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National risk management strategy for contaminated land in Finland

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National risk management strategy for contaminated land in Finland

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Abstract

The PISARA working group appointed by the Ministry of the Environment (term 15 October 2014–30 October 2015) was tasked with devising a national understanding and target state concerning the organisation of the risk management of contaminated land areas in Finland.

The key goal of the strategy is that the health and environmental risks posed by contaminated sites will have been contained in a sustainable manner by 2040. This goal can be achieved by meeting the following six objectives:

- Risk sites are identified, investigated and remediated systematically.
- Land use and risk management in contaminated land areas support each other in a way that sustainable, comprehensive solutions can be achieved.
- Information systems support the planning and decision-making in a user-driven way.
- Restoration methods are cost-efficient, save on natural resources, minimise adverse environmental impacts and promote circular economy.
- Procedures are interactive and the distribution of labour, responsibilities and obligations of the actors are clear.
- Activity and communication is open, transparent and interactive.

The objectives of the strategy are supplemented by recommendations for measures that bring the actions necessary to improve efficiency to the concrete level and designate responsible actors for them.

The purpose of the National Investigation and Remediation Programme for Contaminated Sites is to identify significant contaminated areas and promote research on these and the implementation of necessary risk management measures.

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Tiivistelmä

Ympäristöministeriön asettaman PISARA-työryhmän (toimikausi 15.10.2014–30.10.2015) tehtävänä oli ollut luoda kansallinen näkemys ja tavoitetila siitä, miten pilaantuneiden maa-alueiden riskienhallinta hoidetaan Suomessa.

Strategian tavoitteena on, että pilaantuneiden maa-alueiden riskit terveydelle ja ympäristölle on saatu hallintaan kestävällä tavalla vuoteen 2040 mennessä. Tämä päämäärä saavutetaan täyttämällä kuusi tavoitetta, jotka ovat:

- Riskikohteet tunnistetaan, tutkitaan ja kunnostetaan järjestelmällisesti.
- Alueidenkäyttö ja pilaantuneiden maa-alueiden riskinhallinta tukevat toisiaan kestävien kokonaisratkaisujen saavuttamiseksi
- Tietojärjestelmät tukevat suunnittelua ja päätöksentekoa käyttäjälähtöisesti.
- Kunnostusmenetelmät ovat kustannustehokkaita, säästävät luonnonvaroja, minimoivat haitalliset ympäristövaikutukset ja edistävät kiertotaloutta.
- Menettelytavat ovat vuorovaikutteisia ja toimijoiden työnjako, vastuut, ja velvoitteet ovat selkeitä.
- Toiminta ja viestintä on avointa, läpinäkyvää ja vuorovaikutteista.

Strategian tavoitteita täydentävät toimenpidesuositukset, joilla konkretisoidaan tarvittavat tehostamistoimet ja nimetään niiden vastuutahot.

Strategia sisältää Valtakunnallisen pilaantuneiden maa-alueiden tutkimus- ja kunnostusohjelman, jonka tavoitteena on tunnistaa merkittävät pilaantuneet alueet ja edistää niiden tutkimista ja tarpeellisten riskinhallintatoimien toteuttamista.

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Referat

Miljöministeriet tillsatte en arbetsgrupp för mandatperioden 15 oktober 2014–30 oktober 2015 med uppdrag att skapa en nationell syn och en målbild för hur riskerna i anslutning till förorenade markområden ska hanteras i Finland.

Strategias målet är att de risker för hälsan och miljön som förorenade markområden orsakar ska fås under kontroll på ett hållbart sätt före 2040. Detta övergripande mål nås om följande sex delmål kan uppfyllas:

- Riskobjekten identifieras, undersöks och saneras systematiskt.
- Områdesanvändningen och riskhanteringen i anslutning till förorenade markområden stöder varandra så att hållbara och täckande lösningar kan nås.
- Datasystemen stöder planering och beslutsfattande på ett användarorienterat sätt.
- Saneringsmetoderna är kostnadseffektiva, sparar naturresurser, minimerar skadlig miljöpåverkan och främjar cirkulär ekonomi.
- Förfaringssätten är interaktiva och aktörernas arbetsfördelning, ansvar och skyldigheter tydliga.
- Verksamheten och kommunikationen är öppen, transparent och interaktiv.

Målen i strategin kompletteras av åtgärdsrekommendationer som på mer konkret plan anger vilka effektiviseringsåtgärder som behövs. För dessa åtgärder utses ansvariga.

Strategin innehåller ett riksomfattande program för undersökning och sanering av förorenade markområden. Målet med programmet är att identifiera betydande förorenade områden och att främja undersökning av dessa, liksom även att främja genomförandet av nödvändiga riskhanteringsåtgärder.

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Contents

KEY CONCEPTS AND ABBREVIATIONS USED IN THE STRATEGY

The table below presents the key concepts related to contaminated land used in the Strategy, and their definitions.

BAT	Best Available Technique
BEP	Best Environmental Practice
Cleantech	Products, services and processes which promote the sustainable use of natural resources, and, at the same time, reduce the harmful effects of the processes on the environment.
CLM	Contaminated Land Management
Concept	Explanation
Contaminated area	An area which, due to human activity, contains harmful substances to a level where they cause harm or pose a significant risk to the environment or health.
Contaminated groundwater	Groundwater which, due to human activity, contains harmful substances causing harm or posing a significant risk to the environment or health.
Contaminated soil	Soil which, due to human activity, contains harmful substances causing harm or posing a significant risk to the environment or health.
ELY Centre	Centre for Economic Development, Transport and the Environment
Environmental harm	Ecological harm caused to nature and its functions; or a worsening of the quality of the environment, which significantly reduces the comfort and usage values of the environment.
EU	European Union
Excavated soil	Material removed (excavated) from soil or bedrock. Excavated soil can be classified as either waste or non-waste, depending on its properties and further utilisation.
Groundwater area	A subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.
Harm to health	Diagnosis of an illness in people, other disturbances to health or the presence of a factor or circumstance that may impair the health of the population or the healthiness of an individual's living environment.
Harmful substance	A chemical substance or compound which, due to its properties, could cause harm to the environment or health when found in certain areas.
Land use	The current use of an area or the use of an area in accordance with a legally binding land use plan.
MATTI database	National Database System for soil
MATTI site	A site listed in the National Soil Database System MATTI.
MUTKU	Finnish Society for Soil Investigation and Remediation
Orphan site	A contaminated site where the investigation and remediation of it requires state or other secondary financing. The basis for the financing could be that the polluter or other responsible party for the treatment is not known or cannot be reached, or that it is unreasonable to demand that the responsible party would carry out the required measures.
ÖSRA	Oil Pollution Compensation Fund
PIMA decree	Government Decree on the Assessment of Soil Contamination and Remediation Needs (214/2007)
PIMA project	An investigation and remediation project for contaminated sites.
Remediation	The removal of harmful substances or a reduction in the risks and the harm caused by their properties.
Risk assessment	The stage of risk management where harm and risks are identified, defined and described.
Risk management	Risk management includes the entire risk planning and decision-making processes; as well as investigation, risk assessment, and risk prevention measures.
Soil	The top layer between the bedrock and the surface; it includes mineral particles, organic matter, water and air, and living organisms (Environmental Protection Act 527/2014).
SOILI programme	A remediation programme established by the oil sector in 1996 for the remediation of soil, which is contaminated by oil, at decommissioned service and filling stations.
Sustainable risk management	The practice of demonstrating, in terms of environmental, economic and social indicators, that the benefit of undertaking remediation is greater than its impacts and that the optimum remediation is selected through a balanced decision-making process.
SYKE	Finnish Environment Institute
Tekes	Finnish Funding Agency for Innovation
JASKA project	A remediation project focusing on oil-contaminated land. It was started in 2012 by the Ministry of the Environment and the Finnish Oil Pollution Compensation Fund.
USPA	The electronic management system of the Centres for Economic Development, Transport and the Environment.
VJHT	The State Waste Management System for financing the remediation of contaminated soil sites.
Y-ASPA	Environmental expert resources for use in a centralised multi-channel service organised by Centres for Economic Development, Transport and the Environment.

FOREWORD

Work has been being carried out on contaminated areas in Finland for over a quarter of a century. Each year 250–300 contaminated areas are remediated. Land redevelopment and construction works and closedown of operations are the main reasons for remediation. A significant number of sites still require remediation or other risk management measures. The investigation and remediation of some potentially contaminated sites will require public financing.

The Ministry of the Environment's report on soil protection objectives from 1998 defines the general objectives for soil protection and contaminated land management (CLM). Since then the operating environment has changed, and knowledge about contaminated land has increased to a degree that has rendered the conclusions and recommendations given in the report outdated in many cases. Thus, the re-evaluation of the main goals and principles and the identification of development needs had become a topical issue.

The Ministry of the Environment established a working group to draw up the National Risk Management Strategy for Contaminated Land. The term of the working group was from 15 October 2014 to 30 October 2015. The members of the group represented various interests and wide expertise from the Ministries of the Environment and Finance, the Regional Centres of Economic Development, Transport and the Environment, the Association of Finnish Local and Regional Authorities, the Oil Pollution Compensation Fund, the National Institute for Health and Welfare (THL) and the Finnish Environment Institute.

The main aim of the working group was to formulate a future vision, main goals and principles for a sustainable contaminated land management (CLM) policy in Finland. In addition, the Strategy should contain recommendations for policy measures and instruments, together with a plan for organising the risk management of contaminated sites in Finland. The task was divided into the following actions:

- defining objectives and policy goals for different CLM policy fields,
- making recommendations for policy measures and instruments to achieve the policy goals,

- presenting a groundwork proposal concerning the reform of the state financing system for contaminated soil sites and
- developing a national investigation and remediation programme.

The Strategy was prepared in close cooperation with multiple interests groups that included representatives from the environmental administration, regional authorities, major landowners, consultants, agents for industry, as well as researchers and experts at research institutes and universities.

The National Risk Management Strategy for Contaminated Land was published in 2015, which was the International Year of Soils. This publication is part of the Suomen ympäristö (Finnish environment) series published by the Ministry of the Environment 10/2015.

1 Review of the current situation

Soil and groundwater can be contaminated by activities where harmful substances (chemicals) or wastes are used, manufactured, processed, transported or stored. Contamination can be caused either by a single accident or by long-term emissions stemming from normal activities. Artificial fill or waste from outside can also contaminate the soil or ground water. At many sites, the environmental contamination happened decades ago.

Soil contamination has been investigated in Finland since the 1980s. The Centres for Economic Development, Transport and the Environment (ELY Centres) have compiled data in the National Soil Database System MATTI, concerning sites which are known or suspected to be contaminated or which have already been remediated. In 2015 there were almost 25,000 MATTI sites. These sites are typically former industrial areas, landfill sites, and filling stations for fuel.

The National Soil Database System MATTI contains information about sites where harmful substances may have been released from current or previous activities on the site. The activities are generally known to cause soil or groundwater contamination at comparable sites. Data on land use history and field research are needed to define the actual status of each site. Some of the sites have been included in MATTI because of observations of environmental detriment. Some of these sites have already been investigated and/or remediated. The MATTI sites have been divided into four classes regarding further measures (Figure 1):

- **Functional sites**, where the soil status should be investigated at the latest when operations there cease, approximately 9,000 sites.
- **Sites to be investigated**, where operations have ceased, but where the soil status has not yet been defined, approximately 8,500 sites.
- **Sites to be assessed or treated**, where on the basis of investigations, there are known to be harmful substances in the soil. The next step for these sites is to assess the need for remediation or to carry out remedial actions, approximately 2,100 sites.
- **No need for treatment**, sites where the amount of harmful substances is not significant, or sites which have already been remediated to an acceptable level of current land use, approximately 5,400 sites.

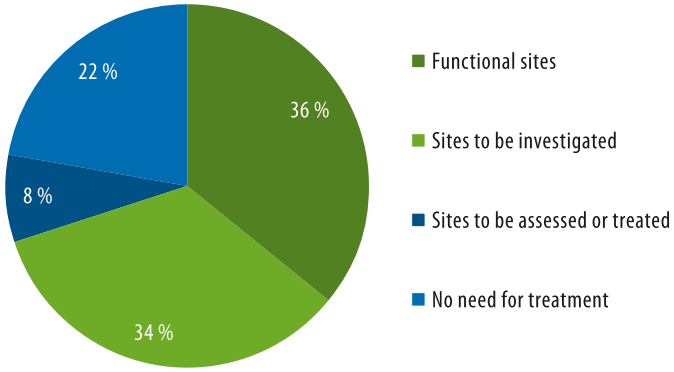


Figure 1. The four classes of sites regarding further measures in the National Database System for Soil MATTI (10 April 2015).

The MATTI sites are concentrated in southern Finland and along coastal areas, in other words, in areas with an abundance of industrial and business operations and with the densest population. Approximately one in five of these sites is located in a classified groundwater area, 20% are in a residential area or near it and 1% in nature reserve areas. A substantial proportion of the sites in groundwater areas are located on eskers in southern Finland, in particular in the Salpausselkä area. Most of the sites in protected areas are found in northern Finland. Because Natura 2000 sites cover around one third of the area of the Lapland Centre for Economic Development, Transport and the Environment, environmentally valuable areas are more likely to be affected than elsewhere in the country.

Fuel distribution is or has been practised on a third of all MATTI sites. The next most common sectors are landfills and the servicing and repair of motor vehicles (Figure 2). Sector breakdowns describe the number of sites that were the focus of the surveys', not the extent and nature of the soil contamination problem. Large-scale soil contamination occurs in industrial, storage and mining areas, as well as on shooting ranges. On the other hand, minor sites, such as dry cleaners or wood impregnation plants, may have caused widespread contamination of the environment, and of groundwater in particular.

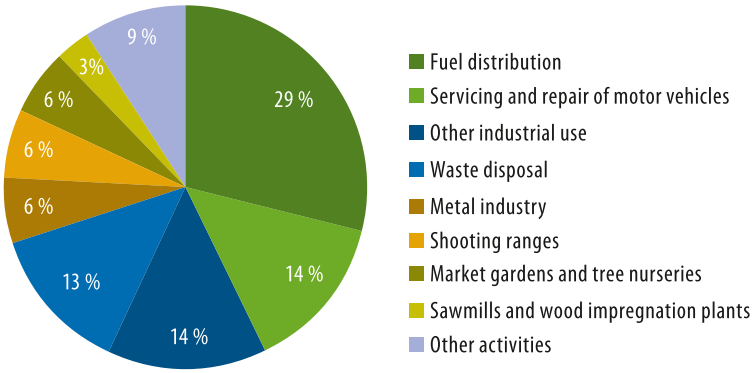


Figure 2. Distribution of the potential polluters of the sites in the National Soil Database System MATTI (10 April 2015).

The number of sites in the MATTI database is still increasing, mainly because of specific investigations of new potential activities. Investigations in 2015 looked into the environmental contamination caused by firefighting training areas, scrapyards and waste facilities for the extractive industry, amongst others. Even for these "new sites" their condition is mostly due to contamination that happened in the past. Newly contaminated areas are mostly linked to oil and chemical accidents and incidents that occur because of neglect in waste management, but the number of these is low and the sites are usually small.

When the MATTI sites are divided by ownership, around two thirds are in private ownership. Of these, over half are owned by private persons and the rest are owned by companies or business operators. Municipalities are also major owners of contaminated areas, a quarter of sites are in their ownership (Figure 3).

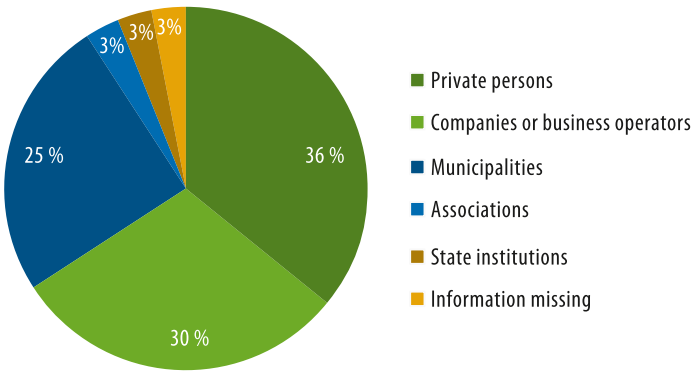


Figure 3. Division by ownership group of sites in the National Soil Database System MATTI (10 April 2015).

Each year 250–300 new remediation projects are initiated. This estimation is based on the data from remediation decisions on contaminated soil sites by environmental authorities. Over 5,000 decisions were made between 1986 and 2014 (Figure 4).

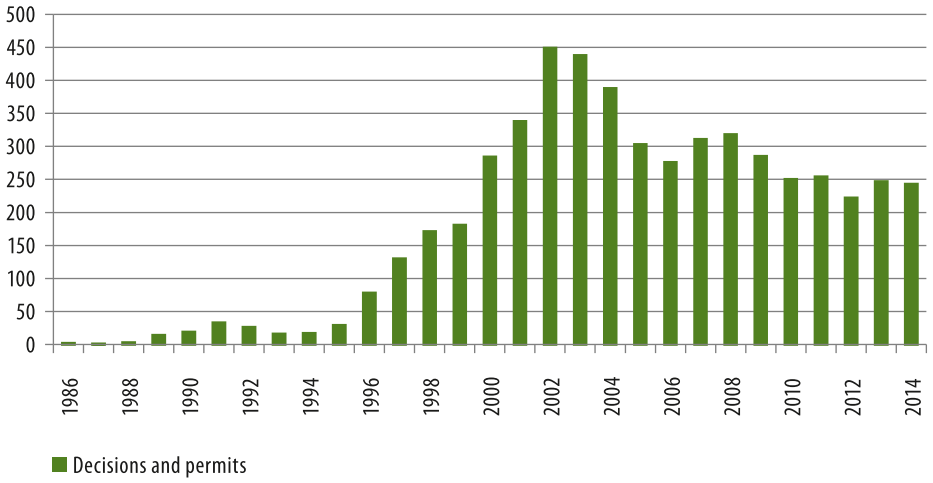


Figure 4. Administrative decisions on contaminated soil sites, 1986–2014.

Land use change or construction works are the most common reasons for initiating the remediation of contaminated sites. Remediation is carried out, for the most part, to reduce health risks in future residential areas that are to be developed, or in areas classified as groundwater areas. Of the remediation work carried out, around 3,000 remedial actions have been carried out in residential areas or in areas in their immediate proximity, and in approximately 1,000 groundwater areas.

Companies and private people are responsible for remediation at around two thirds of the sites, whilst the remaining sites are mainly the responsibility of municipalities and the state. Responsibility for remediation may be based on the contamination or management of the area, or it may lie with municipalities as having the ultimate responsibility, in accordance with the Environmental Protection Act (527/2014). Municipalities and the state have a number of roles in activities relating to contaminated land. They may act as landowners, planners, builders, remediators, experts and officials, for example.

Each year, 1–1.5 million tonnes of contaminated soil are excavated to be treated or disposed of at one of over 70 landfill sites or other treatment plants. Most of the reception capacity is located in southern and western Finland. Elsewhere, the reception points have relatively low capacities, and primarily take excavated soil with low levels of harmful substances. Because of this, heavily contaminated or mixed contaminated soil may have to be transported hundreds of kilometres for treatment or disposal. Almost half of the excavated

and contaminated soil has been utilised as it is, without treatment, as landfill-cover material or in construction. Over recent years, the utilisation of excavated soil has increased significantly in the largest cities.

The targets of remediation are primarily defined as concentration levels of harmful substances in the soil. Often the concentration levels set out as the remediation targets are based on the threshold values and guideline values included in the Government Decree on the Assessment of Soil Contamination and Remediation Needs (PIMA Decree, 214/2007). The target level depends largely on the current or future land use of the area. Since 2007 the issuing of remediation decisions and targets has been guided by the PIMA Decree, which emphasises a risk-based perspective, and by related instructions, the newest of which is the Ministry of the Environment guidelines on the risk assessment of contaminated soils and sustainable risk management (6/2014). In contrast to the earlier practice, the guidelines emphasise the importance of site-specific risk assessments and sustainable risk management solutions.

The state has supported the remediation of orphan sites posing a significant risk to health and the environment. Through financing from the State Waste Management System (VJHT) for contaminated soil sites, which is under the direction of the Ministry of the Environment, approximately 400 sites have been remediated since the 1990s. In recent years these projects have accounted for approximately 5% of the remediation work started each year. The appropriation available has been EUR 1.5–3 million per year. In addition to the State Waste Management System for contaminated soil sites, secondary financing has been channelled through the Finnish Oil Pollution Compensation Fund (ÖSRA), to the tune of EUR 2–2.5 million a year, for the investigation and remediation of areas contaminated with oil. The number of remediated sites is in the same range as those in the State Waste Management System for contaminated soil sites, that is, by 2015, approximately 400 sites had been remediated through the Oil Pollution Compensation Fund.

2 Strategy objectives and implementation

The National Risk Management Strategy for Contaminated Land is based on a national vision of how the risk management and remediation of contaminated areas can be managed cost efficiently and sustainably in Finland, taking into account health and environmental protection in the best way possible. The main policy goal of the Strategy is to ensure that significant risks to human health and the environment due to land contamination will be managed in a sustainable way by 2040. This main goal is further divided into six more specific objectives that are connected to required policy measures and instruments (Figure 5). All six objectives support sustainable risk management.

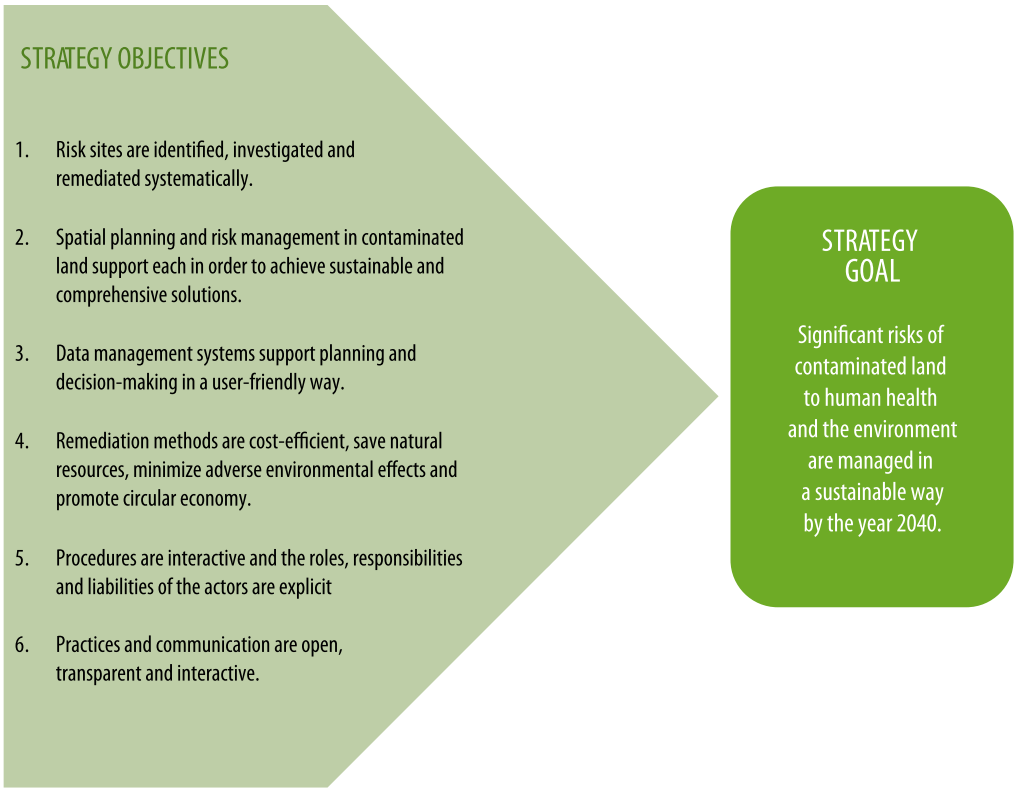


Figure 5. The main policy goal and six objectives of the Strategy.

The Strategy serves as a policy framework to promote sustainable CLM practices in Finland. It contains recommendations for policy means and measures to achieve the objectives in an efficient and feasible way. The Strategy also identifies responsible organisations and stakeholder groups that will carry out the required measures. Moreover, recommendations for administrative, informative and economic instruments to promote sustainable CLM and the policy objectives of the Strategy are introduced. The development of methods for investigation, risk assessment and management, together with instructions, learning material and education, will have a key role in implementing the Strategy. The following sections describe the state of the art and the means and measures to achieve each objective.

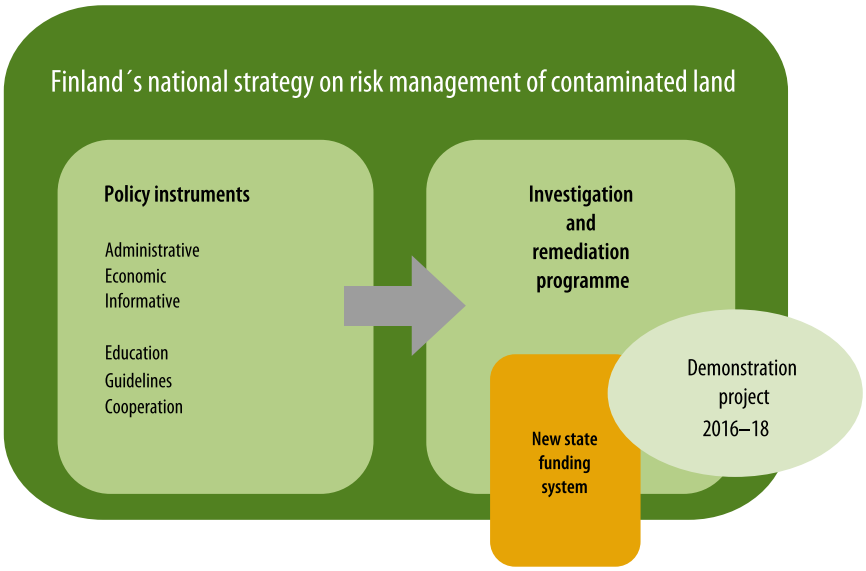


Figure 6. Policy instruments and tools that support the implementation of Finland's Strategy for contaminated land management

2.1 Investigation and remediation of risk sites

The National Soil Database System MATTI contains information on 25,000 sites where harmful substances may have been released into the soil from a current or previous activity in the area. Over 15,000 are still not sufficiently investigated to define whether they are contaminated, and whether there is need for risk management activities. Of these, approximately 3,000 are located either in groundwater areas important for water supply or in the proximity of residential areas, and thus require a more detailed analysis of the health and environmental risks, and, if necessary, risk management measures. The total number of the sites continues to rise, mainly as a result of sector-specific surveys. Investigations are currently under way, for example, in firefighting training areas, scrapyards and closed extractive waste facilities.

Each year, new remediation projects are initiated at 250–300 sites. Changes in land use or excavation and construction work have been the primary reasons that remediation is initiated. Remediation is usually related to mitigating health risks in future residential areas or in areas classified as groundwater areas. In approximately 3,000 cases, remediation measures have been carried out in residential areas or in their immediate vicinity, and in around 1,000 cases, in important groundwater areas. The planning of remediation measures is affected not only by health risk management, but also by factors such as property values, increasing appreciation of the area, or avoiding future treatment responsibilities and economic risks. At the national level, the prioritisation of sites is not carried out systematically on the basis of environmental and health risks. Thus, it could be a long time before risk management measures are taken at sites posing significant risks.

Private companies, landowners or landholders have the greatest responsibility for the remediation of contaminated sites. Municipalities and the state also have an important role, both as landowners and polluters. It has been estimated that at least 800 sites classified as urgent require state support or other secondary financing for investigation and remediation. The total cost of investigations and remediation is expected to rise as high as EUR 4 billion.

OBJECTIVE 1

Risk sites are identified, investigated and remediated systematically.

The national risk-based programme for investigation and remediation is one of the main policy measures for achieving the main goal of the Strategy. The purpose of the programme is to identify significant contaminated sites and promote research and implementation of necessary risk management measures at these sites within the next 25 years. The sites covered by the programme account for approximately 15% of all remediation sites (Figure 7). The programme was introduced in 2016 and its implementation is centralised in the Pirkanmaa Centre for Economic Development, Transport and the Environment.

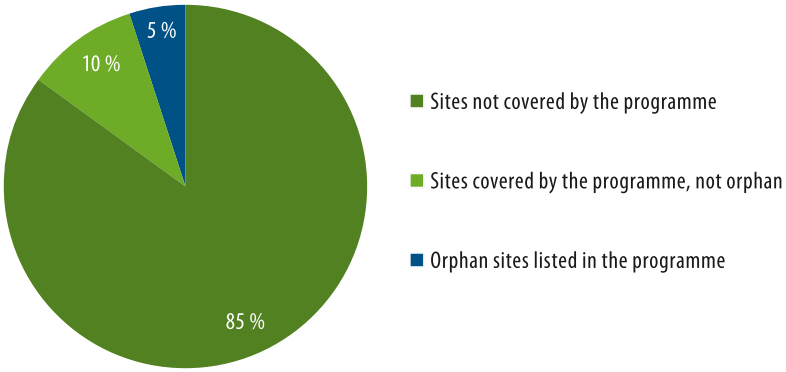


Figure 7. The sites listed in the National Investigation and Remediation Programme account for approximately 15% of all (250–300 sites each year) remediation sites.

The investigation part of the programme is drawn from the National Soil Database System MATTI. Soil sites that are potentially contaminated are ranked according to the prioritisation model. The prioritisation is focused on protecting human health and important groundwater and natural areas. According to the prioritisation model, 1,900 sites of the prioritised 15,300 MATTI sites are classified as urgent: classes A1 and A2. These sites are given the urgency ranking and high scores primarily because they are located in important groundwater areas and they pose a risk to the quality of the water supply. Within the first five years the most urgent sites (class A1) will be investigated and their need for remediation will be assessed. After 2020, investigations will be focused on less urgent sites (class A2).

According to preliminary estimates, the investigation, assessment and remediation of the sites in the programme will require an annual investigation rate of 50–150 sites, the remediation of 35–50 sites, an investment of EUR 10–12 million, and the allocation of EUR 4–4.5 million to orphan sites (Figure 8).

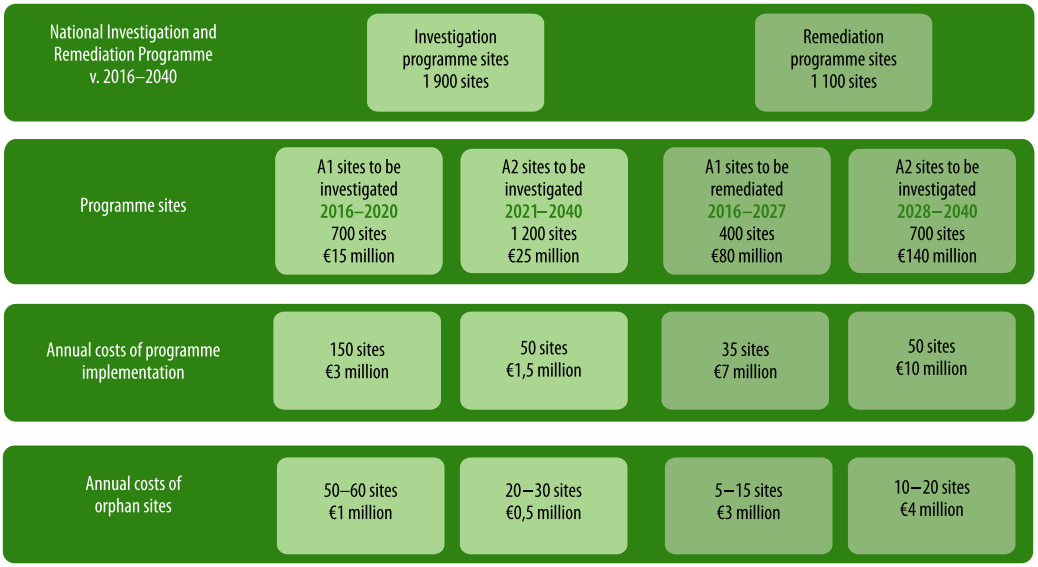


Figure 8. Estimation of the number of sites in the National Investigation and Remediation Programme and resource needs.

The implementation of the National Investigation and Remediation Programme and the use of resources are guided by a centralised organisation the Pirkanmaa Centre for Economic Development, Transport and the Environment (Figure 9). The Centre also oversees the sustainability and cost-effectiveness of operations, and promotes cleantech business operations concerning remediation work. The Ministry of the Environment is responsible for setting objectives and organising programme financing. The Finnish Environment Institute maintains the National Soil Database System MATTI and assists the Pirkanmaa Centre with developing the programme, and also provides expert support in the assessment of and planning for challenging sites. The implementation of the Investigation and Remediation Programme, and the associated support work will require an annual investment of approximately EUR 1 million and 18 man-years.

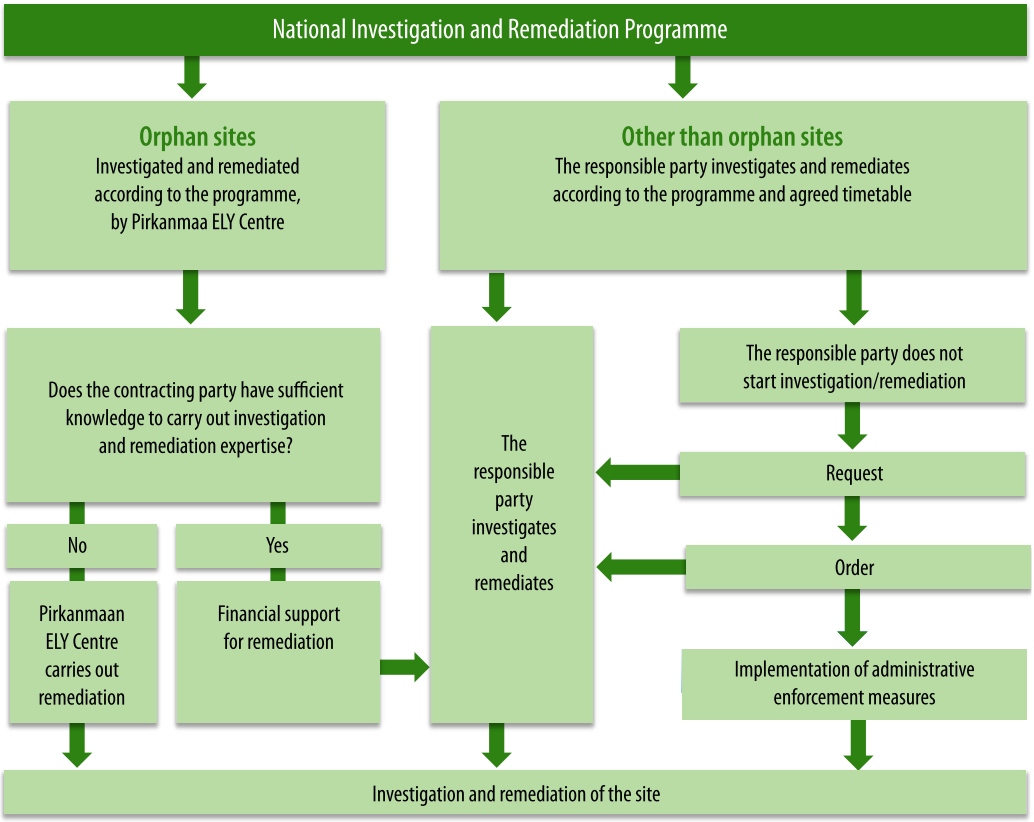


Figure 9. Stages and actors in the implementation of the programme.

The **national pilot project** (2016–2018) on the remediation of contaminated land supports the planning and implementation of the programme. This pilot project is one of the assigned actions related to the key measures and projects in the Finnish Government Programme. The pilot project is intended to bring together administration, different actors and technology vendors for specific pilot initiatives for developing innovative remediation techniques. The objectives of the Investigation and Remediation Programme will be updated after the pilot project on the remediation of contaminated land is completed in 2018.

The current **State Waste Management System** for financing the investigation and remediation of urgent orphan contaminated sites also will be updated in order to ensure that it performs as it should along with the programme.

2.2 Land use planning and remediation

Land use and its planning, according to the Land Use and Building Act (132/1999), are key processes that can be used to identify risks, find solutions and implement sustainable risk management of contaminated land. The Act aims to ensure that the use of land and related construction activities create preconditions for a good living environment, and that these promote ecologically, economically and socially sustainable development, while also enabling public participation in the planning process.

A decision on remediation for more than half of the sites is based on land use changes or construction work. Because the structure of the economy has undergone changes, particularly some former industrial and storage areas are no longer in use and these areas are now available for other land uses. When deciding on remediation and other risk management, the overall cost efficiency of the project must be assessed at an early stage of the planning process. Risk management measures that are well planned and carried out generally have had a positive impact on the development of the urban structure, the municipal economy, the townscape and people's health and safety.

In many municipalities, sustainable risk management of contaminated sites is already a part of land use planning. The municipalities' practices and opportunities to achieve the objective are, however, variable.

OBJECTIVE 2

Land use and risk management of contaminated land are mutually supportive so that sustainable and comprehensive solutions can be achieved.

The objective relating to land use planning and remediation of contaminated land is to make these activities mutually supportive to achieve sustainable and comprehensive solutions. Sustainable risk management and the implementation of sustainable remediation methods are promoted through the close exchange of information and cooperation between different authorities and other stakeholders in the early stages of planning. Expertise relating to land use planning and management of remedial measures for contaminated land is to be developed further through training and other information instruments.

The land use planning objective has been divided into the following sub-objectives:

1. The risks posed by contamination are anticipated to an appropriate extent and level of accuracy at different stages of land use planning.
2. In the siting of new activities, the sustainable use of the built environment and the utilisation of existing urban structures are supported.
3. In the assessment of sustainable solutions, appropriate operating models and tools ensure the overall cost efficiency and sustainability of the remediation work.

Tabel 1. Means, actors and recommended measures related to land use planning.

Means	Actors and recommended measures
Contaminated land is to be taken into consideration at a sufficiently early stage in land use planning.	**Municipalities (land use planners, environmental authorities) and Centres for Economic Development, Transport and the Environment** • during the planning stage ensure that different uses and activities (e.g. parks, day-care centres and residences) will be sited appropriately relative to the contaminated land • intensify cooperation between landowners, property developers and construction companies during the planning stage
Renewal and reuse of former industrial areas are to be promoted systematically. This means that green fields can be preserved and urban structures harmonised.	**Municipalities (land use planners)** • draw up plans for the development in cooperation with project developers and landowners • promote the use of new kinds of project development opportunities in the risk management of contaminated sites • new activities that may pose a risk of environmental contamination are sited in areas that are already contaminated
When assessing the financial aspect of land use plans, the need for soil remediation, costs and the profit generated by the implementation of the land use plan are to be taken into account.	**Municipalities (land use planners) and Centres for Economic Development, Transport and the Environment** • in the early stages ensure close cooperation concerning the comprehensive reviews of the financial aspects of land use plans and risk management measures • improve the financial aspects of land use plans by e.g. increasing the building volume or using financing instruments in areas with a large demand for construction and high remediation costs • ensure fair division of the benefits and costs of remediation work between the different parties
Analyse the risks associated with contaminated sites, utilise risk assessment data, and create opportunities for different risk management practices in land use planning	**Municipalities (land use planners) and Centres for Economic Development, Transport and the Environment** • work in close cooperation and share expertise when drawing up land use plans • increase cooperation at a sufficiently early planning stage with landowners, consultants and/or construction companies, so that the planning and implementation of the construction work support sustainable remediation • in land use plans reserve areas for the temporary storage and recovery of excavated soils • take into account the reuse of excavated soil and mass balances in city block and construction planning

Means	Actors and recommended measures
Improvement in land use planners' interactive skills and expertise in issues of contaminated land, and the taking account of these in land use, will be improved through training and with the help of communications.	**Finnish Environment Institute and Centres for Economic Development, Transport and the Environment** • organise training for municipalities and, in particular, for land use planners **Ministry of the Environment and Finnish Environment Institute** • produce training and guidance material, e.g. Guidance on Contaminated Land and Land Use Planning **Municipalities and Centres for Economic Development, Transport and the Environment** • organise interactive communications aimed at different target groups including property owners • in land use planning, ensure close exchanges of information and cooperation on utilisation of expertise in issues of contaminated sites
The risks posed by soil contamination are to be presented in an open, understandable and non-technical way, based on sufficient amounts of information.	**Municipalities (land use planners)** • systematically organise interactive communications for different stakeholders • ensure openness and comprehensibility in communications • ensure close communication with contaminated land experts from the Centres for Economic Development, Transport and the Environment
Data from MATTI and other data systems are to be utilised in land use planning.	**Finnish Environment Institute** • develop the soil database system to support land use planning **Municipalities (land use planners)** • organise training and guidance in the use of data systems • utilise data systems actively in land use planning

2.3 National Soil data systems

The National Soil Database Systems have been in use since the 1990s and already covers over 25,000 sites. The database includes data on the location, ownership and land use history of MATTI sites, and distances to areas with high conservation value, and on the investigation and remediation measures carried out at these sites. The sites are divided into four classes: operative site, sites which must be investigated, sites requiring assessment or remediation, and sites where remediation is not needed.

Because of deficiencies and possible errors in the MATTI database, its usage rights are restricted. The MATTI database and its data can be accessed by authorities of ELY Centres and municipalities. Site-specific data can be accessed by requesting it from ELY Centres. Additionally, the location of MATTI sites can be checked using a geographical data system intended for experts.

For the MATTI sites, the current holders of the sites do not always know that their property has been included in the database. Furthermore, many authorities are unaware of the existence of the MATTI database. Use of it is perceived to be difficult, thus its data is rarely used in situations such as the sale or renting of property, or in land use and construction planning.

OBJECTIVE 3

Data systems support planning and decision-making in a user-oriented way.

The objective is for data on contaminated sites to be used actively by planners and decision-makers. Therefore, the data systems must be easy to use, reliable, and comprehensive, and it must be possible to access the data held in different systems through one common system (National Data Exchange Layer).

The objective for data systems has been divided into the following sub-objectives:

1. Use of the MATTI database has been realised in a customer- and user-oriented way, through the National Data Exchange Layer of electronic services. The interfaces of different authorities' data systems have been identified, and the data in the systems have been coordinated.
2. Data systems and the opportunities for the use of their data are generally known, and available to all users, in accordance with user profiling of the data exchange layer. Information reserves have been opened up step by step as site data are updated and the reliability of the data is ensured.
3. The site data within the data systems are reliable, comprehensive, up to date and comprehensible, as well as attributable through the geographical data systems.
4. Data systems are utilised more in decision-making. By utilising the data in land use planning and construction planning, potentially contaminated land can be anticipated and taken into account in the planning stage.
5. On the basis of the MATTI database's data and prioritisations, the National Investigation and Remediation Programme will be drawn up and updated, and its implementation monitored.

Tabel 2. Means, actors and recommended measures related to data systems.

Means	Actors and recommended measures
The data in the MATTI database are integrated into the National Data Exchange Layer.	**Ministry of Finance, Ministry of the Environment and Ministry of Employment and the Economy** • are responsible for the planning and realisation of the service architecture • are responsible for the data in the MATTI database being included in the National Data Exchange Layer **Finnish Environment Institute** • is responsible for the development of the MATTI database and its content • is responsible for reciprocal cooperation on and joint use of different data systems • promotes integration of MATTI data into different data services used in land use planning and guidance **Finnish Environment Institute and Centres for Economic Development, Transport and the Environment** • draw up profiles and services for different user groups
The content of the data in the MATTI database is understandable and utilised widely.	**Finnish Environment Institute, Centres for Economic Development, Transport and the Environment and the Association of Finnish Local and Regional Authorities** • organise training and instructions for the municipalities' planners and land use planners, as well as other users of MATTI data **Finnish Environment Institute** • is responsible for the maintenance and user support of the MATTI database **Centres for Economic Development, Transport and the Environment** • inform landowners/holders of their property's inclusion in the MATTI database as well as usage restrictions and the need for further measures applicable to the property **Municipal officials** • use the MATTI database's data in the development of their operations, including in land use and construction planning **Property owners** • take care of the transfer of the MATTI database's data when properties are sold and rented out **Consultants** • take account of the MATTI database's data in investigation and planning projects **Ministry of the Environment, Ministry of Agriculture and Forestry, National Land Survey** • establish opportunities for utilisation of the Real Estate Register
Site contamination data are verified and updated in the MATTI database.	**Centres for Economic Development, Transport and the Environment** • collect and update site data • ensure resources for the collection, verification and recording of data **Municipalities** • promote the gathering of site data
New data are added to the MATTI database using electronic systems.	**Finnish Environment Institute and Centres for Economic Development, Transport and the Environment** • develop electronic services and the corresponding forms **Centres for Economic Development, Transport and the Environment** • provide guidance for data producers regarding the use of the forms **Applicants for notification, consultants, and other site information producers** • use electronic services to transfer data
Indicators are developed for the MATTI database to monitor the implementation of the National Investigation and Remediation Programme.	**Ministry of the Environment, Finnish Environment Institute and Centres for Economic Development, Transport and the Environment** • are responsible for promotion of the National Investigation and Remediation Programme in the development of descriptive indicators • monitor the implementation of the National Investigation and Remediation Programme using the indicators

2.4 Risk management methods

The most common method for the remediation of a contaminated site is removal of the contaminated soil by excavation and the disposal of it off site. At over 90% of sites, excavation is the remedial action taken; although at many sites other methods could better support the objectives of sustainable remediation — such as *in situ* techniques for soil and groundwater. The provision and use of such techniques is still limited by factors such as current practices regarding land use planning and construction.

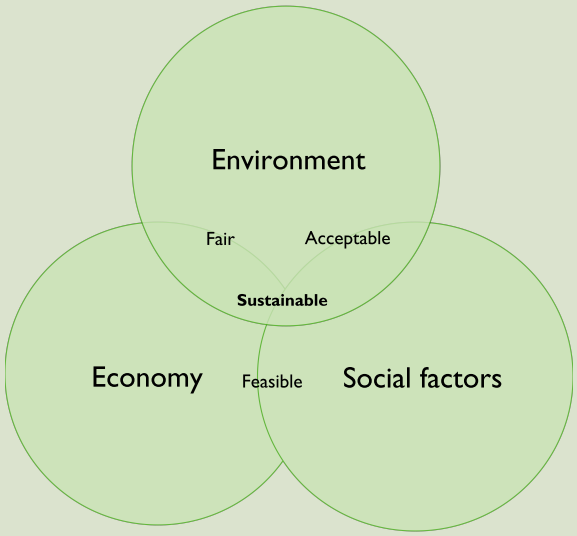
The treatment of excavated contaminated soil is based primarily on its utilisation or final disposal at landfills. Factors that make the disposal at landfills more common include the cheaper cost and inconsistent and unclear requirements for the utilisation of excavated soil. This situation will change given that the number of landfills is continuing to decrease and that utilisation criteria for excavated soil are being defined. In many areas landfill sites are also filling up, and the allocation of new areas in land use planning is difficult.

Instead of disposing of recyclable waste in landfills, the aim is to increase the sorting, treatment and utilisation of waste soil. There are still relatively quite a few experimental activities regarding new methods. The remediation projects that have been implemented have been isolated projects. Excavated and contaminated soil is being utilised in surface structures and extensive regional construction sites.

Environmental permit procedures related to the utilisation of contaminated and other excavated soil require authorities' resources and pose challenges for the often urgent construction schedules. Current practices do not, therefore, always promote environmental protection and circular economy objectives in an appropriate way.

SUSTAINABLE RISK MANAGEMENT

refers to the planning and implementation of an activity in a way that ensures the maximum possible overall benefits. Sustainability is evaluated from environmental, financial, and social perspectives. When ensuring the sustainability of a remediation project, the key starting point is a systematic comparison of the benefits and disadvantages of the different remediation methods available. The best methods are selected on the basis of this comparison. Sustainable risk management solutions should be considered as early as during the land use planning process.



In sustainable risk management, the environmental, financial and social impacts of the activity are balanced.

OBJECTIVE 4

Remediation methods are cost efficient, conserve natural resources, minimise adverse environmental impacts and promote a circular economy.

The objective of the Strategy is to support the use of risk management methods which are cost efficient, conserve natural resources, minimise adverse environmental impacts and promote a circular economy.

The objective for risk management methods has been divided into the following sub-objectives:

1. Research and development of methods are active and forward-looking, and encourage clean technology business operations in this sector.
2. The commercial provision and expertise required for the methods must be sufficient throughout the country.
3. The most appropriate methods which support the objectives of sustainable remediation are selected for each individual project.
4. Excavated soil is utilised efficiently, primarily either at the excavation site or in neighbouring areas.

Tabel 3. Means, actors and recommended measures related to risk management methods.

Means	Actors and recommended measures
Implementation of the three-year Pilot Project on (2016–18) Remediation of Contaminated Land, which is one of the key projects within the Government Programme.	**Ministry of the Environment, Ministry of Employment and the Economy, Finnish Environment Institute, Centres for Economic Development, Transport and the Environment, Tekes, companies** • implement pilot projects within the National Investigation and Remediation Programme • utilise innovative public procurements where possible • implement pilot projects for the remediation of contaminated land
Development of new research and remediation methods, enhancement of experts' expertise and preparation for future challenges are promoted through cooperation between research programmes and different actors.	**Educational institutions and companies** • improve the theoretical knowledge base on new harmful substances and methods for investigation, risk assessment and management • participate actively in national and international research and development activities in the sector • work in cooperation to initiate experimental projects which promote the implementation of new methods and operating models, and which enable the creation of references for the export market • arrange training days and workshops

Means	Actors and recommended measures
Existing financing systems are utilised efficiently, and new financing models which are not restricted by sector are developed. This will create synergy benefits and new business opportunities for developing and implementing sustainable research and risk management methods.	**Companies and Tekes** • direct funding towards pilot and development projects by companies and research organisations • develop new operating models to support not just companies in the sector, but also those initiating projects to test and implement new and sustainable risk management models • work in collaboration with foreign actors to utilise international financing channels
Policy instruments are developed to promote the implementation of sustainable and standardised remediation and treatment solutions.	**Ministry of Finance, Ministry of the Environment, Finnish Environment Institute** • ensure consistent practices at the national level • enhance the expertise of parties responsible for remediation, planners and authorities concerning remediation projects by targeted instructions and training • establish whether a waste tax is a feasible policy instrument for excavated soil disposed in landfills
The aim in the planning and implementation of remediation projects is to always maximise the overall benefits of remediation over the long term.	**Parties responsible for projects, planners, contractors, municipalities, Centres for Economic Development, Transport and the Environment, Finnish Environment Institute** • utilise site-specific risk assessments in the setting of objectives, in an appropriate way and taking into account the plans for land use and construction • examine whether the use of in situ - and on site -techniques is possible • examine whether it is possible to reuse excavated soil and other excess material • renew procurement and tendering practices to support the selection of the best and most sustainable methods (BAT, BEP) • develop general recommendations and objectives for sustainable remediation and promote a commitment to these by strengthening cooperation between different stakeholders
Opportunities to reuse waste soil and other excess material generated at remediation and construction sites are improved through administrative measures and other measures carried out by stakeholders.	**Ministry of the Environment, Finnish Environment Institute, planners, contractors, builders, municipalities, environmental authorities** • specify in a decree the requirements for the reuse of waste soil and other excess material without the need for an environmental permit, e.g. by submitting a notification or through registration • develop a network of temporary storage and treatment areas for excavated soil based on local needs and in cooperation with different stakeholders • facilitate the establishment of these areas and separatesites for recovery by developing administrative operating models and preparing land use plans • promote temporary storage and pre-treatment opportunities for individual remediation and construction projects
The permits for treatment areas and facilities are harmonised and the best available techniques and sustainable requirements for different kinds of contaminated soil are defined.	**Ministry of the Environment, Finnish Environment Institute, environmental permit authorities, companies** • draw up standardised instructions and guidance for permit authorities • work in cooperation to develop BAT requirements for remediation techniques

2.5 Procedures, responsibilities and obligations

Chain of responsibility for remediation

The polluter always carries primary responsibility.

↓

The owner of the site carries responsibility in some cases.

↓

The municipality carries responsibility in cases after 1 January 1994 and in some older cases.

↓

The state's involvement is always discretionary.

The remediation or other risk management of contaminated sites involves a number of stages and measures. The key actors are landowners or property holders, consultants and remediation companies and authorities. The actors' roles, responsibilities and obligations, as well as their operating practices vary on a case-by-case basis, and they are not clear to all parties.

The responsibilities for remediation, its allocation and the administrative procedures are clearly regulated in new contamination cases. The applicable regulation is the Environmental Protection Act. In older cases, where contaminated occurred before 1 January 1994, the earlier Waste Management Act is applicable. According to this act, the allocation of responsibility is based more on legal practice than on specific statutes or regulations. The division of responsibility has often had to be defined by administrative courts, which has resulted in, for example, delays to the remediation projects.

Furthermore, actors may not necessarily know the risks, responsibilities and obligations associated with contaminated sites and do not take these into account, for instance, in the selling or renting of properties or in changes to land use.

OBJECTIVE 5

Procedures are interactive and the roles, responsibilities and obligations of the actors are clear and standardised.

The objective is to standardise operating practices and procedures associated with the risk management and remediation of contaminated land and to make clear the actors' roles, tasks, responsibilities and obligations.

The objective related to procedures has been divided into the following sub-objectives:

1. Statutory responsibilities are consistent and commonly known.
2. The actors' roles and tasks are clear and comprehensible.
3. Technical and cost data on implemented remediation projects are available centrally in order to develop methods and create good practices.

Tabel 4. **Means, actors and recommended measures related to procedures.**

Means	Actors and recommended measures
Allocation of responsibility for remediation responsibility is clarified and application practices are harmonised.	**Ministry of the Environment and Finnish Environment Institute** • create harmonised application practices for allocation of responsibility, e.g. by providing guidelines and organising training
Instructions and training are used to improve the cooperation between actors and to clarify roles.	**Ministry of the Environment, expert and research institutions and the Centres for Economic Development, Transport and the Environment, along with other parties** • provide instructions to different stakeholders and give guidance on functional practices and operating models • organise national and regional training and information events on the subject
Experts' skills in research, risk assessment and remediation methods, as well as interactive methods, are improved through continuing education, instructions and information.	**Companies and authorities** • ensure that experts have sufficient expertise and the opportunity to partake in continuing education if necessary **Finnish Environment Institute and other parties** • establish development needs and opportunities regarding continuing education, professional qualifications and/or competence-based qualifications within the different sub-areas • where necessary, submit a proposal to the Finnish National Board of Education regarding the organisation of training **Expert and research institutions, companies and authorities** • produce material to support education and training (vocational high schools, universities, and companies organising education and training) **Different educational institutions and companies** • organise the necessary professional education and training
Development of an open information portal, where information on publicly funded investigation, remediation and pilot projects is collected for use in other similar projects and national summaries.	**Companies, together with the Finnish Environment Institute** • draw up detailed descriptions and evaluations of new investigation, assessment and risk management methods and their applicability at different kinds of sites • collect descriptions and final reports on publicly funded investigation, remediation and pilot projects, including cost data

2.6 Interaction and communications

The importance of communications and interaction has grown in all official activities. Administrative procedures should be open, transparent and interactive. This is particularly important in activities related to contaminated soil, as the multidimensional links of risk management to health, social and economic issues require close cooperation between authorities from different sectors and with other stakeholders, as well as consideration of the public's information needs and perspectives.

Risk assessments of sites and the choice of remediation targets and methods, as well as many other issues, are to be decided based on expert knowledge. Technical and natural

sciences information has a key role to play; however, it is often difficult to understand because of specialist terminology. The background to and impacts of decisions may remain unclear to stakeholders. Participation procedures and events may not always promote two-way interaction, due to factors such as attitudes and lack of expertise. Furthermore, the public's understanding of the risks and risk management targets may differ from that of the experts, and people may feel that their concerns are being ignored. In such cases, societal approval of measures will not be fully achieved, and some of the different perspectives from decision-making where multiple different stakeholders are involved will not be taken into account. This also reduces confidence in experts, and may lead to conflict situations and complaints that slow the project down.

OBJECTIVE 6

Activities and communications are open, transparent and interactive.

The objective of interaction and communications is to increase the information available about the contamination of soil, and improve the transparency of operating procedures, the comprehensiveness of risk management targets, and trust between different stakeholders. The intention is to improve the attitude towards contaminated soil and make it easier to understand that the use of contaminated sites is a normal part of land use planning and construction.

The objective for interaction and communications is divided into the following sub-objectives:

- Up-to-date and comprehensible information about soil contamination, risk management methods and operating practices is available.
- Authorities and other stakeholders are prepared and able to initiate risk management actions and carry out communications regarding contaminated land in an interactive and user-oriented way.
- Interaction and communications concerning risk management actions are correctly timed and targeted, are carried out in plain language and are open.
- The bases of risk assessments and factors affecting the remediation targets (social, economic, ecological) are identified and described in a comprehensible way.

Tabel 5. Means, actors and recommended measures related to interaction and communications.

Means	Actors and recommended measures
Enhancement of the public's knowledge and understanding of soil contamination, the associated risks, risk management and operating practices.	**Ministry of the Environment and Finnish Environment Institute** • establish environmental administration communications regarding contaminated sites as part of the communications plan **Ministry of the Environment, Finnish Environment Institute and Centres for Economic Development, Transport and the Environment, along with other stakeholders** • produce comprehensible material about soil contamination and risk management solutions • share knowledge through the websites of environmental authorities **Centres for Economic Development, Transport and the Environment** • inform landowners in a way that they can understand that their property is included in the MATTI database, that there are restrictions on use and that there is a need for further measures for the site • are responsible for general guidance • organise expert resources for use in a centralised multi-channel service (known as Y-ASPA)
Improvement of the expertise of authorities and other actors in interactive communications through continuing education, instruction and provision of information.	**Authorities, companies and expert and research institutions** • ensure that experts have sufficient expertise and the opportunity to partake in continuing education if necessary • produce materials to support education **Educational companies** • train experts involved in the PIMA projects in interactive participation
Interaction and communications are made more effective in all practices and methods used by authorities and other actors with links to contaminated sites.	**Authorities, companies, property holders and owners** • ensure experts' readiness to organise genuinely interactive participation • organise interaction and communications in a way that gives the public the opportunity to access understandable and comprehensive information, using the one-stop-shop principle • ensure that the public's concerns about health and other impacts are taken seriously
For large-scale sites, the provision of information and participation take place at a sufficiently early stage in the planning process so that the public has the opportunity to influence decision making.	**Communications experts and actors** • draw up recommendations and instructions regarding the scope of interactive activities and how they should be carried out in projects of different sizes
Development of an open information portal, where information on publicly funded investigation, remediation and pilot projects is collected for use in other similar projects and national summaries.	**Companies, together with the Finnish Environment Institute** • draw up detailed descriptions and evaluations of new investigation, assessment and risk management methods and their applicability at different kinds of sites • collect descriptions and final reports on publicly funded research, remediation and pilot projects, including cost data

3 Assessing the impacts of the Strategy

The most important impacts of the National Risk Management Strategy for Contaminated Land are the advancement of the protection of health and the environment, making investigation and remediation activities for contaminated land more efficient, developing sustainable investigation and remediation methods, and encouraging cleantech business operations. Improving the scope and quality of data systems will mean that data can be better utilised in processes such as decision-making on land use policy. Public awareness and understanding of soil contamination will be improved through interactive communications. The idea of soil contamination as a difficult problem will change when new operating models and a comprehensive approach to risk management are established. The economic effects of the Strategy will be primarily positive. Implementation of the Strategy also supports the meeting of several international and national political objectives and obligations.

3.1 Impacts of the Strategy

The most significant impact the Strategy will have will be the advancement of the protection of health and the environment, which will be realised when the goal of the National Investigation and Remediation Programme is achieved. Significant risk sites are to be identified, investigated, and remediated, if necessary. Anticipatory actions will reduce the harm and danger to health or the environment caused by harmful substances, as well as reduce the need for urgent and expensive risk management measures.

A significant proportion of the economic and administrative impacts will come from the implementation of the National Investigation and Remediation Programme and the realisation of sustainable and diverse remediation solutions. Significant cost savings can be made by taking into account soil contamination at a sufficiently early stage, by recycling materials, and by implementing appropriate risk management solutions in the areas. The most significant administrative impacts will be related to the creation and operation of a

centralised organisation for the National Investigation and Remediation Programme, as well as the development and standardisation of operation models and practices.

The majority of the economic impacts of the private sector are linked to the investigation and remediation of sites. Due to the Strategy, risk management solutions will become more diverse and focus points will change. Demand will cause a shift away from treatment by excavation and transport companies to those companies that are treating and utilising excavated soil. Increasing utilisation will facilitate new cleantech business.

The implementation of the Strategy will also have other, partially indirect, societal impacts. For example, regional equality will progress as the investigation and remediation programme allows the remediation of risk sites located outside growth centres. The key informative impacts include making the utilisation of data on contaminated land more effective in order to support decision-making, for example, in land use planning.

Tabel 6. Evaluation of the key impacts of implementing the Strategy.

Impacts of the Strategy
Environment and health • Health and environmental risks caused by contaminated sites will be assessed and will reach a nationally acceptable level by 2040. • Operations will be focused on sites important in terms of health and the environment, particularly protection of groundwater areas and water supply. • The investigation and remediation of the most significant and urgent sites will be supported by secondary financing systems. • Reuse of excavated soil from contaminated sites, either as it is or after treatment, will help to conserve natural resources and reduce the need to take areas in their natural state into use as soil extraction areas. • The use of energy in remediation work will be reduced when the need for transport of excavated soil decreases and when new remediation methods are taken into use. • Emissions from the excavation, remediation and treatment of excavated soil will decrease when new techniques and operating models are taken into use. • Disposal sites will be utilised sparingly and their environmental impacts will be reduced, thus decreasing the need for the construction of new disposal sites.
Finance and administration • Pre-emptive measures can reduce the need for urgent and expensive risk management solutions. • Sensible land use planning at an early stage will reduce the possibility of risks and the need for remediation. • Contaminated land can be better integrated into land use planning at an early stage, thus speeding up the processes and bringing savings. • Risk-based remediation will reduce unnecessary actions and direct them towards the reduction of real risks. • Operations are to be focused on significant risk sites, so that investigations and remediation of non-urgent sites can be carried out in an appropriate way and at a suitable time in relation to the development and construction of the areas. • Development of training and communications will improve actors' expertise and professional skills, and operations will improve in quality and also become more efficient. • Organisation of training and production of training materials, more interaction and communications and development of data systems will increase the need for financial and human resources. • Harmonised practices, methods and models will speed up the projects and make the process more efficient.

- The National Investigation and Remediation Programme will be implemented cost efficiently, by centralising resources and putting investigations and remediation out to tender.
- Centralisation of government operations and making them more effective will facilitate the development of special administrative expertise and lead to resource and cost savings.
- Reuse of excavated soil is to be encouraged by developing regulatory policy instruments.
- A greater number of investigation and remediation operations will also help to increase the references for companies.
- The volume of excavated soil directed towards utilisation and treatment will facilitate development of cost-efficient practices and methods, and help to promote the expansion of the cleantech business sector.
- The Pilot Project for the Remediation of Contaminated Land, related to the National Investigation and Remediation Programme, will help to promote the development of investigation, assessment and risk management methods, and the strengthening of the cleantech sector.
- Innovations will occur that may have commercial value, thus supporting and advancing the development of businesses in this sector.

Other impacts

- General awareness and understanding of contaminated land will be increased, thus helping to dispel preconceptions.
- Communications and training will support the expertise of stakeholders and encourage them to develop their own practices and methods.
- Data collected will support decision-making at the regional level and in individual projects.
- The objectives will be defined together with different interest groups; thus on the basis of the decisions there will be wider acceptance and shared understanding.
- The data in data systems will be in a format that is easy to use and that supports planning and decision-making. Data will be open, easily accessible, and in a usable format.

3.2 Coherence with other policies

The implementation of the National Risk Management Strategy for Contaminated Land will also support the achievement of other international and national objectives relating to soil and water protection, land use and waste policies, for example. Furthermore, the Strategy will promote a circular economy and cleantech business operations, and also help to streamline regulations. Table 7 features the key objectives and obligations, and shows how they are to be supported by the Risk Management Strategy for Contaminated Land. The international objectives have been taken from UN and EU documentation, whilst at the national level, the sources used include strategies, programmes and legislation.

Tabel 7. Assessment of the key connections between the implementation of the Strategy and other policies.

Policy	Objectives and obligations supported by the implementation of the Strategy
Soil protection	• Soil protection and conservation, and prevention of degradation by 2030 • Risks posed by soil contamination will be reduced to an acceptable level • No (zero) net land taken into use by 2050 • Prevention of soil and groundwater contamination and responsibility for remediation **The Strategy supports these objectives by promoting** • investigation and remediation of contaminated land • better integration of contaminated land into land use planning • the reuse of contaminated areas
Land use	• A functional regional spatial structure, coherent urban structure and good quality living environment • Remedial measures needed for reducing the risks posed by contaminated land are clarified early on and taken into account in land use planning **The Strategy supports these objectives by promoting** • the enhancement of expertise on taking contaminated land into account early on in land use planning • better integration of contaminated land into land use planning • the reuse of contaminated sites
Water protection	• Surface and ground waters reach a good status by 2027 • Achievement of a good quantitative and chemical status of groundwater in all groundwater areas suitable for water supply • Prohibition on groundwater contamination and responsibility for remediation **The Strategy supports these objectives by promoting** • investigation and remediation of risk sites located in classified groundwater areas by 2027
Waste policy	• Promotion of the sustainable use of natural resources, and ensure that waste does not cause harm to health or the environment • Prevention of waste generation, increase in the recycling of waste, ensure that waste treatment causes no harm, and reduction in the disposal of waste in landfills • Limitations on the use of landfills by restricting the types of waste accepted at them **The Strategy supports these objectives by** • always ensuring that there are opportunities for the reuse of excavated soil • development of on *site* - and *in situ* -remediation techniques and support of the use of them
Circular economy and cleantech sector	• Promotion of resource efficiency, and reuse and recycling of waste • Promotion of markets for waste materials and cleantech businesses • Development of expertise and training of experts, ecodesign and innovation that supports recycling markets • Development and use of cleantech in waste management and recycling • Promotion of new kinds of partnerships and value chains that support resource efficiency **The Strategy supports these objectives through** • development of expertise and training in investigation and remediation methods for contaminated land • support of the development of technical innovations and the strengthening of cleantech businesses
Streamlining regulations and improving their effectiveness	• Regulations are streamlined and their effectiveness improved • More efficient coordination of land use planning • Development of electronic systems and procedures **The Strategy supports these objectives through** • closer cooperation between different authorities and other stakeholders • the streamlining of operating methods concerning risk management of contaminated sites • improvements in electronic data systems and their usage • implementation of the National Investigation and Remediation Programme, which is managed by a centralised organisation

4 Monitoring the implementation of the Strategy

The implementation of the National Risk Management Strategy for Contaminated Land and the achievement of the objectives will be monitored through indicators. The indicators will be used to assess the achievement of the specified objectives, and to re-evaluate the priorities and related measures. Implementing the Strategy will take over 20 years, which means that there may be changes in the operating environment and in the understanding of the problems and priorities related to contaminated land, or concerning the objectives and expectations of the Strategy.

An interim evaluation of the National Investigation and Remediation Programme will be carried out after the three-year Pilot Project on the Remediation of Contaminated Land has been completed in 2018. In connection with this, the level of the Investigation and Remediation Programme will be assessed and adjusted to suit the financial frameworks. A broader evaluation will be carried out in 2027, with the objective that the most urgent class A1 risk sites located in groundwater areas will be investigated and remediated. After ten years, the programme will be about halfway through its implementation. The interim evaluation will also include an assessment of how the implementation of the entire National Risk Management Strategy for Contaminated Land is proceeding, and it will examine the need for changes. It will also include an assessment of and updates to the Strategy's objectives.

The indicators have been selected to ensure that they show the progress of the measures and achievement of the objectives, and how the associated data collection can be carried out with as little additional work as possible, using existing data systems (Table 8). Some of the indicators, such as 'Improvement of knowledge and expertise' will require a separate report.

Tabel 8. Indicators linked to monitoring the implementation of the Strategy.

Measure	Indicator	Data sources
Risk sites are identified, investigated and if necessary, remediated in accordance with the objectives of the programme.	Investigation and remediation of sites classified as urgent, number per year	Programme statistics MATTI statistics Authority permits
Functionality of the state financing system	Investigation and remediation of orphan sites classified as urgent, number per year Costs/site	Programme statistics
Implementation of sustainable land use	Remediation related to land use changes Risk management objectives	MATTI statistics Permits/notifications Authorities' permits
Development of technology for treating excavated soil and utilisation of excavated soil	Utilisation sites and volume of excavated soil Treatment technologies and volume of excavated soil used	Waste statistics MATTI statistics
Conservation of natural resources and promotion of a circular economy	Reuse of excavated soil Proportion of in situ remediation	Waste statistics MATTI statistics Permits/notifications
Improvement in knowledge and expertise	Educational and other communication material produced Arranging of training and education	Separate report
Increase in the scope and reliability of data systems, and a broadening of the utilisation of data	Coverage and updating of site data Data system searches and queries	MATTI statistics Usage data for the national data exchange layer

5 Strategy preparation process

The National Risk Management Strategy for Contaminated Land was prepared by a working group appointed by the Ministry of the Environment. The members of the working group represented various interests, with broad expertise, from

- the Ministry of the Environment,
- the Ministry of Finance,
- the Finnish Environment Institute,
- regional Centres for Economic Development, Transport and the Environment,
- the Finnish Oil Pollution Compensation Fund,
- the Association of Finnish Local and Regional Authorities and
- the National Institute for Health and Welfare.

The working group started its task in October 2014 and completed its work in October 2015. There was a project group of experts assisting the working group. Additionally, preparatory work was carried out in six sub-groups, each working on one of the main objectives of the Strategy. The groups contained experts from different stakeholders. The secretariat was responsible for the preparation and writing of the Strategy documents and assisting the working and project groups. The working group maintained a close interaction with multiple interest groups that included representatives from the environmental administration, regional authorities, major landowners, consultants, industry representatives, as well as researchers and experts in research institutes and universities. The preparation process included different participatory methods like workshops, meetings, interviews and commentaries.

Whilst carrying out the Strategy work, the working group met 10 times, the project group nine times, and each sub-group 1–5 times. Part of the Strategy work entailed sending an email questionnaire to ELY Centre experts in contaminated land (approx. 30 individuals) about the Strategy's objectives and the current state, problems and development suggestions for the State Waste Management System. Additionally, they were sent drafts at the different stages of the Strategy preparations for comment.

The Strategy was presented and discussed at different stages in a number of forums and events, including contaminated land consultation days, annual days of the Finnish Society for Soil Investigation and Remediation (MUTKU), meetings of environmental managers at the regional Centres for Economic Development, Transport and the Environment, a seminar for contaminated land experts in the Nordic countries, and the AquaConSoil conference in Copenhagen.

The 2014–2015 schedule for the Strategy work features the key meetings and other events in the preparation process (Figure 10).

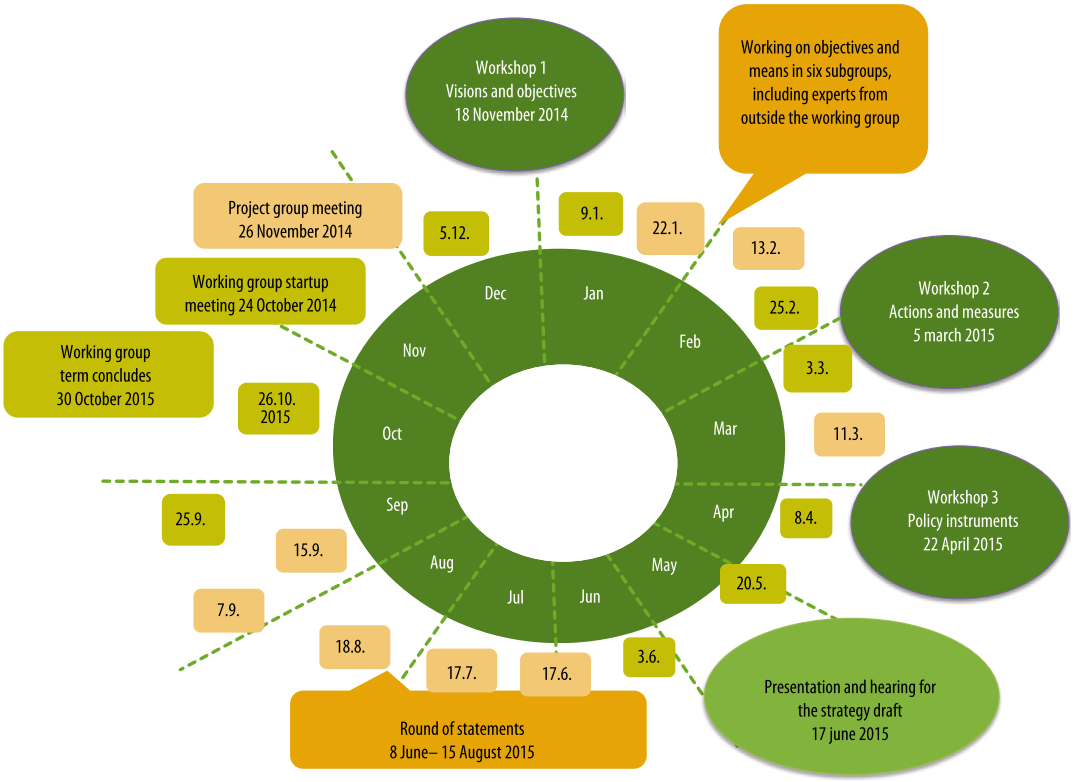


Figure 10. Schedule for the preparation of the Strategy in 2014–2015. The dates of the working group and project group meetings are coded according to the colour of the relevant group.

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