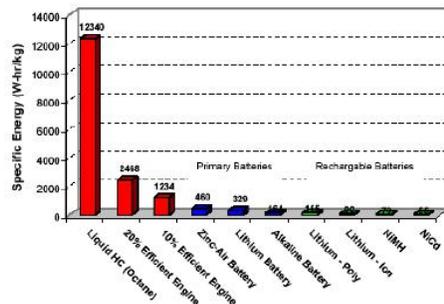


Fig.3 Energy density, liquid fuels vs batteries

Then, in theory, it is possible to increase the operativity range of a delivery system, taking fixed its dimensions, or it is possible to reduce its dimensions, taking fixed its operativity range, just modifying the powertrain, from electrical to combustion mode.

Even though this law does not scale linearly,⁶ because viscosity effects, such as greater heat losses and lower mixing levels, increase as the Reynolds numbers decrease, the reduction factor is, in any case, significant.

Direct applications of these miniaturized technologies might be, in the near future, for instance:

- micro-missiles, with a small “unconventional” payload and short range;
- new kind of small UAV, adopted as means of delivery, with longer lifetimes and/or heavier payloads, see Fig. 4;
- micropropulsion systems for micro/nano/picosatellites used as antisatellite weapons (ASAT).

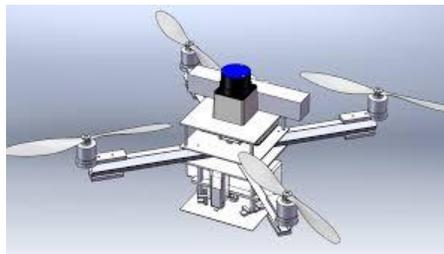


Fig.4 Quadcopter UAV

It is, therefore, evident that the threat is in the possibility to organize hundreds of attacks, in particular with biochemical weapons, each of which is capable of harming from to ten to hundred people, because miniaturization permits to slip through control, being smaller than the smallest “control-filter” dimension.

⁵ Carlos Fernandez Pello, A. “Micro-power generations,” 2002.

⁶ Bruno, C. 2001. Chemical Microthrusters: Effect of Scaling on Combustion. AIAA Paper 2001–3711.

Scientific Developments in the Biological Areas of Concern in Relation to Proliferation by Non-State Actors

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This presentation will focus on biological threats. Somewhat neglected, rapid recent advances and easily put to dual use. Attempts to extrapolate nuclear regulations to biological areas are clearly not feasible.

Many biological innovations that have many positive benefits in human health and well-being may also be used to facilitate harm to humankind in the form of activities related to the production biological weapons. This has been mainly due to the erosion of the barriers to acquiring and utilising these technologies for the production of biological weapons and will no doubt, be even more difficult to monitor and control in the years to come. Recent advances in the biological sciences, although increasing the contribution to fighting human and animal diseases, can also be put to malicious use. These advances and products include:

- Natural pathogens; these include a host of natural human, animal and plant natural pathogens such as Ebola.
- Modified Pathogens; these include pathogens with enhanced virulence, altered host specificity, etc.
- Synthesis of existing agents. Non-specialists can now produce “gene cassettes” containing virulence factors and small peptides, bio regulators and toxins by chemical synthesis. The design and synthesis of novel compounds have been simplified by the ready availability of genetic engineering platforms and sophisticated bioinformatics and chemical modelling tools.
- Modification of genes using gene editing technologies such as the CRISPR/CAS9-mediated ‘gene driver’ or ‘gene silencing’ system to produce more virulent, harmful and drug resistant strains of natural pathogens. CRISPR/CAS-9 gene editing does not leave any ‘fingerprints’ to distinguish between natural genetic events and designed genetic modifications thus impeding forensic investigations into differentiation between natural variations and modified strains. Hundreds of laboratories have this capability as the technology can be bought “off the shelf”. There are even reports of this being done in a home-made laboratory.¹
- Nanoparticle formulations that has led to improved drug delivery to cross barriers and penetrate previously unreachable sites.

The Global Ability to Deal with Disease Outbreaks

Many countries (especially Developing Countries) have limited capacity to deal with infectious disease outbreaks, regardless of whether the outbreak is naturally occurring or the result of a malevolent act.

¹ Gibney, E. (2016). Nature 531, 147 -148

The recent Ebola outbreak serves to highlight the unpreparedness of many countries and even global organisations to fight disease outbreaks. The consequences could even be more devastating when one considers introduced genetic changes in disease vectors. Just one example is the influenza virus where selected mutations confer aerosol transmission in mammals², improve its affinity for human-like airway receptors³ or confer an ability to bind to both human and avian receptors.⁴

Genetic and Structural Analysis

The identification and characterization of genetic components associated with changed susceptibility to toxins such as:

- Identification of genes required for intoxication from Ricin and Pseudomonas exotoxin⁵
- Natural human genetic variation that determines sensitivity to anthrax toxin⁶
- Readily available sequence and data for snake venoms⁷
- Genetic elements associated with Botulinum neurotoxins.

The consequences of inappropriate implementation of such information could result in:

- Specific targeting of population groups based on genotype with increased sensitivity.
- Use individuals with toxin resistant genotypes to act as couriers for the distribution of toxins.

Nanoparticle structure-function relationships has led to improved drug delivery vehicles. The range of nanoparticle-based drug delivery platforms has increased and now includes formulations that can cross barriers and penetrate previously unreachable sites. Nanoparticles can now be designed to enhance the activity of their payload or to overcome its rapid metabolism. This reduces costs and increases efficiency by reducing the amount of payload needed, reducing threshold activity requirements for effective payloads, or prolonging their action by extending their effective life time. Controlled release of payloads, for example by remote activation or environmental response, reduces side effects.

The range of nanoparticle-based drug delivery platforms has increased and now includes those designed to cross boundaries and penetrate previously unreachable sites resulting in enhanced tissue penetration, delivery across the blood-brain barrier, elevated oral absorption rates, slower metabolism of drugs and improved drug activity.⁸

² Herfst et al (2012). *Science*. 336:1534-1541; Zhang et al, (2013). *Virology*. 10:204; Sutton et al, (2014). *J Virol*. 88:6623-6635; Wei et al (2014). *J Virol*. :11981-11994

³ Herfst et al (2012).

⁴ Shi et al (2013). *Science*. 342:243-247

⁵ Moreau et al (2011). *Dev Cell*:21:231-244

⁶ Martchenko et al (2012). *Proc Natl Acad Sci U S A*. 109:2972-2977

⁷ Vonk et al (2013). *Proc Natl Acad Sci U S A*. 110:20651-20656

⁸ Rasko et al (2011). *Proc Natl Acad Sci U S A*. 108:5027-5032; Tong et al (2012). *Int J Nanomedicine*;7:1069-1078; Jin et al (2013). *Colloids Surf B Biointerfaces*.112:421-428; Verma et al (2013). *Phys Chem Phys*. 15:17016-17028; Couvreur P. (2013). *Adv Drug Deliv Rev*.65:21-23.

Differentiating Between Deliberate and Natural Outbreaks

There have been advances in using genomics to differentiate between deliberate and natural outbreaks. These include:

- Gene sequencing to differentiate between an agent of interest from natural microbes, and to identify organisms that may be of unnatural origin and possibly link these harmful pathogens to production facilities;⁹
- Insights into the geographic origins of agents by identifying sequence differences between isolates as has been done in the recent Ebola epidemic using miniaturised and portable DNA sequencers.

Diagnostic equipment, such as PCR machines that are suitable for use in resource limited settings has been developed that allows the establishment of makeshift laboratories. Smaller facilities using smaller equipment increases the range of potential sites and reduces many of logistical challenges. Outsourcing of biological production needs to prevent the use of their services in activities prohibited by the BWC; the tools and technologies available for synthesizing agents have improved and become more accessible, this would require companies to be compliant and get background information on the clients, how does one enforce this? For example, desktop gene synthesizers are now commercially available. The potential for non-specialists to use DNA synthesis to acquire pathogens has been demonstrated in reconstituting a virus from commercially-produced gene cassettes.

Virulence and other biological features of pathogens can now be more easily optimised for use in biological weapons. Some enhanced pathogens have already been produced in research laboratories and it is not difficult for someone equipped with the basic knowledge to reproduce such modified strains from published data. Crucial information is readily available to non-State actors on various web sites (especially the dark web).

The convergence of the sciences such as chemistry, nanotechnology and therapeutic design gives rise to a number of potential future scenarios for concern. Situations such as, for example, where the mechanism of action is not clearly 'chemical' or 'biological', where components are significantly different from existing biological systems, or where inorganic materials mimic biological function, thereby having a biological effect.

Given the logarithmic increase in the rate of progress and the significant advances in biomedical research, it is difficult to predict exactly when such potential threats may become a reality. However, States Parties should proactively consider the implications of these scenarios in order to provide a window of opportunity to develop and take appropriate actions.

⁹ Rasko et al (2011). Proc Natl Acad Sci U S A. 108:5027-5032

Biotechnology is an increasingly important global manufacturing technology and burgeoning 'bio-economy' is therefore a potential target for hijacking into cheaper biological weapons industry that could replace most of the expensive conventional arms manufacturing industry. The devastation caused during insurgency and armed conflict will also be less conspicuous compared to conventional weapons (cf the recent Brussels airport attack, would the images have shown the real impact of the destruction had the insurgents used a biological weapon? Would the public reaction have been the same?). The BWC currently prohibits the use of agents that cause harm to humans, animals and plants and it is not clear whether their production is covered by existing laws and how their production and distribution are monitored and controlled. Is there any control on items that can eventually end in up in the hands of non-State actors?

In many instances pathogens and modified strains are stored in non-secure facilities at academic and research institutions. There is a dire need for education and outreach to create awareness of dual use in biological research amongst the scientific community and the provision of responsible mentorship and the implementation best practices for all researchers.

Monitoring Developments in Science and Technology

It is crucial to ensure that new knowledge and techniques are used to peaceful intent and that inappropriate use and breach of the BWC is carefully monitored. This requires a clear understanding of how innovations in the biosciences might impact on the BWC. It is therefore essential that effective arrangements be put in place to identify specific threats imposed by new technologies in the biosciences and to evaluate these threats in the context of the BWC, followed by specific action to counteract the threats.

Setting up a structure to systematically assess the risk of new technological developments is vital in assessing the possible threats posed by non-State parties. All parties (policymakers, Academia, etc) need to focus on the existing and anticipated risks of dual use in the biological sciences.

Enhancing UNSCR 1540 Implementation-related Activities by Science Council of Japan

Fumiko Kasuga

Former Vice-President, Science Council of Japan

Science Council of Japan

Science Council of Japan (SCJ) is the Japanese national academy, representing Japanese scientists both domestically and internationally. It covers all academic disciplines from humanities, social science, life and medical sciences, physical science and engineering. Since its establishment in 1949, SCJ's activities have been focused on policy recommendations to the government, international activities, promotion of scientific literacy and establishment of networks among scientists. Especially after the Great East Japan Earthquake and the accident of TEPCO's Fukushima-Daiichi Nuclear Power Plant, SCJ has actively delivered recommendations and statements to the society based on the responsibilities of scientists to the society.

Code of Conduct for Scientists and Statements on Dual Use Issue of Science and Technology

SCJ has been aware that the proliferation of nuclear, chemical, and biological weapons could happen even contrary to intentions of scientists and engineers, and that awareness raising would be the first step for the prevention of such proliferation. In January 2013, SCJ revised Code of Conduct for Scientists and included a new text to call attention to dual use of scientific research outcomes, *i.e. Scientists shall recognize that there exist possibilities that their research results, contrary to their own intentions, may be used for destructive actions, and shall select appropriate means and methods as allowed by society in conducting research and publicizing the results.*

This inclusion was recommended by SCJ's preceding report in 2012 on Dual Use Issue of Science and Technology, which declared the following four points, such as:

1. Professional responsibility of scientists/engineers

Scientists and/or engineers, humble and modest in pursuit of their quests, behave responsibly recognizing their professional responsibility to society. For professional pride and reputation, scientists/ engineers pursue the truth and the safe use of their accomplishments for the welfare of society.

2. Principles of conducts of scientists/engineers

To cope with the "dual use" dilemma, scientists/ engineers behave according to the professional ethics. They recognize the danger of being moved by emotion and remain courteous and honest to their colleagues. They do not lie and do not keep silence if silence damages the community at large.

3. Social responsibility of scientists/engineers and sharing information with the community

Scientists/engineers are aware of possibility that their accomplishments could be used for malicious purposes. They share their research data and information in activities of education, research and development. Scientific and technological achievements are returned to the society for beneficial use while avoiding misuse arising from malicious intent or ignorance/negligence. Scientists/engineers refuse engagement in activities that may damage the society, and once the society is in danger they confront the situation responsibly as scientists/engineers.

4. Managing dual use

Scientists/engineers recognize the dual use potential of science and technology as an issue of the credibility of scientists and engineers. Scientists/engineers will manage the dual use issue in a transparent manner by creating a professional community that is fair and honest.

(translated by the Chair of the reporting Committee, Professor Hiroshi Yoshikura, for the publication in Journal of Disaster Research (JDR), Vol.8, No.4, Aug. 2013)

This report in 2012 was prepared on the belief that dual use concerns can be applied to any field of science which has potential to be misused for the purpose of destructive actions, and to be further discussed in individual scientific disciplines to prevent such misuse. In response, researchers for infectious diseases have developed guidelines related to dual use issue. The guidelines are also compatible with the Statement on Biosecurity by then IAP, InterAcademy Panel in 2005.

The initial discussions and preparatory processes for those reports were introduced at the Side Event to the 7th Review Conference of the Biological and Toxin Weapons Convention (BWC) in 2011, and the 2012 Report and the revised Code of Conduct were demonstrated at the BWC 2013 Meeting of Experts, both in Geneva.

Related Activities to Contribute to Sustainable Development Goals (SDGs)

Nuclear, chemical, and biological weapons are apparently the threat to the sustainability of life and society of human beings as well as that of ecosystems on the planet. International scientific communities such as International Council of Science, ICSU, International Social Science Council, ISSC, and a newly established global research platform, Future Earth, which is supported by ICSU, ISSC and UN organizations, are strongly committed to implementation of SDGs that were adopted by UN Member States in September, 2015. SCJ is actively collaborating with those organizations. While Goal number 16, Peace and Justice, would be directly related to UNSCR 1540, we should recognize that other Goals cannot be achieved without implementing UNSCR 1540.

Academic societies in the world should recognize our own potential to commitment to the proliferation of nuclear, chemical, and biological weapons, and also should be aware of our responsibilities. We will work closely with other parties in the society in implementing UNSCR 1540, through conducting our individual researches and in various contributions to sustainability of global society.

Role of Academia in Implementation of UNSCR 1540: Biosafety and Biosecurity

Indira Nath

Formerly, All India Institute of Medical Sciences

The UN Security Council Resolution 1540 is a landmark agreement of nations to uphold good scientific practices and prevent harmful uses of S&T. Developments in Biology have been rapid in the last century and continue to benefit man, animal and plants. These developments have been particularly interesting as they are changing our concept of life and our ability to alter parts of living beings with techniques and infrastructure that does not need large facilities and therefore cannot be easily detected. The same techniques that bring benefit can also be used to harm with greater ease than is the case with nuclear or chemical weapons. Thus recent debates have involved the rights of scientists to investigate how pathogens cause epidemics as has been seen with influenza virus studies. Scientists while investigating virulence of the virus were able to produce strains which were more virulent leading to questions on not only of how to monitor biosafety but also the need for such experiments and whether the information thus obtained should be made public. The publication of the data was resolved by a scientific committee constituted by WHO which decided that making the data public would also mean that solutions to the danger can be designed. However, it was also decided that there should be limited access to the critical parts of the methodology.

The recent upsurge of experiments on CRISPER-Cas 9 technologies have also shown the rapidity with which technologies are growing that can alter the genomes of many species leading to health benefits. Though direct misuse in man is less likely due to strong existing ethics and laws, however altering pathogens or plants to cause epidemics or affect food security is possible as these techniques are reproducible and easy to manipulate. Moreover, synthetic biology is also developing at a fast pace to mimic and improve natural products that can be therapeutic or inimical. Such developments in biology have raised concerns as to how to safeguard and monitor misuse. BTWC which holds conferences every 5 years plays a large role in influencing biological regulations by State Parties. However, implementation requires involvement of academia to increase awareness of harmful effects of an emerging technology and to prevent its misuse. **Academia's strength lies in prevention and promotion of biosafety. It does not have the ability to directly deal with biosecurity which is in the realms of national and international security agencies. However, it can provide the knowledge and understanding required for dealing with such issues in the safest manner.** The main thrust of this paper is on the role of academia in achieving these goals.

Academies consisting of leading scientists exist in each country with expertise for science in general or limited to specialised disciplines. They have an influential voice in the community. In recent years, with increase in global interactions in science, networks of academies have been formed which have a global out reach. The Inter Academy Partnership (IAP) consists of 130 academies. The International Council of Science (ICSU) has affiliated academies of the world as well as science unions. TWAS is the academy for

developing countries and has a large membership. These organisations have been partnering and taking leadership roles in addressing ethical issues and responsible conduct of science with a view to prevent misuse and irresponsible science. In some countries academies play a direct role in investigating suspected cases of misconduct in science. The Academies produce reports, conduct workshops and disseminate information to the scientific community, the governments and society.

The IAP produced a policy report on responsible research conduct to be applicable worldwide in 2012. This was widely circulated to all Academies and also presented at the annual meeting of the Global Research Council in Berlin and in World Conferences. The aim was to disseminate what is acceptable and not acceptable in the practice of science. The same international committee released a Guide on 'Doing Global Science' in Feb 2016 which was aimed at young researchers and teachers in Science and ethics. The Guide lays emphasis on good mentoring by senior scientists as well as institutional guidelines to be followed in promoting good practices, communicating with policy makers, investigating cases of misconduct including dangers of dual technologies. Journals have a particular responsibility in identifying manuscripts that may have implications for harm. These would need another level of screening from the point of national/international security. Issues on dual technologies and codes have also been released by individual countries and are in process in others.

ICSU as well as UNESCO have standing panels for Ethics which address such issues and produce reports from time to time in consonance with latest developments in S&T. These organisations also hold international conferences that draw attention to developments as well as their implications for society. One such Summit was held recently in December 2015 in Washington DC. Sponsored by The US, UK and Chinese Academies on the CRISPER-cas technologies a statement was widely circulated to institutions, science journals and general society. The biannual World Conference on Research Integrity also reaches out to the scientific community and ethicists. Its Singapore statement issued in 2010 has been widely cited as global guide and the Montreal Statement of 2013 addresses international collaborations. The young Global Research Council started as a partnership with research councils of many countries began its early meeting with promotion of good scientific conduct and avoidance of misconduct.

Codes of Ethics have been discussed over the years to be applied to scientists without a clear consensus. Though the Hippocratic Oath has served well for medical doctors and some oaths are also taken in individual disciplines, their influence is not measurable. Some Universities and academies apply codes of conduct and also have them on their websites. These serve to remind the students/scientists of good practices. It is difficult to predict how technologies develop and emerge from basic research and it is also just as difficult to predict how a particular technology can be misused for greater harm. Producing a pathogen with intent to harm is at one level and perhaps easy with present technologies. Weaponising such a pathogen is at another level of technology which requires greater insight into transdisciplinary approaches. Potential for harm may be predicted but acquiring an ability to harm requires greater knowhow. Thus to implement UNUSCR 1504 an outreach to academia is necessary.

In a bilateral partnership the Indian and US National Science Academies have been holding workshops on Biosafety issues with relation to emerging infections in the past 2 years. The discussions have dealt

with how best to improve biosafety and thereby also biosecurity in a cost effective manner. The cost of infrastructure and maintenance for biosafety is high for many low income countries but can be reduced considerably with better co-operation between scientists, engineers and the industry.

In many countries, academia is not used effectively by regulators and national security agencies. The latter are focussed mainly on the physical aspects of security and do not consider advances in sciences as relevant. There is also a tendency to let inter country relations at political level to supersede co-operation at scientific level by posing visa restrictions on scientists.

Harmonisation with academies and networks listed above with the UNSCR would play a major role for dissemination of knowledge and preventive action against harmful technologies. With the vast expertise of their members the Academies can be effective advisers on emerging dangers and the appropriate solutions.

Further Reading:

- IAP Guide on “Doing Global Science” Princeton University Press, New Jersey, USA, 2016
- IAP: Responsible Conduct in the Global Research Enterprise: A policy report 2012
- IAP: Statement on Biosecurity, 2005, <http://www.interacademies.net/File.aspx?id=540>
- US National Academies of Science’ Developing Capacities for Teaching Responsible Science in the MENA region: Refashioning Scientific Dialogue. 2013, http://www.nap.edu/catalog.php?record_id=18356
- WHO 2013 Report of the WHO Informal Consultation on Dual Use Research of Concern, http://www.who.int/csr/durc/durc_feb_2013_full_mtg_report.pdf
- Singapore Statement on Research Integrity, 2nd World Conference on Research Integrity 2010, <http://www.singaporestatement.org/>

Research and UNSCR 1540

Tasks, Challenges, Range of Stakeholders, Role for Co- and Self-Governance and a Practical Example of Research Governance including Civil Society

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Tasks

UNSCR 1540's operative paragraphs are explicit in defining that effective measures to account for and secure CBRN weapons and related materials in production, use, storage or transport must be in place to prevent access by non-state actors. UNSCR 1540 does not exclude CBRN related research.

Research is affected in various ways by these provisions. First, research can contribute to the development of new tools for effective controls (e.g. new detection systems, better containment systems). Second, through mock-up studies research can contribute to a better understanding of the risks of CBRN weapons. Third, research in itself can create risks that need to be governed under UNSCR 1540. The next paragraphs focus on this last aspect of research and highlight how civil society can contribute to help mitigate key gaps in current CBRN risk management and governance.

Challenges

In times of globalization and the increasing importance of knowledge, information and technology, managing the risks arising from research is a key challenge to a successful implementation of UNSCR 1540. Classical risk management tools successfully applied in mitigating risks from large state programmes in the CBRN area like export controls often are not sufficient to cover the risks arising from research. As such, the question what constitutes effective and appropriate controls in relation to research information (e.g. publications) and knowledge (e.g. education) is still today largely unresolved. Another outstanding question is about the relevant material thresholds for the implementation of effective and appropriate controls (e.g. when it comes to research in bio-based manufacturing of toxic chemicals). Furthermore, the exemption of (fundamental) research from relevant oversight mechanisms (e.g. export control legislation) when countering military CBRN programmes does not make sense in a non-state actor environment and causes a significant governance gap. Furthermore, any governance approach in the research area must take into account its international and global dimension as laws and regulations enacted by one country will most likely lead to the transfer of research activities to other countries with less stringent controls.

Range of Stakeholders and Role for Co- and Self-Governance

Regulating a fast moving agenda like research through legal means has been challenging and laws are often outdated by the progress of research before they even enter into force. Therefore, to successfully implement UNSCR 1540 in research, additional governance approaches are needed.

In order to address these unique challenges posed by research, collective self-governance by the wider research community (e.g. individual researchers, research institutions, funding institutions, professional bodies) has been developed (e.g. in the context of participation of human subjects in research).

Practical Example of Research Governance including Civil Society in the Context of UNSCR 1540

Today different approaches to collective self-governance and co-governance in security sensitive research exist. A highly interesting integrative approach, piggy-backing on existing infrastructure and procedures and integrating UNSCR 1540 implementation into the wider framework of research ethics has been developed by the European Commission in its main research funding schemes.¹

The approach strongly builds on capacities and input provided by civil society, ranging from developing a framework for assessment, to carrying out the complex technical assessments requiring elaborate technology foresight and risk management understanding, to verifying and auditing compliance to international standards like UNSCR 1540.

This framework also addresses the key challenges to classical law-based risk management mentioned before. Concrete examples are:

- managing security sensitive information; it provides for a more flexible and tailored way on temporarily restricting information through contractual obligation.
- managing security sensitive knowledge; it provides for additional means beyond personnel security to manage risks from knowledge and creates opportunities to raise awareness and educate individuals and build a culture of responsibility.
- thresholds e.g. in relation to novel production technologies; it provides an early warning and awareness raising approach.
- inclusiveness; it does not exempt basic research from oversight like some export legislation. In contrast it focuses on basic research and complements this gap.

Finally, as funding by the European Commission's research framework programme is necessarily international it has the potential to act as standard setting across national boundaries in an inherently international research environment.

¹ Karatzas, Isidoros, "The Ethics Appraisal in H2020", <http://www.feam-site.eu/cms/docs/activities/ethicalreview/EthicsReviewWorkshopMarch2014IsidorosKaratzas.pdf>; European Commission, "Horizon 2020," http://ec.europa.eu/research/participants/portal/doc/call/h2020/h2020-msca-itn-2015/1620147-h2020_-_guidance_ethics_self_assess_en.pdf

Conclusion

Using and integrating the capacities of civil society in governance and mitigating CBRN risks can enhance the effective implementation of UNSCR 1540, in the highly important, but also very difficult to govern area of research. Although individual practical examples underscore the value of this approach, very limited work has been done at the international level to take advantage of these capacities that civil society provide. Inclusion of civil society in the governance of CBRN risks in a non-state actor environment would not only strengthen and tailor existing means but also provide means to fill gaps in existing governance approaches. Therefore, this approach should be of interest for the upcoming UNSCR 1540 review.

1540 Implementation

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The direct interaction with relevant industries and industry groups, academia and civil society is considered a key point in the implementation of UNSC Resolution 1540. As it has been recognized in the 1540 Committee's Work Program for 2016, in the area of transparency and media outreach (Working Group 4), the Committee will *"encourage States to promote dialogue and cooperation, including, where appropriate, with civil society and academia, to address the threat posed by illicit trafficking in nuclear, chemical or biological (NCB) weapons and their means of delivery, and related materials (...)"*.

Resolution 1540 (and subsequent resolutions) refer to *"(...) the threat of illicit trafficking in NCB weapons and their means of delivery, and related materials (...)"*, and urges all States to *"take and enforce effective measures to establish domestic controls to prevent the proliferation of NCB weapons and their means of delivery, including by establishing appropriate controls over related materials"* and, to this end, it identifies concrete measures, some of them, related with national export and trans-shipment controls over such items.

Although the Resolution does not explicitly mention Intangible Technology Transfers (ITT), they are included in the 1540 Matrix (as well as in some UNSC sanction resolutions). The concept of *"intangible asset technology"* refers to the manufacturing technique, technology or know-how, as well as intellectual property with economic value. The main problem is that export controls do not apply to technology or basic scientific research and information in the public domain (and this definition is difficult in practice as it can be interpreted in different ways). Besides, there are, in fact, many fields of special concern for the application of the Resolution 1540.

Export control authorities face certain challenges related sensitive ITT, among them:

1. Growing participation of academic institutions in Research & Development international projects and the functional symbiosis of industry and academia.
2. Foreign nationals working in the domestic high technology sectors.
3. Mobile and transient qualified personnel.
4. Global information technology networks and digital-electronic methods of intangible transfer.

Some of these challenges may be associated to the potential proliferation of sensitive and dual use technologies, as well as the uncontrolled diffusion of intellectual property rights. States (and, basically, regulators) need to adapt their tools to prevent illicit trafficking of ITT addressing new challenges in an innovative manner. In perusing this goal, both the academia and the industry, play a crucial role to effectively enhance implementation of Resolution 1540.

Export control definitions are usually based on the status of entities involved in transactions and categorized as States, industry or academia. They play different roles; however, both industry and academia can undertake commercial transfers in the fields of technical assistance, information exchange, technology design, know-how development and training. Industry as a concept includes firms and individual brokers, whereas academia includes universities and scientific institutions. Industry is linked to commercial activities, whereas academia is linked to scholarly and scientific activities such as training and research. Nevertheless, a functional approach allows for the possibility that both industry and academia can undertake commercial transfers in the fields of technical assistance, information exchange, technology design, know-how development and training. Universities and scientific institutions sometimes engage in commercial activities based on the outcome of research programmes, in which they have invested resources. In this functional network of interaction, new challenges emerge in the form of ITT. There are two variations of ITT risks relating to WMD proliferation.

1. The transfer of knowledge as technical assistance, through instruction, for example PhD programmes in nuclear physics or microbiology, skills training or consulting. This presents significant challenges to export controls traditionally based on national boundaries.
2. The transfer of technical data in a non-physical form. This includes publicly available encryption software, email exchanges of documents related to highly sensitive information on the manufacture or development of WMD, and consulting on the development and deployment of wireless telecommunications networks.

In order to prevent these risks, unique policies and practices for effective administration and enforcement are required. Mechanisms for ITT controls include company audits, visa screening, raising awareness within industry, universities, research institutions and academia, and monitoring, surveillance & interception of telecommunication channels. Besides, the important role of the “Codes of Conducts” should be considered. They could cover some appropriate measures, such as good practice guidelines recognised by the Nuclear Suppliers Group (NSG), or the “Best practices for implementing ITT Controls”, agreed at the 2006 Plenary of the Waassenaar Arrangement, which stresses the necessity of “(d) *identifying industry, academic institutions and individuals in possession of controlled technology for targeted outreach efforts*”; and (e) “*promoting self-regulation by industry and academic institutions that possess controlled technology, including by assisting them in designing and implementing internal compliance programmes and encouraging them to appoint export control officers*”. At a non-governmental level, there should be mentioned the guidance document for universities and the higher education sector on export controls and the UK Government's student vetting scheme (ATAS), conducted by the Alpha Project (Centre for Science and Security Studies-King's College London) and Association of University Legal Practitioners. The Guide is specifically targeted at university vice chancellors, legal and compliance departments, research support teams and technology transfer offices. It includes suggested templates for working with individual academics and researchers involved in academic disciplines affected by non-proliferation-related controls, particularly engineering and science fields since it is these areas that are most likely, but not exclusively, to be affected by export controls (more info in <https://projectalpha.eu/academia>).

Visa screening of foreign nationals interested in sensitive disciplines and uncontrolled outflows of sensitive knowledge through ITT are two sides of the same problem. Up to now, ITT control mechanisms have addressed this problem with a two fold policy: export controls for transfers from industry (licensing), and visa vetting for knowledge transfers in academia. ITT through academic activities can fall under export control legislation if it is based on technical assistance to an end-user beyond the state's borders. Commercial exports of sensitive and dual-use technologies and products implying a physical transfer need a licence; in this regard, enforcement is ensured by police and customs operations. Commercial exports of sensitive information and designs of enabling technologies implying a transfer of documents or technical assistance also need a licence; enforcement is also ensured by police and customs operations, but is more difficult. New information technologies make electronic and digital transmissions possible anywhere in the world, undercutting the enforcement capabilities of customs authorities. In this regard, technical assistance in sensitive technologies, based on a service contract between supplier and recipient, needs to be authorized with a licence. Finally, if technical assistance in sensitive technologies, based on a service contract between supplier and recipient, takes place in the supplier's territory, the recipient needs a licence, and the recipient's representatives might also need a visa in accordance with the supplier's national regulations. In this case, visa screening would be a second mechanism of control.

If existing commitments on non-proliferation in multilateral conventions and relevant UNSC resolutions were to be merged (including Resolution 1540) as part of a reviewed national ITT legislation, this would also imply a comprehensive approach to visa controls and conceptual changes in the definitions of "academic activities" and ITT. In this regard, a reinforcement of visa-screening mechanisms to make a criteria-based profile selection taking into account proliferation concerns is of paramount importance. However, it is likely to lead to reactions from knowledge-recipient entities abroad. These 'knowledge importers' can seek scientific knowledge and technical expertise in other countries with lower requirements and in international organizations or, if they can afford it, they can invite experts and scientists to work for them in their territories.

The main tool to control ITT in academia is visa screening of foreign students and researchers in sensitive disciplines, if the training takes place in the supplier's territory. It is important to underline that control is enforced on the movement of persons towards the national territory (i.e. immigration control) and not on the knowledge transfers or ITT. If technical or scientific academic experts of the supplier institution undertake the same activities abroad, no control is implemented.

Taking into consideration all the above mentioned, several gaps in the export control and visa-screening systems can be identified. All these loopholes should also be taking into consideration in order to enhance the implementation of the Resolution 1540:

1. In technical assistance activities in the framework of international cooperation, the multilateral organization can appear to be the recipient of ITT, whereas it is only an intermediary or broker for other end-users of ITT.

2. Academic activities within training, scientific cooperation and seminars on sensitive disciplines in the recipient country are not subject to control and visa screening does not apply. The freedom of movement of persons and academic freedom allow such activities to take place.
3. Individuals with technical and scientific skills, either from industry or academia, can be engaged by a third country to work in a sensitive technology project. In this case, even if such a transaction is not an 'export' (as it is based on a contract signed in the recipient country under national regulations), it is a form of ITT.
4. Digital electronic information technologies make it more difficult to control ITT and easier to undercut customs enforcement.

Besides them, the industry and academia can play an active role to help the States to effectively implement the Resolution 1540 at domestic level. Scientifics, high qualified researchers and university professors are widely recognized by the modern societies and their opinions are also respected by the public opinion. For this reason, it would be very useful to actively involve the research centres and universities in the promotion of the Resolution within their societies. They are also the most qualified group to identify relevant areas of concern and sensitive disciplines, that need to be under control and at the same time, to establish continuous dialogue with the regulators and other national officials, being an advisory body capable of reviewing scientific work at the request of scientists, journals or founders available. Finally, they could also provide support to the States (and especially, to the State Security Forces and Corps, as well as the Judiciary and Law enforcement bodies) to evaluate the development of new materials, technologies, and procedures suitable for manufacturing WMD and to advise on the creation of a comprehensive national security structure.

Nevertheless, some conflicts can arise in the promotion of the Resolution 1540 and the Research Centres and the academia regarding the self-restraint on publishing, inherent to the control of the sensitive information. University professors and researchers are continuously evaluated for promotion and to get the best positions based on the quality of their research and impact of the publications (quotations received, impact factor in Scientific Journal Ranking...). All this could have a negative effect for academic experts and qualified researchers to work in sensitive areas related with the Resolution 1540. In order to minimize this impact, some mechanism should be also developed by the States in order to recognize the support of the academicians and researchers, without the necessity to openly divulge the results of the work done.

To sum-up, it can be said that there is a process of symbiosis between industry and academia, beyond purely scientific activities, in two dimensions. First, there is a growing cooperation between industry and academia in the field of research and development, fostered by public policies, where they sometimes undertake common projects. Second, universities and scientific institutions sometimes engage in commercial activities based on the outcome of research programmes, in which they have invested resources. Therefore, it is necessary to raise awareness of proliferation issues early in the academic cycle.

Enhancing Implementation of United Nations Security Council Resolution 1540

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Despite worldwide adoption and an international consensus on UNSCR 1540 as an obligation to address the terrorism threats of weapons of mass destruction (WMD), an effective implementation plan is required to achieve its ultimate goal of ensuring international security. Development of training modules as well as safety and security programs for awareness of the scientists may yield good benefits. There is also a dire need for counter-terrorism action plans to keep the deadly weapons out of the hands of non state actors.

Research carried out in the various life sciences and in biotechnology in particular can have profound impacts on generations to come. The present era is characterized by revolutionary advances in the life sciences. These advances have benefited the human race immensely in terms of new and novel ways of treating disease, making effective diagnoses, bettering human health, developing desired agricultural traits, etc. However, such knowledge also has the potential to be misused. Such technologies are now referred to as “dual-use technologies” and research that has the potential to be misused is known as “dual-use research.”

In terms of biological threats, concern has been expressed that the rapid advancements within the life sciences will enable the development of novel pathogens and more effective or easily accessible dissemination methods and techniques. It is important for life scientists dealing with the biological materials with potential biological weapon threat to consider the security implications of any type of research with dual use potential. There is a moral obligation to the scientists. Ethics must be entrenched in scientific research and life scientists must first seek to do no harm. It is the practice of scientific research and investigation with moral integrity. Science is based on values which include morality, fair-mindedness, sincerity and collegiality. Scientific innovativeness of supreme practicality, efficiency, and vision is helped through these values. A code of conduct for researchers will develop the intrinsic responsibility to the person not to disseminate any sensitive information and not to perform any experiment that is not approved by the ethical committees. With easily available publications, everyone has an access to the recent advancements in science and some of the sensitive information as well, which can be misused. Publishing of articles with sensitive information should be strictly controlled. Following ethical norms in publishing will promote the peaceful applications of science.

Moreover, in the framework of the resolution, implementation strategies must include detailed procedures for risk assessment and monitoring i.e. conduct monitoring and verification of the weapons of mass destruction, provide a proper compliance mechanism and facilitate the range of assistance needed by states e.g. in developing a set mechanism by member states for regular monitoring of the labs in academia or other organizations dealing with dangerous pathogens and to report any security

breaches and take proper actions. Periodic quantitative risk assessment of the potential threats especially in high risk terrorism stricken countries (UN member states) must be encouraged (experts from developed countries can provide great help in this regard).

Assistance to member states for human resource development in order to deal with a security threat in the form of an incentive to comply with the resolution such as involvement and training of lab experts, public health administrators, physicians and other relevant hospital experts should be encouraged. On-hand training sessions for local emergency medical experts, fire and hazardous material experts and law enforcement specialists to prepare for emergency situation must be arranged. This can also facilitate the non-proliferation agenda of the UNSCR 1540. Poor human resource training may increase the risk of accidental or deliberate release of biological materials from the lab and may also contribute to improper pathogen accounting, storage and transportation, which in turn could contribute to the illegitimate acquisition of biological agents by terrorists.

Academia and industries long term partnership lay down the basis of research development. Universities can not only contribute to the basic scientific understanding but in the present age, they are referred as economic engines contributing to the economy regionally as well as globally. Long term, strong and healthy partnerships between industry and academia in which government and policy makers can also make their contributions leads to a win-win situation. The long term objectives of this partnership should be to serve the common people by science and technology with the slogan of “science only for the benefit of humanity”. Perhaps a center can be established at each university that will enhance the collaboration between all the stakeholders and academia. In the light of UNSCR 1540, academia and regulators must work in close collaboration to develop a regulatory framework to prevent non-state actors from acquiring WMD in order to comply with the resolution. In addition to that, there is a need to establish an advisory body within the framework of UNSCR 1540 to provide legal assistance to the member states in terms of developing implementation legislation and in areas such as customs, law enforcement, lab safety and security of pathogens at the domestic level.

In order to ensure information security and effective export control, development of relevant inspection techniques and procedures for accrediting laboratories for analyzing samples is required. Moreover, there is a need to develop proper mechanisms for improving existing legislative and administrative framework related to the control, production and transfer of chemical, biological and toxic materials, and to enhance national export control systems related to conventional weapons, dual use materials such as export licensing, enforcement of sanctions on trafficking of illegal goods, preventing money laundering and proliferation finance.

Last but not least, a multilateral approach such as development of institutional networks between the research organizations, academia, policy makers, industry and security agencies both nationally and internationally to enhance assessment and monitoring to contain biological, chemical, nuclear resources with potential to be used as weapons of mass destruction. Also, development of policy papers and action plans in compliance with rapidly advancing scientific technologies must be done regularly to assist the implementation process.

Since its ratification by Pakistan on 25th September 1974, Pakistan has been committed to strengthening the BTWC regime through national implementation measures. It encourages multilaterally negotiated, non-discriminatory and cooperative efforts on issues related to BTWC. Pakistan also emphasizes on effective implementation of the Convention, including the establishment of a compliance regime and verification mechanism. It shares the concerns of international community and is fully aware of its obligations. Pakistan's comprehensive report on UNSCR 1540 and four follow-up reports to the UN Security Council 1540 Committee provide a detailed matrix of information on existing legislations and their enforcement. Pakistan has thus made substantial progress in implementing existing legislations and is taking effective administrative steps for mitigation of biological risks. Pakistan has taken steps in Legislative and Regulatory Measures; Administrative Measures; Capacity Building as a First Responder ; Code of Conduct for Life Scientists.

Recommendations:

- Capacity Building and Technology Transfer for protection against bio terrorism, in terms of equipment and related training
- Effective Legislative Reforms and Oversight of Dual Use Research
- Awareness/ Training and Promotion of a Culture of Responsibility
- Improvement of relations between academia and regulators /industries
- Experts of bioethics/dual use education be available in universities for educating students
- Role of media is important for dissemination of this knowledge further into the general public/communities
- Designing courses to raise awareness about biosafety and peaceful conduct of biological research especially at the post graduate level
- *Continuing to support, collectively and individually, the promotion of a culture of responsibility and biosecurity among life scientists; and*
- Voluntary code of conduct including Self-restraints on publishing

Conclusion

In recent years, advances in the field of biological sciences have opened up new avenues for the peaceful application of bio-technology as well as international cooperation in his area. The fulfillment of our international obligations under BTWC and the establishment and maintenance of effective bioethics, bio-safety and bio-security standards as well as focus on dual use education at the national level remains not only in our national interest but also enhances international confidence in our system. Transparency and strict compliance of BTWC regime through implementation of national measures by all states have paved the way for global partnerships in the important field of bio-technology. Pakistan thus looks forward for enhanced cooperation in the field of bio-capacity building both in terms of response equipment as well as related training.

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The Strategic Alliance with Academia to Enhance the Implementation of the 1540 Obligations

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SCIENCE is an intellectual adventure that implies the ideas of creativity and progress, is an essential part of the modern culture that has revolutionized our understanding of the world and ourselves. The scientific achievements of the human being and their technological applications have transformed our lives and became key factors for the economic developments of the nations. The new developments in science and technology that are paving the way for a multitude of opportunities beneficial to humankind could also open the door to unforeseen challenges and abuses. The occurrence and consequences of discoveries in basic research are virtually impossible to foresee. Scientists conducting research need to be aware that their work ultimately may have a great impact on society. In this context, education becomes a key element in raising awareness about the potential dual use of the scientific knowledge and for the implementation of non-proliferation programs in the academic community, as well as to strengthen its engagement with international WMD non-proliferation efforts.

Education and outreach has become a core activity of the OPCW, supported by its Member States. Whereas education and outreach was earlier seen in the limited sense of raising awareness among particular groups of society about the provisions of the CWC, today it is seen in a much broader and more substantive sense as an important element of national implementation and as a foundation for preventing the re-emergence of chemical weapons.

To facilitate awareness raising about chemical disarmament and chemical safety and security issues the OPCW makes a number of publications intended to be accessible to broader audiences and supports projects by science educators. A recent example being the IUPAC “Multiple Uses of Chemicals” project, to develop an interactive online tool that explores the beneficial uses, misuses, and abuses of multi-use chemicals, both historically and presently; the website is designed to be informative for students, educators and policymakers.

The Scientific Advisory Board (SAB), a subsidiary body of the OPCW, at its Seventeenth SAB meeting in November 2011 recommended the establishment of a Temporary Working Group (TWG) on Education and Outreach on Science and Technology Relevant to the Convention. Based on the findings and activities carried out by the group during 2012-2014, the TWG produced a report that contains main recommendations regarding the sustainability of OPCW education and outreach efforts. Among them, it can be mentioned:

- “Education and outreach with respect to the responsible use of science, particularly as it is relevant to the Chemical Weapons Convention, should remain a core activity of the OPCW, so as to achieve and maintain a world free of chemical weapons”.

- “An ongoing expert advisory group on education and outreach with respect to the responsible use of science, particularly as it is relevant to the CWC, should be established to help OPCW fulfill its mandate for education and outreach”. The new Advisory Board on Education and Outreach is expected to commence its work early in 2016.

Awareness of the CWC could be placed in a broader educational context of ethical concerns in chemistry. As a way of promoting a culture of responsible conduct in the chemical sciences and to guard against the misuse of chemistry, the OPCW facilitated two workshops during 2015 involving a group of more than 30 scientists and chemistry professionals from over 20 countries, including all regional groups. The objective of these events was to discuss and draft possible ethical guidelines for the practice of chemistry under the norms of the Convention. The workshop arrived at a consensus text, The Hague Ethical Guidelines, which is intended to serve as elements for ethical codes and discussion points for ethical issues related to the practice of chemistry under the Convention. The guidelines provide a useful framework for debating the vital dimension of ethics in relation to chemical disarmament and non-proliferation.

Signing a code of conduct would force professionals to reflect on the impact of their work, increasing the levels of responsibility and awareness. This is in particular important in the academic community as the scientific literature and technical information is easily accessible nowadays and can be searched quickly and thoroughly with adequate computer facilities. In cases where intention to act against society might be present, the procedures and starting materials so readily available could facilitate actions of individuals, in particular those with university education. This scenario makes evident the need to implement strategies on education regarding awareness-raising about the potential dual use of scientific knowledge and prevention of WMD proliferation, to incorporate these and related issues into regular curricula.

Education efforts should be tailored to different types of audiences (such as: age, profession, educational and cultural background, country and region). The educational programmes should be addressed to university undergraduate and graduate students and faculty members, professionals, trainers, scientists, journalists, lawmakers, and diplomats. The important role of partnerships between national and international scientific organizations, national academies of sciences, and other international organizations should allow increasing cooperation to maximize efforts, promote the sharing of experience, lessons learned and effective practices, in the areas covered by resolution 1540 (2004).

The strategic alliance with academia has already demonstrated to be an important partner of the 1540 Committee in strengthening the global implementation of resolution 1540 (2004). The reinforcement of this alliance will provide such a prospect for working together toward addressing the challenges of WMD proliferation, consolidating effective instruments of technology governance, and building a culture of responsibility, while promoting social and economic opportunity and ensuring the international peace and security.

Engaging Scientists in Assessing “Emergent Threats”

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NOTE: *This short paper is an edited excerpt from a chapter that describes how international scientific organizations have become active in providing independent input to the Biological and Chemical Weapons Convention about trends in S&T relevant to the Conventions.¹ A number of scientists attending this meeting have been involved in these efforts and, with the 8th BWC review conference in November 2016 and the 4th CWC review conference in 2018, we want to suggest that the 1540 Committee consider a similar approach or explore how to connect with these continuing efforts.*

...sometimes scientists work with colleagues across political barriers to advance ideas for technical measures to support arms control and disarmament. More broadly, in fields advancing as rapidly as the life sciences, even governments with extensive resources of their own will have trouble keeping up with everything going on and what it means for biosecurity. There is just too much science being done in a growing number of subjects in an increasing number of parts of the world for anyone to effectively track the trends. The scope, pace, and diffusion of scientific capacity is great news for the hopes being placed in biotechnology to solve major global challenges. But it can sometimes resemble a tsunami, beyond anyone’s capacity to comprehend. This matters because, beyond this essential *monitoring* function, policy makers want to know what the advances mean. They need help *assessing the implications* for biosecurity policy and practice. Scientists can help with both monitoring and assessing and, by bringing them into this process *scientists become part of the solution, not part of the problem*. Translating those insights for diplomats and policy makers, who generally lack technical backgrounds, is an important part of the overall challenge and requires expertise from beyond the life sciences.

Inter-academy networks like IAP have been an important vehicle for the contributions of life scientists to biosecurity policy, but the story begins earlier.² Around 2000, as preparations began for the Chemical Weapons Convention (CWC)’s first review conference, the organisation that administers the treaty (the Organisation for the Prohibition of Chemical Weapons) realized that it would benefit from the input and insights that could be provided by the broader chemical sciences community. Fortunately, this organisation already had a relationship with the International Union of Pure and Applied Chemistry (IUPAC), so the chemistry union was asked to organize a meeting on developments in chemical sciences

¹ Jo Husbands and Katie Bowman, The role of scientific organisations in promoting biosecurity: case study on IAP in Simon Whitby, Tatyana Novosiolova, Gerald Walther, and Malcolm Dando (eds.), *Preventing Biological Threats: What You Can Do*. Bradford, UK: University of Bradford, 2015. Available at <http://www.bradford.ac.uk/social-sciences/peace-studies/news-and-events/news/preventing-biological-threatswhat-you-can-do.php>.

² IAP—The Global Network of Science Academies, includes more than 100 of the world’s academies, and since 2004, has supported a Working Group on Biological Weapons that now includes the academies of Australia, China, Cuba, Egypt, India, Nigeria, Pakistan, Poland (chair), Russia, the United Kingdom, and the United States. For more information see <http://www.interacademies.net/>.

and technology that could affect the future implementation of the Convention.³ The Scientific Advisory Board for the CWC wanted advice about emerging threats and about new developments that could support the treaty's missions. This was the first time that an international scientific organisation had been asked to provide input to a disarmament treaty review conference. Given its relatively limited resources, the chemistry union asked one of its national members, the U.S. National Academy of Sciences, to help support the planning committee it created to organize the workshop.

The workshop, held in Norway in 2002, brought together 79 participants from 34 countries, and set a number of precedents for how such events are best organized. The meeting combined researchers from academia and industry who were active in fields relevant to the CWC with government technical experts, many of whom were also practicing scientists. The researchers largely were asked to talk about their work, while the implications for the Convention emerged from the discussions and interactions with the policy and security specialists. This made it easier to interest the outside scientists in taking part, since they could do something they were familiar with doing—give a technical presentation about their work—while getting to think about their work in new ways. It was also an opportunity to bring younger scientists into the process; when a field is advancing rapidly a number of breakthroughs may be made by emerging leaders in research. The discussions encouraged the researchers to consider key hurdles or barriers, both technical and conceptual, which might need to be overcome for a technology to reach fruition or achieve a major breakthrough. This can help bring a dose of reality to claims that may sometimes be exaggerated in the excitement of a scientific moment. Finally, the results were provided to the CWC via its Scientific Advisory Board and published by IUPAC, so that they were available both to officials and a broader interested public.⁴

When the time came for the Second and Third Chemical Weapons Convention review conferences, the treaty organisation again reached out to the chemistry union, which organized similar international workshops in Croatia (2007) and Switzerland (2012).^{5,6} One of the lessons learned from the first workshop was the importance of starting early, so that the results could feed into preparations by national governments for the review conferences. The workshops were thus held a full year in advance of the Chemical Weapons Convention review conferences, which meant the reports could be given to the treaty's Scientific Advisory Board in time to inform its own technical reports to member nations.

³ For more information about the relationship that has developed between the International Union of Pure and Applied Chemistry (IUPAC) and the Chemical Weapons Convention, see Organisation for the Prohibition of Chemical Weapons, *Education and Engagement: Promoting a Culture of Responsible Chemistry*, Final Report of the Scientific Advisory Board's Temporary Working Group, The Hague, Netherlands: Organisation for the Prohibition of Chemical Weapons, 2014, http://www.opcw.org/index.php?elD=dam_frontend_push&docID=18014.

⁴ The results of the first workshop were published as a special issue of the IUPAC journal, *Pure and Applied Chemistry*, 74:12 (2002), pp. 2229-2353, <http://www.iupac.org/publications/pac/74/12/>.

⁵ Balali-Mood, Mahdi et al., 'Impact of scientific developments on the Chemical Weapons Convention (IUPAC Technical Report),' *Pure and Applied Chemistry*, 80:1 (2008), pp.175-200.

⁶ Smallwood, Katie et al., 'Impact of scientific developments on the Chemical Weapons Convention (IUPAC Technical Report),' *Pure and Applied Chemistry*, 85:4 (2013): pp. 851–881, <http://www.iupac.org/publications/pac/85/4/0851/>.

The success of the chemical science community's involvement in discussions for the CWC inspired people interested in biosecurity to consider doing the same thing to support the Biological Weapons Convention's review conferences. Providing input from the broader biological sciences community to the Convention was a more complicated problem in this instance. ...the Biological Weapons Convention's structure is different than the Chemical Weapons Convention's. In addition, instead of a single predominant international union for chemistry, there are perhaps a dozen international unions in the life sciences, reflecting the diversity and fragmentation of the field. Who would take the lead? This provided an opportunity for the IAP Biosecurity Working Group.

Convening an international workshop on developments in science relevant to the Biological Weapons Convention was first undertaken in 2006, to provide input to the treaty's Sixth Review Conference. The report of the meeting, prepared by the Royal Society, was provided directly to the diplomatic missions in Geneva that participate in the BWC meetings. The Royal Society also organized an event at the review conference to describe the results to those taking part.⁷

The IAP's greatest success to date came in conjunction with preparations for the 7th BWC review conference. The workshop was hosted by the Chinese Academy of Sciences and the report was produced by the U.S. National Academy of Sciences. Two international scientific unions, the International Union of Biochemistry and Molecular Biology and the International Union of Microbiological Societies, also collaborated in organizing the event. Abstracts of the presentations were produced in time for the treaty's Preparatory Committee meeting in April 2011, and the final report was released during a side event at the United Nations in October.⁸

As a testament to the relationships that the IAP Working Group had built through its scientific workshops and other efforts [described in the full chapter], the Implementation Support Unit for the Biological Weapons Convention included the summary of the workshop's final report as part of the official background document on science and technology produced for the Seventh Review Conference.⁹ The chair of the workshop organizing committee was also invited to serve as a member of

⁷ The Royal Society, *Report of the RS-IAP-ICSU international workshop on science and technology developments relevant to the Biological and Toxin Weapons Convention*, RS policy document 38(06), London, UK: Royal Society, 2006, https://royalsociety.org/~media/Royal_Society_Content/policy/publications/2006/8245.pdf.

⁸ For summaries of the workshop presentations, see National Research Council, *Trends in Science and Technology Relevant to the Biological and Toxin Weapons Convention: Summary of an International Workshop: October 31 to November 3, 2010, Beijing, China*. Washington, DC: National Academies Press, 2011. The final report, from which the summary provided to the Biological Weapons Convention was taken, is National Research Council, *Life Sciences and Related Fields: Trends Relevant to the Biological Weapons Convention*. Washington, DC: National Academies Press, 2011, http://www.nap.edu/openbook.php?record_id=13130.

⁹ Implementation Support Unit, *New scientific and technological developments relevant to the Convention—Background information document submitted by the Implementation Support Unit, BWC/CONF.VII/INF.3*, [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/E8E780F95338D5C5C1257927004C2D07/\\$file/Background+S&T.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/E8E780F95338D5C5C1257927004C2D07/$file/Background+S&T.pdf).

a temporary working group on the convergence of chemistry and biology organized by the Scientific Advisory Board for the Chemical Weapons Convention.¹⁰

The Royal Society, in collaboration with the Polish Academy and the U.S. National Academy of Sciences, held the third of the IAP trends workshops in September 2015 in Warsaw.¹¹ In addition to releasing the report of the workshop at the meeting of States Parties in December, the Royal Society is hosting a small workshop during the April 2016 Preparatory Committee meeting on potential science advising mechanisms.

As with the workshops held to inform the Chemical Weapons Convention, those for the Biological Weapons Convention bring together practising scientists from academia and industry, scientific and technical members of national delegations, and policy and security experts. Participants are drawn from a number of countries and organisations, reflecting the fact that advances in science come from multiple disciplines and that the life sciences community is global. An IAP member academy of science usually serves as the host and past workshops have involved collaborative partnerships with international unions in biochemistry, molecular biology, and microbiology and umbrella organisations such as the International Council for Science, to which most of the relevant life sciences unions belong. Workshop sessions mix plenary presentations with small-group discussions on how scientific and technical developments can benefit the convention's implementation, such as through improved disease surveillance and treatment, whether new developments could pose potential risks for misuse in ways contrary to the Convention, drivers moving science forward, and technical hurdles that remain to be overcome. Links are also maintained across efforts to inform the Chemical and Biological Weapons Conventions, to enable themes and technical issues to be carried over between workshops.

These events and their impacts have created what can be considered an "informal science advising network" from the scientific community via national and international scientific organisations to the Biological and Chemical Weapons Conventions. The community, including IAP, member academies of science, industry organisations, and individual scientists, has made increasing numbers of contributions to Biological Weapons Convention meetings. As States Parties look ahead to the Eighth BWC review conference in 2016, discussions continue on whether a systematic process is needed to inform the Convention of relevant scientific developments and their implications. Whatever process may be chosen, contributions from the broader scientific community will likely continue to have a role in understanding research advances. For anyone interested in how scientists and scientific organisations can become involved in science policy, particularly at the international level, it is worth wading through the sea of organisational acronyms to explore the case of IAP and its international partners.

¹⁰ Organisation for the Prohibition of Chemical Weapons, *Convergence of Chemistry and Biology*, Report of the Scientific Advisory Board's Temporary Working Group, The Hague, Netherlands: Organisation for the Prohibition of Chemical Weapons, 2014, http://www.opcw.org/index.php?eID=dam_frontend_push&docID=17438. The deputy of the Biological Weapons Convention's Implementation Support Unit also served as a member of the temporary working group.

¹¹ The report, which includes an extensive annotated bibliography, may be found at <https://royalsociety.org/topics-policy/projects/biological-toxin-weapons-convention/>.

Significance of Academics in Pursuit of UNSC Resolution 1540 Objectives

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The prevention of Chemical, Biological, Radiological and Nuclear (CBRN) Terrorism necessitates the adequate implementation of the United Nations Security Council Resolution 1540 (UNSCR 1540). Indeed, the implementation of the Resolution not only enhances the national security, but also having a constructive impact on the international security. It's because, today, the terrorist groups have global reach and thereby they have been conducting transnational terrorist activities.

The international characteristic of modern terrorism has not only obliged states to cooperate with one another, but also necessitated the establishment of multinational institutions/organizations for the prevention of transnational terrorism. Importantly, the UNSCR 1540 was adopted in April 2004 to refrain States "from providing any form of support to non-State actors that attempt to develop, acquire, manufacture, possess, transport, transfer or use nuclear, chemical or biological weapons and their means of delivery." It requires all states to implement a wide range of domestic legislation to prevent such proliferation.

Perhaps, the Resolution 1540 is an important initiative to act nationally to deny the access to chemical, biological and nuclear materials to the non-state actors. The advantage of the Resolution 1540 is that it is making all the members of United Nations as a stakeholder and making obligations for the states to legislate and execute laws to safeguard their chemical, biological and nuclear facilities and material from terrorists.

The Resolution 1540 focuses on the capacity building and resource sharing among the states. The accomplishment of its objectives requires securitization of the CBRN Terrorism entailing maturing of the security culture within the state. The adequate securitization of the constituents of the threat is imperative to attract the attention of both ruling elite and masses. Indeed, the convergence between governors and governed result in the ripening of the security culture. Importantly, without the active involvement of the civil society neither securitization happens nor security culture prospers.

The full implementation of the Resolution 1540 requires the involvement of the civil society, especially the academic community. Importantly, the academics are well placed within the civil society and thereby they are in a better position to explain and publicize the objectives of UNSC Resolution 1540 at both grass roots as well as at the higher strata of the society.

The academics through their research and its dissemination by electronic and print media facilitate the governments to implement Resolution 1540. They can contribute effectively in the securitization of the CBRN Terrorism. Without the securitization of the chemical, biological and nuclear risks/threats the

effective implementation of the safety and security methodology would be a mere wishful thinking. Precisely, the academics can play role of bridging the gap between the theory and practice. They build the capacity among the members of the society to implement Resolution 1540 to prevent the CBRN Terrorism.

The academics need to conduct research on best practices in the areas of biosecurity, nuclear security, chemical security, export controls, border security, counterproliferation financing, and counterterrorism financing to deliberate and rationalize the objectives of Resolution 1540. The academics are capable to identify grey areas through field research and draw attention of the policy makers towards risks related with the nuclear, biological, and chemical industry. However, the Resolution 1540 secretariat's stewardship assist them remaining on the right track while conducting the research and especially broadcasting their findings.

The government of Pakistan is cognizant of the CBRN Terrorism challenges. The *Pakistan Export Control on Goods, Technologies, Material and Equipment Related to Nuclear and Biological Weapons and their Delivery System Act, 2004* manifests its seriousness for the implementation of the Resolution 1540. Its nuclear material and facilities safety and security apparatus was acclaimed by the international community during the recent Nuclear Security Summit held in Washington on March 31 and April 1, 2016.

The chemical security and biological security demands more serious work. For instance, one of my PhD students' conducted a research on the chemical industry in Pakistan. He identified various grey areas in the safety and security of chemical industry. These grey areas alarm us about the inadvertent falling of chemical material in the hands of non-state actors. These grey areas cannot be clarified without the proper legislation.

The biosecurity remains an untapped area in both the developed and less developed states. Though, the biologists did an impressive work in the realm of biosafety, yet the biosecurity securitization lacks the attention of the social scientists.

Therefore the policymakers, especially in the developing states have apathetic attitude towards biosecurity.

Admittedly, the Anthrax attacks in September 2001 had shaken the United States political elite but failed to attract the attention of the ruling elites in the developing states. Hence, it's the responsibility of the civil society, particularly academics to make the common man mindful of biosecurity challenges and also convince the decision makers to resolve the biosecurity puzzles.

The cognizance is vital for the pursuit of the Resolution 1540 objectives. For the sake of awareness, one needs to make UNSC Resolution 1540 part of relevant disciplines—biology, chemistry, physics, international relations, political science etc.—at all levels of education. For instance, at the school level an elementary form of the Resolution's objectives could be taught. The proper Resolution's application

format is taught and practical experiments ought to be included in the College and University syllabi. The continuous awareness also requires that at the Campuses various activities/events such as conferences, workshops, and seminars are organized, in which the experts both academics and practitioners participate.

The encouraging news is that at the School of Politics and International Relations, Quaid-I-Azam University CBRN terrorism challenges and countermeasures are taught in the courses related with arms control, disarmament and international security at Master, MPhil and PhD level. The Resolution 1540 and Pakistan's Export Control Act 2004 are part of the reading material of such courses. The disadvantage is that the students have no access to the practitioners' work/experiences.

To conclude, if the civil society becomes a stakeholder in the full implementation of the Resolution 1540, it would be having a considerable contribution in mitigating the CBRN terrorism threat. It would securitize the threat and also assist in maturing the security culture within the state and society. Indeed, for the efficacy of civil society performance, the serious engagement of the academicians is imperative. Therefore, the Resolution 1540 secretariat and participants of the conference need to deliberate and chalk out a strategy for the effective engagements of the academia. Consequently, the interaction between the Resolution 1540 committee and academia ought to be consistent.

Academia and UN Security Council Resolution 1540

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What are/should be the goals and objectives of scholarship related to 1540? How can a wider academic community, including students, be encouraged to engage in analysis of 1540? How can the Committee most effectively expand and strengthen its relationships with the international community of academics whose research is relevant to the goals of resolution 1540?

Scholars from a wide range of disciplines and using a variety of methods are well-positioned to contribute to the effectiveness of Resolution 1540 and the shared objective of a world secure from non-state actors armed with nuclear, biological, and chemical weapons. Resolution 1540 provides multiple opportunities for independent, evidence-based, and rigorous analysis by academics that can improve the implementation of 1540. First, academic researchers can supplement the role of states and regional and international organizations to “promote the sharing of experience, lessons learned, and effective practices” as called for by Resolution 1977 (2011). Research on best practices in the areas of biosecurity, nuclear security, chemical security, export controls, border security, counterproliferation financing, and counterterrorism financing are all relevant to the mission of 1540. Even when such research is not explicitly linked to 1540, it would nonetheless be of interest to the professionals and practitioners engaged in the implementation of 1540. Given 1540’s universal applicability, there is also a wealth of experience and lessons learned from different states’ efforts to implement 1540 through legislation, policy, and capacity-building. Since only a handful of states (seven at last count) have submitted formal reports on their lessons learned and effective practices to the 1540 committee, this is an area of great untapped potential. Qualitative case study methods could be used to analyze the challenges and opportunities that states encountered in implementing 1540, evaluate the effectiveness of implementation, assistance, and capacity-building programs, identify lessons that would be applicable to similar states, and describe best practices that are widely generalizable.

Second, the implementation of 1540 has generated a large amount of data embedded in national reports and 1540 matrices that are potentially useful for research purposes. By controlling for a large number of variables, quantitative methods could be used to better understand the factors that influence the implementation of 1540, identify areas where domestic controls of nuclear, biological, and/or chemical materials are lagging, and suggest new measures for improving implementation. This type of analysis may also highlight new types of data that should be collected, either through 1540 or by outside parties, to further improve our assessment of 1540’s efficacy.

Increasing the engagement of the wider academic community, including students, with 1540 is a matter of supply and demand. On the supply-side, the United Nations could take steps to increase the number of scholars and students who are interested in the purposes and implementation of 1540. Inviting academics from a range of disciplines to participate in the 1540 Committee’s seminars and workshops is

a useful form of outreach. Encouraging current or former members of the Group of Experts or UN Office of Disarmament Affairs to make presentations at academic conferences (such as the International Studies Association) and publish articles or chapters in scholarly journals would be another way to stoke the interest of scholars in this subject. Engaging scholars who teach courses relevant to 1540 is one way to engage students. Developing model curriculum or modules that revolve around 1540 and providing online and multimedia resources relevant to 1540 for use in the classroom would make it easier for scholars to incorporate 1540-related material into their courses and lesson plans. One way to target more students more directly would be through the Model United Nations clubs active in high schools and universities around the world. For example, a scenario related to non-state actors and weapons of mass destruction could be used in a UN Security Council simulation to highlight the importance and role of 1540 in addressing that threat. Another option is to sponsor a competition for the best essay written by an undergraduate or graduate student related to Resolution 1540. *The Nonproliferation Review* (which I am on the editorial board of) runs the Doreen & Jim McElvany Nonproliferation Challenge “to spur new thinking, specific recommendations, and policy initiatives in the nonproliferation and disarmament field.” The journal publishes the two best essays and gives cash prizes to the authors.

Building the demand for scholarly research on 1540 depends on two inter-related factors: funding and interest. Encouraging foundations, governments, and international organizations to fund research on the implementation and future of 1540 would be very useful. Grant funding is particularly useful for hiring research assistants, which is another tool for engaging students. The 1540 Committee, the Group of Experts, Office of Disarmament Affairs, and concerned states could play an important role by making the case directly to foundations and other grant-making bodies that academic research on the effectiveness and sustainability of 1540 is important and has a high likelihood of impacting national and international policy-making. The United Nations could jump-start that process by hosting an international conference featuring leading academic research on the implementation, effectiveness, sustainability, and future of 1540 and inviting a broad range of stakeholders to discuss what a future research agenda related to 1540 would look like.

UNSCR 1540 as Social Learning: Thoughts on Maximizing the 2016 Comprehensive Review

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Introduction

The panel for which this paper is written is tasked with thinking through the contributions that academic research can make to the UNSCR 1540 process. This paper discusses that question and uses the author's on-going research (with Bryan Early and Patrick Cottrell) to show an academic perspective's utility for the 1540 process.

The Role of Scholarship

As laid out in UNSCR 1711, the immediate task of the 2016 Comprehensive Review is to report on the implementation status of UNSCR 1540. Such exercises are rarely taken as mere reflections. States carefully word those reports because they imply some qualitative assessment about performance and set the agenda for the work of the Committee and Group of Experts moving forward. Reviews also have implications for resource allocation decisions. With that broader effect in mind, academic participation in the Comprehensive Review and UNSCR 1540 brings with it important benefits and substantial obstacles.

The primary benefits stem from two characteristics of academic researchers. First, social science academics are trained to be relatively objective analysts of socio-political phenomena. No observer and no methodology is fully value-neutral, but several professional checks and balances help minimize the distortion prior intellectual and political loyalties. Peer review entails subjecting research to a rigorous review by two to four anonymous experts in the field whose primary job is to identify biases in the analysis that slant the conclusions. Credibility in the field and professional prestige rest ultimately on the quality of analysis, which means making theoretical orientations explicit and carefully presenting and tracing the evidence in support of, and against, one's argument. So while it may be as much art as science, the profession entails mechanisms to enhance the rigor of published social science research.

The second characteristic is the relative outsider status of academics. Many policy practitioners bemoan what they see as the disconnect between social science research and what they deem to be "useful" research. I avoid that debate here and note that this "disconnect" also encourages intellectual autonomy. In the context of UNSCR 1540 and the Comprehensive Review, that means that academics can bring their analytical perspectives to bear on questions without being concerned about diplomatic conventions or bureaucratic politics. I highlight below why this is important in 1540.

These advantages simultaneously present challenges to meaningful academic participation. Academics

face perverse incentives to focus on disciplinary debates, which often means straying from policy relevance. And the same review process and rigor that strengthens our contributions also means that our process for producing knowledge generally is intolerably slow and much less helpful to practitioners who often need information within days or weeks, not months. (Six months from submission to publication likely would be a record, to say nothing of the months it takes to produce the submission in the first place.) Similarly, our status as outsiders hinders access to necessary “inside” information. Our ability to publish frank assessments of states’ performances only reinforces the wall of silence that practitioners erect.

UNSCR 1540 and Social Learning

With those benefits and obstacles in mind, I draw here on continuing research into UNSCR 1540 as an instance of global governance to highlight why academic participation is worth the hassle and risk that both sides face from it. International Relations scholars for roughly 70 years now have focused on understanding the factors that promote cooperation among international actors, especially states. For example, what factors make it more likely that states will ratify and comply with the nuclear non-proliferation treaty? When are states more likely to agree and adhere to international sanctions against another state? The role of international institutions (meant here to include international organizations and international law) is an important arm of that debate. At the risk of oversimplification, we can think of four basic roles of increasing relevance for international institutions. Do international institutions merely reflect the distribution of power in the international systems? Might international institutions promote cooperation by providing information about the actions of other states, which facilitates enforcement of agreements? Might international institutions help states find an acceptable solution to a conflict? Or are international institutions political actors in their own right, imperfectly constrained by states?

It really is in this latter case that we can talk about international institutions having the greatest impact. This perspective sees international organizations as teachers, capable of helping states and the officials within them gain a new understanding of an issue or their obligations within the international system. The political interactions and efforts that occur under the auspices of international institutions can generate new knowledge about the causes, effects, and solutions to a problem, even shaping which issues are considered worthy of attention. In this way, international institutions are sometimes capable of helping practitioners overcome what may be narrow or short-term understandings of interests to cooperate more deeply on vital international problems. I refer to that general process as one of “social learning.” How, then, can UNSCR 1540, including the Committee, the Group of Experts, and the Comprehensive Review, promote a process of social learning whereby all states and state officials can learn from the experience of others to improve their own performance and that of UNSCR 1540 as a non-proliferation tool?

1540 as Teacher

Hugh Hecló describes social learning as “puzzling”: “Politics finds its sources not only in power but also in uncertainty—[people] collectively wondering what to do...Governments not only ‘power’...they also puzzle. Policy-making is a form of collective puzzlement on society’s behalf...Much political interaction has constituted a process of social learning expressed through policy.”³³ We lack a comprehensive theory of social learning within international institutions, in particular, but it seems clear that international institutions can help states, officials, civil society, and other policy actors do exactly this. The IAEA and the OPCW “puzzle” about better policies, methods, and technologies for detecting illicit proliferation. The UN Security Council after 9/11 “puzzled” about filling the non-state actor gap in the non-proliferation regime and produced UNSCR 1540. In that sense, social learning should serve as a guiding principle—maybe the guiding principle—for UNSCR 1540, including the Comprehensive Review. I highlight three characteristics of UNSCR 1540 that might empower it to be a learning exercise for all involved. I also identify weaknesses that delimit the role of learning in UNSCR 1540.

1. Legitimacy of UN Security Council

Strengths - UNSCR 1540’s basis in Ch. VII was understandably controversial, but its unanimous endorsement provides 1540 efforts with an important imprimatur. The regime’s legitimacy seems to have increased because skeptics have slowly accepted that the Security Council has no plans to enforce the provisions materially, but rather focuses on capacity building and resource sharing. In interviews and interactions with providers and recipients of technical assistance, subjects have emphasized that 1540 creates an obligation for compliance, implying that they accept the mandate as legitimate.³⁴ Actors are more likely to learn from an institution that they consider legitimate.

Points of improvement - The General Assembly comes closest to endorsement when it notes in the preambular clauses of its WMD terrorism resolution (66/50) that it passes the resolution “Cognizant of the steps taken by States to implement Security council resolution 1540(2004) on the non-proliferation of weapons of mass destruction...”. A formal endorsement of UNSCR 1540 by the UN General Assembly would further enhance the resolution’s legitimacy.

2. Specific, but adaptable and iterative standards

Strengths - Rather than passing more regulatory language that states could adopt as written, UNSCR 1540 sets an outcome-based standard that requires states to write their own laws to meet those outcomes. This has two positive impacts on effectiveness. First, it makes it more likely that the laws passed are reflective of the “on-the-ground” reality of the risk of

³³ Hecló, Hugh. Modern Social Politics in Britain and Sweden in Hall, Peter. 1993. “Policy Paradigms, Social Learning, and the State: The Case of Economic Policymaking in Britain.” *Comparative Politics* 25(3): 275-296; p. 275-6.

³⁴ For example, the U.S. Department of State’s EXBS program frames its outreach efforts in terms of the obligation created by 1540. Oak Ridge National Laboratory technical experts do the same. Interviews with the author.

proliferation in the state in question. All states face different threats regarding their role in proliferation and so should put in place different institutions to fill those gaps. At the same time, if properly implemented, this differentiation in strategies can create an international policy laboratory in which new ideas are tested for relative effectiveness.

Points of improvement - To date there is very little comparison, likely for diplomatic reasons. The Committee might consider more positive comparisons, including the naming of best practices or case studies of particularly effective or innovative systems. Ultimately the ability to learn from differentiated implementation requires understanding what strategies have been more (and less) effective relative to others. The Experts, if they serve long enough, are well suited to facilitate this learning. It requires that they be given additional autonomy. Ideally those lessons would be folded into new standards or best practices that would be enumerated alongside the basic documents. But that requires that the Committee work to develop and regularly update a more specific set of standards that illustrate different strategies for effective implementation. Here academic research might provide a third-party analysis that can be more frank and more neutral in its assessment, which would aid learning among practitioners.

3) Minimizing politicization, maximizing involvement of technical experts

Strengths - Non-proliferation is a sensitive issue area. The involvement of expressly political actors can enhance legitimacy, but over-involvement is counter-productive. Through the matrices and detailed reporting requirements, UNSCR 1540 minimizes the degree of politicization attached to non-proliferation. Focusing on non-proliferation as a series of technical problems removes some of the pressure from cooperation.

Points of improvement - Highly technical discussions can quickly become isolated discussions among a small group of like-minded people. Creative problem-solving requires a more diverse set of views. In the context of UNSCR 1540, this might mean ensuring that discussions regarding nuclear, biological, and chemical non-proliferation do not happen in isolation from each other. Technical discussions also often favor rich countries over economically less advantaged countries. It is important that all countries be granted equal voice in debates over collective standards, procedures, and lessons learned. Experts from all countries should be incentivized to learn from their colleagues in other contexts. This means also that experts from donor countries should be prepared to draw lessons from their colleagues in countries receiving assistance. The Committee, Group of Experts, and academic research could facilitate that cross-directional learning. Academics also are best suited to assess the degree of participation by all relevant stakeholders.

The Role of the Comprehensive Review

Beyond just reporting on implementation, the 2016 Comprehensive Review can play two vital roles in enhancing UNSCR 1540. First, it can begin a dialogue on the role of the 1540 Committee, the Group of Experts, and future Comprehensive Reviews. Is implementation in isolation enough? Or should learning

from experience be the goal? If so, what role might be played by the Committee and the Group of Experts respectively? Can future reviews be used to identify best practices and successful cases? What currently inhibits learning in the USNCR 1540 process?

The 2016 Review also can shape the coming agenda for 1540, especially regarding measurement of “compliance” and “effectiveness.” Currently, merely turning in a report as required is considered a success. There is some logic to that, as Early (this conference) suggests. But reports that show no progress ultimately do not meet the standard. The Comprehensive Review should consider laying out options for a “ratcheting up” of standards for future Reviews, including the impact of implementation. There is a deep debate in academia about how to measure impact and effectiveness in such a nebulous world as illicit proliferation that should inform that discussion.

Finally, the Review could enumerate strategies such as research support and availability of data that would encourage academic engagement.

Evolution of Bioethics Education in Russia and CIS Countries

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During the Soviet times, the bioethical education was poorly presented in FSU. In the same time, in the Soviet Union all the medical students studied deontological ethics and had to swear the Hippocratic Oath. In 1990s in Russia a lot of educational courses had been modified using Western textbooks and information from the Internet and now the medical students have to study the special bioethics program. The Hippocratic Oath is also implemented and the procedure of taking the Oath is very official and is organized with the presence of Rector or Provost of the university.

During the last decade, some additional improvements in bioethics education in Russia were implemented to upgrade the education of students in the field of pre-clinical and clinical trials, and to educate students in principles of the social responsibilities of researchers working in the field of microbiological and virological research and dual-use research. It should be additionally mentioned, that the standard courses in deontological ethics and for clinical trials education have been taught for Russian medical students for decades in the following form: 36 hrs of lectures and 16 hrs of practical work in hospitals. The special 2-hours lecture module in bioethics was also developed 5 years ago for biotechnology master degree students in a few Russian universities. This module includes the information about the history of BTWC, bioterrorism accidents, biocrime accidents and progress in BTWC talks and initiatives. In the last 20 years it had been implemented at our Novosibirsk state university, Siberian Federal University and some other universities in Russia. In 2015 the Coursera lecture course in virology was developed at our, Novosibirsk State University and became publicly available through Internet in January, 2016. It contains one lecture devoted to the BTWC and bioethics responsibility of researchers and all specialists working in biotechnological or microbiological organizations.

During the last decade, the need of harmonizing of bioethics education was widely recognized among the CIS countries. Two recent events should be specially mentioned. First of all, the Workshop-Conference “Biosafety principles in microbiological laboratories” for virologists, microbiologists, epidemiologists and public health workers of CIS countries took place in October 14-18, 2013 at Novosibirsk State University, Russia. It was organized by joint efforts of the US and Russian specialists, jointly funded by the NAS, USA and Novosibirsk State University and included two lectures in bioethics. Another international seminar “Education and Increase of Dual Use Science Awareness” with Bioethics training took place near Dushanbe, Tajikistan on 1-6 June, 2015. Specialists from Central Asian countries (Tajikistan, Kazakhstan, Kyrgyzstan, Uzbekistan), Russia, Great Britain, France, Pakistan, Georgia, Armenia participated in the meeting; the representatives of WHO and ISTC also attended and actively participated in it. The situation with bioethics education and implementation of international regulations at the Central Asian and CIS countries was discussed. The absence of the bioethics textbook of international level in Russian and in local languages was specially underlined.

The following decisions were made during the 2015 meeting:

- To create an International Working Group (IWG) for the development of international educational program on Biosafety and Bioethics in life sciences in Central Asia countries.
- The IWG should develop and establish the website in bioethics and dual use life sciences and extend the part of the website for general population and mass media education in dual use technologies, biosafety, biosecurity and bioethics.
- To initiate and to develop the modern educational materials in the field of dual use technologies, biosafety, biosecurity and bioethics.
- To organize regular meetings of the experts in biosafety, biosecurity and bioethics in different Central Asian countries using different formats: webinars, online conferences, MOOC etc.
- To prepare the statement for all countries of the region - participants of the Seminar - including the offer to modify regional regulations, laws with the purpose to increase the levels of biosafety, biosecurity and bioethics regulations in this region.

Nevertheless, the following challenges remain unresolved:

- The Russian language textbooks in Bioethics are still far from necessary requirements;
- The history of Bioethics and BTWC is poorly presented in these books;
- The Code of Conduct for researchers was recommended to be developed and implemented but in Russia and in CIS and Central Asia countries it still exists only among chemists at the Moscow State University.
- The Code of Conduct for biotechnologists is under discussion in Russia now and the draft of it has been developed at our Novosibirsk state university. The text of it is attached.

It should be mentioned, that in spite of the fact that there were no cases of bioterrorism in the CIS and Central Asia countries, the preventive work and education in bioethics should remain in the focus of academic specialists. Moreover, we will continue the efforts to close gaps in this field and to implement the UN SC Resolution 1540 in Russia, attracting the best Russian specialists in biotechnology, microbiology and virology and our students.

Appendix

The Code of Conduct for Russian Biotechnologists (DRAFT)

- Accepting with deep appreciation and gratitude the great knowledge bestowed upon me and comprehending the secrets of biological and chemical sciences, I swear by Mikhail Lomonosov,
- Dmitri Mendeleev,
- Ivan Sechenov,
- Dmitri Ivanovsky,
- Ilya Mechnikov,
- Ivan Pavlov,
- Mikhail Chumakov
- And all our great Teachers:
- that during all my life I will not tarnish the honor of the natural sciences Brotherhood I am entering today.
- I swear!
- I will consider the Students of my Teachers as my brothers and sisters and deliver the knowledge of my Teachers and myself, multiplying said knowledge selflessly.
- I swear!
- I will not use my knowledge to harm the Humanity, Nature, Motherland and my Alma mater, I will not prepare secret substances and drugs and I will give no deadly or forbidden substance to any person.
- I swear!
- I will follow this Oath without exceptions.
- If I keep this oath faithfully, may I enjoy my life, be successful in business and be respected by all men and in all times
- If somebody violates the Oath or gives the false Oath, this person will be rejected by all our Brotherhood and will be forgotten forever.
- I swear! I swear! I swear!

UNSCR 1540 Civil Society Forum: Academic Outreach

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Introduction

The 2004 UN Security Council Resolution 1540 makes almost no reference to engaging or interacting with civil society in general and the academic community in particular. Paragraph 8 (d) makes a passing mention to “work with and inform industry and the public”. While UNSCR 1977 on the one hand encourages the 1540 committee to draw upon expertise from civil society and the private sector it leaves it to the Committee’s discretion on the other. Unsurprisingly then the interaction between the 1540 committee and academia and scholars has been sporadic and ad hoc.

Although some scholars were initially interested in the policy implications of 1540, notably the unusual legislative role of the Council in passing the resolution and the various challenges of implementing the Resolution, this research remained distant from the work of the Committee. It is only after the 2009 Prague agenda that there was a greater recognition of the need to engage civil society in general and academia in particular.

Since then there has been greater interaction between the Committee and its work and academia. Notable among them are the dedicated course on ‘Prohibitions and Controls of Sensitive Technologies and Dual-Use Material’ at Federal University of Sao Paulo in 2011, the publication of an e-journal, *The 1540 Compass*, by the University of Georgia’s Center for International and Trade Security since 2012, and a civil society report, *1540: 10 Years On: Opportunities, Challenges and Effective Practices for the Resolution’s Implementation*, in 2014 prepared by King’s College London and the Institute for Defence Studies & Analyses, New Delhi.

Despite these developments the interaction with academia remains unfocused, episodic and primarily dominated by scholars and institutions from the global north. There is still greater emphasis on assessing the policy implications of the implementation of the resolution rather than providing scientific inputs that would enhance the technical capabilities of the Committee. Significantly, even this limited research component overshadows the virtually non-existent pedagogical component of academia. With perhaps one or two exceptions, there are no courses dealing with the relationship between 1540 and weapons of mass destruction and missiles.

What are/should be the goals and objectives of scholarship related to 1540?

Scholarship on 1540 should serve the primary goal of achieving the comprehensive implementation of the Resolution. This would require two parallel tracks.

First, a research component that examines and provides technical inputs on the latest trends in the nuclear, chemical and, especially biological sciences and their dual use and weapons potential. In this context, academics related to natural sciences in general and biology, especially synthetic biology, in particular need to be made aware of the potential proliferation implications of their research by closer interaction with the Committee. On the other hand the Committee also needs to have access to the latest scientific research being conducted in universities and laboratories, which might have implications on the implementation of 1540. To ensue that such cooperation is global, efforts should be made to engage universities and laboratories both in the global north and the global South.

Second, there is a pressing need to develop a teaching component to educate the next generation of scholars on the policy and science components of 1540 in the leading universities of the global north and south. Presently there is a dearth of courses on weapons of mass destruction in general and 1540 in particular. As a former Committee member Roque Monteleone-Neto observed that in the area of WMD “there is a huge gap between the technical and political knowledge of those who deal professionally with this matter and the curricula content at universities”. Such courses are essential, especially in countries that do not have the necessary expertise to implement all the elements related to 1540. This would also help to build capacity on emerging scientific trends in the global south.

How can a wider academic community, including students, be encouraged to engage in analysis of 1540?

A primary prerequisite to encouraging engagement in the analysis of 1540 is the need to have courses at the university level that provide basic knowledge about the provisions of the resolution and how they impact on the national, regional and international commitments of the country. Second, providing scholarships for work on 1540, especially in countries from the global south, which are still trying to build the capacity to adhere to their commitments, can encourage analysis. Finally, the ability to work with Committee members on the analysis and also present their findings to policy makers at the national and international level would also be an incentive for scholars to work on the subject.

How can the Committee most effectively expand and strengthen its relationships with the international community of academics whose research is relevant to the goals of resolution 1540?

There are at least two ways in which the Committee can expand and strengthen its relationships with the community of academics. The first, at the minimalist level, the Committee could establish an academic advisory board (similar to an editorial board for a peer review journal) and an official academic journal. Such a journal, while ensuring a balance between the global north and south, would serve as a platform for peer reviewed applied research – both scientific and policy oriented – to be presented to the wider academic community. Such a journal could be housed at UNU or UNIDIR. Additionally, the Committee could encourage and support universities to develop and run courses related to 1540 and also offer internships or short-term scholarships to work with the Committee.

Second, at the maximalist level the Committee could encourage a country or a group of countries (or indeed a leader or a group of leaders) to emulate the Nuclear Security Summit process, especially as it relates to the objectives of 1540. Such a process could focus specifically on biological capabilities, which remain the most potent and yet the most unregulated; there are no formal institutions or instruments to address the proliferation of biological weapons (as is the case with nuclear and chemical weapons). While the prospects of initiating such a process are daunting, they are not inconceivable and even a limited success would go a long way in meeting the objectives of 1540.

Academic Outreach

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Introduction

The implementation of obligations set out in UNSCR 1540 has traditionally been the responsibility of government agencies and industrial operators involved in WMD nonproliferation. In the field of strategic trade controls, where significant obligations are delineated by OP3 of the resolution, national licensing and enforcement bodies, as well as exporters/brokers/trans-shippers, have formulated policy decisions regarding how best to comply with and implement 1540.

Due to globalization, complex supply chains, security challenges, technological advancements, and new international legal instruments, the role of trade control has come to the forefront of security discussions. This has often taken place faster than the ability of national structures and systems to keep pace. Meanwhile, research interest in the field of trade control has increased worldwide. More individuals from academic and research institutes have begun asking important questions regarding how to tackle new challenges, even on distinctly specific aspects. This has taken place as researchers have realized that what was formerly known as ‘export controls’ and is now more commonly referred to as ‘strategic trade controls’ (also by other names as the field develops) has a direct link to non-proliferation, WMD safety and security, terrorism, and even legal and economic fields of study. However, this research community has thus far been spread widely without any self-aware identity, limiting its ability to grow and flourish.

Researchers’ contributions have proven to be of great value to 1540 implementation. While still few, the academic and research institutions producing scholarship on 1540 related issues have stimulated important discussions regarding how best to approach legislation and enforcement, develop good practice models, and engage policy-makers in discussions that steer informed policy decision-making. The following sections seek to answer more specifically the questions posed in session III of the forum.

What are/should be the goals and objectives of scholarship related to 1540?

First, scholarship should identify existing related fields of study to 1540 that can help inform current implementation issues. A vast body of research has been conducted on nonproliferation, safety and security, the role of non-state actors, illicit trafficking, and more. Comparative literature also exists pertaining to how states have enacted legislation and enforcement measures subsequent to new international obligations. Past scholarship feeds new ideas and can be used to define and frame the more specific issues posed by 1540.

In addition, scholarship should ask questions that practitioners and policy-makers may not necessarily be in a position to ask- the provocative, the challenging, and even the annoying- in order to break new ground and force policy decisions to be based on a sound underlying framework. In the strategic trade control field, researchers have forced policy-makers to consider many 1540 related issues, for example on whether a one-size-fits-all approach is appropriate in 1540 capacity-building, how best to conduct outreach, what items are to be controlled under OP3 and how best to control them, and good practices for implementation, among others. Apart from publishing written scholarship, researchers have organized meetings and conferences bringing together diverse stakeholders involved in 1540 implementation and encouraged cross-discipline debate and discussion. Analytical study of 1540 balances real-world policy-making considerations. This balance is necessary to ensure a holistic approach to implementation.

A great deal of research has been done already on 1540, even if it's not clear if even more exists that is not easily traceable. The work done should not be duplicated, but rather built upon and used. Therefore, a valid exercise may be to take a step back from generating more and more research, and try to map what already exists. The establishment of more solid networks among researchers can help build upon work already done instead of duplicate it. In other fields, this is the role played by peer-reviewed academic journals. Such a network may also foster collaborations, as researchers from different institutions working on similar topics can communicate and collaborate on topics of mutual interest.

How can a wider academic community, including students, be encouraged to engage in analysis of 1540?

The most significant impediment to encouraging new scholarship and interest -especially of young researchers- in the analysis of 1540 is the disassociation of individual institutions and their activities from each other. While progress has been made, there is still a long way to go. Often researchers who begin working on 1540-related topics do so in isolation and encounter difficulty in finding available resources to enhance and facilitate their research. This also leads to duplication of research activities and impedes the growth of certain research topics. Put briefly, the wider academic community lacks a stronger network bridging researchers and their activities.

In the strategic trade field, one effort to create such a network has been the *Strategic Trade Review*, the first open source peer-reviewed academic journal related to 1540 trade-related aspects. With an international author- and readership, the journal seeks to showcase high quality research and create a network of researchers who can read and build upon the published articles, thereby helping them find each other and even work on common projects. The journal brings together a diversity of viewpoints and seeks to continue promoting the field's development through confrontation between different perspectives.

Finally, it is important to promote dialogue between so-called hard and soft scientists. On face, this may not seem necessary given the significant differences between the two and even one's distaste or

disdain for the other. However, especially in the fields relevant to 1540 such as nuclear security and strategic trade, fostering such dialogue is essential to attaining a 360 view of challenging topics. Technical knowledge is necessary to understand the nature of threats and technical capacities to overcome them, and social science knowledge is necessary to put this technical knowledge in legal, political, historical and economic context. Promoting dialogue between experts in both areas may yield more innovative and effective ideas than the two working in isolation. Reaching out to scientists that may be exploited by non-state actors due to their technical skills and knowledge is also essential. Projects should specifically target these groups.

How can the Committee most effectively expand and strengthen its relationships with the international community of academics whose research is relevant to the goals of resolution 1540?

Researchers bring added value to the 1540 process. This is the same for 1540 as for any other field. This value is built on curiosity- asking questions, analyzing information, and searching for ways to enhance quality. However, researchers cannot work in isolation, and for research on 1540 to have the most far-reaching effect, researchers must be used or co-opted in some of the actual policy work done on 1540.

This has taken place to a certain extent- many research departments have been directly part of outreach, invited to communicate views in the policy process, or taken their own steps to increase awareness of 1540 obligations to other stakeholders. The names of many of these institutions are listed in the document on 1540 outreach to academia, where members of the group of experts were invited and present at organized events. It is important to understand, however, if these represent a majority, or even just a minority of institutions working on 1540 issues. This is important also given the geographic composition of the institutions. To answer this question, the group of experts may try to better understand where and what kind of work is being done, and how to foster more geographical diversity. When this is done, efforts to link these institutions can be made to create a network.

The Committee can expand and strengthen these relationships by encouraging and supporting research networks. In a practical sense this can be done in areas of specific interest to the committee's work, such as facilitating the creation of a network related to research in capacity-building good practices, for example. Identifying individual researchers (both established and emerging) and understanding how their work relates to key areas of the resolution in a structured way can also encourage the inclusion of such research in broader decision-making processes. The Committee may also support tangible initiatives that facilitate information sharing and networking, such as new publications, web platforms, and social networks, with a particular emphasis on diversity.

Reaching out to young researchers and helping them develop an interest in 1540-related fields should also be considered by the 1540 Committee. Doing so is important to ensure the sustainability of the 1540 process. This is also an area where more can and should be done. On the one hand, building a literature base on 1540 related fields could make it easier for professors to integrate more into their courses. Having peer-reviewed articles that go into the details of certain issues make it easier to give young researchers a holistic view, and allow them to build interest in subtopics. Another way to attract

young researchers is by specifically reaching out to those that are doing work on the 1540 process and involve them to a greater extent in research networks.

Turning Transparency into Knowledge: Enhancing How the 1540 Committee Shares Information

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Introduction

The 1540 Committee has done an admirable job of leveraging transparency and information-sharing to promote compliance with *UN Security Council Resolution (UNSCR) 1540* (2004). One of the most important choices made by the 1540 Committee was the decision to publically post member states' initial national reports and subsequent reports online. This helped to foster a climate of transparency among UN member states about their nonproliferation policies and placed peer pressure on states to comply with the resolution. At the same time, the information that was published in the national reports and aggregated as part of the 1540 Matrices could also help identify which states could benefit from external assistance to facilitate their compliance efforts (Early, Nance, and Cottrell 2016). By posting this information and other information about member states' engagement with *UNSCR 1540* online, the 1540 Committee also created a really unique data source for scholars and policymakers seeking to understand how global governance works. This paper addresses how the 1540 Committee can become even more effective in presenting the information it makes publically available and how it can package that information to encourage research by academics and non-governmental organizations. The arguments are illustrated by examining trends in the submission of national reports to the 1540 Committee that are published on its website.

Promoting Compliance with UNSCR 1540 through Transparency

The 1540 Committee has promoted international transparency by making a wide array of documents and information about states' efforts to comply with *UNSCR 1540* publically available. The 1540 Committee posts all the national reports it receives related to member states' compliance efforts with *UNSCR 1540* online. In addition to these reports, the Committee has posted the 22 "National Implementation Action Plans" member states have produced that present their plans for enhancing their compliance with *UNSCR 1540*. The Committee's website also hosts information about which countries have requested assistance to support their compliance efforts with the resolution and the countries that have volunteered to provide it. The 1540 Committee recently published the most up-to-date 1540 Matrices for 183 countries on its website.

The 1540 Committee's commitment to publishing information about member states' degree of engagement and compliance with *UNSCR 1540* has supported the resolution in numerous ways. To begin with, it has helped to turn governments' nonproliferation policies from a domestic security issue into an issue in which the international community must be considered a constituency. By making 1540 national reports public documents, the 1540 Committee gave the international community the ability to determine which states are taking their compliance obligations seriously. This introduced a subtle

source of peer pressure to encourage compliance with *UNSCR 1540*. Public reporting also facilitates in the provision of capacity-building assistance to support compliance efforts by helping the international community identify which states need assistance, what type of assistance they need, and whether the assistance given has been effective. Through its transparency-promoting policies, the 1540 Committee has helped to foster a culture of information-sharing, constructive dialogue, and collective cooperation in the effort to enhance global compliance with *UNSCR 1540* (Early, Nance, and Cottrell 2016).

The public availability of information on countries' level of compliance can encourage researchers and members of civil society to complement the 1540 Committee's (2008; 2011) efforts at self-assessment with their own independent research (Crail 2006). Possessing information on the extent to which states have complied with *UNSCR 1540* can also allow researchers to uncover insights into the underlying factors that influence compliance (Stinnett et al. 2011) or can improve it. These insights, in turn, can help the 1540 Committee and Security Council adopt new strategies or innovations to support global compliance efforts. It is notable, for instance, that the Security Council has used a number of subsequent resolutions to *UNSCR 1540* to enhance the role and responsibilities of the 1540 Committee and encouraged states to undertake new practices to support their compliance efforts, such as introduction of "National Implementation Action Plans."

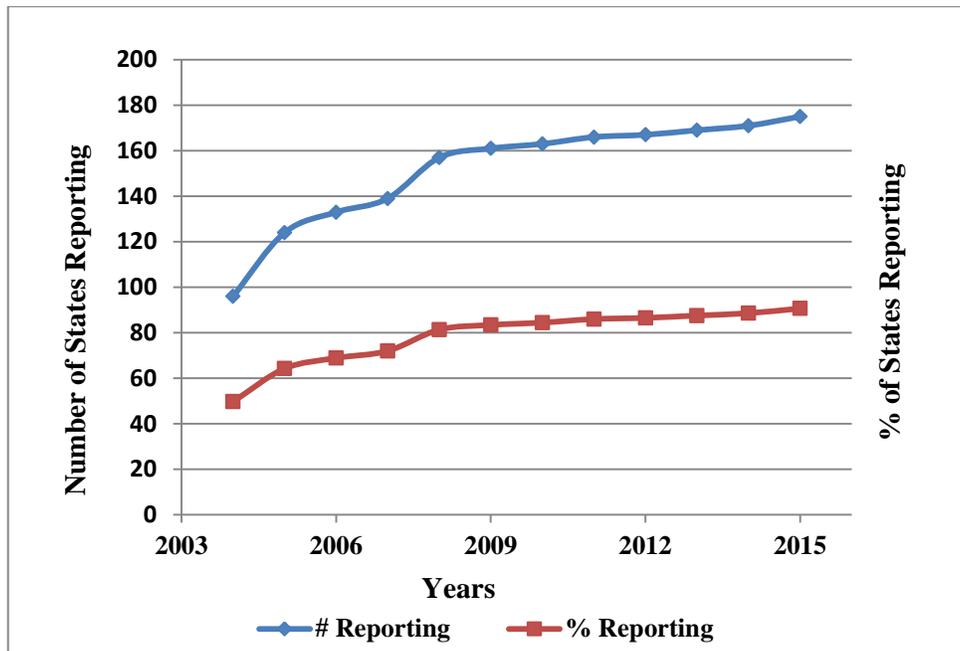
Beyond just promoting transparency, the 1540 Committee can be even more effective in mobilizing academia, civil society, and member state to put its data to effective use. The 1540 Committee can take two major steps that will help make the information it collects and publicizes more user-friendly. The first step involves doing a better job summarizing the information that the 1540 Committee posts on its website. While posting countries' national reports and implementation plans online allows users to investigate what individual countries are doing, just listing the reports does not provide the public with insights into overarching trends. The 1540 Committee should use its expertise to help users contextualize the raw the data posted on its website. It can do this by providing more in-depth summary descriptions about trends in the reports and/or plans it posts and through using data visualization tools, like charts and maps. The second action the 1540 Committee can take is to create databases that compile information about the documents and materials it makes publically available. For example, maintaining a running database on the submission of national reports and action plans to the 1540 Committee could be very useful to researchers. Similarly, summarizing what's contained in the 1540 Matrices within a singular database would also be a very useful tool. For researchers interested in evaluating trends or patterns in the factors that promote compliance with *UNSCR 1540*, the availability of a consolidated, authoritative database with that information would be enormously useful.

Illustrating More Effective Transparency Promoting Strategies

To illustrate the direct value-added of these recommendations, I have created a consolidated database of the online national reports that countries submitted to the 1540 Committee. Through consolidating this information within a single database, trends can be observed in global compliance with *UNSCR 1540*'s initial reporting obligation and in member states' continued submission of voluntary national reports. The best way to summarize and understand these trends is through visualizing the data.

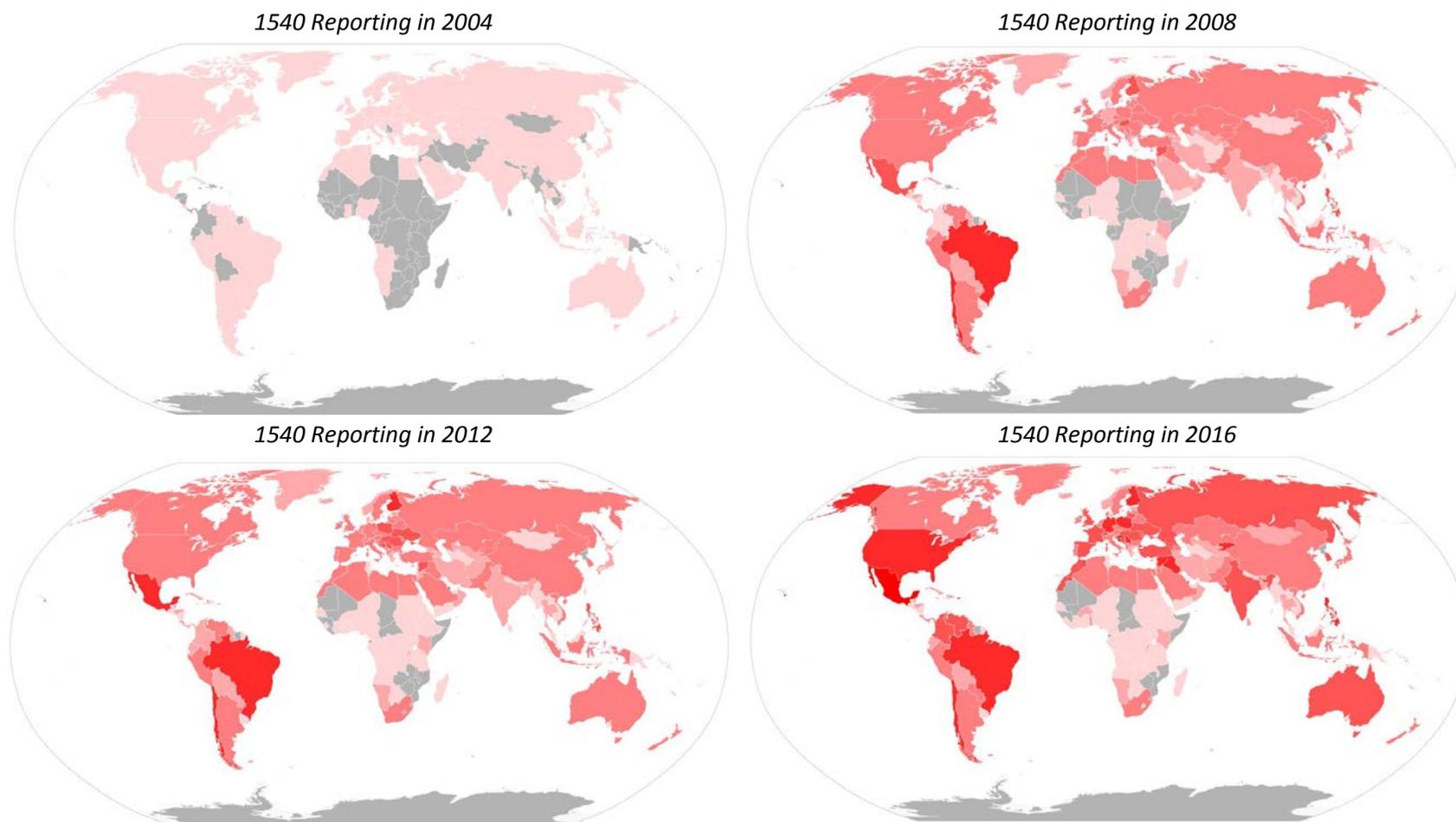
In Figure 1, I have charted the cumulative number of countries that have fulfilled their obligation to submit at least one national report to the 1540 Committee. The chart shows the number of countries that have submitted their first reports by the end of each calendar year. As the chart reveals, only about half of the UN’s membership fulfilled their reporting obligations at the end of 2004. Over the next several years, though, the number of countries submitting their first reports grew steadily and significantly. As of 2015, almost 90% of the countries in the world have complied with their initial reporting obligations. Given that the Security Council passed several follow-on resolutions that have continued to call upon member states to fulfill their initial reporting obligation,³⁵ demonstrating the extent to which the international community has complied is important information to share with the public.

Figure 1: Compliance with *Resolution 1540* Initial Reporting Obligation over Time³⁶



³⁵ For example, see provisions in *UNSCR 1673* (2006) and *UNSCR 1810* (2008).

³⁶ This figure uses data on when states submitted their first national report to the 1540 Committee (1540 Committee 2016; Early, Nance, and Cottrell 2016).

Figure 2: Global Trends in the Submission of National Reports to the 1540 Committee

Notes: The darker the hue of red in the pictures, the more National Reports a state has submitted to the 1540 Committee. Gray denotes that a state has not yet complied with its initial 1540 reporting obligation (1540 Committee 2016; Early, Nance, and Cottrell 2016).

Beyond just the trends in initial compliance, the national reporting data posted online can also uncover trends with respect to which countries are most actively engaged in reporting to the 1540 Committee. Figure 2 uses maps to illustrate the frequency with which states around the world have submitted reports to the 1540 Committee over the past 12 years. As the four maps illustrate, there has been significant variation in terms of which states are most actively involved in submitting reports and in what regions. The darker the shade of red that countries are colored in the maps, the more reports they had submitted to the 1540 Committee. Countries colored in gray had not submitted their initial required reports by the end of a particular period. Out of all the countries in the world, Croatia submitted the largest number of national reports with seven in total. The data suggest that countries in Central America, the Caribbean, the Pacific, and Africa have generally been less engaged in submitting national reports than most other regions of the world. These data also show that 1540 Committee has been remarkably effective in continuing to engage many countries in the world even though continued reporting is voluntary. Without a lot of additional analysis, most visitors to the 1540 Committee's website would fail to grasp most of the large trends evidenced by all of the national reports the 1540 Committee has publically posted.

These figures illustrate the value-added of consolidating information that the 1540 Committee puts online into databases that can allow for broader trends and patterns to be analyzed. Putting the information collected by 1540 Committee into more user-friendly formats can further the goal of promoting transparency by helping policymakers, experts, journalists, and members of civil society understand and contextualize the documents the committee makes available. It also can help researchers develop new insights into the factors that can explain cross-national variation in the degree to which countries have engaged with the 1540 Committee and complied with *UNSCR 1540*. Rather than being a passive provider of raw data, the 1540 Committee can be more proactive in providing scholars and civil society with resources that will encourage them to become more involved in studying how to make *UNSCR 1540* more effective.

Conclusion

The 1540 Committee should be commended for the range of important steps it has taken to promote international transparency. By making the documents member states submit publically available, the 1540 Committee has created a community in which sharing information about nonproliferation policies has become the norm. This is essential to the success of *UNSCR 1540*. Countries must be willing to share information with not only the committee but also each other, especially for the resolution's assistance mechanisms to work effectively. Posting information about the degree to which members have complied has enhanced the social pressure that member states face to comply with the resolution. It has also provided states with plenty of examples for how to comply as well. While posting documents was an excellent starting point for using transparency to promote compliance with *UNSCR 1540*, the next big step for the 1540 Committee should be in encouraging civil society and academia to make effective use of that information as well. Equipped with better, more accessible data, civil society and academia can be valuable partners in finding new ways to enhance the resolution's effectiveness and in expediting global compliance with the resolution.

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The Legitimacy of UN Security Council Resolution 1540

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Summary: *While many states had initially contested the legitimacy of United Nations Security Council Resolution (UNSCR) 1540, the resolution is today widely perceived as legitimate. To maintain the resolution's legitimacy, the 1540 Committee is thus well advised to develop further its managerial approach to implementation, to continue to raise awareness of the value of UNSC 1540, and to advance the regional approach to implementation. The 1540 Committee should also acknowledge that states do not assess the legitimacy of UNSC 1540 in isolation but consider global non-proliferation obligations to be complementary to nuclear weapons states' disarmament obligations.*

Legitimacy means rightful, moral or justified rule. International organizations (IOs) need to be perceived as legitimate actors to govern effectively and ensure compliance with their decisions. Legitimacy is not a static property of institutions but can be forfeited and must be maintained through legitimation strategies. IOs can derive legitimacy from three sources: Legal legitimacy relates to compliance with the mandate states agree upon when founding an IO. Procedural legitimacy pertains to the quality of an IO's decision-making procedures and is associated with good governance standards such as equal participation, transparency and accountability. Performance legitimacy refers to the output an IO generates (Binder and Heupel 2015).

The legitimacy of UNSCR 1540 has initially been contested. States and academics questioned that the Security Council had the legal mandate to adopt quasi-legislative resolutions that do not address specific security threats. They called into question that the Council had the right to impose binding obligation on all UN member states with regard to a generic threat, namely the proliferation of weapons of mass destruction (WMD) and their delivery means to non-state actors *per se*. Moreover, non-Council members deplored that the input they had provided in open meetings prior to the adoption of UNSCR 1540 was not sufficiently reflected in the final text of the resolution. Finally, many developing countries failed to see that the objectives of UNSCR 1540 were in line with their national interest and pointed out that for them issues like sustainable development were of higher relevance than preventing WMD from falling into the hands of terrorists (Heupel 2008).

Today, the legitimacy of the resolution and of the 1540 Committee is widely acknowledged (Nuclear Threat Initiative 2011). Remarkably, the question whether the Security Council overstepped its legal mandate when it adopted UNSCR 1540 and its follow-up resolutions no longer play a role in the public debates on UNSC 1540. If states bring up the issue at all, they make clear that even though they might not support the legislative character of UNSCR 1540, they nevertheless support the resolution's substance (UN Security Council 2014). That states no longer question the legal legitimacy of UNSCR 1540 is mainly due to the approach the 1540 Committee has taken to foster implementation of the resolution. Acknowledging the perceived shortcomings with regard to legal legitimacy, the 1540

Committee chose an approach that reflected the ambition to strengthen both the procedural legitimacy and the performance legitimacy of UNSCR 1540. Three features of this approach are particularly important:

First, the 1540 Committee's decision to adopt a managerial rather than an enforcement-based approach to implementation certainly helped increase the legitimacy of UNSCR 1540. From the outset, the 1540 Committee focused on capacity building, recognizing that many states lacked the knowledge and the resources to implement the obligations mentioned in the resolution. The Committee also went to great lengths to explain what states were expected to do and to make its working methods transparent. Implementation failures were not punished. Weak implementation records were not even made public, except for information in reports and on the Committee website on which states had not yet submitted implementation reports; besides, the stated aim of the country matrices the Committee compiled was to facilitate dialogue on assistance needs rather than to expose non-compliance (Beck 2015).

Second, the 1540 Committee successfully raised awareness of the value UNSCR 1540 had to all states. The 1540 Committee and many other actors organized workshops and developed various other forms of outreach to explain to states that given the global reach of transnational terrorism preventing WMD from falling into the hands of terrorists was in everybody's interest of (1540 Committee 2016). Acknowledging that especially developing countries might still have different priorities, actors who provided implementation assistance sometimes tailored their assistance in a way that more obvious needs of recipient states were equally addressed. For instance, agencies that were in a position to offer help for border control measures aimed at curbing illicit trade in WMD related material offered help that not only addressed the obligations determined in UNSCR 1540 but furthermore strengthened various other aspects of border security (Finlay 2012).

A third legitimation strategy was the regional approach to implementation the 1540 Committee chose. The Committee, oftentimes in partnership with regional or national actors, hosted various regional workshops to raise awareness of the importance of UNSCR 1540. The Committee also encouraged regional intergovernmental organizations and regional and national non-governmental organizations (NGOs) to help identify and meet the assistance needs countries had. These efforts helped create a sense of ownership among states that had initially felt that UNSCR 1540 was something that was imposed on them from the outside and only reflected the interests of the powerful Western Security Council members (see also Finlay 2012).

These achievements do not imply that the legitimacy of UNSCR 1540 can be taken for granted. This applies all the more so given that implementation of the resolution continues to be uneven, with a lot of work still lying ahead. Building on the achievements of the past years, the 1540 Committee therefore should:

- develop further its managerial approach to implementation and especially consider ways to regularly update and simplify access to offers of assistance on its website,
- continue to raise awareness of the value of UNSC 1540 and especially promote efforts to embed UNSCR 1540 related assistance in broader assistance strategies that address core needs of developing countries,
- advance its regional approach to implementation and especially explore ways to productively partner with regional, national and local NGOs,
- acknowledge that UNSCR 1540 is part of the broader non-proliferation regime. In current debates on UNSCR 1540 states still complain that the nuclear weapons states fail to take their nuclear disarmament commitments seriously while all states are expected to honor their non-proliferation obligations. To foster non-nuclear weapons states' readiness to meet their non-proliferation obligations, the nuclear weapons states represented in the Security Council must therefore turn rhetoric into action and take meaningful steps towards full disarmament.

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Transparency: Effective Implementation of UNSCR 1540 Now and in the Future

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Introduction

The questions posed for this panel are:

- From the perspective of academia, what data is needed and what is available for academic analysis of the implementation of resolution 1540?
- How useful is the data and other information published by the 1540 Committee?
- What improvements could be made?

In this paper, I want to respond by offering my views on what can be accomplished with the data currently available to academia, primarily through the information provided on the 1540 Committee website, and suggesting two additional approaches that could be considered for the future. I also want to distinguish between analysis and evaluation, which although related, may address comparable questions at different levels and with different methodologies. The key distinction between the two, from my point of view, would be evaluation's focus on programs, on the specific means and measures through which resolution 1540 is being implemented. With more than a decade of experience with implementing resolution 1540, it seems appropriate that evaluation receive increasing emphasis.

At the outset I want to note two sorts of challenges for any assessment of the implementation of resolution 1540. The first and most profound is existential: for prevention of WMD terrorism, demonstrating success ultimately requires proving a negative. Failure may be obvious, but if nothing bad happens, can 1540 claim credit? Second, resolution 1540 is only one among a substantial number of international, national, and regional efforts, so apportioning success is also a political and practical challenge. These are realities that must be taken into account in thinking about what can and should be done to understand 1540's impact.

What Can Be Done with What Exists?

The amount and variety of information available about the implementation of resolution 1540 is impressive and enables academia and civil society to identify and track patterns and trends. This sort of primarily quantitative analysis can provide essential baselines and benchmarks, as well as insights and

³⁷ This paper draws upon insights gained through the author's work at the National Academies, but any opinions, findings, conclusions or recommendations expressed in this material are her own and do not necessarily reflect the views of the National Academies.

indicators for further, more intensive scrutiny. Just to provide a few examples, analysts interested in 1540 examine questions such as

- Does the progress in implementation vary across the different areas of 1540's focus? Given the high level political attention to nuclear terrorism, one might, for example, expect to find greater progress on measures to address these issues than chemical and biological terrorism.
- Are states continuing to enact separate legislation to address nuclear, chemical, biological, and delivery means, or is the movement in recent years to think comprehensively about CBRN security manifesting itself in more collective statutes, especially in smaller and developing countries?
- Are there patterns among the types of ministries engaged in consultations about 1540 implementation? Have those patterns changed over time?
- What patterns can be discerned in the range and types of international and regional organizations engaged in 1540 implementation? Over time, is there evidence that "networks of networks" have developed and among whom?

In addition, the dedicated efforts of a number of civil society organizations, such as the *1540 Compass* published by the Center for International Trade and Security of the University of Georgia, along with their convening and analytical work as well as that of the Institute for Security Studies, the Stimson Center, the Stanley Foundation, and others provide qualitative and case study evidence.

That said, the publicly available information from the 1540 Committee itself about in-depth experiences and lessons learned and shared is relatively limited, and suggests two potential types of activities that would also engage academia and key stakeholders.

What More Could Be Done?

A decade on, can analysis move beyond the natural initial focus on laws and regulations to capture a more complete sense of the policies that support effective implementation? This is especially important in the realm of preventing chemical and particularly biological terrorism, where responding to rapidly advancing technological developments requires more than regulation. A legal and regulatory framework is an essential foundation, but a wider mix of policies, including outreach and engagement with key stakeholders, is needed. To illustrate why this is important, let me offer a U.S. example. Right now the U.S. government is engaged in a "deliberative process" to decide what sort of oversight should govern experiments with certain pathogens with pandemic potential, the so-called gain-of-function (GOF) controversy. Effective oversight of dual use research is widely accepted as an essential component of mitigating the risks of bioterrorism. The current U.S. policy framework encompasses a mix of regulations, including those in support of international treaties and agreements, guidelines, and policies from different agencies that encompass the life cycle of research. Simply looking at the formal regulatory structure will not provide a complete picture.

Some countries, including the United States, provide information to the 1540 Committee about policies as well as laws and regulations, and the matrices offer the possibility to do so. But at present neither

the 1540 Committee data, nor any other source, can provide a systematic, comprehensive picture of the variety of national oversight mechanisms and experiences. And the experience is rich and varied. The Netherlands has recently adopted a new policy framework to address dual use research, based on its export control system but also involving significant outreach to the research community. Australia has been undertaking and simultaneously assessing another policy process for dual use research, also based in its export control system. Canada has put in place new regulations governing pathogen research whose development featured an extensive consultation process with its academic community. The Science Council of Japan has added responsibilities related to dual use research to its code of conduct for scientists. The Malaysian government, in cooperation with its national academy of sciences, has developed a code of conduct on biosecurity.

Would it be possible for the 1540 Committee to support the systematic collection of national policies, lessons learned, and experiences that would provide a richer picture of implementation? The collection of this type of knowledge can be seen as a research as well as a reporting task. That sort of effort, ideally as a partnership with academia, could also serve important outreach and engagement goals.

In thinking about cases and experiences, I also want to suggest that one could use evaluation to enhance 1540 goals of fostering partnerships to support prevent WMD terrorism. The general approach is “participatory evaluation,” which is used by the World Bank and the UN Development Program, as well as many organizations in the United States and elsewhere that put a premium on partnerships.³⁸ A hallmark of such methods is that partners and participants play a central role in defining what “success” would mean for the project. This often includes the cooperative development of project metrics. The Appendix contains information from the World Bank that answers three important questions about the approach.

In summary, this paper suggests that data and information are available to analyze key components of 1540 implementation. Investments in additional capacity, especially via partnerships, could yield more.

³⁸ Information from the World Bank may be found at <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTISPMA/0,,contentMDK:20190347~menuPK:412148~pagePK:148956~piPK:216618~theSitePK:384329,00.html> and <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/EXTPCENG/0,,contentMDK:20509352~menuPK:1278203~pagePK:148956~piPK:216618~theSitePK:410306,00.html>. Information from UNDP may be found at <http://web.undp.org/evaluation/documents/whop4.htm>.

Appendix

Participatory Evaluation

What is Participatory Monitoring & Evaluation?

Participatory monitoring & evaluation (PM&E) is a process through which stakeholders at various levels engage in monitoring or evaluating a particular project, program or policy, share control over the content, the process and the results of the M&E activity and engage in taking or identifying corrective actions. PM&E focuses on the active engagement of primary stakeholders.

Why is Participatory Monitoring and Evaluation important?

Participation is increasingly being recognized as being integral to the M&E process, since it offers new ways of assessing and learning from change that are more inclusive, and more responsive to the needs and aspirations of those most directly affected. PM&E is geared towards not only measuring the effectiveness of a project, but also towards building ownership and empowering beneficiaries; building accountability and transparency ; and taking corrective actions to improve performance and outcomes.

What are the principles of Participatory Monitoring & Evaluation?

Conventionally, monitoring and evaluation has involved outside experts coming in to measure performance against pre-set indicators, using standardized procedures and tools. PM&E differs from more conventional approaches in that it seeks to engage key project stakeholders more actively in reflecting and assessing the progress of their project and in particular the achievement of results.

Core principles of PM&E are:

- primary stakeholders are active participants – not just sources of information
- building capacity of local people to analyze, reflect and take action
- joint learning of stakeholders at various levels
- catalyzes commitment to taking corrective actions

Source: World Bank

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/EXTPCENG/0,,contentMDK:20509352~menuPK:1278203~pagePK:148956~piPK:216618~theSitePK:410306,00.html>

1540 Review and Analysis: Increasing Transparency

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Introduction

Thanks. As has been indicated I work for the South African-based Institute for Security of Studies (ISS), which is a pan-African organisation working for the advancement of sustainable human security in Africa. The Institute also has offices in Nairobi, Kenya, Addis Ababa, Ethiopia and Dakar, Senegal. The objective of the Institute is to add critical balance and objectivity by providing timely, empirical research, teaching and implementation support on sustainable human security issues to policy makers, area specialists, advocacy groups, and the media.

I run a project called “Africa’s Development and the Threat of Weapons of Mass Destruction Project” (WMD Project), which started in May 2007 and falls under ISS’ Division, Transnational Threats and International Crime (TTIC). This division aims to combat transnational threats and international crimes by enhancing the ability of African inter-governmental organisations, national governments and civil society to respond more effectively and appropriately to transnational threats and international crimes.

Thematically the project focuses on the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and other related Conventions such as the Comprehensive Nuclear Test Ban Treaty; the African Nuclear-Weapon-Free Zone Treaty (Treaty of Pelindaba); the Biological and Toxin Weapons Convention; the Chemical Weapons Convention; and relevant United Nations Security Council resolutions such as UNSCR 1540.

While we have been working on UN Resolution 1540 since the establishment of the programme in 2007, we have recently initiated a dedicated project aimed at strengthening the capacity of African states to prevent the proliferation of weapons of mass destruction and their means of delivery to non-state actors, such as criminals and groups involved in acts of terror. Our work with African governments, international organisations and other partners on disarmament and non-proliferation has shown the real need for a specific project focusing on resolution 1540. As far as we know, the ISS is the first non-governmental organisation to start a project dedicated to the implementation of resolution 1540 in Africa. We were for example involved in the first ‘all-Africa’ conference on 1540 hosted by the South African government in co-operation with the African Union and UNODA in November 2012.

During this conference which it become clear that in order to take full implementation forward and given the limited capacities and resources of African States the synergies between implementing 1540 and advancing African states’ socio-economic and developmental objectives needed to be exposed.

We also work at the international level. Following United Nations Security Council Resolution 1977 (2011), which invited the 1540 Committee 'to consider developing, in close cooperation with relevant international, regional and sub-regional organizations and other United Nations bodies, ways to utilize and maintain expertise, including, in particular, of former experts of the group, that could be made available for specific missions and assistance needs regarding the implementation of resolution 1540 (2004)', the Institute for Security Studies (ISS) hosted a meeting of former 1540 Committee Experts in Cape Town, South Africa, from 28 – 29 May 2015.

With the support of the UN Office for Disarmament Affairs (UNODA), and in liaison with the 1540 Committee Group of Experts, the purpose of the meeting was to provide a platform enabling former 1540 Committee Experts to contribute to an accurate appraisal of collective efforts aimed at facilitating the full implementation of resolution 1540 by States, taking into account achievements so far, challenges faced and possible options for enhanced efficiency and effectiveness. It was also anticipated that this meeting would make a valuable contribution to the 2016 Comprehensive Review of resolution 1540. The report of this meeting in the form of a monograph has been distributed here and has been submitted to the 1540 Committee.

The Security Council in Operative Paragraph 20 and 21, of Resolution 1977 (2011):

- Requests the 1540 Committee to continue to institute transparency measures and activities, *inter alia* by making fullest possible use of the Committee's website, and urges the Committee to conduct, with the participation of the group of experts, regular meetings open to all Member States on the Committee's and group's activities related to the aforementioned objectives;
- Requests the 1540 Committee to continue to organize and participate in outreach events on the implementation of resolution 1540 (2004) at the international, regional, subregional, and, as appropriate, national level, and promote the refinement of these outreach efforts to focus on specific thematic and regional issues related to implementation.

We need to interrogate what this means. We know that the 1540 Committee is engaged in various types of outreach activities to promote full implementation of resolution 1540 (2004), sharing of experiences and lessons learned, capacity building and technical assistance in the areas covered by the resolution. These activities include various events such as conferences, workshops, seminars and relevant international, regional, sub-regional or country-specific meetings, in which the Committee's members and its experts participate. Some of these events are organised by Member States in cooperation with the 1540 Committee, as well as by the UN Office for Disarmament Affairs (UNODA) and other UN bodies. Others still are organised by civil society, academia and multi-lateral organisations such as the African Union.

Presently, there is an insufficient understanding of how 1540 is being implemented at the national level. The matrices, maintained by the 1540 group of experts, is a principle tool that could help to build this understanding. However, we know that in many senses the template of the 1540 Committee Matrix

although revised in 2013 to become more user-friendly (see <http://www.un.org/en/sc/1540/national-implementation/1540-matrix/matrix-template.shtml>), and updated very recently, remains an imperfect tool to accurately reflect implementation efforts. The task of regularly updating the Matrices is challenging for a team of experts limited in number (up to 9 experts but often less - the situation being aggravated by the fact that the process to fill vacant positions is particularly lengthy).

Low readability of the document: the Matrix identifies measures in place, but it does not give a sense of the direction taken by the State. In this regard, the 1540 Matrix is more static than dynamic. Furthermore, the fact that the coding rules are not made public does not help the reader to understand the rationale leading to include, or to exclude any specific measure. Civil organisations and academia can analyse the data presented in the matrixes thereby assisting the Security Council in getting a true overall sense of implementation internationally, by region, nationally and on a thematic basis. For this to happen however, the data needs to be presented or made available in an open format that academia can manipulate and/or import into programmes that allow for in depth analysis.

This, for example:

As ISS we had to take the data and manipulate it so that we could state with some degree of accuracy that as at December 2015, more than half of African states had measures in place to criminalise the use of any kind of weapon of mass destruction, be it a nuclear, a chemical or a biological weapon. And around 50% of African states were identified as having criminalisation measures covering the manufacture, production and acquisition of such weapons.

Criminalisation of WMD Proliferation Activities on the African Continent: Current Status (source: ISS, on the basis of raw data available at http://www.un.org/en/sc/1540/national-implementation/1540-matrix/committee-approved-matrices.shtml)							
Percentage of African states with national legislation in place to criminalise WMD proliferation activities	Manufacture / produce	Acquire	Possess	Develop	Transport	Transfer	Use
For each of the 3 kinds of WMD (nuclear, chemical, biological)	48%	46%	30%	24%	31%	31%	57%
For 2 of the three kinds of WMD	11%	11%	20%	20%	7%	20%	7%
For 1 of the three kinds of WMD	24%	19%	20%	22%	17%	28%	19%
No measure	17%	24%	20%	33%	44%	20%	17%

While these figures illustrate the strong commitment on the African continent to implement resolution 1540 they hide the remaining challenges. For instance, three quarters of the African states do not have measures in place to criminalise the development of nuclear, chemical and biological weapons. In addition, many states on the continent lack effective enforcement measures. It can also be noted that, out of the 17 states that have not sent an implementation report to the 1540 Committee, 13 are from the African continent (hyperlink: <http://www.un.org/en/sc/1540/transparency-and-outreach/outreach-events/pdf/StatementFeb2016Abidjan.pdf>).

The website of the 1540 Committee offers scarce information on assistance made available by States or by international organisations. This represents a challenge as the 1540 Committee is the most legitimate body to centralise and disseminate such information. The status of assistance requests are not clear: although the 1540 Committee and its experts spare no effort to conduct match-making, it is uncertain whether the assistance requests have in fact been met.

Finally, and as we heard yesterday, it can be argued that there is insufficient involvement of the private sector and academia: The private sector and academia are important partners in the implementation of resolution 1540. On the African continent, for example, there are relevant industry associations established at the national, sub-regional and regional levels (for instance: SOACHIM – Societe Ouest-Africaine de Chimie; AfBSA – African Biosafety Association; MOBSA – Moroccan Biosafety Association; AMBIOS - Malian Biosafety Association; Association of African Shipping Lines, etc.). Although some of them have been involved in some of 1540 activities, for instance in the context of the “Wiesbaden Process”, they have not been systematically engaged. With regards to the academic world, it can be noted also that, with the exception of the ISS, no African research institute or university has a project dedicated to facilitating the implementation of resolution 1540. The insufficient involvement of the private sector and academia deprives states of natural partners in the implementation of resolution 1540, and of their resources and expertise.

In their report of a conference in India in 2014, Ian J. Stewart and Rajiv Nayan [1540: 10 years on: Opportunities, Challenges and Effective Practices for the Resolution’s Implementation: A Report from Civil Society Authored - CSSS Occasional Papers 1/2014], conclude that:

“...alternative mechanisms to track 1540 implementation are required. There is potentially a role for civil society in this task. Even after a better appreciation of 1540’s implementation status is gained, there will be a significant amount of work that still must be undertaken. This work should, where possible, integrate the effective practices identified in this report. The work should, where possible, also draw upon the resources of all actors with relevant expertise or resources – including civil society. Consideration should be given by members of the Committee on how best to integrate the resources of civil society into its outreach efforts...”

Perhaps the possible alternatives could be discussed in this session as well as some of the issues I have highlighted.