Finnish nuclear security detection architecture for nuclear and other radioactive material out of regulatory control

REPO – Nuclear security development project

Final report of phase one

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Finnish Radiation and Nuclear Safety Authority
Helsinki Police Department
Finnish Border Guard
Finnish Customs
Finnish Defence Forces Technical Research Centre
Helsinki City Rescue Department
Finnish Transport Agency
National Police Board of Finland
Finnish Ministry of the Interior
Finnish Ministry for Foreign Affairs

Summary

In Finland the development of authority cooperation related to nuclear and other radioactive material started from practical needs. Field activities and information processing have been developed by strongly committed experts of the Helsinki Police Department, the Helsinki City Rescue Department, the Finnish Defence Forces, and STUK – the Finnish Radiation and Nuclear Safety Authority.

The REPO project[1] is a continuation of cooperation in which traditional authority duties are performed in an integrated manner, and all security and safety authorities thus work together. The project is focused on developing the management of threats concerning radioactive and nuclear (RN) material as a part of the comprehensive activities of the Finnish authorities against chemical, biological, radiological, nuclear and explosive (CBRNE) threats.

Nuclear security activities that concern nuclear and other radioactive material out of regulatory control need to be nationally coordinated so that all activities are in agreement with national legislation, regulations and other provisions. A CBRNE Advisory Committee within the Ministry of the Interior is expected to provide nationwide coordination in the future.[2]

The task of the coordinating body is to assess the performance and response plans of the national nuclear security detection architecture, and the authority procedures and infrastructure. These factors form the foundation of counter-terrorism activities. It is important to ensure that the development of the national response has sufficient resources regarding both personnel and technology. The CBRNE activities need centralised management to ensure that a nationally interoperable and cost-effective system will be achieved.

The national nuclear security detection architecture will save resources and increase authority effectiveness in countering criminality and terrorism. Information sharing is a cornerstone of authority activities. Providing correct information to the relevant users at the right time is of paramount importance for the success of nuclear security tasks. For example, correct information about hazardous materials needs to reach first responders fast.

Through the REPO project, a new model for authority cooperation is being created. This model forms the basis for countering unauthorised, criminal and terrorist activities related to RN materials. The goal is to handle problems in a comprehensive manner so that the points of view of all authorities are taken into account. The first phase of the REPO project produced a design for the national nuclear security detection architecture, which has led to a new procurement process. The authority requirements are first defined and solutions are then sought from industry, instead of having a bidding process based on existing technology.

During the first phase of the REPO project, the general performance requirements of the future radiation detection systems were defined. These requirements are described in the non-public report of the project.

1 REPO is a joint, two-phase project of Finnish authorities for the development and maintenance of national nuclear security. Phases: 1 = definition phase (2012–2013), 2 = demonstration and evaluation phase (2014).

2 In accordance with the Nuclear Energy Act (56 § 3), the present Advisory Committee on Nuclear Security only handles matters concerning nuclear security at nuclear facilities.

Basis of the detection architecture design is the prevention of criminal acts against society and management of different threat situations

The International Atomic Energy Agency (IAEA) has defined the three fundamental pillars of nuclear security:

1. Prevention,
2. Detection and
3. Response.

The primary goal for nuclear security activities is the prevention of crime. Thus, prevention may be considered as a more important element than detection or response, because they are just means for fulfilling the goal. What, where, when, how and who are questions of central importance for each pillar. These questions also highlight why the cooperation of different authorities and other actors is important when building comprehensive nuclear security. Each party uses these questions to consider nuclear security from their own point of view. Thus, a multi-functional vision for implementing nuclear security can be obtained.

An integral part of nuclear security is the assessment and handling of alarms. For this purpose, IAEA defines two activities: the initial assessment of the instrument alarms and the assessment process, which determines the security significance of the observation. The person who reacts to the alarm should receive support from a radiation expert, if needed.

IAEA defines risk as the combined effect of the threat and the consequences of threat realisation.[3] Likelihood describes the probability of threat realisation, and is influenced by both the threat and the vulnerability of the target (Figure 1). Behind each threat is a scenario, the most important aspect of which is the adversary that threatens society: criminals, terrorists, or perpetrators of vandalism or disruption. The scenario is also influenced by the availability of RN materials and the target itself.

There are two parts affecting the security assessment of a particular case: assessment of the immediate threat and assessment of the consequences that can result from the threat. The former is carried out by the police, with support from STUK. The latter has the character of a consequence analysis, and regarding the assessment of possible radiological or nuclear emergency the responsibility is STUK's.

In Finland, the terminology for safety and security is somewhat wavering and not in full agreement with international terminology. One reason for this is that in the Finnish language there is only one word, "*turvallisuus*", which means both "safety" and "security". Thus, one important area of development within nuclear security is common terminology, which provides a solid foundation for guides and instructions.

3 Threat Assessment and Risk-Informed Approach for Implementation of Nuclear Security Measures for Nuclear and other Radioactive Material Out of Regulatory Control, IAEA Nuclear Security Series, Vienna, 2014.

The long-term assessment of nuclear security risks directs the development of the response. The risk-informed approach defined by the IAEA determines the basis for developing the authority response.

The ultimate risk could be a nuclear explosion. On the other hand, the threat could be everyday vandalism, or threatening or disruptive behaviour with a harmless or only slightly radioactive material.

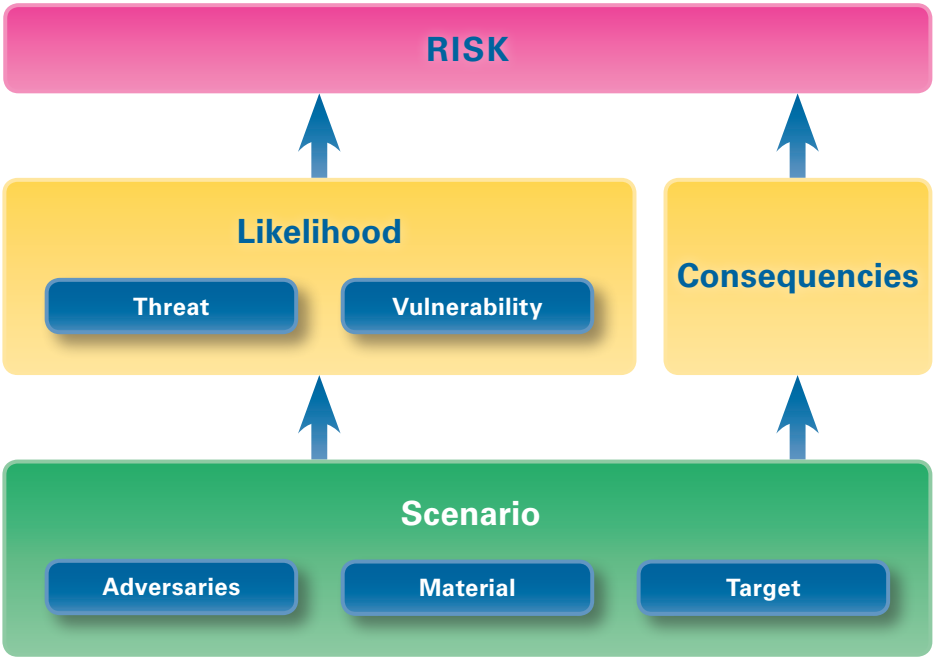


Figure 1. Relationship between risk, threat and consequences. The threat and the vulnerability of the target define the likelihood (probability) of an incident. Risk is the combined effect (product) of the likelihood and the consequences of the incident. Note that even when a threat is high the risk can be low, if the vulnerability of the target is low or the consequences have been minimised.

National coordination is needed to steer the cooperation between authorities

The nuclear security detection architecture needs to be nationally coordinated by one body or mechanism so that all activities are in agreement with national legislation, regulations and other provisions.

According to the IAEA, the tasks of the coordinating body or mechanism include:[4]

1. Ensuring that the development of the national detection strategy is based on a multilayered defence in depth approach and has sufficient resources.

2. Ensuring that a national response plan has been developed for a possible disruptive, threatening or terrorist act; the response needs to use a graded approach and be based on the threat.

3. Overseeing the development and implementation of the national detection and authority response systems.

4. Re-evaluating and identifying possible national nuclear security gaps and resource needs; initiating corrective actions on a regular basis.

5. Ensuring that the points of contact within the competent authorities function as parts of an overall coordination.

6. Ensuring the reliable and comprehensive national sharing of operational information produced by competent authorities, in connection with nuclear security events.

7. Ensuring that a reliable and comprehensive set of records for each nuclear security event is reported; encouraging the exchange of information among competent authorities. The reports and notifications should use a common reporting and notification format.

8. Ensuring that the competent authorities cooperate with relevant authorities in other States and with international organizations.

4 Recommendations on nuclear and other radioactive material out of regulatory control, IAEA Nuclear Security Series No. 15, Vienna, 2011.

Awareness of nuclear security, including education, training and exercises, is an essential part of the architecture

Defining the needs and performance requirements of authorities is an important part of the detection architecture, in order to develop compatible technology. Technical systems are often expensive, and it is justified to question whether purchases are always rational and well-functioning. With a comprehensive architecture, the response can be made nationally cost-effective. The resources are utilized as a whole, adapting to the needs of different authorities at any given time. This requires that the technology is interoperable and data transfer happens in real time, regardless of where activities are taking place. An essential part of the technology is the analysis and sharing of information on both the expert and the operative levels, together with all the actors.

Systematic CBRNE awareness for decision makers and actors in the field

The criminal use of CBRNE materials enables the harming of people on a larger scale than can be achieved with traditional weapons and explosives. At worst, the psychological effects can be crippling for society.

The Government of Finland adopted a Resolution on the Strategy for Security in Society (YTS) on 16 December 2010.[5] The Strategy was drafted by a broad-based working group involving the participation of a number of different agencies, non-governmental organizations and the business sector. This Resolution replaces the Government Resolution on Securing the Functions Vital to Society, adopted in 2006. The Resolution also takes into account CBRNE threats and accidents, because if realised they will have large-scale consequences in society.

In the national counter-terrorism strategy, CBRNE materials are also mentioned as a relevant threat, but this may present the use of these hazardous materials in a manner too heavily slanted towards terrorism. Therefore, the threat may appear distant. It is essential that cooperation between authorities, preventive measures and the national response are developed systematically under the joint leadership of ministries – for example, in a dedicated Advisory Committee, which would undertake the tasks of a coordinating body. The national task of the Advisory Committee would be to create a CBRNE strategy, which in practice means much further developed cooperation between authorities, on quite a different level from today. The responsibilities brought on by EU operational programmes must also be taken into account in the new strategy. The counter-terrorism strategy will be updated during 2014.

5 http://vnk.fi/toiminta/turvallisuus/YTS/en.jsp

Shared education, training and exercises for authorities

Continuous training of authorities and related exercises at different levels are part of the national architecture. Essential elements of training and exercises are threat awareness, detection methods, evaluation of results and cooperation between the authorities. Continuity means the continued development of cooperation and functions, which mirrors the other central elements of the architecture.

An important challenge is the basic training of the first responders. Rescue, police and paramedical personnel are the first on the event scene and they can easily become victims, unless they have basic knowledge and skills concerning CBRNE threats and personal protection. Awareness of CBRNE risks, including criminal and unauthorized activities in connection with them, needs to be integrated into the education and training of the first responders.

Raising security awareness of the general public with information and education

Awareness of threat scenarios builds a solid foundation for different authorities to bring relevant information and education to the general public. The violent events of recent years (school shootings in Finland and abroad, the events in Norway) have created fear and insecurity. This poses challenges to authorities regarding information gathering and dissemination, as well as crisis communication. It is also problematic to combine social media and authority activities for the purposes of informing.

The general public has abundant information, but does not necessarily understand the meaning of the information. An important question is thus how the threshold for informing of a strange occurrence or observation could be made as low as possible, by means of various media. Good ideas and advice from authorities may also be missed simply because they are not marketed on the right forums. Authorities need to have a wide range of methods to actively communicate with the general public. Additionally, systematic information exchange between agencies is needed, to ensure that the right parties receive the necessary information.

The “Nettivinkki” (“Internet tip”) service launched by the Finnish police has lowered the threshold of informing the police of a wide variety of crimes and threats. Tips from the general public arrive at a commendable rate and they end up at the shared Operation Centre of the police, the Customs and the Border Guard.

Information sharing is recognized as a cornerstone of authority activities

Efficient distribution and use of correct information enables the optimisation of authority activities. Many types of information users are connected to the nuclear security detection architecture, all of them have their own individual information needs. Getting correct information to the relevant users at the right time is of paramount importance for the success of nuclear security tasks. For example, correct information about hazardous materials needs to rapidly reach first responders. Commitment to good information security is essential in all areas of the detection architecture, in order to maintain confidence in cooperation and in information integrity, while also making information available to those who need it. The local, isolated use of surveillance equipment limits the efficiency of the system as a whole.

The REPO project is focused on developing shared services from the viewpoint of detection systems. The Government Security Network (TUVE) will, in time, produce a comprehensively secured data transfer option. When technically implementing the detection architecture, it is important to define the requirements (formats and protocols) for how to forward, in real time, the measurement data that the actors produce. The importance of securing telecommunications is emphasised in the new architecture. All competent authorities should join the TUVE network.

Radiation in-field measurements, analyses and data management are integrated

Within nuclear security, the purpose of radiation measurements is the early detection of threats and the assessment of their security significance, so that the gathered information can be used for a correctly dimensioned response. The response must be neither over- nor underdimensioned. Therefore, the quality of the information is critical. Because of this, in the new detection architecture, mobile and relocatable radiation detection systems are being developed alongside fixed systems.

Cooperation between authorities is the foundation of effective nuclear security. However, not all parties have access to radiation experts who could correctly interpret the observations. In Finland, STUK and the Finnish Defence Forces Technical Research Centre have expertise in spectrometric analysis in field conditions. On-call services are being developed to serve, in yet more diverse ways, different authorities when they are performing in-field tasks (24/7 reachback).

Detection systems are evaluated in different areas of nuclear security

The comprehensive detection architecture considers nine areas of nuclear security where the authorities could have an influence on threat reduction. These areas can be grouped into three sets: foreign countries, cross-border and domestic (Figure 2).

Exterior:

1. Nuclear facilities or facilities that handle radioactive material in foreign countries
2. Transport between border crossings and facilities in foreign countries
3. Border crossings in foreign countries

Border:

4. Transport from the source country to the destination country
5. Border crossing point

Interior:

6. Domestic nuclear facilities or facilities that handle radioactive material
7. Nationwide observations – transport, transport hubs
8. Detection systems at a stand-off distance from the target
9. Target

The detection architecture is based on a layered approach. Hazardous materials can be detected at several different stages, before they are used for criminal purposes. It is important to carefully consider all aspects and take into account economic and other realities. Thus, a national approach will be created, aiming at the best possible results for promoting nuclear security.

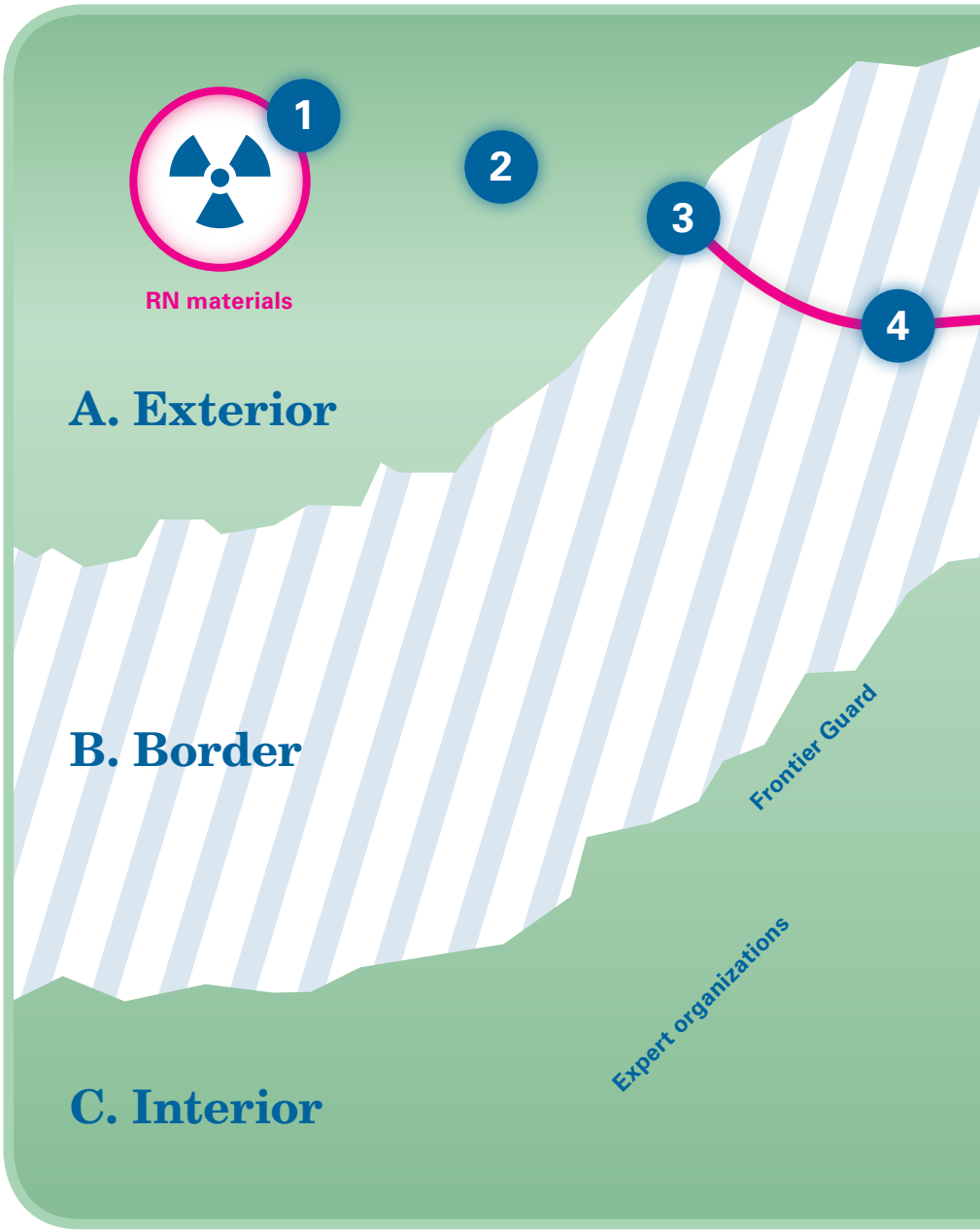
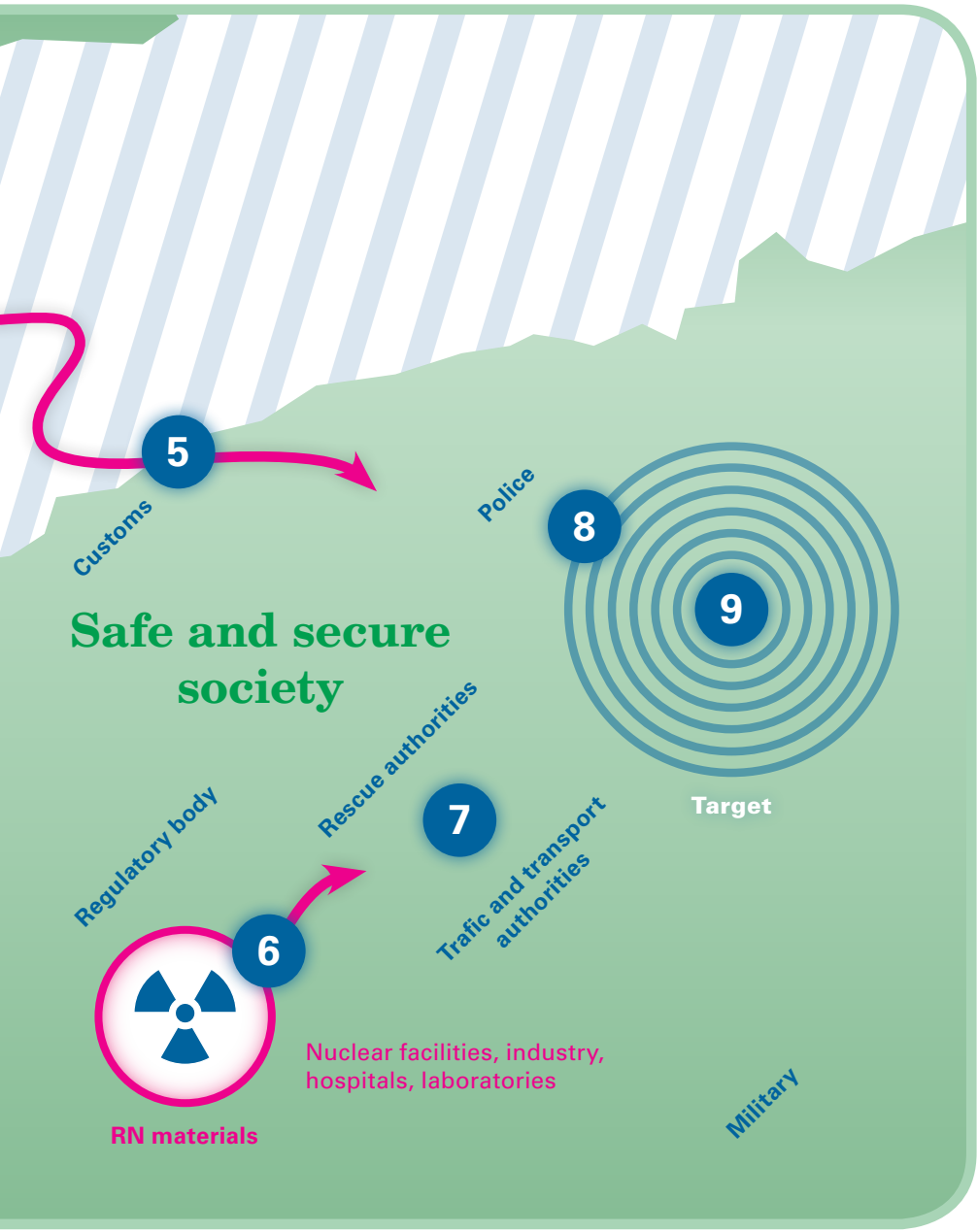


Figure 2. A layered approach to the nuclear security detection architecture. (1) Foreign origin, (2) Transit, (3) Foreign Point of Departure, (4) Transit to target, (5) Border, including Points of Entry and undesignated Points of Entry, (6) Domestic origin, (7) Sub-national, (8) Target vicinity and (9) Target.


5
Customs
Police
8
9
Target
Safe and secure society
Rescue authorities
Regulatory body
7
Trafic and transport authorities
6
Nuclear facilities, industry, hospitals, laboratories
RN materials
Military

Research and development are based on the national needs for nuclear security

The policy "Innovations in public procurement" of TEKES – the Finnish Funding Agency for Technology – supports the idea that technology initiated by authorities can lead to comprehensive solutions. A good example is the REPO project, in which the authorities first together define the technology that they all will use, at least to the proof-of-concept level, and then in the second stage companies are given the opportunity to demonstrate solutions. Finally, the authorities define the exact requirements for procurement. Promising security technologies can be studied and developed by the authorities together with the universities to the technology readiness level (TRL)[6] of 4 or 5. After that, partners should be found from the private sector and they turn the technology concept into products in a well-controlled manner, by raising the TRL level one step at a time. This procedure ensures that the desired goal is reached before larger investments are made.

6 http://en.wikipedia.org/wiki/Technology_readiness_level

Finland contributes actively to the international development of nuclear security

National nuclear security becomes comprehensive only if it takes the international threats connected to RN materials and the consequences of threat realisation sufficiently into account. The international significance of nuclear security is understood ever better and its development is seen important everywhere. Development projects are being started and funding is being reserved to prevent threats. This trend is clearly visible in both IAEA activities and EU projects (e.g. Instrument of Stability). Because many projects are in their early stages and the overall process is of long duration, Finland has good opportunities for active participation in the development of the nuclear security detection architecture of other countries. A good example of such a project is the cooperation between STUK and the Ukrainian authorities, which produced a modern radiation surveillance capability for Ukraine.

Influencing international development can be pursued in many different ways. Participation requires acceptance, cooperation and funding from both Finland and the other parties involved. Because of this, participation in specific foreign projects is accepted flexibly case by case, within the limits of possibilities and priorities. Active domestic partners are selected in a similar manner. The realisation of international cooperation requires permanent administrative structures and functional units, which enable the planning and implementation of programs by providing basic administrative services. The coordination of national participation needs centralised management (CBRNE coordinating body).

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