INTERNATIONAL MEETING ON CHEMICAL SAFETY AND SECURITY

8-9 November 2012
Tarnow, Poland

Meeting proceedings

Edited by:
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ORGANISATION FOR THE
PROHIBITION OF CHEMICAL WEAPONS

Financial support for this meeting was provided by the European Union, the Government of Poland, the US Chemical Security Engagement Programme, Dow Chemical Company, and Azoty Tarnow.

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Foreword

With the rapid development of the chemical industry across the globe the question of safety and security in the areas of production, transportation and use of chemicals is increasing in importance for many OPCW States Parties.

The International Meeting on Chemical Safety and Security in Tarnow, Poland, on 8 and 9 November 2012 brought together a large number of representatives and expertise from states, governmental agencies, international organisations, chemical industry and their trade associations, academia and non-governmental organisations (NGOs). I was pleased that OPCW was able to act as a platform to provide all attendees with an opportunity to discuss experiences and disseminate best practises with existing and potential new partners and allowed them to explore the potential for future coordination and cooperation.

The meeting in Tarnow would not have been possible without the strong support of our partners. I would like to express my gratitude to the Government of Poland and the City of Tarnow as co organisers of the meeting and for the financial support that was provided by the European Union, the Government of Poland, the US Chemical Security Engagement Programme, Dow Chemical Company and Azoty Tarnow.

The publication of the proceedings will make the presentations, discussions and analyses from this meeting available to the wider international audience. I'm confident that this will assist in raising the awareness of the importance of chemical safety and security globally and a need to promote global chemical security culture, and encourage coordination and cooperation among all the stakeholders in this field.

Ahmet Üzümcü
Director-General, OPCW

Programme

Time	Activity	Location
Wednesday November 7 2012		
	Pickup at Krakow airport (schedule to be decided) Accommodation at Hotels in Tarnow	Tarnow
Thursday November 8 2012		
08:00-08:30	Coffee	Tarnow Theatre
08:00-08:30	Registration	Tarnow Theatre
08:30-10:30	***Plenary Session: Chemical, Biological, Nuclear and Radiological /CBRN/ safety and security as key component of international security***	Tarnow Theatre
	Welcome by Dr Ryszard Scigala, Mayor of Tarnow	
	Introduction to the meeting by Mr Krzysztof Paturej, Chairperson of the meeting, Director of Special Projects, OPCW	
	Video address by Ambassador Ahmet Üzümcü, Director-General of the OPCW	
	Director Adam Bugajski, Director of the Department of Security Policy, Ministry of Foreign Affairs, Poland; *"Poland's active support for global cooperation against misuse of chemical, biological, nuclear and radiological (CBRN) materials and technologies*"	
	Mr Nico Frandi, Political Officer, European External Action Service, EEAS: "*The European Union support for enhancing global chemical, biological, nuclear, and radiological /CBRN/ safety and security, and the work of the OPCW"*	
	Ambassador Bonnie Jenkins, Coordinator for Threat Reduction Programmes, Bureau of International Security and Non-proliferation, US State Department: *"The Role of Chemical Safety and Security in International Global Security Engagement Efforts"*	
	Mr Nicolas Kasprzyk, UN 1540 Committee Expert: "*Resolution 1540 and the prevention of the proliferation of WMD to non-State actors: implications for chemical security*"	
	Mr Zeeshan Amin, Special Political Adviser, UN Counter Terrorism Task Force: *"United Nations Counter-Terrorism Implementation Task Force (CTITF) support for the CBRN safety and security; a new project to prevent attacks against chemical installations and promoting chemical security culture"*	
	Prof. Sergei Baranovsky, President Green Cross Russia, presented by Dr. Paul Walker, Director Green Cross International's Environmental Security and Sustainability Programme: "*Facilitating and Mediating Dangerous and Contentious Projects with Local, Regional, National, and International Stakeholders"*	
10:30-11:00	Coffee break Opening of the thematic exhibition and photo opportunity Press conference	Tarnow Theatre

11:00-13:30	***Working Session 1: Development of national and international frameworks for enhancing chemical safety and security: resource centres and promoting global chemical security culture***	Tarnow Theatre
	Chair and Moderator: Prof. William W. Keller, Director, Centre for International Trade & Security, University of Georgia: "*Toward a Chemical Security Summit: The Advent of CBRN Security Culture*"	
	Mr Lukasz Blacha, Municipality of Tarnow: "*Tarnow Centre for Chemical Safety and Security: Concept, partners and plans*''	
	Prof. Leiv Sydnes, Department of Chemistry, University of Bergen, Norway; "*IUPAC - Serving Mankind through Chemistry"*	
	Prof. Shaukat Ali Abdulrazak, Secretary/CEO Kenyan National Council for Science and Technology: "*Developing and sustaining programmes on chemical safety and security in chemical activities in Kenya*"	
	Mr. Michael Thornton, CBRN CoE Project Coordinator, Joint Research Centre, European Commission: "*The CBRN Centers of Excellence. A comprehensive approach towards CBRN risk mitigation*"	
	Ms Kathryn Hughes, Program Officer, US National Academies of Science, "*National and International Security Activities at the US National Academy of Sciences*"	
	Dr Lech Starostin: "*The Tarnow declaration on the development of the international cooperation to enhance chemical safety and security and the promotion of the global chemical security culture*"	
13:30-14:30	Lunch	
14:30-18:30	***Working Session 2: Laboratory, chemical plan, transportation and sales security***	Tarnow Theatre
	Chair and Moderator: Mr W. Wielezynski, President of Polish Chamber of Chemical Industry (PIPC): "*Multi-stakeholders' cooperation in promoting chemical safety and security in all areas of chemicals"*	
	National experiences	
	Mr Fedor Meerts, Dutch National Coordinator for Counter-terrorism: "*Strengthening the security of chemicals sales: Creating Public Private Partnership*"	
	Prof. Valery Kukhar, Director, Institute of Bioorganic Chemistry and Petrochemistry, National Academy of Science of Ukraine: "*Strengthening chemical safety and security in the area of chemical activities in Ukraine*"	
	Mr Todd Klessman., U.S. Department of Homeland Security: "*Overview of the U.S. Department of Homeland Security's Chemical Facility Anti-Terrorism Standards*"	
	Mr William DelBagno. FBI, US: "*FBI Chemical Countermeasure Unit: Strengthening the Partnership between Chemical Industry and Law Enforcement*"	

16:00-16:20	Coffee Break	
	Dr. Maarten Nieuwenhuizen, TNO Netherlands, "*EU FP 7 SPIRIT project concerning infrastructure protection"*	
	International and chemical industry experiences	
	Dr Huang Jiefang, Senior Legal Officer, ICAO: "*Beijing Convention and Transport of Weapons of Mass Destruction*"	
	Mr Wicher Mintjes, Associate Director Emergency Services & Security, Dow Chemical. "*Responsible Care Security Code*"	
	Dr Frank Huess Hedlund, COWI: "*Do provisions to advance chemical facility safety also advance security objectives? An analysis of possible synergies"*	
	Mr Björn McClintock, Interpol: "*INTERPOL CBRNE Terrorism Prevention Programme*"	
	Mr Jadallah Hammal, WINS: "*WINS' experience in promoting nuclear security"*	
	Dr Stefano Miorotti, Cristanini S.p.A. "*Protective Equipment Industry in support of CBRN Security: Proven solution for a safe decontamination against CWA and TICs*"	
19:00-19:30	*Concert*	Tarnow Theatre
20:00-22:00	*Official reception hosted by Ministry of Foreign Affairs of Poland*	Mirror Hall
21:00, 22:00	*Return of participants to the hotels*	
Friday 9 November 2012		
08:00-08:30	Coffee	Tarnow Theatre
08:30-13:00	***Working Session 3: Chemistry for Sustainability***	
	Chair and Moderator: Dr Irma Makalinao, Department of Pharmacology and Toxicology, College of Medicine, University of the Philippines Manila, Philippines: *"Building Bridges form Chemical Safety to Chemical Security at the National and Regional Level"*	
	National and industry experiences in implementing chemical safety	
	Prof. Jonathan Okonkwo, Tshwane University of Technology, South Africa: "*Green Chemistry: Equipping and Strengthening Chemical Sciences for Sustainable Development*"	
	Dr. Sam M. Mannan, Director Process Safety Center Chemical Engineering Department Texas A&M University System, USA: "*Lessons from process and chemical incidents and accidents*"	
	Prof. Adam S. Markowski, Department of Safety Engineering, Technical University of Lodz, Poland: "*Safety and Risk Management Aspects for Major Accident Industry in Poland"*	
	Mr Yagya Saxena, Indian Chemical Council, "*Introducing and Managing Chemical Safety and Security Practice in India*"	
	Mr Ir Mohtar Musri, Deputy Director General, Department of Occupational Safety and Health, Malaysia, "*Chemical Safety and Security: The Legal Framework for Malaysia*"	
10:30-10:50	Coffee Break	

	Mr Hadi Farajvand, Secretariat of the National Authority for CWC, MFA, Iran, "*CWC Regional Assistance and Protection Centres (RAPC)*"	
	Major Marek Poterek, Central School of the State Fire Service, Czestochowa, Poland: "*The tasks of the State Fire Service in the field of chemical and environmental emergency response within the National Firefighting and Rescue System*"	
	International experiences and assistance in sound management of chemicals.	Tarnow Theatre
	Mr Jonathan Krueger, UN Institute for Training and Research /UNITAR/, Geneva, Switzerland: "*Introducing the IOMC (Inter-Organisation Programme for the Sound Management of Chemicals) and relevant activities of UNITAR"*	
	Mr Sjoerd Looijs, Responsible Care Manager, European Chemical Industry Council (Cefic): "*Responsible Care in a global context: options for joint outreach"*	
	Ms Katarina Magulova, Secretariat of the Basel, Rotterdam, and Stockholm Convention, UNEP:"*Chemicals management under the Basel, Rotterdam and Stockholm Conventions*"	
	Mr John Hart, SIPRI: "*Defining a Beneficial Space for NGO-UN System Organization Interaction on Chemical Safety and Security: a Framework Analysis*"	
13:00-14:00	*Lunch*	
14:15-16:00	*Transportation of participants to Wieliczka Salt Mine*	
16:15-17:15	*Tour in Wieliczka Salt Mine*	Wieliczka salt Mine
17:30-18:30	***Concluding Plenary Session***	Wieliczka Salt Mine
	Mr Krzysztof Paturej, Chair and Moderator,	
	Reports by the Chair Persons.	
	Discussion of key findings from the three working sessions and identification of future actions	
	Ambassador Jan Borkowski, Permanent Representative of Poland to the OPCW, "*Development of the OPCW engagement in Chemical Safety and Security – Perspective from Poland*"	
	Mr Przemyslaw Stangierski, Vice President and Partner, A.T. Kearney; "*Chemical Safety and Security: Cost or Investment?*"	
	Prof. Sławomir Neffe, Military University of Technology, Warsaw: "*The Advisory Board for the International Centre for Chemical Safety and Security – building the academic and expert advice on chemical safety and security*"	
	Closing Statements:	
	Closure of Meeting	
18:30-19:45	***Reception***	Wieliczka Salt Mine
20:00-21:30	***Return to Tarnow or Krakow (Airport)***	

Executive summary

Introduction

1. The following provides a background to the International Meeting on Chemical Safety and Security in the perspective of previous activities and engagements by the OPCW in the field of Chemical Safety and Security. For each of the five sessions of the meeting, the key topics covered in the statements, presentations and discussions are summarised. In conclusion the summary details the key results and findings of the meeting and outlines possible next steps that the OPCW might consider for the future work in this field.

2. More than 200 participants from 54 States Parties attended the meeting representing governments, governmental agencies, international organisations, chemical industry and their trade associations, academia and non-governmental organisations (NGOs).

3. The meeting provided an opportunity for further strengthening the OPCW's relationship with relevant international partner organisations and key stakeholders in the area of chemical safety and security. The wide representation at the meting also allowed for contacts with new potential partners and discussion with representatives of States Parties on the engagement of the OPCW in this field. The meeting consisted of an opening plenary session, three working sessions and a concluding plenary session. It was accompanied by a thematic exhibition that highlighted and further expanded on the themes of the meeting.

4. The following main subject areas were covered by the meeting:

    a. Development of national and international frameworks for enhancing chemical safety and security; resource centres and promoting a global chemical safety and security culture;

    b. Laboratory, chemical plant, transportation and sales security;

    c. National and industry experiences in implementing chemical safety and security; and

    d. International experience and assistance in the sound management of chemicals.

5. The relevant documentation of the seminar, including the programme and statements/presentations is available on the OPCW website: www.opcw.org.

Financial Support

6. Financial support for the meeting was provided under the EU Council Decision 2012 in support of activities of the OPCW in the framework of the implementation of the EU Strategy against the Proliferation of Weapons of Mass Destruction (2012/166/CFSP, dated 23 March 2012), the United States Chemical Security Engagement Programme and the Government of Poland.

Background

7. The global chemical industry and its activities have grown rapidly over the past several decades and continue to expand. Applying sound principles for chemical safety and security is consequently becoming critically important for an increasing number of States. Promoting and establishing a global chemical safety-and-security culture will provide greater assurances that national measures undertaken in this regard can prevent the misuse of toxic chemicals.

8. The OPCW's engagement in regard to enhancing chemical safety and security follow-up to the outcomes of the Academic Forum and Industry and Protection Forum held by the OPCW in 2007 (S/674/2008 dated 1 February 2008), subsequent discussions that further developed the contribution of the OPCW to international security, and decisions by the OPCW Policy Making organs. The Second Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention held in 2008 welcomed the fact that some States Parties had taken

measures to minimise security risks at chemical facilities and encouraged States Parties to exchange experiences and discuss related issues (paragraph 9.94 of RC-2/4, dated 18 April 2008). The Conference of the States Parties decided at its Sixteenth Session that, inter alia, a series of measures concerning chemical safety and security should be implemented (C-16/DEC.10, dated 1 December 2011).

9. The subsequent discussions and activities of the Member States and the Secretariat have positioned the OPCW as a platform of support for global cooperation in decreasing the chemical threat, and includes such activities as raising awareness, training, the exchange of best practices, and fostering cooperation between chemical professionals in order to support the safe and secure production, transportation, and storage of chemicals. These activities have included the table-top exercise on the preparedness of States Parties to prevent terrorist attacks involving chemicals conducted in Warsaw, Poland, on 22 and 23 November 2010 (S/890/2011 dated 20 January 2011), the "Seminar on OPCW's Contribution to Security and Non-Proliferation of Chemical Weapons" on 11 and 12 April 2011 (S/959/2011 dated August 2011); the "Conference on International Cooperation and Chemical Safety and Security" on 12 and 13 September 2011, and the "Expert Meeting on Chemical Safety and Security" on 7 to 8 June 2012.

10. These activities complement the OPCW core programmes, in particular those regarding assistance and protection as mandated by Article X of the CWC as well as the OPCW's efforts to support States Parties in the adoption of national implementation measures under Article VII and international cooperation under Article XI.

Summary of the Sessions

Opening Plenary Session

11. The participants in the meeting were welcomed by Dr Ryszard Scigala, Mayor of Tarnow. In his address he pointed to the long involvement of the city of Tarnow and its prominent chemical industry in supporting the implementation of the CWC in Poland as well as to its close contact with the OPCW. This background of interaction with the OPCW, the high level of expertise in chemical industry and the tradition of international cooperation made Tarnow a natural choice for the establishment of the International Centre for Chemical Safety and Security (ICCSS)

12. In his video address to the meeting, the Director-General pointed to the increasing expectations from States Parties that the OPCW devote greater attention to the subject of chemical safety and security and that this was the message from the above-mentioned Conference on International Cooperation and Chemical Safety and Security held at OPCW headquarters in 2011. The Director-General also noted that the Conference of States Parties had decided that safety and security will constitute an important programme area for the OPCW. He also commended Poland for its long-standing support for the goals and objectives of the OPCW and stressed that hosting this important meeting further demonstrated this commitment.

13. The continued engagement of the OPCW in the area of chemical safety and security was strongly supported in the statements and in the discussions. At the same time, it was recognised that there exist a number of international initiatives in this area and that many players are active in this field. This requires an effective coordination by all involved to avoid duplication of the efforts made and calls for multilateral action and the widest possible cooperation among states, international organisations, chemical industry and all other stakeholders.

14. It was also highlighted that promoting a culture of chemical safety and security and assisting States Parties in adopting measures to this end supports them in the implementation of their obligations under UN Resolution 1540. The increased focus on chemical safety and security is also in line with the UN Global Counter Terrorism Strategy.

15. The UN Counter Terrorism Task Force (CTITF) Working Group has developed a new project to enhance interagency cooperation in the prevention of and preparedness for terrorist attacks against chemical installations, and to enhance chemical security culture. The objective of the project is to increase inter- and intra-organizational knowledge and raise awareness of chemical security issues.

It will bring together resources, responsibilities and capabilities in improving chemical security, and will create new training and learning opportunities for reducing the threat of chemical terrorism.

Development of national and international frameworks for enhancing chemical safety and security; resource centres and promoting a global chemical safety and security culture.

16. It was noted that the global chemical industry is expanding rapidly and advanced chemical activities are now a feature of a widening number of States. This, together with concerns about possible malicious uses of toxic chemicals result in a growing focus on global chemical safety and security and its importance for international security. The discussions during the session pointed out that the effective national implementation of measures to enhance chemical safety and security requires that an underlying chemical safety and security culture applicable to all levels of managing chemicals is in place and shared by all concerned. To provide for this, it was proposed that steps should be taken to raise the awareness of the need for a global chemical safety and security culture.

17. The work towards a global chemical safety and security culture will require effective cooperation among all parties concerned. It was stressed that regional centres such as the programme for the EU CBRN Risk Mitigation Centres of Excellence (CBRN CoE's) that was presented during the session, in coordination with other relevant organisations and initiatives, would help bringing together resources and expertise on a regional basis and building networks to help countries to define and implement a chemical safety and security policy through national action plans, good governance programmes and concrete technical projects.

18. In this context, the establishment of the International Centre for Chemical Safety and Security in in Tarnow, Poland /ICCSS/, was welcome. The ICCSS is an independent non-profit foundation and will together with national and international public and private partners serve as a resource centre in chemical safety and security, implementing the principles of sustainable development, public-private partnership and modern management practices. The activities of the ICCSS will be supported by an advisory board comprised of Polish and international experts in the field of chemical safety and security. The establishment of the ICCSS was seen as an important future complement to other centres and it could potentially assume a significant role in coordinating substantive projects involving many stakeholders and in the work towards the establishment of a global chemical safety and security culture The establishment of the ICCSS was warmly welcomed by the Technical Secretariat and in his video address the Director-General stated that the Secretariat within the means, resources and capabilities available will consider supporting the Center's activities. The support for the ICCSS and readiness to cooperate in its programme activities was expressed, inter alia, by the European Union, UN Counter Terrorism Implementation Task Force /UN CTITF/, the Governments of Poland, the United States, and Ukraine, chemical industry associations and leading chemical companies, including Dow Chemicals.

19. To supplement other already existing initiatives it was proposed that the OPCW could establish Regional Assistance and Protection Centres (RAPC) that would also have a role in the support to States Parties in adopting and implementing sound chemical safety and Security procedures. The OPCW would certify or approve such centres and support them with training materials, lectures and coordination between the different RAPCs.

20. During the session the "Tarnow Declaration on the development of the international cooperation to enhance chemical safety and security and the promotion of the global chemical security culture" was introduced. The declaration has been developed by the interested stakeholders from governments, international organisations, industry, academia and independent experts and consulted within the Advisory Board for the ICCSS. The declaration emphasis the need to promote chemical safety and security by enhancing chemical safety and security at a national level, by being more efficient in chemical safety and security capacity building, by exchanging best practices, and by improving national and international coordination, cooperation and assistance in the field of chemical safety and security. The Tarnow Declaration was not formally endorsed or adopted by the meeting. It is a living document outlining general objectives and goals and the intention is that it will develop with time and gradually become an internationally recognised guideline in the work towards the establishment of a global chemical safety and security culture.

21. The session was briefed on Kenya's Vision 2030 that envisages an industrialised and prosperous economy by the year 2030 where chemical activities will play a central role and the important role of the chemical safety and security. A concept of the Kenyan programme on chemical safety and security was presented and discussed during the meeting. The overall goal of the programme is to assist Kenya to create a national potential for chemical safety and security for the ongoing and future peaceful uses of chemistry and for structural/infrastructure projects, supporting the development of national needs in chemical safety and security. The programme will provide assistance in the effective implementation of international efforts to counter terrorism with use of chemical weapons or toxic chemicals, including the Chemical Weapons Convention and the UNSC Resolution 1540 (2004).

22. The dual use nature of many chemicals provides both for the peaceful use of these chemicals and their potential misuse. In a presentation to the meeting, it was stressed that IUPAC sees the need for continued awareness raising, outreach and the inclusion of ethical aspects in the training of chemical professionals as a key factors in preventing chemicals being produced and utilised for malicious purposes. The provisions of the CWC are one such element that should be included in the professional training and the OPCW and IUPAC have cooperated on these topics including the development of a Code of Conduct to further the ethical use of chemistry and to supplement other regulatory and voluntary measures.

Laboratory, chemical plant, transportation and sales security

23. The presenters on this topic took a very wide view on chemical safety and security and covered a large range of issues. The importance of ensuring that all stakeholders are involved and that the creation of public-private partnerships is critical in the process of implementing effective chemical safety and security measures was repeatedly highlighted during the session. The stakeholders identified ranged from legislative bodies, national implementing authorities, chemical industries and their trade associations, to NGOs and the civilian society. The steps required to build a chemical security regime are not limited to measures taken at chemical plants but must cover the full range of chemical activities from production, storage and transport to export/import controls and sales of chemicals.

24. The presentation of the project, EU FP 7 SPIRIT (Safety and Protection of built Infrastructure to Resist Integral Threats) provided an example on the far-reaching considerations that are required when addressing chemical security. The objective of this project is to provide the technology and know-how for the protection of buildings and people against terrorist threats and to minimize the consequences of a terrorist attack in terms of number of casualties/injuries, damage and loss of functionality and services.

25. The discussions during the session also raised the issue of regulatory versus voluntary measures and how the two can complement each other. One view expressed was that a balanced combination of regulations and voluntary industry programs is the best way to achieve safe management of chemicals. At the same time, as the necessity of comprehensive regulatory measures was noted, it was pointed out that such are only as effective as their enforcement.

26. One example of a voluntary commitment is Responsible Care, namely the global chemical industry's initiative to improve health, environmental performance, enhance security, and to communicate with stakeholders about products and processes. Responsible Care is promoted worldwide by the International Council of Chemical Association (ICCA) and by regional associations such as the European Chemical Industry Council (Cefic). The Responsible Care Code is gaining increasing support globally with chemical industry in more than 54 countries having subscribed to its principles. A subset of Responsible Care is its Security Code that describes fundamental management practices of protection against any kind of criminal, malicious and cyber acts

27. In the presentations on Responsible Care it was suggested that there is scope for an increased cooperation with the OPCW. One such area could be combining the ICCA expertise with the outreach capability of the OPCW within e.g. the EU project to promote the introduction of Responsible Care in small and medium enterprises.

28. Another example of the importance of establishing public-private partnerships was provided from The Netherlands, in the context of a presentation on strengthening the security of chemical sales of explosive precursors. The programme was developed in close cooperation with companies and business associations from the chemical producers, traders and retailers and provided for a set of measures to prevent the acquisition of these precursors for malicious purposes. The experience gained from this voluntary programme allowed for the introduction of these measures into the regulatory framework of the EU with the potential of expanding into other categories of chemicals essential for chemical security.

29. The phrase "chemical safety and security" is often used as a catch phrase without considering what each of the two terms safety and security implies separately and what are the actual synergies. Routinely a significant synergy is assumed between the measures implemented to strengthen safety and their applicability on security. A presentation on the analysis of the synergy suggests that in some areas the synergies are less pronounced than commonly assumed. The discussion that followed, pointed to the need to carefully analyse the safety measures taken to evaluate their actual impact on security.

30. The necessity of an extensive international cooperation in the area of chemical security was reinforced during the meeting. This is similar to the situation for nuclear security and lessons could be learned from that work. World Institute for Nuclear Security (WINS) is a non-political organisation set up to provide those who are accountable for nuclear security with an international forum in which to share and promote best security practice. It was proposed that strategies similar to those taken by WINS for dissemination of best practises and conducting training could be applicable to the future work in the area of chemical security.

31. The US Department of Homeland Security delivered a presentation on the Chemical Facility Anti-Terrorism Standards (CFATS) that has established risk-based standards for high-risk chemical facilities. The fact that the CFATS extends to facilities not normally thought of as the "chemical sector" reinforced the understanding that establishing a chemical security culture requires the involvement of a wide range of stakeholders.

32. The session discussed the important role of both national and international law enforcement agencies in the reduction of the chemical threat and the prevention of the use of chemicals in terrorist. Key elements in this work are training and awareness building. One example is the FBI's Weapons of Mass Destruction Directorate, Chemical Countermeasures Unit (CCU) that is responsible for establishing programs to prevent the use of chemicals in terrorist attacks. The CCU mitigation strategy is a multi-layered approach which includes building a culture of awareness and communication between law enforcement and the chemical industry. The CCU conducts outreach to promote a mutually beneficial relationship with businesses that manufacture, store, transport or sell relevant chemicals.

33. Interpol recently launched its new Chemical and Explosives Terrorism Prevention Unit – ChemEx. The ChemEx will perform the same basic tasks and duties as the already existing Radiological and Nuclear Terrorism Prevention Unit (RadNuc) and the Bio-terrorism Prevention Unit (BioT). The CBRNE Programme is threat-based, intelligence-driven and prevention oriented. Cross-community communication is encouraged among law enforcement, the scientific and technical communities, as well as public health agencies to support the development of a "whole of government" approach to incident response and mitigation.

34. ICAO briefed the audience on the 2010 Beijing Convention that has modernized the aviation security instruments, including the criminalization of unlawful transport of BCN weapons. The most important task is now to promote the ratifications of this instrument and it was noted that international cooperation is essential to complete this task.

<u>National and industry experiences in implementing chemical safety and security</u>

35. A number of States Parties are now in the process in of introducing comprehensive chemical safety and security practices. The session did discus the work done by India and the role played by the Indian Chemical Council (ICC) in this process. It was shown that the work towards an effective chemical safety and security management must involve all levels in the establishment of a chemical

plant such as safe technology, safe management, land use planning and emergency planning. These measures must then be followed up by safety reporting and national inspections combined with information to the public. An integral part to this work is the promotion by ICC of the Responsible Care ethics and guidelines to the chemical industry.

36. A presentation from Malaysia demonstrated the need for a consorted effort to establish a regulatory framework that interact with the entire life cycle of chemicals covering import/export, storage, transportation, use, disposal, recycling and use. Interlinked in these regulations are the legislative measured required under the CWC. These specific measures are supplemented with among others a Strategic Trade Act to implement the obligations under the UN 1540 resolution and are also supported by voluntary measures undertaken by the chemical industry and the Chemical Industries Council of Malaysia (CICM) where a key activity is the promotion of Responsible Care.

37. The importance of safety and risk management in the chemical industry was highlighted in this session. An important element in understanding the vulnerability of different parts of the chemical sector is through a comprehensive analysis of chemical incidents and accidents and several such examples were discussed. The lessons learnt from these incidents and accidents points to several areas that are critical to chemical safety and security such as; Inherently Safer Design (ISD); Process Hazard Analysis (PHA); Location of the Facility and Layout; Leading Indicators and Warning Signs; Layers of Protection Analysis (LOPA); Emergency Response and Planning; Risk Communication; and the Role of Academia in education and providing inherently safer processes.

38. The discussion also stressed that the preventive chemical safety and security work is an ongoing process that requires regular reviews and evaluations against set performance indicators. Fundamental to success of this work is an underlying chemical safety and security culture promoted through a visible commitment by the management and adopted by all concerned.

39. The session also addressed the contribution that "Green Chemistry" can make to enhancing chemical safety and security. In seeking to achieve a sustainable development, the leading principles of Green Chemistry results in a general reduction of risks associated with the production of chemicals. This includes the design of inherently safe processes utilizing less toxic or hazardous chemicals and seeking to replace the chemicals produced with less toxic alternatives.

<u>International experience and assistance in the sound management of chemicals</u>

40. The session was briefed on the Inter-Organization Programme for the Sound Management of Chemicals (IOMC). This programme is a aimed at strengthening international cooperation in the field of chemicals by increasing the effectiveness of the programmes of the 9 participating international organizations by promoting coordination of policies and activities, pursued jointly or separately. The framework for the work of OIMC is the Strategic Approach to International Chemicals Management (SAICM) adopted in 2006. The OPCW is not formally part of this programme but follows the work and is considering arrangements for a closer relationship.

41. It was recognised during the session that chemical activities are subject to large number of international agreements and conventions, in addition to the CWC. Three examples were primarily discussed; the Conventions of Basel, Rotterdam and Stockholm. Certain chemicals are covered by all three conventions and in addition, other conventions or initiatives such as SAICM impacts on the same chemicals. It was pointed out during the meeting that the chemical industry is subject to the provisions of additional agreements and regulations making the task of compliance with a large number of separate provisions a time-consuming and difficult process. The view was expressed that coordination, and harmonisation, between different agreements is desirable to avoid unnecessary overlaps and simplify implementation.

<u>Concluding Plenary</u>

42. During the concluding plenary, the meeting was presented a summary of the key findings and topics from the three working sessions by the chairmen. The meeting also had an important discussion on whether the implementation of chemical safety and security measures is a cost or an investment. It was noted that chemical safety and security has no boundaries as chemicals are present in virtually every aspect of our life and that the chemical market is growing very rapidly. As there is no single

global authority responsible for chemical safety and security, the effective international cooperation in this area is critical to meet the current and future challenges and the OPCW can play a significant (leading?) role in the efforts to achieve this.

43. The concluding remarks also pointed to the support from Poland for the gradual development of the engagement by the OPCW in the field of chemical safety and security. It was noted that this is in line with the mandate from the policy making organs and that the OPCW should not develop its own independent capacity or regulatory standards or assume any monitoring responsibilities in the area of chemical security. The OPCW should rather serve as a facilitator and promoter of voluntary cooperation with emphasis on regional cooperation.

Results, Key Findings and the Next Steps

44. The global chemical industry and activities have grown rapidly over the past several decades and continues to grow both in volume and the number of states involved. The need to be able to respond to chemical incidents and applying and managing comprehensive chemical safety and security practises is consequently becoming critically important for an increasing number of States Parties.

45. There are a large number of programmes for enhancing chemical safety and security that are run by the chemical industry or the public sector but having an outreach limited to the company or country in question. Many of these programmes have a potential to be promoted internationally.

46. The statements made at the meeting did provide a strong support for the continued step-by-step engagement of the OPCW in the field of chemical safety and security, and following policy guidance from Member states.

47. The meeting demonstrated in practice the ability of the OPCW to act as a platform that can bring together on a worldwide basis a large number of players to discuss means to enhance chemical safety and security and promote a global chemical safety and security culture. The discussions among the Member States and the relevant stakeholders confirmed support for the further development of the OPCW as a platform of support for global cooperation in decreasing the chemical threat, and includes such activities as raising awareness, training, the exchange of best practices, and fostering cooperation between chemical professionals in order to support the safe and secure production, transportation, and storage of chemicals.

48. A number of presentations referenced the contributions that the OPCW is making to enhancing chemical safety and security. Strengthening the role of the OPCW in matters of safety and security is indeed part of its broader mandate to prevent the reemergence of chemical weapons and to promote protection and response capabilities of States Parties.

49. The presence of a large number of organisations active in the field of chemical safety and security such as UNITAR, UNEP, IUPAC, EU EEAS and Cefic provided a very good opportunity for sharing information about ongoing activities and experiences gained and to identify areas of common interest where synergies can be found through new initiatives for cooperation.

50. The discussions during the meeting again pointed to the fact that there exist a number of international initiatives in this area and that many players are active in this field. This requires an effective coordination by all involved to avoid duplication of the efforts made and calls for multilateral action and the widest possible cooperation among states, international organisations, chemical industry and all other stakeholders. It is consequently important for the OPCW to further develop its role in the work to enhance chemical safety and security and to ensure that mechanisms are in place for effective coordination with other organisations and initiatives.

51. With the approach taken by the OPCW to primarily provide assistance to States Parties on the basis of regional initiatives, the establishment of the EU CBRN Risk Mitigation Centres of Excellence (CBRN CoE's) could provide an important network for coordination of activities and facilitating outreach. The already existing contacts with these CoE's could be further developed and cooperation expanded as appropriate. The OPCW could also consider establishing closer ties with other international initiatives such as the Inter-Organization Programme for the Sound Management of Chemicals (IOMC).

52. It was stressed that the OPCW will depend more and more on the technical advice/expertise in its implementation work due to scientific and technological developments, chemical and biological convergence, the changing nature of assistance and protection against chemical weapons moving toward protection against misuse of toxic chemicals and growing importance of chemical safety and security. This will require a more proactive approach to the implementation of the provisions of the Convention on assistance and protection /Article X/ and international cooperation /Article XI/. The OPCW was encouraged to support networks of resource centres which could provide the OPCW with the technical expertise in the areas of Article X and XI, including chemical safety and security, on the basis of continuity, sustainability and modern management.

53. The presentations and discussions at the meeting took a very broad view particularly on what constitutes chemical security. At the same time the phrase "chemical safety and security" is often used without considering what each of the two terms safety and security implies separately and what the actual synergies are. The future work of the OPCW in this field would benefit from more clearly expressing of what the two areas actually cover and what the contribution of the OPCW can be to each of these.

54. The voluntary Responsible Care initiative that is promoted by the chemical industry through the International Council of Chemical Association (ICCA) and regional and national chemical associations is developing into a de facto world standard with a large acceptance of chemical industry world-wide. The implementation of Responsible Care is, however, predominantly taking place in the larger companies. Steps are now taken to promote the introduction of Responsible Care in small and medium enterprises and with the stated focus of the OPCW on these types of facilities there might be a scope for cooperation and exchange of experiences.

55. At the same time it should be noted that the scope of activities required for national implementation of comprehensive chemical safety and security measures goes beyond what is covered by Responsible Care and that activities of the OPCW such as supporting customs authorities, capacity building for the response to chemical incident and other training activities are critical.

56. The meeting confirmed and stressed the growing importance of chemical safety and security in the global security engagement efforts as part of the larger international effort to help reduce the threat of weapons of mass destruction (WMD) terrorism. Support to implement national chemical security programmes is essential to reduce the global threat of chemical terrorism by preventing access to weapons, their precursors, dual-use infrastructure and expertise and the OPCW is well placed to play a leading role in this process.

Welcoming address

Dr. Ryszard Scigala [*]

Excellences, Distinguished Guests, Ladies & Gentlemen,

I am honoured to address this eminent audience and welcome you in Tarnów, the warmest city in Poland, at the international meeting on chemical safety and security. Let me, as the host of the place, welcome all of our guests, participants of the conference, representatives of governments, organizations, NGO's, business and administration, as well as local authorities.

I would like to express my gratitude to the Organisation for the Prohibition of Chemical Weapons for choosing Tarnów to organise the first major international gathering to address the chemical safety and security. It's my pleasure to thank the Polish Ministry of Foreign Affairs for being one of the organisers of this conference and for its comprehensive and holistic attitude to the problem of global chemical threat. This meeting would be impossible without very hard work done by a lot of people from OPCW. Among them, I have great pleasure to thank Mr Krzysztof Paturej, who is one of the initiators, and now is chairperson of the conference. Special words of welcome, gratitude and thanks I address to the representatives of G8 Global Partnership with her Excellency Ambassador Bonie Jenkins and Prof. Mauricio Martellini for their widespread support.

As the mayor of Tarnów and on behalf of Azoty Tarnów – the main Polish chemical group – we would like to welcome all of you very warmly, and wish you a pleasant stay, a fruitful meeting, and real outcomes. Tarnów has become a solid partner and a source of knowledge and expertise for the Government of Poland and the Organisation for the Prohibition of Chemical Weapons in The Hague, in implementing the objectives of the Chemical Weapons Convention and promoting assistance and international cooperation. I would like to stress that Azoty Tarnów, our leading chemical company in Poland, has almost 100 years of experience in chemical technology and technique including organic and inorganic chemistry, and since that time we have been operating in a safe way with dangerous chemicals, and toxic wastes, including materials that can be used to produce chemical weapons. The city of Tarnów and Azoty Tarnów have actively supported Poland's policies to achieve chemical disarmament and promote international security by providing expertise and modern solutions for the disposal of toxic chemicals. We have implemented the highest standards of health and environmental protection at the Azoty Tarnów, a major nitrogen plant and chemical group in Poland, situated within the city boundaries. This has resulted in a high level of trust among the citizens of Tarnów towards the chemical industry. Tarnów is an example of a unique symbiosis between the modern chemical industry and the local population based on mutual trust and support.

We would like to promote this unique situation and share our positive experiences by initiating cooperation among European chemical industrial cities. We want to build trust among the chemical industry and local populations, as an important prerequisite for social and economic prosperity.

Being a former senior manager and director general of the largest Polish chemical nitrogen plant, Azoty Tarnów, I am aware of the importance of the active support of the chemical industry against misuse of toxic chemicals. Effective systems against misuse of toxic chemicals, and safe and sustainable development of chemical industry should be supported by strict safety and security measures. These measures should be implemented in all possible areas from the supply of raw materials, production, infrastructure, transportation and use of all the relevant chemicals.

We would like to draw your attention to the initiative of the international Centre for Chemical Safety and Security in Tarnów. Why Tarnów?

- because we have the experience in chemistry, technique, technology and we are good at the utilization of chemical weapons,
- we also know how to transfer that kind of technology to partners
- we have vast potential, international credibility and experience in the achievement of chemical disarmament
- we can show how to build the real trust and partnership between industry, science, authorities and society

[*] Dr. Scigala is Mayor of Tarnòw

– because, historically, we have the ability to cooperate with nations, organizations and people)

The Tarnów Centre is a resource centre for capacity building and the exchange of the best practices, implementing the principles of sustainable development, public-private partnership and modern management. Through the centre we aim to offer our potential in strengthening chemical non-proliferation and enhancing cooperation in peaceful uses of chemistry. The centre will offer model solutions and promote centres of excellence for international cooperation at regional and sub-regional levels, in the development and application of chemical safety and security in manufacturing and the supply chain of chemicals.

The International Centre for Chemical Safety and Security in Tarnów will create a platform of cooperation between all the relevant stakeholders, including governments, chemical industries, academia and international organisations. The centre will offer 'access to knowledge about toxic chemicals and the disposal of toxic chemical waste for different countries in need, using specific technologies which have been developed to destroy chemical warfare agents.

We have also prepared, with Polish and international stakeholders, the Tarnów Declaration on the development of international cooperation to enhance chemical safety and security and the promotion of the global chemical security culture. The main purpose of the Tarnów Declaration is to serve as a sound policy basis for broad and multi-stakeholder engagement in the promotion of the global chemical security culture.

The agenda of our meeting includes presentations and discussion of the existing national and international programmes on chemical safety and security. We also would like to present and discuss the perspectives of enhancing concrete programmes of cooperation and possibilities of the development of the Tarnów Centre.

I am especially pleased that during our meeting a unique concept of the development of the chemical safety and security in Kenya will be presented. The concept of the Kenyan programme has been developed with the active support of the Tarnów Centre.

The OPCW should actively assist in enhancing global chemical safety and security. The OPCW has a unique position to do so because it is global in reach, has vast technical expertise and maintains partnerships with all the relevant national and international stakeholders.

We are counting strongly on the support of the OPCW and the international partners to develop and use the resources and potential of the national and international resource centres. We are expecting the real reduction of the chemical weapons-threat, the promotion of economic development, and the enhancement of chemical safety and security worldwide based on sustainability and modern management. The International Centre for Chemical Safety and Security in Tarnów, and the supporters of the Tarnów Declaration, stand ready to join these efforts.

Allow me to cordially thank you for accepting the invitation to visit Tarnów and participate in this important meeting. I am looking forward to fruitful discussions and tangible outcomes

Introduction

Mr. Krzysztof Paturej

With the rapid development of chemical industry production and its spread to new areas of the world the question of security in the area of legitimate production, transportation and use of chemicals is assuming much higher importance. The risk of terrorist attacks using the toxic properties of industrial chemicals adds additional urgency to the problem. The misuse of such chemicals could cause enormous human sufferings, social and economic damage thus threatening international peace and national security.

Following the recommendations of the OPCW Policy Making Organs, including the First and Second Review Conferences, the OPCW has been engaged in the programme activities to enhance chemical safety and security.

As the leading international organisation devoted to preventing the misuse of toxic chemicals, and with close ties to the chemical industry, the OPCW is well-placed to serve as a forum for governments and industry to discuss chemical security.

Since 2009 further steps have been undertaken to promote the OPCW as a platform of support for global cooperation in decreasing the chemical threat, including awareness raising, training, exchange of best practices, and fostering cooperation between chemical professionals in order to support the safe and secure production, transportation, and storage of chemicals.

The Technical Secretariat has encouraged States Parties to exchange experiences and discuss issues relevant to safety and security at chemical plants. The Secretariat supported practical activities involving relevant Convention stakeholders, including the chemical industry, in order to discuss gaps, priorities, and best practices in chemical safety and security, and to build synergies with national and international partners. This cooperation offered an opportunity to address the issues of safety and security of chemical facilities and the transport of chemicals from a variety of perspectives: from an industrial point of view, from the perspective of risk assessment, and from a governmental position. The Secretariat has also promoted the OPCW to continue to develop relationships and partnerships, as appropriate, with relevant regional and international organisations, including those related to chemical safety, with chemical industry associations, and with the private sector and civil society, in order to promote awareness of the objectives and purposes of the Convention.

There has been a renewed interest in the ability of the OPCW to assist States Parties in the prevention of, preparedness for, and response to incidents involving the misuse or release of toxic chemicals and in enhancing chemical safety and security. The provisions of Articles X and XI of the Chemical Weapons Convention (hereinafter "the Convention") provide important mechanisms for States Parties to address issues in this context.

The OPCW has been successful in providing a large number of targeted activities that aim at building national and regional capacities in the area of prevention of, preparedness for, and response to incidents involving the misuse or release of toxic chemicals. Various OPCW activities that support national capacity-building in the fields of national implementation, international cooperation and of assistance and protection against chemical weapons have been carried out with a view to facilitating cooperation among different national and international partners.

The activities referred to above attracted representatives from the National Authorities, other national agencies involved in the implementation of the Convention, industry, international partners, and non-governmental organisations (NGOs), as well as scientists and experts. The core task of the Tarnow meeting was to serve as a continuity of the multi-stakeholder platform.

Video address

Amb. Ahmet Üzümcü [*]

Excellencies, Distinguished Participants, Ladies and Gentlemen,

It gives me great pleasure to open this International meeting on chemical safety and security. I warmly would congratulate all those who have worked so hard to make this important event possible.

Poland has consistently supported the Chemical Weapons Convention since its inception. It sponsors an annual resolution at the United Nations General Assembly on the implementation of the Convention. That resolution represents a clear affirmation of the importance that the international community attaches to the aims and objectives of the Convention. Hosting this event is yet another manifestation of the Government of Poland's strong commitment to the goals of the CWC.

I would, therefore, especially thank the Government of Poland as well as the City of Tarnow for organising this meeting. I should also thank the EU for their generous contribution to us to help sponsor the event.

Why is this meeting important for all of us? It is important because of the increasing expectations of our States Parties that the OPCW should devote greater attention to the subject of chemical safety and security. This was the message from a major international conference we hosted last year. The Conference of States Parties has also decided that safety and security will constitute an important programme area for the Organisation. Events such as this one go a long way towards fulfilling the expectations of our States Parties. They help promote the imperative of creating a global safety and security culture through awareness raising and the exchange of ideas, expertise and best practises.

Your discussions this week will focus on several aspects of Chemical Safety and Security. At OPCW we are consistently working with the chemical industry and various Chemical Industry Associations looking at ways where we could support enhanced global cooperation. We also continue to explore avenues to offer assistance in enhancing national measures in areas including safety and security and the transportation of chemicals.

Strengthening the role of the OPCW in matters of safety and security is indeed part of our broader mandate to prevent the reemergence of chemical weapons. At the heart of our work lies the responsibility of the Organisation to offer security to our States Parties against the chemical threat no matter what shape it takes with the passage of time.

I wish to express my sincere appreciation to all participating States. I am impressed by the fact that so many of you are willing to contribute to this endeavour. Such cooperative exercises strengthen the Convention and our ability to deliver ever better service to our stakeholders, the States Parties.

The Secretariat warmly welcomes the establishment of the International Centre on chemical safety and security in Tarnow. Within the means, resources and capabilities available to us, the Secretariat will consider supporting the Center's activities.

The OPCW is an important component of the global security architecture. It is a model of multilateral cooperation for promoting peace and security. The Organisation has considerable potential for bringing further security benefits to its Members. I wish to conclude by saying that we are determined to work ever more closely and cooperatively to utilise these opportunities and to strengthen our role as a key Organisation in the service of the global community.

Thank you.

[*] Amb. Üzümcü is Director-General of the OPCW

Poland's active support for global cooperation against misuse of chemical, biological, nuclear and radiological (CBRN) materials

Adam Bugajski [*]

I wish to express my gratitude to the Organisation for the Prohibition of Chemical Weapons (OPCW), in particular to director Krzysztof Paturej, Chair of the meeting, and to the Tarnów team, for excellent cooperation and a great job in preparing and organizing this unique international meeting. It is the first global gathering to address chemical safety and security in a holistic and comprehensive manner, with the presence of all the relevant stakeholders.

The promotion of international peace and security is a crucial objective from the point of view of Poland. We confirm our ongoing commitment to the effective multilateralism which lies at the heart of the EU Common Foreign and Security Policy. Poland supports active and concrete engagement of international organizations to implement effective national and international regulatory mechanisms for addressing CBRN proliferation threats. These mechanisms are becoming even more important as more States are building up their technological capacity to develop weapons of mass destruction, while terrorist organisations continue their efforts to obtain such weapons.

The existence of an effective multilateral system with global disarmament and non-proliferation treaties and organisations, including the OPCW, directly supports our security. The reduction of stockpiles of weapons of mass destruction mitigates the potential threat of their acquisition by non-State actors. The implementation of an effective multilateral non-proliferation regime, such as the Chemical Weapons Convention, reduces weapons proliferation by incorporating and introducing national regulations to prohibit and control the development, production and trade of WMD-related materials.

Taking into account the rapid development of the chemical industry worldwide and global access to chemicals, chemical safety and security have become a priority for all relevant stakeholders, including governments, chemical industries, science and academia. While the globalization and spread of CBRN industries and materials are very dynamic, the response from the international community to increase the safety and security network tends to be insufficient and focused on national efforts.

In this ever-changing world, it will be important for the OPCW and relevant national and international non-proliferation mechanisms to upgrade cooperation and improve effectiveness of their efforts against misuse of chemical agents and technologies for prohibited purposes. The OPCW should be a leading international agency for reducing the chemical threat. The forthcoming April 2013 Third Review Conference will be an important venue to discuss how to promote and effectively implement the Chemical Weapons Convention. The Review Conference should provide guidance on how to adapt the implementation of the Convention and the work of the OPCW to today's needs and challenges. The Conference should also enhance the role of OPCW in national capacity-building to counter the growing threat of misuse of toxic chemicals.

To enhance international cooperation in chemical safety and security and to strengthen the implementation of the Chemical Weapons Convention, the Ministry of Foreign Affairs has supported the initiative of the International Centre for Chemical Safety and Security in Tarnów. We are convinced that, the Centre will provide continuity and sustainability to international efforts in the area of chemical safety and security and will become an important factor in fostering cooperation, aid and assistance in that field. The Centre creates opportunities for the OPCW and other international organizations to plan and implement activities to enhance chemical security in a wide spectrum of tasks, including: chemical production, transport, handling, trade, supply chain, and end-use of chemicals.

I hope that this meeting will constitute an effective venue for all stakeholders to establish a more regular dialogue, expand international efforts and capacity building to enhance national chemical safety and security measures, and to promote the global safety and security culture. We look forward to a very constructive meeting in Tarnów and a closing session at the Wieliczka Salt Mine, both in substance and in spirit.

Thank you.

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[*] Mr. Bugajski is Director of the Department of Security Policy, Ministry of Foreign Affairs, Poland

The European Union support for enhancing global chemical, biological, nuclear, and radiological (CBRN) safety and security, and the work of the OPCW

Nico Frandi [*]

Excellencies, Ladies and Gentlemen,

First and foremost, I would like to thank the Government of Poland and the Organization for the Prohibition of Chemical Weapons (OPCW) for organizing this important meeting, which the EU has co-financed. We support the core objective of the meeting to build closer ties among all relevant global stakeholders, including governments, industry, international organisations, academia, and science in the areas of chemical safety and security and the development of the global chemical security culture.

The EU also supports international efforts and among these the growing engagement of the OPCW in the promotion of international cooperation in peaceful uses of chemistry, enhancement of security at chemical plants, and support for prevention, preparedness and response against misuse of toxic chemicals. The European Union considers the OPCW an ideal platform for active cooperation in these important fields.

As stated by the EU High Representative for Foreign Affairs and Security Policy Ms Catherine Ashton in her intervention to mark the commemoration of the entry into force of the Chemical Weapons Convention on 3 September, the OPCW "continues to be a remarkable success and an inspiring example for effective multilateralism". For this, all stakeholders and particularly the OPCW States Parties and the Technical Secretariat deserve praise.

The European Union has repeatedly demonstrated its commitment to, and tangible support for, the OPCW, inter alia, through its successive financial contributions in support of OPCW activities since 2004, which amount to a total of around €9.5 million. These contributions have been used to fund activities in a variety of areas of the Convention such as national implementation, universality, assistance and protection and international cooperation. The European Union continues to support those activities. The fifth voluntary EU contribution for over €2.1 million is now being implemented by the OPCW Technical Secretariat.

The proliferation of weapons of mass destruction remains a major threat to the international community and a global danger for all people, in the European Union and around the world. The challenge to counter proliferation and the strategic choices made by the EU in this respect are guided by the global nature of the threat coming from WMD. Acting bilaterally or in small groups is often not sufficient. The European Union strongly believes that multilateral action and cooperation with the widest possible number of countries is the best response to meet these challenge and threat.

To the European Union, effective multilateralism in the area of WMD means essentially two things:

1. Widen the membership to multilateral non-proliferation and disarmament existing regimes;
2. Enhance the efficiency of those regimes by ensuring that they are fully implemented at national level.

Against this background, the principle of effective multilateralism has been translated into very tangible EU initiatives in support of all the existing multilateral non-proliferation / disarmament instruments and of relevant international agencies, in addition of course to major support to the UN, including UNSCR 1540 activities. The Chemical Weapons Convention, the only international treaty which bans an entire category of WMD, and the OPCW are cornerstones of the whole disarmament and non-proliferation architecture recognized by the EU Weapons of Mass Destruction Strategy.

The proliferation of dangerous chemicals and the possibility of them falling into the wrong hands are real threats that we should not underestimate since they relate directly to the implementation of the Convention and the work of OPCW. Those threats should be addressed promptly and should also be taken into due consideration in the ongoing process of reform of the Organization so that its future activities would be adequately re-directed. The OPCW has concentrated on providing assistance for CWC national implementation in developing countries, and the development of areas in which further progress should be

[*] Mr. Frandi is a Political Officer with the European External Action Service (EEAS)

made in the future, namely the fight against chemical terrorism and the prevention of chemical weapons from falling into the hands of terrorists and non-state actors, chemical safety and security.

Given the rapid development of the chemical industry and use of toxic chemicals worldwide, it is an important task for the international community to build closer ties between governments, international organisations, industry, academia and science. The EU also welcomes the growing and steady engagement of the OPCW in chemical safety and security. It is an important area of engagement that will raise the image of OPCW as an agency actively engaged in the promotion of international cooperation in peaceful uses of chemistry, enhancement of security at chemical plants, and support for prevention, preparedness and response against misuse of toxic chemicals.

The EU welcomes the establishment of the international centre on chemical safety and security in Tarnow. What makes the concept of the Centre attractive is its readiness to public-private partnerships in programmes to enhance chemical safety and security worldwide, with an emphasis on the developing countries. We also support the mission of the Centre based on the implementation of the principles of sustainability, continuity and modern management. The Centre in Tarnow and the EU regional CBRN centres of excellence are complimentary initiatives. The EU initiative on centres of excellence is compatible with the efforts of the OPCW to increase chemical security.

Together, they are well-placed to serve as a meeting ground for governments and relevant national and regional stakeholders, and chemical industries, to discuss and enhance national capacity in the domain of chemical safety and security. We invite the Centre in Tarnow and its partners to co-operate with the EU and seek the support and resources in capacity building and for the common goal of enhancing chemical safety and security.

The European Union stands ready to continue its support to the OPCW and to play a leading role in the discussions on the shaping of the future of the Organisation. It is time now to focus on how the OPCW can further enhance its contribution to global security. The European Union considers that for the purposes of international peace and security, it is of paramount importance to prevent toxic chemicals from being misused. While remaining focused on the destruction of existing chemical weapons, particular attention will have to be given in the future to the non-proliferation aspects of the CWC. Full implementation of all provisions of the Convention, as well as the strengthening of the verification regime and the fostering of universal adherence to the Convention, together with assistance, protection and international cooperation, enhancing chemical safety and security pave the way forward.

Thank you very much for your attention.

The role of chemical safety and security in international global security engagement efforts

Amb. Bonnie Jenkins [*]

Good morning,

I want to thank the organizers of this International Meeting on Chemical Safety and Security, and epecially Mayor Scigala and my colleague Krzystof Paturej, whose vision it was to bring us all together for this international conference and to establish a center of excellence in chemical security. I remember when I met Krzysztof two years ago and one of the first things we discussed was the issue of chemical security. Soon aftewards, he was mentioning to me the idea for having a Center of Excellence in Tarnow, Poland. I am happy to have been a part of this process and I am happy to visit Tarnow once again. I am also looking foward to visiting the salt mine. It is one of my favorites sites to see here in Poland.

My first visit to Tarnow was last year in October and at that time, I spoke at the Seminar on the Development of the International Center for Chemcal Safety and Security. Last year the discussion was focused on some very early thinking about the establishment of such a Center of Excellene in Tarnow, and in my presentation, I listed ten considerations for future engagement in the area of chemcial safety and security. Those considerations still apply as we have come even closer to the establishment of a center and further in the discussions of chemical safety and security.

Today states are more aware of what chemical safety and security is and why it is importnat to be more aware of the role this issue plays nationally and in the larger global security infrastructure. Today, as I look around at all the participants and speakers here, I see how far these discussions have come and I want to congratulate the organizers for sticking with their vision of promoting the international focus on this issue. We have many, many more states and NGOs present here than were present last year. Krzysztof reminded me yesterday that at the conference here last year, there were four states represented: Poland, Kenya, Ukraine and the United States. This year, we have 57. Such a large number of states and others here today highlights the fact that the important issue of chemcial safety and security is being shared and understood by a wider number of stakeholers.

Last year, I highlighted how the security landscape in the past 20 years has changed regarding nonproliferation activities, including in the area of nuclear , biological and chemical security. As many of you know, in the United States, we began to fund activities and programs in the early 1990's in Russia and the Former Soviet Union. At that time, the U.S. was focusing on preventing the spread of Soviet-era weapons of mass destruction, their associated material, and WMD know-how and expertise through various efforts. However, now, the U.S. and other internation partners are increasingly focusing on other regions of the world to engage them as partners in the effort to prevent WMD proliferation and terrorism.

Those engaged in funding and supporting programs in the areaa of WMD nonproliferation have come to realize that what was a more targeted and defined threat in the early 1990's has become more diversified with an increased number of criminal organizations, terrorist networks, and extremists on the international scene. These non-state actors are present in many regions of the world and are able to easily move across borders. Activities and programs must focus on preventing proliferation not only to states but to non-state actors globally.

Chemical safety and security programs are part of this larger effort to prevent WMD proliferation and terrorism. These programs are geared to preventing access to chemical weapons, their precursors, and dual-use infrastructure and expertise. These programs that promote chemical safety and security must be international in scope. This is because WMD materials, pathogens and precursors, that are not secure can be a risk to the international community if those non-state actors with intent to do harm obtain them.
Activities and programs that seek to reduce the global threat of chemical terrorism by preventing access to weapons, their precursors, and dual-use infrastructure and expertise should be strengthened. In this respect, it is time for nations and multilateral organizations that can take a lead in promoting activities and programs in

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chemical safety and security to begin to develop strategies for engagement in this area. The Tarnow Center of Excellence is one such place to promote this work and to help develop an overall strategy that other nations, organizations and NGOs can work with to promote both safety and security, and a culture of security. The establishment of a Center is not only a positive way to move forward, but also follows the current international trend to establish centers where training focuses on specific areas of security.

Other multilateral mechanisms are also focusing on chemical security, and these mechanisms should work together in the area of chemical safety and security.

One such mechanism is the G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, or the GP. The GP, which is in fact a 24 member nation multilateral initiative, focuses on funding activities and programs to prevent WMD terrorism. Its major focus the first ten years of its existence was predominately on destroying Russian nuclear submarines and Russian chemical weapons. To date the GP partners have spent over $21 billion dollars on these two efforts in addition to other areas of work in Ukraine and the Former Soviet Union in the destruction of nuclear weapons and delivery systems and scientist engagement, among other things. The GP, originally established in 2002, was to conclude its activities this year. However, the leaders agreed last year to extend the mandate beyond 2012. They also agreed that the partnership should fund more types of programs beyond the destruction of nuclear submarines and chemical weapons in Russia and no longer focus solely on that region. The leaders agreed that the GP should also focus activities and programs in other regions of the world, and it should fund programs in bio-security, nuclear and radiological security, and implementation of Security Council Resolution 1540.

Just two weeks ago, the GP, currently under the U.S. chairmanship for 2012, established a Chemical Security Sub-Working Group. This sub-working group will provide an opportunity for the 24 nations to discuss ways in which they can fund and support chemical safety and security in many parts of the world. The group will have representatives from relevant international organizations, including the OPCW, attend those meetings. The sub-working group will meet for the first time early next year under the United Kingdom chairmanship of the GP. I believe that the discussion that will take place here in Tarnow these two days will provide very useful information for that sub-working group as it develops its work plan for the future. This sub-working group is to be chaired by Poland and Ukraine.

In many ways, chemical security is a new area of funding for many nations. While the U.S. has funded threat reduction activities since the early 1990's, many GP nations who are funding programs to combat WMD terrorism began to do so only once the Global Partnership was formed. What is really needed is more attention devoted to this area internationally and an increase in awareness of why chemical security, like nuclear and bio-security, are areas where programming should begin for some nations and increase in others.

Another such international mechanism to promote chemical safety and security is UNSCR 1540. As you know, UNSCR 1540 establishes a binding obligation on all UN member states under Chapter VII of the UN Charter to take and enforce effective measures against the proliferation of weapons of mass destruction and their means of delivery and related materials. The United Nations Organization for Disarmament Affairs, or UNODA, does an excellent job of hosting regional meetings to help ensure that states understand not only the obligations of 1540, but that they also understand that states should request assistance in fulfilling those requirements. Including chemical security in these outreach efforts helps to bring the issue of chemical safety and security to the international community and helps ensure that no state or nonstate actor is a source or beneficiary of WMD proliferation. The GP, the Tarnow Center and other efforts by international organizations you will hear from today can multiply the effectiveness of their programs in chemical safety and security by coordinating with the UNSCR 1540 Committee and UNODA.

The Tarnow Center will also need to continue to work with other existing or developing COEs in various regions of the world. It is not only to prevent duplication, but it is also to share lessons learned. The COEs should find ways to work together to compare strategies for implementation and the types of programs engaged. This will need to be done on a continuous basis as the programs develop and COEs determine what programs and in which regions they would like to focus.

As I noted last year, as we begin to implement chemical safety and security programs, we should work with NGOs, think tanks and academic institutions supporting or funding programs on chemical safety and security. And we cannot forget to engage the chemical industry, which has a lot of experience in the area of chemical safety and security and can provide important lessons learned.

One final point I want to note again is the importance of the development of a global security culture in the area of chemical security. Developing an appreciation of chemical security helps ensure the sustainability of any program. We should aim to engage partners in a way that they will want to engage others in this area, and by doing so, this will multiply the effect of the goals we seek. Having someone from one's own country promoting chemical security has a strong impact. Promoting the development of professional organizations also helps to ensure the message of chemical safety and security is passed on to the next generation of scientists.

In conclusion, I hope that in the next two days we can learn from each other and see how we can work together to promote chemical safety and security on a global scale. In addition to efforts that can be accomplished through the OPCW, there are many ways in which we can promote chemical safety and security, and some I have highlighted. There is always the usual concern about duplication of programs among different organizations and initiatives, however good coordination can help prevent that potential problem. What is needed now is to determine which countries and regions should be a focus of efforts in chemical safety and security and what are the appropriate programs to implement chemical safety and security? How can states work together to promote chemical safety and security? How do we incorporate work done by NGOs into this effort? How do we incorporate the activities of international and regional organizations? What is the role of think tanks and academic institutions? How do we incorporate the ongoing work in other relevant centers of excellence and training centers? How do we ensure all these entities work together and how do we promote and maintain information exchange? How do we determine priorities of action? These are questions that I hope we can address in the next two days and in the work we do following our time here in Tarnow.

Thank you.

Resolution 1540 and the prevention of the proliferation of WMD to non-state actors: implications for chemical security

Nicolas Kasprzyk [*]

Mr. Chairman, Distinguished Participants, Dear Colleagues,

I would like to express gratitude and appreciation to Poland and to the municipality of Tarnów for their kind hospitality, and for co-organizing the Meeting together with the Organization for the Prohibition of Chemical Weapons, with the generous support of the sponsors. Let me also express gratitude to the Chairman of the Meeting, Mr Krzysztof Paturej, and to the organization team. It is a great honour for me to participate here and represent the 1540 Committee experts, to engage in discussions on the matter of chemical safety and security, in the context of UN Security Council resolution 1540. I trust that our work and exchanges will be very productive, as was the 27-28 October 2011 *Seminar on the Development of the International Centre for Chemical Safety and Security*, here in Tarnów.

With a focus on the matter of chemical safety and security, the Meeting offers an opportunity to discuss issues of utmost importance in the context of UN Security Council resolution 1540 (2004), and to move forward towards enhanced cooperation among relevant stakeholders in this area, including States, relevant international, regional and subregional organizations, the private sector and the academia, bearing in mind the difference in nature of these various stakeholders, which obviously leads to different prerogatives and responsibilities, as well as to different roles and interactions.

As you are well aware, the intensification of international strategic trade and of industrial activities has resulted in dual-use items becoming more accessible to non-State actors that might attempt to use them for malign purposes, including for terrorist purposes. No State is immune from the danger of non-State actors exploiting its territory for production and proliferation of nuclear, chemical and biological weapons, and their means of delivery. No State, no facility, no laboratory is immune from non-State actors attempting to divert sensitive materials, equipment and technology from their legitimate and peaceful purposes, with a view to have them used as part of weapons of mass destruction. Any weakness in the control mechanisms established over sensitive materials, equipment and technology can lead to dramatic consequences.

By adopting resolution 1540 (2004), at the unanimity of its members, the UN Security Council addresses the threat of terrorism and the risk that non-State may acquire, develop, traffic in or use nuclear, chemical and biological weapons and their means of delivery.

Resolution 1540 (2004) obliges all States, without any discrimination:

- To refrain 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;
- To adopt and enforce appropriate effective laws which prohibit any non-State actor to manufacture, acquire, possess, develop, transport, transfer or use weapons of mass destruction and their means of delivery, as well as attempts to engage in any of these activities, participate in them as an accomplice, assist or finance them;
- To establish appropriate controls over materials, equipment and technology covered by relevant multilateral treaties and arrangements, or included on national control lists, which could be used for the design, development, production or use of nuclear, chemical and biological weapons and their means of delivery. Such controls should encompass:
    - Measures to account for and secure such items in production, use, storage or transport;
    - Physical protection measures;
    - Border controls and law enforcement efforts to prevent and combat the illicit trafficking and brokering in such items;
    - Export and trans-shipment controls, including to control export, transit, trans-shipment and re-export and controls on providing funds and services related to such export and trans-shipment that would contribute to proliferation.

[*] Mr. Kaspryzk is a UN 1540 Committee Expert

In less than ten years since its adoption, resolution 1540 (2004) has profoundly modified the non-proliferation landscape, complementing and supporting other existing international instruments and organizations, such as the OPCW in the chemical area, through mutually reinforcing relationships, for the benefit of States. Resolution 1540 (2004) has helped develop new ways and thinking to prevent proliferation activities from non-State actors, encouraging accrued efforts at the national level and the involvement of the various relevant professional communities, triggering new cooperation dynamics.

The 1540 Committee plays a central role in monitoring and facilitating the implementation of resolution 1540 (2004) by States, including by facilitating the delivery of assistance to States. In its most recent report to the Security Council (S/2011/579), the Committee observed that the status of implementation of the resolution has continued to improve since 2004. It noted, though, that much work remains to be done and that the gravity of the threat remains considerable, underlining that the full implementation of the resolution will require a long-term effort by States.

Today, many States lack the legal and regulatory infrastructure, the implementation experience and/or the resources for fulfilling the provisions of resolution 1540 (2004). This is true in the chemical area, as it can be observed by examining the implementation data reflected in the Matrices prepared by the Committee for each State and posted on the Committee's website with the consent of the concerned State.

In its central role to monitor and facilitate the implementation of resolution 1540 (2004) by States, the 1540 Committee contributes to the delivery of assistance, by facilitating match-making between requests and offers of assistance. In this regard, the Committee liaises with providers of assistance, including through relevant mechanisms such as the G8 Global Partnership, and ensures the necessary communication with States that need assistance for a full implementation of the resolution. The Committee is also an active player in facilitating cooperation with and among international, regional and subregional organizations that can contribute to the implementation of resolution 1540 (2004), which represent a very broad and diverse set of organizations, some of them having a mission primarily focused on weapons of mass destruction, such as for instance the OPCW, some others on collective security, such as for instance the OSCE, while many others are originally neither focused on WMD nor on security, although they can bring a real added-value in mobilizing expertise and resources needed for the implementation of resolution 1540, such as for instance WCO. In its role to facilitate the implementation of resolution 1540 by States, the Committee actively engages in dialogue with States, and keeps track of implementation measures taken or considered by States, including those submitted in the form of a voluntary national action plan. The Committee was also requested by the Security Council to identify effective practices, templates and guidance, with a view to develop a compilation.

As it can be observed, the 1540 Committee has a broad mandate to facilitate the implementation of resolution 1540 (2004). But it must be noted, too, that its resources are limited. In this context, the Committee and its experts need to rely as extensively as possible on other existing resources, within the respective mandates.

As the Tarnów Center for Chemical Safety and Security aims to become an important partner in the chemical area, let me recommend that the Center regularly updates the 1540 Committee and its experts on its activities and on possible projects it might consider to facilitate the implementation of resolution 1540 (2004) by States.

In its report to the Security Council, the 1540 Committee recommended that itself, States and international, regional and subregional organizations in cooperation, where appropriate, with academia, industry and civil society should take a long-term approach that can contribute to national implementation of resolution 1540 (2004). This recommendation might be taken on board in the context of the Tarnow Center for Chemical Safety and Security, with efforts to pull out strengths and resources from a variety of horizons, including from the private sector which, obviously, is a key player.

The 1540 Committee experts are looking forward to continuing dialogue in this direction.

I thank you for your kind attention.

United Nations Counter-Terrorism Implementation Task Force (CTITF) support for CBRN safety and security: a new project to prevent attacks against chemical installations and promoting chemical security culture

Zeeshan Amin [*]

Ladies and Gentlemen,

On behalf of the United Nations Counter-Terrorism Implementation Task Force Office, better known as CTITF, I would like to express my sincere thanks to Organisation for the Prohibition of Chemical Weapons (OPCW), the Government of Poland and the European Union in organizing this important meeting. Thanks also to the distinguished mayor of Tarnow for his welcome remarks.

The United Nations CTITF welcomes the establishment of the International Centre on chemical safety and security in Tarnow. The CTITF is ready to contribute and cooperate with the Centre in national capacity building in chemical safety and security and in increasing potential and expertise of the UN entities in these areas.

The CTITF brings together 31 member entities of the United Nations family and key international organizations to provide a coherent and coordinated multilateral approach against terrorism, and the value of the CTITF is encapsulated in the wide-range of expertise and experience housed within its member entities, OPCW among them. OPCW has been a valuable member of the CTITF since the establishment of the CTITF by the United Nations Secretary-General in 2005, and OPCW has been extremely constructive in the joint efforts of the CTITF in supporting Member States in the implementation of the UN Global Counter-Terrorism Strategy.

The CTITF also assists Member States of the United Nations to implement the United Nations Global Counter-Terrorism Strategy, which was adopted by the General Assembly in September 2006. The Global Strategy was a milestone achievement, since it was the first time that all 192 UN Member States agreed to formulate a comprehensive and collective plan to counter-terrorism.

In the Strategy, Member States welcomed the role of CTITF to ensure coordination and coherence of the UN system-wide counter-terrorism efforts. CTITF thus functions under the framework of the Strategy with a particular focus on supporting Member States' implementation of the Strategy.

As I mentioned earlier, the CTITF inter-agency process now consists of 31 entities within and outside the UN system, including many of you present at the exercise here, including IAEA, ODA, 1540 expert group, UNODC, UNICRI, in addition to OPCW.

In the context of this meeting, I would like to draw specific attention to relevant elements in the UN Global Counter-Terrorism Strategy as well as relevant CTITF initiatives. The Global Strategy specifically cites the danger of WMD attacks and calls upon Member States, the United Nations specialized agencies and relevant international organizations to cooperate to prevent this threat from becoming reality. Under pillar II of the UN Global Counter-Terrorism Strategy, which covers measures to prevent and combat terrorism, member States invites the United Nations to improve coordination in planning a response to an attack using nuclear, chemical, biological or radiological weapons or materials so that Member States can receive adequate assistance.

In Pillar II of the Strategy, Member States decided "to encourage the International Atomic Energy Agency and the Organization for the Prohibition of Chemical Weapons to continue their efforts, within their respective mandates, in helping States to build capacity to prevent terrorists from accessing nuclear, chemical or radiological materials, to ensure security at related facilities and to respond effectively in the event of an attack using such materials."

The CTITF Working Group on Preventing and Responding to Weapons of Mass Destruction (WMD) attacks, which is co-chaired by OPCW and IAEA, was established to support the implementation of such measures covered under the Strategy. The Working Group has produced a report on "Interagency Coordination in the

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Event of a Terrorist Attack Using Chemical or Biological Weapons and Materials", with over 20 international organisations contributing to it. You will find copies of the report outside. The report, coordinated by Krzysztof, concluded, inter alia, that chemical plants are at increased risk of terrorist attacks and the international system should strengthen efforts to enhance safety and security at chemical and biological plants and in the transportation of chemicals. It stated that international organisations should work towards a global chemical security culture.

In response to this important recognition, the CTITF has developed a new project to implement the recommendations of this report of the CTITF, a programme to enhance interagency cooperation in the prevention of and preparedness for terrorist attacks against chemical plants and in the transport of chemicals, as well as in the promotion of a chemical security culture.

The overall objective of the project is to facilitate interagency exchange of knowledge, improve understanding and disseminate best practices, and share experiences in the prevention of, and preparedness for, terrorist attacks against chemical installations, and to enhance chemical security culture.

The project will increase inter- and intra-organizational knowledge and raise awareness of chemical security issues. It will bring together resources, responsibilities and capabilities in improving chemical security, and will create new training and learning opportunities for reducing the threat of chemical terrorism. In order to address urgent and specific needs of the Middle East, for example, where a vast development of chemical industries has taken place and where the threat of terrorism in very imminent, the project could address the specific needs of countries to support chemical safety and security.

The project will be implemented with the active multi-stakeholder participation, the private chemical industry, and centres on chemical safety and security, including the International centre on chemical safety and security in Tarnow, and promote public-private partnerships in enhancing chemical security.
The project will also engage all the agencies which work with in the CTITF Working Group on WMD Terrorism, including Interpol, WHO, IAEA, IMO, ICAO, UNICRI, OPCW, UNODA, and the 1540 Committee.

Through the project the relevant agencies could enhance their response mechanism to the chemical threats within their respective environment. Therefore the project will initiate new form of work within the CTITF to serve as a platform to discuss ways to upgrade UN entities' capabilities to respond to the changing environment and the growing needs of UN Member States.

In general the implementation of this project will place the UN as an important venue for raising the issues of global development of chemical activities and industries within the context of the need to support national and regional capacity building against chemical terrorism. It has to be stressed that the project, while stressing the need to enhance interagency cooperation, also concentrates on the development of the tools which could be helpful for Member States to fight chemical terrorism.

Once again, we thank OPCW for its active leadership in the CTITF working group on preventing and responding to WMD attacks, and we thank other CTITF entities present here for their engagement in this initiative. We will continue to count on your partnership on supporting the implementation of the UN Global Counter-Terrorism Strategy fully and effectively so that all States can benefit from concrete and meaningful assistance, wherever needed, to counter the threat of chemical terrorism.

Thank you.

Facilitating and mediating dangerous and contentious projects with local, regional, national, and international stakeholders

Prof. Sergei Baranovsky & Dr. Paul Walker [*]

When former Soviet President Mikhail Gorbachev founded Green Cross International (GCI) in 1993, partly a result of global disappointment over the lack of progress at the first Earth Summit in Rio de Janeiro the prior year, he set a unique goal for the new global environmental and charitable organization – the safe and sound elimination of weapons of mass destruction (WMD). Along with strong commitments to strengthen the global protection of natural resources, including addressing global warming and climate change, and environmental education, Gorbachev pressed his Green Cross colleagues to help him destroy the Cold War stockpiles which he had helped build over the prior decades of Soviet-American arms races and crises.

With a guiding theme of "cooperation rather than confrontation," Gorbachev thus set the "Legacy of the Cold War Program" in motion for Green Cross International and its first five national affiliates. The Green Cross affiliates which immediately took up the challenge were Green Cross Russia, headquartered in Moscow; Green Cross Switzerland, headquartered in Zurich; and Global Green USA, headquartered in Los Angeles. (The US affiliate was originally named Green Cross USA but was forced to change its name after it was discovered that the "Green Cross" name was a federal factory worker safety campaign in the United States.)

The broad goals of the Legacy Program, as it was known for its first decade of work, were to promote civil control of disarmament and demilitarization efforts; to introduce conflict resolution and mediation to contentious demilitarization projects, including chemical weapons destruction and control of nuclear and biological weapons and related launch systems; to promote environmental and public health protection, including worker safety and facility and stockpile security; to organize public education and outreach at stockpile and demilitarization sites; and to encourage citizen engagement, public dialogue, and transparency in local communities and regions engaged in post-Cold War weapons demilitarization.

We divided our Green Cross work into four subprograms: "ChemTrust" to help promote and facilitate the safe and secure elimination of chemical weapons stockpiles and to strengthen the new Chemical Weapons Convention including its inspection and verification regime; "Radleg-NukeTrust" to begin to address the radioactive legacies of the nuclear arms race and to promote and facilitate safe and secure elimination of nuclear weapons stockpiles and related launch systems including strategic missiles, bombers, silos, and submarines; "ConWeap" to address control, destruction, and remediation of conventional (non-WMD) weapons stockpiles and dump sites; and "HELP" as an acronym for Humanitarian Elements in the Legacy Program to recognize that much of our efforts would revolve around engaging civil society and empowering local communities to take a stake in these contentious and important processes.

The first working meeting of the Green Cross Legacy Program took place in Saint Petersburg, Russia in July 1994, with representatives of nine Green Cross national affiliates from Canada, Denmark, Finland, The Netherlands, Russia, Sweden, Switzerland, United Kingdom, and the United States. All participants agreed that the Program should be guided by a commitment to build "mutual trust and understanding" about the critical nature of these weapon demilitarization projects to improving post-Cold War global security. There was also the clear recognition that the demilitarization of weapons of mass destruction – nuclear, chemical, and biological – had to involve local communities, regions, and states which had the most to gain and lose in these arms control and disarmament efforts.

Chemical Weapons Demilitarization

At the same time in July 1994 Russian and American federal authorities were conducting the first on-site inspection of a Russian chemical weapons (CW) stockpile near the town of Shchuch'ye in the Kurgan Oblast. This was one of seven large Russian CW stockpiles which would be subsequently declared to the Organization for the Prohibition of Chemical Weapons (OPCW), the newly forming global implementation group for the Chemical Weapons Convention which had been opened for signature in January 1993. The Shchuch'ye CW

[*] Prof. Baranovsky is the President of Green Cross Russia; Dr. Walker is the Director of Green Cross International's Environmental Security & Sustainability Programme

stockpile held over 5,400 metric tons of nerve agents in some two million artillery shells and almost 1,000 missile warheads.

It became apparent from this inspection, in which one of the authors of this article (Paul Walker) took part on behalf of the Committee on Armed Services in the US House of Representatives, that the Russian CW destruction program would be very challenging from many perspectives – technology choice, community impacts, environmental and public health protection, international collaboration, and economic costs. Security of the man-portable artillery shells, as well as the safety of the workers and community, was clearly a top priority. And similar observations were taking place in the United States as well where the US Army was proposing that on-site incineration would be the technology of choice for CW munitions destruction at nine stockpile sites, but local stakeholders and regulators were opposing high-temperature technologies.

The Legacy Program team – Dr. Sergei Baranovsky from Green Cross Russia, Dr. Stephan Robinson from Green Cross Switzerland, and Dr. Paul Walker from Global Green USA – therefore began developing a model for public outreach, mediation, facilitation, and advocacy to help move both the US and Russian chemical weapons destruction program forward in an efficient, safe, and timely manner. We began by offering the US and Russian federal authorities to organize regional public hearings in the Saratov and Kurgan Oblasts, and in the Udmurt Republic, where four chemical weapons stockpiles were located – Gorny, an 1,100-metric-ton stockpile of lewisite in the Saratov Oblast; Kizner and Kambarka, a 5,700-metric-ton stockpile of nerve agents and a 6,300-metric-ton stockpile of lewisite respectively; and Shchuch'ye, a 5,400 metric ton stockpile of weaponized nerve agent in the Kurgan Oblast.i

We organized five regional public hearings from 1995, when the first hearing in Saratov took place, through 1998 when we organized two hearings in Izhevsk, the capital of Udmurtia, and in the Penza Oblast to address the nerve agent stockpile at Leonidovka. These hearings, held in Russian with English translation, sought to bring together all stakeholders including the Russian federal and military authorities, regional and local authorities, non-governmental groups including public health and environmental experts, community leaders, and foreign experts and partners from the US Cooperative Threat Reduction (CTR) Program which had begun funding some of our outreach and facilitation efforts.

There were many challenges to address in these early hearings. Federal authorities were very nervous about talking publicly about previously top secret facilities housing weapons of mass destruction, and were very concerned about public reaction to this new and troubling information. Local authorities and citizens were likewise very concerned about the safety of these stockpiles, about which almost nothing was known, and how carefully they would be transported and destroyed. And predictable questions continually arose about the role of foreign partners, namely the United States, and what the motives of these foreign governments really were. Was the US, for example, planning to test experimental technologies in Russia for CW destruction, perhaps technology which they couldn't test in the US? Were they secretly bringing nuclear weapons to the regions? What interest could the US have in helping Russia destroy its CW stockpiles other than to disarm Russia and leave it more vulnerable? Such suspicions, although somewhat incredible to believe, were very expected in the 1990s, given the recent past Cold War history and animosity between the two nuclear superpowers. But it would take time to overcome these suspicions and to build trust among all stakeholders.

By 1999, after these five regional hearings had taken place and we had established local and regional public outreach and information offices, the Green Cross Legacy Program began to realize progress in building consensus in the six Russian regions which hosted seven large chemical weapons stockpiles with a total of 40,000 metric tons of deadly chemical agents. The Russian communities also realized that each new CW destruction facility would potentially bring some positive economic impact to their regions and began pressuring federal authorities to guarantee some minimum community and regional investment. And Russian authorities also realized that becoming more transparent about the CW stockpiles, and working more closely with local and regional stakeholders, would help a great deal in precluding lawsuits and open opposition to such large and dangerous industrial projects.

Chemical Weapons Destruction in the US

During this time in the mid-late 1990s the Legacy Program had also been actively working in the United States along three primary lines: (1) to provide alternative destruction technology options to local communities and states other than just high-temperature incineration which many stakeholders were opposing; (2) to advocate for civil society involvement and oversight in the technology selection process and in stockpile destruction planning and operations; and (3) to help guarantee an adequate annual budget for CW destruction planning,

construction, and operations, and for the CTR Program in order to help move the Russian CW destruction effort along.

We were able to help establish a new US program entitled the "Assembled Chemical Weapons Assessment (ACWA) Program" by 1996-1997 to begin evaluating and testing non-incineration technologies for chemical weapons destruction. This effort was heavily opposed at first by the US Army which had its hopes set on nine large incineration facilities, but is now recognized by most observers as a fortunate and excellent complement to the incinerator program. Of the nine CW stockpiles declared by the United States – a total of 28,500 metric tons, five sites have chosen incineration and four neutralization, thereby meeting most citizens' concerns about the risks involved with certain technologies. The US program also began establishing local outreach and information offices at stockpile sites, promoting transparency and engagement of local authorities, and also established local Citizens' Advisory Committees (CACs) to help facilitate local advice and oversight.ii

The US Cooperative Threat Reduction Program, which was initially established with a $400 million appropriation, soon expanded to over $500 million annually and began working closely with Russian partners to design the CW destruction facility at Shchuch'ye. The CTR Program also began actively working with Russia and former Soviet regions to help secure and eliminate aging nuclear weapons and launch systems including submarines, silos, and bombers. This year the CTR Program celebrates its 20th anniversary and has appropriated over $10 billion to date, of which over $1 billion has been committed to chemical weapons destruction in Russia.

Green Cross expanded its outreach efforts in both the US and Russia in 1999 by organizing annual "Forum-Dialogues" in Moscow and Washington DC. These events brought together senior Russian and American authorities, other national experts interested in the nonproliferation and elimination of chemical weapons stockpiles, senior officials for the newly established Organization for the Prohibition of Chemical Weapons (OPCW) in The Hague, and regional and local officials and citizens to openly and frankly discuss challenges in the ongoing CW demilitarization processes in the two possessor countries and to share best practices. These annual meetings were also attended by Congressional and Duma representatives in order to help the political establishments better understand the historic importance of eliminating a whole class of weapons of mass destruction.

Several years earlier, Green Cross Russia and Global Green USA, in Moscow and Washington respectively, had worked in collaboration with other NGOs and the White House and Kremlin, to ratify the Chemical Weapons Convention; after a long campaign, the US Senate finally ratified the treaty in April, 1997, and Russia ratified it several months later that year. But these difficult political struggles had made clear that politicians in each country needed more education and information on the importance of the CWC to global security.

The G-8 Global Partnership and Threat Reduction

Green Cross also worked to bring in other countries to help the US and Russia finance and manage their challenging CW destruction programs. Green Cross organized a large parliamentary meeting in Bern, Switzerland, for example, with President Mikhail Gorbachev as the speaker to advocate for additional countries to come to the aid of Russia to help with chemical weapons destruction. The Swiss Parliament agreed a few months later to commit some 16 million Swiss Francs over five years to CW destruction in Russia. And in 2002 the US and Canada were successful in establishing the G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, pledging $20 billion over 10 years, primarily towards securing and eliminating nuclear and chemical weapons in the former Soviet Union.

To help further with regional and local facilitation of these projects, Green Cross established a network of ten local Public Outreach and Information Offices (POIOs) in Russia, all located near chemical weapons stockpiles and in regional capitals. These were all funded by Global Partners including the US, United Kingdom, Canada, The Netherlands, and other European countries. While Russia provided no funding for the Green Cross efforts, they actively participated in the annual National Forum-Dialogues in Moscow and began considering establishing small outreach efforts of their own in the various regions. Green Cross also established three Citizens' Advisory Commissions (CACs), modeled after the US and European models, in Shchuch'ye, Kizner, and Kambarka from 2000 to 2004. These became very successful and important in helping empower local citizens and officials and in providing regular and honest feedback to Russian federal authorities.iii

Further efforts by Green Cross to deepen its outreach, education, and trust-building efforts in Russia included establishing summer camps for young children in CW stockpile regions, providing limited humanitarian support for poor and underdeveloped communities which surrounded these remote stockpiles, and reaching out to all sectors of society including veterans, students, workers, environmentalists, medical and public health workers, teachers, media, and politicians. Mobile vans were useful in reaching remote villages, and videos, PowerPoint presentations, and educational materials were all developed on a regular basis.

Because of the similar concerns and needs of both US and Russian communities and regions, we also organized a number of Russian-American exchange programs for local and regional authorities, including Governors and state regulators, and concerned citizens. These visits to such remote places as Tooele, Utah and Umatilla, Oregon in the United States, and to Shchuch'ye and Kambarka in Russia, served to build solidarity between these very different communities across the globe which, although diverse in culture, economic development, and language, could closely identify with each other in helping create a world free of chemical weapons.

Neutral, Independent, Third-Party Facilitation

Today, over fifteen years since we first started helping promote, mediate, and facilitate the safe and sound elimination of weapons stockpiles, we remain not only very proud of the work we've helped to accomplish – the destruction of almost 90% of the US chemical weapons stockpile, some 25,600 metric tons, and about 65% of the Russian stockpile, some 26,000 metric tons, but we are convinced more than ever that independent, neutral, trusted, third-party facilitation of these contentious processes remains a very important tool of nonproliferation, arms control, disarmament, and demilitarization. Our strong biases, central to our strategy for facilitation, have included the goals of inclusiveness, that is, seeking to include all stakeholders, not just those who will rubber-stamp predetermined decisions or quietly look the other way; and patiently working to build strong, lasting, and transparent working relationships, recognizing that this process speeds the process in the longer run, although may force tough issues to be addressed early on in projects.

Such a public facilitation model, not at all new to those involved in conflict mediation and peaceful resolution of disputes, will continue to be very relevant as we move beyond weapons stockpile destruction over the coming decade and concentrate on chemical industry inspections and national reporting and implementation of CWC States Parties. Our experience also points to the usefulness of involving civil society and non-governmental experts in independent assessments of technology, risks, environmental and public health evaluations, socio-economic impacts of projects, emergency preparedness and response mechanisms to accidents, attacks, and catastrophes, both natural and man-made.

Concluding Remarks

The Green Cross Legacy Program was retitled about five years ago and is now called the Environmental Security and Sustainability (ESS) Program. During its fifteen years or more of work in chemical weapons demilitarization in Russia, it has included over 5,000 citizens, experts, officials, and other interested stakeholders in its hearings and events. Over 150,000 educational brochures, pamphlets, and expert studies have been distributed. Some 4,600 Russian children have been included in Green Cross summer camps in weapons stockpile regions. All stockpile communities have been moved from primarily suspicious and negative attitudes in the 1990s, to constructive collaboration today with local, regional, national, and international authorities, all central to full implementation of the Chemical Weapons Convention and Russia's legal obligations thereunder.

And perhaps most importantly, Russia has been able to construct and operate six CW destruction facilities since the Gorny facility started initial operations in late 2002, just a decade ago, and its seventh and last facility at Kizner will likely start initial operations in 2013. In the United States, seven of nine facilities completed operations in early 2012 since the first prototype incinerator began operating on Johnston Atoll in the Pacific Ocean in 1990. The last two facilities at Pueblo, Colorado and Blue Grass, Kentucky will begin operating in the next few years, and will hopefully finish destruction operations a decade from now. Of the seven declared CW possessor countries today, the Russian and US stockpiles account for over 95% of these deadly weapons; their final abolition, along with the much smaller stockpiles in Albania, India, Iraq, Libya, and South Korea, will provide a much needed improvement in global security and mark a historic moment in global nonproliferation and disarmament.

As a final comment, we would like to emphasize that three interrelated concepts – transparency, stakeholder involvement, and public dialogue – hold the key to successful projects in general. Without these three

fundamental business goals, projects run a much higher risk of being delayed, derailed, or possibly permanently halted. In a modern world facing many threats to global security, we cannot allow this to happen.

[i] These tonnage figures are estimates. Actual announced figures are as follows: Gorny – 1,142 MTs; Kizner – 5,745 MTs; Kambarka – 6,349 MTs; and Shchuch'ye – 5,457 MTs, all rounded to the nearest metric ton.
[ii] For more information on the US CW destruction program, see www.cma.army.mil. For the ACWA Program, see www.peoacwa.army.mil.
[iii] The Green Cross Legacy Program organized a workshop in Moscow on February 4, 1999, for example, to discuss a working paper on "Citizen Advisory Boards and Public Involvement: A Discussion of the Role of Citizens in Public Decision-Making, Post-Cold-War Demilitarization, and Environmental Clean-Up."

Toward a chemical security summit: the advent of CBRN security culture

Prof. William W. Keller [*]

I begin by expressing my appreciation and gratitude to the Government of Poland, the G-8 Global Partnership, and the Organization for the Prohibition of Chemical Weapons for organizing and sponsoring this farsighted and extremely important conference. It is a conference that has the potential to influence the landscape of proliferation and revolutionize the regime that has protected the world from CW for more that 15 years.

My purpose today to expound a bold argument. It is that the time has come to take a page from the nuclear field and begin to make preparations for a "Chemical Safety and Security Leadership Forum" to be held in 2014. It is clear that the Nuclear Security Summits of 2010 and 2012 cannot serve as a model for chemistry, but they are most assuredly a precedent for gaining the focus and sustained interest of the international community. A "Chemical Leadership Forum" could be patterned on aspects of the nuclear security summits, but would likely be somewhat less ambitious and would reflect the greater role of transparency, industry involvement and public opinion in the chemical domain.

But before I make the case for a "Chemical Safety and Security Leadership Forum"—or rather as part of making that argument—I want to recognize the critical contributions that the CWC and the OPCW have made to eliminate the global menace of chemical weapons. The CWC today remains a central pillar of chemical safety and security. The OPCW and the states parties to the CWC have played a critical role in their long-term mission to make the world free of chemical weapons. This effort has been so successful that the vast majority of CW will soon have been accounted for and destroyed. This essential organization should continue its work until all known chemical weapons have been entirely eliminated.

But we must not look to the past accomplishments of the CWC and the OPCW to see their finest hour. Indeed, the march of technology has fashioned new challenges, new branches of chemistry, interdisciplinary synergies and even the certainty that new toxic substances will inevitably emerge for use in chemical weapons. We are fortunate, indeed, that the Organization for the Prohibition of Chemical Weapons is a remarkable and flexible instrument. It has the institutional knowledge, the global reach, and I would argue the ethical mandate to address new challenges of chemical security and safety, that are certain to characterize the future of the global chemical industries, supply chains and strategic trade.

The argument for a Chemical Leadership Forum has two parts. I have tried to sketch the first—which is that the basic institutional structure for the elimination of chemical weapons must broaden its mandate to include addressing the extraordinary technological advances that have come to characterize the chemical disciplines as well as the peaceful use of chemistry.

We are all aware of the degree to which enabling technologies have revolutionized the workplace, communications, transportation, education, warfare, and even social relations in just one generation. The field of chemistry is no different. Many universities now offer multidisciplinary doctoral-level training in chemical biology. The discipline of neuroscience, which is the scientific study of the nervous system, was traditionally viewed as a branch of biology. Today it has become a multidisciplinary endeavor closely associated with such fields as chemistry, computer science, mathematics, medicine and psychology.

Perhaps, even more revolutionary, we are today witnessing the emergence of the field of nanochemistry. It is a relatively new branch of chemistry concerned with the unique properties associated with assemblies of atoms or molecules at the nanoscale (~1-100 nm), so that the size of nanoparticles lies somewhere between individual atoms or molecules and larger assemblies of bulk material with which we are more familiar. Physical and chemical techniques already exist to manipulate atoms to form molecules and nanoscale assemblies.

It does not take much imagination to think of new forms of chemical enterprise as well as "chemical weapons" that can emerge from such fields as chemical biology, neuroscience and nanochemistry. These advances in our knowledge, as well as their highly educated practitioners, are spreading throughout the world. They have the potential to awaken new cures for ancient diseases, and to ease the hardships of life in developing nations. But they also hold the keys to unlocking chemical weapons of unprecedented power and savagery. The current

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situation, it would seem, is akin to the ethical and political dilemma of the 20 Century, after the discovery of nuclear fission—with both the destructive and peaceful potential that it brought into the world.

To summarize, the time has come to revisit and strengthen the role and mandate of the CWC and OPCW in the context of the few examples I have given, and broad advances in the technology of chemistry and related fields. The destruction of the old CW stockpiles must not be viewed as an ultimate mission, but rather as the first essential step toward a world safe and secure from abuse of chemical materials and technologies—regardless of their origins and nature. The question is how to accomplish this task, how to make this mode of operation sustainable, and how to add a sense of urgency.

The second part of the argument for a "Chemical Leadership Forum" has to do with the increasing penetration of peaceful chemical infrastructure into a host of new countries. As you know, the chemical industry is one in which foreign direct investment plays a leading part. Companies are investing in increasingly sophisticated chemical infrastructure, and introducing it more deeply into the developing world. In many areas, the introduction of new chemical facilities coincides with varying degrees of political instability, local conflict and even terrorist activity. Under such circumstances, chemical safety cannot exist in the absence of chemical security and chemical security culture. As we have seen of late in the nuclear field, it proved possible for an 82-year-old woman to breach the security of the Y-12 nuclear weapons complex at Oak Ridge; and for some 70 Greenpeace activists to enter restricted areas in two power plants in Sweden and remain there undetected for hours. The cause of these incidents was a breakdown in the human factor, and a lack of security culture; if the perpetrators had been terrorists armed with C-4, the consequences might have been catastrophic.

Last year the Center for International Trade and Security held a workshop on the development of "Sustainable CBRN Security Culture". The participants came from very different disciplines and industries and they talked about very different kinds of security challenges. In some cases, the received 'vocabulary' was difficult to translate from one stovepipe to another. Nevertheless, the workshop showed that some concepts can be elevated above existing C, B, R and N divides. Experts concluded that to achieve real and sustainable security and safety in their respective areas, it is necessary to inculcate an appropriate culture within the minds of the people who operate and work in very different kinds of facilities. As we discussed disparate security challenges, the only common element—the only fungible concept to emerge—was that of developing and maintaining a rigorous security culture at the level of the facility.

As applied to chemistry, this means creating and reinforcing a set of shared values and characteristics to promote safety and security for the protection of human lives, society and the environment. The development of chemical safety and security culture must also take place in the context of comprehensive strategic trade legislation and regulations. Let me give a brief illustration: it is the likely introduction of chemical infrastructure to Kenya.

As you know, the Port of Mombasa is in many respects the gateway to East Africa. You are also aware of the historical presence of Al Qaeda, Al Shabbab and like organizations in the region. The potential exists at any time for violence or sabotage, perhaps perpetrated by sub-state groups located near the borders with Somalia or Ethiopia. Just a month ago, Kenya launched a significant military operation, landing hundreds of troops on a Somali beach to drive Al-Shabaab from one of its last local strongholds. My Center—CITS/UGA—is very aware of this context because we have been working in Kenya, working to put in place comprehensive strategic trade legislation and regulations, and contribute to a new architecture of CBRN nonproliferation and security. We also applaud the efforts of the Governments of Kenya and Poland, the OPCW, the Global Partnership and the chemical industry to develop and sustain a Program on Chemical Safety and Security for chemical activities in Kenya. This is an example of proactive engagement to create security and safety in advance of the introduction of new chemical infrastructure. The involvement of governments, industry, NGOs, public opinion and other stakeholders is essential.

To summarize the second part of the movement toward a "Chemical Leadership Forum" in 2014: It is time to take the next steps beyond the prohibition and destruction of traditional CW. That is, to provide for the security and safety of all chemical infrastructure, and particularly chemical facilities operating or being introduced to potentially volatile political environments.

We had a big success story in the nuclear field when some 50 countries of the world realized that the status, enforcement and legal framework were vulnerable to emerging threats posed by sub-state actors. They agreed to extraordinary measures, that is, to hold a series of nuclear security summits. Why not emulate this successful endeavor—to deal with a variety of chemical risks in a wide disciplinary context?

There will certainly be differences. In the nuclear field government is the principal and key player. And as I indicated earlier, while the Nuclear Security Summit is an excellent precedent, it is by no means a model. In the chemical field government, industry and the public are all deeply invested. Indeed, in the creation of the Chemical Weapons Convention, industry played a seminal role, just as it plays a key role today, and just as it must be centrally involved as we reach for greater chemical safety and security in the future. The Responsible Care program and its achievements are an excellent example of the maturity and social responsibility of the chemical industry.

In approaching the concept and organization of a "Chemical Leadership Forum", we know for certain that it is necessary to have a champion. In the nuclear field, that champion was the United States. President Barack Obama became personally engaged, taking on the challenge of leadership. And yes, the US will go down in history for bringing the challenge of nuclear security to the sustained attention of the international community.

When I think of these two major ideas, the incubation—perhaps right here in Tarnów—of the idea for a "Chemical Leadership Forum" and an expanded future role for the OCPW, it is entirely possible that what we are doing here in Tarnów today and tomorrow can help to lead the way. Indeed, it is an opportunity that we must not miss. The establishment of the International Center for Chemical Safety and Security (ICCSS) can become the venue where these ideas are formulated and brought to fruition over time. Because of this conference and because it has a highly developed chemical industry, Poland is especially qualified to take on this challenge in the chemical field. The wisdom and support of the Government of Poland can become its platform.

My organization, the Center for International Trade and Security at the University of Georgia, is prepared to partner with the new International Center here in Tarnów. Perhaps a next tentative step would be to create a High Level Study Group on Chemical Safety and Security with an explicit mandate to explore the feasibility of holding a chemical safety and security summit in 2014.

Thank you for your attention to these remarks.

Tarnow Centre for Chemical Safety and Security: concept, partners, and plans

Lukasz Blacha [*]

Introduction

The aim of the project is to develop in the city of Tarnow an International Centre for Chemical Safety and Security (ICCSS), which would serve as a centre of excellence in chemical safety and security, implementing the principles of sustainable development, public-private partnership and modern management practices. The project of the ICCSS was the subject of an international conference which took place in Tarnow on October 27-28, 2011. As a result of that event national and international partners expressed their support and readiness to be involved in the project. The international stakeholders and donors are invited to join the development, operation and co-finance the centre and to provide resources/expertise in capacity building, training and exchange programmes for the developing countries or countries in transition, in the areas of chemical safety and security.

Principles of functioning of the ICCSS in Tarnow

1. *Objectives*

The International Centre for Chemical Safety and Security will respond to challenges resultant from fast growth of the chemical industry and globalised access to chemicals, where safety of production, infrastructure and supply chains have become a priority for all stakeholders: governments, industry, local communities and NGOs.

The Centre will provide continuity and sustainability to the international efforts in chemical safety and security and focus on promoting national capacity-building for research, development, storage, production and safe use of chemicals for purposes not prohibited by the Chemical Weapons Convention and other international agreements, including international health regulations.

The Centre will support international efforts to raise awareness about the nature of dual-use chemicals and the risks arising from the use of chemicals contrary to their identified purposes. It will promote good laboratory practice and the prevention of sales of toxic compounds to unauthorised recipients, or their release into the environment as a result of an accident at an industrial site.

The Centre will create opportunities for international organisations to implement, in a permanent manner and on a global scale, their statutory duties of strengthening chemical security in a wide spectrum of tasks including chemical production, transport, handling, trade, supply chain, and end use of chemicals.

The Centre will support the Organisation for the Prohibition of Chemical Weapons (OPCW) and other international organisations in supporting the governments and chemical industry in the promotion and implementation of chemical safety and security. The Centre's activities will cover a wide range of issues related to peaceful uses of chemistry.

In practice the Centre will support and offer a venue for practical implementation of efforts to prevent illegal use of CBRN materials, in accordance with UN Security Council Resolution1540 and other international commitments. It shall raise the safety and security standards in the field of producing and marketing chemical compounds and materials of dual use and promotion of the global culture of chemical safety and security.

The Centre will support the promotion of economic exchange and international trade. International practice shows that the road from co-operation in implementing safety standards to economic co-operation is short.

The Centre will establish a permanent platform for sharing experience in the field of chemical safety and security with developing countries and countries in economic transition. At the same time it will focus attention to direct assistance in development of safe activities in the sphere of toxic chemicals.

2. *Main areas of activity*

[*] Mr. Blacha is from the Municipality of Tarnów

The activity of the International Centre for Chemical Safety and Security will cover areas such as:

- Industrial production of chemicals
- Supply chain
- Transport of chemicals and protection of transportation lines
- Scientific research
- Laboratory work
- Any other academic studies and activities.

The core activity of the Centre will be providing expert advice, managing trainings, drills exercises and workforce retraining in the broad area of chemical security and safety issues. The Centre will be developing training curricula and programs on the basis of recognised international standards, and providing international and national certification. Further the Centre will be promoting scientific exchange and developing and implementing new, environmentally safe processes and materials in the area of disposal of toxic materials.

The Centre will provide support for the chemical industry, industry executives and academics in their work, focusing on new challenges in the field of chemical safety and security in the entire field of chemical activities (construction of installations, marketing, production, transportation, and use of industrial chemicals).

The Centre will be conducive to academic institutions and research centres offering the best practical knowledge and ensuring the leading position of the chemical safety and security among topics of academic discussions.

The Centre will:

- create a database of all existing national and international programmes in the safe and secure handling of toxic chemicals;
- offer assistance to governments to draft safety and security standards of chemical plants and transportation lines;
- offer employees of the chemical industry, universities and governmental institutions workshops improving good practices on areas of chemical safety and security;
- conduct training in the field of industry best practices for small and medium enterprises;
- assist in the design of national anti-terrorism standards for chemical plant protection and transportation of chemicals;
- conduct certified educational activities and develop training modules for the industrial safety and security in the entire field of chemical activities;
- be used as a forum to organise conferences, symposia and will be publishing security and safety related literature.

Furthermore it will assist in drafting documents, handbooks, guidelines for procedures and good practice.

Next steps

The concept covering a general range of goals has been completed and awaits describing the scope of involvement of the key players. The most important action at the current stage is the translation of a concept into a concrete project, which should meet the high standards of sustainable development and correspond to the requirements of a modern industrial landscape, attractive to investors and Polish authorities.

The Centre is already functioning as a foundation, a non-profit entity. It will be accompanied by an association of potential partners and a company responsible for conducting concrete activities.

In the coming years, the Centre will offer training courses for national and international partners, develop course curricula and chemical industry training materials, expand partnerships and create opportunities to cooperate with the chemical industry, academia and laboratories. The Centre will operate a website to strengthen national and international networks and support national, regional and international efforts to foster chemical safety and security. The website will offer training materials and will serve as a tool to maintain contacts between experts and trainers. The Centre will develop an *Information Exchange Mechanism* (using the Internet) on best practices in the safe and secure handling of toxic chemicals.
The Centre will develop an *Evaluation Mechanism* to review the existing industry measures for the safe and secure handling of toxic chemicals. In particular, the Centre will expand partnerships with the OPCW, the World Health Organisation (WHO), and other international organisations.

Advantages of Tarnow

The Tarnow region is characterized by its exceptional geographical location and excellent transport links on the crossroads between Eastern and Western Europe. Tarnow is an important economic centre with its strong chemical industry and focus on professional development and vocational education.

Since the 1920s, Tarnow has been a leading place for developing chemical processes and research cooperation in the area of chemistry. A number of technologies for disposal of toxic chemicals, including disposal of chemical weapons, have been successfully developed in Tarnow and later used in army demilitarisation programs.

In 1999-2011 a series of projects encompassing technical support and disposal of toxic substances were completed in Tarnow. Tarnow hosted a number of seminars and international visits, which resulted in initiating co-operation with OPCW.

The experience and recognition gained, long-term co-operation with the Ministry of Foreign Affairs and the Ministry of Science and Higher Education, as well as international contacts, have paved a solid ground for Tarnow to become a place for international co-operation, technical development and environmental protection. As a result Tarnow should become an international investment platform in technical activities, education, training and production in the general scope of chemistry.

IUPAC – serving mankind through chemistry

Prof. Leiv Sydnes [*]

The International Union of Pure and Applied Chemistry, IUPAC, was established in 1919, in the aftermath of World War I. During the war the power of chemistry had been demonstrated in tragic ways through the use of chemicals as powerful weapons, and this, I am sure, showed the need for international cooperation in the chemistry communities around the world. The membership of IUPAC grew quickly and today the Union has 59 full members and 2 associate members. The union's headquarter is currently in USA, but it was first situated in Paris, then it moved to Zürich and then to Oxford before it was moved to Research Triangle Park, North Carolina before the turn of the last century.

The organizational structure of IUPAC has changed over the years. There used to be few divisions and many commissions, but that was profoundly changed when the organization was completely overhauled around the turn of the last millennium, so today there are eight divisions and almost no commissions. As Box 1 shows, most of the divisions have a name associated with a sub-discipline of the chemical sciences, but three divisions and three standing committees have names which reflect the interdisciplinary nature of the issues they deal with.

IUPAC fulfils its mission by working through its divisions and standing committees:

Divisions

Division I:	Physical & Biophysical Chemistry
Division II:	Inorganic Chemistry
Division III:	Organic & Biomolecular Chemistry
Division IV:	Polymer
Division V:	Analytical Chemistry
Division VI:	Chemistry & the Environment
Division VII:	Chemistry & Human Health
Division VIII:	Chemical Nomenclature & Structure Representation

Standing committees

Committee on Chemistry and Industry (COCI)
Committee on Chemistry Education (CCE)
Committee on Chemical Research Applied to World Needs (CHEMRAWN)

Box 1

From the beginning all IUPAC activities have been based on voluntary involvement of a large number of chemists from around the world, and indeed, over the years thousands of chemists have been engaged in this partnership. This collaboration has enabled the Union to make recommendations on chemical nomenclature and terminology, provide compilations of critically evaluated chemical data, set standards for chemical analyses, nourish chemical research through conferences, promote global cooperation between chemists, and cooperate widely with other international organizations. These activities have never been glamorous and they do usually not make news headlines, but standardization of chemical measurements, terminology, nomenclature and analytical methods are of crucial importance and constitute a significant part of the basis for healthy commerce and prosperous societies in all parts of the world. And in the context of this meeting it should also be mentioned that the work carried out by the Union, which is on-going, makes it possible for the Organization for the Prohibition of Chemical Weapons, OPCW, to implement the Chemical Weapons Convention (CWC). It is therefore no exaggeration when it is stated that IUPAC is a key non-governmental

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organization (NGO) to involve when roadmaps for sustainable development in the 21st century are being discussed, drawn and revised.

Implementation of the Union's mission

The ultimate goal of IUPAC has always been to serve the chemical community worldwide and the global civil society as a whole. Over the years this aspiration has been expressed in a number of ways, but the bottom line has always been that the union wants "to serve Mankind through chemistry" as the current mission statement says (Box 2). This is achieved through a wide range of activities which not only scrutinize and critically evaluate scientific data and terminology, but also promote the norms, values and ethics of science, advocate free exchange of scientific information and free access of scientists, and address global issues as an objective, scientific body.

IUPAC's mission statement

IUPAC 's mission is to advance the worldwide aspects of the chemical sciences and contribute to the application of chemistry in the service of Mankind.

Box 2

For IUPAC it is paramount to maintain a high reputation among its stakeholders, and this requires consistent performance and hard work. But this is not a simple task for an organization based on volunteers and whose stakeholders constitute a very complex group of people, nations, regions, governmental institutions, industrial companies, professional societies, and a diversity of other ngos. Among members of these different groups there are significant differences in the understanding of chemistry and the awareness of the needs to use chemical products, the importance of secure handling of chemicals, and chemical management.

As a result the Union has to:

- live up to professional expectations from the scientific and industrial communities;
- respond to adequate requests and questions from practicing chemists;
- relate to regulations and legal aspects in societies at different stages of development;
- take seriously curious as well as biased questions from lay people and the general public;
- and finally, explain damages caused by natural processes, accidents, and disasters involving chemicals.

Most work carried out by the union belongs to one or several of four categories. The activity with the longest history, in fact as long as the IUPAC history, is evaluation and standardization of terminology and data such as nomenclature, symbols, published experimental values, analytical methods, and experimental procedures of all sorts. Such data constitute the very basis for chemical research and the application of chemistry in industry and society. It is noteworthy that without such data the implementation of the Chemical Weapons Convention (CWC) would be absolutely impossible. Thus, data verified and quality-controlled by and through IUPAC are the foundation for chemical safety and security as well.

The second category with an international reputation encompasses the IUPAC conferences. At the outset all these meeting were scientific and research oriented, but gradually congresses addressing global issues, where chemistry was a key discipline to find solutions and rationalize the need for new policies or improved practises, started to become an important part of the conference portfolio. A central group of congresses of this type was and is in particular the CHEMRAWN conferences, which explore how chemistry can be applied to satisfy world needs, and this is reflected in the title of some of the CHEMRAWN meeting held to date (Box 3). In this context it is worthwhile to mention that the preparation of the scientific/technical documents used by OPCW to review the CWC has been carried out under the auspices of IUPAC's CHEMRAWN Committee.

A selection of CHEMRAWN Conferences held in the past:

CHEMRAWN I:	Resources of Organic Matter for the Future
CHEMRAWN II:	Chemistry and World Food Supplies: The New Frontiers
CHEMRAWN IV:	Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources
CHEMRAWN V:	Current and Future Contribution of Chemistry to Health
CHEMRAWN VII:	Chemistry of the Atmosphere: Its Impact on Global Change
CHEMRAWN VIII:	Chemistry and Sustainable Development: Towards a Clean Environment, Zero Waste and Highest Energy Efficiency
CHEMRAWN IX:	The Role of Advanced Materials in Sustainable Development.
CHEMRAWN X:	The Globalization of Chemical Education
CHEMRAWN XII:	Chemistry, Sustainable Agriculture and Human Well-Being in Sub-Saharan Africa
CHEMRAWN XIII:	Chemistry for Clean Energy
CHEMRAWN XIV:	Toward Environmentally Benign Products and Processes
CHEMRAWN XV:	Chemistry for Water
CHEMRAWN XVI:	Innovation and the Chemical Industry
CHEMRAWN XIII:	Science, Ethics and Development
CHEMRAWN XVII:	Greenhouse Gases Mitigation and Utilization

Box 3

A third category of activities is publication of journals and books. Research presented at conferences is published in the more than 60 years old journal *Pure and Applied Chemistry* (PAC) (Figure 1), where IUPAC Recommendations and Technical Reports are also reported after having been thoroughly reviewed. In CI, *Chemistry International*, reports from the global chemical scene and IUPAC's internal life, aimed at the interested public, are published. Then there are IUPAC's "colored books" (Box 4), which are presentations of stringent chemical nomenclature and terminology in all fields of chemistry. The books are very important reference publications, which used to be printed, but nowadays are available on the IUPAC homepage (see Figure and www.iupac.org) free of charge. In this context it is should be mentioned that IUPAC, in collaboration with several UN organizations, has published a handbook on chemical safety.

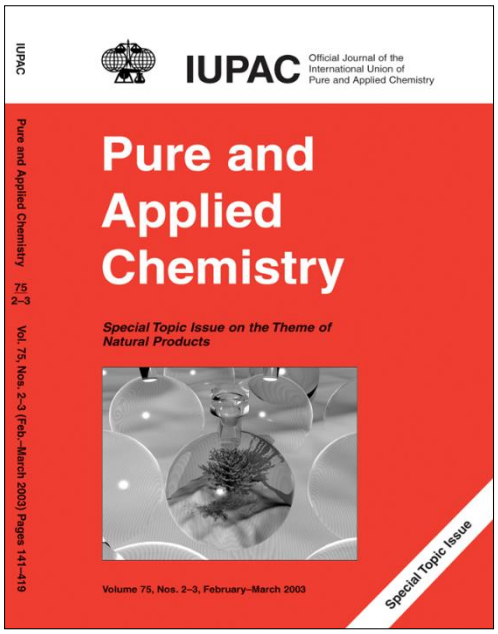
IUPAC's color books contain stringent stringent chemical nomenclature and terminology:

The IUPAC Red Book:	Nomenclature of Inorganic Chemistry
The IUPAC Blue Book Blue:	Nomenclature of Organic Chemistry
The IUPAC Green Book:	Quantities, Units and Symbols in Physical Chemistry
The IUPAC Gold Book:	Compendium of Chemical Terminology
The IUPAC Orange Book:	Compendium of Analytical Terminology
The IUPAC Purple Book:	Compendium of Macromolecular Terminology
The IUPAC White Book:	The Biochemical Nomenclature and Related Documents.

Box 4

a) The scientific journal, *Pure and Applied Chemistry*

b) The news magazine, *Chemistry International*



c) The web edition of *The Orange Book* (go to www.iupac.org)

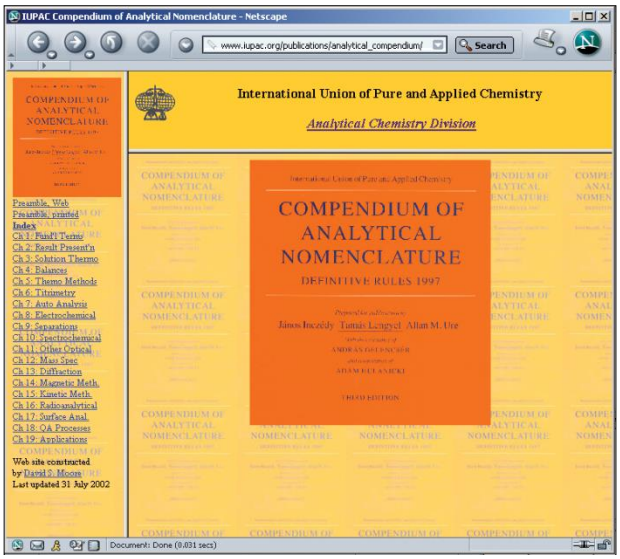


Figure 1: Examples of IUPAC publications

The latest addition to the IUPAC activities is the IUPAC project system. The projects are not aiming at solving research problems, but focus on issues, data, terminology or nomenclature where quality control and evaluation are required or consensus and recommendations are going to be developed. The projects have to fulfil certain criteria which are clearly spelled out at the IUPAC home page (search for *IUPAC projects*) (*e.g.* be related to "the needs of the chemists in the world" and/or "the needs of mankind" and be carried out by an international team such as IUPAC). The project system is very efficient and flexible, and it is a credit to the system that the IUPAC project portfolio is much more diverse than it used to be. There is no doubt that the project system has made it easier for IUPAC to support projects dealing with societal issues, and this has been beneficial for the union's collaboration with OPCW.

IUPAC and OPCW

OPCW and IUPAC have now collaborated for more than a decade. The main co-operations have focused on assessment of trends and developments in chemistry and chemical technology that are of relevance to the Chemical Weapons Convention, but other topics have been added to the agenda as well.

The first formal contact between the two organizations was in 2001 when IUPAC was invited to take the responsibility for working out a report evaluating the scientific and technological advances that had taken place since 1993 and might have an impact on the implementation of the CWC in preparation of the First Review Conference to be held in 2003. The invitation was a natural consequence of the fact that IUPAC was (and still is) the only independent, non-governmental, international organization devoted to chemistry and the chemical sciences and their applications in both research and industry. IUPAC accepted the offer and an international group of specialists, covering relevant fields of chemistry, chemical engineering, and industrial chemistry, was appointed to do the work. During a workshop in Bergen, Norway ("The Bergen Meeting") the main parts of the report was worked out (Figure 2), and through subsequent communications the report was finalized. The document was widely distributed within OPCW and among the members of the Scientific Advisory Board (SAB). It was also published in *Pure and Applied Chemistry* (Figure 2), and as a finally presented at the Open Forum during the First Review Conference of the CWC May 1st, 2003.

a) The first conference on Impact of Scientific Developments on the Chemical Weapons Convention was held in Bergen, Norway in 2002

b) Most of the lectures held at the conference were published in a special issue of *Pure and Applied Chemistry*.

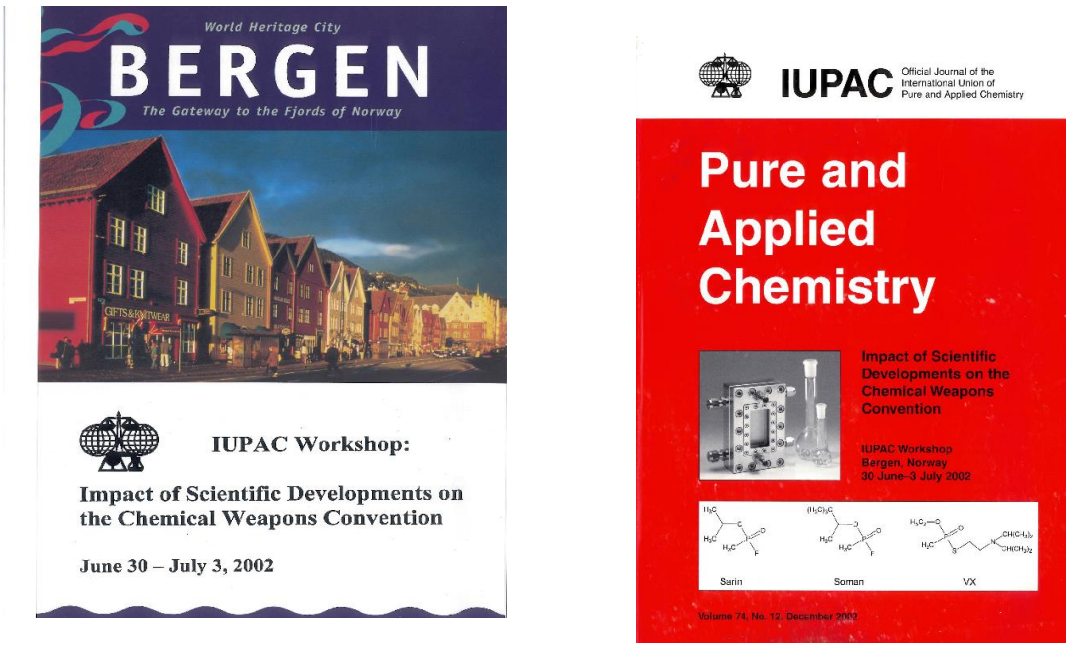


Figure 2

IUPAC was again approached when the preparation of the Second Review Conference of the CWC started, and again IUPAC accepted the invitation to take the responsibility for working out a report on the impact of developments in chemistry and chemical technology on the CWC. This time Zagreb, Croatia was the venue, but the meeting was organized and run following the Bergen formula which had proved to work well and had given the outcome requested by OPCW. The resulting report was structured much like the first, and it was interesting to see that the key issues in the first report, viz. 1) technical challenges to the convention, 2) advances in analytical techniques, 3) the technical capabilities of the Secretariat, and 4) challenges in education and outreach, were the main themes in the 2007 report as well. It is fair to say that the report was well received and appeared to play a useful role in the second revision of the Convention.

The third review conference is due to take place in April/May next year, and IUPAC was once again asked to be involved in the preparation of the report on chemistry and chemical technology required for the review. The work with the report started by a three-day workshop, following the Bergen format, at Spiez Laboratories,

Spiez, Switzerland. The event was attended by some 80 participants from close to 30 countries, who analyzed the scientific developments in chemistry and chemical technology the past five years to find areas and trends with (potential) impact on the CWC. Overall, the general conclusion from the workshop was that the main challenges basically remain the same as in 2002 and 2007, but the nature of the challenges has changed because the science and technology relevant to the Convention have been advancing at a very rapid pace.

That being said, three facts have to be acknowledged: 1) The convergence of chemistry and biology has continued and can bring about an increased risk potential which might represent a challenge to the current verification systems; 2) significant progress in organic synthesis has made production of toxic agents easier; and 3) the development of new production equipment, such as microreactors which were just over the horizon five years ago, has made it easier to produce chemical weapons without being caught. These facts require focus on chemical safety and security beyond today's level, and here both OPCW and IUPAC have important roles to play on the basis of their competences.

An important task in this context is education. The report presented recently to OPCW contained a section on this and it is so brief that it can be quoted in full length: "1) Greater efforts on education and outreach to the worldwide scientific and technical community are needed in order to increase awareness of the CWC and its benefits. An informed scientific community within each country can be helpful in providing advice to States Parties and in disseminating unbiased information to the public. 2) Education of and outreach to Signatory States and non-signatory States could be helpful in increasing awareness of the importance of universal adherence to the Convention thereby enhancing safety and security for all States."

Education

Education at all levels has for decades been on the agenda in IUPAC. It is a matter of fact that chemistry is not well understood and not highly appreciated in most countries around the world at all levels. Lack of understanding is basically due to lack of proper education, and lack of appreciation is probably due to the fact that chemicals are mainly associated with negative properties and impacts. Positive contributions from chemistry and chemical engineering on a daily basis are barely communicated in spite of the fact that the chemical sciences are instrumental in feeding us, clothing us, housing us, healing us, and even entertaining us. This situation is a significant challenge, which industrial and chemical organizations on an individual basis and in collaboration have made efforts to rectify to balance the picture.

The return from such efforts is always difficult to measure, but it is a fact that educational material available (for an example, see Figure 3) on the IUPAC web site free of charge is being used to reach out to young and old in different contexts around the world and conceivably makes a difference. With modern technology such free educational material can be easily transferred and utilized in all sorts of settings so that people around the world can be exposed to the latest developments with limited resources. We have to believe that such measures gradually will make an impact, and that belief was certainly strengthened from a lot of positive feedback during the International Year of Chemistry, IYC2011, when IUPAC and OPCW again joined forces on several occasions.

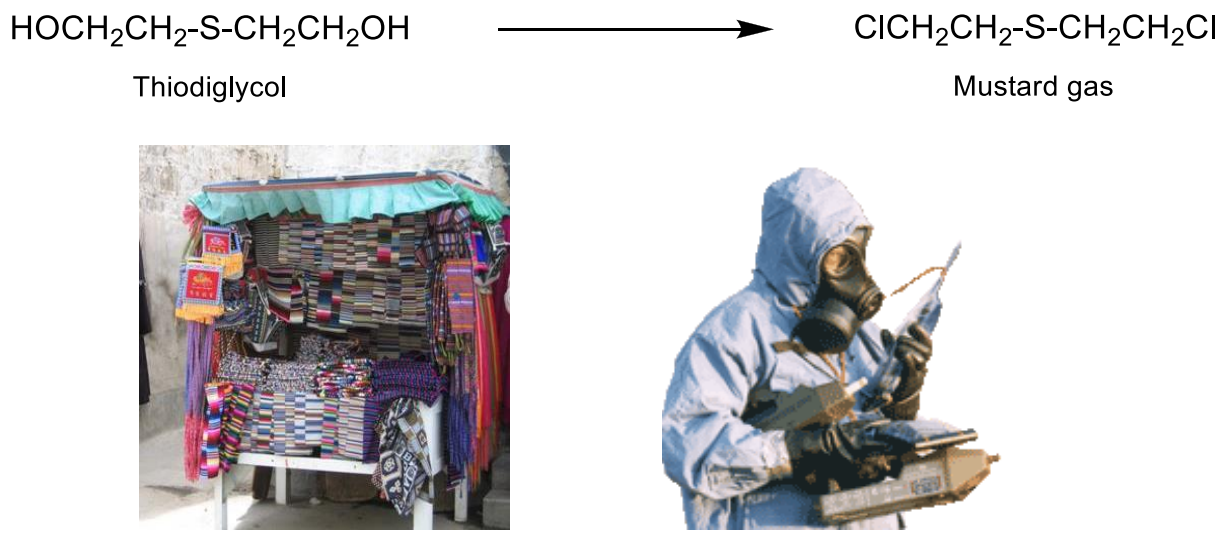


Figure 3: A simple illustration of dual use of chemicals. The fact that chemicals in principles can be used in more than one way is the fundamental reason for why chemicals are such a challenge to keep under control. An example is thiodiglycol which is used to stabilize colored fabrics and to make mustard gas.

The need for increased awareness about chemicals in relation to chemical weapons in general and CWC in particular is also necessary among practising chemists. Unfortunately, it is a fact that in most countries these topics are not even mentioned in the regular courses given at almost all universities. An action to develop relevant course material to cover these topics is there very appropriate and an initiative that should be welcomed. Since the material needed have to have a global perspective, the task is demanding and calls for contributions from focused task groups with international composition. This is a *modus operandi* which fits the IUPAC project system perfectly, and I am quite confident that IUPAC is looking forward to becoming involved in the generation and execution of relevant projects in this and related fields. However, just as important is the involvement from OPCW, and this must be kept in mind when the Tarnow declaration is going to be turned into practice.

The basis for comments above is a firm conviction that an informed scientific and technical community is instrumental in providing advice and facilitating dissemination of information to the public. IUPAC, with its global membership, has a role to play in such education and outreach programs, but the National Authorities in the individual States Parties are also instrumental. An analogous approach could be envisaged to become useful if chemical-industry associations would take regional initiatives in cooperation with relevant National Authorities.

Code of conduct

Before closing some words about a Code of Conduct for chemists are appropriate. Within IUPAC the idea of developing such a document has been aired a number of times, but until a few years back the conclusion was always that the task was too difficult to handle well. The reason for this was usually the argument that dual use of many chemicals made it impossible to find the short, precise wording required in such an important document. Of course the potential misuse would have to be properly described so as to include pesticides, illicit drugs, chemical and biological weapons, as well as hazardous wastes, but the problem is that the same chemical principles and many of the same chemicals, when applied in a proper fashion, contribute to the application of chemistry in the service of Mankind. As a result nothing happened for a long time.

What triggered a change was an initiative from the then Director-General, Ambassador Pfirter, who in a letter to the Scientific Advisory Board of OPCW noted that “OPCW needs to clearly establish what it requires in the field of education, outreach, and international cooperation […. and these] activities would benefit from increased cooperation with other international, regional, and national organizations." This led to a joint OPCW/IUPAC workshop in Oxford, England in July 2005 where a range of topics were discussed: How to increase the awareness of the CWC in the scientific community, facilitate the integration of issues related to

the Convention into chemistry teaching, and *promote professional conduct of chemists and chemical engineers*. Fruitful sessions and lively discussions generated significant ideas (see *Pure and Applied Chemistry* 2006*,* 74*,* 2169, available under Publications at www.iupac.org), and one idea that was picked up swiftly was the push for a code of conduct.

The need to develop a code of conduct for chemists was not a new idea in IUPAC. A group under the leadership of Graham S. Pearson had in fact started to discuss just that before the Oxford meeting took place, but the acknowledgement of the need was further strengthened when several chemical-weapon issues, such as the general purpose criterion and the dual use of chemicals, were taken into consideration. From an IUPAC point of view it was important to carry out the work as an inclusive process, which meant involving the whole organization and engaging the member countries before a proposal, in due course, would be presented. Such a process was carried through by the Pearson group and the resulting document was sent to the IUPAC executive. The process and the recommendations are described in an article in Chemistry International (see CI *2011*, *33* (6), 7, available under Publications at www.iupac.org), and when studied carefully it is clear that the framework of an acceptable Code of Conduct for chemists is in place.

Concluding remarks

From the discussion above it is quite clear that IUPAC, alone and in collaboration with a number of other organizations, has been, still is and will continue to be actively engaged in a range of issues related to chemical safety and security as they are described in the Tarnow Declaration. It is also clear that many other topics, tasks and challenges mentioned in this declaration are high on the agenda in a number of major international organizations including OPCW, UNESCO, SAICM, and ICSU, in regional and national organizations, in national agencies, and at many universities worldwide. Before starting to move the Tarnow initiative from theory to practice it is therefore important to acquire a detailed overview of the relevant actors, the work they have done, the projects that are under way, and the plans they have for the future. If that is not being done, I am afraid the Tarnow Declaration will lead to unnecessary duplication, unwanted competition, and reinventions of the wheel, However, if such an overview is worked out and becomes a significant part of the basis for the work at the International Centre for Chemical Safety and Security, I am convinced that Tarnow initiative will contribute and accelerate the development toward a better chemical safety-and-security culture globally.

Developing and sustaining programmes on chemical safety and security in chemical activities in Kenya

Prof. Shaukat Ali Abdulrazak [*]

Abstract: Kenya's Vision 2030 envisages an industrialized and a globally competitive and prosperous economy by 2030. As a developing country, most of the economic activities revolve around different manufacturing industries that use chemicals as a raw material, product or waste. Kenya signed the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapon (CWC) on 15th January 1993 and ratified it on 25th April 1997. The government fully supports the investments, however banned chemicals are not allowed into the country and if there is a process that leads to the production toxic chemicals there exist guidelines on how they should be handled to avoid endangering the citizens. Chemical Control from production to disposal is an important step in ensuring safety and security of the public, workers in industries and chemical users. Since joining the OPCW, Kenya has actively participated in its activities and continues to reiterate its support by fulfilling the mandates and goals of the convention by ensuring peaceful uses of chemicals and preventing production and use of chemical weapons. Although Kenya has no chemical weapons and does not intend to produce or use such weapons, Kenya recognizes the need to enforce strong legislation, human capacity building and the necessary infrastructure so as to meet her conventional obligations and ensure the safety and security of her people. There are several government agencies that help in enforcing the OPCW convention. These include the National Environment Management Authority (NEMA), Pest Control and Prevention Board (PCPB), Kenya Plant Health Inspectorate Services (KEPHIS) and the Government chemist which is the secretariat of OCPW in Kenya. All these agencies were established by different Acts of parliament and with different mandates, which in some cases cross over each other. The chemical weapons bill of 2010 seeks to create a national authority that will harmonize the working of these agencies.

Introduction

Chemical science has broadened our understanding of both macro and micro processes that have enabled important discoveries in science and engineering. Most chemical processes have been deployed for the betterment of the our lives, however as in many cases there is always a negative aspect to it. Some chemicals are also produced for weapons and with a potential and aim to cause adverse damage to the environment and human beings. Controlling and monitoring these chemicals from production to disposal is very important in ensuring the safety and security of the producers and users of these chemicals. In Kenya, Chemicals account for 6 – 7% of the inputs of the gross domestic product and are used in homes, provision of services, industries, agriculture, transport, mining health etc. Chemicals have also demonstrated serious risks in use and also in very serious accidents where people were not fully aware or did not appreciate the toxicity and hazards of chemicals.

Given the damage and danger caused by chemical weapons, Kenya is committed and fully supports the OPCW Convention by ensuring that it is a free chemical weapon state through prohibition of its production, transit and use. Kenya does not intend to produce or use chemical weapons and we hope that the OPCW will ensure complete elimination of chemical weapons from all states and promote its peaceful uses. The recent rise in terrorist activities from Kenya's neighboring countries has increased the possibilities of such chemical weapons being bought and used in the country.

Developing and sustaining programme on chemical safety and security in Kenya

Kenya has put in place a long term economic plan called Vision 2030; the plan is meant to make Kenya economically competitive, prosperous and a middle level industrialized nation. The vision is supported by three pillars i.e. social, economic and political pillars. Science Technology and Innovation (ST&I) is one of the enablers that form the foundation for the pillars. For the country to achieve the Vision it has to embrace ST&I which includes value addition to some of the agricultural products and also attract investors in key processing industries including chemical industries.

[*] Prof. Abdulrazak is Secretary/CEO of the Kenyan National Council for Science and Technology

As for now Kenya has no chemical weapons but is involved in a multitude of activities that use chemicals either as raw materials in industries, process enablers, by-products and more importantly in the agricultural sector where the chemicals are used at different levels from land preparation to storage of produce. Overall, Kenya is not a major producer of synthetic chemicals. However there is extensive extraction of minerals that contributes to manufacturing, including soda ash, fluorspar, diatomite and titanium prospects. The other major source of chemicals is in their recovery from waste products. The overall import for the year ended April 2008 was 16.5 for chemicals and oil, 24.8% which were mostly chemicals fertilizers, plastics in primary and non primary forms. It is notable that major toxic chemicals are not relatively significant in quantity and are thus classified as in the category of all other commodities. The main manufacturing enterprises, both large and small, represent an estimated 6% of the GDP. The transport and energy sectors use chemicals and petroleum products and generate toxic waste through automobile service stations, garages etc. while energy sector includes chemicals used in power generation using fossil fuels, batteries, oil, refrigeration/metal treatment.

Chemicals safety remains a major challenge in Kenya; exposure to harmful substances is one of the most significant environmental risks to human health. Chemicals substances and their derivatives are widely used in many development and economic sectors including industry, agriculture, mining, water purification, public health – particularly disease eradication – and infrastructure development. Pesticides are the group of chemicals that is of greatest concern in Kenya due to their importance in agriculture, which has been using pesticides for pest and disease control for more than 40 years. In some cases, chemical exposures of particularly high concern can occur at the point of disposal or recycling. This is the case for electronic waste. E-wastes contain toxic chemical substances such as lead, cadmium, beryllium, mercury, polychlorinated biphenyls, brominated flame retardants, and polyvinyl chloride. Polychlorinated biphenyls in obsolete capacitors and transformers continue to be a problem as well. Illegal trade involving chemicals comes in many forms, including export and import of hazardous and electronic waste, ozone-depleting substances, metals, counterfeit products, persistent organic pollutants, and banned pesticides.

Most of the chemical activities are governed by general regulations developed by various government agencies that include Occupational Safety and Health Act 2007, National Environmental Management Authority (NEMA), Pest Control and Protection Board (PCPB), while most of the pharmaceutical issues are regulated by the Division of Government Chemist in the Ministry of Public Health and Sanitation.

As mentioned above the major actors in chemical activity that may be of concern and need urgent attention to make them safe can be broadly categorized into:

- Manufacturing industry
- Universities, research institutions, and hospitals
- Agricultural sector including floriculture/horticulture
- Others

The manufacturing industry in Kenya uses chemicals for processing products and in the end spew out chemical effluents that are a hazard to both the people and the environment, chief among them are, the soap and detergent industry, paper industry, textile dyeing plants, dyestuff producers, metal working and electroplating shops, foundries, automobile service shops and gas stations, lead-acid battery manufacturing/recycling, chemical industries/laboratories, paint shops, printers, photographic processors, and dry cleaners. The soap industry is rapidly becoming a big business thanks to mass market and simple methodology of soap processing. Many players have taken to it without following the due process leading to contamination of water masses with phosphate/sulphate compounds; this needs to be governed especially the cottage industries which are the norm now, otherwise the levels of these compounds in water bodies will exceed the recommended. The paper industry in Kenya is not well developed, and we are still using the old technology that is not efficient with moulds of chemical waste and polluted water getting into our rivers. Hide and skin processing require the use of chemicals, some of them are end up in rivers and ocean. Other industries that indirectly use chemicals include the cement industry. Most of these industries are closely monitored by NEMA, OSH and the government chemist; their yearly reports are sent in January to the Organization on Prohibition of Chemical Weapons (OPCW).

All seven public and six private universities in Kenya teach either biological or physical sciences. They use chemicals for teaching, research and preservation of samples for further research, some of these chemicals are carcinogens, heavy pollutants and a source of chemical security that require care in handling from acquisition to disposal. This is also true for research institutions that import chemicals for their use, though currently they are mainly agricultural. Chemical safety and security in the medical sector is multifaceted in that it involves research, acquisition and use of drugs some of which are radioactive, contraband/counterfeit drugs and

disposal of expired drugs by both public hospitals and private practitioners. Most of the cases arising from the sector are dealt with by the Pharmacy and Poisons board and the government chemist which is currently affiliated with the OPCW.

In Kenya, the agricultural sector is the backbone of the economy. This has meant that chemical activities are also high on the agenda, from land preparation to post harvest processing. Most of the chemicals are used as fertilizer, herbicides pesticide and soil fumigation, with most of the farm attends getting long exposure to low doses of the chemicals. Some of the chemicals like furan derivatives have been banned in other developed countries but due to their low cost find their way into Kenya. Another case study is the floriculture industry where flowers are grown under artificial conditions to meet the high demand in the world market. The flower farms have become a big source of chemical poisoning, especially in the Naivasha region where unusual fish deaths in Lake Naivasha have been reported.

Data from customs concerning chemical transit is also monitored by the government chemist, with details on the type of chemical, the quantity, the intended purpose and the details of the organization or individual using or ordering for the chemicals. Most chemicals are imported but disposed through small scale enterprises after value addition or repackaging. This happens mostly with pesticides, hydrocarbon, paints, solvents, pigments and lacquers. Some chemicals and waste include:

- Flammable eg solvents - from chemical manufacturers, laundries & dry cleaners, metal plating, tanneries, print shops etc
- Corrosive eg acids and alkalis - from cleaning & maintenance, equipment repair, vehicle body shops etc
- Reactive eg bleaches and oxidisers - from chemical manufacturers, laboratories etc
- Toxic and eco-toxic eg heavy metals, pesticides, cyanides from metals manufacturing, photographic processing, pesticide end users etc

The Kenya Chemical Society is a professional body of chemists. It was formed in 1991 to promote chemical sciences and technology in Kenya and enlighten the Kenyan population through forums, discussions and dissemination of chemical knowledge especially on the issues of safety and security when dealing with chemicals. During this year's 7th international conference at Maseno University, Kenya, the theme was 'Chemical Sciences as a vehicle for achieving Kenya's Vision 2030'. In this regard, the chemical society is to promote the country's economic growth through promotion of chemical sciences and technology. This has helped in increasing awareness on chemical safety and security in the country. The Kenyan government is also conducting a nationwide chemical safety and security culture training to create awareness so as to mitigate the risks of a possible use of chemical weapons. This is ongoing in various government departments like the Police, Army, Immigration and Registration of Persons and Foreign Affairs. The general public is also benefiting from the programme especially those who reside close to the chemical industries.

The National Security intelligence Service (NSIS) which was established in 1988 has also been strengthened and has been mandated to identify threats against the security of Kenya, collect and analyze intelligence reports on these threats, and advise the Government accordingly through appropriate intelligence reports. This coupled with the activities of the regular police has helped in enhancing safety and security against any threats emanating from inside and outside Kenya.

Emergency response and preparedness is a very important aspect of safety and security. In this regard, the government of Kenya has also started developing a programme to train government departments involved in security and other emergency response organizations on emergency detection and mitigation of chemical weapons to enhance awareness, emergency preparedness, safety and security.

The Kenyan government also through the National Council for Science and Technology which administers the Science technology and Innovation grant on behalf of the government will increase its financial support to research and conferences on chemical safety and security from the researchers in academia and industry so as to increase knowledge and awareness on chemical safety and security.

Regulatory framework

There are several chemical activities in Kenya that need to be strictly regulated by law to ensure safety and security issues are well addressed. Currently there are many players with overlapping mandates on how to ensure the safe use of chemicals. The industry sector is majorly governed by the Occupational Safety and Health Act 2004 and the NEMA regulations that govern waste management. This includes monitoring the

manufacturing industries and data from customs on chemical transit with details. Control and monitoring of chemicals cannot be effective without proper legislation in place to effectively regulate and license the use of chemicals and their by-products, source and special chemical materials to ensure adequate protection of public health and safety, promote security and protect the environment. The Agriculture sector is governed by the Pest Control Products Act Cap 346 of The Laws of Kenya which regulate the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic function of plants and animals and for connected purposes. Unfortunately they do not have the well-equipped laboratories to test every consignment that is imported into the country. Kenya Plant Health Inspectorate Services (KEPHIS) is another regulatory body that is charged with ensuring safe use of plants so that no contaminated crops can be imported/exported out of the country. Government Chemist in the Ministry of Public Health and Sanitation is responsible in overseeing the activities in the hospitals and research institutions like KEMRI, ICIPE and to some extent the universities.

To address the disparities, a draft bill and policy on chemical weapons was prepared in 2005 in consultation with the stakeholders under the Ministry of Public Health and Sanitation and the Ministry of Defense. The policy and bill has been presented to the Cabinet for deliberations before it is taken to parliament for approval. Once the law is operational, it will help enhance full realization of the OPCW obligations; ensure the Protection, control and accountability of chemical materials so as to minimize unauthorized access, loss, theft, misuse, diversion or intentional release of chemicals. At present, the chemical industries are supposed to declare and show the chemicals within their possession and ensure that they are used only for the intended purposes.

Conclusions and recommendations

The enactment of the bill on chemicals into law will help in addressing gaps in regards to handling, using and disposal of chemicals so as to protect workers, the public and the environment from the potential hazards of chemicals. The government of Kenya sincerely appreciates the support in training personnel and detection equipment that it has been receiving from the OPCW and wishes to reiterate the need for continued support in providing emergency chemical detection and safety equipments to improve its preparedness to chemical weapon emergency response due to increased terrorist activities. Lastly, Kenya will continue to support OPCW activities in ensuring international security and stability, through complete disarmament of chemical weapons.

The CBRN Centres of Excellence: a comprehensive approach towards CBRN risk mitigation

Michael Thornton [*]

[*] Mr. Thornton is the CBRN CoE Project Coordinator from the Joint Research Centre, European Commission

Natural, accidental, intentional




Bhopal 1984

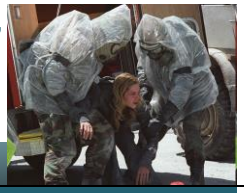
Lack of coordination and preparedness at national levels and fragmentation of responsibilities within a region can have dramatic consequences and an incoherent response will broaden the impact of a CBRN incident


Preparedness

We must be prepared

CBRN events
- **low probability**
- **high consequences**


"Think the unthinkable" – although there are scenarios attacks, accidents and natural events that might be considered "unrealistic"

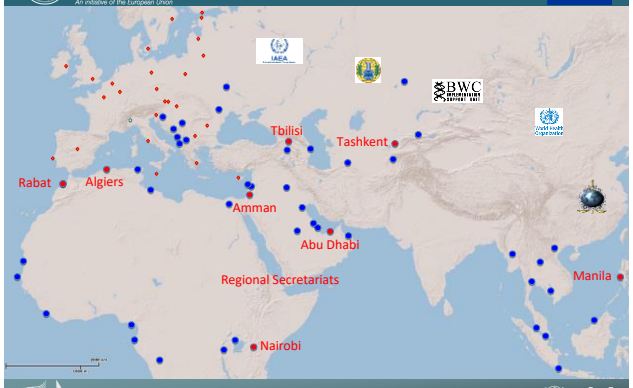



The unthinkable?


Scenarios

These scenarios will never be completely relevant for emergency preparedness systems
- **but can pinpoint weaknesses**
- **especially the need for co-operation**


Co-operative network



The Network

- Currently working with 40 countries in 8 regions
- Membership is on a voluntary basis (Partner Countries)
- Obligation to nominate NFP and form a CBRN team
- Develop a coherent CBRN Policy
- PoC in all 27 EU MS, Eu Delegations and I.O.s

Round Tables







Hold round table meetings every 6 months in every region

First Round Table Meeting of the Eastern and Central Africa Region

13 November Nairobi

Example projects

Identify needs and develop projects together

Forensics and training related to illicit trafficking of chemical substances

Knowledge development and transfer of best practice on chemical and biological waste management

International network of universities and institutes raising awareness on dual use of chemical materials

Synergy without duplication (G8-GP, EU-MS, EC, I.O.s)

CBRN projects

Building capacity to identify and respond to threats from chemical, biological, radiological and nuclear substances
Knowledge development and transfer of best practice on inter-agency CBRN response
Knowledge development and transfer of best practice on CBRN import/export monitoring
Prerequisite to strengthening CBRN national legal frameworks
CBRN Risk assessment best practices and procedures
Capacity building and awareness raising of CBRN illicit trafficking threats in Sub Saharan African countries

CBRN projects

Provision of specialized and technical training to enhance the first response capabilities
Establish CBRN National response plan
Procedures and guidelines for secure CBRN information systems and data exchange
Building regional border control capacity to identify and detect CRN materials

CBRN Centres of Excellence
An initiative of the European Union

Overlap & Synergy Mapping Database

As projects are reviewed by our International Partners, CoE will populate a database highlighting potential overlaps or synergies: by region, country, date and scope.
Extract from database:

GP	Global Partnership
IO	International Organisations
EU	European Union
DON	Other Donors
	CBRN CoE Project Country

COE Project	Field	Albania	Armenia	Azerbaijan	Bosnia Herzegovina	Croatia	FYROM	Georgia	Moldova	Montenegro	Serbia	Ukraine	Morocco
1	C	DON											
2	CBRN		EU						EU			EU	
3	B		GP	GP				GP DON	DON			GP DON	
4	B		GP	GP				GP DON	DON			GP DON	
7	B								DON				
11	CBRN		EU						EU			EU	EU
14	CBRN		GP EU						EU			EU	
18	B		GP	GP				GP DON	DON			GP EU DON	
19	CBRN		GP EU						EU				EU
20	C	DON						GP	DON				
23	CBRN	EU DON	EU						GP EU DON			EU	
24	RN												DON
31	C	DON	GP	GP				GP	DON			GP	

Select Project 23 - Moldova

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Overlap & Synergy: Project 23

CBRN CoE

Project 23
Title: Building capacity to identify and respond to threats from chemical, biological, radiological and nuclear substances

Field: CBRN

Current status: Contracting

Geographic scope: Albania, Cambodia, Iraq, Moldova, Senegal, Tunisia

Budget: 500,00 Euro
Start: Jan 2013
Duration: 24 months
Implemented by: TBD

Global Partnership

UK
Geographic scope: Moldova
Activity: Nuclear security, Physical Protection Systems upgrades (via IAEA Nuclear Security Fund)
US
Activity: Global Threat Reduction - Preventing Nuclear Smuggling Program
Start: 2002
Duration: 8 years

European Union

Geographic scope: Moldova
JRC - IFS/2008/145-156
Activity: Illicit trafficking of RN material. Provision of equipment
Date:2008-2013

Joint Action 2008/858/CFSP now
Council Decision 2012/421/CFSP
Activity: Workshops on laboratory bio-safety and bio-security
Date: 2011

Other Donors

US
Program: DOS/ISN:
Geographic scope: Moldova
Activity: National RN smuggling response Plan workshops
Date: 2011/2012

Program: DOD/CTR:

Geographic scope: Albania
Activity: Chemical weapon destruction
Date: 2007

Geographic scope: Iraq
Activity: Cooperative Biological Engagement Program
Date: Ongoing

Geographic scope: Moldova
Activity: Interdiction of WMD materials at land borders
Date: Ongoing

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CBRN CoE Project Action Fiche

CBRN CoE Project 23

Building capacity to identify and respond to threats from chemical, biological, radiological and nuclear substances

Current status: Contracting with Implementers
Geographical scope: Cambodia, Moldova, Albania, Iraq, Tunisia and Senegal
Field: CBRN
Contact sign date: Dec – 2012
Budget: 500,000 Euro
Duration: 24 months

Background:

There is a need to develop, at national and regional levels, the necessary institutional capacity to identify and manage the response to incidents involving CBRN substances

Objectives:

Train staff on international procedures and standards to build capacities for identifying and responding to threats from chemical, biological, radiological and nuclear substances

Main activities and deliverables:

1.Seminars/training sessions on basic knowledge of chemical materials, prevention and protection measures, international procedures and standards
2.Seminars/training sessions on basic knowledge of biological materials, prevention and protection measures, international procedures and standards
3.Seminars/training sessions on basic knowledge on basic knowledge of radiological and nuclear materials, prevention and protection measures, international procedures and standard

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Governance

- Workshops on CBRN Governance to raise awareness on the importance of inter-agency coordination and cooperation
- Have covered 7 countries will eventually cover all

EU CBRN Risk Mitigation CoE

- The CoE, through its network, delivers a threat reduction methodology to help countries define and implement policy through national action plans, good governance programmes and concrete technical projects
- This is in the obvious interest of the regions themselves but also helps build a stronger EU security architecture

Single integrated platform

- The EU CBRN Risk Mitigation Centres of Excellence is a worldwide initiative set up by the EU under the Instrument for Stability
- Is gradually providing a single and integrated platform for actions in all of the CBRN domains
- Engaged €25 million in 33 projects in 36 countries
- 2013 onwards €30 million per year in projects

New terminology

CoE = building capabilities locally (ownership + sustainability) not just delivering equipment

CoE = delivers a methodology that will support trust and ownership at regional level

CoE = a platform for cooperation – more synergy – less duplication (G8-Global Partnership, EU-MS, EC, I.O.s)

Move from
- Technical Assistance to Co-operation
- Beneficiaries to Partners
- WMD Strategy to CBRN Policy

National and international security activities at the US National Academy of Sciences

Kathryn Hughes [*]

What is the US National Academy of Sciences?

- Established 1863 to provide S&T advice to the US government
  - National Research Council (NRC) established 1914
- Source of independent advice on issues of science and technology
  - Primarily through ad hoc committees of volunteers
  - Workshops, consensus reports, standing committee meetings, and more
- For international work, often partner with international organizations (IAP, scientific unions, TWAS, etc.)

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

NRC Study Features

- Unique relationship to the government
- Ability to attract recognized experts and leaders to serve on committees
- "Pro bono" nature of committee service
- Quality control procedures:
  - Conflict of interest screening;
  - Committee composition and balance;
  - External review process;
  - Draft report confidentiality.

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Some Safety and Security Activities at the NRC

- Programmatic reviews and advice
- Educational efforts related to the chemical laboratory
- Biosecurity activities
  - Some overlaps in focus and training needs
  - Potential for convergence of biology and chemistry to raise the profile of these concerns in the chemistry and chemical engineering communities

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*Making the Nation Safer: The role of science and technology in countering terrorism**

- Published in 2002, funded by the institution
- Broad scope for the report
  - Prepare a framework for the application of S&T for countering terrorism
  - Prepare research agendas in nine key areas
  - Examine a series of cross-cutting issues
- Chapter 4: Toxic Chemical and Explosive Materials
  - Recommendation 4.9: The Departments of Transportation and Commerce…should be tasked with developing plans for regulating the movement of hazardous materials through and near cities

* http://www.nap.edu/catalog.php?record_id=10415

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*Terrorism and the Chemical Infrastructure: Protecting People and Reducing Vulnerabilities**

- Published in 2006, funded by US Department of Homeland Security
- Scope focused on the chemical industry infrastructure
  - Identify critical classes of chemicals and chemical processes and major vulnerabilities in their supply chains
  - Assess the likely impact of a significant disruption in those supply chains
  - Identify and assess the effectiveness of current efforts to protect the chemical supply and processes from attack
  - Identify actions to help prevent disruption and actions to mitigate loss and injury and incentives and disincentives that affect decisions to take those actions
  - Discuss areas of R&D that might advance the nation's capability to protect against such losses and minimize their impact.

* http://www.nap.edu/catalog.php?record_id=11597

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Terrorism and the Chemical Infrastructure Continued

- Focused on catastrophic incidents as defined in DHS's *National Response Plan*
  - "results in large numbers of casualties and/or displaced persons, possibly in the tens of thousands"
  - Conclusion: Toxic, flammable, and explosive materials pose the greatest risk of catastrophic incident
- The committee envisioned realistic scenarios to aid in their analysis
  - Release from high-volume storage
  - Shortage of key chemical or chemical product
  - Misuse of a small quantity of chemical
- Conclusion: In the absence of specific information, it is most appropriate to invest in mitigation and preparedness for general classes of vulnerabilities

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[*] Ms. Hughes is a Programme Officer from the US National Academies of Science

Terrorism and the Chemical Infrastructure Continued

Recommendations to DHS:

- Explore ways to enable rapid analysis and communication of data for decision making and for communication to the public
- Support research toward enhancing emergency preparedness, emergency response, and disaster recovery
- Support R&D to foster cost-effective, inherently safer chemistries and chemical processes
- Support the development and application of robust models to predict off-site consequences of chemical events
- When considering investments to prevent or mitigate vulnerabilities,…complete an overall risk assessment that would consist of analyzing the combination of vulnerability, threat or likelihood, and consequences of an event

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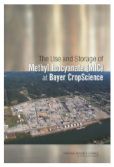
*Use and Storage of Methyl Isocyanate (MIC) at Bayer CropScience**

- Published in 2012, funded by the U.S. Chemical Safety and Hazard Investigation Board (CSB)
- Summarized study scope:
  - Consider elements of inherently safer process (ISP) assessments
  - Evaluate the process assessments performed by Bayer CropScience and the legacy owners in light of those elements
  - Consider the application of ISP assessments in decision-making and in post-accident investigations



* http://www.nap.edu/catalog.php?record_id=13385

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Use and Storage of MIC Continued

Brief summary of committee findings:

- Bayer incorporated aspects of risk reduction associated with Inherently Safer Process assessment…but not in an explicit and structured manner
- ISP analysis…may become too narrowly focused and may overlook certain outcomes
- CSB or other appropriate entity should consider the incorporation of decision theory frameworks into (ISP) assessments
- The principles of ISP assessment can be used to good effect in conducting an incident investigation when comparing similar incidents

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Potential Use of ISP Concepts for Reducing Impact of Catastrophic Incidents

- Inherent and passive control strategies are the most robust and reliable, but all process safety controls have the potential to reduce the probability or likelihood that a worst-case accident occurs.
- Incorporation of ISP concepts into process design also has the potential to decrease scope of organizational emergency preparedness programs and reduce the size of the vulnerable zones surrounding facilities by reducing the impact of a worst-case scenario release

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Some Caveats

- The entire footprint of a process must be considered when performing ISP assessments to evaluate process options
  - Is risk actually reduced, or is it transferred somewhere else? (transportation, introducing new risks with a modified process, etc.)
- An ISP assessment often will not result in a clear, well-defined, and feasible path forward for a company
- The results of any analysis have to be considered in context (design feasibility, cost considerations to other hazard control options, community perception of chosen option, product quality, etc.)

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*Promoting Chemical Safety and Security in Developing Countries**

- Published 2010, funded by US Department of State
- Committee's task
  - **Examine the dual use risks** posed by toxic industrial chemicals (TICs) and other hazardous chemicals in developing countries, and provide guidance on a baseline of practices required to ensure safety and security in their handling and use in laboratories in the developing world.
  - **Produce educational materials** providing guidance on a baseline of practices required to promote safety and security in the handling and use of TICs and other hazardous chemicals on the laboratory scale in the developing world

* http://www.nap.edu/catalog.php?record_id=12857

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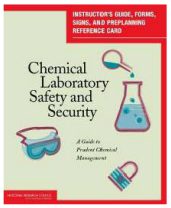
Examine the Dual-Use Risk and Program Goals

- Outlines basic elements of an effective program
- Three main recommendations to CSP:
  - **Build strong relationships**
  - **Help establish management systems**
  - **Foster compliance with rules, programs, and policies**

Toolkit Items*

- Built on report *Prudent Practices in the Laboratory* (2011)
- Quick Guide brochures for laboratory managers
- Executive summary brochures to share with institutional leaders
- Instructor's Guide with classroom lessons for laboratory managers, staff, and students
- Sample laboratory forms and signs
- Preplanning reference cards to distribute to laboratory personnel



* http://dels.nas.edu/global/bcst/Chemical-Management

Derivative: 4-page document (2012)*


Keeping Laboratory Chemicals Safe and Secure

* http://dels.nas.edu/resources/static-assets/materials-based-on-reports/special-products/Chemical-Safety-and-Security-Final.pdf

Biosecurity Education

Education and Outreach in Biosecurity

- National and international scientific organizations have recognized the importance of education as fundamental to the "web of prevention"
- Recognition led both to calls for expanding education and specific actions
- Evidence of a recent increase in the introduction of dual use issues into education in the life sciences.

Biosecurity and Ethics

- Focus on longstanding concepts of ethical dimensions of scientific conduct
  - specific aspects of appropriate scientific conduct and
  - universal values such as honesty and openness that underpin science
- Focus on social responsibility of science
- "Expanding" and "promoting" – not "creating" – culture of responsibility in the scientific community

2009 Workshop: *Promoting Education about Dual Use Issues in the Life Sciences*

- Co-conveners: IAP—The Global Network of Science Academies, International Union of Biochemistry and Molecular Biology, International Union of Microbiological Societies, and the Biosecurity Engagement Program (BEP) of U.S. Department of State (Funds from BEP and IAP)
- More than 60 participants from over 25 countries, plus BWC ISU and UNESCO
- Hosted by Polish Academy of Sciences; U.S. National Academy of Sciences responsible for the report
- New element: experts in the "science of learning," what research tells us about how people learn at different stages of life and what this means for effective approaches to teaching

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Report: *Challenges and Opportunities for Education about Dual Use Issues in the Life Sciences*

- An introduction to dual use issues should be part of the education of every life scientist
- For most, incorporate education within broader coursework and training. As appropriate, more specific education and training on biosecurity
- Support from governments will be essential to achieve the necessary scope and scale to have an impact
- 7th Review Conference "will provide an obvious opportunity for member states to build on prior work and take affirmative steps in support of education"

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IAP – InterAcademy Council project: Research Integrity and Scientific Responsibility

- Produce a short policy report on research integrity; one target is the U.S. National Science Foundation Global Merit Review Summit in May 2012
- Produce educational materials with a broader focus, likely including international version of *On Being a Scientist* from U.S. NAS
- Expect biosecurity to be part of the materials
- Extensive dissemination via national and regional academies and science societies

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The Tarnow declaration on the development of the international cooperation to enhance chemical safety and security and the promotion of the global chemical security culture

Dr. Lech Starostin [*]

The Tarnow declaration on the development of the international cooperation to enhance chemical safety and security and the promotion of the chemical security culture globally, stresses the importance of increased cooperation between all the relevant stakeholders. The stakeholders include Governments and relevant national agencies, relevant industries, including chemical associations and companies in private industry, laboratories, international organisations involved in the international security and peaceful uses of chemistry, civil society, including scientific community and NGO's, independent experts, and information circles.

All stakeholders are encouraged to fully commit to enhancing chemical safety and security culture and to maintain robust communication and coordination of activities at national and international levels, and to promote globally chemical safety and security culture; this will provide greater assurances that the national chemical security systems can perform their functions of preventing misuse of toxic chemicals.

A number of countries and organizations have already promoted new programme activities and announced plans to enhance chemical safety and security at the national and regional levels. The core objective of the Tarnow Declaration is to support a platform and modalities for furthering the international cooperation to enhance chemical safety and security and the promotion of the global chemical security culture, based on common interests and inclusive, comprehensive approach.

The Tarnow Declaration was developed as an integral part of preparations to the Tarnow Meeting on Chemical Safety and Security taking place on 8 and 9 November in Tarnow, Poland, which was a first global and multi-stakeholder gathering with a mission to discuss the chemical safety and security issues in comprehensive manner. The Tarnow Declaration is a broad policy framework of global, multi-stakeholders cooperation on chemical safety and security.

The Tarnow Declaration welcomes the establishment of the International Centre for Chemical Safety and Security in Tarnow and invites the national and international partners to cooperate with the Centre in capacity building, training, best practices exchanges and cooperation between the professional in chemical safety and security and to enhance chemical security culture.

We expect that the Tarnow Declaration will be further developed and used, as a point of reference, for promotion of international cooperation and multi-stakeholder approach in chemical safety and security and for the promotion of the chemical security culture globally.

Official text

The importance of chemical industries and activities is on the rise globally. Chemical safety and security of the development, production, infrastructure and supply chain of chemicals are therefore of increasing importance for governments, the chemical industry, and the users of chemistry. Promoting a chemical safety and security culture will provide greater assurances that the national chemical security systems can perform their functions of preventing misuse of toxic chemicals.

Acknowledging that safety measures and security measures have in common the aim of protecting human life and health and the environment, there is a need for a coherent and synergistic development and introduction of chemical safety and security culture. That culture facilitates implementation and management of safety and security prerequisites, including bilateral and multilateral cooperation.

[*] Dr. Starostin is Secretary of the Board for the International Centre for Chemical Safety and Security, Tarnów.

All stakeholders, including the governments, regulatory bodies, industry, academia, nongovernmental organizations and the media, are encouraged to fully commit to enhancing chemical safety and security culture and to maintain robust communication and coordination of activities at national and international levels.

National and international efforts are welcome to provide relevant support and assistance to enhance safety and security in all areas of chemical activities.

The International Meeting on Chemical Safety and Security taking place on 8 and 9 November in Tarnow, Poland, is an important event to further the international cooperation to enhance chemical safety and security and the promotion of the global chemical security culture.

The international cooperation to enhance chemical safety and security could include the following general considerations, goals, guidelines, and principles:

General considerations

1. A comprehensive approach toward better chemical safety and security goes beyond chemical site limits and necessitates efforts to extend the scope of safety and security culture promotion to all relevant stakeholders. The stakeholders include Governments and relevant national agencies, relevant industries, including chemical associations and companies in private industry, laboratories, international organisations involved in the international security and peaceful uses of chemistry, civil society, including scientific community and NGO's, independent experts, and information circles.

2. Strict chemical safety and security measures, implemented in the supply chain of raw materials, production, infrastructure, transportation and use of chemicals, support effective barriers against misuse and diversion of CBRN agents and materials.

3. The foundation of chemical security culture are shared values, beliefs and behaviour patterns leading to promotion, use and development of safety management systems for humans and environment protection and security measures, such as deterrence, protection, detection of, and response to theft, sabotage, unauthorized access, illegal transfer, or other malicious acts involving both the materials that can be used for unconventional terrorist purposes and their associated facilities.

4. A number of countries and organizations have promoted new programme activities and announced plans to enhance chemical safety and security at the national and regional levels. They intend, inter alia, to develop national and international programmes and centres on chemical safety and security, as well as use of the regional CBRN security centres and resources centres.

5. For more than 25 years, the Responsible Care programme has promoted safety and, since year 2001, also security practices that safeguard our workplaces, communities and, the broader environment.

6. These national, international and industry initiatives should receive support of all the relevant stakeholders to advance chemical safety and security at national level, and in the relevant spheres of chemical activities.

7. The establishment of the International Centre for Chemical Safety and Security in Tarnow serves the purpose of the practical promotion and development of the chemical security culture. The Centre offers both the national and international partners venue for cooperation in capacity building, training, best practices exchanges, and cooperation between the professionals on area of chemical safety and security.

General goals

1. To promote the chemical safety and security:
   - by bringing the issue to national level,
   - by being more efficient in chemical safety and security capacity building and best practices exchanges, and
   - by improving national and international coordination of chemical safety and security actors;

2. To promote mechanisms to share experience in these areas among all the relevant stakeholders;

3. To promote solutions which will be continued, sustainable, affordable and accountable globally, with the emphasis on the low income countries;

4. To promote mechanisms to identify and analyze third countries' assistance needs, upon their request, in chemical safety and security, and match these needs and programmes with the relevant national and international capacities;

5. To engage representatives of the private sector to build public-private partnerships to enhance chemical safety and security worldwide.

General guidelines

1. To seek a comprehensive approach to capacity building that develops chemical safety and security employing whole hazard approach at national level;

2. To provide demand-driven assistance that is respectful of recipient country's needs, identification and ownership of decision-making;

3. To map programmes to ensure, that all partners are aware of each other's work in the area of chemical safety and security;

4. To coordinate efforts to maximize inter-operability, and to recognize the role of national governments, as well as the complementary roles of multilateral partners;

5. To structure finances in ways that are more predictable and transparent and enhance mutual accountability.

General Principles of enhancing chemical safety and security

1. To focus on enhancing awareness, training, and best practices in the broad areas of chemical security and safety issues;

2. To strengthen international cooperation to promote a chemical security culture globally. These efforts should also engage researchers from academia and private industry;

3. To promote implementation of the World Health Organization /WHO/ International Health Regulations /IHR 2000/, to improve global abilities to detect, assess, report, and respond to health events of international concern;

4. To promote and work in line with Strategic Approach to International Chemical Management /SAICM/, Inter-Organisation Programme for Sound Management of Chemicals /IOMC/, and the national and international activities towards sound management of chemicals;

5. To promote the implementation of the provisions of the Chemical Weapons Convention;

6. To promote the comprehensive implementation of the provisions of the United Nations Security Council Resolution 1540 (2004).

Development of chemical security culture

1. Chemical security culture could be considered as an assembly of beliefs, attitudes, and patterns of behaviour which will strengthen and/or complement physical security and legislation, in their mission to achieve intended security goals.

2. In the age of globalized and diversified communications, codes of conduct, ethics, and other similar sources of individual voluntary commitments are becoming increasingly effective tools of culture promotion.

3. Security culture promotion is likely to yield practical results if its underlying standards are embedded in national values and traditions.

4. Security culture is no longer limited to the facility or even industry level, as continuously expanding and increasingly vulnerable supply chains, with a multitude of diverse and overlapping players, create much larger area of chemical security implementation, and thus need to be practices creatively throughout.

5. Chemical security culture could derive its strengths or weaknesses from overall organizational culture at the level of individual chemical companies. The security culture is a part of an overall organizational culture, and it can significantly strengthen or weaken the latter

6. The manifestation of security culture is the most important at the organizational and individual level, but their goals can be fully achieved only if there are adequate inputs from high tiers, ie. from international and national levels

Multi-stakeholders' cooperation in promoting chemical safety and security in all areas of chemicals

Wojciech Lubiewa-Wielezynski [*]

The Polish Chamber of Chemical Industry (PIPC) is the organization representing chemical companies towards domestic and foreign government and non-government organizations. PIPC is the only Polish organization being a member of CEFIC and is authorized to represent chemical industry in international forums.

The Polish Chamber of Chemical Industry has a long standing relationship with the OPCW. We have contributed substantively to its various relevant events. The Polish Chamber very much value the recommendations and encouragement of Governments to promote – via the OPCW platform – safety and security of chemical facilities and in transportation, and engage all the relevant stakeholders. Enhancing chemical safety and security culture will provide greater assurance that the national chemical security systems will accomplish their functions of preventing, detecting and responding to theft, sabotage, unauthorized access, and illegal transfer of chemical material in the associated facilities and transport.

With the rapid development of chemical industry production all over the world, the question of security in the area of legitimate production, transportation and use of chemicals is assuming growing importance. Chemical industry could be targeted by terrorist, and therefore it requires advice, assistance and common strategic approaches to tackle these dangers.

The growing threat of terrorist attacks with the use of chemicals requires in all countries the introduction of more stringent measures in the sphere of chemical safety and security. This will require serious financial resources and expertise, which chemical industry does not have in many cases. There is a need for multi-stakeholder cooperation and combining of resources in enhancing chemical safety and security, and preventing the hostile use of toxic chemicals.

The OPCW, through the national and international resource centres, and with close ties to the chemical industry, should serve as a meeting ground for governments, industry, and academia to discuss chemical security. The OPCW could facilitate and promote joint approaches combining governments and industries to develop and introduce effective safety and security measures at the global level.

Cooperation among all the relevant stakeholders against misuse of toxic chemicals and enhancement of chemical safety and security will solidify mutual relations and build them on a solid partnership basis.

Lessons should be learnt from CEFIC programmes in the area of safety and security, national and industry approaches, programs in the International Atomic Energy Agency (IAEA) and WHO in terms of promoting safety and disseminating best practices in the field of safety and security in nuclear and biological materials and promoting health regulations.

An effective chemical security culture can result in a significant increase in the effectiveness of the security of chemical material and associated facilities and transport. The Responsible Care programme has now incorporated a Security Code which addresses facility, cyber and transportation security, requiring companies to conduct comprehensive security vulnerability assessments of the facilities, implement security enhancement and to create security management systems. ICCA, CEFIC, Member States, national chemical associations, scientific community, and the relevant international organisations are involved in this issue.

The OPCW and international organisations should develop national and regional programmes, with the involvement of stakeholders and their expertise as appropriate, to promote chemical safety and security in the participating countries. These programmes should be seen as a process of gathering and sharing relevant knowledge, expertise and practical experience, and training to be offered the States Parties and the chemical industry. These programmes should also offer a platform for discussion of the practical issues relating to the contributions that participating countries can make to support prevention, preparedness and response to misuse or release of toxic chemicals and the achievement of the non-proliferation of weapons of mass destruction.

[*] Mr. Lubiewa-Wielezynski is President of the Polish Chamber of Chemical Industry (PIPC)

At national level the OPCW should cooperate with relevant national and international partners to build comprehensive national and regional approaches in promoting security of the activities and facilities related to Chemical, Biological, Nuclear and Radiological materials.

The Polish chemical industry initiated - within the regional programmes of cooperation – establishment of the International Centre for Chemical Safety and Security in Tarnow. The Centre will offer a platform for training and best practices exchanges, on practical issues related to prevention, preparedness and response to misuse or release of toxic chemicals as well as chemical safety and security.

There is a need to develop the national centres in chemical safety and security to enhance chemical safety and security culture and provide assistance to national chemical security systems in preventing, detecting and responding to theft, sabotage, unauthorized access, illegal transfer of chemical material and the associated facilities and transport. They should promote cooperation among relevant stakeholders and actors, including government agencies, related industries, scientific institutions and international organisations and partners, to address the growing risks associated with terrorism.

Strengthening chemical safety and security in the area of chemical activities in Ukraine

Prof. Valery Kukhar [*]

Dear Mr. Chairman, Ladies and Gentlemen,

The problems of chemical security and safety, in my vision, are necessary to divide on three large directions: chemicals as weapons, chemical production and industrial usage and, so called, chemicals in everyday life. I'd like to present the situation in Ukraine from this general approach.

Chemical security and chemical safety in Ukraine are based on national regulation and international conventions. Ukraine is a state-party of various Conventions which concern chemicals or toxic materials, such as the Chemical Weapons Convention, Basel and Rotterdam Conventions, Montreal Protocol etc. The national legislation contains numerous acts and rules to regulate production and usage of chemicals, from industrial safety to pesticide and fertilizer registration and usage. We collaborate with the EU and international organizations in order to harmonize our legislation on chemical management.

The first area – "chemicals as weapons". Ukraine is a member of the OPCW and ratified the Chemical Weapons Convention. Fortunately, we have no chemical weapons on our territory. For many years, we actively participated in activity of the OPCW and other international organizations in order to eliminate threatening weapons of mass destruction. Our state was a place of military and civil defense exercises, teaching and practical courses for specialists from foreign countries, etc.

Control service on state borders enables in some way to detect and to prevent a transfer of toxic chemicals, explosives, narcotics and precursors by standard procedures and technique. Nevertheless, the system needs improvements, in my opinion. We received some new instruments from the US and other international partners. The next step, in my vision, we need to create the national reference laboratory in order to be ready to solve some complicated tasks, if it will be necessary. On the other hand, it's impossible to exclude some cases of illegal use of "home-made" toxic materials or explosives, as happened this year in Dnepropetrovsk. Obviously, we have to improve the control system on a general management with some chemical components and precursors in order to prevent their illegal use by criminal groups.

Ukraine ratified the UN Single Convention on Narcotic Drugs, 1961, and other Conventions, which control all aspects of narcotic and psychotropic substances and precursors. In my opinion, Ukrainian legislation and regulation in this area is stronger than in the EU. For example, my Institute must have the special license to work with hydrochloric and sulfuric acids, acetone and some other common reagents, which do not license by EU Directive. Special Nation service was organized and is working on narcotic control. Of course, this area of activity is very important for my country, especially in view of growing immigration from Asia.

The chemical industry sector is an important part of Ukrainian economy. It includes about 50 big enterprises plus more than 6500 medium-size and smaller companies. They employ nearly 155 thousand people and produce more than 6000 names of chemical products. Foreign trade turnover of Ukrainian chemical sector has reached 14.4 billion US dollars in 2011. Export of chemicals from Ukraine last year was near 10% of the whole countries exports, and share of the chemical industry in GDP is about 6%.

For the last 20 years, chemical industry and production of chemicals in Ukraine demonstrated unstable processes in many sectors, with drop in production as a whole. Production of fine chemicals, dyes, pesticides, additives etc, reduced very fast. Primary chemicals, first – inorganic chemicals and fertilizers, dominate production and occupy the export structure. Import of chemicals for the last 3 years is near equal to national production. The new investments and modernization of technology proceed slowly enough.

Industrial safety at plants is regulated by technological documentation, licensing and additional safety regulatory documents. For instance, there are national regulations on inorganic chemical production, basic chemicals or licensing on toxic chemicals production and trade. Other examples, we have a special law "About

[*] Prof. Kukhar is Director of the Institute of Bioorganic Chemistry and Petrochemistry, National Academy of Science of Ukraine

pesticides and agrochemicals". Toxic and hazardous chemicals occupy the main place in national regulation on chemical production, transportation and trade. Unfortunately, some accidents with chemicals have occurred in Ukraine, mainly in transportation by railway or cars. These cases demonstrate a necessity of corresponding preparedness to act quickly and correctly.

The country's largest chemical manufacturers representing 70% of the national chemical industry have joined the Responsible Care initiative and UCU, making further efforts to attract smaller-sized and medium companies. We are grateful to Cefic and ICCA for their support of the Responsible Care initiative in Ukraine. Major Ukrainian companies have realized the registration of their products (72 names) in EC from 2010 by REACH recommendations. We have plans to register 110 preliminary registered chemicals.

As a national association of chemical industry, the Ukrainian Chemists Union supports the objectives of Cefic and shares the values of our European partners. We also support efforts aimed at the implementation of common approaches to legislation and regulations on chemicals production and their safe use, tariff regulations and trade practices. UCU welcomes the introduction of international standards of safe management of chemical products, voluntary initiatives and principles of corporate social responsibility.

In 2008, the Ukrainian Cabinet of Ministries accepted the Conception on "Promotion of Chemical security and safety". The Conception provides for improvement of national legislation with international and European standards and practice, strengthening safety, classification of chemicals on dangerous properties on EU Directives. The document proposes to create expert groups, special advisory centers, risk management systems etc. The expert system of decision makers was created to be ready to act in emergencies or accidents. Monitoring, toxicological investigations, preparation of specialists and education programs jointly with other proposed directions of activity should be a general basis in improvement and development of chemical safety. This Conception is a right and comprehensive document. Only one problem exists – to find money for its realization…

The Conception provides for active participating in international programs to prevent chemical pollution, environment protection, collaboration with international bodies and public organizations on bilateral and multilateral levels, cooperation in the field of chemical safety and actions in prevention of chemical accidents.

Many provisions of the Conception are directed to the safe use of chemicals in other sectors of industry and social life of a society. From the past, chemical processes are the fundamental technological principle to convert raw material into materials needed for human activity and life. No doubt, chemical processes and chemicals will be used by society in everyday practice in future from purification of water to production of very sophisticated materials for high-tech and pharmaceuticals. If we look about more precisely, we can find that chemical processes dominate in industrial technology, e.g. energy production from carbon fuels or metallurgical processes are also chemical processes – oxidation or reduction, correspondingly. Food processing is also based on chemical or biochemical conversion of carbohydrates, proteins, water and other components into final desired products, and numerous chemicals are used as food additives. Sometimes a general knowledge of hazardous properties of chemicals among staff and workers is far from necessary. To overcome the situation it is desirable to organize continuous education of a personal on chemical safety and handling.

On the other hand we have to improve "chemical culture" of the population as a whole. New findings in toxicology, diversity of chemicals used, nano-materials, pollution of water, air and soil determine a necessity to activate international collaboration and exchange of knowledge, to apply new methodology in chemical education and professional training.

Unfortunately, one day our society has discovered that our world has been polluted by various chemicals – NO_x and SO_x, chlorofluorocarbons HFC, lead and mercury compounds. River and surface waters contain numerous pollutants and need fine cleaning for usage. Agricultural lands contaminated with chlorine-containing pesticides and nitrates. Industrial and municipal wastes containing numerous polymers and plastics polluted soil. Well-known heavy accidents on chemical plants, Bhopal, Seveso, oil spills, the accident in Mexico gulf on BP platform, as well as numerous small scale accidents during transportation or use of chemicals (chlorine, phosphorus, acids or ammonia) clearly demonstrate the high risk of chemicals to life and the environment. Chemical pollution, or the migration of chemicals, doesn't "know" national borders, and toxic chemicals contaminate water or atmosphere of neighboring states very rapidly.

At the same time, new scientific discoveries may bring new risks, including the potential of new chemical compounds being abused as chemical weapons or toxic matter by terrorists. Even humane targets in the pharmaceutical industry can result in some tragic consequences, as was the case with thalidomide use.

After sharp criticism from the public, chemistry has also tried to change a "face of chemical industry". Indeed, modern technological advances in chemical manufacturing are significant. It is obvious that numerous traditional chemical operations based on oil- or gas-based feedstock will use a renewable feedstock and bio-processing technologies. Process efficiency can also be significantly improved in order to minimize the environmental impact of manufacturing and to minimize by-products and wastes. Principles of "Green Chemistry", which have been recently formulated, make provisions for implementation of energy-efficient processes with (near)-100 % atoms efficiency leading to drastically reduced generation of unwanted by-products, to increase selectivity and to improve the economy of reactions using standard equipment. Efficient optimization of processes has been proposed and applied to produce medicines, pesticides, fine chemicals and other high-value products for market demands.

Chemical industry has to take the best principle of modern nuclear energy industry – this is the "safety culture". But safety culture in use of chemicals should be also implemented in all spheres of human activity

In order to use chemistry, science and technology, to the benefit of society, to reduce adverse effects of chemicals and chemical accidents, we have to organize an appropriate system of chemical security. All the aforementioned determine the necessity to have strong control and corresponding regulation for chemical production, as well as for usage of chemicals over their entire life-cycle. The first very important result and excellent example of the possibility to organize this complex system of chemical security, in my opinion, is the Chemical Weapons Convention.

The very important element in chemical security and safety is education. Unfortunately, in recent years we can see shortening education programs on chemistry in schools and some deficiencies in its curricula. Simultaneously with basic knowledge in chemistry, chemical education has to explain the dual-use nature of advances in chemical science and technology as well as chemicals. University curricula should include appropriate references to the International Conventions, which regulate management of chemicals, their requirements, related information and ethical guidance. Ethic codes of conduct and professional codes are also important tools in chemical security.

I welcome the initiative of Polish colleagues and the OPCW to organize the Tarnow Conference and to consolidate our will and activity in order to protect populations and the environment from negative consequences of the use of chemicals. Let me express my strong confidence that the Tarnow Center will be a very important international organization for the peaceful and safe use of chemistry on the principles of high professional level, responsibility and international collaboration.

Overview of the U.S. Department of Homeland Security's chemical facility anti-terrorism standards

Todd Klessman [*]

Why Chemical Facility Security?

- The Homeland faces a persistent and evolving threat from terrorist groups and cells.
- Chemical facilities potentially are attractive targets as:
  - A successful attack on some chemical facilities could potentially cause a significant number of deaths and injuries.
  - Certain chemical facilities possess materials that could be stolen or diverted and used as or converted into weapons for use offsite.
- In 2006, Congress authorized the Department to regulate security at "high-risk" chemical facilities.
  - Covered facilities must perform Security Vulnerability Assessments (SVAs) and implement Site Security Plans (SSPs) containing security measures that meet DHS-defined Risk-Based Performance Standards (RBPS).
  - The Department developed the Chemical Facility Anti-Terrorism Standards (CFATS), 6 CFR Part 27, to implement this authority.

Homeland Security

2

Who Is Regulated?

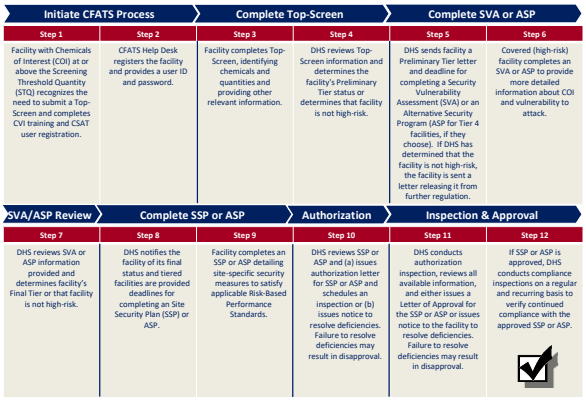
- To determine if a facility is subject to CFATS, DHS looks at the unique circumstances faced by the facility, starting with the quantities of Chemicals of Interest (COI) the facility possesses.
- Potential regulation is *not* based on the facility type, meaning that many different types of facilities may be subject to CFATS, including:
  - Chemical manufacturers
  - Warehouse and distributors
  - Chemical repackaging operations
  - Oil and gas operations
  - Hospitals
  - Semi-conductor manufacturers
  - Paint manufacturers
  - Colleges and universities

Homeland Security

3

CFATS Process

Homeland Security



Site Security Plan (SSP) Review and Inspections

- DHS uses a two-step process to determine if an SSP (or ASP) meets all applicable risk-based performance standards (RBPS).
  - An SSP (or ASP) is reviewed by DHS
    - If it appears to meet the applicable RBPS, the facility will receive a Letter of Authorization and an inspection is scheduled.
    - If it does not meet the applicable RBPS, the facility will receive a letter identifying deficiencies that must be resolved prior to authorization or final approval.
  - After a facility receives a Letter of Authorization, DHS will inspect the facility for compliance with CFATS and will either issue a Letter of Approval approving the SSP (or ASP) or issue a notice of deficiencies that must be resolved prior to final approval.
- Inspections typically take approximately one week and involve two or more inspectors. Facilities should be prepared to show all security elements in the authorized SSP (or ASP) during an inspection.

Homeland Security

5

Risk-Based Performance Standards (RBPS)

- A CFATS-covered facility must submit for DHS approval an SSP or, if the facility chooses, an ASP that contains security measures that meet all applicable RBPS.
  - RBPS are non-prescriptive, and thus provide facilities with substantial flexibility, including the ability to leverage existing measures where appropriate.
- Compliance with the RBPS will be tailored to fit each facility's circumstances, including tier level, security issues, and physical and operating environments.
  - Consequently, measures appropriate to meet an RBPS for one type of facility will not necessarily be appropriate for anther type of facility (e.g., DHS would not expect a covered university to necessarily employ the same type of measures as a large chemical manufacturer).
- CFATS currently has 18 RBPS, addressing areas such as perimeter security; shipping, receipt, and storage; cybersecurity; personnel surety; training; and recordkeeping.

Homeland Security

6

Key CFATS Tools

- Chemical Security Assessment Tool (CSAT): CSAT is the backbone of the CFATS program, and currently includes four primary applications:
  - User Registration
  - Top-Screen
  - SVA
  - SSP
- Chemical-terrorism Vulnerability Information (CVI): CVI is the information protection category used to ensure secure handling of certain sensitive CFATS-related information.
  - Except in emergency or exigent circumstances, only CVI authorized users with a "need-to-know" are permitted to access the CSAT Top-Screen, SVA, and SSP, certain correspondence, and other types CVI as specified in CFATS.
  - Persons potentially eligible to access CVI include facility employees; Federal employees, contractors, and grantees; and State/local government employees.
  - DHS provides online CVI training and authorization.

Homeland Security

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[*] Mr. Klessman is from the US Department of Homeland Security

Program Status: Covered Facilities

- DHS has received over 41,000 Top-Screens.
- Of the Top-Screens received and analyzed, DHS issued preliminary tier notification and SVA due dates to over 7,800 facilities.
- DHS has received over 8,000 SVAs and has reviewed nearly all of them.
- As of September 04, 2012, CFATS covers 4,433 facilities (3,660 final tiered facilities, 773 preliminarily tiered facilities) across all 50 states.

Tier	Final Tiered Facilities	Facilities Awaiting Final Tier
1	114	7
2	452	51
3	1069	174
4	2025	541
Total	**3660**	**773**

Homeland Security

All statistics are current as of September 4, 2012

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Program Status: Other Results

- Since the inception of CFATS, more than 2,700 chemical facilities have eliminated, reduced, or otherwise made modifications to their holdings of potentially dangerous chemicals and are now no longer considered high-risk.

Homeland Security

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Available Resources

- **Outreach:** DHS outreach for CFATS is a continuous effort to educate stakeholders on the program.
  - To request a CFATS presentation or a CAV, individuals may submit a request through the program Web site, located at www.dhs.gov/chemicalsecurity, or by e-mailing DHS at CFATS@dhs.gov.
- **CFATS Help Desk:** DHS has developed a CFATS Help Desk that individuals can call or email with questions on the CFATS program.
  - Hours of Operation are 7:00 AM – 7:00 PM, Monday through Friday.
  - The CFATS Help Desk toll-free number is 1-866-323-2957.
  - The CFATS Help Desk email address is csat@dhs.gov.
- **CFATS Web site:** For CFATS Frequently Asked Questions (FAQs), CVI training, and other useful CFATS-related information, please go to www.dhs.gov/chemicalsecurity.

Homeland Security

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EU FP 7 SPIRIT project concerning infrastructure protection

Dr. Maarten Nieuwenhuizen [*]

Terrorist attacks by bombing (E) or Chemical, Biological or Radiological (CBR)-agents are threats with a low probability but with disastrous consequences. There is a strong need to protect people, the societal community and critical infrastructures and utilities of any kind against being damaged, destroyed or disrupted by deliberate acts of terrorism. Solutions have to be developed to realize sufficient resilience of the infrastructure for rare occasions with minimum effect on normality. Hitherto, normal regulations and building guidelines do not take into account the CBRE threat.

Modern society is a complex, intertwined system in which a small disturbance in one area may have a disproportional effect on the system as a whole. In fact, the system character of modern society implies that certain types of attack could cause the system itself to lose stability. E.g. the effect of a large-scale B-attack might, if it remains undetected, grow out of control because infected people travel around looking for medical aid thus infecting more people. The health services may then find themselves unable to cope so that an ever increasing number of societal services are disrupted.

The immense societal reaction that these incidents cause can be subdivided into:
- 1st tier effects (effects on health and first responders' actions) at the site of the attack,
- 2nd tier effects (effects on societal functions shortly after and close to the location of the attack), and
- 3rd tier effects (effects on the economic and political viability of a nation or EU as a whole), in terms of the colossal damages that will consequently incur both in human life (the so-called psycho-social impact) and in economic losses, show how vulnerable a modern society is to a CBRE terrorist attack.

Figure 1 below represents a model of impact area in EU society: it shows both the 1st, 2nd and 3rd tier damage effect layers in society as introduced above. Figure 2 depicts the various countermeasures that could be taken. Both figures, which indicate the system-of-systems nature of CBRE counterterrorism, are taken from the results of the ASSRBCVUL project entitled: 'Assessment of the vulnerabilities of modern societies to terrorist acts employing radiological, biological or chemical agents with the view to assist in developing preventive and suppressive crisis management strategies'. ASSRBCVUL was a prospective study performed by an international consortium of European Science and Technology Observatory (ESTO) members sponsored by the Institute for Prospective Technological Studies (IPTS). Where possible in this paper the impact of CBRE terrorism as well as the impact of CBRE counterterrorism are valued in terms of the multi-tier effect concept as described above, i.e. not only in terms of casualties only.

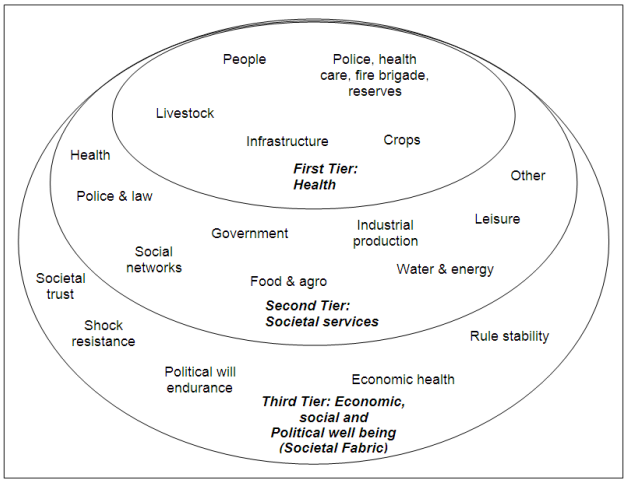

Figure 1. Model of impact areas in EU society

[*] Dr. Nieuwenhuizen is from TNO Netherlands

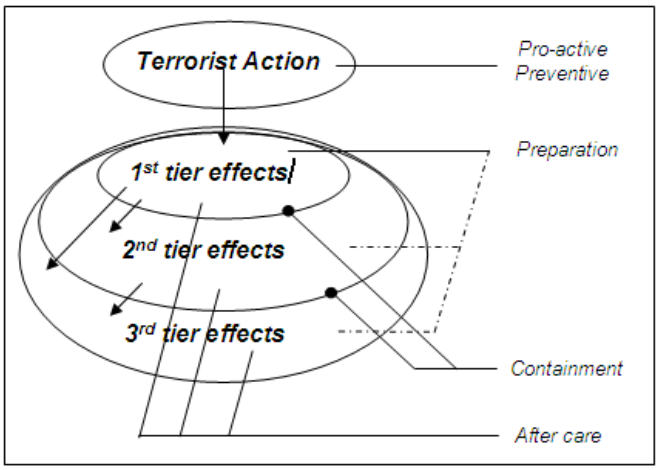

Figure 2. Countermeasures and their relation to effects

CBRE counterterrorism is a concept consisting of the following dimensions:

- The hazardous material:
  - C: almost instant effects, large range of available amounts and toxicity.
  - B: medium term effects, possibility of contagious diseases at the threat agent.
  - R: long term effects.
  - E: instant effects, most widely used by terrorists, and socially more "accepted" than C, B and R.
- The targets:
  - People directly or indirectly affected (goods, food-chain, water supplies, etc.).
  - Transportation (airports, railways, etc.).
  - Symbolic locations (e.g. governmental buildings) or people (e.g. politicians).
  - Infrastructures.
- The scale:
  - Toxicity (from non-toxic hoaxes to pandemic-like B-attacks).
  - Physical effects (from bomb attacks with no victims to nuclear detonations), etc.
- The Security Chain (timeline): threat – prevention – preparation – protection – response - recovery.

As can be seen from the above listing the "Chemical" in Chemical Safety and Security is only one element of a multidimensional complex. Nevertheless the work that was performed in a number of projects in the European 7th Framework Programme exhibits illustrations about how safety and security, not only for "Chemical", can be married.

The DECOTESSC1 project

A first project, coordinated by TNO with a consortium of Research and Technology organizations, was named DECOTESSC1 (DEmonstration of COunterTErrorism System-of-Systems against CBRNE phase 1). The DECOTESSC1 project's objectives were to define a strategic roadmap

- by taking into account relevant completed, ongoing and planned work on CBRNE related issues as well as related areas,
- by assessing the relevant trends in all expertise areas as well as the political situation,
- by defining further research work required, also in conjunction with other bodies working on strategic roadmaps such as European Security Research Innovation Forum (ESRIF) and the European Defence Agency (EDA), as well as national bodies inside and outside the EU.

Among the many outcomes of DECOTESSC1 the following are relevant for the further discussions in this paper. These outcomes can be summarized as follows:

- No single element of the multidimensional complex shown above should be taken into account. In this way zooming in on "Chemical" only is an important but somewhat dangerous limitation. A systems-of-systems approach (all threats, all targets, al scales and full security cycle) is to be preferred.
- Preferably counterterrorism should try to deal with the problems as close to the source as possible (as left as possible from the "boom"), i.e. prevention is of utmost importance.

- No dedicated solutions for CBRE security should be developed. Apart from a growing complexity of treaties, laws, procedures, responsible organizations, technology etc. economy simply does not allow for dedicated solutions for isolated problems. In that respect a marriage between the Security domain and other domains such as Safety, Environment, Health, Defence, Non-proliferation, etc. is welcomed. Chemical Safety and Security is a clear example of such a marriage.
- The so-called Security-by-Design approach is the preferred way of handling terrorism, especially when thinking about the future of society.

The SPIRIT project

Introduction
SPIRIT is an EU 7th framework project entitled "Safety and Protection of built Infrastructure to Resist Integral Threats". The SPIRIT consortium is a collaboration between several European government organizations, academic institutions and companies. TNO is the coordinator.

Within the SPIRIT project a consortium was formed to bring the required expertise regarding protection of infrastructure against terrorist threats together, to make these commonly available and to find solutions that can be integrated into normal life and planning and building procedures. SPIRIT addresses CBRE terrorist attack scenarios. The anticipated main outcome of the project is an integrated approach to evaluate and counter CBRE-threats, including proposed guidelines for an EU Regulatory Framework. With this approach, government, end users of buildings and designers can define and achieve a desired level of protection.

The SPIRIT project is a clear example of a marriage between Safety and Security. Although the strongest examples of this marriage are in the E-domain rather than the C-domain, by illustrating how SPIRIT works it will in a metaphoric way also become clear how eventually Chemical Safety and Security may become an optimum joint-venture.
The scope of the SPIRIT-project is defined by the type of threats and the type of built infrastructure considered. The threats considered are terrorist threats with use of CBRE-means. Regarding the infrastructural target, SPIRIT limit itself to large modern buildings, often (partly) public buildings, where a lot of people can be present. Modern refers to the fact that only buildings are considered that are designed according to the current standards.

The targeted contribution of SPIRIT to build infrastructure protection will be:
- A methodology to quantify the vulnerability of built infrastructure in number of casualties/injuries, amount of damage and loss of functionality and services.
- A guidance tool to assess the vulnerability of a design/building and select efficient and cost effective countermeasures (ready to use solutions) to achieve a required protection level against terrorist attacks.
- Portfolios of protection products for new and existing buildings.
- Recommendations for draft EU regulatory framework to enable safety based engineering and the incorporation of 'CBRE protection' in the regular building guidelines and regulations.

The technical work of the SPIRIT project is divided in five work packages. Figure 3 shows these work packages, as well as the interrelation between them.

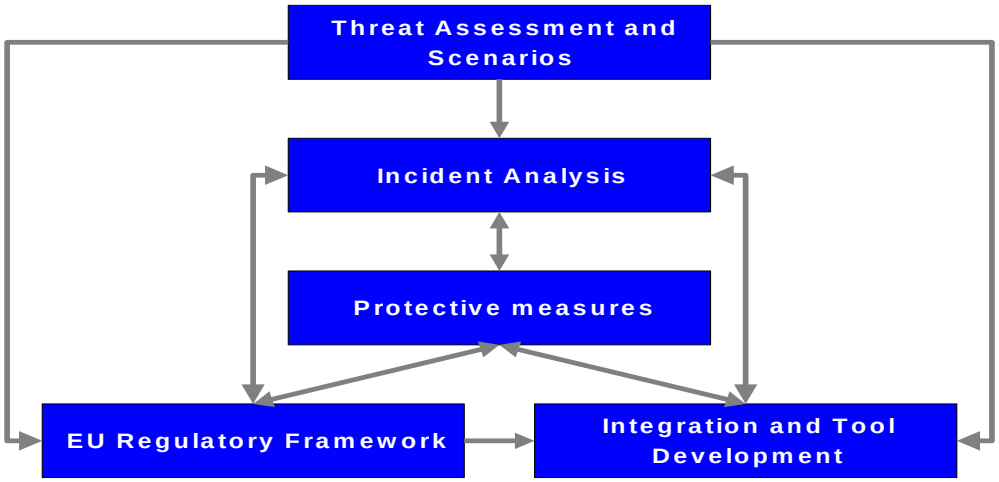

Figure 3. Overall strategy of SPIRIT.

Threat assessment and scenarios
Within the SPIRIT project, scenarios are defined which are specific for attacks on buildings. In total, 20 Chemical, 12 Biological, 9 Radiological and 14 Explosive scenarios have been defined. To be able to make a well-considered choice of the vast amount of available CBR agents, some new concepts are introduced like 'building interaction vectors' and a 'threat space'. Interaction vectors describe how a building interacts with the outside world. Examples of interaction vectors are shown in Figure 4. By exploiting these interaction vectors, one can get an indication about how a building can be attacked. Also, by reciprocating safety principles (how can I make things go wrong?) additional attack possibilities are defined.

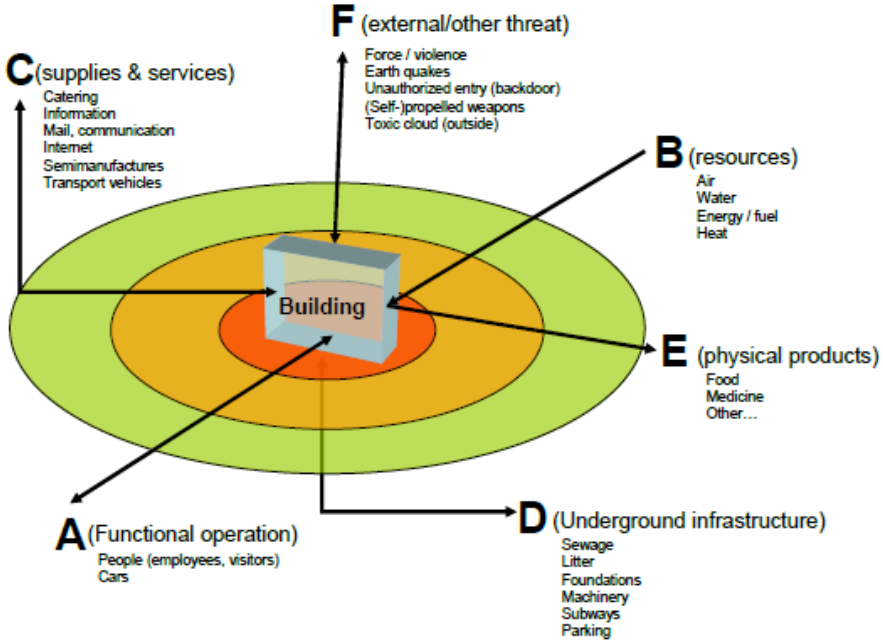

Figure 4. Examples of interaction vectors and carriers of a building with the outside world, that can possibly be exploited as attack vectors.

A CBR threat space is a (visual) representation of agents in a multidimensional space to ensure that the threat has been evenly distributed through the threat spectrum, avoiding clustering around 'known' (already happened/studied in the past) attacks which may cause bias. By superimposing scenarios that have occurred in the past or are considered to be credible in other studies, some 'blind spots' are identified in the interaction vector exploits, i.e. an exploited vector could theoretically be used for an attack on a building, however no

occurred or credible scenarios were (yet) found in existing literature. Finally a set of 41 attack scenarios were defined to represent all different CBR attacks.

For explosive attacks, a range of explosive materials are known to have been used in actual terrorist attacks. However, the well-established procedure of TNT-equivalence has been adopted to define representative quantities of high explosives and credible scenarios. In the framework of infrastructure safety, (close-in) blast is assumed to be the dominant phenomenon to be considered in this study, whereas fragments from either casing around or shrapnel in the explosive charge cause effects of second order. Therefore the TNT-equivalency-approach is appropriate.

Incident analysis
It is a challenge to develop a relatively simple, not too detailed consequence analysis methodology for the guidance tool, that still has the ability to discern between different cases, scenarios and buildings, and that also can show the effectiveness of protective measures.

The anticipated approach is a kind of three dimensional database method, with a bypass, where possible, based on simple quantitative correlations. The three dimensions are threat classes, a categorization of the structures and structural elements, and consequence classes, in terms of structural damage, injuries and/or loss of functionality.

The quantitative breakdown will be based on a large number of calculations, both with relatively simple engineering tools, as well as with sophisticated numerical tools, e.g. for analyzing specific details. These analyses are done to understand the phenomena that are dominant for the consequences and to select the proper parameters to consider in the tool.

Two generic buildings, that have been defined, are the target constructions for the analyses to be performed: a multi-use high rise concrete frame structure and a large shopping mall of prefabricated elements. The consequence calculations concern blast loading calculations, window breakage analysis, damage zone prediction, injury and lethality prediction, column damage due to close-in charges and residual capacity, analysis of progressive collapse, the dispersion of CBR-agencies through the building and the CBR-lethality. Figure 5 shows an example for explosions.

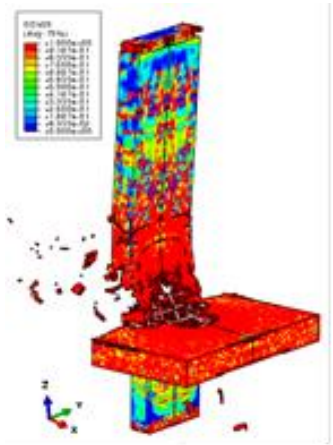

Figure 5. Examples of incident analysis due to close-in detonation.

Protective measures
Protective products will be identified and developed in order to provide architects and building designers with ready-to-use products and solutions to harden infrastructure against CBRE terrorist threats. The innovative products for protection of structural components and indoor air quality are related to the identified CBRE-threats. Countermeasures such as blast proof masonry retrofit systems, blast resistant window/facade systems, micro-reinforced high performance concrete, detectors, monitors and filters for ventilation systems are analyzed with regard to protective effectiveness and economic benefit. New solutions are developed to fill the gaps. Experiments and numerical analysis are used to obtain generalized results. Thus, a protection product portfolio is generated that assists to improve the most vulnerable components of critical infrastructure.

Assessment tool development

One of the main aims of the SPIRIT project is to make the specialist knowledge available and easily accessible for the design and planning of the built infrastructure. A safety integrated design is needed in which also the vulnerability of a building, an asset, to CBRE threat is considered. To enable such an integrated design, a method to quantify the potential loss of functionality and structural integrity due to CBRE attacks is needed. Therefore the results of the individual SPIRIT work packages on the threat scenarios, the classification of the buildings, the consequence modelling and the counter measures will be integrated and combined in a guidance tool.

The basic idea behind the guidance tool is:

- A building, an asset is known and defined.
- The asset might be a target for a CBRE terrorist attack.
- The user wants to know how vulnerable the asset is to various CBRE threats.
- The user wants to know the possibilities and effectiveness of countermeasures.
- The user needs a tool to support the decision on the necessity and the kind of protective measures.

Figure 6. Concept of the assessment tool.

To answer all these questions quantitatively expert knowledge and classified information is needed. To meet the EU-requirements of public release, it was decided to make the guidance tool a two-step approach with a qualitative first step and a quantitative second step. Also the typical user for the two steps differs.

Step 1 is for the non-expert user to make a rough estimate of the asset vulnerability for threat scenarios covered by the SPIRIT project. Step 1 is qualitative and will be based on non-restricted information and uses no, or only very simple calculations. Basically, in this phase, the critical conditions for the asset, or modules of the asset, are identified. This SPIRIT Step 1 model will have a web-based format and the distribution is non-restricted.

In the second step, the initial vulnerability and the effectiveness of countermeasures are quantified. In this Step 2 restricted information may be used and the results are obtained by numerous calculations. This second part of the tool is intended to be used by experts only and the distribution will be restricted.

The tool provides guidance for the assessment in two parts: 1. asset attractiveness, and 2. threat evaluation. The output is a ranking of the vulnerability of the asset to the various scenarios.

Regarding attractiveness SPIRIT, intended for the Security domain, builds upon Safety related standards and rules for building. In Figure 7 it is clearly observed that for the attractiveness rating an existing DIN standard is used.

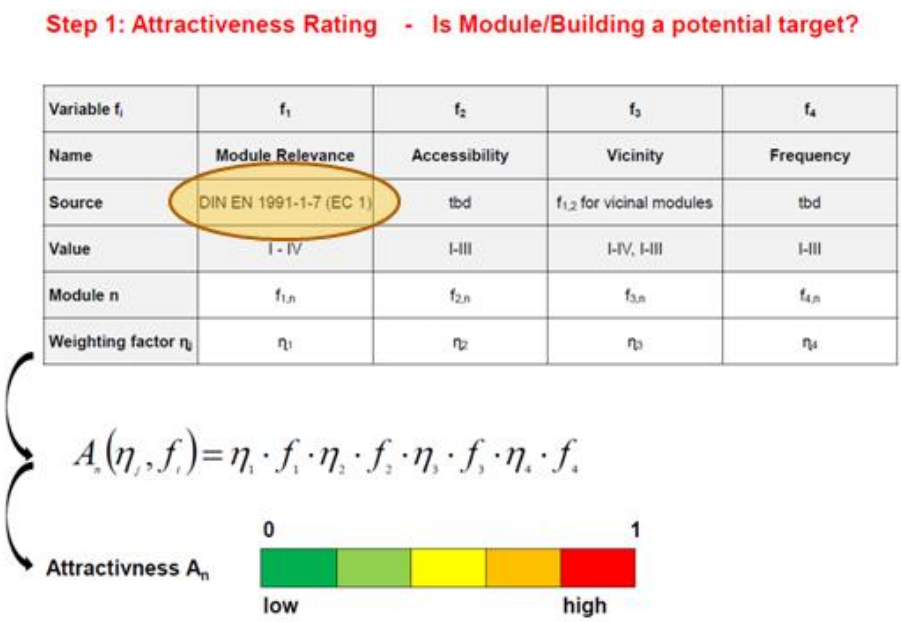

Figure 7. Attractiveness rating method using DIN standards for building.

Concluding remarks

The SPIRIT project will provide the technology and know-how for the protection of buildings and people against terrorist threat and to minimize the consequences of a terrorist attack. The results will be a first step towards this overall aim, with the guidance tool as the tangible result and the instrument for the knowledge transfer.

Regarding Safety and Security (not only for C but also BRE) the technical approach in SPIRIT mimics Safety philosophy. Buildings design rules and norms were “borrowed” from the Safety domain indicating that a marriage between Safety and Security is possible.

Beijing Convention and transport of Weapons of Mass Destruction

Dr. Huang Jiefang [*]

The International Meeting on Chemical Safety and Security in Tarnow is an important event. On behalf of the International Civil Aviation Organization (ICAO), I wish to express our support for this event and our thanks to the Organization for the Prohibition of Chemical Weapons for inviting ICAO to participate in this meeting. We also wish to thank the Government of Poland and the City of Tarnow for hosting this meeting.

Chemical safety and security are closely related to international civil aviation. In this presentation, I will try to give a brief introduction of our work in this respect.

Criminalization of the Act to Transport Chemical Weapons by Air and the Act to Use Chemical Weapons through or on Board Civil Aircraft

Under the auspices of ICAO, the Diplomatic Conference on Aviation Security in Beijing adopted on 10 September 2010 the *Convention on the Suppression of Unlawful Acts Relating to International Civil Aviation* (hereinafter referred to as "the Beijing Convention). One of the salient features of the Beijing Convention is the criminalization of the act to transport biological, chemical and nuclear (BCN) weapons, as well as related materials mentioned in the Convention.[i]

The offence is defined in Article 1, paragraph 1 (i) of the Convention as follows:
(i) transports, causes to be transported, or facilitates the transport of, on board an aircraft:

> (1) any explosive or radioactive material, knowing that it is intended to be used to cause, or in a threat to cause, with or without a condition, as is provided for under national law, death or serious injury or damage for the purpose of intimidating a population, or compelling a government or an international organization to do or to abstain from doing any act; or
>
> (2) any BCN weapon, knowing it to be a BCN weapon as defined in Article 2; or
>
> (3) any source material, special fissionable material, or equipment or material especially designed or prepared for the processing, use or production of special fissionable material, knowing that it is intended to be used in a nuclear explosive activity or in any other nuclear activity not under safeguards pursuant to a safeguards agreement with the International Atomic Energy Agency; or
>
> (4) any equipment, materials or software or related technology that significantly contributes to the design, manufacture or delivery of a BCN weapon without lawful authorization and with the intention that it will be used for such purpose;

provided that for activities involving a State Party, including those undertaken by a person or legal entity authorized by a State Party, it shall not be an offence under subparagraphs (3) and (4) if the transport of such items or materials is consistent with or is for a use or activity that is consistent with its rights, responsibilities and obligations under the applicable multilateral non-proliferation treaty to which it is a party including those referred to in Article 7.

"BCN weapon" means biological weapons, chemical weapons, nuclear weapons and other nuclear explosive devices. The term "chemical weapons" is defined in Article 2, paragraph h, subparagraph (b) as follows:

"chemical weapons", which are, together or separately:
(i) toxic chemicals and their precursors, except where intended for:

> (A) industrial, agricultural, research, medical, pharmaceutical or other peaceful purposes; or
>
> (B) protective purposes, namely those purposes directly related to protection against toxic chemicals and to protection against chemical weapons; or
>
> (C) military purposes not connected with the use of chemical weapons and not dependent on the use of the toxic properties of chemicals as a method of warfare; or

[*] Dr. Jiefang is a Senior Legal Officer with ICAO. The views expressed here are that of the author and do not necessarily reflect the position of the organizations with which he is associated.

(D) law enforcement including domestic riot control purposes, as long as the types and quantities are consistent with such purposes;

(ii) munitions and devices specifically designed to cause death or other harm through the toxic properties of those toxic chemicals specified in subparagraph (b)(i), which would be released as a result of the employment of such munitions and devices;

(iii) any equipment specifically designed for use directly in connection with the employment of munitions and devices specified in subparagraph (b)(ii)."

In defining the terms relating to chemical weapons, the drafters of the Beijing Convention have taken into account, and benefited from the provisions of numerous existing conventions. Since such definitions exist in other conventions, it is necessary to maintain consistency and uniformity. For example, the definition of "Toxic chemical" in Article 2 of the Beijing Convention is as follows:

(d) "Toxic chemical" means any chemical which through its chemical action on life processes can cause death, temporary incapacitation or permanent harm to humans or animals. This includes all such chemicals, regardless of their origin or of their method of production, and regardless of whether they are produced in facilities, in munitions or elsewhere;

This provision was quoted from Article II (2) of the *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction* of 1993.

In addition to the offence of aerial transport of chemical weapons, the Beijing Convention also criminalizes the act to release or discharge from a civil aircraft in service any chemical weapon or similar substances in a manner that causes or is likely to cause death, serious bodily injury or serious damage to property or the environment.[ii] Similarly, it is also an offence punishable by severe penalties to use any chemical weapon of similar substances against or on board a civil aircraft in service in a manner that causes or is likely to cause death, serious bodily injury or serious damage to property or the environment.[iii]

Regulations for the Transport of Dangerous Goods.[iv]

Another important aspect of ICAO's work relating chemical safety and security is in the area of the regulations for the transport of dangerous goods, which include numerous chemical items. Dangerous goods are carried regularly and routinely by air all over the world. To ensure that they do not put an aircraft and its occupants at risk, there are international Standards that each State, under the provisions of the *Convention on International Civil Aviation* (Chicago Convention), is required to introduce into national legislation. This system ensures governmental control over the carriage of dangerous goods by air and gives worldwide harmonization of safety standards.

Annex 18 to the Chicago Convention deals with the Safe Transport of Dangerous Goods by Air and sets down board principles; one of the Standards, however, requires that dangerous goods be carried in accordance with the Technical Instructions for the Safe Transport of Dangerous Goods by Air (the "Technical Instructions). States are required by Annex 18 to have inspection and enforcement procedures in place to ensure that dangerous goods are being carried in compliance with the requirements.

The Technical Instructions contain a comprehensive set of requirements; among other things, they provide for the classification of dangerous goods and list these goods. The list identifies those goods which: a) are forbidden under any circumstances; b) are forbidden on both passenger and cargo aircraft in normal circumstances but could be carried in exceptional circumstances subject to exemption by the States concerned; c) are forbidden on passenger aircraft but permitted on cargo aircraft in normal circumstances; and d) are permitted on both passenger and cargo aircraft in normal circumstances. The Technical Instructions require that all dangerous goods be packaged and, in general, restrict the quantity per package according to the degree of hazard and the type of aircraft (i.e. passenger or cargo) to be used. There is generally no restriction on the number of packages per aircraft. The Technical Instructions also give the packing methods to be used and the packagings permitted, together with the specifications for those packagings and the stringent testing regime that must be followed. There are also requirements for the markings and labels for packages and the documentation for consignments.

In the Technical Instructions, there is a requirement that every package of dangerous goods be inspected externally by the operator before carriage to ensure that it is in a fit state and appears to comply with all the relevant requirements. Packages are subject to loading restrictions, including segregation of those containing

incompatible dangerous goods and securement to prevent movement in flight. The pilot-in-command of an aircraft must be informed of the dangerous goods on-board and their location since, in the event of an emergency (not necessarily involving dangerous goods), the pilot-in-command, if the situation permits, must inform the appropriate air traffic services unit of what is on the aircraft to assist the emergency services in their response. The provision in the Technical Instructions allows pilots-in-command to exercise discretion in regard to conveying information about dangerous goods since they must judge the risks involved in diverting their attention (or the co-pilot's attention) from controlling the aircraft in emergency situations.

Operators are aware of what dangerous goods have been loaded on their aircraft; in the event of an aircraft accident, the Technical Instructions require that they must, as soon as possible, inform the State in which the accident occurred of what was on-board and where it was located. However, it is possible that, depending on the circumstances and place of an accident, this information may not be readily available. The Technical Instructions also require that operators report to the relevant authority accidents and incidents involving dangerous goods. States, in turn, are required to have procedures in place to investigate such occurrences.

The Technical Instructions contain training requirements that apply to everyone involved in consigning, handling and carrying dangerous goods, and cargo and passenger baggage. These include the need for refresher training at two-year intervals and the keeping of training records. There are specific responsibilities for shippers and operators. Shippers must ensure that staff preparing consignments of dangerous goods receive training or that another organization with trained staff is used. Operators must ensure that their own staff and those of their handling agents are trained. Training programmes for operators are subject to approval by the State of the Operator.

Concluding Remarks

In the context of international civil aviation, ICAO has promoted chemical safety and security through the adoption of treaties, international standards and recommended practices. It is hoped that ICAO and OPCW could continue their cooperation in the future in this field.

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[i] For more detailed analysis, see J.Huang & H. Liu, " Beijing Convention and The Offence for Transporting Chemical Weapons", in *Seminar on the OPCW's Contribution to Security and the Non Proliferation of Chemical Weapons*, Edited by H. Mashhadi, K. Paturej, P. Runn, and R. Trapp (OPCW, 2011).

[ii] Article 1, paragraph 1, subparagraph (g) of the Beijing Convention.

[iii] Article 1, paragraph 1, subparagraph (h) of the Beijing Convention.

[iv] The presentation under this subheading is virtually quoted from the existing material developed by Dangerous Goods Section of ICAO, which may also be found in the ICAO website: http://www.icao.int/safety/DangerousGoods. The author expresses his thanks to Dr. Katherine Rooney, Chief, Dangerous Goods Section, for her kind assistance.

Responsible Care security code

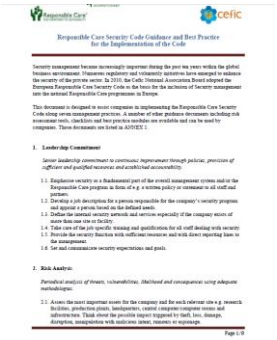
Wicher Mintjes [*]

Responsible Care Security Code

- Developed by the American Chemistry Council (ACC) after 9/11
- Adopted by Cefic in Europe in 2010

Responsible Care Security Code

- Implementation document developed
- Implementation at national level ongoing (including translations of documents, organizing workshops etc.)
- Focus on Small & Medium Enterprises



Responsible Care Security Code

- Describes fundamental management practices of protection against any kind of criminal, malicious and cyber acts
- Affects production, storage, distribution and transportation of products as well as liaison with suppliers and customers
- Designed to help companies achieve continuous improvement in security performance using a risk-based approach to identify, assess and address vulnerabilities, prevent or mitigate incidents, enhance training and response capabilities, and maintain and improve relationships with key stakeholders and authorities
- Shared responsibility requiring actions also by other parties such as customers, suppliers, service providers and governmental security agencies

Elements of the code

- **Leadership Commitment**

  Senior leadership commitment to continuous improvement through policies, provision of sufficient and qualified resources and established accountability

- **Risk Analysis**

  Periodical analysis of threats, vulnerabilities, likelihood and consequences using adequate methodologies.

[*] Mr. Mintjes is Associate Director of Emergency Services & Security, at Dow Chemical

Elements of the code

- **Implementation of Security Measures**

  Development and implementation of security measures commensurate with the risks.

- **Training, Guidance and Information**

  Training, guidance for, and information of employees, contractors, service providers and supply chain partners, as appropriate, to enhance security awareness.

Elements of the code

- **Communication, Dialogue and Information Exchange**

  Communications, dialogue and information exchange on appropriate security issues with stakeholders such as employees, contractors, communities, customers, suppliers, service providers and government officials and agencies, balanced with safeguards for sensitive information.

Elements of the code

- **Response to Security Threats and Incidents**

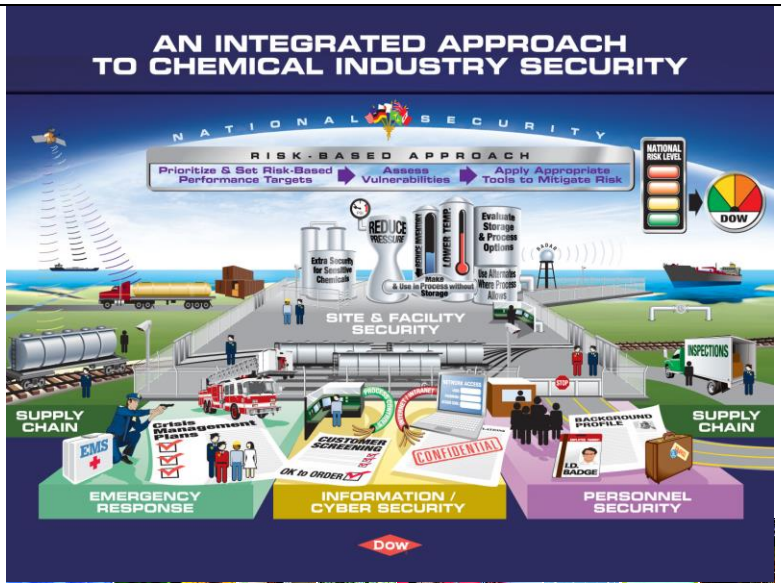
  Evaluation, response, reporting and communication of security threats and security incidents, as appropriate, and corrective action for security incidents including "near misses".

- **Audits, Verification and Continuous Improvement**

  The commitment to security calls on companies to seek continuous monitoring of all security processes.

Implementation at Dow

- One common system, globally implemented
- All elements fully embedded in Dow's Operating Discipline Management System
- Next slides will depict the system setup


AN INTEGRATED APPROACH
TO CHEMICAL INDUSTRY SECURITY
NATIONAL SECURITY
RISK-BASED APPROACH
Prioritize & Set Risk-Based Performance Targets
Assess Vulnerabilities
Apply Appropriate Tools to Mitigate Risk
NATIONAL RISK LEVEL
DOW
REDUCE PRESSURE
LOWER TEMP
Evaluate Storage & Process Options
Extra Security for Sensitive Chemicals
Make & Use in Process without Storage
Use Alternates When Process Allows
SITE & FACILITY SECURITY
INSPECTIONS
SUPPLY CHAIN
SUPPLY CHAIN
Crisis Management Plans
EMS
CUSTOMER SCREENING
OK to ORDER
CONFIDENTIAL
BACKGROUND PROFILE
I.D. BADGE
EMERGENCY RESPONSE
INFORMATION / CYBER SECURITY
PERSONNEL SECURITY
Dow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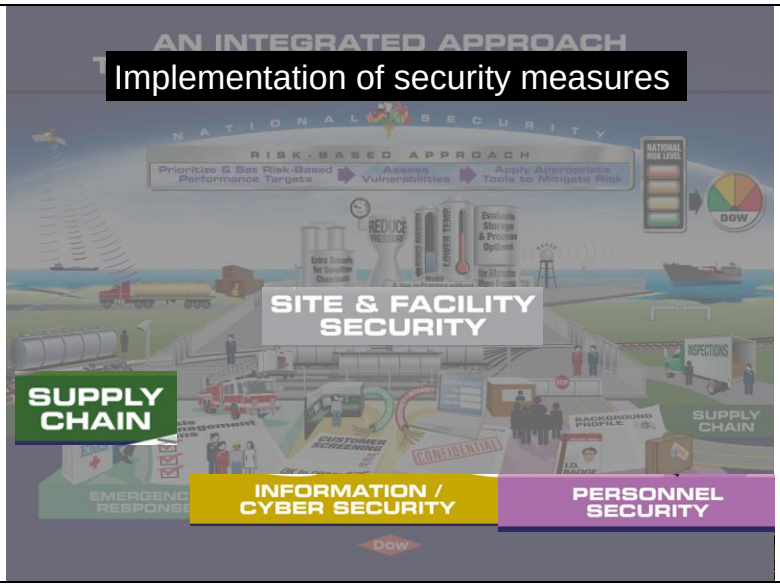
AN INTEGRATED APPROACH
Implementation of security measures
NATIONAL SECURITY
RISK-BASED APPROACH
Prioritize & Set Risk-Based Performance Targets
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AN INTEGRATED APPROACH
Training, Guidance and Information
NATIONAL SECURITY
RISK-BASED APPROACH
Prioritize & Set Risk-Based Performance Targets
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AN INTEGRATED APPROACH
Communication, Dialogue, Information Exchange
NATIONAL SECURITY
RISK-BASED APPROACH
Prioritize & Set Risk-Based Performance Targets
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SUPPLY CHAIN
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PERSONNEL SECURITY
Dow


AN INTEGRATED APPROACH
Response to Security Threats and Incidents
NATIONAL RISK LEVEL
DOW
EMS
Crisis Management Plans
EMERGENCY RESPONSE
INSPECTIONS
SUPPLY CHAIN
CONFIDENTIAL
PERSONNEL SECURITY
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Audits, Verification and Continuous Improvement are part of Dow's standard Management System and part of the Plan-Do-Check-Act Cycle
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Do provisions to advance chemical facility safety also advance security objectives? An analysis of possible synergies

Dr. Frank Huess Hedlund [*]

Abstract: The European Commission has launched a study on the applicability of existing chemical industry safety provisions to enhancing security of chemical facilities covering the situation in 18 EU Member States. This paper reports some preliminary analytical findings regarding the extent to which existing provisions that have been put into existence to advance safety objectives due to synergy effects could be expected advance security objectives as well. The paper provides a conceptual definition of safety and security and presents a framework of their essential components. Key differences are discussed. A safety framework is examined with the intent to identify security elements potentially covered. Vice versa, a security framework is examined with the intent to identify safety elements potentially covered. It is concluded that Synergies exist at the mitigation level. At the strategic policy level, synergies are obvious. Synergies are largely absent at the preventive level. The security of chemical facilities is important. First, facilities with large inventories of toxic materials could be attractive targets for terrorists. The concern is sabotage causing an intentional release that could endanger neighbouring populated areas. Second, facilities where high-risk chemicals are present could present opportunities for theft. The concern is that relatively small amounts of highly toxic chemicals could be taken to another location selected for higher impact. The Directive on European Critical Infrastructures (ECI Directive) addresses facility security but does not cover the chemical sector. Chemical facility safety at EU level is addressed by way of the Seveso-II Directive. Preliminary estimates by the chemical industry suggest that perhaps 80% of the existing safety measures under Seveso-II would also be instrumental in terms of raising security. This paper finds no support for the idea that such strong synergies exist at chemical facility level.

1. Introduction

1.1 Background

The purpose of this paper is to examine the extent to which existing provisions and practices related to enhancing chemical facility safety can be expected to serve the dual purpose of also enhancing chemical facility security.

The context is the growing concern about terrorism which has led to various initiatives to counter the threat from terrorists accessing toxic industrial materials (TIMs) and misusing these for terrorist attacks. The Directive on European Critical Infrastructures (ECI Directive) addresses facility security but does not cover the chemical sector.

Industries that hold large inventories of TIMs are already subjected to much safety legislation in order to control the risks of accidental (unintentional) exposure. Chemical facility safety at EU level is addressed by way of the Seveso-II Directive. Preliminary estimates by the chemical industry (IMPROVE 2010) suggest that perhaps 80% of the existing safety measures under Seveso-II would also be instrumental in terms of raising security. Synergies of this magnitude could have policy implications, implying little need for a new security regulatory regime. An examination of the relationship between safety and security is therefore warranted.

In 2012, the European Commission launched a study on the applicability of existing chemical industry safety provisions to enhancing security of chemical facilities. This paper presents some preliminary analytical findings from this study.

1.2 Key differences between safety and security

The key distinction between safety and security relates to malicious intent. Preventive safety precautions relate to the prevention of accidents, i.e. prevention of unforeseen and unplanned events with lack of intention

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or necessity. In contrast, preventive security is the degree of protection against danger, damage, loss, and crime.

Preventive safety analysis techniques aim at identifying vulnerabilities in the design and control philosophy of a chemical facility, in particular situations where the failure of a single component could lead to an excursion of the design parameters. The common method to improve safety is by introducing redundant components. Mitigation safety analysis aim at limiting the amount of material released, for instance the ability to detect a release, close valves and isolate flow to the damaged section; or otherwise reducing the consequences of a release, for instance activating water curtains to disperse or absorb vapours.

In contrast, preventive security analysis techniques aim at identifying vulnerabilities to an adversary attack, be it vandalism or terrorism. Security measures therefore generally relate to physical protection. This includes safeguarding of an asset from unauthorized access and acts of malevolence, as well as surveillance of the site property and security force response capability.

Generally, the concept "risk" expresses a combination of frequency of an unwanted event and the extent of the consequences (Christensen et al. 2003). Within the safety domain, risk is usually expressed as

Safety Risk = Likelihood of accident × Consequence

In contrast, within the security domain risk is usually expressed as (McIntyre 2008)

Security Risk = Threat × Vulnerability × Impact

The differences are profound. Within the safety domain, it is a fair assumption that failures occur randomly and the likelihood of failures can be estimated using statistical methods. In contrast, within the security domain, likelihood estimations present a challenge. Because of the human element - the fact that humans plan, rehearse, learn and modify in order to optimize the attack effectiveness - the events are not random and many of the required mathematical assumptions cannot be met. Human behaviour is difficult to predict and providing a quantified prediction of human behaviour is an even more difficult task (Sandia 2008). The nub of the problem is the unpredictable nature of terrorism and the terrorists' deliberate efforts to do what is least expected -- that is, to defy prediction (Schierow 2006).

Consequently, this paper argues that while facilities are able undertake a safety risk analysis, they are unable to undertake a security risk analysis, for how should the facility be able to estimate the likelihood of an adversary attack? Information on threats and the capability and determination of adversary groups is scarce, the threat situation is dynamic, and the information sits with the intelligence agencies. Facilities can only examine the site specific vulnerabilities to adversary attack - a so-called security vulnerability analysis (SVA) -- not the risk.

2. Defining chemical facility security

2.1 Security methodologies from the USA

The USA has produced several guidance documents and codes for facility security, which are available in the public domain. The American Chemistry Council introduced a security addendum to the Responsible Care programme less than a year after the 2001 attack on the World Trade Center (ACC 2002). Later, the American Petroleum Institute issued a security vulnerability assessment methodology for the petrochemical industries (API 2004). The US department of homeland security has developed a web-based chemical security assessment tool (CSAT) (DHS 2008) and a set of chemical facility anti-terrorism performance standards (CFATS) (DHS 2009).

2.2 The German Baseline Protection Concept

Germany has developed a security concept and methodology known as the Baseline Protection Concept (BMI 2006) which aims to provide guidelines for infrastructure operators to develop protection measures. The guidelines cover the methodology for adopting protection measures and on minimum protection requirements.

A sample checklist is provided to assist private sector operators in completing or upgrading their infrastructure protection plans in practice. Since special aspects relating to individual locations and situations cannot be

taken into account, the disclaimer says, the aspects covered in the checklist must be adapted and supplemented according to the specific needs.

Despite such caveats, the checklist is elaborated to great detail. Examples are:

- Are cellar windows equipped with certified security grids corresponding to resistance class 5 at least in accordance with DIN 18106?
- Are windows without bars equipped with intrusion-resistant fittings of at least resistance class WK 5, projectile-resistant laminated safety glass (in accordance with DIN EN 356, resistance class P 6 A), lockable window handles and screwed-on glazing retaining strips?
- Do all external doors comply with resistance class WK 5 in accordance with DIN ENV 1627?

However, such concepts developed for critical infrastructures covered by the European ECI Directive may present limitations for chemical facilities. First, some EU Member States interpret critical infrastructures in terms of non- interruptibility of service, whereas the concern for chemical facilities would be protection of neighbour communities from chemical releases. Second, while important, the priority is not only to restrict physical access to large facilities (protection) but also to be able to detect if theft has taken place and determine what substance has been stolen, in which quantity and subsequently alert law enforcement agencies. The Baseline Protection Concept is silent on this issue. The CFATS guidelines specifically address the ability to resolve inventory shortages.

2.3 Chemical facility security elements, defined

In order to examine possible synergies between safety and security, essential security components must be defined. Two distinct categories of chemical facilities can be identified. (1) Facilities where toxic industrial materials are present and from which they could be stolen or otherwise obtained. (2) Facilities which because of large inventories and a location in vulnerable surroundings could be attractive targets for terrorists. Table 1 presents a non-exhaustive listing, defining some security components for the two types of facilities.

Table 1 Selected components of chemical facility security.
Note: SVA = Security Vulnerability Analysis

	Category of chemical facility	
Facility	**Facilities with toxic industrial materials (TIMs)**	**Facilities with TIMs that are targets in themselves**
Concern	• Theft of TIM, misappropriation elsewhere (metro system etc)	• Attack with destructive force, intentional release of TIM endangering the nearby community
Perimeter	• Fences and gates, access control	• Fences and gates, access control • Vehicle barriers • SVA
Building	• Stored under lock	• Target hardening • SVA
Intrusion response	• (not required)	• SVA

Inventory control and response	• Procedures that identify, investigate, and resolve shortages • Procedures for reporting shortages to law enforcement agencies	• SVA
Cyber security	• (not required)	• SVA
Onsite emergency response, release reduction, release mitigation	• (not required)	• Written plan, rehearsals • SVA
Offsite emergency response, crisis management,	• (not required)	• Written plan, rehearsals • SVA

3. Examination of synergies

3.1 The EU Seveso Directive's safety provisions

In response to some major industrial disasters the EU Seveso Directive came into existence in 1982 to control the safety of facilities that store or process dangerous substances (82/501/EEC). The main requirements of the Directive relate to prevention and mitigation. First, the facilities must engage in industrial accident prevention work, systematically identifying and assessing hazards and taking the necessary safety precautions. Second, steps shall be taken to limit the consequences of an accident, should it occur despite the precautions taken, for instance invoking emergency plans to limit the release or activating a pre-planned emergency response.

3.2 OECD guidelines

In 2003, OECD issued the second edition of its guiding principles for chemical accident prevention, preparedness and response. The aim is to set out general guidance for the safe planning and operation of facilities, to prevent accidents and, to mitigate adverse effects through effective emergency preparedness, land-use planning, and accident response.[1]

3.3 Security elements potentially covered by chemical facility safety provisions

Selected safety elements from Seveso II and OECD are presented in Table 2 below. Each element is annotated with an interpretation of the typical scope of the safety provision and an assessment of how it could serve the dual purpose of also addressing security.

[1] The 2003 OECD guideline covers some security elements, the subject was given additional attention in a 2011 addendum

Table 2 Examination of security elements covered in some safety provisions

Safety provisions	**Interpretation of typical scope**	**Assessment of security elements (potentially) covered**
Safety policy	A Seveso II requirement. Example elements are: To prevent accidents and provide adequate control of risks; to provide adequate training; to engage and consult with employees, etc	The policy concerns prevention of accidental (unintentional) events. Security elements not covered
Safety Strategy and Control Framework	Typical control elements comprise: formal management of change not to introduce errors into a good design; a formal permit to work system (PtW) to coordinate and manage staff; a mechanical integrity program (e.g. corrosion monitoring); etc	Concerns prevention of accidental (unintentional) events. Security elements not covered
Safety management systems	A Seveso II requirement. Safety management systems will often employ a Deming Circle (plan-do-check-act) to define and implement the control framework.	Security elements not covered
Hazard Identification and Risk Assessment	A Seveso II requirement. The purpose of a hazard identification is to list potential release concerns	A hazard identification step is the starting point for a list of possible targets -- overlap with security
	Risk assessment employ frequency analysis, assuming random failures of components	Security elements not covered
Inspections, audits, reviews	Typical inspections deal with workplace tidiness, corrosions monitoring,	Security elements not covered
	Typical audits relate to adherence to work to permit procedures, if preventive systematic risk reviews have been carried out,	Security elements not covered
	Typical technical reviews relate to overpressure protection, liquid slugs, adequacy of blow down facilities	Security elements not covered
Maintenance and repairs (incl. screening of personnel)	Safe maintenance is managed by work permit systems and efficient de-energizing of systems prior to starting the work	Security elements not covered
	Safe repairs are managed according to procedure, using certified welders, controlled annealing of HAZ zones, reassembling and fastening equipment according to procedure and specification, carried out by competent personnel	Security elements not covered
Design, layout, construction of facilities	Safe design is according to standards and good engineering practice; with redundant preventive risk controls	Security elements not covered

Safety provisions	Interpretation of typical scope	Assessment of security elements (potentially) covered
	Safe layout traditionally aims to prevent accident escalation	Overlap with security is possible (if it leads to reduced vulnerability to intentional acts)
	Safe construction is weld management and control of construction materials	Security elements not covered
Land-use Planning	A Seveso II requirement. Good land use planning keeps population away from hazardous installations	Very clear overlap with security
Procedures, personnel, internal communication, education and training, human factors	Competent personnel may spot mishaps at an early stage and stop an accident in its tracks	Security elements not covered
	Competent personnel may in some cases mitigate the effects of an intentional act of vandalism	Overlap with security is possible (emergency preparedness)
Emergency preparedness and planning	A Seveso II requirement. Emergency preparedness aims to mitigate the effects of a release, regardless if it is intentional or accidental	Very clear overlap with security
Communication with and information to the Public	A Seveso II requirement. General knowledge enables citizens to take adequate protective measures in case of a toxic release	Very clear overlap with security
Incident reporting and analysis	A Seveso II requirement. Reporting criteria are based on damage, however, only "accidents" are reportable	Security incidents probably not reportable -- depends on interpretation if terror act is an "accident"
Contractor evaluation, selection, training and control	Safe contractor management aim to have competent hired-in personnel that knows procedures for alarm initiation and evacuation	Security elements not covered

3.4 Safety elements potentially covered in a chemical facility security framework

The checklist in the German Baseline Protection Concept offers an opportunity to examine the extent to which safety elements are covered in a security framework. While the perspective is slightly different, if security measures enhance safety, not if safety measures enhance security, the results of this analysis are instructive.

Each security checklist item was simply categorized as potentially benefitting or not benefitting safety. Results are shown in Table 3. Slightly more than one out of four items would have the dual effect of also enhancing safety. The synergies are mainly within emergency planning, organization and risk management. Some checklist items covered protection against natural phenomena (e.g. flooding), they were counted as synergies

It is noteworthy that negative synergies were identified. They relate to restriction of information, either information on where the toxic material is located at the facility (warning placards), which is a mandatory requirement in most countries, or restriction of information to the public, which is contrary to several right-to-know initiatives. The security concern is that the information could be useful to terrorists.

Table 3 Examination of safety elements covered in the German security concept, (Baseline Protection Concept)

Checklist category	Number of checklist items	Synergy	Negative synergy	Unclear
1. Protection of facilities and installations	69	7	1	1
2. Personnel	9	0	0	0
3. Organisation	30	10	1	3
4. Risk management	9	6	0	3
5. Emergency planning and contingency planning	14	13	0	0
Total	131	36	2	7
Percent	100%	27%	2%	5%

4. Mapping safety-security overlaps

Barrier diagrams are useful for a broad initial mapping exercise of overlaps between the safety and the security domain. A barrier diagram in its most basic form is shown in *Figure 1*.

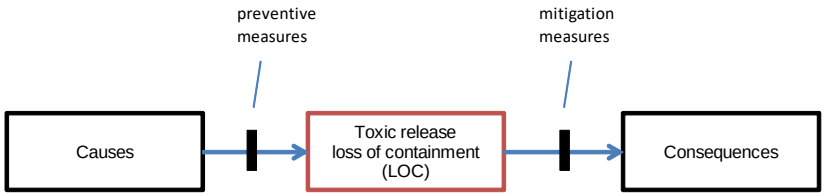

Figure 1 *A basic barrier diagram showing causes and consequences of a toxic release from a high risk chemical facility and measures related to prevention and mitigation*

Figure 2 shows a barrier diagram that has been modified to reflect concerns from the effect of random equipment breakdowns and human error (safety) and concerns from human intent on causing damage and harm (security). The preventive barriers for safety condenses the analysis in **Błąd! Nie można odnaleźć źródła odwołania.**, emphasizing that safety is achieved through systematic application of redundancy, mechanical integrity and programmatic practices related to the execution fo the work. In contrast, the preventive barriers related to security relate to physical protection and access restrictions. While the exposition is simplified is serves to show that synergies are largely absent at the preventive level.

At the mitigation level synergies are obvious, the value of emergency response efforts and the general knowledge of the public to take adequate protective measures in case of a toxic release are beneficial both for accidental and intentional releases of toxic chemicals.

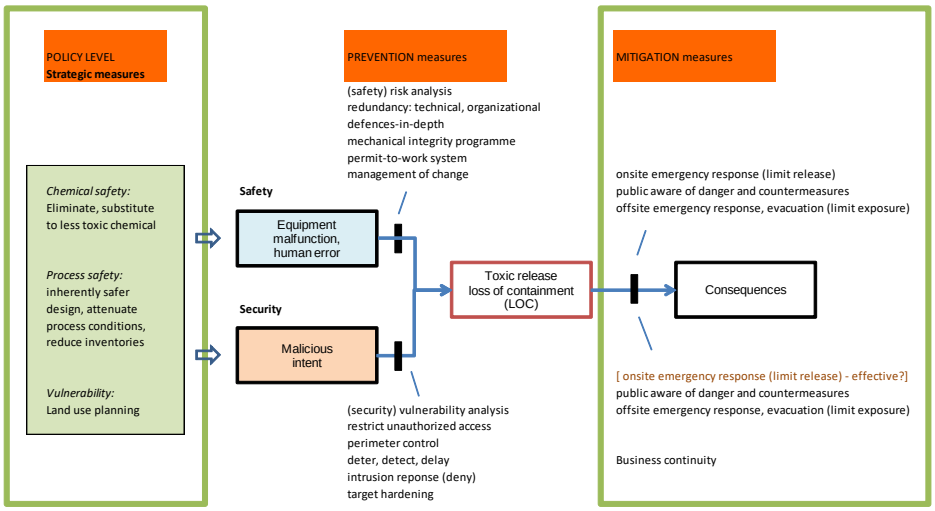

Figure 2 *Barrier diagram shows that barriers related to prevention are different for the safety and the security domains, while barriers related to mitigation are largely the same. Prevention measures at the strategic level are equally beneficial for both safety and security. Green boxes mark synergies.*

At the strategic level, synergies are obvious:

– *Chemical safety: Eliminate, substitute*: A general chemical safety strategy aimed at elimination of dangerous chemicals, or the substitution to less dangerous chemicals. This equally benefits security, see e.g. Orum (2008) for an excellent exposition of this topic.

– *Process safety: Inherently safer design:* A general chemical process design safety strategy advocated e.g. by Kletz (1984), simplify, reduce inventories, attenuate process conditions (pressure, temperature etc) to lower the hazard.

– *Vulnerability: Land-use planning*: A general strategy to ensure that facilities with major hazard potential are located at distance from the general population to minimize the offsite consequences (impact) of an uncontrolled event.

The Venn diagram in Figure 3 maps synergies from a legislation perspective. The three domains presented are (1) chemical facility security legislation, (2) major accident hazard legislation (Seveso II) and (3) chemical workplace safety legislation. The Venn diagram illustrates that the hazard mapping activity is common for both the safety and the security domain, a clear synergy. Measures to protect unsuspecting individuals from accidental exposure to workplace chemicals (keep under lock) benefit both safety and security, also a clear synergy.

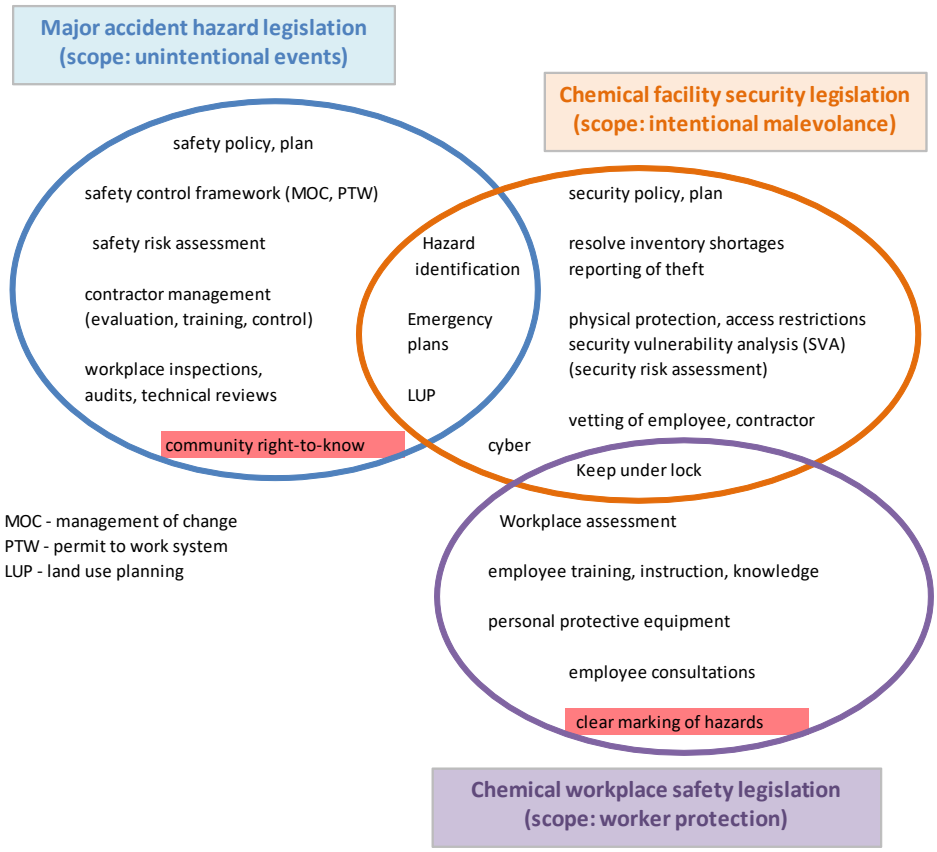

Figure 3 *Mapping overlaps between elements within the domains of chemical facility security provisions, major accident hazard provisions (Seveso II) and chemical workplace safety provisions*

Figure 3 also illustrates that there are relatively few overlaps between the safety and the security domain. Important security elements are left unaddressed in safety legislation and, vice versa, important safety elements not covered in the security domain.

5. Concluding remarks

A complex relation exists between the chemical facility safety and security domain. Within some areas there are evident overlaps, or synergies, with the two domains supporting each other. Within a few areas, priorities are incompatible, leading to conflict. Most of the time, there is limited or no overlap between the two.

The strongest synergies exist at the strategic level. The general chemical safety strategy aimed at elimination of dangerous chemicals, or the substitution to less dangerous chemicals equally benefits security. Inherently safer design strategies (simplify, reduce inventories) also clearly benefit security. Vulnerability reduction strategies by means of land-use planning to keep communities away from hazardous installations similarly present strong synergies.

Regarding preventive measures at chemical facility level, overlaps are minimal. Preventive safety is achieved through systematic application of redundancy, mechanical integrity and programmatic practices related to the safe execution of work. In contrast, preventive security relates to physical protection and access restrictions.

It is noteworthy that negative synergies were identified. They relate to restriction of information: Either information (warning placards) on where the toxic material is located at the facility, which is a mandatory requirement in most countries to warn unsuspecting workers; or restriction of information to the public, which is contrary to several right-to-know initiatives, to support local democracy. The safety objective is that facility

knowledge enables citizens to take adequate protective measures in case of a toxic release. The security concern is that facility knowledge could be useful to terrorist.

Major synergies exist at the mitigation level, in particular concerning effective emergency response. The relation is complex however. Within the safety domain, only consequences of "credible worst-case" scenarios may have been considered in emergency planning efforts. This may be perfectly defensible from a safety risk point of view if abundant redundant safety measures make the likelihood of a severe accidental scenario negligible. The safety reasoning, however, ignores the situation with a determined and capable adversary attacker -- the security risk may therefore be much different.

It is important that these issues are identified, that benefits from synergies are supported, that negative synergies are resolved, with the overall policy objective to ensure safe and secure chemical facilities.

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INTERPOL CBRNE Terrorism Prevention Programme

Björn McClintock [*]

Introduction

As the world's only global law enforcement organisation, INTERPOL has a leading role to play in helping its 190 member countries meet the challenge of chemical terrorism by providing qualified support to law enforcement agencies around the world.

Terrorism that makes effective use of chemical, biological, radiological, nuclear and explosives-based (CBRNE) materials is commonly considered to be the worst-case scenario of all potential terrorist attacks. Given that the threat posed by chemical and explosives-based terrorism is a serious concern for all INTERPOL's 190 member countries, INTERPOL recently launched a specialised unit to address these issues: the Chemical and Explosives Terrorism Prevention (ChemEx) unit.

The ChemEx unit – which was launched at the INTERPOL Chemical and Explosives Terrorism Prevention Global Conference in Tallinn, Estonia, on 18-19 September 2012 – will be part of the INTERPOL CBRNE Terrorism Prevention Programme. The creation of the ChemEx unit under the CBRNE umbrella is a vital complement to both the already existing Bioterrorism Prevention Unit (BioT) and the Radiological and Nuclear Terrorism Prevention Unit (RadNuc). Moreover, the formation of the ChemEx unit constitutes the final pillar in the structure of INTERPOL's CBRNE Programme, thereby compounding INTERPOL's ability to proactively address the global threat of CBRNE terrorism in a more comprehensive and efficient way.

INTERPOL's role and the way forward

INTERPOL is uniquely positioned to provide significant support to the police services of its 190 member countries in preventing chemical terrorism by employing a threat-based, intelligence-driven and prevention-oriented approach. INTERPOL's CBRNE Terrorism Prevention Programme provides support through criminal intelligence analysis, capacity building and training programmes, as well as operational assistance.

The ChemEx unit will draw upon subject-matter expertise within the field of chemical terrorism prevention through a specialist officer (the ChemEx Coordinator) as well as through a global network of experts. Since the threat posed by chemical and explosives-based terrorism is of a global nature, this use of expertise will have positive outcomes for member countries with more developed chemical terrorism prevention programmes, which might traditionally not have relationships with those countries with which they wish to engage. In addition, this cooperation with national experts would enhance the prevention abilities of countries that currently have not developed their own national prevention measures. INTERPOL would in this regard act as a mediator for relationship enhancement and programme delivery.

Although there is a desire from the developed law enforcement agencies to provide international assistance within the CBRNE area, there is currently no existing coordinated law enforcement regime on a global level. The creation of the ChemEx unit will assist in bridging this gap by serving countries with significant capabilities to enhance their support to countries with less developed capabilities – particularly in view of the fact that INTERPOL is well known as an efficient conduit to police services worldwide.

The goals of INTERPOL's CBRNE Terrorism Prevention Programme

The establishment of a ChemEx unit enables INTERPOL to better support member countries' police services in responding to and preventing the threat posed by malicious acts involving the use of chemical materials. The following goals are cornerstones of the INTERPOL CBRNE Terrorism Prevention Programme: to prevent the initial terrorist attack; to respond effectively to an attack; to prevent follow-on attacks; and to do so in a manner that respects the rule of law.

Consequently, INTERPOL's ChemEx unit will be focusing on these four fundamental goals in the relevant areas of the chemical and explosives modalities:

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1. *Preventing an attack*

Prevention will be the thrust of the programme. The cost of prevention is worth the investment compared to the cost of dealing with a full-scale CBRNE attack. For example, the Anthrax case in the United States resulted in a temporary shutdown of the postal system and cost a total of 1 billion dollars in response and investigation. If governments decide to spend even a fraction of this on preventative measures, much will be gained. By working proactively to address the threat, instead of reactively in dealing with the consequences, police agencies can prevent the occurrence of both economic damage and, more importantly, human suffering.

2. *Addressing the attack*

If prevention fails, authorities need to be able to address the attack. INTERPOL will assemble a panel of law enforcement experts in the chemical area and specialists who can provide qualified scientific support in the event of an attack. Today, many police departments around the world have expertise in HAZMAT transportation and decontamination procedures. However, the law enforcement community must prepare for all eventualities; cooperative procedures need to be in place to mitigate the consequences of an attack, including human suffering. In managing both the prevention and the aftermath of a CBRNE attack, an inter-ministerial and inter-agency collaborative approach is of vital importance.

3. *Preventing follow-on attack(s)*

If an initial attack occurs, law enforcement agencies must be prepared to prevent any follow-on attacks. Experience from previous CBRNE-attacks tells us that one incident is often followed by others. By anticipating follow-on attacks, tightening security measures and increasing surveillance efforts, as well as collecting information on the perpetrators and their modus operandi, law enforcement agencies will be better prepared to avert further attacks.

4. *Bringing perpetrators to justice*

Terrorism is essentially a criminal act with a political motive, which makes it ever more important for law enforcement agencies to arrest, prosecute and convict the perpetrators within the rule of law. While preventing loss of life is paramount, the actions taken to address incidents should be on a par with the criminal acts involved and not play into the hands of terrorists by setting aside fundamental principles of justice.

INTERPOL's added value in combating chemical terrorism

As the only truly global police organisation, INTERPOL can play an important role in the prevention of incidents involving the malicious use of toxic industrial chemicals. The consistent level of criminal activity involving chemical materials suggests that INTERPOL can have an active role in supporting member countries with their investigations and with the exchange of information. INTERPOL is also in a position to provide global analysis on current trends in chemical terrorism. With regard to capacity building and training courses, INTERPOL has extensive experience of providing training to national police agencies all over the world. As part of its regular operational police support capabilities, INTERPOL can facilitate communication and exchange of information among national police forces; check a range of data against INTERPOL-databases, including DNA and fingerprints; and deploy an Incident Response Team (IRT) to assist member countries with emergencies and investigations.

There are a number of international agencies working in the field of chemical terrorism. INTERPOL recognises the need to deliver its services in a consultative and collaborative fashion in order to minimise duplication of effort and to ensure that INTERPOL's efforts are complementary and inclusive. In this regard, the ChemEx unit will be able to provide the following main services for INTERPOL's member countries: criminal intelligence analysis; capacity building; and operational and investigative support.

- *Criminal intelligence analysis*

  In November 2012, INTERPOL is publishing its first joint CBRNE Intelligence Report, which provides law enforcement officers and specialists with an overview of recent CBRNE-incidents, a report that will continue to be published on a monthly basis. Furthermore, INTERPOL also publishes Orange Notices, which alert law enforcement officers to any new or imminent threat. One of the first Orange Notices that INTERPOL published was on the *Mubtakkar* device – an improvised chemical device designed by Al Qaeda to disperse hydrogen cyanide in the New York subway system.

- *Capacity building and training*

INTERPOL is also able to provide training for law enforcement officials and other first responders so as to ensure a comprehensive and structured approach in preventing CBRNE attacks. It is important for INTERPOL to conduct and promote awareness training on both the local and national levels. By establishing countermeasures and trip wires and developing relationships with representatives from the chemical industry – ranging from the local hardware stores to the major chemical companies – the law enforcement community will also gain both a local and a national view of vulnerabilities in the chemical area. It is essential to create public-private partnerships founded on mutual trust. Furthermore, universities, laboratories and other sectors in the scientific community need to be included in these educational efforts.

– *Operational and investigative support*

The criminal case begins when the suspects or CBRNE-materials start to move. Since materials, money, information and individuals are highly likely to cross national borders, INTERPOL is in a unique position to connect national law enforcement agencies and to facilitate cross-border cooperation. After an attack has taken place, it is essential to start gathering forensic evidence at the crime scene. This will require police officers to have knowledge of specialised CBRNE-forensics while paying particular attention to the personal protection equipment of the police officers while they are trying to identify chemical agents and gather evidence. In the event of an attack, ChemEx is also available to staff an INTERPOL Major Events Support Team (IMEST), which is for mass gatherings such as sporting events, or an Incident Response Team (IRT), which can be deployed at short notice. In July 2012, the CBRNE Terrorism Prevention Programme had its first deployment with an INTERPOL IRT to assist with the investigation of the bomb attack in Burgas, Bulgaria.

Last, but not least, information exchange among national agencies is of the utmost importance to prevent an attack from taking place. National agencies need to work together and ensure that they can cooperate effectively. This can be validated by conducting regular training exercises on the local, regional, national and international level. INTERPOL's CBRNE Programme already has a well-functioning cooperation with international organisations – such as the International Atomic Energy Agency (IAEA) and the World Health Organisation (WHO) – when it comes to radiological, nuclear and bio-terrorism prevention – as well as with a group of national experts. On the chemical terrorism prevention side, the Organisation for the Prohibition of Chemical Weapons (OPCW) can be a strong partner in terms of providing access to expertise within academia and the chemical industry. However, sharing sensitive information – and acting upon it – takes time and practice, as it also requires trust in our partners and their ability to maintain confidentiality and to properly utilise sensitive information. Nevertheless, in order to successfully combat transnational criminal enterprises and terrorist organisations, it is imperative that we work together. In this regard, INTERPOL connects police forces globally for a safer world.

WINS' experience in promoting nuclear security

Jadallah Hammal [*]

Abstract: This paper sets out the programme specification for establishing a WINS ACADEMY to promote security leadership and establish Nuclear Security Management as a recognised and regulated Profession. We believe that promoting professional development at all levels of nuclear-related organisations is the future mission for WINS and the most effective way of enhancing nuclear security worldwide.

The strategy to date and associated achievements

WINS' strategy over the first 3 years has been to establish its international reputation by producing excellent Best Practice Guides on a range of practical nuclear security related issues and by running effective and innovative workshops that support the production of the Guides. By the end of 2011 and in line with its commitments, WINS ran over 25 International workshops on five Continents, produced over 25 Guides and produced the Compendium of Best Practices for Nuclear Security Management, which is targeted for distribution at the Nuclear Security Summit (NSS) in Seoul in March 2012. The work to share best practices is aligned to the NSS work plan and is a tangible contribution to the NSS process.

WINS has achieved broad international and political recognition, grown its Membership to almost 900 organisations and individuals, developed an effective website and has largely completed its foundation work on Best Practice Guides. We have focused on outreach and products, funded by Foundations and Governments, and our philosophy has been to provide best practice guidance free of charge to members. We have intentionally avoided complex membership rules and the associated bureaucracy.

Future strategy

This paper sets out the work necessary to achieve the goal of having a WINS ACADEMY operating successfully within the next two years.

Why a WINS Academy?

Our work on Best Practice Guides and interaction with industry and other nuclear security practitioners has highlighted a stark fact; security managers need no formal training and there is no such thing as a Nuclear Security Professional.

There are no accredited courses and no structure of required competences for the "profession". The work is performed by a mixture of ex-police, ex military and/or general managers. As far as we are aware, none of the Nuclear Regulators have specified any requirement for nuclear security personnel at management level to hold any nuclear security accreditation. There must be a presumption amongst regulators and industry leaders that securing a nuclear site is no different from securing an Airfield or Army Base, and that police qualifications and training are sufficient for the role, supplemented by on the job training. And, as far as we can tell, Regulatory staff need no accreditation either and reflect the same group of ex-professionals, so the system becomes mutually reinforcing and contributes to the isolation of the security function from mainstream organisational goals, oversight and culture.

There is, however, a growing recognition of the need for "Training and Education" in nuclear security, and a number of countries are establishing so-called Centres of Excellence (CoE) which appear to focus on nuclear safeguards, safety and security. The IAEA is attempting to co-ordinate these efforts through two separate networks and WINS is involved with both, as an adviser and Chair of one of the key working groups.

The IAEA has established a core curriculum for a two-year full time Master's Degree in Nuclear Security and a one-year Certificate in the same subject and is working with Universities to populate the curriculum. The curriculum is extremely broad and has identified Statistics and Nuclear Physics courses as prerequisites for the Master's course. This work has taken about 4 years to reach this stage. The IAEA has also recently

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launched a web "Portal" to encourage collaboration between the different entities involved, who are being asked to submit details of their courses so that there is visibility of State efforts to develop Training and Education.

Our assessment is that these efforts are to be broadly welcomed but that they lack focus and realism for people in full time jobs. In today's world, nuclear security practitioners do not have the time, support or resources to spend two years in full time education, not least because there is no structured career path or accreditation for nuclear security that would justify the time. The IAEA will not be accrediting any of the courses; this will be left to individual universities or institutes in Member States, as they see fit.

We also believe that the curricula are too broad and technical and intended as a "one-size-fits-all" – rather than using an approach which is based on what people with accountabilities for nuclear security need to do their jobs, to make nuclear security as effective as possible.

Job-task analysis has been used by some nuclear organisations (Bruce Power being the best example) to define the training that is required for Security Guards and we have promoted that approach in our Best Practice guidance.

We therefore believe that WINS could make a significant contribution by establishing a mechanism for promoting Professional Development (PD) in the nuclear security field and to create an environment that leads to the recognition of the Nuclear Security Manager as a recognised and regulated profession and to ensure that other key organisational positions (such as design engineers, safety management, Senior Management, off-site armed response agencies, etc) have PD materials available to them.

We can try and do this in a number of ways. Just as WINS successfully challenged the belief that nuclear security best practices cannot be discussed because of confidentiality, WINS can challenge the *status quo* regarding the professional status of nuclear security managers and catalyse change. We have started to do this through policy papers, speeches, input into the Nuclear Security Summit process and other outreach activities including working with INPO and WANO.

The key question is whether we simply aim to sensitise people and organisations to the issue and the need for change or if WINS does this **AND** takes the lead to develop the international framework for accreditation and the necessary competency-based training materials - essentially to develop the "WINS Seal of Approval" for professional development.

We believe that WINS needs to take the lead and to have the WINS ACADEMY established within the two year period. We also believe that the concept of the WINS ACADEMY will appeal politically; not only does it convey the right image and standard but it will also make good financial sense to establish the competency-based training materials once for adoption by the COEs and other establishments/institutions that are involved with training.

Hand in hand with the development of the WINS ACADEMY we must get an acceptance by the nuclear industry and its regulators that the peer review of security oversight, as an integral part of the nuclear safety/emergency planning/response arrangements is an acceptable and necessary development. We know that both INPO and WANO have been considering their response to the Fukushima incident and that an opportunity exists to Influence changes. If regulators and industry accept this requirement it will only be a matter of time before the peer review process highlights the lack of professional development in the security management of both types of organisation and will then see the need for a framework with which to address the problem, just as INPO did from the 1980's in relation to nuclear safety. It was announced on the 22nd February that WANO and WINS will form a collaborative working group to examine the interface between nuclear safety and security and this is a vital step forward.

What will the academy do? How will it work?

The Vision of the WINS ACADEMY will be - To Enhance Nuclear Security Leadership and Professional Development, Worldwide.

Its Mission will be - To Provide World-Class, Accredited, Competency-Based Training for Nuclear Security Professionals.

Both of these are entirely consistent with WINS' Vision and Mission and a logical extension of the first phase of WINS' work to develop International Best Practices.

The WINS ACADEMY will develop and provide what the Vision says – a suite of competency-based training modules that are organised around specific roles amongst security-related practitioners, including non security personnel. We will ensure that these cover the obligations of operators/licensees as set out in INF/CIRC/225 and cluster them around different roles and responsibilities such as:

- Board Members and the Secretary to the Board
- Senior Management – CEOs/Chief Operating Officers
- Nuclear Security Directors
- Engineers (and Designers) and Scientists engaged in nuclear security-related activities or with nuclear security interfaces
- Nuclear Safety and Emergency Planning Managers
- Off-Site Response Force Management
- Guard Force Managers

The Professional Development (PD) materials produced by WINS will be based on a thorough understanding of the security competences required by different professional positions within typical nuclear organisations; so called job-task analysis. The competencies will be established by surveying nuclear professionals and taking into account, as much as possible, regional and cultural differences that affect the security competency framework. The security competency framework will be used as the basis for determining the knowledge and skill sets required for professional accreditation in nuclear security and for the design and production of the PD materials to a high, business school quality.

The PD materials are expected to be delivered to course participants in local languages in the most appropriate format; the local Centre or Institute will be responsible for translation. WINS' role will be to ensure that the Centres of Excellence include the fundamental WINS' materials in their courses in order to achieve and maintain accreditation from WINS. This approach will greatly enhance quality and sustainability and should also lead to significant cost savings for those governments and organisations that contribute to the funding of international nuclear security and training programmes.

In developing the PD materials, WINS will review existing materials that are currently being developed, in use, or under consideration by security training suppliers as well as those involved in providing local training, in order to establish the best practices and the most relevant content. This will include materials in use at more advance centres so that as much shared learning and transfer of knowledge can take place as possible. In that context, WINS has been appointed the Chair of the key Working Group on the International Network for Nuclear Security Training and Support Centres, coordinated by the IAEA, and will hold that position from February 2011 for 12 months, which will greatly facilitate the objectives of this work and ensure that the work being done by WINS is in close collaboration with IAEA initiatives.

WINS will seek and achieve relevant ISO Accreditation to support its reputation as an organisation that is competent to establish the WINS Academy and associated responsibilities for accreditation.

Programme stages

	WORKSTREAM	TARGET DATE
1	**Achieve ISO Accreditation for WINS** as a quality supplier to underpin the Academy concept and professional reputation	**December 2012**
2	**Build the Nuclear Security Competency Framework** through Job-task analysis, taking into account regional and cultural differences that affect competencies and behaviours. This will be achieved through regional roundtable discussions and interviews with relevant professional practitioners and with targeted surveys	**August 2012**
3	**Conduct an International Capability and Capacity Review** of existing educational and training materials for nuclear security at all relevant centres of excellence, institutes, (including both target countries and in other countries, where there is benefit from encouraging knowledge transfer) and identify and collate the materials, translating them as necessary. Assess the quality and relevance of the materials and encourage the sharing of best practices particularly where they have been funded by national governments.	**January 2013**
4	**Produce the WINS Academy PD materials**, and Identify and appoint partner organisations to assist with the production of the materials that will be produced to "Business School" standards and which allow for Course participants to be tested on their understanding and competence.	**January 2013**
5	**Select Centres of Excellence and Institutes for WINS Accreditation** and develop the accreditation processes and agreements, including oversight of standards and maintenance of standards that lead to sustainable and meaningful improvement in competency and professionalism. Identify and develop the "Aftercare" arrangements to maintain quality and focus, and provide opportunities for feedback and continuous improvement.	**May 2013**
6	**Implement WINS Academy PD Courses** at selected institutes and run any necessary Pilot courses to assist with implementation.	**June 2013**
7	**Promote the Value of Accredited Professional Development** to the international nuclear and government community (and organise specific events at relevant conferences such as INMM) to order to help build sustainable and meaningful improvements in nuclear security professionalism (rather than the alternative of unstructured and untested education and training courses) and help make the best use of government and other international funding.	**Throughout Programme**
8	**Establish Governance Arrangements for the WINS Academy** to ensure that it has the backing and support of key institutes.	**December 2012**
9	**Examine the Feasibility and Costs associated with providing WINS Accredited courses** via an e-platform.	**December 2012**

Protective equipment industry in support of CBRN security: proven solutions for safe decontamination against CWA and TICs

Dr. Stefano Miorotti [*]

Chemical risk today is not only related to CWA and CBRN. Industrial risk has also been named as an additional risk that we must be able to face at any moment. Preparedness, hazard management and multipurpose systems are keys words for facing them properly. Below risk factors and suitable technologies which have been approved and tested with OTAN/NATO standards will be described. Individual and collective protection systems are critical for being prepared to minimize and neutralize effects of contamination caused by accident, sabotage, neglect, natural disasters, terrorism or criminality.

Basic principles: the threats

1. Chemical contamination

Chemical contamination arises from the release of hazardous substances ranging from a relatively small number of chemical warfare agents to many thousands of toxic industrial chemicals. Chemical agents can have an immediate effect, however it is the more persistent agents, such as mustard blister agents, that can prove an enduring hazard, unless decontaminated as soon as practicably possible. The most prominent form of chemical release is, however, through accident or neglect with significant emphasis placed on emergency services to mitigate the hazard as quickly as possible. Release can vary from short term to those of a more enduring nature, often attracting considerable governmental, media and public interest.

2. Biological contamination

Biological contamination can take many forms and in terms of loss of life can be more devastating than the use of a nuclear weapon. While the deliberate and overt use of biological weapons by a State is probably less likely than the covert use of such weapons, many of the 'diseases' associated with biological weapons occur naturally in the form of epidemics and so, unlike a nuclear attack, a biological attack may be deniable, difficult to prove and may be wholly indiscriminate. There are numerous instances of extremists attempting to manufacture their own crude biological effects, with the internet providing the platform for acquisition of technical 'know how' as well as widespread publicity for any act of criminality or terror.

3. Radiological and nuclear contamination

While nuclear attack is a very low probability, it has a high potential impact and cannot be completely ruled out in the future. Of greater likelihood is the deliberate or accidental release of radiological materials. As such materials are found in many industries and in the medical and industrial fields, there is a risk of items finding their way into terrorist or criminal groups or unwittingly being disposed of in an inappropriate manner. The monthly INTERPOL round-up of incidents is testament to this. This could result in exposure to radiological penetration or contamination by radiological particulate.

Comments and suggestions

It seems appropriate to provide for CBRN decontamination and detoxification specific systems which can allow the phases of recovery, reconstruction and hazard management (remediation or demilitarization), in

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complete safety for both operators (whether they are NGOs or peace multinational forces) and for population safety.

Regarding the conventional risk concerning the discovery of large calibre ammunition it is advisable to use non-destructive methods of emptying which allow the safe demilitarization of the explosive devices. Among other benefits (time, safety of professionals, population and environment), there is the psychological benefit of avoiding further panic and discomfort to the population. These systems, called EOD 2000 (p/n 800020255 – N.S.N. 1385-15-151-0735), have already been supplied to the Italian Army and other OTAN Countries.

Concerning the environmental and chemical toxic risk, it is suggested the autonomous large capacity equipment SANIJET C. 921 (p/n 800020030 – N.S.N.4230-15-157-5553, see UP 948), that used with the decontaminant and detoxifying product BX 24 (P/N 240243 - N.S.N. 6810-15-149-4789), represents the best solution in terms of effectiveness and also in terms of multi-spectrum coverage to blended threats either deriving from homemade agents or from its precursors.
In fact, the BX 24 is a multi-spectrum and multi agent decontaminant, effective against CWA, BWA and also TICs.

The same might also be useful in chemical weapons plants demilitarization (1 kg of pure mustard gas can be neutralized with about 2 kg of product). Today, it is also used as personal protective equipment, provided by the OPCW inspection teams.

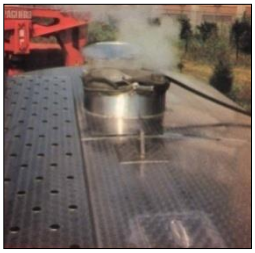
Moreover, the BX 24 combined with large capacity equipment SANIJET C. 921 allows missions to be accomplished directly within contaminated sites, by minimizing the environmental impact (*negligible*) and allowing the use by well trained local personnel too (in fact, to operate Sanijet C. 921, a few hours of training is sufficient).

The SANIJET C. 921 design criteria and hardiness allow minimum maintenance; associated spare parts and the same equipment are also particularly suitable to harsh environmental conditions of use, as well as, the lack of logistical organization.

Concerning the biological risk SANIJET C. 921 allows two options: the use in sanitizing operations through steam and usage of BX 24 as a sanitizer.

In addition, thanks to optional accessories which can be added, the equipment can be used:

- for the sanification of drinking water tanks
- for tanks degassing operations
- for fire fighting operations



Manual portable equipment such as PSDS/1,5 MIL (p/n 240440 – N.S.N.4230-15-203-0549) and PSDS/10 MIL (p/n 240407 – N.S.N. 4230-15-170-4160) can be used for immediate remediation, by using the decontaminant/detoxifying product BX 24, and allowing an increase of capabilities throughout the territory at low cost.

Last but not least, the technologies and the decontaminants indicated above may be used for mandatory preventive decontamination (as currently required by the existing applicable national and international interagency directives, with the aim to prevent risks deriving from the introduction of diseases which may endanger our zoological heritage), to be made before the return of equipment and materials used in hazardous areas.

Conclusions

Decontamination is one of the most important consequence management tasks to be carried out after release of CBRN Warfare Agents or Toxic Industrial Materials. Release may be due to a deliberate act during operations, by act of terrorism, criminality, accident, natural disaster or neglect. By demonstrating an effective decontamination capability, nations contribute to deterrence and stability while retaining the ability to respond to the unexpected.

Green Chemistry: equipping and strengthening chemical sciences for sustainable development

Prof. Jonathan Okonkwo [*]

Abstract: The new methods in agriculture and forestry, the high demand in consumer products, the use of chemicals in health programmes, and the expansion of industrial processes, have contributed to the dramatic increase in the production of chemicals. In fact every facet of modern life has been transformed by products of the chemical and related industries. However, some of the advances made in science and technology have brought with them negative consequences in complex mechanisms that have caused collateral environmental damage. Some of the environmental damage could be attributed to negligence and lack of knowledge, especially of the long-term effects of products entering into the environment. With an increased awareness for environmental protection, environmental pollution prevention, safer industrial ecology and cleaner production technologies worldwide, there is a heightened interest and almost a grand challenge for chemical science and allied industries to develop new products, processes and services in order to align with the current thinking of sustainable development. This current thinking of sustainable development that is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs", paved the way for green chemistry. The current study reviews the progress made so far in green chemistry towards the realization of sustainable development by giving real-world cases on atom economy, alternative feedstock, biocatalysis, green solvent, biosorption, energy and waste management.

The past 100 years or so have witnessed unprecedented change in the general way of living in many walks of life. Apart from all the political, economic, and social developments that have taken place, many of the key changes in society have stemmed from the numerous advances in science and technology. Some of the advances made include, but not limited to the following:

- *Pharmaceutical:* manufacture of drugs (pain killers, antibiotics, heart and hypertensive drugs);
- *Agriculture:* production of fertilizers, pesticides;
- *Food:* manufacture of preservatives, packaging and food wraps, refrigerants;
- *Medical:* disinfectants, vaccines, dental fillings, anaesthetics, contraceptives;
- *Transportation:* production of petrol and diesel, catalytic converters to reduce exhaust emissions;
- *Clothing:* synthetic fibres, dyes, waterproofing materials;
- *Safety:* polycarbonate materials for crash helmets;
- *Sports:* composite materials for rackets, all weather surfaces;
- *Office:* inks, photocopying toners;
- *Homes:* paints, varnishes and polish, detergents, pest killers

Some of these advances in modern society for the betterment of overall living conditions of humans, and to some extent for animals, have brought with them negative consequences in complex mechanisms that cause collateral environmental damage and are virtually irreversible. As well as air pollution and global warming, which are thought to arise from the ever-expanding use of energy, there are other problems of a global nature that may be grossly categorized as the following: environmental pollution of natural waters and soils, bioaccumulation of heavy metals and other harmful molecules in living biota including humans, unequal distribution of energy, and ecological disruption in several biospheres. Some of the negative consequences associated with chemical sciences, *inter alia*, include the following:

1956: Minamata disease was first discovered in Minimata city in Japan and was caused by the release of methylmercury in the industrial wastewater from a chemical factory;

1961: Itai-itai disease was caused by cadmium poisoning due to mining in Toyama Prefecture in Japan;

1976: The Seveso disaster was an industrial accident that occurred in a small chemical manufacturing plant near Milan in Italy. It resulted in the highest known exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin in residential population;

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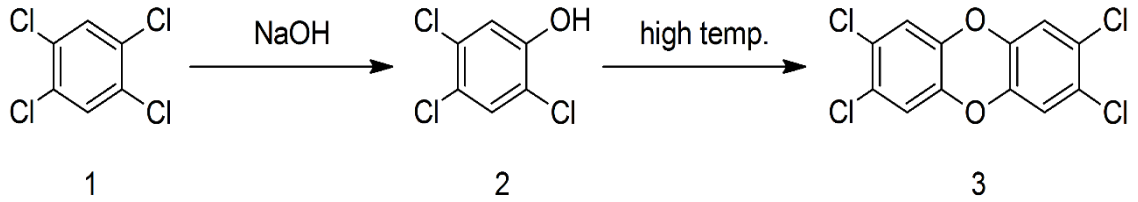


1984: The Bhopal disaster was an industrial catastrophy that took place at a pesticide plant owned and operated by Union Carbide (UCIL) in Bhopal India, resulting in the exposure of over 500,000 people. It was caused by methyl cyanate (MIC) gas;

1986: The Chernobyl disaster was a nuclear accident at the Chernobyl nuclear plant in Ukraine. It resulted in a severe release of radioactive materials. Most fatalities from the accident were caused by radiation poisoning;

1989: Exxon Valdez, an oil tanker hit a reef and spilled an estimated minimum 10.8 million US gallons (40.9 million litres) of crude oil. This has been recorded as one of the largest spills in United States history and one of the largest ecological disasters.

Historical

In 1990 the Pollution Prevention Act was passed in the United States. This act helped create a *modus operandi* for dealing with pollution in an original and innovative way. It aims to avoid problems before they happen. Paul Anastas, then of the United States Environmental Protection Agency, and John C. Warner developed the twelve principles of green chemistry, which help to explain what the definition means in practice. In 2005, Ryoji Noyori identified three key developments in green chemistry: use of supercritical carbon dioxide as green solvent, aqueous hydrogen peroxide for clean oxidations and the use of hydrogen in asymmetric synthesis. Ever since then, there has been a global acceptance of the principles of green chemistry in science and engineering. For example, in Australia, the Royal Australian Chemical Institute (RACI) presents Australia's Green Chemistry Challenge Awards. In Canada, Green Chemistry Medal is an annual award given to an individual or group for promotion and development of green chemistry, while in Italy green chemistry activities centre on the inter-university consortium known as INCA. Beginning in 1999, the INCA has given three awards annually to industry for applications of green chemistry. In Japan, The Green & Sustainable Chemistry Network (GSCN), formed in 1999, is an organization consisting of representatives from chemical manufacturers and researchers. In the United Kingdom, the Crystal Faraday Partnership, a non-profit group founded in 2001, awards businesses annually for incorporation of green chemistry. The Nobel Prize Committee recognized the importance of green chemistry in 2005 by awarding Yves Chauvin, Robert H. Grubbs, and Richard R. Schrock the Nobel Prize for Chemistry for "the development of the metathesis method in organic synthesis.

Green Chemistry and sustainable development

Green chemistry, often referred to as environmentally-benign chemistry, involves the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture, and application of chemical products (Kidwai and Mohan, 2005). In practice, green chemistry covers a much broader range of issues than the definition suggests (Lancaster, 2000). In addition to using and producing better chemicals with less waste, green chemistry also involves reducing other associated environmental impacts, including a reduction in the amount of energy used in chemical processes (Kidwai and Mohan, 2005). As a chemical philosophy, green chemistry applies to organic chemistry, inorganic chemistry, biochemistry, analytical chemistry, and even physical chemistry.

Over the past several years, international efforts in the field of green chemistry have greatly increased the hopes of combating the most pressing environmental problems such as water pollution, global warming and ozone depletion and others. The International Union of Pure and Applied Chemistry (IUPAC) and the management organization of Green Chemistry Institute have been working in collaboration with industry and other research institutions worldwide, to help solve pollution and related problems. Collective efforts in the field of green chemistry have made tremendous impacts on several industrial sectors in recent years. Since the types of chemicals and the types of transformations are very varied in the chemical industry and chemical research world, so are the green chemistry solutions that have been proposed. Anastas and Warner (1998) developed "The twelve principles of green chemistry," which serve as benchmark guidelines for practicing

chemists and engineers in developing and assessing how green a synthesis, compound, process, or technology is.

The twelve principles of green chemistry are as follows (Anastas and Warner, 1998):

- *Prevention*: It is better to prevent waste than to treat or clean up waste after it has been created.
- *Atom Economy*: Synthetic methods should be designed to maximize incorporation of all materials used in the process into the final product.
- *Less Hazardous Chemical Syntheses*: Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.
- *Designing Safer Chemicals*: Chemical products should be designed to effect their desired function while minimizing their toxicity.
- *Safer Solvents and Auxiliaries*: Use of auxiliary substances (solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used.
- *Design for Energy Efficiency*: Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure.
- *Use of Renewable Feedstocks*: A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.
- *Reduce Derivatives*: Unnecessary derivatization (use of blocking groups, protection/deprotection, and temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste.
- *Catalysis*: Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.
- *Design for Degradation*: Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.
- *Real-Time Analysis for Pollution Prevention*: Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.
- *Inherently Safer Chemistry for Accident Prevention*: Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.

To better understand and solve the issue of environmental pollution, many approaches and models have been developed for environmental impact assessments. Some of these approaches and models have been successful in predicting impacts for selected chemicals in selected environmental settings. These models have joined air and water quality aspects to point and nonpoint sources and have been very useful for the development of emission control and compliance strategies (Mihelcic et al., 2003). However, some of the approaches and models were aimed primarily at evaluating the quantity of pollutants that could be discharged into the environment with acceptable impact, but failed to focus on pollution prevention as well as develop mechanistic understanding of how pollutants are initially formed and released. Furthermore, those involved in developing strategy for pollution and waste control assumed that pollutant generation and release were a normal part of industry. Also, as time went on, the concept of end-of-pipe approaches to waste management decreased, and strategies such as environmentally conscious manufacturing, eco-efficient production, or pollution prevention gained recognition (Polshettiwar and Varma, 2008). These “green” approaches to the design and development of processes and products have served as the basis for green chemistry and green engineering (Mihelcic et al., 2003).

Green chemistry and green engineering bring about changes in the hazard of a product at the molecular level which encompasses the intrinsic properties of, say, a chemical (Lankey and Anastas, 2002). By modifying the intrinsic properties of chemicals, the reduction or elimination of the hazardous nature of these substances can be achieved (Lankey and Anastas, 2002). Green chemistry (Anastas et al., 2000) focuses on how to achieve sustainability through science and technology (Fiksel, 1998; Skerlos et al., 2001). Indeed, sustainability is the main driver for innovation in order to allow the industries to care for the well-being of consumers in a safe and healthy environment (Hofer and Bigorra, 2007). The hope and long-term vision of green chemistry is to see a strong, just, and wealthy society that can be consistent with a clean environment, healthy ecosystems, and a beautiful planet.

Progress in Green Chemistry

Over the past decade, green chemistry has convincingly demonstrated how fundamental scientific methodologies can be devised and applied to protect human health and the environment in an economically beneficial manner (Anastas and Kirchhoff, 2002). Significant progress has been made in key research areas,

such as atom economy, alternative feedstock, biocatalysis, green solvent, biosorption, energy and waste management.

Atom economy

Atom economy looks at the number of atoms in the reactants that end up in the final product and by-product or waste.

$$\% \text{ Atom economy} = 100 \times \frac{\text{Relative molecular mass of product}}{\text{Relative molecular mass of reactants}}$$

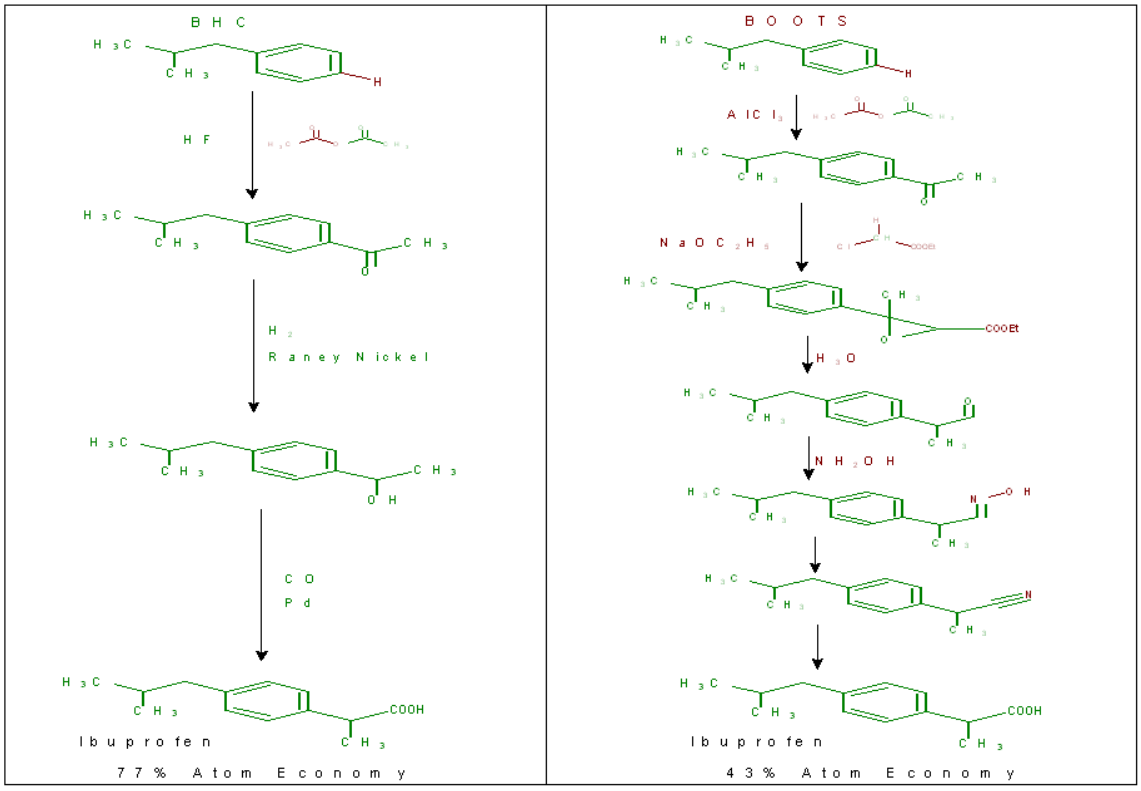


Figure 1: Synthesis of ibuprofen [2]

Alternative feedstock

Production of dimethylcarbonate (DMC) production

DMC is a versatile and environmentally innocuous material for the chemical industry. Owing to its high oxygen content and blending properties, it is used as a component of fuel.

Traditional method for the production of DMC

This method involves the use of phosgene ($COCl_2$) and methanol (CH_3OH) as shown below:

$$COCl_2 + 2CH_3OH \rightarrow CH_3OCOOCH_3 \text{ (DMC)} + 2HCl$$

Alternative route for the production of DMC

This involves the use of copper chloride (CuCl), methanol (CH_3OH), oxygen (O_2) and carbon monoxide.

$$2CuCl + 2CH_3OH + {}_{1/2}O_2 \rightarrow 2Cu(OCH_3)Cl + H_2O$$

[2] Source: Cann (1999). Available at http://academic.scranton.edu/faculty/CANNM1/greenchemistry.html

$$2Cu(OCH_3)Cl + CO \rightarrow 2CuCl + CH_3OCOOCH_3$$

Production of lactic acid

Lactic acid or 2-hydroxypropanoic acid), is a chemical compound that plays a role in several biochemical processes and has a chemical formula of $C_3H_6O_3$. It is used as a monomer for producing polylactic acid (PLA) which later has application as biodegradable plastic. This kind of plastic is a good option for substituting conventional plastic produced from petroleum oil because of low emission of carbon dioxide. Lactic acid has gained importance in the detergents industry the last decade. Being a good descaler, soap-scum remover and being a registered anti-bacterial agent - an economically beneficial as well as environmentally beneficial trend toward safer and natural ingredients has also contributed.

There are two competing processes for the manufacture of lactic acid namely: chemical synthesis and fermentation.

1. Chemical synthesis of lactic acid

This involves the reaction of hydrogen cyanide (HCN) with acetyladehyde (CH_3CHO). The resulting nitrile is isolated by distillation and hydrolysed by sulphuric acid. This is followed by esterification with methanol followed by distillation, hydrolysis and further distillation and finally lactic acid of high quality.

$CH_3CHO + HCN \rightarrow CH_3CH(OH)CN \rightarrow$hydrolysis using H_2SO_4 + esterification using $CH_3OH \rightarrow CH_3CH(OH)COOCH_3 \rightarrow$ distillation$\rightarrow$ hydrolysis$\rightarrow$ distillation$\rightarrow CH_3CH(OH)COOH$

2. Fermentation

Corn syrup or molasses + carbon + calcium carbonate + lactobacillus acidophilus + 4-6 days + filtration + evaporation and distillation $\rightarrow CH_3CH(OH)COOH$

Biocatalysis

Extraction of gold

Bioleaching is the extraction of specific metals from their ores through the use of microrganisms such as bacteria. This is much cleaner than the traditional heap leaching using cyanide in the case of gold extraction. For example, in the extraction of gold from its ore can involve numerous ferrous and sulphur oxidizing bacteria, such as *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans* (also referred to as *Thiobacillus*). For example, bacteria catalyse the breakdown of the mineral arsenopyrite (FeAsS) by oxidising the sulphur and metal (in this case arsenic ions) to higher oxidation states whilst reducing dioxygen by H_2 and Fe^{3+}. This allows the soluble products to dissolve.

$$FeAsS(s) \rightarrow Fe^{2+}(aq) + As^{3+}(aq) + S^{6+}(aq)$$

This process occurs at the cell membrane of the bacteria. The electrons pass into the cells and are used in biochemical processes to produce energy for the bacteria to reduce oxygen molecules to water. In stage 2, bacteria oxidise Fe^{2+} to Fe^{3+} (whilst reducing O_2).

$$Fe^{2+} \rightarrow Fe^{3+}$$

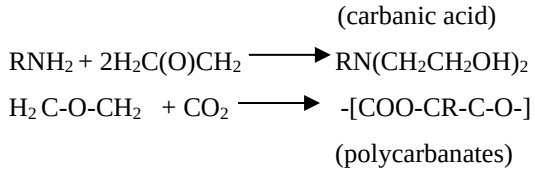
They then oxidise the metal to a higher positive oxidation state. With the electrons gained, they reduce Fe^{3+} to Fe^{2+} to continue the cycle. The gold is now separated from the ore and in solution.

Green solvents

Solvents are part and parcel of in any chemical synthesis. However, they are not an integral part of the compounds undergoing reaction, yet they play an important role in chemical production and synthesis (Li and Trost, 2008). By far, the largest amount of "auxiliary waste" in most chemical productions is associated with solvent usage. In a classical chemical process, solvents are used extensively for dissolving reactants, extracting and washing products, separating mixtures, cleaning reaction apparatuses, and dispersing products for practical applications. Although the invention of various exotic organic solvents has resulted in some remarkable advances in chemistry, the legacy of such solvents has led to various environmental and health concerns. Consequently, as part of green chemistry efforts, various cleaner solvents have been evaluated as

replacements. One of the green solvent is supercritical carbon dioxide ($scCO_2$) which has been receiving heightening interest and application in green chemistry research because of its unusual properties. Supercritical carbon dioxide refers to carbon dioxide that is in a fluid state while also being at or above both its critical temperature and pressure (Tc = 31.3 ^oC, P_c = 1071 psi (72.9 atm) yielding rather uncommon properties. Supercritical carbon dioxide has been used as a processing solvent in polymer applications such as polymer modification, formation of polymer composites, polymer blending, microcellular foaming, particle production, and polymerization (Nalawade et al., 2006).

Reaction of amines with CO_2



Biosorption

Biosorption is one such important phenomenon, which is based on one of the twelve principles of Green Chemistry, i.e., "Use of renewable resources." It has gathered a great deal of attention in recent years due to a rise in environmental awareness and the consequent severity of legislation regarding the removal of toxic metal ions from wastewaters. The challenges of safe and various treating and diagnosing environmental problems require discovery of newer, more potent, specific, safe, and cost-effective (natural and synthetic) biomolecules. For example, maize tassel, a waste plant material, has been used to remove trace metals from aqueous solutions (Zvinowanda et al, 2008, 2009). In recent years, a number of agricultural materials such as palm kernel husk, modified cellulosic material, corn cobs, residual lignin, wool, apple residues, olive mill products, polymerized orange skin, banana husk, pine back, sawdust, coals, and others have been reported for their removal of toxic metals from aqueous solutions (Bailey *et al.,* 1999; Doyurum and Celik, 2006; Lakatos *et al.,* 2002; Srivastava *et al.,*1986).

Energy

Fossil fuel

It has been predicted that the total dependence on fossil resources will come to an end during the twenty first century. There is, therefore, a growing need for alternative energy sources to replace fossil fuels. Apart from longer-term supply of fossil fuel, the main driver for moving away from fossil resource is pollution. Renewable energy resources that are currently receiving attention include solar energy, wind energy, hydro energy, fuel cells and others.

Safer petrol

In the late 1970s, a wealth of evidence was produced by scientist to show that lead emission from car exhaust fumes affected the IQ of children living in cities. The presence of lead also meant that catalytic converters could not be used to reduce noxious emissions. Consequently, tetraethyl lead (added into petrol to boost the octane rating in order to prevent engine knock and also to provide lubrication of the pistons) was banned.
The following options have been considered for the replacement of tetraethyl lead:

- altering the refinery process to put more aromatics into the petrol pool. This option brings along with exposure of the public to benzene as well as increase in crude oil requirement per litre of fuel;
- addition of ethanol produced from biomaterials to the petrol pool. This has been ongoing in Brazil for some years;
- addition of methyl t-butyl ether (MTBE) to the petrol pool. MTBE has high octane
- use of electric vehicles powered by fuel cells

Waste management

Waste is a natural consequence of all human activities and, therefore, unavoidable. However, the problems posed by waste include health risks to humans and degradation of the environment. The recognition of the impact of waste on the environment has prompted many countries to develop active programmes to reduce the amount of waste disposed into land and other environmental media. An accepted hierarchy for waste

management has been developed with the most preferred solution being reduction at source followed by recycling to recover materials or energy, and finally disposal as a last resort.

Concluding remarks

The challenges in resource and environmental sustainabilities require more efficient and benign scientific technologies for chemical processes and manufacture of products. Green chemistry addresses such challenges by opening a wide and multifaceted research scope thus allowing the invention of novel reactions that can maximize the desired products and minimize the waste and by-products, as well as the design of new synthetic schemes that are inherently, environmentally, and ecologically benign. Therefore, combining the principles of the sustainability concept as broadly promoted by the green chemistry principles with established cost and performance standards will be the continual endeavour for economies for the chemical industry. It is, therefore, essential to direct research and development efforts towards a goal that will constitute a powerful tool for fostering sustainable innovation. Green chemistry alone cannot solve the pressing environmental concerns and impacts to our modern era, but applying the twelve principles of green chemistry into practice will eventually help to pave the way to a world where the grass is greener.

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Lessons from process and chemical incidents and accidents

Dr. Sam M. Mannan [*]

A History of Disasters

2

- Bhopal, India, 1984
- Chernobyl, Ukraine, 1986
- Shell Oil Norco, Louisiana, 1988
- Piper Alpha, North Sea, 1988
- Exxon Valdez, Alaska, 1989
- Phillips 66, Texas, 1989
- Kader Toy Factory Fire, Thailand, 1993
- Enschede Fireworks disaster, 2000
- Toulouse, France, 2001
- BP Texas City, USA, 2005
- Buncefield, UK, 2005
- Caribbean Petroleum Corporation, Puerto Rico, 2009
- Kleen Energy Explosion, USA, 2010
- Deepwater Horizon, USA, 2010
- Fukushima Daiichi, Japan, 2011

Major Moments for Learning

3

- Bhopal Disaster – 1984
- Toulouse, France – 2009
- BP Texas City – 2005
- Buncefield Terminal Fire – 2005
- Deepwater Horizon – 2005
- Fukushima Daiichi – 2011

Overview of Selected Accidents

4

- **Bhopal, India – 1984**
  - MIC release resulted from the mixing of incompatible materials and the failure of several layers of protection.
  - Over 2000 fatalities (estimate varies).
  - Several of the failures/deficiencies blamed on budgeting.
- **BP Texas City, USA – 2005**
  - Vapor cloud explosion (VCE) resulting from improper start-up and over-filling of isomerization unit.
  - 15 fatalities
  - Disaster caused by: inadequate and obsolete process design, poor maintenance, improper temporary building siting, worker fatigue, etc.

Both of these incidents involve systems that were out of date, inadequately maintained, or understaffed because of budget problems.

Overview of Selected Major Recent Disasters

5

- **Deepwater Horizon Oil Spill – 2010**
  - Loss of well integrity in the final stages of drilling resulted in a fire, explosion, and oil spill.
  - 11 fatalities, rig lost.
  - BP failed to follow best practices and heed warning signs.
  - Insufficient emergency response capabilities.
- **Buncefield Fire, UK – 2005**
  - Vapor cloud explosion caused by over filling of a gasoline storage tank and the resulting loss of containment.
  - Automatic high level alarm and shutdown switch failed.
  - Destroyed 20 large storage tanks

Both of these incidents involve the extraction and transportation of combustible fuels. Deepwater Horizon: Several decisions were made to reduce the number of layers of protection, use inferior materials, skip tests and otherwise violate RAGAGEP in favor of saving relatively small amounts of money (<$10 Million)

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Overview of Selected Major Recent Disasters

6

- **Toulouse, France – 2001**
  - Explosion of "off-spec" Ammonium Nitrate (AN) in a warehouse
  - 30 fatalities, 10000+ injuries, 27000+ houses damaged
  - Most likely cause: incompatibility of AN with chlorinated compounds lead to decomposition and detonation of AN
- **Fukushima Daiichi NPP, Japan – 2011**
  - Tsunami flooded rooms emergency generators, causing power system damage and affecting seawater intake structures.
  - Lack of cooling, 3 reactors went into meltdown, hydrogen accumulated, causing explosions and releasing radioactive material
  - 20-km exclusion zone, thousands of people affected

2 Nuclear reactor incidents 25 years apart. Three Mile Island might also be worthy of discussion. Chernobyl design flaws: Improper design of moderators (which facilitate the reaction), poor design of control rods, reactor designed so that it became more reactive when temperature increased, when it could have been designed to become less active when hot. Chernobyl test: Trying to figure out how long they could cool the unit on residual steam in the event of a shutdown. This test would have been illegal in the US. Firefighters and workers entered the area without being told of the radiation hazard and all died from radiation poisoning.

Fukushima: Natural disaster caused a technical disaster. The reactor was not designed for a tsunami as big as the one that struck (rare event). Protection of property was allowed to eclipse safety and human life as a concern. Estimated amount of radiation released is ~one tenth that of Chernobyl.

Chernobyl has or will cause between 9,000 and 985,000 premature deaths, depending on the source used. Fukushima is expected to cause between 0 and 1000 premature cancer deaths by some estimates.

Lessons Learned Applicable to Chemical Security

7

- Inherently Safer Design
- Process Hazard Analysis
- Facility Siting and Layout
- Leading Indicators and Warning Signs
- Layers of Protection Analysis (LOPA)
- Emergency Response and Planning
- Risk Communication
- Role of Academia

Inherently Safer Design (ISD)

8

- Inherent – Permanent, inseparable

ELIMINATE
REDUCE

rather than

CONTROL

Most important lesson and most effective way to reduce risk. First, we need to define the concept of "inherent". It is a quality or attribute that is permanent or inseparable. In this way, inherently safer technologies are those which achieve a hazard elimination or reduction by means that are inherent in the process. Inherent safety focus on reducing or eliminating hazards, rather than controlling them with add-on features. Therefore, less layers of protection are needed. It must be pointed out that inherently SAFER is different than inherently SAFE. Inherently SAFEST would be the best but it is also the unachievable case. There are hazards everywhere, so what we really can do is to have an inherently SAFER plant. A process is inherently safer when compared to other alternatives, but it's never inherently safe.

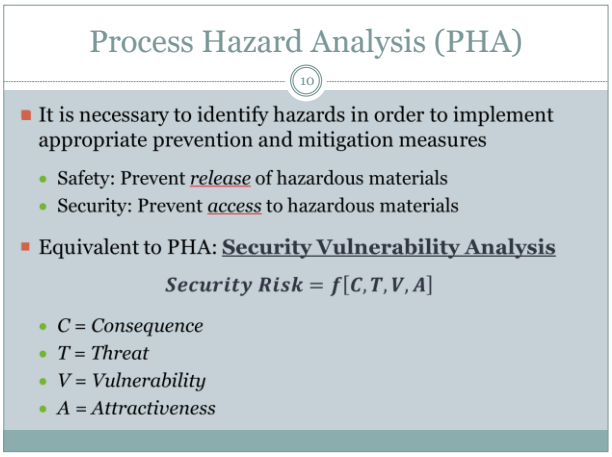
Inherently Safer Design (ISD)

9

- Inherent Safety (IS) can help reduce/eliminate the hazard, thus the escalation of consequences.
- Reduction of hazards may make the facility less interesting as a target.
- Application of the four main strategies for IS:
  - Minimize – *"What you don't have, can't leak"* – Kletz, 1978
  - Substitute
  - Moderate
  - Simplify
- IS strategies do not necessarily remove the threat(s).
- Issue – How to determine inherently safer alternative?

How does inherent safety affect each one of the security risk factors?

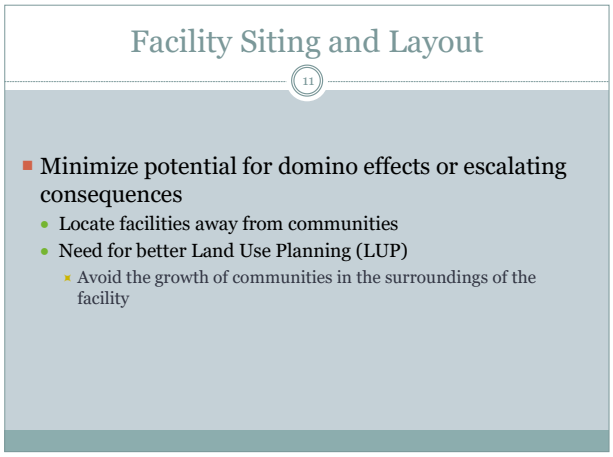
IS affects consequences the most. We can reduce the severity of the consequences by applying the principles of inherent safety, thus reducing or eliminating hazards. IS can also affect threats. If hazards are reduced or eliminated, the target may not look as interesting anymore. Although IS can help in some cases, an adversary may be difficult to persuade, especially if the hazard is reduced but not eliminated, there is still room for damage. Vulnerability is the least affected by inherent safety. Although the consequences would be different, the facility may be equally vulnerable before and after the application of inherent safety strategies unless the sources of vulnerabilities are changed as well. Regarding attractiveness, it depends on the threat, consequences and vulnerabilities. As explained earlier, adversaries choose their targets according to their goals. Therefore, facilities with same consequences and vulnerabilities may not have the same attractiveness for a certain threat. IS affects attractiveness in a similar way as it affects threats. A hazard reduction or elimination may reduce the attractiveness of a target.
Bhopal, Mexico City
(a) In the Mexico City disaster, the presence of thousands of LPG bottles (from the loaded trucks) at the plant area increased the severity of explosion,
(b) In the Texas City disaster, high proximity of Petrochemical facilities to each other created domino effects, and
(c) In the Buncefield explosion the short distance between gasoline tanks created domino effects and a bigger disaster.



The recent occurrence of severe major accidents has brought to light flaws and limitations of hazard identification (HAZID) processes performed for safety reports, as in the accidents at Toulouse (France) and Buncefield (UK), where the accident scenarios that occurred were not captured by HAZID techniques. several accident scenarios, such as the ammonium nitrate explosion that occurred at Toulouse and the vapor cloud explosion that occurred at Buncefield, had been missed by HAZID techniques users in their respective safety cases for competent authorities (Paltrinieri, N., et al. 2012 paper). The explosion scenario was excluded by the fertilizer industry guideline and the LUP and emergency response plans relied on toxic release scenarios (ammonia, chlorine), which were considered as the worst-case scenarios. In addition, the Seveso II directive did not explicitly address the risk posed by "off-spec" AN.

Although security risks are much more difficult to assess, it is important to analyze how vulnerable is the facility and based on that, implement appropriate measures. Companies are responsible for an integral assessment of the safety and security of their facilities. Terrorist attacks might come in unexpected ways. Therefore it is necessary to reduce the consequences of these intentional acts.

What is the difference between safety and security protection? Security protection helps preventing the access to hazardous materials while safety protection helps preventing the release of those. Security risk is defined differently than process safety risk. Process safety risk is a combination of probability and consequences. While consequences can be estimated in both, safety and security analyses, likelihood cannot be estimated in security in the same way as in process safety. Likelihood estimation in safety relies on history of failure and statistical data. This is not applicable to security since terrorist attacks cannot be represented by a probability distribution. Terrorists adjust their methods to specific conditions and learn from their previous attacks, thus their methods evolve and may be more sophisticated and smarter every time. Therefore, it is not possible to create valid statistic data sets of terrorist attacks. Instead of likelihood, the following factors are used in security risk assessment: Threat, vulnerability and attractiveness.



Bp Texas City, Toulouse, France, Bhopal and Fukushima are ex
where facility siting and layout has escalated the consequences c
accident.
Had it not been for the temporary trailer located near the explosi
many lives would have been saved at Texas City.
In Bhopal, and Toulouse, the population grew around the plants,
they were at greater risk

Leading Indicators and Warning Signs

12

- Before incidents occur, there are usually warning signs
- Lack of knowledge management may impede the identification of serious problems

"what is unknown does not coincide with what is impossible"
(Paltrinieri et al., 2012)

Before an accident occurs, there are usually signs that something is going wrong. However, people may ignore those signs, or may not recognize them. Thus, the problem was real and present but lack of knowledge management impeded identification. This is an example of a "black swan," which is a metaphor of impossibility in the past because all historical records of swans reported they had white plumage.

For example, similar incidents such as the one in Toulouse, France and Buncefield had occurred in the past, however, the companies failed to learn the lessons and did not consider those scenarios as credible.

Layers of Protection Analysis (LOPA)

13

- Objective: Reduce vulnerability of facility by making it less attractive and increasing difficulty to attack.
- Multiple independent layers are needed.
- No layer of protection can be perfect.
- Watch out for common cause failures or single point failures
- Devices should not be considered "fail-safe" unless it can be proven.

At Deepwater Horizon/Macondo, and excessive and undue amount of faith/trust was placed in the ability of the blowout preventer to keep the rig safe. Literature shows that the BOP was considered "fail-safe." It was not fail-safe and this over dependency contributed significantly to the disaster.
Warning signs that went ignored, tests that were not performed, and additional barriers that were not put in place during well construction would have all provided additional layers of protection against this failure.
Depending on the security concern associated with an asset, such layers may include:10
• Facility or asset perimeter security
• Access controls for persons, vehicles and packages
• Measures to deter, detect and delay an attack
• Measures to secure chemicals and equipment to prevent theft, diversion, contamination or sabotage
• Securing business, process control and other computer Systems, Monitoring, communications and warning systems
• Emergency response plans

Integrity, Reliability, Availability of IPLs

14

- Risk can be reduced by reducing the likelihood or the consequences of an incident
  - Inherent
  - Passive
  - Active
  - Procedural
- A good safety program involves **ALL** strategies
- Layers must be inspected and maintained on a regular basis
- Layers must be able to operate upon demand.

High level alarms were not properly maintained at Texas City. Operators didn't notice that it wasn't working. Protective systems were turned off deliberately at Bhopal, Chernobyl, and Piper Alpha.

Risk is the combination of probability and consequence. In order to reduce risk, we can reduce the probability (frequency) of an accident, the magnitude of the consequences, or both. In general, the strategies to reduce either likelihood or consequences are:

- Inherent: Eliminate or reduce hazards by applying inherent safety principles. That is minimization, substitution, moderation or simplification
- Passive: Consists of eliminating or reducing hazards by adding design features that do not need to be activated, for example, dikes
- Active: This includes all the devices that need to be activated in order to avoid the hazard or reduce the consequences. For example, control system, sprinkler system, alarms, etc.
- Procedural: Hazards are reduced or consequences are mitigated by following certain procedures. For example, operating procedures, emergency response.

The strategies shown here are in order of reliability and robustness. As we can see, inherent safety is the most robust strategy out of these 4. However, a complete safety program needs all strategies.

Emergency Response Planning

15

- Plant personnel, local authorities and community should be prepared to respond to emergencies
  - Need for coordinated response
- Prepare for inevitable occurrence of accidents (earthquakes, tsunamis) – known unknown events
- Train responders in non-technical skills
  - Decision making, task leadership, communication, teamwork
  - Manage high uncertainty and stressful situations

The stress of the situation can lead to poor judgment resulting in severe losses. Additionally, the emergency response is characterized by the urgent need for rapid decisions; therefore the protection system should always be in place and in operable status. Some examples of accidents due to training deficiencies are presented as follows: (a) In the Texas City disaster, the captain was not aware of the hazards of ammonium nitrate. Under normal storage conditions, ammonium nitrate poses a low risk; however, increasing the temperature to between 160 and 2008C will result in an explosion. On April 16, 1947, the incident started with the mid-morning fire, but it was more severe when the captain decided to pour water on the fertilizer in his attempt to save the cargo. The improper decision caused a runaway reaction and detonated 7,700 tons of ammonium nitrate on board, (b) In the Port Hudson explosion, the operator noticed a propane leak in a pipeline. He tried to crash shutdown the system but failed without success. Instead of shutting down the system, he shut down a pump station which increased the pressure to 942 psig and consequently aggravated the gas release. In this incident, if the operator was trained well in the crash shutdown of the system, the consequences would not have been so severe. An absence of arrangements for a coordinated response hampered efforts to fight the fire.

Emergency Response Planning

16

- Crisis Management and response
  - Clarify supervisory roles
    - Who is in charge?
  - Ensure emergency power and utilities
  - Communicate honestly and frequently with the media
    - Acknowledge unknowns and uncertainties

Risk Communication

17

- Communicating information to the public
  - Need to balance between "right-to-know" and "security issues"
  - Revealing information has benefits and consequences
    - Build credibility
    - Make the facility of special value when times are tough
    - Terrorist can benefit from information released
- Need to educate society and risk communicators so that they have a more accurate perception of risk
  - Public lack of awareness of hazards may escalate the consequences of the incident

1. There are currently about 60 Reading rooms in the US where the public can go to access information on chemical facilities and transport.
2. License to operate at risk if public doesn't trust the industry
3. Directly pertains to Bhopal

Role of Academia

18

- Teach undergraduate and graduate students, and integrate engineering solutions in education and research curriculum
- Provide innovative and inherently safer solutions to industry problems

Many accidents have occurred due to a poor safety culture and risk management. One of the best ways of starting to prevent incidents is by creating consciousness of safety and security since school. Educating engineers to recognize hazards and the importance of a good risk management plan is essential. People need to stop thinking "that will not happen here". The first step is to acknowledge that it can happen so we can take appropriate measures.

References

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Safety and risk management aspects for major accident industry in Poland

Prof. Adam S. Markowski *

PROCESS SAFETY MANAGEMENT
What is PSM?

COMPREHENSIVE EVERGREEN SYSTEM FOR PREVENTION OF MAJOR ACCIDENTS

Focus on
- AVOIDING THE OCCURRENCE OF CATASTROPHIC RELEASES

- MINIMIZING THE CONSEQUENCES OF CATASTROPHIC RELEASES

Accidents are viewed as lack of Management Control

Process Safety Developmenet

- Highly publicized accidents, eg. Flixborough, 1974, Seveso 1976, Bohpal 1984, Piper Alpha 1984……
- Increasing number and size of facilities
- Highly complex new technologies using large inventories, working under extreme operating conditions.

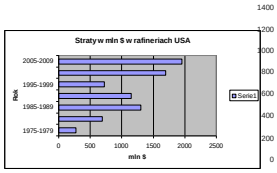
Increase awareness and concern about major accident (safety science, organisations and government and industry Regulations (Seveso Directive in EU) !

Industrial plant changes

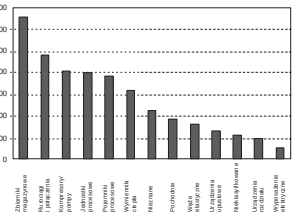
Major Accidents

Flixborough Incident 1974
……

Losses and causes for major accidents



Losses in USA refineries due to major accident hazards

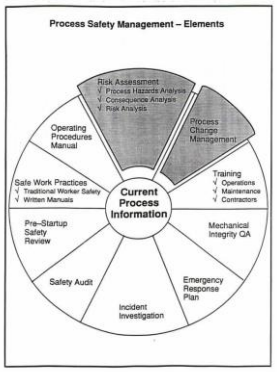


Type of the equipment

The main causes of major accidents - management oversights and omissions (up to 70-80%)

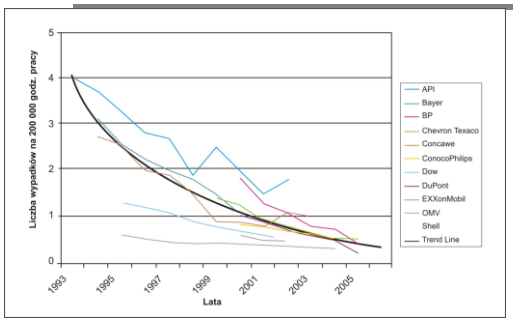
Elements of PSM

The key element of PSM applicable to major hazard industry is *Risk Management Process*.



* Prof. Markowski is from the Department of Safety Engineering, Technical University of Lodz, Poland

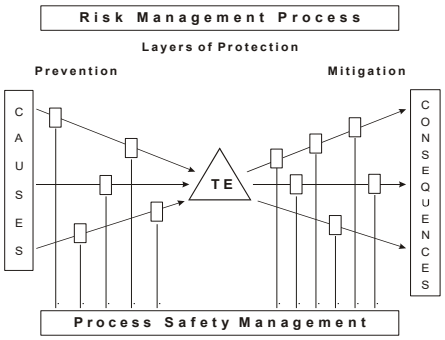
Process Safety Mangement Benefits



Protecting people, Avoiding production and Markets lost after accident, Satisfying regulatory requirements, Reduction of insurance costs

8

Process Safety Mangement and Risk Management Process



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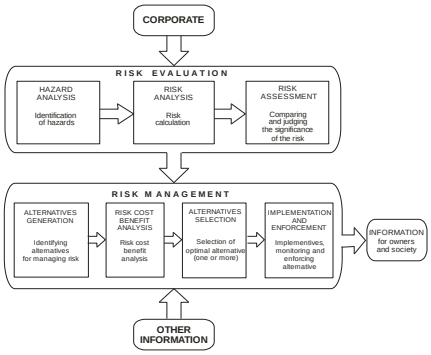
Process Risk Mangement



State of the art in Process Safety Management in Poland

358 Seveso Plants (171 upper-tier and 187 lower-tier plants)

1205 non- Seveso Establishments

Advantages of Polish process safety measures	Disadvantages of Polish process safety measures
- general conformity to the technical standards, - quite good technical standards, - well organized health and safety staff and Labour Inspection, - well organized accident investigation process and rescue system.	- not appreciation of safety management system, - limited staff involved in process safety manag, - not enough specialists and tools in process risk - limited application of risk analysis, - unsatisfactory safety culture.

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Elements of PSM of special intrest to the Polish Industry

1.Process Risk Management

2. Management of Change

3. Human Error - Safety Culture

4. Learning from Incident

5. Safety Performance Indicators

12

The methods used in Risk Management

Group	Relevance criteria				
	Input data and level of team expertise	Complexity of the plant and method	Nature and degree of uncertainty	Applicability to SEVESO sites	Time required
Ranking methods	Low	Low	Low	Low	Low
PHA methods	Low	Medium/ High	Medium	Medium	Medium
Scenario analysis methods	Medium	Medium	High	Medium	High
LOPA Basic methods	**Medium**	**Medium**	**Medium**	**Medium/ high**	**Medium**
Complex methods, QRA	High	High	High	High	Very long

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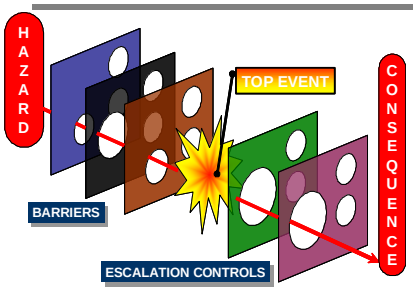
Layer of Protection Analysis-LOPA



The LOPA assumes that no layer of protection is perfect; every layer has some probability failure on demand (PFD). Therefore the risk of occurrence of unwanted consequences depends on the failure of the Independent Protection Layers-IPLs.

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LOPA

Advantages	Disadvantages
Focuses on major accident hazard events Useful for prioritizing hazard scenario and making a risk-based decision Allocates risk reduction measures efficiently Is less work-demanding than FTA /QRA Is intuitive, easy to learn and well understood by industry people Possible extension of LOPA framework to other risk assessment purposes	Does not identify incident scenario No effect of the mitigated severity of consequence on the risk index Uncertainty of frequency data used PFD only available for basic IPLs and initiating causes Doesn't pay an attention to non-SIS layer of protection, especially human and operating culture

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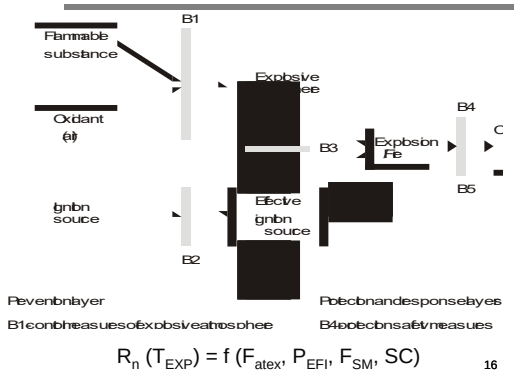
ExLOPA for ATEX



$$R_n (T_{EXP}) = f (F_{atex}, P_{EFI}, F_{SM}, SC)$$

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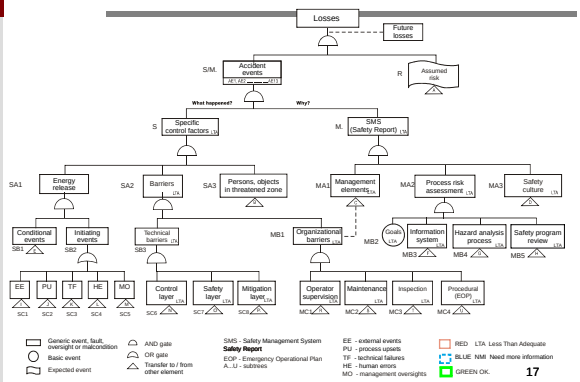
MART for Accident Investigation



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Management of Change

Establish and implement Written Management of Change Procedures which address:

Technical Basis
Impact on Safety and Health (risk assesment)
Modifications to Operating Procedures
Necessary Time Period for the Change
Authorization Requirements

18

Safety Culture

Achieving a positive safety culture in organization is fundamental to managing health and safety effectively.

The following organisational factors need to be included:

- Visible management commitment (leadership)
- Management style
- Good communication between all levels of employee
- A balance of health and safety and production goals
- Participation in safety Health & safety resources
- Risk-taking behavior
- Trust between management and frontline staff
- Industrial relations and job satisfaction
- Safety training

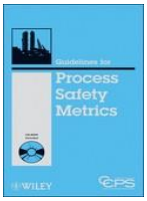
Safety culture assessment should be adopted!

19

You don't improve what you don't measure

An effective Process Management System requires to **use of key performance Indicators.**

In Poland, there is practice to analyse so called **„lagging metrics"**. They represent a retrospective measures of unexpected failures occurring in normal operations.



In terms of prevention it is important to use **„leading metrics",** representing measures of acivity in risk control discover during routine checks.

The leading metrics can be subsequently used for assessment of potentaillity of major hazards occurances.

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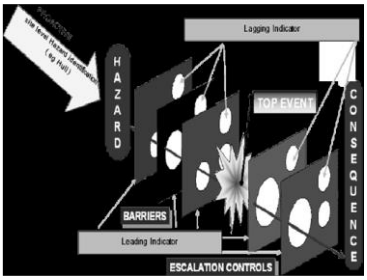
Lagging and leading metrics



lagging metrics represent a retrospective measures of unexpected failures occurring in normal operations
„leading metrics", representing measures of acivity in risk control discover during routine checks before major failure

21

Learning from incidents

Six steps for effective learning from incidents

1. Detection of a SHE incident
2. Reporting of the incident
3. Aplly proper analysis of the incident (Tripod, MART, MORT)
4. Establishing of the learning effects
5. Implementation of the learning effects
6. Checking the effectiveness of the implementation

Learning must go on various organizational levels: site level, plant level and corporate lavel.

22

Conclusions

1. There is need for national data base on incident /accidents and development of cooperation with other international sources.
2. Risk management process implementation requires process safety education program to be included in Polish Higher Learning. Uncertainity aspects in analysis should be widlely considered.
3. Speciall attention should be paid to the management of change, safety performance Indicators, safety culture and learning from incidents. These elements shoud be an integral part of PSM in each Polish major hazard company.
4. Attention should be paid also to the Non-Seveso establishments which poses the events with the attributes of a major accident.

23

Introducing and managing chemical safety and security practice in India

Yagya Saxena *

Indian Chemical Industry

- Chemical Industry is an important constituent of the Indian economy. Its size is estimated at around US$ 100 billion approx., which is equivalent to about 3% of India's GDP. The total investment in Indian Chemical Sector is >US$ 60 billion and total employment generated is about 1 million.
- The Indian Chemical sector accounts for >13% of total exports and 9% of total imports of the country. Per capita consumption of products of chemical industry in India is about 1/10th of the world average.
- Over the last decade, the Indian Chemical industry has evolved from being a basic chemical producer, becoming an innovative industry. With investments in R&D, the industry is registering significant growth in the knowledge sector comprising of specialty chemicals, fine chemicals and pharmaceuticals.

2

Indian Chemical Industry

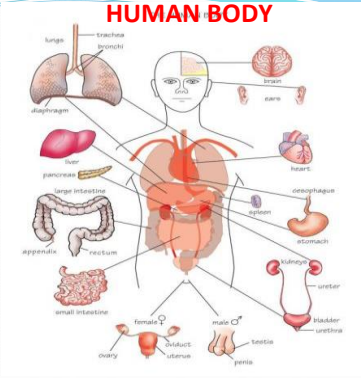
- Global Size - US$ 3.5 Trillion
- Third largest in Asia
- Sixth largest in world &
- Twelfth largest by volume globally
- Employs approx. 1 Million workforce
- Likely to be 2 Million by 2020

3

A CHEMICAL PLANT

4

HUMAN BODY



A CHEMICAL PLANT

5

Human Body – A Mobile Chemical Plant

- Evolved & Developing
- Extremely Useful
- Complicated & Sophisticated
- Lot To Learn
- Dangerous & Disastrous

6

Safety & Security

"Instead of Managing a disaster when it has already taken place, there must be a planned emphasis for complete mitigation of a disaster".

Indian Chemical Council propagates Safety & Security to be a culture in Chemical industry as a top most priority.

- The culture of **Safety & Security Consciousness and accountability** in an organization and education has also been developed around the world in the chemical industry.
- The development of a "**Culture of Safety & Security**" results in safe and healthy environments of society.

7

* Mr. Saxena is from the Indian Chemical Council

CWC & OPCW

- **India was the FIRST country outside Europe to be selected for 'Associate Programmes' run by the OPCW.**
- **Department of Chemical & Petrochemicals & National Authority-CWC, Govt. of India actively oversee and participate in the events across the country for awareness and implementation of CWC organised by ICC.**
- **Under the auspices of OPCW, ICC organised a two days seminar on CWC & Chemical Safety Management, in April – 2011 at Vadodara, Gujarat.**

8

Large-Scale Emergencies & Sensitive Situations

Many large-scale events OR natural calamities can affect the industry and disrupt the operations severely. Some of the most common large-scale emergencies and sensitive situations include:

- **Fire & Flooding,**
- **Power Failures**
- **Explosion**
- **Deflagration**
- **Detonation**
- **Gas/dust explosion**
- **Unconfined Vapour-cloud Explosion (UVCE)**

9

Security Breach

- Intentional or unintentional security breaches in the industry, either by personnel or by outside agents, pose a serious risk for institutions. Possible breaches include, theft or diversion of high-value equipment or dual-use chemicals or materials that may be utilized for illegal activities, accidental or intentional release or exposure to hazardous materials and unauthorized manufacturing experimentation.

10

Toxic Chemical Exposure

- One of the least predictable, most dangerous risks in chemical industry is the leakages of toxic chemicals. No substance is entirely safe and all chemicals result in some toxic effects. If living systems are exposed to a larger amount of the substance, some chemicals can be more hazardous after a single exposure itself. Others cause an effect after repeated or long-duration exposure, which could be carcinogenic chemicals.

11

Importance of Chemical Industry

- Chemical industry plays a vital role in supporting good standard of living
- It provides various chemicals needed by other industries
- Almost all products that we use chemicals in some form.
  - Soap and detergents
  - Medicines
  - Cosmetics
  - Fertilisers
  - Synthetic clothing, etc., etc.

12

Significant Milestones In Improving Safety & Lowering Risk

Indian Chemical Council also disseminates the Responsible Care ethics and guidelines in to the chemical industry in India.

- Finding a way to identify what can go wrong
- Finding a simple set of tools which allow 'quantification' of the severity
- Finding a way to communicate hazards and HSE-related information within the organisation
- Making everyone accountable for knowing what can go wrong, what role they have in preventing it and if it happens, what they need to do to mitigate it.
- Making business leadership understand that they (and not the Safety Department) are primarily accountable for performance
- Board of Directors setting the risk governance criteria in the full knowledge of what it is likely to cost

13

Safe Plant Operations

- It is possible to operate the chemical process plants safely by–
  - Incorporating HSE in plant and equipment design, preferably inherently safe design
  - Following industry/national/international standards
  - Appointing competent employees
  - Training (including refresher training)
  - Incorporating HSE in operating procedures
  - Incorporating HSE in plant/equipment maintenance
  - Compliance of all applicable statutes
  - Hazard identification, risk assessment, Hazop study, etc.
  - Periodic safety audits
  - Emergency response plan

14

Key Roles Of The CEO, Board Of Directors & Business Leaders

- Understand the risks for the business
- Recognise their responsibility for performance
- Have dialogue with the Technical Expertise in the company who have assessed the risks
- Challenge the Technical Expertise on improvement programmes – tell them "**what must be done**" not "how it must be done"
- Have them develop relevant, time-bound programmes – and implement them
- Fund the programmes and discipline the organisation
- Follow up with periodic review and reports

15

Legal Obligations

- To ensure safety in the manufacture, storage, handling and use of chemicals, various statutes have been enacted and rules framed.
- Legal provisions are the minimum requirements for safety, health, hygiene and the environment.
- The applicable statutes must be complied with.

16

An understanding of how safe is the design code ...!

- Design codes are often industry driven and adopted by a wider range of stakeholders
- Design codes feature as Best Practice
- Care needed on how they are applied

17

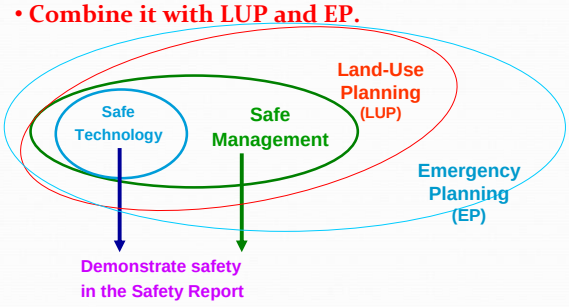
Philosophy of Disaster Prevention

- Integrate technology and the management

18

Disaster Prevention

- **Combine it with LUP and EP.**



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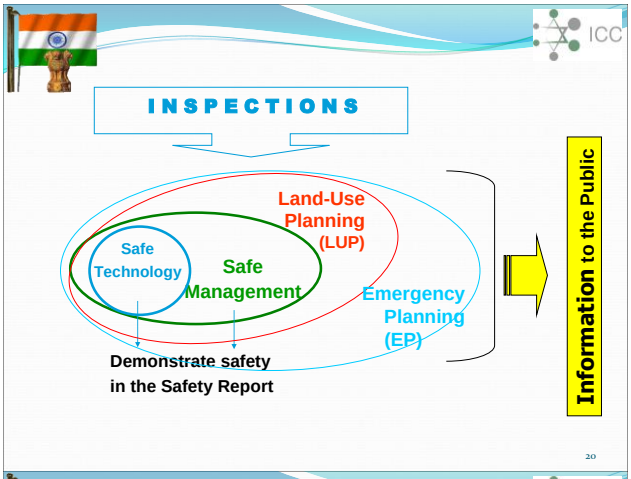

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21

Safety & Security Management System

4. **Implement Administrative Controls.** Administrative controls define an institution's rules and procedures for safe and secure practices and establish the responsibilities of individuals involved. These controls should include general safety rules, plant & laboratory housekeeping procedures, manuals for use of materials and equipment and other documents to communicate rules to all stakeholders.
5. **Identify & Address Particularly Hazardous Situations**. Conducting a risk-based evaluation determines the impact and adequacy of existing control measures, prioritize needs, and incorporate corrective actions based on level of importance and available resources. This information will provide the foundation for a robust safety management system, as well as help prioritize efforts to improve safety and security.

22

Safety & Security Management System

6. **Evaluate Facilities & Address Weaknesses**. Safety and security must be an important factor, while designing a chemical plant and its divisions. Safety of the plant security of personnel should be a top most priority in order to mitigate the mishaps.
7. **Establish Procedures For Chemical Management**. Chemical management is a critical component in a manufacturing plant. Safety program must include defined procedures for buying and handling the chemicals including, appropriate use of personal protective equipment, as per rules and procedures, especially for spills and emergencies. Storing, inventory tracking, transporting and shipping of chemicals and disposal of chemical waste.

23

Safety & Security Management System

8. **Employ Engineering Controls And Personal Protective Equipment**. Engineering measures, Personal protective equipment, such as chemical splash goggles and face shields, should supplement engineering controls.
9. **Plan For Emergencies**. In the process of developing an emergency plan most likely incidents that are to occur must be included first. Identifying the decision makers and stakeholders, as well as safety priorities, creating a plan for all types of emergencies identified, and training the staff in the procedures outlined in the plan.

Safety meetings at regular intervals must be a routine.

24

Safety & Security Management System

10. **Identify & Address Barriers To Following Safety And Security Best Practices.** Good safety and security practices involve having people consistently follow policies and procedures. However, it is often challenging to change behaviors and foster a culture of best practices. The organisation must identify barriers and establish incentives for all personnel to comply with safety and security measures.
11. **Train, Communicate And Mentor.** The best way to create a culture of safety in the workplace is to set a good example every day by following and enforcing safety and security rules and procedures.

It is extremely important to establish a system for training and mentoring the personnel in a chemical plant. Every organisation must establish effective channels for communicating about chemical safety with personnel at all levels.

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- **If you feel, managing SAFETY is a costly affair,**

  .....Try an accident !

26

Thank you...

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Chemical safety and security: the legal framework for Malaysia

Ir Mohtar Bin Musri [*]

Abstract: According to the 9th Malaysia Plan report, the value of chemicals and chemical product exports has increased from RM15 millions in 2000 to RM49 millions in 2010. In 2010, the chemical industry contributed 7.3% of the total Malaysian export, the second largest contributor after electrical and electronic products. Imported chemicals and chemical products on the other hand valued up to RM 45 millions in 2010. Ranging from multinational companies, big local companies and small to medium enterprises, Malaysia's chemical industry consists of diverse subsectors such as petrochemicals, oleo-chemicals and industrial gases. In the interest of many, management systems were developed involving a few government agencies such as the Ministry of Human Resource, Ministry of International Trade and Industry, Ministry of Foreign Affairs. On top of that, a few laws concerning chemical management has also been established in Malaysia such as the Pesticide Act 1974 enforced by the Pesticides Board, Ministry of Agriculture and Agro-product and Occupational Safety and Health Act 1994 enforced by the Department of Occupational Safety and Health, Ministry of Human Resources. Among the highlighted issues involving chemicals in Malaysia nowadays are the Chemical Weapons Convention and the Globally Harmonised System of Classification and Labelling of Chemicals (GHS). The Chemical Weapons Convention has been signed by Malaysia in 1993 and ratified in 2000. A CWC Act was been drafted and gazetted in 2005 followed by the Regulations in 2007. With the establishment of the legislation on chemical weapons, a national authority that oversees the implementation of the Convention was also created consisting of 14 ministries and agencies. The National Authority is in charge of conducting national inspections as well as providing assistance during international inspections. In addition to the CWC, Malaysia is also working towards the implementation of GHS in the chemical industry. A National Coordinating Committee (NCC) that is led by the Ministry of International Trade and Industry was established to ensure the effectiveness of the implementation. A few sub-committees were also established to take care of four main sectors (industrial workplace, pesticide, transport and consumer products) involved in the implementation of GHS in Malaysia.

Background

According to the 9th Malaysia Plan report, the value of chemicals and chemical product exports have increased from RM15 millions in 2000 to RM49 millions in 2010. In 2010, the chemical industry contributed 7.3% of the total Malaysian export, the second largest contributor after electrical and electronic products. Imported chemicals and chemical products on the other hand valued up to RM 45 millions in 2010. Ranging from multinational companies, big local companies and small to medium enterprises, Malaysia's chemical industry consists of diverse subsectors such as petrochemicals, oleo-chemicals and industrial gases.

Chemical Weapons Convention

The Chemical Weapons Convention (CWC) was signed by Malaysia since it first opened for signatories on 13 January 1993, and ratified it on 20 April 2000. The drafting of the legal framework then began, and in 2005 Malaysia gazetted the Chemical Weapons Convention Act 2005 and followed Chemical Weapons Convention Regulations in 2007. With the gazetting of the CWC Act 2005, the National Authority of Chemical Weapons Convention (NA CWC) was established in September 2006. The establishment of NA CWC is also in accordance with Article VII of CWC. There are 14 ministries and agencies as members of NA CWC namely Ministry of Foreign Affairs (Lead Agency), Ministry of Defense. Ministry of International Trade and Industry, Ministry of Home Affairs, Ministry of Science, Technology and Innovation, Ministry of Natural Resources and Environment, Department of Chemistry, Department of Environment, Department of Occupational Safety and Health, Royal Malaysia Customs, Royal Malaysian Police, Pesticides Board, Pharmaceutical Services Division and Science and Technology Research Institute for Defense.

The function of NA CWC is to oversee the implementation of the Convention at national level and serves as national focal point for effective liaison with the OPCW and other State Parties. NA CWC actively participates in domestic and international outreach programmes, advising domestic stakeholders on CWC obligations such

[*] Mr Musri is Deputy Director-General of the Department of Occupational Safety & Health, Malaysia

as declarations and inspection requirements. NA CWC also facilitates international inspection by Organisation for Prohibition of Chemical Weapons (OPCW).

Chemical management: legal framework

One important aspect of CWC is the Chemicals Safety and Security management as outlined under Article XI of the Convention. Chemical management should start from 'cradle to the grave'. The chemicals are produced or imported into the country. The chemicals then are stored at storage facilities. Stored chemicals are either exported to another country or locally distributed through transportation. The receiver is normally end users. After the usage of the chemicals, another important part is disposal of the waste chemicals. Some portion of the used chemicals may be recycled into another production process. Chemical safety management should be implemented at each cycle of the chemicals.

In the interest of many, chemical management systems were developed involving a few government agencies such as the Ministry of Human Resources, Ministry of International Trade and Industry, and Ministry of Foreign Affairs. On top of that, a few laws concerning chemical management has also been established in Malaysia such as the Pesticide Act 1974 enforced by the Pesticides Board, Ministry of Agriculture and Agro-product and Occupational Safety and Health Act 1994 enforced by the Department of Occupational Safety and Health, and the Ministry of Human Resources.

Being a member of the United Nations (UN), Member States are obliged to adopt United Nations Security Council Resolution 1540 (UNSCR 1540) on non-proliferation of weapons of mass destruction (WMD). Another important and recently gazetted legislation in relation to UNSCR 1540 is the Strategic Trade Act 2010 (STA). This act, in accordance with UNSCR 1540, is to enforce effective measures to establish domestic controls to prevent the proliferation of nuclear, chemical, or biological weapons and their means of delivery, including by establishing appropriate controls over related matters.

The Internal Compliance Program (ICP) is another example of a chemical management system that is carried out within a company before the product is exported. It contains a set of procedures which ensure the company complies with the STA and associated regulations. There are five elements of ICP: management committee, screening process, record keeping, training and audit.

Chemical management: voluntary programmes

The Chemical Industries Council of Malaysia (CICM) was established and incorporated in 1982. Currently, it has 105 members comprising manufacturers, traders, distributors, and companies providing services to the chemical industry. It serves as the umbrella body and is affiliated with the various sub-sector chemical groups. It also acts as a channel of communication between chemical industry and the Government. One of CICM's flagship activities in Malaysia is Responsible Care (RC) which was introduced in 1994. RC is a voluntary system established to promote continuous improvements in safety, health and environmental (SHE) performance. The scope of RC covers the SHE of a chemical product from cradle to the grave.

Another important voluntary adoption of chemical management instrument is Globally Harmonised System of Classification and Labelling (GHS). The goal of GHS is to identify intrinsic hazards found in chemical substances and mixtures and to convey hazard information about these hazards. Having the same and similar hazards classification and hazards communication system, will help to facilitate the trade of chemicals throughout the world. This instrument was set up by the United Nations and available for voluntary adoption by countries. In Malaysia, the National Coordinating Council for GHS Implementation formed in 2006 and led by the Ministry of International Trade and Industry and represented by various ministries, government agencies, industry associations and civil society. Even though GHS is a voluntary UN program, the council decided to adopt GHS as a legal framework in Malaysia. There are four sectors covered in the GHS: industrial workplace, pesticides, transports and consumer products. Industrial workplace chemicals is governed by department of Occupational Safety and Health (DOSH), pesticides by Pesticides Board, transports by Ministry of transport and consumer products by Ministry of Domestic Trade, Co-operatives and Consumerism.

Challenges in managing chemicals in Malaysia

The perception from employers and employees towards chemical-related risk is still unsatisfactory. Various education programs have been carried out by many different agencies regarding the importance of risk assessment and risk management at workplaces. Costs of compliance to the legal requirements are relatively

high, especially for small and medium industries. There are some efforts carried out by the regulatory bodies to simplify the legal requirements without neglecting the safety and health aspect. Simplification of legal requirements will lead to cheaper costs of compliance. Other challenges are limited numbers of expertise in chemical management field, limited chemicals testing facilities, and decentralization of regulatory requirements. There are many government agencies governing different types and levels of chemical life cycles in Malaysia. Discussions have been carried out to look into the possibilities of having one central agency for governing the chemical industry.

Conclusion

Malaysia in general has a proper system of management of chemicals. However, the current system needs to be further strengthened to meet with current global trends and demand. More and more chemical production facilities have been set up in recent years and the quality and standards of chemical management should be a number one priority.

CWC Regional Assistant and Protection Centres (RAPC)

Hadi Farajvand [*]

Objective 1 (To assist the OPCW)

- The CWC is silent on the role of the OPCW on safety and security but it is obvious that based on principal of "prevention is much easier than treatment" the OPCW has to actively engage
- this aspect is very important since Safety and security of chemical facilities is as much important as the issue of Chemical Weapons attack
  - Accident in chemical industries
  - Terrorist attack on chemical production facilities
  - Natural disasters (Flood, earthquake, …)
  - Targeting chemical facilities (release of toxic chemicals)
- Currently the opcw is unable to assist States Parties in case of use of Chemical Weapons and incidents involving toxic chemicals or promoting safety and security of chemicals (lack of capacities)
- It is costly and insufficient for the OPCW to have stockpiles of protection materials and equipment and ensuring the safety and security of chemicals facilities
- It's better to establish OPCW regional centers to assist the OPCW in this regards

Objective 2 (To assist the States parties)

- Assist States Parties in implementing their obligations under the CWC
- Build synergies with other regional centers and relevant specialized international organizations
- Develop of national capacities to respond in case of an accident involving Chemical Weapons or toxic chemicals
- Provide training and education to the States parties in the region
- Establish of regional networking
- Facilitate exchange of equipment, materials and information
- Coordinate of assistance and international supports
- Provide a forum for consultation and cooperation among regional states parties
- Transfer of technology and equipment to states parties in need
- Provide the best available techniques and best practice in handling, transfer and use of hazardous chemicals
- Initiate public awareness raising programs and activities about the nature of dual-use chemicals and the risks arising from the use of chemicals
- Promote global chemical safety and security culture
- promote of green chemistry by Identification and provision of alternative to the dangerous goods and hazardous chemicals
- Holed Courses, Seminars and Workshops on different aspects related to the implementation of the CWC

Criteria for hosting RSSC

- Hardware and software requirements (to be determined by the TS of the OPCW)
- Personal and Financial Resources (having knowledgeable experts to carry out deferent duties)
- Accreditation and Certification by the OPCW (according the criteria and relevant conditions to be verified by the TS of the OPCW)
- Agreement with the OPCW (draft model agreement to be prepared by the TS)
- Programs and Planning (yearly program of RSSCs should be discussed and approved by the TS)

The OPCW Assistances to RSSC

- Providing training materials
- Training for staff
- Dispatching lecturers to the RSSCs events
- Collecting possible voluntary contributions to the RSSCs activities
- Coordination among RSSCs
- Providing the RSSCs with guidelines and the needs
- Considering and approving annual programs of RSSCs

Chemical safety and security in IRAN

- Classification of industries working with dangerous and hazardous chemicals based on risk assessment
- Periodic inspection of workshops and industries bases on the degree of assessed risk
- Implementation of measures for substitution of hazardous chemicals with alternatives
- Holding training courses and workshops at the national and regional levels
- Publishing educational packages to aware owners of industries, workers, and targeted communities.
- Preparing guidelines: to identify, control, dispose dangerous chemicals
- Implementation of harmonized classification and tagging of chemicals
- Developing and implementing Programs to prevent and confront chemical incidents
- Preparing national and local chemicals safety index
- promotion of chemicals management measures through revision of relevant laws and regulations, etc

Chemical Safety and Security Need in IRAN

- Public awareness rising
- Developing comprehensive national chemical data base with regards to dangerous goods and chemicals
- Specialized training for industries
- Regulation, legislation and administrative directives
- Training for first responders and fire fighting staff
- Developing SOPs for handling hazardous chemicals
- Storage and transportation
- Physical inventory and protection

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The tasks of the State Fire Service in the field of chemical and environmental emergency response, within the National Firefighting and Rescue System

Major Marek Poterek [*]

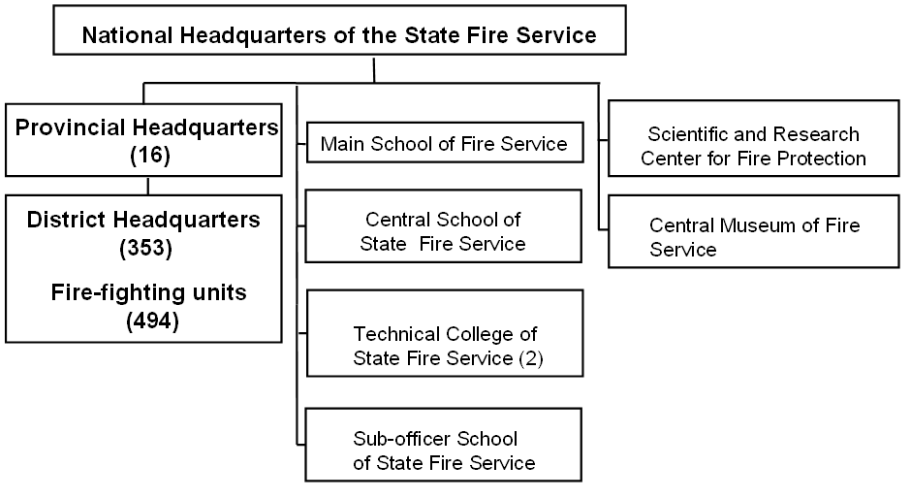
Abstract: The State Fire Service (SFS) is a professional and uniformed formation equipped with special technical gear designed to respond to daily emergencies, for example fires, natural disasters and other local threats. The National Firefighting and Rescue System (NFRS) was established by the SFS in 1995 and is aimed at protecting human life and health, property and the environment by fighting against fires and other natural disasters, conducting technical and chemical emergency response and, since 1997, environmental and medical emergency response. Chemical and environmental response operations are conducted to the extent provided in the rescue plans by the NFRS units regarding the level of their training, special equipment and personal protective equipment, and in particular by specialized environmental and chemical emergency response groups of the SFS. The tasks of the organizational units of the SFS in the field of environmental and chemical emergency response include planning, organizing and conducting emergency operations in order to reduce or eliminate direct threats caused by dangerous substances to humans, animals, property or environment.

The State Fire Service in Poland is a professional and uniformed formation equipped with special technical gear designed to respond to daily emergencies. Is uniformly organized the whole territory country. The State Fire Service of Poland comprises variety of activities, starting from prevention and recognition of hazards, through education, research and development, up to responding to daily emergencies and disasters (fighting fires and other local threats, chemical and ecological rescue, technical rescue, rope rescue, water and diving rescue, urban search & rescue, limited first medical aid). At the moment the State Fire Service employs about 32 000 people.

The Polish State Fire Service, supervised by the Ministry of Interior, is one of the basic parts of the National Firefighting and Rescue System - an integral part of the internal safety structure of the state. The Chief Commandant of the State Fire Service is the central authority responsible for the organization of fire protection. The Chief Commandant of the State Fire Service, being the Chief of the National Civil Defence acts also as the Director General for Civil Protection.

Organizational structure of the State Fire Service

The National Headquarters of the State Fire Service are placed on the top of the organizational structure of the State Fire Service of Poland, consisting of the National Headquarters of the SFS, 16 Regional Headquarters of the SFS, 353 District (Municipal) Headquarters of the SFS and 494 Fire and Rescue Units.



[*] Major Poterek is from the Central School of the State Fire Service, Czestochowa, Poland

The system of the Polish State Fire Service embraces the network of fire service schools educating the country's firefighters: the Main School of Fire Service (SGSP) in Warsaw, Central School of the State Fire Service (CS PSP) in Czestochowa, 2 Fire Service Colleges (SA PSP) in Krakow and Poznan and Sub-Officers School of the State Fire Service (SP PSP) in Bydgoszcz.

The system of the Polish State Fire Service comprises the Scientific and Research Centre for Fire Protection situated in Józefów near Warsaw. The Centre is responsible for testing, certification and validation of the equipment used in the State Fire Service, technical fire protection systems, as well as the expertise concerning fire protection systems, including design and installation.

Another organizational unit of the State Fire Service supervised by the National Headquarters of the SFS is the Central Museum of Fire Service**.**

The State Fire Service is also an active international player. Our 24/7 room (the National Centre for Rescue Coordination and Civil Protection) serves as the Poland's focal point for the EU-MIC, the NATO-EADRCC and the UN OCHA civil protection and humanitarian aid operations. Besides the above mentioned organizations, we cooperate i.e. within the UN ECE Convention on the Transboundary Effects of Industrial Accidents, OECD, CBSS, Forum Salzburg, V4, CTIF, FEU, EFA, ISF, IRO as well as bilaterally.

Our actions involve exchange of expert knowledge, contributing to international standards and rules, cooperating within projects with our partners, as well as sending our specialized teams for operations abroad.

In conclusion, the Polish State Fire Service is a formation:

- fully professional;
- fully harmonized and standardized in all country
- is the organizer and core of the national rescue and firefighting system

The Fire Service is the State, but strongly decentralized because:

- supervised by public authorities on each level
- budget comes from public administration authorities
- the appointment of Chief Fire Officers must be agreed with public administrations on each level
- rescue plans are approved by the public authorities on every level.

In addition to the tasks which have been previously mentioned, the Polish firefighters carry out activities related to the:

- recognizing the risk of fire hazards and other local treat,
- training of personnel of the State Fire Service, other fire protection units and for civil protection,
- monitoring the compliance with the fire regulation,
- development of research work in the field of fire protection.

National Rescue and Firefighting System

National Firefighting and Rescue System (NRFG) is an integral part of the internal security of the country, including in order to save life, health, property or the environment, prediction, detection and fighting of fires, natural disasters or other local threats. The design of the system assumes that the culture of the basic tasks of rescue are fixed and adapted to all kinds of events, including mass events or natural disasters when power and emergency measures are insufficient, and the organization of rescue operations priorities and needs to be modified to simplify the procedures of operation. The basic idea in the construction of fire-extinguishing system was to create a unified and coherent system, which brings together various interrelated entities of rescue, so that you can take any action to effectively rescue.

The National Rescue and Firefighting System is financed by the government. The Chief Commandant of the State Fire Service is the central body of the state administration responsible for organization and managing the National Rescue and Firefighting System. The Minister of Interior of the Republic of Poland is the central body responsible for the supervision of the System.

The National Rescue and Firefighting System was created to protect people, property and the environment in the territory of the Polish Republic. The main activities carried out in the system can include:

- extinguishing fires,
- fighting against the local threats,
- chemical and ecological rescue operations,
- technical rescue operations,
- rope rescue operations,
- urban Search and Rescue operations,
- water and diving rescue operations,
- first medical aid.

The National Rescue and Firefighting System operates on three administrative levels corresponding with the administrative structure of the country:

- DISTRICT – main executive level, where interventions are carried out by the district's resources,
- REGIONAL – coordination and assistance to the rescue operations when resources in the district are insufficient,
- NATIONAL – rescue operations assistance and coordination when resources in the region are insufficient.

The System embraces:

- 494 state firefighting and rescue units,
- 3 745 voluntary firefighting units,
- 5 industrial fire service units,
- 2 industrial rescue services,
- 11 hospitals in major Polish cities,
- 201 national experts specializing in different rescue types.

The National Rescue and Firefighting System is supported by:

- Police,
- Border Guard,
- State Inspection for Environment Protection,
- Institute for Meteorology and Water Management,
- National Atomic Energy Agency,
- Mining rescue stations,
- Maritime Search and Rescue Service,
- Naval Rescue Service,
- NGOs, e.g. Mountain Voluntary Rescue Service; Water Voluntary Rescue Service, and many others.

Some part of resources of the National Rescue and Firefighting System is organized in the form of operational reserves. Operational reserves consist of 16 provincial brigades, that make up the central operational reserve**.** These regional brigades in the first place are used for activities outside their own area.

At present, the Central Operational Reserve a form subdivisions such as:

- 25 firefighting companies.
- 23 special purposes companies.
- 2 logistic companies,
- 5 firefighting schools' companies,
- 10 water and diving rescue teams,
- 14 rope rescue teams,
- 16 chemical response teams,
- 7 technical rescue teams,
- 5 search and rescue teams.

Chemical and environmental emergency response within the National Firefighting and Rescue System

These activities include the use of rescue techniques and means of neutralizing, absorbing, limiting or stopping pollution, necessary to eliminate the direct effects of hazards of substances dangerous to humans, animals, the environment or property.

Activities in the field of chemical and environmental emergency response can be realized at the basic and specialized level:

- Basic level - applies to the tasks during the rescue operations, the rescue equipment owned and size of each firefighting unit.
- Specialized level - applies to the full range of tasks during the rescue operations carried out by a specialized chemical rescue teams.

The chemical response team is a subdivision consisting of rescuers with specialized training in the field of chemical and environmental emergency response and specialized car (chemical, rescue, fire) as well as equipment and powers to special rescue operations.

Total resources the State Fire Service for removal chemical hazards include:

- at a basic level – 494 fire units (first fire engines),
- at a specialist level – 16 chemical response teams,
- 16 chemical reconnaissance vehicles – located in each regions,
- 3 mobile laboratory – units located in Katowice, Poznań, Warszawa.

For chemical rescue tasks at a basic level firefighters make use of the following equipment:

- splash suit (TYCHEM F),
- breathing apparatus or filter mask,
- gloves,
- bots,
- standard equipment and rescue vehicles to carry out basic operations of rescue,
- portable device to detect concentration of gases, for example, to measure the carbon monoxide or explosive detection (CO, H2S, O2, LEL).

Emergency action in the field of chemical and environmental response implemented on a specialist level, require the use of multipurpose equipment.

The equipment used by the chemical response teams include:

- chemical protective suit;
- breathing apparatus and filter mask;
- sealing equipment;
- pump fittings;
- containers for the collection of hazardous materials;
- equipment to reduce oil spills on water;
- neutralizers and sorbents;
- equipment for exposure assessment;
- and other necessary equipment

During the action, chemical rescue the most serious problem is the proper identification of the substance. For this purpose, the selected fire units are equipped with mobile laboratories. In these vehicles, equipment for the detection of substances is installed. At any time, the car can be used in the place of a chemical accident.

Equipment for exposure assessment in chemical incidents for firefighters on mobile laboratory level:

- First Defender/STREET LAB – Raman spectroscopy (for solid and liquid),
- Gas chromatography with mass spectrometry (solid, liquid, gases),
- IR spectroscopy (solid, liquid, gases),
- RAID M – IMS (for toxic gases e.g. CWA),
- portable device to detect concentration of gases,
- detector PID,
- detector tubes,
- dosimeters (for radiological incidents).

Training system of the State Fire Service in Poland

One of the tasks assigned by legislation to the State Fire Service is to educate the staff for the purposes of the State Fire Service and fire protection units. Basic firefighting course is provided in every fire service training centre in district and in selected fire service schools. Firefighters who have completed a sub-officers course can continue their education in the Fire Service College. The Main School of Fire Service in Warsaw is the only technical university in Poland educating fire service officers, fire safety and civil safety engineers. Training centers of the State Fire Service also offer professional courses and trainings in the field of specialized rescue, fire and civil protection.

Specialized training of the State Fire Service on the example of The Central School in Czestochowa.
The Central School of the State Fire Service in Czestochowa was founded on 21 October 1994 in accordance with the ruling of the Ministry of Interior. Its buildings are former barracks of a military unit which were adapted for the school purposes. Central School of the State Fire Service is the youngest training unit of this kind in Poland.

The buildings of CS PSP have undergone some fundamental changes in the course of the past several years. Nowadays the school is modern, well equipped and develops very fast.

The Central School of the State Fire Service prepares firemen for fire fighting, natural disasters and other local threats on the medium level of education.

The school's training ground, laboratories and lecture rooms are equipped with modern audio-visual and teaching aids as well as training stands.

Teaching and training base encompasses:
- many lecture rooms,
- assembly 1 hall for 200 persons,
- assembly 2 hall for 100 persons
- assembly hall for 60 persons,
- 2 computer rooms,
- 8 laboratories,
- a library and reading room,
- training ground with 48 stands,
- sports premises,
- fire and rescue unit,
- accommodation and meals for 500 people.

The School provides the following types of trainings and courses.

- **Full-time course for Aspirants of the National Fire Service**

  Full-time course for Aspirants of National Fire Service is a two-year vocational college preparing commanding staff of the medium level for units of the National Fire Service and other units of fire protection.

- **Extramural course for Aspirants of the National Fire Service**

  The course is based on the syllabus binding from the year 2000 and is aimed for the firefighters being on duty in the units of the National Fire Service, units of fire protection and other rescue subjects.

- **Supplementary Course for Firefighter of Fire Protection Unit**

  The course is designed for the firefighters to be on duty at the positions for non-commisioned officers in the units of the National Fire Service, units of fire protection and other rescue subjects.

- **Course for staff responsible for fire prevention in their place of work**

  The aim of this course is to prepare people to deal with fire protection in their workplace and to carry out tasks ensuring protection of life, health and property against fire, natural disasters and other local threats.

- **Trainings in Civil Protection and Civil Defence**

The trainings in this field started in the year 2002 and are aimed at organs and staff of national and local governments. During such a training people are prepared to fulfill tasks in the field of civil protection. Trainings are carried out in accordance to syllabuses adjusted to individual needs of participants.

– **Specialist trainings**

In the central school are carried out in accordance with the specific training needs. The most popular courses are:

- Training on Chemical and Environmental Response,
- First Aid Training,
- Rope Rescue Training.

– **International specialized training**

At the Central School are also carried out international exchange and training. Until now been carried out following types of training:

- Rescue techniques in road accidents,
- Principles of organization of the mass decontamination during the chemical threat,
- Identification and elimination of hazards during fires, chemical and technical rescue,
- Tactics in technical and medical rescue operations,
- Training Course in Sampling Preparation and Analysis of Toxic Chemicals (in cooperation and with the help of OPCW)

During the lectures, the fireman is given theoretical and practical knowledge. Practical training (exercises, games) are conducted at fire practice grounds. The School boasts the largest training ground in Poland. It is equipped with stands for training in technical and chemical rescue, external and internal fire-fighting and training chamber with respiratory ducts protection equipment. The practical part of the training program is carried out on the training facilities 8 hectares a site, maneuver yard adjacent to the School comprising 3 hectares in area and a former military firing ground situated 2 kilometers from school.

Introducing the IOMC (Inter-Organisation Programme for the Sound Management of Chemicals) and relevant activities of UNITAR

Jonathan Krueger *

Outline

2

- What is the IOMC?
- IOMC Decision-making Toolbox for Chemicals Management
- UNITAR Chemicals and Waste Management Programme (CWM)
- Relevant activities to OPCW and CWC

What is the IOMC?

3

- **9 Inter-governmental Organizations** (IGOs) working together
- Established in 1995 to strengthen cooperation and increase coordination in the field of **chemical safety**
- Participating Organizations:
  - Food and Agriculture Organization of the United Nations (FAO)
  - International Labour Organization (ILO)
  - United Nations Development Programme (UNDP)
  - United Nations Environment Programme (UNEP)
  - United Nations Industrial Development Organization (UNIDO)
  - United Nations Institute for Training and Research (UNITAR)
  - World Health Organization (WHO)
  - World Bank
  - Organisation for Economic Co-operation and Development (OECD)

Objectives of the IOMC

4

⇨ **To achieve the sound management of chemicals in relation to human health and the environment**

- By strengthening international **cooperation** in the field of chemicals
- By increasing the **effectiveness** of the programmes of the 9 organizations
- By promoting **coordination** of policies and activities, pursued jointly or separately

The IOMC Vision Statement

*The Inter-Organization Programme for the Sound Management of Chemicals (IOMC) is the pre-eminent mechanism for **initiating, facilitating and coordinating international action to achieve the WSSD 2020 goal for sound management of chemicals**.*

IOMC Activities

5

Each organization undertakes the following capacity building related tasks (in its respective sector/field of expertise):

- ✓**providing assistance** where countries have identified a capacity gap
- ✓supporting the implementation of **international agreements**
- ✓providing support to the development of situation analyses and baseline **reports**
- ✓supporting national governments in the formulation and discussion of **policies and related instruments**
- ✓providing access to **information**
- ✓providing **outreach and awareness raising** for regional and international activities
- ✓providing **technical assistance** to countries to develop their overall national chemicals management infrastructure
- ✓assisting in the identification, development and transfer of (environmentally) sound **technologies**.

Framework: saicm

6

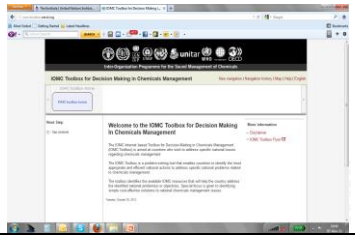
- **S**trategic **A**pproach to **I**nternational **C**hemicals **M**anagement (**SAICM**) - a policy framework to foster the sound management of chemicals
- Adopted by the International Conference on Chemicals Management (ICCM) on 6 February 2006 in Dubai
- developed by a multi-stakeholder and multi-sectoral Preparatory Committee
- supports the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that:

  by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health

IOMC Toolbox

7

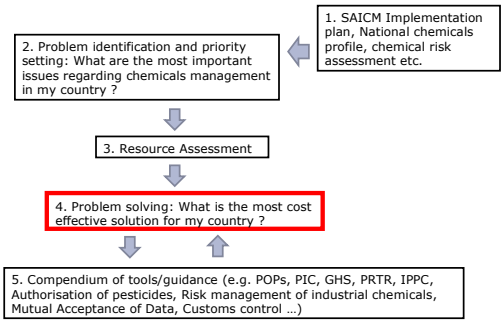
- IOMC Decision-making Toolbox for Chemicals Management
- One stop shop on the web for countries wishing to set up or improve their chemicals management system to find answers to and ways of dealing with specific needs and objectives
- **iomctoolbox.oecd.org**



* Mr. Krueger is Acting Programme Manager of the Chemicals and Waste Management Programme (CWM) of the United Nations Institute for Training and Research (UNITAR).

IOMC Toolbox Objectives

8



UNITAR

9

- Founded in 1963 as an **autonomous** body within the United Nations system
- a **training** arm of the United Nations System
- Serves some 27,000 **beneficiaries** annually by conducting more than 400 capacity development and research activities around the world
- Mission: to deliver **innovative** training and conduct research on knowledge systems to develop capacities of beneficiaries in the fields of Environment; Peace, Security and Diplomacy; and Governance

UNITAR's Chemicals and Waste Management (CWM) Programme

10

- UNITAR CWM provides support to governments and stakeholders to **strengthen their institutional, technical, and legal infrastructure and capacities** for sound chemicals management
- Activities take place in the framework of implementing **international agreements** such as the Basel, Stockholm, and Rotterdam Conventions, the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), the Strategic Approach to International Chemicals Management (SAICM)
- Activities are aimed at protecting human health and the environment while ensuring **sustainable development**
- UNITAR's approach to capacity building supports a country-driven and integrated approach to chemicals management as endorsed by **ICCM-1**, held in Dubai in February 2006
- It is linked to the **2020 goa**l to achieve **sound management of chemicals** as adopted by the World Summit on Sustainable Development (WSSD) in 2002

Relevant Activities to OPCW/CWC

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UNITAR supports countries in a wide range of chemical safety areas - these include:

- National **pilot projects/integrated national programmes** - assisting countries to establish/strengthen a collaborative framework at the national level
- National chemical management profiles - **country assessments**
- Specialized **training and capacity building** - GHS, PRTR, Mercury, Nanotechnology

Conclusions

12

- Significant opportunities exist for expanding international cooperation for chemical safety and security
- UNITAR ready to collaborate with OPCW and interested stakeholders to assist countries to improve chemical safety and security
- IOMC also interested to learn more about possible opportunities and synergies
- We look forward to further discussions!

Responsible Care: Security Code guidance and best practice for the implementation of the Code

Sjoerd Looijs [*]

Security management became increasingly important during the past ten years within the global business environment. Numerous regulatory and voluntarily initiatives have emerged to enhance the security of the private sector. In 2010, the Cefic National Association Board adopted the European Responsible Care Security Code as the basis for the inclusion of Security management into the national Responsible Care programmes in Europe.

This document is designed to assist companies in implementing the Responsible Care Security Code along seven management practices. A number of other guidance documents including risk assessment tools, checklists and best practice modules are available and can be used by companies. Those documents are listed in ANNEX 1.

1. Leadership commitment

Senior leadership commitment to continuous improvement through policies, provision of sufficient and qualified resources and established accountability.

- Assess the most important assets for the company and for each relevant site e.g. research facilities, production plants, headquarters, central computer/computer rooms and infrastructure. Think about the possible impact triggered by theft, loss, damage, disruption, manipulation with malicious intent, rumours or espionage.
- Emphasise security as a fundamental part of the overall management system and/or the Responsible Care program in form of e.g. a written policy or statement to all staff and partners.
- Develop a job description for a person responsible for the company's security program and appoint a person based on the defined needs.
- Define the internal security network and services especially if the company exists of more than one site or facility.
- Take care of the job specific training and qualification for all staff dealing with security.
- Provide the security function with sufficient resources and with direct reporting lines to the management.
- Set and communicate security expectations and goals.

2. Risk analysis

Periodical analysis of threats, vulnerabilities, likelihood and consequences using adequate methodologies.

- Assess the most important assets for the company and for each relevant site e.g. research facilities, production plants, headquarters, central computer/computer rooms and infrastructure. Think about the possible impact triggered by theft, loss, damage, disruption, manipulation with malicious intent, rumours or espionage.
- Evaluate the dependence on raw materials, telecommunication (phone, radio and data network), transport and utilities like energy.
- Identify critical chemicals/products and processes whose theft, loss, manipulation or release caused by a malicious act could result in significant impacts for the company or the public e.g. tank farms, dangerous goods loading facilities, high pressure equipment, process control systems. Take into account any relevant assessments that the company has already performed.
- Analyse the essential security threats for the company, the staff, the assets, the products and the knowhow. Know about the motivation and tactics of e.g. thieves, hackers, frustrated employees, organised crime, violent pressure groups, extremists and terrorists. Governmental and local security agencies should be asked to provide initial information and maintain a reporting system.
- Make sure that a security analysis is a fundamental aspect of the overall business continuity planning and decisions on all capital expenditures and investments.
- Determine what is acceptable and what is not

[*] Mr. Looijs is Responsible Care Manager for the European Chemical Industry Council (Cefic)

3. Implementation of security measures

Development and implementation of security measures commensurate with the risks.

- Define the goals of a company specific security concept, based on a risk analysis and guided by the principle “Deter, Detect, Delay and Respond”.
- Conduct a security survey for the company or the site to assess the already existing security measures. For this purpose build a team consisting of management representatives and experts for security, process safety, infrastructure, IT, emergency response, logistics, human resources, etc. It is important to understand how technical, personnel and organisational means of security act together and help to secure other processes e.g. within the supply chain.
- Analyse if there are any gaps between these measures and the risk and the goals defined before.
- Close the gaps by putting additional or modified security measures into place, resulting into a comprehensive plan for site security which should cover all relevant categories.
- Implement the plan and check that scheduled measures have been put in place and are working as desired, especially in case of significant modifications
- Integrate security and information protection needs and requirements into site procedures, contracts and service level agreements, in an appropriate way and whenever necessary

See ANNEX 2 for good practices for items usually included in a security plan

4. Training, Guidance, and Information

Training, guidance for, and information of employees, contractors, service providers and supply chain partners, as appropriate, to enhance security awareness.

- Make sure that staff, contractors, suppliers and service provider are aware of, and respect the company’s security rules and procedures. This information should be a fundamental part of the “day one” package for new employees and contactors but also for e.g. visitors, possibly in a shortened version.
- Raise the general awareness for security and information protection by appropriate measures like presentations, workshops, training sessions, posters, flyers and any state- of-the-art communication technology or platforms.
- Inform and train staff involved with critical assets or functions in more detail about the particular security and information protection threats caused not only by outsiders but also by insiders.

5. Communication, Dialogue, and Information Exchange

Communications, dialogue and information exchange on appropriate security issues with stakeholders such as employees, contractors, communities, customers, suppliers, service providers and government officials and agencies, balanced with safeguards for sensitive information.

- Establish means of communication, possibly making use of already existing ones within the company
    - to inform employees, as appropriate, about current security threats and countermeasures, and
    - to inform management, as appropriate, about lessons learned from security threats, incidents and investigations that have occurred.

- Establish regular information exchange meetings with local/national law enforcement agencies and make sure that they will inform you immediately about upcoming threats.
- Make sure that when there is a change in threat level, site security but also management and other relevant units are informed and will react as required or appropriate. Several threat level systems can exist that may have an impact on the company and these can include national and international systems.
- Build or extend already existing networks within the industry for the exchange of security best practices and other relevant security information.

6. Response to Security Threats and Incidents

Evaluation, response, reporting and communication of security threats and security incidents, as appropriate, and corrective action for security incidents including “near misses”.

- Establish a reporting system for security issues or extend an already existing reporting process
- Evaluate incidents without delay in order to reduce or to limit the impact.
- Establish a Crisis Management/Emergency Response Organisation for handling major security incidents, whereby the use of existing teams is recommended.
- Make sure to be able to rely on local or national law enforcement agencies which provides a 24/7 single point of contact.
- Establish a "lessons-learned culture" for security issues inside the company and with others, as appropriate.

7. Audits, Verification, and Continuous Improvement

The commitment to security calls on companies to seek continuous monitoring of all security processes.

- Integrate security in the "management of change" processes.
- Evaluate on a regular basis the number and severity of reported company internal security incidents and outside security incidents relevant for the chemical industry to keep the security system updated.
- Make sure that the security processes and procedures are reviewed on a regular basis by internal or external experts.
- Integrate security into the regular review system of the company e.g. Responsible Care.

DISCLAIMER

ANNEX 1

References or other useful reading

1. Leadership Commitment

2. Risk analysis

- IMPROVE: Vulnerability assessment methodology for chemical sites http://click-in.cefic.org/document/security-vulnerability-assessment-tool-improve-ec-funded-project-led-by-cefic.aspx (via Cefic Click-in)

3. Implementation of Security Measures

- EC Council Regulation (EC) No 881/2002 (OJ L 139, 29.5.2002, p. 9-22), which imposes a number of specific restrictive measures directed against suspected terrorists: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:139:0009:0022:EN:PDF
  Note that the Annex, containing the list of persons and entities, gets amended frequently.

4. Training, Guidance and Information

- Industry guidelines for the security of the transport of dangerous goods by road http://www.cefic.org/Documents/IndustrySupport/Transport-and-Logistics/Best%20Practice%20Guidelines%20-%20General%20Guidelines/security_guidelines.pdf
- e-Learning tool for the AEO (Authorised Economic Operator) legislation that aims at balancing increased security requirements with facilitations for compliant traders http://ec.europa.eu/taxation_customs/common/elearning/aeo/index_en.htm
- Chemical security awareness training (requiring free of charge registration) https://chemicalsecuritytraining.dhs.gov/newlogin.aspx

5. Communications, Dialogue and Information Exchange

6. Response to security Threats and Incidents

7. Audits, Verification and Continuous Improvement

Examples of existing security legislation and initiatives: Chapter 1.10 of RID/ADR/ADN, ISPS, C-TPAT, AEO, etc

ANNEX 2

Good practices for items included in a site security plan
(related to item 3. "Implementation of Security Measures)

a) Perimeter security: Fence, wall, gates, pedestrian entrances, turnstiles, barriers, doors and windows of buildings located directly at the fence-line must have a homogenous security level.

b) Locking devices: External gates, doors, windows and emergency exits must be secured with sufficient locking devices. Keys have to be checked on a regular basis.

c) Gate areas: Sufficient parking space for private vehicles and sufficient waiting and control areas for trucks and contractors must be present. The strict separation of external and internal territory is a must.

d) Lighting: Adequate illumination for gate areas, site perimeter, loading facilities and security control points should be installed.

e) Patrols: Depending on the size and the complexity of a facility, random patrols by security officers to check the site perimeter and also critical assets could be useful.

f) Video surveillance and sensors: The use of CCTV (Closed Circuit Television), fence detection, etc depends very much on the risk and the needs of a chemical facility. If necessary those systems need to be designed by experts and must be adapted to the technical and organisational capability of the internal or external security organisation.

g) Access control: All people (staff, contractors, visitors, guests, truck drivers, service providers, consultants, etc) have to be checked before getting access. Company badges for staff could be used for identification. All other people have to present a valid official document with a photograph like a passport. The host has to be contacted before access is granted or should pick up the person at the gate or entrance. In case of drivers, service providers, etc the relevant internal unit has to be contacted for verification. Company badges should be visibly displayed permanently by each person on site or within the facility. Huge and complex sites should have a sound system for denying access to (parts of) the site to unauthorised persons.

h) Access control technology: Automated access control systems, in combination with physical barriers, assist or can replace the guard function. In addition to the need for an up-to-date technology, the administration of such access control systems is very important: the administrator must be very reliable and qualified but it must be ensured that the data flow (in both directions) between the human resources data base, the badge producing system and the access control system, results in nearly instantaneous synchronisation.

i) Additional layers of protection: If the risk assessment identifies critical assets it must be checked whether additional protection with intrusion alarm systems, CCTV or other sensors might be necessary. Note that also physical and other security measures are essential for those assets.

j) Security operations: Tasks and duties of the site security function should be defined and documented. Security officers need to have job related education, training and qualification. Security incidents (near misses) and findings during patrolling etc. should be reported. Make sure that the security officers have all the information, training and equipment they need for alarm verification/response and patrolling.

k) Controls and inspections: Sufficient inspections of arriving and departing trucks, cars, containers,

railcars, mail, etc should be established at the gates and/or at the relevant places inside like loading and unloading facilities, mail room, packaging etc. Use should be made of adequate inspection checklists specifically for trucks and containers; the U.S. C-TPAT program offers some good examples. Trucks and containers shall be secured by seals which are accepted for international transport.

l) Personnel security: Based on national legislation companies should have a process in place to screen employees and candidates for employment at the start of the employment and at regular intervals thereafter. Comply with the European Council Regulation No 881/2002 which imposes a number of specific restrictive measures directed against suspected terrorists.

m) Trade control: Security is a horizontal function within an organisation. It must therefore be ensured that, by formation and training, the security aspects in the areas of e.g. the Chemical Weapon Convention, explosive precursors, drugs and drug precursors are known and complied with by logistics, marketing and sales and all other involved units and staff of the company. Measures relate mainly to customer credibility checks, end-user declarations and the selection of reliable service providers such as e.g. forwarders.

n) Information Protection: In addition to the intellectual property aspect of information protection activities, it is also important to protect any other company information and systems against unauthorised access, misuse and manipulation. Therefore strong access procedures and controls to systems and applications are essential although the "need to know" principle must be taken into consideration. Business partners which duly need access to those systems and applications, have to be informed and trained but also monitored.

o) Maintenance: All security installations and systems must be regularly checked and maintained in working condition. All system failures and damages must be reported and repaired without any unacceptable delay.

p) Regulations: If the company is affected by laws and regulations with security aspects included (e.g. transport regulations for dangerous goods such as ADR, RID, ADN) these additional specific requirements need to be included within the overall security plan of the company or the site. Some security measures such as video monitoring may be limited or affected by national legal regulations.

Chemicals management under the Basel, Rotterdam, and Stockholm Conventions

Katarina Magulova [*]

As the UNEP Global Chemical Outlook[i] points out, the 20th century led to the invention and worldwide use of thousands of synthetic chemicals whose global footprint has accumulated in almost every living thing, including human beings. Their unsustainable management is causing growing risks to the environment and human health.

Important aspects of these issues are being addressed and regulated in Geneva. Geneva hosts the Chemicals branch[ii] of the United Nations Environment Programme (UNEP) and three important conventions, namely the Conventions of Basel, Rotterdam and Stockholm.

Negotiated independently but targeting a sound management and trade of chemicals and hazardous wastes, these three conventions have been undergoing a synergies process since 2008.

Focus, differences and complementarities of the three conventions

The 1989 Basel Convention[iii] on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global agreement specifically targeting hazardous and other wastes. The main goal of the Convention is the regulation of transboundary movements of hazardous wastes. It also has three additional objectives: to minimize hazardous waste generation (both in quantity and hazardousness),to treat and dispose of hazardous wastes and other wastes as close as possible to their source of generation in an environmentally sound manner; and to reduce transboundary movements of hazardous wastes and other wastes to a minimum, consistent with their environmentally sound management.

The 1998 Rotterdam Convention[iv] on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade focuses on facilitating information exchange about hazardous chemicals and severely hazardous pesticide formulations, by providing for a national decision-making process on their imports and exports and by disseminating these decisions to Parties. The Convention does not ban the export or import of hazardous chemicals and pesticides, but empowers countries to make informed decisions about the import and export of these substances.

The 2001 Stockholm Convention[v] on Persistent Organic Pollutants (POPs) lists 22 chemicals that are persistent, toxic, bioaccumulative and travel long distances in the environment, for which consumption, production and use, import and export, disposal and/or environmental release must be reduced, prohibited and/or eliminated. It also promotes safe and effective alternatives to POPs available on the global market.
Together, the three conventions work synergistically to provide the most comprehensive framework of international regulation of hazardous chemicals available to countries to protect human health and the environment. Collectively, they address the full life-cycle or chemicals from the time they are manufactured until their eventual disposal.

Some concrete examples of impact on the ground

Under the Basel Convention, an historic agreement that will ban the export of hazardous wastes from OECD to non-OECD countries was reached as long ago as 1995 and reaffirmed in 2011, along with a set of measures aimed at strengthening international control of transboundary movements of hazardous wastes. Although the BAN Amendment has not yet entered into force, participating countries are respecting its intent, and membership is growing.

Technical guidelines for environmentally sound management of wastes developed under the Basel Convention address such globally critical waste issues as persistent organic pollutants (POPs) in waste, electronic and electrical waste, and mercury in waste. This helps countries soundly manage their own wastes, while controlling illicit movement of wastes across borders, which is a challenge especially faced by many developing countries.

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The Basel Convention is one of the very few environmental treaties to define such prohibited activity as a crime. The fact that illegal traffic is deemed a crime that Parties undertake to prevent and punish demonstrates the international community's commitment to the environmentally sound management of hazardous and other wastes.

The Rotterdam Convention encourages nations to help each other to manage safely chemicals in international trade. The Prior Informed Consent, or PIC, procedure provides an early warning system that empowers countries to take informed decisions on whether or not to import hazardous chemicals in order to minimize the risks posed to human health and the environment. At present, there are a total of 39 banned or severely restricted industrial chemicals and pesticides plus four severely hazardous pesticide formulations listed in the Rotterdam Convention and therefore subject to the PIC procedure.

The PIC list is very dynamic and continues to expand over time as an increasing number of dangerous pesticides and industrial chemicals are reported under the treaty. For example, in 2011, the Rotterdam Convention parties added three pesticides, alachlor, aldicarb and endosulfan, to the PIC procedure. For those chemicals which have been nominated for listing by two or more countries from at least two regions of the globe, the Convention's review mechanism triggers a robust global exchange of information, promoting the right-to-know about the risks they carry and how countries can protect public health and the environment, as well as the means to protect against unwanted imports.

As of 2012, there were 22 POPs listed in the Stockholm Convention; 18 of these are targeted for elimination, two are restricted, and five are listed for the prevention or reduction of unintentional releases using best available techniques/best environmental practices (BAT/BEP). Three of the latter are also on the list for elimination.

PCBs and several organochlorine pesticides were among the initial "dirty dozen" substances slated for elimination under the Stockholm Convention and are in decline of in air, soils, and arctic biota. Ample evidence also documents the decrease of the "Stockholm" POPs in humans. For at least four of these POPs, our Parties have reported success in identifying innovative methods to introduce alternatives to POPs in a variety of products, from household goods to construction materials, semiconductors and textiles.

Progress against POPs is also being led by Parties through their support for regional centres engaged in capacity-building at regional and national level. Stockholm Convention has established a network of 15 Stockholm Convention Regional and Subregional Centres for Capacity-building and the Transfer of Technology.

As part of the conventions' synergies process, Stockholm Convention's centres are increasing their cooperation on capacity-building and technical assistance activities with Basel Convention Regional Centres, multiplying the benefits provided to the parties of all three conventions.

Key challenges regarding global management of chemicals and hazardous wastes

It is important to note that although these three conventions have done a great deal to improve the global situation regarding toxic chemicals and hazardous wastes, the treaties alone cannot solve all the problems. For example, the global chemicals industry accounts for around 9% of the world's economy, agricultural productivity and pesticide use continues to climb, and waste generation tends to intensify as countries industrialise, and the nature of waste changes – for example the very significant increase in e-waste in the past decade. To continue the progress made to date means continuing to build partnerships, engage and strengthen the active roles of all stakeholders, improve access to needed financial resources, and develop new instruments – such as the future mercury treaty, the negotiations of which are being facilitated by UNEP's offices in Geneva.

One example is the illegal dumping of toxic waste in Abidjan, Cote d'Ivoire in 2006 which underlines many remaining challenges including the urgency of strengthening the UN treaties covering shipping and hazardous wastes, specifically MARPOL and the Basel Convention. We need to give vulnerable peoples a tool that protects them by bringing into force the Basel Convention Ban Amendment finally prohibiting the export of toxic wastes from developed countries into vulnerable developing ones.

Another example is in financing. The Stockholm Convention has a financial mechanism - the Global Environment Facility – which provides new and additional resources to eligible Parties to enable them to

implement treaty obligations. But there is, as yet, no integrated approach for the financing of chemicals and waste challenges more broadly. While finding agreements on possible new and additional funding approaches can be exceedingly difficult in difficult economic times, governments have signaled that they wish to make progress in this area, and are working through UNEP's consultative process on the financing of chemicals and wastes – another Geneva-based activity – on finding solutions.

Objectives of the synergies process

The "synergies process" aims to strengthen the implementation of the three conventions at the national, regional and global levels by providing coherent policy guidance, enhancing efficiency in the provision of support to Parties to the conventions, reducing their administrative burden and maximizing the effective and efficient use of resources at all levels, while maintaining the legal autonomy of these three multilateral environmental agreements. This unique approach is a successful example to other parts of the global environmental agenda and demonstrates how to enhance international environmental governance through coordination and cooperation.

Under the leadership and oversight of Parties three critical components to successful synergies are: (1) policy development, where parties have taken a number of decisions at Conferences of the Parties between 2005 and the present, including ones directed to the management of the secretariat of the three conventions, such as the establishment of a single Executive Secretary for all three; (2) specific decisions at COPs on activities where they want delivery to take place in a synergistic way, and the corresponding budgets; and, (3) catalyzing synergies at the regional and global levels to extend the initial benefits more broadly to parties.

The overall goal of the synergies work is strengthened and improved support to parties of the conventions in meeting the objectives of the treaties.

Reference:

Interview with Jim Willis, Executive Secretary of the Secretariat of the Basel, Rotterdam and Stockholm Conventions; Geneva, 23 October 2012

[i] http://www.unep.org/pdf/GCO_Synthesis%20Report_CBDTIE_UNEP_September5_2012.pdf
[ii] http://www.chem.unep.ch/
[iii] http://www.basel.int
[iv] http://www.pic.int
[v] http://www.pops.int

Defining a beneficial space for NGO-UN system organisation interaction on chemical safety and security: a framework analysis

John Hart [*]

Abstract: A framework analysis is developed in order to define a beneficial space for NGO-UN system organization interaction on chemical safety and security. It is informed by a more general consideration of existing literature on transparency and accountability in science and politics. This includes a review of the various actors who possess or utilize relevant information, and how they should ideally interact with the broader international community. Capacities and mandates of NGOs and UN-system organizations are compared. The analysis is also informed by recent and current activity to maintain and strengthen nuclear safety and security, and biological safety and security, respectively. Political and technical sensitivities (including institutional) are then considered within the chemical safety and security context. Chemical safety and security measures can influence evaluations of the deterrent value of the 1993 Chemical Weapons Convention (CWC) and how to optimize the structure of the treaty's routine chemical industry verification. Such measures also affect the more general interaction between states on chemical health and safety, and emergency response. The working paper concludes by presenting options for utilizing a defined 'space' to permit (or strengthen) mutually beneficial interaction that is both process- and results-oriented. For example, analyses produced within such a context could include a further consideration of whether defined objectives to strengthen and maintain chemical safety and security have been met (e.g., through the implementation of key performance indictors (KPI) or equivalent). They could also include assessments on whether the scope and level of intrusiveness of routine chemical industry verification under the CWC are effective or possess sufficient deterrent value (via, *inter alia*, a further consideration of risk factors and frequency of inspection algorithms *and their relevance to the broader arms control verification literature*). Such analyses, if properly validated and taking into proper account confidentiality policies and other sensitivities, can strengthen the perceived and actual relevance of treaty regimes. This can be achieved partly by presenting to the broader international community (including industry and research communities) the existence of practical or operational-level activity and by presenting a sufficient context by which to assess their effectiveness.

Introduction

A variety of regulatory and other treaty-based regimes promote, support or mandate chemical safety and security.[i] Similarities, differences and synergies exist between this activity and that carried out on nuclear safety and security, and biological safety and security, respectively. Nuclear, biological and chemical (NBC) safety and security are also relevant to and inform the mandates of the principal international legal instruments against NBC weapons: the 1968 Non-Proliferation Treaty (NPT), the 1972 Biological and Toxin Weapons Convention (BTWC) and the CWC. The institutional support mechanisms for these treaty regimes differ in capacity and focus. For example, two of the treaties are supported by standing international bodies: the International Atomic Energy Agency (IAEA) and the Organisation for the Prohibition of Chemical Weapons (OPCW).[ii] In addition, efforts to ensure that materials, technology, equipment and intangible technologies are not misused for NBC weapon purposes are distinct according to weapon type.

NGOs in the UN context

Various principles inform transparency and accountability in science and politics which, in turn, influence or define the interaction between officials, the public and non-governmental organizations (NGOs).[iii] In a literal sense, NGOs may be understood to be any 'organization' that is not part of a government. Determining when an actor is performing a government role or task may, in practice, be difficult through, for example, the practice of outsourcing service contracts.

The legal basis for NGO roles at the UN and associated implementation practice are partly informed by Article 71 of the UN Charter which states:

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> ‘The Economic and Social Council [ECOSOC] may make suitable arrangements for consultation with non-governmental organizations which are concerned with matters within its competence. Such arrangements may be made with international organizations and, where appropriate, with national organizations after consultation with the Member of the United Nations concerned’.[iv]

The UN has three categories of consultative status within the ECOSOC context: (*a*) category I (general consultative status); (*b*) category II (special consultative status) and (*c*) ‘roster’ (lists of NGOs that ‘can make occasional useful contributions to the work of the council, its subsidiary organs, and other UN bodies’).[v]

Since 1910 the Yearbook of International Organizations has profiled international nongovernmental organizations (INGOs), intergovernmental organizations (IGOs) and various civil society organizations. Currently, it lists 65736 civil society organizations in 300 countries and territories ‘in every field of human endeavour’.[vi]

In practice, NGOs are often divided according to type of activity (e.g., human health, environmental protection, education and training programmes, charity giving, and the promotion of good governance). They may be considered a sub-set of ‘transnational civil society’.[vii] NGOs also encompass pressure groups and research organizations and may possess religious, regional and national distinctions. In the CBW arms control context, one Hungarian diplomat has often characterized NGOs as ‘blue collar’ or ‘white collar’.[viii] The former are more activist and partisan, while the latter tend to be more research-oriented and apolitical.

NGOs in the CBW context

In any conflict where chemical or biological weapons (CBW) are employed (or alleged to have been used), one can generally identify NGOs (or individuals who fulfill a similar role) that seek to clarify the nature of such use or attempt to stop it (perhaps) and to hold those responsible legally accountable. NGO-like interaction with those involved in CBW arms control, and state defence and security contexts have existed since at least World War I.

For example, towards the end of the war British intelligence analysts became aware that the Council of the International Red Cross Society[ix] based in Berne[x] was about to issue an appeal to all belligerents to cease chemical warfare.[xi] They also became aware that a member of the Council was a German chemist and pacifist who had recently returned from Germany where he was apparently asked to become involved in chemical weapon (CW)-related activity.[xii] He was reportedly horrified at the prospect of becoming involved and returned to Switzerland where he spoke of the terrible effects of such weapons. Thuillier, who was the Director of British Gas Services at General Headquarters in France during the war, summarizes:

> ‘In a very short time, the appeal from the International Red Cross Council duly arrived, addressed to the British Government, and to the Governments of all the belligerents, to enter into an agreement to stop the use of gas or chemicals in any form, on the grounds of humanity, and [es]specially in view of the terrible sufferings to the troops and civil populations that would be likely to ensure from the use of the more deadly gases which it was believed that belligerents on both sides were preparing to employ’.[xiii]

The story prompted British suspicion that Germany was using the chemist in order to stop or delay Allied chemical attacks. The UK theorized that this reflected the diminishing resources available to Germany.[xiv] The UK nevertheless had to decide whether to risk exposure to an extremely effective agent when a humanitarian opportunity presented by the Red Cross Council could prevent this.[xv]

After the Allies turned the proposal down, the reports of the super CW agent suddenly ceased.[xvi] A member of the Council later visited the UK, met with the head of the British Chemical Warfare Service,[xvii] and assured the head that the German chemistry professor’s convictions were real.[xviii] Thus a scientist who opposed chemical warfare on moral grounds (regardless of whether he was manipulated) gave pause to the UK in its consideration of whether and how to continue conducting chemical warfare.

In the inter-World War period, various commentators sought to clarify the military strategic implications of technological developments, methods of warfare.[xix] This grew out of a general recognition and fear that the industrial and technological nature of World War I and its attendant mass deaths would continue and extend to civil populations in cities.[xx] Peace societies weighed in on arms limitation proposals, including on arms

trades. The military historian and strategist John F. C. Fuller, the scientist John B. S. Haldane, the philosopher, mathematician and peace activist Bertrand Russell and the author and social commentator Herbert G. Wells toured the lecture circuit addressing future conflict, international relations, and civil defence.

In addition, various pacifist and peace societies promoted pledges not to join the military. They also followed League of Nations proposals to limit or prohibit weapons. With respect to disarmament, the negotiations fell under three main headings: (*a*) disarmament of Germany, (*b*) international force reductions and budget cuts, and (*c*) international naval arms limitations.[xxi]

A technical sub-committee considered the matter of chemical weapons as part of the Washington Naval Conference (held on 12 November 1921–6 February 1922). However, this committee was unable to agree a method by which states could verify that toxic substances were not being developed or stockpiled for chemical warfare purposes. It also recognized that any verification of specific CW agents would necessitate a politically unacceptable degree of intrusiveness and restriction over civilian chemical industries.[xxii] The UK was concerned that violating a ban against chemical warfare was too simple, and that verification measures would expose a state's vulnerability to such weapons.[xxiii]

By contrast, US General John J. Pershing, who led a 1913 incursion against Francisco 'Pancho' Villa in Mexico and commanded the US expeditionary force in Europe in World War I, supported the complete and unequivocal renouncement of chemical warfare.[xxiv]

After the Washington Conference, an 8-member technical sub-committee under the League of Nations auspices continued to evaluate the manufacture and use of CBW agents and, in 1924, cast further doubt on the ability of states to verify non-production, warning against the dangers of such agents to civilians as well as to military personnel.[xxv]

The work carried out in Geneva under the auspices of the League of Nations have parallels with contemporary arms control and disarmament discussions.[xxvi] A sub-committee (perhaps related to the one above) to the Preparatory Commission on Disarmament in Geneva was tasked in 1926 to consider the possibility that chemical industry could be converted to produce chemical warfare agents.[xxvii] It concluded that 'chemical factories, especially dyeworks and factories connected therewith, can be very quickly adapted' to CW manufacture, that 'it is impossible to prevent or hinder the manufacture' of CW and that 'there is no technical means of preventing chemical warfare'.[xxviii] This phrasing echoes that of skeptics, including some parts of the research and lobby NGO community, of whether the BTWC is sufficiently verifiable.

Threat and risk pronouncements by governments was another factor in the mix of arms control and the promotion of peace activities. On 2–19 December 1927 at the 15th Congress of the Communist Party of the Soviet Union, Joseph V. Stalin spoke at length on the need for Soviet military preparedness, and the lack of relevance of arms control and disarmament work then being conducted in Geneva. He observed:

> 'the position as regards *war chemicals* is illustrated by the well-known statement of General Fries, Chief of the United States Chemical Warfare Service (CWS): "One chemical air-bomb of 560 kilograms charged with Lewisite can make ten blocks of New York uninhabitable, and 100 tons of Lewisite dropped from 50 aeroplanes can make the whole of New York uninhabitable, at least for a week"'.[xxix]

The reference to CBW in a Party Congress speech was unusual. Stalin's reference to CW can perhaps be explained in part because the Soviet Union participated in the Preparatory Commission for the League of Nations' Disarmament Conference for the first time that year (the Soviets had not participated in the first three sessions of the commission prior to this time).[xxx]

The speech perhaps was meant to support the incoming Soviet delegation to Geneva, either by signaling a negotiating position, by appealing to broader international opinion or by stimulating more general unease among non-Bolshevik societies.

Post-World War II

New NGOs (and NGO-like activity) emerged in the post-World War II period.[xxxi] Much of this was driven by a desire to limit or prevent war through the newly-established UN. Security and defence planners were especially uncertain of the future utility and role of nuclear weapons.[xxxii]

In 1957 the Pugwash Conference on Science and World Affairs held its first meeting—on nuclear weapon threats—in Nova Scotia. The establishment of this body was triggered by the issuance in 1955 of the Russell-Einstein Manifesto (signed by prominent scientists and public figures, including Albert Einstein and Bertrand Russell) that warned of the dangers of nuclear warfare.[xxxiii]

Pugwash annual meetings of scientists, officials and international organizations discuss the promotion and strengthening of international peace and security, and technical and political aspects of arms limitation and control. The meetings have sometimes served to support 'track 2' diplomacy between the Cold War blocs and, more recently, attempts to find mutually-acceptable approaches to clarify Iran's nuclear activity.[xxxiv] In particular, Pugwash has offered a platform for government representatives to discuss more freely sensitive matters in an informal setting.

The first Pugwash meeting devoted to CBW was held in 1959.[xxxv] Some NBC arms control meetings were jointly sponsored by the Stockholm International Peace Research Institute (SIPRI) and Pugwash in the 1960s and 1970s. Pugwash meeting participants have devoted much attention to a broad range of political and technical arms control compliance and verification questions.

NGOs have also facilitated the dissemination and analysis of CBW arms control relevant developments, including the status of treaty negotiation and implementation. Since 1969, SIPRI has published annual chapters on CBW events and developments its annual Yearbook.[xxxvi] From 1988–2011, the Harvard-Sussex Program on Chemical and Biological Weapons (CBW) published the *CBW Conventions Bulletin* which generally included otherwise difficult-to-obtain information on BTWC and CWC treaty implementation.[xxxvii] Much of this detail is today more readily on the Internet, including through the BTWC's Implementation Support Unit (ISU) and OPCW websites.[xxxviii]

The BioWeapons Prevention (BWPP) has some 60 network partners. Two notable activities are its email-based news list and discussion server, and the production of daily summary reports of BTWC meetings (when in session).[xxxix]

The Sunshine Project, which suspended its operations in 2008, but whose website is still accessible, made available important material mainly concerning US work on incapacitants and less-than-lethal weapons (NLWs).[xl]

Hamburg University's Research Group for Biological Arms Control has carried important work on *inter alia* confidence-building measures (CBMs) and analyses on the control and oversight of the life sciences.[xli]

In 2010 the EU Council decided to create a European network of international relations institutions and research centres to carry out work to support and strengthen efforts against Weapons of Mass Destruction (WMD) proliferation (e.g., through meetings and publications). The consortium will continue its work through at least the spring of 2014.[xlii]

As part of its environmental security and sustainability programmes, Green Cross International/Global Green USA support *inter alia* information outreach activities on CW destruction in Russia and the US, and consideration of the possible remediation of dumped munitions.[xliii]

The International Dialogue on Underwater Munitions (IDUM) performs at least some of the functions of an NGO, partly by promoting communication and better understanding of threats posed by dumped, including chemical, munitions.[xliv]

Since its establishment in 2010, the CWC Coalition has sought to support the goals of the treaty regime, partly by attempting to expand geographically NGO participation.[xlv]
Since the mid-1990s, the Monterey Institute's Center for Nonproliferation Studies (CNS) CBW project has supported the BTWC and CWC through *inter alia* the training of students and arms control and disarmament publications.[xlvi]

The Organisation for Defending Victims of Chemical Weapons (ODVCW) and the Society for Chemical Weapons Victims Support (SCWVS) are Iranian NGOs that represent victims of CW attack from the 1980–1988 Iran-Iraq War. They have attended the OPCW's annual Conferences of the States Parties (CSP) in The Hague.

NGOs in the CWC context

Comparisons have been made over the years between the level and type of NGO engagement in the BTWC regime in Geneva, and that for the CWC in The Hague. Some argue that the Geneva venue has been generally more hospitable to NGOs than the one in The Hague.[xlvii] The support for this argument include the fact that NGO attendance at BTWC meetings is higher and that NGOs have historically been able to present and circulate statements within the meeting venue area. However, it should also be noted that the two regimes are not structurally comparable. BTWC meetings largely consist of exchanges of information and views, while the CWC is supported by a Secretariat that must implement the organization's annual Programme and Budget. The OPCW's Executive Council typically meets just prior to and in parallel with CSPs. Also, the meeting area for the CSPs is in a separate building (a city conference hall). OPCW activity is not analogous to annual intersessional Meetings of Experts and States Parties of the BTWC. However, some of the more operational or functional aspects of the current BTWC Intersessional Process, such as the ongoing ISU database project that collects offers and requests for assistance, should also be noted.

The 2011 Ekéus report observes that The Hague 'lacks a presence of a strong NGO community with a focus on disarmament'.[xlviii] However, the OPCW has also noted that NGOs have recently started to pay greater attention to the organization, the positive role of NGOs in supporting a 2010 workshop on the implementation of Article XI (economic cooperation and assistance) and their important more general networking role in treaty-regime relevant activities.[xlix]

Finally, the OPCW Scientific Advisory Board (SAB) recently concluded: 'Many observers, particularly non-governmental organisations (NGOs), are expressing increasing concern for the development of chemical incapacitants for "law enforcement"'.[l] While correct, this statement probably also reflects directly a view and concern of the SAB (individually and collectively).

It should also be noted that in 2007 the OPCW organized and hosted an *Academic Forum* and *Industry and Protection Forum*.[li] This exercise, which appears to be inactive today, included the circulation and publication of a large number and variety of papers. The results of this exercise could perhaps be considered further as relevant activity involving NGOs is carried forward.

Towards a future working agenda

Consideration of how to structure and 'populate' a constructive agenda that includes NGO participation in the CWC regime can be based partly on: (*a*) general principles and objectives, (*b*) criteria for assessing the utility of the activity, and (*c*) activity that is specific to chemical safety and security. Areas for continued and future consultation, interaction and engagement could include: (*a*) international security and regime analyses, (*b*) the environment, and (*c*) public outreach and information exchange.

International security and regime analyses can include efforts to help bridge various gaps, such as those between technical *vs.* political factors; quantitative *vs.* qualitative; and science *vs.* policy factors. Such analyses could also inform consideration of how various regional and national priorities and understandings affect treaty regime implementation. They should also help to elucidate the implications for both the BTWC and CWC that result from developments in science and technology (S&T).[lii] A published review of risk factors and frequency of inspection algorithms developed by the OPCW since the CWC's entry-into-force which also describes the underlying understandings and preferences of the member states would assist in maintaining institutional memory.[liii] It could also be subjected to outside evaluation, including by NGOs. Any output should be checked through appropriate consultation mechanisms.

On the environment, some NGOs have developed an understanding and experience of how CW destruction programmes are developed and implemented in a manner that takes into account local community concerns and questions. Such experience can help to inform further consideration of best practices of destruction operations and health and safety procedures and monitoring. They may also inform a better understanding of continuing threats and concerns posed by munitions (stockpiled and non-stockpiled, conventional and non-conventional).

The longer-term relevance of the CWC regime (perceived and actual) must take into account periodic allegations of CW use, break-out capacity and the possible fallout caused by the later discovery of undeclared CW stockpiles (i.e., in Libya in 2011). Some NGOs may also be able to contribute in clarifying the importance of sampling and analysis protocols (e.g., through a cross-comparison with those developed under the UN Secretary-General's mechanism to investigate alleged CBW use, and those developed by NATO).

The Third CWC Review Conference could perhaps further consider options for providing additional context and background on whether a CWC violation may have occurred. In particular, the parties could consider the modalities of tasking an appropriate working technical group to list media allegations of CW use over a 12-month period. Such a review could indicate the nature of the associated ambiguities and lay out a technical basis (based on established and validated sampling and analysis protocols) for how such ambiguities could be reduced or resolved in the abstract (i.e., without reference to any particular organization's capacity or mandate to undertake such a resolution). The parties could then consider whether such an exercize was useful and whether any such documentation might be made publicly available. Some of this review and evaluation activity is already undertaken by individual States Parties. If this were to be an 'OPCW product', however, it could help to reduce or clarify media allegations that are largely not analyzed today for lack of authoritative information and associated technical analytical capacity. Such an exercize could also perhaps be undertaken in cooperation with the UN Office for Disarmament Affairs (UNODA) in view of the UN Secretary-General's authority to investigate allegations of CBW use. The focus of any such activity should be on the technical requirements of how to clarify or resolve allegations of chemical weapon use (i.e., the possible role of political interests and perceptions are kept separate).

Finally, the OPCW may wish to clarify further the current status and nature of its NGO policy and planned activities via new publication and dissemination strategies. This could serve as a basis for further public outreach and information exchange and clarification by interested parties.

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[i] For a recent comprehensive review of chemical safety and security, see Eds. Philip Wexler, Jan van der Kolk, Asish Mohapatra and Ravi Agarwal, *Chemicals, Environment, Health: a Global Management Perspective* (CRC Press: London, 2012).

[ii] On IAEA nuclear safety and security programmes and activity, see <http://www-ns.iaea.org/>. On a proposed consultation on biosafety and biosecurity consultations at the margins between the BTWC and CWC states parties, see Poland, 'Strengthening biosafety and biosecurity while the convergence of biological and chemistry has increased: building joint responses between the BTWC and CWC regimes against misuse of biological and chemical agents', 7th BTWC Review Conference document BWC/CONF.VII/WP.4, 11 Oct. 2011.

[iii] Andersson, K., *Transparency and Accountability in Science and Politics: the Awareness Principle* (Palgrave Macmillan: Basingstoke, 2008).

[iv] Osmanczyk, E. J., 'Nongovernmental organizations (NGOs)', p. 1623 in Ed. Anthony Mango, *Encyclopedia of the United Nations and International Agreements*, 3rd edtn., vol. 3 (Routledge: London, 2003).

[v] Osmanczyk, E. J., 'Nongovernmental organizations (NGOs)', p. 1623 in Ed. Anthony Mango, *Encyclopedia of the United Nations and International Agreements*, 3rd edtn., vol. 3 (Routledge: London, 2003).

[vi] Union of International Associations, 'Yearbook of International Organizations', <http://www.uia.be/yearbook>, accessed 6 Nov. 2012.

[vii] See Davies, T. R., *The Rise and Fall of Transnational Civil Society: the Evolution of International Non-Governmental Organizations since 1839*, working paper CUTP/003 (Centre for International Politics (City University): London, Apr. 2008).

[viii] At the time of writing, the author had not obtained permission from this official to cite his name. However, some credit should be acknowledged.

[ix] The actual title was (and is) the International Committee of the Red Cross. E.g., see 'Appel contre l'emploi des gaz vénéneux' [Appeal against the employment of poisonous gas], *Bulletin International de la Croix-Rouge*, no. 194 (Apr. 1918), p. 185.

[x] The ICRC headquarters is in Geneva. The appeal to which Thuillier apparently refers, was issued in Geneva on 6 February 1918.

[xi] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), p. 165. The appeal about which Thuillier speaks appears to be 'Appel contre l'emploi des gaz vénéneux' [Appeal against the employment of poisonous gas], *Bulletin International de la Croix-Rouge*, no. 194 (Apr. 1918), pp. 185–192. I would like to thank the Library and Public Archives Unit of the International Committee of the Red Cross for providing me a copy of the 1918 appeal.

[xii] The committee members and appeal signatories were Edourd Naville (President), Adolphe D'Espine (Vice President), Dr F. Ferriere, Afred Gautier, Adolphe Moynier (Treasurer), Horace Micheli, Edmond Boissier, Frédéric Barbey, William E. Rappard and Paul Des Gouttes (Secretary-General). 'Appel contre l'emploi des gaz vénéneux' [Appeal against the employment of poisonous gas], *Bulletin International de la Croix-Rouge*, no. 194 (Apr. 1918), p. 187.

[xiii] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), pp. 167–168.

[xiv] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), pp. 165–167.

[xv] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), pp. 166–168.

[xvi] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), pp. 168–169.

[xvii] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), p. 169.

[xviii] Thuillier, H. F., *Gas in the Next War* (Geoffrey Blis: London, 1939), p. 169.

[xix] E.g., Kenworthy, J. M., *New Wars: New Weapons*, Colonial Edtn. (Elkin Mathews & Marrot: London, 1930); Kenworthy, J. M., *Peace or War?* (Boni & Liveright: New York City, 1927) Kenworthy served on the UK Admiralty War Staff in London and was a Member of Parliament. For a Francophone view of the disarmament provisions of the Treaty of Versailles, see De Lavallaz, M., *Essai Sur Le Désarmement et le Pacte de la Société des Nations* [Essays on Disarmament and the League of Nations Treaty], fascicule II (Collection de L'École des Sciences Sociales de L'Université de Lausanne: Paris, 1926), (edited by Arthur Rousseau).

[xx] E.g., Timm, H., *Röda Armén Marsherar* [The Red Army on the March] (Albert Bonniers Förlag: Stockholm, 1936), transl. by C. F. Palmstierna in consultation with Maj. Curt S. R. Kempff (d. 1970) of the Swedish General Staff's foreign department.

[xxi] Webster, A., 'From Versailles to Germany: the many forms of interwar disarmament', *Journal of Strategic Studies*, vol. 29, no. 2 (Apr. 2006), pp. 225–246.

[xxii] Spiers, E. M., 'Gas disarmament in the 1920s: hopes confounded', *Journal of Strategic Studies*, vol.29, no. 2 (Apr. 2006), pp. 287–288.

[xxiii] Key, The National Archives, Foreign Office records 371/7245, A. J. Balfour to D. Lloyd George, 22 Dec. 1921; and War Office records 188/144, British Empire Delegation, 'Report of Committee with Respect to Poison Gas', 22 Dec. 1921. Quoted in Spiers, E. M., 'Gas disarmament in the 1920s: hopes confounded', *Journal of Strategic Studies*, vol.29, no. 2 (Apr. 2006), p. 288, reference 25.

[xxiv] Spiers, E. M., 'Gas disarmament in the 1920s: hopes confounded', *Journal of Strategic Studies*, vol.29, no. 2 (Apr. 2006), p. 288.

[xxv] Spiers, E. M., 'Gas disarmament in the 1920s: hopes confounded', *Journal of Strategic Studies*, vol.29, no. 2 (Apr. 2006), p. 291.

[xxvi] On League of Nations chemical disarmament activity, see de Madariaga, S., *Disarmament* (Oxford University Press: London, 1929), pp. 158–164.

[xxvii] For a description of the work of the League of Nations on control over and prohibition of chemical warfare by a Secretariat official, see de Madariaga, S., *Disarmament* (Oxford University Press: London, 1929), pp. 158–164.

[xxviii] Liddell-Hart, B. H., *The Remaking of Modern Armies* (John Murray: London, 1927), pp. 80–81.

[xxix] Stalin, J. V., 'The Fifteenth Congress of the Communist Party of the Soviet Union', 2–19 Dec. 1927, in Stalin, J. V., *Sochineniya* [Works], vol. 10 (Foreign Language Publishers: Moscow, 1954).

[xxx] Zanders, J. P., *Dynamics of Chemical Armament: Towards a Theory of Proliferation*, doctoral thesis (Free University of Brussels: Feb. 1996), p. 261.

[xxxi] The list of NGOs and other organizations that perform some of the functions of an NGO should not be taken as an endorsement of their activity. Nor is the list comprehensive. Please contact the author if it is believed that further names should be added. Any future iteration of this paper may only list institutions in a separate table or annexe.

[xxxii] E.g., Blackett, P. M. S., *Military and Political Consequences of Atomic Energy* (Turnstile Press: London, 1948); Titterton, E. W., *Facing the Atomic Future* (Macmillan & Co. Ltd.: London, 1956); Teller, E. and Latter, A. L., *Our Nuclear Future: Facts, Dangers and Opportunities* (Criterion Books: New York, 1958); Ed. Per Edvin Sköld, *Svenska Atom Vapen? Fakta och Problem, Sex Fackmannauppsatser* [Swedish Atomic Weapons? Facts and Problems, Six Specialist Essays] (Tidens Förlag: Stockholm, 1959); and Miksche, F. O., *The Failure of Atomic Strategy & a New Proposal for the Defence of the West* (Faber and Faber Ltd.: London, 1959).

[xxxiii] While Pugwash fulfils many of the roles of an NGO, there are those who might dispute whether it meets any particular definition of an NGO. The initial meeting was funded by the Canadian philanthropist Cyrus S. Eaton.

[xxxiv] See <http://www.pugwash.org/projects_and_news.htm>.

[xxxv] *Pugwash Conference of International Scientists on Biological and Chemical Wafare*, proceedings (Pugwash: Nova Scotia, Canada, 24–30 Aug. 1959).

[xxxvi] Perry Robinson, J., 'Chapter 2. The technological arms race, part III. Developments in chemical and biological warfare', *SIPRI Yearbook of World Armaments and Disarmament 1968/69* (Almqvist & Wiksell: Stockholm, 1969), pp. 112–134.

[xxxvii] See <http://www.sussex.ac.uk/Units/spru/hsp/pdfbulletin.html>.

[xxxviii] UNOG, 'Disarmament, Implementation Support Unit', <http://www.unog.ch/80256EE600585943/%28httpPages%29/16C37624830EDAE5C12572BC0044DFC1?OpenDocument>.

[xxxix] See <http://bwpp.org/reports.html>.

[xl] <http://www.sunshine-project.org/>.

[xli] <http://www.biological-arms-control.org/index.html>.

[xlii] The leading institutions of the consortium are the Foundation for Strategic Research (FRS), the Peace Research Institute in Frankfurt (HSFK/PRIF), the International Institute for Strategic Studies (IISS) and SIPRI. The list of participating institutions is at <http://www.nonproliferation.eu/network/network.php?display=text>.

[xliii] For a list of Green Cross Russia's regional offices and current (broader) activity, see <http://www.green-cross.ru/regions/>.

[xliv] <http://www.underwatermunitions.org>.

[xlv] For the list of participating organizations and individuals, see <http://www.cwccoalition.org/?page_id=37>.

[xlvi] <http://cns.miis.edu/programs/cbwnp/index.htm>

[xlvii] The author is 'agnostic' on this question.

[xlviii] 'Report of the advisory panel on future priorities of the Organisation for the Prohibition of Chemical Weapons' ['the Ekéus report'], OPCW document S/951/2011, 25 July 2011, para. 121, p. 29.

[xlix] 'Note by the Technical Secretariat, review of the operation of the Chemical Weapons Convention since the Second Review Conference', OPCW document WGRC-3/S/1, 5 Oct. 2012, paras. 3.372, 3.478, pp. 82, 104.

[l] 'Report of the Scientific Advisory Board on developments in science and technology for the third special session of the conference of the states parties to review the operation of the Chemical Weapons Convention', OPCW document RC-3/DG.1, 29 Oct. 2012, para. 83, p. 20.

[li] OPCW, <http://www.opcw.org/news/article/opcw-academic-forum>; and <http://www.opcw.org/news/article/opcw-industry-and-protection-forum-1>.

[lii] Hart, J. and Trapp, R., 'Science, technology and the Biological Weapons Convention', *Arms Control Today*, vol. 42 (Oct. 2012), pp. 15–21.

[liii] For a dated (and basic) summary, see Hart, J., *Chemical Industry Inspections Under the Chemical Weapons Convention*, Verification Matters no. 1 (VERTIC: London, Oct. 2001), pp. 41–45.

Development of the OPCW engagement in chemical safety and security: perspective from Poland

Amb. Jan Borkowski [*]

Chemical safety and security, as an issue, is not totally a new subject for the Organisation for the Prohibition of Chemical Weapons in The Hague /OPCW/. The OPCW Second Review Conference reaffirmed concerns expressed at the First Review Conference that chemical facilities may become subject to attacks or other incidents that could lead to the release or theft of toxic chemicals. The OPCW Second Review Conference welcomed the fact that some States Parties had taken measures to minimise such risks and encouraged States Parties to exchange experiences and discuss related issues. The OPCW Second Review Conference also recognised the need for close cooperation with other relevant international organisations and agencies active in this field.

The UN Global Counter-terrorism Strategy, adopted by consensus in September 2006, encourages the International Atomic Energy Agency and the OPCW to continue their efforts, within their respective mandates, to help States to build capacity to prevent terrorists from accessing nuclear, chemical, or radiological materials, to ensure security at related facilities, and to respond effectively in the event of an attack using such materials.

Since the Second Review Conference the OPCW, together with its Member States and the Secretariat, has successfully conducted a number of targeted activities aimed at building national and regional capacities in the area of prevention of, preparedness for, and response to incidents involving the misuse or release of toxic chemicals, and to enhance chemical safety and security.

These activities and statements by the OPCW Member States have confirmed that the introduction of the chemical safety and security in the work of the OPCW is highly desirable, although it has to be done gradually and carefully. The OPCW should not aim at developing its own independent capacity or regulatory standards and monitoring responsibilities in the area of chemical security. The OPCW should not include chemical safety and security issues in inspection and verification activities. The OPCW should, rather, serve as a facilitator and promoter of voluntary cooperation, with the emphasis on regional cooperation.

Poland supports the evolution of the OPCW, as a long term objective, towards a platform, or venue, of support for global cooperation in reducing the chemical threat. Article VIII of the Chemical Weapons Convention establishes the OPCW as a forum for consultation and cooperation. The platform should promote international cooperation in peaceful uses of chemistry, enhancement of security at chemical plants, and support national capacity for prevention, preparedness and response against misuse of toxic chemicals. The platform should engage all the relevant stakeholders, including government agencies, chemical industry associations, academia and the scientific community, and the relevant international organisations. The platform should facilitate and promote a comprehensive/synergetic implementation of the provisions of the Convention and voluntary cooperation in the area of chemical safety and security.

One of the goals of the OPCW chemical security programme could be the provision of guidance and assistance to help Member States establish a strong chemical security culture. An effective chemical security culture can result in a significant increase in the effectiveness of the security of chemical materials and associated facilities and transport.

The chemical industry will be a crucial partner in promoting the issues of chemical safety and security. The Responsible Care programme has now incorporated a security code, which encourages companies requiring facility, cyber and transportation security to conduct comprehensive security vulnerability assessments of the facilities, implement security enhancement, and create security management systems.

The OPCW should encourage States Parties to exchange experiences and promote efforts to enhance safety and security at chemical plants and in transportation of chemicals.

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[*] Amb. Borkowski is the Permanent Representative of Poland to the OPCW

The OPCW should develop relationships and partnerships, as appropriate, with relevant regional and international organisations, and international initiatives to enhance chemical safety and security, including through the G8 Global Partnership /G8 GP/. G8 GP is playing a growing role in addressing the threats posed by weapons and materials of mass destruction, including efforts to enhance chemical safety. While the G8 GP provides a broad policy support and a general framework for cooperation between the GP members, including donors and the international organizations, a concrete cooperation in chemical security should be provided through the relevant international partners, including the OPCW.

The active and successful engagement of the OPCW in programmes to decrease chemical threat and support capacity building has increased interest in the ability of the OPCW to assist States Parties in the prevention of, preparedness for, and response to incidents involving the misuse or release of toxic chemicals and in enhancing chemical safety and security. The provisions of Articles X and XI of the Chemical Weapons Convention provide important mechanisms for States Parties to address issues in this context.

The steady development of the OPCW as a platform to decrease the chemical threat, promote international cooperation, and enhance chemical safety and security, will broaden the scope and accommodate the implementation of Article X (on assistance and protection) and Article XI (on international and technological cooperation) Both articles are core drivers for the OPCW transformation.

Poland emphasizes the importance of national programmes related to protective purposes and the importance of capacity building on prevention and preparedness against misuse of toxic chemicals. Along the same lines, we strongly subscribe to the need for international cooperation, as enshrined in Article XI of the Convention. Programmes which promote international cooperation in peaceful use of chemistry, strengthen national controls of toxic chemicals, and enhance the security and safety of chemical industry and transportation of chemical agents, must be invested in and supported by all the OPCW stakeholders.

The forthcoming Third Review Conference, to be held in April 2013, will be an important venue to discuss and promote the effective implementation of the Chemical Weapons Convention. The Conference should provide guidance on how to adapt the implementation of the Convention and the work of the OPCW to today's needs and challenges.

The Conference should enhance the roles of the OPCW in national capacity-building to counter the growing threats of misuse of toxic chemicals, and provide guidance on the further engagement in chemical safety and security.

Chemical safety and security: cost or investment?

Przemyslaw Stangierski [*]

ATKearney

Chemical safety and security has no boundaries

Importance of chemical safety and security is dramatically growing as we speak

To cope with increasing challenges it is vital to bring international cooperation into next level

Source: A.T. Kearney

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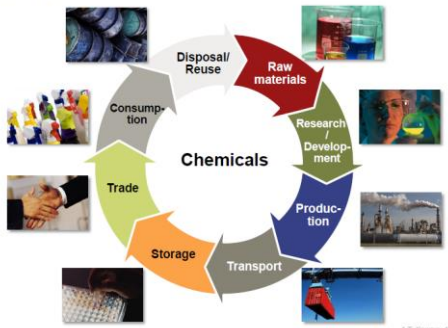
Chemical safety and security has no boundaries as chemicals are present in virtually every aspect of our life

Chemicals life cycle



Source: A.T. Kearney

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Chemical safety and security is gaining on importance as new trends are driving global market environment

Chemicals related industry trends

Increase and shift in chemical production	• There is hardly any sector where chemicals are not used **and industry where chemicals do not play an important role** • Chemical market is **growing rapidly** predominantly in **developing countries** • **Necessity for longer distances chemicals transportation** from deve-loping countries is increasing as chemical production is more centralized
Strong penetration of chemical intensive products	• Consumption of a wide range of **chemical intensive products** like plastic increases over time
Increased chemical emissions	• Many industries do not produce chemicals as a core business but produce significant amounts of **chemicals as by-products**
Rising pressure on stakeholders with different agendas	• Profit maximization/price reductions by **limiting necessary investments** at the expense of safety (results of shareholders, market pressure) • **Different time horizons, distribution of costs and investments** among various stakeholders involved in chemicals safety and security • **Safety negligence** is still an important **reason for chemical accidents**
Increasing danger of using chemical as a weapon	• **Intensification of terrorist attacks** involving the use of chemicals (misuse of industrial chemical agents, attacks with toxic chemicals, improvised chemical devices)

Source: American Chemistry Council 2012; United Nations Environment Programme - Global Chemicals Outlook 2012

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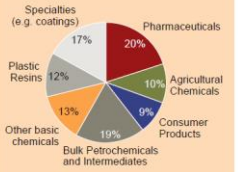
Chemical market is rapidly growing predominantly in developing countries

Global chemical market snapshot

Global chemical value of output (produced and shipped) [$bn USD]

Global chemical value of output by segments in 2011 [%]



Other basic chemicals: inorganic chemicals, synthetic rubber, man-made fibers

- Global chemical sales is forecasted to grow about 3% per year till 2050
- Shift of chemical industry from highly industrialized to developing countries.
- Predicted compound annual growth rate of chemical value of output in years 2011-2021: Nafta 2,8%, Western Europe 2,0%, Asia-Pacific 6,4%

Source: American Chemistry Council; United Nations Environment Programme - Global Chemicals Outlook 2012

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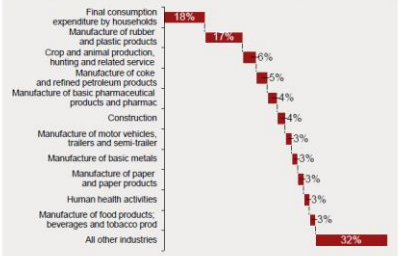
There is hardly any sector where chemicals are not used and industry where chemicals do not play an important role

Customer sectors of the EU chemicals industry

Output of chemical products industry is used in all sectors of the economy



- 143,835 chemical substances have been pre-registered under the pre-registration requirement of the European Union's chemicals regulation (REACH)
- Chemicals play an integral part of our lives (selected cases):
  - Food – e.g.: use of colors, antioxidants, emulsifiers, stabilizers
  - Work – e.g.: production of glue, paper, pens, cleaning
  - Health – e.g.: medicines, ointments
  - Spare time – e.g.: chlorine in the swimming pool
  - …

Source: Eurostat, Global Chemicals Outlook UNEP

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Asia-Pacific region attracts majority of world chemicals investment

World foreign investment climate

A.T. Kearney FDI Confidence Index 2012

	2007	2010	2012
China	1	1	1
India	2	3	2
Brazil	6	4	3
US	3	2	4
Germany	10	5	5
Australia	11	7	6
Singapore	7	24	7
UK	4	10	8
Indonesia	21	19	9
Malaysia	16	20	10

General Foreign Direct Investment trends

- Recovery brings the shift to the large and medium-sized emerging markets
- Continuation of economic uncertainty in Europe and US
- Rising income, urban mitigation and increased demand for consumer goods in China continue to attract foreign investors

Chemicals sector investment trends

- China and the rest of the Asia-Pacific region is leader accounting for 73% of world chemicals capital spending in 2010, up from 39% in 2000.
- Capital spending in Western Europe reached US$46,3 bn in 2010 (10% of world capital spending in value terms US$464,3 bn)
- The contribution of Western Europe declined from 22% in 2000 to about 10% in 2010

The FDI Confidence Index is constructed using primary data from a proprietary survey of senior executives of the world's leading corporations. Participating companies represents 27 countries and span 17 industry sectors. The Index is calculated as a weighted average of the number of high, medium and low responses to questions about the likelihood of direct investment in a market over the next 3 years.

Source: Cefic, A.T. Kearney

[*] Mr. Stangierski is Vice-President and Partner at A.T. Kearney

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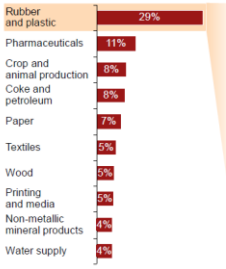
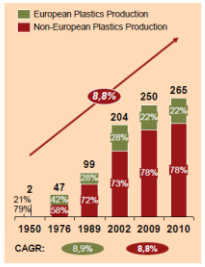
Production of a wide range of chemical intensive products like plastic increases over time

Example of strong penetration of chemical intensive products

Use of chemical industry products in differentia sectors[1]



World Plastics Production [mil t]



- Consumption of a wide range of chemical intensive products increases over time
  - Products containing plastic or rubber are more chemical intensive (e.g. electrical and electronic equipment like cell phones, laptops)
- Chemical intensity of products is not changing rapidly over time

1. Year 2008; EU 27 data
Source: Eurostat, Plastics Europe Market Research Group

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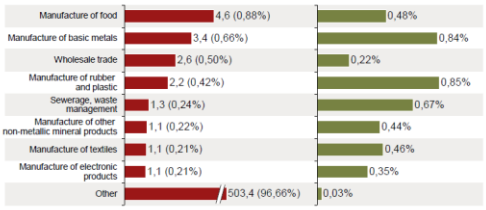
Also industries that do not produce chemicals as a core business emit significant amounts of chemicals as by-products

Chemicals and chemical products supply in EU

Chemicals and chemical products supply [EUR bn; %]



% of chemical by-products in particular industry output [%]

- In EU in 2008 **almost 13%** of chemicals and chemical products **valued almost 67 EURbn** were by-products of non-chemical industry

Chemical safety and security is increasingly important for entities that have no expertise in the area of chemical industry

Source: Eurostat,

ATKearney

Setting/complying with chemicals safety & security is a real challenge with numerous stakeholders involved

Selected benefits and costs of chemical safety and security

Stakeholder	Benefits	Costs
Customers	• Safety of goods/services • Sustaining environment	• Additional costs included in goods/services
Manufacturers/ service providers	• H&S of own employees • Avoided costs of chemical accidents/ incidents • Acceptance by customers/suppliers	• Expenditures to comply with internal and external standards • Costs to settle chemical accident/incident consequences
Environment, H&S protection	• Realization of statutory targets focused purely on highest environmental, H&S protection	• Operational costs
Media	• Increased media coverage due to an accident/incident	• Investigation, publishing and legal costs
…	• …	• …

Source: A.T. Kearney

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Profit maximization by reducing necessary investments at the expense of safety can have devastating consequences

Trafigura case study

Avoided expenditures

- In 2005, a **multinational trading company Trafigura** decided to buy large amounts of an unrefined gasoline.
- Trafigura intended to use the coker naphtha as a cheap blendstock for fuels
- In 2006, after several unsuccessful attempts to dispose of the **toxic waste it was dumped at approximately 18 different locations** around the city of Abidjan in Côte d'Ivoire.
- **Cost of safe disposal of the waste in Netherlands - 665k $**
- Trafigura's 2006 profits were US$511 million

Environmental damage

- Considerable risk to wildlife in the **immediate vicinity** if had any direct contact with waste
- **Significant decrease** of the pH levels

Health damage

- **Tens of thousands of people** suffered from nausea, headaches, breathing difficulties, stinging eyes and burning skin.
- More than **100.000 people** were treated, according to official records
- Between **15 and 17 people died**

Material damage

- Total cost of more than **310 mil $** (including compensation, legal fees, fines)
- Huge PR costs impossible to estimate

Source: United Nations Environment Programme - Global Chemicals Outlook 2012; Côte d'Ivoire Toxic Waste Report – Greenpeace, Amnesty International 2012

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Chemical accidents are a cause of substantial costs, health damage and casualties

Examples of major chemical accidents by categories

Environmental costs	**Gulf of Mexico (2010) - BP oil spill** • $ 17.6 bn fine imposed • Marine & wildlife affected • ~ 790 km contaminated	**Ajka, Hungary (2010) - Chemical Spill** • ~ Nearby areas flooded • ~ 7000 people affected • ~40 sq km of land affected	**Jilin ,China (2005) - Explosion & chemical spill** • 3.5 mn temporarily people left without water • ~ 5 killed, 70 injured
Material costs	**Secunda, SA (2005) - Sasol factory explosion** • Functioning of ethylene unit affected • ~ 16 killed, 146 injured	**Graniteville, USA (2005) - Train collision** • Toxic gases released • 5400 people evacuated for 2 weeks, 9 killed	**Toronto, Canada (2008) - explosion & fire** • ~1200 people evacuated from nearby areas • $ 1.8 mn in cleaning up
People deaths and injured	**Bhopal, India (1984) -Union Carbide Gas leak** • ~15000 killed • People convicted, Charges levied against the company	**Lagos, Nigeria (2002)- armory explosion** • ~1000 killed • ~ 5000 injured • 12k left homeless	**Gao Qiao, China (2003) - Gas well blowout** • ~ 240 killed • ~ 9000 injured • ~ 64,000 evacuated
Reputation cost	**Bad Fallingbostel, Germany (2012) - fire at factory of Kraft Foods** • ~1400 people evacuated • ~ 700 firefighters were called to control the fire	**Marl, Germany (2012) - fire at plant of Evonik Degussa** • 130 firefighters worked for 16 hours • 2 killed	**Toulouse, France (2002) - explosion in Total's factory** • ~29 killed • 25 law suits have been filed

Source: American Chemistry Council 2012; United Nations Environment Programme- Global Chemicals Outlook 2012, A.T. Kearney Analysis

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Commonly accidents have a number of causes leading to occurrence of unsafe conditions

Reasons for selected chemical accidents

Technical

- Equipment failure (e.g. installation of pollution control equipment, piping)
- Failure of auxiliary systems
- Use of inappropriate or poorly designed equipment (not in accordance with current standards)
- Operating beyond the equipment design limits

Organizational

- Inadequate indications of process condition
- Inadequate hazard review or process hazards analysis
- Ignoring warnings
- Wrong/inadequate instructions/ policies/ directions
- Lack of process analysis in respect to chemical reactivity and incompatibility

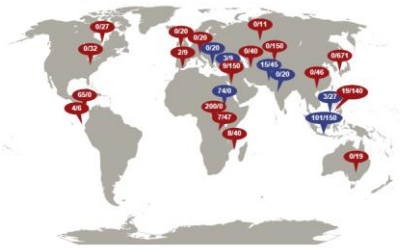
Chemical safety negligence still allow catastrophic chemical accidents to occur

Source: Factiva, General web; U.S. Environmental Protection Agency ; Helsinki University of Technology ; A.T. Kearney Analysis

ATKearney

Intensification of terrorist attacks involving the use of chemicals is an important threat

Terrorist incidents



- Since 1971 there have been almost **50 thousand terrorist incidents** involving chemical weapons or explosives (CAGR for years 1971-2011 was equal 6,4%)
- Improvised chemical terrorism expands the agents of concern from the ~50 classical chemical warfare agents to **thousands of toxic industrial chemicals**
- **Expansion of terrorist attacks** with nontraditional chemical agents and delivery systems, such as improvised chemical devices
- Threat of chemical terrorism concerns under-secured and unsecured **stocks of dangerous chemical agents** and munitions

X/Y Bomb terrorist attack X – killed, Y - Injured

X/Y Chemical terrorist attack X – killed, Y - Injured

Source: National Consortium for the Study of Terrorism and Responses to Terrorism (START). (2012). Global Terrorism Database [Data file]. Retrieved from http://www.start.umd.edu/gtd,; A.T Kearney Analysis

ATKearney

There have been no single superior organization responsible for chemical safety and security …

Examples of organizations engaged in chemical safety and security

International organizations	• Umbrella organizations coordinating regional efforts • Consultative and advisory functions • Forums for consultation and cooperation	• E.g.: Intergovernmental Forum on Chemical Safety (IFCS), Organization for the Prohibition of Chemical Weapons (OPCW)
Regional organizations	• Help companies to comply with the legislation, advance the safe use of chemicals, address chemicals of concern, provide information on chemicals	• E.g.: European Chemical Agency (ECHA)
National organizations	• Implement regulations, investigate industrial chemical accidents, set standards, provide training, outreach, education and assistance	• E.g.: Office of Chemical Safety (OCS), Central Crisis Group, Office of Chemical Safety and Pollution Prevention (OCSPP), Occupational Safety and Health Administration (OSHA)

Source: American Chemistry Council;

ATKearney

There is plenty of not aligned chemical safety and security management policies

Chemical safety and security standards, methods and tools

Source: American Chemistry Council; United Nations Environment Programme - Global Chemicals Outlook 2012

ATKearney

To cope with increasing challenges it is vital to bring international cooperation into next level

Source: A.T. Kearney

The advisory board for the International Centre on Chemical Safety and Security – building the academic and expert advice on chemical safety and security

Prof. Slawomir Neffe [*]

Introduction

The Advisory Board for the International Centre for Chemical Safety and Security

– building the academic and expert advice on chemical safety and security.

The Advisory Board is initiated and sponsored by the International Centre for Chemical Safety and Security in Tarnow.

The Board will provide independent advice and guidence for the development of the international cooperation on the issues of chemical safety and security.

Advisory Board consists of independent experts in areas of peaceful use of chemistry and chemical safety and security, as well as, representatives of relevant institutions: governmental agencies, non-governmental organisations, chemical industry companies, international organisations, research institutions, universities, security forces, crisis management services, defence, laboratories, NGO's, and independent experts.

The members of the Board serve in their individual capacity as independent experts, supporting the Board activities on the basis of their individual knowledge and experience.

The Board will enable the rendering of specialised advice and recommendations in areas of chemical safety and security and support the development of the ICCSS programs and activities.

A permanent website of the Board will be open, as part of the website of the International Centre for Chemical Safety and Security in Tarnow (ICCSS).

The website should serve as a tool for networking, thus facilitating online discussions and the publication on the internet of relevant documents.

[*] Prof. Neffe is from the Military University of Technology, Warsaw

The Board will prepare and submit regular yearly reports on its activities to be presented at the ICCSS website.

Members of the Advisory Board

Prof. Ph.D. Eng. Stanislaw Witek – Chairman of the Board - Professor of the Military Institute of Engineering Technology in Wrocław.

Ph.D. Eng. Lech Starostin –- Independent Expert, PCW Consultant, the Secretary of the Board.

Prof. D.Sc. Eng. Adam S. Markowski - Professor of the Technical University of Lodz.

Members of the Advisory Board

Prof. Renato Bonora, PhD Eng. - Professorat the University of Padua, Department of Industrial Engineering.

Dipl. Eng. Pavel CASTULIK, PhD – Independent Expert.

Prof. Alexander D. Gorbovskiy, D.Sc. - Head Group Experts Green Cross Russia.

Members of the Advisory Board

Prof. Valery P. Kukhar, D.Sc. Eng.- Institute of Bioorganic Chemistry and Petrochemistry, National Academy of Science of Ukraine.

Prof. Maurizio Martellini - Secretary General of the Landau Network-Centro Volta.

Mr Oleksandr Sadovskyi - Senior specialists of the Scientific and Technological Centre of the Ukrainian Chemists Union.

Members of the Advisory Board

Mr Timothy J. Scott - Chief Security Officer & Corporate Director, Emergency Services and Security, The Dow Chemical Company.

Mr Paul Walker - International Director of the Environmental Security and Sustainability Program for Green Cross International

Mr Per Runn – PhD – Independent Consultant, Sweden

Members of the Advisory Board

Prof. M. Sam Mannan, Ph.D – Regents Professor at Mary Kay O'Connor Process Safety Center Artie McFerrin Department of Chemical Engineering, Texas A&T University System, US.

M.Sc. Łukasz Blacha - Main Specialist for Social Relations at Tarnów City.

Prof. Ph.D. Eng. Jan Legocki – Professor of the Institute of Industrial Organic Chemistry Warsaw.

ICCSS

Members of the Advisory Board

Ph.D. Eng. Leszek Bogdan – Director of the Military Institute of Engineering Technology, Wroclaw.

Prof. D.Sc. Eng.Henryk Górecki – Professor of the of the Technical University of Wrocław.

Prof. D.Sc. Eng. Sławomir Neffe – Co-Chairman of the Board – The Military University of Technology, Warsaw.

International Centre for Chemical Safety and Security
9th of November 2012 – Tarnów, Poland

ICCSS

Members of the Advisory Board (which declared to join the Advisory Board)

Ambasador Bonnie Jenkins, US. Department of State, United States.

Dr Ryszard Scigała, Major of the town Tarnów.

International Centre for Chemical Safety and Security
9th of November 2012 – Tarnów, Poland

ICCSS

The involvement of universities, academia, research institutes and decision makers in the whole process of promotion of chemical security is particularly important in the present time.

In our opinion there is a strong need for intensification of involving young generation in the process of establishing more safe environment and creation the best conditions for using the chemistry for safer and better life of the community.

Contributors

Prof. Shaukat Abdulrazak is the Executive Secretary/CEO of the National Council for Science and Technology, Kenya. The Council is the focal point on Science, Technology and Innovation (ST&I) in Kenya whose mandate is to advise the government upon all matters relating to ST&I and Research issues necessary for proper co-ordination and economic development of the Republic of Kenya. He is a member of the National Economic Social Council (NESC) Kenya, a standing committee comprising of eminent persons with diverse experience, knowledge and skills who are mandated to provide expert advice on economic and social matters to the President and Cabinet. He is the Chairman of African Technology Policy Studies (ATPS) Board, Commissioner of African Commission on Nuclear Energy (AFCONE). Prof. Abdulrazak is also the National Liaison Officer of International Atomic Energy Agency (IAEA) in Kenya, Chairman of African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA) and Governor of the International Centre for Genetic Engineering and Biotechnology (ICGEB) Board based in Trieste, Italy. He is a full Professor and has taught at Egerton University, Kenya since 1997. While there he also served as the Deputy Vice Chancellor (Research & Extension). He has supervised postgraduate students at both the PhD and MSc levels. He was also an External Examiner in the Faculty of Agriculture, Makerere University between 2008 and 2010. He is a Fellow of the Academy of Sciences for the Developing World (TWAS), Japan Society for the Promotion of Sciences (JSPS), the Society of Biologists, UK, and Harvard Kennedy School Executive Alumni. He has published widely and is an Editorial Board member of several International refereed journals. He received his MSc and PhD training from University of Aberdeen, UK and Post doctorate training from Shimane University, Japan.

Zeeshan Amin is Political Affairs Officer at the Counter-Terrorism Implementation Task Force (CTITF), Office of the Department of Political Affairs at the United Nations. A graduate of Columbia University, Mr. Amin started his career at the United Nations in 2004 serving as research officer for the Secretary-General's High Level Panel on Threats, Challenges and Change. In 2005, he joined the Counter-Terrorism Committee Executive Directorate (CTED), which monitors and facilitates assistance to States on the implementation of Security Council resolutions 1373 (2001) and 1624 (2005). At CTED, Mr. Amin worked on national assessments of counter-terrorism policies of countries in Europe and Asia. In 2009, Mr. Amin commenced work at CTITF, where he currently manages the cluster responsible for assisting States in the implementation of Pillar II of the United Nations Global Counter-Terrorism Strategy. His cluster's thematic topics include preventing and responding to WMD attacks, countering the use of the internet by terrorists, improving border management, countering the financing of terrorism and protecting vulnerable targets and critical infrastructure. Mr. Amin also oversees efforts to build in-depth knowledge of the UN Global Counter-Terrorism Strategy amongst officials and other partners at the national and regional levels. He also helped organize the United Nations High-Level Meeting on Countering Nuclear Terrorism - an initiative of the Secretary-General - in New York in September 2012.

Prof. Sergei Baranovsky is President of Green Cross Russia (GCR), an environmental non-governmental organization founded in 1993 and located in Moscow. GCR is the Russian affiliate of Green Cross International (GCI), also founded in 1993 by former Soviet President Mikhail Gorbachev; GCI is located in Geneva. Professor Baranovsky was formerly an aviation engineer, senior scientist, professor, and laboratory director at the Moscow Aviation Institute where he earned his Doctorate of Technical Science in 1988. He has also served as Deputy General Director and Head of the Scientific Division of EcoProm, 1990-1992, and as the President's Environmental Expert at the Gorbachev Foundation, 1992-1993. He joined Green Cross Russia in 1993. He is a recipient of the Gold Medal from the USSR Council of Ministers and has published over one hundred articles, books, and abstracts in combustion engineering, environmental sciences and education, disarmament and demilitarization, and related fields. He has helped to manage annual National Dialogues on chemical and nuclear weapons, demilitarization, and alternative energy, and has organized public outreach and information offices and programs at Russian WMD stockpiles. Professor Baranovsky has been a member of the Russian State Commission on Chemical Weapons Destruction and has been active in weapons demilitarization and threat reduction activities for over fifteen years. He is also President of the Russian Environmental Congress where he serves on the GCI Management Committee. He is also Deputy Chairman of RosAtom's Voluntary Advisory Council.

Lukasz Blacha is the main specialist for social relations at Tarnów City Hall, Poland. He graduated

from the International Relations Faculty, at the Institute of Political Science in Krakow, Poland. From 2004 to 2007, he worked at Azoty Tarnów in the public relations department, where he was responsible for social relations and media contacts. He has been working at the Tarnów City Hall since 2008, during which time he held positions as mayor's assistant, social issues advisor, and spokesman. He was the Municipality's main coordinator for the International Meeting on Chemical Safety and Security.

Amb. Jan Borkowski is a scholar, politician, and experienced diplomat. He is the author of some 50 scholarly publications and articles devoted to European integration and editor or co-editor of several monographies on this subject. He was elected to the Lower House of the Polish Parliament (the Sejm) for a four year term from 1993 to 1997. From 1996 to 1997 he served as an Under-Secretary of State and in years 2007-2012 as the Secretary of State at the Ministry of Foreign Affairs. Since June 2012 he has been serving as the Ambassador Extraordinary and Plenipotentiary of the Republic of Poland to the Kingdom of the Netherlands and Permanent Representative of Poland to the OPCW.

Adam Bugajski was appointed Director of the Department of Security Policy at the Ministry of Foreign Affairs in July 2011. As the Head of the Department, he has the overall responsibility for Poland's security policy, as well as Poland's relations with NATO, the OSCE and for security policy-related issues in the European Union (CSDP). Crisis management, non-proliferation, conventional arms control and disarmament, terrorism, prevention policy as well as arms exports control and cooperation of defence industries also fall within the purview of the Department, as does Poland's participation with military and civilian personnel in international peace support operations. Prior to the current assignment, Adam Bugajski was Deputy Director of the Department of Strategy and Foreign Policy Planning. He was responsible for development of the concept of long-term Polish foreign policy and for monitoring its implementation. He contributed to formulation of variant forecasts of Poland's actions at the European and global level, and identified long-term challenges and threats to Poland. In the years 2008-2010, Mr. Bugajski was Deputy Permanent Representative of Poland to NATO. In that capacity, he oversaw the overall performance of the Delegation, represented Poland at senior NATO fora and was responsible for drafting of key political documents, including declarations from NATO Summits and ministerial meetings. Adam Bugajski was born on June 11th, 1974, in Gdańsk, Poland. He was educated at Gdańsk University and is a graduate of the National School of Public Administration in Warsaw. He speaks English, French and has a basic knowledge of German.

William DelBagno is an FBI Supervisory Special Agent (SSA) with the Weapons of Mass Destruction Directorate, Chemical Countermeasures Unit. Prior to this assignment, SSA DelBagno worked for six years in the FBI's New York Field Office as a Counter-Terrorism Case Agent, Assistant WMD Coordinator, and HazMat Team Member. Prior to his appointment to the FBI, SSA DelBagno graduated from the United States Military Academy at West Point with a degree in physics and served the U.S. Army as an Armour Office where he was awarded a Bronze Star for his combat service.

Hadi Farajvand is the Secretary of the National Authority of the Islamic Republic of Iran for Conventions on Chemicals. He has 21 years experience in multilateral diplomacy and international negotiations. He has been a member of the delegation of Iran in the CWC, BTWC, and CTBT treaty negotiations. He was also Ambassador of Iran to Poland between 2006 and 2009. He has a PhD in Political Sciences, and was lecturer at the School of International Relations. He has several articles and publications in the field of international securities and treaties.

Nico Frandi is a Political Desk Officer (Counsellor) at the European External Action Service (EAAS) in Brussels. His duties include Relations with UN and UNSC 1540. Relations with OPCW and BTWC ISU; elaboration and implementation of the EU Council Decisions in the chemical and biological sectors. Coordination and implementation WMD Free Zone in the Middle East. Coordination of briefings related to the Middle East and the South Mediterranean Region. Coordination of G8 briefings on non proliferation and disarmament issues. Mr Frandi has previously worked as; 1st Secretary, Human Rights Officer at the Mission of Italy to the United Nations; 1st Secretary & Deputy Head of Mission at the Embassy of Italy in Kuwait; 2nd Secretary seconded by the Ministry of Foreign Affairs at the Council of the European Union; and 2nd Secretary, CFSP/ESDP Desk, Assistant to the European Correspondent at the Italian Ministry of Foreign Affairs in Rome. Mr Frandi has also worked at the British American Security Information Council, The European Commission and the Center for Strategic and International Studies, Washington DC, US. Mr Frandi holds a Masters Degree in History

of International Relations/ International Politics/Economy/Law from Universita degli Studi di Firenze, Florence, Italy. He has also studied at the Columbia University in New York US, Georgetown University, Washington DC US and King's College, London UK.

Jadallah Hammal joined WINS in May 2010 as Project Manager, where he is responsible for implementing various operational projects. Prior to joining WINS, he worked in the programme departments of various humanitarian NGOs in Vienna and London. Mr. Hammal holds a Bachelor's degree in Economics and Social Studies from the University of Manchester, where he specialised in Development Studies and Politics. He also has an MSc in Violence, Conflict and Development from the School of Oriental and African Studies, University of London. He speaks fluent German, English and Arabic.

John Hart heads the Chemical and Biological Security Project (Arms Control and Non-proliferation Programme) at the Stockholm International Peace Research Institute (SIPRI). He is a doctoral candidate in military sciences. His publications include Chemical Weapons Destruction in Russia: Political, Legal and Technical Aspects (Oxford University Press: 1998, co-editor) and Historical Dictionary of Nuclear, Biological and Chemical Warfare (Scarecrow Press: 2007, co-author). In 2011 he headed an expert group to facilitate EU support for public health in Central Asia and the South Caucasus under the Instrument for Stability.

Dr. Frank Huess Hedlund is a risk expert at COWI, as well as Associate External Professor at the Technical University of Denmark (DTU) for the course in Risk Management, and External Lecturer at Copenhagen University in the Master of Disaster Management programme. Dr. Hedlund holds a PhD from Aalborg University (2002), an M.Sc. (Chem.Eng.) from the Technical University of Denmark (1996), an MBA from the National University, California, CR Campus (1993), and a B.Sc. (Chem.Eng.) from the Danish Engineering Academy (1986). For soon 20 years, Dr. Hedlund has worked with risk and safety analysis, assessment and management of oil and gas activities- particularly concerning the control of major industrial hazards, EU Seveso regulation and safety reports. He has worked extensively with hazard identification and risk assessment techniques for private sector clients, and has particular interest in learning from near-miss incidents and past accidents. Dr Hedlund has worked on projects for public authorities with expert advice on interpretation and assessment of safety reports, capacity building and institutional support to risk authorities, workshops and courses; and he has worked on Seveso related assignments for the European Commission.

Kathryn Hughes is a Senior Program Officer with the Board on Chemical Sciences and Technology (BCST), which she joined in 2006. In this role, Ms. Hughes supports scientific and technical advisory committees working in the areas of chemistry and chemical engineering. She has worked on several studies pertaining to a variety of topics including examining methods for disrupting IED terror campaigns (2008), research at the intersection of physical and life sciences (2009), and laboratory safety (2010), and science and technology relevant to the Biological Weapons Convention (2010) and Chemical Weapons Convention (2012). Currently, she is also supporting the U.S. National Committee for IUPAC on behalf of the National Academies' Board on International Scientific Organizations. Prior to joining the NRC staff, Hughes was a Science Policy Fellow with the American Chemical Society. She received her Ph.D. in Analytical Chemistry from the University of Michigan and holds a bachelors degree from Carleton College.

Amb. Bonnie Jenkins is the Department of State's (DOS) Coordinator for Threat Reduction Programmes. She is also the U.S. Representative to the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (Global Partnership) and currently Chairs the Global Partnership. She is the DOS lead on the Nuclear Security Summit and the four-year effort to secure all vulnerable nuclear material. Prior to rejoining the U.S. Government, Ambassador Jenkins served as Program Officer for U.S. Foreign and Security policy at the Ford Foundation. She has also served as counsel on the National Commission on Terrorist Attacks upon the United States, known as the "9-11 Commission." Ambassador Jenkins worked at the RAND Corporation and is a retired U.S. Naval Reserve officer. She also worked as a legal advisor in the Office of General Council at the U.S. Arms Control and Disarmament Agency. Ambassador Jenkins was a fellow at the Belfer Center at the John F. Kennedy School of Government, Harvard University. She was as an advisor at Harvard Law School's Office of Public Interest Advising. Ambassador Jenkins has a Ph.D. in International Relations from the University of Virginia; an LL.M. in International Law from the Georgetown University Law

Center; an M.P.A. from the State University of New York at Albany; a J.D. from Albany Law School; and a B.A. from Amherst College.

Dr. Huang Jiefang is a Senior Legal Officer in the Legal Affairs and External Relations Bureau of the International Civil Aviation Organisation (ICAO). Dr. Huang Jiefang graduated from Wuhan University, China, obtained an L.L.M. from the Institute of Air and Space Law, McGill University, Canada, and a PhD from the International Institute of Air and Space Law, Leiden University, the Netherlands. Before joining ICAO, he served as Third Secretary in the Ministry of Foreign Affairs of China. He joined the ICAO's Secretariat in 1996 and has been assigned to work as Assistant Secretary, Deputy Secretary or Secretary of various ICAO legal meetings. He has also served as ICAO representative for a number of UN meetings, and a member of the UN Counter-Terrorism Implementation Task Force (CTITF). He was Deputy Secretary of the Diplomatic Conference in 2010, which adopted the Beijing Convention and Beijing Protocol. Teaching air law and international law in the Civil Aviation University of China, the Institute of Air and Space Law, McGill University and the International Institute of Air and Space Law, Leiden University. He has authored a number of publications, including a book "Aviation Safety through the Rule of Law: ICAO's Mechanisms and Practices" (Kluiwer, 2009). He is also a member of the Editorial Board of Annals of Air and Space Law, McGill University.

Nicolas Kasprzyk has been serving as a1540 Committee expert since April 2009, at the United Nations headquarters in New York. In this capacity, he provides support to the 1540 Committee to facilitate the implementation by States of United Nations Security Council resolution 1540 (2004). From 2002 to 2009, he was an adviser on non-proliferation and disarmament at the Directorate for Strategic Affairs (délégation aux affaires stratégiques) in the French Ministry of Defense. From 1999 until 2002, Mr Kasprzyk worked as a researcher at CESIM (Center for International Security and Arms Control Studies), and was seconded during that time to the Strategic Analysis Department of the European Aeronautic Defence and Space Company (Launch Vehicles branch), participating in particular in analysis activities in the area of ballistic missiles and related doctrines, budgets and policies. Mr Kasprzyk graduated in Law, with a specialisation in arms control and nonproliferation.

Prof. William W. Keller is Professor of International Affairs and holds the Gary K. Bertsch Directorship of the Center for International Trade and Security at the University of Georgia. He was formerly Professor of International Affairs and Political Science at the University of Pittsburgh, where he directed the Matthew B. Ridgway Center and held the Wesley W. Posvar Chair in International Security Studies from 2002 to 2008. He is a past Executive Director of the Center for International Studies at the Massachusetts Institute of Technology, where he was a Principal Research Scientist and Research Director of the M.I.T. Japan Program (1998-2002). His research interests include internal security, terrorism, WMD proliferation, and strategic trade; East Asia economic and security issues; and the political economy of multinational corporations. Prior to joining M.I.T., he served as Associate Professor and Deputy Director of the Center for Trade and Commercial Diplomacy at the Monterey Institute of International Studies. From 1987-95, he directed international projects at the Office of Technology Assessment in Washington, DC, under the auspices of the Senate Committee on Armed Services and the Senate Committee on Commerce, among others. Major reports include Multinationals and the U.S. Technology Base (September 1994) and Global Arms Trade: Commerce in Advanced Military Technology and Weapons (June 1991). Professor Keller is the author, coauthor, and editor of numerous articles and books, including 'China's Rise and the Balance of Influence in Asia' (Univ. of Pittsburgh Press); 'Hitting First: Preventive Force in U.S. Security Strategy' (Univ. of Pittsburgh Press); 'Crisis and Innovation in Asian Technology' (Cambridge Univ. Press); 'The Myth of the Global Corporation' (Princeton Univ. Press); Arm In Arm: 'The Political Economy of the Global Arms Trade' (Basic Books) and 'The Liberals and J. Edgar Hoover: Rise and Fall of a Domestic Intelligence State' (Princeton Univ. Press). .Dr. Keller is a graduate of Princeton University and holds an M.A. and Ph.D. in Government from Cornell University.

Todd Klessman is the Acting Branch Chief for the Policy and Programs Branch (PPB) within the Infrastructure Security Compliance Division (ISCD). ISCD, which is part of the U.S. Department of Homeland Security (DHS), National Protection and Programs Directorate (NPPD), is the office within DHS responsible for chemical security regulations. Prior to being appointed the Acting Branch Chief, Mr. Klessman served as the Acting Deputy Director for ISCD from September 2009 to December

2010, and was one of the original Chemical Security Task Force members who developed the Chemical Facility Anti-Terrorism Standards (CFATS). Mr. Klessman has been working on infrastructure and chemical security issues for the Office of Infrastructure Protection since April 2004. Prior to entering the homeland security field, Mr. Klessman served as an attorney assisting clients in various types of litigation, including: complex commercial disputes, copyright infringement cases, First Amendment cases, labor and employment cases, and international trade matters. Mr. Klessman has a B.B.A. from the University of Michigan Business School, and a J.D. from the University of Michigan Law School.

Jonathan Krueger is the Acting Programme Manager of the Chemicals and Waste Management Programme (CWM) of the United Nations Institute for Training and Research (UNITAR). UNITAR CWM provides support to governments and stakeholders to strengthen their institutional, technical, and legal infrastructure and capacities for sound chemicals and waste management and has on-going projects in over 40 countries. Prior to joining UNITAR in 2001, Jonathan followed the international negotiations for the Stockholm POPs and Rotterdam PIC Convention for the International Institute for Sustainable Development (IISD). He holds a PhD in International Relations (London School of Economics and Political Science), and was a post-doctoral Fellow at Harvard University's Belfer Center for Science and International Affairs. He has also authored numerous publications on international environmental policy, with a focus on global chemicals and waste management issues, including "International Trade and the Basel Convention" (London: RIIA/Earthscan, 1999).

Prof. Valery Kukhar is the Director of the Institute of Bioorganic Chemistry and Petrochemistry, in the National Academy of Sciences of Ukraine (NASU). Prof. Kukhar graduated from the Chemical Technology Institute, Dnepropetrovsk in 1963, and earned a Cand. Chem.Sci. degree from the Institute of Organic Chemistry, NASU, in 1967, followed by a Doctorate of Chemical Science in 1974. He served as head of the Chemical Department of NASU from 1978 to 1988, and Vice-President of NASU from 1988 to 1993. Also, from 1987 he became Director of the Institute of Bioorganic Chemistry and Petrochemistry at NASU. Prof. Kukhar was also President of the Ukrainian Chemical Society from 1992 to 2002. In the period 1995-2002 he was the Chief of Commission of Nuclear Policy and Ecological Security for the President of Ukraine; 1996-2003 he served as Deputy-chairman, Council for Science and Technology Policy for President of Ukraine. Currently, Prof. Kukhar is the Head of State Fund for Fundamental Research of Ukraine. Prof. Kukhar is a member of International Advisory Group for Chernobyl Shelter Fund, EBRD. Prof. Kukhar was also a member of the OPCW Scientific Advisory Board. His research is concentrated on phosphorus and fluorine organic chemistry, eco-technology and sustainable development. He is author and editor of 6 books and more than 600 scientific articles. He was awarded as Member - "GLOBAL - 500 " UNEP (1993), San-Valentino Award, World Federation of Scientists, 1999, Ukrainian State Award in Science & Technology, 1999.

Sjoerd Looijs is the Responsible Care Manager of the European Chemical Industry Council (Cefic). Mr. Looijs holds a Master of Science in Chemistry at the University of Nijmegen in the Netherlands with majors in Analytical Chemistry and Pharmacology. During the period from 1984 to 1989 he worked for Philips Semiconductors as Manager of the Chemistry Department and as Environmental Project Officer. In 1989 he moved to the Corporate Environmental Office of Royal Philips Electronics in Eindhoven, the Netherlands. His primary duties involved the development and implementation of the company's global environmental policy. Mr Looijs joined the Association of the Dutch Chemical Industry (VNCI) in 1997, where he occupied the position of senior advisor Responsible Care and Sustainability. He was VNCIs National Responsible Care manager and was actively involved in new membership development and supporting SME company members. In May 2012 he joined the European Chemical Industry Council (Cefic) as manager Responsible Care. He is responsible for coordinating the European implementation of the global Responsible Care programme.

Wojciech Lubiewa-Wielezynski is President of the Polish Chamber of Chemical Industry (PIPC). He graduated from Warsaw Technical University with a degree in Chemical Engineering. Mr. Lubiewa-Wielezynski is also a member of the National Association Board of Cefic. Between 2003 and 2007, he served as a member of the Cefic Board, and member of the European Chemical Employers Group Board (ECEG). He took part in activities of the Executive Committee of the European Fertilizers Manufactures Association (EFMA). Member of the Scientific Council in Ministry of Science and Higher Education, Permanent Committee of the Chemical Technology Congresses, many scientific councils of the chemical scientific institutes and program councils of the chemical magazines.Member of Supervisory Boards in chemical companies. In 1990-2002 he was the Managing Director of the Industrial Chemistry Research Institute. Author and co-author of numerous

implementations, patents and publications. He is involved in safety and security issues in UN Economic Commission for Europe, Cefic and OPCW.

Katarina Magulova has worked with UNEP as a Programme Officer in the Secretariat of the Stockholm Convention on Persistent Organic Pollutants (POPs) since May 2006. She is responsible for implementation of issues related to measures to reduce or eliminate releases from unintentional production of POPs and from the use or recycling of products containing POPs. Her other main task is related to effectiveness evaluation of the Convention, including world-wide implementation of the POPs Global Monitoring Plan. Before joining the Secretariat, her work focused on technical aspects of environment protection such as development and implementation of legislation, strategies, and action plans for reduction of harmful pollution; issues related to best available techniques and best environmental practices (BAT&BEP) and their implementation on international, regional, and national levels; inventory of environment pollution sources and their releases; as well as development of on-ground projects to implement concrete actions.

Dr. Irma Makalinao, M.D., M.A. (Peace and Security Studies), FPSCOT, FPPS is a Full Professor of the Department of Pharmacology and Toxicology at the University of the Philippines College of Medicine. A former Chair and Coordinator of the graduate program Master's of Science in Pharmacology. Dr. Makalinao expertise lies in areas of toxicology, pharmacology, advanced hazardous material life support, chemical safety and security and paediatric environmental health She has pioneered the conceptual framework for biosecurity in the Philippines. She has been trainer for HazMat First responders both at the awareness and operational level. Since 2010 she has co-organised two major chemical safety and security workshops at the national and regional level for the Anti-Terrorism Council in partnership with the US Department of State Chemical Security Programme. She has served two terms as president of the Philippine Society of Clinical and Occupational Toxicology. She has been instrumental in institutionalizing the first and only Toxicology Fellowship Program in the Philippines in 1996 at the University of the Philippines in Manila From 1997 to 2005 she has served as the first Program Director of the Clinical Toxicology Fellowship based at the then National Poison Control and Information Service at the Philippine General Hospital. She has been a member of and consultant to numerous international and national professional societies and organizations, including the Pacific Basin Consortium for Environment and Health Sciences (PBC), the Asia-Pacific Association of Medical Toxicology (APAMT), the European Association of Poison Control Centres, and the International Network on Children's Health and Environmental Safety (INCHES). She has several years of work with the International Program for Chemical Safety (IPCS) in her capacity as WHO Temporary Adviser and Short Term Consultant. She has also served as the SCIENCE NGO representing APAMT to the Forum Standing Committee of the Intergovernmental Forum for Chemical Safety (IFCS) and the SAICM Expanded Bureau for the Strategic Approach to Chemicals Management. She has participated as a technical expert in some of the Persistent Organic Pollutant Review Committee (POPRC) of the Stockholm Convention. Recently, Dr. Makalinao has been invited to an expert's meeting on Chemical Safety and Security by the OPCW. She has also been assisting in setting up the CBRN Centre's Excellence (CBRN CoE) in the Philippines.

Dr. M. Sam Mannan is Regents Professor in the Chemical Engineering Department at Texas A&M University and Director of the Mary Kay O'Connor Process Safety Center at the Texas Engineering Experiment Station. The mission of the Center is to improve safety in the chemical process industry by conducting programs and research activities that promote safety as second nature for all plant personnel in their day-to-day activities. Before joining Texas A&M University, Dr. Mannan was Vice President at RMT, Inc., a nationwide engineering services company. Dr. Mannan is a registered professional engineer in the states of Texas and Louisiana and is a Certified Safety Professional. His experience is wide ranging, covering process design of chemical plants and refineries, computer simulation of engineering problems, mathematical modelling, process safety, risk assessment, inherently safer design, critical infrastructure vulnerability assessment, aerosol modelling, and reactive and energetic materials assessments.. Dr. Mannan is involved very closely with projects that include hazard assessment and risk analysis, process hazard identification, HAZOP (hazard and operability) studies, vulnerability assessment, process safety management, and risk management. His research interests include development of inherently safer processes, application of computational fluid dynamics to study the explosive characteristics of flammable gases, development of quantitative methods to determine incompatibility among various chemicals, application of calorimetric methods for the assessment of reactive hazards, and the application of consequence analyses to assess the impact of process plant incidents. He co-authored the Guidelines for Safe Process Operations and

Maintenance published by the Center for Chemical Process Safety, American Institute of Chemical Engineers. He is the editor of the 3rd and 4th edition of the 3-volume authoritative reference for process safety and loss prevention, Lees' Loss Prevention in the Process Industries. Dr. Mannan has published 167 peer-reviewed journal publications, along with numerous proceedings papers, books, and technical meeting presentations. 3 books, 7 book chapters, 172 proceedings papers, 12 major reports, and 187 technical meeting presentations. Dr. Mannan is the recipient of numerous awards and recognitions including the American Institute of Chemical Engineers Service to Society Award, the Texas A&M University Association of Former Students' Distinguished Achievement Award for Teaching, the Texas Engineering Experiment Station Research Fellow, the Texas A&M University Dwight Look College of Engineering George Armistead, Jr. '23 Fellow. In 2003, Dr. Mannan served as a consultant to Columbia Accident Investigation Board. In 2006, he was named the inaugural holder of the T. Michael O'Connor Chair I. In 2007, he was elected Fellow of the American Institute of Chemical Engineers. In December 2008, the Board of Regents of Texas A&M University System recognized Dr. Mannan's exemplary contributions to the university, agency, and to the people of Texas in teaching, research and service by naming him Regents Professor of Chemical Engineering. Dr. Mannan is a Guest Professor at the Nanjing University of Technology and the China University of Petroleum in Qing Dao. In September 2011, the Technical University of Łódź, Poland, conferred the Doctoris Honoris Causa on Dr. Mannan. In 2012, Dr. Mannan was awarded the Bush Excellence Award for Faculty in Public Service. Dr. Mannan received his B.S. in chemical engineering from the Engineering University in Dhaka, Bangladesh in 1978, and obtained his M.S. in 1983 and Ph.D. in 1986 in Chemical Engineering from the University of Oklahoma.

Prof. Adam S. Markowski is a Professor at the Faculty of Process and Environmental Engineering, at the Technical University of Lodz, Poland. He is also the programme coordinator for the safe-work engineering programme at the University, and since 1996 has been manager of postgraduate studies on Industrial Process Safety. In the field of process safety, Prof. Markowski has research and training experience on quantitative risk assessment, safety and risk management in process industries, layer of protection analysis, domino effects, risk analysis for ATEX, accident analysis, and fuzzy logic application. Prof. Markowski is a member of numerous professional associations, including the Chemical and Process Engineering Committee at the Polish Academy of Sciences; Functional Safety Committee, TU Gdansk; Editorial Board at the International Journal of Oil, Gas, and Coal Technology; Loss Prevention Working Party, European Federation of Chemical Engineers; International Emergency Management Foundation, TIEMS; Technical Advisory Committee and Research Associate of the Mary Kay O'Connor Process Safety Centre at Texas A&M University. Prof. Markowski has published 5 patents, 163 papers, 6 student handbooks, 5 handbooks and 20 chapters in professional handbooks, 1 monograph, 40 research projects for industry, 5 grants for KBN and NCBR, and 65 promotions of MSc works. In the area of safety, Prof. Markowski was awarded first Award of the Polish National Labour Inspection (1995); award of the ATEST Work Protection Journal (2001); the Polish National Education Award (2001); the Helena Krahelska Award of the Polish National Labour Inspection (2002); 'Men of the Year' award of ExMagazin, Poland (2008); and the Trevor Kletz Merit Award, MKOPSC, from Texas A&M University (2012).

Björn McClintock is an Assistant Criminal Intelligence Analyst in the Chemical and Explosives Terrorism Prevention Unit of INTERPOL's CBRNE Programme. A Swedish national, he joined INTERPOL in 2009. Prior to joining the CBRNE team, he worked in INTERPOL's Criminal Intelligence Analysis Sub-directorate, where he was responsible for conducting strategic and operational intelligence analysis, and in INTERPOL's Command and Coordination Centre (CCC). Mr. McClintock was also a member of the INTERPOL Major Events Support Team to Bangladesh during the Cricket World Cup in 2011. Mr. McClintock studied intelligence analysis and political science at Lund University, Sweden, and holds a Master's Degree in Terrorism and International Relations from the University of Wales, Aberystwyth.

Fedor Meerts is a project leader at the National Coordinator for Counterterrorism and Security of the Netherlands Ministry of Security and Justice. Within the Dutch CBRN/E programme he is responsible for a number of projects on explosives precursors and security of CBRN locations.

Wicher Mintjes is Associate Director Emergency Services & Security at Dow Chemical. His area of responsibility is Middle East and Africa. Next to that he is the Security Advocacy Leader for Dow in Europe and the main contact for European agencies and trade associations. He is a member of various Dow Crisis Management Teams. Mr. Mintjes is also responsible for travel security in the Europe,

Middle East and Africa region. Mr. Mintjes holds an MSc in Chemical Engineering and started to work for Dow in 1987. He worked in various process design and manufacturing roles and in 2002 became the leader of the Emergency Services & Security organization of the largest Dow site outside of the US. In 2008 he was appointed to his current position at Dow's Global Emergency Services & Security Expertise Centre.

Dr. Stefano Miorotti joined Cristanini SpA in 2005, following service in CBRN with the Italian Army. He is currently the Chief Operations Officer responsible for global sales and marketing. He is well known on the international circuit, presenting at CBRN conferences and seminars and is very active in the Decontamination and Detoxification Research and Development domain; in particular, working with academia and scientific and technological centres of excellence. During his military service, Dr. Miorotti served with the 7th CBRN Regiment as a CBRN Reconnaissance Platoon Commander and then as a Company Commander. His Defence and Security CBRN training was conducted at the Italian Military Academy, the Italian Joint CBRN School in Riete and at the NATO School in Oberammergau, Germany. He also attended Live Agent Training in Dugway Proving Ground in the United States of America and at the Advanced Counter Terrorism CBRN Course in Suffield, Canada. His last duty assignment was as CBRN Advisor at the Multinational NATO Rapid Deployment Corps in Milan. CBRN operational experience has included Kosovo, dealing with toxic industrial hazards and then Iraq and Afghanistan. In Afghanistan he was a member of the CBRN Multinational Team that carried out Sensitive Site Exploitation of Biological and Radiological sites, specialising in personnel, equipment and platform decontamination, containment and removal. Doctor Miorotti's service in Afghanistan was publicly recognized in Italy with the award of the Bronze Cross. Dr. Miorotti graduated in Economics from the University of Turin in 2002 and in International Diplomatic Law from the University of Trieste in 2004, a course which was orientated towards Weapons of Mass Destruction. He then attained a Masters in Biological and Chemical Defence at the University of Rome. He is currently enrolled in a Counter Terrorism Course at the University of St. Andrews, Scotland.

Ir Mothar Bin Musri, M.Sc. (Engineering) is the Deputy Director General (Operations) of Department of Occupational Safety and Health Malaysia (DOSH), one of agency/department under the Ministry of Human Resources, Malaysia. He has vast experience in the field of occupational safety and health and has been working with DOSH for approximately 30 years. Currently he is responsible for the DOSH's operational activities which cover workplace safety and health such as Industrial Safety, Major Hazard Installations, Offshore Safety, Chemical Management, Industrial Hygiene & Ergonomics, and Occupational Health. Previously he has been posted to various divisions within DOSH as well as to the State Office as the Director. He also has been posted as Director of DOSH/UNDP Project. He is the author of numerous articles related to occupational safety and health and ergonomics for national and international level. He received a Bachelor Degree from the University of Nottingham, England in Mechanical Engineering and his Master Degree from the University of Birmingham, England in Work Design and Ergonomics.

Prof. Sławomir Neffe is Professor of the Faculty of Advanced Technologies and Chemistry at the Military University of Technology in Warsaw. Head of the Department of Radiometry and Monitoring of Air Pollution. Former Director of the Institute of Chemistry and Protection against Chemical Warfare Agents. Member of the OPCW Scientific Advisory Board. For many years member of the Chemistry, Biology and Physics Panel of the NATO Science for Peace Programme. Former inspector with the United Nations Special Commission (UNSCOM) in Iraq. Areas of interest and expertise: physical and analytical chemistry, development of new technologies for neutralisation of toxic chemicals and hazardous materials, air pollution monitoring and international verification of dual use chemicals, chemical defence, chemical safety and security.

Dr. Maarten S. Nieuwenhuizen is the Senior Consultant and Strategic Business Development of the Department CBRN Protection at TNO. Dr. Nieuwenhuizen received his M.Sc. (1980) and Ph.D. (1985) in chemistry and chemical engineering from Delft University of Technology. In 1985 he joined TNO where he acted first as a section manager of Detection. He subsequently became manager of the research group Analysis of Toxic and Explosive Substances (1993-2000), the research group Pharmacology (2000-2002), the research group Threat Analysis and System Integration (2002-2005) and the Department Detection and Identification (2005-2007). As of 2007 he is Senior Consultant and Strategic Business Developer of the Department CBRN Protection. From 1995 on he was involved in aspects related to the Chemical Weapons Convention and its implications, i.e. the creation of the

OPCW (training of inspectors), a Netherlands support program to CW destruction in the Russian Federation. He was programme manager of TNO-MoD joint R&D programme entitled 'Passive defence against NBC-weapons' (2004-2005). From 2002 to 2005 he was the chairman of the Security-related Civil Science and Technology panel of the NATO Science Programme which involved among others industrial CW destruction technology as well as the 'marriage' between security related science and technology and other domains such as safety, environment and health. From 2000 on he is involved in various EU CBRN-counterterrorism related research projects as a partner as well as a coordinator, e.g. 'Assessment of the vulnerabilities of modern societies to terrorist acts employing radiological, biological or chemical agents with the view to assist in developing preventive and suppressive crisis management strategies (ASSRBCVUL)' and 'Innovative Measures for Protection against CBRN Terrorism (IMPACT)' as well as Demonstration of counterterrorism system-of-systems against CBRNE phase 1 (DECOTESSC1). In the latter project the same philosophy to link the security domain to the safety, environment and health domain was discussed at the system-of-systems level.

Prof. Jonathan Okonkwo has been a full Professor in Environmental Chemistry at Tshwane University of Technology (TUT), South Africa, since 2002. Prof. Okonkwo obtained his BSc, MSc and PhD in Chemistry from Brunel University, UK, in 1982, 1989 and 1992 respectively. After a one year postdoctoral studies at Brunel, Jonathan was appointed as a lecturer in Analytical/Inorganic Chemistry at the University of Swaziland in 1993. After 3 years in Swaziland, Prof. Okonkwo went to the University of Venda, South Africa in 1998, as a senior lecturer in Environmental Chemistry. Prof. Okonkwo has trained many postgraduate students, published over 60 scientific papers in peer-reviewed journals, four chapters in books and has attended international conferences on Chemical Sciences. In 2007, Prof. Okonkwo won the Senior Researcher of the year at TUT. This is an award bestowed to outstanding researchers at the university. In 1999 and 2010, Prof. Okonkwo was admitted as a Chartered Chemist (CChem) and a Fellow of the Royal Society of Chemistry (FRSC), UK, respectively. He is currently a member of the Scientific Advisory Committee of International Conference on Ecotoxicolgy and Environmental Sciences, India and a consultant for UNIDO on the Stockholm Convention's new POPs. Prof. Okonkwo's research areas include, adsorption technology; speciation of toxic metals in aquatic environment; soil remediation and persistent organic pollutants. Prof. Okonkwo is currently collaborating with researchers from, Germany, India, Sweden, UK and USA.

Krzysztof Paturej is Director /since 2006/ of the Office of Special Projects in the OPCW Technical Secretariat. Mr. Paturej is experienced in multilateral diplomacy, negotiations and multicultural relations, disarmament and non-proliferation of WMD, efforts against terrorism, development and cooperation programmes, relations with stakeholders and public society, result based management and risk management strategies. In his recent function at the OPCW, Mr. Paturej is responsible, inter alia, for coordination of the OPCW policies in disarmament, WMD non-proliferation and global efforts against terrorism, relations and programmes with the OPWC stakeholders and international partners, and the development of the OPCW policies on prevention of and preparedness for misuse of toxic chemicals and chemical safety and security. Prior to the recent post at the OPCW, Mr. Paturej was Head of Division on Non-proliferation within the Polish Ministry of Foreign Affairs. Mr. Krzysztof Paturej is a former national coordinator of the Proliferation Security Initiative (PSI), and Senior Representative of Poland to the G8 Global Partnership /2003-2005/. He was the Representative of Poland to the OPCW /1997 till 2000/and served as the Chairman of the OPCW Executive Council /1998-1999/ and Chairman of the IX Conference of States Parties to the OPCW /2004 – 2005/.

Major Marek Poterek is a firefighter serving in the Central School of the State Fire Service in Czestochowa, Poland. He currently works as the head of the rescue tactics station. His responsibilities include conducting theoretical and practical training in rescuing people in building disasters, road and chemical accidents, natural disasters; conducting training workshops in the field of fire protection, civil protection and chemical rescue; the development of handbooks and education programs; managing a training team of rescuers. Mr Poterek is a graduate of The Main School of Fire Service in Warsaw. He also graduated from post-graduate studies in the field of hazardous materials and chemical emergencies response (Military University of Technology) and post-graduate pedagogical studies (Polonia University in Czestochowa). He also completed specialist courses, such as: International Train the Trainers Course for First Responders to CBRN Incidents (Crisis Management Centre in Kuopio, Finland) or specialist training in the control of radiometric and radiation protection (Polish Border Guard Training Centre in Koszalin).

Yagya Saxena is the Secretary of the Indian Chemical Council (ICC). In this role, he has been

associated with the CWC since 2004 and has been credited with organising the first seminar on awareness of the CWC in India. He also initiated the idea of establishing the 'CWC Help Desk' for obtaining the declarations under the CWC. The first CWC Help Desk was inaugurated by Mr. John Freeman. Dy. Director General – OPCW, during 10 Year Celebrations of CWC In India. The CWC Help Desk is a unique model aimed at obtaining declarations and dissemination of awareness to CWC. Mr. Saxena has organized more than 60 CWC awareness programmes & camps across the industry, resulting in a large number of declarations from the chemical industry in India. Mr. Saxena spent 16 years with the Indian Air Force, and is an engineer and law graduate, then completing postgraduate studies in materials, marketing and export/import management.

Dr. Ryszard Scigala is Mayor of the city of Tarnów, Poland. Dr. Scigala graduated from the University of Science and Technology in Krakow with a degree in Technical Physics. He completed his PhD studies at the Technical University of Lodz. From 1981 to 2006 he was professionally connected with Azoty Tarnów. From 1991 to 2001 he worked as a main specialist for environmental protection, a chief of the environment prevention department, and a proxy of the board for the environment management system. From 2001 to 2002 he was the President of the Polish Chamber of Chemical Industry in Warsaw. From 2001 to 2006 he was the President of the board and general manager of Azoty Tarnow. He was also a lecturer of higher education, a vice-president of national engineering authorities organizations and a member of program council of science institutes and specialist press. Dr. Scigala specialises in scanning microscopy, Fourier's cryogenic interferometry, thermal differential analyzes –DTA, differential thermogravimetry - DTG, x-ray wide-angular diffractometry – wave and crystallography analyzes, mercury porosimetry - BET methods of low temperature gas adsorption. He is an expert in environmental protection, and has worked for the Polish Chamber of Chemical Industry, Government Environmental Protection, Natural Environment and Forests Committee, and the Inter-department Ministry of Environment Protection. Previous titles include Strategic Counsellor and Scientific Council of Industrial Chemistry Research Institute; the Economic Council of Lesser Poland Voivodeship; Programme Council of "Chemist" and "Chemical Industry" monthly magazines; Vice President of the Polish Technology Platform; and Common Commission of Territorial and Economical Governments. He is also the founder of the 'Tarnowianie' association, has authored multiple scientific publications, and has served as a lecturer and supervisor to numerous students.

Przemysław Stangierski is Vice President and Partner with A.T. Kearney, global management consultancy. With 20 years of experience in management consulting, Mr. Stangierski worked with a number of multinational companies, advising in strategy and operations. He lead more than 100 hands-on projects with several billion Euros at stake in oil and gas, petrochemical, telecommunication, transportation and other industries. Currently he is partner in charge of A.T.Kearney Polish practice, with over 30 high caliber consultants, based in Warsaw leading the firm's thought leadership in regulatory and marketing efficiency topics. He graduated from Lodz University and The City University in London, in the field of Business Systems Analysis.

Dr. Lech Starostin is Secretary of the Board for the International Centre for Chemical Safety and Security, based in Tarnów. Dr. Starostin is a graduate from Military University of Technology in Warsaw, Poland, Faculty of Chemistry and Technical Physics. M.Sc. in Chemistry in 1973, Ph.D. in Chemistry in 1982. Specialized in NBC Defence, Non-destructive evaluation (NDE), CBRN Safety and Security. Near 25 years experience as scientific researcher on areas of radiochemistry, dosimetry, NBC protection, and detection of both ionizing radiation and chemical warfare agents. Vast theoretical and practical knowledge of operating sophisticated NDE equipment. Practical knowledge of treaties, laws, regulations and procedures pertaining to toxic chemicals and wastes, and to the environmental protection. Professional Career: Military University of Technology, Senior Assistant of Science, Nuclear Weapons Defence Department (1973–1983); Institute of Atomic Energy, Otwock-Swierk, Poland, Head of Research & Development Group (1983–1991); Military University of Technology, Head of Environmental Laboratory, Chemical Warfare Agents Defence Department (1991-1997); Organization for the Prohibition of Chemical Weapons, The Hague, The Netherlands, CWMS Inspector (1997–2008); Freelance - CBRN and NDE expert, OPCW Consultant; preparation and conduct of lectures, courses, trainings and exercises on areas of CBRN safety and security, NDE and environmental protection (2009 – current).

Prof. Leiv Sydnes is Professor of Organic Chemistry at the University of Bergen, Norway. His

research field is organic synthesis, with emphasis on development of synthetic methodology. Many of the problems investigated have been and are related to preparation and studies of biologically active molecules and compounds of medicinal interest. Prof. Sydnes has for a number of years been a consultant for chemical companies, including pharmaceutical companies. He has been and still is heavily involved in several international organizations, most notably in the International Union of Pure and Applied Chemistry (IUPAC) where he served as Vice President (2002-03), President (2004-05), and Past President (2006-07), and currently is chair of the CHEMRAWN Committee. Through IUPAC he has been involved in cooperation with OPCW since 2002.

Michael Thornton is CBRN Risk Mitigation Centre of Excellence (CoE) Project Coordinator in the Joint Research Centre (JRC) of the European Commission. Mr. Thornton has worked with the JRC for over 25 years. Prior to joining the CBRN Risk Mitigation CoE, he worked in a variety of areas within the JRC, including nuclear inspector training; serving as representative for the Commission on the European Council's Civil Protection Working Party for the European Programme for Critical Infrastructure Protection; working in European tritium-handling laboratories; and has given numerous briefs on nuclear proliferation issues to EU military step, MEP's, and the intelligence staff of the Situation Centre of the European Council. For the past 10 years he has carried out training of military staff at the EU's Satellite Centre in Spain on the identification of nuclear facilities by satellite imagery. Prior to working for the European Commission, he worked for the UK Ministry of Defence at the Atomic Weapons Research Establishment.

Dr. Paul Walker is the International Director of the Environmental Security and Sustainability (ESS) Program for Green Cross International (GCI) and manages the Washington DC office for GCI and its US national affiliate, Global Green USA. The ESS Program, formerly known as the "Legacy of the Cold War Program," is an international effort to facilitate and advocate the safe and sound demilitarization, nonproliferation, and remediation of nuclear, chemical, biological, and conventional weapons stockpiles. Walker is a former Professional Staff Member of the Armed Services Committee in the U.S. House of Representatives where he served as a senior advisor to the Chairman and full committee. Walker holds a Ph.D. in security studies from the Massachusetts Institute of Technology; an M.A. from Johns Hopkins School for Advanced International Studies; a Russian Honors Certificate from the Defense Language Institute of the West Coast; and a Post-Doctoral Fellowship from the Center for Science and International Affairs at Harvard University. He is also a Vietnam-era U.S. Army veteran. Walker has worked, spoken, and published widely in the areas of international security, threat reduction, non-proliferation, and weapons demilitarization for over three decades and took part in the first on-site inspection by US officials of the Russian chemical weapons stockpile at Shchuch'ye in the Kurgan Oblast in 1994. Since that time he has worked closely with the Organization for the Prohibition of Chemical Weapons (OPCW), US and Russian officials, the US Cooperative Threat Reduction (CTR) Program, the G-8 Global Partnership, and other multilateral regimes to help foster cooperative, timely, and safe elimination of nuclear, chemical, and biological weapons and related systems. He has helped to permanently eliminate over 50,000 tons of chemical weapons and millions of munitions in six countries to date. In December 2009 at the 14th Conference of the States Parties in The Hague he led the effort to establish the CWC Coalition, an international NGO network to support the Chemical Weapons Convention and OPCW. He is also a founding member of the Fissile Material Working Group (FMWG) which supported the 2010 and 2012 Nuclear Security Summits in Washington DC and Seoul, South Korea. Recent articles include "How the US can prevent the use and spread of Syria's chemical weapons" (with Daryl Kimball), Christian Science Monitor (December 11, 2012); "Strengthening the OPCW" in OPCW Today (April 2012), "Abolishing Chemical Weapons: Progress, Challenges, and Opportunities," in Arms Control Today (November 2010); and "The legacy of Reykjavik and the future of nuclear disarmament," (with Jonathan Hunt) in the Bulletin of the Atomic Scientists (December 2011).

Amb. Ahmet Üzümcü was appointed Director-General of the OPCW in December 2009 by the 14th Session of the Conference of the States Parties to the Chemical Weapons Convention and began his term of office on 25 July 2010. Immediately prior to this appointment he served as the Permanent Representative of the Republic of Turkey to the United Nations Office at Geneva. Amb. Üzümcü is a career diplomat with vast experience in multilateral diplomacy. During the past decade he has represented Turkey at the North Atlantic Treaty Organization (NATO) Council, the Conference on Disarmament, the United Nations and other international organisations in Geneva. Amb. Üzümcü chaired the Conference on Disarmament for four weeks in March 2008 and attended various disarmament-related meetings and conferences in Geneva, Brussels and elsewhere. He has a thorough

understanding of and considerable expertise in political-military affairs, disarmament and proliferation issues. Previously, Amb. Üzümcü served as Deputy Undersecretary of State for Bilateral Political Affairs. From June 2002 to August 2004, he was the Permanent Representative of Turkey to the NATO Council in Brussels. He held the post of Amb. of Turkey to Israel from 1999 to 2002. From 1996 to 1999, he headed the Personnel Department at the Ministry of Foreign Affairs in Ankara. Prior to that, he served in various posts at the Ministry of Foreign Affairs as well as at the Turkish delegation to NATO (1986-1989), the Turkish Embassy in Vienna (1979-1982) and as a Consul in Aleppo, Syria (1982-1984). In addition to his diplomatic experience, Amb. Üzümcü served in an international capacity as a staff member of NATO's Political Directorate from 1989 to 1994, where he contributed to work on NATO's Partnership for Peace initiative in the immediate aftermath of the Cold War and travelled extensively in Eastern European countries and the former USSR. Amb. Üzümcü was born in Armutlu, Turkey on 30 August 1951 and holds a Bachelors Degree in International Relations with a specialisation in Public Administration from the Faculty of Political Sciences, Ankara University.

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INTERNATIONAL MEETING ON CHEMICAL SAFETY AND SECURITY
TARNÓW, POLAND November 8-9 2012
ICCSS
TRZY SIOSTRY

International meeting on chemical safety and security

The meeting encouraged international cooperation in the field of chemical safety and security, and promoted the development of a global chemical safety and security culture. The meeting sought ways to enhance chemical safety and security at the national level, support capacity building and exchanges of best practices, and improve national and international coordination of chemical safety and security matters. The meeting initiated a regular dialogue and meetings in Tarnow on chemical safety and security.

Scope/objectives

- Promoted a global chemical safety and security culture, and international cooperation in that field
- Shared a commitment for actions to strengthen the global chemical safety and security culture
- Discussed the role of international organisations and mechanisms in the new security environment, and the changing nature of chemical industry
- Built synergies and strengthened collaborative frameworks between the governments, international organisations, chemical industry, academia, and non-governmental organisations
- Discussed the effective ways and means of effective responses to misuse of chemicals
- Discussed available tools for States Parties to undertake a needs assessment in the field of chemical safety and security, and other types of support for such assessments
- Identified assistance needs in the areas of chemical safety and security and transportation of chemicals, including in countries with emerging economies
- Identified means to share, disseminate, and support the implementation of good practices in the field of chemical safety and security
- Presented the International Centre for Chemical Safety and Security in Tarnow

Main seminar topics

- Development of national and international frameworks for enhancing chemical safety and security: resource centres, and promoting global chemical security culture
- Laboratory, chemical plant, transportation and sales security
- Chemistry for sustainability

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