



Science for Peace and Security (SPS)
North Atlantic Treaty Organisation

NATO

**SCIENCE FOR PEACE AND SECURITY (SPS)
PROGRAMME**

**2010 ANNUAL REPORT
ON SPS ACTIVITIES**

TABLE OF CONTENT

		Page
	EXECUTIVE SUMMARY	1
Chapter I.	INTRODUCTION	3
Chapter II.	PURPOSE OF REPORT	5
Chapter III.	SPS PROGRAMME REFORM	5
Chapter IV.	SPS CONTRIBUTIONS TO NATO'S STRATEGIC AND OPERATIONAL OBJECTIVES	6
	A. Euro-Atlantic Partnership Committee (EAPC)	6
	B. NATO-Russia Council (NRC)	7
	C. NATO-Ukraine (NUKR)	8
	D. Mediterranean Dialogue (MD)	9
	E. Istanbul Cooperation Initiative (ICI)	9
	F. International Organizations (IO)	9
	G. SILK Afghanistan Programme	9
	H. Public Diplomacy	10
Chapter V.	SPS TOP-DOWN ACTIVITIES INITIATED BY NATO IN 2010	13
	* Mélange Uzbekistan-Conversion of Rocket Fuel Oxidizer	13
	* SILK-Afghanistan Expansion Project	13
	* Explosives Detection: STANDEX Programme	14
	* Development of an Advanced X-Ray Generator Based on Compton Back-Scattering	15
	* Flood Monitoring and Forecast in the Pripyat River Basin	16
Chapter VI.	SPS BOTTOM-UP ACTIVITIES CARRIED OUT BY SPS SUPPORTED SCIENTISTS AND EXPERTS	17
	Facts and Figures for 2010	18
Chapter VII.	MEASURING THE IMPACT OF SPS ACTIVITIES	21
Chapter VIII.	SPS PROGRAMME CONTRIBUTIONS TO PUBLIC DIPLOMACY	25
Chapter IX.	CONCLUSIONS	30

	ANNEXES	Page
ANNEX I	Overview about the NATO SPS Programme	33
ANNEX II	Expansion of the SILK-Afghanistan Programme	35
ANNEX III-a	List of Bottom-up events conducted in 2010	36
ANNEX III-b	List of R&D projects completed in 2010	39
ANNEX III-c	List of NIG projects completed in 2010	43
ANNEX IV-a	Description of selected SPS events completed in 2010	44
ANNEX IV-b	Description of the 19 R&D projects completed in 2010	52
ANNEX IV-c	Description of the 5 NIG projects implemented in 2010	72
ANNEX IV-d	Description of selected Nationally Funded Activities implemented in 2010	75
ANNEX IV-e	Description of the 5 R&D projects initiated in 2010	79
ANNEX V	Statistics for SPS Online News Stories	81
ANNEX VI	SPS Programme Questionnaire	82

NATO SCIENCE FOR PEACE AND SECURITY (SPS) PROGRAMME

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EXECUTIVE SUMMARY

1. The NATO Science for Peace and Security (SPS) Programme serves the Alliance's Strategic Objective of "Partnership" and makes substantial contributions to the Euro-Atlantic Partnership Cooperation (EAPC), the objectives of the NATO-Russia Council as well as the NATO-Ukraine Commission, NATO's Mediterranean Dialogue, and its cooperation with other International Organizations. It also supports NATO Operations and Public Diplomacy efforts of the Alliance. The 2010 SPS Annual Report provides a brief synopsis of all activities that took place, were completed or were launched under the umbrella of the NATO SPS Programme in the year 2010. Prominent amongst these activities were the five (5) Top-down projects that NATO carried out in cooperation with some of the partner countries.

2. In October 2010, the "Uzbekistan Mélange" project was completed with the destruction of 1,100 tonnes of rocket fuel. This project has played a significant role in empowering the Uzbek Government (who formally requested NATO's assistance after the success of the previous Azerbaijan project) to better protect the local environment as well as the safety of the population in the vicinity of the Oqtosh military base in the Samahand Region.

3. Following the commencement of the "*SILK-Afghanistan Programme*" on 1 January 2010, NATO's Emerging Security Challenges (ESC) and Public Diplomacy (PDD) Divisions, in close cooperation with the Afghan Ministry of Higher Education and the US Embassy in Kabul, have embarked on an ambitious and strategic effort to expand this project, and to connect the academic communities in 7 additional provinces of Afghanistan with high speed internet access to 9,000 students and their teaching staff. This is in addition to the 28,000 that are currently connected to the internet via the programme. Beginning in October 2010, this initiative is scheduled for completion in 2013. It constitutes an important civilian component to the NATO-led International Security Assistance Force (ISAF) Mission. The "*SILK-Afghanistan Programme*" is providing the Government of the Islamic Republic of Afghanistan and its people with the capacity to promote economic, social and political development.

4. NATO's engagement with Russia is another strong feature in the Organisation's history, present and future. Here, the SPS Programme is the framework for a paramount NATO-Russia initiative -- the "*STANDEX Programme*", which began in December 2009. Finding common ground in the shared experience of suicide bomber/terrorist attacks in mass transport depots, France, Turkey, the Netherlands, the United States of America, Italy and Russia have decided to join forces and pool their expertise to deliver an innovative solution to what has become a thorn in the side of many governments of NATO and partner nations. The "*STANDEX Programme*" illustrates NATO's strategic application of counter terrorism activities outside the conventional theatre of war and, when completed, has the potential to be a dynamic tool in the defence against terrorist threats.

5. Last but not least, regional environmental security is of particular concern to countries that share geographically challenging features.

6. The “*Flood Monitoring and Forecast in the Pripyat River Basin*” project demonstrates NATO’s response to a critical environmental and nuclear hazard that is detrimental to the security of Ukraine and Belarus. This project, which will result in the installation of three (3) automatic hydro meteorological stations in the transboundary region between Belarus and Ukraine, will strengthen NATO’s relations to both Belarus and Ukraine.

7. In line with NATO’s key priorities, as set out by the Political and Partnership Committee (PPC), the SPS Programme also launched five (5) new Bottom-up multi-year Projects in 2010. These focus, through collaborative research among interested partner institutions, on the development of new technologies for the detection of explosives and CBRN agents, as well as on studies promoting fruitful regional cooperation between countries where security is a top priority, such as the Balkans and the Mediterranean Dialogue countries. A detailed description of these projects can be found in *Annex IV-e*.

8. Besides these examples of 5 Top Down and 5 Bottom up Projects, 84 main activities, funded by the SPS Programme, took place or were completed in 2010. They include 60 events (Advanced Research Workshops, Advanced Training Courses and Advanced Study Institutes), 19 multi-year R&D SfP Projects and 5 Networking Infrastructure Projects (NIG). The 60 SPS funded events provided a total of 1,600 participants from NATO and Partner countries with a platform to interact, exchange ideas and to form partnerships for future collaborative work, aiming at better meeting modern emerging security challenges. Intrinsically linked with its contribution to NATO’s objectives and to the Political and Partnership Committee’s (PPC) key priorities, the SPS Programme also established cooperative links through the 19 multi-year R&D SfP Projects, which were completed in 2010. This brought experts in NATO nations into direct contact with their partners in 13 partner countries and also served to strengthen political, economic and academic ties between NATO and these partner countries.

9. The Alliance’s commitment, support and contribution to the aforementioned projects has been highlighted on several occasions and widely publicized (see SPS Country Flyers). Thus, these projects contribute to the promotion of security, cooperation and of capability development in NATO’s partner countries.

I. INTRODUCTION

10. The 2010 Annual Report for the NATO Science for Peace and Security (SPS) Programme is prepared and submitted for review by the Political and Partnership Committee (PPC). It provides an evaluation of the impact of the SPS Work Programme for 2010¹, an overview of its activities, deliverables and how they address the “*SPS Key Priorities*”, as well as a brief overview of the SPS budget.

11. The SPS Programme is uniquely placed to foster collaboration between experts in NATO and partner countries and adds value by addressing a broad range of security issues that are of public concern. This is because science is a strategic tool with the capacity to address the emerging security challenges outlined in the “*SPS Key Priorities*”. Undoubtedly, the SPS Programme is distinct when compared to similar initiatives in other international organizations, as it focus’ on multilateral cooperation’s that are geared towards tackling security-related issues as stated in the April 2009 evaluation of the SPS Programme by McKinsey & Company².

12. In essence, the SPS Programme is an operational one; linking NATO and partner experts in a collaborative network that produces tangible results. In 2010, submissions for proposed multi-year R&D projects were peer-reviewed by independent scientific experts in the four (4) SPS Advisory Panels organised by scientific disciplines (i.e., ESP, CBP, ICS and HSD), thus ensuring credibility amongst the scientific community and the political leadership of partner countries. This report also details the restructuring of the SPS Programme as well as its contribution to NATO’s strategic and operational objectives in the year 2010 (e.g., Operations (OPS), EAPC, NATO-Russia Council (NRC), NATO-Ukraine (NUKR), Mediterranean Dialogue (MD), International Organisations (IO), and Public Diplomacy (PD)). In addition, significant developments in the programme’s top-down multi-year activities are given a brief overview in this report, providing the reader with a broader perspective of the programme’s global relevance and impact.

13. In 2010 the “*SILK-Afghanistan Programme*” began an important expansion project that is scheduled for completion in 2013. A strategically bold initiative, this project is becoming increasingly crucial in the wider communication strategy of Afghanistan, and indeed the region. The “*Mélange Uzbekistan*” project, which had the unenviable task of cleaning up 1,100 tonnes of toxic mélange rocker fuel oxidizer, has been successfully completed. This project along with the “*Flood Monitoring and Forecast in Pripyat River Basin*” project (empowering Belarus and Ukraine with greater flood forecasting and prevention capabilities) serve as compelling evidence of NATO’s commitment to helping partner nations resolve their security related problems.

14. The “*STANDEX Programme*” for detecting potential suicide bombers is progressing well and is a prominent example of the programme’s ability to facilitate partnership with Russia. Bearing this project in mind and with the recent bombings in Russia (Moscow’s Domodedovo Airport, 24 January 2011) and Belarus (Minsk Oktyabrskaya Metro Station, 11 April 2011), the importance of science at NATO become ever more apparent.

15. The SPS activities involving experts from MD countries display a high degree of regional cooperation and a mutual exchange of skills, knowledge and ideas. An example

¹ On 27 November 2009, under a silence procedure, the members of the Science for Peace and Security (SPS) Committee approved the SPS Work Programme for 2010 [document AC/328-D (2009)0013 dated 10 November 2009].

² Developing a Sustainable and Performance-based SPS Programme: Preliminary Diagnostic, McKinsey & Company, April 2009.

of such cooperation was the recently completed “*Riverbank Filtration of Jordanian Surface and Groundwater Reserves*” project. Coupled with the opening of the SPS Programme to the Istanbul Cooperation Initiative (ICI) countries on 30 April 2010, the Alliance is now positioned to engage the wider Gulf Region in cooperative initiatives that will build relationships and solve regional security problems.

16. As this report details, NATO is still actively participating in the ENVSEC Initiative³ and is recording some success in assisting, with the help of other International Organisations, partner nations confront a myriad of environmental challenges on a local, national and regional level. The report briefly summarises the coverage of SPS activities on local, regional and global media outlets, revealing enthusiastic signs of a “*media breakthrough*” into the global news arena via well known TV news networks like CNN. Nevertheless, the report clearly pinpoints the SPS Website as a powerful tool in reaching and informing the outside world about the programme’s activities.

17. The report also details the substantial number of activities, i.e., 19 multi-year R&D projects, 37 Advanced Research Workshops (ARW), 15 Advanced Study Institutes (ASI) and 8 Advanced Training Courses (ATC), that either took place or were completed in 2010. A brief synopsis of their impact is also given, which enables the reader to ascertain the programme’s place in the larger scheme of things *vis-à-vis* the “*global security environment*” of the 21st Century. The total grants awarded to each activity is provided in the *Annexes*, however, a detailed breakdown of how much funding was provided for a particular partnership objective (i.e., EAPC, NRC, NUKR, MD, IO, OPS and PD) per activity (i.e., multi-year R&D and NIG projects, ARW, ASI and ATC) is provided in the main body of the report.

18. The report also contains the results of the *SPS Programme Questionnaire* and expectedly they reveal the local, national, regional and global impact of the 19 projects that were completed in 2010. The fact that all 19 questionnaires were returned, an unprecedented success rate of 100%, is not only encouraging but sheds light on the collaboration and mutual understanding that exists between the SPS funded scientists and experts and the NATO SPS Section. The results of the questionnaire, coupled with the information gleaned from the projects *final report*, highlight the global reach of NATO SPS activities as well as the diversity of the people taking part in the projects. This report also reveals the source of the € 949,090 in extra funds used to supplement the SPS funded projects, which were provided by an array of different organisations and institutions around the world. Undoubtedly this is good news as it is clear evidence of the programme’s legitimacy, as well as its ability to induce a sense of “*buy-in*” from experts, organisations, institutes and ministries the world over.

19. Finally, the impressive findings of this report serve as a clear testimony of the SPS Programme’s ability to initiate regional cooperation (e.g., in the Caucasus’, in the Balkans, in Central Asia and in the Mediterranean Dialogue countries). The programme’s support for global experts engaged in SPS activities is not only comprehensive but strategically focused on helping NATO address the key priorities of Defence Against Terrorist Threats and Countering Other Threats to Security.

³ Under the ENVSEC Initiative, six international Organizations (NATO, OSCE, REC, UNDP, UNECE and UNEP) are coordinating their activities on environmental security issues in the vulnerable regions South East Europe, South Caucasus, Eastern Europe and Central Asia (www.envsec.org).

II. PURPOSE OF THIS REPORT

20. This report highlights the achievements of the SPS Programme's main activities, i.e., events (Advanced Research Workshops, Advanced Study Institutes and Advanced Training Courses), completed multi-year top-down and bottom-up projects, which took place, or were completed, in 2010. According to the budget figures and the relevance to NATO Objectives, the SPS activities are top-down multi-year projects organised by NATO and SPS Advanced Research Workshops, Advanced Training Courses, Advanced Study Institutes, Networking Infrastructure Grants (NIG) and bottom-up multi-year R&D projects conducted by SPS *Project Co-Directors*⁴.

21. The budgetary details give the reader an overview of NATO SPS investments in building capabilities to address common NATO and partner country civil science security issues as well as the *emerging security challenges*. Furthermore, this report shows how SPS activities contribute towards NATO's Strategic and Operational Objectives.

III. SPS PROGRAMME REFORM

22. In 2009, the NATO Secretary General initiated a "*NATO HQ Reform*" with the aim of increasing efficiency and reducing costs. Subsequently, the SPS Committee and Programme were addressed under two sub-elements: (a) the Committee Review and (b) the Science Reform. As far as the Committee Review is concerned, NATO Nations approved the recommendations made by the DPRG/CR on 8 June 2010.

23. On 21 April 2010, the Council approved the establishment of a new, single politico-military committee to manage partnerships: the PPC. The procedures for the practical implementation of this new Committee are set out in document: PASP (2010) 0417 dated 29 April 2010.

24. As the main goal of the SPS Programme is to enhance cooperation with partners, it was decided on 8 June 2010, by NATO Nations following the recommendations made by the DPRG/CR⁵ on the SPS Committee and Programme that strategic and political guidance for the SPS Programme will be provided by the PPC. In addition, the four SPS Advisory Panels presently organised by scientific disciplines (ESP, CBP, ICS and HSD) have been disbanded and are in the process of being replaced by a multi-disciplinary, "*Independent Scientific Evaluation Group*" (ISEG).

25. Therefore, the scientific evaluation will be presented back to the PPC, which will take the final decision on the selection of the projects.

26. A new structure is being proposed with the aim of conducting the SPS Programme in a more efficient and cost-effective manner. The grant mechanisms are reduced from seven to three categories for NATO-funded grants to be employed in the implementation of cooperative activities under the NATO SPS Programme. The mechanisms are as follows:

- Projects: Multi-year Science for Peace projects (SfP) and Networking Infrastructure Grants (NIG)

⁴ SPS *Co-Directors* are scientists and experts from NATO, Partner and Mediterranean Dialogue countries that received a grant to conduct SPS activities.

⁵ Annex 1 of PO(2010)0074-REV2

- Workshops: Advanced Research Workshops (ARW)
- Training: Advanced Training Courses (ATC) and Advanced Study Institutes (ASI)

27. The Collaborative Linkage Grant (CLG) mechanism has been abolished.

IV. SPS CONTRIBUTIONS TO NATO'S STRATEGIC AND OPERATIONAL OBJECTIVES

28. As agreed upon by the allied nations in 2010, the SPS Programme falls under NATO's Strategic Objective "*Partnership*"⁶ and its collaborative activities fall under the following eight categories. The reader is able to read a brief synopsis of the main achievements for 2010 under each category:

A. Euro-Atlantic Partnership Committee (EAPC)

29. On 18 March 2010 the SPS Committee met under the EAPC format at the NATO HQ, Brussels, Belgium. During this meeting, the newly adopted and revised "*SPS Key Priorities*" [circulated under EAPC(SPS)D(2010)0006] were presented to partners. These new Key Priorities provide additional clarity and help scientists and experts in Partner countries to fully engage in NATO SPS activities, as well as to better communicate these activities to their young generation. It was important to inform the NATO Partners of the new "*SPS Key Priorities*" as the document would serve as a guide for the programme's work in the years to come.

30. During a *tour de table*, all Partners were invited to provide comments and suggestions on the SPS Programme within the framework of the Euro Atlantic Partnership Work Programme (EAPWP).

31. Presentations were made on the following projects:

- a) Uranium Extraction in Central Asian Republics (Kazakhstan);
- b) Consequence Management after Catastrophes (Jordan);
- c) Harmonisation of Seismic Hazards Maps for the Western Balkan Countries (Montenegro);
- d) Water Management Issues (Azerbaijan & Georgia); and
- e) Sustainable Use and Protection of Groundwater Resources – Transboundary Water Management (Ukraine).

32. The Committee was also briefed on activities held under the Defence and Environment Expert Group (DEEG) and about the various tools that had been or were being developed to support SPS communication activities.

33. The conclusion of the meeting was a broad agreement on the importance and continued relevance of the SPS Programme, the need to enhance contacts and share knowledge with other NATO bodies and with Partners, and more concretely, to strengthen the regional dimension of the programme.

⁶ The exact wording of NATO's Strategic Objective "*Partnership*" is "Conduct effective consultation with Partners to strengthen security and respond to new security challenges and threats."

34. In 2010 there were 31 SPS funded events (19 ARW, 3 ATC and 9 ASI) that addressed the *SPS Key Priorities* of Non-proliferation of Weapons of Mass Destruction, Countering Other Threats to Security, Defence Against Terrorist Threats, Cyber Security, Environmental Security and Defence Against CBRN Agents.

35. In addition, there were 8 SPS multi-year projects under EAPC that were completed in 2010. These were: "System for Protecting People and Underground Facilities from Explosions" (Georgia), "Clean-up of Chemicals in Moldova" (Moldova), "Decontamination of Neurotoxic and Vesicant Compounds" (Romania⁷), "The Genetic Bases of Hypoxic Pulmonary Hypertension and Acute Mountain Sickness" (Kyrgyzstan), "Management of Security Related R&D in Support of Defence Industrial Transformation" (Bulgaria⁸), "Countermeasures against Sepsis Caused by Biological Weapons" (Bulgaria), "Environmental Security in Khorezm, Uzbekistan" (Uzbekistan), and "Hazardous Chemical Contamination in the Sava River Basin" (Croatia⁹)

B. NATO-Russia Council (NRC)

36. On 30 July 2010, the NRC(SPS) Committee approved the NRC(SPS) Action Plan for 2010-2012¹⁰, which includes the following six priority topics for cooperation in security-related civil science and innovation:

- Four (4) areas are related to Defence Against Terrorist Threats: explosives detection, information technology-based threats, eco-terrorism, study of human factors in defence against terrorism, and
- Two (2) areas are in the field of Countering Other Threats to Security: defence-related environmental security and disaster forecast and prevention of catastrophes

37. The "*Stand-off Detection of Explosives (STANDEX) Programme*", which is the most prominent initiative under NRC(SPS), is currently ongoing. The STANDEX Programme aims at countering the threat of suicide terrorist attacks on mass transit and possibly other public places. This initiative brings together and integrates four (4) different technologies for the detection of explosives by localising, identifying and tracking potential perpetrators of attacks.

38. Research institutes from NATO countries – France, Germany and the Netherlands and Russia - are involved in the development and engineering. Funding is provided by the NATO SPS Programme, with additional support from the US, France, Russia and Turkey. The Research Technology Organisation (RTO) established a Steering Committee and CEA/France is the executive agency.

39. The STANDEX Consortium's Executive Board has met several times and made significant progress in bringing forward the various elements of the project and its implementation. Plans for "*Big City Trials*" are under preparation with the intention of conducting trials in the Paris Metro system, with an additional offer for trials to be held at the Moscow St. Petersburg subway system in Russia. These trials are scheduled for the end of 2012/2013.

⁷ Romania became a NATO member state on 2 April 2004.

⁸ Bulgaria became a NATO member state on 2 April 2004

⁹ Croatia became a NATO member state on 2 April 2009

¹⁰ NRC(SPS)D(2010)0001-REV2

40. Regarding the other 9 NRC(SPS) multi-year projects, which were also listed in NRC 2010 Work Programme¹¹, 5 were successfully completed¹², 2 projects will be completed by the end of 2011¹³ and 1 new project was launched in 2010¹⁴.

41. In 2010 two (2) Advanced Research Workshops under NATO-Russia were supported by the SPS Programme. They were:

41.1. The “*Legal Framework for Strengthening Nuclear Security and Combating Nuclear Terrorism*” workshop led by the US and Russia was held in Vienna, Austria on 28 to 29 January 2010. This event examined the existing legal instruments in counter-terrorist activities, as well as proposing new measures for achieving rapid ratification and compatibility of the legal jurisdictions; and

41.2. The “*Environmental Security in the Arctic Ocean*” workshop led by Russia and the UK was held in London on 13 to 15 October 2010 and engaged scientists and policy makers in characterising environmental security risks in the Arctic Ocean as well as promoting cooperation and the prevention of conflict in the region. Both workshops facilitated networking and information sharing by linking scientists from NATO countries and Russia.

42. The results of the NRC(SPS) activities were effectively communicated to other NATO divisions. “NRC(SPS) Contribution to NRC Joint Review of 21st Century – Common Security Challenges” was provided to the NRC Working Groups on Terrorism and Civil Emergency Planning.

C. NATO-Ukraine (NUKR)

43. The NATO-Ukraine Joint Working Group (JWG) on Scientific and Environmental Cooperation met in Kiev on 2 July 2010 to review its activities and to discuss and develop new cooperative projects¹⁵.

44. Five events involving Ukrainian scientists (3 ARW, 1 ASI and 1 ATC) took place in 2010. In addition, two SFP multi-year projects: “*Tantalum-Free Microwave Dielectric Resonators*”. and “*Regional Segments and Implementation of New Services in the Ukrainian National Research and Education Network URAN*” (NIG) were completed in 2010.

45. The “*Rehabilitation of Pryluky Air Base*” project, which was to be implemented jointly by the Ministries of Defence of Canada and Ukraine with NAMSA as the executive agency in Kiev, was cancelled and may be replaced by a project dealing with another contaminated site in the Ukraine.

46. The procurement of the monitoring stations for the “*Flood Risk Monitoring and Forecast of the Pripjat River*” project is ongoing. This project is led by Ukraine, Belarus

¹¹ NRC(C)D(2009)0006-FINAL dated 2 December 2009

¹² Projects 3.3.3, 3.3.4, 3.3.6, 3.3.8 and 3.3.9.: “Nanosecond Radiation Pulses for Rapid Detection of Explosives and Nuclear Agents” (Poland, Estonia, & Russia); “Capture and Decontamination of Chemicals & Biological Agents by Novel Catalysts and Millisecond Jet Reactors” (USA & Russia); “Chemical Threat Detectors Based on Multisensor Arrays and Selective Porous Concentrators” (France, Italy, Portugal, Spain, & Russia); “Development of a Prototype of the International Situational Centre on Interaction in Case of Eco-terrorism” (Italy & Russia); “Electrically Driven Quantum Dot Single Photon Sources for Data Encryption” (Germany, UK, USA, & Russia).

¹³ Projects 3.3.5., 3.3.7.: “New Biosensor for Rapid Detection of the Anthrax Lethal Toxin” (USA & Russia); “Sensors with Remote Operation for Chemical and Biological Protection” (USA & Russia).

¹⁴ Projects 3.3.2.: Highly Sensitive Nuclear Quadrupole/Magnetic Resonance (NQR/NMR) Technique for Explosive Detection (Turkey & Russia).

¹⁵ Decision Sheet, PPC(NUC)N(2010)0001 dated on 26 August 2010.

and the Slovak Republic and is implemented in coordination with the ENVSEC Initiative. The first automated river station was inaugurated on 19 February 2011.

47. The construction of the X-ray generator in Kharkiv, Ukraine is being conducted with technical assistance provided by Russia, the Netherlands and Germany. A no-cost extension until the end of 2011 has already been approved by NATO.

D. Mediterranean Dialogue (MD)

48. SPS Staff worked closely with officials and experts from the MD countries and facilitated, through SPS activities, the strengthening of MD countries capabilities. This was achieved by developing and supporting cooperative activities in science, society & the environment through implementation of the Work Programme and the Individual Cooperation Programmes (ICP) with individual countries.

49. In 2010, MD scientists and experts were involved in 19 SPS events (5 Environmental Security, 5 Defence Against Terrorist Threats, 3 Countering Other Threats to Security, 3 Cyber Security and 3 CBRN) and 5 completed multi-year R&D projects. These projects were “*Riverbank Filtration of Jordanian Surface and Groundwater Reserves*” (Jordan), “*Rapid Detection of Bioagents Using Nanomechanics*” (Israel), “*Novel Agents to Neutralize Toxicity of Venom Polypeptides*” (Tunisia), “*Social and Environmental Impacts of Mariculture in the Red Sea*” (Jordan and Israel) and “*Behaviour Learning in Surveilled Areas with Feature Extraction*” (Israel).

E. Istanbul Cooperation Initiative (ICI)

50. As of 30 April 2010 the North Atlantic Council (NAC) approved the opening of the SPS Programme to the Istanbul Cooperation Initiative (ICI) countries on a self funding basis. This decision allows ICI countries access to the SPS Programme at their expense and without any NATO funding. ICI countries include Bahrain, Qatar, Kuwait and the United Arab Emirates. Countries of the Gulf Cooperation Council, which have an interest in the ICI, are Oman and Saudi Arabia.

51. The SPS Programme did not have any activities involving any ICI country in 2010.

F. International Organizations (IO)

52. As agreed by the SPS Committee in Vilnius in October 2009, the NATO SPS Programme will continue as an Associated Member of the multilateral Environmental Security (ENVSEC) Initiative for an additional three years. The ENVSEC Initiative coordinates the activities of NATO, OSCE, REC, UNDP, UNECE and UNEP. The SPS projects “*Clean-up of Chemicals in Moldova*”, “*Prediction of Glacial Hazards in the Central Caucasus, Russia*”, “*Environmental Security in Khorezm, Uzbekistan*”, and “*Hazardous Chemical Contamination in the Sava River Basin*” were all conducted under the ENVSEC Initiative and completed in 2010. In addition, a SPS Top-down initiative, “*Flood Risk Monitoring and Forecast of Pripjat River Basin*”, commenced in 2010.

53. For more information on the ENVSEC Initiative visit them on www.envsec.org.

G. Civil Support to NATO Operations: SILK-Afghanistan Programme

54. In 2010, the “*Virtual Silk-Highway*” project was completed and the “*SILK-Afghanistan Programme*” officially commenced on 1 January 2010. “*SILK-Afghanistan*”

was approved by NATO nations on 27 October 2009. Prior to that, the Norwegian company VIZADA Networks had won the tender to provide internet connectivity to the academic and governmental institutions in Kabul as well as the provinces of Afghanistan. The contract with VIZADA Networks was signed on 21 December 2009, following the signing of a contract between the Public Diplomacy Division and the NATO agency NC3A, tasking NC3A (as the Procurement Agent) with the management of the VIZADA contract and as the Technical Agent responsible for network monitoring.

55. This high profile programme is facilitated by an information and communication technology (ICT) initiative provided by the SPS Programme. These consist of:

- a) high-speed internet access for 28,000 students in 11 Afghan universities (seven of them in the provinces) and for nine other governmental institutions in Kabul;
- b) additional Networking Infrastructure Grants (NIGs) to build and improve the existing telecommunications facilities of these institutions; and
- c) training in ICT of Afghans, together with the support of distance education platforms by Western universities.

56. Five new satellite ground stations were installed in Bamiyan, Jalalabad, Khost, Mazar-e-Sharif, and Sheberghan. The already installed ground stations in Kabul, i.e., Kabul University and the Government Media & Information Centre as well as the ones in Herat and Kandahar, were upgraded from SILK-II to SILK-Afghanistan technology. At the time of writing this report the project is on course for completion in the summer of 2013.

57. Starting in October 2010, thanks to a \$3.25 million grant from the US Government an expansion of the “*SILK-Afghanistan Programme*” will provide free high-speed internet access to an additional 9,000 university students and their teaching staff from seven different provinces.

58. High-speed internet connection will be established in the universities of Baghlan, Faryab, Ghazni, Helmand, Kunduz, Paktia and Parwan. The grant will also provide funding to increase the bandwidth in the five universities of Balkh, Herat and Nangarhar, as well as the Kabul Education University and Kabul Polytechnic University, institutions which are already serviced by the NATO project.

59. In addition to the provision of broadband internet connectivity to be purchased from Afghan Telecom and a local satellite provider, each of the provincial universities will have funds available (US\$ 90,000.00 on average) to improve their IT infrastructure. Work is scheduled to run through to September 2013. Please refer to *Annex II* for a detailed map of the SILK-Afghanistan expansion project.

H. Public Diplomacy

60. Fostering long-term relations through the promotion of concrete co-operation, information sharing and knowledge transfer is - by its own nature - public diplomacy.

61. In all EAPC and MD countries where the SPS Programme is building local capabilities through multi-year R&D projects, it is also giving the participating scientists, their institutions and end-users (local authorities, industry and the public), a broader image of NATO. Through its reputation and civilian co-operation the SPS Programme has become a vehicle that opens doors for further discussions at universities and ministries.

62. In 2010 there were 20 SPS Website Update Stories, with almost 13,000 (combined) unique views, showcasing SPS activities around the world. There were also

four (4) NITV films featuring SPS multi-year projects around the world. These were: “*Salt of the Earth*” (Tuzla, Bosnia and Herzegovina) 26 April 2010, a NITV film on the development of a monitoring system designed to counter manage the risks of subsidence deformation on the population of Tuzla in Bosnia & Herzegovina; “*Broadband for Afghanistan*” (Bamiyan, Afghanistan) 4 May 2010, produced as part of the “*NATO Chronicles*” series, this film shows the University of Bamiyan being connected to the internet; “*Managing the Environment*” (Bosnia and Herzegovina) 17 May 2010, a NITV film highlighting the impact of military operations on the environment; and “*Using Nature to Clean Up*” (Aveiro, Portugal) 29 October 2010, a NITV film depicting the innovative clean up of soil contaminated by years of Uranium mining in Morocco, Portugal and Tunisia . This film was also shown on local Portuguese TV networks during the pre and post NATO 2010 Lisbon Summit periods.

63. Below the reader will find two tables illustrating the volume of the SPS Programme’s main activities completed in 2010, namely SPS top-down activities initiated by NATO and SPS bottom-up activities carried out by *Project Co-Directors*. In total, the bottom up activities amounted to 84: 60 events (37 ARW, 15 ASI and 8 ATC), 19 multi-year projects and 5 Networking Infrastructure Grant (NIG) Projects, for which NATO awarded a total of € 7,930,990 in grants.

SPS Top-down Activities Initiated by NATO

A detailed description of each project can be found under *Chapter V*. Public Diplomacy activities are described in *Chapter VIII*

PARTNERSHIP	PARTNERSHIP UNDER EAPC	Mélange Uzbekistan Completed in October 2010
	NATO-RUSSIA	Explosives Detection: STANDEX Commenced December 2009 - <u>ongoing</u> :
	NATO-UKRAINE	Development of an Advanced X-Ray Generator Based on Compton Back-Scattering Flood Monitoring & Forecasting in Pripjat River Basin Commenced 16 November 2009 - <u>ongoing</u>
	OPERATIONS	SILK–Afghanistan Project Commenced 1 October 2010 - <u>ongoing</u>

SPS Bottom-up Activities Conducted by *Project Co-Directors*

For the year 2010 84 main activities were completed. Each reference number is representative of the specific SPS activity, for which more information can be found in *Annex III-a* (events (ARW, ASI and ATC)), *Annex III-b* (R&D projects), and *Annex III-c* (NIG projects)

Strategic Objective	Operational Objectives of PDD	R&D Projects, NIG Projects and Events ¹⁶ in 2010
PARTNERSHIP	Partnership Under EAPC	980981, 981116, 981186, 981476, 981866, 982063, 982158, 982159, 982590, 982702 , 983659 , 983667 , 983494, 983599, 983647, 983658, 983681, 983717, 983720, 983770, 983855, 983866, 983867, 983868, 983877, 983909, 983921, 983922, 983971, 983988, 983989, 983993, 983994, 983995, 984003, 984025, 984033, 984040, 984042, 984053, 984061, 984103, 984108, 984193 Total: €3,688,000
	NATO-Russia	981118, 981461, 982143, 982498, 982735, 983732, 983738 Total: €1,359,000
	Operations	983457 , 984046, 984204 Total: €342,990
	Mediterranean Dialogue	981454, 981786, 981865, 982381, 983481, 983584, 983697, 983731, 983753, 983758, 983767, 983880, 983890, 983892, 983894, 983898, 983903, 983907, 983966, 983972, 984015, 984016, 984124 Total: €1,819,000
	NATO-Ukraine	980881, 983279 , 983540, 983741, 983865, 983957, 984108 Total: €693,000
	Public Diplomacy	984206 Total: €29,000

¹⁶ SPS events are: Advanced Research Workshops (ARW), Advanced Study Institutes (ASI) and Advanced Training Courses (ATC).

V. SPS TOP-DOWN MULTI-YEAR ACTIVITIES INITIATED BY NATO IN 2010

Mélange Uzbekistan – Conversion of Rocket Fuel Oxidizer

64. After successfully destroying 1,272 tonnes of mélange in Azerbaijan's military bases of Alat (934 tonnes) and Mingacevir (338 tonnes), the NATO SPS Committee agreed on 7 October 2008 to carry out and fund the destruction of rocket fuel oxidizer in Uzbekistan. Mélange, a rocket fuel oxidiser that was used during the Soviet era, has been kept in deteriorating storage conditions in Uzbekistan, posing a risk to the environment and local population. The SPS Mélange Uzbekistan project was tasked to destroy 1,100 tonnes of rocket fuel oxidiser by the completion of the project.

65. This process, by means of the NATO mobile plant previously used in Azerbaijan, was completed in October 2010. The mobile plant was built four years ago, with the financial support of the NATO SPS Programme. For the Azerbaijan project, NATO invested € 2,200,000 to construct, transport, assemble and operate the plant as well as to cover the costs of the technical personnel. The NATO SPS Programme covered the operational costs, while the NATO Maintenance and Supply Agency (NAMSA) and MD2, a Turkish company, operated the plant in Uzbekistan with the help of locally trained experts. The Uzbek Government provided the necessary chemicals, infrastructure and logistical support.

66. On 12 October 2010, a closing ceremony at the Uzbekistan MOD marked the completion of the project. During the ceremony, the Uzbek Minister of Defence, Mr. Kabul Berdiyev, and the then NATO Deputy Assistant Secretary General for Security Cooperation and Partnership, Mr. Robert F. Simmons, expressed their satisfaction at the successful completion of the project. Delegates from NATO, NAMSA and representatives of the diplomatic community in Uzbekistan attended the event.

67. Impact: By the end of this project Uzbekistan's 1,100 tonnes of mélange rocket fuel oxidizer was successfully converted through the NATO mobile plant. Logistical support provided by the Uzbekistan authorities was exemplary and contributed greatly to the success of the project, and subsequently reduced costs. As was the case in the Azerbaijan Mélange project, NAMSA was supervising the project while the plant itself was operated by MD2. The success of this SPS funded venture clearly demonstrates the SPS Programmes corporate, collaborative and solution-finding ability.

SILK-Afghanistan Expansion Project

68. An expansion of the NATO-funded SILK-Afghanistan Programme commenced on 1 October 2010 and will eventually provide free high-speed internet access to 9,000 additional university students and their teaching staff from 7 different provinces in the country. The SILK-Afghanistan Programme, an initiative costing €10.5 million, is key to fostering cooperation and mutual understanding between people both locally and internationally. Today, the Government Media and Information Centre in Kabul, as well as 28,000 university students and lecturers from 11 universities in Balkh, Bamiyan, Herat, Jawzjan, Kabul (four universities) Kandahar, Khost and Nangarhar provinces are connected to the information superhighway through the SILK-Afghanistan Programme.

69. Supplemented by a \$3.25 million grant from the US Government, high-speed internet connection will also be provided to the universities of Baghlan, Faryab, Ghazni,

Helmand, Kunduz, Paktia and Parwan provinces. In addition there will be an increase in the bandwidth in the five universities of Balkh, Herat and Nangarhar provinces, as well as the Kabul Education University and Kabul Polytechnic University, institutions that are already serviced by the NATO project. Provision of internet services, via fibre optics or satellite as appropriate, is scheduled to run through to September 2013.

70. The project is carried out and facilitated by NATO's ESC and Public Diplomacy Division's, in close cooperation with both the US Embassy in Kabul and the Afghan Ministry of Higher Education. Technical support is provided by NATO's "SILK-Afghanistan Board". The Board has also supported the Alliance's internet project, SILK and SILK-II, popularly called the "*Virtual Silk Highway*", named after the Great Silk Road trading route linking Asia and Europe. This project was initiated in 2002 under the NATO SPS Programme and was managed by NATO's Public Diplomacy Division. Over the past eight years it has provided free high-speed Internet access via satellite and fibre optics to the academic communities in the Caucasus and Central Asian countries. Afghanistan's Kabul University was included in 2004.

71. Impact: Apart from improving higher education in Afghanistan, the SILK-Afghanistan Programme helps develop Afghan capacity especially in the fields of information and communication technology, a vital component of any growing economy. It also offers opportunities to utilize distance education as a teaching tool, including video-conferencing of high-level events like NATO Summits and NATO-Afghan Students' Fora. It is part of a wider communication connectivity initiative in the country and the region at large.

Explosives Detection: STANDEX Programme

72. An ongoing NRC(SPS) project, the STANDEX Programme is aimed at the detection of potential suicide bombers in mass transit environments.

73. In December 2009, following the approval by the NATO Science for Peace and Security Committee, the STANDEX Programme was launched with the formation of the STANDEX Consortium of participating laboratories and the appropriate management structure. The start of the STANDEX Programme was the culmination of several years work, initiated by the NATO-Russia Explosives Detection Expert Group (EDEG), formed under the NATO-Russia Council in 2003. EDEG, over the course of two years, organized a number of studies and workshops on explosives detection and published its findings in five books. It was recognised that there was a paramount threat posed by suicide bombers, and investments were needed to develop techniques for stand-off detection applicable to the surveillance of large groups of people. This need has been rendered only more urgent by the continuation of suicide bomb attacks in mass transit environments.

74. In examining proposals for a credible engineering solution to the challenge of stand-off detection of suicide bombers and mobile objects, it became clear that no single technology was up to the task of localization, recognition, identification and tracking, with a low alarm error rate, in all kinds of environments. The experts agreed that, instead, a new system was needed; one that was intelligent, easily operated by security personnel and one that would involve different technologies.

75. Research institutes from NATO countries and Russia are involved in the development and engineering of such a system. They include the *Commissariat de l'Energie Atomique* (CEA) in France (the executing agency), the *Fraunhofer Institute* in

Germany, the *Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek*, (the Netherlands Organization for Applied Scientific Research), the *Khlopin Radium Institute* in Russia and the *Applied Science and Technology Organization* (APSTEC) in Russia. Additional participants and technologies are under discussion. The United States Department of Homeland Security, France and Turkey are providing additional funding and advisory support. At the time of writing the forecasted total budget of the programme is € 4.4 million over a 4 year period (2009 to 2012). An extra €600,000 is needed to enable the big city trials in Paris, France and St. Petersburg, Russia, which are scheduled to take place in 2012. The NATO SPS Programme is responsible for the management of the STANDEX Programme and administers the grants, monitors progress, financial reporting and controls the classification and diffusion of documents.

76. Impact: The cooperation between NATO and Russia in this project is designed to create a tool that will significantly reduce the incidence of terrorist attacks in mass transportation environments like airports and underground stations. This innovation will contribute to preventing atrocities like the recent suicide bomb attack at Moscow's Domodedovo airport and the bomb blast at Belarus' Minsk Oktyabrskaya Metro Station on 24 January and 11 April 2011 respectively.

Development of an Advanced X-Ray Generator Based on Compton Back-Scattering

77. The aim of this project is to develop a facility that will produce high-energy x-rays needed in the wide range of fundamental and applied sciences such as physics, biology and medicine. The advantage of x-ray sources based on the Compton back scattering process is to be able to develop compact devices, which can produce an intense flux of monochromatic x-rays in a wide range of photon energy (from infra-red up to hard x-ray). Worldwide, huge and expensive machines like synchrotron are needed to produce x-rays in the same range and with the same energy. The most advanced machines are located in France, Japan and the USA. The dimension of these machines range from 700 to 1 500 meters of circumference and the total cost from € 200 million to €1,000 million.

78. The new generator will be based on advanced storage ring and laser technologies. It will be very compact with circumference of only 15 meters. It means that if this project is successful there is the possibility of the construction of a commercial version. The total price for this new machine and its running costs will be significantly lower than those currently manufactured worldwide.

79. Impact: This x-ray generator can be used for medical applications. It is also a capacity building project providing equipment and training for the National Science Center in Kharkiv, Ukraine. A team of 42 people, of which 18 are young scientists, are working at the development of the x-ray source, which is a clear success with respect to counteracting the brain drain from this region. It also is an important project demonstrating the scientific and technical capabilities of this centre.

80. When completed, the national Science Centre in Kharkiv will have a modern facility that will help the re-integration of its scientists into the international scientific community. Different applications can be envisaged that could be sold in the form of payable service. This concrete project with a tangible end-result will raise the visibility of NATO as a security organisation that is helping Ukraine in its advancement towards a knowledge-based society.

Flood Monitoring and Forecast in the Pripyat River Basin

81. The main objective of this project is to enhance the flood monitoring in the Pripyat River Basin by implementing the contemporary modelling tools for flood forecasting. Another aim is to predict the radionuclide transport in the Pripyat River basin for the different scenarios of natural hazards and technological impacts. The new monitoring station, located in the Pripyat river basin, represents a first step towards a modern flood monitoring and forecast system to be installed in Belarus and Ukraine with NATO's support. This system will help the local authorities and the population to prepare for and respond to floods in the region.

82. Beginning in 2010, this two-year project started building the necessary capabilities in Belarus and Ukraine. It is being implemented by the *Slovak Hydrometeorological Institute*, the *Ukrainian Center of Environmental and Water Projects*, the *Ukrainian Hydrometeorological Institute* and the *Central Research Institute of Complex Use of Water Resources* in Belarus. The estimated total NATO funding for the project is € 260,000. The Pripyat River originates in the northwest of Ukraine and flows through Belarus before it enters Ukraine again via the Chernobyl Exclusion Zone and the Dniepr River, near Kyiv.

83. In recent years, the Pripyat River Basin has often suffered from severe floods which have destroyed crops and put the people of Belarus and Ukraine and their property in danger. The radioactive, polluted dredges and nuclear power stations located in the Pripyat River basin pose an additional risk. In view of these security threats, these two countries have identified the monitoring, modeling and forecast of floods as a national priority.

84. Impact: The three (3) soon to be completed automatic flood monitoring stations are designed to collect and send data, several times a day, to the *Volyn Hydrometeorological Center* in Lutsk, Ukraine. It will greatly improve the current process where measurements taken manually are not frequent or fast enough in order to give an accurate understanding of the dynamics of this river basin. This NATO SPS project complements the efforts of the Environment and Security (ENVSEC) Initiative of which NATO is an associate member.

VI. SPS BOTTOM-UP ACTIVITIES CARRIED OUT BY SPS SUPPORTED SCIENTISTS AND EXPERTS

85. This chapter provides the reader with an overview of events (ARW, ASI and ATC) and multi-year projects completed in 2010 that were organised by scientists and experts (hereafter referred to as *Project Co-Directors*) who received funding from the NATO SPS Programme.

86. NATO SPS grants for events, i.e., Advanced Research Workshops (ARW), Advanced Study Institutes (ASI) and Advanced Training Courses (ATC), create opportunities for experts to network and share information amongst each other. The NATO SPS funded events provide a unique opportunity for NATO and partner country experts to participate in an intense exchange of ideas and viewpoints within a collaborative forum. The benefits of such gatherings help to complement capabilities and harmonize policy at the national and international level, as well as enabling the participation of the “*successor generation*” – the leaders of tomorrow. With a combined grant amount of € 2,573,490 funding 60 events in 2010, the funding per individual event is on average € 42,892. The reader can find descriptions of a selected number of ARW’s, ASI’s and ATC’s in *Annex IV-a*.

87. In parallel, SPS funds for multi-year R&D and Networking Infrastructure Grants (NIGs) projects help to build capabilities and technical competence in partner countries. Equally important is the linking of partner scientists with their counterparts in NATO countries. The major part of this funding is to cover the costs, for equipment incurred by partner country scientists.

88. For multi-year R&D projects, the majority (85%) of the SPS grant covers costs incurred by partner countries, while about the remaining 15% cover costs incurred by NATO countries, mainly for project specific consumables, travel and administration. The main part of the total funding for a multi-year R&D project is used to acquire equipment for partners who may not be able to afford it from their university budgets. The average funding of an SPS multi-year R&D project is € 244,650 for the entire project duration, which is usually 3 to 5 years.

89. As well as the events (ARW, ASI and ATC) and R&D projects, 5 NIGs were completed in 2010, with an average funding of € 144,640. The total duration of a NIG project is usually between 2 to 4 years. NIGs are mainly focused on the procurement of hardware that is used to support universities and academies, mainly in the Caucasus and Central Asian region, to connect to the internet. They are all linked to the SPS “*Virtual SILK Highway*” Project. Descriptions of the completed NIG projects are to be found in *Annex IV-c*.

90. Full lists of the 84 SPS sponsored activities are given in *Annex III-a* (events), *Annex III-b* (R&D projects) and *Annex III-c* (NIG projects). A selection of the SPS events and the 19 R&D projects are described with their achievements and impact in *Annex IV-b*. In addition, *Annex IV-d* provides details of the three (3) Nationally Funded Activities that took place in 2010.

91. Below the reader will find facts and figures detailing the financial expenditure on the SPS activities that were completed or took place in 2010.

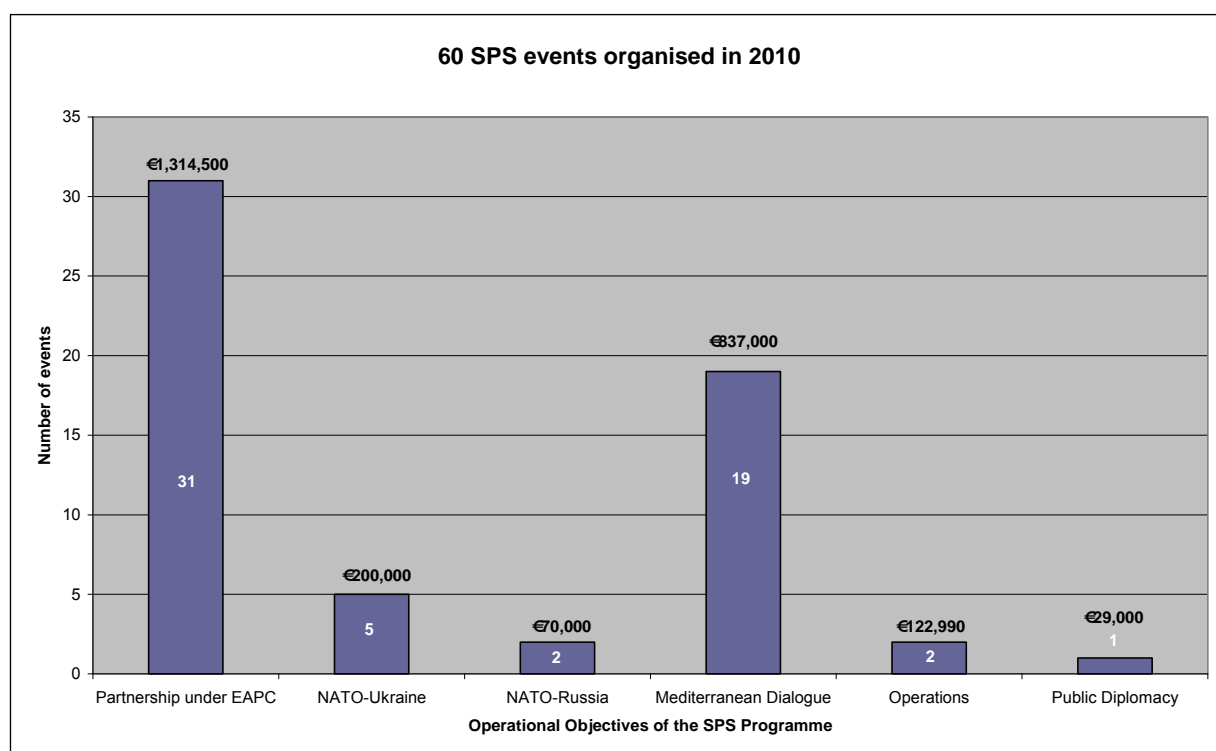
Facts and Figures for 2010

92. In 2010, **60 SPS funded events** (i.e., ARW, ASI and ATC) took place in a range of NATO, Partner and Mediterranean Dialogue countries. Each event hosted an average of 27 participants, about 1,600 participants in total. In total these events received a combined NATO grant worth € 2,573,490, **contributing** to the Operational Objectives of the SPS Programme:

- **37 Advanced Research Workshops (ARW):**
 - Euro Atlantic Partnership: 19 (€ 664,500)
 - Mediterranean Dialogue: 12 (€ 427,000)
 - NATO-Russia: 2 (€ 70,000)
 - NATO-Ukraine: 3 (€ 105,000)
 - Public Diplomacy: 1 (€ 29,000)

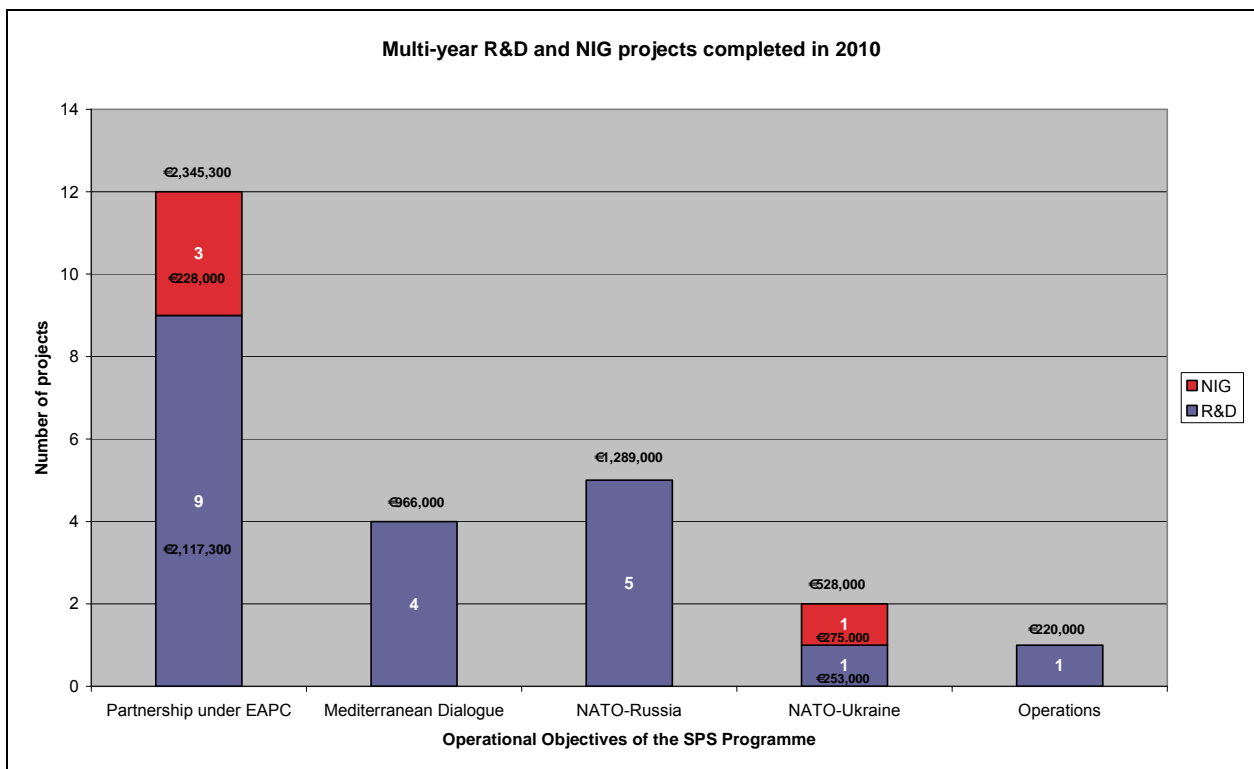
- **8 Advanced Training Courses (ATC):**
 - Euro Atlantic Partnership: 3 (€ 135,000)
 - Mediterranean Dialogue: 2 (€ 120,000)
 - NATO-Ukraine: 1 (€ 40,000)
 - Operations: 2 (€ 122,990)

- **15 Advanced Study Institutes (ASI):**
 - Euro Atlantic Partnership: 9 (€ 515,000)
 - Mediterranean Dialogue: 5 (€ 290,000)
 - NATO-Ukraine: 1 (€ 55,000)



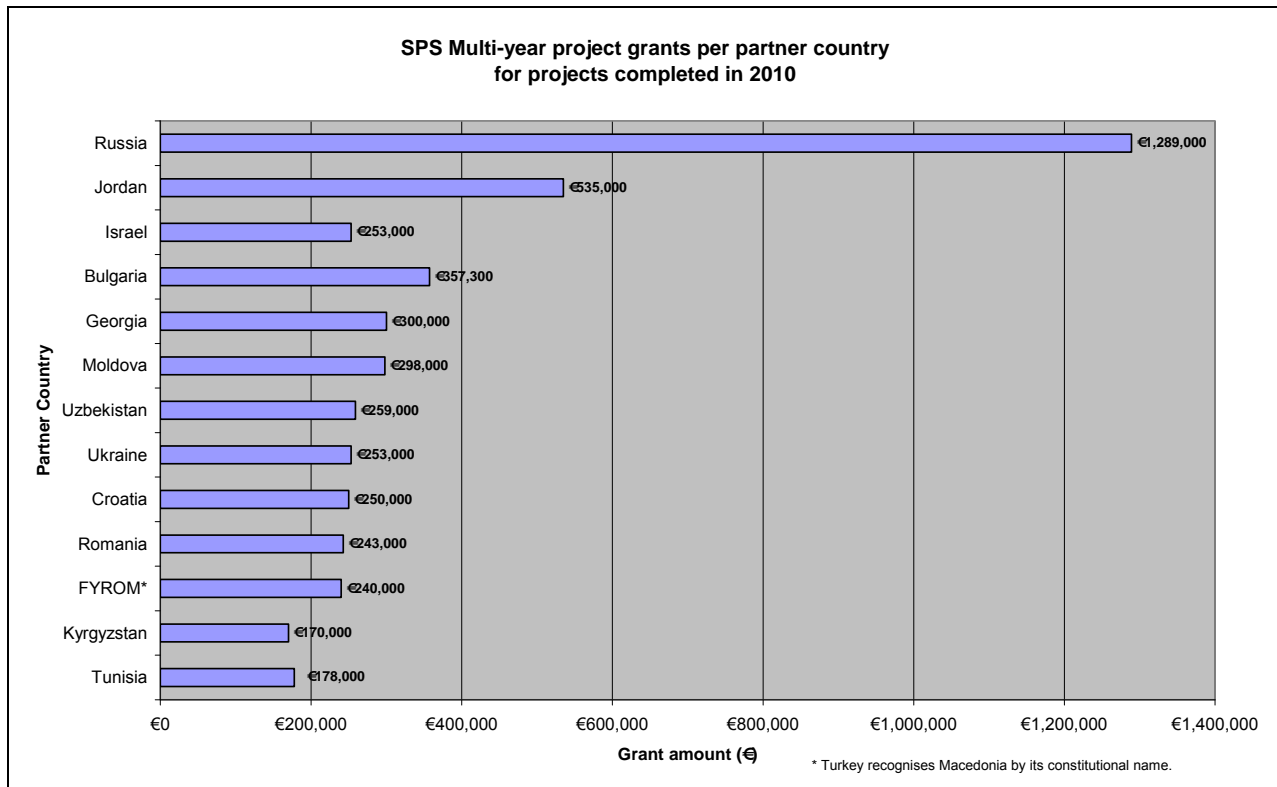
93. In addition, 2010 saw the completion of **24 SPS funded multi-year projects** (Research & Development (R&D) and Networking Infrastructure Grant (NIG) projects) for a total amount of € 4,625,300 (R&D) and € 732, 200 (NIG), respectively, contributing to the Operational Objectives of the SPS Programme:

- *Partnership under EAPC:* 9 R&D projects and 3 NIGs (€ 2,345,300)
- *Mediterranean Dialogue:* 4 R&D projects (€ 966,000)
- *NATO-Russia:* 5 R&D projects (€ 1,289,000)
- *NATO-Ukraine:* 1 R&D project and 1 NIG (€ 528,000)
- *Operations:* 1 NIG (€ 220,000)



SPS Funding by country distribution of multi-year R&D projects completed in 2010

94. In 2010 there were 19 multi-year R&D projects that were completed. In total, these projects involved 13 partner countries [Bulgaria (2004), Romania (2004) and Croatia (2009) are now NATO member states] in the regions of (North) Africa, (Central) Asia, Europe, the Gulf Region and Russia. As the chart below shows, most of the NATO funds for these 19 projects went to scientists and experts from Russia (27.87%) while the least went to a Mediterranean Dialogue country (Tunisia: 3.84%).



VII. MEASURING THE IMPACT OF SPS ACTIVITIES

95. The results and impact of SPS top-down activities organised by NATO have already been covered under *Chapter V*. *Chapter VI* is focused on the SPS bottom-up activities that are conducted by *Project Co-Directors*.

96. For this report, three sources were used to evaluate the results and impact of SPS funded activities:

- the proceedings of SPS events published under the *SPS Series*
- the final reports of multi-year R&D projects
- an *SPS Programme Questionnaire* for R&D projects

Results and impact of SPS Events

97. After the completion of SPS funded events, the Co-Directors produce a book under the SPS Series that includes the network of experts involved in the activity as well as the results, contributions and conclusions of the event. Typically, this book is published within a year after the event took place. This pool of knowledge and expertise often provide a solid foundation for future SPS activities.

Results and impact of 2010 Multi-Year SPS R&D Projects

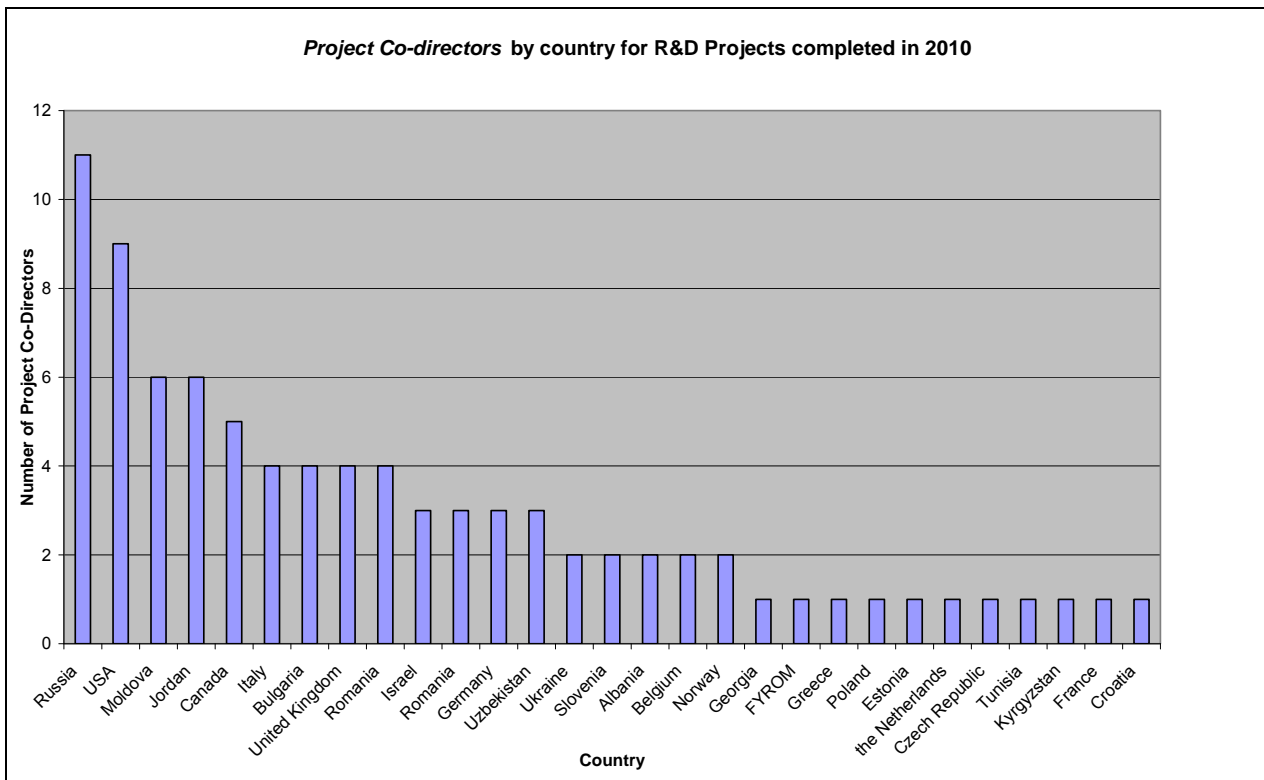
98. To make a full assessment of the results and impact of the multi-year SPS R&D projects completed in 2010 there are two resources from which to pull from: the *final report* and the results of the *SPS Programme Questionnaire*. Please refer to *Annex VI* for a copy of the SPS Programme Questionnaire. In terms of the final report, the reader will find a comprehensive breakdown of the project and description of the specific security challenge that was tackled during the project. Also included is a description of the objectives, methodology, results as well as the knowledge transferred to the project *end-users* at the completion of the research activities.

99. To gain further insight into the particulars of each project the *SPS Programme Questionnaire* was sent out in January 2011 to all of the *Project Co-Directors* of the 19 multi-year R&D projects completed in 2010. Encouragingly, the *SPS Programme Questionnaire* was returned for all 19 projects; an extremely astonishing success rate of 100% and up 18% from the previous year. This only goes to underline the established, positive and practical relationship the *Project Co-Directors* have with the NATO SPS Section.

Participation in R&D projects

100. According to the information gathered from the *SPS Programme Questionnaire* and the *final reports*, a total of 491 people participated in the 19 multi-year R&D projects completed in 2010: Out of this a total of 87 Project Co-Directors from 30 different partner countries supervised project teams, which had a combined total of 386 participants. An additional 18 “*end-users*” were directly involved in the projects, representing their respected authorities and/or companies. Their inclusion in the research activities ensured practical knowledge transfer as well as the utilization of the project results.

101. It is pertinent to note that these individuals are each a part of both professional and social networks, through which information about NATO's values are disseminated to other experts, as well as to a much broader audience.



102. Another important aspect of these multi-year R&D projects is the number of students that obtained a degree. In total 87 participants obtained advanced degrees as a result of the 19 multi-year R&D projects that ended in 2010. The projects also engaged 98 young students that received a small financial stipend (i.e., stipendiaries), all of whom are under 40 years of age.

	Projects	Co-Directors	Participants	End-Users	Total People Involved
Total #	19	87	386	18	491
Average # per project		4.4	19.3	0.9	24.6

Dissemination of SPS R&D project results

103. According to the *final reports* and the *SPS Programme Questionnaire*, the results of the multi-year R&D projects have been discussed or were the topic of various national and international conferences, workshops as well as publications.

104. Below is a breakdown, according to the results of the *SPS Programme Questionnaire* and the project *final reports*, of the number of publications and conference

contributions that referenced the 19 completed multi-year R&D projects, as well as the resulting patents:

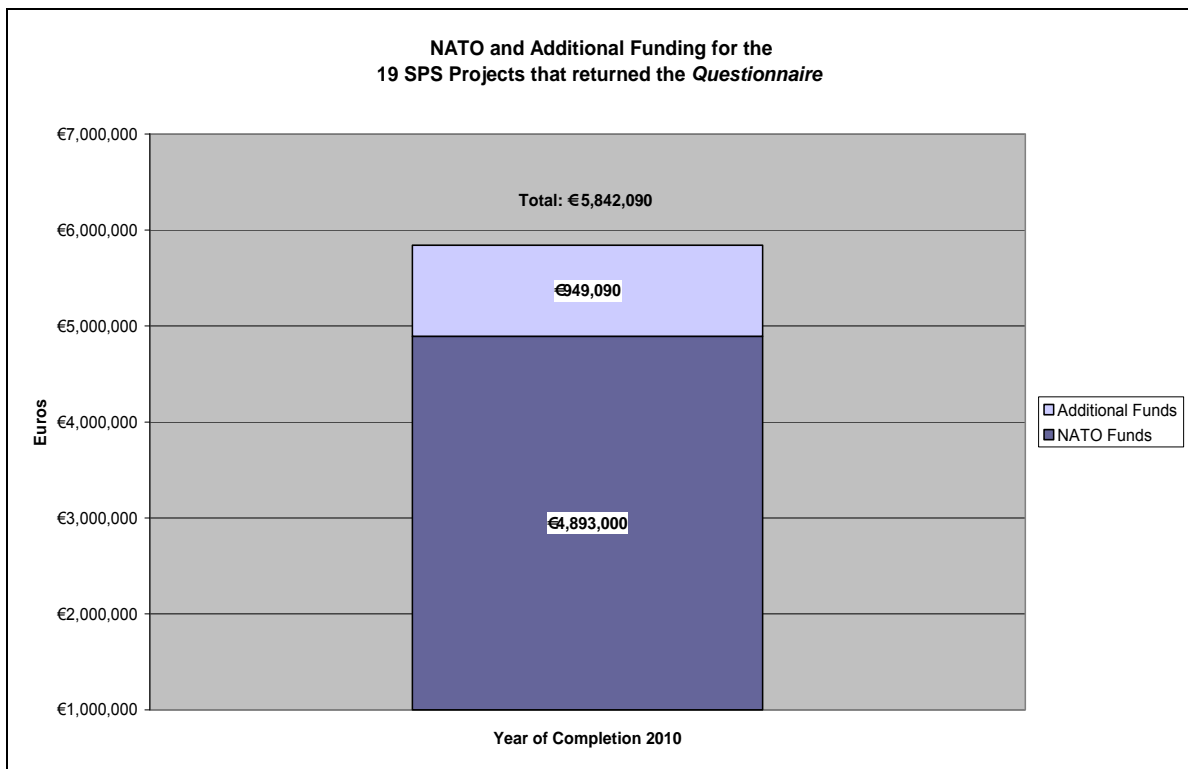
Multi-year R&D Project Output	Number	Average per Project
International Conferences	179	9.4
Peer Reviewed Publications	129	6.8
National Conferences	61	3.2
Newspapers and Magazines including electronic media	55	2.9
International Journals	27	1.4
National Journals	22	1.2
Patents	7	0.4

105. According to the above figures there is a high number of international conferences that feature and/or present the results of the multi-year R&D projects. This is almost 3 times the number of national conferences, which helps in raising global awareness of SPS activities and NATO as a whole. Equally, there is also a high number (almost 7 per multi-year R&D project) of Peer-Reviewed Publications that are produced for each project. Following last years trend, the low number of patents is attributed to the high number of projects addressing environmental security issues. By their very nature environmental projects tend to use existing technologies and processes and apply them to a particular situation.

Additional funding attracted by R&D projects

106. According to the returned *SPS Programme Questionnaire* the 19 multi-year R&D projects that were completed in 2010 managed to attract a considerable amount of additional funds. Of the 19 completed projects an additional € 949,090 was gained from other sources with € 200,000 and € 7,600 being the highest and lowest amounts respectively. Only 6 (32%) of the 19 projects that were completed in 2010 failed to attract any additional funds, which means that over two thirds of the 19 completed multi-year R&D projects were able to attract additional funds.

107. The success of the *Project Co-Directors* in raising additional funds highlights the fact that SPS projects are deemed credible and relevant in finding solutions to local, national and global security challenges. Additional funds are often used to complement the salaries of existing staff or to employ additional staff.



108. Examples of the global institutions, organisations and ministries that contributed additional funds to the 19 completed multi-year R&D projects are:

- ❖ Baikov Institute of Metallurgy and Material Sciences (IMET)
- ❖ Bulgarian National Science Fund
- ❖ Croatian Ministry of Science, Education and Sports
- ❖ International Science and Technology Center
- ❖ NASA
- ❖ National Geographic
- ❖ National Science Foundation (United States)
- ❖ Ukrainian Ministry of Education and Science
- ❖ UNESCO
- ❖ Russian Foundation for Basic Research
- ❖ The Georgian National Science Foundation

VIII. SPS PROGRAMME CONTRIBUTIONS TO PUBLIC DIPLOMACY

109. In 2010 SPS activities were communicated to the outside world with a variety of different tools. The following lists the number of communication products and their impacts as of January 2011. For the statistics of unique viewers of SPS Online News Stories please refer to *Annex V*.

- **SPS Country Fliers**

- The SPS Country Fliers for each NATO and Partner Country were updated in May 2010. Included were ongoing or recently concluded activities that were in the particular country. These are available on the NATO SPS Website (www.nato.int/science)

Impact: These fliers are valued by the Contact Point Embassies and local information points when addressing diplomats, opinion formers and local authorities. Visitors to the NATO HQ from NATO and partner countries are each given a flier for their country.

- **NATO Update Stories**

(See www.nato.int -> Newsroom -> News)

- The NATO SPS Website keeps the general public informed about SPS events and milestones. In 2010 there were 20 stories about SPS activities.

Impact: According to Google Analytics the 20 NATO Update Stories published in 2010 received a total of 13,000 views with an average of 638 views per story. For a detailed analysis please refer to *Annex V*.

The top NATO Update stories on SPS activities were:

1. *“NATO science workshop addresses environmental security”* published on 29 April 2010 (**1,032 views**)
2. *“NATO Science Programme addresses environmental security in the Arctic Ocean”* published on 15 October 2010 (**962 views**)
3. *“Counter-terrorism experts to share knowledge at NATO science training course”* published on 27 May 2010 (**944 views**)
4. *“NATO science programme examines origins, trends and methods of tackling suicide terrorism”* published on 23 September 2010 (**835 views**)

- **NATO Internet Television (NITV)**

(See www.natochannel.tv/)

In 2010 there were a total of four (4) NITV films (one of which was made as part of the “NATO Chronicles” series) on SPS activities. Each of these films featured SPS projects that addressed a number of environmental concerns:

- “Salt of the Earth” (Tuzla, Bosnia and Herzegovina) 26 April 2010, a NITV film on the development of a monitoring system designed to counter manage the risks of subsidence deformation on the population of Tuzla in Bosnia & Herzegovina. The report shows how collaboration between researchers at Tuzla University in Bosnia & Herzegovina and the NATO Science for Peace and Security Programme helps to save the town’s architectural heritage through controlling subsidence problems caused by abandoned salt mines under the town.

Impact: CNN World View slotted this story as the number 2 spot for their 8 May 2010 show. The show premiered on CNN on Saturday 8 May 2010 at 7:30 CET and was repeated the same day at 15:30 CET. After the premiere, CNN showed the programme online at: www.cnn.com/worldview. In addition, this story was requested 26 times by 15 media outlets through The Newsmarket. These media outlets were based in Canada (1), Croatia (1), Italy (1), the Netherlands (1), Portugal (1), Romania (1), Ukraine (2), United Kingdom (1) and the United States (6). The three (3) most popular requested formats of this film were:

1. Edited package with narration (10 requests) by:

African Television Online
Cihan news agency
Information agency Frontier service of Ukra
Kayenna.tv
MHz Networks
Salfordonline
Spektar Produkcija
Track180
TVNET

2. General views (10 requests) by:

Cihan News Agency
Community TV Network
Information agency Frontier service of Ukra
Kayenna.tv
Net green news
Net Green News
Spektar Produkcija
Sperana TV
State Broadcasting Company (UTR)

Track180

3. Edited Package, no narration (6 requests) by:

Cihan News Agency
Information Agency Frontier Service of Ukra
Kayenna.tv
Net Green News
Spektar Produkcija
Track180

- *“Managing the environment”* (Bosnia and Herzegovina) 17 May 2010, a NITV film highlighting the impact of military operations on the environment.

Impact: This story was requested 45 times by 28 media outlets through The Newsmarket. These media outlets were based in Argentina (1), Australia (1), Belgium (1), France (1), Germany (3), India (1), Malta (1), Ukraine (2), United Kingdom (3) and the United States (14). The three (3) most popular requested formats of this film were:

1. Edited package with graphics and voiceover (20 requests) by:

African Television Online
Alma Magazine
Astro Media pty ltd
Atlantic Television News
Blue Man Publishing
Clear Compass Media
Dominio Digital TV
Education Channel 22
Green TV
Information agency Frontier service of Ukra
MHz Networks
MOFilm production
PIO TV
Radio Audiokiss 90.7 FM, Bolivia
Rhymes Guts and Glory.com
Salfordonline
Scientific Frontline SFL ORG. Educational News
State Broadcasting Company (UTR)
Track180
Xpression Media

2. General views (16 requests) by:

AB London Media Vision
Alma Magazine
Astro Media pty ltd
ATN
Blue Man Publishing
Citizens Centre Bennohaus / OWTv
Community TV Network
Direct 8
Green TV
Information agency Frontier service of Ukra
Mostra
PIO Tv
Radio Audiokiss 90.7 FM, Bolivia
SBTV.com
State Broadcasting Company (UTR)
Track180

3. Edited package without graphics or voiceover (9 requests) by:

African Television Online
Astro Media pty ltd
BBV, Inc.
Blue Man Publishing
Green TV
Information agency Frontier service of Ukra
PIO Tv
Radio Audiokiss 90.7 FM, Bolivia
Track180

- *“Using nature to clean up”* (Aveiro, Portugal) 29 October 2010, a NITV film depicting the innovative clean up of soil contaminated by years of Uranium mining in Morocco, Portugal and Tunisia .

Impact: This film was distributed to all media prior to NATO’s 2010 Lisbon Summit.

- **NATO Chronicles**

As part of a series of films featured in the NATO Chronicles, NITV's "*Broadband for Afghanistan*" (Bamiyan, Afghanistan 4 May 2010) featuring Dr Walter Kaffenberger (NATO Public Diplomacy Division) draws attention to NATO's effort in connecting the University of Bamiyan to the information super highway.

Impact: From October 2010 to January 2011 the NATO Chronicles website (www.natochronicles.org) had a total of 19,104 unique visitors. During this same period it was also recorded that NATO Chronicles achieved a total of 93,423 impressions on Facebook. On Youtube, "*Broadband for Afghanistan*" received a total of 1,274 unique views. In addition, this film won a Silver Award at the 2011 World Media Festival in Hamburg, Germany.

This film is also available on 15 other websites. Examples of these websites are:

- La France à l'OTAN: www.rpfrance-otan.org
- Atlantische Commissie : www.atlcom.nl/english/
- Atlantic Council USA : www.acus.org
- Atlantic Treaty Association: www.ata-sec.org
- Allied Command Operations: www.aco.nato.int
- NATO-Moldova Website: www.nato.md
- NATO C3 Agency: www.nc3a.nato.int
- Facebook pages:
 - SHAPE
 - Latvian Transatlantic Organisation
 - Operation Active Endeavour

IX. CONCLUSIONS

110. This report has provided a clear evaluation of the impact of the 2010 SPS Work Programme, detailing its budget, activities, deliverables and how they specifically address the “SPS Key Priorities”. The year 2010 has proven to be one of change for the SPS Programme, and indeed NATO itself. The NATO SPS Programme continues to prove its capability in fostering collaboration and partnership, oftentimes between culturally and politically disparate parties. The transfer of the SPS Programme to the *Emerging Security Challenges Division* brings to the fore the pivotal role the programme will play in NATO’s foreseeable future; specifically in the global security landscape of the 21st century. The restructuring of the programme has set it on the path towards greater efficiency and positions it to help the Alliance actualise its New Strategic Concept, as outlined at the 2010 NATO Summit in Lisbon, Portugal.

111. The *emerging security challenges* draws our attention to a myriad of seemingly unconnected issues. This has led to what has been termed the “*modern security environment*”, containing a broad and evolving set of challenges to the security of NATO’s territories and populations. Now more than ever issues like cyber security, energy security, the proliferation of weapons of mass destruction, terrorism (extremism) and the environment factor into discussions regarding the security and defence of NATO member states, and indeed beyond. The SPS Programme is well positioned to provide solutions to these new challenges.

112. The success of the SILK-Afghanistan Programme and its strategic position in Afghanistan and the region’s communication network cannot be overstated. This has earned the project widespread recognition and led to the initiation of the programme’s expansion project in October 2010. The € 3.25 million grant from the US Government, for the purpose of supplementing the project, illustrates the programmes ability to motivate “*buy in*” from partner governments, organisations and institutions and also serves as a testimony to the SPS Programme’s ability to deliver “*game-changing*” innovations that build peace. The delivery of information and communication technology, and capacity, to the Afghan people (especially the women) is helping to build a foundation upon which true socio-economic, even political, advancement reaches every part of the country long after the draw down of NATO’s mission. This reinforces the capability of the programme being a long term strategic tool for NATO.

113. Leaning on its widespread links with NATO and partner country experts, the SPS Programme has the capacity to help deliver, foster and maintain peace and security in no fewer than four continents around the world. No where is this typified more than in the area of environmental security, an issue of global concern. For example, the successful completion of the “*Mélange Uzbekistan*” project in October 2010 highlights the programmes ability to find solutions to environmental problems, as well as the confidence partner nations have for solutions gleaned from SPS funded multi-year R&D projects. This project was initiated after the successful destruction of 1,272 tonnes of mélange in Azerbaijan’s military bases using a plant constructed by SPS funded scientists and experts.

114. The STANDEX Programme continues to make strides and is indeed the most prominent NATO-Russia (top-down) project that falls under the “SPS Key Priority” of Defence against Terrorist Threats. The recent suicide bomb attack in Moscow’s Domodedovo Airport (24 January 2011) as well as the more recent bomb blast at Belarus’ Minsk Oktyabrskaya Metro Station (11 April 2011) demonstrates the SPS Programme’s timeliness and dexterity as well as its ability to provide innovative solutions to counter terrorist threats. NATO’s commitment to counter terrorism activities has been enshrined in this programme, displaying the “*thinking out of the box*” expertise of SPS funded scientists and experts in NATO and partner countries. NATO’s collaboration with Russia on the STANDEX Programme forms part of a wider interaction between the Alliance and Russia through the SPS Programme. This report reveals the strong engagement of Russian scientists and experts in the 19 SPS multi-year R&D projects that were completed in 2010. In addition, € 1,289,000 (27.87%) of the total combined budget (€ 4,625,300) of these projects went to Russian *Project Co-Directors* who accounted for 13% (11) of the (87) *Project Co-Directors* that completed their projects in 2010. This serves as a testament to the Alliance’s commitment and ability to create a collaborative and productive forum with Russia, a crucial NATO partner country.

115. NATO’s working relationship with the Ukraine is proving to be an equally beneficial relationship. The eventual construction of the three (3) automatic flood monitoring stations in the Pripyat River Basin presents a good example of NATO responding to the problematic nature of floods and their environmental consequences. With the inauguration of the first river station taking place on 19 February 2011 and the eventual completion of the “*Flood Monitoring and Forecast in Pripyat River Basin*” project, Belarus and Ukraine will be a step closer towards achieving better flood preparation and response. Equally, the eventual completion of the X-ray generator in Kharkiv, Ukraine will provide a major breakthrough in medical care of military and civilian personnel. Despite the cancellation of the “*Rehabilitation of Pryluki Air Base*” project, there is a concerted effort to replace it with a project dealing with another contaminated site in the Ukraine.

116. Proving to be an increasingly vital partner, the Mediterranean Dialogue (MD) countries, through their scientists and experts, have been involved in a number of important SPS activities. The completion of the “*Riverbank Filtration of Jordanian Surface and Groundwater Reserves*” project brings Jordan and its neighbours a step closer towards greater water and political security. The 19 SPS events involving MD experts mainly focused on environmental security (5) and counter terrorism (5). With the opening of the SPS Programme to the Istanbul Cooperation Initiative (ICI) on 30 April 2010, NATO has an enhanced opportunity to form “*partnerships of peace*” with the wider Gulf Region. This recent development has also enabled the expansion of the Alliance’s political, scientific and regional networks; underscoring the programme’s unique capacity to form regional “*Partnerships*”.

117. The SPS Programme’s continued involvement in the ENVSEC Initiative is a positive sign for NATO. Indeed, the programme’s continued involvement shows an increasing degree of synergy between NATO and other international organisations, especially through SPS funded activities. The successful completion of the “*Clean-up of Chemicals in Moldova*”, “*Prediction of Glacial Hazards in the Central Caucasus, Russia*”, “*Environmental Security in Khorezm, Uzbekistan*”, and “*Hazardous Chemical Contamination in the Sava River Basin*” illustrates how well the programme works with International Organisations in addressing global environmental issues.

118. The ability to attract participation and support from external organisations further emphasizes the SPS Programme key feature as a global *Partnership* tool for the Alliance, which is due to the widespread aspect of its activities.

119. The power of the media is well established and has been used quite effectively to expose SPS activities worldwide. The 2010 NITV films on SPS projects was accessed and broadcast on news channels such as CNN and by various media outlets in Australia, Europe, India, and North & South America. This helps to inform the wider world about the dynamic manner NATO addresses global security issues outside the scope of conventional military action.

120. Coupled with the large number of international conferences (an average of 9.4 per multi-year R&D project) and exposure through local newspapers and magazines, the profile of NATO SPS activities continue to rise on a global scale. The SPS Website proves to be a popular source where users can get information on NATO funded projects and events. With each NATO Update Story averaging 638 unique views the SPS Website is clearly a useful tool in raising awareness of the programme. Making the NATO SPS Website dynamic and possibly interactive will reach and attract more visitors to the website.

121. As this report emphasizes, one of the programme's strong points is the global relevance and credibility of its activities. Proof of this is seen in the additional funds attracted from institutions around the world, which were used to help support and expand the multi-year R&D projects that were completed in 2010. As the results of the *SPS Programme Questionnaire* reveal, € 949,090 was the combined total of the additional funds from external institutions and organisations that supported the 2010 completed multi-year R&D projects. This represents 16% of all funds, NATO plus additional, which were used in these projects. This is substantial and shows the legitimacy of SPS projects. It also further underlines the programmes ability to gain "*buy-in*" from partnering nations, organisations and institutions from around the world. In tandem, a strong public diplomacy initiative serves to both inform and potentially induce the involvement of global experts, institutions, organisations and ministries in SPS multi-year projects.

122. The continued success of the SPS Programme is of great importance, not just to the Emerging Security Challenges Division, but to the Alliance itself. The unpredictable, dynamic and amorphous nature of today's security environment calls for a similar response in equal measure. Science, whether in its traditional '*hard*' form of chemistry, physics or biology, or, the '*soft*' version of the "*social sciences*", enables NATO to do just that. A poignant example has been noted by an expert involved in the creation of a detection device used to track potential suicide bombers at mass transit depots: "*Such a tool is only a partial success in the fight against terrorism. Addressing the factors that help create suicide bombers as well as developing a device that detects them during an attempted attack, constitutes a comprehensive counter terrorism strategy*". On the whole, the SPS Programme symbolises this all-inclusive solution to a security challenge. As we venture deeper into the 21st Century such an approach will become imperative, rendering the NATO SPS Programme an indispensable tool for the Alliance.

Annex I

NATO Science for Peace and Security (SPS) Programme Overview

On 21st April 2010, the Council approved the establishment of a new, single politico-military committee to manage partnerships, the Political and Partnerships Committee (PPC). Being that the main goal of the SPS Programme is to enhance cooperation with partners, it has been decided that the PPC will replace the SPS Committee and provide strategic and political guidance for the SPS Programme. The four SPS Advisory Panels organized by scientific disciplines (ESP, CBP, ICS and HSD) was disbanded and a new multi-disciplinary “*Independent Scientific Evaluation Group*” (ISEG) has been set up. The scientific evaluation will be presented back to the PPC, which will take the final decision on the selection of the projects.

The SPS Programme enables NATO to demonstrate its commitment to practical, visible projects in Partner and Mediterranean Dialogue countries with tangible output. The aim of the SPS Programme is to contribute to security, stability and solidarity among nations, by applying the best technical expertise to problem solving. Collaboration, networking and capacity-building are means used to accomplish this end. A further aim is to facilitate continued democratic growth and support economic development in NATO's partner countries.

Civil science has proved to be a highly effective vehicle for international dialogue, due to its universality and dependence upon international networks. The talent which exists in these scientific networks can be applied to the emerging security challenges facing the Alliance and its partners. Science is both a means of finding answers to critical questions and a way of connecting nations.

The PPC provides a unique forum for the sharing of knowledge and experience on technical, scientific and policy aspects of security, social and environmental matters in the 57 countries of the EAPC (Euro-Atlantic Partnership Council, including NATO and Partner countries) and of the Mediterranean Dialogue.

The SPS programme includes activities for which NATO grants are offered, as well as Nationally Funded Activities (NFA). These activities are focused on the “*SPS Key Priorities*” identified by the nations in the broad fields of (1) Defence Against Terrorist Threats and (2) Countering Other Threats to Security.

Collaborative Activities under the SPS Programme

All SPS activities, whether supported by NATO funds or nationally funded, are carried out jointly by scientists from NATO and Partner or Mediterranean Dialogue countries. The mechanisms that are funded are described below:

TECHNICAL WORKSHOPS

Advanced Research Workshops (ARW): grants to organise expert workshops where an intense but informal exchange of views at the frontiers of a subject aims at identifying directions for future action.

TRAINING COURSES

Advanced Study Institutes (ASI): grants to organise high-level tutorial courses to convey the latest developments in a subject to an advanced-level audience.

Advanced Training Courses (ATC): grants to enable specialists in NATO countries to share their expertise with trainees.

MULTI-YEAR PROJECTS

Research and Development (R&D) Projects: grants to collaborate on applied environmental and industrial projects with the main research activities carried out in Partner or Mediterranean Dialogue countries.

Networking Infrastructure Grant (NIG) Projects: to assist research and educational institutions in Partner countries with improving the level and quality of their telecommunication facilities.

NATIONALLY FUNDED ACTIVITIES (NFA)

In addition to the above listed activities that are funded collectively by all NATO nations, NFAs are funded by groups of nations when regional and local interest prevails.

Workshops: Nations funding nationally recurring events such as round-tables, international conferences and seminars which address topics of continuing interest.

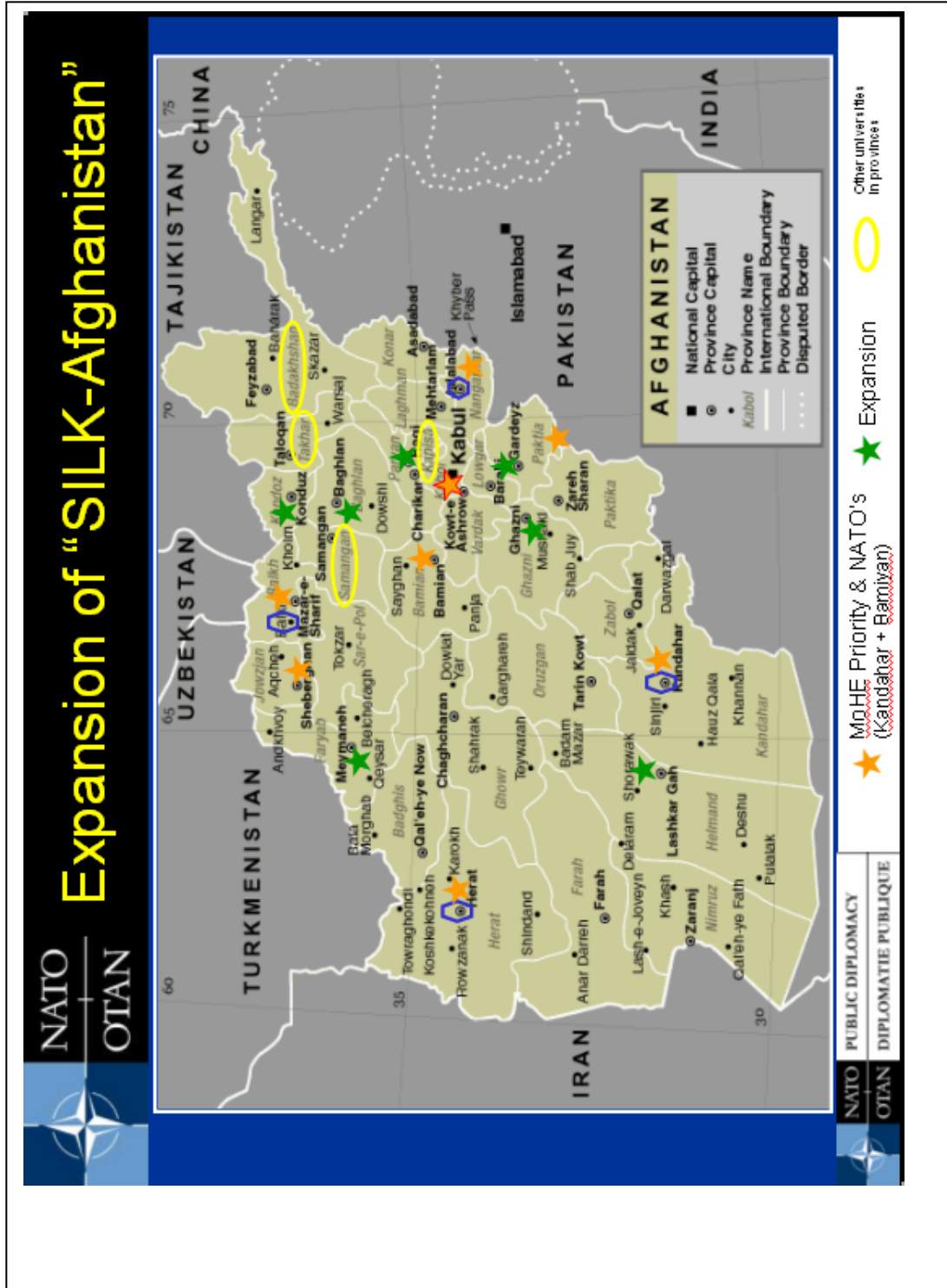
Pilot Studies: Nations funding studies that are generally of a regional nature and take place over one to five years. These studies frequently address defence-related environmental issues.

Short Term Projects: Nations funding projects that are generally for a duration of 18-24 months aiming at solutions to environmental security problems including defence related issues.

Annex II

SILK-Afghanistan Expansion Project

Providing free high-speed internet access to 9,000 additional university students and their teaching staff from seven different provinces.



Annex III-a

SPS Events Conducted in 2010

The events are listed in numerical order.

Those in bolded are described in **Annex IV-a**, unless otherwise stipulated.

Events in 2010

Ref No.	Oper. Obj.	Mechanism	Location of Event	Event Start	Grant (EUR)	Title of the Event
983481	MD	ASI	Turkey	14-Jul-2010	60,000.00	Culturally Sensitive Treatment of Post Trauma
983494	EAP	ARW	Germany	26-Oct-2010	35,000.00	The Development of Communication Protocols for Regional Exchange of WMD Counter Proliferation and Trafficking Information
983540	NUKR	ARW	Poland	17-May-2010	35,000.00	Perceptions of NATO : a Balance 60 Years Later
983584	MD	ARW	Italy	19-Mar-2010	35,000.00	Predictors of Opposition to Western Modernity and of Identification with Terrorism among Young European Immigrants
983599	EAP	ASI	Italy	22-Jun-2010	55,000.00	Biophysics and Structure to Counter Threats and Challenges
983647	EAP	ARW	Turkey	15-Sep-2010	35,000.00	New Therapy Approaches in Countering the Negative Effects of Terrorism
983658	EAP	ARW	Turkey	22-Jun-2010	35,000.00	Ethics, Morality and the Law : Managing Bio-Terrorism Threats
983681	EAP	ASI	Italy	17-May-2010	60,000.00	Advanced Training for Architects of Secure Networks
983697	MD	ATC	Jordan	03-Jan-2010	60,000.00	Defence Against Terrorism
983717	EAP	ARW	Turkey	01-Sep-2010	35,000.00	Effect of Climate Change on Water Resources - Issues of National and Global Security
983720	EAP	ASI	Moldova	07-Jun-2010	50,000.00	Technological Innovations in Detection and Sensing of CBRN Agents and Ecological Terrorism
983731	MD	ARW	Albania	26-Apr-2010	27,000.00	Corrosion Protection of Pipelines Transporting Hydrocarbons
983732	NR	NRARW	United Kingdom	13-Oct-2010	35,000.00	Environmental Security in the Arctic Ocean
983738	NR	NRARW	Austria	28-Jan-2010	35,000.00	Legal Basis to Combat Nuclear Terrorism : International and National Challenges in the 21st Century
983741	NUKR	ASI	Ukraine	12-Sep-2010	55,000.00	Special Detection Technique (Polarimetry) and Remote Sensing
983753	MD	ARW	Israel	01-Dec-2010	40,000.00	Exploring Multidisciplinary Approaches to Chemical and Biological Defense
983758	MD	ARW	Morocco	31-May-2010	30,000.00	Environmental Security: Water Security, Management and Control
983767	MD	ARW	Iceland	06-Jun-2010	35,000.00	Global Climate Change and Local Adaptation
983770	EAP	ASI	Turkey	14-Aug-2010	50,000.00	Advanced All-Terrain Autonomous Systems
983855	EAP	ARW	Turkey	14-Jan-2010	35,000.00	Response to Nuclear and Radiological Terrorism
983865	NUKR	ARW	Ukraine	25-Jun-2010	35,000.00	Carbon Nanomaterials in Clean Energy Hydrogen Systems
983866	EAP	ASI	Italy	03-Jun-2010	60,000.00	Structure and Function of Biomacromolecules as a Tool against CBRN Agents

983867	EAP	ARW	Bulgaria	28-Apr-2010	40,000.00	Environmental Heavy Metal Pollution and Effects on Child Mental Development - Risk Assessment and Prevention Strategies
983868	EAP	ASI	Bulgaria	30-May-2010	60,000.00	Nanotechnological Basis for Advanced Sensors
983877	EAP	ARW	Ukraine	09-Oct-2010	40,000.00	Radiobiological Issues Pertaining to Environmental Security and Ecoterrorism
983880	MD	ASI	Germany	03-Aug-2010	60,000.00	Software and Systems Safety : Specification and Verification
983890	MD	ARW	United States	01-Dec-2010	35,000.00	Requirements and Implementation of a Comprehensive Information Database for Global Infectious Diseases
983892	MD	ASI	Canada	21-Jun-2010	60,000.00	Quantum Information Processing and Quantum Cryptography
983894	MD	ARW	Turkey	13-Sep-2010	40,000.00	Security of Industrial Water Supply and Management
983898	MD	ARW	Kazakhstan	23-Sep-2010	35,000.00	Contemporary Suicide Terrorism in an Islamic World : Origins, Trends, Ways of Tackling
983903	MD	ATC	France	05-Jul-2010	60,000.00	Risk Prevention for Environment and Human Society against Dangerous Goods Transport Accidents and Malicious Intentions : Methods and Tools
983907	MD	ARW	Egypt	13-Apr-2010	35,000.00	Advances in Food Security and Safety against Terrorist Threats and Natural Disasters
983909	EAP	ARW	Slovenia	28-Jun-2010	40,000.00	Managing Global Environmental Threats to Air, Water and Soil - Examples from South Eastern Europe
983921	EAP	ARW	Russia	27-Apr-2010	40,000.00	Environmental Security and Eco-Terrorism
983922	EAP	ASI	Russia	06-Sep-2010	60,000.00	Watershed Approach to Environmental Security: Fostering Interdisciplinary Cross-Sectoral Integrated Water Management in the Azov Sea Basin
983957	NUKR	ARW	Ukraine	19-May-2010	35,000.00	Advanced Water Supply and Wastewater Treatment : A Road to Safer Society and Environment
983966	MD	ARW	Egypt	22-Feb-2010	35,000.00	Metamaterials and Plasmonics : Environmental Sensing and Information Security
983971	EAP	ANW	Uzbekistan	29-Sep-2010	35,000.00	Pathology Training into Central Asia through Distance Education and Telepathology
983972	MD	ASI	Morocco	13-Sep-2010	40,000.00	Software Agents, Agent Systems and their Applications
983988	EAP	ASI	Croatia	31-May-2010	60,000.00	Information Security and Related Combinatorics
983989	EAP	ATC	Serbia	23-Nov-2010	35,000.00	Preparing Leaders of the Region for New Challenges in International Security
983993	EAP	ASI	Croatia	06-Apr-2010	60,000.00	Defence-Related Intelligent Textiles and Clothing for Ballistic and NBC Protection
983994	EAP	ARW	Turkey	07-Dec-2010	30,000.00	Developing Prevention Strategies and Tactics in Countering Radicalization
983995	EAP	ARW	Turkey	23-Sep-2010	30,000.00	Security and Cross-Border Cooperation in the EU, Black Sea Region and Southern Caucasus
984003	EAP	ARW	Serbia	22-Sep-2010	30,000.00	Emerging Asymmetric Threats in the Balkans
984015	MD	ARW	Morocco	01-Dec-2010	45,000.00	Regional Tsunami Warning and Mitigation System in the Mediterranean
984016	MD	ASI	Tunisia	20-Sep-2010	70,000.00	Prediction and Recognition of Piracy Efforts Using Collaborative Human-Centric Information Systems
984025	EAP	ARW	Armenia	05-Oct-2010	35,000.00	Stimulus for Human and Social Dynamics in the Prevention of Catastrophes

984033	EAP	ARW	Turkey	11-Oct-2010	35,000.00	Trends and Development in Contemporary Terrorism 2010
984040	EAP	ATC	Kazakhstan	27-Sep-2010	50,000.00	Enhancing Cooperation in Defence Against Terrorism
984042	EAP	ATC	Serbia	22-Nov-2010	50,000.00	Defence Against Terrorism: A Conceptual Approach in Combating Terrorism
984046	OPS	ATC	Afghanistan	23-May-2010	50,000.00	Defence Against Terrorism: Different Dimensions and Trends of Emerging Threat
984053	EAP	NFA-W	Austria	04-May-2010	54,000.00	Effects of Environmental Conditions on Soldiers - Phase II
984061	EAP	ARW	Kazakhstan	01-Dec-2010	36,000.00	From Joint Scientific Research to Sustainable Regional Cooperation on Water
984103	EAP	ARW	Serbia	15-Nov-2010	30,000.00	Exploring Synergies between Bioterrorism Preparedness and General Public Health Measures
984108	NUKR	ATC	Ukraine	27-Sep-2010	40,000.00	Cyber Terrorism Prevention and Counteraction
984124	MD	ARW	Turkey	08-Nov-2010	35,000.00	Maritime Security and Defence Against Terrorism
984193	EAP	NFA-W		09-Feb-2010	14,500.00	Environmental future Outlooks and their Military Implications
984204	OPS	ATC	Turkey	25-Jan-2010	72,990.00	Advanced Training of Afghan IT Professionals
984206	PDC	ARW	Turkey	04-Feb-2010	29,000.00	NATO SPS Information Day: Enhancing Partnership through Co-operation
TOTAL: 60 Events in 2010 EUR 2,573,490						

Annex III-b

List of R&D Projects completed in 2010

Projects for 2010 are listed in numerical order. All 19 projects are described under **Annex IV-b**.

		Project Title				SPS Grant
		<i>Project Co-Director</i>	<i>Institute</i>	<i>City</i>	<i>Country</i>	(EUR)
NUKR	980881	Tantalum-Free Microwave Dielectric Resonators				253,000
Effective Start Date:	01-Apr-05	Mascher, Peter (NPD)	McMaster University	Ontario	Canada	
End of SPS Activities:	01-Dec-08	Belous, Anatoliy (PPD)	National Academy of Sciences of Ukraine	Kyiv	Ukraine	Additional funds: €8, 000
Final Report:	15-Apr-10	Annino, Giuseppe	Istituto per I Processi Chmico-Fisici	Pisa	Italy	
		Jancar, Bostjan	Jozef Stefan Institute	Ljubljana	Slovenia	
		Matjaz, Valant	Jozef Stefan Institute	Ljubljana	Slovenia	
EAP	980981	System for Protecting People and Underground Facilities from Explosions				300,000
Effective Start Date:	01-Dec-05	Krauthammer, Theodor (NPD)	University of Florida	Gainesville, FL	USA	Additional funds: €37,035
End of SPS Activities:	01-Dec-08	Mataradze, Edgar (PPD)	Mining Institute, Georgian Academy of Sciences	Tbilisi	Georgia	
Final Report:	29-Nov-10					
EAP	981116	Sustainable Management of International Waters – Prespa Lake				240,000
Effective Start Date:	01-Dec-05	Popov, Viktor (NPD)	Wessex Institute of Technology	Southampton	United Kingdom	
End of SPS Activities:	30-Nov-08	Anovski, Todor (PPD)	University Sv. Kiril I Metodj	Skopje	FYROM*	Additional funds: €15, 000
Final Report:	26-Feb-10	Stamos, Alkiviadis	Institute of Geology and Mineral Exploration	Athens	Greece	
		Amataj, Sokrat	Institute of Nuclear Physics	Tirana	Albania	
		Kolaneci, Molner	Institute of Hydrometeorology	Tirana	Albania	
NR	981118	Nanosecond Radiation Pulses for Rapid Explosives Detection				204,000
Effective Start Date:	01-Jul-05	Miklaszewski, Ryszard (NPD)	Institute of Plasma Physics and Laser Microfusion	Warsaw	Poland	
End of SPS Activities:	30-Jun-08	Gribkov, Vladimir (PPD)	Institute for Theoretical & Experimental Physics	Moscow	Russia	Additional funds: €100,000
Final Report:	06-Dec-10	Ugaste, Ulo	Tallinn Pedagogical University	Tallinn	Estonia	
		Zoita, Vasile	National Institute for Laser, Plasma & Radiation Physics	Bucharest	Romania	
EAP	981186	Clean-up of Chemicals in Moldova				298,000
Effective Start Date:	01-Feb-05	Adams, Freddy (NPD)	University of Antwerp	Gent	Belgium	Additional funds: €41,920
End of SPS Activities:	01-Feb-09	Gram, Mariana (PPD)	Ministry of Defence of Republic of Moldova	Chisinau	Moldova	
Final Report:	31-Mar-10	Bulmaga, Petru	State University of Moldova	Chisinau	Moldova	
		Macaev, Fliur	Institute of Chemistry	Chisinau	Moldova	
		Ringstad, Oddvar	Foundation for Industrial & Scientific Research	Oslo	Norway	
		Siretanu, Ludmila	Ministry of Agriculture of Republic of Moldova	Chisinau	Moldova	
		Manolache, Constantin	Ministry of Defence of Republic of Moldova	Chisinau	Moldova	

		Ciobu, Victor	Ministry of Defence of Republic of Moldova	Chisinau	Moldova	
MD	981454	Riverbank Filtration of Jordanian Surface and Groundwater Reserves				265,000
Effective Start Date:	01-Jan-06	Boving, Thomas (NPD)	University of Rhode Island	Kingston, RI	USA	
End of SPS Activities:	31-Dec-09	Al-Ghazawi, Ziad (PPD)	Jordan University of Science and Technology	Irbid	Jordan	
Final Report:	05-Aug-10	Saadoun, Ismael	Jordan University of Science and Technology	Irbid	Jordan	
		Shawaqfah, Mo'ayyad	Mutah University Water Authority of Jordan	Karak	Jordan	Additional funds: €0
		Al-Rashdan, Jamal		Amman	Jordan	
		Schijven, Jack	National Institute of Public Health & the Environment	Bilthoven	the Netherlands	
		Blanford, William	Louisiana State University	Baton Rouge, LA	USA	
		Abu-Ashour, Jamal	Jordan University of Science and Technology	Irbid	Jordan	
NR	981461	Capture and Decontamination of Chemical and Biological Agents				282,000
Effective Start Date:	01-Jun-06	Smirniotis, Panagiotis (NPD)	University of Cincinnati	Cincinnati, OH	USA	
End of SPS Activities:	31-Dec-09	Vorontsov, Alexander (PPD)	Boreskov Institute of Catalysis	Novosibirsk	Russia	Additional funds: €73,561
Final Report:	07-Jul-10	Nikulin, Victor	Lavrentyev Institute of Hydrodynamics	Novosibirsk	Russia	
		Safatov, Alexander	FSRI SRC VB Vector	Novosibirsk	Russia	
		Pokrovsky, Andrey	Institute of Molecular Biology	Novosibirsk	Russia	
EAP	981476	Decontamination of Neurotoxic and Vesicant Compounds				243,000
Effective Start Date:	29-Oct-05	Zecchina, Adriano (NPD)	Universita di Torino	Torino	Italy	
End of SPS Activities:	01-Nov-08	Parvulescu, Vasile (PPD)	University of Bucharest	Bucharest	Romania	
Final Report:	16-Apr-10	Garcia, Hermenegildo	Technical University of Valencia	Valencia	Spain	Additional funds: €100,000
		Scaiano, Tito	University of Ottawa Chemical Centre for Defence NBC and Ecology, Romania Defence Ministry	Ottawa	Canada	
		Somoghi, Vasile		Bucharest	Romania	
MD	981786	Rapid Detection of Bioagents Using Nanomechanics				253,000
Effective Start Date:	01-Apr-06	Raiteri, Roberto (NPD)	University of Genova	Genova	Italy	
End of SPS Activities:	31-Mar-09	Nemirovsky, Yael (PPD)	Technion-Israel Institute of Technology	Haifa	Israel	
Final Report:	28-May-10	Zaitsev, Vladimir	Taras Shevchenko National University	Kyiv	Ukraine	Additional funds: €0
		Willner, Itamar	The Hebrew University of Jerusalem	Jerusalem	Israel	
		Skladal, Petr	Masaryk University	Brno	Czech Republic	
MD	981865	Novel Agents to Neutralize Toxicity of Venom Polypeptides				178,000
Effective Start Date:	01-May-06	Muyldermans, Serge (NPD)	Flanders Interuniversity Institute for Biotechnology	Brussels	Belgium	Additional funds: €0
End of SPS Activities:	30-Apr-09	El-Ayeb, Mohamed (PPD)	Institut Pasteur de Tunis	Tunis-Belvedere	Tunisia	
Final Report:	08-Jan-10					

EAP	981866	The Genetic Bases of Hypoxic Pulmonary Hypertension and Acute Mountain Sickness				170,000
Effective Start Date:	01-May-06	Wilkins, Martin (NPD)	Imperial College of Scientific Technology & Medicine	London	United Kingdom	
End of SPS Activities:	01-Mar-09	Aldashev, Almaz (PPD)	Institute of Molecular Biology and Medicine	Bishkek	Kyrgyzstan	Additional funds: €7,600
Final Report:	29-Oct-10	Morrell, Nickolas	Cambridge University	Cambridge	United Kingdom	
EAP	982063	Management of Security Related R&D in Support of Defence Industrial Transformation				182,300
Effective Start Date:	15-Oct-06	Buch, Heinrich (NPD)	Universität der Bundeswehr München	München	Germany	
End of SPS Activities:	01-Oct-09	Ivanov, Tilcho (PPD)	University of National and World Economy	Sofia	Bulgaria	Additional funds: €0
Final Report:	07-Jun-10	Ivanovski, Zoran	European University	Skopje	Bulgaria	
		Fota, Julian	National Defence College	Bucharest	Romania	
		Markov, Stoian	Institute for Parallel Processing of Information	Sofia	Bulgaria	
NR	982143	Prediction of Glacial Hazards in the Central Caucasus, Russia				281,000
Effective Start Date:	26-Nov-06	Evans, Stephen (NPD)	University of Waterloo	Ontario	Canada	
End of SPS Activities:	29-Nov-09	Chernomorets, Sergey (PPD)	University Center for Engineering, Geodynamics	Moscow	Russia	
Final Report:	16-Jan-10	Petrakov, Dmitry	Moscow State University	Moscow	Russia	Additional funds: €130,000
		Guthrie, Richard	British Columbia Ministry of Environment	Nanaimo, BC	Canada	
		Tutubalina, Olga	University Centre for Engineering Geodynamics and Monitoring	Moscow	Russia	
		Hungr, Oldrich	University of British Columbia	Vancouver, BC	Canada	
EAP	982158	Countermeasures against Sepsis Caused by Biological Weapons				175,000
Effective Start Date:	01-Oct-06	Kaveri, Srimi (NPD)	Centre de Recherche des Cordeliers	Paris	France	Additional funds: €25,000
End of SPS Activities:	30-Sep-09	Vassilev, Tchavdar (PPD)	Stefan Angeloff Institute of Microbiology, BAS	Sofia	Bulgaria	
Final Report:	23-Apr-10					
EAP	982159	Environmental Security in Khorezm, Uzbekistan				259,000
Effective Start Date:	06-Jul-06	Saito, Laurel (NPD)	University of Nevada Reno	Reno, NV	USA	
End of SPS Activities:	05-Jul-09	Fayzieva, Dilorom (PPD)	Institute of Water Problems	Tashkent	Uzbekistan	
Final Report:	24-Aug-10	Nishonov, Bakhridin	Hydrometeorological Research Institute	Tashkent	Uzbekistan	Additional funds: €102,066
		Rosen, Michael	United States Geological Survey	Carson City, NV	USA	
		Lamers, Johannes	UNESCO-ZEF German-Uzbek Khorez	Khorezm	Uzbekistan	
		Chandra, Sudeep	University of Nevada Reno	Reno, NV	USA	
MD	982381	Social and Environmental Impacts of Mariculture in the Red Sea				270,000
Effective Start Date:	01-Mar-07	Krost, Peter (NPD)	Coastal Research and Management, CRM	Kiel	Germany	
End of SPS Activities:	28-Feb-10	Badran, Mohammad (PPD)	Ben-Hayyan_Aqaba International Laboratories	Aqaba	Jordan	Additional funds: €0
Final Report:	20-Sep-10	Angel, Dror	Recanati Institute for Maritime Studies	Haifa	Israel	
NR	982498	Prototype for the International Situational Centre in Case of Ecoterrorism				262,000

Effective Start Date:	19-Apr-07	Marmioli, Nelson (NPD)	University of Parma	Parma	Italy	
End of SPS Activities:	20-Apr-10	Krivilev, Vladimir (PPD)	Academy for Geopolitical Problems	Moscow	Russia	Additional funds: €36,000
Final Report:	19-Jul-10	Ovsienko, Sergey	State Oceanographic Institute	Moscow	Russia	
EAP	982590	Hazardous Chemical Contamination in the Sava River Basin				250,000
Effective Start Date:	21-Sep-07	Tollefsen, Knut-Erik (NPD)	Norwegian Institute for Water Research (NIVA)	Oslo	Norway	Additional funds: €200,000
End of SPS Activities:	21-Sep-10	Ahel, Marijan (PPD)	Rudjer Boskovic Institute	Zagreb	Croatia	
Final Report:	20-Dec-10					
NR	982735	Quantum Dot Single Photon Sources for Data Encryption				260,000
Effective Start Date:	07-Aug-07	Bimberg, Dieter (NPD)	Technische Universitaet Berlin	Berlin	Germany	
End of SPS Activities:	11-Sep-10	Alferov, Zhores (PPD)	St. Petersburg Academic University	St. Petersburg	Russia	
Final Report:	22-Dec-10	Merz, James	University of Notre Dame	Notre Dame, IN	USA	Additional funds: €72,908
		Buller, Gerald	Heriot-Watt University	Edinburgh	United Kingdom	
		Mitin, Vladimir	University at Buffalo	Buffalo, NY	USA	
		Haisler, Vladimir	Institute of Semiconductor Physics	Novosibirsk	Russia	
TOTAL completed R&D projects in 2010 : 19					Sub-total €4,625,300	

Annex III-c

List of bottom-up NIG Projects completed in 2010

Projects for 2010 are listed in numerical order. All 5 projects are described under [Annex IV-c](#).

NIG Projects completed in 2010

Ref. No.	Grant (EUR)	NAME	Country	TITLE
982702	100,000	Secieru, Gregory	Moldova	New RENAM-RoEduNet Gateway Based on CWDM
983279	275,000	Yakymenko, Yuriy	Belarus	Regional Segments and Implementation of New Services in the Ukrainian National Research and Education Network URAN
983457	220,000	Amed, Ezatullah	Afghanistan	Setting of the Computer & Electronics Engineering Faculty in Kabul Polytechnic University (KPU)
983659	115,000	Isgandarov, Asaf	Azerbaijan	Educational Network of Lankaran State University
983667	13,200	Mkrtchyan, Ruben	Turkmenistan	Educational Public Key Infrastructure to Enhance Information and Communications Security in Armenian Cybercommunities
	723,200			

Annex IV-a

Description of SPS events carried out by SPS supported grantees in 2010

This Annex highlights the objectives, outcomes, deliverables and impact of the SPS funded activities that were conducted by grantees in 2010 and explains how they contributed to the *Operational Objectives* of the SPS Programme.

This Annex is broken down as follows:

- A selection of SPS events conducted in 2010
- Descriptions of the 19 R&D projects completed in 2010
- Descriptions of the 5 NIG projects completed in 2010

A Selection of Events in 2010 (In chronological order)

a) 14 – 23 July 2010, Istanbul, Turkey
Culturally Sensitive Treatment of Post Trauma
(ref. 983481)

The event, which took place at Bahçeşehir University in Istanbul, Turkey, addressed issues commonly faced by psychologists, clinical social workers and psychiatrists dealing with traumatised patients.

A total of 37 participants from NATO, Partner and Mediterranean Dialogue countries and from the International School Psychology Association studied the theory behind treating and diagnosing PTSD. The workshop included a series of lectures, demonstrations and practical exercises on topics such as:

- trauma and its responses: from acute stress reaction to PTSD
- the impact of trauma on the body, thoughts and feelings
- trauma in children, youth and adults
- a psychodynamic perception regarding trust in treatment
- cognitive behavioral therapy in PTSD
- fantastic reality use in desensitization
- fantastic reality use in imaginal reconstruction using therapeutic cards

PTSD can affect up to 15 to 20 per cent of a given population following mass disasters such as terrorist acts and wars. The workshop was evidence-based and equipped the participants to train and support other professionals in using these techniques when needed.

Each attendee received articles and case studies, which were discussed during the event, as well as specialised manuals comprising the most up to date and effective trauma treatment methods, including:

- Somatic Experience - a method focused on "the body's memory"
- A method based on the Fantastic Reality model

- Cognitive behavioral therapy theories, such as the prolonged exposure principles of in-vivo and imaginal reconstruction

This model was tested among PTSD patients, both children and adults, traumatised by rape, robbery, road accidents, terror, war and military service in various countries around the world.

The event's participants have already reported positive results from patients treated with methodologies taught at the seminar. An on-line supervision is open to all practitioners who attended the seminar, either in written or video conference format.

b) 15 – 16 September 2010, Ankara, Turkey

New Therapy Approaches in Countering the Negative Effects of Terrorism

(ref. 983647)

Promising to be an innovative approach in treating post-trauma victims, this event brought together more than 50 scholars from NATO, partner and Mediterranean Dialogue countries, representing disciplines such as:

- musicology
- music therapy
- psychiatry, and
- history

The importance of music as an expression of human emotions and knowledge can be seen throughout history. Various communities have found that music, rhythm and dance can provide a range of social benefits.

This workshop analyzed the use of music therapy in reducing the negative effects of terrorism, minimizing the level of stress and increasing the self-esteem and motivation of affected people.

It covered the following topics:

- music therapy in psychiatry/psychology
- the history of music therapy and war trauma
- theoretical perspectives
- music therapy and terrorism
- music therapy and violence
- cross-cultural perspectives

This workshop aimed to contribute to the rehabilitation of psychological disorders that arise in both the people in the regions exposed to terrorism and personnel engaged in NATO operations.

c) 13 – 15 October 2010, Cambridge, United Kingdom

Environmental Security in the Arctic Ocean

(ref. 983732)

This NATO-funded workshop analysed the changing environment of the Arctic Ocean and its potential economic, political and cultural impact both regionally and globally. Taking place at the Scott Polar Research Institute, University of Cambridge, in the United Kingdom, it brought together more than 80 experts from NATO and partner countries including Russia, and China. The

workshop was supported by NATO's Science for Peace and Security (SPS) Programme and addresses environmental security, an SPS key priority.

The goal of the workshop was to engage scientists, international legal authorities and policy-makers in characterising environmental security risks in the region. The participants identified and assessed these risks against the backdrop of international governance challenges and explored opportunities for cooperation.

Participants from the Arctic Coastal Nations (Canada, Denmark, Norway, Russia and the United States) discussed the region's melting ice and the emerging energy, shipping, fishing and tourism interests that will follow. These trans-national activities, if not properly regulated, pose a myriad of new challenges.

Currently there is insufficient data on the impact of increased human activity on the Arctic's ecosystem. With commercial activities in the Arctic sea lanes on the rise, there is growing interest from non-Arctic nations to formalise the region's governance, as reflected in the European Parliament's 9 October 2008 Arctic resolution.

Many view the growing international interest in the Arctic Ocean as a direct challenge to the High North nations who have historic interests in the region. This was articulated by the five Arctic Coastal States in the 28 May 2008 Ilulissat Declaration with regard to "their sovereignty, sovereign rights and jurisdiction in large areas of the Arctic Ocean".

At the event there were contributions from 14 key speakers, including experts from world renowned institutions such as the Arctic Council, the United Nations Law Commission and the European Parliament.

d) 6 – 10 June 2010, Hella, Iceland

Global Climate Change and Local Adaptation

(ref. 983767)

High-level experts at a NATO science workshop in Hella, Iceland, analyzed the growing dynamics of global climate change. This event, which took place from 6 to 10 June 2010, is seen as a crucial step towards developing an integrated multi-criteria, multi-hazard risk-informed decision framework.

The 50 key speakers and experts in attendance evaluated the recent advances in understanding climate change as well as its subsequent management and adaptive measures at both regional and local levels. The participants, drawn from renowned institutions such as the London School of Economics and the International Risk Governance Council, demonstrated a unity of purpose in their pursuit to summarise what is known about vulnerability and impacts of climate change at local and regional levels define the role of risk analysis in managing risks posed by climate change define the applicability of adaptive management for climate change identify strategies developing countries can use to manage security risks identify specific research needs for improving the value of risk analysis as applied to climate change.

This NATO-funded workshop also provided environmental scientists and government officials with a clear view of the trade-offs associated with the environmental and societal impacts of climate change.

Scientists and decision makers from developing countries were encouraged to implement policy decisions and technologies in environmentally sustainable and secure ways. For this endeavour, special emphasis was placed on attracting young scientists and leaders from NATO's partner countries to this field.

As a result of this event, the participants and organizers are brainstorming ideas for projects, proposals and workshops, such as a possible workshop in Iceland on energy security. Icelandic President Ólafur Grimsson, who gave the event's opening speech, has recommended a series of follow-up meetings.

This event was hosted by the University of Iceland, and jointly organized by the US Army Corps of Engineers and Egypt's Cairo University. The keynote lectures were given by the US Army Corps of Engineers Chief Scientist and Chief Engineer as well as the Former Deputy and Acting Secretary of the US Department of Interior.

e) 3 – 15 August 2010, Munich, Germany

Software and Systems Safety: Specification and Verification

(ref. 983880)

From 3 to 15 August, participants at the NATO-funded International Summer School Marktoberdorf in Munich, Germany, examined various methods for protecting against unauthorized disclosure, transfer, modification and destruction of information on cyber networks.

During this event, a group of 95 leading international researchers and experts from NATO, Partner and Mediterranean Dialogue countries exchanged knowledge gained over 40 years of theoretical foundation and industrial practice. Speakers from Microsoft Research, Intel Corporation and SRI International also attended.

Emerging as a key research topic in computer science, enhanced information security aims to protect against attacks and vandalism that could cause considerable economic and physical damage.

The event focused on the following four areas:

- specification and modelling
- verification
- tools
- methodologies

The summer school demonstrated that cyber security, as well as advanced software engineering methods, depend on an excellent understanding of software systems functionality. With this in mind, the lectures focused on the development of safe and correct software systems to safeguard communication, services and data against catastrophic failure and malicious interference.

As one in a series of Marktoberdorf summer schools, the event shows that discussing, working and learning together are essential for future scientific results that guarantee the safety of large scale software systems.

In 1968, the NATO Science Committee sponsored the 'Garmisch Conference', where software engineering was born as a key issue in computer science. This conference was the main catalyst that established the Summer School Marktoberdorf series.

f) 23 – 26 September, 2010

Contemporary Suicide Terrorism in an Islamic World: Origins, Trends, Ways of Tackling

(ref. 983898)

To support one of NATO's key priorities, combating terrorism, an Advanced Research Workshop from 23 to 26 September in Astana, Kazakhstan, analysed suicide terrorism in the theatre of war.

Around 35 experts from NATO, Partner and Mediterranean Dialogue countries examined this form of terrorism at the levels of society, the organization and the individual.

According to the 2009 Annual US State Department Report to Congress on “International Terrorism”, almost 300 of the 10 999 terrorist attacks that killed 14 971 people were perpetrated by suicide bombers.

At the event this phenomenon was analyzed and interpreted in an Islamic as well as Western context, as many ‘Jihad’ supporters were born and/or raised in NATO member states. Studies have shown that many suicide attacks carried out by international terrorist networks are often perpetrated by second generation Muslim immigrant men.

Participants also closely examined the concept of ‘Jihad’, originally used to illustrate a Muslims internal and continuous struggle for peace, evolving into an ideology used to justify politically-motivated terrorist attacks against the ‘enemies of Islam’.

Experts agree that the study of jihadist suicide terrorism should be conducted in close relation with other concepts, such as:

- achievements and limits of multiculturalism,
- the contact and clash of civilisations,
- the situation of Muslim immigrants in Western societies,
- mechanisms of integration, and
- emigration policies.

There were 17 speakers at the event including world renowned experts from the International Security Review Journal (Morocco), the International Institute for Counter-Terrorism (Israel) and the Human Security Institute (Canada).

g) 6 – 12 September Rostov – on – Dov, Russia

Watershed Approach to Environmental Security: Fostering Interdisciplinary Cross-Sectoral Integrated Water Management in the Azov Sea Basin

(ref. 983922)

This event, which brought together almost 80 experts from NATO and partner countries, including Russia, is in line with the overall purpose of the Center: to carry out research, education and coordination functions in sustainable management of water and aquatic resources in the Azov Sea Basin.

Considered by many to be one of the biggest non-military threats to human society, access, or lack of access, to fresh water can limit development and fuel conflicts. River basins are therefore recognized as the most appropriate territorial units for integrated water resource management and sustainable development. But little attention has been paid to the dynamics of the processes involved.

The lectures at this Advanced Study Institute, which was funded by NATO’s Science for Peace and Security Programme, focused on various aspects of environmental security, river rehabilitation and integrated watershed management.

The course syllabus was divided into three modules:

- scientific foundations (overview of related disciplines, technologies, etc.)

- legislative, political and institutional concerns (national laws, international conventions, organizations, etc.), and
- economic and social aspects (education, mass media, etc.)

The Don River basin (the main tributary of the Sea of Azov) was used as a case study. It is one of the most economically developed and densely populated areas in both Russia and Ukraine, the two countries that share it.

Lecturers from the Central European University, Moscow State University, the US Environmental Protection Agency, the United Nations Environmental Programme and the United Nations Food and Agricultural Organization provided both theoretical and practical insight from various disciplines.

h) 20 – 25 September 2010, Hammamet, Tunisia

Prediction and Recognition of Piracy Efforts Using Collaborative Human-Centric Information Systems

(ref. 984016)

From 20-25 September, 70 experts from NATO, Partner and Mediterranean Dialogue countries met at a NATO-funded Advance Study Institute in Hammamet, Tunisia, to examine ways by which a collaborative, human-centric information system can help curb the rise of modern piracy.

A dramatic increase in the number of maritime attacks has exposed the vulnerability of vessels to hostile boarding. Curbing the problem is essential for global trade and security.

Lecturers from the US Office of Navy Research, Eurocrime, Texas A&M University and the World Maritime University joined their peers to present how collaborative human-centric information systems can improve the ability of nations to predict and prevent an incident or, if unsuccessful, to rapidly recognize the nature and size of the incident for a better collective response.

Inherent to the concept of collaborative information support systems are:

- Human-system integration concepts,
- cognitive systems engineering methodologies,
- collaborative environment technologies, and
- knowledge exploitation and data mining technologies instantiated into concepts/approaches of decision support systems (where the human is an integrated part of the system).

Operating in the crisis management and anti-piracy environment, decision-makers at all levels and their staff can use collaborative human-centric information support capabilities to:

- better understand the maritime environment's vulnerabilities,
- rapidly develop a shared understanding of the operational environment,
- formulate evaluation criteria,
- enhance existing business procedures to address security issues and provide enhanced situational awareness and inter-agency cooperation,
- support crew security awareness and detection training,
- enhance capacity for deterrence, interdiction and/or response, and
- support better policing.

Funded by NATO's Science for Peace and Security Programme ,this event was held in Africa's northernmost country – Tunisia, both a coastal and maritime country, where maritime security and piracy issues are of top priority.

i) 5 – 8 October 2010, Yerevan, Armenia

Stimulus for Human and Social Dynamics in the Prevention of Catastrophes

(ref. 984025)

Forty-three experts from NATO and Partner countries met from 5 to 8 October in Yerevan, Armenia, to discuss ways of forecasting and preventing natural and man-made catastrophes. They brought with them a range of theoretical experience in social policies, the sociology of catastrophe, international relations, economics and forecasting to a workshop funded by NATO's Science for Peace and Security Programme. The event supports one of the Alliance's key priorities – defence and environment.

The formation of the New Independent States at the end of the Cold War led to a collapse of civil protection systems in the region. The well-organized civil protection structures of Soviet times were, however, oriented more towards defending the population and economy against a nuclear attack than responding to natural and man-made disasters.

In 2006, Armenia and NATO adopted the Individual Partnership Action Plan (IPAP), under which a survey on non-traditional threats to security was carried out. Threats include soil erosion, landslides, earthquakes, environmental pollution as well as a decrease in resources.

The increasing frequency and severity of natural disasters over the last 10 years in Armenia, together with limited resources for prevention and mitigation of their impacts, has increased the environment's and people's vulnerability to disasters. This workshop is part of a larger drive to mitigate the problem.

Experts from organizations such as Shell International, the United Nations Economic Commission for Europe and the Office of the Committee for European Integration gave presentations at the event. The participants demonstrated how international security policy is not limited to regional security, but is part of a global security framework that requires effective international cooperation.

j) 23 – 27 May 2010, Kabul, Afghanistan

Defence against Terrorism: Different Dimensions and Trends of Emerging Threat (ref. 984046)

From 23 to 27 May 2010, a NATO funded Advanced Training Course in Kabul taught Afghan military and government officials the latest methods and strategies used in counter-terrorism operations.

With the active involvement of officials from the Afghan Ministries of Interior, Defence and Foreign Affairs, as well as the Government Media and Information Centre (GMIC) and the Peace and Reconciliation Secretariat, this course looked at both the strategic and operational implications for staff officers engaged in anti-terrorist activities. It raised awareness of the roles played by the United Nations, NATO and the European Union in the fight against terrorism.

While most of the more than 40 participants came from Afghanistan, some will also come from NATO countries such as Germany, Turkey, the United Kingdom and the United States, and partner countries such as Azerbaijan, Kyrgyzstan, Russia, Turkmenistan and Uzbekistan. The five-day mix of lectures, working groups and panel discussions provided both a comprehensive and general overview of the subject. Experts from George Washington University, Georgia Institute of Technology and King's College London were among those giving lectures.

An important objective that this event achieved was informing the attendees about the current dynamics of terrorism in modern warfare, as well as the various aspects of defence against

terrorism (DAT), providing them with additional skills and practical tools to prevent and defeat terrorist acts.

They discussed topics such as:

- the root causes of terrorism
- terrorist motivations and DAT response models
- countering the ideology of terrorism
- suicide terrorism
- an overview of the legal response to terrorism
- military operations against terrorism, and international law
- NATO's capability to combat WMD terrorism
- defence against bio-terrorism
- financing terror
- media and terrorism: the development of reporting terror

Another objective that was achieved at this event was the dissemination of knowledge useful in drafting and developing policy used in counter-terrorism operations.

It gave the participants a conceptual understanding about the issues of terrorism as well as equipping them with tools to use at the strategic and operational level.

Annex IV-b

SPS R&D Projects completed in 2010

This section includes information on the 19 multi-year Research & Development (R&D) projects that submitted final reports in 2010.

For easy reference the descriptions are ordered by *ascending* reference numbers:

1) Ref. 980881

Tantalum-Free Microwave Dielectric Resonators

(Canada, Italy, Slovenia and Ukraine)

Effective start date: 01-Apr-2005; Final report: 15-Apr-2010

In this project, investigators from Canada, Italy, Slovenia and Ukraine worked to develop improved microwave dielectric resonators and to understand how crystalline structural defects in barium cobalt niobate ($Ba(B^{1/3}Nb_{2/3}O_3)$) or BCN ceramics contribute to dielectric loss. They have also worked on tailoring the dielectric properties of these ceramics by optimizing processing conditions and dopant concentrations. Since the start of the project, the phase transformations which occur during solid-state synthesis of complex niobates have been defined. The formation of major secondary phases has been demonstrated during the synthesis of both stoichiometric and non-stoichiometric columbites (MNb_2O_6). The effect of these phases on the microstructure and dielectric properties of the sintered materials has been evaluated. In the systems $Mg_{1-x}Nb_2O_6$, $Co_{1-x}Nb_2O_6$, and $Zn_{1-x}Nb_2O_6$ it was found that by changing the cation ratio it is possible to obtain materials with the product Qxf as high as 80,000 – 120,000 GHz. This is 20 to 100 % higher than previously reported. It was also found that sintering under higher oxygen pressure ensures higher density in the ceramics. Preliminary tests of the dielectric resonators have shown advantages in comparison to currently commercial dielectric resonators when used in microwave oscillators operating in the frequency region of 15-17 GHz. Tests have indicated that the new dielectric resonators that have been developed enable low phase noise in solid state oscillators. Further testing will be conducted with the aim of establishing the potential of these oscillators for application in radio-filters and low-power solid state oscillators for centimeter and millimeter wavelength bands.

In total there were 18 people involved in this project, 7 of whom came from the V.I.Vernadskii Institute of General and Inorganic Chemistry of Ukrainian National Academy of Sciences (IGIC NASU). Further to the NATO Grant, additional funding (UAH 58, 000 or approx. € 8,000) for the activities of the Ukrainian team was obtained from the Ukrainian Ministry of Education and Science. This project resulted in 18 scientific papers (including 6 papers published in Russian and 12 papers published in English), and was also presented at 8 international conferences (10 contributions) most of which involved co-authors from all the participating teams.

In Ukraine, 2 End Users were involved in the project. The End Users were the Research institute "Orion" (Kyiv) and the Joint stock company "Fazotron-Ukraine" (Kyiv). Both of them were involved on a self-funding basis.

Impact: The results of the project have been implemented at the facilities of the Ukrainian End Users, which are using the developed high-Q dielectric resonators in their production line. However, the further advancement in its implementation is dependent upon the current economic situation in Ukraine and from an international perspective- on the global market for microwave resonators.

Nevertheless, the Ukrainian team is making further steps to enhance the parameters of the dielectric components developed under this NATO funded project. These activities are beyond the scope of this project, and are being conducted in close cooperation with the Ukrainian developers of microwave equipment including both End Users of this project.

The results of this project address certain global security challenges. The implementation of new materials and resonators, developed in this project, in various microwave apparatus would result in higher reliability and selectivity of microwave equipment, and hence, enhanced protection against unauthorized access; significant reduction in the cost of production in contrast to the currently available materials. These two factors combined will ensure safer and more reliable wireless data transmission in both NATO and Partner Countries.

Because of NATO's support to this project several teams from different NATO (Canada, Italy) and Partner (Ukraine, previously Slovenia) countries have combined their expertise and facilities in this joint research. The interaction between participating teams allowed, on the one hand, more efficient ways to achieve the main goals of the project, whereas on the other hand it has enabled greater science cooperation.

Moreover, the established partnership allowed Ukrainian scientists to enhance their science and organizational structures by making them conform to the NATO standard. The Ukrainian scientists were also given the opportunity to extend their international contacts by sharing new ideas and research results, which adapted them to the global science community.

2) Ref. 980981

System for Protecting People and Underground Facilities from Explosions
(United States and Republic of Georgia)

Effective start date: 1-Dec-2005; Final report: 29-Nov-2010

Investigators from the United States and the Republic of Georgia cooperated in developing a system to protect people in underground facilities from terrorist explosions. To this end, they have studied the propagation of shock waves and energy absorption processes in tunnels and have designed hydraulic shock absorbers.

Methods to identify blasts based on seismic, electromagnetic pulse, optical, thermal and overpressure effects have been analysed, and a system based on the detection of the electromagnetic pulse and optical signals has been selected. The investigators have characterized electromagnetic pulses generated by tunnel explosions and found that they can be broken up into time phases associated with detonation; explosion of the main charge; polarization of detonation products; and formation of shock waves. These findings have been used to establish blast identification criteria and identification software. In addition, a hydraulic shock absorber equipped with a pyrotechnic element was designed and bench-tested. At a later stage of the project lifecycle additional studies were performed on the reliability of the blast identification software, as well as the completion of further bench-testing of a hydraulic shock absorber.

In total there were 22 specialists involved in this project; 14 were researchers, 7 engineers and 1 student. In total there were 5 young researchers who received stipends from the Georgian National Science Foundation, amounting to € 12, 345 per year. The Georgian Technical University, St. Andrew Georgian University of Georgian Patriarchy and JSC "Tbilaviamshen" took part in the study of blast detection methods, modeling of processes in the absorber and manufacturing of prototypes of protective systems respectively.

The protective system developed through this project was selected, together with other fifteen designs, from a large number of proposed security facilities for the 2008 Global Security Challenge Competition: (www.globalsecuritychallenge.com/gsc_competitions.php.)

After a successful presentation at the Global Security Challenge Competition, several venture companies showed interest in the proposed automatic system of protection. Preliminary negotiations have commenced. A marketing strategy was developed for the organization of serial manufacturing of the new protective system, together with the end-user. The basic strategy of marketing actions will be based on a comparative advantage of the product. The offered protective system has time characteristics and indicators to decrease overpressure of a shock wave, which cannot be offered by competitors in the nearest future. In order to facilitate the process of finding the market for the product, a video presenting the system and highlighting its advantages was produced. The potential users of the protective system are to be companies engaged in security and counter-terrorism, coal mine companies facing methane explosion threats, chemical plants, underground transport and other sites which are under risk of explosion.

The presented protective system can be effectively applied in:

- ❖ motorway and railway tunnels;
- ❖ subway tunnels;
- ❖ coal mines under threat of methane explosion;
- ❖ land or sea-based oil platforms;
- ❖ other petrol-chemical plants;
- ❖ long superstructures with limited cross sections that could be loaded by gas or dust explosions
- ❖ protecting of entrances of underground structures from effect of termobaric bombs

The results of this project were published in 14 articles and presented at 12 international conferences. Two patents were obtained.

Impact: Based on the results of the research, a project for the protection of several underground sites from blasts in Georgia was drawn up. The project achieved the formation of blast energy damping barrier in the zone of the tunnel portal. At the tunnel entry, the absorber ensures the reduction of shock wave overpressure and protection of people in the underground site under the unauthorized explosions.

The results of the research and the experimental base modernized with the project support were used by the Mining Institute of Georgia for the development of a new project, which aims to increase the reliability and effectiveness of the system (designed within the framework of the SfP project) for protecting against methane explosion in coal mines (2009-2012). The project is sponsored by the National Science Foundation.

The implementation of the project and its results have provided incentives in Georgia for follow-up studies relating to blast processes and creation of active protective systems against accidental and unauthorized explosions. The experimental base of the Mining Institute of Georgia was modernized and equipped with contemporary research facilities, test benches and other kinds of equipment. Research contacts were established with foreign colleagues.

Within the framework of the project, four young researchers received training at research centres in Europe and the US, two young participants of the project produced master's theses. A new proposal relating to the increasing the stability of the buildings during unauthorised explosions was prepared and submitted to the NATO SPS Programme.

The results of this Project will be useful in protecting against terrorist attacks and unauthorized explosions on a local, regional and global scale. Defense Against Terrorism (DAT) is a key

challenge, not only for NATO member countries, but for Georgia as well, a NATO partner country. The 2008 Russian aggression on Georgian territory leading to the occupation of a significant part of the country and the threat of repeated aggression has increased the relevance of the problem.

3) Ref. 981116

Sustainable Management of International Waters – Prespa Lake

(Albania, Greece, the Former Yugoslav Republic of Macedonia¹⁷ and the United Kingdom)

Effective start date: 1-Dec-2005; Final report: 26-Feb-2010

Beginning in December 2005, scientists from Albania, Greece, the Former Yugoslav Republic of Macedonia and the United Kingdom have cooperated in an effort to understand the mechanisms behind the loss of water from Lake Prespa, one of the three largest lakes in the Former Yugoslav Republic of Macedonia.

The project developed recommendations for the sustainable use of the water in the Lake Prespa watershed. Since the beginning of the project, several field trips were undertaken to “Big Lake Prespa”, which is separated from “Small Lake Prespa” by an isthmus. The lakes are fed by subterranean channels running under the Galichica Mountain. It has been found that water loss through infiltration into the Galichica Mountain has strongly intensified in the last few months. Three water-pumping tests have been carried out in order to estimate the hydraulic parameters of the groundwater table that is hydrogeologically connected to the southwestern part of Lake Prespa. Also, the researchers used land sat data to estimate changes in the water surface area of Lake Prespa and have developed a model of water flow through Galichica Mountain. Once the methodology was perfected, water balance measurements in the three neighbouring countries were carried out, and mapping and monitoring of the ecosystems of other lakes was also undertaken. In this project there has been extensive interaction with the local governments of the Prespa and Resen municipalities, and with the Institute for Hydrometeorology in Skopje and the Institute for Hydrobiology in Ohrid, the Former Yugoslav Republic of Macedonia.

In total there were a total of 19 people involved in this project. 8 People from the Former Yugoslav Republic of Macedonia (2 University Professors, 1 Scientific researcher, 1 PhD student, 3 Graduated Engineers and 2 MPhil students, whose studies have been supported by the Project funds) 5 from Albania (2 University Professors, 1 PhD Scientific researcher and 2 MPhil students, whose studies have been supported by the Project funds) 2 People from the UK (1 University Professor and 1 PhD Scientific researcher) and 4 People from Greece (3 PhD Scientific researchers and 1 Graduated Engineer). In addition, all relevant and complementary research activities on Prespa Lake Hydro System have been supported by UNESCO who provided extra funds of € 15, 000. This project has also been the subject of 4 scientific publications, 2 national conferences, 1 book, 1 scientific journal and 1 international conference.

A number of institutions and municipalities were involved in this project in various capacities. For example, the Institute of Hydrometeorology (Skopje), the Municipalities of Resen and Agios Germanos in the Former Yugoslav Republic of Macedonia as well as the Municipality of Korcha, Republic of Albania, all provided free access to the Historical Hydro-Meteorological Data during this project.

Impact: The capacities of these Institutions have been increased enabling them to deal with similar problems that may arise in the future. For example, the Macedonian research team have been instrumental in ascertaining the origin of the Karst Spring used to supply water to Skopje City, the capital of the Former Yugoslav Republic of Macedonia. The obtained results will ensure better

¹⁷ Turkey recognises the Republic of Macedonia with its constitutional name.

protection of the Prespa Lake, facilitating the easy calculation of the amount of water within the lakes and its pollution levels.

People living around the Lake have learned how to use and protect the water in a more sustainable way. In addition, this project has taught people from the neighbouring countries that good cooperation and daily implementation of defined best practices will enable the long term preservation of the Prespa Lakes. With the international cooperation fostered by this NATO funded project, the peace and security benefits have a more global reach.

4) Ref. 981118

Nanosecond Radiation Pulses for Rapid Explosives Detection

(Estonia, Poland and Russia)

Effective start date: 1-Jul-2005; Final report: 6-Dec-2010

Beginning in July 2005 these scientists have cooperated to produce two different sources of intense, nanosecond-pulse neutron and X-ray radiation for use in the detection of explosives and also nuclear agents. Their design is based on the Dense Plasma Focus (DPF) concept which uses a single nanosecond impulse of neutrons. It is intended that one source of neutrons should be portable, weighing about 20 kg, while the other would be used in more stationary detection systems and would weigh about 400 kg. The unique features of the radiation source and detection methods increase the likelihood that hidden explosives can be detected at lower radiation doses and with better signal-to-noise ratios. Among the most likely applications of this technology is the detection of explosive materials hidden in luggage at airports. Since the beginning of the project, five special diagnostic systems have been tested, including one consisting of a scintillator and photomultiplier with a response time around 1.7 milliseconds. Experiments on neutron-scattering by targets of methanol and phosphoric acid have also been performed. Analysis of the resulting scattered signals has been very promising. As the project progressed experiments on a 10kJ Plasma Focus device continued and a database was prepared of neutrons scattered by various elements and compounds. Experiments will also be performed on the possibility of detecting Uranium-235 using neutron pulses. This project, which is limited to the construction of appropriate radiation sources, is being co-joined with another, not funded by NATO, which concentrates on detection systems. Among the end-users of the combined systems is a consortium of three companies working to develop equipment for border security.

At the start of the project there were 9 participants: 1 Professor, 5 PhD holders, 1 junior researcher and 1 engineer. By the end of the project the Laboratory of High Energy Density was abolished (ITEP now is mostly intended for the aims of fission reactors), and several of the project participants left ITEP. However, in 2009 the A.A. Baikov Institute of Metallurgy and Material Sciences (IMET), Russian Academy of Sciences (Laboratory of Radiation Action upon Metals), Moscow, Russia, expressed interest in this project and invited 4 participants (including the project NPD) to continue the research in IMET.

The Project Co-Directors have published 3 papers in international peer review journals, 11 international conference reports and an IAEA Tech. Doc. and chapters in 2 monographs.

There were a number of institutions and organisations that were involved in this project such as the A.A. Baikov Institute of Metallurgy and Material Sciences (IMET), Russian Academy of Sciences (Laboratory of Radiation Action upon Metals), Moscow, Russia, which supported the projects field activities; while the main experiments were conducted in IMET (in cooperation with the Polish and Estonian partners on the Project) The Institute of Nuclear Physics Polish Academy of Sciences, Krakow, Poland, helped in Monte-Carlo simulations of the interaction of neutrons with matter.

The Institute of Atomic Energy, Otwock-Swierk, Poland, helped in experiments devoted to a disclosure of hidden fissile materials, and the N.L. Dukhov All-Russia Research Institute of Automatics, Moscow, Russia, assisted in experiments with Dense Plasma Focus (DPF) chambers filled with deuterium-tritium mixture and producing 14-MeV neutrons.

Impact: The Project Co-Directors are currently at the 4th to 5th stage of implementation. They are ready to conduct so-called “blind” tests. To be implemented in a real environment they must pass through several additional steps such as *mutual* use of neutrons with hard X-Rays for visualizing of the object under interrogation (currently being done separately). The most important one must include an elaboration of a procedure of fast numerical processing of the oscilloscope traces (this problem belongs to a branch of automatics known as “images recognition”).

The method used in this project (a single-pulse Nanosecond Impulse Neutron Investigation System - NINIS) enables the disclosure of hidden explosives and fissile materials during a hundredth of a nanosecond. It could work with *fast moving objects* (like a car with a suicide bomber or a coach filled with explosives or fissile materials). Therefore, it is envisaged that the results of this project will address local, regional and global security challenges, especially in the “*theatre of war*”.

This project has contributed towards NATO’s *Partnership* objective by enabling the collaboration of experts from Polish, Estonian and Russian institutes to conduct experiments in different places, as well as to comprehensively discuss with colleagues from various countries at International Conferences the advantages and restrictions of the NINIS technique.

5) Ref. 981186

Clean-up of Chemicals in Moldova
(Belgium and Moldova)

Effective start date: 1-Feb-2005; Final report: 31-Mar-2010

Researchers from Belgium and Moldova have addressed the threat of chemical pollution in Moldova posed by hazardous pesticide chemicals, which had been scattered throughout more than 30 districts, either in storage or buried in the ground. These stockpiles and dumps, especially those containing persistent organic pollutants (POPs), were believed to pose high health and environmental risks. The project provided the necessary facilities and training in order to characterize pesticide residues throughout the country. This has involved cataloguing pesticide dumping sites, improving analytical capabilities and establishing standardized sampling procedures. A centralized laboratory was selected for the analytical chemistry and was equipped with the requisite instrumentation including gas chromatographic mass spectrometry, high pressure liquid chromatography and pH-meters.

Six people from the Ministry of Defence of the Republic of Moldova were involved in this project. These included a Project Partner Director (PPD) responsible for the general management of the project at the national level, sampling management as well as quality control; a Director of Department of Supply, tasked with project acquisitions in the country; Head of the Policy Defence Department, responsible for international relationships; and 3 military personnel from NBC units, each responsible for technical sampling and shipment of samples to the laboratories.

The Ministry of Agriculture and Food Industry provided 5 people to participate in this project. They included a PPD, the Head of the Phytosanitation Test Product Centre and 3 chemistry technicians who were responsible for the testing of pesticide samples and pesticide residues in agricultural products and soil. There were 4 people from the Moldovan State University. A PPD, a University Vice-Rector, and 2 students, each responsible for the determination of inorganic compound presence in obsolete pesticides stockpiles. From the above mentioned participants 2 students and a PPD received stipends.

The Local Public Authority of 2 municipalities, 32 districts and Gagauz-Yeri were involved in organizing the sampling process on their administrative territory during 2006-2009. In addition, the Public Centre of the Ministry Of Defence and military and civil mass-media were involved in the public assessment of the project activities during 2006 to 2010. The ministries of finance, economy and customs were involved in free taxes for imported and purchased goods and services.

During the project it was noted that over 1,500,000 people lived in the vicinity of the pesticide waste sites and that the majority of the Moldovan population consumes mostly agricultural products found in the local markets. For this reason it was agreed upon that the local populations are the 'main actors' in the fight against the contamination of food, water and the environment. This information was broadcast on local TV and radio news networks, newspapers and in public awareness campaigns. The obligation on the part of the Moldovan authorities to disseminate information about pesticides extended to neighbouring countries, organisations and the scientific community at large. Subsequently, Moldova is positioned to act as fast as possible to eliminate the spread of obsolete pesticide waste in cooperation with EU member states, non-EU countries and the ENVSEC¹⁸ organisations (NATO, OSCE, UNEP, UNDP, REC).

This NATO funded project enabled the communities impacted by the pesticides the opportunity to debate important issues such as chemicals monitoring and control as well as take part in cooperative scientific research. This project provided training for a new generation of scientists and specialists in analytical chemistry, as well as in a wide range of studies, workshops, symposiums and other forums in which researchers would meet and exchange knowledge.

The Project Co-Directors managed to attract € 40,000 in additional funds from the Wine Companies during the period of 2007 to 2010.

During 2009 this project assisted in the analytical study of obsolete pesticides in the World Bank Project: *"The obsolete pesticides technical study in Kyrgyz Republic, Republic of Tajikistan and the Republic of Uzbekistan"*. This was conducted in co-operation with TAUW, a company from the Netherlands. The additional funds received for this project was € 1,920. This project has been the subject of 5 international conferences and has resulted in 5 publications including congress proceedings as well as 5 abstracts in congress books. To date, no patent applications have been filed as a result of this project.

Impact: The database created as a result of this NATO funded project, regarding the characterisation of the pesticides stockpiles, were used by a French company called TREDI in the GEF/WB Project *"Management and disposal of POPs stockpiles"* during the period of 2007 to 2008. This was for the purpose of evacuating and disposing of 1,296 tonnes of pesticide stockpiles from 12 districts of Moldova. Also, the database will provided cartographic information of the areas of Moldova contaminated with pesticides in a Canadian initiative, implemented by the Moldovan Ministry of Environment. In parallel, the analytical study of the Cismichioi pesticide landfill will facilitate the launch of a new project on the elimination of acute pesticide stockpiles risks on the environment and public health. Another possibility that is being considered is the use of the database in monitoring pesticide residues in food, environment and breast milk.

The benefits from this NATO SPS funded project are immense and far reaching. The government of Moldova will use the results of this project to protect the environment and the local population. This will be done by safely managing and disposing of pesticide stockpiles, through the

¹⁸ Under the ENVSEC Initiative, six International Organisations (NATO, OSCE, REC, UNDP, UNECE and UNEP) are coordinating their activities on environmental security issues in the vulnerable regions: South East Europe, South Caucasus, Eastern Europe and Central Asia (www.envsec.org).

strengthening of regulatory and institutional arrangements. This will ensure long term control of pesticide waste and other toxic substances, in line with the requirements of the related conventions and protocols ratified by Moldova.

6) Ref. 981454

Riverbank Filtration of Jordanian Surface and Groundwater Reserves

(United States, the Netherlands and Jordan)

Effective start date: 1-Jan-2006; Final report: 5-Aug-2010

Since July 2005, scientists from the United States, the Netherlands and Jordan have examined the efficiency of riverbank filtration (RBF) for the protection of surface and groundwater resources in Jordan. The intentional or unintentional release of pathogenic chemical, biological or radiological agents into drinking and irrigation water is a serious threat to health and agriculture. The objective of this research project was to evaluate RBF technology as a practical and inexpensive treatment for contaminated drinking and irrigation water drawn from Jordanian surface water resources. This initial treatment has lowered overall contaminant levels and has provided a buffer that greatly increases resistance against rapid deterioration of water quality caused by a release of harmful agents. RBF is a relatively new technology that has shown tremendous potential for meeting high performance requirements. As part of this method, the water is made to flow through riverbed soil into the pumping wells located on the banks of the river.

As the water passes through the riverbed soil and aquifer, dissolved and suspended contaminants, as well as pathogens, are removed by a combination of physical, chemical and biological processes.

In total there were 13 people involved in this project. Out of these there was 1 PhD student, 4 graduate students and 1 undergraduate student. The remaining 7 were a mix of civil engineers, biologists and hydrogeologists from institutions like the Jordanian Institute of Science and Technology, Mutah University, Water Authority of Jordan as well as the National Institute of Public Health and the Environment. As a result of this project there have been 9 proceedings and 2 papers.

Inpact: This project served as a model for a 2007 World Bank funded (\$ 183,000) project in a heavily polluted river environment in southern India. The goal of this project was to use the RBF site selection and investigation strategy developed in Jordan.

This RBF project in Jordan also received the attention of the *EU-India Riverbank Filtration Network* (<http://www.bau.htw-dresden.de/euindiabankfiltration/frame-motivation.htm>). This RBF initiative, lead by Dresden University, Germany, established the *Cooperation Centre for River Bank Filtration* in Haridwar, India, which is a joint-effort between institutions in Germany, the UK, Austria and India. This project was invited to collaborate with the Haridwar RBF center and as a result a meeting with the Project Co-Director and representatives from the Indian Institute of Technology was organized. Since then, a permanent collaboration has developed.

Based on the results of this project, together with the lessons learned from working on the commercial aspects of the RBF technology in India, the Project Co-Directors have developed a potential RBF business model. Under this model, the RBF system - once installed - is transitioned and eventually operated by a small private sector provider (SPSP), such as the local farmer cooperative. The World Bank views the SPSP model as a favorable means to assure and sustain accessibility to clean water. This is largely because SASP can market their water at similar cost than public water providers. This people-centered approach, however, relies on intensive training and education efforts to guide the transition of the RBF system to the SPSB. The type of consumer targeted were rural households in small towns or villages near rivers that are too

polluted to be useful. The goal is to produce water, of sufficient quality, for agricultural use, such as irrigation of high valuable cash crops.

In addition, together with the *African Center for Engineering Social Solutions* (ACCESS) of Kenya, Brown University (USA) and University of Hartford (USA), the Project Co-Director is developing a new water-centred field project which focuses on RBF as the central technology for treating water in rural areas near Lake Victoria. The experiences from installing the RBF system in Jordan will now be utilized in Sub Sahara Africa.

Currently the Project Co-Directors are working with US AID - Jordan on expanding the usage of RBF along the Zarqa River, Jordan. This may take the form of a 3 year \$ 3 million project centred on the methodologies developed during this project. The first step towards this was the submission of a concept paper in January 2011.

7) Ref. 981461

Capture and Decontamination of Chemical and Biological Agents (Russia and the United States)

Effective start date: 1-Jun-2006; Final report: 7-Jul-2010

Starting in June 2006, investigators from the Russian Federation and the United States cooperated in the development of equipment for the destruction of chemical and biological agents. This included the development of air concentration systems for the rapid removal of large volumes of contaminated air from the environment and the transfer to adsorption-photocatalytic filters. The scientists have also worked on ways to expedite the destruction of chemical and biological agents, specifically targeting chemical warfare agents. From the onset of the project, an apparatus has been set up to destroy agents introduced as aerosols. TiO₂ and Pt/TiO₂ photocatalysts have been successfully used to destroy an aerosol containing *Mycobacterium smegmatis*. Other biological agents were selected on the basis of their epidemiological importance.

In total there were 19 people involved in this project. Of these 3 were science PhD holders, 6 were PhD students, 5 were junior researchers and the remaining 5 were students. Twelve of these participants were stipendiary. The Russian Foundation for Basic Research and the International Science and Technology Center donated € 33, 462 and € 40, 099, respectively, to this project. Also, there were a number of Russian and American institutions that were involved in this project. These were the University of Cincinnati (USA), Boreskov Institute of Catalysis (RUS), Lavrentyev Institute of Hydrodynamics (RUS), State Research Center of Virology and Biotechnology "Vector" (RUS) and OOO "Aeroservice" (RUS). These institutions were instrumental in the creation of novel photocatalyst (adsorbents) as well as their characterization. In addition, they conducted the research and development of adsorption – photocatalytic air purification unit's parts and design including the elucidation of capabilities for the treatment of biological agents, air purification equipment related studies as well as the implementation of the project results.

The implementation of the project results is carried out with close and continued collaboration with the end-users in commercial enterprises as well as governmental agencies. At present, this includes maintaining regular contacts, initiating research and development contracts as well as performing research to determine the applicability of the project results. The planned activities include creating new models of air purification units and mutual studies on their performance, utilization of project results, materials created and knowledge and experience obtained.

The number of publications derived from this project has been quite substantial. There have been 18 international peer reviewed journals as well as 27 conference proceedings. There have also been 3 national patents as a result of this project; however, only 1 is being implemented while none have been put to commercial use.

A potential major industrial end-user, Airlife Inc. of Lipetsk, Russia, has expressed interest in using the photocatalysts and catalysts supports for commercial production of air purifiers.

Impact: The project findings are of immediate benefit for people involved in the photo catalysis research at the institutional, national and global scale. The results of the project will help to enhance global security against the spread of disease and toxic chemical exposure. The research and development activities have focused on the destruction of model biological and chemical agents, the engineering of air de-pollution systems including the development of novel photo catalyst and photo catalyst supports, geometries of adsorption-photo catalytic air purification units as well as their testing infrastructure expansion. The project served as a catalyst for a number of global research projects on air, water, soil and surface purification and protection against biological and chemical agents. The research findings of this project, which are in a number of publications, are frequently cited worldwide.

The projects activities contributed strongly towards the development of partnership, and trust between the scientific communities of Russia and the USA. The mutual visits facilitated the understanding of each others country and academic culture, research climate and helped in the exchange of experiences and ideas.

8) Ref. 981476

Decontamination of Neurotoxic and Vesicant Compounds
(Canada, Italy, Romania and Spain)

Effective start date: 29-Oct-2005; Final report: 16-Apr-2010

Starting in October 2005, investigators from Canada, Italy, Romania and Spain have cooperated in the development of a photocatalytic procedure for neutralizing neurotoxic and vesicant compounds. This would be useful in the clean-up of land and materials exposed to chemical weapons. The work employed a series of solid photocatalysts used in photocatalytic degradation tests with chemical warfare agents. Photodecomposition carried out in the laboratory with the vesicant agent Yperite has shown excellent results. This was confirmed by experiments conducted under real conditions in the field. Tests have also been conducted on Soman, a powerful neurotoxic agent, and some derivatives of it. As the project progressed more tests were carried out under varying conditions of temperature, humidity and sun intensity. One end-user of the results is the Romanian Ministry of Defence.

In total there were 17 people involved in this project, 7 of which were professors, 2 scientists and 8 PhD students. The project attracted € 100,000 in additional funds from various government ministries. The results of this project have been published in 8 scientific journals and were the subject of 7 international conferences.

Impact: The results of this project provide protection and ways to remediate terrorist attacks involving chemical warfare agents. This project has also helped to create a cooperative network of scientists and experts that have plans to continue working together after the end of this project.

9) Ref. 981786

Rapid Detection of Bioagents Using Nanomechanics
(Czech Republic, Israel, Italy and Ukraine)

Effective start date: 1-Apr-2006; Final report: 28-May-2010

Starting in April 2006 investigators from the Czech Republic, Israel, Italy and Ukraine have cooperated in a project that created better sensing techniques for the rapid detection of Bioagents.

The project involved modifying silicon/silicon-oxide surfaces and newly developed cantilever surfaces so that receptors for Bioagents can be imbedded on them. A feasibility study for scaling down the laboratory device to a portable device was also conducted during this project. From the onset of the project a porous silicon layer has been made on commercial cantilevers by a chemical etch method, and polyclonal antibodies to *E. coli* have been immobilized on the array. During the end of the project the experts performed experiments to detect *E. coli* using antibody-immobilized micro cantilever bending measurements and developed magnetic actuation and signal enhancement of the cantilevers. Gold nanoparticles were also used as a signal-enhancement technique.

In total there were 6 people involved in this project, 1 of which was a professor, 2 were post doctorates and 3 were PhD students. Three received stipends. The results of this project have been featured in 25 international journals and have been the topic of 9 conference presentations.

Impact: The results of this project have led to 4 PhD and 5 master-level students being accepted for new nanobiotechnology-related projects. Also, the scope of the project will be expanded within a newly planned EU – ESF project “*CEITEC – formation of nanobio-related core facility and research program*”

10) Ref. 981865

Novel Agents to Neutralize Toxicity of Venom Polypeptides

(Belgium and Tunisia)

Effective start date: 1-May-2006; Final report: 8-Jan-2010

Scientists in Belgium and Tunisia have worked together to develop agents capable of neutralizing the toxicity of polypeptide venoms. This has involved the identification of a new heavy-chain antibody-based neutralizing agent and the development of therapies using it. Since the start of the project, venom from *Androctonus australis* (a type of scorpion) has been collected and frozen. The toxins Aahl and AahlI have been purified from venom, and dromedaries were immunized with these toxins. The investigators constructed an antibody library and ranked all antibodies according to their Aahl and AahlI-neutralizing capacity. Antibodies with high neutralizing activity have been further tested.

Altogether there were 8 people involved in this project; 1 professor, 3 PhD holder, 2 PhD students from Tunisia and 2 PhD students from Belgium. The results of the project were the subject of 6 articles in international peer reviewed journals and has resulted in 1 patent application in Tunisia. The results of this project have also been the subject of 10 national and 9 international conference presentations.

The image laboratory at the Academic Hospital in Brussels (UZ Brussels) provided the technical know-how and imaging equipment to label and follow the pharmacodynamic and pharmacokinetic parameters of the products. Apart from publishing the project results in scientific journals, the Project Co-Directors disseminated the data at conferences, guest lectures, university seminars and research institutes. The Project Co-Directors have plans to test the scorpion antivenom therapeutic product in large animals and then commence with GMP production for tests to be carried out on humans. However, the large costs of GMP production and the clinical phase of the project have prevented the continuation of the project.

Impact: Those to benefit from this project are the local Tunisian population as well as the people living in the same areas as the scorpion (Algeria and Libya). The results will also help other countries experiencing endemic populations of scorpions.

An encouraging by-product of this NATO funded project has been the opportunity given to the participating Tunisian students to further their education. It has also raised the visibility of scorpion toxin binders at scientific conferences. In terms of knowledge transfer it has helped the Tunisian partner to equip its laboratory with the latest technology and has also helped them to publish a number of internationally renowned scientific articles.

11) Ref. 981866

The Genetic Bases of Hypoxic Pulmonary Hypertension and Acute Mountain Sickness
(Kyrgyzstan and United Kingdom)

Effective start date: 1-May-2006; Final report: 29-Oct-2010

Beginning in May 2006 experts from Kyrgyzstan and the United Kingdom sought to understand the factors that influence the response of the pulmonary vasculature to hypoxia in highlanders living in Kyrgyzstan, an ethnic group that have lived at altitude for several hundred years, with a view to identifying risk factors and treatment strategies.

Life at high-altitude exposes human beings to hypoxia, which carries significant health risks such as pulmonary hypertension. The major elements of this project comprised an epidemiological screen of high-altitude residents (2,400 to 4,200 metres) for high-altitude pulmonary hypertension (HAPH) and matching healthy controls; an investigation of candidate genetic risk factors based on known biology; a study of acclimatisation of lowlanders to high-altitude and pharmacological interventions based on candidate factors and available drugs.

From 2006 to 2009, Doppler-Echo assessment was performed in more than 1,500 highlanders and 12% had evidence of HAPH. Subjects with HAPH and subjects liable to acute mountain sickness demonstrated lower exhaled nitric oxide levels and higher levels of ADMA, a circulating endogenous inhibitor of nitric oxide synthase, suggesting a role for the nitric oxide signalling pathway in maladaptation to high-altitude existence. In support of this, treatment of HAPH subjects with L-arginine, a substrate for nitric oxide production, appeared to reduce pulmonary artery pressure measurements.

Circulating levels of endothelin were also elevated in HAPH subjects, and acute treatment with an endothelin antagonist reduced pulmonary artery pressures. Treatment with fasudil, an inhibitor of Rho kinase (a target for nitric oxide signalling), also reduced pulmonary artery pressure in HAPH subjects. In contrast, short term treatment with rosiglitazone, which stimulates DDAH, was not effective. Specific polymorphisms of genes encoding ACE, DDAH2, endothelin and angiotensinogen were found to be more common in people with HAPH, offering the possibility of genetic screening, but this must await separate validation studies.

During this project a total of 19 people, including PhD physicians, young researchers, technicians and post graduate students, took part with 8 of them receiving stipends. The Project Co-Directors managed to attract € 7,600 in extra funds from the Kyrgyzstan Ministry of Education and Science. Also involved in this project were a number of notable institutions in London and in the region, such as Imperial College of Science, Technology and Medicine, Hammersmith Hospital (London); National Center of Cardiology and Internal Medicine, Ministry of Health, Kyrgyz Republic; Regional hospital of Naryn region; Regional hospital of At-Basy region; Regional hospital of Ak-Shyirak region; Aid post of frontier post of Naryn region. The project results were published in 8 peer reviewed journals and were the subject of 8 international conferences.

Impact: During the project, the Kyrgyz team worked with a number of medical scientists, physicians, officers of public health services and military physicians of the Frontier Guard Services. They shared expertise in mountain medicine, science and disseminated up to date knowledge. The results of this study are being used in the National Center of Cardiology and Internal Medicine

for the diagnosis and specific treatment of patients with HAPH. It is also used at Kumtor mine (4200 m above sea level) during the selection process when choosing workers to work in high altitude. The results are also being used at the local hospital in At-Bashy district and Alai district serving high-altitude communities. In fact, during the time of the project the Kyrgyzstan people living at high altitude received the required medical service. From 2006 to 2010 the project participants performed what is called a Doppler-Echo assessment in more than 1500 highlanders and it was found that up to 12% of adult highlanders had some signs of HAPH.

This project also helped in improving the scientific infrastructure of the Kyrgyz institute. The NATO funding enabled them to acquire a portable Doppler-ECHO-cardiograph; NIOX MINO machine for the measurement of exhaled NO low temperature freezer, a water purification system and a number of computers. The results of this project will enable the Kyrgyz Frontier guards serving at high altitude to apprehend and stem the flow of terrorists entering Kyrgyzstan from the Pamir region of neighbouring Tajikistan. The project was helpful in training a series of junior physician-scientists and 3 were awarded PhDs.

12) Ref. 982063

Management of Security Related R&D in Support of Defence Industrial Transformation
(Bulgaria, Germany, Romania and the Former Yugoslav Republic of Macedonia)

Effective start date: 15-Oct-2006; Final report: 7-Jun-2010

The main objective of this project was to study and give practical recommendations for the transformation of security and defence related Research and Development (R&D) management. The result of this will lead to a more comprehensive and integrated defence industry system that is supportive of new network enabled capabilities essential in both the fight against terrorism and emerging security threats. Thus, a new Concept and Model for defence R&D management was elaborated to serve as an integrator of National Defence and defence industries. Its purpose is to help the transformation and internationalisation of presently fragmented and nationally oriented defence industries, as well as to solve the challenging social problems stemming from defence industry crisis. The national and regional defence industries are isolated and a new level of regional cooperation as well as wider international cooperation is needed.

Enhanced R&D capabilities in new technologies and intellectual property are crucial to the defence industry. To ensure continued success these capabilities must be properly managed and improved. The management of R&D activities is comprehensive and has to be steered within a strategic framework, which is based on national security needs and economic prospects. Ad-hoc employment of state support has to be reoriented toward a strategy for support and development of specific R&D advantages.

One strong practical result of the project is the R&D Concept and Model, (R&DCM). The Model explicitly shows the specific relative advantages from which the defence industry can benefit and/or the scientific areas which have to be developed and supported to fill the gap between the current level of capabilities and politically adopted concepts. Therefore, the setting-up of requirements for new R&D activities in the participating nations has to be based upon the respective national capabilities assessment and will improve relations between national administrations and business. As NATO member countries Bulgaria and Romania need a NATO-compatible Defence R&D Concept and Model, which can play a basic role in developing and improving areas such as management, setting-up requirements for the defence industry and Joint Projects as well as Military Codification and NATO Standardization.

There were a total of 47 people involved in this project, 21 of which were professors/assistant professors, 25 students and 1 state secretary. All of the participants were stipendiary. Support from the world of academia came from notable institutions such as the University for National and

World Economy (Sofia, Bulgaria), the Institute for Parallel Processing of the Bulgarian Academy of Sciences (Sofia, Bulgaria), the National Defence College/Ministry of Defence (MoD) (Bucharest, Romania), the European University Skopje (Skopje, The Former Yugoslav Republic of Macedonia) and the University of the Bundeswehr Munich, Institute for Techniques of Intelligent Systems.

The Project Co-Directors have currently produced 7 project publications detailing the results of this project as well as a series of thesis papers. They have also taken part in 5 international conferences, 4 in Bulgaria and 1 in Romania, where they presented the findings of their project and elaborated on the best way forward.

Impact: The project results are intended to significantly improve cooperation and interdependence in advanced technology sectors. This will enable the South East European Regional Security Council improve regional security as well as participating countries governmental and industrial policies. Aside from this benefit this project has made a substantial contribution to building a good relationship between academia, a number of national MoDs, industry and the project participants at various levels. A self sustaining network of scientific cooperation has been created, which will help maintain peace and security in the region.

13) Ref. 982143

Prediction of Glacial Hazards in the Central Caucasus, Russia
(Canada and Russia)

Effective start date: 26-Nov-2006; Final report: 16-Jan-2010

Beginning in November 2006, experts from Canada and the Russian Federation have cooperated in a project to study the disasters caused by glaciers in the Central Caucasus region of Russia. The project advanced knowledge of these types of disasters and made improvements to modeling techniques of slope instability and debris flow, as well as produced hazard maps and developed a set of emergency response criteria. Since the start of the project, past glacial disasters in the region have been catalogued and maps of glacial lakes and flow hazards have been made. The Kalka Glacier disaster was modeled with DAN-3D model/software. The maps generated by this study are of particular interest to Emercom North Ossetia-Alania in Vladikavkaz, Russia and the Sevkavgeoprovdokoz Institute, Pyatigorsk, Russia.

In total there were 53 people involved in this project including 5 co-directors, 36 participants and 12 end users. Out of these 15 were stipendiary young scientists. The Russian Foundation for Basic Research and the national Geographic Young Explorer Grant donated € 125, 000 and € 5, 000 to this project. The results were published in 27 scientific papers in peer reviewed journals, 28 conference papers and 20 conference presentations. In addition, there was at least 41 items about this project in Russian national massmedia (TV, radio, newspapers and the Internet).

The Project Co-Directors have been transferring the project results to end-users during the project and this has culminated in the October 2009 end-user workshop in the Caucasus. Since then, they have continued monitoring the glacial hazards in the region and interacting with end-users.

In addition to five end-user organisations (Main office of the Russian Ministry for Emergencies and Disaster Mitigation (Emercom) in the Republic of North Ossetia-Alania, the Subsoil Resources Management Territorial Agency (Sevosetinnedra) of the Russian Ministry of Natural Resources in the Republic of North Ossetia-Alania, Main office of the Ministry of Russian Federation for Emergencies and Disaster Mitigation (Emercom) in the Republic of Kabardino-Balkaria, Regional Office (Kabbalkgeo-monitoring) for the Federal Agency of Mineral Exploration of the Russian Ministry of Natural Resources and Environmental Protection in the Republic of Kabardino-Balkaria, North Caucasian Engineering and Design Institute for Water Industry and Land Reclamation (Sevkavgeoprovdokoz)) the Project Co-Directors have also involved the National Park Alania in

North Ossetia-Alania and the government of the Republic of North Ossetia-Alania, local administrations of Elbrus settlement and Karmadon village. All these organisations were recipients of the projects hazard assessments and interacted with the project participants in formulating the requirements for the research. They continue to cooperate with the Project Co-Directors in glacial hazard monitoring.

Impact: The project participants gained a unique opportunity to participate in a knowledge transfer, which enabled them to fulfil a large-scale research project oriented at end-user implementation and the training of young scientists.

Thanks to this project they were able to raise their research to international standards, train several outstanding young scientists, and obtain research and professional contacts worldwide. In several cases NATO funding acted as catalyser to write new research proposals and obtain other research grants.

Local and regional challenges in the Caucasus are being addressed through the continued monitoring of glacial hazards. It is estimated that dozens of lives have been saved in the region due to the warnings ascertained as a result of the project. Lessons learned in this project can contribute to the worldwide improvement of hazard monitoring technologies near mountain glaciers.

Throughout the project there was a fruitful exchange between scientists from NATO and Partner countries. Participants on both sides gained invaluable research and field experience. Joint activities resulted in numerous publications, as well as 5 PhDs, 2 MScs, and 13 5-year Diploma degrees and thesis. Research collaborations continue.

14) Ref. 982158

Countermeasures against Sepsis Caused by Biological Weapons
(Bulgaria and France)

Effective start date: 1-Oct-2006; Final report: 23-Apr-2010

Scientists in Bulgaria and France have cooperated on a project to develop a treatment for the sepsis caused by biological weapons. Sepsis and septic shock are major causes for death worldwide and cases would increase dramatically in an attack involving biological agents. The focus of this project was on improving immunoglobulin preparations in animal models of sepsis, septic shock and multiple organ dysfunction. Since the start of the project, it has been demonstrated that the infusion of a single dose of ferrous ions-exposed pooled immunoglobulin G (IVIg) results in significantly improved survival rates. It was further shown that the continuous presence of the ferrous ions, bound to the IgG molecule, is necessary. The ferrous ions-exposed immunoglobulins had not only a prophylactic, but also a therapeutic effect, when administered as late as six hours after the induction of sepsis.

In a separate set of experiments, it was demonstrated that acid pH-exposed and heme-exposed G (IVIg) also had therapeutic potential.

In total 9 people were involved in this project, which included 1 professor, 3 research fellows, 2 PhD students and 3 undergraduate students. None were stipendiary. The Project Co-Directors managed to attract an additional € 25,000 from the Bulgarian National Science Fund to augment the funding NATO provided for this project. The results of the project are featured in 3 publications and the Project Co-Directors have made 1 patent application.

Impact: It is envisaged that several bio-tech companies will benefit from the results of this project and that eventually patients suffering from severe inflammatory disorders, brought on by sepsis after a biological weapons attack, will be able to get treatment from the discoveries made in this NATO SPS funded project.

15) Ref. 982159

Environmental Security in Khorezm, Uzbekistan
(United States and Uzbekistan)

Effective start date: 6-Jul-2006; Final report: 24-Aug-2010

Beginning in July 2006, investigators from the United States and Uzbekistan cooperated on a project designed to assess the security of the environment around Khorezm, Uzbekistan. To do this, they investigated the quality of the water, aquatic ecosystems and aquatic food sources, and developed models of anthropogenic influences on the irrigation lakes and Amu Darya River. This included determining the potential utility of the region for aquaculture and other water-related industries. Since the start of the project, three comprehensive sampling studies have been carried out on 13 irrigation lakes and three sites on the Amu Darya River. In addition, monthly samples for water quality were taken from many of the lakes and the river sites, continuing on throughout the project lifecycle. The researchers analyzed the samples for stable radioisotope content and organic contaminants. In implementing the project results, the end-users in Uzbekistan include the State University of Urgench, the Institute of Water Problems, the Hydrometeorological Research Institute and the Center for Environmental Research of the German-Uzbek Khorezm Project, as well as local landowners.

In total there were 16 people involved in this project, of which 10 were young scientists. Six of the students received stipends. The Project Co-Directors were able to attract \$ 139, 995 (€ 102, 066) in extra funds from the US National Science Foundation: The results of this project were published in 1 peer reviewed publication, 1 submitted peer reviewed publication, 2 published publications in conference proceedings and 4 scientific publications.

The Institute of Zoology and the Uzbekistan Academy of Sciences provided assistance with some analyses. They and The National University of Uzbekistan, Uzbek Research Centre of Fishery Development Institute of Irrigation and Melioration participated in End-User training. The Project Co-Directors gave presentations on the project at the American Society of Limnology and Oceanography and American Geophysical Union Fall meetings.

Impact: In 2009 the Project Co-Directors began training the End-Users and young scientists in Uzbekistan the techniques used to perform this project. The co-directors continued to collaborate with the ZEF-UNESCO project, which is exploring alternatives to water and land management in Khorezm. The organisers of the project plan to link the data from this NATO funded project with their models to examine the possibility of using aquaculture as an alternative economic resource.

This NATO funded project facilitated collaboration between US and Uzbek experts and institutions that would probably not have been previously possible. An encouraging by product of this is strengthened links and understanding between the two nations. This project is capable of addressing more wider, global concerns as the issues in the Khorezm region tend to be characteristic of arid regions where heavy flood irrigation has occurred. The threats to water sustainability are not unique to Uzbekistan. In addition, the techniques used in this project can be useful in other regions where resources are scarce.

16) Ref. 982381

Social and Environmental Impacts of Mariculture in the Red Sea
(Germany, Israel and Jordan)

Effective start date: 1-Mar-2007; Final report: 20-Sep-2010

Beginning in March 2007, investigators from Germany, Israel and Jordan have been cooperating in a study of the impact of marine aquaculture in the Red Sea on the surrounding environment. The project involved the analysis of the prevailing conditions in the sediments and sea floor under the fish cages, as well as the water column surrounding the fish farms in Eilat, Israel. The investigators are currently examining changes in the environment resulting from the removal of the cages from the sea. A previous observation (1991) indicated that the sediments have a rapid recovery rate after farms are removed. Included in the project is an assessment of the socioeconomic and environmental feasibility of sustainable fish cage aquaculture in the Gulf of Aqaba.

Since the start of the project, sediment and water samples have been collected, mainly in Eilat, in the waters adjacent to the fish farms. These have been analyzed for nutrients, organic matter, sediment oxygen demand, stable isotopes, foraminifera, macro fauna and other variables. A socioeconomic programme and questionnaire were developed and carried out in the second year of the project. There were 8 principle investigators involved in the project, all of whom were PhD holders, as well as 20 students and technicians. All participants were stipendiary. Student training for this project was carried out by the University of Kiel, Ben Gurion University, University of Jordan and Yarmuk University. Aqaba Municipality was responsible for policy formation whilst the Technion Israel Institute of Technology provided training.

Impact: The results of this project have been presented at scientific fora in Israel, Jordan, Germany, the USA and elsewhere. The Project Co-Directors are currently in the process of preparing scientific publications to share the lessons learned with professional colleagues. In addition the outcome of this research will be presented to policy-makers, politicians, coastal planners and decision makers. The immediate beneficiaries of this project are deemed to be coastal planners and the aquaculture industry.

17) Ref. 982498

Prototype for the International Situational Centre in Case of Ecoterrorism
(Italy and Russia)

Effective start date: 19-Apr-2007; Final report: 19-Jul-2010

Commencing in April 2007 researchers in Italy and Russia worked to develop an International Situational Centre that addresses the growing threat of ecoterrorism. They developed a facility for the acquisition, storage and retrieval of unclassified data useful in counteracting ecoterrorism. The Centre is linked with analogous organizations in other countries. Since the start of the project, the researchers collected information on possible targets of ecoterrorism and on the nature of potential threats, through literature searches, scientific meetings and individual contacts with potential end-users. During this project the Situational Centre of the Russian Academy of Public Administration acted as the model on which the International Situational Centre was based. During the project the participants established the Centre, completed a database on potential targets and initiated an evaluation of sensor technologies.

The Russian Academy of State Service, NOU "IPK NEFTECHIM", AR-TI Limited, the National Institute of Development, the Academy of Geopolitical Problems and two institutes from Latvia contributed to developing the prototype of an International Situational Centre. There are plans to replicate this in the Baltic region as well as Northern and Southern Europe.

In total there were over 30 specialists from different organizations who were working on the project, none of which were stipendiary. This project was successful in attracting € 36,000 in extra funds from the Economy and Safety Organisation of Russia and Latvia. The results of this project have been the subject of 6 proceedings, 14 international and 16 national conferences as well as 8 books. There were no patents as a result of this project.

Impact: The results of this project forms part of a concerted effort to address the emerging security challenge of ecoterrorism on a global scale. A Prototype of the International Situational Centre was created, creating a regional situational centre in the Baltic's. As mentioned above a North-European and South-European centre is also being planned. Depending on the availability of funds they will be merged into an International Situational Centre in accordance with the NRC(SPS) Committee "*Action Plan*"¹⁹.

18) Ref. 982590

Hazardous Chemical Contamination in the Sava River Basin (Croatia and Norway)

Effective start date: 21-Sep-2007; Final report: 20-Dec-2010

Starting in September 2007, investigators from Croatia and Norway worked on a project that aimed to measure hazardous chemical contamination in the Sava River basin. The Sava River represents the natural north-western boundary of the Balkan Peninsula and flows through Slovenia, Croatia, Bosnia and Herzegovina and Serbia and connects the capital cities of Ljubljana, Zagreb and Belgrade. The river basin is a strategic priority for all riparian countries, and the basin catchment area accounts for 40% of the land area of these countries and more than 80% of total available water resources. The key environmental problem is the release of contaminated untreated effluents from municipalities and industrial facilities with old and environmentally unfriendly technologies. The transboundary consequences of the hazardous contamination cause serious environmental concerns and associated security risks. By developing and applying a state-of-the-art approach for the identification of priority pollutants, this project addressed that critical deficiency in the current approach to water management of the Sava River basin.

There were 25 people involved in this project of which 13 were PhD holders, 9 were master's degree holders, 2 held bachelor's degrees and 1 was a technician. In total 6 of the participants were stipendiaries. A significant part of the activities were carried out in synergy with the basic projects funded by the Croatian Ministry of Science, Education and Sports (MSES).

The contribution of MSES was approximately € 50,000 per year. In addition, the Project Co-Directors were active in proposing some related projects in order to demonstrate the implementation of the developed tools for contaminant identification and prioritization, however, no funding has been secured for this.

The activities during the project resulted in 3 peer reviewed published papers, one submitted paper and an additional 2 are currently being prepared. This project has also been the topic of up to 26 papers that were presented at 14 national and 12 international conferences respectively. This project was supported by the 3 main end-users, including the Croatian Environment Agency, Croatian National Institute for Public Health and Institute for Research and Development of Defence Systems. Their contribution was mainly in providing the information needed to plan the project field activities. No financial support was obtained from these sources; however, the

¹⁹ NRC(SPS)D(2007)0006, Final Report of the Short Term Project on Development of a Prototype System for Sharing Information Related to Acts of Terrorism to the Environment, Agriculture and Water Systems (Eco-Terrorism), p.6

representatives from these institutions participated in informative workshops, which helped in the dissemination of the approaches and achievements of the project.

Impact: As indicated in the final report, the results of this project provided several benefits such as:

- Capacity building of the specialized laboratories capable of performing complex EDA studies;
- Development of cost-effective EDA procedures, adapted for the assessment of hazardous contamination in the Sava River basin, and
- (Eco) toxicological prioritization of contaminants present in the Sava River as a basis for rational planning of water protection measures.

The authorities responsible for water management and implementation of water protection strategies, including the Croatian Environment Agency and Croatian National Institute for Public Health, will strongly benefit from the results of this project.

This project launched an initiative on transboundary cooperation with Laboratories from the University of Novi Sad (Serbia) and Vukovar-Srijem County (Croatia) on the project entitled "*Development of the Effects-Directed Analyses (EDA) framework for identification of hazardous chemical contamination in the Croatia-Serbia transboundary area of the Danube and Sava River basins*" under the Instrument for Pre-Accession Assistance (IPA), Component II. It is expected that the input from this project could be very helpful in the design and implementation of the Sava River Management Plan based on the experience with the Joint Danube Survey, which involves participants from several NATO countries.

This project is included in the portfolio of the Environment and Security (ENVSEC) Initiative, under which activities of six international organizations are coordinated.

19) Ref. 982735

Quantum Dot Single Photon Sources for Data Encryption

(Germany, Russia and the United States)

Effective start date: 7-Aug-2007; Final report: 22-Dec-2010

Since August 2007, investigators from Germany, Russia and the United States have cooperated in a project on data encryption using electrically driven quantum dot single photon sources. There is an urgent need to improve the security of data transmission and storage to avoid penetration by terrorists, industrial spies and other criminals. Classical cryptographic systems are based on coding of messages with certain algorithms that can be activated by a secret key. With the increase in the computational power of modern computers, decoding of such messages can be more easily accomplished, so alternative cryptographic solutions are necessary. The quantum cryptography (or QKD - quantum key distribution) takes advantage of the quantum nature of single photon transmission and, thus, the basic properties of quantum mechanics. The physical uncertainties associated with quantum mechanics render error-free reading or cloning of single photon transmission impossible, without *a priori* knowledge of the quantum state.

Practical implementation of quantum cryptography systems is possible only with the development of a cost-acceptable, current-driven monolithic semiconductor single-photon source (SPS). Development of such a source is the main goal of the project.

The project produced a quantum dot SPS, which is capable for operation at elevated temperatures. Six partners from the academic world joined forces to deliver a prototype system which can be commercialized by a high-tech company in St. Petersburg, Russia.

In total there were 6 people involved in this project; 3 professors and 3 students. The results of this project were presented at 42 international conferences and were published in 17 international peer reviewed journals.

Impact: The result of this project has led to the further improvement and development of superconducting nanosensors, which are to be used by NASA in the United States. This initiative will help to secure communications and monitor the environment.

Annex IV-c

SPS Network Infrastructure Grant (NIG) Projects Implemented in 2010

1) Ref. NIG 982702

New RENAM-RoEduNet Gateway Based on CWCM

26 April 2010 saw the completion of a NATO infrastructure Grant in Chisinau, Moldova, which helped to create a high performance, reliable and effective fibre optic backbone connection between national scientific – educational networks, such as the Research and Education (R&E) Network of Moldova (RENAM) and Romania Education Network (RoEduNet).

The project was primarily focused on improving all the basic characteristics of regional and international connectivity channels like capacity, performance, quality of services, multimedia streaming support, GRID computing support, GEANT community integration and regional research networking promotion taking into account the ability to enlarge joint fibre optics infrastructure to the Eastern Europe.

This project was a follow-up and further development of previously adopted NATO supported projects that were executed in Moldova. These were:

- NIG 972759 – “AMNET” – *Development of Science and Educational Network in Moldova*
- NIG 975476 – “*The Informational Corporate Network of the Polytechnic Community*”
- NIG 977298 – “*RENAM Network – second stage*”
- NIG 978385 – “*RENAM-RoEduNet networks direct link and gateway construction*”
- NIG 980321 – “*RENAM 5 GHz – band wireless Network Construction*”

The strategic objective of this project was to establish a direct ‘Dark Fibre’ fibre optic link between RENAM and RoEduNet, which provides conditions for broadband joint investigations, teaching activity promotion, online scientific collaborative work assistance and video-conferencing, implementation GRID technologies and getting access to GRID computing. It also helped to empower regional connectivity between National R&E networks of neighbouring Eastern European countries.

Impact: This project also facilitated the creation, improvement and widening of research cooperation support facilities as well as scientific educational content development in the Romanian language.

Another benefit from this project has been the integration of the Moldovan academic community with their European counterparts by providing a more agile and reliable access to the Trans-European research and educational network. This has provided the forum for regional and international academic cooperation that is mutually beneficial to all parties involved.

2) Ref. NIG 983279

Regional Segments and Implementation of New Services in the Ukrainian National Research and Education Network URAN

The completion of the NATO Networking Infrastructure Grant project in Kharkiv and Kiev, Ukraine addressed previous challenges experienced by the Ukrainian National Research and Education Network (URAN), geographically the biggest and widest Ukrainian network structure connecting

both universities and organisations (which ones? as not everybody is accepted in GEANT) to GEANT and the Internet.

This project led to the successful upgrading of the URAN backbone with additional fibre optic and microwave segments in Kiev, Kharkiv, Donetsk and the Crimea region. In addition, fibre optic segments were created in Lviv, Vinnitsa, Rivne, Khmelnytsky, Chernigiv and Nikolaev.

Impact: New universities and organisations have been connected to the URAN network, which has been upgraded with video conferencing servers that enable users to conduct virtual meetings, interactive long distance learning and seminars over URAN channels. The installation of a new IPv6 router in Kiev, Kharkiv and Odessa has greatly facilitated the forwarding of GEANT traffic to URAN users in science oriented URAN segments in the large cities of Ukraine. This project has also implemented a new service of corporate telephone communication over IP between digital university telephone stations on the URAN.

3) Ref. NIG 983457

Setting of the Computer & Electronics Engineering Faculty in Kabul Polytechnic University (KPU)

This project set up a Computer and Electronics faculty in Kabul Polytechnic University (KPU) in Kabul. Using Ankara University's Engineering Faculty as a model, a similar school of engineering was replicated at KPU. This will initially consist of 2 departments and will be open to expand with other departments in the future. This faculty has been equipped from NIG funds with all the modern facilities, up to date computers. This project has also equipped the KPU with modern inter connected laboratories, which enables the students and faculty members to transfer data and files. A medium scale parallel processor unit has also been constructed for fast computing operations.

Impact: This project has greatly benefited higher level students and has enabled them to carry out their studies as well as improve their computer skills. In parallel, an English Language teaching facility has been set up in the computer labs. It is foreseen that in four years time students graduating from the KPU will have acquired the same knowledge as their peers in the west.

4) Ref. NIG 983659

Educational Network of Lankaran State University

The completion of this project has created a robust information communication technology infrastructure, which links several buildings within the Lankaran State University (LSU) in south-eastern Azerbaijan. Complying with modern standards the university network will allow for greater cooperation between Lankaran State University scientists and educators with their counter parts in European and global academic institutions. This is in tandem with the current trend of linking Azeri educational systems, which was initiated by their link to the Virtual Silk Highway Project and is due to be replaced by a high speed fibre link to GEANT within the Black Sea Interconnection Initiative.

This project was born out of the growing demands for multimedia, e-learning, e-library and other kind of services which require a high speed data network. Due to the relative proximity of the university buildings from each other a distributed campus network was deemed to be the most appropriate solution. This implied a high speed core built on a fibre optic backbone. Prior to the start of this project LSU only had a poor Local Area Network infrastructure located in four of its buildings and they were not interconnected. This coupled with the low bandwidth restricted the provision of modern IT services at the LSU.

The awarding of this NIG grant enabled the procurement of a core fibre optic backbone and its components, core communications equipment as well as a server and tape back up equipment.

After the installation of the equipment system administrators at each faculty, departments and the library were given training on how to use the equipment.

Impact: This project has created a modern university campus network and has also produced 30 system administrators that are eligible for Cisco certification. It has also enabled 120 high school teachers to pass initial courses in Information Communication Technology. The university network is now linked to the Lankaran city network, the local AzTelekom operator as well as the local government network.

5) Ref. NIG 983667

Educational Public Key Infrastructure to Enhance Information and Communications Security in Armenian Cyber Communities

This project successfully deployed an Educational Public Key Infrastructure (PKI) in Armenia that will provide scientists, engineers, graduates and PhD students with the tools to safeguard information in cyberspace. This will be done through a mix of education and practical training in the latest technologies used in cyber security. To ensure the security of data transferred through cyberspace four principles must be adhered to: sender verification, data integrity, confidentiality and non repudiation. PKI, which is created by a Certification Authority (CA), has been found to be the most advanced technology that satisfies these requirements.

Groups from 4 Armenian institutions participated in this project: Armenian e-Science Foundation (ArmSFo), State Engineering University of Armenia (SEUA), Yerevan Physics Institute (YerPhI) and Yerevan State University (YSU). The ArmSFo group has an established expertise in CA management and other PKI-related issues and for this reason they took the lead and coordinated this project.

The SEUA, YerPhI and YSU teams organised the educational process in their institutions. In parallel they also provided assistance to the establishment of the Registration Authorities in their institutions and will assume operational responsibility for these authorities.

Impact: The completion of this project has established an Educational CA in Armenia, possessing all the attributes of an Academic CA. It has also deployed a network of Registration Authorities for the initial registration and authentication of the users of the CA. The project has led to the development of a framework for the operations of CA, RAs and users. The framework has incorporated a Web Portal, user friendly graphical interfaces as well as guidelines and manuals for users and RA operators on the certification process. A core group of specialists in the PKI technologies, capable of disseminating these technologies throughout Armenian society, have been created as a result of this project. This has resulted in a large number of national scientists, engineers as well as students gaining a competent background in Cyber Security technologies. A welcomed by product of this is their involvement in global collaborative efforts in Cyber Security, especially in the areas of medicine, biology, ecology, engineering, physics, mathematics and government.

Nevertheless, the main result of this project is the creation of a sustainable Educational PKI infrastructure in Armenia as well as the formation of a group of national specialists in PKI technologies. This has ensured the continuation of the teaching, training and dissemination of Cyber Security technologies in Armenian society.

Annex IV-d

Description of Nationally Funded Activities Implemented in 2010

2010 Activities Implemented within the framework of the Defence and the Environment Expert Group (DEEG)

The creation of the Defence and Environment Expert Group (DEEG) was approved by the NATO Science for Peace and Security (SPS) Committee at its March 2008 plenary meeting in Brussels. The DEEG's status as an SPS expert group was agreed at the October 2009 (Vilnius) plenary meeting of the SPS Committee.

The immediate goals of the DEEG are to identify and implement proposals for projects and initiatives that address the areas of concern such as environmental and sustainability elements of infrastructure and property, domestic operations (both of which have been quite well covered by projects and studies conducted by the former Committee on the Challenges of Modern Society) as well as of impacts on soldiers, deployed operations and areas of deployment, and logistics and materiel. These priority areas are supported by a toolbox of activities and techniques such as Environmental Management Systems (EMS) and communications ("getting the good news out").

The DEEG currently consists of membership from Belgium, Canada, Germany, Lithuania, the Netherlands, and the United Kingdom as well as a member of the Environmental Security Panel (ESP). The group has a chair and a secretary and meets twice yearly. Observers from other NATO organisations (e.g. the Environmental Protection Working Group and NAMSA etc.) are invited to attend the Group's meetings and to make presentations on their mandates and priorities. This "cross pollination" ensures that duplication of effort is avoided and that NATO's resources are exploited to the full degree.

Since its inaugural meeting in The Hague in September 2008, the DEEG has considered a total of 10 proposals of which 1 has been completed and 3 are currently under way. A further 5 projects are under active consideration while one project has been rejected.

The first proposal under the DEEG's umbrella "*Effects of Environmental Conditions on Soldiers*" was accepted in March 2009, under the co-leadership of Canada and Sweden. The complexity of current and future NATO missions requires the interaction and cooperation from a variety of specialized fields to address risks posed by the environment. To address these emerging issues and ensure interoperability of disciplines to achieve mission success, experts from environment, medicine, chemical-biological-radiological-nuclear, and engineering disciplines within NATO, EAPC and Partners, are brought together under this project. This is a four phase project, the first phase of which was held in June 2009 in Stockholm, Sweden.

The second phase, a three day workshop, took place in Vienna, Austria, from 4 to 6 May 2010, during which the following themes were discussed:

- Interoperability: risk management of environmental issues that might pose a concern to mission success;
- Bridging the communication gap between scientific specialists and the military; and
- Emerging challenges: what issues are on the horizon and how do we begin addressing them.

40 participants from 14 countries were given the opportunity to share their knowledge and experience, as well as discuss the different environmental and health related issues of military deployments with experts from Defence Ministries, Armed Forces and other governmental organisations. Future phases will look into scenario planning for missions that will become increasingly complex as a result of environmental changes and will require the significant collaboration among the full spectrum of relevant disciplines.

The second proposal made by the DEEG was a workshop to examine "*Environmental Future Outlooks and their Military Implications*". From 9 to 11 February 2010, Germany and the Netherlands, together with ACT (Allied Command Transformation), organised in Sonthofen, Germany, a workshop on "Environmental Future Outlooks and their Military Implications". The proposal for this workshop, reviewed by the Defence and Environment Expert Group (DEEG), had been approved as a Nationally-Funded Activity by the SPS Committee at its meeting of 15 October 2009. The workshop had the following objectives:

- Establish which participating countries have environmental future outlook studies available, set up a repository of these documents and make them available to all participants;
- establish a network of experts and organisations so that bilateral contacts can follow;
- establish which sources have been used, then list and prioritize them;
- compare the contents of the national studies and establish similarities and differences;
- establish to what extent the national conclusions have been used in the "Multiple Futures Project"; and
- determine whether follow-up activities, such as a short term project or a pilot study, are useful and desirable.

The participants consisted of 30 experts from environmental policy and strategic long- term planning departments of the Ministries of Defence or from specific study centres used by the Defence Ministries. Most participants were involved in Future Outlook studies on a regular (sometimes daily) basis.

During the presentations it became clear that, in general, Future Outlook studies are set up using the same methodology: trends, key factors, strategic "shocks", scenarios and implications.

The presentations also conveyed three thematic issues that face the trans-Atlantic community:

- Access to and responsible use of energy and resources;
- Proficiency in consequence management;
- Resiliency in the face of environmental shocks and long-term change.

The most important future environmentally-related issues affecting the trans-Atlantic community were determined:

- Disruption of flows of vital resources
- Disruption of access to critical resources
- Uncontrolled migration from disaster
- Manmade disasters
- Consequence management from catastrophic environmental change
- Climatic disasters
- Rise in sea level.

The scope of the workshop was limited to environmental developments and trends and their direct implications for strategic planning. The outcome of the workshop can be used as a basis for future defence planning, to evaluate existing long-term defence plans, influence concept and strategy development and improve training and threat analysis efforts.

Reduction of Negative Pollution Impact on Baltic Sea Environment and Development of Joint Response Operations (Lithuania-Russia)

On 2-3 December 2010, a conference on “*Reduction of Oil Spills Impact on Baltic Sea Environment and Development of Response Operations*” was held in Palanga, Lithuania. NRC(OPS) Committee members were informed about this initiative at the last meeting on November 22, 2010.

The Conference, organized by the Coastal Research and Planning Institute of Klaipeda University with the support of the Lithuanian Ministry of Foreign Affairs, attracted 39 scientists/practitioners from Lithuania, Russia, Denmark, Italy and Latvia.

The conference considered the possibilities in making better use of the NRC(OPS) Programme to supplement the efforts outlined in the EU’s Baltic Sea Region Strategy’s Action Plan and existing bilateral cooperation mechanisms. Participants outlined current projects and identified the need to review and reinforce the existing maritime accident response capacity. The discussion outlined several areas of potential cooperation among scientific communities of NATO nations and Russia:

- Improvement of oil spills observation methods and expansion of remote methods application possibilities;
- Improvement of the modelling methods of oil spills drifting in the open sea, near shore, estuaries and lagoons;
- Preparation of the Baltic Sea oil spills sensitivity maps based on natural, social and economic factors;
- Analysis of new investigation methods and their applicability for the evaluation of oil spills and environmental monitoring in high risk zones (including the improvement of existing monitoring programmes in terminals);
- Analysis of oil transportation and mining activities and their possible impact on the environment.

A joint Science for Peace Project proposal for funding is now been prepared by Lithuania and Russia which will be examined in due time by the Independent Scientific Expert Group.

Sustainable Use and Protection of Groundwater Resources – Transboundary Water Management

From 10 to 12 November 2010 in Kiev, Ukraine, 29 participants from Belarus, Germany, Hungary, Israel, Lithuania, Moldova, Poland, Russia, Slovakia, Uzbekistan and Ukraine met and were presented with 19 strategies for the management of water systems and water resources protection in the transboundary areas along the European Union’s eastern border. The meeting focused on the regional aspects of transboundary groundwater resources, particularly those of the NATO countries sharing a common border with Partner countries in Eastern Europe.

In many regions around this area, especially where surface water is scarce or contaminated, groundwater is often the most accessible, cheapest as well as the most reliable freshwater resource. It is a key resource that can be used for both urban and rural water supply; however, this process has to be sustainable as groundwater is not always a renewable source. The participants presented some case studies that illustrated border cooperation between countries as good examples of water security problem-solving strategies. The institutions that represented the countries that are new in this pilot project stressed the need for building a multivariant and complex strategy for resolving water security issues in the region.

There are differences in the water security challenges faced by NATO and partner countries; however, this can be resolved by adequate planning and governance, which will enable the

sustainable management of transboundary aquifers. Despite this, more research has to be done to achieve satisfactory results. Moreover, close cooperation between riparian countries is the essential factor in the successful management of transboundary aquifers, the International Commission for Protection of the Odra against Pollution (ICPO) being a good example of such a collaborative effort.

It was pointed out that all transboundary aquifer management issues should be closely correlated with both groundwater and surface water monitoring in order to obtain the desired results. The project participants noted the importance of continuing the previous activities in the Bug River Basin District and highlighted the need for further surveys and measurements to extend the project to the entire transborder area of the European Community and the neighboring countries (which stretch from the Baltic Sea to the Black Sea).

Research covering the transboundary areas from the Baltic Sea to the Black Sea will not only resolve issues on a scientific level, but will also support NATO's Eastern European partner countries in gaining access to the much needed measuring and field equipment. The results of local research will help to create a common methodology for the management of transboundary aquifers in the Central and Eastern European region, as well as facilitate the creation of legislation for bilateral agreements between the riparian countries. This is important in light of the United Nations International Law Commission's 2008 draft articles on the Law of Transboundary aquifers.

Annex IV-e

SPS R&D projects initiated in 2010

1) Ref. 983638

New Inhibitors of Botulinum Neurotoxins

U.S.A and Serbia

Botulinum neurotoxins (BoNTs), enzymes that are the causative agents of the disease state botulism, are considered the highest priority (category A) bio-threat agents by the Centers of Disease Control and Prevention (CDC). There are currently no drugs to counter the deadly flaccid paralysis mediated by these enzymes once they enter the neuronal cytosol. An act of bioterror employing these toxins would result in high mortality rates, public panic and major social disturbance. The proposed project addresses this security issue by developing 'drug-like' small molecules, non-peptidic, inhibitors (SMNPIs) as therapeutic countermeasures for these toxins. The hypothesis is that SMNPIs can be used as drugs to rescue neuromuscular function in intoxicated victims, as well as serve as prophylactics. Specifically, such drugs would provide NATO and its partners with a defensive therapeutic response against these bioterror agents. Moreover, while this project focuses on scientific research, it transcends science as it provides a very tangible social example of the positive achievements that can be accomplished when experts from the United States and Serbia work in harmony for the common good/security.

2) Ref.983789

Highly sensitive standoff detection of explosives in condensed and gas phase

Germany and Israel

Rapid detection of hazardous materials, particularly explosives, is an increasingly important capability requiring novel approaches for remote detection of molecular species. Common optical standoff and remote detection methods of trace amounts of samples, shown to provide detection of explosives and their stimulants under specific conditions, suffer from several drawbacks. The method suggested in the current proposal, which relies on preliminary results of state-of-the-art methods for standoff detection, aims at developing systems that overcome these drawbacks. One way of enhancing the sensitivity is by replacing spontaneous Raman by two- or four- wave coherent, parametric process, namely Stimulated Raman Excitation (SRE) and Coherent anti-Stokes Raman Spectroscopy (CARS), respectively. Both SRE and CARS are powerful and convenient non-linear scattering processes, providing unique spectroscopic tools and promising high sensitivity, molecular specificity and detailed structural information, based on Raman signatures of materials. The expected contribution of the results of the study to improved security in the participating countries is obvious and highly sensitive, multi-compound standoff detection systems in both condensed and gas phase will be an important step forward in the defense against terrorist threats.

3) Ref. 983805

Designing intelligent, resilient, scalable and secure Next Generation SCADA (Supervisory Control and Data Acquisition) Infrastructures (SCADA-NG)

Italy and Croatia

Energy utilities are undergoing structural changes, in parallel with the recently developed legal framework in the region. The new EU policy framework allows open access to the previously vertically integrated power system. Hence, companies with interest in building power-generation capacities are allowed to supply electricity to the power-grid. An electricity market has been established with an expected increase in trading capacity as the market fully develops and new investors start entering the market. The changes in the operation of the system are making anticipation of possible transformations on the national power system scale imperative. Nevertheless, the security of the physical system cannot be allowed to be compromised as electricity is the underlying factor of all the other critical infrastructures. The system must be operated both in a safe, and for the benefit of society, and economical way through the energy market. Thus, the restructuring of the energy related utility industry has resulted in the need for varying levels of system security, electricity market information awareness and general Information & Communication Technology (ICT) security.

4) Ref. 983807

Nanoparticle-based sensors for detection of chemical and biological threats

Spain, Israel and U.S.A.

The objective of this project is to develop electrochemical/optical Nanoparticle-based sensing platforms capable of detecting biological and/or chemical warfare agents. The development of highly sensitive and field deployable electrochemical/optical devices capable of sensing biological and/or chemical (i.e. explosives and toxins) targets would greatly aid the fight against terrorism by providing a means of fast and accurate detection of warfare agents. The research will also enable advancements in autonomous detection of multiple targets, which may be useful for monitoring production facilities, transportation systems and high-profile public buildings.

5) Ref. 983828

Seismic upgrading of bridges in South-East Europe by innovative technologies

Germany, the former Yugoslav Republic of Macedonia, Albania, Bosnia & Herzegovina and Serbia

The high seismic risk to the transportation networks of Southeast Europe (SSE) is a serious threat to public safety, sustained economic and social development and the general security of the region. This risk has not been quantified to this date and sound seismic risk mitigation concepts are not available. Thus, the responsible governmental ministries lack the tools for targeted decision making on seismic vulnerability reduction measures.

With most of the existing bridges being constructed as non-seismic and are older than 40 years they are highly vulnerable to seismic loads and require immediate, reliable and cost-effective seismic upgrading so as to guarantee continuous functionality of the road networks in all South-East European countries. This innovative project is devoted to developing an advanced diagnostic tool applicable for efficient and reliable seismic vulnerability assessment of existing bridges of various types and experimental validation of a new, highly efficient bridge seismic isolation system, in order to complete seismic protection of bridge structures, even under the strongest recorded earthquakes.

Annex V

Statistics for SPS online news stories

Order by number of views

Individual news stories published in 2010 (date)	SPS ref.	URL www.nato.int	Unique views
NATO science workshop addresses environmental security (29 Apr 10)	983921	http://www.nato.int/cps/en/natolive/news_62927.htm	1,032
NATO Science Programme addresses environmental security in the Arctic Ocean (15 Oct 10)	983732	http://www.nato.int/cps/en/natolive/news_66852.htm	962
Counter-terrorism experts to share knowledge at NATO science training course (27 May 10)	984046	http://www.nato.int/cps/en/natolive/news_63714.htm	944
NATO science programme examines origins, trends and methods of tackling suicide terrorism (23 Sep 10)	983898	http://www.nato.int/cps/en/natolive/news_66314.htm	835
NATO science programme examines dynamic approach to water management (12 Sep 10)	983922	http://www.nato.int/cps/en/natolive/news_66053.htm	824
Science workshop looks at how to identify terrorist behaviour (20 May 10)	983584	http://www.nato.int/cps/en/natolive/news_62236.htm	808
Enhancing NATO's partnerships through cooperation in science (4 Feb 10)	Top-down	http://www.nato.int/cps/en/natolive/news_61473.htm	792
NATO science programme seeks food security solutions (15 Apr 10)	983907	http://www.nato.int/cps/en/natolive/news_62559.htm	773
Environmental future outlooks and their military implications (11 Feb 10)	984193	http://www.nato.int/cps/en/natolive/news_61176.htm	760
NATO science workshop examines global climate change and local adaptation (10 Jun 10)	983767	http://www.nato.int/cps/en/natolive/news_64191.htm	718
NATO aims to find ways to predict, recognize and deter maritime piracy (25 Sep 10)	984016	http://www.nato.int/cps/en/natolive/news_66066.htm	636
NATO science programme trains secure cyber networks architects (22 May 10)	983681	http://www.nato.int/cps/en/natolive/news_63705.htm	560
NATO Science Programme helps start world's first free university (14 Dec 10)	983220	http://www.nato.int/cps/en/natolive/news_69320.htm	518
Water management experts share knowledge at NATO science workshop (22 May 10)	983957	http://www.nato.int/cps/en/natolive/news_63712.htm	495
NATO Advanced Research Workshop looks at new exotic materials for civilian and defence use (25 Feb 10)	983966	http://www.nato.int/cps/en/natolive/news_62082.htm	423
NATO science programme identifies new techniques in dealing with effects of terrorism (16 Sep 10)	983647	http://www.nato.int/cps/en/natolive/news_66002.htm	419
NATO science programme aims to secure computer systems and networks (15 Aug 10)	983880	http://www.nato.int/cps/en/natolive/news_65981.htm	368
NATO seminar enhances treatment of trauma victims (23 Jul 10)	983481	http://www.nato.int/cps/en/natolive/news_64842.htm	353
NATO science workshop assesses environmental impact on military operations (6 May 10)	984053	http://www.nato.int/cps/en/natolive/news_63587.htm	308
NATO helps integrate human and social dynamics into natural disaster response (8 Oct 10)	984025	http://www.nato.int/cps/en/natolive/news_66568.htm	229
		Total Views:	12,757
		Average Views:	638

Annex VI

NATO Science for Peace and Security (SPS) Programme Questionnaire

- 1) How many people are involved in your SPS activity? (give level/position involved and indicate how many of those are stipendiary)
- 2) Did your activity attract any additional funds? If so, from where and how much?
- 3) Give the number of publications and patents that have resulted from your activity?
 - a. If applicable, how many patents are currently being used commercially?
- 4) Which other organisations/companies/universities/authorities were involved in this activity? How did they contribute?
- 5) How will the results of your activity be implemented? What action have you carried out, or, are you planning to carry out in order to advance the implementation of your results?
- 6) Who will immediately benefit from your activity?
- 7) Aside from funding, what is NATO's added value in this activity?
- 8) Can the results of the activity address a local/regional/global security challenge? If so, how?
- 9) How has this activity contributed towards NATO's objective of partnership (i.e. bringing together NATO and partner countries)
- 10) Do you have any other comments you would like to make?