

Translation of reprint from
The Royal Swedish Academy of Military
Sciences, Transactions and Journal
(KKrVA Handlingar och Tidskrift),
218(2015)4

Peace Technology

*Annual report 2014 from the
Royal Swedish Academy of War Sciences,
dept IV, Military Technology, on 11 mars 2015,
by Bo Janzon, Lennart Axelsson and Jan-Erik Lövgren*

*Translated into English and edited
by Bo Janzon*

Peace Technology

(in Swedish: Fredsteknik)

*Annual report 2014 from KKrVA,
dept IV, Military Technology, on 11 mars 2015,
by Bo Janzon, Lennart Axelsson and Jan-Erik
Lövgren*

*Translated into English and edited
by Bo Janzon (aided by Google Translate)*

31 pages

Peace Technology

Annual report 2014 from KKrVA dept IV, Military Technology, on 11 mars 2015, by Bo Janson, Lennart Axelsson and Jan-Erik Lövgren



1)

Résumé

The Annual Report for 2014 of Section IV “The Science of Military Technology” of the Royal Swedish Academy of War Sciences, deals with “Peace Technology”, i.e. non-military (technical) measures that can help remove obstacles to the return to (or creation of) a normal, peaceful society. The study focused on nations affected by war and armed conflict, in a situation where large-scale fighting has ceased, and the community should be geared towards normalization. There are often many obstacles, but some might be possible to eliminate or at least reduce through the use of existing technology. This study has mainly focused on relevant technologies available in Sweden, often as a spin-off from defence industry and projects. Some possibilities are described for providing assistance to affected nations in the form of technical measures to facilitate the transition to a peaceful society. Peace Technology could become a Swedish niche, where many more companies and organizations could contribute to creating a more peaceful world, perhaps especially relating to weapons control and the handling and demilitarization of ammunition and explosives!

Contents

Résumé	3
Introduction	6
Background	6
International Law, agreements and international regulations	7
IATG, Safer Guard etc.....	8
Peace Technology - needs in different countries	8
Bosnia-Herzegovina ⁹	8
Afghanistan.....	9
Problem areas of importance for the peace technology	10
Non-violent resistance and civil defence	10
<i>Communication systems</i>	10
<i>Reporting systems</i>	11
<i>Protective gear</i>	11
<i>Monitoring etc.</i>	11
Societal structure	11
<i>Democracy building</i>	11
<i>Critical infrastructure</i>	12
<i>Construction of small-scale infrastructure</i>	12
<i>Administrative systems</i>	12
Presence of objects that promote/facilitate the use of violence.....	12
<i>Weapons, especially military type weapons (assault rifles, anti-tank weapons)</i>	12
<i>Munitions and explosives</i>	13
<i>Raw materials for manufacturing explosives</i>	13
Mines, IEDs, unexploded ordnance	14
<i>Land mines and minefields</i>	14
<i>Unexploded ordnance</i>	14
<i>Munitions storages and dumps</i>	14
<i>Chemical weapons and chemical substances</i>	15
Some other phenomena and objects that represent risks to society and population and which obstruct the emergence of a peaceful society	15
Other obstacles to the emergence of a peaceful society.....	16
<i>Conflicts between ethnic groups, clans, ...</i>	16
<i>Other States' involvement</i>	16
<i>Lack of control and lack of an effective state apparatus</i>	16
<i>Lack of water</i> ¹⁷	16
Similar problems exist also in Sweden!	16
<i>Clearing of land and water areas</i>	17
<i>Societal utility</i>	17
<i>Regulations and standards</i>	18
<i>Dumping</i>	19
Need for a Swedish profile in SALW and SCA.....	19
A global problem	19
Munitions technical skills are in demand.....	20
Some Swedish companies/organizations with possible solutions ¹⁸	20
ABB ¹⁹	20
Cesium AB.....	20
Dynasafe	21
Ericsson ²²	22
Folke Bernadotte Academy ²³	22
FOI ²⁴	22
FortV ²⁵	22

LTEAB ²⁷	23
Milsec ²⁸	23
Mojang AB ²⁹	23
MSB ³⁰	24
Nammo ³¹	24
NCC AB ³²	24
Swedish Police Authority ³³	24
<i>NFC – the National Forensic Centre – formerly the National Laboratory</i>	
<i>of Forensic Science</i>	24
<i>Swedish police abroad</i>	25
Saab AB	25
Secoil ³⁵	26
Secrab	26
SIDA ³⁸	26
Skanska AB ³⁹	27
Swedish Tax Agency ⁴⁰	27
Swedec	27
Some possible Swedish measures in Peace Technology	28
Some conclusions	28
References	30

Introduction

The annual report of Department 4, "Military Technology", of the Royal Swedish Academy of War Sciences for 2014 is about "Peace Technology", i.e. non-military technical measures that can help remove obstacles to the return to or establishment of a normal society. The study focused on war and conflict affected nations, at a time when large-scale hostilities have ceased and the community should be geared towards normalization. Against this there are usually many obstacles. Two countries, Bosnia-Herzegovina and Afghanistan will be mentioned as examples. Furthermore some Swedish companies and organizations are listed, which are expected to be able to contribute with technology and activities.

Mines and demining is a key area, which, however, was deemed to be as far developed and well described in other writings. It will just be treated briefly here, but there is still great need for development and improvement

The report was prepared by a group of Fellows of the Academy, consisting of the Dept. IV members Bo Janzon (Chairman), Jan-Erik Lövgren and Bengt Vretblad, later expanded with Lennart Axelsson. Other people who have contributed information and comments are the Academy Fellows Ulf Henricsson (Department I) and Håkan Rugeland (Department IV). Other experts who were kind enough to contribute were Messrs. Fredrik Johnsson, Swedec, Conny Åkerblom, MSB, and Jan-Inge Kull, the Police Authority. This report (and its translation) were essentially prepared and edited by Bo Janzon.

A background to the study is a seminar organized at the National Defence College (FHS) on 8 September 2014, with the topic of "Peace Technology - Security policy and commercial opportunities." The initiative was taken by Mr, Hans Wallin, Cesium AB, Professor Lars Ingelstam and Professor Bo Janzon, who also drew up the report of that seminar³, which has been the baseline for this study.

Background

Today's technological societies are remarkably vulnerable to breakdowns or sabotage. Disabling some communications nodes or power lines can render the electricity supply paralyzed for a long time; computer viruses can disable communication networks; toxins in a central water supply can kill or injure large numbers of people. These technical vulnerabilities are particularly acute in the face of military aggression. A few bombs or other attacks that impact major industrial installations or communication nodes can be devastating.

One way to reduce the technical vulnerability is to create differently structured technical systems, in particular decentralized ones. An energy system based on energy efficiency and local, renewable energy sources, will be much less vulnerable to bombs or saboteurs than huge centralized power systems. The Internet is much less vulnerable to attack than a few major TV and radio stations. Technical systems based on networks, independent of external energy supply, and with less consequence if affected, are generally considerably more resistant against attacks than large, centralized, expert dependent, and potentially hazardous systems.

In developing countries, especially those recently exposed to armed conflict the infrastructure may be less developed and often damaged by violent action. The existence of continued armed violence can be a difficult obstacle to any form of normalization.

The Swedish International Development Cooperation Agency's (SIDA) feedback report to the government on foreign aid in 2014, in the area of mine action⁵ lists under "Overall observations" (p.2): "Security and development are closely linked, as is obvious to SIDA and also noted in the

Government's latest Foreign Policy Declaration. The declaration mentioned specifically the UN Arms Trade Treaty, ATT, which entered into force on 24 December 2014 and therefore constitutes International Law, which is an important tool to combat illicit trade in conventional arms, including small arms and light weapons. SIDA believes that the Arms Trade Treaty represents the recognition of the global impact of armed conflicts and armed violence. The consequences, in Foreign Aid often termed 'development obstacles', are measured not only in human suffering but also in lack of socio-economic stability and development."

The UN's eight Millennium Development Goals were replaced by the 17 "Sustainable Development" during the autumn of 2015⁶. Among these numbered goals, one can find, among others:

- 2: ...achieve food security...
- 3: ...ensure healthy lives...
- 4: Ensure inclusive and equitable quality education ...
- 5: Achieve gender equality and empower all women and girls.
- 6: Ensure availability and sustainable management of water and sanitation for all.
- 7: Ensure access to affordable, reliable, sustainable and modern energy for all.
- 8: Promote sustained, inclusive and sustainable economic growth ...
- 9: Build resilient infrastructure ...
- 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
- 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

None of these highly relevant goals will be achievable in countries or areas where a normal, peaceful society cannot be established or restored!

International Law, agreements and international regulations

International Law consists of all international laws and principles that govern how states and other international actors must cooperate and how they may and may not act towards each other. International law is binding on states, but accountability is limited when a State has breached these rules.

In the area of disarmament and non-proliferation, the international community has agreed on a number of agreements and frameworks to promote peace and security:

In the Non-Proliferation Treaty (NPT), countries without nuclear weapons have pledged not to acquire these weapons, while the five countries that had nuclear weapons in 1968 have pledged to disarm and not disseminate technology to develop nuclear weapons.

The Chemical Weapons Convention (CWC) prohibits chemical weapons. The states that had such types of weapons were committed to destroy them. The Convention also has a functioning control mechanism through the Organisation for the Prohibition of Chemical Weapons (OPCW), based in The Hague.

The Convention on the Prohibition of Biological and Toxin Weapons (BTWC) bans the development, production, acquisition, trade and storage of microbiological, biological agents and toxins as weapons. The Convention is not an explicit prohibition against the use of these weapons, but presents a basic norm against production, trade and use of biological weapons.

Some weapons that were seen as particularly inhumane were regulated or prohibited by the 1980 Weapons Convention (CCW), including incendiary weapons, some land mines and IEDs, and

permanently blinding laser weapons. One current issue on the revision agenda is the regulation of autonomous weapons systems, i.e. weapons systems without human control.

The Ottawa Convention bans the use of anti-personnel mines which can be detonated by the presence of a person.

The Convention on Cluster Munitions prohibits cluster munitions.

A UN Programme of Action and an EU strategy with an action plan were developed to combat the illicit trade in small arms and light weapons (SALW).

The UN Arms Trade Treaty (ATT) is an international binding instrument created for effective national control of Conventional Weapons, including standards for what such controls must include. This is the first binding agreement relating to trade in conventional weapons.

Within the so-called export control regimes (Zangger Committee, the Nuclear Suppliers Group, the Australia Group, Missile Technology Control Regime and the Wassenaar Arrangement) it was agreed on a political basis which products and technologies will be export controlled, as well as other export control related issues.

A common problem is that not all countries have acceded to these agreements. However, Sweden has done so for all rules mentioned.

IATG, Safer Guard etc.

International Ammunition Technical Guidelines, IATG⁷, is a regulatory framework for the management and storage of ammunition and explosives, prepared by a large number of experts tasked by the UN, which is being implemented through the UN programme SaferGuard⁸. It must be seen as the "state-of-the-art" in munitions handling and storage.

The IATG includes a description of principles on how to administer and liquidate stocks of ammunition and weapons. All relevant areas are treated, like risk analysis, risk to society, theft and auto-ignition, or sabotage. IATG forms an excellent common basis for international cooperation, and is easily accessible to all via the Internet. It can be introduced in various logical steps.

Sweden has joined the IATG, but has not yet implemented the regulations nationally, and has not yet, as far as known, participated in any SaferGuard project.

Peace Technology - needs in different countries

Bosnia-Herzegovina⁹

The antagonism between Bosnia-Herzegovina's three dominant ethnic groups – Bosniaks, Serbs and Croats – aggravated by the civil war in the early 1990s means continuing conflicts. About half of the population is Christian, half are Muslims, mainly Sunni. The capital, Sarajevo, is dominated by Muslims. Policy is characterized by ethnic conflicts, extensive corruption and sluggish and corrupt bureaucracy. It has been difficult to launch exports after the war, and Bosnia's already weak economy has a large deficit in foreign trade. The country is beautiful and has thousands of years' of history. Tourism has increased significantly, and helps reduce the deficit.

The country's government was created to put an end to the bloody civil war 1992-1995 and involves two autonomous regions: the Serb-dominated "Republika Srpska" and the "Federation of Bosnia-Herzegovina", with Bosniaks and Croats. The central government is weak, and in practice

the country is still largely governed by the international community, with the EU as the dominant party. Trust in politics is low, and low wages and high unemployment makes it tempting to become part of the corrupt society. Competence loss is a great problem, and many qualified people have left the country to create a better future elsewhere.

There are still very large quantities of landmines and unexploded ordnance left in the country, which cannot be expected to be cleared in the foreseeable future. During the late spring of 2014 huge amounts of rain fell over Bosnia in a short time, which led to extensive flooding. One result of this was that landmines from the war in the 1990s were washed out with the liquefied soil, and sometimes mines have reinfected land already cleared.

OSCE and SFOR have input much effort to gain control and order of weapons and munitions in the country¹⁰ but there is much left to do. They monitor and coordinate arms control activities and try to improve the monitoring capacity for small arms and light weapons, monitor destruction and sale of stores of military surplus and unstable munitions, support monitoring and act to increase the safety and security of Bosnian ordnance and weapons storage facilities, demilitarize facilities, organize arms control activities together with local and regional partners, and promote participation in weapons control education in the country and abroad.

Afghanistan

A positive development in Afghanistan is due to the coalition supported work undertaken by the Afghan leadership to modernize the country and create a sustainable long-term political and economic situation. Equally important is, of course, to weaken the counteracting forces, including the Taliban.

During the fourteen years since the allied intervention, much has changed in a positive direction. Access to free and unbound information was created by more than 50 television and 150 radio channels. Nine out of ten households in the cities own mobile phones. The number of students has risen from one million, exclusively boys, to about 8 million, of which 40% are girls. The proportion of the literacy has increased from 12 to 39%.

64% have access to clean water against previously 22%. The expected average life expectancy has increased from 43 to 64 years, Afghanistan has caught up, and in several respects surpassed its neighbours in the development of a modern society.

Major outstanding issues are state economy, which is based essentially on support from the outside world. Due to lack of safety and security and poor infrastructure, it is difficult to extract the natural wealth existing. The tax collection system is not developed; it was estimated that only about 10% of the population pay taxes and wealthy people invest their money abroad. Corruption is widespread throughout the public sector and constitutes a major obstacle to achieving the sense of security and confidence needed for continued positive development of the country.

Confidence in the Army is relatively high, in terms of its fighting capacity as well as correct behaviour with a low level of corruption. The Afghan defence forces are relatively well equipped, trained and exercised, due to the longstanding support received from the coalition. In many respects, they are also ready to take on an own operational responsibility. The remaining major concern, however, is the country's shortcomings in the ability to maintain its materiel. The technological maturity in Afghanistan is generally low, and for the few technicians available a dangerous and underpaid job in the army is not attractive. A change could be achieved with the help of modern computer-aided technical instruction and interactive tutorials for repair and service work.

In addition to supporting the good forces, the country must weaken the groups that oppose a peaceful, democratic development. Among security-sensitive business and transactions in a country like Afghanistan, the arms trade is important. Customers are primarily the Taliban, but also criminal groups and to some extent the IS in the past year. The bulk of goods/services to be mediated are already produced and in circulation. Suppliers may be the producer, an end user (such as a state) or a legitimate third party, but much too often munitions of various kinds will be provided by, for instance, corrupt public servants. Customers can possess own means of payment, but such business is often sponsored, both politically and economically, by third parties which do not participate actively in the hostilities, but which, for various reasons, want to influence the course of events. Customers and suppliers are brought together by brokers who survey the market for supply and demand and administer transfer of goods/services and compensation.

Contextual factors have greater significance than a Swede would imagine. There is great distinction between the treatment of friend and foe, and underlying, often historical conflicts due to committed wrongs can be resurrected for generations to come. Thoughts on general human rights and universal human equality are very poorly anchored and respect for international agreements is low.

Peace technology could be applied to reduce these flows, by influencing the producers to limit the production of armaments, establishing (and enforcing) end-user agreements and establishing transparency and traceability of the produced materiel. The suppliers should, if possible, be limited only to operators with state support and acceptance from the international community. This can be made possible by strict monitoring of the market and equipment produced, relative to end-user certificates issued. Producers' origin marking is a valuable tool, but international demands for supplementary labelling of elder munitions should be included on the agenda.

Sponsor and broker influence can be reduced through greater transparency in the legal arms trade, but also through improved analysis of the value chain, by tracing transfer of armaments through financial transactions. Brokers can usually be affected by law enforcement efforts, and the risk of detection should be increased and sanctions tightened. Sponsors, however, are more difficult to access, partly because they are often state actors and partly because they usually act beside connections to the international community and international agreements. They also have good opportunities to act through intermediaries, making it difficult to trace their influence. To affect this strong international and joint action will usually be required, which is often hampered by global policy considerations, for example in the UN Security Council. In summary, increased ability to identify and track military equipment as well as increased opportunities to link different databases in search of illegal transfers of military equipment and money will be required.

Problem areas of importance for the peace technology

Non-violent resistance and civil defence

Communication systems

Communications are required to be able to plan and organize a society. Communications are also becoming increasingly important in the citizen's daily life. Non-force resistance is an established method to prevent escalation of an internal conflict. To be able to coordinate non-violent resistance communications are required communication, which are often less developed and unreliable in countries in question¹¹.

Can good communication be created, for example, via mobile systems and smart phones¹², it will increase the capacity to organize non-violent actions quickly and efficiently. Such systems are best

built at smaller scale, but with opportunity to connect with the outside world via links or satellites. Such systems will be less vulnerable, and may also reduce opportunities for a repressive regime to use shut-off or blocking of networks as measures against a non-compliant population.

Reporting systems

In an environment of high violence and sometimes with several armed groups fighting each other, an effective reporting and warning system will reduce the impact on the civilian population¹³, by giving it the opportunity to avoid battles and dangerous areas.

A modern mobile network can provide good opportunity to create such systems.

Protective gear

In addition to personal protective equipment such as helmets and body armour there are simple measures that can improve protection in existing buildings. Glass windows crushed by explosive blast or small arms fire involve substantial risk of death or severe injury to people inside the building. A simple polymer film bonded to the inside of a window will keep the fragments together and can greatly reduce the risks. To be effective, the film should also be attached the window frame. Replacement of window materials by tempered or laminated glass will also reduce risks greatly, as well as changing to window panes made of, for example, polycarbonate. The latter will be suitable at higher risk levels, and will also much improve burglary protection.

The strongest protection against combat action can be achieved in shelters. Even relatively simple ones can result in greatly increased probability of survival of civilians. If you can dig down into the ground, conditions are often favourable to be able to achieve good protection.

Also, humanitarian assistance efforts will be afflicted by violence, sometimes to the extent that it will render impossible any effort in an area. The need for both personal protection and better protected vehicles is increasing.

Monitoring etc.

A mobile network can also be used for monitoring of critical points and zones, for forwarding alarms, etc. in order to warn and alert.

Societal structure

The society in countries concerned is often highly disturbed and injured, civil authorities are missing or not in control.

Democracy building

Democracy is one of the main guarantors of a society where violence may be pushed aside. Democracy requires information and communication, which can be obtained via mobile networks. Knowledge and information can be disseminated in an attractive manner via a mobile data network, for example through various types of computer games.

Education is critical in order to improve conditions in this regard.

Critical infrastructure

Critical infrastructure, such as water, electricity and communications supply are often damaged or missing. Fast and transitory measures will be required to restore function, preferably in such a manner that the solution can later be made permanent.

Construction of small-scale infrastructure

Rather than trying to build/rebuild large supply systems, it may be simpler and more reliable to rebuild them as lesser, of each other relatively independent systems. As mentioned, this reduces both vulnerability for and consequences of damage to them.

Administrative systems

States under construction often lack functioning administrative management systems. Examples include population registry and taxes.

Presence of objects that promote/facilitate the use of violence

After a recent conflict there will be enormous amounts of materiel available in the society, possible to use for continued violence.

Weapons, especially military type weapons (assault rifles, anti-tank weapons)

Military types of automatic weapons, such as the Russian Ak47, will normally be quite easily available in the affected communities. Some will be surplus after the armed hostilities, others will be stolen or embezzled weapons from legal sources, such as military or police.

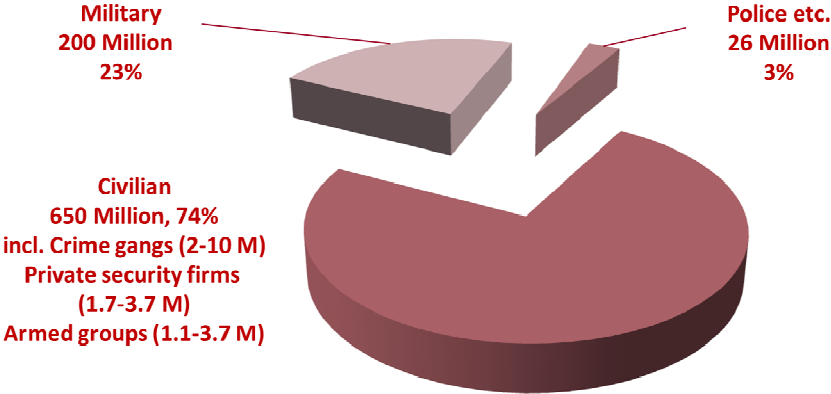


Figure 1 Estimated number of weapons in the world¹⁴

Many weapons are stolen, misappropriated and through illicit trade will end up with warlords, terrorists and ultimately with “normal” criminals. Nations often consider surplus weapons and munitions as assets rather than liabilities, and will prefer export rather than destruction of them.

These countries also often have poor accounting and control of weapons, munitions and explosives, and they are often kept at poor security. Some weapons do not even have a serial

number, making it difficult to prosecute somebody who stole it. Often marking of munitions will also be poor.

Catastrophic losses of state-owned weapons are not unusual. For example, in 2003 4.2 million small arms “disappeared” in Iraq¹⁴, and as late as in 2014 750,000 US weapons were “lost” in Afghanistan¹⁵.

Munitions and explosives

Also, military and other explosives are usually available in large quantities after an armed conflict. It may involve excess ammunition, often stored in large "dumps" or primitive storage facilities with inadequate security and monitoring. During the latest 10 years there were accidents with munitions stores in more than 60 countries, about 20 000 people were killed and many others were injured or maimed¹⁶.

Bombs and other unexploded ammunition (UXO) are another source of explosives, particularly dangerous because they may be armed and ready to detonate at the least impact. Another source is mines, which are also very dangerous if not defuzed or neutralized in the right way. Also, civil explosives used for construction, etc. are often under inadequate control and easy to steal. Stolen explosives and munitions constitute the main components for the manufacture of weapons used in terrorist attacks, and bombs and IEDs are used in the majority of such attacks.

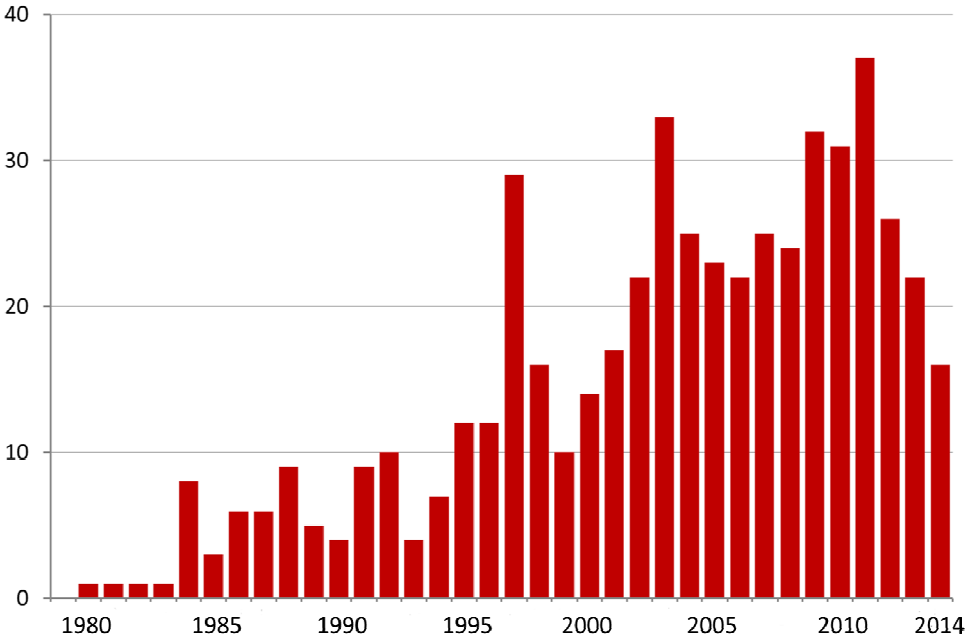


Figure 2 Number of accidentally exploded munitions dumps¹⁶

Raw materials for manufacturing explosives

Ordinary substances readily available in civil society can be used to manufacture home-made explosives. In principle you will only need a suitable fuel and an oxidizer that are well mixed in the right proportion, with the right particle size, or bound in a chemical compound.

Within the EU, there were recently introduced increased controls and restrictions on some substances that can be used to make illegal explosives. The US has made similar efforts. The rest

of the world is largely lacking restrictions, but after the last large and serious explosion accidents in China, including the grave accident in the port of Tianjin, increased attention arose in China for the regulation and control of this type of substances.

Mines, IEDs, unexploded ordnance

Mines, IEDs, unexploded ordnance (UXO), surplus ammunition and explosives, are readily available throughout society and the environment after an armed conflict.

Land mines and minefields

Especially mines and IEDs can effectively prevent access and use of an area, for example for agriculture. Refugees can be barred from returning home, transports can be difficult or impossible. The Mine Weapons Convention prohibits anti-personnel mines, but despite its provisions there are, and will be in the future, very large numbers of emplaced such mines, with resources lacking to clear them. Military forces must, under the Mine Weapons Convention and also for self-preservation, keep records and maps of minefields and individual mines, but if a combat zone was used by both sides, perhaps including relatively disorganized armed groups, in a back and forth fluctuating combat, there will typically be much less or zero documentation. Different fighters, such as non-governmental factions, may also consider themselves unbound by the Convention and lay out new or used mines or IEDs. Thereby areas already cleared may be re-infected, which will disrupt society's operations and structure and create a need for new clearance efforts and divert resources away from the main task to clear already existing minefields. Floods and sand storms can also contribute to already cleared land becoming mine infested again.

Unexploded ordnance

Unexploded ordnance, or UXO, "Duds", can be found wherever combat has occurred, and sometimes at other locations, since erroneous shelling or bombing can often occur.

Munitions storages and dumps

Surplus munitions are often stored in huge "dumps", which in the worst case are located outdoors with no protection. Their location can also be very inappropriate, in the middle of cities, near dwellings, other premises and transport routes, and often they are poorly or not at all fenced and gated, rendering them neither safe nor secure, and making it easy to steal explosive ordnance effects that can be used as IEDs. If not in dumps, munitions storages may also be as poorly secured and guarded. Explosive munitions that were exposed to temperature cycling for a long time can be dangerous to handle, and even explode by itself. If the climate is hot and humid further, serious problems will arise.

Leftover or expired munitions may have been dumped at various locations, without being destroyed, for example at sea, in lakes and rivers or in disused mines. If munitions are located under water some of the mechanisms that make it unsafe will have less effect, including temperature cycling, but instead, the steel and metal components will rust and may break. Normally, military explosives are very resistant even under water and can remain fairly unchanged over hundreds of years at prevalent deep water temperatures, but some parts of or contaminants in them can dissolve and spread to groundwater, wells, etc.. Most explosives are very toxic, causing different effects, and may affect humans, animals and plants in very negative ways.

Handling of explosives requires special skills and experience. Independent work with an unknown explosive is one of earth's most dangerous operations, where a single error may lead to instant death!

Often trained technicians do not want to work with such tasks, hence there is need for training of new specialists. With modern technology, such as computer-aided training and interactive supervision, the situation could be improved. Additional requirements for a mine and munitions clearance expert will be many years of practical experience, effective resorption of all experience collected among elder generations, plus a suitable, extremely stable psychological profile.

Chemical weapons and chemical substances

Also in civil society there are many hazardous chemicals that may be used as chemical weapons, including herbicides and insecticides. Many of these were banned in the West, but may be left in various developing countries. To synthesize and manage such compounds requires specific expertise. For some chemical warfare agents, such as nerve gases, you can find synthesis recipes on the Internet; however, the CWC makes chemical weapons and their precursors prohibited to possess, handle or deal with, which makes them difficult to obtain.

Some other phenomena and objects that represent risks to society and population and which obstruct the emergence of a peaceful society

Lack of societal control. The societal system is often disturbed or destroyed. Societal control requires state monopoly on violence, which will be difficult or impossible to maintain if illegal factions and militias will be superior to police and military, perhaps in all of numbers, equipment and motivation.

Lack of democracy and influence. This creates many conflicts, which will increase the frustration and propensity to violence of humans.

Poor respect for human life. After an armed conflict with large losses there is risk that human life is valued very low, and therefore the threshold for use of violence will be lowered.

Corruption is a dominant and difficult problem in many communities, strongly obstructing reconstruction and creation of a normal society, and it will also increase dissent and antagonism between different groups. Corruption is also a highly aggravating factor for various relief efforts and often means that aid cannot reach those people who need it most. The only possibilities to reduce and eliminate corruption are education and changing of attitudes, plus creating an efficient and independent judicial system which must be functioning well at all levels of society.

Embedded conflicts can be quite deep, inherited, age-old and infected, between different peoples, religions, clans, families or other groups, and can be difficult or impossible to affect or eliminate. Several generations may have to pass before it may be possible to change hostile attitudes created by such embedded conflicts.

Use of force. In a society with large amounts of violence there is risk that humanitarian aid may never arrive, because various relief agencies will not or are not able to operate in the area. Hence, vulnerable people and groups of people will suffer even more.

Violence. Use of violence is augmented by ample access to weapons, munitions and explosives, which in turn means that the impact of violence will become more serious and affect more people. This will also cause emergence and protraction of conflicts between groups!

Extensive use of force renders difficult or impossible every effort to build a "normal" society.

Lack of essential supplies such as food and water! This may be due to a true deficit, but more often to insufficient resources for transportation, etc., and none or poor function of other infrastructures. Food may rot or be damaged by vermin before it can be distributed because of lack of suitable storage, transport means, etc..

Inadequate or non-functioning infrastructure is a naturally emerging problem after an armed conflict. Much of the infrastructure, such as water, electricity and communications may be damaged or ruined, and may often have been inadequate even before the conflict.

Other obstacles to the emergence of a peaceful society

Conflicts between ethnic groups, clans, ...

Such conflicts can sometimes be centuries old, and people involved may even have forgotten why they started, but they just know "that it has always been so." Often they involve the power over an area and its resources. Old conflicts can sometimes come to the surface, prompted by minor incidents, be reactivated and cause major steps in the wrong direction.

Other States' involvement

It is common for neighbouring States to see an internal conflict or a failing state as a reason to intervene in various ways, also militarily, in order to obtain benefits. Additionally, the international community may intervene, often with good purpose, but also, unfortunately, often with negative consequences.

Lack of control and lack of an effective state apparatus

If a legal government cannot establish control of its own country, a peaceful society cannot be realized. If the government lacks trust by its own people society will function badly, and if it does not have sufficient means in the form of police, military and legal system, or if these are corrupt, the prospects will be poor.

*Lack of water*¹⁷

From time to time there will be shortage of water at some places on earth, which sometimes will lead to conflicts. However, people usually have learned to deal with these problems. The first humans followed the water and moved as lakes or rivers dried out. In our time we instead move water to man by building dams, reservoirs, canals, aqueducts, water pipes, pumping stations and water towers. In the last hundred years, the world population has increased strongly, urbanization has increased tremendously and many Megacities have arisen. Water consumption per capita has also increased sevenfold, and naturally occurring fresh water is no longer enough to quench our thirst, cleanse ourselves and our environment, and also to provide agriculture or industry with adequate amounts, so competition for water has increased at local, regional and national levels. Today many large rivers have almost no water left when they reach the sea. Moreover, human activities and climate change create risk for dramatic redistribution of water resources.

Similar problems exist also in Sweden!

Explosive remnants exist also at many and various locations in Sweden, even though Sweden has enjoyed peace and avoided war action since 1814. It is self-evident that other European nations,

which were exposed to both the first and second World Wars, will suffer much more extensive and often unknown problems. In Sweden, primarily the problems are connected with exercise and firing ranges, which, in some cases, may have been used for hundreds of years, and where no one now has an overview of what may be found within them. Additionally, very large amounts of surplus, decommissioned or defective munitions and explosives were dumped at sea, in lakes and abandoned mines, both by the Defence Forces and various munitions manufacturers.

Clearing of land and water areas

Demands for new land or water use will occur when areas are abandoned by the Defence Forces. At some locations where there were regiments, such areas may be located within or close to city centres, and thereby highly attractive to both private investors and municipalities.

With the need for new uses of such sites problems will arise. Often a municipality will insist to make use of such land areas, which were left by Defence at a very large scale in recent years. Clearance tasks will then often be procured by a community, in the open market, with no quality assurance of the competence of the company or organization winning the contract. In many cases they proved highly incompetent, exposing to great risks builders, construction workers and the general public.

An area shelled by, for example, artillery, or even more so with aerial bombs, UXOs may be found many meters into the ground. Safe clearance of such areas would require that all materials down to the depth deemed safe would need to be bulldozed and shipped away, at a cost that would frequently be deemed completely unacceptable. The clearance work can sometimes entail significant risk for both work force and the public. At static detonation of a 15.5 cm artillery shell the normal risk area for fragments will be of radius 600 m; for a large aerial bomb much more, typically 1500 meters for a 1000 lb HE bomb with a solid metal casing! Even outside these risk areas, material objects may be propelled. These risk area sizes are results of risk weighting for defence purposes, and it is not proven that the area outside is totally free of risk.

An all hazards risk analysis is missing. The different roles of the various parties are unclear. No one has, or has assumed, full responsibility for the areas concerned. On the contrary, the different actors involved will often shirk responsibility in order to avoid responsibility for the ensuing cost. Often, the government will decide on the decommissioning of an area, the Armed Forces were its users, however, normally it will be owned by another Government authority, the Fortifications Administration (FortV). The area may be transferred, for example, to a municipality, which in turn will assume responsibility for something for which they completely lack the necessary knowledge, skills or experience, and, indeed, may not even know enough to procure a clearance effort. Cost will be a strongly governing factor, and if incorrect requirements were put up, money may be "thrown down the drain" and major hazards may also arise. Clarification of liability issues and establishment of guidelines how remediation matters of this nature should be dealt with must be regarded as important and highly urgent.

Societal utility

From a socio-economic aspect the utility of "new use" of an "infected" area should be put in relation to the cost of remediation. In many cases such comparison would be likely to show that it would be better to let the area remain uncleared. This will not preclude its use in certain ways, for example as a recreational area. The public has long had access to various Defence firing and training grounds, with no extensive accidents occurring, and as long as you do not dig into the ground or pick up and handle various munitions which might be found, the risks can be considered

quite low. Exceptions may exist, and for such areas it must be decided whether they should be cleared, or be fenced in and access prohibited. However munitions abandoned on forested or open land give rise to two types of risks – one is that they may cause accidents if somebody would disturb or, by ignorance, pick up an object like a fuze, which may explode and injure, maim or kill; the other is that interested persons, for example youngsters, criminals or terrorists, may actively search for and seize explosively charged objects in order to use them for their purposes. In Sweden there is a ban on field use of metal detectors, mainly intended to prevent looting of ancient remains and artefacts buried in the ground, but this will not prevent unscrupulous people from using them to find explosives.

Regulations and standards

There are no regulations or quality standards in Sweden for clearance of abandoned firing and training ranges or other similar areas. According to the UN recommendations, as given in the IATG, such rules must exist and be implemented, and there must also be a central national authority with overall responsibility for all EOD and demining. Such structures were created in many developing countries, but unfortunately not yet in Sweden. Sweden has adopted the IATG, but has still done little to implement its rules and recommendations.

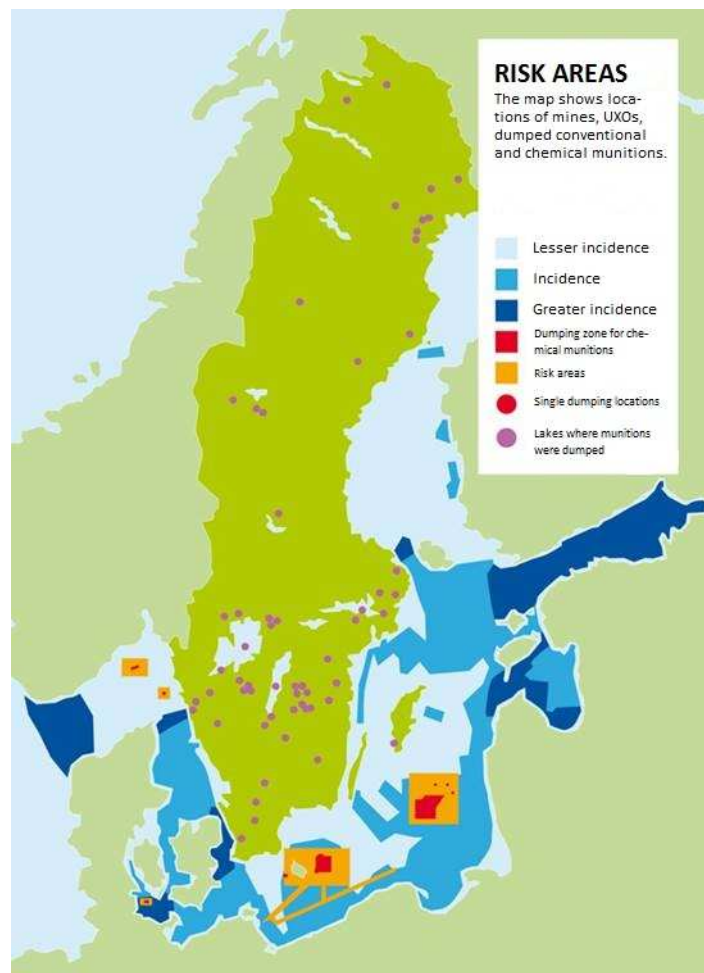


Figure 3 Locations where ammunition and explosives dumped. Source: Swedec

Dumping

There exist many locations in Sweden where ammunition and explosives were manufactured, stored or dumped, for example at sea, in lakes and in abandoned underground mines and quarries. The map of fig. 3 shows the distribution of these problems. Some dumps are relatively well demarcated, fenced off and not easy to access, while others may be very poorly protected. There are even examples of lakes where munitions are sometimes visible above the surface at low water. At sea many different nations have dumped huge amounts of ammunition, and naval mines from both World Wars still remain deployed, despite major clearance efforts, in great numbers both in the Baltic and along the Western coast of Sweden. Elder naval mines are normally anchored to the sea bed, but sometimes, after many years of corrosion, may tear themselves loose and become mines drifting with wind and current! Also chemical weapons, chiefly mustard gas, dumped mainly by Hitler's Germany, exist in the South Baltic, and will sometimes be caught by fishing vessels. Also these, quite extensive problems, would benefit from the existence of a central authority with the responsibility of coordinating all efforts concerning such problems.

Need for a Swedish profile in SALW and SCA

The policy areas of Small Arms and Light Weapons (SALW) and Stockpiles of Conventional Ammunition (SCA) have become a renewed international focus. Sweden is an acknowledged actor, called for in international projects undertaken to promote global security of weapons and munitions. Mainly through the resources of the Armed Forces (Swedec), Sweden participates in so-called PSSM (Physical Security and Stockpile Management) projects, but activities are fragmented and there is no explicit Swedish strategy. An explicit Swedish profile involving both authorities and business community would benefit both Sweden and International safety and security.

A global problem

The lack of control of weapons and munitions is a global problem which increasingly attracts the attention of international actors. The illegal trade in weapons and munitions is closely related to human and drug trafficking, organized crime and terrorism, and hereby constitutes one of the dominant safety and security threats against our globalized society. The ATT (Arms Trade Treaty) improves the ability to exercise control of this trade.

By limiting proliferation at an early stage, consequences can be alleviated. This has meant that actors like the UN, OSCE, AU (African Union) and the EU operate and promote projects conducted in states where control of weapons and munitions is inadequate. PSSM projects are tools applied to help states in need and will be carried out only in states positive to receiving assistance and asking for support. Sweden is a sought-after actor with unique expertise in this field.

In recent years, PSSM projects have undergone a transformation which has meant that activities have evolved from counselling to capacity building. Previous visits were conducted by expert teams who would hand over recommendations for the exposed government to be able to increase security and safety around the arms and munitions. The practical execution then passed over to the State itself to manage, at best with financial support from the international community.

The new type of projects involves considerably more extensive support. A number of voluntary countries normally join together to form a project team responsible for a long-term plan for capacity building in the country in need. Initially the supporting states will supply all assistance, such as training and equipment. Gradually responsibility will be handed over, piece by piece, to

the receiving State, until they will perform all operations completely self-reliant. This means that these commitments will be more long-term than in the past and requiring another type of resources.

This new generation of projects has also led to a clearer profiling regarding the type of support provided by different actors. No clear Swedish profile exists, and so Sweden's role will be perceived as ill-defined and fragmented in different projects.

Munitions technical skills are in demand

It has been shown that Sweden has unique expertise in the technical field of munitions. These services are in demand as a natural complement to other countries' areas of expertise. Within the Armed Forces almost exclusively resources from the Swedish EOD and Demining Centre (Swedec) and the Armed Forces Logistics Command (FMLOG) were used.

Swedec has worked to prioritize the areas where there is unique expertise, which meant that a Swedish munitions technology profile has begun to take shape in projects undertaken. In the EU-led PSSM- project in Bosnia-Herzegovina, Sweden was responsible for documenting existing ammunition types and producing a munitions technology manual. This product filled a clear need and similar demands now exist in other projects. A similar manual will be developed by Swedec in 2015 in the OSCE-led PSSM project in Moldova.

So far, the ammunition technology profile was exclusively built around the expertise available within the Defence Forces. However, Sweden has other unique expertise and resources that can strengthen and complement this profile. Sweden conducts unique research (FOI) and have specialized industry in ammunition surveillance, world leading industry in secure storage solutions and expertise in safety and protective technology. In addition, Sweden has unique industry working with environmentally friendly recycling and destruction of munitions. Together, this creates the basis for a complete Swedish concept in munitions technology.

Some Swedish companies/organizations with possible solutions¹⁸

ABB¹⁹

This company is a global leader in power and automation. It provides efficient and high-quality electric energy generation and transmission facilities with minimized environmental impact, including solar power and corresponding power storage facilities. ABB exists in many countries around the world. ABB's operations in Sweden are found at about 30 locations, including Västerås and Ludvika in central Sweden.

Cesium AB

is a wholly Swedish-owned company²⁰, with head office, development and production at Katrineholm. It develops, manufactures and markets high-security protected storage and transport containers, and other cost effective storage solutions, intended for safe storage of valuable or hazardous materials and explosives.

The product range includes prefabricated security vaults, storage facilities, doors, gates and larger high-security buildings like server halls and hangars. Product solutions from Cesium are tailored to the customer's wishes and are certified according to European Security Standard (EN 1143-1, Grade III or higher) and/or bullet protected to standard EN 1522.



Figure 4 Mobile Security Vault - MSV

Examples of some products are:

- MSV Explosives Storage (Grade III-IV).
- MSV Mobile Security Vault (Grade V-VI).
- Security Buildings, permanent or removable (Grade IV-V).
- MSV Mobile Security Vault, for maximum 60 kg of explosives
- Security doors (Grades IV-VI).

The company, located at Katrineholm, has great potential for growth, including a joint venture project in progress in China to build a large factory in Chongqing, Sichuan, to supply the Chinese market, primarily the government sector, with secure storage for weapons, munitions and explosives. There is also great interest in Cesium's innovative products

from other parts of the world.

Dynasafe

Dynasafe International AB²¹ is an international group which is the global market leader in treatment of unexploded ordnance and other hazardous materials. Munitions Destruction is a segment of "CBRNE", which includes protection against and mitigation of chemical, biological, radiological, nuclear and explosive risks.

Dynasafe has over twenty years of experience working in regions affected by landmines, unexploded ordnance or terrorist activities, and can deliver transportation and protection systems as integrated solutions.

Dynasafe Demil Systems develops, manufactures and markets reliable solutions for recycling, dismantling and destruction, including military munitions and explosives and explosives for civil use, explosive wastes and fireworks. It provides, among other things dismantling and combustion equipment, from small mobile units to large-scale facilities that can handle both conventional and chemical weapons, from handguns to large calibres.

All solutions were designed to purify gases and liquids produced during the processes from all harmful substances, and the plants can be remotely controlled from a safe distance.

Dynasafe Protection Systems provides containment solutions to protect personnel, companies and organizations against the effects of explosions. It supplies equipment to customers, which include defence, police, airports, security industry and research.

Dynasafe Area Clearance possesses more than 23 years' experience in mine and ordnance environmental remediation and offers mine and UXO clearance on land and underwater. Over a thousand successful UXO clearance and demining projects were conducted globally, including munitions detection, localization and clearance with machinery or manually, and also supported by mine and explosive detection dogs.

The Dynasafe Group is headquartered at Kista, and there is a factory for protection and disposal systems at Karlskoga. In 2014 the Group had subsidiaries in 16 countries.

Ericsson²²

Ericsson Sweden's second largest and most multinational industrial company, with operations in more than 180 countries, is the world's largest and most important manufacturer of telecom equipment, providing communications networks, telecom services and support solutions.

Ericsson is a driving force behind the Networked Society and is a world leader in communications technology and services. The company has long term relationships with all major telecom operators in the world. Earlier Ericsson sold mostly equipment for telecom operators. Often today the company will supply complete systems, including construction, commissioning and maintenance, and will then mostly work with local contractors.

In addition to the usual business in telecommunications there is also an in-house relief organization consisting of volunteer Ericsson employees – Ericsson Response – which is a global initiative that provides communications, expertise, equipment and resources in times of need. In 2014 about 140 volunteers were active in this network. The aim is to facilitate humanitarian aid organizations with communications technology and expertise, to contribute to a better and faster response to human suffering at a disaster. Ericsson's head office is at Kista, in northern Stockholm.

Folke Bernadotte Academy²³

The Folke Bernadotte Academy (FBA) is a government agency with the overarching responsibility of supporting international peace-promoting activities, promoting fair and just global development, contributing to international peace and security and to improve living conditions for people in poverty and under oppression. The FBA conducts training, research and method development, and cooperates with a number of Swedish and International organizations. FBA recruits civilian personnel for international peace efforts led by, for instance, the UN, EU and OSCE, and is one of the largest dispatching authorities for crisis management in Sweden. It has coordination responsibility for other agencies, such as the MSB and the Police Authority, sending out civilian personnel to participate in civil crisis management. The FBA is located in Stockholm.

FOI²⁴

The FOI – Swedish Defence Research Agency – is a government authority with broad and high expertise in the entire area of CBRNE, i.e. chemical, biological, radiological, nuclear and explosive warfare agents. The FOI's research on weapons, protection and security is aimed mainly at the Defence Forces' need for knowledge of weapons and protection technology. Support for the civil society safety and security is increasing and focus is on consequences and possible remedies for acts of terrorism. Mitigation measures associated with dangerous or hazardous activities, like production and transport of energetic materials, are other important parts of the support for the civil society.

FOI has outstanding expertise on energetic materials, their handling, safety and security, and has test sites and advanced laboratories for production and analysis of explosives, and also powerful computational resources, at their experimental facilities at Grindsjön, south of Stockholm.

FortV²⁵

The Fortifikationsverket (FortV) is a government authority, with a role as owner and manager of all defence related real estate, and also maintains special expertise in safety and security

technology for buildings for special use, including fortifications. The FortV is located at Eskilstuna.

ISP²⁶

The Inspectorate of Strategic Products (ISP) is a government agency charged with exercising control and supervision of military equipment and products that can, additionally, be used for military purposes, and also has important other international tasks.

In order to maintain the international export control function, it is important to have a well-developed cooperation, both within the EU and with countries outside the EU. This is implemented through a number of export control arrangements, and multilateral and bilateral cooperations.

By educating and informing States the export controls of which are not as well developed, called international support and assistance or "Outreach", the ISP strengthens export control and non-proliferation efforts, and contributes to increase global security. The ISP regularly participates in outreach work organized by the EU or by the ISP's German equivalent, the BAFA. The ISP is located in Stockholm.

LTEAB²⁷

Lifetime Engineering AB (LTEAB) has a personnel core consisting of experts who are qualified specialists on lifetime assessments. They are experts on managing and investigating energetic materials in connection with sustainability and product testing. These materials are always combined with other types of materials or devices, the life of which is also limited by environmental factors to which they will be exposed during their lifetime. Analytical methods are used for both product development activities and for monitoring and maintenance. Munitions and missiles are typical application areas

One area where LTEAB has great expertise is to assess the status of ammunition, gunpowder and explosives in different types of storage, and after exposure to harsh environments. Education within this area is another activity. The LTEAB is located at Karlstad.

Milsec²⁸

The Milsec AB delivers "safe and secure rooms" to protect people from assaults, robbery, burglary, vandalism and attacks with weapons. With global opportunities also follows the emergence of new threats. Each threat and situation will be unique. Together with the customer Milsec will define the current threat and as "Security Builders" they will deliver a complete customer security solution, including the customer's required protection against bullets, ramming by vehicles, and blast waves, plus metal detection and x-ray devices, gates and fences. Milsec is located at Enköping, Karlstad and Stockholm.

Mojang AB²⁹

Mojang is Sweden's largest computer games developer, which, since 2014, is owned by the Microsoft Co.. The company's largest selling product is "Minecraft", one of the world's most popular computer games.

MSB³⁰

The Swedish Civil Contingencies Agency (MSB) possesses significant resources for international relief efforts, which are committed by demand of the EU, the UN and others. Not only is their task to quickly respond and save lives after a disaster, but longer-term efforts concerning disaster risk reduction are increasingly important. Normally the MSB will operate 50-60 activities abroad at any time.

Every year 20,000 people are killed by land mines and unexploded ordnance (UXOs). MSB works with Mine Action.

Urban search and rescue – SWIFT USAR – is an advanced search and rescue force used in events with collapsed building structures, caused by natural disasters, accidents or deliberate destruction acts.

The MSB is responsible for a knowledge basis on shelters, their design and construction, and is also the regulatory authority for explosives and their handling in Sweden. MSB is found at several locations in Sweden, and the head office is at Karlstad.

Nammo³¹

The Nammo Vingåkersverken AB has worked with demilitarization and recycling of ammunition for more than 40 years.

The company has developed a number of processes to remove explosives from munitions in an environmentally safe way, and has special high-speed dismantling machines for all types of explosives and munitions. It produces unique civilian explosive products from recycled explosive materials and also recycles all metal waste. Operations are conducted at Vingåker.

NCC AB³²

NCC is one of Sweden's largest construction and real estate development companies, with extensive operations in other countries, developing and building residential and commercial buildings, industrial facilities, public buildings, roads, bridges and facilities. Almost half of the NCC Group's sales occurs abroad. The NCC head office is in Stockholm, and NCC has many offices throughout Sweden and the World. Its head office is in Solna, close to Stockholm.

Swedish Police Authority³³

The Swedish Police Authority (in Swedish: Polismyndigheten) is, since 1 January 2015, the single authority for the police in Sweden. Sweden has strict weapons laws, with careful control of legal owners and sales of weapons, and strict requirements on how they should be stored. Weapons (rifles, shotguns and automatic weapons) confiscated by the police (not including weapons subject to criminal investigation) or handed in at police stations have as their country of origin at 75% Sweden or Belgium, handguns most often originate in the former Eastern Bloc, and these weapons were usually manufactured before 1960. The police also receive ammunition, both civilian and military, the extent of which has increased significantly in recent years.

NFC – the National Forensic Centre – formerly the National Laboratory of Forensic Science

NFC works primarily within the legal system and since January 2015 it is a department within the Police Authority. It investigates, among other, weapons function, tracks, fingerprints etc. to prove if weapons were used in crimes, and also analyzes cartridges and shell casings. In a national

registry all information is stored about weapons, cartridges and cartridge case, and access to these records is shared with some other countries and vice versa. The forensic laboratories in many EU countries collaborate increasingly. The NFC also scraps all weapons handed in by the public – this activity is no longer permitted for arms dealers or individuals. Before scrapping they will be test fired.

Swedish police abroad

The Swedish police are involved in peace and security support missions. International engagement is an important part of the work of Swedish police and they are in demand for international work. Assignments will given by the Ministry of Foreign Affairs, which will decide where to act. The assignments will normally be led by the UN, EU or OSCE.

The police's role in international operations is long term and intended to assist the current country to establish a functioning judicial system and lawful policing. Mostly the work focuses on supporting the building up of local police work. Much work is dedicated to change the approach of a corrupt police force, which for example, may sell confiscated weapons and ammunition. The situation is, however, very different in different countries.

In a few missions and specific functions there may be policemen with operative tasks, for instance as replacement or supplement to the national police force. Then Swedish police officers will be armed.

Each year about 150 Swedish police officers will be recruited for work in the police foreign service force, both for shorter and longer assignments.

In 2014 about 110 Swedish police officers served in about 25 different activities, including:

- Special family violence unit in Nicaragua
- Community policing in Kenya
- Forensics Training Centre in Serbia
- Police efforts in Moldova

Saab AB

The Saab AB³⁴ is the Sweden's largest defence and security company, and works, in addition to its well-known aerial systems, on other aerospace products, submarines, radars, etc., and also with advanced management, control and communication systems. It is active in many areas of importance for peace technology. Some examples are given below:

“Soft Armour” is a patented technology that uses a large amount of spherical balls made of hard ceramic material, in order to protect people and sensitive equipment from small calibre and armour-piercing munitions. Soft Armour is self-healing, can withstand several hits in the same area, and provides environmentally friendly and ricochet free protection against projectiles and shrapnel with a customizable level of protection that is easy to transport and set up. Soft Armour can also be used and stored in bulk. It can be used in design solutions, such as walls, shields and soft coatings.

“SAFE” is a platform that enables safe, robust and cost-effective management and coordination solutions for safety work. SAFE can be easily adjusted and adapted to match different requirements, and is modular. Various functions can be easily added or removed, also for systems already running.

“Paratus” is a product family, specifically developed for rescue services, fire brigades, ambulance, police and others. The system is user-friendly and versatile, ranging from PDAs and compact navigators for ambulance services to complex systems for fire and police and provides, among other things:

- Reliable and user-friendly information, always at hand when needed.
- Shared situational awareness.
- Sharing of information between command centres and operational units.

Saab also specializes in robust and secure communications and radio solutions for both indoor and outdoor operations. Saab's solutions cover all major radio technologies, like TETRA, DMR, P25, LTE, UHF, VHF, etc. Saab is found at many sites in Sweden, with the main activities in Linköping.

Secoil³⁵



Figure 5 A Secoil station, completely self-sufficient for energy and communications. Only a foundation plate with environmentally safe runoff will be needed.

The name stands for Secure Oil – Safe fuel storage – and the company develops and sells modular fuel supply solutions for land or marine use, with highest standard for environmental, safety, security and anti-theft protection. The facilities are provided with a patented shell protection against theft and burglary, and all products are quality certified. Secoil partners with three major global suppliers of dispensing and payment systems, with associated service agreements. Secoil is located at Katrineholm.

Secrab

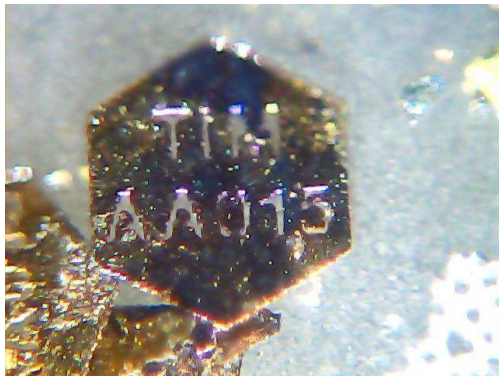


Figure 6 0.5 mm nickel marker suitable for marking of weapons and ammunition. This marker was exposed to extremely high temperatures, still remaining intact.

Secrab Security Research³⁶ is a company with long experience of research and technology for security and defence, including:

- Consultancy in security, anti-terrorism, effects, safety, security and environmental aspects of explosives and extremely fast processes, weapons, and advanced rock blasting
- Development of new technologies for indelible anti-theft marking, particularly for theft-prone metals such as copper, bronze and lead, and for weapons and munitions.

Secrab cooperates closely with Trace-in-Metal Ltd.³⁷, UK, which markets anti-theft products for metal objects.

SIDA³⁸

SIDA is a Government authority which administers most of the Swedish foreign development assistance. It aims to stimulate sustainable development and save lives, and to lead changes to eradicate poverty.

SIDA works in many important areas, such as:

- Democracy, human rights and freedom of speech
- Equality
- Environment and climate
- Health
- Market Development
- Agriculture and Food Security
- Training
- Sustainable development
- Conflict, peace and security
- Humanitarian aid

SIDA finances initiatives in, among others, mine action and humanitarian demining.

Skanska AB³⁹

Skanska is a world-leading project development and construction company with quite extensive activities in other countries, and also Sweden's largest construction company in terms of total sales. It has very extensive experience in large projects and infrastructure construction. More than 2/3 of the Skanska Group's operations were conducted outside Sweden in 2014. Skanska's head office is located in Stockholm.

Swedish Tax Agency⁴⁰

The Swedish Tax Agency (in Swedish: Skatteverket) has, for many years, conducted successful international activities in several countries, supported by SIDA and carried out by their own experts. Extensive cooperation occurred already in the 1990s with South Africa, where tax revenues could be tripled thanks to the cooperation. Unfortunately, in recent years such cooperative projects appear to have ceased, perhaps due to previous occurrence of certain irregularities and problems with part of the responsible staff.

Swedec

Swedec – the Swedish EOD and Demining Centre⁴¹ is part of the Swedish Armed Forces, is Sweden's centre of excellence for national and international tasks in munitions and mine clearance, and works in both military and humanitarian operations, with a focus on training, development and operative support.

Swedec contributes to increased safety and efficiency through information and education, and provides technical and practical support in EOD and demining. The centre coordinates and manages materiel and method development in EOD and mine clearance (EOC). The staff's expertise is complemented by cooperation with international experts and humanitarian organizations. A large part of Swedec's staff works with education and offers a range of different courses for both military and civilian operations. Swedec is located at Eksjö, in southern Sweden.

Swedec's skills include, among others:

- Expertise in munitiona technology
- Technical information handling (total concept)
- Training and education development (Amtek)
- Field munitions monitoring
- Risk management
- Custom protection solutions

- Mobile destruction plants

Some possible Swedish measures in Peace Technology

Comparing the list of companies and organizations above and their expertise with the previous list of problems, you can easily see many opportunities for new initiatives. Some thoughts will be described in table 1.

Some conclusions

From the descriptions of the needs and opportunities, and the brief summary of some Swedish organizations and companies above it appears that there may be many areas where the Swedish entities mentioned could be effectively and successfully utilised for Swedish humanitarian operations. Many more companies and organizations might also contribute! Currently most services procured for Swedish foreign development aid activities are found in the international or sometimes the local markets in the current support countries. Therefore, unfortunately, the Government will fail to utilize most of the relevant, substantial and outstanding, relevant skills and equipment available in Sweden.

Management, control, clearance, destruction and recycling of munitions and explosive items are areas of particular significance to eliminate barriers and obstacles and facilitate the building of a peaceful society. These components will, of course, also be important in military operations, but here we refer to the period after the conclusion of hostilities. There still exist much expertise and technology in this field in Sweden, but unfortunately all at risk of disappearing, partly because the defence financing in the area has decreased dramatically or disappeared. Abroad, persons concerned often know about the Swedish competence and ask for it. An investment in this area, including as part of development assistance, would contribute to make Sweden a unique country, which would attempt to eliminate the roots of evil, rather than to try to relieve the symptoms!

By drafting an explicit Swedish strategy and profile in munitions technology, a unique total solution for the munitions component in PSSM projects would be created. Sweden could take a complete responsibility that would clearly profile Swedish authorities, expertise and research, and promote domestic industry.

The fact that those same kinds of problems with munitions and explosives, current in war-affected developing countries, also occur extensively in our own country ought to increase motivation to ensure that the necessary expertise would be maintained within Sweden.

Table 1 Compilation of possible measures and tentative Swedish operators

Subject	Possible measures	Possible operator(s)
Non-violent resistance and civil defence		
Communication systems	Rapidly built, small scale mobile networks for GSM/4G, voice and data communications	Ericsson
Reporting systems	Use of mobile communication networks	Saab, Ericsson
Protective equipment	Reinforcing houses and buildings to a higher level of protection, protected rooms Rapidly built protective structures	FortV, MSB, Milsec, Saab
Monitoring, surveillance etc.	Use of mobile networks for monitoring	Saab, Ericsson
Societal structure		
Democratic development	Use of mobile networks Computer gaming	Ericsson Mojang
Critical infrastructure	Mobile networks, transport networks, water and energy supply Protection of infrastructure	Ericsson, NCC, Skanska, ABB, FortV, MSB, Milsec, SECRAB
Establishing small-scale infrastructure	Construction and commissioning of mobile communication networks	Ericsson
	Rapidly built facilities, roads, bridges, water mains and sewage Energy supply	NCC, Skanska ABB
Administrative systems	Support for development and commissioning of, for instance, a tax administrative system	Swedish Tax Authority, SIDA
Weapons (assault rifles, anti-tank weapons)	Secure storage Permanent and indelible marking of weapons	Cesium, FortV Secrab
Munitions and explosives	Transfer of knowledge, PSSM projects, implementing the IATG, support to SaferGuard, Lifetime assessment and monitoring	Swedec, Cesium, Secrab, LTEAB, FortV LTEAB
	Durable marking	Secrab
	Recovery and destruction	Dynasafe, Nammo
	Education and training of technicians and other	Swedec, LTEAB
Materials for manufacture of explosives	Detection and "denaturation" of precursor	FOI etc.
Land mines and mine fields	Mine awareness, clearance, destruction	Swedec, SIDA, Dynasafe
UXO - Unexploded ordnance	Munitions knowledge, clearance, destruction	Swedec, Dynasafe
Munitions storage and dumps	Knowledge and personnel for assessment and clearance Implementation of IATG	Swedec, LTEAB, FOI Swedec, Cesium, Secrab,
Chemical munitions and chemical substances	Detection, marking, destruction	FOI, Swedec, Dynasafe, Secrab
Phenomena and objects that represent risks to society and population and which obstruct the emergence of a		
Lack of societal control	Reinforcing and supplementing police etc.	Swedish Police Authority, FBA
Lack of democracy and influence	Information and education	SIDA, Mojang, FBA
Poor respect for human life	Information and education	SIDA, Swedish Police Authority, FBA
Corruption	Information and education, follow-up and prosecution	Ericsson, Mojang, FBA, SIDA, Swedish Police Authority
Embedded conflicts	Information and education	Swedish Police Authority, FBA, SIDA
Use of force, violence	Information and education	FBA, SIDA, Swedish Police Authority, MSB
Lack of essential supplies	Organisation, logistics, transports	FBA, SIDA, MSB & others
Inadequate or non-functioning infrastructure	Design and construction	SIDA, FBA, Ericsson, NCC, Skanska
Other obstacles to the emergence of peaceful society		
Conflicts between ethnic groups, clans, ...	Information, contact opportunities, via e.g. mobile networks and "computer games"	Ericsson, Saab, Mojang, FBA
	Information and education	
Other States' involvement	Monitoring via mobile networks	Ericsson, Saab
Lack of control and lack of an effective state apparatus	Information and education	FBA, SIDA, Swedish Police Authority
Lack of water	Building infrastructure with water and sewage	SIDA, NCC, Skanska

Sweden should actively support the work of SaferGuard and implementation of IATG in selected countries, and to do this would be clearly in line with Swedish foreign policy and humanitarian traditions. Sweden also needs to introduce IATG's principles for domestic use! The implementation of the Arms Trade Treaty (ATT) in different countries is, in part, supported through EU financed projects, where Sweden has a high profile. This could be one possible channel to carry out and implement some proposals advanced in this report.

Peace Technology, geared towards seeking to reduce violence in the world by, among other things, providing support for controlling and reducing the availability of illegal weapons and munitions, and increasing security of their handling, could develop into a unique Swedish profile area! Skills and activities required already exist! Strong international pressure, including from the United Nations and some countries concerned, will mean that this could rapidly be established!

The authors are Fellows of the Royal Swedish Academy of War Sciences.

References

1. Tzovaras, Mickos (photo): Non-violence, sculpture by C F Reuterswård, Sweden, United Nations Building, photo: United Nations, New York.
2. See, for example, www.gichd.org. (accessed 2015-08-24)
3. Janzon, B (ed.): Peace Technology - Security policy and commercial opportunities, (in Swedish: Fredsteknik – Säkerhetspolitiska och kommersiella möjligheter), 2014. Available from bo.janzon@secrab.eu
4. OECD. Breaking cycles of violence. Key Issue in Armed Violence Reduction, OECD, 2011, <http://www.oecd.org/governance/governance-peace/conflictandfragility/docs/48913388.pdf>, accessed 2015-03-07
5. SIDA, HUMASIEN, Olofsson Karin: Feedback for Appropriations Year 2015 concerning a compilation of Sida contributions in 2014 in the area of mine action (landmines, cluster munitions and other explosive remnants of war) and small arms and light weapons, (in Swedish: Återrapportering enligt Regleringsbrev år 2015 avseende sammanställning av Sidas bistånd år 2014 på området minhantering (landminor, klusterammunition och andra explosiva lämningar efter krig) och små och lätta vapen), SALW, SIDA, Stockholm, 2015.
6. <https://sustainabledevelopment.un.org/sdgs> (accessed 2017-01-15); United Nations' General Assembly, A/68/L.61, 2015
7. UNODA, International Ammunition Technical Guidelines, 2015, <https://www.un.org/disarmament/un-safeguard/guide-lines/>, accessed 14 Jan. 2017.
8. UNODA, IATG Implementation Support Toolkit, 2015 <https://www.un.org/disarmament/un-safeguard/>, accessed 14 Jan. 2017.
9. Henricsson, U: Personal message (2015-01-30), <http://www.so-rummet.se> (accessed 2015-10-05)
10. *Ibid.*
11. Martin, B: *Technology, Violence, and Peace*, Oxford in Kurtz L R (ed): *Encyclopedia of Violence, Peace, and Conflict*, Elsevier, 2008.
12. Banks, K: *Reflections on a Decade of Mobile in Development, Stability, International Journal of Security and Development*, 2 (3), Vol. 51, 2013;
- Mancini F and O'Reilly M: *New Technology and the Prevention of Violence and conflict, Stability, International Journal of Development & Security*, 2 (3), Vol. 55, 2013; and
- Puig Laurari, H and Kahl, A: *Technology for Peace Building, Stability, International Journal of Security and Development*, 2 (3), Vol. 61, 2013.
13. Martin-Shields, C: *Inter-ethnic Cooperation Revisited: Why the PHONES Mobile can help preventable discrete events of violence, using the Kenyan case study, Stability, International Journal of Security and Development*, 2 (3), Vol. 58,, 2013.
14. Small Arms Survey, <http://www.smallarmssurvey.org/fileadmin/docs/A-Yearbook/2007/en/full/Small-Arms-Survey-2007-Chapter-02-EN.pdf> . (accessed 2015-10-05)
15. Williams, Carol J: "The Pentagon audit finds poor control of weapons given to Afghan Forces," the Los Angeles Times, 2014-07-29, <http://www.latimes.com/world/afghanistan-pakistan/la-fg-afghanistan-us-weapons-20140728-story.html> , accessed 14 Jan. 2017)

16. Small Arms Survey, 2014, <http://www.smallarmssurvey.org/weapons-and-markets/stockpiles/unplanned-explosions-at-munitions-sites.html>, (accessed 2015-10-05)
17. Cosgrove, William J. (ed.): Water Security and Peace, UNESCO SC-2003/WS/51, 2003, p. 122.
18. The information about the companies and organizations comes mainly from the respective websites (2015-08-24).
19. www.abb.com
20. www.cesium.se
21. www.dynasafe.com
22. www.ericsson.com
23. <https://www.fba.se>
24. www.foi.se/sv/
25. www.fortv.se/
26. www.isp.se
27. www.lifetime-engineering.com
28. www.milsec.se
29. <https://mojang.com> ; Mojang has been mentioned as an example of the Swedish games industry, there are several more, some quite large.
30. www.msb.se
31. <https://www.nammo.com/who-we-are/locations/Sweden/nammo-vingakersverken>
32. www.ncc.se
33. <https://polisen.se/en/Languages/Startpage>
34. www.saab.com
35. <http://www.secoil.se/eng/k20.php>
36. www.secrab.eu
37. www.trace-in-metal.com
38. www.sida.se
39. www.skanska.com
40. <https://www.skatteverket.se/omoss/omskatteverket/varauppgifter/internationaltsamarbete.4.76a43be412206334b89800051601.html> (accessed 2015-08-24)
41. <http://www.forsvarsmakten.se/en/about/organisation/training-units-schools-and-centres/the-swedish-eod-and-demining-centre-swedec> (accessed 2017-01-15)